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Air Quality

Ambient air quality, or the quality of the surrounding air, may be affected by air pollutants produced by motor vehicles, referred to as "mobile sources"; by fixed facilities, usually referred to as "stationary sources"; or by a combination of both. Under CEQR, an air quality assessment determines both a proposed project's effects on ambient air quality as well as the effects of ambient air quality on the project.

Introduction

This section examines the potential for air quality impacts from the Proposed Development. According to the *2021 CEQR Technical Manual*, air quality impacts can be characterized as either direct or indirect impacts. Direct impacts result from emissions generated by stationary sources, such as stack emissions from on-site fuel burned for boilers and heating, ventilation, and air conditioning (HVAC) systems. Indirect effects are caused by off-site emissions associated with a project, such as emissions from on-road motor vehicles ("mobile sources") traveling to and from a development site.

Consistent with the *2021 CEQR Technical Manual*, air quality analyses for a proposed project focus on these main areas of potential concern:

- Potential impacts from mobile sources introduced by a project.
- Emissions from a project's parking facilities.
- Potential impacts from project's HVAC system.

› Potential impacts on the Proposed Project from either manufacturing/processing facilities or large/major sources that are located near the Development Site.

The Development Site is located in East New York, Brooklyn on the south side of Flatlands Avenue between Louisiana and Pennsylvania Avenues. The Proposed Actions would facilitate development ten buildings ranging from two to 15 stories. The proposed building program for the site would include approximately 1,645,820 gsf of residential space accommodating approximately 2,050 residential units; approximately 100,904 gsf of community facility space, including general community facility space to include a day care (approximately 12,320 gsf), other community facility uses such as a senior center or medical clinic (approximately 9,900 gsf), and the existing CCC facility (78,684 gsf); approximately 110,570 gsf of commercial space that includes a grocery store (approximately 14,300 gsf) and local retail space (approximately 65,670 gsf), a trade school (approximately 14,100 gsf) to be located in one wing of the existing CCC building (thereby reclassifying approximately 14,100 gsf of existing community facility space to commercial space) and a PAC (approximately 16,500 gsf); and approximately 343,244 gsf of parking, including 145,684 gsf of below grade parking and a 197,560-gsf public parking garage that would accommodate accessory parking for the retail and community facility uses.[1] **Figure 14-1** shows the illustrative axonometric diagram for the Proposed Development.

Principal Conclusions

The air quality analysis addressed mobile sources, parking facilities, emissions from the HVAC and hot water systems and from industrial sources.

Mobile Sources

The number of incremental trips generated by the Proposed Actions would be higher than the screening thresholds for carbon monoxide (CO) and particulate matter ($PM_{2.5}$) identified in the *2021 CEQR Technical Manual*. A mobile source screening assessment was undertaken, which indicated the need for additional analysis. Based on screening analysis results and consultation with the NYC Department of City Planning (NYC DCP), the intersection of Louisiana Avenue and Flatlands Avenue was selected as a worst-case location. A microscale analysis for CO and PM was conducted for this location using the weekday traffic. The highest predicted CO and PM concentrations were below respective National Ambient Air Quality Standards (NAAQS) and the City's *de minimis* ~~value~~values.

Parking Facilities

A parking garage analysis was undertaken for the two largest proposed parking garages. One facility is a subgrade accessory parking garage that would be mechanically ventilated; the other is a naturally ventilated seven-story public parking garage. The accessory parking facility would be located under Buildings 3 and 4, while the public parking garage would be a standalone structure next to Buildings 9 and 10. The analysis determined that emissions

[1] The 197,560-gsf public parking garage includes 18,400 sf of flex space that would be provided on the roof to allow for increased parking capacity during the church's peak parking periods (Sundays and Tuesday evenings). At all other times, this space would be reserved for recreational space.

from both parking facilities would not result in a significant adverse air quality impact. Since the two other proposed accessory parking facilities (under Buildings 1 and 2 and Buildings 9 and 10) would have lower parking capacities and lower inbound and outbound traffic volumes, it was determined that no impacts would result from these facilities. Overall, no significant adverse air quality impacts are expected from the parking facilities.

Stationary Sources

An analysis of the potential for the Proposed Actions to result in stationary source impacts was undertaken. The detailed analysis of HVAC and hot water systems emissions from Buildings 1 through 10 and the PAC demonstrated that these buildings must use natural gas with low NO_x burners in their fossil fuel-fired heating and hot water systems[2] and ensure that the exhaust stacks are located at the highest proposed building tier and at specified height above grade to avoid any potential significant adverse air quality impact. Further, the exhaust stacks for Building 4 must be located at a certain horizontal distance from northern and eastern edge of the building to avoid potential significant adverse air quality impacts. These commitments are memorized in an (E) designation for the Proposed Actions (E-679). With these measures, the Proposed Development would not result in significant adverse stationary source air quality impacts.

Industrial Sources

No industrial sources were identified within a 400-foot radius of the Project Area and no large or major sources were identified within a 1,000-foot radius of the Project Area. Therefore, the analysis of industrial, large or major sources was not warranted.

[2] While the stationary source assessment assumes the use of natural gas for conservative analysis purposes, the Applicant may consider the use of electric heating and hot water systems.

Figure 14-1 Innovative Urban Village Site Axonometric Diagram



National Ambient Air Quality Standards

In accordance with the requirements of the Clean Air Act, as amended in 1990, the U.S. Environmental Protection Agency (EPA) has promulgated NAAQS (40 CFR part 50) for pollutants considered harmful to public health and the environment. The NAAQS are presented in **Table 14-1**.

The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of sensitive populations such as sick, children, and elderly populations. Secondary standards set limits to protect public welfare, including protection against decreased visibility and protections against damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called "criteria" pollutants. These six pollutants are ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) and less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), and lead (Pb). Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$).

These standards are reviewed periodically and may be revised. The State of New York has adopted similar standards as those set by the EPA, with the exception of sulfur dioxide, particulates, fluorides, and hydrogen sulfide.

Table 14-1 National and New York Ambient Air Quality Standards

Pollutant [links to historical tables of NAAQS reviews]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)		primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead (Pb)		primary and secondary	Rolling 3 month average	0.15 µg/m^3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2)		primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	1 year	53 ppb (2)	Annual Mean
Ozone (O_3)		primary and secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM)	$PM_{2.5}$	primary	1 year	12.0 µg/m^3	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m^3	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m^3	98th percentile, averaged over 3 years
	PM_{10}	primary and secondary	24 hours	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.
(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.
(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O_3 standards.
(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated non-attainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Pollutants of Concern

Air pollution is of concern because of its demonstrated effects on human health. Of special concern are the cardiovascular and respiratory effects of air pollutants and their potential toxic effects, as described below.

Carbon monoxide (CO) is a colorless and odorless gas that is a product of incomplete combustion. Carbon monoxide is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen carrying capacity of the blood. At low concentrations, CO has been shown to aggravate the symptoms of cardiovascular disease. It can cause headaches, nausea, and at sustained high concentration levels, can lead to coma and death.

Particulate matter is made up of small solid particles and liquid droplets. PM_{10} refers to particulate matter with a nominal aerodynamic diameter of 10 micrometers or less, and $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter of 2.5 micrometers or less. Particulates can enter the body through the respiratory system. Particulates over 10 micrometers in size are generally captured in the nose and throat and are readily expelled from the body. Particulates smaller than 10 micrometers, and especially particles smaller than 2.5 micrometers, can reach the air ducts (bronchi) and the air sacs (alveoli) in the lungs. Particulates are associated with increased incidence of respiratory diseases, cardiopulmonary disease, and cancer.

Nitrogen oxides (NO_X), the most significant of which are nitric oxide (NO) and nitrogen dioxide (NO_2), can occur when fossil fuel combustion temperatures are extremely high (such as in engines), and atmosphere nitrogen gas combines with oxygen gas. NO is relatively harmless to humans but quickly converts to NO_2. Nitrogen dioxide has been found to be a lung irritant and can lead to respiratory illnesses. Nitrogen oxides, along with VOCs, are also precursors to ozone formation.

Sulfur Dioxide (SO_2) emissions are the main components of the "oxides of sulfur," a group of highly reactive gases from fossil fuel combustion at power plants, other industrial facilities, industrial processes, and burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. High concentrations of SO_2 will lead to formation of other sulfur oxides. By reducing the SO_2 emissions, other forms of sulfur oxides are also expected to decrease. When oxides of sulfur react with other compounds in the atmosphere, small particles that can affect the lungs can be formed. This can lead to respiratory disease and aggravate existing heart disease.

Regulatory Context

The 1990 Clean Air Act with Amendments resulted in states being divided into attainment and non-attainment areas, with classifications based upon the severity of their air quality problems. Air quality control regions are classified and divided into one of four categories: attainment, unclassified, maintenance, or non-attainment depending upon air quality data and ambient concentrations of pollutants. Attainment areas are regions where ambient concentrations of a pollutant are below the respective NAAQS; non-attainment areas are those where concentrations exceed the NAAQS. Maintenance areas are former non-attainment that achieved attainment. An unclassified area is a region where data are insufficient to make a determination and is generally considered as an attainment area for

administrative purposes. A single area can be in attainment of the standards for some pollutants while being in non-attainment for others.

Kings County is designated as a serious non-attainment area for the 2008 8-hour ozone standard and a moderate non-attainment area for the 2015 8-hour ozone standard. Both designations are part of the larger New York-Northern New Jersey-Long Island, NY-NJ-CT non-attainment areas. Kings County has been designated as a maintenance area for CO as of May 20, 2002, and for the 2006 $PM_{2.5}$ standard as of April 18, 2014. Kings County is in attainment for all other criteria pollutants (PM_{10}, Pb, NO_2, and SO_2).

Impact Criteria

The predicted concentrations of pollutants of concern associated with a proposed project are compared with either the NAAQS for criteria air pollutants or ambient guideline concentrations for non-criteria pollutants. In general, if a project would cause the standards for any pollutant to be exceeded, it would likely result in a significant adverse air quality impact. In addition, the City's de minimis criteria are also used to determine significance of impacts for CO and $PM_{2.5}$.

CO De Minimis Criteria

New York City has developed de minimis criteria to assess the significance of the increase in CO concentrations that would result from the introduction of project-generated mobile sources, as set forth in the *CEQR Technical Manual*. These criteria set the minimum change in CO concentration that defines a significant adverse environmental impact. Significant increases of CO concentrations in New York City are defined as:

- An increase of 0.5 ppm or more in the maximum eight-hour average CO concentration at a location where the predicted No-Action eight-hour concentration is equal to or between 8.0 and 9.0 ppm; or
- An increase of more than half the difference between baseline (i.e., No-Action) concentrations and the eight-hour standard, when No-Action concentrations are below 8.0 ppm.

$PM_{2.5}$ De Minimis Criteria

New York City uses de minimis criteria to determine a project's potential to result in a significant adverse $PM_{2.5}$ impact under CEQR. The de minimis criteria are as follows:

- Predicted increase of more than half the difference between the background concentration and the 24-hour standard;
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.1 µg/m3 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 µg/m3 at a discrete receptor location (elevated or ground level).

Non-Criteria Pollutant Thresholds

Non-criteria, or toxic air pollutants include a multitude of pollutants of variable toxicity. No federal ambient air quality standards have been promulgated for toxic air pollutants. However, NYSDEC has issued guideline non-criteria pollutant ambient air concentrations and acceptable risk management range to determine the potential effects to the public.

The NYSDEC DAR-1 guidance document presents guideline concentrations in micrograms per cubic meter (µg/m^3) for the one-hour (SGC) and annual average time (AGC) periods for various air toxic compounds[3]. The offsite concentration should not exceed the SGC at any time.

In order to evaluate residual risk of non-carcinogenic toxic air emissions, hazard index is calculated based on annual exposure limits. If the combined ratio of pollutant concentration divided by its annual exposure threshold for each of the toxic pollutants is found to be less than 2.0, according to DAR-1, the residual risk is deemed acceptable.

In addition, the potential cancer risk associated with each carcinogenic pollutant, as well as the total cancer risk of the releases of all the carcinogenic toxic pollutants combined, can be estimated. If the total incremental cancer risk of all the carcinogenic toxic pollutants combined is less than ten-in-one million, the residual risk is deemed acceptable.

Background Concentrations

Background concentrations are ambient pollution levels associated with existing stationary, mobile, and other area emission sources, but not with the Proposed Development. The latest three years of monitoring data (2018 to 2020) from the representative monitoring stations were used to develop background concentrations for all pollutants. CO, NO_2 and ozone levels were collected at the Queens College monitoring station located at 65-30 Kissena Boulevard, $PM_{2.5}$ -- from the station at JHS 126, 424 Leonard Street in Brooklyn. 1-hour and annual NO_2 background concentrations were developed from monitoring data collected in 2017-2019 to account for pre-COVID conditions. These concentrations were estimated using the form of the NAAQS (see the "Form" column in **Table 14-1** for more information).

Table 14-2 summarizes the background concentrations for each of the pollutants.

Potential CO and $PM_{2.5}$ impacts are also assessed on an incremental basis and compared with the respective CO or $PM_{2.5}$ *de minimis* criteria. Based on the background concentrations, the 8-hour CO *de minimis* is 3.7 ppm, 24-hour $PM_{2.5}$ *de minimis* is 8.2 µg/m^3.

[3] NYSDEC DAR-1 - http://www.dec.ny.gov/docs/air_pdf/dar1.pdf.

Table 14-2 Background Concentrations

Pollutant	Averaging Time	Monitoring Location	Background Concentration
Carbon Monoxide	1-Hour	Queens College 2	2.1 ppm
	8-Hour	Queens College 2	1.6 ppm
Nitrogen Dioxide (NO_2)	1-Hour	Queens College 2	104.1 µg/m^3
	Annual	Queens College 2	27.5 µg/m^3
Particulate Matter ($PM_{2.5}$)	24-Hour	JHS 126	18.7 µg/m3
	Annual	JHS 126	7.6 µg/m3
Particulate Matter (PM_{10})	24-Hour	Queens College 2	34.3 µg/m3

Source: EPA Monitor Values Report, Outdoor Air Quality Data, https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

Methodology and Screening Analyses-Mobile Sources

Mobile Sources

Mobile Source Screening Analysis

A screening analysis of mobile source emissions of Carbon Monoxide (CO) and Particulate Matter (PM) on ambient pollutant levels in the study area was conducted pursuant to guidance in the *2021 CEQR Technical Manual*. For the project's study area, as described in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*, the threshold for conducting an analysis of CO emissions corresponds to 170 project-generated vehicles at a given intersection in the peak hour. The need for conducting an analysis of PM emissions is based on road type and the number of project-generated peak hour heavy-duty diesel vehicles or its equivalency (HDDVs) in vehicular $PM_{2.5}$ emissions as determined using the worksheet ~~provided~~referenced on page 17-12 of the *2021 CEQR Technical Manual*.

Detailed Mobile Source Analysis

The CEQR threshold for CO and $PM_{2.5}$ were exceeded at several intersections. The intersections were ranked by the generated traffic volume, HDDVs, and level of service for weekday, Saturday and Sunday to select the worst-case location(s) for modeling. One intersection, Louisiana Avenue and Flatlands Avenue, was selected for detailed modeling based on the ranking results and in consultation with the lead agency, NYC DCP. Detailed microscale analysis of particulate matter ($PM_{2.5}$ and PM_{10}) and CO was conducted for this intersection.

Vehicle Emissions

Vehicular CO, PM emission factors utilized in the dispersion modeling were computed using the latest version of the EPA's Motor Vehicle Emission Simulator, MOVES3. This emissions model is capable of calculating engine emission factors for various vehicle types, based on the fuel type (gasoline, diesel, or compressed 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 an inspection maintenance program.

MOVES input files (i.e., fuel data, county-specific hourly temperature and relative humidity data, inspection/maintenance coverage, etc.) for ~~Queens~~Kings County were obtained from NYSDEC. Source type age distribution data were obtained from NYSDEC and processed using the EPA's *Age Distribution Projection Tool for MOVES3*.[4]

Traffic Data

Traffic information from **Chapter 13, Transportation** and speeds developed specifically for this analysis on the basis of speed runs collected for the project were used to estimate emissions and to develop geometries for the dispersion modeling.

CO Emissions

CO emissions were estimated for the month of January, which is the highest month of the year for CO emissions. MOVES3 runs for CO were conducted for ~~four~~two peak periods (weekday ~~AM, midday,~~ PM and Saturday midday) for both No-Action and With-Action conditions.

PM Emissions

Following the EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Non-attainment and Maintenance Areas*,[5] particulate matter MOVES runs were conducted for January, and for the peak AM, midday, PM, and overnight time periods. For peak AM, midday, and PM analyses, traffic volumes were based on volumes presented in **Chapter 13, Transportation**. For the overnight period, the midday traffic volumes were used as a reference and were then factored down to reflect projected overnight volumes. The runs were made for the No-Action and With-Action conditions for each link used in the intersection model utilizing link-specific parameters and data.

Fugitive Dust

In addition to exhaust, tire and brake-wear emission factors estimated by MOVES3 for particulate matter, fugitive dust emissions were estimated using EPA's Compilation of Air Emissions Factors (AP-42)[6] guidance for paved roads. Fugitive dust emissions were used in the short-term, 24-hour modeling of $PM_{2.5}$ and PM_{10}. Consistent with NYCDEP's conclusion that fugitive dust has insignificant contribution on the neighborhood scale, fugitive dust emissions were not used in the annual $PM_{2.5}$ modeling (i.e., neighborhood scale analysis).

Dispersion Model

The EPA AERMOD model (version 21112) was used in the analyses of CO, $PM_{2.5}$ at the selected intersections. The intersection links were modeled using the line source option in the model and following the EPA's PM Transportation Conformity Guidance. Initial vertical and horizontal dimensions and source release heights were determined based on the source

[4] EPA. Age Distribution Projection Tool for MOVES3.xlsx <Tools to Develop or Convert MOVES Inputs | US EPA>

[5] https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100NMXM.pdf

[6] EPA. AP-42, chapter 13.2.1 Paved Roads. https://www.epa.gov/sites/production/files/2020-10/documents/13.2.1_paved_roads.pdf

types in the fleet as described in Appendix J.3 to the EPA PM Guidance. CO analysis used peak hour emission rates at each link, while PM analysis utilized variable hourly emission rates.

Receptor Placement

Sensitive receptors near the intersection were placed at the existing sidewalks under No-Action and With-Action conditions at 1.8 meters above grade. For the assessment of short-term impacts, receptors were placed at the sidewalks around the intersection at approximately 10 feet from the curb. For compliance with the annual neighborhood $PM_{2.5}$ criterion, receptors were placed at 15 meters away from the curb.

Analysis Year

The mobile sources analyses were performed for 2031, the analysis year for this EIS.

Meteorological Data

Dispersion analysis used the latest available five years (2016-2020) of hourly meteorological observations from JFK Airport National Weather Service station and upper air data obtained from the Brookhaven station, New York. JFK Airport is located not far from the project location in East New York and was considered to be more representative of the Project Area than LaGuardia Airport.

Parking Facilities

Under the With-Action condition, several parking garages would be constructed on the Development Site. This includes a naturally ventilated multi-level public parking garage and three below grade mechanically ventilated accessory parking garages under Buildings 1 and 2, Buildings 3 and 4, and Buildings 8 and 9. The potential for air quality impacts was estimated for the above-grade public parking garage and from the largest of the three mechanically ventilated accessory parking garages. In consultation with the MEP engineer for the project it was determined that above-parking entrance louvers would be used for the ventilation of exhaust from the below grade accessory parking garages. The parking facilities were analyzed following the procedures described in sections 311.2 and 321.2 in Chapter 17 of the *2021 CEQR Technical Manual* and as detailed in the Appendix to this chapter.

Stationary Sources

HVAC Analysis

The Proposed Project would include a total approximate 2,200,538-gsf development with ten buildings ranging from two to 15 stories. Based on the number of proposed buildings, the *2021 CEQR Technical Manual* requires a detailed dispersion analysis using the EPA's AERMOD model. For conservative analysis purposes it was assumed that the proposed buildings would utilize natural gas-fueled low NO_x boilers for the HVAC and hot-water systems. However, it should be noted that the Applicant may consider the use of electric heating and hot water systems. The HVAC analysis assesses the potential for cumulative

emissions from the proposed buildings and for emissions from each individual building to significantly impact the nearest receptor buildings.

AERMOD Dispersion Modeling

The dispersion modeling for the HVAC analysis was conducted using AERMOD version 21112. AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions. The AERMOD model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data and has the capability to calculate pollutant concentrations at locations where the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by nearby structures. AERMOD can be run with and without building downwash. The downwash option accounts for the effects on plume dispersion created by the structure the stack is located on, and other nearby structures.

Emission Rates and Stack Parameters

The MEP engineer for the project provided information on HVAC and hot water equipment. As described above, it was assumed that natural gas would be used for HVAC and hot water.[7] Short-term emission rates for the proposed HVAC and hot-water systems were estimated using the MEP-provided boiler sizes and emission factors from AP-42, EPA's Compilation of Air Emissions.[8] Annual emission rates were calculated using short-term emission rates and a factor of 100/365.

Exhaust stack parameters such as temperature, velocity and diameter were obtained from the MEP specifications. Exhaust stacks for the proposed HVAC and hot-water systems were analyzed on the highest roof of each respective building and were assumed to rise 3 feet above the tallest mechanical bulkhead of each building.

Methodology Utilized for Estimating NO_2 Concentrations

The 1-hour NO_2 concentration associated with the Proposed Development was estimated using the AERMOD Plume Volume Molar Ratio Method (PVMRM) module. The PVMRM module limits the NO_x to NO_2 conversion by considering NO_2 formation based on the amount of ozone within the plume volume. Hourly background ozone concentrations from the Queens College ambient monitoring station for the latest five years (2016-2020) of hourly data were incorporated into the model. Hourly background NO_2 concentrations from the Queens College monitoring station for the years 2017 to 2019 (as opposed to latest three years of 2018-2020) were conservatively used to account for higher concentrations from pre-COVID conditions. Overall, the total 1-hour NO_2 concentration was estimated using 5 years of background ozone concentrations and seasonal hourly background NO_2

[7] While the stationary source assessment assumes the use of natural gas for conservative analysis purposes, the Applicant may consider the use of electric heating and hot water systems.

[8] https://www.epa.gov/sites/production/files/2020-09/documents/1.4_natural_gas_combustion.pdf

concentrations directly in the model. The annual NO_2 concentrations were estimated using the 0.75 conversion rate.

Receptor Locations

Receptors were placed on the nearest affected receptor buildings. The nearest receptors to the proposed buildings would be the other buildings that would be constructed in conjunction with the Proposed Development. Therefore, receptors were placed 20 feet apart horizontally on each floor of the proposed buildings.

Meteorological Data

The same meteorological data that was used in the mobile source analysis was used in the HVAC analysis.

Industrial Source Analysis

As described in Section 220 and Section 321 in Chapter 17 of the *CEQR Technical* Manual, an air quality assessment is required to evaluate the potential impacts of air toxics emissions from ventilation exhaust systems of manufacturing or processing facilities within a 400-foot radius of a project site when a project would result in new sensitive uses (particularly residences, schools, hospitals, or parks). If any sources are identified, a screening analysis is performed based on Table 17-3 in Chapter 17 of the *CEQR Technical Manual*. The screening table provides the maximum 1-hour, 8-hour, 24-hour and annual average modeled values based on a generic emission rate of 1 gram per second of a pollutant from a 20-foot-tall point source for the distances between 30 feet and 400 feet from the receptor of same height. Potential impacts predicted from the industrial source of concern based on the screen table are compared with the short-term guideline concentrations (SGCs) and annual guideline concentration (AGCs) recommended in NYSDEC's DAR-1 AGC/SGC Tables. If a proposed project fails the above screening analysis, or the screening analysis methodology is not applicable to the project, further refined analysis using EPA's AERSCREEN and/or AERMOD model is warranted to determine any potential for significant adverse impacts.

Large or Major Source Analysis

As described in Section 220 and Section 321 in Chapter 17 of the *CEQR Technical Manual*, an air quality assessment is required to evaluate the potential impacts of emissions from a "large" or "major" emission source within a 1,000-foot radius of a project site. "Major" sources are identified as those sources located at Title V facilities that require Prevention of Significant Deterioration permits. "Large" sources are identified as sources located at facilities that require a State Facility Permit. A detailed analysis is usually performed for such sources, if any are identified, to determine any potential for significant adverse impact.

Existing Condition

Existing conditions in the area are characterized by the monitored concentrations representative of the Project Area. The background concentrations (see **Table 14-2**) are representative of the existing conditions in the Project Area for the presented pollutants. Pollutant concentrations that are not shown in **Table 14-2** are presented in the **Table 14-3**.

Lead concentrations are monitored at only one location in New York City, in the Bronx at IS 52 at 681 Kelly Street. Ozone and SO_2 concentrations were collected at the same Queens College monitoring station as CO, PM_{10} and NO_2 concentrations for **Table 14-2**. Concentrations of all pollutants except ozone are below their respective NAAQS. Ozone concentrations slightly exceeded the 2015 8-hour standard which corresponds with the non-attainment status of Kings County, where the project would be located.

Table 14-3 Existing Monitored Concentrations (2018-2020)

Pollutant	Averaging Time	Concentration	NAAQS
Lead	3-month	0.0033 µg/m^3	0.15 µg/m^3
Ozone	8-Hour	0.071 ppm	0.070 ppm
Sulfur Dioxide	1-Hour	5.7 ppb	75 ppb

Source: VHB, Inc. March 2022
ppm: parts per million; ppb: parts per billion

Assessment

Mobile Sources

Screening Analysis

The Proposed Actions would facilitate a mixed-use development with residential, local retail and community facility uses. As described in **Chapter 13, Transportation**, the Proposed Development would generate mostly auto trips. The generated peak hour (AM, MD, PM, Saturday, and Sunday) trips were screened using the CEQR screening threshold for CO and $PM_{2.5}$. The Project Area has a number of signalized and unsignalized intersections that would be affected by the Proposed Development. **Table 14-4** and **Table 14-5** list signalized intersections ranked by the number of total generated trips for the weekday and weekend, respectively. Several intersections failed the CO screening threshold of 170 trips per peak hour. The failing intersections in **Table 14-4** and **Table 14-5** are highlighted in bold.

The Proposed Development would not generate heavy-duty diesel vehicle trips, but it will create truck and shuttle bus trips. As shown in **Table 13-9** of **Chapter 13, Transportation**, the number of incremental truck and shuttle bus trips would be highest during the weekday AM peak hour, with a maximum of 38 trips. It is anticipated that the truck trips generated by the Proposed Development would be delivery vehicles (class 3 trucks) and shuttle buses (HDDV3). Shuttle bus trips would be expected to concentrate around the Project Site, while truck volumes would be the highest along the Pennsylvania Avenue corridor. The equivalent $PM_{2.5}$ emissions from the generated vehicles considered LDGT1 and the HDDV3 trips. The resultant trips would exceed the CEQR threshold. Therefore, a microscale intersection PM analysis is warranted.

Based on the screening results presented in **Table 14-4** and **Table 14-5**, on $PM_{2.5}$ screening and in consultation with NYC DCP, the intersection of Louisiana Avenue and Flatlands Avenue was selected for the detailed mobile source analysis.

Table 14-4 Weekday Signalized Intersections Project-Generated Trips Screening

	AM		MD		PM	
Intersection	**Vehicle Volume**	**LOS**	**Vehicle Volume**	**LOS**	**Vehicle Volume**	**LOS**
Flatlands and Georgia	**319**	B	**276**	B	**438**	B
Flatlands and Louisiana	**320**	D	**296**	D	**410**	D
Flatlands and Pennsylvania	**287**	D	**212**	C	**279**	D
Flatlands and East 108 Street	**188**	C	159	C	**218**	D
Cozine and Pennsylvania	**173**	D	133	C	**173**	D
Stanley and Pennsylvania	**181**	C	129	C	164	C
Wortman and Pennsylvania	**175**	D	130	C	168	C
Linden Blvd and Pennsylvania	**173**	F	120	E	152	E
Flatlands and Rockaway Pkwy	134	D	106	D	141	E
Twin Pines Drive East and Pennsylvania	127	B	97	B	135	C
Vandalia and Pennsylvania	122	C	87	D	124	C
Seaview and Pennsylvania	119	D	82	C	113	C
Vandalia and Louisiana	90	B	90	B	130	B

Source: VHB, Inc. March 2022

In order to select the appropriate condition for the PM analysis, the weekday and the weekend, Saturday and Sunday, conditions were considered. The weekend conditions reflect the trips associated with retail and community facility uses and additional trips related to church services on Sundays. Trips generated during weekend peak periods are presented in **Table 14-5**. While the weekend peak hour volumes are higher than the weekday peak hour volumes, the average weekend incremental trips are comparable to or lower than the weekday volumes because of the lower increment during the other hours of the day. Sunday vehicle increments are directly related to the two church services and are limited to pre- and post-service times. Saturday incremental vehicle trips are higher during midday hours, but the average daily trips would be similar to the weekday. As such, it is anticipated

that the 24-hour PM weekday impacts would be similar to or higher than on a weekend. Therefore, weekday impacts were considered in the PM analysis.

Table 14-5 Weekend Signalized Intersections Project-Generated Trips Screening

	Saturday		Sunday	
Intersection	**Volume**	**LOS**	**Volume**	**LOS**
Flatlands and Georgia	**497**	B	**571**	C
Flatlands and Louisiana	**422**	E	**395**	E
Flatlands and Pennsylvania	**305**	D	**320**	D
Flatlands and East 108 Street	**235**	E	**237**	N/A
Cozine and Pennsylvania	**184**	D	**189**	N/A
Stanley and Pennsylvania	**178**	D	**186**	N/A
Wortman and Pennsylvania	**179**	C	**185**	N/A
Linden Blvd and Pennsylvania	164	D	**173**	N/A
Flatlands and Rockaway Pkwy	153	F	158	N/A
Twin Pines Drive East and Pennsylvania	138	B	143	D
Vandalia and Pennsylvania	128	C	136	E
Seaview and Pennsylvania	119	C	125	D
Vandalia and Louisiana	123	B	118	B

Source: VHB, Inc. March 2022

Microscale Intersection Analysis

Microscale intersection analysis compares the future No-Action condition to the With-Action condition at the intersection selected for analysis. It is assumed that if no significant adverse impacts are identified at the selected intersection with the highest volumes and poor level of service, other intersections would not experience significant adverse air quality impacts.

In the No-Action condition, the Proposed Development would remain unchanged from existing conditions. The No-Action condition considers the effects of background growth and growth generated by known projects (e.g., developments that are under construction,

planned, or proposed by the 2031 build year; see **Table 13-32** in the **Chapter 13, Transportation**).[9]

CO Analysis

Emissions from vehicles at the intersection selected for analysis were estimated using EPA's MOVES3 mobile source emissions model and NYSDEC inputs for Kings County. The analysis was conducted for the two highest peak periods, the weekday PM, and the Saturday peak hours. It is anticipated that if no adverse impacts are identified during the highest peak hours, there would not be adverse impacts during the other hours. CO emissions were conservatively estimated using the month of January as the PM peak hour emissions. The other assumptions are described above in the **Analysis Approach** section.

The results of the AERMOD analysis are presented in **Table 14-6** for the highest CO concentrations. All estimated concentrations were below respective CO NAAQS and CEQR *de minimis* criterion.

Table 14-6 Highest 1-Hour and 8-Hour CO Concentrations for No-Action and With Action Conditions in 2031 (ppm)

		1-Hour		8-Hour		
Intersection	**Time Period**	**No-Action[1]**	**With Action[2]**	**No-Action[1]**	**With Action[2]**	**Increment**
Louisiana & Flatlands Ave	Weekday PM	2.7	2.9	2.0	2.1	0.11
	Saturday	2.8	3.4	2.1	2.4	0.36
CO NAAQS/*de minimis*		**35**		**9**		**3.7**

Source: VHB, Inc. March 2022
Note:
No-Action and With Action total results include background concentrations from **Table 14-2.**

~~Source: VHB, Inc. March 2022~~
~~Notes:~~
~~[1] No-Action and With-Action concentrations are highest second highest 1 or 8-hour concentrations.~~
~~[2] Resultant concentrations include background concentrations from *Table 14-2*.~~

The highest impacts were estimated for the Saturday peak period. As the results show, the highest modeled concentrations under the No-Action and With Action conditions at the selected intersections were below the 1 and 8-hour NAAQS. The 8-hour impact of the With Action condition over the No-Action was below the CEQR *de minimis* criterion for CO. As such, the Proposed Project would not adversely impact ~~the~~ CO levels near the affected intersections.

[9] The FEIS microscale intersection analysis has lower speeds in the overall With-Action condition and a greater difference in the speed increments as compared to the DEIS as a result of an adjustment made to the No-Action and With-Action condition speed equations. Subsequently, the analysis was refined to account for a more detailed link coverage close to the intersection. The vehicle source type percentages in the With-Action condition were adjusted to include shuttle buses generated by the Project.

PM Analysis

The particulate matter analysis was conducted to estimate the 24-hour $PM_{2.5}$ and PM_{10} and annual $PM_{2.5}$ concentrations and to compare them with the CEQR *de minimis* thresholds for 24-~~hours~~hour and ~~for the~~ annual ~~period~~$PM_{2.5}$, and NAAQS for PM_{10}. The 24-hour hourly traffic conditions were composed of blocks of time reflective of the AM, midday, and PM peak periods. The overnight traffic was estimated by using midday traffic as a reference and adjusting the volumes down. Weekend hour-by-hour 24-hour traffic is lighter than the weekday traffic and therefore impacts of weekend traffic emissions were assumed to be lower than weekday traffic emissions.

$PM_{2.5}$ concentrations were estimated for the 24-hour and annual periods. **Table 14-7** presents the 24-hour results in comparison with the 24-hour de minimis criterion and **Table 14-8** presents the annual results.

Table 14-7 Highest 24-Hour $PM_{2.5}$ Concentrations for No-Action and With Action Conditions in 2031 (μg/m³)

Intersection	Time Period	No-Action Impact	No-Action Total[1,2]	With Action Impact	With Action Total[1,2]	Increment
Louisiana Ave & Flatlands Ave	weekday	7.9	26.6	8.9	27.6	1.0
$PM_{2.5}$ NAAQS/ *de minimis*			**35**		**35**	**8.2**

Source: VHB, Inc. March 2022

Notes:

[1] ~~No~~[1]No-Action and With-Action impacts are the ~~average of 98th percentile of the annual 24-hour~~ concentrations ~~over the modeled five years of meteorological observations. These levels correspond to~~ associated with the highest 24-hour ~~impact of With-Action over~~$PM_{2.5}$ incremental concentration and are not in the form of 24-hour NAAQS. These higher levels were estimated for the purpose of calculating the ~~No-Action condition~~highest increment to compare to the CEQR *de minimis* threshold.

[2] No-Action and With Action total results include background concentrations from **Table 14-2**.

Table 14-8 Highest Annual $PM_{2.5}$ Concentrations for No-Action and With-Action Conditions in 2031 (μg/m³)

Intersection	Time Period	No-Action Impact[1]	No-Action Total[2]	With-Action Impact[1]	With-Action Total[2]	Increment
Louisiana Ave & Flatlands Ave	weekday	0.35	7.95	0.43	8.03	0.085
$PM_{2.5}$ NAAQS/*de minimis*			**12.0**		**12.0**	**0.1**

Source: VHB, Inc. March 2022

Notes:

[1] No-Action and With Action impacts are the average ~~levels~~concentrations over the modeled five years of meteorological observations corresponding to the highest annual incremental impact.

[2] No-Action and With Action total results include background concentrations from **Table 14-2**.

PM_{10} concentrations were estimated for the 24-hour period. Results of this analysis are presented in **Table 14-9** in comparison with the PM_{10} NAAQS.

Table 14-9 Highest 24-Hour PM_{10} Concentrations for With Action Conditions in 2031 ($\mu g/m^3$)

Intersection	Time Period	With Action Impact	With Action Total[1]
Louisiana Ave & Flatlands Ave	weekday	29.4	63.7
PM_{10} NAAQS			150

Source: VHB, Inc. March 2022
Notes:
[1] Total results include background concentrations from *Table 14-2*.

The results presented in **Table 14-7** through **Table 14-9** indicate that the 24-hour and annual $PM_{2.5}$ and 24-hour PM_{10} concentrations at the modeled intersection would be below the NAAQS for both No-Action and With-Action conditions. The 24-hour $PM_{2.5}$ increments of With-Action over the No-Action condition would be below the CEQR *de minimis* threshold for 24 hours at ~~all~~the modeled ~~intersections~~intersection. The annual $PM_{2.5}$ increments would be below the CEQR *de minimis* threshold for the annual averaging period.

Parking Assessment

Two types of parking garages are proposed on the Development Site; three below-grade accessory parking garages with a total of approximately 386 parking spaces and a seven-story public parking garage that would be naturally ventilated with approximately 500 spaces for the CCC, PAC and other visitors (see **Figure 14-2**). Accessory parking would be located under Buildings 1 and 2, Buildings 3 and 4, and Buildings 9 and 10. Each accessory garage would be mechanically ventilated with the louvres for the exhaust located above the entrance and exit ramps (see **Figure 14-2**).

An air quality analysis was conducted to assess the potential for impacts related to emissions from these parking garages. The analysis estimated emissions from the above-grade public parking garage structure and from the largest accessory garage as it would be the garage with the highest emissions and would be representative of the other two below-grade parking facilities. The selection between the accessory garages was based on the vehicular volumes arriving to and departing from each of these garages. The garage with the highest inbound and outbound trips was considered to be representative of the condition with the highest emissions. Further, the hourly ins and outs were examined to identify the hour of the highest vehicle volumes for each of the public and accessory garages selected for analysis. The hour with the highest vehicle volumes was considered to represent the hour of the highest emissions for the short-term analysis. The 24-hour and annual impacts were assessed using the highest 24-hour average of the ins and outs between the weekday, Saturday and Sunday.

The hourly ins and outs for the accessory garage under Buildings 3 and 4 are shown in **Table 14-10**. Based on the projected vehicle volumes, the Sunday 3 to 4 PM time period was selected for the analysis of the accessory parking. The Saturday 24-hour average was the highest and was used for the 24-hour and annual analysis.

Table 14-11 presents the hourly ins and outs for the public parking garage. Based on the hourly volumes the 10 to 11 AM hour on a Sunday was conservatively selected for the analysis of the public parking garage, and the Saturday average 24-hour ins and outs were used for the annual impacts.

Figure 14-2 Proposed Parking Garages



Table 14-10 Hourly In and Out Volumes for the Accessory Garage Under Buildings 3 and 4

	Weekday			Saturday			Sunday		
Time	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
12-1 AM	22	9	31	41	27	68	38	23	61
1-2 AM	8	3	11	26	14	40	29	13	42
2-3 AM	5	2	7	21	6	27	22	7	29
3-4 AM	4	3	7	15	8	23	15	4	19
4-5 AM	4	5	9	10	5	15	10	6	16
5-6 AM	5	17	22	5	7	12	5	4	9
6-7 AM	15	41	56	10	12	22	5	12	17
7-8 AM	38	99	137	22	38	60	16	25	41
8-9 AM	74	179	253	46	70	116	41	54	95
9-10 AM	56	103	159	63	100	163	57	90	147
10-11 AM	50	82	132	81	112	193	73	115	188
11 AM-12 PM	68	80	148	100	123	223	99	130	229
12-1 PM	88	87	175	115	136	251	106	132	238
1-2 PM	103	103	206	115	122	237	117	122	239
2-3 PM	90	90	180	126	121	247	114	124	238
3-4 PM	106	92	198	**154**	**158**	**312**	**154**	**166**	**320**
4-5 PM	**161**	**120**	**281**	135	120	255	113	109	222
5-6 PM	129	95	224	137	121	258	115	109	224
6-7 PM	108	97	205	120	106	226	117	93	2120
7-8 PM	132	100	232	107	100	207	108	86	194
8-9 PM	113	74	187	103	87	190	102	76	178
9-10 PM	91	53	144	86	67	153	73	56	129
10-11 PM	65	31	96	65	55	120	55	38	93
11 PM-12 AM	48	19	67	52	42	94	36	20	56

Source: VHB, Inc. March 2022

The analysis of the residential facility used the 2021 CEQR parking analysis spreadsheet for a mechanically ventilated garage to estimate CO and PM impacts of idling, starting, and running emissions from vehicles in the garage. Vehicular emission rates were calculated using MOVES3 for Kings County with similar assumptions as in the intersection analysis for the year 2031. The impacts of garage emissions on the opposite sidewalk were estimated using contribution from parking garage under buildings 3 and 4 and on-street traffic that combined traffic from both parking garages on Street C. The results presented in the **Table 14-12** indicate that the resultant concentrations would be below the applicable NAAQS and CEQR *de minimis* values. As a result, there would be no potential for parking emissions from residential garages to have significant adverse impacts on the air quality levels.

Table 14-11 Hourly In and Out Volumes for the Public Parking Garage

	Weekday			Saturday			Sunday		
Time	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
12-1 AM	0	0	0	0	0	0	0	0	0
1-2 AM	0	0	0	0	0	0	0	0	0
2-3 AM	0	0	0	0	0	0	0	0	0
3-4 AM	0	0	0	0	0	0	0	0	0
4-5 AM	0	0	0	0	0	0	0	0	0
5-6 AM	0	0	0	0	0	0	0	0	0
6-7 AM	0	0	0	0	0	0	111	0	111
7-8 AM	3	1	4	1	0	1	280	0	280
8-9 AM	11	1	12	3	0	3	84	0	84
9-10 AM	4	3	7	2	1	3	57	95	152
10-11 AM	4	3	7	2	1	3	**310**	**271**	**581**
11 AM-12 PM	6	3	9	2	1	3	26	37	63
12-1 PM	4	3	7	4	1	5	27	311	338
1-2 PM	8	8	16	9	1	10	21	112	133
2-3 PM	3	4	7	1	2	3	1	50	51
3-4 PM	3	6	9	3	8	11	3	32	35
4-5 PM	**10**	**14**	**24**	**8**	**5**	**13**	8	5	13
5-6 PM	3	9	12	4	3	7	4	3	7
6-7 PM	2	3	5	2	10	12	2	10	12
7-8 PM	0	3	3	2	5	7	2	5	7
8-9 PM	0	0	0	2	4	6	2	4	6
9-10 PM	0	0	0	0	0	0	0	3	3
10-11 PM	0	0	0	0	0	0	0	0	0
11 PM-12 AM	0	0	0	0	0	0	0	0	0

Source: VHB, Inc. March 2022

The multilevel public parking garage emissions were also analyzed using the *2021 CEQR Technical Manual* parking analysis spreadsheet. The multilevel public parking facility would consist of seven floors and an open-air roof level. Contributions from all eight parking levels were accounted for in the analysis of CO and PM. The results presented in **Table 14-12** indicated that concentrations from this garage would be below the appropriate criteria and no significant adverse air quality impacts would be expected.

Table 14-12 Highest Concentrations from Parking Garages

Garage	Receptor Location	CO (ppm) 8-hr	$PM_{2.5}$ ($\mu g/m^3$) 24-hr	$PM_{2.5}$ ($\mu g/m^3$) Annual
Accessory	Near side	2.1/0.5	2.15	0.19
	Far side	2.1/0.5	1.86	0.19
Public	Far side	1.7	0.24	0.01
Criteria		***9/3.7***	***8.2***	***0.3***

HVAC Analysis

Refined HVAC Analysis

As described above and as shown in **Figure 14-1**, the Proposed Actions would facilitate the development of a RWCDS consisting of ten buildings ranging from two to 15 stories, and the PAC would be approximately 50 feet tall.

Based on the MEP information, it was assumed that the proposed buildings would use natural gas-fueled low NO_x 20 ppm boilers to service the HVAC and hot-water systems.[10] According to the MEP engineer for the project, the HVAC and hot-water systems would use three boilers in each building, with each boiler exhausting through its own individual stack. The combined Buildings 7-8 and Buildings 9-10 would have three boilers for each combined building. The HVAC analysis assesses the potential for individual and cumulative boiler emissions to significantly impact the nearest affected receptor buildings. However, emission rates were estimated using EPA's AP-42 for low NO_x (approximately 41 ppm) emission factor which was conservative for the low NO_x 20 ppm boilers.

Stacks were assumed to be 3 feet above the elevation of the highest bulkhead on the proposed buildings. Building sizes and heights are presented in **Table 14-13**. Emission rates and stack parameters for each modeled building are shown in **Table 14-14** and **Table 14-15**.

[10] While the stationary source assessment assumes the use of natural gas for conservative analysis purposes, the Applicant may consider the use of electric heating and hot water systems.

Table 14-13 Proposed Building Sizes and Heights

Building	Approximate Building Size (gsf)*	Approximate Building Height** (ft)
Building 1	261,140	142.5
Building 2	200,110	145
Building 3	245,225	149.8
Building 4	323,235	143.7
Building 5	138,050	152.7
Building 6	177,760	154.8
Building 7/8	208,670	134.2
Building 9/10	264,800	133.5
PAC	16,500	49.5

Source: VHB, Inc. April 2022

*Excludes parking garage areas, the existing CCC building (which will also include the Trade School), and the public parking garage.

**The highest roof height of the building

Table 14-14 HVAC and Hot Water Systems Emission Rates (for each Boiler)

Building	No. of Boilers	1-hr NOx Emission Rate (g/s)	Annual NOx Emission Rate (g/s)	24-hr PM2.5 Emission Rate (g/s)	Annual PM2.5 Emission Rate (g/s)
Building 1	3	1.88E-02	5.14E-03	2.82E-03	7.72E-04
Building 2	3	1.88E-02	5.14E-03	2.82E-03	7.72E-04
Building 3	3	1.88E-02	5.14E-03	2.82E-03	7.72E-04
Building 4	3	2.50E-02	6.86E-03	3.76E-03	1.03E-03
Building 5	3	9.39E-03	2.57E-03	1.41E-03	3.86E-04
Building 6	3	9.39E-03	2.57E-03	1.41E-03	3.86E-04
Building 7/8	3	1.25E-02	3.43E-03	1.88E-03	5.14E-04
Building 9/10	3	1.88E-02	5.14E-03	2.82E-03	7.72E-04
PAC	3	1.56E-03	4.29E-04	2.35E-04	6.43E-05

Source: VHB, Inc. January 2022

Table 14-15 HVAC and Hot Water Systems Exhaust Stack Parameters (for each Stack)

Building	No. of Stacks	Stack Height (m)	Exhaust Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
Building 1	3	54.52	338.7	9.3	0.254
Building 2	3	48.09	338.7	9.3	0.254
Building 3	3	51.14	338.7	9.3	0.254
Building 4	3	44.72	338.7	8.6	0.3048
Building 5	3	52.05	338.7	12.9	0.1524
Building 6	3	52.68	338.7	12.9	0.1524
Building 7/8	3	46.38	338.7	9.7	0.2032
Building 9/10	3	46.07	338.7	9.3	0.254
PAC	3	20.56	338.7	4.8	0.1016

Source: VHB, Inc. January 2022

AERMOD was run with and without the downwash algorithm to assess the potential direct impact of the HVAC exhaust and potential impact with the added turbulence from the surrounding structures of each individual building. The highest results of the dispersion analysis for each individual building are presented in **Table 14-16** for NO_2 and $PM_{2.5}$. As shown in **Table 14-16**, all resultant concentrations and impacts are below the relevant NAAQS and CEQR *de minimis* criteria.

Table 14-16 Maximum NO_2 and $PM_{2.5}$ Concentrations from Each Building (µg/m³)

Building	1-hr NO_2 Concentration	Annual NO_2 Concentration	24-hr $PM_{2.5}$ Concentration	Annual $PM_{2.5}$ Concentration
Building 1	100.7	27.7	0.9	0.03
Building 2	152.0	28.0	3.3	0.09
Building 3	119.2	27.9	2.9	0.07
Building 4	170.8	28.6	6.2	0.21
Building 5	98.2	27.7	0.8	0.03
Building 6	98.5	27.6	0.4	0.02
Building 7/8	101.3	27.7	1.0	0.04
Building 9/10	102.2	27.8	1.0	0.05
PAC	134.3	27.8	2.4	0.06
NAAQS/CEQR *de minimis*	**188**	**100**	**8.2**	**0.3**

Source: VHB, Inc. January 2022

Table 14-17 presents the highest cumulative results from emissions of all buildings together. The table demonstrates that the combined impact of all proposed building emissions results in concentrations below the applicable NAAQS and *CEQR de minimis* thresholds. As such, no significant adverse air quality impacts are anticipated from the Proposed Project's HVAC and hot-water systems.

Table 14-17 Maximum Cumulative NO_2 and $PM_{2.5}$ Concentrations ($\mu g/m^3$)

Building	1-hr NO_2 Concentration	Annual NO_2 Concentration	24-hr $PM_{2.5}$ Concentration	Annual $PM_{2.5}$ Concentration
All buildings	171	29	6.8	0.3
NAAQS/CEQR *de minimis*	**188**	**100**	**8.2**	**0.3**

Source: VHB, Inc. January 2022

To ensure that there would be no significant adverse impacts from the HVAC and hot-water systems of the Proposed Project, certain restrictions related to the fuel type and stack locations would be incorporated into an E-Designation for air quality (E-679).

The E-Designation text would be as follows:

Block 4430, Lot 1, Block 4434, Lots 1 and 10: Buildings 1-10 and Performing Arts Center Building

Block 4434, Lot 10, Building 1

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 178.9 feet above grade.

Block 4434, Lot 10, Building 2

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 157.8 feet above grade to avoid any significant adverse air quality impacts.

Block 4434, Lot 1, Building 3

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 167.8 feet above grade to avoid any significant adverse air quality impacts.

Block 4434, Lot 1, Building 4

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 146.7 feet above grade. Additionally, HVAC stacks must be located on the highest roof of the building at a minimum of 18.5 feet away from the northern facade of Building 4 facing Flatlands Avenue and 55 feet west of the eastern facade of Building 4 facing Pennsylvania Avenue. With these stack restrictions there would not be any significant adverse air quality impacts.

Block 4430, Lot 1, Building 5

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with

low-NO_x (up to 41 ppm) burners and have a stack at least 170.8 feet above grade to avoid any significant adverse air quality impacts.

Block 4430, Lot 1, Building 6

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 172.8 feet above grade to avoid any significant adverse air quality impacts.

Block 4430, Lot 1, Building 7 & 8

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 152.2 feet above grade.

Block 4430, Lot 1, Building 9 & 10

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 151.1 feet above grade to avoid any significant adverse air quality impacts.

Block 4430, Lot 1, PAC Building

Any new residential or mixed-use development on the above-referenced property, if using fossil-fuel fired HVAC or hot water systems, must exclusively use natural gas and be fitted with low-NO_x (up to 41 ppm) burners and have a stack at least 67.5 feet above grade to avoid any significant adverse air quality impacts.

Industrial Source Analysis

To assess potential air quality impacts on the Proposed Development from existing industrial sources that emit toxic air contaminants, an investigation of existing land uses within a 400-foot radius of the Development Site was conducted to identify potential sources and determine if there are active permits associated with those sources. The presence of "large" or "major" sources was investigated using the NYSDEC Title V and State Facility Permit website along with maps and aerial photos. Based on this review, there are no existing industrial sources within 400-foot radius of the Development Site. No "large" or "major" emission sources within a 1,000-foot radius of the Development Site were identified. Therefore, no significant adverse impacts from existing industrial, "large" or "major" emission sources on the Proposed Development are anticipated, and no further analysis is warranted.