Chapter 13: Air Quality

13.1 Introduction

Air quality, which is a general term used to describe pollutant levels in the atmosphere, has the potential to be affected by the Proposed Action under the Reasonable Worst-Case Development Scenario (RWCDS). Under the RWCDS, 30 Development Sites (16 Projected and 14 Potential) have been identified in the rezoning area.

This chapter examines the potential for the Proposed Action to result in significant adverse air quality impacts. 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 boilers for heating/hot water, ventilation, and air conditioning (HVAC) systems. Indirect impacts are caused by off-site emissions associated with a project, such as emissions from nearby existing stationary sources or by emissions from on-road vehicle trips ("mobile sources") generated by the Proposed Action or other changes to future traffic conditions due to a project.

The following key areas are addressed in this chapter:

- The potential for emissions associated with project-generated vehicular travel under the RWCDS to result in significant mobile source air quality impacts.
- The potential of the heating, ventilation, and air conditioning (HVAC) emissions of the proposed RWCDS development sites to significantly impact other proposed development sites or existing land uses.
- The potential from the HVAC systems of existing large or major emission sources that have Title V or State Facility Permits to significantly impact proposed RWCDS development sites.
- The potential from industrial air toxics emissions generated by existing sources to significantly impact proposed RWCDS development sites.

Principal Conclusions

The analyses conclude that the Proposed Action would not result in any significant adverse air quality impacts on sensitive uses in the surrounding community, and the Projected and Potential Development Sites under the RWCDS would not be adversely affected by existing sources of pollutant emissions in the rezoning area. A summary of the general findings is presented below.

The mobile source analyses determined that Proposed Action-generated traffic resulting in concentrations of CO and fine particulate matter less than ten microns in diameter (PM_{10}) at the analyzed intersections would not result in any violations of National Ambient Air Quality Standards (NAAQS). Furthermore, the 8-hour CO incremental concentrations and the 24-hour incremental $PM_{2.5}$ concentrations were predicted to be below the City's *de minimis* criteria. However, the annual incremental $PM_{2.5}$ concentrations are predicted to exceed the *de minimis* criteria at the three analysis sites and would be considered a significant adverse air quality impact. However, with traffic mitigation

measures applied, no potential significant adverse impacts are predicted at these analysis sites. Traffic mitigation measures and air quality results are also discussed in Chapter 19, "Mitigation."

The stationary source analyses determined that there would be no potential significant adverse air quality impacts from fossil fuel-fired HVAC systems at the 16 Projected and 14 Potential Development Sites. At certain sites, an (E) designation (E-408) would be mapped as part of the Proposed Action to ensure the developments sites' HVAC systems emissions would not significantly impact either other development sites (project-on-project impacts) or existing land uses (project-on-existing impacts). Further examination under a detailed analysis may be performed between this Draft Environmental Impact Statement (DEIS) and Final Environmental Impact Statement (FEIS) to refine the parameters associated with the (E) designation at each of the proposed development sites initially identified with an (E) designation under the DEIS. The draft (E) designation is provided in Appendix K.

An analysis of the cumulative impacts from existing industrial sources on Projected and Potential Development Sites was performed. Maximum concentration levels at Projected and Potential Development Sites were below the air toxic guideline levels and health risk criteria established by regulatory agencies, and below the NAAQS. "Large" and "major" emissions sources within 1,000 feet of the Proposed Development Sites were also analyzed and the results indicated that the potential impacts from these emission sources on sensitive receptors are not expected to be significant.

13.2 Pollutants of Concern

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 CO are predominantly influenced by mobile source emissions. Particulate Matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (NO and NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of SO_2 are associated mainly with stationary sources, and some sources utilizing non-road diesel such as large international marine 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. Ambient concentrations of CO, PM, NO_2, SO_2, and lead are regulated by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act (CAA), and are referred to as "criteria pollutants"; emissions of VOCs, NO_x, and other precursors to criteria pollutants are also regulated by EPA.

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. CO concentrations can diminish rapidly 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 Action would result in an increase in additional vehicle trips higher than the *2014 CEQR Technical Manual* screening threshold of 140 trips at certain intersections in the study area. Therefore, a mobile source analysis was conducted at three critical intersections to evaluate future CO concentrations with and without the Proposed Action.

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. Therefore, the effects of NO_x and VOC emissions from all sources are 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.

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.) While NO_2 emissions are a concern from stationary sources of combustion, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may also become of greater concern for this pollutant in the future. Under the Proposed Action emissions of NO_2 were analyzed for existing "large" and "major" emissions sources within 1,000 feet of projected and potential development sites to determine potential significant adverse impacts.

Lead

Airborne lead emissions are currently associated principally with industrial sources. Lead in gasoline has been banned under the Clean Air Act and would not be emitted from any other component of the Proposed Action. Therefore, an analysis of this pollutant 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 VOCs; 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 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, construction and agricultural activities, and 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) or from precursor gases reacting in the atmosphere to form secondary PM.

Gasoline-powered and diesel-powered vehicles, especially heavy duty trucks and buses operating on diesel fuel, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways. The Proposed Action would result in traffic at certain intersections in the study area exceeding the $PM_{2.5}$ vehicle emissions screening analysis thresholds as defined in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. Therefore, the potential impacts from vehicle-based $PM_{2.5}$ emissions were assessed at three critical intersections.

Under the Proposed Action, an assessment of PM emissions from HVAC systems at the Projected and Potential Development Sites as well as from existing combustion sources onto the proposed development sites was conducted, following the *CEQR Technical Manual* and EPA guidance.

Sulfur Dioxide

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). SO_2 is also of concern as a precursor to $PM_{2.5}$ and is regulated as a $PM_{2.5}$ precursor under the New Source Review permitting program for large sources. Due to the federal restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO_2 are not significant and therefore, analysis of SO_2 from mobile and/or non-road sources was not warranted.

Emissions of SO_2 were analyzed from existing "large" and "major" emissions sources within 1,000 feet of Projected and Potential Development Sites to determine the potential impacts on the proposed development sites.

Non-Criteria Pollutants

In addition to the criteria pollutants discussed above, non-criteria air pollutants, also called air toxics, may be of concern. Air toxics are those pollutants that are known or suspected to cause serious health effects in small doses. Air toxics are emitted by a wide range of manmade and naturally occurring sources. Emissions of air toxics from industries are regulated by EPA.

Federal ambient air quality standards do not exist for non-criteria pollutants; however, the New York State Department of Environmental Conservation (NYSDEC) has issued standards for certain non-criteria compounds, including beryllium, gaseous fluorides and hydrogen sulfide. NYSDEC has also developed guideline concentrations for numerous non-criteria pollutants. The NYSDEC guidance document DAR-1 (February 2014) contains a compilation of annual and short term (1-hour) guideline concentrations for these compounds. The NYSDEC guidance thresholds represent ambient levels that

are considered safe for public exposure. EPA has also developed guidelines for assessing exposure to non-criteria pollutants. These exposure guidelines are used in health risk assessments to determine the potential effects to the public.

The project area contains existing manufacturing uses, which would remain in the Proposed Action. Therefore, an analysis to examine the potential for impacts from these existing sources of industrial source emissions on the Proposed Development Sites from was performed.

13.3 Air Quality Standards, Regulations and Benchmarks

National and State Air Quality Standards

As required by the Clean Air Act (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, lead and PM; there is no secondary standard for CO and the 1-hour NO_2 standard. The NAAQS are presented in Table 13.1. The NAAQS for CO, annual NO_2, and SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended PM, settleable particles, non-methane hydrocarbons and ozone that correspond to federal standards that have since been revoked or replaced, and for beryllium, fluoride, and hydrogen sulfide.

EPA recently lowered the primary annual average $PM_{2.5}$ standard from 15 $\mu g/m^3$ to 12 $\mu g/m^3$, effective March, 2013.

The current 8-hour ozone standard of 0.075 parts per million (ppm) is effective as of May 2008, and the previous 1997 ozone standard was fully revoked effective April 1, 2015. Effective December 2015, EPA further reduced the 2008 ozone NAAQS, lowering the primary and secondary NAAQS from the current 0.075 ppm to 0.070. EPA expects to issue final area designations by October 1, 2017; those designations likely would be based on 2014-2016 air quality data.

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 three-year span.

EPA established a new 1-hour average NO_2 standard of 0.100 ppm, effective April 10, 2010, in addition to the current annual standard. The statistical form is the three-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 three-year average of the 99th percentile of the annual distribution of the daily maximum 1-hour average concentration (the 4th highest daily maximum corresponds approximately to 99th percentile for a year.) Federal ambient air quality standards do not exist for non-criteria pollutants; however, as mentioned above, NYSDEC has issued standards for three non-criteria compounds. As described above, NYSDEC has also developed

a guidance document DAR-1, which contains a compilation of annual and short term (1-hour) guideline concentrations for numerous other non-criteria compounds. The NYSDEC guidance thresholds represent ambient levels that are considered safe for public exposure.

Federal ambient air quality standards do not exist for non-criteria pollutants; however, as mentioned above, NYSDEC has issued standards for three non-criteria compounds. As described above, NYSDEC has also developed a guidance document DAR-1, which contains a compilation of annual and short term (1-hour) guideline concentrations for numerous other non-criteria compounds. The NYSDEC guidance thresholds represent ambient levels that are considered safe for public exposure.

Table 13.1: National Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	ppm	µg/m^3	ppm	µg/m^3
Carbon Monoxide (CO)				
8-hour Average[1]	9	10,000	N/A	
1-hour Average[1]	35	40,000		
Lead				
Rolling 3-month Average[2]	N/A	0.15	N/A	0.15
Nitrogen Dioxide (NO_2)				
1-hour Average[3]	0.100	188	N/A	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-hour Average[4,5]	0.070	140	0.070	140
Respirable Particulate Matter (PM_{10})				
24-Hour Average[1]	N/A	150	N/A	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean[6]	N/A	12	N/A	15
24-Hour Average[7]	N/A	35	N/A	35
Sulfur Dioxide (SO_2)[8]				
1-hour Average[9]	0.075	196	N/A	N/A
Maximum 3-hour Average[1]	N/A	N/A	0.50	1,300

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

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)
N/A – 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 Three-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010.
4 Three-year average of the annual fourth highest daily maximum 8-hr average concentration.
5 EPA has lowered the NAAQS down from 0.070 ppm, effective December 2015.
6 Three-year average of annual mean. EPA has lowered the primary standard from 15 µg/m^3, effective March 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 Three-year average of the annual 99th percentile daily maximum 1-hr average concentration.

NAAQS Attainment Status and State Implementation Plans

The CAA, as amended in 1990, defines non-attainment areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as non-attainment by EPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the CAA, 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 plans, 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. The second CO maintenance plan for the region was approved by EPA on May 30th, 2014.

Manhattan (New York county), which had been designated as a moderate NAA for PM_{10}, was reclassified by EPA as being in attainment on July 29, 2015.

The five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties had been designated as a $PM_{2.5}$ NAA (New York Portion of the New York– Northern New Jersey–Long Island, NY–NJ–CT NAA) since 2004 under the CAA due to exceedance of the 1997 annual average standard, and was also nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS since November 2009. The area was redesignated as in attainment for that standard on April 18, 2014, and is now under a maintenance plan. As stated above, EPA lowered the annual average primary standard to 12 $\mu g/m^3$, effective March 2013. EPA designated the area as in attainment for the new 12 $\mu g/m^3$ NAAQS, effective April 15, 2015.

Effective June 15, 2004, EPA designated Nassau, Rockland, Suffolk, Westchester, and the five New York City counties (NY portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT, NAA) as in moderate nonattainment for the 1997 8-hour average ozone standard. In March 2008 EPA strengthened the 8–hour ozone standards. EPA designated the New York–Northern New Jersey–Long Island, NY-NJ-CT NAA as a marginal NAA for the 2008 ozone NAAQS, effective July 20, 2012. On April 11, 2016, as requested by New York State, EPA reclassified the area as a moderate NAA. New York State has begun submitting SIP documents in December 2014. The state is expected to be able to meet its SIP obligations for both the 1997 and 2008 standards by satisfying the requirements for a moderate attainment plan for the 2008 ozone NAAQS.

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" for 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 new 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. Draft attainment designations were published by EPA in February 2013, indicating that EPA is deferring action to designate areas in New York State and expects to proceed with designations once additional data are gathered.

Determining the Significance of Air Quality Impacts

The State Environmental Quality Review Act (SEQRA) regulations and the *CEQR Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.[1] In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see Table 13.1) would be deemed to have a potential significant adverse impact. In addition, in order to maintain concentrations lower than the NAAQS in attainment and maintenance 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.

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 impact of Proposed Actions 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: (i) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No-Action 8-hour concentration is equal to or between 8 and 9 ppm; or (ii) 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.

$PM_{2.5}$ *De Minimis* Criteria

For projects subject to CEQR, the *de minimis* criteria currently employed for determination of potential significant adverse $PM_{2.5}$ impacts are as follows:

- Predicted increase of more than half the difference between the applicable background concentration and the 24-hour standard; or
- Annual average $PM_{2.5}$ concentration increments that 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 one 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 by the EPA for locating neighborhood scale monitoring stations); or
- Annual average $PM_{2.5}$ concentration increments that are predicted to be greater than 0.3 $\mu g/m^3$ at any discreet receptor location for stationary sources.

[1] New York City. *CEQR Technical Manual*. Chapter 1, section 222. March 2014; and New York State Environmental Quality Review Regulations, 6 NYCRR § 617.7.

Actions under CEQR predicted to increase $PM_{2.5}$ concentrations by more than the CEQR *de minimis* criteria above will be considered to have a potential significant adverse impact.

The above *de minimis* criteria have been used to evaluate the significance of predicted impacts on $PM_{2.5}$ concentrations and determine the need to minimize particulate matter emissions resulting from the Proposed Action.

Non-Criteria Pollutant Thresholds

Non-criteria, or toxic, air pollutants include a multitude of pollutants of ranging toxicity. No federal ambient air quality standards have been promulgated for toxic air pollutants. However, the EPA and the NYSDEC have issued guidelines that establish acceptable ambient levels for these pollutants based on human exposure, which are shown on Table 13.2.

Table 13.2: NYSDEC Air Guideline Concentrations for Non-Criteria Pollutants

Pollutant	CAS Number	SGC (µg/m³)	AGC (µg/m³)
Ethanol	00064-17-5	---	45,000
Isopropyl Alcohol	00067-63-0	98,000	7,000
Acetone	00067-64-1	180,000	30,000
1-Butanol	00071-36-3	---	1,500
Propane	00074-98-6	---	43,000
Isobutyl Alcohol	00078-83-1	---	360
MethylEthyl Ketone	00078-93-3	13,000	5,000
Butyl BenzylPhthalate	00085-68-7	---	0.42
Ethylbenzene	00100-41-4	---	1,000
Butane	00108-88-3	238,000	---
Toluene	00108-88-3	37,000	5,000
Ethylenglycolmonobutyl	00111-76-2	14,000	1,600
Butyl Carbitol	00112-34-5	370	200
Butyl Acetate	00123-86-4	95,000	17,000
Tetrachloroethylene	00127-18-4	300	4
Ethylacetate	00141-78-6	---	3,400
Carbon Monoxide	00630-08-0	14,000	---
Ethyl 3-Ethoxyproprioanate	00763-69-9	140	64
Xylene M,O& P Mix	01330-20-7	22,000	100
Sulfur Dioxide	07446-09-5	197	80
Oil Mist (Mineral)	08012-95-1	380	12
Mineral Spirits	08032-32-4	---	900
Stoddard Solvents	08052-41-3	---	900
Aliphatic Hydrocarbons	64742-89-8	---	3,200
Aromatic Petroleum Distillates	64742-94-5	---	100
Particulates[1]	NY075-02-5[2]	88	12
Liquid Mist NEC	NY105-00-0	380	12
Oxides of Nitrogen	NY210-00-0	188.1	100
Misc. VOC	NY990-00-0	98,000	7,000

Source: NYSDEC, DAR-1 AGC/SGC Tables, August, 2016.

Notes:

1 Pollutant includes emissions from both Particulates (NY075-00-0) and Total Solid Particulate (NY079-00-0).

2 Conservatively assumes all particulate emissions would be $PM_{2.5}$. SGC and AGC from Particulate (PM-2.5) used.

13.4 Methodology

Mobile Sources

As discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*, the screening threshold criteria for this area of the City, if 140 or more project-generated vehicles pass through a signalized intersection within the project area of concern in any given peak period, there is a potential for mobile source air quality impacts for CO and a detailed analysis is required. For $PM_{2.5}$, the screening threshold for potential impacts is 23 heavy-duty diesel truck equivalents assuming all streets at the study area intersections are classified as principal and minor arterials.

The trip generation forecast and the vehicle trip assignments conducted for the Proposed Action indicates that the number of project-generated vehicles would be above the *CEQR Technical Manual* screening threshold values during the AM/MD/PM weekday peak period(s) at multiple intersections for both CO and PM. Therefore, a detailed microscale modeling analysis was conducted near five worst-case intersections (see Table 13-4). Both CO and PM levels were estimated for future (2036) conditions with and without the Proposed Action.

Intersection Analysis

Analyses for microscale, or localized, air quality predictions are made for specific locations, such as intersections—and at those locations, for specific geographic points. These prediction locations are called "receptor locations," or simply "receptors." 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 Action employ EPA-approved models that have been widely used for evaluating the air quality impacts of projects in New York City, other parts of New York State and throughout the country. The modeling approach, which includes a series of conservative assumptions relating to meteorology, traffic and background concentration levels, results in a conservatively high estimate of the pollutant concentrations that could be expected to ensue from the Proposed Action.

Vehicle Emissions

Vehicular cruise and idle CO and PM ($PM_{2.5}$ and PM_{10}) emission factors utilized in the dispersion modeling were computed using EPA's mobile source emissions model, the Motor Vehicle Emission Simulator (MOVES). The emissions model is capable of calculating engine emission factors for various vehicles based on the fuel type (gasoline, diesel, or electricity), 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 analyses were performed using the latest version of the model, MOVES2014a.[2] Project specific traffic data (e.g., traffic volumes, speeds and vehicle classification data) used in the model were obtained through field studies. Some default input files (e.g., source type age distribution) were obtained from the NYSDEC and processed using the EPA's *Age Distribution Projection Tool for MOVES2014*.[3] Other required input files (i.e., fuel data, county-specific hourly temperature and relative humidity data, IM coverage, etc.) were exported from the MOVES2014a model itself after specifying the county, analysis year and modeled peak hour for the analysis.

Road Dust

In order to account for how much road dust vehicular traffic could be expected to suspend in the air, $PM_{2.5}$ and PM10 emission factors will include fugitive road dust in for the microscale analyses pursuant to the guidance of Chapter 13 of EPA's Compilation of Air Pollutant Emission Factors (AP-42). However, fugitive road dust is not included in the annual neighborhood-scale PM2.5 analyses, since the New York City Department of Environmental Protection (DEP) considers it to have an insignificant contribution on that scale. Road dust emission factors were calculated according to the latest procedure delineated by EPA and the *CEQR Technical Manual*.

Traffic Data

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic and other information developed as part of the traffic analysis for the Proposed Action (see Chapter 12, "Transportation"). Traffic speed data, existing vehicle distribution and lane configuration for the future—without and with the Proposed Action—were employed in the respective air quality modeling scenarios.

Traffic conditions for the each of the peak periods (weekday morning [8 to 9 AM], midday [12 to 1 PM], and evening [5 to 6 PM] were used for these analyses under No Action and With-Action Conditions together with 24-hour distributions of ATR data and trip generation assignments. For the determination of 24-hour and annual impacts, weekly 24-hour distributions were used to more accurately simulate traffic patterns.

Dispersion Model and Meteorological Data

The maximum 1-hour CO concentrations resulting from vehicle emissions adjacent to streets within the surrounding area were predicted using the Tier I CAL3QHC model Version 2.0.[4] The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC calculates emissions and dispersion of CO from idling and moving vehicles. The queuing algorithm includes site-specific traffic parameters, such as signal timing and delay (from the 2000 Highway Capacity Manual traffic forecasting models, and Synchro, which uses the *Highway Capacity Manual* (HCM) to determine the

[2] EPA, Motor Vehicle Emission Simulator (MOVES), User Guide for MOVES2014a, November 2015~~5~~6.

[3] EPA, Age Distribution Projection Tool for MOVES2014. https://www3.epa.gov/otaq/models/moves/documents/age-distribution-projection-tool-moves2014.xlsm

[4] 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.

operating characteristics of an intersection), saturation flow rate, vehicle arrival type and signal actuation characteristics (i.e., pre-timed or actuated signal) to project the number of idling vehicles.

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

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

The analyses followed the EPA's Intersection Modeling Guidelines (EPA-454/R-92-005) for CO modeling methodology and receptor placement. All major roadway segments (links) within approximately 1,000 feet from each analysis site (i.e., congested intersection) were considered.

The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model is employed if maximum predicted future CO concentrations are greater than the applicable ambient air quality standards or when *de minimis* thresholds are exceeded using the first level of CAL3QHC modeling.

The CAL3QHCR model offers two approaches to utilizing traffic data, with varying degrees of detail:

- **Tier I approach –** one hour of vehicular emissions, traffic volumes and signalization data are entered into CAL3QHCR as a screening level model that is most appropriate for short-term averaging periods where peak hour traffic conditions are suitable.
- **Tier II approach -** vehicular emissions, traffic volumes and signalization data are more detailed and entered into the CAL3QHCR model for each hour of a week. The weekly traffic conditions are assumed to be the same for each week throughout the modeled period.

To determine motor vehicle generated PM (PM_{10} and $PM_{2.5}$) concentrations adjacent to streets within the traffic study area, the CAL3QHCR dispersion model was applied.

Tier I CO Analysis - CAL3QHC

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

Following the EPA guidelines[5], CAL3QHC computations were performed using a wind speed of one 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 0.77 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness of 3.21 meters was chosen. At each receptor location, concentrations were calculated for all wind directions, and the highest predicted concentration was reported, regardless of frequency of occurrence. These assumptions ensured that reasonable worst-case meteorology was used to estimate impacts.

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

Tier II PM Analysis - CAL3QHCR

A Tier II PM analysis performed with the CAL3QHCR model includes the modeling of hourly concentrations based on hourly traffic data and five years of monitored hourly meteorological data (2011-2015). The data consist of surface data obtained from La Guardia Airport and upper air data obtained from the Brookhaven, NY monitoring station. Data was processed using the current EPA AERMET version 15181 and the EPA procedure.

Analysis Year

The microscale analyses were performed for the 2036 future analysis year. These analyses were performed for both without the Proposed Action (the No-Action Condition) and with the Proposed Action (the With-Action 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 concentrations are added to modeling results to obtain total pollutant concentrations at an analysis site.

The background concentrations that were used for the intersection analysis are presented in Table 13.3. These background concentrations were obtained from the nearest monitored location, representing the second-highest value from the latest available five years (2011–2015) of monitored data for 1-hour and 8-hour CO concentrations, the second highest value from the three most recent years (2013-2015) of data available for 24-hour PM_{10}, and the maximum 98th percentile concentration averaged over three years (2013-2015) of data for 24-hour $PM_{2.5}$ concentration.

The 24-hour $PM_{2.5}$ average background concentration of 26.2 $\mu g/m^3$ was used to establish the *de minimis* value, consistent with the guidance provided in the *CEQR Technical Manual*. The $PM_{2.5}$ annual average impacts are assessed on an incremental basis and compared with the $PM_{2.5}$ *de minimis* criteria threshold of 0.1 $\mu g/m^3$, without considering the annual background.

Table 13.3: Background Concentrations for Intersection Analysis

Pollutant	Averaging Time	Monitoring Location	Background Concentration
Carbon Monoxide (CO)	1-hour[1]	CCNY, Manhattan	2.3 ppm
	8-hour[1]	CCNY, Manhattan	1.5 ppm
Particulate Matter (PM_{10})	24-Hour[2]	Division Street, Manhattan	44 $\mu g/m^3$
Particulate Matter ($PM_{2.5}$)	24-Hour[3]	PS 19, Manhattan	26.2 $\mu g/m^3$

Source: NYSDEC Ambient Air Quality Report, 2015, http://www.dec.ny.gov/chemical/29310.html
Notes:
1 1-hour CO and 8-hour CO background concentrations are based on the highest second max value from the latest five years (2011-2015) of available monitoring data from NYSDEC.
2 24-hour PM_{10} is based on the highest second max value from the latest three years (2013-2015) of available monitoring data from NYSDEC.
3 The 24-hour $PM_{2.5}$ background concentration is based on maximum 98th percentile concentration averaged over three years (2013-2015) of data from NYSDEC.

Analysis Sites

Intersections in the study area were considered for analysis based on *CEQR Technical Manual* guidance. For the air quality mobile source screening analysis, the project-generated traffic volumes for the weekday AM, midday, and PM periods were reviewed at all 119 study area intersections, and increments exceeding the CO and PM volume thresholds were identified. The screening analysis indicated that 53 intersections exceed the CO screening threshold and eight intersections exceed the $PM_{2.5}$ screening threshold. Of these intersections, five were selected for detailed microscale analysis (see Table 13.4 and Figure 13-1).

Analysis sites 1, 2 and 3 were selected for CO analysis since these locations have the overall highest number of project-generated vehicles in addition to exceeding the *CEQR Technical Manual* threshold. Analysis sites 3, 4 and 5 were selected for PM analysis since they are the locations with the highest number of project-generated peak hour HDDV vehicle equivalents. Traffic data for all eight intersections along the Third Avenue corridor that exceed the $PM_{2.5}$ screening criteria were included in the PM microscale analysis.

Table 13.4: Intersection Analysis Sites

Analysis Site	Location	Pollutant
1	First Avenue & East 48th Street	CO
2	Second Avenue & East 37th Street	CO
3	Third Avenue & East 44th Street	CO, PM ($PM_{2.5}$ & PM_{10})
4	Third Avenue & East 46th Street	PM ($PM_{2.5}$ & PM_{10})
5	Third Avenue & East 54th Street	PM ($PM_{2.5}$ & PM_{10})

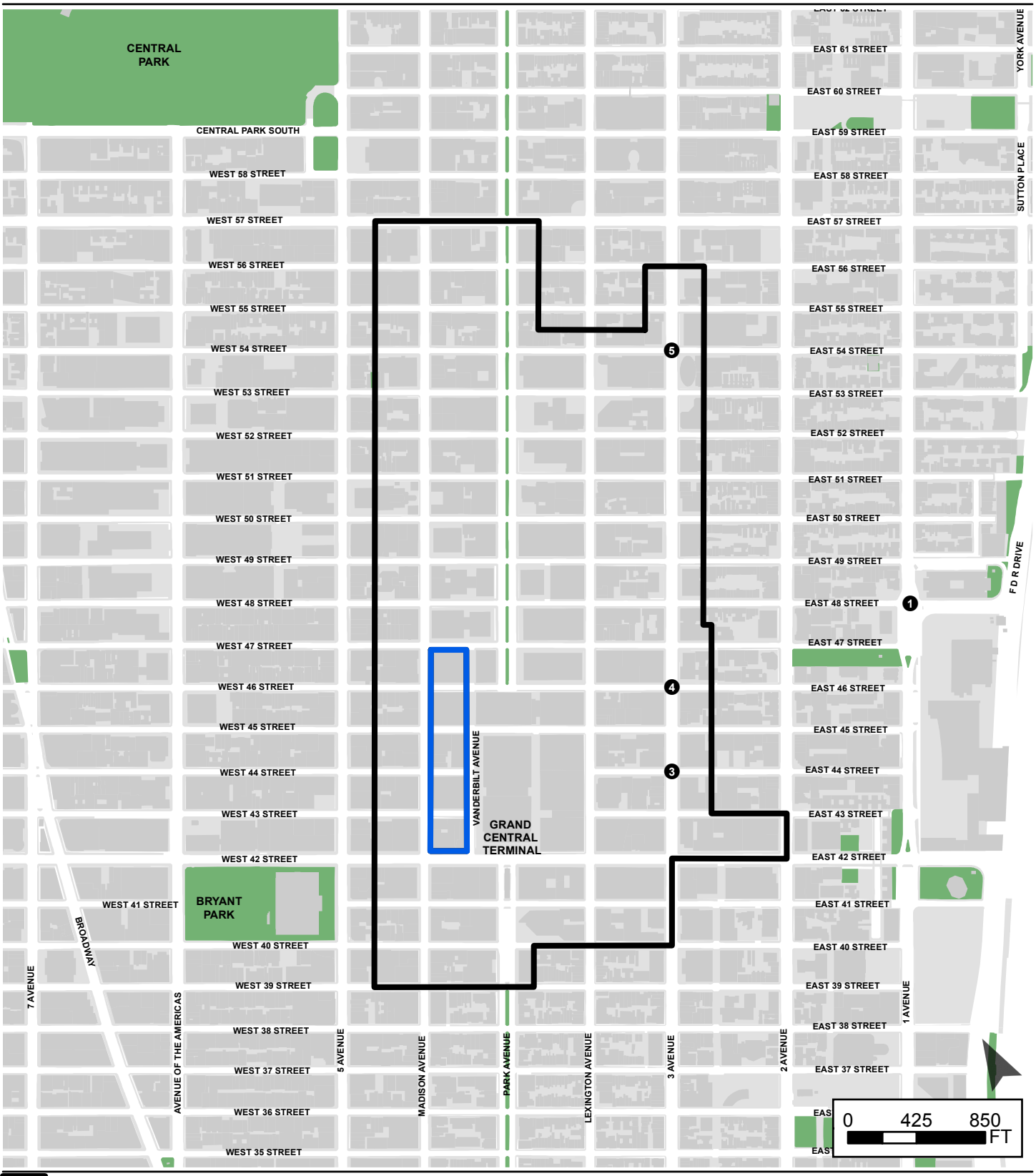
Receptor Placement

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 per EPA modeling guidelines. Ground level receptors were placed at sidewalk or roadside locations near intersections with continuous public access, at a pedestrian height of 1.8 meters. Receptors in the CAL3QHCR model for predicting annual average $PM_{2.5}$ concentrations were placed at a distance of 15 meters from the nearest moving lane at each analysis location based on the *CEQR Technical Manual* procedure for neighborhood-scale corridor $PM_{2.5}$ modeling.

Stationary Sources

Stationary source analyses were conducted following the methodologies presented in the *CEQR Technical Manual* to evaluate potential future pollutant concentrations with the Proposed Action, including:

- Potential impacts from the Projected and Potential Development Sites' HVAC systems on existing buildings (project-on-existing impact);
- Potential impacts from HVAC emissions of Projected and Potential Development Sites on other Projected and Potential Development sites with similar or greater heights (project-on-project impact);



Proposed Greater East Midtown Rezoning Boundary

Vanderbilt Corridor (Existing Regulations Apply)

1 Mobile Source Analysis Site (w/ I.D. Label)

Greater East Midtown Rezoning
Manhattan, New York

Air Quality Mobile Source Analysis Sites

Figure 13-1

vhb

- Potential impacts from air toxics emissions from existing nearby industrial facilities on proposed development sites;
- Potential effects from existing "large" and "major" sources of emissions in the study area on the proposed development sites.

Individual HVAC Systems

A stationary source analysis was conducted to evaluate potential impacts from emissions associated with each Projected and Potential Development Site's HVAC systems on sensitive uses from existing buildings (project-on-existing impact) and on other proposed development buildings (project-on-project impact) with heights similar or greater than the proposed building[6].

Screening Analysis

A screening analysis was performed to assess air quality impacts from emissions associated with the HVAC systems of each Projected and Potential Development Site. The methodology described in the *CEQR Technical Manual* was used for the analysis to determine the potential impacts from the Proposed Action's HVAC systems.

The methodology determines the minimum required distance from the source to the nearest receptor of similar or greater height, beyond which the action would not have a significant adverse impact. The screening procedures utilize information regarding the type of fuel to be used, the maximum development size, and the HVAC systems exhaust stack height to evaluate whether a significant adverse impact may occur.

Based on the maximum development size, if the distance from the development site to the nearest building of similar or greater height is less than the minimum required distance determined in the *CEQR Technical Manual*, there is the potential for significant air quality impacts, and a refined dispersion modeling analysis would be required. Otherwise, if the source passes the screening analysis, and no further analysis is required.

Per consultation with Con Edison, many existing buildings in the study area use steam (supplied by Con Edison) for their HVAC needs, and the steam utility system is readily available throughout the study area. There would be no localized HVAC impacts from these buildings because no stack is needed for space heating and/or heat water systems.

The HVAC analysis for the Proposed Action was conducted as follows:

For conservative purposes, the distance from lot line to lot line was used for the screening analysis. It was initially assumed that No. 2 fuel oil would be used in the Projected and Potential Development Sites' HVAC systems, and that exhaust stacks would be located three feet above roof height (as per the *CEQR Technical Manual*). The screening analysis was initially performed using the *CEQR Technical Manual* procedures assuming the use of No. 2 fuel oil. If the screening results failed with the use of No. 2 fuel oil, a second screening procedure was conducting, assuming use of natural gas. If the screening results passed with natural gas, an E-designation on fuel restrictions (natural gas only) would be

[6] The *CEQR Technical Manual* provides methodologies for both screening and detailed analysis (if the screening analysis fails) in regard to stationary sources HVAC analyses. More refined HVAC analyses ~~may~~ would be performed between the Draft EIS and Final EIS. Thus, the proposed (E) designation requirement on some of the development sites might need to be revised accordingly.

included. If the screening results still indicated failure using natural gas, an E-designation for the use of Con Edison steam would be included. The (E) designation (E-408) resulting from the screening procedure is described in detail below and reported in Appendix K, and it is noted that a detailed analysis may be conducted between this Draft EIS and the FEIS for each (E) designated development site to further define the stack height, setback and fuel parameters.

Cumulative Impacts from HVAC Systems

In addition to the individual HVAC analysis, groups or "clusters" of heat and hot water sources with similar stack heights were analyzed, to address the cumulative impacts of multiple sources. The affected area was reviewed to determine areas where clusters with a high density of proposed development sites with similar heights would be located which could result in potential cumulative impacts on nearby buildings of a similar or greater height. Two clusters were selected for analysis to determine the cumulative air quality impacts from the Proposed Action on existing buildings or other Projected and Potential Development Sites. The proposed development sites associated with each cluster and their locations are presented in Table 13.5.

Table 13.5: Cluster Sites for Cumulative HVAC Analysis

Cluster	Development Sites
1	Projected Development Sites 3, 4 and 5
2	Potential Development Sites J and K

Screening Analysis

A screening analysis was performed to assess potential cumulative air quality impacts associated with the HVAC systems of the two clusters on existing or other proposed development buildings. Similar to individual HVAC analysis, the methodology described in the *CEQR Technical Manual* was used for the analysis with a combined development size.

For conservative purposes, the distance from lot line to lot line was used for the screening analysis. The screening analysis was initially performed using the *CEQR Technical Manual* procedures assuming the use of No. 2 fuel oil. If the screening results failed with the use of No. 2 fuel oil, screening procedures were utilized assuming natural gas. If the screening results passed with natural gas, an E-designation on fuel restrictions (natural gas only) would be included. If the screening results still failed with natural gas, an E-designation for steam would be included.

Industrial Sources Analysis

According to the *CEQR Technical Manual*, an air quality assessment is required to evaluate the potential impacts of emissions from ventilation exhaust systems of manufacturing or processing facilities when the Proposed Action would result in new sensitive uses (particularly schools, hospitals, parks, and residences) within a 400-foot radius of the study area boundaries.

Land use maps were reviewed to identify potential sources of emissions from manufacturing/industrial operations. A preliminary survey was conducted using the New York City Department of Environmental Protection's Clean Air Tracking System (DEP CATS) to determine if there are any DEP issued industrial permits for these potential sources of air toxics concerns. Next, a request was made to DEP's Bureau of Environmental Compliance (BEC) to obtain the most current information regarding

the release of air pollutants from the existing manufacturing or industrial sources that were identified to have industrial permits.

Thirty-nine (39) DEP issued industrial permits were identified in the study area. Based on a further review of these permits:

- Twenty-one (21) of these permits were issued to facilities further than 400 feet from any Projected or Potential Development Site; these permitted sites would therefore not require analysis.
- Five (5) permits were for the facilities with emergency generators.
- One (1) permit was cancelled.
- Four (4) permits were issued for dry cleaner services.

As per DEP guidance, permits associated with emergency generators or cancelled industrial permits are not included in the air toxics analysis. In addition, all dry cleaning facilities in New York City are required to be equipped with fourth generation emission control systems – with built-in carbon absorber and refrigeration units, by the New York State's PERC Dry Cleaning Facilities Regulation (Part 232). These facilities are considered dry-to-dry type non-vented refrigerated totally enclosed systems with, presumably, no emissions and therefore, per current DEP/DCP guidance, the industrial analysis for these facilities are not warranted. As a result, eight (8) permits remain for analysis. An air quality analysis was conducted for all these active permits including one found on Potential Development Site A (Block 895, Lot 1) since for conservative purposes, there is a potential for the site to be developed under the With-Action Condition.

Industrial Source Screen

A screening analysis was initially performed to assess the potential impacts from industrial sources on the Projected and Potential Development Sites following the procedures described in the *CEQR Technical Manual*. The procedures use pre-tabulated pollutant concentration values based on a generic emission rate of one gram per second from Table 17-3, "Industrial Source Screen," for the applicable averaging periods. This approach, which can be used to estimate maximum short-term and annual average concentration values at various distances (from 30 to 400 feet) from an emission source, was used to assess the potential impacts of the emissions to be released under the aforementioned eight (8) industrial permits.

Predicted impact from the industrial source of concern based on the screen table will be compared with the SGCs and AGCs recommended in NYSDEC's DAR-1 AGC/SGC Tables. If a Proposed Action fails the above screening analysis, further refined analysis using the EPA's AERSCREEN model (version 15181) was conducted to determine any potential for significant adverse impacts.

AERSCREEN predicts worst-case one-hour impacts downwind from a point, area or volume source. The model generates application-specific worst-case methodology using representative minimum and maximum ambient air temperatures, and site-specific surface characteristics such as albedo, Bowen ratio, and surface roughness[7]. If the worst-case concentrations predicted by AERSCREEN are above

[7] The albedo is the fraction of the total incident solar radiation reflected by the ground surface. The Bowen ration is the ratio of the sensible heat flux to the latent (evaporative) heat flux. The surface roughness length is related to the height of the obstacles to the wind flow and represents the height at which the mean horizontal wind speed is zero.

significant impact levels for an analyzed pollutant, further analysis with AERMOD is required to determine the potential for air quality impacts from the proposed actions. However, if the worst-case concentrations predicted by the AERSCREEN model are below impact levels for each pollutant analyzed, there is no potential for impact and no further analysis is required. The analysis was performed utilizing a unitary emission rate (1 gram/second) to predict 1-hour peak concentration. The actual emissions rates for each pollutant obtained from the permits were multiplied by the modeled unitary concentrations to determine potential impact. The annual concentrations were calculated using a persistence factor of 0.1.

Health Risk Assessment Methodology

Toxic air pollutants can be grouped into two categories: carcinogenic air pollutants, and non-carcinogenic air pollutants. The EPA developed cancer risk inhalation guideline values based on compound-specific inhalation unit risk factors *(*URFs*)* for carcinogenic pollutants and chronic non-cancer (annual) and short-term acute (1-hour) inhalation guideline values for toxic pollutants that are defined as *RfCs* (reference dose concentrations) and AIECs (acute inhalation exposure concentrations), respectively. These data are contained in the EPA IRIS (Integrated Risk Information System) database and/or EPA Prioritized Chronic Dose-Response Values and Acute Dose-Response Values for Screening Risk Assessment.

In order to evaluate short-term and annual impacts of non-carcinogenic and carcinogenic toxic air pollutants, the NYSDEC, following EPA guidelines, has also established short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) for exposure limits. AGCs for the carcinogenic pollutants is based on cancer risk threshold of one per million. These are allowable guideline concentrations that are considered acceptable concentrations below which there should be no adverse effects on the health of the public. This value could be increased to ten-in-one million, as per NYSDEC's Guidelines for the Control of Toxic Ambient Air Contaminants (DAR-1) with DEP concurrence, if the emissions from the facility or facilities causing this increase are controlled using Best Available Control Technology.

Once the risk of each carcinogenic compound is estimated, they are summed together. If the total incremental cancer risk is estimated to be less than or equal to one in one million (1.0 E-06), the risk due to all carcinogenic pollutant releases is considered to be insignificant. Once the chronic non-cancer hazard quotient (HQ) of each compound is established, they are summed together to arrive at the total hazard index (HI). HQs are also estimated for the carcinogenic pollutants where they have an appropriate guideline values *RfCs*). If the HI is less than or equal to one, then the non-carcinogenic risk is considered to be insignificant. Similar to this, once the acute hazard quotient (AHQ) of each compound is established, they are summed together to arrive at the total acute hazard index (AHI). If the AHI is less than or equal to one, then the acute non-carcinogenic risk is considered to be insignificant.

The procedures to estimate cancer risk and chronic non-cancer and acute hazard indexes of toxic pollutants are outlined in the EPA Human Health Risk Assessment Protocol (HHRAP). The HHRAP is a guideline that can be used to perform health risk assessment for individual compounds with known health effects to determine the level of health risk posed by an increased ambient concentration of that compound at a potentially sensitive receptor. The derived health risk values from the HHRAP are used in this analysis to determine the total risk posed by the release of multiple air toxic contaminants.

Carcinogens

Individual lifetime cancer risk through direct inhalation of carcinogen is estimated using the following equation (HHRAP, Table B-5-1 and C-2-1):

$$\text{Cancer Risk (CR)} = \text{EC} \times \text{URF and EC} = C_a \times \text{EF} \times \text{ED/AT} \times 365 \text{ days/year}$$

Where:

EC = annual exposure concentrations of compound, $\mu g/m^3$
C_a = annual ambient air concentration of specific pollutant (estimated by the dispersion model), $\mu g/m^3$
URF = compound-specific inhalation unit risk factor in $(\mu g/m^3)^{-1}$
EF = exposure frequency, days/year (EPA recommends to use 350)
ED = exposure duration, year (EPA recommends value of 30 for adult resident)
AT = averaging time, year (EPA assumes 70 years of lifetime exposure)

Once the individual CR of each compound is established, these values are summed together to estimate the total cancer risk of all carcinogens. If the total risk of all carcinogenic pollutants combined is less than or equal to one in one million (1.0 E-06), the carcinogenic risk is not considered to be significant.

Non-Carcinogens

Chronic non-cancer hazard quotients (HQ) through inhalation are estimated using the following equation (HHRAP, Table B-5-1 and C-2-2):

$$\text{HQ} = \text{EC} \times 0.001/\text{RfC and EC} = C_a \times \text{EF} \times \text{ED/AT} \times 365 \text{ days/year}$$

Where:

EC = exposure concentrations of compound, $\mu g/m^3$
C_a = total ambient air concentration of specific pollutant (estimated by the dispersion model), $\mu g/m^3$
RfC = reference dose concentration, established by the EPA, mg/m^3
EF = exposure frequency, days/year (EPA recommends to use 350)
ED = exposure duration, year (EPA recommends value of 30 for adult resident)
AT = averaging time, year (EPA recommends value of 30 for non-carcinogens)
0.001 = units conversion factor, $mg/\mu g$

Acute hazard quotients through inhalation (AHQ) are estimated using the following equation (HHRAP, Table C-2-3):

$$\text{AHQ} = C_{acute} \times 0.001/\text{AIEC}$$

Where:

C_{acute} = 1-hour air concentration, (estimated by the dispersion model), $\mu g/m^3$
AIEC = 1-hour acute inhalation exposure guideline value, mg/m^3
0.001 = units conversion factor, $mg/\mu g$

Once the chronic non-cancer (HQ) or acute hazard quotients (AHQ) of each compound are established, they are summed together to arrive at the total chronic non-cancer (HI) or acute hazard index (AHI). If the total chronic non-cancer or acute hazard indexes are less than or equal to one, then the non-cancer or acute risk is not considered to be significant.

"Large" or "Major" Source Analysis

A comprehensive search was also performed to identify "large" or "major" emission sources within 1,000 feet of the development sites. "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 NYSDEC permit or a "State Facility Permit".

After reviewing the NYSDEC Title V and State Facility Permit websites[8] and available aerial photos provided by Google and Bing, three potential facilities were identified within 1,000 feet of the Projected and Potential Development Sites. After further review of the permits, two of the three emissions sources were determined to operate for emergency use only. With the limited number of operating hours (monthly scheduled maintenance and testing) it is unlikely that either emissions source would have any significant adverse air quality impact on any of the nearby Projected or Potential Development Sites and therefore, no analysis was warranted. The remaining potential source facility is a cogeneration plant (Power Plant Building) located at 11 West 42nd Street, located approximately 520 feet from the nearest development site – Projected Development Site 3.

The potential air quality impacts from the Power Plant Building at 11 West 42nd Street on the nearest proposed development site – Projected Development Site 3 were analyzed. Receptors were placed at each floor along each building façade where operable windows, balconies, air intakes or intake vents would be located.

Refined Dispersion Modeling

The potential air quality impacts from the Power Plant Building located at 11 West 42nd Street were analyzed using EPA's AERMOD dispersion model. 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. The analyses of potential impacts from exhaust stacks were made assuming stack tip downwash, urban dispersion and surface roughness length, and elimination of calms. 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). Therefore, the analysis was performed using the AERMOD model for both options to assess the worst case impact from these sources.

[8] NYSDEC Title V- http://www.dec.ny.gov/dardata/boss/afs/issued_atv.html;
State Permit- http://www.dec.ny.gov/dardata/boss/afs/issued_asf.html.

Emission Rate and Stack Parameters

The refined dispersion modeling analysis was performed for NO_2, $PM_{2.5}$, PM_{10} and SO_2. The emission rates used for the analysis were calculated based on the emission factors directly from the permit or from *Chapter 3: Stationary Internal Combustion Sources* of EPA's AP-42[9]. Stack parameters such as stack diameter and stack height were obtained from the permit. Stack exhaust temperature and exhaust velocity were estimated based on the DEP boiler CA database or EPA's *Catalog of CHP Technologies*.

Methodology Utilized for Estimating NO_2 Concentrations

EPA's preferred regulatory stationary source dispersion 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 NO_2/NO_x conversion ratio, applicable to heating and hot water systems, as discussed further below.

The 1-hour NO_2 concentration associated with the emissions from the Power Plant Building's boilers and engines were estimated using AERMOD model's Tier 3 option - Ozone Limiting Method (OLM). The OLM module involves an initial comparison of the estimated maximum NO_x concentration and the ambient ozone (O_3) concentration to determine which of the two is the limiting factor to NO_2 formation.[10] Hourly background ozone concentrations from the Queens College monitoring station were incorporated into the AERMOD model to estimate the conversion from NO_x to NO_2. Ozone concentrations were taken from the nearest ozone monitoring station which has complete latest five years of hourly data available.

An in-stack ratio of 0.1 was assumed based on EPA's "alpha" version of the in-stack ratio database which indicates that the in-stack ratio for boilers and combustion turbines is approximately 0.1.[11] The NO_2/NO_x equilibrium ratio was set to 0.9 (the recommended default value).[12]

The methodology used to determine the compliance of total 1-hour NO_2 concentrations from the Proposed Action's HVAC systems with the 1-hour NO_2 NAAQS 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. This methodology is recognized by EPA and the City and is referenced in EPA modeling guidance.[13]

Annual NO_2 concentrations from heating and hot water sources were estimated using a NO_2/NO_x conversion ratio of 0.75, as described in EPA's Guideline on Air Quality Models at 40 CFR part 51 Appendix W, Section 5.2.4.10.[14]

[9] https://www3.epa.gov/ttn/chief/ap42/ch03/index.html
[10] Review and Evaluation of the PVMRM and OLM for Short-Term (1-hour average) NO2 Impacts (API, 2012).
[11] http://www.epa.gov/ttn/scram/no2_isr_database.htm.
[12] EPA. Technical Support Document (TSD) for NO_2-related AERMOD modifications (July 2015).
[13] http://www.epa.gov/ttn/scram/guidance/clarification/NO2_Clarification_Memo-20140930.pdf
[14] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

Meteorological Data

All analyses were conducted using the latest five consecutive years of meteorological data (2011-2015). Surface data were obtained from La Guardia Airport and upper air data were obtained from Brookhaven, NY monitoring station. Data will be processed using the current EPA AERMET version 15181 and the EPA procedure.

Receptor Placement

Discrete receptors (i.e., locations at which concentrations are calculated) were modeled along each of the building façades of Projected Development Site 3 to represent potentially sensitive locations such as operable windows and air intake vents. Rows of receptors at spaced intervals on the modeled buildings were analyzed at multiple elevations.

Background Concentrations

Appropriate background concentrations values (see Table 13.6) were added to modeling results to get the total concentrations for 1-hour and annual NO_2, and 24-hour PM_{10}. Predicted values were compared with the NAAQS. To develop background levels, concentration measured at the nearest NYSDEC ambient monitoring station over the latest available three-year period (2013-2015) were used for the 1-hour NO_2, the latest five-year period (2011-2015) were used for the annual average NO_2, and the latest 2015 data were used for 24-hour PM_{10} background concentration.

The 24-hour $PM_{2.5}$ average background concentration of 26.2 $\mu g/m^3$ was used to establish the *de minimis* value, consistent with the guidance provided in the *CEQR Technical Manual*. Annual average $PM_{2.5}$ impacts will be assessed on an incremental basis and compared with the $PM_{2.5}$ *de minimis* criteria threshold of 0.3 $\mu g/m^3$, without considering the annual background.

Table 13.6: Background Concentrations for Stationary Sources Analysis

Pollutant	Averaging Time	Monitoring Location	Background Concentration
Nitrogen Dioxide (NO_2)	1-hour[1]	IS 52, Bronx	120.9 $\mu g/m^3$
	Annual[2]	IS 52, Bronx	38.3 $\mu g/m^3$
Particulate Matter (PM_{10})	24-Hour[3]	Division Street, Manhattan	44 $\mu g/m^3$
Particulate Matter ($PM_{2.5}$)	24-Hour[4]	PS 19, Manhattan	26.2 $\mu g/m^3$
Sulfur Dioxide (SO_2)	1-hour[5]	IS 52, Bronx	36.9 $\mu g/m^3$

Source: NYSDEC Ambient Air Quality Report, 2015, http://www.dec.ny.gov/chemical/29310.html
Notes:
1 1-hour NO_2 background concentration is based on three-year average (2013-2015) of the 98th percentile of daily maximum 1-hour concentrations from available monitoring data from NYSDEC.
2 Annual NO_2 background concentration is based on the maximum annual average from the latest five years of available monitoring data from NYSDEC (2011-2015).
3 24-hour PM_{10} is based on the highest second max value from the latest three years of available monitoring data from NYSDEC (2013-2015).
4 The 24-hour $PM_{2.5}$ background concentration is based on maximum 98th percentile concentration averaged over three years of data from NYSDEC (2013-2015).
5 1-hour SO_2 background concentration is based on maximum 99th percentile concentration averaged over the latest three years (2013-2015) of available monitoring data from NYSDEC.

13.5 Assessment

Existing Conditions

The total concentrations experienced at receptors include background concentrations from existing surrounding emission sources. Background concentrations are ambient pollution levels associated with existing stationary, mobile, and other area emission sources. The NYSDEC maintains an air quality monitoring network and produces annual air quality reports that include monitoring data for CO, NO_x, PM_{10}, $PM_{2.5}$, and SO_2. To develop background levels, the latest available pollutant concentrations from monitoring sites located closest to the project site were used. If the pollutant concentration from the nearest monitoring station is not available or the data is not for background concentrations determination (e.g., data collected from Tapered Element Oscillating Microbalance [TEOM] sampler), the next closest monitoring station would be selected and so forth. Table 13.7 summarizes the background concentrations used for each of the pollutants.

Annual $PM_{2.5}$ impacts are assessed on an incremental basis and compared with the $PM_{2.5}$ *de minimis* criteria of 0.3 µg/m^3, without considering the annual background. Therefore the annual $PM_{2.5}$ background is not presented in the table.

Table 13.7: Ambient Background Concentrations

Pollutant	Averaging Time	Monitoring Location	Background Concentration
Carbon Monoxide (CO)	1-hour[1]	CCNY, Manhattan	2.3 ppm
	8-hour[1]	CCNY, Manhattan	1.5 ppm
Nitrogen Dioxide (NO_2)	1-hour[2]	IS 52, Bronx	120.9 µg/m^3
	Annual[3]	IS 52, Bronx	38.3 µg/m^3
Particulate Matter (PM_{10})	24-Hour[4]	Division Street, Manhattan	44 µg/m^3
Particulate Matter ($PM_{2.5}$)	24-Hour[5]	PS 19, Manhattan	26.2 µg/m^3
Sulfur Dioxide (SO_2)	1-hour[6]	IS 52, Bronx	36.9 µg/m^3

Source: NYSDEC Ambient Air Quality Report, 2015, http://www.dec.ny.gov/chemical/29310.html
Notes:

1 1-hour CO and 8-hour CO background concentrations are based on the highest second max value from the latest five years (2011-2015) of available monitoring data from NYSDEC.

2 1-hour NO_2 background concentration is based on three-year (2013-2015) average of the 98th percentile of daily maximum 1-hour concentrations from available monitoring data from NYSDEC.

3 Annual NO_2 background concentration is based on the maximum annual average from the latest five years (2011-2015) of available monitoring data from NYSDEC.

4 24-hour PM_{10} is based on the highest second max value from the latest three years (2013-2015) of available monitoring data from NYSDEC.

5 The 24-hour $PM_{2.5}$ background concentration is based on maximum 98th percentile concentration averaged over three years (2013-2015) of data from NYSDEC.

6 1-hour SO_2 background concentration is based on maximum 99th percentile concentration averaged over the latest three years (2013-2015) of available monitoring data from NYSDEC.

The Future without the Proposed Action (No-Action Condition)

In the future without the Proposed Action (No-Action Condition), given the existing zoning and land use trends in the area, it is anticipated that the rezoning area would experience limited growth in commercial uses and modest growth in residential uses over the next 20-year period.

Mobile Sources

For microscale mobile sources analysis, the No-Action Condition serves as a baseline for determining if a Proposed Action could result in a significant adverse impact. Predicted CO and PM levels at each analysis site for future (2036) No-Action Condition are presented below.

CO and PM concentrations for the 2036 No-Action Condition were determined using the methodology previously described. Table 13.8 shows future maximum predicted 1-hour and 8-hour average CO concentrations, with background concentrations, at the three analysis sites under the 2036 future No-Action Condition. The values shown are the highest predicted concentrations for all the receptor locations for any of the time periods analyzed. As shown in Table 13.8, the 2036 No-Action Condition values are predicted to be well below the 1-hour CO standard of 35 ppm and the 8-hour CO standard of 9 ppm.

Table 13.8: No-Action Maximum Predicted CO Concentrations (ppm)

Analysis Site	Location	1-hour Concentration[1]	NAAQS	8-hour Concentration[2]	NAAQS
1	First Avenue & East 48th Street	2.50	35	1.65	9
2	Second Avenue & East 37th Street	2.60		1.73	
3	Third Avenue & East 44th Street	2.50		1.65	

Predicted 2036 future No-Action 24-hour PM_{10} concentrations at each analysis site, with background concentrations, are presented in Table 13.9. The values shown are the highest predicted concentrations for all the receptor locations. As shown in Table 13.9, the 24-hour PM_{10} concentrations are well below the NAAQS of 150 $\mu g/m^3$.

Table 13.9: No-Action Maximum Predicted 24-Hour PM_{10} Concentrations ($\mu g/m^3$)

Analysis Site	Location	**Modeled Concentration**	Background Concentration	**Total Concentration**	NAAQS
3	Third Avenue & East 44th Street	27.47	44	71.47	150
4	Third Avenue & East 46th Street	23.32		67.32	
5	Third Avenue & East 54th Street	27.73		71.73	

$PM_{2.5}$ concentrations for the No-Action Condition are not presented, since impacts are assessed on an incremental basis.

Stationary Sources

Even without the Proposed Action, some development within the study area would occur by future analysis year 2036. The Proposed Action would result in more development—and therefore the emissions from heat and hot water systems associated with the Proposed Actions would cumulatively be greater than the emissions from heat and hot water systems under the 2036 future No-Action Condition.

The Future with the Proposed Action (With-Action Condition)

With the Proposed Action, higher density commercial development is expected to occur throughout the rezoning area. The Proposed Action is expected to result in new development on the 16 Projected Development Sites. In addition, the analysis recognizes that 14 Potential Development Sites could be developed under the Proposed Action. Therefore, all Projected and Potential Development Sites are analyzed in the environmental review for site-specific effects under the 2036 With-Action Condition.

Mobile Sources

CO concentrations for the 2036 With-Action Condition were predicted using the methodology previously described. Table 13.10 shows the future maximum predicted 1-hour and 8-hour average CO concentrations at each analysis site. The values shown are the highest predicted concentrations for all receptor locations. The results indicate that the Proposed Action would not result in any violations of the 1-hour and 8-hour NAAQS for CO. In addition, the incremental changes in 8-hour average CO concentrations are very small, and consequently would not result in CO exceeding the CEQR *de minimis* criteria. Therefore, mobile source CO emissions of the Proposed Action would not result in a significant adverse impact on air quality.

Table 13.10: With-Action Maximum Predicted CO Concentrations (ppm)

Analysis Site	Location	Time Period	1-hour Concentration[1,3]	8-hour Concentration[2,3]	8-hour Increment	*De Minimis*
1	First Avenue & East 48th Street	PM	2.50	1.65	0.00	3.67
2	Second Avenue & East 37th Street	PM	2.70	1.81	0.08	3.63
3	Third Avenue & East 44th Street	AM	2.60	1.73	0.08	3.67

Notes:
1 The 1-hour CO concentrations include a background concentration of 2.3 ppm (see Table 13.3)
2 The 8-hour concentrations include a background concentration of 1.5 ppm (see Table 13.3).
3 The 1-hour NAAQS for CO is 35 ppm and the 8-hour NAAQS for CO is nine ppm.

PM_{10} concentrations for the 2036 future With-Action Condition were determined using the methodology previously described. Table 13.11 presents the predicted 24-hour PM_{10} concentrations at the analyzed intersections for the 2036 future With-Action Condition. The values shown are the highest predicted concentrations for all modeled receptor locations and include background concentrations. As shown in Table 13.11, the 2036 future 24-hour PM_{10} concentrations are well below the NAAQS of 150 $\mu g/m^3$.

Table 13.11: With-Action Maximum Predicted 24-Hour PM_{10} Concentrations (µg/m³)

Analysis Site	Location	Modeled Concentration	Background Concentration	Total Concentration	NAAQS
3	Third Avenue & East 44th Street	32.57	44	76.57	150
4	Third Avenue & East 46th Street	32.25		76.25	
5	Third Avenue & East 54th Street	35.97		79.97	

$PM_{2.5}$ concentrations for the 2036 future With-Action Condition were determined using the methodology previously described and the maximum predicted 2036 future 24-hour $PM_{2.5}$ incremental concentrations are present in Table 13.12. The 2036 future annual $PM_{2.5}$ incremental concentrations are present in Table 13.13.

The results indicate that the maximum predicted 24-hour average $PM_{2.5}$ concentrations for the 2036 future With-Action Condition are below the *de minimis* criteria. However, the maximum predicted annual average incremental $PM_{2.5}$ concentrations at all three analyzed intersections would exceed the *de minimis* criteria of 0.1 µg/m³ and **would result in a significant adverse air quality impact**. Therefore, traffic mitigation measures were examined and applied to avoid potential significant impact at this intersection location. Mitigation measures are discussed in Chapter 19, "Mitigation."

Table 13.12: Maximum Predicted 24-Hour $PM_{2.5}$ Incremental Concentrations (µg/m³)

Analysis Site	Location	No Action	With Action	Increment	*De Minimis*[1]
3	Third Avenue & East 44th Street	6.72	9.45	2.74	4.4
4	Third Avenue & East 46th Street	6.31	10.19	3.88	
5	Third Avenue & East 54th Street	8.56	12.96	4.39	

Note:
[1] The 24-hour $PM_{2.5}$ *de minimis* criteria threshold is half the difference between the background concentration of 26.2 µg/m³ and the 24-hour NAAQS of 35 µg/m³.

Table 13.13: Maximum Predicted Annual $PM_{2.5}$ Incremental Concentrations (µg/m³)

Analysis Site	Location	No Action	With Action	Increment	*De Minimis*[1]
3	Third Avenue & East 44th Street	0.95	1.47	0.52	0.1
4	Third Avenue & East 46th Street	0.73	1.37	0.64	
5	Third Avenue & East 54th Street	1.13	1.86	0.72	

Note:
[1] The $PM_{2.5}$ *de minimis* criteria threshold for annual (neighborhood scale) is 0.1 µg/m³ without considering background concentration.

Stationary Sources

Individual HVAC Systems

Screening Analysis

A screening analysis was performed using the methodology previously described to evaluate whether potential air quality impacts from the HVAC systems associated with the Projected and Potential Development Sites could potentially impact other Projected and Potential Development Sites (project-on-project impact), or existing buildings (project-on-existing impact).

Table 13.14 presents a summary of the HVAC screening analysis results for each of the development site. Based on the screening-level analysis, 20 of the development sites failed the screening analysis using No. 2 fuel oil and therefore would require fuel type restrictions as related to their HVAC systems. The results of the HVAC screening analysis determined the following:

- A total of seven (7) Projected Development Sites and three (3) Potential Development Sites passed the screening analysis using No. 2 fuel oil. However, to ensure there would be no air quality impact from their HVAC emissions onto existing or other proposed development sites, these proposed development sites would be restricted to specific HVAC stack height.
- One (1) Projected Development Site would screen out if restricted to the use of natural gas for its HVAC system.
- The other eight (8) Projected Development Sites and eleven (11) Potential Development Sites would not screen out using No. 2 fuel oil or natural gas and therefore would need to be restricted to the use of steam for their HVAC systems.

Based on the results of the individual HVAC impact analysis, (E) designations would be mapped as part of the zoning proposal to ensure that would be no significant adverse air quality impacts from HVAC emissions of each of development sites on existing or other proposed development sites. Overall, one of the development sites would be restricted to use natural gas, 19 of the development sites must use Con Edison utility steam for their HVAC systems, and 10 of the development sites would be restricted to HVAC stack heights of at least a specified height above grade. Further detailed analysis will be conducted between the DEIS and the FEIS to refine stack height and setback and fuel parameters for each of the proposed development sites that are currently identified with an (E) designation.

The language specifying (E) designations and the appropriate HVAC restrictions for the applicable development sites is provided in Appendix K.

Table 13.14: HVAC Screening Analysis Results

RWCDS Site Number	Development Size (gsf)	BLDG Ht (ft)	Receptor[1]	Receptor Ht (ft)	Distance to Receptor (ft)	No. 2 Oil		Natural Gas		Required E-Designation
						Distance Threshold (ft)	Screen Result	Distance Threshold (ft)	Screen Result	
Projected Development Sites										
Proj-1	759,100	566	10 East 40th Street	621	Adjacent	205	FAIL	175	FAIL	Steam only
Proj-2	820,336	706	N/A	N/A	400	319	PASS	--	PASS	Stack Height
Proj-3	1,225,588	720	343 Madison Avenue	814	92	262	FAIL	246	FAIL	Steam only
Proj-4	1,197,840	678	Proj-5	748	50	257	FAIL	212	FAIL	Steam only
Proj-5	824,578	748	343 Madison Avenue	814	87	217	FAIL	186	FAIL	Steam only
Proj-6	707,871	776	200 Park Avenue	798	332	202	PASS	--	PASS	Stack Height
Proj-7	893,813	818	N/A	N/A	400	228	PASS	--	PASS	Stack Height
Proj-8	554,821	720	395 Lexington Avenue	947	354	175	PASS	--	PASS	Stack Height
Proj-9	1,113,919	846	N/A	N/A	400	362	PASS	--	PASS	Stack Height
Proj-10	933,736	580	301 Park Avenue	614	57	232	FAIL	196	FAIL	Steam only
Proj-11	597,109	720	138 East 50th Street	789	Adjacent	180	FAIL	155	FAIL	Steam only
Proj-12	787,894	734	Proj-13	818	173	207	FAIL	179	FAIL	Steam only
Proj-13	727,398	818	884 Third Avenue	910	56	205	FAIL	171	FAIL	Steam only
Proj-14	368,871	524	919 Third Avenue	585	124	206	FAIL	114	PASS	NG only
Proj-15	1,730,892	692	N/A	N/A	400	330	PASS	--	PASS	Stack Height
Proj-16	990,753	650	Proj-15	692	317	237	PASS	--	PASS	Stack Height

Table 13.14: HVAC Screening Analysis Results (Continued)

RWCDS Site Number	Development Size (gsf)	BLDG Ht (ft)	Receptor[1]	Receptor Ht (ft)	Distance to Receptor (ft)	No. 2 Oil		Natural Gas		Required E-Designation
						Distance Threshold (ft)	Screen Result	Distance Threshold (ft)	Screen Result	
Projected Development Sites										
Pot-A	582,309	664	Proj-8	720	358	181	PASS	--	PASS	Stack Height
Pot-B	494,991	650	Proj-2	706	70	240	FAIL	160	FAIL	Steam only
Pot-C	461,289	650	270 Park Avenue	708	74	157	FAIL	136	FAIL	Steam only
Pot-D	408,807	524	7 East 48th Street	616	Adjacent	149	FAIL	127	FAIL	Steam only
Pot-E	733,031	776	Proj-7	818	314	205	PASS	--	PASS	Stack Height
Pot-F	637,009	664	Pot-G	790	349	189	PASS	--	PASS	Stack Height
Pot-G	379,418	790	434 Park Avenue	1400	Adjacent	162	FAIL	--	FAIL	Steam only
Pot-H	616,238	608	Proj-8	720	70	185	FAIL	128	FAIL	Steam only
Pot-I	996,602	566	Proj-9	846	58	239	FAIL	202	FAIL	Steam only
Pot-J	392,837	552	Pot-K	552	58	146	FAIL	125	FAIL	Steam only
Pot-K	634,712	552	Proj-12	734	Adjacent	190	FAIL	161	FAIL	Steam only
Pot-L	706,006	566	Proj-16	650	56	201	FAIL	170	FAIL	Steam only
Pot-M	487,015	482	Pot-I	566	102	162	FAIL	139	FAIL	Steam only
Pot-N	398,790	510	Pot-K	552	98	145	FAIL	125	FAIL	Steam only

Notes:

[1] "N/A" means there are no other buildings of similar or greater height in a 400-foot radius of the development sites. Per *CEQR Technical Manual*, as there are no buildings of similar or greater height within 400 feet of the project site, a distance of 400 feet was used for screening purposes.
Address is provided when existing building is considered as the nearest receptor.
gsf = gross square footage
NG=Natural Gas

Cumulative Impacts from HVAC Systems

As discussed above, two clusters were selected for analysis to determine the Proposed Action's cumulative air quality impacts on existing buildings or other proposed development buildings. Cluster 1 includes Projected Development Sites 3, 4 and 5, and Cluster 2 includes Potential Development Sites J and K.

Based on the individual HVAC analysis results, these five development sites failed the screening analysis for both No.2 fuel oil and natural gas, and therefore would need to be restricted to the use of steam for their HVAC systems. There would be no cumulative HVAC impacts from these buildings on to existing or other proposed development buildings because no stack is needed for space heating and/or heat water systems[15]. Therefore, with these five development sites being restricted, as a part of the proposed (E) designations, to use steam for their HVAC needs, there would be no local HVAC-related emissions. Further analysis will be conducted between the DEIS and the FEIS to refine the stack height and setback and fuel parameters for these proposed development sites.

Industrial Sources Analysis

As noted above, seven permits were analyzed to evaluate the potential impacts of emissions from ventilation exhaust systems of existing manufacturing/processing facilities on the proposed development sites. Of these, six permits are for jewelry manufacturing and one permit is for a gas sterilization facility.

Emission Data and Stack Parameters

Emission data and stack parameters for the facilities included in the analysis were obtained and/or developed as follows:

- Directly from the permit for each facility; or
- When emission data were not included in a permit listed in the DEP CA database, the necessary data were obtained from the permit application for this facility that is on file at DEP.

Table 13.15 provides permit information for the existing permitted industrial sources considered in the analysis, including type and location of each facility, permit number, contaminant name, CAS registry number, and hourly and annual emission rates (gram per second) for each pollutant.

Industrial Source Screen

A screening analysis was initially performed to assess the potential impacts from these industrial sources on the proposed development sites using the methodology described previously and further refined analysis using the EPA's AERSCREEN model was conducted if a proposed development site fails the above screening analysis. Of the 30 Projected and Potential Development Sites, 20 developments sites are located beyond 400 feet of any identified industrial sources and therefore the screening analysis was only conducted for ten (10) proposed development sites.

[15] More refined HVAC analyses may be performed between the Draft EIS and Final EIS to determine if the development sites would pass the analysis using natural gas for their HVAC systems.

Based on the distance between the emission source and affected development site, maximum unitary short-term and annual average concentration values were predicted according to Table 17-3, "Industrial Source Screen", of the *CEQR Technical Manual*. These values were then multiplied by the actual emission rates of each pollutant to estimate actual short-term and annual average concentration values. When concentrations predicted using the screening analysis methodologies exceed applicable SGCs and AGCs recommended in NYSDEC's DAR-1 AGC/SGC Tables, detailed analysis was performed following the methodology previously described. For development sites that are located within a 400-foot radius of multiple industrial sources, cumulative impacts from these emission sources were considered.

The short-term and annual average concentration values by each pollutant at each development site is present in Table 13.16. As shown in Table 13.16, all the predicted short-term and annual average concentration values are below the applicable SGCs and AGCs recommended in NYSDEC's DAR-1 AGC/SGC Tables. Some of the pollutants, such as Tetrasodium Pyrophosphate (CAS 7722-88-55), Gold (CAS 7440-57-5), Rhodium Sulfate (CAS10489-46-0) and Pyrophosphoric acid (CAS07722-85-6) have no guideline health values available, and were not included in the analysis.

Table 13.15: Existing Active Industrial Sources Permit Information

Facility Name	Facility Location			Permit Information					
	Block	Lot	Address	Permit #	Facility Type	Chemical Name	CAS No.	Hourly ER	Annual ER
Sage Realty	1285	21	437 Madison Avenue	PB029915	Engine/Generator	Total Particulates	NY075-00-0	1.764E-03	1.036E-04
						Total VOC	NY998-00-0	1.210E-01	6.875E-03
						Nitrogen Dioxide	NY210-00-0	2.686E-02	1.535E-03
						Carbon Monoxide	00630-08-0	1.076E+00	6.142E-02
						Sulfur Dioxide	07446-09-5	2.520E-03	1.294E-04
Jewels By Star	1281	69	555 Fifth Avenue	PB008715	Jewelry Manufacturing	Rhodium Sulfate	0489-40-0	1.663E-05	3.639E-06
				PB008715	Jewelry Manufacturing	Sulfuric Acid	07644-93-9	1.109E-05	2.344E-06
				PB009115	Jewelry Manufacturing	Monoethanolamine	00141-43-5	2.772E-05	6.070E-06
						Sodium Hydroxide	01310-73-2	2.608E-04	5.523E-07
						Pyrophosphoric acid	07722-85-6	2.520E-06	5.523E-07
						Gold	07440-57-5	6.300E-08	1.410E-08
						Platinum	07440-06-4	1.260E-04	2.877E-05
						Cobalt	07440-48-4	1.890E-03	4.315E-04
Oscar Heyman & Bros Inc.	1288	21	501 Madison Avenue	PA034988	Jewelry Manufacturing	Hydrogen Chloride	07647-01-0	1.260E-04	2.877E-05
						Hydrocarbon	68527-16-2	1.260E-04	2.877E-05
						Nitric Acid	07697-37-2	1.260E-04	2.877E-05
						Ammonia	07664-41-7	1.260E-04	2.877E-05
Jewels By Star	1283	1	579 Fifth Avenue	PA021393	Jewelry Cleaning	Sodium cyanide	00143-33-9	1.260E-04	2.877E-05
						Ammonia	07664-41-7	1.260E-04	2.877E-05
						Caustic Soda	01310-73-2	1.260E-04	2.877E-05
						Hydrogen Cyanide	00074-90-8	1.260E-04	1.510E-05
				PA021493	Jewelry Manufacturing	Particulate	NY075-00-0	1.008E-04	9.349E-06
Yacoubian Jewelry Co.	1260	42	2 West 45 Street	PB476203	Jewelry Manufacturing	Aluminum Oxide	01344-28-1	1.134E-04	2.402E-03
						Iron Oxide	01309-37-1	3.024E-05	8.242E-04
						Monoethanolamine	00141-43-5	7.560E-04	1.582E-04
						Sodium Hydroxide	01310-73-2	5.040E-04	3.164E-05
						Tetrasodium	07722-88-55	1.663E-05	3.639E-06
Bosley Medical	895	1	99 Park Avenue	PA038295	Gas Sterilization	Ethylene Oxide	00075-21-8	1.109E-05	2.344E-06

Table 13.16: Maximum Predicted Impacts on Projected and Potential Sites from Industrial Sources

Development Site	Chemical Name	CAS No.	1-Hour Concentration (µg/m³)	SGC (µg/m³)	Annual Concentration (µg/m³)	AGC (µg/m³)
Proj-3	Aluminum Oxide	01344-28-1	0.14707	---	0.00085	4.5
	Iron Oxide	01309-37-1	0.11766	---	0.00053	12
	Monoethanolamine	00141-43-5	0.13236	1500	0.13535	18
	Sodium Hydroxide	01310-73-2	0.03530	200	0.04644	---
Proj-4	Sulfuric Acid	07644-93-9	0.01341	120	0.00015	1
	Monoethanolamine	00141-43-5	0.24880	1500	0.15969	18
	Sodium Hydroxide	01310-73-2	0.10422	200	0.05511	---
	Platinum	07440-06-4	0.01435	---	0.00016	0.0048
	Cobalt	07440-48-4	0.00036	---	0.00000	0.001
	Aluminum Oxide	01344-28-1	0.17125	---	0.00100	4.5
	Iron Oxide	01309-37-1	0.13700	---	0.00062	12
Proj-5	Sulfuric Acid	07644-93-9	0.05470	120	0.00066	1
	Monoethanolamine	00141-43-5	0.38609	1500	0.00463	18
	Sodium Hydroxide	01310-73-2	0.25740	200	0.00298	---
	Platinum	07440-06-4	0.05850	---	0.00070	0.0048
	Cobalt	07440-48-4	0.00146	---	0.00002	0.001
Proj-7	Particulate (PM2.5)	NY075-00-0	5.19487	380	0.03050	45
	Total VOC	NY998-00-0	356.21935	98000	2.02474	7000
	Nitrogen Dioxide	NY210-00-0	79.11038	188	0.45209	100
	Carbon Monoxide	00630-08-0	3168.86794	14000	18.08715	---
	Sulfur Dioxide	07446-09-5	7.42124	197	0.03812	80
Proj-8	Ethylene Oxide	00075-21-8	0.66504	18	0.00203	0.019
Pot-B	Ethylene Oxide	00075-21-8	0.63375	18	0.00193	0.019
Pot-C	Particulate (PM2.5)	NY075-00-0	1.35306	380	0.00871	45
	Total VOC	NY998-00-0	82.65015	98000	0.46978	7000
	Nitrogen Dioxide	NY210-00-0	18.35522	188	0.10490	100
	Carbon Monoxide	00630-08-0	735.24192	14000	4.19659	---
	Sulfur Dioxide	07446-09-5	1.72188	197	0.00885	80
	Sodium cyanide	00143-33-9	0.14774	380	0.00163	45
	Ammonia	07664-41-7	0.14774	2400	0.00163	100
	Sodium Hydroxide	01310-73-2	0.14774	200	0.00163	---
	Hydrogen Cyanide	00074-90-8	0.14774	520	0.00163	3
	Caustic Soda	01310-73-2	0.14774	200	0.00163	---

Table 13.16: Maximum Predicted Impacts on Projected and Potential Sites from Industrial Sources (Continued)

Development Site	Chemical Name	CAS No.	1-Hour Concentration (µg/m³)	SGC (µg/m³)	Annual Concentration (µg/m³)	AGC (µg/m³)
Pot-D	Particulate (PM2.5)	NY075-00-0	0.89401	380	0.00718	45
	Total VOC	NY998-00-0	37.50887	98000	0.21320	7000
	Nitrogen Dioxide	NY210-00-0	8.33009	188	0.04760	100
	Carbon Monoxide	00630-08-0	333.67265	14000	1.90452	---
	Sulfur Dioxide	07446-09-5	0.78143	197	0.00401	80
	Sodium cyanide	00143-33-9	0.34700	380	0.00397	45
	Ammonia	07664-41-7	0.34700	2400	0.00397	100
	Sodium Hydroxide	01310-73-2	0.34700	200	0.00397	---
	Hydrogen Cyanide	00074-90-8	0.34700	520	0.00397	3
	Caustic Soda	01310-73-2	0.34700	200	0.00397	---
	Total Particulates	NY075-00-0	0.34700	380	0.00397	45
Pot-E	Particulate (PM2.5)	NY075-00-0	0.11379	380	0.00067	45
	Total VOC	NY998-00-0	7.80296	98000	0.04435	7000
	Nitrogen Dioxide	NY210-00-0	1.73291	188	0.00990	100
	Carbon Monoxide	00630-08-0	69.41381	14000	0.39620	---
	Sulfur Dioxide	07446-09-5	0.16256	197	0.00084	80
	Hydrogen Chloride	07647-01-0	0.55265	2100	0.00644	20
	Hydrocarbon	68527-16-2	8.28980	98000	0.09662	7000
	Nitric Acid	07697-37-2	0.55265	86	0.00644	12
	Ammonia	07664-41-7	0.55265	2400	0.00644	100
Pot-H	Ethylene Oxide	00075-21-8	2.16841	18	0.00694	0.019

Results of the Cancer Risk and Hazard Index Evaluation

Table 13.17 provides estimated annual (long-term) exposure concentrations, cancer risks for each pollutant and total incremental cancer risk (CR), and chronic non-cancer quotients for each pollutant and total non-cancer hazard index (HI). Chronic non-cancer quotients (HQ) were also estimated for the carcinogenic pollutants where they have an appropriate guideline values (e.g., *RfC*). The pollutant concentrations shown in table are the maximum values estimated at all receptor locations. The full set of exposure concentrations, cancer risk values at each receptor locations and source group, and non-cancer chronic and acute quotients for each pollutant are provided in the backup documentation for this analysis. Also provided are the assumptions, parameters, and equations used in estimating these values.

As shown in Table 13.17, the total individual cancer risk and the total cancer risk caused by the identified facilities (0.25 in-a-million) are below the conservative one-in-a-million threshold established by EPA. Therefore, the cancer risk increase under the Proposed Action is not considered to be significant. In addition, the total chronic non-cancer quotients (HQ) and total hazard index (HI) caused by both the carcinogenic and non-carcinogenic pollutants emitted from all of sources combined is estimated to be 0.525. This value is below the level (of 1.0) that is considered by the EPA to be significant.

Table 13.18 provides estimated 1-hour (short-term) exposure concentrations and acute hazard quotients (AHQ) for each pollutant and the total acute hazard index (AHI). As shown in this table, the total acute hazard index caused by all the pollutants emitted from all of sources combined is estimated to be 0.835. This value is below the level (of one) that is considered by the EPA to be significant.

Summary of Air Toxics Results

The result of this analysis is that no exceedances of EPA/NYSDEC/DEP guideline thresholds values for both carcinogenic and non-carcinogenic toxic pollutants are predicted under the Proposed Action. Therefore, based on the analysis for existing industrial uses, development resulting from the Proposed Action would not experience significant adverse air quality impacts from these facilities.

Table 13.17: Cancer Risk (CR) and Chronic Non-Cancer Hazard Quotients (HQ) and Total Hazard Index (HI) of the Toxic Pollutants

			Cancer Risk (CR)				Chronic Non-Cancer Risk			
Chemical Name	CAS No.	Max Estimated Concentration ($\mu g/m^3$)	F_c	Carcinogen ($\mu g/m^3$)	URF $(\mu g/m^3)^{-1}$	Estimated CR per million	F_{nc}	Non-Carcinogen ($\mu g/m^3$)	RfC ($\mu g/m^3$)	Hazard Quotients (HQ)
Aluminum Oxide	01344-28-1	0.000997					0.96	9.57E-04	4.5	2.13E-04
Ammonia	07664-41-7	0.006441					0.96	6.18E-03	100	6.18E-05
Cobalt	07440-48-4	0.000018					0.96	1.73E-05	0.001	1.73E-02
Ethylene Oxide	00075-21-8	0.006944	0.41	2.8472E-03	0.000088	0.25	0.96	6.67E-03	0.019	3.51E-01
Hydrocarbon	68527-16-2	0.096619					0.96	9.28E-02	7000	1.33E-05
Hydrogen Chloride	07647-01-0	0.006441					0.96	6.18E-03	20	3.09E-04
Iron Oxide	01309-37-1	0.000617					0.96	5.92E-04	12	4.94E-05
Monoethanolamine	00141-43-5	0.159691					0.96	1.53E-01	18	8.52E-03
Nitric Acid	07697-37-2	0.006441					0.96	6.18E-03	12	5.15E-04
Platinum	07440-06-4	0.000702					0.96	6.74E-04	0.0048	1.40E-01
Sodium cyanide	00143-33-9	0.003966					0.96	3.81E-03	45	8.46E-05
Sulfuric Acid	07644-93-9	0.000658					0.96	6.32E-04	1	6.32E-04
Total Particulates	NY075-00-0	0.030498					0.96	2.93E-02	45	6.51E-04
Total VOC	NY998-00-0	2.024744					0.96	1.94E+00	7000	2.78E-04
Nitrogen Dioxide	NY210-00-0	0.452094					0.96	4.34E-01	100	4.34E-03
Sulfur Dioxide	07446-09-5	0.038123					0.96	3.66E-02	80	4.57E-04
						Total Estimated Cancer Risk (per million)	0.25			
						Cancer Risk Threshold (per million)	1.0			
									Total Estimated Non-Cancer Hazard Index (HI)	0.525
									Non-Cancer Hazard Index Threshold	1.0

Notes:
URF = compound specific inhalation unit risk factor in $(\mu g/m^3)^{-1}$
RfC = reference dose concentration, established by the EPA or NYSDEC, $\mu g/m^3$

Table 13.18: Acute Quotients (AHQ) and Total Hazard Index (AHI) of the Toxic Pollutants

Chemical Name	CAS No.	Max Estimated Concentration (µg/m³)	SGC (µg/m³)	Acute Hazard Quotients (AHQ)
Ammonia	07664-41-7	0.552653	2400	2.30E-04
Caustic Soda	01310-73-2	0.347003	200	1.74E-03
Ethylene Oxide	00075-21-8	2.168412	18	1.20E-01
Hydrocarbon	68527-16-2	8.289799	98000	8.46E-05
Hydrogen Chloride	07647-01-0	0.552653	2100	2.63E-04
Monoethanolamine	00141-43-5	0.386094	1500	2.57E-04
Nitric Acid	07697-37-2	0.552653	86	6.43E-03
Sodium cyanide	00143-33-9	0.347003	380	9.13E-04
Sodium Hydroxide	01310-73-2	0.347003	200	1.74E-03
Sulfuric Acid	07644-93-9	0.054697	120	4.56E-04
Total Particulates	NY075-00-0	5.194865	380	1.37E-02
Total VOC	NY998-00-0	356.2193	98000	3.63E-03
Nitrogen Dioxide	NY210-00-0	79.11038	188	4.21E-01
Carbon Monoxide	00630-08-0	3168.868	14000	2.26E-01
Sulfur Dioxide	07446-09-5	7.421236	197	3.78E-02
			Total Estimated Acute Hazard Index (AHI)	0.835
			Total Acute Hazard Index Threshold	1.0

"Large" or "Major" Source Analysis

Potential stationary source impacts on the nearest receptor - Projected Development Site 3 from the existing Power Plant Building at 11 West 42nd Street were determined using EPA's AERMOD dispersion model. The facility consists of one boiler that uses No.2 fuel oil and eight (8) natural gas fueled engines powering electric generator. Table 13.19 presents the stack parameters and emission rates used in the analysis.

Table 13.19: Emission Rates & Stack Parameters for Existing Power Plant Building

Emission Sources	Boiler	NG Engines
Emission Rates (g/s)		
1-hour NO_2	0.1728	0.5964
Annual NO_2	0.1609	0.5554
24-Hour PM_{10}	0.0206	0.0539
24-Hour $PM_{2.5}$	0.0184	0.0539
Annual $PM_{2.5}$	0.0171	0.0502
1-hour SO_2	0.0018	0.0016
Stack Parameters		
Stack Height (m)	114.91	93.57
Stack Diameter (m)	0.508	0.762
Exhaust Velocity (m/s)	7.2	0.3728
Exhaust Temperature (˚F)	426	426

The maximum estimated concentrations of annual NO_2, 24-hour PM_{10} and 1-hour SO_2 from the modeling were added to the background concentrations to estimate total air quality concentrations for the Proposed Action, while 24-hour and annual $PM_{2.5}$ concentrations were compared with the PM2.5 *de minimis* criteria without considering background concentration. Additionally, seasonal hourly background concentrations were added to the modeled 1-hour NO_2 concentrations to predict the maximum total NO_2 concentration. The results of the detailed AERMOD analysis are presented in Table 13.20.

As shown in Table 13.20, the maximum 1-hour and annual NO_2, as well as the 24-hr PM_{10} are below their respective NAAQS values. The maximum 24-hour $PM_{2.5}$ concentration is below the *de minimis* criteria threshold of 4.4 μg/m³, and the annual $PM_{2.5}$ concentration is below the *de minimis* criteria threshold of 0.3 μg/m³. Therefore, there would be no significant adverse stationary source impacts on any Projected and Potential Development Sites from existing "large" or "major" sources.

Table 13.20: Maximum Predicted Concentration (μg/m³) from Existing Power Plant Building

Pollutant	Averaging Period	Maximum Modeled Concentration		Background Concentration	Total Concentration/Increment	NAAQS / *De Minimis*	Pass / Fail
		No Downwash	Downwash				
NO_2	1-hour	180.38	130.81	120.9	180.38	188	PASS
	Annual	2.45	1.59	38.3	40.75	100	PASS
PM_{10}	24-Hour	2.91	0.88	44	46.91	150	PASS
$PM_{2.5}$	24-Hour	1.97	0.65	26.2	1.97	4.4	PASS
	Annual	0.264	0.250	--	0.264	0.3	PASS
SO_2	1-hour	0.46	0.24	36.9	37.36	196	PASS

Notes:
[1] Seasonal-hourly background concentration was added to the modeled 1-hour NO_2 concentrations to predict the maximum total concentration.
[2] Total concentration represents the higher pollutant level predicted from "No Downwash" and "Downwash".