Chapter 12: Air Quality

A. INTRODUCTION

This chapter examines the potential for the Proposed Actions to result in significant adverse air quality impacts. As described in Chapter 1, "Project Description," the Proposed Project would redevelop the Project Sites with an arena for the New York Islanders National Hockey League (NHL) franchise and for other sports, music, and entertainment events; dining, retail, and entertainment uses; a hotel; commercial office space; community space; publicly accessible open space, and parking. The Proposed Project would also include approximately 1,500 parking spaces in new structured parking beneath the Site B retail village and approximately 400 parking spaces within and below the Site A hotel's podium. During times of high attendance arena events, approximately 6,312 additional surface parking spaces on the North, South and East Lots would be utilized through a shared parking agreement with the FOB and NYRA.

Air quality impacts can be either direct or indirect. Direct impacts result from emissions generated by stationary sources at a development site, such as emissions from on-site fuel combustion for heat and hot water systems. Indirect impacts are caused by off-site emissions associated with a project, such as impacts on the project site associated with emissions from nearby existing stationary sources or by emissions from on-road vehicle trips (mobile sources) generated by a proposed project or other changes to future traffic conditions due to a project. Potential air quality effects associated with the construction of the Proposed Project (i.e., emissions from on-site construction equipment, and on-road construction-related vehicles) are discussed in Chapter 15, "Construction."

An assessment of the potential air quality effects of carbon monoxide (CO) concentrations that would result from the Proposed Project was performed according to the procedures outlined in New York State Department of Transportation's (NYSDOT) The Environmental Manual (*TEM*). This assessment included a mobile source screening analysis to determine the locations where a more detailed analysis may be required. In addition, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of the proposed parking garages and surface lots.

Boiler plants would provide space heating and domestic hot water to the proposed buildings. Therefore, a stationary source analysis was conducted to evaluate potential future pollutant concentrations from the proposed heating and hot water systems on both the surrounding neighborhood (project-on-existing) and the Project Sites (project-on-project).

PRINCIPAL CONCLUSIONS

As discussed below, the screening analysis determined that none of the Proposed Project-affected intersections would require a detailed microscale air quality analysis. The analysis of the proposed parking facilities determined that the emissions from vehicles using the facilities would not result in any significant adverse air quality impacts.

Based on stationary source dispersion modeling, there would not be any potential significant adverse air quality impacts from emission of nitrogen dioxide and particulate matter from the proposed heat and hot water systems for the Proposed Project.

B. CRITERIA POLLUTANTS

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 (nitric oxide [NO] and nitrogen dioxide [NO_2], collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources, and some sources utilizing non-road diesel equipment 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, ozone, and lead are regulated by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act (CAA),[1] and are referred to as ‘criteria pollutants’; emissions of precursors to criteria pollutants, including VOCs, NO_x, and SO_2, 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 analyzed on a local (microscale) basis.

The Proposed Project would increase traffic volumes on roadways near the Project Sites and would result in localized increases in CO levels. Therefore, a mobile source screening analysis was performed to determine whether there are locations where a full mobile source analysis would be required.

NITROGEN OXIDES, VOCS, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are advected downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from all sources are therefore generally examined on a regional basis. The contribution of any action or project to regional emissions of these pollutants would include any added stationary or mobile source emissions. The change in regional mobile source emissions of these pollutants would be related to the total vehicle miles

[1] The Clean Air Act of 1970, as amended 1990 (42 U.S.C. §7401 et seq.).

traveled added or subtracted on various roadway types throughout the New York metropolitan area, which is designated as a moderate non-attainment area for ozone by the EPA.

The Proposed Project would not have a significant effect on the overall volume of vehicular travel in the metropolitan area. Therefore, no measureable impact on regional NO_x emissions or on ozone levels is predicted. A regional analysis of emissions of these pollutants from mobile sources associated with the Proposed Project was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a criteria pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern farther downwind from large stationary point sources, and not a local concern from mobile sources. (NO_x emissions from fuel combustion are mostly in the form of NO at the source.) However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may be of greater concern. In the instance of the Proposed Project, however, the changes in NO_2 concentrations have not been analyzed explicitly due to limitations in guidance and modeling tools. Nevertheless, any changes in NO_2 associated with the Proposed Project would be relatively small.

Potential impacts on local NO_2 concentrations from the Proposed Project's natural gas-fired heating and hot water systems were evaluated.

LEAD

Current airborne lead emissions are principally associated with industrial sources. Lead in gasoline has been banned under the CAA and would not be emitted from any other component of the Proposed Project. 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: 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 from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction and agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) of other pollutants, often toxic, and some likely carcinogenic compounds.

As described below, PM is regulated in two size categories: particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}, which includes $PM_{2.5}$). $PM_{2.5}$ has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles, and is also extremely persistent in the atmosphere. $PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from a source) or from precursor gases reacting in the atmosphere to form secondary PM.

Gasoline-powered vehicles do not produce any significant quantities of particulate emissions. Diesel-powered vehicles, especially heavy duty trucks and buses, do emit respirable PM, most of which is $PM_{2.5}$. PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel-powered vehicles. The Proposed Project would not result in significant increases in truck traffic near the Project Sites or in the region. Therefore, an analysis of potential impacts from PM was not warranted. Potential future levels of PM from the proposed heating and hot water systems were examined.

SULFUR DIOXIDE

SO_2 emissions are associated primarily with the combustion of oil and coal, both sulfur-containing fuels. Due to the federal rules on the sulfur content in fuel for on-road vehicles, no significant quantities are emitted from vehicular sources. Therefore, an analysis of SO_2 from mobile sources was not warranted. Natural gas would be burned in the proposed heating and hot water systems. The sulfur content of natural gas is negligible.[2,3] Therefore, an analysis of SO_2 impacts from the Proposed Project's natural gas fired heating and hot water systems was not warranted.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established[4] 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 standards are generally either the same as the secondary standards or more restrictive. The NAAQS are presented in **Table 12-1**. The NAAQS for CO, annual NO_2, and 3-hour SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particles, settleable particles, non-methane hydrocarbons, 24-hour and annual SO_2, and ozone which correspond to federal standards that have since been revoked or replaced, and for the noncriteria pollutants beryllium, fluoride, and hydrogen sulfide.

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 a non-attainment area by EPA, the state is required to develop and implement a State

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[2] Per EPA's AP-42, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, Section 1.4, Natural Gas Combustion, emissions of SO2 from natural gas-fired boilers are low because pipeline quality natural gas typically has sulfur levels of 2,000 grains per million cubic feet.

[3] *Energy Information Administration, Natural Gas 1998: Issues and Trends* states that U.S. coal contains 1.6 percent sulfur (a consumption-weighted national average) by weight. The oil burned at electric utility power plants ranges from 0.5 to 1.4 percent sulfur. Diesel fuel has less than 0.05 percent, while the current national average for motor gasoline is 0.034 percent sulfur. Comparatively, natural gas at the burner tip has less than 0.0005 percent sulfur compounds.

[4] EPA. *National Ambient Air Quality Standards*. 40 CFR part 50.

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.

Table 12-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	µg/m³	ppm	µg/m³
Carbon Monoxide (CO)				
8-Hour Average	9 (1)	10,000	None	
1-Hour Average	35 (1)	40,000		
Lead				
Rolling 3-Month Average	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
1-Hour Average (2)	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average (3,4)	0.070	140	0.070	140
Respirable Particulate Matter (PM_{10})				
24-Hour Average (1)	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean (5)	NA	12	NA	15
24-Hour Average (6)	NA	35	NA	35
Sulfur Dioxide (SO_2)				
1-Hour Average (7)	0.075	196	NA	NA
Maximum 3-Hour Average (1)	NA	NA	0.5	1,300

Notes: ppm – parts per million (unit of measure for gases only)
µg/m³ – micrograms per cubic meter (unit of measure for gases and particles, including lead)
NA – not applicable
All annual periods refer to calendar year.
Standards are defined in ppm. Approximately equivalent concentrations in µg/m³ are presented.
(1) Not to be exceeded more than once a year.
(2) 3-year average of the annual 98th percentile daily maximum 1-hr average concentration.
(3) 3-year average of the annual fourth highest daily maximum 8-hr average concentration.
(4) EPA has lowered the NAAQS down from 0.075 ppm, effective December 2015.
(5) 3-year average of annual mean.
(6) Not to be exceeded by the annual 98th percentile when averaged over 3 years.
(7) 3-year average of the annual 99th percentile daily maximum 1-hr average concentration.
Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.

In 2002, EPA re-designated Nassau County as in attainment for CO. Under the resulting maintenance plans, the County is committed to implementing site-specific control measures 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 30, 2014.

Nassau County has been designated as an attainment area for PM_{10}.

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 were also nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS since November 2009. The area was re-designated as in attainment for the 24-hour standard effective April 18, 2014 and is now under a maintenance plan. 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 "moderate" non-attainment areas 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 began submitting SIP documents in December 2014. On July 19, 2017 NYSDEC announced that the New York Metropolitan Area (NYMA) is not projected to meet the July 20, 2018 attainment deadline and NYSDEC is therefore requesting that EPA reclassify the NYMA to "serious" nonattainment, which would impose a new attainment deadline of July 20, 2021 (based on 2018–2020 monitored data). On April 30, 2018, EPA designated the same area as a moderate NAA for the revised 2015 ozone standard.

New York State is currently in attainment of the annual-average NO_2 standard. EPA has designated the entire state of New York as "unclassifiable/attainment" of the 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.

EPA has established a 1-hour SO_2 standard, replacing the former 24-hour and annual standards, effective August 23, 2010. In December 2017, EPA designated the entire State of New York as in attainment for this standard, with the exception of Monroe County, which was designated 'unclassifiable'.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations 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.[5] 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 12-1**) would be deemed to have a potential significant adverse impact. In addition, in order to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be significantly increased in non-attainment areas, *de minimis* 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.

[5] New York State Environmental Quality Review Regulations. 6 NYCRR § 617.7.

$PM_{2.5}$ DE MINIMIS CRITERIA

NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts.[6] This policy applies only to facilities applying for permits or major permit modifications under SEQRA that emit 15 tons of PM_{10} or more annually. The policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum impacts are predicted to increase $PM_{2.5}$ concentrations by more than 0.3 µg/m^3 averaged annually or more than 5 µg/m^3 on a 24-hour basis. Projects that exceed either the annual or 24-hour threshold will be required to prepare an Environmental Impact Statement (EIS) to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

Actions that would increase $PM_{2.5}$ concentrations by more than the interim guidance criteria above would be considered to have a potential significant adverse impact. NYSDEC requires that permitted sources that would potentially cause exceedance of these criteria prepare an environmental impact statement and examine potential measures to reduce or eliminate such impacts. PM_{10} emissions from the Proposed Project would also be well below the 15-ton-per year threshold under DEC's $PM_{2.5}$ policy guidance; therefore, an analysis for $PM_{2.5}$ was not warranted under this criteria.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCE AIR QUALITY SCREENING ANALYSIS

NYSDOT guidance states that PM microscale/hot-spot screening and analysis should be based on the USEPA guidance *Transportation Conformity Guidance to Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas*. The USEPA guidance lists the types of projects that could be of concern for PM. These projects include those that have a substantial number of diesel vehicles, or would substantially increase the number of diesel vehicles.

The Proposed Project would introduce delivery trucks servicing the retail village and coach buses transporting shoppers to and from the retail village. During arena events and/or peak shopping periods, electric powered shuttle buses would be provided to transport attendees between the North and East Lots and the arena or between the South and East Lots and the retail village. The Proposed Project would not substantially increase the number of diesel vehicles in the area. Overall, the change in vehicle mix in the area caused by the Proposed Project would be negligible, and the percentage of diesel vehicles (delivery trucks and coach buses) traveling to the area would not increase considerably compared to the future condition without the Proposed Actions. Therefore, a microscale analysis for PM is not warranted.

An assessment of the potential air quality effects of CO emissions that would result from vehicles coming to and departing from the Proposed Project sites was performed following the procedures outlined in the NYSDOT *TEM*. The study area includes 38 intersections for local street network and 37 highway segments on the northbound and southbound Cross Island Parkway evaluated as part of the analysis for Chapter 11, "Transportation." The potential for CO impacts was assessed using traffic data for the 2021 Build year during the Weekday AM (7:30 AM–8:30 AM), Weekday PM (6:30 PM–7:30 PM), Saturday midday (12:45 PM–1:45 PM), Saturday PM (6:00 PM–7:00 PM) and Saturday

6 NYSDEC. *CP33: Assessing and Mitigating Impacts of Fine Particulate Emissions*. December 29, 2003.

night time (9:30 PM–10:30 PM) peak traffic hours. The following multi-step *TEM* screening procedure was used to determine whether a detailed air quality analysis of CO concentrations is needed for any of the intersections in the study area.

CO SCREENING CRITERIA

Screening criteria described in the *TEM* were employed to determine whether the Proposed Project requires a detailed air quality analysis at the intersections in the study area. Before undertaking a detailed microscale modeling analysis of CO concentrations at the study area intersections, the screening criteria first determines whether the Proposed Project would increase traffic volumes or implement any other changes (e.g., changes in speed, roadway width, sidewalk locations, or traffic signals) to the extent whereby significant increases in air pollutant concentrations could be expected. The following multi step procedure is suggested in the *TEM* to determine if there is the potential for CO impacts from the Proposed Project:

- **Level of Service (LOS) Screening:** If the Build condition LOS is A, B, or C, no air quality analysis is required. For intersections operating at LOS D or worse, proceed to Capture Criteria.
- **Capture Criteria:** If the Build condition LOS is D, E, or F, then the following Capture Criteria should be applied at each intersection or corridor to determine if an air quality analysis may be warranted:
  - a 10 percent or more reduction in the distance between source and receptor (e.g., street or highway widening); or
  - a 10 percent or more increase in traffic volume on affected roadways for the Build year; or
  - a 10 percent or more increase in vehicle emissions for the Build year; or
  - any increase in the number of queued lanes for the Build year (this applies to intersections); it is not expected that intersections in the Build condition controlled by stop signs would require an air quality analysis; or
  - a 20 percent reduction in speed when Build average speeds are below 30 miles per hour (mph).

If the project does not meet any of the above criteria, a microscale analysis is not required. Should any one of the above criteria be met in addition to the LOS screening, then a Volume Threshold Screening is performed, using traffic volume and emission factor data to compare with specific volume thresholds established in the *TEM*.

Both the Capture Criteria and Volume Threshold Screening were developed by NYSDOT to be conservative air quality estimates based on worst-case assumptions. *TEM* states that if the project-related traffic volumes are below the volume threshold criteria, then a microscale air quality analysis is unnecessary even if the other Capture Criteria are met for a location with LOS D or worse, since a violation of the NAAQS would be extremely unlikely.

PARKING ANALYSIS

The Proposed Project would include 1,500 parking spaces in a new structured parking facility beneath the Site B retail village and 400 parking spaces in and below the Site A hotel's podium. In addition, during times of high attendance arena events, approximately 6,312 additional surface parking spaces on the North, South and East Lots would be utilized through a shared parking agreement with the FOB and NYRA.

Emissions from vehicles using the proposed facilities could potentially affect ambient levels of CO in the immediate vicinity of the ventilation outlets. Projected parking facility capacity and the peak hour arrivals and departures were used to identify the parking facilities most likely to result in impacts on local air quality. Based on these factors, the effect of proposed parking garages at the Site B retail village with a parking capacity of 1,500 spaces and the South Lot with 1,150 surface parking spaces were analyzed to assess maximum potential concentrations from parking facilities associated with the Proposed Project. The analysis of the South Lot is more conservative as compared to North and East Lots due to its proximity to the sidewalk receptors that would be affected by emissions from the parking facility, as well as by on-street emissions from Hempstead Turnpike.

Emissions from vehicles entering, parking, and exiting the parking facilities were estimated using the EPA MOVES mobile source emission model. For all arriving and departing vehicles, an average speed of 5 miles per hour was conservatively assumed for travel within the parking facilities. In addition, all departing vehicles were assumed to idle for 1 minute before proceeding to the exit. While specific development plans for the Proposed Project have not yet been defined, based on preliminary information provided by the design team, the enclosed parking structures would be designed for an exhaust airflow of not more than 0.75 cubic foot per minute per gross square foot of garage area.

To determine compliance with the NAAQS, CO concentrations were determined for the maximum 8-hour average period. A persistence factor of 0.70 was used to convert the calculated 1-hour average maximum concentrations to 8-hour averages, accounting for meteorological variability over the average 8-hour period.

To determine pollutant concentrations, the outlet vents were analyzed as a "virtual point source" using the methodology in EPA's *Workbook of Atmospheric Dispersion Estimates, AP-26*. This methodology estimates CO concentrations at various distances from an outlet vent by assuming that the concentration in the garage is equal to the concentration leaving the vent, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces. The ventilation of the Site B retail parking facility would be primarily by natural means, with openings on the North, East and West sides. The natural ventilation, if necessary, would be augmented with mechanical ventilation activated by CO sensors. For the purpose of this analysis, the parking facility was modeled as if it were mechanically ventilated because that is a more conservative approach for the purposes of environmental review.

The CO concentrations were determined for the time periods when overall parking facility usage would be the greatest, considering the hours when the greatest number of vehicles would enter and exit the facility. Traffic data for the parking analysis were derived from the trip generation analysis described in Chapter 11, "Transportation." Background and on-street concentrations, where applicable, were added to the modeling results to obtain the total ambient levels for CO.

Exhaust air from the analyzed parking garage on Site B was assumed to be vented through a single outlet at a height of approximately 10 feet above the sidewalk. Since there is no specific garage design at this time, the vent face was assumed to discharge towards the street that has the highest background levels of traffic, to be conservative. "Near" and "far" receptors were placed along the sidewalks at a pedestrian height of six feet; a near side sidewalk receptor was modeled on the same side of the street (at a distance of seven feet from the garage), and a far side sidewalk receptor was modeled near eastbound Hempstead Turnpike (at a distance of 73 feet). While the parking facility on Site B would be adjacent to a residential area to the east, that area is located farther away compared to the receptors modeled in the analysis, which represent potential worst-case locations. A receptor was also modeled at and above the assumed vent release height, 10 feet from the vent, to conservatively assess the air quality impacts from the proposed garage on the adjacent retail, representing windows or air intake locations.

For the open surface South Lot, a receptor was modeled on the sidewalk along westbound Hempstead Turnpike, at near and far lot distances of 23 feet and 319 feet, respectively.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

A stationary source analysis was conducted to evaluate potential impacts from heating and hot water systems for the Project Sites. As described in Chapter 1, "Project Description," the Proposed Project would consist of an arena, a hotel, commercial office space and community space, retail and dining on Site A and a retail village on Site B.

Based on the information provided by the project design team, the arena would have a gas-fired central boiler system for space heating, gas-fired domestic hot water plant and gas-fired dehumidification equipment exhausting through the roof of the building. Each of the other proposed buildings on Site A would have a boiler installation that would generate hot water for building heating and domestic hot water, and would utilize natural gas exclusively. It was assumed that the exhaust stack(s) would be located on the tallest portion of the roof of the buildings. For the retail village on Site B, it was assumed that there would be multiple heating and hot water systems on each of the buildings. Since there is no information available at this time on the specific layout and sizing of the Site B retail buildings, the site was modeled as a group of multiple area sources.

The annual fuel usage estimates were provided by the project design team for the arena and hotel. Annual emissions rates for the heating and hot water systems of the other proposed buildings were calculated based on fuel consumption estimates, using energy use estimates based on type of development and size of the building obtained from the Energy Information Administration (EIA).[7] Short-term emissions were conservatively estimated assuming a 100-day heating season.

The exhaust velocity was calculated based on the exhaust flowrate for the boiler capacity, estimated using the energy use of the proposed building and EPA's fuel factors. Assumptions for stack diameter and exhaust temperature for the proposed systems were obtained from a survey of similar sized equipment.

Emissions rates for the boilers were calculated based on emissions factors obtained from the EPA *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources*. $PM_{2.5}$ emissions include both the filterable and condensable fractions. **Table 12-2** presents the stack parameters and emission rates used in the heating and hot water system analysis.

[7] EIA. Commercial Buildings Energy Consumption Survey (CBECS). Table C27. 2012.

Table 12-2
Boiler Stack Parameters and Emission Rates

Parameter		Site A – Arena: Central Heating Plant	Site A – Arena: Central Hot Water Plant	Site A – Arena: Desiccant Dehumidifiers	Site A: Hotel	Site A: Retail & Dining	Site A: Office & Community Space	Site B: Retail & Dining
Building Size (gsf)		690,000			230,000	7,000	60,000	350,000
Source Type		Point	Point	Point	Point	Point	Point	Area
Number of Stacks		1	1	1	1	1	1	10
Initial Vertical Dispersion (m)		-	-	-	-	-	-	4.253
Building Height (ft)		81	81	81	150	36	50	27
Stack Exhaust Temp. (°F)(2)		307.8	307.8	307.8	307.8	307.8	307.8	307.8
Stack Exhaust Height (ft)		84	84	84	153	36	53	30
Stack Exhaust Diameter (ft)(2)		5.0	2.0	5.0	2.0	2.0	2.0	-
Stack Exhaust Flow (ACFM)(1)(3)		7,937	1,058	5,291	1,349	133	224	-
Stack Exhaust Velocity (ft/s)		6.74	5.61	4.49	7.16	0.71	1.19	-
Fuel Type		Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas	Natural gas
Short-Term Emission Rates								
g/s(4)	NO_x	0.185(5)	0.049	0.247	0.063	0.006	0.010	0.006
	PM_{10}	0.028	0.004	0.019	0.005	0.0005	0.001	0.00049
	$PM_{2.5}$	0.028	0.004	0.019	0.005	0.0005	0.001	0.00049
Annual Emission Rates								
g/s(4)	NO_x	0.035(6)			0.017(6)	0.002	0.003	0.002
	$PM_{2.5}$	0.005(6)			0.001(6)	0.0001	0.0002	0.0001

Notes:
(1) ACFM = actual cubic feet per minute.
(2) The stack diameter and exhaust temperature are based on boiler specifications for similar sized boilers.
(3) The stack exhaust flow rate was estimated based on the type of fuel and heat input rates.
(4) Emission rates are based on EPA AP-42 data.
(5) NO_x emission rates based on EPA AP-42 data for low NO_x burners based on information provided by the design team.
(6) Emission rates are based on annual fuel consumption provided by the design team.

Dispersion Modeling

Potential impacts were evaluated using the EPA/AMS AERMOD dispersion model.[8] 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 analysis of potential impacts from exhaust stacks was performed assuming stack tip downwash, urban dispersion and surface roughness length, with and without building downwash, and elimination of calms. The AERMOD model also incorporates the algorithms from the PRIME model, which is designed to predict impacts in the "cavity region" (i.e., the area around a structure that under certain conditions may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region). The Building Profile Input Program (BPIP) program for the PRIME model (BPIPRM)

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8 EPA. *AERMOD Implementation Guide*. 454/B-16-013. December 2016; EPA. AERMOD Model Formulation and Evaluation. 454/R-17-001. May 2017; EPA. User's Guide for the AMS/EPA Regulatory Model (AERMOD). 454/B-16-011. December 2016.

was used to determine the projected building dimensions modeling with the building downwash algorithm enabled. The modeling of downwash from sources accounts for all obstructions within a radius equal to five obstruction heights of the stack.

Methodology Utilized for Estimating NO_2 Concentrations

Annual NO_2 concentrations from stationary sources were estimated using a NO_2 to NO_x ratio of 0.75, as described in EPA's Guideline on Air Quality Models at 40 CFR part 51 Appendix W, Section 5.2.4.

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

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

Meteorological Data

The meteorological data set consisted of five consecutive years of meteorological data: surface data collected at JFK Airport (2013–2017), and concurrent upper air data collected at Brookhaven, New York. The meteorological data provide hour-by-hour wind speeds and directions, stability states, and temperature inversion elevation over the five-year period. These data were processed using the EPA AERMET program to develop data in a format that can be readily processed by the AERMOD model. The land uses around the site where meteorological surface data were available were classified using categories defined in digital United States Geological Survey (USGS) maps to determine surface parameters used by the AERMET program.

Receptor Placement

A comprehensive receptor network (i.e., locations with continuous public access) was developed for the modeling analyses. Discrete receptors (i.e., locations at which concentrations are calculated) were modeled along the existing and proposed buildings' façades to represent potentially sensitive locations such as operable windows and intake vents. Rows of receptors at spaced intervals on the modeled buildings were analyzed at multiple elevations. Receptors were also placed at publicly accessible ground-level locations.

Background Concentrations

To estimate the maximum expected total pollutant concentrations, the calculated impacts from the emission sources must be added to a background value that accounts for existing pollutant concentrations from other sources (see **Table 12-3**). The background levels are based on concentrations monitored at the nearest NYSDEC ambient air monitoring stations over the most recent five-year period for which data are available (2013–2017), with the exception of PM_{10}, which is based on three years of data (2015–2017). For the 24-hour PM_{10} concentration, the maximum second-highest measured value over the specified period was used.

Table 12-3
Maximum Background Pollutant Concentrations for Heating and Hot Water System Analysis

Pollutant	Average Period	Location	Concentration (µg/m³)	NAAQS (µg/m³)
NO_2	1-hour	Queens College, Queens	(1)	188
	Annual	Queens College, Queens	32.9	100
$PM_{2.5}$	24-hour	Queens College, Queens	18.9	35
	Annual	Queens College, Queens	7.3	
PM_{10}	24-hour	Queens College, Queens	38	150

Note:
(1) The 1-Hour NO_2 background concentration is not presented in the table since the AERMOD model determines the total 98th percentile 1-Hour NO_2 concentration at each receptor.
Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2013–2017

Total 1-hour NO_2 concentrations were calculated following methodologies that are accepted by the EPA and are considered appropriate and conservative. The methodology used to determine the compliance of total 1-hour NO_2 concentrations from the proposed sources with the 1-hour NO_2 NAAQS[9] 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.

E. EXISTING CONDITIONS

Concentrations of all criteria pollutants at NYSDEC air quality monitoring stations nearest the study area are presented in **Table 12-4**. All data statistical forms and averaging periods are consistent with the definitions of the NAAQS. It should be noted that these values are somewhat different than the background concentrations presented in **Table 12-3** above, since the data presented in **Table 12-4** are based on the most current data, compared with background concentrations used for modeling purposes, which are based on several years of monitoring data.

These existing concentrations are based on recent published measurements, averaged according to the form of the NAAQS (e.g., $PM_{2.5}$ concentrations are averaged over the three years); the background concentrations are the highest values in past years and are used as a conservative estimate of the highest background concentrations for future conditions.

There were no monitored violations of the NAAQS for the pollutants at these sites in 2017, with the exception of ozone.

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

Table 12-4
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Queens College, Queens	ppm	1-hour	1.4	35
			8-hour	0.9	9
SO_2	Queens College, Queens	µg/m³	3-hour	42.1	1,300
			1-hour	18.1	196
PM_{10}	Queens College, Queens	µg/m³	24-hour	31	150
$PM_{2.5}$	Queens College, Queens	µg/m³	Annual	7.3	12
			24-hour	18.9	35
NO_2	Queens College, Queens	µg/m³	Annual	28.7	100
			1-hour	112.3	188
Lead	IS 52, Bronx	µg/m³	3-month	0.0041	0.15
Ozone	Queens College, Queens	ppm	8-hour	0.074	0.070

Notes:
The CO, PM_{10}, and 3-hour SO_2 concentrations for short-term averages are the second-highest from the most recent year with available data.
$PM_{2.5}$ annual concentrations are the average of 2015–2017 annual concentrations, and the 24-hour concentration is the average of the annual 98th percentiles in the same period.
8-Hour average ozone concentrations are the average of the fourth-highest-daily values from 2015–2017.
SO_2 1-hour and NO_2 1-hour concentrations are the average of the 99th percentile and 98th percentile, respectively, of the highest daily 1-hour maximum from 2015 to 2017.
Source:
New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2013–2017.

F. FUTURE WITHOUT THE PROPOSED ACTIONS

In the future without the Proposed Project, no significant changes in air quality are expected to occur on the Project Sites. Sites A and B would continue to be used for occasional parking related to Belmont Park Racetrack and its associated activities and events. Site B would also continue to be used for vehicle storage.

G. POTENTIAL IMPACTS OF THE PROPOSED ACTIONS

MOBILE SOURCE AIR QUALITY SCREENING RESULTS

The area roadway intersections were reviewed based on NYSDOT's *TEM* criteria for determining locations that may warrant a CO microscale air quality analysis. The screening analysis examined the LOS and projected volume increases by intersection approach. As described below, the results of the screening analysis show that none of the intersections would require a detailed microscale air quality analysis.

LOS SCREENING ANALYSIS

Results of the traffic capacity analysis performed for the 2021 Build year condition, for the peak traffic periods, were reviewed at each of the study area intersections for the local street network as well as the highway segments to determine the potential need for a microscale air quality analysis.

The LOS screening criteria were first applied to identify those intersections with approach LOS D or worse. All of the 37 highway segments analyzed for traffic operate at LOS D or worse similar to the No Action condition. Based on the review of the 38 intersections analyzed for local street network, the following 14 intersections were projected to operate at LOS D or worse on approaches during any of the peak traffic periods analyzed:

LOCAL STREET NETWORK

- Hempstead Turnpike and Locustwood Boulevard/Gate 5 Road;
- Hempstead Turnpike and School Road/Marguerite Avenue;
- Hempstead Turnpike and Covert Avenue/Meacham Avenue;
- Plainfield Avenue and Cherry Street (unsignalized);
- Plainfield Avenue and Magnolia Avenue/Woodbine Court;
- Jericho Turnpike and Plainfield Avenue;
- Jericho Turnpike and Covert Avenue;
- Jericho Turnpike and New Hyde Park Road;
- Jamaica Avenue and 213th Street/Hempstead Avenue;
- Jamaica Avenue and Springfield Boulevard;
- Hempstead Avenue and Springfield Boulevard;
- Hempstead Avenue and 225th Street;
- Hempstead Avenue and Cross Island Parkway southbound off-ramp (unsignalized); and
- Hempstead Avenue and Cross Island Parkway northbound off-ramp (unsignalized).

CAPTURE CRITERIA SCREENING ANALYSIS

Further screening on the highway segments and intersections identified in the LOS Screening Analysis was conducted using the Capture Criteria outlined above. This screening indicated that for the local street network for 12 of the 14 intersections listed above, one of the listed Capture Criteria would be met: there would be a 10 percent or more increase in traffic volume on affected roadways for the Build year. For the highway segments there would be a 10 percent or more increase in traffic volume on all the affected segments for the Build year and 20 percent reduction in speed at 14 of the 37 segments.

Therefore, a volume threshold screening analysis was conducted for the following 12 intersections and one worst-case highway segment:

LOCAL STREET NETWORK

- Hempstead Turnpike and Locustwood Boulevard/Gate 5 Road;
- Hempstead Turnpike and School Road/Marguerite Avenue;
- Hempstead Turnpike and Covert Avenue/Meacham Avenue;
- Plainfield Avenue and Cherry Street (unsignalized);
- Plainfield Avenue and Magnolia Avenue/Woodbine Court;
- Jericho Turnpike and Plainfield Avenue;
- Jericho Turnpike and Covert Avenue;
- Jericho Turnpike and New Hyde Park Road;
- Hempstead Avenue and Springfield Boulevard;
- Hempstead Avenue and 225th Street;
- Hempstead Avenue and Cross Island Parkway southbound off-ramp (unsignalized); and
- Hempstead Avenue and Cross Island Parkway northbound off-ramp (unsignalized).

HIGHWAY SEGMENT

- Southbound Mainline between Hempstead Ave WB off-ramp and on-ramp.

VOLUME THRESHOLD SCREENING

As discussed in the Capture Criteria Screening Analysis above, the Capture Criteria was triggered for 12 study area intersections and one highway segment in the Build year. Therefore, a Volume Threshold screening analysis was conducted to further determine the need for a microscale air quality analysis at these intersections. The volume thresholds (provided in *TEM)* establish traffic volumes in which a violation of the NAAQs for CO is extremely unlikely. This approach uses project area specific emissions data to determine corresponding vehicle thresholds. For intersections where approach volumes are equal to or less than the applicable thresholds, microscale air quality analysis is not required.

Based on the Volume Threshold screening, the Proposed Project-related traffic volumes in the Build year at each of the intersections and the highway segment would be below the Volume Threshold criteria. Although the Proposed Project would generate additional traffic at these intersections and highway segment, it would not be enough to necessitate further study. Therefore, a detailed CO microscale air quality analysis was not warranted at these intersections and highway segment.

PARKING ANALYSIS

The CO levels from the Site B retail village parking garage and the surface parking South Lot associated with the Proposed Project were predicted using the methodology previously described. The total CO impacts included both background CO levels and contributions from traffic on adjacent roadways (for the far side receptor only).

The overall maximum predicted 8-hour average CO concentration at the analyzed receptors of the modeled parking facilities would be 2.21 ppm. This value includes a predicted concentration of 0.81 ppm from emissions within the parking facility and a background level of 1.4 ppm. The maximum predicted concentration is substantially below the applicable standard of 9 ppm and the *de minimis* CO criterion of 5.2 ppm.

These maximum predicted CO levels fall below the applicable CO standards. Therefore, the Proposed Project's parking facilities would not result in any significant adverse air quality impacts.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

Tables 12-5 and 12-6 present the maximum predicted concentrations from the heating and hot water systems of the Proposed Project buildings (as well as the dehumidification system for the arena) at the modeled off-site and project receptors, respectively. As presented in **Table 12-5**, maximum concentrations at off-site receptor locations were predicted to be well below NAAQS. The maximum overall concentrations were predicted to occur on the proposed Site A hotel building from the arena sources (see **Table 12-6**). For the short-term modeled averaging periods, the arena sources were modeled as operating continuously, which resulted in conservative predictions of modeled concentrations on the proposed Site A hotel.

As shown in the tables, maximum predicted concentrations from the Proposed Project buildings, when added to the ambient background levels, are below the NAAQS. Therefore, the Proposed

Project would not result in a significant air quality impact due to the proposed heating and hot water system emissions.

Table 12-5
Maximum Modeled Pollutant Concentrations from Heating and Hot Water Systems Off-Site Receptors (µg/m3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS (µg/m^3)
NO_2	1-hour	(1)	(1)	113.3	188(1)
	Annual	0.28	32.9	33.2	100
$PM_{2.5}$	24-hour	0.97	18.9	19.9	35
	Annual	0.02	7.3	7.32	12
PM_{10}	24-hour	0.97	38	39.0	150

Note:
(1) The 1-hour NO_2 concentration presented represents the maximum of the total 98th percentile 1-hour NO_2 concentration predicted at any receptor using seasonal-hourly background concentrations.

Table 12-6
Maximum Modeled Pollutant Concentrations from Heating and Hot Water Systems On the Proposed Project (µg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS (µg/m^3)
NO_2	1-hour	(1)	(1)	181.6	188(1)
	Annual	0.62	32.9	33.5	100
$PM_{2.5}$	24-hour	3.9	18.9	22.7	35
	Annual	0.07	7.3	7.37	12
PM_{10}	24-hour	3.9	38	41.9	150

Note:
(1) The 1-hour NO_2 concentration presented represents the maximum of the total 98th percentile 1-hour NO_2 concentration predicted at any receptor using seasonal-hourly background concentrations.

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