A. INTRODUCTION

This chapter discusses the potential for air quality impacts associated with the proposed project and the Reasonable Worst Case Development Scenario (RWCDS). The analyses presented account for changes to the proposed project and background conditions since the 2008 Final Generic Environmental Impact Statement (FGEIS) for the Willets Point Development Plan and assesses whether any changed background conditions or differences in elements between the proposed project and the development program analyzed in the 2008 FGEIS and subsequent technical memoranda would result in any significant adverse impacts on air quality that were not addressed previously.

The proposed project would create new sources of air pollutant emissions, both mobile (emissions from vehicle trips generated by the proposed project) and stationary (such as exhaust from fossil fuel-fired heating and hot water systems). The maximum hourly traffic generated by the proposed project would exceed the 2012 *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide (CO) screening threshold of 170 peak hour vehicle trips at an intersection in the study area. In addition, the particulate matter emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual* would be exceeded. Therefore, a quantified assessment of the potential impacts on air quality from traffic generated by the proposed project was conducted.

A quantified analysis was also conducted to evaluate potential future CO concentrations in the vicinity of the proposed parking lots, naturally ventilated parking facilities, and ventilation outlets for the proposed parking garages.

The potential for impact on air quality from the heat and hot water systems for the proposed development was analyzed, following the *CEQR Technical Manual* guidance. The proposed project would also introduce new sensitive uses (such as residences and open spaces) near existing sources of emissions. Existing emission sources include existing businesses within the District that emit pollutants of concern. Therefore, the potential for air quality impacts from those existing uses on the proposed uses was evaluated.

PRINCIPAL CONCLUSIONS

Concentrations of carbon monoxide (CO) and fine particulate matter less than 10 microns in diameter (PM_{10}) due to project-generated traffic at intersections near the project site would not result in any violations of National Ambient Air Quality Standards (NAAQS). It was also determined that CO impacts from mobile sources associated with the proposed project would not exceed CEQR *de minimis* criteria. While incremental increases in fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) from mobile sources would be between 2 $\mu g/m^3$ and 5 $\mu g/m^3$, based on the frequency and magnitude of the concentrations above 2 $\mu g/m^3$, which will be subject to further refined analysis between DSEIS and FSEIS in consultation with DEP, the predicted $PM_{2.5}$ increments would not indicate a significant air quality impact. In addition,

impacts due to the proposed project's parking facilities were found to result in no significant adverse air quality impacts.

Based on a refined analyses, using conservative assumptions regarding floor area served by a single heating and hot water system stack, there would be no potential for significant adverse air quality impacts from the proposed project's heating and hot water systems (considering buildings proposed for construction in all phases), provided that certain restrictions on the fuel type, placement of heating and hot water system stacks, and use of low-nitrogen oxide (low-NO_x) burners described in Section H, "Probable Impacts of the Proposed Project," are imposed. These restrictions would supersede those identified in the 2008 FGEIS and Technical Memorandum #4. The restrictions reflect the changes to the proposed project since the 2008 FGEIS and subsequent technical memoranda, as well as the promulgation of the 1-hour nitrogen dioxide (NO_2) standard, in 2010. A screening level analysis was conducted to assess whether existing auto, manufacturing, and industrial uses that may remain in the area proposed for development in Phase 2, would have the potential to significantly impact the air quality in the area proposed for development in Phase 1A and Phase 1B, which would be occupied by recreational, residential, hotel, open space, and commercial uses. The results of that analysis show that there would be no potential for significant adverse impact on air quality from these sources on the proposed project. Therefore, there would be no potential for a significant adverse impact from stationary sources.

B. SUMMARY OF FINDINGS—2008 FGEIS AND SUBSEQUENT TECHNICAL MEMORANDA

The 2008 FGEIS considered mobile and stationary sources of air pollutant emissions, including emissions from vehicle trips generated by the Willets Point Development Plan for the District, emissions from vehicles using proposed parking facilities, emissions from fossil fuel use in heating, ventilation, and air conditioning (HVAC) systems, and emissions from existing industrial sources. No potential for air quality impacts was identified, provided that restrictions on HVAC fuel type and stack placement would be implemented. The 2010 update to the *CEQR Technical Manual* included revisions to the HVAC (heating and hot water system) screening analysis procedures. Accordingly, Technical Memorandum #4, included an update to the stack restrictions that resulted in "E-Designations" on the affected properties. In Technical Memorandum #4 the development within the Special Willets Point District was assumed to occur in phases, with the western portion of the District developed first. Technical Memorandum #4 also assumed a "buffer area" between the portion of the District that was to be redeveloped in the initial phase and the rest of the District. This buffer would not be included in the proposed project, and the absence of the buffer would not have the potential to result in significant adverse air quality impacts as described in this chapter.

C. POLLUTANTS FOR ANALYSIS

Ambient air quality is affected by air pollutants produced by both motor vehicles and stationary sources. Emissions from motor vehicles are referred to as mobile source emissions, while emissions from fixed facilities are referred to as stationary source emissions. Ambient concentrations of carbon monoxide (CO) are predominantly influenced by mobile source emissions. Particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (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 sulfur dioxide (SO_2) are associated mainly with stationary sources, and

some sources utilizing non-road diesel, such as large international marine vessels. 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 (USEPA) under the Clean Air Act, and are referred to as "criteria pollutants," emissions of VOCs, NO_x, and other precursors to criteria pollutants are also regulated by USEPA.

CARBON MONOXIDE

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

The proposed project would result in changes in traffic patterns and an increase in traffic volumes. Therefore, a mobile source analysis was conducted at critical intersections to evaluate future CO concentrations with and without the proposed project. An analysis was also conducted to evaluate future CO concentrations with the operation of proposed parking facilities.

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 project to regional emissions of these pollutants would include any added stationary or mobile source emissions. The proposed project would not have a significant effect on the overall volume of vehicular travel in the metropolitan area; therefore, no measurable impact on regional NO_x emissions or on ozone levels is predicted. 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 regulated criteria pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern further downwind from large stationary point sources, and not a local concern from mobile sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO_2 at the source.) However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may become of greater concern for this pollutant.

An assessment of NO_x emissions from stationary sources was conducted, following the *CEQR Technical Manual* and USEPA guidance. In order to evaluate the effect of mobile source emissions due to the proposed actions, predicted mobile source pollutant concentrations at affected roadways and intersections must be added to background concentrations. Community-scale monitors currently in operation can be used to represent background NO_2 conditions away from roadways, but there is substantial uncertainty regarding background concentrations at or near ground-level locations in close proximity to roadways. USEPA estimates that

concentrations near roadways may be anywhere from 30 to 100 percent higher than those measured at community-scale monitors. Furthermore, the existing USEPA mobile source models are not capable of assessing the chemical transformation of emitted NO to NO_2 over relatively short distances (e.g., sidewalks, low-floor windows). In addition, existing USEPA mobile source models are designed to provide only peak concentrations, which are not consistent with the statistical format of the 1-hour average NO_2 standard.

Given the current uncertainty regarding background concentrations at specific locations near roadways, and the lack of approved modeling protocols for the prediction of total maximum 1-hour daily 98th percentile NO_2 concentrations, as well as the lack of a benchmark for evaluating the significance of these incremental concentrations, no methodology exists that could provide reasonable predictions about concentrations from mobile sources due to the proposed project on the receptors at or near ground-level locations. The traffic associated with the proposed project is not expected to change NO_2 concentrations appreciably, since the vehicular traffic associated with the proposed project would be a very small percentage of the total number of vehicles in the area. The amount of NO emitted that would rapidly transform to NO_2 in the immediate vicinity of roadways and intersections with project-generated traffic would be very small. It is not known whether conditions in the future condition without the proposed project will be within or in excess of the NAAQS in these near-road areas. Background concentrations are in fact expected to decrease over time and local sources would contribute an incremental amount of NO_2 to those background concentrations. The analysis limitations described above preclude the performance of an accurate quantitative assessment of the significance of the 1-hour NO_2 increments from the increase in traffic resulting from the proposed project.

LEAD

Currently, airborne lead emissions are principally associated with industrial sources. Lead in gasoline has been banned under the Clean Air Act, and is not a pollutant of concern for the proposed project.

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 from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption 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, or $PM_{2.5}$, and particles with an aerodynamic diameter of less than or equal to 10 micrometers, or PM_{10}, which includes the smaller $PM_{2.5}$. $PM_{2.5}$ 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 an exhaust pipe or stack) or from precursor gases reacting in the atmosphere to form secondary PM.

Diesel-powered vehicles, especially heavy duty trucks and buses, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel powered vehicles. The proposed project would result in traffic exceeding the $PM_{2.5}$ vehicle emission screening analysis thresholds as defined in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. The proposed project's heating and hot water systems would use natural gas, if operating on fossil fuel. Following the guidance of the *CEQR Technical Manual*, NO_2 is the critical pollutant of concern with the use of natural gas. Therefore, an analysis of PM_{10} and $PM_{2.5}$ emissions from the heating and hot water systems was not warranted.

SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). Monitored SO_2 concentrations in New York City do not exceed national standards. 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 non-road sources was not warranted. As part of the proposed project, the only fossil fuel permitted for use in the heating and hot water systems would be natural gas. The sulfur content of natural gas is negligible; therefore, an analysis of future levels of SO_2 from the proposed heating and hot water systems was not warranted.

NONCRITERIA POLLUTANTS

In addition to the criteria pollutants discussed above, noncriteria pollutants may be of concern. Noncriteria pollutants are emitted by a wide range of man-made and naturally occurring sources. These pollutants are sometimes referred to as hazardous air pollutants (HAP) and when emitted from mobile sources, as Mobile Source Air Toxics (MSATs). Emissions of noncriteria pollutants from industries are regulated by USEPA. The existing industrial and auto uses within the proposed project study area were analyzed as potential sources of noncriteria pollutant emissions.

D. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: CO, NO_2, ozone, respirable PM (both $PM_{2.5}$ and PM_{10}), SO_2, and lead. The primary standards represent levels that are requisite to protect the public health, allowing an adequate margin of safety. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. The primary and secondary standards are the same for NO_2 (annual), ozone, lead, $PM_{2.5}$ (24-hr) and PM_{10}, and there is no secondary standard for CO and the 1-hour NO_2 standard. The NAAQS are presented in **Table 15-1**. 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

Table 15-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	$\mu g/m^3$	ppm	$\mu g/m^3$
Carbon Monoxide (CO)				
8-Hour Average [1]	9	10,000	None	
1-Hour Average [1]	35	40,000		
Lead				
Rolling 3-Month Average [2]	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
1-Hour Average [3]	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average [4,5]	0.075	150	0.075	150
Respirable Particulate Matter (PM_{10})				
24-Hour Average [1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean [6]	NA	12	NA	15
24-Hour Average [7]	NA	35	NA	35
Sulfur Dioxide (SO_2) [8]				
1-Hour Average [9]	0.075	197	NA	NA
Maximum 3-Hour Average [1]	NA	NA	0.50	1,300

Notes:

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

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

NA – not applicable

All annual periods refer to calendar year.

Standards are defined in ppm. Approximately equivalent concentrations in $\mu g/m^3$ are presented.

(1) Not to be exceeded more than once a year.

(2) USEPA has lowered the NAAQS down from 1.5 $\mu g/m^3$, effective January 12, 2009.

(3) 3-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010.

(4) 3-year average of the annual fourth highest daily maximum 8-hr average concentration.

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

(6) USEPA has lowered the primary standard from 15 $\mu g/m^3$, effective March 2013.

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

(8) USEPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010.

(9) 3-year average of the annual 99th percentile daily maximum 1-hr average concentration.

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

rather than for calendar years only. New York State also has standards for total suspended particulate matter (TSP), settleable particles, non-methane hydrocarbons (NMHC), 24-hour and annual SO_2, and ozone which correspond to federal standards that have since been revoked or replaced, and for the noncriteria pollutants beryllium, fluoride, and hydrogen sulfide. USEPA has revised the NAAQS for PM, effective December 18, 2006. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and retaining the level of the annual standard at 15 $\mu g/m^3$. The PM_{10} 24-hour average standard was retained and the annual average PM_{10} standard was revoked. USEPA recently announced a final decision to lower the primary annual-average standard from 15 $\mu g/m^3$ to 12 $\mu g/m^3$, effective March 2013.

USEPA has also revised the 8-hour ozone standard, lowering it from 0.08 to 0.075 parts per million (ppm), effective as of May 2008. On January 6, 2010, USEPA proposed a change in the 2008 ozone NAAQS, lowering the primary NAAQS from the current 0.075 ppm level to within the range of 0.060 to 0.070 ppm. USEPA is also proposing a secondary ozone standard, measured as a cumulative concentration within the range of 7 to 15 ppm-hours aimed mainly at protecting sensitive vegetation. A final decision on this standard has been postponed but is expected to occur in 2013.

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

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

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

Federal ambient air quality standards do not exist for noncriteria pollutants; however, as mentioned above, the New York State Department of Environmental Conservation (NYSDEC) has issued standards for three noncriteria compounds. NYSDEC has also developed a guidance document DAR-1 (October 2010)[1], which contains a compilation of annual and short term (1-hour) guideline concentrations for numerous other noncriteria compounds. The NYSDEC guidance thresholds represent ambient levels that are considered safe for public exposure.

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 USEPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the Clean Air Act, followed by a plan for maintaining attainment status once the area is in attainment.

In 2002, USEPA re-designated New York City as in attainment for CO. Under the resulting maintenance plan, New York City is committed to implementing site-specific control measures

[1] New York State Department of Environmental Conservation DAR-1 (Air Guide-1) AGC/SGC Tables, October 2010.

throughout the city to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period.

Manhattan has been designated as a moderate NAA for PM_{10}. On January 30, 2013, New York State requested that USEPA approve its withdrawal of the 1995 SIP and redesignation request for the 1987 PM_{10} NAAQS, and that USEPA make a clean data finding instead, based on data monitored from 2009-2011 indicating PM_{10} concentrations well below the 1987 NAAQS. Although not yet a redesignation to attainment status, if approved, this determination would remove further requirements for related SIP submissions. On December 17, 2004, USEPA took final action designating the five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties as a $PM_{2.5}$ non-attainment area under the Clean Air Act due to exceedance of the annual average standard. Based on recent monitoring data (2006-2009), annual average concentrations of $PM_{2.5}$ in New York City no longer exceed the annual standard. USEPA has determined that the area has attained the 1997 annual $PM_{2.5}$ NAAQS, effective December 15, 2010. As stated earlier, USEPA has recently lowered the annual average primary standard to 12 $\mu g/m^3$. USEPA will make initial attainment designations by December 2014. Based on analysis of 2009–2011 monitoring data, it is likely that the region will be in attainment for the new standard.

As described above, USEPA has revised the 24-hour average $PM_{2.5}$ standard. In November 2009, USEPA designated the New York City Metropolitan Area as nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS. The nonattainment area includes the same 10-county area originally designated as nonattainment with the 1997 annual $PM_{2.5}$ NAAQS. Based on recent monitoring data (2007–2011), USEPA determined that the area has attained the standard. Although it has not yet been redesignated to attainment status, this determination removes further requirements for related SIP submissions.

The five New York City counties, Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA) had been designated as a severe non-attainment area (the New York-New Jersey-Long Island Nonattainment Area, New York portion) for ozone (1-hour average standard, 0.12 ppm). In November 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone*, which was finalized and approved by USEPA effective March 6, 2002, addressing attainment of the 1-hour ozone NAAQS by 2007. The 1-hour standard was revoked in 2004 when it was replaced by the 8-hour ozone standard, but certain further requirements remained ('anti-backsliding'). On June 18, 2012, USEPA determined that the New York-New Jersey-Long Island NAA has also attained the standard. Although it has not yet been redesignated to attainment status, this determination removes further requirements under the 1-hour standard.

Effective June 15, 2004, USEPA designated the five New York City counties, Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA) as moderate non-attainment for the 1997 8-hour average ozone standard. On February 8, 2008, NYSDEC submitted final revisions to the SIP to USEPA to address the 1997 8-hour ozone standard. Based on recent monitoring data (2007–2011), USEPA determined that the Poughkeepsie and the NY-NJ-CT areas have attained the 1997 8-hour ozone NAAQS (0.08 ppm). Although it has not yet been redesignated to attainment status, this determination removes further requirements under the 1997 8-hour standard. In March 2008 USEPA strengthened the 8-hour ozone standards. USEPA designated the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester (NY portion of the New York-Northern

New Jersey-Long Island, NY-NJ-CT NAA) as a marginal non-attainment area for the 2008 ozone NAAQS, effective July 20, 2012. SIPs will be due in 2015.

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

USEPA has established a 1-hour SO_2 standard, replacing the former 24-hour and annual standards, effective August 23, 2010. Based on the available monitoring data, all New York State counties currently meet the 1-hour standard. Additional monitoring will be required. USEPA plans to make final attainment designations in June 2013. SIPs for nonattainment areas will be due by June 2015.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The 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 15-1**) would be deemed to have a potential significant adverse impact. Similarly, for non-criteria pollutants, predicted exceedance of the DAR-1 guideline concentrations would be considered a potential significant adverse impact.

In addition, in order to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be significantly increased in non-attainment areas, threshold levels have been defined for certain pollutants; any action predicted to increase the concentrations of these pollutants above the thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted.

DE MINIMIS CRITERIA REGARDING CO IMPACTS

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

[1] *CEQR Technical Manual*, Chapter 1, section 222, June 2012; and State Environmental Quality Review Regulations, 6 NYCRR § 617.7

$PM_{2.5}$ INTERIM GUIDANCE CRITERIA

NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts.[1] This policy applies only to facilities applying for permits or major permit modifications under SEQRA that emit 15 tons of PM_{10} or more annually. The policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum impacts are predicted to increase $PM_{2.5}$ concentrations by more than 0.3 $\mu g/m^3$ averaged annually or more than 5 $\mu g/m^3$ on a 24-hour basis. Projects that exceed either the annual or 24-hour threshold will be required to prepare an EIS to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

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

- 24-hour average $PM_{2.5}$ concentration increments which are predicted to be greater than 5 $\mu g/m^3$ at a discrete receptor location would be considered a significant adverse impact on air quality under operational conditions (i.e., a permanent condition predicted to exist for many years regardless of the frequency of occurrence);
- 24-hour average $PM_{2.5}$ concentration increments which are predicted to be greater than 2 $\mu g/m^3$ but no greater than 5 $\mu g/m^3$ would be considered a significant adverse impact on air quality based on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations;
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.1 $\mu g/m^3$ at ground level on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.3 $\mu g/m^3$ at a discrete receptor location (elevated or ground level).

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

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

E. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

INTRODUCTION

This section presents the methodologies, data, and assumptions used to conduct the air quality analyses for the proposed project. The following analyses were conducted.

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

MOBILE SOURCE ANALYSIS

Assessment of the change in CO and PM concentrations as a result of changes in traffic volumes and geometry due to the proposed project (one intersection in Phase 1A to account for Willets West and development within the District by 2018, prior to completion of Van Wyck ramps; and two intersections in Phase 2 to account for the full program proposed by 2032). The Phase 1B development would occur after the completion of the Van Wyck ramps and would generate less traffic than the full program proposed by 2032. Therefore, Phase 1B would result in fewer mobile source emissions and less potential for an impact on air quality than Phase 2, and a quantified mobile source analysis was not conducted for Phase 1B.

PARKING FACILITIES

Assessment of the potential impacts associated with the proposed parking uses (the Willets West garage for Phase 1A and the proposed convention center garage within the District in Phase 2).

STATIONARY SOURCE ANALYSIS

Assessment of the potential impacts from the fossil fuel-fired heating and hot water systems for the proposed project (as proposed with the completion of Phase 2, in 2032).

Assessment of the potential impacts from existing businesses/industrial sources on the proposed project (business in Phase 2 area that could potentially affect Phase 1A / Phase 1B development).

MOBILE SOURCES

The prediction of vehicle-generated emissions and their dispersion in an urban environment incorporates meteorological phenomena, traffic conditions, and physical configuration. Air pollutant dispersion models mathematically simulate how traffic, meteorology, and physical configuration combine to affect pollutant concentrations. The mathematical expressions and formulations contained in the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions, and since it is necessary to predict the reasonable worst-case condition, most dispersion analyses predict conservatively high concentrations of pollutants, particularly under adverse meteorological conditions.

The mobile source analysis for the proposed project employs a model approved by USEPA that has been widely used for evaluating air quality impacts of projects in New York City, other parts of New York State, and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels resulting in a conservatively high estimate of expected pollutant concentrations that could ensue from the proposed project.

VEHICLE EMISSIONS

Engine Emissions

Vehicular CO, PM_{10}, and $PM_{2.5}$ engine emission factors were computed using the USEPA mobile source emissions model, MOVES.[1] This emissions model is capable of calculating engine emission factors for various vehicle types, based on the fuel type (gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway type and grade, number of starts per day, engine soak time, and various other factors that influence emissions,

[1] EPA, Motor Vehicle Emission Simulator (MOVES), User Guide for MOVES2010b, June 2012.

such as inspection maintenance programs. The inputs and use of MOVES incorporate the most current guidance available from USEPA and NYSDEC.

Vehicle classification data were based on field studies obtained as part of the traffic data collections summarized in Chapter 14, "Transportation." Appropriate credits were used to accurately reflect the inspection and maintenance program. The inspection and maintenance programs require inspections of automobiles and light trucks to determine if pollutant emissions from each vehicle exhaust system comply with emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered in New York State. County-specific hourly temperature and relative humidity data obtained from NYSDEC were used.

Road Dust

The contribution of re-entrained road dust to PM_{10} concentrations, as presented in the PM_{10} SIP, is considered to be significant; therefore, the PM_{10} estimates include both exhaust and road dust. In accordance with the $PM_{2.5}$ interim guidance criteria methodology, $PM_{2.5}$ emission rates were determined with fugitive road dust to account for their impacts in local microscale analyses. However, fugitive road dust was not included in the annual neighborhood scale $PM_{2.5}$ microscale analyses, since the New York Department of Environment 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 USEPA[1] and the 2012 *CEQR Technical Manual*.

DISPERSION MODELS FOR MICROSCALE ANALYSIS

Maximum CO concentrations resulting from vehicular emissions adjacent to the analysis sites were predicted using the CAL3QHC model Version 2.0.[2] The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC predicts emissions and dispersion of CO from idling and moving vehicles. The queuing algorithm includes site-specific traffic parameters, such as signal timing and delay calculations (from the 2000 *Highway Capacity Manual* traffic forecasting model), saturation flow rate, vehicle arrival type, and signal actuation (i.e., pre-timed or actuated signal) characteristics to accurately predict the number of idling vehicles. The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model, CAL3QHCR, can be 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 and was applied for PM_{10} and $PM_{2.5}$ concentrations on sidewalks near the project sites. This refined version of the CAL3QHC model can utilize hourly traffic and meteorological data, and is therefore appropriate for calculating the 24-hour and annual average concentrations required to address the timescales of the PM NAAQS.

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

[2] 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.

METEOROLOGY

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability. Wind direction influences the direction in which pollutants are dispersed, and atmospheric stability accounts for the effects of vertical mixing in the atmosphere. These factors, therefore, influence the concentration at a particular prediction location (receptor). In applying the CAL3QHC model, the wind angle was varied to determine the wind direction resulting in the maximum concentrations at each receptor. Following the USEPA guidelines,[1] CAL3QHC computations were performed using a wind speed of 1 meter per second, and the neutral stability class D. The 8-hour average CO concentrations were estimated by multiplying the predicted 1-hour average CO concentrations by a factor of 0.70 to account for persistence of meteorological conditions per the 2012 *CEQR Technical Manual* guidance. A surface roughness of 3.21 meters was chosen. At each receptor location, concentrations were calculated for all wind directions, and the highest predicted concentration was reported, regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

Using the CAL3QHCR model, hourly concentrations were predicted based on hourly traffic data and five years (2007–2011) of monitored hourly meteorological data. The data consist of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York. All hours were modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

An analysis was performed for Phase 1A's Build Year of 2018, to account for the construction of Willets West, which was previously not considered, as well as to account for the fact that the construction of the new Van Wyck ramps would not be completed before the operation of Phase 1A. An analysis was also performed to assess the potential for mobile source impacts from the operation of the fully build project as proposed with Phase 2, in 2032. No analysis was conducted for Phase 1B, because the project generated traffic in that phase would be well below that projected for Phase 2, and because the Van Wyck ramps would be completed before the uses constructed by 2028 in Phase 1B would be occupied.

TRAFFIC DATA

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the proposed project (see Chapter 14, "Transportation"). Traffic data for the future without and with the proposed project were used in the respective air quality modeling scenarios. The data for the future with the proposed project accounted for traffic associated with the cumulative development with Lot B. Two peak periods were analyzed to assess the impact of weekend midday peak traffic, with and without a game event at CitiField. The weekend (1:30 PM to 2:30 PM) and weekend pre-game (3:15 PM to 4:15 PM) peak periods were analyzed. The weekend non-game time period was selected for the mobile source analysis because it would result in the maximum anticipated project-generated and total future traffic at signalized intersections and, therefore, have the greatest potential for significant air quality impacts. Of the peak periods with

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

game events, the weekend pre-game peak period was analyzed because it is the game day peak period with the greatest amount of project-generated traffic.

Since the PM analysis requires hourly traffic data over an entire 24-hour period, it was necessary to estimate this information for the non-peak traffic periods. The projected weekend peak traffic volumes in the future without the proposed project were used as a baseline. Traffic volumes for other hours without the proposed project were determined by adjusting the peak period volumes by the 24-hour distributions based on the Automatic Traffic Recorder (ATR) data. Traffic generated by the proposed project over the 24-hour period was similarly determined using the predicted hourly parking accumulation data, obtained from the traffic analysis.

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 1-hour and 8-hour CO background concentrations used in this analysis, which were based on the maximum second-highest concentrations recorded at the NYSDEC Queens College 2 monitoring station from 2007 to 2011, were 3.1 ppm and 2.0 ppm, respectively. The monitoring station at Queens College 2 is the closest monitoring station to the proposed project sites that has available recorded data over a recent 5-year period.

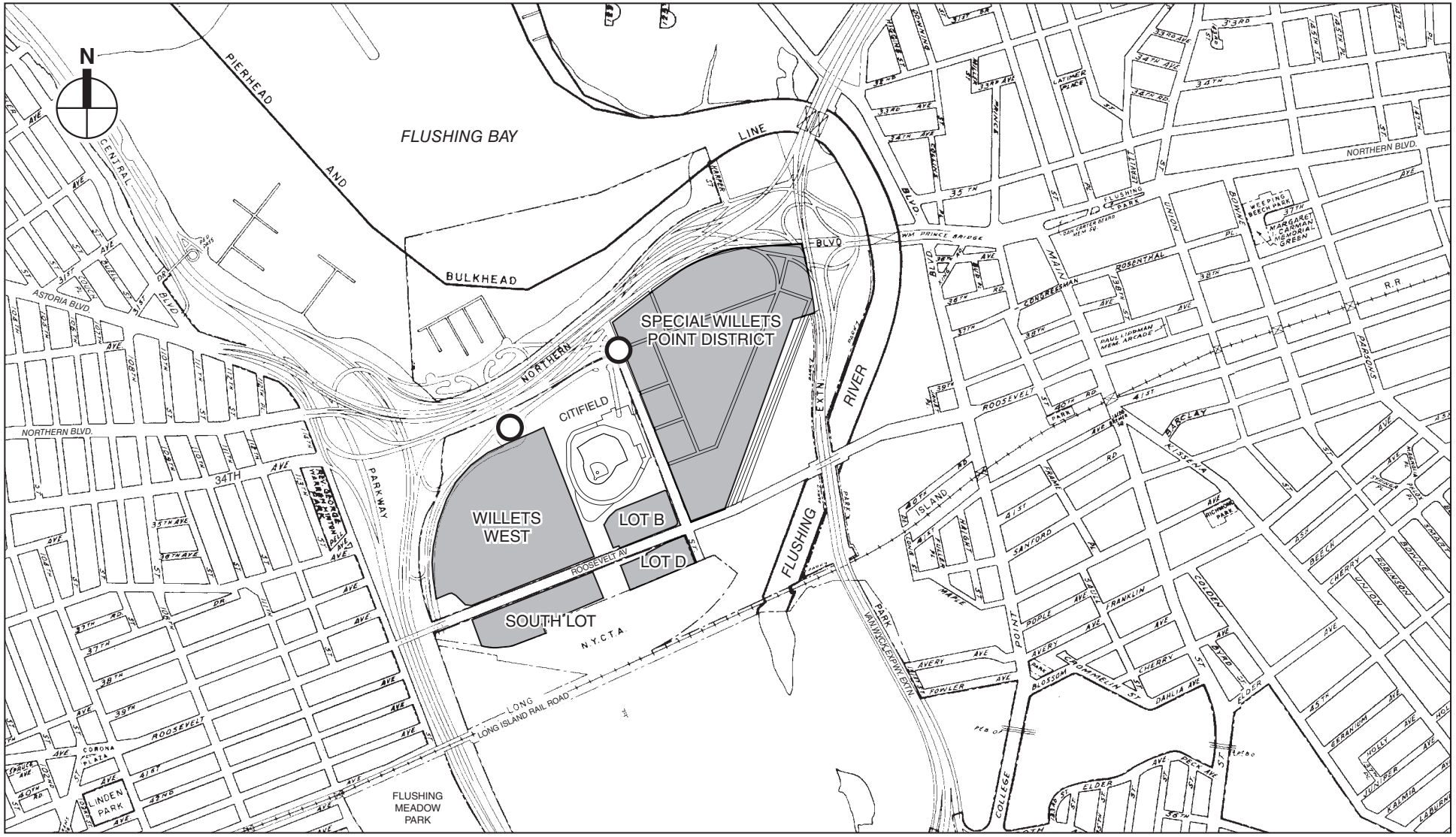
The PM_{10} 24-hour background concentration of 50 $\mu g/m^3$ was based on the maximum second-highest concentration, measured over the most recent three-year period at the Queens College 2 monitoring station. $PM_{2.5}$ impacts are assessed on an incremental basis and compared with the $PM_{2.5}$ interim guidance criteria. Therefore, a background concentration for $PM_{2.5}$ is not included.

MOBILE SOURCE ANALYSIS SITES

Two signalized intersection locations (Site 1 and Site 2, shown in **Figure 15-1**) were selected for the microscale CO and PM analysis, for Phase 1A and Phase 2, as shown in **Table 15-2**. These intersections were selected after considering all intersection locations analyzed for the traffic study (see Chapter 14, "Transportation") because they are among the signalized locations where the greatest number of vehicles generated by the proposed project and, therefore, the maximum changes in the concentrations and greatest potential for air quality impacts are expected. Existing traffic volumes, existing and future predicted levels of service, and proximity of the intersections to pedestrian uses were also considered in the selection of intersections for the air quality analysis. Site 1 was also the location where the highest concentration of CO was predicted as part of the analysis conducted for the 2008 FGEIS. PM impacts were analyzed at Site 1 for Phase 2, as Site 1 would have the greatest number of projected emissions from truck and overall vehicle trips in Phase 2. PM impacts were also analyzed at Site 2 for Phase 1A to assess the effect on PM concentrations from Willets West and development within the District prior to the construction of Van Wyck ramps.

Table 15-2
Mobile Source Analysis Intersection Locations

Analysis Site	Location	Phase	Pollutant
1	34th Avenue and 126th Street	2	CO, PM_{10} , $PM_{2.5}$
2	Boat Basin Road and Shea Road	1A	CO, PM_{10} , $PM_{2.5}$
		2	CO



Project Site

Intersection Location

Mobile Source Analysis Intersection Locations

Figure 15-1

RECEPTOR LOCATIONS

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. Local model receptors were placed at sidewalk or roadside locations near intersections with continuous public access. Receptors in the annual $PM_{2.5}$ neighborhood scale models were placed at a distance of 15 meters from the nearest moving lane, based on the DEP recommended procedure for neighborhood scale corridor $PM_{2.5}$ modeling.

PARKING FACILITIES

The proposed project would include parking facilities to provide for new parking demand and replace the CitiField parking that would be displaced from construction of the Willets West portion of the project in Phase 1A. Emissions from vehicles using the parking areas could potentially affect ambient levels of CO.

The proposed parking facility at Willets West was selected for analysis as it is the largest parking facility proposed for development outside of the Special Willets Point District, and would be constructed in the first phase of development (Phase 1A), when the emissions on a per vehicle basis would be highest.

The garage associated with the proposed convention center was analyzed since the convention center would generate the greatest potential parking demand within the District and would result in the highest concentrations of pollutants at nearby receptors. The analysis year for the convention center garage was 2032, as the convention center would be constructed in Phase 2, when the on-street traffic volumes would be greatest.

The analysis of emissions from the proposed parking facilities' outlet vents and their dispersion was performed using the methodology set forth in the *CEQR Technical Manual*. Emissions from vehicles entering, parking, and exiting the parking structures 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 structure. In addition, all departing vehicles were assumed to idle for 1 minute before proceeding to the exit. The concentration of CO within the parking structure was calculated assuming a minimum ventilation rate, based on New York City Building Code requirements, of 1 cubic foot per minute of fresh air per gross square foot of garage area.

To determine pollutant levels in the vicinity of the vents, the exhaust from the parking garages was 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 the vents by assuming that the concentration in the garage is equal to the concentration leaving the exhaust, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces. Background and on-street CO concentrations were then added to the modeling results to obtain the total ambient levels at each receptor location. The on-street CO concentration was determined using the methodology in Air Quality Appendix 1 of the *CEQR Technical Manual,* utilizing traffic volumes on 34th Avenue approaching 126th Street (mobile source analysis Site 1).

Since there are no specific garage designs for the proposed project, reasonable worst-case assumptions for air quality modeling were made regarding the design of the garages mechanical ventilation systems. The exhaust from each parking garage was assumed to be vented through a single outlet vent with a height of 10 feet. The vent was assumed to exhaust directly onto the

street, and a "near" receptor was placed along the sidewalks at a pedestrian height of six feet and at a distance of five feet from the vent. A "far" receptor was placed directly across the street from the assumed vent location, at a distance of 60 feet for the Willets West parking facility and 84 feet for the convention center. The vent at the convention center was also analyzed assuming a sensitive receptor on the building façade located at a height of six feet above the vent A persistence factor of 0.7 was used to convert the calculated 1-hour average maximum concentrations to 8-hour averages, accounting for meteorological variability over the average 8-hour period.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

The only fossil fuel that would be used for heating and hot water systems for the proposed development would be natural gas. For the District, the requirement to use natural gas, if using a fossil fuel, would be implemented through the E-designations that are already in place; the requirements set forth in this SEIS would supersede the requirements previously set forth for the E-designations. For Willets West, the requirement would be incorporated into the development agreements and/or amended leases.

Per the guidance presented in the *CEQR Technical Manual* for natural gas burning sources, NO_2 was the only pollutant considered in the dispersion analysis. Future concentrations of 1-hour average and annual average NO_2 resulting from the proposed heating and hot water system emissions were predicted using the USEPA/AMS AERMOD dispersion model.[1]

Dispersion Modeling

AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatment of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of the interaction between the plume and terrain.

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

The AERMOD model also incorporates the algorithms from the PRIME model, which is designed to predict impacts in the "cavity region" (i.e., the area around a structure which under certain conditions may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region). The Building Profile Input Program (BPIP) program for the PRIME model (BPIPRM) was used to determine the projected building dimensions for modeling

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

with the building downwash algorithm enabled. The modeling of plume downwash accounts for all obstructions within a radius equal to five obstruction heights of the stack.

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

For the analysis of the proposed project's effect on 1-hour average NO_2 concentrations, the Plume Volume Molar Ratio Method (PVMRM) module was applied within AERMOD, following USEPA's modeling guidance.[1] PVMRM analyzes chemical transformation of NO emitted from the stack to NO_2. The PVMRM module incorporates hourly background ozone concentrations to estimate NO_x transformation within the source plume. Ozone concentrations were obtained from the NYSDEC Queens College monitoring station, which is the station with recent ozone data nearest to the proposed project sites. An initial NO_2 to NO_x ratio of 10 percent at the source exhaust was assumed for the heating and hot water systems for the proposed buildings. This ratio is appropriate for boilers.[2]

Meteorological Data

The meteorological data set consisted of five consecutive years of meteorological data: surface data collected at LaGuardia Airport (2007–2011) and concurrent upper air data collected at Brookhaven, New York. The meteorological data provide hour-by-hour wind speeds and directions, stability states, and temperature inversion elevation over the five-year period. These data were processed using the USEPA 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.

Background Concentrations

To estimate the maximum expected pollutant concentration at a given location (receptor), the predicted impacts must be added to a background value that accounts for existing pollutant concentrations from other sources that are not directly accounted for in the model. To develop background levels, concentrations measured over the latest available 5-year period (2007–2011) at Queens College 2, the nearest NYSDEC ambient monitoring station to the proposed project, were used to determine the annual average NO_2 concentration of 43 $\mu g/m^3$. The annual background concentration was developed in accordance with the *CEQR Technical Manual* methodology.

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

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

[2] MACTEC for Alaska Department of Environmental Conservation, Evaluation of Bias in AERMOD-PVMRM, June 2005 http://www.epa.gov/scram001/7thconf/aermod/pvmrm_bias_eval.pdf; San Joaquin Valley, Recommended In-stack NO_2/NOx Ratios, http://www.valleyair.org/busind/pto/Tox_Resources/AirQualityMonitoring.htm

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

Receptor Placement

Discrete receptors (i.e., locations at which concentrations are calculated) were modeled along the facades of buildings nearby each source to represent operable window locations, intake vents, and otherwise accessible locations such as terraces, as well as open spaces, and the CitiField stadium. Rows of receptors were placed in the model at spaced intervals along the proposed building façades, at multiple elevations. Ground level Cartesian grid receptors were also modeled.

Emission Estimates and Stack Parameters

A site-specific heat and hot water system design is not yet available. For heating and hot water, the proposed development may use renewable energy (such as solar) or energy produced offsite (such as electricity or steam from a cogeneration plant, if proposed in the future), as well as natural gas. Other fossil fuels would not be permitted for use in heating and hot water systems. Therefore, the use of natural gas was assumed as the reasonable worst case. The annual average emission rates for the heating and hot water systems operating on natural gas, were developed using the proposed development size (square feet) by use, annual energy intensity data from the Air Quality Appendix of the *CEQR Technical Manual*, and USEPA's *Compilations of Air Pollutant Emission Factors (AP-42)*[2] emission factors (except for emission factors associated with the use of low-NO_x [<30 ppm] burners where required). The 1-hour average emission rate was calculated from the annual emission rate by assuming 100 heating days. The heat and hot water system stacks for the proposed buildings were assumed to be located at the top building tier. This stack placement, needed to avoid the potential for significant adverse impacts on air quality, would be required for the proposed development within the District and Willets West. For the District, the requirement would be implemented through E-designations that are already in place; these requirements would supersede the requirements previously set forth for the E-designations. For Willets West, the requirement would be incorporated into the development agreements and/or amended leases. As discussed in more detail in Section H, "Probable Impacts of the Proposed Project," the requirements regarding the type of fuel use, stack placement, and low-NO_x burners could be amended in the future, as more information becomes available, if it could be demonstrated that there would be no potential for adverse impacts on air quality.

Typical stack parameters for exhaust velocity, diameter, and temperature were determined based on expected heat and hot water system calculated fuel usage rates. Emission rates and stack parameters are provided in **Table 15-3**.

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

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

INDUSTRIAL SOURCE ANALYSIS

The industrial source analysis presented in the Air Quality chapter of the 2008 FGEIS did not consider uses within the District because at the time it was assumed that the entire District would be redeveloped in one phase, requiring the existing on-site businesses to relocate before any of the proposed uses became occupied. The Staged Acquisition Alternative, considered in the 2008 FGEIS, and the Updated Plan, analyzed in Technical Memorandum #4, considered development in phases and assessed the potential for emissions from existing uses in the District to affect development within 400 feet, that was proposed to be built early on. However, the boundaries of the early and later phases of development currently proposed are different from those analyzed previously. Therefore, the analysis was conducted to account for the changes to the boundary of the phasing, as well as any potential changes in the operations and emissions from the existing business.

Table 15-3
Emission Rates and Stack Parameters for Proposed Sites

Site / Parcel	Total Residential (gsf)	Total Commercial (gsf)	Annual Fuel Use (Mcf)	Annual NO_x Emission Rate (g/s)	1-hour NO_x Emission Rate (g/s)	Stack Diameter (m)	Average Stack Velocity (m/s)	Peak Stack Velocity (m/s)	Stack Height (m)
A1	348,359	749,275	54.25	$2.89x10^{-2}$	$1.05x10^{-1}$	0.4572	3.1	11.4	70.1
A2	243,073	341,362	29.65	$1.58x10^{-2}$	$5.76x10^{-2}$	0.4572	1.7	6.2	69.5
A3	432,257	29,393	26.62	$1.42x10^{-2}$	$5.17x10^{-2}$	0.3048	3.4	12.5	69.5
A4	440,585	111,719	30.82	$1.64x10^{-2}$	$5.99x10^{-2}$	0.4572	1.8	6.5	69.5
A5	396,175	142,571	29.62	$1.58x10^{-2}$	$5.75x10^{-2}$	0.4572	1.7	6.2	67.4
A6	180,397	318,991	24.97	$1.33x10^{-2}$	$4.85x10^{-2}$	0.3048	3.2	11.8	67.4
A7	312,337	107,693	23.14	$1.23x10^{-2}$	$4.49x10^{-2}$	0.3048	3.0	10.9	37.5
A8	401,569	136,910	29.68	$1.58x10^{-2}$	$5.76x10^{-2}$	0.4572	1.7	6.2	69.5
A9	540,875	129,826	37.51	$2.00x10^{-2}$	$7.28x10^{-2}$	0.4572	2.2	7.9	67.4
A10	352,323	45,331	22.66	$1.21x10^{-2}$	$4.40x10^{-2}$	0.3048	2.9	10.7	67.4
A11	343,742	112,424	25.19	$1.34x10^{-2}$	$4.89x10^{-2}$	0.3048	3.3	11.9	69.5
A12	427,789	0	25.03	$1.33x10^{-2}$	$4.86x10^{-2}$	0.3048	3.2	11.8	42.1
A13	427,814	0	25.03	$1.33x10^{-2}$	$4.86x10^{-2}$	0.3048	3.2	11.8	42.1
A14	427,811	0	25.03	$1.33x10^{-2}$	$4.86x10^{-2}$	0.3048	3.2	11.8	42.1
A15	442,524	0	25.89	$1.38x10^{-2}$	$5.03x10^{-2}$	0.3048	3.3	12.2	36.0
A17	378,741	0	22.16	$1.18x10^{-2}$	$4.30x10^{-2}$	0.3048	2.9	10.4	36.0
A18	368,640	0	21.57	$1.15x10^{-2}$	$4.19x10^{-2}$	0.3048	2.8	10.2	36.0
A19	0	400,000	18.08	$9.62x10^{-3}$	$3.51x10^{-2}$	0.3048	2.3	8.5	25.3
Willets West	0	1,430,000	64.64	$3.44x10^{-2}$	$1.26x10^{-1}$	0.6096	2.1	7.6	34.7
Lot B	0	464,500	21.00	$1.12x10^{-2}$	$4.08x10^{-2}$	0.3048	2.7	9.9	67.4

Notes:
-Parcels A1 through A19 are developments proposed within the Special Willets Point District.
-The uses modeled as residential include residential and hotel uses. The uses modeled as commercial include retail, office, community facility, school, and convention center.
-Parcel A16 is not included as it would be developed with open space.
-The exhaust temperature modeled for all proposed sites is 300 ºF.
-Natural gas and low-NO_x burners would be used on all of the proposed development sites.

In addition, a NYSDEC permit search and a search of USEPA's Envirofacts database[1] was performed to obtain information about manufacturing or industrial emissions for larger sources,

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

such as asphalt plants, within 1,000 feet of the proposed project. No new or substantially changed sources of emissions were identified, and no additional analysis was warranted.

Information regarding the release of air contaminants from permitted facilities within and beyond the study area was obtained from DEP's Bureau of Environmental Compliance (BEC). The only uses with a potential to affect the proposed project were identified to be existing uses in the area proposed for development in Phase 2, within 400 feet of the District area proposed for development in Phase 1A and Phase 1B.

After compiling the information on facilities with manufacturing or process operations in the study area, maximum potential pollutant concentrations from different sources, at various distances from the site, are estimated based on the screening database in the *CEQR Technical Manual*. The database provides factors for estimating maximum concentrations based on emission levels at the source, which were derived from generic AERMOD dispersion modeling for the New York City area. Impact distances selected for each source are the minimum distances between the Phase 1A/Phase 1B boundary and the source site. Predicted worst-case impacts on the proposed project were compared with the short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) in NYSDEC's DAR-1 AGC/SGC tables. These guidelines represent levels that are considered safe for inhalation exposure by the public. Predicted concentrations below an SGC or AGC indicate that there is no potential for significant adverse impacts on air quality. Industrial source emissions of criteria pollutants are also considered and the potential for impact is assessed by comparing the predicted pollutant levels to NAAQS.

F. EXISTING CONDITIONS

Representative criteria pollutant concentrations measured in recent years at NYSDEC air quality monitoring stations nearest to the proposed project site are presented in **Table 15-4**. The values presented are consistent with the NAAQS format. For example, the 8-hour ozone concentration shown is the 3-year average of the 4th highest daily maximum 8-hour average concentrations. The concentrations were obtained from the 2011 New York State Ambient Air Quality Report, the most recent report available. The recently monitored levels did not exceed the NAAQS. It should be noted that these values are somewhat different from the background concentrations used in the stationary source and parking facility analyses. The concentrations presented in **Table 15-4** provide a comparison of the air quality in the project area with the NAAQS, while background concentrations are obtained from several years of monitoring data, and represent a conservative estimate of the highest concentrations for future ambient conditions.

Table 15-4
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Queens College 2, Queens	ppm	8-hour	1.4	9
			1-hour	1.9	35
SO_2	Queens College 2, Queens[1]	µg/m^3	3-hour	78	1,300
			1-hour	79	196
PM_{10}	Queens College 2, Queens	µg/m^3	24-hour	40	150
$PM_{2.5}$	P.S. 219, Queens	µg/m^3	Annual	9.9	15[3]
			24-hour	26	35
NO_2	Queens College 2, Queens[2]	µg/m^3	Annual	41	100
			1-hour	126	188
Lead	J.H.S. 126, Brooklyn	µg/m^3	3-month	0.012	0.15
Ozone	Queens College 2, Queens	ppm	8-hour	0.075	0.075

Notes:
(1) The 1-hour value is based on a three-year average (2009-2011) of the 99th percentile of daily maximum 1-hour average concentrations. USEPA replaced the 24-hr and the annual standards with the 1-hour standard.
(2) The 1-hour value is based on a three-year average (2009-2011) of the 98th percentile of daily maximum 1-hour average concentrations.
(3) The NAAQS shown was that in effect at the time when the monitored data were collected. USEPA has lowered the primary standard to 12 µg/m3, effective March 2013.

Source: NYSDEC, New York State Ambient Air Quality Report (2011).

G. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES

CARBON MONOXIDE

CO concentrations without the proposed project (No Action) were determined for the 2018 analysis year for Phase 1A, as well as for the 2032 analysis year for Phase 2, using the methodology previously described. **Table 15-5** shows future maximum predicted 8-hour average CO concentrations at the analyzed intersections in 2018 without the proposed project during the peak period when those concentrations were predicted to be greatest. The values shown are the highest predicted concentrations for the receptor locations for both of the time periods analyzed.

Table 15-5
Phase 1A (2018)
8-Hour Average CO Concentrations
Without the Proposed Project

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)
2	Boat Basin Road and Shea Road	Weekend non-game day	2.1
2	Boat Basin Road and Shea Road	Weekend game day	2.3

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

Table 15-6
Phase 2 (2032)
8-Hour Average CO Concentrations
Without the Proposed Project

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)
1	34th Avenue and 126th Street	Weekend non-game day	2.1
1	34th Avenue and 126th Street	Weekend game day	2.2
Note:	8-hour standard (NAAQS) is 9 ppm.		

As shown in **Table 15-5** and **Table 15-6**, the CO concentrations without the proposed project are predicted to be well below the 8-hour CO standard of 9 ppm, in both the Phase 1A and Phase 2 analysis years.

PARTICULATE MATTER

PM concentrations without the proposed project were determined for 2018, the analysis year for Phase 1A, and for 2032, the analysis year for Phase 2, using the methodology previously described. **Table 15-7** and **Table 15-8** present the future maximum predicted 24-hour concentrations at the analyzed intersections for the Phase 1A analysis year (2018) and Phase 2 analysis year (2032), respectively without the proposed project (No Action). The values shown are the highest predicted concentrations for the receptor locations. As shown in the tables, the 24-hour PM_{10} concentrations would be below the NAAQS without the proposed project in both the Phase 1A and Phase 2 analysis years.

Table 15-7
Phase 1A (2018)
24-Hour PM_{10} Concentrations Without the Proposed Project

Analysis Site	Location	Time Period	Concentration ($\mu g/m^3$)
2	Boat Basin Road and Shea Road	Weekend non-game day	57.8
2	Boat Basin Road and Shea Road	Weekend game day	65.9
Note: NAAQS—24-hour average 150 µg/m3. The annual average standard was revoked in 2006.			

Table 15-8
Phase 2 (2032)
24-Hour PM_{10} Concentrations Without the Proposed Project

Analysis Site	Location	Time Period	Concentration ($\mu g/m^3$)
1	34th Avenue and 126th Street	Weekend non-game day	62.2
1	34th Avenue and 126th Street	Weekend game day	69.3
Note: NAAQS—24-hour average 150 µg/m3. The annual average standard was revoked in 2006.			

STATIONARY SOURCES

Without the proposed project, there would likely much less or possibly no development at the proposed sites. Stationary source emissions from existing sources would decrease with the phased implementation of State and local laws to restrict the use of Nos. 6 and 4 fuel oil for heating, and lower the sulfur content of No. 2 fuel oil. With or without the proposed project, vehicle technology would continue to improve, and emission standards for new vehicles would become more stringent. With the improvements in technology and the implementation of New York State and New York City regulations that would require the use of cleaner fuels for heat and hot water, an overall improvement in air quality is anticipated. The auto and manufacturing businesses and associated emissions from those uses within the District would likely remain, as would the contamination in the District.

H. PROBABLE IMPACTS OF THE PROPOSED PROJECT

As discussed, the proposed project would result in increased mobile source emissions in the vicinity of the project sites, emissions at the proposed parking facilities, as well as emissions from fuel combustion in heating and hot water systems. In Phase 1A and Phase 1B, the proposed project would also result in the development of recreational, residential, community facility, and other sensitive uses within 400 feet of existing stationary source noncriteria pollutant emissions sources (auto and manufacturing businesses). The following sections describe the results of the studies performed to analyze the potential air quality impacts from these sources.

MOBILE SOURCES ANALYSIS

PHASE 1A (2018)

Carbon Monoxide

Using the methodology previously described, CO concentrations with the proposed project (With Action) and without the proposed project (No Action) were determined for Phase 1A in 2018, at the signalized traffic intersection that would have the greatest potential for significant adverse impact on air quality. **Table 15-9** shows the future maximum predicted 8-hour average CO concentration with and without the proposed project at the intersection analyzed. (No 1-hour values are shown, since no exceedances of the NAAQS would occur and the *de minimis* criteria are only applicable to 8-hour concentrations; therefore, the 8-hour values are the most critical for impact assessment.) The values shown represent the highest predicted concentrations for any of the receptors analyzed for the peak periods for which the greatest concentrations and/or concentration increments were predicted. The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the incremental increases in 8-hour average CO concentrations are very small, and consequently would not result in a violation of the CEQR *de minimis* CO criteria. (The *de minimis* criteria are described above in Section D: “Air Quality Regulations, Standards, and Benchmarks.”)

Table 15-9
Phase 1A (2018)
8-Hour Average CO Concentrations

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)			
			No Action	With Action	Increment	*De Minimis*
2	Boat Basin Road and Shea Road	Weekend non-game day	2.1	2.3	0.2	3.5
2	Boat Basin Road and Shea Road	Weekend game day	2.3	2.4	0.1	3.4

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

PARTICULATE MATTER

PM concentrations with the proposed project (With Action) were determined for the 2018 Phase 1A analysis year using the methodology previously described. **Table 15-10** shows the 2018 maximum predicted 24-hour average PM_{10} concentrations without and with the proposed project (No Action and With Action).

Table 15-10
Phase 1A (2018)
24-Hour Average PM_{10} Concentrations

Analysis Site	Location	Time Period	24-Hour Concentration ($\mu g/m^3$)[1]	
			No Action	With Action
2	Boat Basin Road and Shea Road	Weekend non-game day	57.8	65.2
2	Boat Basin Road and Shea Road	Weekend game day	65.9	66.4

Note: [1] NAAQS—24-hour average 150 $\mu g/m^3$.

The values shown are the highest predicted concentrations for any of the receptors analyzed. The results indicate that the proposed project in Phase 1A would not result in any violations of the PM_{10} standard at any of the receptor locations analyzed.

Future maximum predicted 24-hour and annual average $PM_{2.5}$ concentrations were determined so that they could be compared with the interim guidance criteria for $PM_{2.5}$. Consistent with current CEQR guidance, $PM_{2.5}$ concentrations are presented as an incremental change in concentrations with and without the proposed project (With Action and No Action). The maximum predicted localized 24-hour average and neighborhood-scale annual average $PM_{2.5}$ concentration increments are presented in **Tables 15-11** and **15-12**, respectively. The results show that the daily (24-hour) $PM_{2.5}$ and annual increments are predicted to be well below the interim guidance criteria and, therefore, the proposed project would not result in significant $PM_{2.5}$ impacts at the analyzed receptor locations.

Table 15-11
Phase 1A (2018)
24-Hour Average $PM_{2.5}$ Concentration Increments in $\mu g/m^3$

Analysis Site	Location	Time Period	Increment
2	Boat Basin Road and Shea Road	Weekend non-game day	2.31
2	Boat Basin Road and Shea Road	Weekend game day	0.93

Note: $PM_{2.5}$ interim guidance criteria—24-hour average, > 2 $\mu g/m^3$ (5 $\mu g/m^3$ not-to-exceed value), based on the magnitude, frequency duration, location, and size of the area of the predicted concentrations.

Table 15-12
Phase 1A (2018)
Neighborhood Scale $PM_{2.5}$ Concentration Increments in $\mu g/m^3$

Analysis Site	Location	Increment
2	Boat Basin Road and Shea Road	0.03

Note: $PM_{2.5}$ interim guidance criteria—annual average (neighborhood scale) greater than 0.1 $\mu g/m^3$.

The maximum 24-hour average incremental $PM_{2.5}$ concentration from mobile source analysis was predicted to be 2.31 $\mu g/m^3$ (shown in **Table 15-11**) at Site 2, for Phase 1A, for the non-game analysis period. On game days, the 24-hour average incremental $PM_{2.5}$ was predicted to be below 2.0 $\mu g/m^3$. Throughout the five analysis years, 24-hour average $PM_{2.5}$ concentration increments above 2.0 $\mu g/m^3$ were predicted to occur only once. Based on the magnitude, extent, and frequency of 24-hour average $PM_{2.5}$ concentrations above 2.0 $\mu g/m^3$, the proposed project would not result in significant $PM_{2.5}$ impacts at the analyzed receptor location. Furthermore, the maximum predicted 24-hour average concentration is 5.18 $\mu g/m^3$, which when added to the $PM_{2.5}$ background concentration of 26 $\mu g/m^3$ would be less than the corresponding NAAQS of 35 $\mu g/m^3$.

PHASE 2 (2032)

CO concentrations with the proposed project were determined for Phase 2, in the 2032 analysis year, at the traffic intersection selected using the methodology previously described. **Table 15-13** shows the future maximum predicted 8-hour average CO concentration with and without the proposed project (With Action and No Action) at the intersection studied. (No 1-hour values are shown, since no exceedances of the NAAQS would occur and the *de minimis* criteria are only applicable to 8-hour concentrations; therefore, the 8-hour values are the most critical for impact assessment.) The values shown represent the highest predicted concentrations for any of the receptors analyzed for the peak periods for which the greatest concentrations and/or concentration increments were predicted. The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the incremental increases in 8-hour average CO concentrations are very small, and consequently would not result in a violation of the CEQR *de minimis* CO criteria. (The *de minimis* criteria are described above in Section D: "Air Quality Regulations, Standards, and Benchmarks.")

Table 15-13
Phase 2 (2032)
8-Hour Average CO Concentrations

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)			
			No Action	With Action	Increment	*De Minimis*
1	34th Avenue and 126th Street	Weekend non-game day	2.1	2.6	0.5	3.5
1	34th Avenue and 126th Street	Weekend game day	2.2	2.6	0.4	3.4
Note: 8-hour standard (NAAQS) is 9 ppm.						

PARTICULATE MATTER

PM concentrations with the proposed project (With Action) were determined for Phase 2, in the 2032 analysis year, using the methodology previously described. **Table 15-14** shows the future maximum predicted 24-hour average PM_{10} concentrations without and with the proposed project (No Action and With Action).

Table 15-14
Phase 2 (2032)
24-Hour Average PM_{10} Concentrations

Analysis Site	Location	Time Period	24-Hour Concentration ($\mu g/m^3$)[1]	
			No Action	With Action
1	34th Avenue and 126th Street	Weekend non-game day	62.2	70.6
1	34th Avenue and 126th Street	Weekend game day	69.3	70.1
Note: [1] NAAQS—24-hour average 150 $\mu g/m^3$.				

The values shown are the highest predicted concentrations for any of the receptors analyzed. The results indicate that the proposed project would not result in any violations of the PM_{10} standard at any of the receptor locations analyzed.

Future maximum predicted 24-hour and annual average $PM_{2.5}$ concentrations were determined so that they could be compared with the interim guidance criteria for $PM_{2.5}$. Consistent with current CEQR guidance, $PM_{2.5}$ concentrations are presented as an incremental change in concentrations with and without the proposed project. The maximum predicted localized 24-hour average and neighborhood-scale annual average $PM_{2.5}$ concentration increments are presented in **Tables 15-15** and **15-16**, respectively. The results show that the maximum daily (24-hour) $PM_{2.5}$ increments are predicted to be below the applicable interim guidance criterion of 5 $\mu g/m^3$, and the maximum annual average $PM_{2.5}$ increments are not predicted to exceed the applicable interim guidance criterion of 0.1 $\mu g/m^3$.

Table 15-15
Phase 2 (2032)
24-Hour Average $PM_{2.5}$ Concentration Increments in $\mu g/m^3$

Analysis Site	Location	Time Period	Increment
1	34th Avenue and 126th Street	Weekend non-game day	3.50
1	34th Avenue and 126th Street	Weekend game day	1.70

Note: $PM_{2.5}$ interim guidance criteria—24-hour average, > 2 $\mu g/m^3$ (5 $\mu g/m^3$ not-to-exceed value), based on the magnitude, frequency duration, location, and size of the area of the predicted concentrations.

Table 15-16
Phase 2 (2032)
Neighborhood Scale $PM_{2.5}$ Concentration Increments in $\mu g/m^3$

Analysis Site	Location	Increment
1	126th Street and Roosevelt Avenue	0.10

Note: $PM_{2.5}$ interim guidance criteria—annual average (neighborhood scale) greater than 0.1 $\mu g/m^3$.

The maximum 24-hour average incremental $PM_{2.5}$ concentration from mobile source analysis at Site 1 was predicted to be 3.50 $\mu g/m^3$ (shown in **Table 15-15**), in Phase 2, for the non-game analysis period. On game days, the 24-hour average incremental $PM_{2.5}$ was predicted to be below 2.0 $\mu g/m^3$.

Assuming non-game day conditions throughout the five analysis years, 24-hour average $PM_{2.5}$ concentration increments above 2.0 $\mu g/m^3$ were predicted to occur for at most 10 times in a year, and at an average of 7.4 times per year. Over the five year period, there were only three occurrences per year of concentration increments above 3.0 $\mu g/m^3$, occurring at most once per year, and at an average of 0.6 times per year. The $PM_{2.5}$ emission factors calculated by the MOVES model vary by speed, with higher levels of engine emissions at low travel speeds. As the MOVES model was primarily created and to date used for modeling inventories, there is limited guidance on the use of the model for project-level microscale analysis in urban areas. There are a number of refinements that could provide more accurate estimations of emissions on an hour-by-hour basis using project-specific traffic data instead of the more conservative assumptions used in the analysis. Additional air quality studies will be undertaken between the DSEIS and FSEIS to further refine the mobile source analysis for the Phase 2 analysis year, in consultation with DEP. A sensitivity analysis was performed to assess the potential reductions of predicted $PM_{2.5}$ emissions that would likely occur as a result of the refinements that would be performed between DSEIS and FSEIS. Based on a potential reduction of 12 to 15 percent, developed using the sensitivity analysis, it is anticipated that the maximum frequency of $PM_{2.5}$ concentrations above 2 $\mu g/m^3$ would be reduced to at most 7 times in any year. In consideration of these factors including effects of vehicle idling and average vehicle speeds, the frequency of occurrence is not considered to be significant. Furthermore, the maximum predicted 24-hour average concentration is 6.73 $\mu g/m^3$, which when added to the $PM_{2.5}$ background concentration of 26 $\mu g/m^3$ would be less than the corresponding NAAQS of 35 $\mu g/m^3$.

PARKING FACILITIES

WILLETS WEST PARKING

Using the methodology set forth in the *CEQR Technical Manual*, the CO concentrations from the proposed Willets West parking facility were predicted. In 2018, the completion of Phase 1A, when Willets West would be constructed, the maximum CO concentrations from the parking facility, including ambient background levels and contributions from on-street traffic at sensitive receptors closest to the exhaust would be 8.4 ppm for the 1-hour period, and 5.1 ppm for the 8-hour period. These maximum predicted CO levels would be in compliance with the applicable CO federal ambient air quality standards. The maximum CO concentrations for the 1-hour and 8-hour averaging period for the Willets West parking without the background and on-street contributions (i.e., the concentration increments) would be 5.0 ppm and 3.1 ppm, respectively. The 8-hour average change in CO concentration of 3.1 ppm would be less than the *de minimis* value of 3.5 ppm[1]. Since the proposed Willets West parking facility under the worst-case assumptions would not exceed the NAAQS or the *de minimis criteria,* and would therefore not result in significant air quality impacts, it is concluded that other parking facilities that would be constructed outside of the Special Willets Point District, with a smaller capacity, would also not result in significant air quality impacts.

CONVENTION CENTER PARKING

Using the methodology set forth in the *CEQR Technical Manual*, the CO concentrations from a parking garage at the proposed convention center were predicted. The maximum CO concentrations in 2032, the analysis year for Phase 2, in which the convention center would be built, including ambient background levels and contributions from on-street traffic at sensitive receptors closest to the exhaust would be 4.9 ppm for the 1-hour period, and 2.9 ppm for the 8-hour period. These maximum predicted CO levels would be in compliance with the applicable CO federal ambient air quality standards. The maximum CO concentrations for the 1-hour and 8-hour averaging period for the convention center parking garage without the background and on-street contributions would be 1.3 ppm and 0.7 ppm, respectively. The 8-hour average change in CO concentration of 0.7 ppm would be less than the *de minimis* value of 3.5 ppm. Since the proposed convention center garage under the worst-case assumptions would not exceed the NAAQS or the *de minimis criteria*, and would therefore not result in significant air quality impacts, it is concluded that other garages that would be constructed within the District, with a smaller capacity would also not result in significant air quality impacts.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

As described previously, a refined dispersion modeling analysis of heating and hot water systems for the proposed project was performed using the available information regarding the proposed project buildings. It was determined that all proposed buildings would be restricted to using natural gas as the only fossil fuel for heating and hot water systems; fuel oil would be prohibited. To account for a range of possible development sizes and stack locations, very conservative assumptions were made regarding the gross square foot area that would be served by a single heating and hot water system exhaust and stack locations analyzed. Based on the

[1] The baseline concentration used to compute the *de minimis* value was assumed to be the background CO concentration.

results of the conservative heating and hot water systems refined modeling analysis, a number of measures would be needed to avoid the potential for significant adverse impact on air quality. For the District, these requirements would be implemented through the E-designations that are already in place; these requirements would supersede the requirements previously set forth for the E-designations. For Willets West, the requirements would be incorporated into the development agreements and/or amended leases. The requirements specified in the E-designations or development agreements and/or amended leases would be as follows:

1. Natural gas shall be the only fossil fuel used for heating and hot water equipment on all of the proposed project sites.
2. Any fossil-fuel fired heating and hot water system exhaust stack for the proposed development shall be located at the highest tier of the building that it would serve.
3. Any heating and hot water exhaust stack on Parcel A1 shall be at least 12 feet above the top habitable floor roof. Any fossil-fuel fired heating and hot water system stack exhaust height on Parcels A2, A3, A4, A8, A11, and Willets West shall be at least 10 feet above the top habitable floor roof.
4. Any new development must use low-NO_x (<30 ppm) burners.
5. In lieu of the requirements described above, an analysis may be performed to demonstrate that national and local ambient air quality standards and thresholds would be met using a different fuel type, stack location, stack height, and/or without low-NO_x burners. Such an analysis could consider information regarding emissions from the heating and hot water systems, emission controls, and projected heat and hot water demand specific to the proposed development. It is expected that such site specific information would become available as the mechanical design of the proposed sites progresses.

The cumulative heating and hot water analysis conducted considered the anticipated development on Lot B. The analysis showed that with the use of natural gas, low-NO_x burners and exhaust stack placement at the top building tier, there would be no potential for significant adverse impact with the development on Lot B. As Lot B would require additional approvals that are not a part of the proposed project, any measures needed to preclude the potential for a significant adverse impact on air quality could be reevaluated and implemented in the future.

With the above requirements in place, the calculated concentrations for NO_2 are presented in **Table 15-17**, along with the relevant background concentrations, the total potential concentrations, and the applicable ambient standards. The annual average NO_2 impacts from the proposed development were conservatively calculated assuming that all of the NO emitted by the heat and hot water systems of the proposed development was fully transformed to NO_2 (100 percent conversion). The highest annual average concentration at any receptor over the 5-year modeling period is reported in **Table 15-17**. For the analysis of 1-hour impacts, the PVMRM module was applied and seasonal hourly background NO_2 data were added within the model. The highest combined daily 1-hour NO_2 concentration was determined at each receptor location for each day. The 8th highest (98th percentile) of the daily 1-hour maximum concentration for each modeled year was then calculated within the model. The 98th percentile concentrations were averaged over five years at each receptor, in accordance with USEPA guidance for addressing the NO_2 1-hour standard and the maximum 5-year average value at any receptor is reported in **Table 15-17.**

Table 15-17
Potential Future NO_2 Concentrations
From the Heat and Hot Water Systems ($\mu g/m^3$)

Pollutant	Averaging Period	Project Increment	Background Concentration	Total Concentration	NAAQS
NO_2	Annual [1]	4.42	43	47	100
	1-hour [2]	—	—	182.9	188

Notes:
[1] The annual modeled NO_2 concentration was conservatively reported to be equal to the NO_x concentration. The increment presented is the highest concentration at any receptor over the five years modeled (2007–2011).
[2] 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. Total hourly NO_2 concentrations throughout the modeling period were determined by adding the hourly modeled concentrations to the seasonal hourly ambient NO_2 concentrations for each corresponding hour. The total 1-hour concentration reported is the five-year average of the annual 98th percentile of the highest combined daily 1-hour NO_2 concentrations, in accordance with USEPA guidance.

The maximum potential increase in concentrations associated with the proposed development's heat and hot water systems, when added to background concentrations, would be less than the NAAQS. Therefore, the proposed development's heat and hot water systems would not have the potential for significant adverse impacts on air quality.

With the implementation of the above discussed requirements, there would be no potential for significant adverse impacts on air quality from the proposed project.

INDUSTRIAL SOURCE ANALYSIS

A review of land uses and field survey information was conducted to identify auto, manufacturing and industrial uses within 400 feet of the proposed project, considering the existing uses within the District that would potentially remain until construction of the development proposed under Phase 2. Information was requested from DEP on permitted uses within and beyond the project study area. No existing uses of concern were identified outside of the District. Seven businesses having a DEP air emissions permit were identified within 400 feet of the uses proposed for development in Phase 1A and Phase 1B. The emission rates specified in the permits and the minimum distance between each of the businesses and the proposed Phase 1A/Phase 1B development were used in the screening analysis.

Predicted worst-case short-term (1-hour average) and long-term (annual) levels of non-criteria pollutants resulting from existing uses that would potentially remain until construction of Phase 2 are shown in **Table 15-18**, along with the applicable guideline concentrations. The results of the screening analysis indicate that the non-criteria pollutant levels at the proposed development that would occur in Phase 1A and Phase 1B would be well below the NYSDEC guideline concentrations.

PM_{10} concentrations resulting from particulate emissions from the identified businesses were also analyzed, using the *CEQR Technical Manual* screening approach. The conservatively predicted maximum PM_{10} 24-hour average concentration of 97 $\mu g/m^3$, when added to the monitored background of 50 $\mu g/m^3$ is 147 $\mu g/m^3$, which is below the 24-hour NAAQS of 150 $\mu g/m^3$. Accordingly, based on the data available on the existing auto, manufacturing, and industrial uses, there would be no potential for significant adverse air quality impacts on the proposed project.

Table 15-18
Pollutant Concentration Resulting from Businesses with BEC Permits

Potential Contaminants	CAS No.	Estimated Emissions (g/s)	Predicted Short-term Concentrations ($\mu g/m^3$)	SGC[1] ($\mu g/m^3$)	Predicted Long-term Concentrations ($\mu g/m^3$)	AGC[1] ($\mu g/m^3$)
Butyl Acetate	00123-86-4	0.277	688	95,000	0.79	17,000
Toluene	00108-88-3	0.265	657	37,000	0.76	5,000
Solvents[2]	NY998-00-0	0.926	23,288	98,000	148	7,000

Notes:
1) NYSDEC DAR-1 (Air Guide-1) AGC/SGC Tables (October 2010)
AGC - Annual Guideline Concentrations
SGC - Short-term Guideline Concentrations
2) As "Solvents" do not have an SGC or AGC listed in DAR-1 tables, the SGC and AGC for Isopropyl Alcohol (CAS# 00067-63-0), a common solvent, were used.

Other Potential Sources

As discussed in the 2008 FGEIS, the Special District regulations allow the development of a wastewater reclamation facility, a cogeneration facility and an electrical utility substation within the District, provided they would primarily serve the District. Such facilities are not currently proposed as part of Phases 1A and 1B but may be included as part of Phase 2. Any such facilities, if proposed or needed at a future time, would require further study and additional approvals. If proposed as part of Phase 2, these uses would be subject to a separate environmental and public review process. The water reclamation facility would require approval by the Board of Standards and Appeals (BSA). The cogeneration facility would require approval by the BSA, as well as air permit approvals from DEP and NYSDEC. The substation would require authorization by the City Planning Commission (CPC). The Special District text requires that reviewing agencies prescribe appropriate conditions to minimize adverse effects on the character of the surrounding area, including emissions limits.

The wastewater reclamation facility and substation would likely have minimal air emissions and therefore would likely not result in any additional air quality impacts. The cogeneration facility may result in additional emissions; however, emissions of some pollutants may be lower due to stringent regulatory requirements for gas turbines and reciprocating engines used to generate power, and the availability of advanced air pollution control systems which are effective in minimizing and reducing emissions. Therefore, future environmental review would ensure that any facilities allowed by the Special District regulations incorporate measures to avoid the potential for significant adverse impacts on air quality. ✷