Chapter 8: Air Quality

A. INTRODUCTION

The potential for air quality impacts from the Proposed Project is examined in this chapter. Air quality impacts can be either direct or indirect. Direct impacts result from emissions generated by stationary sources at a development site, such as emissions from on-site fuel combustion for heat and hot water systems. Indirect impacts are impacts that are caused by emissions from existing sources on a proposed project or by emissions from sources that would be affected by a proposed project, such as on-road vehicle trips generated by a project or other changes to future traffic conditions due to a project.

The Proposed Project would include heat and hot water systems for re-tenanted buildings. Therefore, a stationary source analysis was conducted to evaluate potential future pollutant concentrations with the proposed heat and hot water systems. In addition, since the Proposed Project would result in additional vehicle trips and would increase ferry operations, the potential for indirect mobile source impacts from the Proposed Project was analyzed.

B. PRINCIPAL CONCLUSIONS

2022 ANALYSIS YEAR

The maximum predicted pollutant concentrations and concentration increments from on-road mobile sources, from ferry operations, and from potential heat and hot water systems with the Proposed Project would be below the corresponding guidance thresholds and ambient air quality standards. Thus, the Proposed Project would not have any significant adverse impacts on air quality.

2030 ANALYSIS YEAR

Since the specific program and design of the South Island Development Zones have not yet been defined, the potential for air quality impacts from these components are reviewed qualitatively. The conclusion remains the same as in the FGEIS—although not all details can be analyzed at this time, any potential air quality impacts can be avoided by design measures or other mitigation options. These elements will be analyzed in detail in subsequent environmental review.

C. SUMMARY OF 2011 FGEIS FINDINGS

PHASE 1

Phase 1 of the Proposed Project would improve existing open spaces and open new areas to public access on Governors Island (the Island) and would not result in the development of new buildings. It would not result in a significant number of new vehicle or ferry trips or other

significant changes. Therefore, Phase 1 would not result in a significant adverse impact on air quality.

LATER PHASES

Based on the traffic analysis conducted for the Later Phases–Park and Public Spaces, the number of peak hour trips at any one intersection is expected to be below the *CEQR Technical Manual* screening analysis thresholds. Therefore, the Later Phases–Park and Public Spaces would not have the potential for significant adverse impacts on air quality from the projected additional vehicle trips. The radiant heating system for the Shell that would be developed in the Later Phases–Park and Public Spaces would not have the potential for significant adverse impacts on air quality. Nor would the maximum predicted pollutant concentrations, and concentration increments from on-road transportation be likely to exceed the relevant guidance thresholds and ambient air quality standards. Ferry operations could have the potential to significantly affect pollutant concentrations locally in areas adjacent to the ferry landings; however, with appropriate site design and/or emission mitigation measures, significant adverse impacts on air quality can be avoided.

Since the specific future uses for the Later Phases–Island Redevelopment have not been proposed, defined, or designed, it is not possible to perform a detailed air quality analysis of potential transportation impacts from the full development of the Proposed Project. Therefore, the potential for impacts from transportation emissions was assessed qualitatively. Any new buildings constructed as part of the Later Phases–Island Redevelopment would require heat and hot water systems, which would likely use natural gas or oil as fuel. While a detailed assessment of these sources is not possible since the specific use and design of these buildings have not been determined, the assessment approach for future environmental review was described and reasonable measures that could be implemented to avoid the potential for significant adverse impact were identified. The public school, research, or university laboratories that could be included in the Later Phases–Island Redevelopment can be designed to avoid the potential for significant adverse impact on air quality in the event of an accidental chemical spill. The design and operational measures that may be required would be reasonable and typical for laboratory facilities.

At such time when the Later Phases–Island Redevelopment has been planned and designed, it is anticipated that it would be subject to CEQR, and that the associated future environmental review would take into account analyses of potential air quality impacts from the full development of the Proposed Project.

D. POLLUTANTS FOR ANALYSIS

Ambient air quality is affected by air pollutants produced by both motor vehicles and stationary sources. Emissions from motor vehicles are referred to as mobile source emissions, while emissions from fixed facilities are referred to as stationary source emissions. Ambient concentrations of carbon monoxide (CO) are predominantly influenced by mobile source emissions. Particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (nitric oxide, NO, and nitrogen dioxide, NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources, and some sources utilizing non-road diesel such as large international marine engines. On-road

diesel vehicles currently contribute very little to SO_2 emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs. Ambient concentrations of CO, PM, NO_2, SO_2, and lead are regulated by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act, and are referred to as 'criteria pollutants'; emissions of VOCs, NO_x, and other precursors to criteria pollutants are also regulated by EPA.

CARBON MONOXIDE

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

The Proposed Project would result in changes in traffic patterns and an increase in traffic volume in the study area. Therefore, a mobile source analysis was conducted at critical intersections in the study area to evaluate future CO concentrations with and without the Proposed Project.

NITROGEN OXIDES, VOCS, AND OZONE

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

The Proposed Project would not have a significant effect on the overall volume of vehicular travel in the metropolitan area and would not include any other large-scale potential emissions sources; therefore, no measurable impact on regional NO_x emissions or on ozone levels is predicted. An analysis of Proposed Project-related total emissions of these pollutants was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a regulated pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern further downwind from large stationary point sources, and not a local concern from mobile sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO_2 at the source.) However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may become of greater concern for this pollutant. Potential impacts on local NO_2 concentrations from the fuel combustion for the Proposed Project's heat and hot water boiler systems were evaluated.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Lead in gasoline has been banned under the Clean Air Act, and therefore, lead 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 VOC; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) of other pollutants, often toxic and some likely carcinogenic compounds.

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

Diesel-powered vehicles, especially heavy duty trucks and buses, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel powered vehicles. An analysis was conducted to assess the worst case PM impacts due to the increased traffic associated with the Proposed Project.

SULFUR DIOXIDE

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

As part of the Proposed Project, natural gas would be burned in the proposed heat and hot water systems. The sulfur content of natural gas is negligible; therefore, no analysis was performed to estimate the future levels of SO_2 with the Proposed Project.

E. 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 8-1. The NAAQS for CO, annual NO_2, and 3-hour SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particulate matter (TSP), settleable particles, non-methane hydrocarbons (NMHC), 24-hour and annual SO_2, and ozone which correspond to federal standards that have since been revoked or replaced, and for the noncriteria pollutants beryllium, fluoride, and hydrogen sulfide.

EPA has revised the NAAQS for PM, effective December 18, 2006. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ 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. EPA 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.

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

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

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

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

Table 8-1
National Ambient Air Quality Standards (NAAQS)

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

Notes:

ppm – parts per million (unit of measure for gases only)
µg/m^3 – micrograms per cubic meter (unit of measure for gases and particles, including lead)
NA – not applicable

All annual periods refer to calendar year.

Standards are defined in ppm. Approximately equivalent concentrations in µg/m^3 are presented.

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

(2) EPA has lowered the NAAQS down from 1.5 µg/m^3, effective January 12, 2009.

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

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

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

(6) EPA has lowered the primary standard from 15 µg/m^3, effective March 2013.

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

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

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

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

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

The CAA, as amended in 1990, defines non-attainment areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as non-attainment by EPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the Clean Air Act, followed by a plan for maintaining attainment status once the area is in attainment.

In 2002, EPA re-designated New York City as in attainment for CO. Under the resulting maintenance plan, New York City is committed to implementing site-specific control measures throughout the city to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period.

Manhattan has been designated as a moderate NAA for PM_{10}. On December 17, 2004, EPA took final action designating the five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties as a $PM_{2.5}$ non-attainment area under the Clean Air Act due to exceedance of the annual average standard. Based on recent monitoring data (2006-2009), annual average concentrations of $PM_{2.5}$ in New York City no longer exceed the annual standard. EPA has determined that the area has attained the 1997 annual $PM_{2.5}$ NAAQS, effective December 15, 2010. As stated earlier, EPA has recently lowered the annual average primary standard to 12 $\mu g/m^3$. EPA will make initial attainment designations by 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, EPA has revised the 24-hour average $PM_{2.5}$ standard. In November 2009, EPA designated the New York City Metropolitan Area as nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS. The nonattainment area includes the same 10-county area originally designated as nonattainment with the 1997 annual $PM_{2.5}$ NAAQS. Based on recent monitoring data (2007-2011), EPA determined that the area has attained the standard. Although not yet a redesignation to attainment status, this determination removes further requirements for related SIP submissions.

Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA), and the five New York City counties (the New York–New Jersey–Long Island Nonattainment Area, New York portion) had been designated as a severe non-attainment area for ozone (1-hour average standard, 0.12 ppm). In November 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone*, which was finalized and approved by EPA effective March 6, 2002, addressing attainment of the 1-hour ozone NAAQS by 2007. The 1-hour standard was revoked in 2004 when it was replaced by the 8-hour ozone standard, but certain further requirements remained ('anti-backsliding'). On December 7, 2009, EPA determined that the Poughkeepsie nonattainment area (Dutchess, Orange, Ulster, and Putnam counties) has attained the 1-hour standard. On June 18, 2012, EPA determined that the New York–New Jersey–Long Island NAA has also attained the standard. Although not yet a redesignation to attainment status, this determination removes further requirements under the 1-hour standard.

Effective June 15, 2004, EPA designated these same counties as moderate non-attainment for the 1997 8-hour average ozone standard (LOCMA was moved to the Poughkeepsie moderate non-attainment area for 8-hour ozone). On February 8, 2008, NYSDEC submitted final revisions to the SIP to EPA to address the 1997 8-hour ozone standard. Based on recent monitoring data

(2007-2011), EPA determined that the NY-NJ-CT area has attained the 1997 8-hour ozone NAAQS (0.08 ppm). Although not yet a redesignation to attainment status, this determination removes further requirements under the 1997 8-hour standard. In March 2008 EPA strengthened the 8–hour ozone standards. EPA designated the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester (NY portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT NAA) as a marginal non-attainment area for the 2008 ozone NAAQS, effective July 20, 2012. SIPs will be due in 2015.

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

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

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the *City Environmental Quality Review (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 8-1) would be deemed to have a potential significant adverse impact.

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

DE MINIMIS CRITERIA REGARDING CO IMPACTS

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

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

difference between baseline (i.e., No Action) concentrations and the 8-hour standard, when No Action concentrations are below 8.0 ppm.

$PM_{2.5}$ INTERIM GUIDANCE CRITERIA

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

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 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.

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

F. METHODOLOGY

MOBILE SOURCES

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

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

VEHICLE EMISSIONS

Engine Emissions

Vehicular CO and PM engine emission factors were computed using the EPA mobile source emissions model, MOBILE6.2.[1] This emissions model is capable of calculating engine emission factors for various vehicle types, based on the fuel type (gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway types, number of starts per day, engine soak time, and various other factors that influence emissions, such as inspection maintenance programs. The inputs and use of MOBILE6.2 incorporate the most current guidance available from NYSDEC and NYCDEP.[2]

Vehicle classification data were based on field studies. Appropriate credits were used to accurately reflect the inspection and maintenance program. The inspection and maintenance programs require inspections of automobiles and light trucks to determine if pollutant emissions from each vehicle exhaust system are lower than emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered in New York State.

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

[2] EPA is phasing in a new model for vehicular emissions, MOVES (current version MOVES2010b). The CEQR Technical Manual indicates that projects that have begun to model mobile emissions based upon MOBILE6.2 can complete the analysis with this model until the end of EPA's two-year phase-in period, which is March 2nd, 2013.

All taxis were assumed to be in hot stabilized mode (i.e., excluding any start emissions). The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative breakdown within the fleet.[1]

An ambient temperature of 50.0° Fahrenheit was used, as per the *CEQR Technical Manual* guidance.

Road Dust

The contribution of re-entrained road dust to PM_{10} concentrations, as presented in the PM_{10} SIP, is considered to be significant; therefore, the PM_{10} estimates include both exhaust and road dust. In accordance with the $PM_{2.5}$ interim guidance criteria methodology, $PM_{2.5}$ emission rates 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 NYCDEP considers it to have an insignificant contribution on that scale. Road dust emission factors were calculated according to the latest procedure delineated by EPA[2] and the *CEQR Technical Manual*.

TRAFFIC DATA

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the Proposed Project (see Chapter 7, "Transportation"). Traffic data for the future without and with the Proposed Project were employed in the respective air quality modeling scenarios. The weekday morning (9 to 10 AM) and evening (5 to 6 PM) peak periods were analyzed. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant air quality impacts.

For particulate matter, the peak morning and evening period traffic volumes were used as a baseline for determining off-peak volumes. Off-peak traffic volumes in the existing condition and in the future without the Proposed Project, and off-peak increments from the Proposed Project, were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected at appropriate locations.

DISPERSION MODEL FOR MICROSCALE ANALYSES

Maximum CO concentrations resulting from vehicular emissions adjacent to each analysis site were predicted using the CAL3QHC model Version 2.0.[3] The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC predicts emissions and dispersion of CO from idling and moving vehicles. The queuing algorithm includes site-specific traffic

[1] The MOBILE6.2 emissions model utilizes 28 vehicle categories by size and fuel. Traffic counts and predictions are based on broader size categories, and then broken down according to the fleet-wide distribution of subcategories and fuel types (diesel, gasoline, or alternative).

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

[3] EPA, User's Guide to CAL3QHC, A Modeling Methodology for Predicted Pollutant Concentrations Near Roadway Intersections, Office of Air Quality, Planning Standards, Research Triangle Park, North Carolina, EPA-454/R-92-006.

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 modeling. This refined version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating the 24-hour and annual average concentrations required to address the timescales of the PM NAAQS.

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).

Tier I CO Analyses—CAL3QHC

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

Following the EPA guidelines[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 0.79 to account for persistence of meteorological conditions per the *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.

PM Analyses—CAL3QHCR

A Tier II analysis performed with the CAL3QHCR model includes the modeling of hourly concentrations based on hourly traffic data and five years of monitored hourly meteorological data. The data consists of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York for the period 2007-2011. All hours were modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

The microscale analyses were performed for 2022, the year by which the Proposed Project is likely to be completed. The future analysis was performed both without the Proposed Project (the No Build condition) and with the Proposed Project (the Build condition).

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

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant concentrations originating from distant sources that are not directly included in the modeling analysis (which directly accounts only for vehicular emissions on intersecting streets within 1,000 feet of the analyzed intersection). Background concentrations must be added to modeling results to obtain total pollutant concentrations at an analysis site.

The background concentrations used in the mobile source analysis were based on concentrations recorded at the CCNY and Division Street monitoring stations from 2007 to 2011. The monitoring stations are the closest monitoring stations to the analysis sites that have available recorded data over a recent 5-year period. The background concentrations are presented in **Table 8-2**. The background concentrations represent the highest measured 3-year average $PM_{2.5}$ concentration, the 98th percentile 24-hour average $PM_{2.5}$ concentration, and the second highest 24-hour PM_{10}, and 8-hour and 1-hour CO concentrations, consistent with the NAAQS.

Table 8-2
Maximum Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration	NAAQS
CO	1-hour	CCNY, Manhattan	2.7 ppm	35 ppm
	8-hour		1.8 ppm	9 ppm
PM_{10}	24-hour	Division Street, Manhattan	53 $\mu g/m^3$	150
$PM_{2.5}$	24-hour	Division Street, Manhattan	27.6 $\mu g/m^3$	65
	Annual		11.7 $\mu g/m^3$	15

Notes: Consistent with the NAAQS, PM values are the highest of the latest available 3 years; all other pollutants are the highest of the latest 5 years. Consistent with the NAAQS for each pollutant, for averaging periods shorter than a year the second highest value is used, aside from $PM_{2.5}$ which is the 98th percentile.
Sources: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2001–2005.

ANALYSIS SITES

Intersections in the study area were reviewed for microscale analysis based on the *CEQR Technical Manual* guidance. The incremental traffic volumes for the AM, midday, PM, and Saturday midday periods were reviewed. Two intersections with increments exceeding the CO volume thresholds were identified and selected for microscale analysis (see **Table 8-3**). The potential impact from vehicle emissions of CO, PM_{10}, and $PM_{2.5}$ was analyzed at each site.

Table 8-3
Mobile Source Analysis Sites

Analysis Site	Location	Peak Period Analyzed
1	Whitehall Street & South Street	AM, PM
2	Broad Street & South Street	AM, PM

RECEPTOR PLACEMENT

Multiple receptors (i.e., precise locations at which concentrations are predicted) were modeled at each of the selected sites; receptors were placed along the approach and departure links at spaced intervals. Receptors were placed at sidewalk or roadside locations near intersections with continuous public access. Receptors in the analysis models for predicting annual average

neighborhood-scale $PM_{2.5}$ concentrations were placed at a distance of 15 meters, from the nearest moving lane at each analysis location, based on the *CEQR Technical Manual* procedure for neighborhood-scale corridor $PM_{2.5}$ modeling.

HEAT AND HOT WATER SYSTEMS

Since all building energy systems on the Island would use natural gas, the main pollutant of concern is NO_2. The NO_2 annual-average analysis was prepared using the screening method outlined in the *CEQR Technical Manual*. Since the manual does not provide a screening procedure for 1-hour average NO_2 concentrations, a screening procedure was prepared using the detailed modeling methods described in the *CEQR Technical Manual*, as described below.

ANNUAL NO_2 SCREENING

To assess potential air quality impacts associated with emissions from the Proposed Project's heat and hot water systems, a screening analysis was performed for each of the buildings proposed to be re-tenanted. The methodology determines the threshold of development size below which the action would not have a significant adverse impact. The screening procedure considers the fuel to be used, the maximum development size, type of development, and the stack height, to evaluate whether a significant adverse impact is likely. Based on the distance from the Proposed Project to the nearest building of similar or greater height, if the maximum development size was greater than the threshold size in the *CEQR Technical Manual,* further refined screening was prepared based on more detailed emissions data. Emissions for the more detailed screening were estimated using the same parameters described below for the 1-hour average dispersion modeling.

1-HOUR AVERAGE NO_2 DISPERSION MODELING

In order to facilitate the analysis of all of the re-tenanted buildings, generic dispersion modeling was performed so as to represent the various combinations of stack and building heights and surrounding receptor locations. Generic models were prepared representing several stack heights, and each was run with receptors placed radially surrounding the source in all directions and at several elevations. Since the Proposed Project consists of relatively low buildings with open spaces surrounding each and without any urban canyons or other features which would complicate such analysis in a more urban setting, the above models would well represent all re-tenanted buildings. Results for each source were then selected according to the specific setting and projected emissions level of the source. The detailed model parameters are described below.

Model Selection

The potential 1-Hour Average NO_2 impacts were evaluated using the EPA/AMS AERMOD dispersion model.[1] AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and

[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.

includes handling of terrain interactions. The AERMOD model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data. The analysis of potential impacts from exhaust stacks was performed assuming stack tip downwash, urban dispersion and surface roughness length, and without building downwash, and elimination of calms.

Receptor Placement

Discrete receptors (i.e., locations at which concentrations are calculated) were modeled at ground level, representing open spaces, starting at 20 feet from the sources and out to a distance of 500 feet; and elevated receptors at elevations from 10 feet to 47 feet and distance of 10 feet to 180 feet from the source, representing potentially sensitive locations such as operable windows and intake vents on adjacent buildings.

Emission Estimates and Stack Parameters

Fuel consumption was estimated based on procedures outlined in the *CEQR Technical Manual* for natural gas. A more detailed source was used based on the *CEQR Technical Manual* guidance, applying energy intensities for specific uses using natural gas (**Table 8-4**), based on the Energy Information Administration's Commercial Buildings Energy Consumption Survey.[1] It was conservatively assumed that peak day use would be equivalent to 1 percent of total annual use (representing 100 heating days per year—actual use would include hot water during all seasons and would likely include more heating days at lower average intensity).

Table 8-4
Energy Intensity for Commercial Uses

Use	**Energy Intensity** (scf per sf)
New School	26.4
Office/No Build	30.1
Theater	55.0*
Residential/Dorm	37.0
Artist Studios	30.1
Hospitality	72.8*
Office New	30.1
Restaurant/Food	134.4*
Mixed Education	26.4
School No Build	26.4

Note: Intensities represent climate zone 3 averages.
* not available for climate zone 3, conservatively assumes zone 2
Source: EIA, 2006

An emission factor of 100 pounds per standard cubic foot of natural gas, from the natural gas combustion sections of EPA's AP-42, was used to calculate emission rates for the heat and hot water systems. The annual average NO_2 impacts from the Proposed Project were conservatively calculated assuming that all of the NO emitted by these operations was fully transformed to NO_2, while 1-hour averages assumed an 80 percent conversion, as per EPA guidance.

[1] EIA, *Commercial Buildings Energy Consumption Survey* "Table C30: Natural Gas Consumption and Conditional Energy Intensity by Climate Zone for Non-Mall Buildings, 2003" using zone 3 data, December 2006.

Default worst-case stack parameters were applied based on the *CEQR Technical Manual* guidance for cases where stack information is unavailable. These assumptions included an exhaust velocity of 0.001 m/s, a stack diameter of 0 meters, an exhaust temperature of 293 K, and a stack height of 3 feet above the rooftop level. The generic models were run with a unitary emission rate of 1.0 g/s; **i**ncremental concentrations were then calculated for each source by multiplying the maximum projected generic concentration for the appropriate height and distance by the emission rate of the source. The detailed emissions, stack heights, and relative receptor locations for all re-tenanted buildings are detailed in Appendix B.

Background Concentrations

To estimate the maximum expected total pollutant concentrations at a given receptor, the predicted levels were added to corresponding background concentration of 126.0 $\mu g/m^3$. The background level was based on concentrations monitored at the nearest NYSDEC background monitoring station, Queens College 2. The measured background concentration was added to the predicted contribution from the modeled source to determine the maximum predicted total pollutant concentration. It was conservatively assumed that the maximum background concentrations occur on all days.

Calculating Total Concentrations

Using the methodology above, worst-case maximum projected concentration for each building's HVAC system was evaluated from all receptor heights and wind directions in relation to the source from all ground-level receptors and elevated receptors with a minimum distance equal to the distance between the source and the nearest building. In cases where this worst-case maximum would exceed standards, more detailed results were extracted based on adjacent buildings' heights. A second level of refinement was done for systems that continued to result in an exceedance by evaluating only receptor within the wind angles which would carry pollutants from the source to the adjacent buildings.

FERRIES

To analyze the potential for local air quality impacts from ferry operations, the potential pollutant concentrations in the areas surrounding the Soissons and Yankee ferry landings were evaluated. The analyses were prepared based on the potential 2022 weekday ferry trips described in Chapter 7, "Transportation." The analysis assumed that propulsion and auxiliary engines would be similar in size and operation to the engines currently used for the Coursen, Waterways, and Water Taxi ferries, but does not assume any emissions controls or upgraded engines. Since some ferries currently have engine controls and more likely will by 2022, this is a conservative assumption.

Emissions were calculated using emission factors of 13 and 0.3 grams per kilowatt-hour (g/kW-hr) of NO_x and PM, respectively, for propulsion engines, and 10 and 0.4 g/kW-hr of NO_x and PM, respectively, for auxiliary engines, with engine load of 75 percent for all auxiliary engines and cruising propulsion engines and 12 percent for idling propulsion engines.[1] The ratio of PM to $PM_{2.5}$ was taken from EPA published data.[2] Emissions included ferry cruising to and from the dock out to 1,000 feet from the dock and 10 minutes of idle at the dock.

[1] Bluewater Network, *Air Pollution from Passenger Ferries In New York Harbor*, 2003.

[2] EPA, AP-42 Fifth Edition *Compilation of Air Pollutant Emission Factors*, Table 3.4-2, 1996.

The dispersion analysis used the AERMOD model as described above for the stationary source analysis, and applying the EPA procedures for NO_x chemical transformation modeling.[1] Idle emissions were modeled as point sources at an elevation of 20 feet, applying an exit velocity of 35 meters per second, a stack diameter of 1 foot, and a temperature of 700 degrees Fahrenheit.[2] Cruising emissions were modeled as area sources out to 1,000 feet with varying width according to the approach profiles, and release height similar to the plume rise calculated for the idle point sources.

Receptors were included to represent both open spaces and buildings in the area of the landings.

G. EXISTING CONDITIONS

There is no air monitoring station on the Island. The pollutant concentrations presented in **Table 8-5** represent the existing concentrations of pollutant in the area from the nearest background monitoring stations. The concentrations of regional pollutants or pollutants which do not have local sources, such as ozone and lead, are generally representative of concentrations that may occur on the Island. Concentrations of other pollutants on the Island would likely be lower than those presented here because the Island currently has very limited vehicular traffic or other sources of these pollutants.

Table 8-5
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	CCNY, Queens	ppm	8-hour	1.7	9
			1-hour	2.7	35
SO_2	Queens College 2, Queens[1]	µg/m^3	3-hour	78	1,300
			1-hour	79.8	196
PM_{10}	Division Street, Queens	µg/m^3	24-hour	48	150
$PM_{2.5}$	PS 314, Brooklyn	µg/m^3	Annual	12	15
			24-hour	26.8	35
NO_2	Queens College 2, Queens[2]	µg/m^3	Annual	41	100
			1-hour	126.0	188
Lead	Morrisania, Bronx	µg/m^3	3-month	0.008	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.
(2) The 1-hour value is based on a three-year average (2009-2011) of the 98th percentile of daily maximum 1-hour average concentrations.
Source: NYSDEC, New York State Ambient Air Quality Report (2011).

[1] EPA, *Memorandum: Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS,* March 1, 2011.

[2] San Francisco Bay Area Water Transit Authority, *Human Health Risk Assessment for Proposed South San Francisco WTA Ferry Terminal,* 2005.

H. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES

CARBON MONOXIDE

Maximum projected 8-hour average CO concentrations without the proposed project for the 2022 Build year, including background concentrations, are presented in **Table 8-6.** The values shown are the highest projected concentrations at any receptor location for the time periods analyzed.

As shown in **Table 8-6**, CO concentrations in 2022 without the proposed project would be well below the 8-hour CO standard of 9 ppm.

Table 8-6
Maximum Projected Future (2022) 8-Hour Average CO Concentrations Without the Proposed Project (ppm)

Analysis Site	Location	Time Period	8-Hour Concentration
1	Whitehall Street & South Street	AM	2.6
2	Broad Street & South Street	AM	2.6
Note: The 8-hour average NAAQS for CO is 9 ppm.			

PARTICULATE MATTER

Maximum projected 24-hour average PM_{10} concentrations without the proposed project for the 2022 Build year, including background concentrations, are presented in **Table 8-7**. The values shown are the highest projected concentrations at any receptor location. Since $PM_{2.5}$ impacts are determined based on incremental values only, total No Build concentrations of $PM_{2.5}$ were not evaluated.

Table 8-7
Maximum Projected Future (2022) 24-Hour Average PM_{10} Concentrations Without the Proposed Project ($\mu g/m^3$)

Analysis Site	Location	Concentration
1	Whitehall Street & South Street	67.15
2	Broad Street & South Street	67.30
Note: The 24-hour average NAAQS for PM_{10} is 150 $\mu g/m^3$.		

HEAT AND HOT WATER SYSTEMS

In the No Build condition, some existing uses may continue to operate. These small systems would not influence the locations analyzed for the Build condition, and therefore have not been analyzed in detail.

FERRIES

In the existing condition, there is ferry service to the Island on weekends during part of the year, and some additional service for existing uses. Although this service is expected to continue in

the future No Build condition, the analysis conservatively assumes no service in the No Build condition and therefore No Build service was not analyzed.

I. PROBABLE IMPACTS OF THE PROPOSED PROJECT

2022 ANALYSIS YEAR

MOBILE SOURCES

Carbon Monoxide

Maximum projected 8-hour average CO concentrations with and without the proposed project for the 2022 Build year, including background concentrations, are presented in **Table 8-8.** The values shown are the highest projected concentrations at any receptor location for the time periods analyzed. (1-hour values are not presented because exceedances of the NAAQS would not 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 all of the receptors analyzed.

The results indicate that the proposed project would not result in any violations of the 8-hour average CO standard. In addition, the increments in 8-hour average CO concentrations are small and consequently would not exceed the *de minimis* CO criteria.

Table 8-8
Maximum Predicted Future (2022) 8-Hour Average CO Concentrations With and Without the Proposed Project (ppm)

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)			
			Without the Project	With the Project	Increment	*De Minimis*
1	Whitehall St & South St	AM	2.6	2.7	0.1	5.8
2	Broad St & South St	AM	2.6	2.7	0.1	5.8
Notes:	8-hour standard (NAAQS) is 9 ppm.					

Particulate Matter

Maximum projected 24-hour average PM_{10} concentrations with and without the proposed project for the 2022 Build year, including background concentrations, are presented in **Table 8-9**. The values shown are the highest projected concentrations at any receptor location. The results indicate that the vehicle trips generated by the proposed project would not result in PM_{10} concentrations that would exceed the NAAQS.

Table 8-9
Future (2022) Maximum Predicted 24-Hour Average PM_{10} Concentrations With and Without the Proposed Project ($\mu g/m^3$)

Analysis Site	Location	No Build	Build
1	Whitehall St & South St	67.15	68.68
2	Broad St & South St	67.30	68.67
Note: The National Ambient Air Quality Standard for PM_{10} is 150 $\mu g/m^3$, for a 24-hour average.			

Maximum projected 24-hour average and annual $PM_{2.5}$ concentration increments were calculated so that they could be compared to the interim guidance criteria that determine the potential significance of any impacts from the proposed project. Based on this analysis, the maximum projected 24-hour average and neighborhood-scale annual average incremental $PM_{2.5}$ concentrations are presented in **Table 8-10**. $PM_{2.5}$ concentrations without the proposed project are not presented, since impacts are assessed on an incremental basis.

Table 8-10
Maximum Predicted 24-Hour Average $PM_{2.5}$ Increments ($\mu g/m^3$)

Analysis Site	Location	24-hour Average Increment	Annual Average Increment
1	Whitehall St & South St	0.40	0.01
2	Broad St & South St	0.36	0.01

Notes:
$PM_{2.5}$ interim guidance criteria:
- 24-hour average, 2 $\mu g/m^3$ (5 $\mu g/m^3$ not-to-exceed value).
- annual (neighborhood scale), 0.1 $\mu g/m^3$.

The results indicate that the annual and 24-hour average $PM_{2.5}$ increments would be well below the interim guidance criteria. Therefore, there would be no potential for significant adverse impacts on air quality from vehicle trips generated by the proposed project.

HEAT AND HOT WATER SYSTEMS

Estimated maximum projected concentrations were developed for 46 potential heat and hot water systems in re-tenanted buildings on the Island. The detailed analysis parameters and results are presented in Appendix B. After applying receptor network refinements based on appropriate receptor heights and location in relation to the source, all systems passed the screening analysis, and would not result in maximum projected concentrations exceeding the standard. Therefore, no significant adverse air quality impact would occur from the operation of heat and hot water systems in the re-tenanted buildings.

FERRIES

Maximum predicted pollutant concentrations from the proposed ferry operations in the Build condition are presented in **Table 8-11.** Maximum predicted criteria pollutant concentrations from the proposed ferries are all below the NAAQS. Maximum predicted $PM_{2.5}$ increments would be below the interim guidance criteria. Therefore, there would be no potential significant adverse air quality impacts from the proposed ferry operations.

2030 ANALYSIS YEAR

As described in the 2011 FGEIS, since the specific future uses for the South Island development have not been proposed, defined, or designed, it is not possible to perform a detailed air quality analysis of potential impacts from the full development of the Proposed Project in 2030. Any new buildings constructed would require heat and hot water systems, which would likely use natural gas as fuel, and would generate trips to the island, including on-road sources in other boroughs and ferry service to the island. While a detailed assessment of these sources is not possible since the specific use and design of these buildings have not been determined, the FGEIS described reasonable measures that could be implemented to avoid the potential for

significant adverse impact. When the South Island development has been planned and designed, it is anticipated that it would be subject to CEQR, and that the associated future environmental review would take into account analyses of potential air quality impacts from the full development of the Proposed Project.

Table 8-11
Maximum Predicted Concentrations from the Ferries (µg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS / Threshold
NO_2	1-hour	(1)	(1)	158 (1)	188
	Annual(2)	4.6	43	47.6	100
PM_{10}	24-hour	0.9	53	53.9	150
$PM_{2.5}$	24-hour	0.81	NR	NR	5/2 (3)
	Annual	0.12	NR	NR	0.3 (4)

Notes:
NR—Not relevant. $PM_{2.5}$ concentrations are assessed on an incremental basis.
(1) The 1-hour NO_2 total concentration represents the maximum of the total 98th percentile 1-hour NO_2 concentrations predicted at any receptor using seasonal-hourly background concentrations. Maximum modeled impact and background are not provided since they vary by season and hour and the model output is combined accordingly.
(2) NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.75 as per EPA guidance.
(3) 24-hour $PM_{2.5}$ interim guidance criterion, > 2 µg/m^3 (5 µg/m^3 not to exceed value), depending on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations.
(4) Annual $PM_{2.5}$ interim guidance criterion, > 0.3 µg/m^3 at any discrete receptor location for localized impacts.

✷