Chapter 4: Air Quality

A. INTRODUCTION

Stationary source impacts include emissions from fuel burned for heating, ventilation, and air conditioning (HVAC) of buildings. A stationary source screening analysis was undertaken as part of the Environmental Assessment Statement (EAS). Based on the screening analysis, it was determined that this project would not have the potential for significant adverse stationary source impacts to Air Quality.

Therefore, this chapter examines the potential for mobile air quality impacts from the proposed actions. Mobile source impacts are those generated by motor vehicles traveling to and from the project site once the project is operational. The peak hour traffic from the proposed actions would exceed the 2010 *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide screening threshold of 170 peak hour vehicle trips at an intersection. In addition, the proposed actions would exceed the particulate matter emission screening thresholds discussed in Chapter 17, Sections 210 and 311 of the 2010 *CEQR Technical Manual*. Therefore, a quantified assessment of on-street mobile source emissions was performed. Further, an analysis was conducted to evaluate pollutant concentrations from nearby existing parking facilities that would provide parking for the proposed project. The predicted increments from the parking facilities were added, where appropriate, to the predicted concentrations from the mobile source analysis, to assess the potential for cumulative impacts.

As discussed below, the maximum predicted pollutant concentrations and concentration increments from mobile sources with the proposed actions would be below the corresponding guidance thresholds and ambient air quality standards. Thus, the proposed action would not result in any significant adverse impacts from mobile source emissions.

B. 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 sources utilizing non-road diesel such as diesel trains, marine engines, and non-road vehicles (e.g., construction 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.

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 actions 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 actions. A cumulative impact analysis was also conducted to evaluate future CO concentrations from the nearby parking facilities and the adjacent roadways.

NITROGEN OXIDES, VOCS, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are advected downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from all sources are therefore generally examined on a regional basis. The contribution of any action or project to regional emissions of these pollutants would include any added stationary or mobile source emissions; the change in regional mobile source emissions of these pollutants would be related to the total vehicle miles traveled added or subtracted on various roadway types throughout the New York metropolitan area, which is designated as a moderate non-attainment area for ozone by the U.S. Environmental Protection Agency (EPA).

The proposed actions 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. An analysis of project-related emissions of these pollutants from mobile sources is 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.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Effective January 1, 1996, the Clean Air Act (CAA) banned the sale of the small amount of leaded fuel that was still available in some parts of the country for use in on-road vehicles, concluding a 25-year effort to phase out lead in gasoline. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the 3-month average national standard of 0.15 micrograms per cubic meter ($\mu g/m^3$).

No significant sources of lead are associated with the proposed actions and, therefore, further analysis is not warranted.

RESPIRABLE PARTICULATE MATTER—PM_{10} AND $PM_{2.5}$

PM is a broad class of air pollutants that includes discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets (aerosols) or solids suspended in the atmosphere. The constituents of PM are both numerous and varied, and they are emitted from a wide variety of sources (both natural and anthropogenic). Natural sources include the condensed and reacted forms of naturally occurring 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 actions.

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 are lower than the current national standards. Due to the federal restrictions on the sulfur content in diesel fuel for on-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO_2 are not significant and therefore, an analysis of SO_2 from mobile sources was not warranted.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: CO, NO_2, ozone, respirable PM (both $PM_{2.5}$ and PM_{10}), SO_2, and lead. The primary standards represent levels that are requisite to protect

the public health, allowing an adequate margin of safety. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. The primary and secondary standards are the same for NO_2 (annual), ozone, lead, and PM, and there is no secondary standard for CO and the 1-hour NO_2 standard. The NAAQS are presented in **Table 4-1**. The NAAQS for CO, annual NO_2, and SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particulate matter (TSP), settleable particles, non-methane hydrocarbons (NMHC), and ozone which correspond to federal standards that have since been revoked or replaced, and for beryllium, fluoride, and hydrogen sulfide (H_2S).

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 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.

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. The current lead NAAQS will remain in place for one year following the effective date of attainment designations for any new or revised NAAQS before being revoked, except in current non-attainment areas, where the existing NAAQS will not be revoked until the affected area submits, and EPA approves, an attainment demonstration for the revised lead NAAQS.

EPA established a new 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 established a new 1-hour average SO_2 standard of 0.075 ppm, replacing the current 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.)

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

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

In 2002, EPA re-designated New York City as in attainment for CO. The CAA requires that a maintenance plan ensure continued compliance with the CO NAAQS for former non-attainment areas. New York City is also 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.

Table 4-1
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	NA	15	NA	15
24-Hour Average [6,7]	NA	35	NA	35
Sulfur Dioxide (SO_2) [8]				
1-Hour Average [9]	0.075	196	NA	NA
Maximum 3-Hour Average [1]	NA	NA	0.50	1,300

Notes:

ppm – parts per million
µg/m^3 – micrograms per cubic meter
NA – not applicable

All annual periods refer to calendar year.

PM concentrations (including lead) are in µg/m^3 since ppm is a measure for gas concentrations. Concentrations of all gaseous pollutants are defined in ppm and 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 this standard further to within the range 0.060-0.070 ppm.

[6] Not to be exceeded by the annual 98th percentile when averaged over 3 years.

[7] EPA has lowered the NAAQS down from 65 µg/m^3, effective December 18, 2006.

[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 98th percentile daily maximum 1-hr average concentration. Effective August 23, 2010.

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

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 CAA due to exceedance of the annual average standard. New York State submitted a final SIP to EPA, dated October 2009, designed to meet the annual average standard by April 5, 2010. Based on recent monitoring data (2006-2009), annual average concentrations of $PM_{2.5}$ in New York City no longer exceed the annual standard. On August 2, 2010, EPA proposed to determine that the New York–Northern New Jersey–Long Island $PM_{2.5}$ nonattainment area has attained the 1997 annual NAAQS.

As described above, EPA has revised the 24-hour average $PM_{2.5}$ standard. In October 2009 EPA finalized the designation of the New York City Metropolitan Area as nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS, effective in November 2009. The nonattainment area includes the same 10-county area EPA designated as nonattainment with the 1997 annual $PM_{2.5}$ NAAQS. By November 2012 New York will be required to submit a SIP demonstrating attainment with the 2006 24-hour standard by November 2014 (EPA may grant attainment date extensions for up to five additional years).

Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA), and the five New York City counties had been designated as a severe non-attainment area for ozone (1-hour average standard). 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. These SIP revisions included additional emission reductions that EPA requested to demonstrate attainment of the standard, and an update of the SIP estimates using the latest versions of the mobile source emissions model, MOBILE6.2, and the nonroad emissions model, NONROAD—which have been updated to reflect current knowledge of engine emissions and the latest mobile and nonroad engine emissions regulations.

On April 15, 2004, EPA designated these same counties as moderate non-attainment for the 8-hour average ozone standard which became effective as of June 15, 2004 (LOCMA was moved to the Poughkeepsie moderate non-attainment area for 8-hour ozone). EPA revoked the 1-hour standard on June 15, 2005; however, the specific control measures for the 1-hour standard included in the SIP are required to stay in place until the 8-hour standard is attained. The discretionary emissions reductions in the SIP would also remain but could be revised or dropped based on modeling. On February 8, 2008, New York State Department of Environmental Conservation (NYSDEC) submitted final revisions to a new SIP for ozone to EPA. NYSDEC has determined that achieving attainment for ozone before 2012 is unlikely, and has therefore made a request for a voluntary reclassification of the New York nonattainment area as “serious”.

In March 2008 EPA strengthened the 8-hour ozone standards. SIPs will be due three years after the final designations are made. On March 12, 2009, NYSDEC recommended that the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester be designated as a non-attainment area for the 2008 ozone NAAQS (the NYMA MSA nonattainment area). EPA has proposed to determine that the Poughkeepsie nonattainment area (Dutchess, Orange, Ulster, and Putnam counties) has attained the 2008 one-hour and eight-hour NAAQS for ozone. It is unclear at this time what the attainment status of these areas will be under the newly proposed standard due to the range of concentrations proposed.

New York City is currently in attainment of the annual-average NO_2 standard. EPA has promulgated a new 1-hour standard, but it is unclear at this time what the City’s attainment

status will be due to the need for additional near road monitoring required for the new standard. The existing monitoring data indicates background concentrations below the standard. It is likely that New York City will be designated as "unclassifiable" at first (January 2012), and then classified once three years of monitoring data are available (2016 or 2017).

EPA has established a new 1-hour SO_2 standard, replacing the 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 2012, based on 2008 to 2010 monitoring data and refined modeling. SIPs for nonattainment areas will be due by June 2014.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the 2010 *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 4-1**) 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 actions on mobile sources, as set forth in the 2010 *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.

$PM_{2.5}$ INTERIM GUIDANCE CRITERIA

NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts[2]. This policy would apply 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

[1] *CEQR Technical Manual*, Chapter 17, section 400, May 2010; and State Environmental Quality Review Regulations, 6 NYCRR § 617.7

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

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, the 2010 *CEQR Technical Manual* applies interim guidance criteria for evaluating potential $PM_{2.5}$ impacts for projects subject to CEQR. The interim guidance criteria for determination of potential 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 CEQR or NYSDEC interim guidance criteria above will be considered to have a potential significant adverse impact. Actions subject to CEQR that fail the interim guidance criteria should prepare an EIS and examine potential measures to reduce or eliminate such potential significant adverse impacts.

The above interim guidance criteria have been used to evaluate the significance of predicted impacts of the proposed actions on $PM_{2.5}$ concentrations and determine the need to minimize particulate matter emissions from the proposed actions.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS (MOBILE SOURCE ANALYSIS)

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 actions 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 actions.

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 New York City Environmental Protection (NYCDEP).

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.

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.[2]

An ambient temperature of 43.0° Fahrenheit was used. The use of this temperature is recommended in the 2010 *CEQR Technical Manual* and is consistent with current NYCDEP 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 CEQR $PM_{2.5}$ interim guidance criteria methodology, 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 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.[3]

---

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

[2] 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).

[3] 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, December 2003.

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 actions (see Chapter 3, "Transportation"). Traffic data for the future without the proposed actions and with the proposed actions were employed in the respective air quality modeling scenarios. The Saturday midday arrival, and the Saturday evening arrival 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 midday arrival, and evening arrival 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 actions, and off-peak increments from the proposed actions, 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 adjacent to streets near the project site, resulting from vehicle emissions, were predicted using the CAL3QHC model Version 2.0.[1] 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, is employed if maximum predicted future CO concentrations are greater than the applicable ambient air quality standards or when *de minimis* thresholds are exceeded using the first level of CAL3QHC modeling.

To determine motor vehicle generated PM concentrations adjacent to streets near the proposed actions area, the CAL3QHCR model was applied. This refined version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating 24-hour and annual average concentrations.

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).

---

[1] 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.

TIER I ANALYSES—CAL3QHC

CO calculations were performed using the CAL3QHC model. 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 0.70 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness of 3.21 meters was chosen. At each receptor location, concentrations were calculated for all wind directions, and the highest predicted concentration was reported, regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

TIER II 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 consist of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York for the period 2005-2009. All hours were modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

The microscale analyses were performed for existing conditions and 2014, the year by which the proposed actions are likely to be completed. The future analysis was performed both without the proposed actions and with the proposed actions.

ANALYSIS SITES

A total of two intersections were selected for microscale analysis (see **Table 4-2**). These sites were selected because they are the locations in the study area where the largest levels of project-generated traffic are expected, and, therefore, where the greatest air quality impacts and maximum changes in concentrations would be expected. Each of these intersections was analyzed for CO. The intersection of Bedford Avenue and Tilden Avenue was also analyzed for PM because it has the highest overall build increment, and would therefore result in the maximum changes in PM concentrations.

Table 4-2
Mobile Source Analysis Sites

Analysis Site	Location
1	Bedford Avenue and Tilden Avenue
2	Flatbush Avenue and Tilden Avenue

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

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 NYCDEP procedure for neighborhood-scale corridor $PM_{2.5}$ modeling.

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 must be added to modeling results to obtain total pollutant concentrations at an analysis site. The highest background concentrations monitored at the nearest NYSDEC background monitoring station in the most recent 3-year period were used. It was conservatively assumed that the maximum background concentrations occur on all days.

The eight-hour average CO background concentration used in this analysis was 2.0 ppm for the 2014 prediction, which is based on the second-highest eight-hour measurements over the most recent five-year period for which complete monitoring data is available (2004–2008), utilizing measurements obtained at the NYSDEC P.S. 59 monitoring station located on East 57th Street in Manhattan. The one-hour CO background employed in the analysis was 2.6 ppm.

The PM_{10} 24-hour background concentration of 60 $\mu g/m^3$ was based on the second-highest concentration, measured over the most recent three-year period for which complete data are available (2006–2008). The nearest NYSDEC monitoring site, at P.S. 59, was used. $PM_{2.5}$ background concentrations are not presented, since impacts are assessed on an incremental basis.

EXISTING PARKING FACILITIES

The proposed actions would not create any new parking facilities. The existing parking supply within the surrounding area, including the Sears parking lot directly east of the project site and the Stop and Shop rooftop lot directly north of the project site, would be relied upon to accommodate the project-generated parking demand. An analysis was conducted to evaluate CO concentrations from these two parking facilities. The predicted increments from the parking facilities were added, where appropriate, to the predicted concentrations from the mobile source analysis, to assess the potential cumulative impacts.

As described in Chapter 17, Sections 321.2 of the 2010 *CEQR Technical Manual*, $PM_{2.5}$ and PM_{10} are the primary pollutants of concern if the parking lots are used by large numbers of diesel trucks or buses. Both lots are private lots designated for patrons of adjacent retailers. The number of diesel trucks that use these parking lots is limited. In addition, the proposed actions would not generate any diesel truck or bus increments. Therefore, the predicted PM increments from these parking facilities would be negligible and a cumulative PM impact from the parking facilities and the adjacent roadways is not warranted.

Emissions from vehicles entering, parking, and exiting the parking lots were estimated using the EPA MOBILE6.2 mobile source emission model and an ambient temperature of 43°F, as referenced in the 2010 *CEQR Technical Manual.* All arriving and departing vehicles were conservatively assumed to

travel at an average speed of 5 miles per hour within the parking facilities. In addition, all departing vehicles were assumed to idle for 1 minute before exiting. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 1- and 8-hour average periods.

The CO concentrations were determined for the Saturday midday arrival, and the Saturday evening arrival peak periods. These time periods produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant mobile source impacts and cumulative impacts from the parking facilities and the adjacent roadways. Traffic data for existing parking utilization were obtained from field observations. Project-generated parking demand was developed as part of the traffic analysis for the proposed actions (see Chapter 3, "Transportation").

A "near" and "far" receptor was placed adjacent to Tilden Avenue directly opposite each parking lot. A persistence factor of 0.70, supplied by DEP, 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. Background and on-street CO concentrations were added to the modeling results to obtain the cumulative totals.

E. EXISTING CONDITIONS

The background concentrations (presented above) represent general air quality in the study area. However, the concentrations adjacent to the mobile-source analysis sites in the existing condition may be higher than at the monitoring stations, due to the adjacent vehicular emissions. Existing concentrations were calculated using the CAL3QHC dispersion model. The highest simulated existing eight-hour average CO concentrations at the mobile-source analysis sites are presented in **Table 4-3**. (One-hour average values are not shown since predicted values are much lower than the one-hour standard of 35 ppm.)

Table 4-3
Maximum Predicted Existing Eight-Hour Average CO Concentrations for 2010

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Bedford Avenue and Tilden Avenue	SAT PM	2.5
2	Flatbush Avenue and Tilden Avenue	SAT PM	3.0
Note: 8-hour standard is 9 ppm.			

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

CO

CO concentrations without the proposed actions were determined for the 2014 analysis year using the methodology previously described. **Table 4-4** shows future maximum predicted eight-hour average CO concentrations at the analysis intersections without the proposed actions (i.e., No Action values). The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed.

Table 4-4
Maximum Predicted Future (2014) Eight-Hour Average
CO No Action Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Bedford Avenue and Tilden Avenue	SAT PM	2.4
2	Flatbush Avenue and Tilden Avenue	SAT PM	2.9
Note: 8-hour standard is 9 ppm.			

PM

PM concentrations in the No Action condition were determined for the Build year using the methodology previously described. **Table 4-5** presents the future maximum predicted 24-hour and annual average PM_{10} concentrations at the analysis intersections in the No Action condition (i.e., No Action values). The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed. Note that $PM_{2.5}$ concentrations in the No Action condition are not presented, since impacts are assessed on an incremental basis.

Table 4-5
Maximum Predicted Future (2014) 24-Hour Average
PM_{10} No Action Concentrations

Receptor Site	Location	Concentration (µg/m^3)
1	Bedford Avenue and Tilden Avenue	74.9
Note: NAAQS—24-hour, 150 µg/m^3.		

G. THE FUTURE WITH THE PROPOSED ACTIONS

CO

CO concentrations with the proposed actions were determined for future 2014 conditions at traffic intersections using the methodology previously described. **Table 4-6** shows the future maximum predicted eight-hour average CO concentration with the proposed actions at the two intersections studied. (No one-hour values are shown, since no exceedances of the NAAQS would occur and the *de minimis* criteria are only applicable to eight-hour concentrations; therefore, the eight-hour values are the most critical for impact assessment.) The values shown are the highest predicted concentration for any of the time periods analyzed. The results indicate that the proposed actions would not result in any violations of the eight-hour CO standard. In addition, the incremental increases in eight-hour average CO concentrations are very small, and consequently would not result in a violation of the CEQR *de minimis* CO criteria. Consequently, the proposed actions would not result in any significantly CO air quality impacts in the Build condition.

Table 4-6
Maximum Predicted Future (2014) Eight-Hour Average
No Action and Future with the Proposed Actions CO Concentrations

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)	
			No Action	Future with the Proposed Actions
1	Bedford Avenue and Tilden Avenue	SAT PM	2.4	2.6
2	Flatbush Avenue and Tilden Avenue	SAT PM	2.9	3.3
Note: 8-hour standard is 9 ppm.				

PM

PM concentrations with the proposed actions were determined for future 2014 conditions using the methodology previously described. **Table 4-7** shows the future maximum predicted 24-hour average PM_{10} concentrations with the proposed actions. The values shown are the highest predicted concentrations for all locations analyzed and include the ambient background concentrations. The results indicate that the proposed actions would not result in any violations of the PM_{10} standard or any significant adverse impacts on air quality.

Table 4-7
Maximum Predicted Future (2014) 24-Hour Average
No Action and Future with the Proposed Actions PM_{10} Concentrations

Receptor Site	Location	24-Hour Concentration (µg/m^3)	
		No Action	Future with the Proposed Actions
1	Bedford Avenue and Tilden Avenue	74.9	79.7
Note:	National Ambient Air Quality Standards—24-hour, 150 µg/m^3.		

Future maximum predicted 24-hour and annual average $PM_{2.5}$ concentration increments were calculated so that they could be compared to the interim guidance criteria that would determine the potential significance of any impacts from the proposed actions. Based on this analysis, the maximum predicted localized 24-hour average and neighborhood-scale annual average incremental $PM_{2.5}$ concentrations are presented in **Table 4-8**. The results show that the annual and daily (24-hour) $PM_{2.5}$ increments are predicted to be well below the interim guidance criteria and, therefore, the proposed actions would not result in significant $PM_{2.5}$ impacts at the analyzed receptor locations.

Table 4-8
Maximum Predicted Future (2014)
24-Hour and Annual Average $PM_{2.5}$ Increments

Receptor Site	Location	24-Hour Average $PM_{2.5}$ Increment (µg/m^3)	Annual Average $PM_{2.5}$ Increment (µg/m^3)
1	Bedford Avenue and Tilden Avenue	0.3	0.04
Note: $PM_{2.5}$ interim guidance criteria—24-hour average, 2 µg/m^3 (5 µg/m^3 not-to-exceed value). $PM_{2.5}$ interim guidance criteria—annual (neighborhood scale) 0.1 µg/m^3.			

ANALYSIS OF EXISTING PARKING FACILITIES

As presented in Table 4-6, based on an analysis of intersections within the study area, the future maximum predicted 8-hour average CO concentration from mobile sources with the proposed actions would be 3.3 ppm. This value includes a maximum predicted concentration of 1.3 ppm from mobile sources and a background level of 2.0 ppm, and would occur at receptors placed along the sidewalk on Tilden Avenue, near Flatbush Avenue.

Based on the methodology previously described, the maximum predicted 8-hour average CO concentrations from the existing parking facilities were analyzed using several receptor points; a near side receptor on the same side of the street as the parking facility on Tilden Avenue and a far side receptor on the opposite side of the street on Tilden Avenue from the parking facility. The maximum predicted 8-hour average CO concentration of all the sensitive receptors described above would be 0.5 ppm. This value includes a predicted concentration of 0.4 ppm

from the Stop and Shop rooftop lot and a predicted concentration of 0.1 ppm from the Sears parking lot.

The cumulative concentration of CO from the parking facilities and on-street mobile sources is estimated to be 3.8 ppm. This concentration is substantially below the applicable 8-hour standard of 9 ppm. Therefore, no significant adverse air quality impact would occur due to the combined effects of nearby parking facilities and on-street mobile sources. ✷