CHAPTER 14. AIR QUALITY

14.1 INTRODUCTION

14.1.1 CONTEXT

The analysis of potential impacts of the Proposed Action on air quality is described in this chapter. The attacks on the World Trade Center (WTC) on September 11, 2001, and the consequent collapse of the Twin Towers and the ensuing fires, created a large plume of particulate matter, smoke, and combustion byproducts which blanketed Downtown Manhattan and was carried downwind to other areas of the city. Over a period of weeks, as the fires were extinguished and as the air cleared, outdoor air quality improved, with levels of all monitored pollutants in nearby neighborhoods returning to normal by February 2002. The destruction of buildings and transportation infrastructure resulted in some significant reductions in traffic volumes and changes in traffic patterns in Downtown Manhattan, as described in Chapter 13A, "Traffic and Parking." The World Trade Center Memorial and Redevelopment Plan (Proposed Action), once completed, would revitalize the area, generating new and restored activity; the ensuing traffic volumes would be somewhat different than those that would have been present had September 11 not occurred. The Proposed Action would introduce new local streets and would also include extensive below-grade transportation infrastructure to accommodate vehicle and bus parking, and truck delivery docks. All of these elements are potential sources of air pollution that are analyzed in this chapter.

Additional information regarding the emissions and dispersion modeling procedures, methodology, and detailed results are included in Appendix G. Analysis of the predicted impacts of construction of the Proposed Action on air quality is presented in Chapter 21, "Construction."

14.1.2 CONCLUSIONS

The predicted impact of the Proposed Action on air quality during the operational phase, summarized below, was analyzed based on both the Current Conditions Scenario and the Pre-September 11 Scenario. Operation of the Proposed Action is not predicted to cause any significant adverse air quality impacts in either 2009 or 2015, or to cause any exceedance of National Ambient Air Quality Standard (NAAQS) in either of those years.

PRE-SEPTEMBER 11 SCENARIO

No significant adverse impacts were predicted during the operational phase of the Proposed Action. Four locations were analyzed for potential air quality impacts (Liberty Street, Albany Street and Vesey Street at Route 9A; and the proposed bus loading area at Greenwich Street from Vesey to Liberty Streets). Using a conservative screening approach, maximum predicted changes in future 8-hour average carbon monoxide (CO) concentrations from the Proposed Action ranged from a slight decrease to 0.6 parts per million (ppm), with the highest predicted total concentration, including background, of 5.7 ppm. Predicted changes in concentrations of fine respirable particulate matter ($PM_{2.5}$) smaller than 2.5 micrometers (µm) ranged from *no change* to an increase of *0.2* micrograms per cubic meter (µg/m^3) on a 24-hour average basis and *0.05* µg/m^3 on an annual average neighborhood scale. Predicted change in concentrations of respirable particulate matter (PM_{10}) smaller than 10 µm ranged from a slight decrease to a maximum of *9.3 µg*/m^3 *on a 24-hour average basis*, and *from 0.1 µg/m^3 to 3.9 µg/m^3 on* an annual average basis.

The modeling for this scenario was conducted assuming at-grade construction of Route 9A; it is expected that the *increments* with the short bypass alternative for Route 9A reconstruction would be higher but would not be significant and, as with the at-grade alternative, would not result in exceedances of the NAAQS.

CURRENT CONDITIONS SCENARIO

Under this scenario, maximum predicted future 8-hour average CO increments ranged from *0.1 ppm* to *2.0* ppm, with the highest predicted total concentration of *6.8* ppm; these values were predicted using the same conservative screening approach. Predicted changes in $PM_{2.5}$ concentrations ranged from *0.1 µg/m^3* to *0.9* µg/m^3 on a 24-hour average, and *on an annual average 0.01* µg/m^3 to *0.06* µg/m^3. Predicted change in maximum 24-hour average concentrations of PM_{10} ranged from *0.3 µg/m^3* to *10.2* µg/m^3 and on an annual average from *0.17 µg/m^3 to 4.0* µg/m^3.

14.2 AIR QUALITY IN THE CONTEXT OF SEPTEMBER 11

In response to comments raised by the public on the Draft Scope for the GEIS, this section includes a summary, from other sources, of the impact of September 11 on air quality in Lower Manhattan. This is not intended as a comprehensive analysis, but is focused on issues pertinent to understanding what occurred, and that may be relevant to the study of the Proposed Action. Data and information presented here are based on: analysis by AKRF of New York State Department of Environmental Conservation's (NYSDEC) monitored data; the U.S. Environmental Protection Agency (EPA) *draft* study of WTC exposure[1], oral comments on th*at* EPA report *made* by the external *technical* peer review committee *and by the public* on July 14-15, 2003 *and the summary report of that meeting*[2]; the Evaluation Report by the Office of Inspector General of the EPA (OIG) on the EPA response[3]; the Natural Resources Defense Council's (NRDC) assessment[4]; and the results of a health survey in Lower Manhattan from December, 2001, performed by New York City Department of Health (NYCDOH) in

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[1] *EPA, External Review Draft—Exposure and Human Health Evaluation of Airborne Pollution from the World Trade Center Disaster, NCEA, October 2002.*

[2] *EPA, Summary Report of the U.S.EPA Technical Peer Review Meeting on the Draft Document Entitled: Exposure and Human Health Evaluation of Airborne Pollution from the World Trade Center Disaster, NCEA, Washington, DC; EPA/600/R-03/142; NTIS, Springfield, VA, and www.epa.gov/ncea December, 2003 (publicly available as of March, 2004)*

[3] *EPA, EPA's Response to the World Trade Center Collapse: Challenges, Successes, and Areas for Improvement, Report No. 2003-P-00012, Office of Inspector General, August 21, 2003.*

[4] *NRDC, The Environmental Impacts of World Trade Center Attacks—A Preliminary Assessment, February 2002.*

collaboration with the Centers for Disease Control and Prevention (CDC)[1], as well as anecdotal information, questions and concerns raised by members of the general public in various forums and media.

14.2.1 POLLUTANTS RELEASED ON SEPTEMBER 11

The destruction of the Twin Towers and the environmental aftermath in a heavily populated urban setting were unprecedented. A complex mixture of smoke and dust blanketed Lower Manhattan, penetrated many surrounding buildings, and was carried downwind.

The massive plume of pulverized material consisted mainly of cement, glass fibers, and cellulose, but also included high concentrations of silica, calcium, sulfate, metals such as lead and zinc, and numerous other compounds. The dust also included significant amounts of polycyclic aromatic hydrocarbons (PAHs), products of incomplete combustion, which had adsorbed to particles. Roughly 1.5 percent of the material was respirable, that is PM_{10}, including approximately 0.5 percent in the $PM_{2.5}$ size range. Some of the concerns regarding the WTC dust are unique to the events of September 11 and are not addressed by standards such as the National Ambient Air Quality Standards (NAAQS). For example, the alkalinity of WTC dust is a possible health concern for exposed individuals, not only because of the basic nature of some constituent particles but also because of other unusual features, such as slender microscopic glass fibers with toxic materials attached to them or very fine particles composed of unusual combinations of silica coalesced with lead or other toxic materials. The particulate matter standards, normally used for comparison with concentrations of particulate matter in outdoor air, were not based on particulate matter including such combinations of contaminants, since they are not normally found in ambient air.

The initial explosion and the below-grade fires that continued to burn long after September 11 released smoke containing combustion and partial combustion products, including, among others, PCBs, acetone, benzene, 1,3-butadiene, chloromethane, ethylbenzene, and toluene.

14.2.2 MONITORED CONCENTRATIONS

Comparison of measured concentrations to benchmarks in this section refers to screening levels below which it has been determined that no significant health impact is expected; these include both existing benchmarks where available, and benchmarks that were developed specifically for comparison with the monitoring that followed September 11.

Monitoring of pollutant concentrations in the near vicinity of the WTC and on-site began on September 14 and 23, depending on the pollutant. *Prior to that time, the only monitored data available is from stations farther from the site; very little is known with certainty about exposures in the immediate area in the first few days after September 11. Ongoing research efforts aimed at modeling emissions and dispersion may yield better estimates in the future.* During the weeks that followed September 11, concentrations of monitored air pollutants exceeded screening benchmarks, and elevated levels of contaminants were recorded within and near the WTC Site. Population exposure to these exceedances was reduced by the fact that after the event, most of the affected areas were within restricted access zones, that is, zones where

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[1] *NYCDOH, A Community Needs Assessment of Lower Manhattan Following the World Trade Center Attack, Community HealthWorks, December 2001.*

access was limited to emergency management and rescue personnel and to other credentialed people.

By mid to late October, particulate matter, chromium, PCBs, and lead concentrations across Lower Manhattan had largely returned to levels typical of New York City and other U.S. urban areas, with only a few WTC or nearby sites occasionally approaching or exceeding the $PM_{2.5}$ Air Quality Index level of concern. In late September, monitored concentrations of airborne lead higher than normal background levels were measured at perimeter sites; however, concentrations did not exceed the NAAQS.

EPA concluded that exposure to particulate matter for several days following September 11 was at levels that exceeded benchmarks. As described above, lower levels may also have been of concern due to the chemical and physical properties of the dust. After late September, once concentrations mostly returned to normal, the concern regarding particulate matter would have been mainly in indoor spaces that had been impacted. Peer review has suggested that with the exception of small exceedances in the first few days, measured levels of metals such as lead, chromium, and nickel were not of concern.

In the draft report, EPA concluded that exposure to PCB was of minimal concern for cancer risk. Although the draft concluded that non-cancer risk from PCB exposure was not of concern, peer review has suggested that the results for the assessment could change as there might be exceedances if the occupational benchmarks used were adjusted for application to general population exposure.

Although extremely elevated dioxin concentrations were measured in some instances to a distance of a few blocks around WTC, returning to normal by December, the dioxin exposure due to September 11 was not expected to significantly increase the lifetime total exposure of individuals, and was not expected to increase the risk of related health problems.

The large majority of outdoor air measurements of asbestos were below established benchmarks and within the range of typical background levels. Few exceedances of asbestos occurred near September 11 in time and in close proximity to the WTC. There is some evidence of incursion of asbestos into indoor environments. A few very high levels of asbestos were found in settled dust indoors and in the WTC material. *Peer review has suggested that some technical adjustments should be made to the EPA asbestos assessment that would likely result in slightly more conservative health risk estimates.*

Of the 11 volatile organic compounds (VOCs) evaluated, short term exceedances of screening benchmarks were seen for acetone, benzene, 1,3-butadiene, chloromethane, ethylbenzene, and toluene. Except for benzene, exceedances for these chemicals occurred in restricted zones where public access was prohibited. The benzene exceedances were more frequent and were measured farther from the WTC Site. Very high concentrations of benzene may have been sustained for a month or more after September 11. *Overall, peer reviewers agreed that VOC concentrations in outdoor air posed minimal impacts to the general population, but stated that the monitored data was mostly limited to locations near smoldering fires not representing the average concentrations, and could therefore represent at best an upper bound estimate for population exposure.*

In general, based on monitoring data, outdoor levels of all air pollutants decreased to background concentrations characteristic of pre-September 11 in the New York metropolitan area by January to February 2002. During the days following September 11 before air quality monitoring began

(September 14 and 23 depending on the pollutant), it is reasonable to conclude that concentrations were significantly higher.

14.2.3 HUMAN EXPOSURE AND HEALTH IMPACTS

The penetration of substantial quantities of the dust into indoor office or residential spaces likely increased the potential for indoor exposures to higher levels of constituent elements and compounds via ingestion or inhalation of re-entrained particles. EPA concluded that people exposed to the extremely high levels of ambient particulate matter and its components during the collapse of the Twin Towers and for several hours afterward were at risk of immediate acute and possibly chronic symptoms. Following that period and for several days thereafter—a period for which limited data are available—exposure and health impacts could not be evaluated with certainty.

EPA has concluded, in its October 2002 draft study, that except for the first few days, people in the surrounding community were unlikely to suffer short or long term adverse health effects caused by exposure to elevations in outdoor air concentrations of the contaminants evaluated. However, people who remained in restricted zones and rescue workers who were not using adequate respiratory protection were likely to be exposed to benchmark exceedances and associated health risks. Additionally, people who spent extensive periods in indoor spaces that were not properly cleaned may have been exposed to re-entrained particulate contaminants.

Various indoor cleanup operations were undertaken, including instructions for residents to clean their own apartments, and various testing and cleaning programs. The impact of indoor air quality on the health of returning residents remains uncertain. Some questions have been raised by members of the public and by members of the peer review committee regarding the current state of indoor contamination. Although the current cleanup program has been completed, EPA has recently committed to take further samples to resolve the issue of indoor cleanup in order to reduce future exposure.

A wide range of complaints related to air quality in the aftermath of September 11 were reported. The NYCDOH survey of residents in a few neighborhoods in Lower Manhattan, conducted in the end of October, 2001, concluded that 50 percent of those surveyed were experiencing health symptoms such as shortness of breath, and nose, throat and eye irritation. The survey included only residents who had reoccupied their residences at that time. One private organization—NRDC, has estimated by extrapolating from the NYCDOH survey that as of December, 2001, as many as 6,000 residents in the three neighborhoods surveyed, and up to 4,000 additional people who had been there during the event or participated in rescue and clean-up operations, were experiencing short-term respiratory health symptoms. Preliminary results from an ongoing research project at the NYU School of Medicine, as one of many related projects coordinated by the National Institute of Environmental Health Sciences (NIEHS), previously healthy persons living near the WTC Site had a greater increase in prevalence of respiratory symptoms after September 11 than persons living at a distance from the site. Some medical experts have expressed concern that people who had extensive exposure may experience permanent respiratory symptoms. There is an ongoing effort by New York City Department of Health and Mental Hygiene (DOHMH) to prepare a comprehensive health registry of those most directly exposed to the events of September 11, which will follow up with participants in the future as well. It is hoped that this and other efforts will give a clearer picture of the health impacts of September 11, but some impacts and exposure levels may never be entirely known.

14.2.4 RELEVANCE TO THE FUTURE

LMDC COMMITMENTS

With the above uncertainty in mind, and in order to minimize impacts from the massive simultaneous reconstruction efforts in Lower Manhattan, LMDC, in coordination with all agencies involved in the reconstruction, has taken upon itself a higher standard for environmental performance in an effort to reduce to the extent practical environmental impacts during both the construction and the operational phases of the Proposed Action, with special attention given to air quality. The policy for significantly reducing diesel emissions during construction, for instance, will result in a large fleet of clean-technology construction equipment in service long after the project is constructed; the associated long term benefit to air pollution will be on both local and regional scales.

AMBIENT AIR QUALITY

The primary NAAQS, defining acceptable levels of criteria pollutants in outdoor air, were designed to protect public health, including the health of "sensitive" populations, such as asthmatics, children, and the elderly. These standards, in addition to other relevant benchmarks described in section 14.3.2, are used in this study for the assessment of predicted impacts related to the Proposed Action.

Regarding pollutants that are discussed in this study, particulate matter monitoring around the WTC Site began on September 26, 2001. Nearly all particulate matter associated with the September 11 dust cloud was larger than 30 micrometers in diameter. $PM_{2.5}$ measurements from newly established ground-based sampling sites around the WTC perimeter varied widely, depending on wind direction. During some days in late September and early October, 24-hr average $PM_{2.5}$ concentrations exceeded 200 $\mu g/m^3$ at locations along the WTC perimeter. However, $PM_{2.5}$ concentrations decreased rapidly with distance from the WTC, with few elevated $PM_{2.5}$ values (exceeding 40 μ/m^3) at monitoring locations ranging from three to ten blocks away from the WTC. During the entire period following September 11, $PM_{2.5}$ values recorded at Lower Manhattan monitoring sites away from the WTC perimeter were not markedly different than during periods before or since. Although $PM_{2.5}$ high values were monitored at some sites, no exceedance of the $PM_{2.5}$ or PM_{10} NAAQS were monitored. A summary of the particulate matter data monitored at WTC monitoring sites through July 2003 is presented in Table 14-1.

The particulate matter concentrations monitored at the source-oriented stations, starting in 2002 (Table 14-1), are comparable to normal concentrations in Manhattan, as presented in Table 14-3 in section 14.3.3 below. The PM_{10} concentrations are somewhat higher in 2002, possibly due to recovery and cleanup operations. The highest $PM_{2.5}$ concentrations in Lower Manhattan at these monitors in 2002 were actually slightly lower than the highest concentrations monitored elsewhere in Manhattan.

SOURCES OF AIR POLLUTANTS FROM THE PROPOSED ACTION

It should be noted that the Proposed Action would not introduce sources of most of the non-criteria pollutants or high-alkalinity PM or glass fibers that affected Lower Manhattan following September 11. Any excavation and tunneling planned would not include hazardous material from September 11, which has largely been removed from the WTC Site during recovery and cleanup operations. Any remaining contaminants would be managed or isolated to protect public

Table 14-1
Particulate Matter Concentrations Monitored at WTC Specific Monitors, 2001-2003

	Albany Street	Battery Park	Chambers Street	Pace Plaza	Wall Street
PM_{10}					
Sept. 24 to Dec. 31, 2001, 24-hour average (range)	11.9 – 79.5	NA	NA	NA	11.0 – 49.1
2002 annual average	26.8	NA	NA	20.5	27.4
July 2002 to July 2003 annual average	19.1	NA	NA	20.4	NA
2002 2nd high 24-hour average	65.4	NA	NA	45.0	54.0
July 2002 to July 2003 2nd high 24-hour average	52.9	NA	NA	73.1	NA
$PM_{2.5}$					
Sept. 24 to Dec. 31, 2001, 24-hour average (range)	5.9 - 37.6	4.8 - 32.9	4.8 - 39.3	5.2 - 42.4	5.6 - 25.1
2002 annual average	15.1	NA	14.7	14.8	15.0
July 2002-July 2003 annual average	16.9	NA	NA	13.2	NA
2002 98th percentile 24-hour average	41.7	NA	32.0	42.3	31.9
July 2002-July 2003 98th percentile 24-hour average	30.4	NA	NA	33.9	NA

Notes: Data that was impacted by the Quebec forest fire in July 2002 were eliminated from this summary.
Source: AKRF analysis of hourly data provided by NYSDEC.

health and the environment, in the manner set forth in Chapter 11, "Hazardous Materials." It is also expected that any remaining contamination on the Southern Site would be removed or addressed in the appropriate manner by the respective owners of the properties, in accordance with applicable law and regulations.

Under the Proposed Action, the most substantive new emission of pollutants other than criteria pollutants would be in the context of diesel emissions from construction equipment and later from buses and trucks. Diesel exhaust includes gaseous components, such as aldehydes benzene, 1,3-butadiene, and PAHs and nitro-PAHs, as well as some toxics adsorbed to the surfaces of particles, such as PAHs and their derivatives—comprising less than 1 percent of the particulate diesel exhaust mass. Environmental performance commitments made by LMDC and the Port Authority for the Proposed Action require reduction and control of diesel emissions, both during construction and operation through emissions reduction technologies and other measures aimed at minimizing diesel exhaust emissions to be set forth in the *Sustainable Design Guidelines* (the current draft of which is attached as Appendix A). For example, the diesel fuel to be used on-site for backup and emergency power would have ultra low sulfur content. Potential impacts from diesel-powered engines are addressed below and analyzed in depth in Chapter 21, "Construction."

14.3 METHODOLOGY

This section includes a discussion of the selection of pollutants for analysis, benchmarks and regulations for assessing future potential impacts and determining their significance, background concentrations, and the methodologies used for the analyses. Three types of analyses are discussed: regional emissions, and local mobile and stationary sources. The regional (mesoscale) analysis includes an examination of the total predicted emissions from all project-related sources. The mobile source and stationary source analyses examine the potential impacts of the Proposed Action on local air quality. Mobile sources include all roadway and intersection emissions; stationary sources include exhaust from stationary fuel combustion sources and exhaust from enclosed vehicle facilities. In cases where multiple sources may affect air quality in the same location, the potential cumulative impact was assessed. The mobile source section includes a discussion of emission rates for each source, the dispersion models selected for analysis, the meteorological data applied to the models and the locations analyzed.

14.3.1 POLLUTANTS FOR ANALYSIS

In the New York metropolitan area, ambient concentrations of CO are predominantly influenced by mobile source emissions. Emissions of particulate matter (PM) and nitrogen oxides (NO_x—nitrogen oxide, NO, together with nitrogen dioxide, NO_2) come from both mobile and stationary sources; emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources. Ozone, one of the region's most problematic air pollutants, is not emitted directly in any significant quantity, but is formed in the atmosphere by a series of complex chemical reactions involving volatile organic compounds (VOCs) and NO_x.

CARBON MONOXIDE

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In urban areas, approximately 80 to 90 percent of CO emissions are from motor vehicles. CO concentrations can 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 Action would result in changes in traffic patterns and an increase in traffic volume in the study area; therefore, an analysis was performed of the impact from traffic increases on CO levels at critical intersections in the study area and near air vents of enclosed vehicular facilities.

NITROGEN OXIDES, VOCS, AND OZONE

Nitrogen oxides are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. While there is a standard for average annual NO_2 concentrations, it is normally examined only for fossil fuel energy sources. 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 diffusing downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from mobile sources are therefore generally examined on a regional basis, together with the emissions of these pollutants from stationary sources. The change in regional mobile source emissions of these pollutants is related to the total number of vehicle trips and vehicle miles of travel throughout the New York metropolitan area, which is designated as a "Severe Non-Attainment area" for ozone by EPA. The Proposed Action would potentially result in changes to the regional vehicular travel patterns in the study areas. Therefore, the change in regional NO_x and VOC emissions was analyzed.

LEAD

Lead emissions in air are principally associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, and all produced after 1980, are designed to use unleaded fuel. As these newer vehicles have replaced the older ones, motor vehicle related lead emissions have decreased. As a result, ambient concentrations of lead have declined significantly. Nationally, the average measured atmospheric lead level in 1985 was only about one-quarter the level in 1975.

In 1985, EPA announced new rules drastically reducing the amount of lead permitted in leaded gasoline. The maximum allowable lead level in leaded gasoline was reduced from the previous limit of 1.1 to 0.5 grams per gallon effective July 1, 1985, and to 0.1 grams per gallon effective January 1, 1986. Monitoring results indicate that this action has been effective in significantly reducing atmospheric lead levels. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the national standard of 1.5 micrograms per cubic meter (3-month average). No significant sources of lead are associated with the Proposed Action, and, therefore, an analysis was not warranted.

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

Particulate matter is a broad class of air pollutants that include discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets or solids suspended in the atmosphere (aerosols). 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 natural organic vapors: 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. 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. Particulate matter also acts as a substrate for the adsorption of other pollutants, often toxic and some likely carcinogenic compounds.

Fine particulate matter, or $PM_{2.5}$, are "fine particles" with an aerodynamic diameter of less than or equal to 2.5 micrometers. This smaller fraction of the particle size range has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorbed 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 particulate matter (often soon after the release from an exhaust pipe or stack) or from precursor gases reacting in the atmosphere to form secondary particulate matter. Diesel-powered vehicles, especially heavy trucks and buses, are a significant source of respirable PM; PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel-powered vehicles. An analysis of $PM_{2.5}$ and PM_{10} (particles with an aerodynamic diameter of less than or equal to 10 micrometers) has been conducted for the Proposed Action.

SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. Due to the federal restrictions on the sulfur content in diesel fuel for on-road vehicles, no significant quantities are emitted from vehicular sources and therefore an analysis was not warranted.

14.3.2 AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the Clean Air Act, primary and secondary NAAQS have been established for six major air pollutants: CO, NO_2, ozone, respirable PM, SO_2, and lead. EPA recently promulgated additional respirable PM standards. In addition to retaining the PM_{10} standards, EPA adopted 24-hour and annual standards for $PM_{2.5}$, which became effective September 16, 1997. The standards for these pollutants are presented in Table 14-2. These standards have also been adopted as the ambient air quality standards for New York State. The primary standards protect public health and represent levels at which there are no known significant effects on human health. 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. For NO_2, ozone, lead and PM, the primary and secondary standards are the same.

STATE IMPLEMENTATION PLAN

The Clean Air Act, as amended in 1990 (CAA) defines Non-Attainment Areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. Manhattan has been designated as Moderate Non-Attainment for PM_{10}, and all counties in New York City as well as Suffolk and Nassau counties have been designated Severe Non-Attainment for ozone.

EPA has recently re-designated New York City as in attainment for CO. The CAA requires that a maintenance plan ensure continued compliance of 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.

On February 13, 2004, New York State formally recommended that EPA designate the five counties of New York City Metropolitan Area as nonattainment for $PM_{2.5}$; EPA has not yet made a determination of attainment.

A State Implementation Plan (SIP) is a state's plan on how it will meet the NAAQS under the deadlines established by the CAA. In November 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone*, which addressed attainment of the NAAQS by 2007, and has recently submitted revisions to the SIP for the attainment of the one-hour ozone NAAQS. These SIP revisions included additional emission reductions that EPA requested to demonstrate attainment of the standard and to update the SIP estimates using a new EPA model to predict mobile source emissions (MOBILE6.2).

DETERMINING THE SIGNIFICANCE 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 (above) 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 these thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted.

Table 14-2
Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	ppm	μg/m³	ppm	μg/m³
Carbon Monoxide (CO)				
Maximum 8-Hour Concentration[1]	9	10,000	None	
Maximum 1-Hour Concentration[1]	35	40,000		
Lead				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months	NA	1.5	None	
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.053	100	0.053	100
Ozone (O_3)				
1-Hour Average[2]	0.12	235	0.12	235
8-Hour Average[3]	0.08	157	0.08	157
Total Suspended Particles (TSP)				
Annual Mean Rural Open Space Rural Residential Urban Residential Urban Industrial	NA	 45 55 65 75	None	
Maximum 24-Hour Concentration	NA	250		
Respirable Particulate Matter (PM_{10})				
Average of 3 Annual Arithmetic Means	NA	50	NA	50
24-Hour Concentration[1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Average of 3 Annual Arithmetic Means	NA	15	NA	15
24-Hour Concentration[4]	NA	65	NA	65
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80	NA	NA
Maximum 24-Hour Concentration[1]	0.14	365	NA	NA
Maximum 3-Hour Concentration[1]	NA	NA	0.50	1,300

Notes: ppm – parts per million
μg/m³ – micrograms per cubic meter
NA – not applicable
Particulate matter concentrations are in μg/m³. Concentrations of all gaseous pollutants are defined in ppm -- approximately equivalent concentrations in μg/m³ are presented.
TSP levels are regulated by a New York State Standard only. All other standards are National Ambient Air Quality Standards (NAAQS).
[1] Not to be exceeded more than once a year.
[2] Applies only to areas designated as Non Attainment.
[3] Three-year average of the annual fourth highest daily maximum 8-hr average concentration.
[4] Not to be exceeded by the 98th percentile averaged over 3 years.

Sources: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards;
6 NYCRR Part 257: Air Quality Standards.

De Minimis Criteria Regarding CO Impacts

New York City has developed criteria to assess the significance of the incremental increase in CO concentrations that would result from proposed projects or actions, as set forth in the *City Environmental Quality Review (CEQR) Technical Manual*. These criteria (known as de minimis 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 concentrations and the 8-hour standard, when No Action concentrations are below 8.0 ppm.

Interim Guidance Criteria Regarding $PM_{2.5}$ Impacts

The above-mentioned 24-hour and annual average NAAQS for $PM_{2.5}$, aimed at protecting public health and welfare, came into effect September 16, 1997. New York State has also adopted these standards.

NYSDEC is currently reviewing and evaluating the $PM_{2.5}$ ambient air quality monitoring data that have been collected within New York City. At this time, EPA has not yet formally determined if the measured $PM_{2.5}$ levels in New York City indicate whether the city (or counties within the city) will be designated as either attainment (i.e., meeting the standards) or non-attainment (i.e., not meeting the standards) with respect to the $PM_{2.5}$ ambient air quality standards.

NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts. This draft policy would apply only to facilities applying for permits or major permit modification under the State Environmental Quality Review Act (SEQRA) that emit 15 tons of PM_{10} or more annually. The interim draft policy states that such a project will be deemed to have a potentially significant adverse impact if the project's maximum predicted impacts are predicted to increase $PM_{2.5}$ concentrations by more than 0.3 $\mu g/m^3$ averaged annually or more than 5 $\mu g/m^3$ on a 24-hour basis. Projects that exceed either the annual or 24-hour threshold will be required to prepare an EIS to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable. *The Proposed Action as a whole was not predicted to have emissions of more than 15 tons per year at any stage, and is not a "source" requiring a permit from NYSDEC. The alternative cogeneration facility, addressed in Chapter 23, "Alternatives," would be subject to permitting.*

NYCDEP is currently recommending interim guidance criteria for evaluating the potential $PM_{2.5}$ impacts from NYCDEP projects subject to City Environmental Quality Review (CEQR). The interim guidance criteria currently employed by NYCDEP[1] for determination of potential significant adverse impacts from $PM_{2.5}$ are as follows:

- Predicted 24-hour (daily) average increase in $PM_{2.5}$ concentrations greater than 5 $\mu g/m^3$ at a discrete location of public access, either at ground or elevated levels (microscale analysis);
- Predicted annual average increase in ground-level $PM_{2.5}$ concentrations greater than 0.1 $\mu g/m^3$ on a neighborhood scale (i.e., the annual increase in concentration representing

[1] NYCDEP, Croton Water Filtration Plant EIS, January 2004.

the average over an area of approximately 1 square kilometer, centered on the location where the maximum impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating background monitoring stations);

Actions under CEQR that would increase $PM_{2.5}$ concentrations more than the interim guidance criteria above will be considered to have potential significant adverse impacts. NYCDEP recommends that its actions subject to CEQR that fail the interim guidance criteria prepare an Environmental Impact Statement and examine potential measures to reduce or eliminate such potential significant adverse impacts.

In order to put these levels in context, the average bias (difference) between 24-hour average $PM_{2.5}$ concentrations measured at collocated monitors (two identical monitors at the same location) in four monitoring stations in New York City from January to December 2000 ranged from 0.41 to 0.83 $\mu g/m^3$. Monitored changes in concentration that would be lower than these levels could not conclusively indicate any change in concentration.

The above NYCDEP draft interim guidance criteria has been used for the purpose of evaluating the significance of predicted impacts of the Proposed Action on $PM_{2.5}$ concentrations from mobile sources.

CONFORMITY WITH STATE IMPLEMENTATION PLANS

The conformity requirements of the Clean Air Act and regulations promulgated thereunder (conformity requirements) limit the ability of federal agencies to assist, fund, permit, and approve projects that do not conform to the applicable SIP. When subject to this regulation, the federal agency is responsible for demonstrating conformity for its proposed action. At a federal level, conformity determinations must be made according to the requirements of 40 CFR Parts 51 and 93 (federal general conformity regulations).

The general conformity requirements in 40 CFR Part 93, Subpart B, apply to those federal actions in non-attainment or maintenance areas where the action's direct and indirect emissions have the potential to emit one or more of the six criteria pollutants at rates equal to or exceeding the prescribed rates or representing 10 percent or more of a non-attainment or maintenance area's total emissions inventory for that pollutant. In the case of New York City, the prescribed annual rates are 25 tons of VOCs or NO_x (severe ozone non-attainment area), *100 tons of CO (maintenance area)*, and in Manhattan only, 100 tons of PM_{10} (moderate PM_{10} non-attainment area).

The general conformity requirements do not apply to federal actions that:

- Do not satisfy either one of the above conditions;
- Occur in an attainment area;
- Are related to transportation plans, programs, and projects developed, funded, or approved under the Federal Transit Act (49 U.S.C. 1601); or
- Qualify for exemptions established at § 51.853.

The regulation assumes that a proposed federal action whose criteria pollutant emissions have already been included in the local SIP's attainment or maintenance demonstrations conforms to the SIP.

In parallel with this GEIS, LMDC *is conducting* a general conformity analysis pursuant to 40 CFR Part 93, Subpart B. *LMDC has consulted with the Interagency Consultation Group (ICG) on this analysis. Pursuant to ICG's recommendation, the general conformity analysis will include* the direct and indirect emissions from construction associated with the Proposed Action over the years *2004* through 2015.

The transportation conformity requirements for the New York Metropolitan area have been temporarily waived until September 30, 2005, pursuant to Public Law 107-230; Stat. 1469, enacted October 1, 2002. This waiver followed the World Trade Center disaster on September 11, 2001, due to the ensuing loss of New York Metropolitan Transportation Council's (NYMTC) files containing regional transportation and air quality data, the damage incurred to the downtown mass transit system, and the disruption of the regional transportation landscape resulting in new traffic patterns. Pursuant to the request of ICG, LMDC will coordinate with NYMTC in order to permit them to include the Proposed Action in the regional transportation Best Practices Model and in the regional Transportation Improvement Program (TIP).

14.3.3 BACKGROUND CONDITIONS

The local modeling analyses directly account for only those pollutants emitted by sources that are included in the models. For mobile source analysis, vehicular-generated emissions on the streets within 1,000 feet and which are within the line of sight of receptor locations are included. In modeling stationary sources, such as generators, cogeneration, or exhaust vents, those individual sources are modeled explicitly; other background sources that are in the immediate vicinity are included where applicable. The calculated difference between the Build condition and the No Action condition is the predicted increment. Background concentrations must be added to the concentrations predicted from all of these sources (which are modeled explicitly) to obtain the total predicted ambient concentrations at any given location. (In the case of $PM_{2.5}$, official annual background levels, representing the average of three years, is not available; annual $PM_{2.5}$ is evaluated by comparing the predicted increment to the interim guidance threshold levels, although highest recorded background levels as shown on NYSDEC monitors is also provided in the analysis below.)

Worst-case background concentrations are represented by the highest concentrations monitored during past years at the nearest NYSDEC background monitoring stations. Stations used for background would generally be stations that are designed to monitor general population exposure and are located so as not to monitor specific local sources (i.e., stations that are not source-oriented, such as mobile source stations) but rather the impact of distant background sources. The concentrations monitored at such stations do nonetheless include a component of impacts from local sources, such as traffic, and therefore this approach results in a conservatively high estimate of total predicted concentrations.

The case of Lower Manhattan is somewhat unique in this respect, because prior to September 11, 2001, there were not many monitoring stations in the immediate vicinity. In response to the events of September 11 and the ensuing impact on air quality, New York State and federal agencies initiated numerous air monitoring activities to better understand the ongoing impact of the disaster on air quality. The impacts of September 11 are described in detail in section 14.2 above.

The data presented here relate the conditions prior to September 11, as well as data monitored long after September 11 which were not influenced by the events themselves, and represent existing conditions at a time when general activity in Lower Manhattan is still reduced, but possibly include components of ongoing reconstruction activity. Conditions during both of these periods can be used as background concentrations for current and future conditions, as described above, to obtain the complete picture in respect to predicted outdoor air quality and the impact of the Proposed Action on air quality in general. This procedure results in conservatively high concentrations, because background concentrations of pollutants are decreasing over the years.

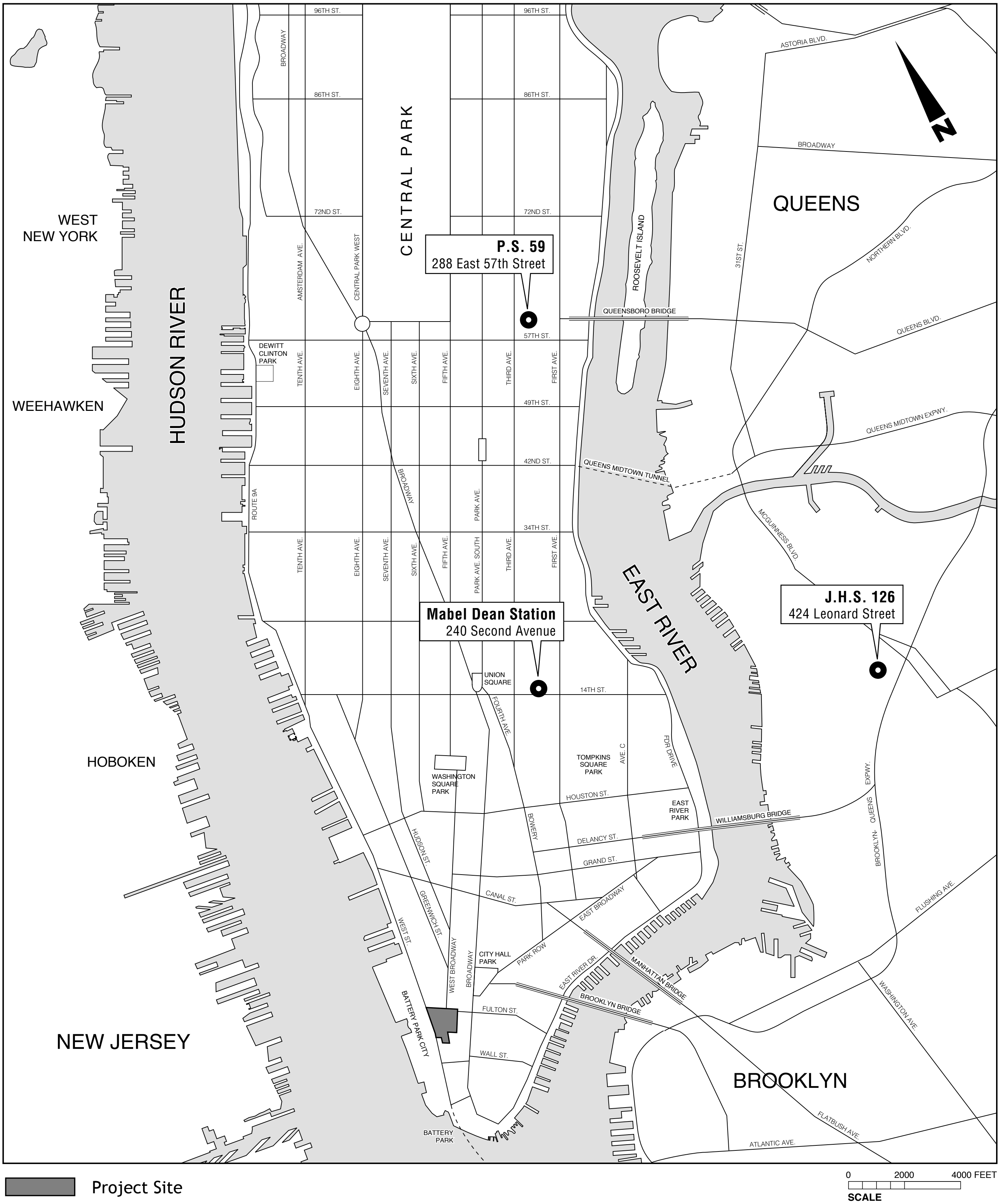
Monitored concentrations from 2000 through 2002 at the nearest stations (shown in Figure 14-1) are presented in Table 14-3. Although monitored $PM_{2.5}$ values are presented, they are used only as a conservatively high estimate of background due to the fact that NYSDEC has not yet officially determined the procedure for determining $PM_{2.5}$ backgrounds. The maximum concentrations presented for each pollutant and averaging period are the levels that were used as background in this study.

Table 14-3
Monitored Concentrations from the Nearest Air Quality Stations

Pollutant	Station	Period	Units	2000	2001	2002	*Max*
CO	PS 59, 288 E. 57th Street, Manhattan	1-hour	ppm	4.1	3.7	3.2	**4.1**
		8-hour	ppm	2.8	2.3	2.2	**2.8**
NO_2	Mabel Dean Station, 240 2nd Ave.	Annual	ppm	0.036	0.038	NA	
	PS 59, 288 E. 57th Street, Manhattan	Annual	ppm	0.038	0.038	0.038	**0.038**
SO_2	Mabel Dean station, 240 2nd Ave.	3-hour	ppm	0.081	0.064	NA	
	PS 59, 288 E. 57th Street, Manhattan	3-hour	ppm	0.073	0.065	0.057	**0.081**
	Mabel Dean station, 240 2nd Ave.	24-hour	ppm	0.045	0.045	NA	
	PS 59, 288 E. 57th Street, Manhattan	24-hour	ppm	0.046	0.038	0.036	**0.046**
	Mabel Dean station, 240 2nd Ave.	Annual	ppm	0.013	0.014	NA	
	PS 59, 288 E. 57th Street, Manhattan	Annual	ppm	0.013	0.012	0.012	**0.014**
PM_{10}	Mabel Dean station, 240 2nd Ave.	24-hour	$\mu g/m^3$	49	30	NA	
	JHS 126 424 Leonard St, Brooklyn	24-hour	$\mu g/m^3$	NA	50	42	**50**
	Mabel Dean station, 240 2nd Ave.	Annual	$\mu g/m^3$	22	19	NA	
	JHS 126 424 Leonard St, Brooklyn	Annual	$\mu g/m^3$	NA	20	21	**22**
$PM_{2.5}$	Mabel Dean station, 240 2nd Ave.	24-hour	$\mu g/m^3$	43	44	NA	
	JHS 126 424 Leonard St, Brooklyn	24-hour	$\mu g/m^3$	NA	35	34	**44**
	Mabel Dean station, 240 2nd Ave.	Annual	$\mu g/m^3$	16.8	17.1	NA	
	JHS 126 424 Leonard St, Brooklyn	Annual	$\mu g/m^3$	NA	15.3	14.0	**17.1**

Notes: NA—Full data not available
All averages other than annual are second-highest of the year, except $PM_{2.5}$ 24-hour averages, which are the 98th percentile value.
Mabel Dean station was located at the former Mabel Dean High School Annex.
Sources: NYSDEC, EPA

The higher levels of PM_{10} monitored in Lower Manhattan at source-oriented stations during 2002 are not included here, since they represent specific sources such as the impact of recovery and cleanup efforts that will not be present in the years analyzed. During the construction period,



Project Site

Location of Background Air Quality Monitoring Station

Background Air Quality Monitoring Stations

Figure 14-1

the impact of the proposed construction activity is explicitly modeled and added to background values (see Chapter 21, "Construction," for details).

A long-term trend of gradual reduction in background CO concentrations has been observed over the years, and has been attributed to the progressively lower vehicle emission rates over the years. Background CO concentrations used for future years were calculated based on the procedure defined by NYCDEP, using the most current monitoring data (1998 through 2002) and reductions estimated using MOBILE6.2 emission factors for the New York City region. Based on that procedure, the highest predicted background CO concentrations used for local analyses was 2.0 and 1.7 ppm for 2009 and 2015, respectively. A detailed description of the calculations can be found in Appendix G.

14.3.4 MESOSCALE EMISSIONS ANALYSIS

A mesoscale (i.e., regional) analysis of air pollutants is typically performed by computing total pollutant levels ("burdens") within a project's overall study area. Pollutant burdens represent total expected quantities of pollutant emissions for a region throughout a defined time period. The increment in pollutant emissions was computed for the annual quantities of *CO,* VOCs, NO_x, and PM_{10} that would be emitted due to project-related changes in vehicular activity within *New York and New Jersey*. Traffic generation and the associated vehicle miles were estimated for both the Pre-September 11 scenario and the Proposed Action, with the difference between these two conditions representing the increase in VMT attributable to the proposed project. Stationary sources were not expected to significantly increase emissions and were therefore not analyzed.

Vehicular pollutant burdens were computed based on the EPA emission estimating procedures, using MOBILE6.2 (for *CO,* PM_{10}, VOCs, and NO_x) *and the procedures described in AP-42 (for resuspended road dust),* and on the changes in vehicle miles traveled (VMT) for the final build year—2015. The choice and use of MOBILE6.2 is described in more detail in section 14.3.5, and in Appendix G.

The annual number of vehicle trips was estimated based on travel demand factors presented in Chapter 13A, "Traffic and Parking." Based on the characteristics of the different program components, separate estimates were made for Weekday, Saturday and Sunday travel in order to estimate annual traffic trips. Trip estimates for each land use were translated into vehicle miles based on an average travel distance of 9.2 miles for work related trips as reported by NYMTC. Adjustments were also made to account for the substitution affect of trips that would be relocating to the Project Site from within the region, and are therefore not new to the region. *Assignment of the destinations and origins of the trips associated with the Proposed Action was based on origin–destination information reported in the U.S. Census for the New York region. As a conservative estimate, the small portion of emissions related to trips to/from other areas (e.g., Connecticut) was also assigned to the New York region.*

NYSDEC has submitted detailed draft MOBILE6 regional emissions modeling results to EPA for 2007 as an update to the ozone SIP, including a breakdown of miles traveled on all roadway types and speeds by all vehicle classes. This model was used to generate NO_x and VOC emissions for all model years. The same model was revised in order to produce worst case winter CO emissions, as described in Section 14.3.5 below. Meteorological conditions for the VOCs and NO_x were taken from the SIP determination, reflecting the summer ozone season.

Additional details of this analysis are provided in Appendix G.

14.3.5 ANALYSIS OF MOBILE SOURCES

Maximum concentrations of CO, PM_{10}, and $PM_{2.5}$ were predicted for the analysis years 2009 and 2015. The concentrations were calculated for the averaging periods corresponding to those defined for each pollutant in the NAAQS: 24-hour and annual for PM and 8-hour for CO. Since no violations of the 1 hour CO standard have been measured in New York City within the last 10 years, 1-hour averages were not summarized in this report (although all 1-hour predicted CO concentrations would be well within the applicable standard).

The analysis uses a modeling approach approved by EPA that has been widely employed for evaluating CO and PM_{10} impacts of projects in New York City, New York State, and throughout the country, with some additional, newer procedures for modeling $PM_{2.5}$ that have been developed in coordination with NYCDEP. This approach is coupled with a series of worst-case assumptions relating to meteorology, traffic, and background concentrations, resulting in a conservatively high estimate of expected concentrations and ensuing air quality impacts caused by the Proposed Action.

Additional details of the data used are provided in Appendix G.

VEHICLE EMISSIONS DATA

Vehicular exhaust emission factors were computed using the EPA Mobile Source Emissions Model, MOBILE6.2. This is the latest, recently released, emissions model, capable of calculating engine emission factors for various vehicle types, based on the fuel (gas, diesel, or alternative technologies), meteorological conditions, vehicle speeds, roadway types, number of starts per day and engine soak time, and various other factors that influence emissions, such as inspection maintenance programs.

Vehicle classification data were based on field studies and data obtained from other traffic studies as discussed in Chapter 13A, "Traffic and Parking." Emission estimates were based on guidance from NYCDEP and NYSDEC on the appropriate credits to be used in the MOBILE6.2 model 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 the vehicles' exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered.

Based on the latest guidance from NYSDEC and NYCDEP, sport utility vehicles (SUVs) were classified as light-duty gasoline powered trucks, with operating conditions (starts per day and soak time) and registration characteristics (age of vehicles and mileage accumulation) set to be the same as for light-duty vehicles (LDV), in order to properly model their emissions. Taxis are assumed to all be in hot stabilized mode (excluding any start emissions). The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative fleet-wide breakdown[1].

An ambient temperature of 52.5° Fahrenheit was used for the sites in New York City. This temperature, calculated based on the latest guidance from EPA, NYSDEC, and NYCDEP, represents the average temperature measured at the Central Park meteorological station during

[1] *The MOBILE6 emissions model utilizes 29 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).*

the 10 highest 8-hour CO events measured at the East 34th Street NYSDEC *air quality* monitoring station during the years 2000 through 2002.

EPA has recently proposed revisions to the transportation conformity rules to incorporate procedures for assessing the effects of $PM_{2.5}$ for future projects that may be subject to transportation conformity in $PM_{2.5}$ non-attainment areas.[1] Under these proposed revisions, fugitive road dust would be included in regional emissions and in local hotspot analyses only if it is identified as a significant contributor to $PM_{2.5}$ regional air quality. Although EPA has not yet made a determination as to whether any specific areas have a regional $PM_{2.5}$ issue with respect to road dust, it is unlikely that such a determination would be made for locations within the New York City metropolitan area. First, predicted impacts based on modeling emission inventories are significantly higher than actual measured concentrations of PM attributed to road dust. This is the case in New York City, where the primary component of measured PM_{10} concentrations in the designated Non-Attainment area (Manhattan) was found to be due to diesel engine exhausts, rather than road dust. Second, while EPA has determined that areas that are not in attainment with the PM_{10} standard have significant emissions of fugitive road dust, there is less evidence that this road dust is a contributor to $PM_{2.5}$ concentrations.

Furthermore, in the event that EPA would require quantified analysis of $PM_{2.5}$ at "hot-spot" (i.e., microscale receptor) locations, EPA would only require an assessment of the contribution from fugitive dust if those emissions were identified as regionally significant. This would first require preparation of a $PM_{2.5}$ SIP by NYSDEC, an identification of specific hot-spot locations requiring quantified analysis for transportation conformity decisions, and a determination that inclusion of re-entrained road dust in the hot-spot analysis is warranted; designation of New York in regard to attainment of the $PM_{2.5}$ NAAQS is expected in 2004. Since none of these criteria have been met, and since fugitive road dust is unlikely to be characterized as a regionally or locally significant contributor to $PM_{2.5}$ concentrations, inclusion of fugitive road dust was not considered to be necessary for assessing $PM_{2.5}$ impacts from the Proposed Action.

Since the contribution of re-entrained road dust to PM_{10} concentrations, as presented in the PM_{10} SIP, is considered to be significant, the PM_{10} estimates include both exhaust and road dust. Road dust emission factors were calculated according to the latest procedure delineated by EPA[2].

DISPERSION MODELS

Carbon Monoxide

At all sites selected for CO analysis, initial screening of worst-case predicted maximum 1- and 8-hour average CO concentrations were determined using EPA's CAL3QHC model[3], Version 2.0. The CAL3QHC model is a Gaussian dispersion model, which assumes that the dispersion of pollutants downwind of a pollution source follows a Gaussian (or normal) distribution, and is designed specifically for predicting CO concentrations along roadway segments.

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[1] *68 Fed. Reg. 62690-62729, November 5, 2003.*

[2] *EPA, "Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources", Draft Ch. 13.2.1, NC, http://www.epa.gov/ttn/chief/ap42/, August 2003.*

[3] *EPA, User's guide to CAL3QHC, "A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections", Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, September 1995.*

Particulate Matter

Ambient concentrations of PM were computed at the selected receptor sites using the more refined version, CAL3QHCR. This version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating 24-hour and annual average concentrations. Tier II analysis, which includes the modeling of hour-by-hour concentrations based on hourly traffic data and hourly meteorological data over a 5-year monitoring period, was performed to predict maximum 24-hour and annual average PM levels.

In addition to the standard intersection models, two special features were modeled:

Tunnel Emissions: The dispersion of pollutants from the proposed short bypass tunnel alternative for Route 9A was modeled within the same traffic modeling framework, with a special procedure applied to the tunnel emissions. The tunnel would consist of two separate tubes, one for each traffic direction. Vehicle engine missions within the tunnel would be mixed within the tunnel air and emitted via the exit portals. Air flow in the tunnel would be induced by a longitudinal, portal to portal jet fan ventilation system assisted by the traffic induced piston air flow. To emulate these emissions, an additional link was added from each exit portal in the out bound direction for a distance of 60 meters (roughly 197 feet). The mass emission rate of pollutants from these links consisted of the total emissions within each tube throughout the length of the tunnel.

Bus Idling: A model was designed to simulate the emission from buses that would be loading and unloading passengers along Greenwich Street south of Fulton Street. The main focus of this analysis is diesel bus idle emissions, and therefore PM is the pollutant of concern. Since these streets are new sections introduced by the Proposed Action, there is no model for that area for the Future Without the Proposed Action Scenario, and incremental impact criteria are not relevant. The intersection of Fulton and Greenwich Streets was modeled according to the standard procedure described in this section for intersections; the bus idle emissions were emulated by introducing a narrow line source which included the total predicted idle emissions along the west side of Greenwich Street for each hour, with the length of the source varying hourly by the number of buses predicted to be present.

More information on the determination of these procedures is presented in Appendix G.

METEOROLOGICAL CONDITIONS

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, which accounts for the effects of dispersion or mixing in the atmosphere.

The CAL3QHC CO computations were performed using a wind speed of 1 meter/second, and stability class D, representative of neutral conditions in New York City. At each receptor location, the wind angle that maximized, the pollutant concentrations was used in the analysis regardless of frequency of occurrence.

The CAL3QHCR Tier II PM analyses utilized monitored hourly meteorological data from LaGuardia Airport station in the years 1998–2002. All hours are modeled, and the highest resulting concentration for any averaging time is presented.

RECEPTOR LOCATIONS

At each location analyzed, receptors (locations defined in the model at which concentrations are calculated) were located at the nearest sensitive land uses, such as public spaces that would be continuously accessible for the duration of the averaging time, windows of residential buildings, and building fresh air intake vents. Receptors in the annual $PM_{2.5}$ neighborhood scale models were placed at a minimum distance of 15 meters, or at a distance of one meter per 1,000 daily vehicle miles traveled on the roadway, from the nearest moving lane, based on the NYCDEP procedure for neighborhood scale corridor $PM_{2.5}$ modeling.

SITE SELECTION

The selection of air quality receptor sites followed the guidance suggested by EPA in the Revisions to the Guideline on Air Quality Models (40 CFR Part 51). In the Guideline on Air Quality Models, the EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections (EPA–454/R–92–005, 1992) is referred to for further guidance.

In the Guideline for Modeling Carbon Monoxide from Roadway Intersections, it is noted in Section 3, "Intersection Selection Procedure," 3.1 "Rationale" that "this guidance provides a ranking and selection procedure to allow the discernment of those intersections that could be potential hot spots, i.e., have high CO concentrations. The guidance will be used primarily to determine potential hot spots in a SIP analysis, but will also be useful for project level analysis when more than three intersections are affected."

The Guideline for Modeling Carbon Monoxide from Roadway Intersections outlines under Section 3.3, "Ranking and Selecting Intersections" to (1) rank the top 20 intersections by traffic volumes, (2) calculate the Level of Service (LOS) for the top 20 intersections based on traffic volumes, (3) rank these intersections by LOS, (4) model the top 3 intersections based on the worst LOS, and (5) model the top 3 intersections based on the highest traffic volumes. The Guideline for Modeling Carbon Monoxide from Roadway Intersections notes that if the selected intersections do not show an exceedance of the NAAQS, none of the intersections would, and concludes "thus, if no exceedances of the carbon monoxide ambient air quality standards occur for the attainment year when the results of the intersection modeling are added to the urban areawide component of the carbon monoxide concentration at the intersection [background], then the carbon monoxide attainment demonstration is complete. If carbon monoxide exceedances do occur, then further controls are necessary."

As noted in the Guideline for Modeling Carbon Monoxide from Roadway Intersections, much of the guidance towards ranking and selecting intersections is geared towards helping agencies identify the most critical intersections to ensure that carbon monoxide attainment demonstrations are complete. While New York City is currently designated as being in "attainment" of the carbon monoxide standards, this was not the case for New York City (and other cities) when the Guideline for Modeling Carbon Monoxide from Roadway Intersections was released (1992). In 1992, the measured (and predicted) levels of carbon monoxide were near or above the applicable 8-hour average carbon monoxide standards. However, starting in 1992, NYSDEC submitted several demonstrations of attainment to indicate that New York City (and the adjacent Westchester and Nassau counties) would achieve attainment of the 8-hour average carbon monoxide standard. (Monitoring had indicated that all of New York State was in attainment of the 1-hour carbon monoxide standards for many years, even in 1992). The first major New York State carbon monoxide SIP demonstration was the Carbon Monoxide Attainment Demonstration for the New York Metropolitan Area that was submitted by the NYSDEC to the EPA in 1992. The intersections analyzed in this 1992 demonstration included the following locations in Manhattan:

1. Route 9A & 57th Street
2. Route 9A & 42nd Street
3. Delancey & Allen Street
4. Eight Ave & 42nd Street
5. Third Ave. & 57th Street
6. Second Ave. & 36th Street
7. First Ave.& 57th Street
8. Tenth Ave. & 57th Street
9. Lincoln Center
10. Herald Square
11. Seventh Ave. /Broadway & 45th Street
12. Columbus Circle

In the 1992 carbon monoxide demonstration, all of these intersections were projected to have 8-hour average carbon monoxide concentrations less than the applicable standard (9 parts per million) by December 31, 1995 (the original attainment date proscribed in the 1990 Clean Air Act Amendments). Some of the worst projected carbon monoxide locations in New York City were identified in downtown Brooklyn, which was due to the large arterial corridors that fed the Brooklyn and Manhattan Bridge traffic to Manhattan. In 1999, NYSDEC submitted another proposed carbon monoxide SIP revision which demonstrated that carbon monoxide 8-hour concentrations in the most congested intersections in downtown Brooklyn were within standards even without costly transportation improvements that were considered under the 1992 SIP. Based on this SIP revision, EPA re-designated New York City as in attainment for carbon monoxide (see 67 Fed. Reg. 19337, April 19, 2002). Historical air quality monitoring in Manhattan and downtown Brooklyn have also indicated that (as predicted) carbon monoxide concentrations have reduced substantially since the EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections was released. Table 14-4 provides a summary of measured carbon monoxide concentrations at the nearest NYSDEC carbon monoxide monitors near the project site (350 Canal Street) and at one of the most heavily trafficked and congested locations in the City (Brooklyn Transit near the intersections of Tillary Street and Flatbush Avenue in downtown Brooklyn). As shown in this table, measured second-highest 8-hour average carbon monoxide concentrations in 2002 are less than half of the measured values in 1993. Second-highest 8-hour average carbon monoxide levels are included in this table, since compliance with the corresponding standard is based on the second-highest 8-hour levels.

Given that the carbon monoxide concentrations are measured and projected to be well below the applicable standards by the time of the operation of the Proposed Action, the selection of receptor locations also considered the influence of project-generated traffic, since the analysis needed to address potential de minimis impacts for comparison to New York City recommended impact thresholds. Therefore, the general guidance in the EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections was followed. The study area intersections were ranked by volume, poorest projected level of service, and the greatest projected project incremental traffic. Appendix G provides more supportive documentation on

Table 14-4
Historical Carbon Monoxide Monitoring Data for Downtown Brooklyn and Lower Manhattan: 1993-2002

Monitoring Station	350 Canal Street		Brooklyn Transit	
Standard	9 ppm		9 ppm	
Year	CO Concentration	Number of Exceedances of the Standard	CO Concentration	Number of Exceedances of the Standard
1993	6.3	0	7.0	0
1994	7.2	0	6.4	0
1995	7.0	0	7.9	0
1996	4.4	0	6.1	0
1997	4.2	0	4.3	0
1998	4.2	0	4.1	0
1999	4.1	0	5.0	0
2000	4.2	0	4.3	0
2001	3.0	0	3.5	0
2002	3.0*	0*	3.4	0

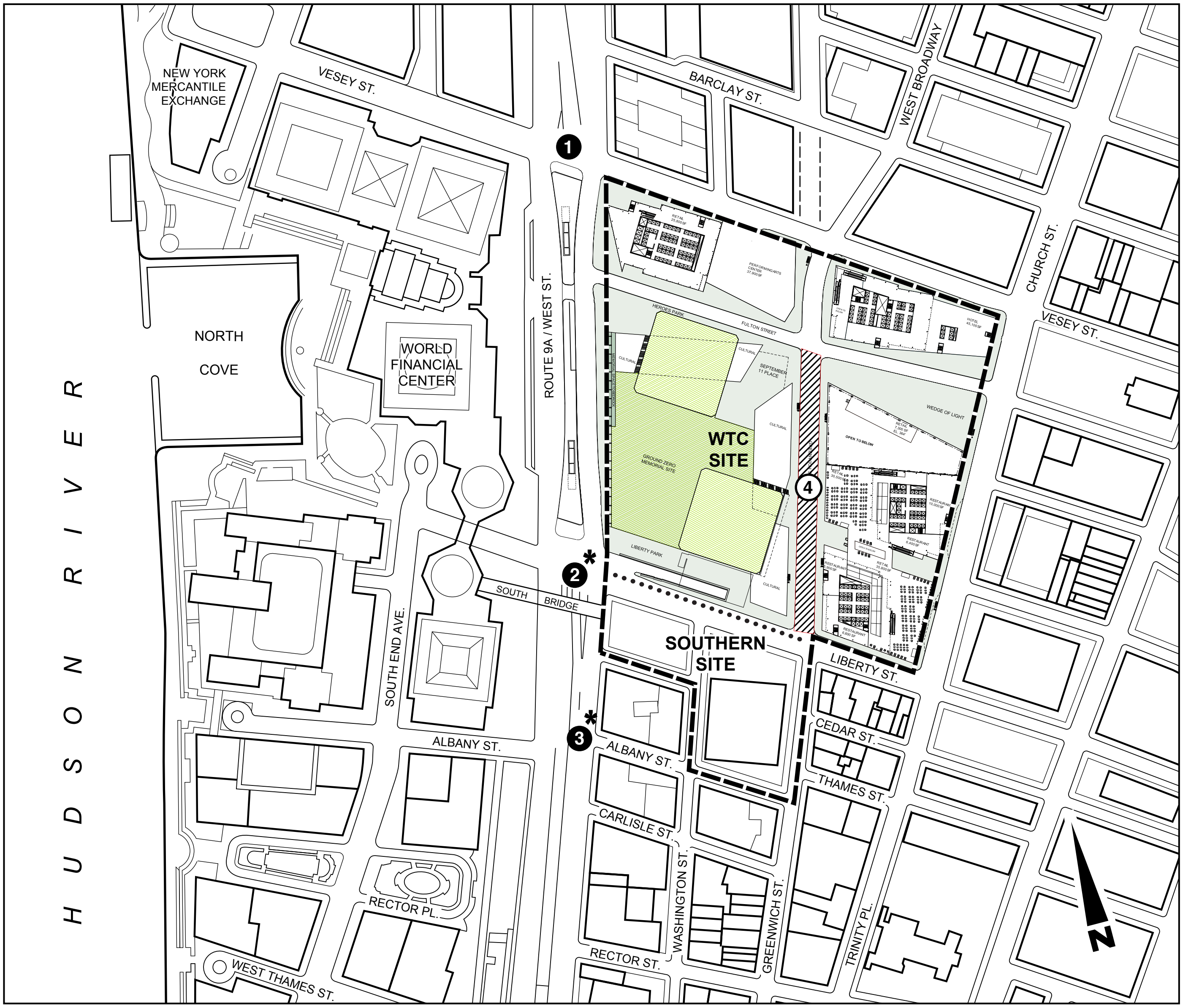
Notes: Monitoring site located at 350 Canal Street and at Brooklyn Transit, Flatbush Avenue near Tillary Street.
Concentrations are parts per million (ppm), the second highest reported 8-hour average value.
* Data is from 225 East 34th Street. Sampling at 350 Canal Street was terminated on 12/31/01.

Sources: *New York State Air Quality Report, Ambient Air Monitoring System*, Annual 1993 DAR-94-1—Annual 2002 DAR-03- 1. 2002 values based on draft report obtained from NYSDEC.

this screening analysis. Given that the region is designated as being in attainment, emphasis in the selection of receptors was given to evaluating the potential effect of incremental traffic from the Proposed Action in the selection of receptor sites. If the computed impacts and overall concentrations at these locations were determined to be within standards and de minimis impact criteria, projected impacts at other intersections would be expected to be insignificant with respect to local air quality impacts. Also, none of the 12 Manhattan sites (listed above) that were included in the carbon monoxide SIP demonstration in 1992 were selected for this study, since they were distant from the project site, and potential local impacts from on-street traffic at further distances from the site are expected to be less than computed at congested, heavily trafficked locations near the project site.

Based on the results of this screening analysis, the sites that were analyzed, shown in Figure 14-2, were the three intersections of Route 9A and Vesey Street, Route 9A and Liberty Street and Route 9A and Albany Street (the last two intersections included in one model), and Greenwich Street from Vesey Street to Liberty Street—the area where tour buses would load and unload visitors to the Memorial. The intersections include the locations that would experience a combination of the highest background traffic volumes and levels of service, and the highest volumes of project induced traffic from all access routes converging near the WTC Site and leaving the site. In addition, these areas would be influenced by emissions released from the Route 9A short bypass tunnel, should that alternative be built. The concentrated release of the

3.25.04



Site Plan Source: Studio Daniel Libeskind

0 200 400 FEET
SCALE

Project Site

1/2/3 Intersections

4 Visitor Bus Loading and Unloading Zone

* Sites 2 and 3 were included in a single dispersion model

World Trade Center Memorial
and Redevelopment Plan

Mobile Source Analysis Locations

Figure 14-2

vehicular emissions from within the tunnel as a jet release from the portals was included in those models as described above. More details on the procedure and considerations for the selection of mobile source sites for analysis is delineated in Appendix G.

14.3.6 ANALYSIS OF STATIONARY SOURCES

Stationary sources located within the Project Site would include: emergency generators for life-saving operations and generators used for client-operated backup power in case of power outage, which would be tested up to 1 hour per month; and ventilation system outlets that would exhaust air from the enclosed below-grade vehicular facilities, including bus and car parking, delivery truck docks, security vehicle inspection facility, and connecting ramps. HVAC systems would be electric and/or steam distributed by Con Edison with no additional generation facilities associated with them. Wind turbines would also be placed on Freedom Tower, which would generate electricity for the Proposed Action, reducing the power demand from conventional sources. The project alternatives include options for on-site power cogeneration in addition to the above-mentioned sources, which are analyzed in Chapter 23, "Alternatives."

The backup and life saving emergency generators would be fueled by ultra low sulfur diesel fuel (ULSD). *Generator exhaust would be located at a minimum elevation of 40 feet above grade*. The generators would be used in the event of *emergency or* sudden loss of power from the electrical grid. Occasionally, the generators would be tested for a short period of time to ensure availability and reliability in the event of an actual emergency. Emergency generators are exempt from NYSDEC air permitting requirements if they meet the applicable requirements of 6 NYCRR 201. The emergency generators would be installed and operated in accordance with applicable requirements. Potential air quality impacts are considered insignificant since the emergency generators would be used only for testing purposes outside of an actual emergency, and the frequency and duration of such tests would be minimal. *Therefore, no additional analysis of emissions from generators was necessary.*

In the pre-September 11 condition, sources on the site included backup and emergency generators. In addition, there were some generators operating regularly onsite supplementing power for some activities. Below grade parking was available as well. Precise details of these sources are not available at this time since records and the people involved in much of the on-site operations did not survive the tragic events of September 11.

Although the detailed plan for the ventilation of the below grade vehicular facilities is not yet available, a conservative assessment of the potential impacts of the ventilation on ambient air quality was performed, as delineated in the following sections.

EMISSIONS DATA

Emissions from below-grade vehicular facilities were calculated using the procedures detailed for mobile sources in section 14.3.5 above, based on the truck, bus, and car parking volumes presented in Chapter 13A, "Traffic and Parking," and on the physical layout of the facilities, dictating travel distances within each facility. All vehicles were assumed to travel at five miles per hour within the facility and to idle for three minutes on entrance and exit. 24-hour traffic profiles were applied, and the highest resulting emission for each averaging period corresponding to the relevant NAAQS period was used. All emissions were assumed to originate from two air discharge vents: the first including air from the Vesey Street entrance tunnel and the northern end of the facility, the second including air from the West Street *entrances, the security area and the southern end of the facility. Since the facilities include diesel and gasoline vehicles, both CO and PM were modeled. A full description of all parameters used for this analysis is presented in Appendix G.*

DISPERSION MODEL

Air quality impacts from the below grade vehicular facilities were evaluated using the Industrial Source Complex Short Term (ISC3) dispersion model developed by EPA. The ISC3 model calculates pollutant concentrations from one or more sources (e.g., air discharge vents) based on hourly meteorological data.

Emissions were simulated as a point source at 40 feet above grade. Since all emissions were modeled as being discharged from a point source, the air exchange rate in the below grade facility has no impact on the result. This generic analysis is applicable to any potential air discharge vent location and assumes that the elevated vents would be located away from sensitive receptors, such as residences and open spaces.

METEOROLOGICAL CONDITIONS

The meteorological data set consisted of the five latest years of concurrent meteorological data appropriate for the study sites, LaGuardia Airport (1998-2002). All hours were modeled and the highest resulting concentration for any averaging time is presented.

RECEPTOR LOCATIONS

Receptors were placed as a polar grid surrounding the source at a distance of up to 200 meters from the source and at 10 meter intervals, along radials surrounding the source located at every 10 degrees. This setup enables the location of the highest maximum concentration at any location surrounding the source.

14.4 PREDICTED IMPACTS OF THE PROPOSED ACTION

14.4.1 PREDICTED *MESOSCALE* EMISSIONS

According to the methodology set forth in Section 14.3.4 above, predicted future *direct and indirect* emissions due to the *operation of the* Proposed Action were calculated *based on* estimates *that* were prepared of the project's affect on vehicle miles traveled (VMT) in the region. The estimates were prepared on an annual basis and focus on the predicted increase in VMT within the downstate New York and the Northern New Jersey non-attainment regions. Similar estimates were prepared for the future without the Proposed Action. Based on these estimates, the increase in emissions due to the Proposed Action relative to the future without the Proposed Action was calculated.

Since the first elements of the Proposed Action will be operational in 2009, no trips are generated in earlier years and therefore no operational emissions will occur prior to 2009. Construction related emissions are addressed in Chapter 21, "Construction." Because the 2009 interim program does not yet replace most of the office space that existed at the Project Site, there would still be a net reduction in vehicle travel generated by the Proposed Action in 2009 when compared to the Pre-September 11 Scenario. By 2015, full development at the Project Site is estimated to *generate approximately 15.6 million vehicle miles traveled regionally, which represents* an increase of approximately *1.97* million vehicle miles; *this rate would* *remain constant in future years*. Based on this distribution the incremental annual VMT in the New York region is estimated to be *1.626* million miles and the increase in the New Jersey region is estimated to be *342* thousand miles.

The VMT associated with the land uses that existed in the pre-September 11 condition and the predicted emissions generated in future years by those VMT are presented in Tables 14-5 and 14-6, respectively. The predicted total project generated annual VMT by region and vehicle type is presented in Table 14-7, and the associated region wide emissions is presented in Table 14-8. The predicted annual increase in VMT by region and vehicle type, as compared to the pre-September 11 condition, is presented in Table 14-9, and the associated region wide increment in emissions is presented in Table 14-10.

Table 14-5
Regional Vehicle Miles Traveled Generated in the Pre-September 11 Condition
(miles)

Region	Mode	2009	2012	2015	2020
New York	Car	9,402,988	9,402,988	9,402,988	9,402,988
	Bus	None	None	None	None
	Truck	1,885,409	1,885,409	1,885,409	1,885,409
New Jersey	Car	1,980,775	1,980,775	1,980,775	1,980,775
	Bus	None	None	None	None
	Truck	397,168	397,168	397,168	397,168

Table 14-6
Regional Onroad Emissions Generated in the Pre-September 11 Condition
(tons per year)

Region	Pollutant	2009	2012	2015	2020
New York	NO_x	20.3	13.6	9.3	5.6
	CO	162.0	141.1	128.5	116.0
	VOC	14.7	10.3	7.8	6.1
	PM_{10}	10.1	9.9	9.8	9.8
New Jersey	NO_x	4.3	2.9	2.0	1.2
	CO	34.1	29.7	27.1	24.4
	VOC	3.1	2.2	1.6	1.3
	PM_{10}	2.1	2.1	2.1	2.1

Table 14-7
Regional Vehicle Miles Traveled Generated by the Proposed Action
(miles)

Region	Mode	2009	2012	2015	2020
New York	Car	5,870,999	8,147,964	10,424,930	10,424,930
	Bus	728,217	586,764	445,312	445,312
	Truck	835,722	1,440,362	2,045,002	2,045,002
New Jersey	Car	1,236,748	1,716,399	2,196,051	2,196,051
	Bus	153,402	123,604	93,807	93,807
	Truck	176,048	303,418	430,787	430,787

Table 14-8
Regional Onroad Emissions Generated by the Proposed Action
(tons per year)

Region	Pollutant	2009	2012	2015	2020
New York	NO_x	20.4	17.8	13.8	8.5
	CO	100.1	122.3	143.4	129.0
	VOC	9.6	9.4	9.0	7.1
	PM_{10}	6.7	9.0	11.3	11.2
New Jersey	NO_x	4.3	3.7	2.9	1.8
	CO	21.1	25.8	30.2	27.2
	VOC	2.0	2.0	1.9	1.5
	PM_{10}	1.4	1.9	2.4	2.4

Table 14-9
Increment in Regional Vehicle Miles Traveled Generated by the Proposed Action as Compared to Pre-September 11 (miles)

Region	Mode	2009	2012	2015	2020
New York	Car	-3,531,989	-1,255,024	1,021,942	1,021,942
	Bus	728,217	586,764	445,312	445,312
	Truck	-1,049,687	-445,047	159,593	159,593
New Jersey	Car	-744,027	-264,375	215,276	215,276
	Bus	153,402	123,604	93,807	93,807
	Truck	-221,121	-93,751	33,619	33,619

Table 14-10
Increment in Regional Onroad Emissions Generated by the Proposed Action as Compared to Pre-September 11 (tons per year)

Region	Pollutant	2009	2012	2015	2020
New York	NO_x	0.1	4.2	4.6	2.9
	CO	-61.9	-18.9	14.9	13.0
	VOC	-5.1	-0.9	1.3	1.0
	PM_{10}	-3.4	-0.9	1.4	1.4
New Jersey	NO_x	0.0	0.9	1.0	0.6
	CO	-13.0	-4.0	3.1	2.7
	VOC	-1.1	-0.2	0.3	0.2
	PM_{10}	-0.7	-0.2	0.3	0.3

Vehicular emissions in general are predicted to gradually decrease over the years. Emissions of NO_x which are largely associated with diesel engines will decrease rapidly beginning in 2006 due to new regulations on those engines. Emissions of PM_{10} are mostly driven by conservative estimates of resuspended road dust, and therefore remain mostly constant. The increment in trips generated by the Proposed Action is expected to peak in 2015 and remain constant in later years; therefore the emission increments were predicted to peak in that year. Due to a combination of all of the above factors, the total emissions from the trips generated by the Proposed Action either decrease from the outset, or peak in 2015 depending on the pollutant. The total project generated NO_x emissions decrease from nearly 25 tons in 2009 to 10 tons in 2020. The total project generated CO emissions were predicted to exceed 100 tons per year. The vast majority of these CO emissions existed in the pre-September 11 *condition, which was considered in the CO attainment demonstration. The actual maximum increment of 14.9 tons per year in CO emissions from the Proposed Action over Pre-September 11 condition that is predicted to occur in 2015 would not be regionally significant. Local hotspot analyses were performed, as presented in the mobile source section 14.4.3 below, to ensure that exceedances or significant increases do not occur as a result of the Proposed Action. The total project generated VOC emissions decrease from approximately 12 tons in 2009 to 9 tons in 2020. The total project generated PM_{10} emissions decrease from roughly 8 tons in 2009 to 14 tons in 2020.*

The resulting region wide increase in emissions would not be considered regionally significant. LMDC is coordinating with NYSDOT, NYSDEC, and EPA in order to make the transportation data available for inclusion in the regional transportation Best Practices Model and in the TIP.

14.4.2 PREDICTED IMPACTS OF STATIONARY SOURCES

No significant adverse impacts are predicted due to the operation of backup and emergency generators.

Based on the generic modeling of emissions from below grade vehicular facilities, as presented in Table 14-11, no significant adverse impacts on air quality are predicted from the air discharge vents. Computations were performed for emissions generated within the northern and southern portions of the underground garage, with exhaust vents directed away from sensitive receptors. Ventilation of the below grade parking facilities will be designed in a manner that would conform to any applicable laws and regulations, and that would not result in any significant adverse impacts on air quality.

Table 14-11
Maximum Predicted Increments in Concentrations from Below Grade Vehicular Facilities

Garage Parking Areas	Year	Maximum Predicted $PM_{2.5}$ Concentration ($\mu g/m^3$)		Maximum Predicted CO Concentration (ppm)	
		24-hour	Annual	1-hour	8-hour
North	2009	0.31	0.03	0.24	0.08
South		0.40	0.04	0.30	0.09
North	2015	0.27	0.03	0.50	0.15
South		0.43	0.04	0.57	0.17

14.4.3 PREDICTED IMPACTS OF MOBILE SOURCES

PREDICTED IMPACTS OF MOBILE SOURCES—CURRENT CONDITIONS SCENARIO

Current Conditions Scenario—2009

Concentrations of all analyzed pollutants in 2009 under the Current Conditions Scenario presented in Table 14-12 and 14-13 represent the predicted concentrations with Route 9A at grade and short bypass, respectively. No exceedance of any benchmarks levels were predicted

Table 14-12
Total Predicted Pollutant Concentrations
Current Conditions At Grade Scenario, 2009

Site	Pollutant	NAAQS	Period	Future Without the Proposed Action	Future With the Proposed Action	Increment
Vesey St./ Route 9A	CO	9	8-hour	5.6	5.7	0.1
	$PM_{2.5}$	65	24-hour	47.2	47.4	0.2
		15	Annual*	17.37	17.39	0.02
	PM10	150	24-hour	65.9	67.7	1.8
		50	Annual	27.6	28.7	1.1
Liberty-Albany St./ Route 9A	CO	9	8-hour	4.9	5.4	0.5
	$PM_{2.5}$	65	24-hour	47.1	47.3	0.2
		15	Annual*	17.34	17.39	0.05
	PM_{10}	150	24-hour	61.5	67.0	5.5
		50	Annual	26.2	27.9	1.7

Notes: All PM concentrations are in μg/m^3; CO concentrations are in ppm.
All CO results are screening CAL3QHC analyses.
* $PM_{2.5}$ annual concentrations are neighborhood scale.

Table 14-13
Total Predicted Pollutant Concentrations
Current Conditions Short Bypass Scenario, 2009

Site	Pollutant	NAAQS	Period	Future Without the Proposed Action	Future With the Proposed Action	Increment
Vesey St./ Route 9A	CO	9	8-hour	6.5	6.8	0.3
	$PM_{2.5}$	65	24-hour	48.0	48.8	0.8
		15	Annual*	17.30	17.34	0.04
	PM_{10}	150	24-hour	59.8	64.4	4.6
		50	Annual	25.22	27.27	2.05
Liberty-Albany St./ Route 9A	CO	9	8-hour	3.2	5.2	2.0
	$PM_{2.5}$	65	24-hour	47.8	48.1	0.3
		15	Annual*	17.30	17.33	0.03
	PM_{10}	150	24-hour	63.3	63.6	0.3
		50	Annual	25.98	26.15	0.17

Notes: All PM concentrations are in μg/m^3; CO concentrations are in ppm.
All CO results are screening CAL3QHC analyses.
* $PM_{2.5}$ annual concentrations are neighborhood scale.

for the proposed Route 9A at grade alternative. *For most pollutants, the increment in concentrations, although insignificant, would be higher for the Route 9A short bypass alternative, due to the concentrations from the tunnel portals. PM_{10} increments for the short bypass increase due to the reduced emission of fugitive road dust from the covered tunnel.*

Along Greenwich Street, in the area where buses will be loading and unloading visitors to the WTC Site, the predicted increment in $PM_{2.5}$ concentrations from all local mobile sources were predicted to be a maximum of 1.14 μg/m^3 and 0.14 μg/m^3 on a 24-hour and annual average basis, respectively. Total predicted PM_{10} concentrations, including background, were 62.1 and 25.8 μg/m^3 on a 24-hour and annual average basis, respectively. No exceedance of the PM_{10} or of $PM_{2.5}$ 24-hour NAAQS was predicted. Since this is a location where no roadway existed previously, the comparison to $PM_{2.5}$ interim guidance threshold values normally used for increased traffic on existing roadways is inappropriate. For comparative purposes, the total contribution from all mobile sources along Route 9A is on the order of 0.6 μg/m^3 annually, and 3.1 μg/m^3 on a 24-hour basis—three to four times higher than those computed near the new section along Greenwich Street.

Impacts on air quality at any other location that would be impacted by the Proposed Action would be lower than those presented here for the three worst intersections, as described in section 14.3.5. Since no significant adverse air quality impacts were predicted at the three worst intersections, none would be expected at any other intersections identified in Chapter 13A, including those defined as level of service D, E, or F.

Current Conditions Scenario—2015

Concentrations of all analyzed pollutants in 2015 under the Current Conditions Scenario, presented in Table 14-14 and 14-15, represent the predicted concentrations with Route 9A at grade and short bypass, respectively. *For most pollutants, the increment in concentrations, although insignificant, would be higher for the Route 9A short bypass alternative, due to the concentrations from the tunnel portals. PM_{10} increments for the short bypass increase due to the reduced emission of fugitive road dust from the covered tunnel.*

Table 14-14
Total Predicted Pollutant Concentrations
Current Conditions At Grade Scenario, 2015

Site	Pollutant	*NAAQS*	Period	Future Without the Proposed Action	Future With the Proposed Action	Increment
Vesey St./ Route 9A	CO	*9*	8-hour	*4.8*	*4.9*	*0.1*
	$PM_{2.5}$	*65*	24-hour	*46.4*	*46.5*	*0.1*
		15	Annual*	*17.31*	*17.32*	*0.01*
	PM_{10}	*150*	24-hour	*67.9*	*71.1*	*3.2*
		50	Annual	*28.4*	*29.8*	*1.4*
Liberty-Albany St./ Route 9A	CO	*9*	8-hour	*4.2*	*4.9*	*0.7*
	$PM_{2.5}$	*65*	24-hour	*46.2*	*46.4*	*0.2*
		15	Annual*	*17.27*	*17.33*	*0.06*
	PM_{10}	*150*	24-hour	*62.5*	*72.7*	*10.2*
		50	Annual	*26.4*	*30.4*	*4.0*

Notes: All PM concentrations are in $\mu g/m^3$; CO concentrations are in ppm.
All CO results are screening CAL3QHC analyses.
* $PM_{2.5}$ annual concentrations are neighborhood scale.

Table 14-15
Total Predicted Pollutant Concentrations
Current Conditions Short Bypass Scenario, 2015

Site	Pollutant	NAAQS	Period	Future Without the Proposed Action	Future With the Proposed Action	Increment
Vesey St./ Route 9A	CO	9	8-hour	4.5	6.0	1.5
	$PM_{2.5}$	65	24-hour	46.4	47.3	0.9
		15	Annual*	17.25	17.28	0.03
	PM_{10}	150	24-hour	58.9	65.6	6.7
		50	Annual	24.64	27.62	2.98
Liberty-Albany St./ Route 9A	CO	9	8-hour	3.8	4.7	0.9
	$PM_{2.5}$	65	24-hour	46.6	46.8	0.2
		15	Annual*	17.25	17.27	0.02
	PM_{10}	150	24-hour	64.2	64.9	0.7
		50	Annual	26.12	27.07	0.95

Notes: All PM concentrations are in μg/m^3; CO concentrations are in ppm.
All CO results are screening CAL3QHC analyses.
* $PM_{2.5}$ annual concentrations are neighborhood scale.

The Greenwich Street bus area was analyzed only for 2009, since the highest visitor rate and ensuing bus volumes were predicted for that year and since vehicular emissions were predicted to be higher in 2009 than in subsequent years (see "Current Conditions Scenario—2009" above).

Impacts on air quality at any other location that would be impacted by the Proposed Action would be lower than those presented here for the three worst intersections, as described in section 14.3.5. Since no significant adverse air quality impacts were predicted at the three worst intersections, none would be expected at any other intersections identified in Chapter 13A, including those defined as level of service D, E, or F.

PREDICTED IMPACTS OF MOBILE SOURCES—PRE-SEPTEMBER 11 SCENARIO

Pre-September 11 Scenario—2009

Concentrations of all analyzed pollutants in 2009 under the Pre-September 11 Scenario presented in Table 14-16 represent the predicted concentrations with Proposed Route 9A at grade alternative. Some reductions were predicted in the *Vesey* Street area; this is probably due to the change in direction of traffic and geometry of the street. As shown in this table, the Proposed Action is not predicted to cause any significant adverse air quality impacts or to cause any exceedance of the NAAQS under the Route 9A at grade alternative. *For most pollutants, the increment in concentrations, although insignificant, would be higher for the Route 9A short bypass alternative, due to the concentrations from the tunnel portals but would not result in exceedance of the NAAQS. PM_{10} increments for the short bypass increase due to the reduced emission of fugitive road dust from the covered tunnel.*

Since Greenwich Street is a new street, the analysis for Pre-September 11 and Current Conditions Scenarios would be the same (see "Current Conditions Scenario—2009" above).

Table 14-16
Total Predicted Pollutant Concentrations
Pre-September 11 At Grade Scenario, 2009

Site	Pollutant	NAAQS	Period	Future Without the Proposed Action	Future With the Proposed Action	Increment
Vesey St./ Route 9A	CO	9	8-hour	5.9	5.7	-0.2
	$PM_{2.5}$	65	24-hour	47.4	47.4	-0.0
		15	Annual*	17.39	17.39	+0.00
	PM_{10}	150	24-hour	67.8	67.7	-0.1
		50	Annual	28.6	28.7	0.1
Liberty-Albany St./ Route 9A	CO	9	8-hour	5.0	5.4	0.4
	$PM_{2.5}$	65	24-hour	47.3	47.3	+0.0
		15	Annual*	17.36	17.39	0.03
	PM_{10}	150	24-hour	62.2	67.0	4.8
		50	Annual	26.3	27.9	1.6

Notes: All PM concentrations are in μg/m^3; CO concentrations are in ppm.
All CO results are screening CAL3QHC analyses.
* $PM_{2.5}$ annual concentrations are neighborhood scale.

Impacts on air quality at any other location that would be impacted by the Proposed Action would be lower than those presented here for the three worst intersections, as described in section 14.3.5. Since no significant adverse air quality impacts were predicted at the three worst intersections, none would be expected at any other intersections identified in Chapter 13A, including those defined as level of service D, E, or F.

Pre-September 11 Scenario—2015

Concentrations of all analyzed pollutants in 2015 under the Pre-September 11 Scenario presented in Table 14-17 represent the predicted concentrations with the proposed Route 9A at grade alternative. Some reductions were predicted in the *Vesey* Street area; this is probably due to the change in direction of traffic and geometry of the street. As shown in the table, the Proposed Action is not predicted to cause any significant adverse air quality impacts or to cause any exceedance of the NAAQS under the Route 9A at grade alternative. *For most pollutants, the increment in concentrations, although insignificant, would be higher for the Route 9A short bypass alternative, due to the concentrations from the tunnel portals. PM_{10} increments for the short bypass increase due to the reduced emission of fugitive road dust from the covered tunnel.*

It is expected that the results with the short bypass alternative for Route 9A reconstruction would be higher than that presented in Table 14-17, but would not be significant and, as with the at grade alternative, would not result in exceedances of the NAAQS.

Since Greenwich Street is a new street, the analysis for Pre-September 11 and Current Conditions Scenarios would be the same (see "Current Conditions Scenario—2009," above).

Table 14-17
Total Predicted Pollutant Concentrations
Pre-September 11 At Grade Scenario, 2015

Site	Pollutant	NAAQS	Period	Future Without the Proposed Action	Future With the Proposed Action	Increment
Vesey St./ Route 9A	CO	9	8-hour	5.0	4.9	-0.1
	$PM_{2.5}$	65	24-hour	46.3	46.5	0.2
		15	Annual*	17.31	17.32	0.02
	PM_{10}	150	24-hour	69.8	71.1	1.3
		50	Annual	29.1	29.8	0.7
Liberty-Albany St./ Route 9A	CO	9	8-hour	4.3	4.9	0.6
	$PM_{2.5}$	65	24-hour	46.2	46.4	0.2
		15	Annual*	17.28	17.33	0.05
	PM_{10}	150	24-hour	63.4	72.7	9.3
		50	Annual	26.5	30.4	3.9

Notes: All PM concentrations are in μg/m^3; CO concentrations are in ppm.
All CO results are screening CAL3QHC analyses.
* $PM_{2.5}$ annual concentrations are neighborhood scale.

Impacts on air quality at any other location that would be impacted by the Proposed Action would be lower than those presented here for the three worst intersections, as described in section 14.3.5. Since no significant adverse air quality impacts were predicted at the three worst intersections, none would be expected at any other intersections identified in Chapter 13A, including those defined as level of service D, E, or F. ✷