Q. Air Quality

For air quality, the goal of CEQR is to determine a proposed action's effects on ambient air quality, or effects on the project because of ambient air quality. Ambient air quality, or the quality of the surrounding air, can be affected by air pollutants produced by motor vehicles, referred to as "mobile sources;" and by fixed facilities, usually referenced as "stationary sources." This can occur during operation and/or construction of a proposed action. This chapter of the manual discusses how to assess those impacts. This assessment typically uses computer models to predict pollutant concentrations. Because models are periodically revised and updated, the lead agency or analyst should check to be sure the most recent appropriate editions are being used before performing the analysis. Note that certain large stationary sources could require a review through the U.S. Environmental Protection Agency's (EPA) New Source Review procedures (see Section 710 below). The techniques described in this Manual do not replace those assessments, which have their own guidelines.

100. Definitions

110. SOURCES OF POLLUTANTS

111. Mobile Source

Vehicular traffic, both on the roads and in parking garages, can affect air quality. Other moving sources, such as planes, helicopters, boats, trains, etc., can also affect air quality. All of these sources of pollution are termed "mobile sources."

For CEQR, mobile source analyses consider actions that add new vehicles to the roads or change traffic patterns by diverting vehicles, either of which can have significant adverse air quality impacts. Actions that include parking lots or garages can also have significant air quality impacts from emissions within the facility affecting the surrounding environment. In addition, actions that do not even add any cars can have significant air quality impacts from mobile sources, if new uses are added near sources of pollutants, such as when a park is proposed beside a highway.

112. Stationary Sources

Other sources of pollutants are fixed in location, rather than mobile. These are termed "stationary sources." Stationary sources that can cause air quality impacts include exhaust from boiler stack(s) used for the heating/hot water, ventilation, or air conditioning systems of a building; the process exhaust points of a manufacturing or industrial operation; the stack emissions from a nearby power generating station; or the emissions from incinerators or medical or chemical laboratory vents.

A proposed action could have significant stationary source air quality impacts if it creates new stationary sources that affect the air quality in the surrounding community, such as a large new boiler that exhausts pollutants into the air. Conversely, stationary source impacts can also result when a proposed action adds new uses that would be affected by emissions from existing fixed facilities, such as might occur if a new residential building were built beside a power generating station. Proposed buildings can also cause stationary source impacts by changing the building geometry or topography of an area, so that existing fixed facilities begin to adversely affect other existing structures in the area.

Odors can also result from stationary sources. Significant odor impacts can occur when a new, odor-producing facility is created by an action, or when an action adds sensitive uses close to such a facility that would be affected by it.

113. Construction Activities

Potential air quality impacts from construction activities include the dust emissions generated by the construction of a new facility (or, likewise, the demolition of an existing structure that contains asbestos—see the hazardous materials chapter of the Manual, Chapter 3J, for further discussion on this issue); dust emissions related to sandblasting; the emissions from construction equipment (typically only an issue of concern for very large, multiphase actions); and the emissions from construction-generated traffic or diversions of traffic because of the project or its construction activities. Because these impacts are only temporary, they usually need to be assessed only when the action's construction period would be relatively long-term. However, the magnitude of construction activities is also considered—an analysis may be appropriate for certain activities, even if temporary, such as concrete batching plants.

120. POLLUTANTS OF CONCERN

National and state regulations identify a number of air pollutants that are of concern nationwide and statewide. These include seven key pollutants of general concern, and numerous other pollutants of concern primarily for industrial activities. Some pollutants, such as lead, may be present in the soil or groundwater as well. A discussion of the potential impacts associated with soil and groundwater contamination is included in Chapter 3J.

121. National and State Ambient Air Quality Standards

Seven air pollutants have been identified by the EPA as being of concern nationwide: carbon monoxide, hydrocarbons, nitrogen oxides, photochemical oxidants, lead, particulate matter, and sulfur oxides. As required by the Clean Air Act (CAA), National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: carbon monoxide, nitrogen dioxide, ozone (photochemical oxidants), respirable particulate matter, sulfur dioxide, and lead. (National standards for the seventh pollutant, hydrocarbons, have been rescinded because this pollutant is primarily of concern only in its role as ozone precursors.) In addition to retaining the PM_{10} (particulates that are less than 10 µm in diameter) standards, EPA has adopted proposed 24-hour and annual standards for particulate matter with an aerodynamic equivalent diameter less than 2.5 µm ($PM_{2.5}$). Table 3Q-1 shows the standards for these pollutants. These standards have been promulgated as primary and secondary standards. The primary standards are intended to protect the 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 carbon monoxide, nitrogen dioxide, ozone, and respirable particulates, the primary and secondary standards are the same.

121.1. Other National Standards

EPA has also published the National Emission Standards for Hazardous Air Pollutants (NESHAP), which limit the emission rates of certain highly toxic compounds, in most cases for specifically selected processes or operations. The NESHAP are listed in 40CFR61, and include emissions limitations for arsenic, asbestos, benzene, beryllium, mercury, radionuclides, and vinyl chloride. In addition, the U.S. Occupational Safety and Health Administration's (OSHA) and National Institute for Occupational Safety and Health (NIOSH) Short-Term Exposure Levels (STELs) can be used as a guideline for emissions typically present for short periods of time, such as chemical spills. In addition, the EPA has promulgated regulations that limit emissions of Hazardous Air Pollutants (HAPS) from any new facility to 10 tons per year (TPY) of any individual HAP, or 25 TPY of any combination of the 189 listed HAPs.

New York State has also set limitations on volatile organic compound (VOC) emissions from new sources at 25 TPY in New York City.

121.2. State Standards

New York State Ambient Air Quality Standards. The NAAQS have also been adopted as the ambient air quality standards for the State of New York. In addition to the NAAQS, there are New York State Ambient Air Quality Standards (NYAAQS) for total suspended particulates, hydrocarbons, hydrogen sulfide, fluorides, and beryllium. These pollutants are generally associated with industrial actions.

Noncriteria Pollutants. The New York State Department of Environmental Conservation (DEC) also publishes maximum allowable guideline concentrations for certain pollutants for which the EPA has no established standards, known as "noncriteria pollutants." The DEC's proposed guidelines are reported in *Draft Guidelines for the Control of Toxic Ambient Air Contaminants*, DAR-1, 1991 Edition. DAR -1 presents Annual and Short-Term Guideline Concentrations (AGCs and SGCs, respectively) for contaminants that range in toxicity from high to low. The AGCs and SGCs are annual and 1-hour guideline concentrations, respectively, for potentially toxic or carcinogenic air contaminants. AGCs and SGCs are guideline concentrations for noncriteria pollutants that are considered acceptable concentrations below which there should be no adverse effects on the general public's health. Since these AGCs and SGCs within the DAR-1 are updated periodically, when employing AGCs and SGCs for analyses, the latest available DEC DAR-1 AGC/SGC Tables must be used.

Table 3Q-1
National and New York State Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	PPM	Micrograms Per Cubic Meter	PPM	Micrograms Per Cubic Meter
Carbon Monoxide (CO)				
Maximum 8-Hour Concentration[1]	9		9	
Maximum 1-Hour Concentration[1]	35		35	
Lead (Pb)				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months		1.5		
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.05	100	0.05	100
Ozone (Photochemical Oxidants—O_3)				
1-Hour Maximum	0.12	235	0.12	235
8-Hour Maximum[1]	0.08	157	0.08	157
Inhalable Particulates (PM_{10})				
Annual Geometric Mean		50		50
Maximum 24-Hour Concentration[2]		150		150
Fine Particulate Matter (PM2.5)				
Annual Geometric Mean		15		15
Maximum 24-Hour Concentration1		65		65
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80		
Maximum 24-Hour Concentration[1]	0.14	365		
Maximum 3-Hour Concentration[1]			0.50	1,300

Note:

[1] The ozone 8-Hour standard is included for information only. A 1999 federal court ruling blocked implementation of this standard, which EPA proposed in 1997.

[2] Not to be exceeded more than once a year. A violation of standards would occur if these are exceeded more than once.

Sources: 40 CFR Part 50—National Primary and Secondary Ambient Air Quality Standards
40 CFR 50.12 "National Primary and Secondary Standard for Lead," 43 CFR 46245

Odors. DEC enforces regulations that generally state that no facility should emit measurable amounts of airborne pollutants that result in the detection of malodorous smells by the general public at any off-site locations. These regulations are found in the New York Codes, Rules and Regulations, Title 6, Chapter III — Air Resources, Subchapter A — Prevention and Control of Air Contamination and Air Pollution, Part 211 General Prohibitions. Part 211.2 prohibits "emissions of air contaminants to the outdoor atmosphere of such quantity, characteristic or duration which ... unreasonably interfere with the comfortable enjoyment of life or property. Notwithstanding the existence of specific air quality standards or emission limits, this prohibition applies, but is not limited, to any particulate, fume, gas, mist, odor, smoke, vapor, pollen, toxic or deleterious emission, either alone or in combination with others."

122. Regulated Pollutants.

The air pollutants for which national or state air quality standards exist, and the potential actions for which they would be of concern, are described below. In addition, Table 3Q-2 lists the air pollutants that might be of concern for different types of actions. (In addition, as described above, some pollutants, such as lead, may be present in the soil or groundwater as well. A discussion of the potential impacts associated with soil and groundwater contamination is included in Chapter 3J.)

122.1. Carbon Monoxide

Carbon monoxide (CO) is produced from the incomplete combustion of gasoline and other fossil fuels. In New York City, about 80 percent of CO emissions are from motor vehicles. Because this gas disperses quickly, CO concentrations can vary greatly over relatively short distances. Elevated concentrations are usually limited to locations near congested intersections and along heavily traveled and congested roadways. Consequently, it is important to evaluate concentrations of CO on a localized, or "microscale" basis. For proposed actions that would generate (or divert) a significant number of motor vehicles, it is appropriate to examine the potential incremental impact on CO levels from this traffic.

122.2. Hydrocarbons, Nitrogen Oxides, and Ozone (Photochemical Oxidants)

Hydrocarbons and nitrogen oxides (NO_x) are of concern because of their role as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of nitrogen oxides emissions from mobile sources are therefore generally examined on a regional basis. The change in regional mobile source emissions of these pollutants is related to the total number of vehicle miles of travel throughout the New York metropolitan area. Actions that would significantly increase the number of vehicle miles traveled throughout New York City would require an analysis of impacts on ozone levels from mobile sources. There is also a standard for average annual nitrogen dioxide (NO_2) concentrations. For proposed actions that could create large new sources of nitrogen dioxide, it may be appropriate to perform a stationary source analysis to determine the impact on nitrogen dioxide levels on the surrounding community.

122.3. Lead

Lead emissions 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.

In 1985, the EPA announced new rules drastically reducing the amount of lead permitted in leaded gasoline. 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 (three-month average). For proposed actions that could produce significant new sources of lead (e.g., lead smelters), resulting ambient lead levels in the surrounding community should be examined. For actions that promote the development of new

Table 3Q-2
Potential Pollutants of Concern for Typical Kinds of Actions or Uses Surrounding Those Actions

Type of Action/Use	Potential Issue of Concern	CO	PM	SO_2	NO_x	O_3	Pb	NC
Office, Retail, Mixed-Use, or Residential Building	Induced Traffic Induced Trucks or Buses Boilers Near Elevated Highway/Bridge Near Large Stacks (e.g., Con Edison)							
Manufacturing or Industrial	Induced Traffic Induced Trucks Boilers Process							
Hospital, Medical Center, and Laboratories	Induced Traffic Boilers Incinerators Process							
Parking lots/garages	Induced Traffic							
Bus or Truck Depots, Garages, Parking Lots, or Franchises	Induced Bus or Truck Traffic							
New or Modified Roadway	Induced Traffic							
Cogeneration/Power Plant	Process							
Demapping Built Streets	Traffic Diversion							
Transfer Stations	Induced Traffic Process							
Asphalt/Concrete Plants	Induced Traffic Process							

Notes: CO - Carbon monoxide
PM - Particulate matter (e.g., PM_{10})
SO_2 - Sulfur dioxide
NO_2 - Nitrogen dioxide and/or nitrogen oxides
O_3 - Ozone (i.e.,volatile organic compounds or nitrogen oxides that lead to ozone formation)
Pb - Lead
NC - Noncriteria or malodorous pollutants

structures that could be affected by existing stationary lead emitters (i.e., a new residential building proposed to be located near or in a manufacturing zone), it may be appropriate to perform an impact analysis of ambient lead levels on these structures.

122.4. Total Suspended and Respirable Particulates (PM_{10} and $PM_{2.5}$)

Particulate matter is emitted into the atmosphere from a variety of sources: industrial facilities, power plants, construction activity, concrete batching plants, waste transfer stations, etc. The primary concern is with those particulates that are less than 10 µm in diameter (referred to as PM_{10} and $PM_{2.5}$) and therefore respirable. EPA's proposed standards for particulate matter with an aerodynamic equivalent diameter less than 2.5 µm ($PM_{2.5}$) became effective September 16, 1997. $PM_{2.5}$ concentrations are a concern of a regional nature. Neighborhood scale analyses may be favored over microscale analyses. Gasoline-powered vehicles do not produce any significant quantities of particulate emissions, but diesel-powered vehicles, especially heavy trucks and buses, do emit particulates, and respirable particulate concentrations may be associated with high volumes of heavy diesel-powered vehicles. Parking garages or lots that would accommodate large numbers of diesel-powered vehicles could elevate PM_{10} and $PM_{2.5}$ levels in the surrounding area. Stationary sources that burn large volumes of fuel oil could also elevate PM_{10} and $PM_{2.5}$ in the surrounding area. Vehicular traffic also contributes to background levels of airborne particulate matter through brake and tire wear and by disturbing dust on roadways.

122.5. Sulfur Dioxide

Sulfur dioxide (SO_2) emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. No significant quantities are emitted from mobile sources. For actions that result in the development of stationary sources, evaluation of the potential impacts on ambient SO_2 levels may be appropriate.

122.6. Noncriteria Pollutants

Noncriteria pollutants include hundreds of toxic pollutants, ranging from high-toxicity contaminants, which are demonstrated or potential human carcinogens (cancer-causing); moderate-toxicity contaminants, including animal carcinogens, mutagens (causing mutations), and other substances posing a health risk to humans; and low-toxicity contaminants, which are of primary concern as irritants and have not been confirmed as carcinogens, mutagens, or teratogens (causing malformations). Noncriteria pollutants can be a concern for actions that would promote new airborne sources of such compounds (e.g., hospital waste incinerators), or actions that induce development of residential facilities within manufacturing zones with sources of these compounds. Examples of such instances include an action that would result in the development of a tall, residential building near a manufacturing area that has several low-level sources (one- to two-story industrial facilities with multiple exhaust stacks) of airborne toxic compounds; or new industrial sources, such as a solid waste facility, that could emit such compounds in potentially significant quantities.

122.7. Odors

In addition to the noncriteria pollutants described above, certain other pollutants are also of concern because of their odor, rather than their toxicity. These are of concern primarily because of the discomfort they can cause people, rather than the harm they do to the body. As an example, uncontrolled emissions of ammonia or sulfide compounds can result in detectable malodorous off-site pollutant levels, depending on the processes in which they are being used or from which they are a byproduct. Other compounds that can cause odors include amines, diamines, mercapatans, and skatoles. Activities that have the potential for releasing malodorous emissions in significant quantities include light and heavy industrial facilities and waste management facilities, including solid waste management facilities, water pollution control plants (i.e., sewage treatment plants), and landfills.

New York State has a one hour ambient air quality standard for hydrogen sulfide of 10 parts per billion (ppb). While hydrogen sulfide has a malodorous smell (similar to rotten eggs), the 1-hour New York ambient air standard is health-based and is applicable at all off-site locations when subject to CEQR review. In addition, the New York City Department of Environmental Protection (DEP) considers a 1 ppb increase as significant odor impacts from wastewater related processes. The 1 ppb guidance level is the recommended method when using hydrogen sulfide as a precursor for assessing malodorous compounds at sensitive receptors (e.g., residences, playgrounds). Since DEP is currently performing more detailed studies on the sources of malodorous pollutants of concern related to wastewater processes, it should be consulted before undertaking detailed odor impact assessments.

123. Compliance with Standards.

Historical monitoring data for New York City indicate that the ozone 1-hour standard is still exceeded several days a year during hot, bright sunny days when the air movement is relatively stagnant. To be in compliance an area must have no more than a single annual exceedance of the ozone 1-hour standard. Monitoring data have also shown that in New York City, the CO 1-hour standard has not been exceeded in many years. A single exceedance of the 8-hour CO standard was recorded in New York City in 1995, at the Brooklyn Transit traffic site (a DEC CO monitor located near the intersections of Tillary Street and Flatbush Avenue), and has been the only such exceedance since 1991. CO levels throughout the City have been significantly reduced over the past several years partially as a result of the introduction of newer, cleaner vehicles into the general mix of vehicles traveling in the City. This trend of gradually declining CO levels is expected to persist into the future because of continual vehicle turnover from older to newer vehicles, and adoption of tighter "tailpipe" emission standards mandated by the 1990 CAA Amendments. Under the 1990 CAA, New York State is required to attain compliance with the CO standard by December 31, 1995, and the ozone standard by 2007. The State is required to submit a State Implementation Plan to demonstrate how this compliance can be achieved and maintained in the future (see Section 711). Currently, the EPA is proposing to take New York City off the list of areas which are nonattainment with respect to carbon monoxide in response to the state-submitted CO Redesignation Request and Maintenance Plan for the New York Metropolitan Area that specifically demonstrates attainment of the NAAQS. The state has also submitted a final revision, known as “Phase II” for the State Implementation Plan for Ozone for the New York Metropolitan Area documenting how the area will attain the 1-hour ozone standard by 2007. The SIP was prepared to meet the 1-hour standard, which has been recently revised to an 8-hour ozone standard by EPA. However, a 1999 federal court ruling blocked implementation of this standard. EPA has asked the U.S. Supreme Court to reconsider that decision as it is expected that the 8-hour standard may become enforceable in the near future.

Air quality monitoring in Manhattan indicates that the annual average concentration of respirable particulates is above the national ambient air quality standard. EPA designated New York County (Manhattan) as a nonattainment area for respirable particulate matter (PM_{10}). The other four New York City boroughs are designated as in attainment for the PM_{10} standards. DEC is currently collecting ambient air data for $PM_{2.5}$, and based on the results of this multi-year monitoring effort, DEC and EPA will determine whether or not New York City is in attainment of the $PM_{2.5}$ standards. Three years of monitoring data are required. If portions of New York City are designated as nonattainment for $PM_{2.5}$, then there would be some time period for the City to attain such standards. Monitoring data for the other three national criteria pollutants demonstrate that New York City is in compliance with the corresponding NAAQS for these pollutants.

The limited monitoring data available for noncriteria compounds indicate that annual monitored arsenic, cadmium, and nickel concentrations are greater than the current AGCs for these substances in New York City. In addition, based on data reported from other urban areas, it is expected that the annual formaldehyde concentrations are greater than the current AGC.

It is recommended that the lead agency check with the New York City Department of Environmental Protection (DEP) for the latest background levels and compliance status prior to commencing detailed analyses.

124. Conformity

Conformity, a process mandated by the CAA, requires that air pollution emissions from federal actions not contribute to state air quality violations. Conformity is defined in Section 176(c) of the CAA as conformity to the State Implementation Plan’s (SIP) purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards, and ensuring that such activities will not: (1) Cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

EPA has promulgated criteria and procedures for determining conformity of all proposed actions that a federal agency is supporting, licensing, permitting, or approving. The purpose of these rules is to determine whether or not the proposed action would interfere with the clean air goals stipulated in the SIP. The criteria and procedures developed for this purpose are called “general conformity" rules. Currently, the general conformity requirements apply only in areas that are designated "nonattainment" or "maintenance" for CO, lead, nitrogen oxides (NO_x), ozone, PM_{10}, and sulfur dioxide (SO_2). A "nonattainment" area is designated by the EPA as exceeding the NAAQS. A "maintenance" area has been redesignated to "attainment" from "nonattainment" and must maintain the NAAQS for 20 years by following two sequential 10-year plans.

In addition to general conformity, CAA has special “transportation conformity” rules which support the development of transportation plans, programs, and projects that enable areas to meet and maintain national air quality standards for ozone, particulate matter, and CO which impact human health and the environment. Transportation conformity is a CAA requirement that calls for EPA, the Department of Transportation (DOT), and various regional, state and local government agencies to integrate the air quality and transportation planning development process. New York State has also adopted transportation conformity regulations (http://www.dec.state.ny.us/website/regs/240.htm), which are coordinated by the DEC Division of Air Resources.

130. AIR QUALITY ANALYSES

131. Microscale Analyses

Air quality pollutants except nitrogen oxides and total hydrocarbons (discussed below), may be of concern on a localized, or microscale, level: elevated concentrations can occur at particular locations. PM_{10} and $PM_{2.5}$ may be characterized at discrete sites or receptor locations or may be more appropriately characterized for a neighborhood or similarly scaled area. Therefore, these pollutants are assessed on a microscale level, which considers pollutant concentrations at particular sites.

For these microscale analyses, air quality impacts are assessed by considering the pollutant source—specifically, the type and magnitude of pollutants being emitted from the mobile or stationary sources—and dispersion, or the way these pollutants mix with the ambient air and become dispersed before reaching the analysis locations, given meteorological conditions (such as wind speed, wind direction, atmospheric stability, and temperature), the distance between the source and the receptor, roadway and building geometry, and other factors. Often, mathematical models are used to make these predictions of emissions; mathematical or physical models, such as wind tunnels, are always used to evaluate dispersion. Calculating the emissions and their dispersion provides the particular source's contribution of pollutants to the ambient air at a given location (called a "receptor"). This value is added to the general background concentrations of that pollutant to find the total concentration of the pollutant at the receptor being assessed.

For use in the dispersion models, mobile and stationary sources of air pollutants can be considered either line sources, area sources, or point sources, as follows:

- *Line sources.* A source of pollutant emissions that can be simulated as a continuous or segmented group of lines in a mathematical model is considered to be a "line" source. Typical examples of line sources include emissions from vehicular traffic traveling along a roadway that is curved, elevated, at-grade, or below grade with an opening above (otherwise know as a "cut-section"); particulate emissions from traffic traversing an unpaved or dusty roadway; and emissions from industrial operations, such as conveyor belt operations.

- *Area sources.* Emissions that can be simulated over a small region are "area" sources. Typical area sources include the following: emissions from vehicles traveling in a parking lot or multilevel parking facility; pollutants discharged through multiple exhaust stacks around the rooftop of a building or several buildings; particulate emissions from an outdoor storage area of fine particulate material; and pollutant emissions from an industrial process that is distributed over large sections of a manufacturing plant.

- *Point sources.* "Point" sources are pollutant discharges from a relatively small, restricted area. Sample applications of point sources are pollutants released through boiler exhaust stacks; emissions from power generating station stacks; release of chemicals discharged through the exhaust vents from a medical laboratory; effluent from an incinerator; CO released through an exhaust vent for a parking garage; and discharge from the vent for a spray booth.

The models should generally conform with the EPA's *Guideline on Air Quality Models*, which is periodically updated.

132. Mesoscale Analyses

Nitrogen oxides and hydrocarbons are concerns on a regional, or mesoscale, level. They are of concern because they are precursors to ozone (both can react in sunlight to form photochemical oxidants, also known as ozone, or smog). This reaction occurs relatively slowly and takes places far downwind from the site of the actual pollutant emission, and therefore cannot be related to localized changes. Consequently, the effects of these two pollutants are examined on an areawide, or mesoscale, basis. The area for examination would typically be large, such as an entire borough, or the entire City of New York, or even the tri-state metropolitan area. Such an analysis is rarely performed, however, because few actions have the potential to affect ozone over such large regions. CO and PM_{10} are also analyzed on a regional basis if the action could significantly affect background levels of these pollutants.

200. Determining Whether An Air Quality Assessment is Appropriate

The following guidelines for determining whether air quality analyses are needed were developed using a combination of examination of historical air quality data in New York City and prototypical air quality modeling.

210. MOBILE SOURCES

Actions—whether site-specific or generic—can result in significant mobile source air quality impacts when they increase or cause a redistribution of traffic, create any other mobile sources of pollutants (such as diesel trains, helicopters, etc.), or add new uses near mobile sources (roadways, garages, parking lots, etc.). The following actions may result in significant adverse air quality impacts from mobile sources and therefore require further analyses, which may include microscale analyses of mobile sources (complete the assessment section of Chapter 3O of this Manual, "Traffic and Parking," before reviewing this checklist):

- Actions that would result in placement of operable windows, balconies, air intakes, or intake vents generally within 200 feet of an atypical (e.g., not at-grade) source of vehicular pollutants, such as a highway or bridge with a total of more than two lanes.
- Actions that would result in the creation of a fully or partially covered roadway, would exacerbate traffic conditions on such a roadway, or would add new uses near such a roadway.
- Actions that would generate peak hour auto traffic or divert existing peak hour traffic, resulting in the following:

  50 or more auto trips in sections of downtown Brooklyn, or Long Island City, Queens (see Figures 3Q-1 and 3Q-2Q-2);

  75 or more auto trips in Manhattan between 30th and 61st Streets; or

  100 or more auto trips in all other areas of the City.
- Actions that would result in a substantial number of local or regional diesel vehicle trips.
- Actions that would result in new sensitive uses (particularly schools, hospitals, parks, and residences) adjacent to large existing parking facilities or parking garage exhaust vents.
- In addition, applications to the City Planning Commission requesting the grant of a special permit or authorization for parking facilities pursuant to Section 13-43 of the Zoning Resolution must be referred to DEP for its report on air quality at the proposed location.
- Actions that would result a sizable number of other mobile sources of pollution, such as a heliport, new railroad terminal, or trucking.

Figure 3Q-1
Area of Concern in Downtown Brooklyn

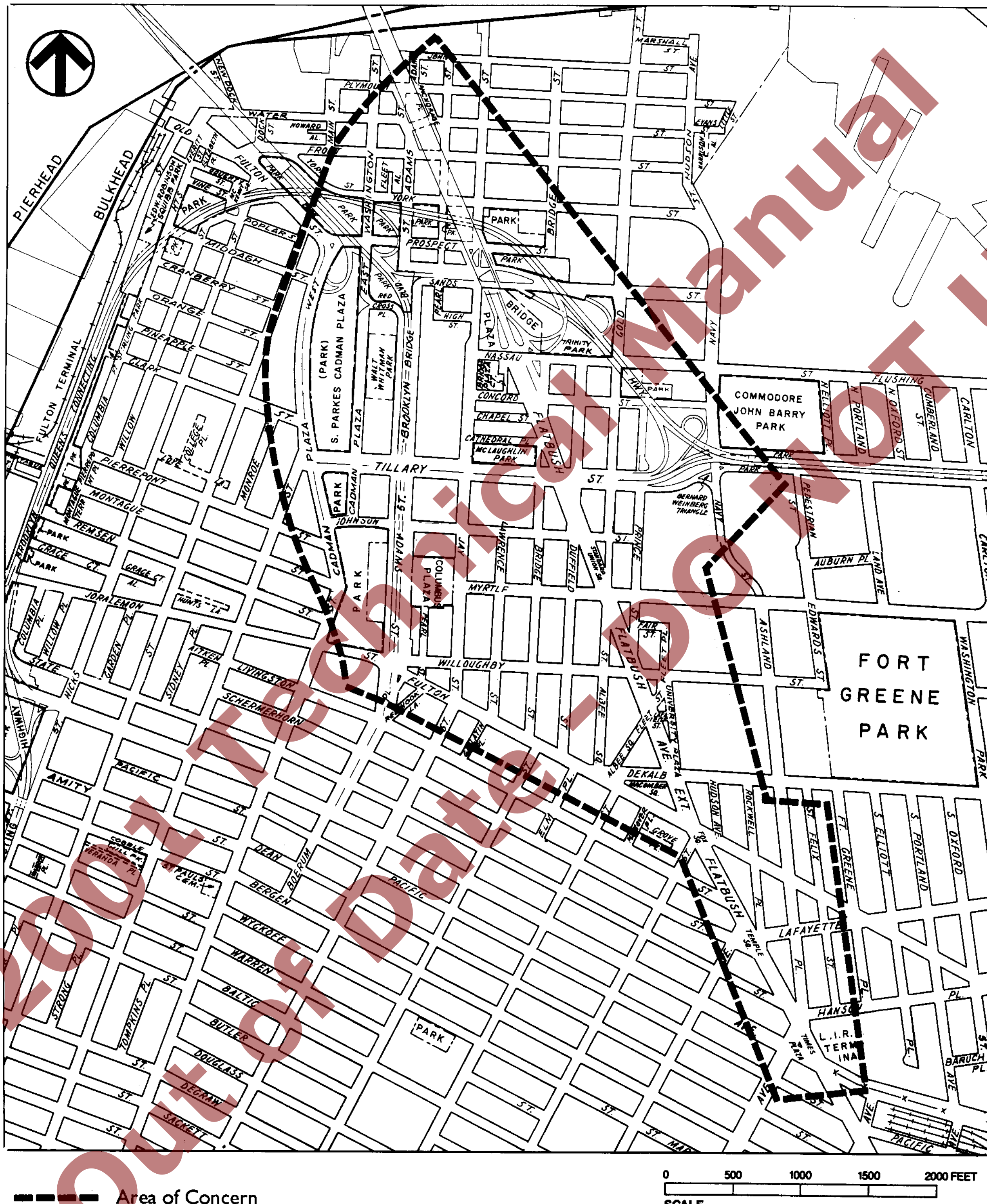
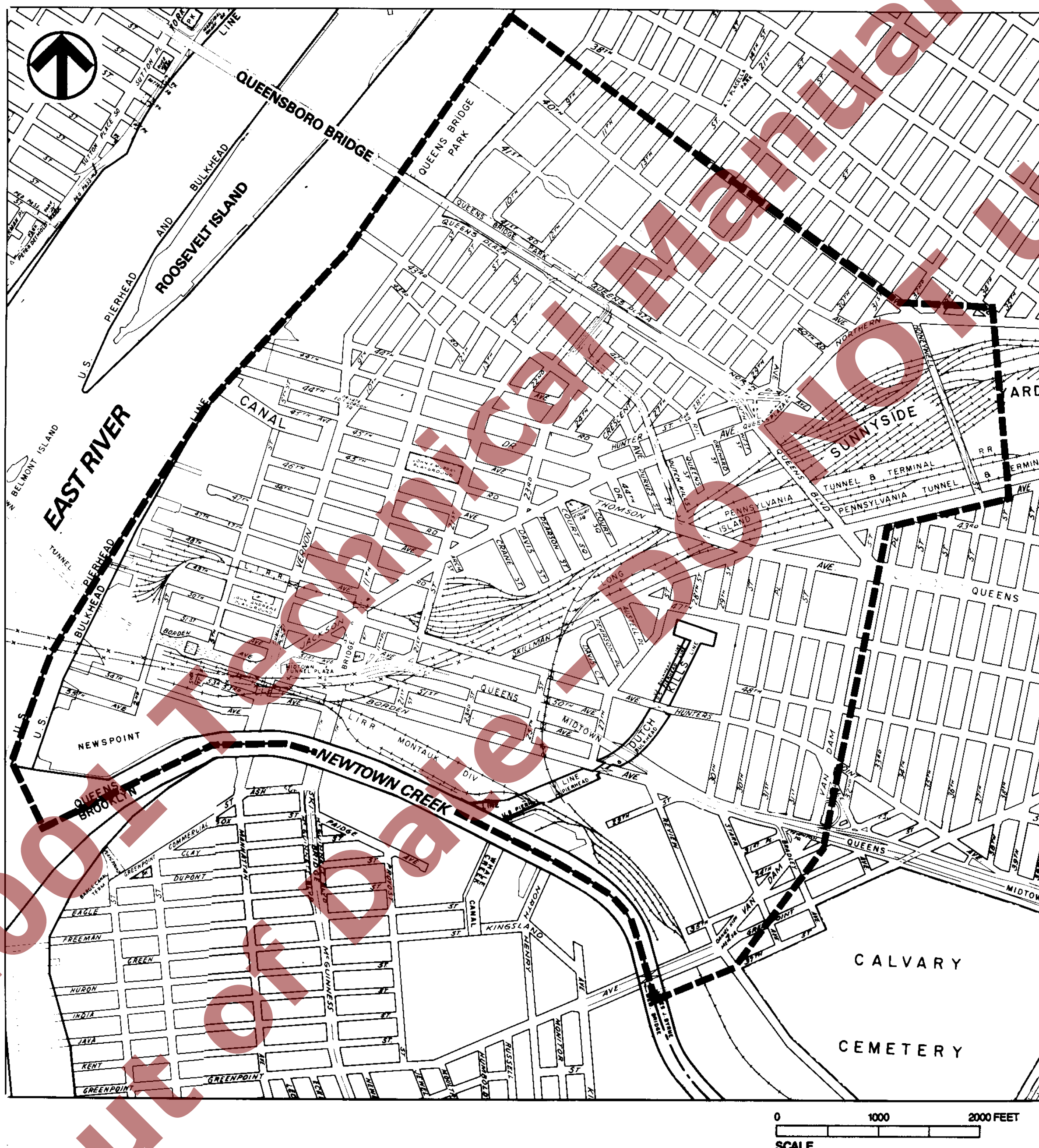


Figure 3Q-2
Area of Concern in Long Island City



Area of Concern

In addition, actions that would substantially increase the vehicle miles traveled in a large area (a borough, the City, or larger) may require mesoscale analyses of the effects on ozone.

220. STATIONARY SOURCES

Actions can result in stationary source air quality impacts when they create new stationary sources of pollutants—such as emission stacks for industrial plants, hospitals, or other large institutional uses, or even a building's boilers—that can affect surrounding uses; when they add uses near existing (or planned future) emissions stacks, and the new uses might be affected by the emissions from the stacks; or when they add structures near such stacks and those structures can change the dispersion of emissions from the stacks so that they begin to affect surrounding uses. (Note that the Building Code of the City of New York regulates the placement of chimneys and vents and of buildings relative to nearby chimneys and vents, and that the Zoning Resolution contains performance standards for emissions from manufacturing uses. These regulations are independent of CEQR, but may apply to actions that are being assessed under CEQR. See Section 713, below.) The following actions could result in significant adverse impacts related to stationary sources, and therefore require stationary source analyses:

- Actions that would use any fossil fuels (fuel oil or natural gas) for their heating/hot water, ventilation, and air conditioning systems (note that single-building projects may be able to perform a screening analysis rather than detailed stationary source analyses; see Section 322.1, below).
- Actions that would create large emission sources, including but not limited to the following: solid waste or medical waste incinerators, cogeneration facilities, asphalt and concrete plants, or power generating plants.
- Actions that would result in sensitive uses (particularly schools, hospitals, parks, and residences) located within 1,000 feet of a large emission source (see above).
- Actions that would include medical, chemical, or research labs.
- Actions that would result in sensitive uses being located near medical, chemical, or research labs.
- Actions that would include operation of manufacturing or processing facilities.
- Actions that would result in sensitive uses (such as residences, schools, hospitals, parks, etc.) within 400 feet of manufacturing or processing facilities.
- Actions that would result in sensitive uses within 400 feet of a stack associated with commercial, institutional, or large-scale residential developments, and the height of the new structures would be similar to or greater than the height of the emission stack.
- Actions that would result in potentially significant odors. This includes, but is not limited to, solid waste management facilities, water pollution control plants (i.e., sewage treatment plants), and incinerators.
- Actions that would result in sensitive uses within 1,000 feet of an odor-producing facility (see above).
- Actions that would create "non-point" sources, such as particles from unpaved surfaces and storage piles. These particles are also known as fugitive dust.
- Actions that would be affected by non-point sources (see above).

Stationary sources can also be an issue for generic or programmatic actions that would change or create a stationary source (as described above) or that would expose new populations to such a stationary source.

230. CONFORMITY

All actions that require federal support, federal licensing, federal permitting, or federal approval are subject to the conformity requirements. Examples of actions that are subject to “general conformity” would be an airport expansion, a veteran's hospital expansion, and new federal court facilities. Highway and transit projects are examples of projects which must comply with “transportation conformity” requirements.

300. Assessment Methods

310. STUDY AREAS AND RECEPTOR LOCATIONS

The first step in performing air quality analyses is to determine the appropriate study area. This is the region and/or locations where there is the potential for a significant air quality impact resulting directly or indirectly from the action. Thus, the extent of the study area depends on the action proposed (and therefore, the pollutants of concern).

For mesoscale analyses, which are rarely performed for CEQR, the study area is the area that would be affected by the large-scale change in pollutant sources. For example, if an action would result in a large increase in the number of vehicle miles traveled in the City, the study area would be the entire City. This delineation can be difficult, however—the analysis must consider the origins and destinations of those vehicle trips to assess whether a larger area should be studied. On the other hand, choosing a study area that is too large will make the relative effects of one action seem insignificant (for example, if the action would greatly increase the number of vehicle miles traveled in the City, but the analysis considered the tri-state metropolitan area, the action's effect might be inappropriately considered insignificant).

For microscale, or localized, analyses, air quality predictions are not made for an entire study area; they are made instead for specific locations, such as intersections, and at those locations, for specific geographic points. These prediction locations, called "receptor locations," or simply "receptors," are, from among all the locations to which people will have continuous access when the action is implemented, those where the worst air quality impacts are expected. For mobile source analyses, the study area often consists of intersections where congestion is expected; receptors are sited at numerous locations at these intersections. Median strips or crosswalks in roadways are not appropriate receptor locations, since the public would not be in those locations for more than a few minutes; sidewalks and other ground-level locations alongside roadways and highways are often receptor locations. Sometimes, particularly for stationary source analyses, elevated receptors are located high up on the faces of buildings, either existing or proposed, if there is or will be an operable window or air intake vent at that location. An elevated location without an operable window would not be a receptor location, however. Different study areas and receptor locations will be appropriate depending on whether mobile or stationary sources are being examined, as follows. Consideration of potential cumulative impacts from other nearby substantial sources of pollution (e.g. a heat input of 2.8 million BTU/hour or higher) may also be required in such analyses.

311. Mobile Sources

311.1. Roadways

Locations for Study. The study area for mobile sources is directly related to the action's traffic study area (explained in Chapter 3O). It usually includes those intersections where traffic congestion is expected, since this is where air quality impacts are likely to occur. The choice of which intersections to include in the mobile source air quality analysis is based on the estimates of incremental vehicular traffic associated with the action, following the guidance provided in the traffic and parking chapter of this Manual. The study area should include at least any of the following locations:

- Based on peak hour traffic assignments, intersections in the traffic study area to which the action would add the following incremental traffic;

  —50 or more auto trips in downtown Brooklyn or Long Island City, Queens;

  —75 or more auto trips in Manhattan between 30th and 61st Streets;

  —100 or more auto trips in the rest of the City; or

  —a substantial number of local or regional diesel vehicle trips.

- When covered roadways are a concern (e.g., when the action would create, exacerbate traffic conditions on, or add new uses near a fully or partially covered roadway), locations within and adjacent to the fully or partially covered roadway.

- Locations adjacent to an atypical (e.g., not at-grade) source of pollutants (if those receptors or the source is created by the action), such as a multilane highway or bridge.

For some actions, following the criteria for determining the study area listed above will result in too many or too few intersections to be analyzed. After determining the general study area, the following procedure may be used to choose intersections for further study:

- Choose three or four intersections where the projected incremental traffic increase is greater than the thresholds suggested above for a preliminary analysis. These intersections should be those with the worst conditions—those that would process the largest traffic volumes if the action is implemented or would be severely congested under the no action scenario (and will be affected by the action-generated or diverted vehicular traffic), and/or those at which the greatest traffic impacts would result from the action.

- Perform a mobile source analysis for these intersections (following the procedures set forth later in this chapter). This initial analysis will provide an indication of the magnitude of the action's impacts.

- If any significant impacts are predicted, review the study area to consider whether additional intersections with less severe traffic conditions should be added.

- This procedure may need to be repeated several times until enough receptor locations have been chosen to accurately characterized the action's mobile source air quality impacts.

Therefore, when initially collecting traffic data to be used for air quality analyses, it may be prudent to collect data from additional intersections that may be of some concern. Returning to collect these data on a different day, should those intersections be added to the air quality study area later, can lead to data inconsistencies that are difficult to resolve. Traffic data are collected for all roadway segments ("links") within 1,000 feet of the intersection of concern.

For generic or programmatic actions, the study area would depend on the nature of the action proposed and the amount of information that exists about its implementation. The air quality analyses can follow the same procedure used for the traffic analyses in these cases. Typically, depending on the size of the proposed action, certain areas are chosen as representative of all the types of areas that may be affected, and within those areas, intersections are selected as representative critical analysis locations. The air quality assessment would then be performed in the same way as for any other intersections.

Receptor Locations. For each of the intersections selected for study, receptor locations are chosen. Numerous receptors are sited at each intersection studied, to accurately characterize the ambient air quality there. As described above, receptors are generally located where the maximum total pollutant concentrations with the action or incremental pollutant concentrations resulting from the action are likely to occur and where people are likely to have continuous access. This usually means that receptors are located near those approaches of the intersection where traffic is likely to be the greatest or the most congested (e.g., where vehicles are delayed waiting at traffic signals). Examples of reasonable receptor sites are:

- Sidewalks near roadways;

- Edge of right-of-way for roadways without sidewalks, if publicly accessible;

- Property lines of all residences, hospitals, schools, playgrounds, and the entrances and air intakes to all other buildings;

- Portions of a parking lot to which pedestrians have continuous access;

- Parks proximate to roadways; and

- All air intakes or operable windows adjacent to elevated emission sources such as elevated highways or bridges for vehicular traffic.

Receptors are *not* located in places that are not considered ambient air (in other words, places where the public does not have continuous access). Some locations, such as tollbooths, are not considered accessible to the public although particular people may work there all day. The air quality at these locations is regulated by the U.S. Occupational Safety and Health Administration (OSHA), which has promulgated various workplace standards. Examples of unreasonable receptor sites according to EPA guidelines are:

- Median strips of roadways;

- Locations within the right-of-way on limited access highways;

- Locations within intersections or on crosswalks at intersections; and

- Tunnel approaches.

When analyzing pollutant levels near an intersection, at least one receptor at each corner of the intersection and one or two receptors adjacent to each queue (line of vehicles waiting at a traffic signal) on an approach link (the segment of roadway between two intersections, approaching the intersection being analyzed) to the primary intersection under analysis is analyzed. Multiple receptors are used to determine the location of both the highest total pollutant concentration and the highest increment caused by the action. Therefore, a series of receptors at different locations are assessed. Depending on the analysis results at these receptors, additional receptor locations may be appropriate. For example, if significant impacts are predicted at the receptors farthest from the intersection, additional receptors are added still farther away, until no impact is predicted. Receptors should be placed at midsidewalk, generally 6 to 7½ feet from the curbline of the sidewalk (for wider sidewalks, no more than 7½ feet from the curb), and set back from the corner of the intersection. If this results in receptors in the mixing zone (for the CAL3QHC version 2.0 model, discussed below), the mixing zone should be narrowed so that receptors are 1 foot from the edge of the mixing zone.

311.2 Parking Facilities

The locations where the worst potential air quality impacts might result from parking facilities' emissions (and, therefore, the locations where receptors should be placed in an air quality analysis of these facilities) vary depending on whether the facility would be open and at-grade (a parking lot), multilevel and open-sided (therefore, naturally ventilated), or totally enclosed (parking garage). As discussed later in Section 321.2, potential cumulative impacts from both on-street and off-street sources of emissions may be required in such analyses. Each of these is discussed below.

Parking Lots and Open-Sided Garages. The greatest potential pollutant concentrations from at-grade, unenclosed parking lots or multilevel, open-sided parking facilities would be immediately adjacent to such facilities, with the additional potential for cumulative impacts from pollutant emissions from the facility and from nearby on-street sources. Therefore, receptor locations are placed on sidewalks adjacent to and across the street from the garage.

Enclosed Garages. In the case of parking garages that are to be totally enclosed and mechanically ventilated, potential impacts from the exhaust vent(s) are assessed. The greatest impacts from the exhaust vent(s) might occur at a nearby residential building if the vent(s) are exhausted above the rooftop of the garage, or at pedestrian height if the vent(s) are near ground level. (The exhaust vents are actually stationary sources—even though the exhaust is from cars within the garage, the emissions emanate from a fixed location—and are assessed in the same way as other stationary sources; see the discussion of analysis techniques, below.) Receptor locations are placed at elevated locations on nearby residential buildings when rooftop exhaust vents are being assessed, and at sidewalk locations adjacent to and across the street from the vent(s) when other, pedestrian-level vents are being examined.

312. Stationary Sources

312.1. Study Area

Study areas for the analysis of stationary source impacts depend on the magnitude of the pollutant emission rates from the new source(s), the relative harmfulness of the compounds emitted, the characteristics of the systems that would discharge such pollutants (e.g., stack heights, stack exhaust velocities, etc.), and the surrounding topography relative to these sources (e.g., tall residential buildings near shorter stacks). Similar to mobile sources, the study area consists of particular locations chosen for study, although in this analysis, those receptors are not usually located at intersections.

- When the proposed action would result in a new stationary source, the following general guidelines may apply:

    1. For actions that would result in a single building that would use any fossil fuels (fuel oil or natural gas) for the heating/hot water, ventilation, and air conditioning systems, first perform the screening analysis presented below (Section 322.1). If further analyses are required, the study area should generally include nearby tall buildings—particularly any tall buildings of comparable height to the stack.

    2. For actions that would result in more than one building that would use fossil fuels for heating/hot water, ventilation,

and air conditioning, the study area would generally include the area within 400 feet from the boundaries of a project site.

3. For actions that would include operation of manufacturing or processing facilities, or medical, chemical, or research labs, at least the area within a 400-foot radius should be included in the study area.

4. For actions that would create large emission sources, including but not limited to, solid waste or medical waste incinerators, cogeneration facilities, asphalt and concrete plants, or power generating plants, the study area should include at least the area within a 1,000-foot radius of the new source(s).

5. Major sources require the preparation of a cumulative air impact assessment, which would analyze the effect of a proposed project's emissions in conjunction with other existing or planned projects, which might have combined air impacts at receptor sites.

6. For actions that would result in potentially significant odors, including, but not limited to, solid waste management facilities, water pollution control plants (i.e., sewage treatment plants), and incinerators, the study area should include at least a 1,000-foot radius.

- When the proposed action would result in the addition of sensitive uses near stationary sources, the analysis considers the effects of those sources on the site of the action.

- For actions that would create "non-point" sources, such as fugitive dust, the effects on the nearest locations to which the public has general access are typically considered.

Generally, a preliminary analysis is performed for the locations chosen using the above criteria. If significant impacts are predicted at all or most of the chosen locations, it may be appropriate to expand the study area so that more distant locations are included where potential significant impacts may also occur. Alternatively, a preliminary screening analysis can be performed for several locations at various distances from the stationary source. The results of this screening analysis will determine the radius where the maximum impacts from the source will be calculated in a more detailed analysis. When more detailed modeling analyses may be required, it may be appropriate to submit a detailed modeling protocol to the lead agency for review and approval before undertaking such extensive studies. The lead agency may wish to consult with DEP for its advice on the detailed modeling protocol.

For generic or programmatic actions the first step would be to consider the potential ranges of stationary sources that could be a concern. Then, prototypical worst-case scenarios assuming prototypical stationary sources could be addressed.

312.2. Receptor Locations

Similar to the procedure for mobile sources, numerous receptors are analyzed at each of the locations to be studied in the assessment of stationary sources. These are located where the maximum total pollutant concentrations or incremental pollutant concentrations resulting from the action are likely to occur and where people are likely to have continuous access. When the action would result in a new stationary source, off-site receptor locations are usually modeled; on-site receptors may also be appropriate. For analyses of the effects of heating/hot water, ventilation, and air conditioning systems or other stacks, receptors are placed at elevated locations on nearby buildings (at operable windows or air intake vents). On the other hand, when development related to the action could be affected by existing (or planned) stationary sources, receptors are typically located on the project site. For actions that would result in development that could affect the dispersion of pollutants from an existing emissions source (e.g., power generating station), receptors are placed both on-site and off-site at locations where pollutant levels could increase significantly because of the changes in dispersion of the emissions from the source.

Examples of reasonable receptor sites include the following:

- Pedestrian-height receptors on sidewalks.

- Exterior uses, such as parks and playgrounds, and entrances and air intakes to sensitive interior uses, such as residences, hospitals, nursing homes, schools, and community facilities.

- Buildings with operable windows (i.e., windows that can be opened and closed by the tenant)—usually just residential buildings. Receptors may be at elevated locations, such as at operable windows anywhere on the building. When receptors are placed on a structure with operable windows, such as a tall residential building, multiple receptors should be placed along the building faces (from roof level down along the side of the building) closest to the source(s) under analysis.
- Air intake vent locations of buildings.
- Balconies on buildings and other accessible areas at elevated locations on buildings, such as rooftop decks, etc.

If there are substantial differences between the local grade levels of the source(s) and the receptors, the differences in terrain should be accounted for in the mathematical modeling. When performing either mathematical modeling or physical modeling, such as wind tunnel studies, some initial test runs should be performed with the first set of selected receptor sites. Based on these initial test runs, it will be possible to determine the specific locations or general regions where additional receptors should be added to ensure that the locations where the maximum total pollutant levels and incremental changes in concentration from the action are included in the complete analysis.

320. MODELS AND ANALYSIS TECHNIQUES

For CEQR analyses, air quality is usually assessed at the microscale level, using mathematical models that predict the pollutant concentrations for given locations. The models take into consideration all the different elements that can affect air quality—the pollutants being emitted from the mobile sources (usually, vehicle tailpipes) or stationary sources (usually, stacks), and the way these pollutants are dispersed, given meteorological conditions and roadway and building geometry. Generally, models are used to predict the pollutant concentrations for existing and future conditions; field monitoring of air quality is seldom used. Models used for the air quality assessment generally should conform with the U.S. EPA's *Guidelines on Air Quality Models* or should be approved by the lead agency as appropriate on a case-by-case basis.

Predictions are typically made for the future no action condition and the future with the action in place, so those scenarios can be compared and an action's effects on air quality determined. For mobile sources, the predictions for the analysis year are made using mathematical or physical models rather than actual monitoring, and the existing condition does not serve as a baseline for predicting the future (as it does in other technical areas). Predictions of pollutant concentrations are made separately for each of the analysis years chosen. For analyses of the effects of existing stationary sources, information on the existing pollutants being emitted from the source in question is obtained, and the analysis assumes that the future emissions are the same, unless available information indicates otherwise. Existing conditions are typically included in the analysis for illustrative purposes.

1. The following general procedures are used for microscale analyses of both mobile and stationary sources. These are described in detail in the sections that follow (Section 321 through 324). (Also note that actions that would result in single buildings can complete the stationary source screening analysis in Section 322.1 to determine the potential for significant impact from stationary sources before proceeding to more detailed analysis.)
2. Determine which pollutants will be assessed. This depends on the nature of the proposed action.
3. Choose a preliminary study area and receptor locations (see Section 310, above).
4. Determine the emissions of pollutants from the sources of concern.
5. Estimate the dispersion of those pollutants into the air, using a model.
6. To the predicted pollutant concentrations at the receptor locations resulting from the source, add the appropriate background pollutant concentrations to determine the total concentrations for the pollutants of concern at each receptor site.

7. Compare the predicted concentrations for each pollutant of concern with the appropriate standards and criteria (see Section 400).

Sections 321 and 322 describe the methodology for predicting microscale mobile and stationary source pollutant concentrations, respectively—whether for existing conditions, no action conditions, or the future with the action in place. They describe the various models appropriate for mobile and stationary source analyses, as well as how those models are applied. Input parameters to the models, methodological assumptions, and limitations of the models are also discussed. The approach to assessing construction impacts is discussed in Section 323. Mesoscale analyses are discussed separately in Section 324.

321. Microscale Mobile Source Modeling

CO is the primary pollutant of concern for most microscale mobile source analyses, including the assessments of roadways and automobile parking lots and garages. For parking lots and garages used primarily by heavy-duty diesel-powered trucks and buses, and for actions generating bus or truck traffic with the potential to affect nearby sensitive receptors for a prolonged period of time, respirable particulates may also be of concern.

The basic tool for analyzing pollutant concentrations from mobile sources is the air pollutant dispersion model. These models estimate CO and PM_{10} concentrations under given conditions of traffic, meteorology, and roadway configuration, as follows. First, traffic data for the analysis years are input into the model. Then, emissions from vehicle exhaust systems (and other on-road sources of emissions for particulate matter), and their distribution over the roadway, are estimated for that year, using a separate mathematical model. However, for areas with complex topography or actions that propose or would affect a fully or partially covered roadway, it may be more appropriate to use physical rather than mathematical models to assess the potential for significant impacts. The way these emissions are dispersed because of meteorological conditions, roadway geometry, and other factors is then considered.

321.1. Roadways

Mobile source analyses related to roadways are performed for actions that change traffic patterns, add traffic to an area's roadways, or reconfigure roadways, or for actions that could be affected by pollutants from roadways. Typically, they assess at-grade intersections or street corridors with adjoining sidewalks. Sometimes, analyses are needed for major sources of CO or particulate matter, such as multilane highways or bridges, or partially or fully covered roadways.

Traffic Data Requirements. Before any mobile source impact analysis can be performed, input data on the vehicular traffic conditions on the roadways near the receptor sites under analysis will be required. Data are generally collected, and analyses performed, for roadway "links." A link is the section of roadway between two traffic signals. The links leading to a particular intersection are also called "approaches." At a minimum, the following information is required for each signalized street segment approach included in the mobile source modeling of at-grade roadways for each time period analyzed:

- Vehicle classifications—the relative mix of autos, taxis, trucks, etc. For air quality modeling, vehicles are divided into the following classifications: autos, sport-utility vehicles (SUVs), taxis, light-duty trucks (those with four wheels, including vans and ambulances), heavy-duty gasoline-powered trucks and buses (heavy duty trucks have six or more wheels), and heavy-duty diesel-powered trucks and buses. Documentation on the procedures used to distinguish among the different vehicle types and weight categories when field surveys are performed is provided in the appendix.
- Hourly traffic volume.
- Width of traveled roadway (the effective width of the roadway).
- Average speed of base traffic.
- Stopped delay at the intersection.
- Number of moving lanes.
- Signal cycle length.
- Red time length per cycle.

In addition, the following information, derived from the Highway *Capacity Manual* (see Chapter 3O, "Traffic and Parking"), is also needed:

- Saturation flow rate (a measure of each lane's vehicular capacity per hour of green time).
- Arrival type—the way traffic arrives at a light (e.g., in a constant stream or in platoons), which depends on how lights at the adjacent intersections are timed (and, particularly, the extent of signal timing progression for those lights).
- Signal type—pretimed, actuated (a signal that changes in response to the presence of a vehicle), or semi-actuated.

These data are collected for at least 1,000 feet from the intersection to be analyzed. Traffic data should also be gathered for all links within 1,000 feet of the intersection. Those links should be modeled in their entirety. It is generally not necessary to collect traffic data and model links that begin beyond 1,000 feet of the intersection. These links should also be modeled in their entirety. The traffic and parking chapter of the Manual provides more information on many of these traffic parameters, including specifically, procedures for collecting travel speed and delay data for subsequent use in air quality analyses. Others are parameters used only for air quality analyses (and not for traffic impact analyses); coordination with the traffic task will be required to ensure that the appropriate data are collected in the field.

Estimates of Mobile Source Emissions. Emissions models predict the distribution of pollutants emitted from vehicles' exhaust systems over the roadway (for both idling and moving vehicles). The primary pollutant of concern from mobile sources on roadways from autos is CO, while particulate matter may be more of concern from diesel trucks and buses. Emissions models used to analyze CO and particulate matter from mobile sources are a series of computer programs developed by EPA and periodically updated to account for the most recent test data on new vehicles under production (and any revised standards for emissions from new vehicles, also called "tailpipe" standards). At the issuance of this manual, EPA's MOBILE5B program is the most recent version of the mobile emissions factor model for CO emissions estimates, and PART5 is the latest emissions models for particulate matter for on-street mobile sources. DEP believes that the prediction of PM_{10} emissions from Mobile PART5 model may over-predict PM_{10} emissions from mobile sources since it may over-emphasize the contribution of reentrained dust concentrations under various simulation conditions. However, EPA is continually updating the MOBILE model to reflect changes in emissions characteristics of on-road vehicles. The next version of the MOBILE model is expected to be MOBILE6.

Each new version of MOBILE reflects the collection and analysis of new test data. It also incorporates changes in vehicle, engine, and emission control system technologies; changes in applicable regulations, emission standards, and test procedures; and improved understanding of in-use emission levels and the factors that influence them.

MOBILE6 will represent the first major update to EPA's emission factor model since the release of MOBILE5b in 1996. It will allow for more detailed vehicle classes, and account for new regulations promulgated since MOBILE5b. DEP should be consulted for information regarding new releases and updates to mobile emissions models.

The various factors to be considered when using mobile emissions models are described below. These general guidelines are intended to provide conservative estimates and may be revised at times when specific data about a project or location is available.

- *Ambient temperature.* Estimates of CO emissions should be computed with a mobile model at 50° in Manhattan and 43ºF for the rest of the City (these are for winter conditions), unless an action would generate a significantly larger number of (or only) vehicle trips during the summer period, when a higher ambient temperature for CO emissions calculations might be prudent. These recommended temperatures are revised at times to reflect the most recent recorded data from CO monitoring, and DEP should be contacted to make sure the most recent temperature guidance for CO modeling is understood. The current EPA emissions model for particulates, PART5, does not require temperature as an input variable. If a summer CO analysis is required, the appropriate ambient temperature would be determined by examining meteorological data for the period of concern following this procedure:

A summer temperature can be determined by following the general recommended procedures in EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections*, (EPA-454/R-92-005). As a first step, three years of the most recent hourly CO monitoring data at DEC's nearest CO street level monitor needs to be obtained and used to compute running 8-hour average CO levels for each of the three complete years. Then the highest and second highest non-overlapping periods for the entire year should be calculated, and compared to the values reported by the DEC. This step will indicate that the data and calculations are accurate.

The next step would be to parse out the 8-hour CO concentrations for the summer period of interest for each year. Based on the guidance in Section 4.7.1 of the EPA document referenced above, the temperature corresponding to each of the ten highest non-overlapping 8-hour CO monitoring values for the last three years for the period of interest should be obtained. Temperatures for these time periods would be based on the corresponding values recorded at the nearest representative meteorological surface station for these 10 time period sets. The ten average temperatures would then averaged for use with emissions modeling.

- *Vehicle operating conditions (auto thermal states).* For automobiles and light-duty gasoline-powered trucks, emission estimates of CO account for three possible vehicle operating conditions: cold-vehicle operation, hot-start operation, and hot-stabilized operation. It is important to distinguish between these three operating categories, because vehicles emit CO at different rates depending on whether they are cold or warmed up—cold vehicles emit significantly higher CO emissions than hot vehicles. The current EPA emissions model for particulates, PART5, does not use thermal states as input variables. The following assumptions are generally appropriate when determining thermal states:

    1. All action-generated taxis and heavy-duty gas trucks are assumed to be operating in a hot-stabilized mode. In order to provide conservative projections of project increments in CO analyses large trucks may be considered to be gas trucks, while in particulate matter analyses the same large trucks may be simulated as heavy-duty diesel vehicles.

    2. All arriving action-generated autos are, in general, assumed to be operating in a hot-stabilized mode (unless the arriving induced trips are from the immediate community, such as a local supermarket, where this assumption may not be valid). Unless project specific or new data are available, the above auto trips may be assumed to be composed of 75% auto trips and 25% sport utility vehicle (SUV) trips.

    3. All departing action-generated autos and SUVs are assumed to be operating in a cold mode.

    4. Recommended auto thermal states for existing traffic have been compiled both on a regional basis and at some of the more congested street locations in Manhattan, Queens (Long Island City), and downtown Brooklyn. DEP can be contacted to obtain the most up-to-date list of recommended auto thermal states. DEP's *Report #34*, Revised can be used to estimate auto thermal states where site-specific data are not available. In most instances, no action thermal states are assumed to be the same as those in the existing condition. However, for large future no action projects located in the study area, it may be appropriate to consider that project's vehicles separately. Vehicles generated by such projects are modeled individually as hot stabilized or cold start autos/SUVS, taxis, or trucks based on that project's traffic assignment. In addition, the amount of time a vehicle is parked affects its operating condition: vehicles that have been parked for less than one hour are still hot when started again, and therefore are considered to be in hot-start operation when leaving the parking facility. Vehicles parked for more than an hour have cooled down, and operate in the cold-start mode when leaving the parking facility. For certain types of retail projects, it may be reasonable to estimate that a fraction of auto departures would be hot-starts. Typically, length-of-stay field survey data from similar types of projects may

be necessary to make such an assumption.

5. Current guidance is to include SUVs as light-duty gasoline-powered trucks and assume the same thermal states as autos for mobile source modeling. DEP may be contacted for further guidance, since this guidance may be subject to change in the future with the use of MOBILE6.

As discussed above, although the primary pollutant of concern from autos on roadways is CO, particulate matter may be more of a concern from diesel truck or buses. EPA's PART5 (*Draft User's Guide to PART5: A Program for Calculating Particle Emissions from Motor Vehicles*, Office of Mobile Sources, February 1995) (http://www.epa.gov/otaq/part5.htm) particulate emissions model may be used to estimate particulate emissions from gasoline-fueled and diesel-fueled motor vehicles. PART5 calculates particle emission factors in grams per mile (g/mi) from on-road automobiles, trucks, and motorcycles for particle sizes up to 10 microns. The particulate matter emission factors include exhaust particulate, exhaust particulate components, brakewear, tirewear, and reentrained road dust, all of which are required for PM_{10} inventories and analyses. The program contains default values for most data required for the calculation of all the emission factors, but it also allows for user-supplied data in many cases.

One of the key inputs to the model is the silt loading factor. A paved road silt loading factor of 0.4 grams per square meter (g/m^2) is the default within the model, and may be most suitable for roadways with average daily traffic less than 500 vehicles. However, for roadways with greater than 500 vehicles per day, paved road silt loading factors may be based on actual measured silt loadings on paved roads in New York City. Based on data collected in New York City, it is recommended that for paved roads, a silt factor of 0.02 g/m^2 for expressways, 0.08 g/m^2 for sites near Canal Street in downtown Manhattan, 0.12 g/m^2 for sites on Madison Avenue in midtown Manhattan, and 0.16 g/m^2 for other roadways in the City may be employed.

An unpaved road silt percent of 4.3 percent, the lower bound stated in the PART5 *User's Guide*, is generally assumed for unpaved areas. It is also in the range given for sand and gravel processing. Fugitive dust levels are inversely affected by frequency of precipitation. 140 days of precipitation are assumed, which is the number of days in the year with more than 0.01 inches of rain.

A standard fleet average vehicle weight of 6,000 pounds is recommended for estimating existing particulate emissions from on-street traffic for typical New York City roadways with a high percentage of truck traffic. If a roadway has less than 500 vehicles per day, a lower average vehicle weight may be applicable. Vehicle classifications for on-street traffic are generally obtained from collected traffic data. Estimates of increased particulate matter from project generated traffic may be added to the estimated No Action base volumes to recalculate the vehicle mix for the build scenario in the PART5 modeling.

Dispersion Modeling. The necessary traffic data for each roadway segment and the emission outputs from the recommended mobile emissions model (both discussed above) are analyzed together, using a dispersion model. Mobile source dispersion models estimate the way CO and particulate matter concentrations resulting from given traffic conditions are dispersed because of meteorological conditions, roadway geometry, and other factors, and predict resultant pollutant concentrations at given receptor sites.

For most locations adjacent to at-grade signalized roadways, the CAL3QHC version 2.0 dispersion model, as described in *User's Guide to CAL3QHC2.0*, Research Triangle Park, North Carolina, is usually most appropriate (http://www.epa.gov/scram001/). The CAL3QHC version 2.0 model is a microcomputer-based modeling methodology developed by EPA to predict the concentration of CO and particulate matter from motor vehicles traveling near or through roadway intersections. Based on the assumption that vehicles at an intersection are either in motion or idling, the program is designed to predict air pollution levels by combining the emissions from both moving and idling vehicles.

The CAL3QHC version 2.0 model requires a coordinate system corresponding to the roadway geometries under study as part of the input to the program. For each street approach to a signalized intersection, a "free flow" link simulates the emissions from vehicles over the block that are not delayed by traffic signals. A second "queue" link length is calculated by the algorithms within the program, using input parameters supplied to the model for each approach of a signalized intersection. Emission factors for idling vehicles from the mobile model are input into the CAL3QHC version 2.0 model to estimate emission rates from these queued links. As recommended in the User's Manual for CAL3QCH, in overcapacity situations, where the predicted hourly traffic volume-to-capacity ratio (V/C) is greater than 1, the "model predicted queue length" could be larger than the physical roadway configuration. The user could either revise the traffic assumption for the link, or limit the length of the queue by running the analysis in the following manner: (1) input the queue link as a free flow link; (2) specify X1, Y1, X2, Y2 coordinates that determine the physical limits of the queue (i.e., the physically largest queue length); and (3) input the emission source as the equivalent VPH (from the output run on the queue link) with an emission rate of EF=100. This will provide the appropriate emission source for the queue link with the manually determined queue length. T: In certain cases, the links for left- or right-turn movements may be separated from the through movements of an approach if the signal phasing differs or if such movements have high volume-to-capacity (v/c) ratios.

For a more refined analysis, the CAL3QHC model has been updated with an extended module, which allows for the incorporation of actual meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model, CAL3QHCR (http://www.epa.gov/scram001/), should only be employed if maximum predicted CO concentrations are greater than the applicable ambient air quality standards or if significant air quality impacts are predicted with the CAL3QHC modeling, or if particulate matter modeling from mobile sources is necessary. Refined modeling with CAL3QHCR should also be performed before identifying traffic mitigation measures for eliminating predicted impacts.

In the first approach with CAL3QHCR, called Tier I, a full year of hourly meteorological data is entered into CAL3QHCR in place of the one hour of "worst-case" meteorological data that are commonly entered into CAL3QHC. One hour of vehicular emissions, traffic volume, and signalization data are also entered as is done when using CAL3QHC. This is a screening level model that is most suitable for short-term time averaging periods where peak hour traffic conditions are suitable. However, use of Tier I modeling (i.e., assuming peak hour traffic and project increment conditions for every hour of the year) may result in overly conservative projections of pollutant levels or project impacts for analyses that are dependent upon non-peak hour conditions or for long term pollutant time averaging periods (e.g., annual averages).

The CAL3QHCR model also offers a second approach, called Tier II, for which the same meteorological data used in the Tier I approach are entered into the model. The vehicular emissions, traffic volume, and signalization (ETS) data, however, are more detailed and reflect traffic conditions for each hour of a week. CAL3QHCR reads the ETS data as up to 7 sets of hourly ETS data (in the form of diurnal patterns) and processes the data into a week of hourly ETS data. The weekly ETS data are synchronized to the day of the week of the meteorological data year (weekday or weekend). The weekly traffic conditions are assumed to be the same for each week throughout the modeled period. The Tier II modeling approach is not typically employed for projects evaluating peak hour conditions or short term pollutant time averaging periods. Consultation with DEP before undertaking a Tier II analysis is recommended.

Since the refined CAL3QHCR model uses meteorological data in the computation of pollutant levels at selected receptor locations, the coordinate system in the modeling must be developed with consideration of true north and the corresponding directions of the compass. A critical component of the hourly meteorological data used in these computations is wind direction. When the meteorological data are initially compiled, all hourly wind directions are referenced to true north. Therefore, like coordinate systems developed for stationary sources mathematical modeling, mobile source modeling must simulate sources and receptor locations using a coordinate system that is consistent with the meteorological data set.

Generally, the following assumptions are employed for the various input parameters to the CAL3QHC version 2.0 model for assessments of CO concentrations:

1. Surface roughness of 3.21 meters in Manhattan south of 96th Street, downtown Brooklyn, and Long Island City; for other areas, the CAL3QHC *User's*

Guide can be used to determine surface roughness, based on the area's building geometry;

2. Wind speed of 1 meter/second;
3. Settling and deposition velocities of 0;
4. Source height of 0 (for at-grade roadways);
5. Mixing height set at 1,000 meters;
6. Neutral atmospheric stability (unless along an undeveloped shoreline area where a stable atmospheric stability may be appropriate, based on Aeur's technique—see the ISC3 *User's Guide*);
7. Time averaging period of 60 minutes;
8. Wind angle search over 360° with default wind angle search routine;
9. Receptor height of 1.8 meters (approximately 6 feet);
10. Clearance interval time of 2 seconds per approach;
11. Saturation flow rate as determined by the traffic model used (e.g., the Highway *Capacity Manual*);
12. Add 6 meters to the width of the effective roadway for free flow links.

For the refined analyses with CAL3QHCR, the meteorological data set should consist of the latest available five consecutive years of meteorological data in order to ensure that an adequate number of hours are simulated to determine compliance with applicable standards and guideline concentrations. It is recommended that surface data collected at the nearest representative airport (either La Guardia, JFK or Newark airport) and upper air data collected at Brookhaven, NY be used for this 5-year meteorological data set. DEP may be contacted to determine the latest 5-year meteorological data set.

In some instances, irregular applications of a dispersion model may be required to simulate unique roadway configurations (i.e., estimating potential pollutant levels at receptors on a new residential structure adjacent to an elevated highway or a raised entrance/exit to a bridge crossing). For these situations, CAL3QHC version 2.0 may be used to simulate these line sources by treating these roadways as unsignalized, free flow links (if travel speeds warrant such an assumption). The CAL3QHC can be used to assess unsignalized intersections; however, air quality is not typically a concern at these intersections, so such an analysis is seldom needed. For areas with complex topography or fully or partially covered roadways, physical models, such as wind tunnel modeling, may be appropriate. It is prudent to check with DEP before using other models, to determine their appropriateness.

Time Averaging Periods. Predictions of pollutant concentrations are made to be comparable with the National Ambient Air Quality Standards, so they are made for the same time periods as the standards (for example, the NAAQS for CO are for 1-hour and 8-hour concentrations; the PM_{10} standards are for an annual geometric mean and a 24-hour average concentration). These standards are for the *average* concentration during each of those time periods. Annual standards pertain to the average pollutant concentrations either predicted or measured in a calendar year, while 24-hour standards pertain to pollutant concentrations occurring in a calendar day.

As discussed in the traffic and parking chapter of the Manual, peak hour periods are commonly used to evaluate the potential impacts of traffic generated by an action. Peak 1-hour traffic data gathered as part of the traffic analysis are typically used as the basis for predicting the maximum pollutant levels near a roadway. In the CAL3QHC modeling of CO, these peak 1-hour traffic data are also typically used to develop the maximum predicted 8-hour CO levels. To derive the 8-hour CO level, the maximum 1-hour concentration calculated from local sources for the peak hour is multiplied by a "persistence" factor, based on historical air quality monitoring data in New York City. The persistence factor takes account of the fact that over 8 hours (as distinct from a single hour), vehicle volumes will fluctuate downward from the peak hour, traffic speeds may vary, and wind directions and speeds will change to some degree relative to the conservative assumptions used for the single highest hour. The following persistence factors are recommended: for Midtown Manhattan, 0.77; for Lower Manhattan 0.79; for downtown Brooklyn, 0.81; and for the rest of the City, 0.70. Given that these factors are subject to change over time, DEP should be contacted to confirm the latest guidance for these parameters.

Background Concentrations. Mobile source modeling of CO concentrations at sidewalk locations accounts solely for emissions from vehicles on the nearby streets, but not for overall pollutant levels. Therefore, background pollutant concentrations must be added to modeling results to obtain total pollutant concentrations at a prediction site. Background pollutant concentrations are usually derived from recorded pollutant concentrations throughout New York City at elevated monitors, maintained by the DEC, that are not unduly influenced by local sources of pollutants. These monitors are indicative of pollutant levels associated with pollutants emitted throughout the nearby region.

One of the primary applications of mobile source modeling is to evaluate maximum predicted 8-hour CO concentrations at places of public access. Therefore, background CO levels for the 8-hour averaging period is required for each of the analysis years (existing and the build year(s), as appropriate). Future year background concentrations of CO are based on measured CO levels at the nearest DEC monitoring stations, adjusted to reflect the reduced vehicular emissions expected in the future (because, as older vehicles on the road are replaced by newer ones, more and more vehicles have stringent emissions controls—see below). For purposes of these adjustments, it is typically assumed that 20 percent of the background CO value is caused by non-roadway emissions that have remained relatively unchanged with time, and that 80 percent of the background CO value is caused by mobile sources, and will decrease in time. This decrease reflects the increasing numbers of Federally mandated lower-emission vehicles that are projected to enter the vehicle fleet as older, higher polluting vehicles are retired (i.e., vehicle turnover), and the continuing benefits of the New York State Inspection & Maintenance (I&M) program. For PM_{10} modeling of on-street sources, background levels are generally considered to be the same for existing and future year conditions. DEP will provide the most up-to-date monitored pollutant background levels for the various regions within New York City.

Future No Action Condition. The future no action condition accounts for general background traffic growth in the study area, new trips and other changes expected because of other proposed developments, and changes in emissions because of vehicle turnover, etc. Traffic that would be generated by development on "soft" sites may also need to be considered. Generally, the no action scenario analyzed is similar to that assessed for the land use task. More information on determining the future no action condition is provided in Chapter 2 of this Manual, and in Chapter 3A, "Land Use, Zoning, and Public Policy."

Future Action Condition. The future action condition adds any changes resulting from the action to conditions predicted in the future without the action. The differences between these two conditions and the potential for significant impacts are then assessed.

321.2. Parking Facilities

Analyses of parking facilities are similar to those for roadways (Section 321.1, above), but the assumptions used in estimating emissions (or, the inputs to the emission model) will differ, and so will the dispersion model.

Parking Lots. CO is the primary pollutant of concern for unenclosed, at-grade parking lots used by automobiles; PM_{10} is the primary pollutant of concern for parking lots used by heavy-duty diesel vehicles. The modeling procedures for both types of parking lots are explained below.

- For automobile/SUV parking lots, the following techniques are appropriate:

  1. *Estimates of mobile source emissions.* Emissions estimates for CO are calculated at an ambient temperature of 43°F (except for Manhattan, which would be 50°F) with a mobile emissions model (such as the EPA's MOBILE model; see the discussion in Section 321.1, above). Information required for the mobile emissions model includes the following: the dimensions (i.e., length and width) of the parking lot; idle emission factors for cold autos/SUVs or idle emission factors for other vehicles; emission factors at 5 miles per hour for both cold and hot autos/SUVs or other vehicles; and hour-by-hour vehicular entrances to and exits from ("ins and outs") the parking lot (typically, the eight hours with the highest volumes). Peak 1-hour averaging periods' emission rates are typically calculated for the

build year assuming that autos idle for 1 minute before starting to travel to the parking lot exit(s), and the traveling distance within the lot by vehicles entering and exiting the lot is usually conservatively estimated by calculating this mean travel distance as two-thirds of the maximum travel distance from the entrance/exit of the lot to the farthest parking space. The 1-hour and (in most cases) 8-hour averaging periods with the largest total number of departing autos will yield the highest CO emission rates for these respective time averaging periods.

2. *Dispersion estimates*. Potential cumulative concentrations from on-street sources and emissions from the parking lot at a receptor location adjacent to the lot can be calculated by adding the CO levels calculated from the parking facility at this location to the contribution of on-street sources. It is advisable to analyze receptor locations on the near and far sidewalks adjacent to the parking lot, to ensure that maximum cumulative effects from on-street and parking lot emissions are disclosed. Appropriate background concentrations also must be added. Contribution of on-street source emissions at this receptor location can be calculated through microscale modeling for the same wind directions that cause the parking lot emissions to affect this location. Or, alternatively, they can be calculated to include parking lot emissions as line sources, as mentioned below. Air quality impacts from parking facilities can be followed to estimate potential CO concentrations from parking lots with the EPA's SCREEN3 model (described in *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, EPA-450/4-88-010 (http://www.epa.gov/scram001/). A sample air quality analysis of potential CO impacts from an automobile multilevel, naturally ventilated parking facility is included in the appendix.

As discussed in Section 321.2, emissions from parking facilities can also be modeled as line sources in CAL3QHC or CAL3QHCR for assessing cumulative emissions adjacent to on-street sources. This would include simulating the parking lot as multiple line sources adjacent to the on-street source in a dispersion model, such as CAL3QHC or CAL3QHCR. The EPA's *Guideline on Models* provides more information.

- For parking lots used by large numbers of diesel trucks or buses, where PM_{10} is the primary pollutant of concern, a procedure analogous to that used for automobile parking lots (see above) can be used to determine PM_{10} concentrations near the lot:

  1. Idle emissions of PM_{10} from heavy-duty diesel vehicles are insignificant when compared with PM_{10} emission rates for accelerating heavy-duty diesel trucks. Therefore, only PM_{10} emission rates from trucks traveling within the lot are typically estimated, usually from factors listed in EPA's *Compilation of Air Pollutant Emission Factors (AP-42)* or EPA's PART5 for this kind of analysis. Estimates of particulate emissions from heavy vehicles operating on paved and unpaved surfaces may also be included in such analyses if they overlap with the parking areas.

  2. Analyses are performed to determine the maximum potential PM_{10} 24-hour concentrations adjacent to the lot, based on the hourly average (over a 24-hour period) for the diesel vehicles entering and exiting the parking lot.

  3. Twenty-four-hour PM_{10} background values are then added to the localized contribution.

Multilevel, Naturally Ventilated Parking Facilities. Multilevel parking facilities with at least three sides partially open are, for air quality analyses, considered in a similar manner to at-grade parking lots. As for at-grade lots, CO is the primary pollutant of concern for facilities used by automobiles, and PM_{10} is of concern when diesel trucks or buses use the facility. The CO impact analyses for these facilities are almost identical to those performed for parking lots, except that CO emissions from arriving and departing vehicles are distributed over the various levels and ramps of the parking facility. It is usually appropriate to adjust the calculation of CO impacts at a ground-level receptor from the above-grade levels of the facility following calculations presented in EPA's *Workbook of Atmospheric Dispersion Estimates (AP-26)*. A PM_{10} analysis for a multilevel, naturally ventilated facility used by diesel trucks or buses could be similarly modified. A sample air quality analysis of potential CO impacts from a multilevel, naturally ventilated automobile parking facility is in the appendix.

Emissions from multilevel parking facilities can also be modeled as line sources in CAL3QHC or CAL3QHCR (for source heights less than 30 feet), for assessing cumulative emissions adjacent to on-street sources.

Parking Garages. These include any parking facilities, whether multi- or single-level, below- or above-grade, that would be enclosed and include a ventilation system. Similar to at-grade lots and multilevel, naturally ventilated facilities, CO is the primary pollutant of concern for automobile parking garages, and PM_{10} is of concern when heavy-duty diesel trucks or buses use the garage. In either case, pollutants would be present within the garage and would be exhausted by the garage's vent(s) for the mechanical ventilation system. Thus, pollutant levels could be elevated near the vents outside of the garage. The vents are stationary sources, similar to stacks. The analysis of pollutant concentrations within and outside parking garages is described below.

- For automobile garages, the following procedures are generally appropriate:

  1. For CO concentrations within the garage, it is recommended that CO emissions within the facility be conservatively estimated at an ambient temperature of 43°F (and 50°F for Manhattan). Total CO emissions rates (for 1- and 8-hour averaging periods) within the garage are calculated following the same procedures for the multilevel, naturally ventilated garage, and all of the emissions from the different levels are summed together.

  2. The appropriate background concentrations are then added to the predicted concentrations.

  3. These total emission rates are then divided by the minimum ventilation rate required by the New York City Building Code (i.e., 1 cubic foot per minute of fresh air per gross square foot of garage area), to determine the maximum 1- and 8-hour CO levels within the garage.

  4. For concentrations near the garage vents, the CO concentrations predicted within the garage are then used in the calculations. The garage vent(s) are converted into "virtual point sources" using equations listed in EPA's *AP-26*, and the concentrations within the garage are used to estimate the initial dispersion at the garage vent(s). These equations can be used to estimate CO impacts at nearby elevated receptors (e.g., tall residential buildings nearby) if the effluent is exhausted at an elevated height, or at pedestrian-level height (for lower exhaust stacks).

  5. Potential cumulative CO impacts on the near and far sidewalks adjacent to the garage vent(s) can be calculated by adding the impact from the garage exhaust to on-street sources following a methodology similar to that employed for naturally ventilated parking facilities. A sample air quality analysis of potential CO impacts from an automobile parking garage is in the appendix.

- For garages that would be used by heavy-duty diesel trucks or buses, the following procedures can be used:

  1. Estimates of PM_{10} emissions are calculated following procedures similar to those for parking lots.

  2. These total PM_{10} emissions should be divided by the minimum ventilation rate required by the New York City Building Code to determine maximum PM_{10} levels within the facility.

  3. The PM_{10} concentrations within the facility should be compared with the U.S. Occupational and Safety Health Administration's (OSHA's) guideline worker exposure levels for various time averaging periods. These are available in *Air Contaminants—Permissible Exposure Limits* available from the U.S. Department of Labor, OSHA.

  4. Off-site PM_{10} concentrations can be calculated by following the same methodology employed for CO exhaust from automobile garages, or if there would be numerous exhaust points, such as exhaust vents all along the

rooftop of the structure, off-site PM_{10} impacts can be calculated treating these emissions as an "area source" (see discussion on area source analyses in Section 322.2, below).

Time Averaging Periods. The anticipated hourly vehicular entrances and exits to the facility are usually reviewed to determine the hour that would yield the largest amount of pollutants emitted from the parking facility. Peak 1-hour concentrations adjacent to the facility (and peak 1-hour concentrations within the facility if it is an enclosed garage), are then determined for this hour. The hourly vehicular entrances to and exits from the garage are also used to determine the period that would generate the largest amount of pollutants over a multi-hour period. Off-site concentrations calculated with the average hourly pollutant emission rate over this multi- hour interval are also multiplied by a persistence factor when determining multi-hour pollutant incremental impacts from parking facilities.

Future No Action Condition. Similar to the assessment of roadways, analyses of parking facilities will consider conditions in the future without the action. This assessment considers any new developments expected by the action's build year (see discussion above), but does not include the proposed parking facility.

Future Action Condition. The future action condition assesses the proposed parking facility, and compares the results of that analysis with conditions expected in the no action condition to determine the potential for significant impacts.

321.3. Conformity Analyses

Air quality modeling analyses are used in the conformity determination (both general and transportation) to show that the federal action neither contributes to any new violations of standards nor increases the frequency or severity of any existing violations.

The analyses are to be based on the latest planning assumptions developed by the municipal planning organization (MPO). Any revisions to these estimates are to be approved by the MPO or other authorized agency. New York Metropolitan Transportation Council is the MPO for the New York Region. The analyses are to be based on the latest and most accurate emission estimation techniques available. For motor vehicle emissions, the most current EPA emissions models are to be used. For stationary and area source emissions, the latest emissions factors specified by EPA in the *Compilation of Air Pollutant Emissions Factors (AP-42)* should be used unless more accurate emission data are available. The air quality modeling analyses are to be based on the applicable models, databases, and other requirements specified in the most recent version of the *Guideline on Air Quality Models (Revised).*

The analyses are to be based on the total of emissions from the action, and are to reflect emission scenarios that are expected: (1) during the attainment year mandated by the CAA (or during the furthest year for which emissions are projected in the maintenance plan); (2) during the year for which the total emissions from the action are expected to be the greatest; and (3) during any year with a specific emissions budget. Also, the federal agency is to identify any measures for mitigating air quality impacts, describe the enforcement process for these measures, and obtain written commitments for these mitigation measures.

322. Stationary Source Modeling

Stationary source modeling is typically required to evaluate the potential impacts of emissions from the following:

- Boilers for heating/hot water, ventilation, and air conditioning systems in new buildings or building expansions.
- Ventilation exhaust systems for new manufacturing or industrial facilities or medical, chemical, or research laboratories.
- Large emissions sources, such as power generating stations, which could affect surrounding uses, or could be affected by new structures nearby.
- Existing (or future planned) manufacturing and industrial facilities, which could affect sensitive uses nearby.
- Industrial facilities that could potentially discharge malodorous pollutants into the nearby neighborhood.

For actions with potential impacts related to boilers for heating/hot water, ventilation, and air conditioning systems for a single building, a preliminary screening analysis can be performed to determine the potential for significant stationary source air quality impacts. Many such actions will not require any further analysis. This screening analysis is presented in Section 322.1, below.

All other actions with potential stationary source air quality impacts will require detailed analyses, described in Section 322.2, below.

In general, for actions that would result in or facilitate the development of either new significant fossil fuel burning sources or new facilities that could be adversely affected by airborne emissions from nearby existing (or planned) major fossil fuel burning sources, SO_2, NO_2, and PM_{10}, are the primary pollutants of concern. If such sources under study would exclusively burn natural gas, NO_2 is the primary pollutant of concern. For actions that would result in or facilitate the development of either new significant industrial sources or new facilities that could be adversely affected by airborne emissions from existing (or planned) industrial sources, the six national criteria pollutants (with the possible exception of ozone) and noncriteria pollutants will have to be taken into consideration before identifying the pollutants of concern for the more detailed stationary source impact analysis. The existing or potential new stationary source(s) under review should be examined on a case-by-case basis to appropriately determine the pollutants of concern. This is also applicable for proposed industrial facilities that could potentially discharge malodorous pollutants into the nearby neighborhood, or existing facilities that discharge malodorous pollutants that may affect new development resulting from or facilitated by an action.

322.1. Screening Analyses for Heat and Hot Water Systems

Impacts from boiler emissions are a function of fuel oil type, stack height, minimum distance from the source to the nearest receptor (building), and square footage of development resulting from the action. Screening of stationary source impacts can be performed with the EPA's SCREEN3 model, although information on the amount of pollution from the new source and details on the configuration of the source and nearby places of public access will be required. This section describes an alternative preliminary screening analysis that can be performed to determine an action's potential for significant impacts, and to avoid preparing a more detailed analysis if it is not necessary. The preliminary screening analysis uses Figure 3Q-3, which was specifically developed through detailed mathematical modeling to predict the threshold of development size below which an action would not likely have a significant impact. This figure indicates size of proposed development and distance to nearest building of a height similar to or greater than the stack height of the proposed building(s). The step-by-step methodology outlined below explains how to use these figures. This methodology is only appropriate for single buildings or sources. For other situations, refer to the discussion below on area sources. It is also only appropriate for buildings at least 30 feet from the nearest building of similar or greater height.

1. Determine the maximum size of development that would use the boiler stack.

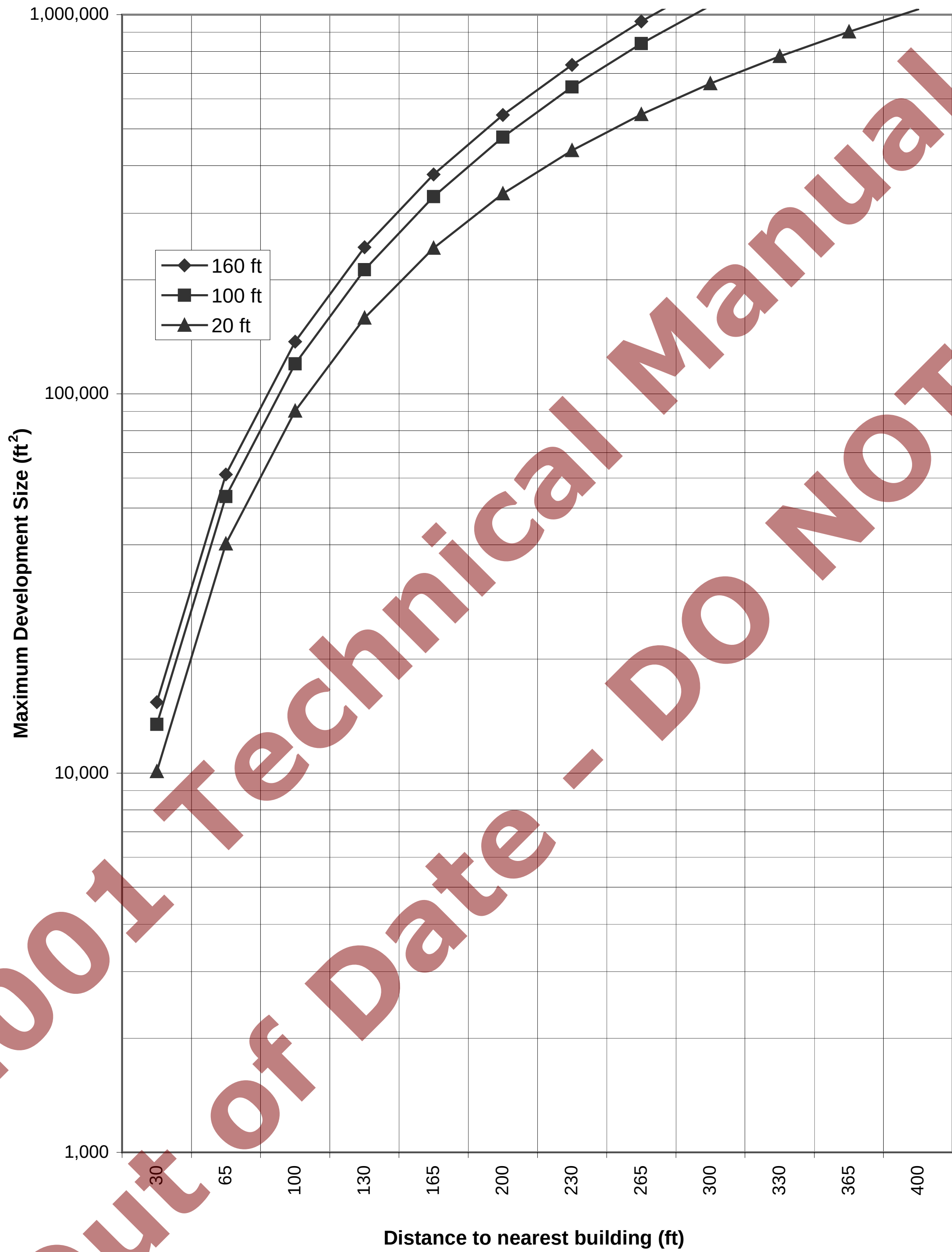
2. Using a Borough President's map, Sanborn atlas, or equivalent, determine the minimum distance (in feet) between the building(s) resulting from or facilitated by the proposed action and the nearest building of similar or greater height. If this distance is less than 30 feet, more detailed analyses than this step-by-step screen are required. If the distance is greater than 400 feet, assume 400 feet.

3. Determine the stack height of the building resulting from the proposed action, in feet above the local ground level. If unknown, assume 3 feet above the roof height of the building.

4. Then, select from the heights of 20, 100, and 160 feet, the number closest to but NOT higher than the proposed stack height.

5. Based on steps 1 through 4 above, select the appropriate figure (by fuel and type of development) and curve (by stack height) for the proposed action. Locate a point on the appropriate chart by plotting the size of the development against the distance in feet to the edge of the nearest building of height similar to or greater than the stack of the proposed action.

Figure 3Q-3:
Stationary Source Screen



6. If the plotted point is on or above the curve corresponding to the height recorded in step 5, there is the potential for a significant air quality impact from the action's boiler(s), and detailed analyses may need to be conducted. More refined screening analyses (which account for the type of fuel consumed and development type) are available for use in the technical appendices. If the plotted point is below the applicable curve, a potential significant impact due to boiler stack emissions is unlikely and no further analysis is needed.

In some cases, it may be possible to pass this screening analysis by restricting the type of fuel that could be used to supply heat and hot water. As illustrated in the air quality stationary source screening analysis figures in the appendices, No. 4 and No. 6 oils have greater emissions than No. 2 oil or natural gas. Limiting the fuel used by the proposed action to No. 2 oil or natural gas may eliminate the potential for significant adverse impacts and also the need for further analyses. This can be determined using steps 1 through 6 above. The action, however, would have to include the restriction on the boiler fuel type (and indicate the mechanism that would ensure the use of a specific fuel type) if this option is selected.

Alternatively, if a proposed action fails the initial screening analysis, but the maximum short term emissions of sulfur dioxide (for oil burning facilities) and annual emissions of nitrogen dioxide (for oil and gas burning facilities) have been estimated, figures for screening known emissions from boilers are included in the technical appendices.

Industrial Source Screen. Impacts from industrial stationary sources may be performed by SCREEN3. However, the maximum unitary 1-hour and annual average values (from the ISC3 dispersion model; see Section 322.2 below) for the distances from 30 feet to 400 feet and the shortest stack and receptor height (20 feet) have also been summarized for use as an additional screen for industrial sources and for assessing potential impacts from non-criteria pollutants (see Table 3Q-3). This look up table is based on a generic emission rate of 1 gram per second of pollutant from a point source. To use the values in this table to determine accurately the potential impact from industrial emissions on a new proposed action, the first step would be to convert the estimated emissions from the industrial source of concern into grams/second. This converted emission rate should then be multiplied with the value in the table corresponding to the minimum distance between the industrial source and the new use of concern. Values are provided for 1-hour and annual averages since, in many cases, the analysis is performed for comparisons of pollutant levels to SGCs (1-hour averaging period) or AGCs (annual averaging period).

Table 3Q-3
Industrial Source Screen

20 Foot Source Height				
Distance from Source	**1-Hour Averaging Period (ug/m3)**	**8-Hour Averaging Period (ug/m3)**	**24-Hour Averaging Period (ug/m3)**	**Annual Averaging Period (ug/m3)**
30 ft	151,114	52,690	22,850	2,196
65 ft	38,130	13,290	5,751	551
100 ft	17,103	5,959	2,573	246
130 ft	9,708	3,381	1,458	140
165 ft	6,269	2,183	942	91
200 ft	4,392	1,530	664	66
230 ft	3,258	1,135	499	51
265 ft	2,524	880	392	41
300 ft	2,028	707	319	34
330 ft	1,681	587	267	29
365 ft	1,431	499	228	25
400 ft	1245	434	199	21

If these screening methods indicate that further analysis is necessary, then detailed stationary source analysis is required as described below in Section 322.2.

322.2. Detailed Analyses

Estimates of Stationary Source Emissions. The method for estimating the pollutant emissions from a stationary source depends on whether the source is existing or planned for the future.

- For existing large fossil-fuel burning sources, emissions rates can be obtained as follows:

  1. Almost all existing large fossil-fuel burning sources will have certificate-to-operate permits from either DEP Bureau of Environmental Compliance (BEC) or DEC that limit the amount and type of fuel to burned and/or pollutants that can be emitted through the exhaust stacks. "Major" sources (those large sources that require Prevention of Significant Deterioration permits) and City-owned sources (e.g., large boilers for a facility owned by the Health and Hospitals Corporation) will have

permits issued by DEC, while all other facilities will probably have permits filed with BEC. Even if an existing source discharges less than the prescribed limits in a permit, the limits specified in the permits should still be considered as the basis for estimating the maximum emissions from this source. In addition to the permits issued by the City, BEC usually has copies of DEC permits for these types of facilities, and the procedures for obtaining copies of permits from DEC are discussed under item 2, below, for existing manufacturing uses.

2. In cases where only the fuel consumption rates (or refuse burning rates) are supplied, emission factors for the criteria pollutants of concern—which can usually be obtained from EPA's *Compilation of Air Pollutant Emission Factors (AP-42)*—are multiplied by the consumption rates to yield estimates for pollutant emission rates. Sulfur dioxide emission factors reported in AP-42 for oil-burning boilers are directly proportional to the percentage of sulfur in the oil. New York City limits the sulfur contents of distillate (No. 2) oil to no more than 0.2 percent (by weight) sulfur, and to no more than 0.3 percent sulfur for residual (No. 4 and No. 6) oils. Therefore, these percent sulfur limits should be used for the respective fuel types to estimate sulfur dioxide emission factors for oil-burning boilers.

- For existing manufacturing uses, the following steps may be performed:

1. Perform field observations of manufacturing uses within the study area to identify the existing manufacturing uses with exhaust stacks (or points) that may have the potential to adversely affect the structure(s) that could be developed as a result of the action. Documenting field observations with field notes and on maps is recommended.

2. After preparing a list of these facilities with their corresponding addresses, a formal request can be made to BEC for a copy of any air contaminant permits for these facilities. BEC should also be able to supply any permits for nearby major source emitters of concern. In some instances, such as a facility operated by a New York City agency, DEC issues the air contaminant permits, but BEC should still have a copy of such permits in its files. BEC will assess a charge for each address in a search request, unless a waiver of the fees (which is normally done for actions sponsored by governmental agencies) is first approved by DEP's counsel. Requests for copies of the BEC air contaminant permits should be addressed to the New York City Department of Environmental Protection, Bureau of Air Resources, 59-17 Junction Boulevard, Elmhurst NY 11373, and requests for fee waivers for BEC searches should be addressed to DEP Bureau of Legal & Legislative Affairs at the same address as BEC. The permits can be used to ascertain the pollutants being emitted from the facility in question. The analysis considers the maximum emissions allowable under the permit, even if actual operating conditions are different. With respect to the accuracy of the technical information provided by an air permit, DEP relies upon verification of the information by an applicant's professional engineer or registered architect. Therefore, DEP does not certify as accurate any information gathered through the permitting or certification process. If possible, this information should be independently verified before relying on it for analyses in compliance with any local, state or federal law, rule or regulation. DEP accepts no responsibility for the use of the data or consequences of the use of the data by any party.

3. When no permits are available from BEC for a given location, but emissions are apparent there, a conservative emissions analysis based on the likely manufacturing process may be appropriate. This may entail examining material safety data sheets (MSDS), available from the manufacturer, to ascertain details of the pollutants involved in the particular manufacturing

process. Contact DEP for assistance with this analysis.

4. When manufacturing facilities may result in potential impacts on proposed actions, the following measures for alleviating such adverse impacts should be considered:

- Modifications to the design of the proposed action that would eliminate receptor locations that would experience impacts (building setbacks, sealed windows, etc.);
- Restricting the processing capacity at the facility;
- Restricting the operating parameters and physical dimensions of the stack or vent (i.e., increasing the source height or increasing the exhaust velocity, which may lessen the impact on the action);
- Control equipment to limit emissions from the facility; and
- Moving the location of the stack or vent to ensure that there would be no significant impacts from the facility on the proposed action.

However, these measures may be difficult to implement if the facility that would cause the impact is not part of the action, and is owned by a party other than the one involved in the action.

- For new sources associated with proposed actions (and for future sources that may affect or be affected by an action), estimates of pollutant emission rates will depend on the type of sources and the pollutants emitted from such sources. Generally, the following procedure may be used:

1. For new fuel burning sources, estimates of fuel consumption rates can either be based on "rule of thumb" fuel consumption rates estimated by mechanical engineers designing the facility, or default emission factor values for residential and commercial facilities. Energy consumption surveys conducted by the Department of Energy and available on its website (http://www.eia.doe.gov/) may be used to develop fuel consumption rates. DEP should be contacted to determine the appropriateness of using this method.

2. For buildings with interruptible gas systems (these are systems that use natural gas for most of the year, but during the coldest days, use fuel oil; such energy systems are chosen because of the more economical rates available from the power utility), analyses of short-term effects are typically performed for fuel oil, while analyses of annual emissions are performed for natural gas. More information on this is provided below in the section that discusses time averaging periods.

- Estimates of malodorous pollutant emission rates are evaluated on a case-by-case basis. Odor thresholds of specific pollutants (i.e., pollutant levels in ambient air that result in a malodorous smell that is recognized by the general populace) can vary by several orders of magnitude, depending on the pollutants. For odor concerns from facilities that are related to wastewater treatment, DEP should be consulted first. Similarly, for facilities that handle solid waste, DEP or DOS should be contacted. To evaluate the potential for malodorous emissions, the following general procedures can be used:

1. Perform a rigorous evaluation of the processes at the facility in question to determine the potentially malodorous substances emitted and their respective emission rates.

2. For those substances, perform a literature search for odor thresholds and other characteristics.

3. Of all the chemical compounds emitted, the one that will result in the greatest potential for malodorous emissions is usually defined as the "indicator" compound. This is the compound with correct combination of these elements: (1) the lowest odor threshold (the minimum concentration at which the odor is detectable), and/or (2) the highest emission rate. An identified malodorous pollutant that has the largest potential emission rate of all potential malodorous pollutants discharged from a facility may not be the appropriate indicator compound for

evaluating potential odor impacts, because other malodorous compounds emitted from the facility may have tremendously smaller odor threshold concentrations. Published test data on malodorous emission rates for specific operations with corresponding odor control mechanisms (if any) can provide information for preparing estimates of malodorous pollutant emission rates. Alternatively, in lieu of an indicator compound, a mix of malodorous pollutants may be addressed by the use of dilution thresholds. Consultation with DEP is suggested before undertaking such analyses.

Time Averaging Periods. SO_2, NO_2, and PM_{10}, the principal pollutants of concern for fuel-burning stationary sources, are examined for oil or interruptible gas burning facilities, while NO_2 is the only pollutant analyzed in any refined study of a natural gas burning source. Peak daily emission rates are typically employed in the modeling to calculate the maximum 3- and 24-hour pollutant concentrations. Peak daily emission rates are calculated by determining the total amount of pollutants emitted in the peak day and dividing by 24 hours. However, in instances when oil-burning equipment is used irregularly (e.g., only 8 hours per day at a manufacturing facility), peak hourly emission rates are used to evaluate the maximum potential 3-hour SO_2 concentrations, while 24-hour SO_2 and PM_{10} levels should be calculated with emission rates based on the total amount of fuel burned in a peak day and dividing by 24 hours. The average hourly annual emission rates (e.g., the anticipated or permitted total amount of a pollutant emitted in a year divided by 8,760 hours—the approximate number of hours in a year) are used in the modeling to determine the annual average pollutant concentrations at selected locations. Some simple stationary source models, such as EPA's SCREEN3, only simulate maximum 1-hour impacts. Persistence factors of 0.9 and 0.4 are recommended for adjusting 1-hour impacts to 3- and 24-hour time averaging periods, respectively, with these simple models.

In an analysis of potential noncriteria pollutant impacts from new sources on the surrounding community or from existing sources on a proposed facility, comparisons are ultimately required between the maximum predicted pollutant levels and the corresponding AGCs and SGCs listed in DEC's *DAR -1*. Since SGCs and AGCs are intended for time-averaging periods of 1 hour and 1 year, respectively, suitable noncriteria emission rates for these scenarios are needed. Maximum 1-hour concentrations for noncriteria pollutant sources are usually calculated with the maximum hourly pollutant emission rates from these sources through modeling (described below). Maximum hourly pollutant emission rates are estimated either through the permitted values or estimates generated for new sources. Annual average pollutant emission rates are used to determine maximum annual impacts, which are then compared to the AGCs. Annual average hourly emission rates are estimated by dividing the total amount permissible, as listed in a permit, or the pollutant amount estimated for a proposed facility by 8,760 hours. In addition, certain pollutants—specifically, air toxics that could be released during chemical spills—have shorter averaging periods. These are discussed below under "Puff Modeling."

Dispersion Modeling. Modeling of potential pollutant concentrations from stationary sources can be performed either through the use of dispersion or fluid (i.e., physical, or wind tunnel) modeling. In most instances where a refined stationary source impact analysis would be required, mathematical dispersion modeling is the most suitable choice for performing these evaluations. A discussion on the conditions that may warrant fluid (i.e., physical, or wind tunnel) modeling over mathematical modeling is included below under "Suitability of Fluid Modeling Versus Mathematical Modeling." A detailed discussion on the procedures involved and input parameters needed for the various typical types of mathematical dispersion modeling scenarios is provided below.

- *Emission rates for pollutants of concern.* Before modeling is performed, determine the pollutants of concern and the respective emission rates following the procedures discussed above. In the cases of sources emitting pollutants through an exhaust stack, pollutant emission rates and stack exhaust parameters for multiple potential operating loads (e.g., operation of large fossil fuel burning facility at 100 percent capacity, 75 percent capacity, and annual average conditions) should be prepared for input into the dispersion modeling. The analysis of all three conditions is appropriate in a prediction of worst-case impacts for the following reasons. Although the 100 percent capacity load usually results in the greatest amount of pollutants discharged by such an operation, it may not result in the worst-case analysis, because the exit velocity of the pollutants through the stack is also at its greatest in this condition, so that greater plume rise would result. In this case, the bulk of the pollutants can be ejected to a height greater than nearby receptor locations. On the other hand, if a nearby receptor location is of near or equal height to the exhaust stack(s) under analysis, maximum pollutant concentrations at the receptor from the local source may occur with a lower load, and therefore a lower exit velocity. In addition, pollutant emission rates and stack exhaust velocities under annual average operating conditions are normally much lower than the 100 percent load conditions. Since maximum annual pollutant levels are sometimes required for comparison to either applicable criteria pollutant standards or non-criteria pollutant AGCs, estimations of pollutant levels on an annual average basis at receptor locations should be determined by modeling annual average operating conditions of the source(s).

- *ISC3 model.* For most actions, the EPA's ISC3 computer program model is the most suitable mathematical dispersion model for performing a refined air quality impact analysis. The ISC3 model, which is described in *User's Guide for the Industrial Source Complex (ISC3) Dispersion Model (EPA-450/4-92-008a)*, calculates pollutant concentrations from one or more sources using hourly meteorological data (http://www.epa.gov/scram001/). The ISC3 model can simulate impacts from point, area, and volume sources, and can also account for building-induced turbulence, or "wake" effects, that nearby structures can cause on the dispersion of pollutants from nearby stacks that do not meet GEP, or Good Engineering Practice, heights.

GEP stack height is defined as the sum of the height of the structure (or nearby structure) plus 1½ times the lesser dimension (height or width) of the structure (or nearby structure). Both the height and width of the structure used to determine if the GEP stack height criterion is fulfilled are determined from the frontal area of the structure projected onto a plane perpendicular to the direction of the wind. According to EPA guidelines, a building is sufficiently close to a stack to cause wake effects when the distance between the stack and nearest part of the building is less than or equal to five times the lesser of the height or the maximum projected width of the building. For directionally dependent building wake effects (which is a modeling option within the ISC3 model), wake effects are assumed to occur if the stack is within a rectangle composed of two lines perpendicular to the wind direction, one line at 5LB downwind of the building and the other at 2LB upwind of the building, and by two lines parallel to the wind, each at 0.5LB away from each side of the building (where LB is the lesser of the height and projected width of the building).

The following information is required to execute the ISC3 computer program model:

1. When modeling potential pollutant concentrations emitted from stacks (i.e., point sources) with the ISC3 model, the following information is needed: the appropriate pollutant emission rates, dimensions of a building that could induce wake effects, local grade elevations, stack exhaust parameters (i.e., stack exhaust velocity, inner stack diameter, stack exhaust temperature, stack height), and representative meteorological data.

2. Computations with the ISC3 model are usually made assuming stack tip downwash, buoyancy-induced dispersion, gradual plume rise, RAM urban dispersion coefficients and wind profile exponents, no collapsing of stable stability classes, and elimination of calms.

3. The ISC3 model should be run both with and without building downwash (i.e., wake effects option) if the exhaust from the stack(s) could be affected by the building the stack is on or by a nearby structure. EPA's Building Profile Input Program (BPIP) program—which is described in the *User's Guide to the Building Profile Input Program*, EPA, Research Triangle Park, North Carolina (http://www.epa.gov/scram001/) — should be used to determine the projected building dimensions for the ISC3 modeling with the building downwash algorithm enabled. Modeling should account for all obstructions

within a radius equal to 5 obstruction heights of the stack.

4. In cases where the sources and receptors are in a relatively undeveloped, coastal area of New York City (i.e., less than 50 percent of the land area within a 1.9-mile radius from the source is developed into non-park uses), RAM rural dispersion coefficients and wind profile exponents should be selected in the ISC3 modeling of such facilities. Auer's technique may also be used to classify whether the region should be simulated as urban or rural (Auer, A.H. Correlation of Land Use and Cover with Meteorological Anomalies, Journal of Applied Meteorology, Vol. 17, 1978).

5. The meteorological data set used with the ISC3 model should consist of the latest available five consecutive years of meteorological data in order to ensure that an adequate number of hours are simulated to determine compliance with applicable standards and guideline concentrations. It is recommended that surface data collected at the nearest representative airport with upper air data concurrently collected at Brookhaven, NY be used for this 5-year meteorological data set. Depending on the location of the proposed action, the use of surface data from La Guardia, J.F.K. International or Newark airport may be acceptable for modeling. This meteorological data set includes wind speeds, wind directions, ambient temperatures, and mixing height data for every hour of a year. DEP may be contacted to confirm the latest recommended meteorological data set before performing any analyses.

6. Ideally, estimates of stack exhaust parameters (i.e., stack exhaust velocity at 100 percent load, inner stack diameter, exhaust temperature, and stack height) for new significant stationary sources will be available. If this information is unavailable for a new source that would be located on top of a structure, in most applications, the following assumptions can be used as conservative estimates in a stationary source analysis:

   - exhaust velocity at all loads: 0.001 meter/sec
   - inner stack diameter: 0 meters (no plume rise)
   - stack exhaust temperature: 293 °K
   - stack height: 3 feet above rooftop level

7. Since dispersion modeling uses meteorological data in the computation of pollutant levels at selected receptor locations, the coordinate system in the modeling must be developed with consideration of true north and the corresponding directions of the compass. A critical component of the hourly meteorological data used in these computations is wind direction. When the meteorological data are initially compiled, all hourly wind directions are referenced to true north. Therefore, contrary to coordinate systems developed for mobile sources mathematical modeling, stationary source modeling must simulate sources and receptor locations using a coordinate system that is consistent with the meteorological data set.

Other models. EPA has proposed the adoption of ISC-PRIME and AERMOD as refined models to eventually replace the current regulatory model for stationary source modeling, ISC3. Both are awaiting EPA approval for regulatory use. It is anticipated, however, that ISC-PRIME and AERMOD will be incorporated into one new and improved model, AERMOD-PRIME. Outlined below are some of the anticipated improvements in the new stationary source models forthcoming from EPA.

- EPA's AERMOD serves as an improved alternative to ISC3. It has superior treatment of boundary layer turbulence and is more accurate for complex terrain. AERMOD has two pre-processors, AERMET and AERMAP. AERMET is the meteorological data pre-processor and provides the model with meteorological information. The major purpose of AERMET is to calculate boundary layer parameters for use by AERMOD. AERMAP is the terrain pre-processor and it characterizes and generates receptor grids and elevations. Unlike ISC3 and ISC-PRIME, AERMOD does not contain the enhanced algorithms for treatment of deposition and building downwash. There is an effort to include in the model new algorithms for both wet and dry deposition and building downwash. This program uses BPIP, the current EPA model, for calculating downwash.

- EPA's ISC-PRIME is another improved alternative to ISC3. This model has been developed for enhanced plume rise and building downwash and includes a new set of algorithms named PRIME (Plume Rise Model Enhancements). PRIME calculates the concentration of pollutants in the cavity region and considers the position of the stack relative to the building. These features are not included in the modeling procedures, of ISC3. In addition, ISC-PRIME model uses BPIP-Prime, as opposed to BPIP, for calculating downwash.

These models are not currently approved by DEP for regulatory use and therefore DEP should be contacted to determine the suitability of such models as appropriate on a case-by-case basis, or to confirm the latest recommended dispersion model to employ. Other models may also be appropriate.

Cavity regions. Under certain meteorological conditions, the exhaust from a stack on top of or proximate to a structure may be entrapped for short periods in the cavity regions adjacent to the structure. For these cases, additional analysis may be appropriate.

The predicted concentrations in a cavity zone are inversely proportional to the surface area of the building (perpendicular to the wind direction) and to the wind speed required to entrap most of the exhaust plume. It should be assumed in this type of analysis that all of the exhaust would be entrapped in the cavity zone.

Maximum predicted pollutant short-term (e.g., 1-, 3-, and 24-hour) averaging periods are calculated for at least two of the perpendicular cross-sectional areas of the structure producing the cavity effect. Maximum potential cavity concentrations may be calculated using the SCREEN3 model.

Meteorological persistence factors of 0.9 and 0.4 are used to calculate the maximum 3- and 24-hour cavity pollutant concentrations, respectively, from 1-hour concentrations yielded from the SCREEN3 modeling.

Volume and area sources. If a proposed action would result in development of a facility that would emit pollutants through a series of stacks along the rooftop edges of a structure, or over an area on top of or adjacent to the facility, a volume or area source analysis is used. Pollutant emission rates through the multiple stacks or over the area can be estimated following the procedures discussed above, and concentrations at selected receptor sites should be determined following the procedures outlined in the ISC3 User's Manual. Conservative estimates of concentrations can be calculated using the recommended algorithms for these applications, assuming a wind speed of 1 meter per second, neutral atmospheric stability, and (if needed) meteorological persistence factors of 0.9 and 0.4 for 3- and 24-hour time averaging periods, respectively. For a more refined analysis, the ISC3 model can be run for these area or volume source analyses using five years of meteorological data.

Cumulative Analysis. For larger sources, or sources near significant existing sources, a cumulative analysis may be necessary. The following steps should be completed:

- An initial (primary) study area for analysis should be defined by delineating a 1,000-foot distance from the boundaries of the project's property line.
- Ground level and elevated sensitive receptors outside the property line of the proposed action that may be affected by the proposed source should be identified. Maximum predicted concentrations and those receptors that may be affected by more than one source should be identified. This should be done in accordance with the guidelines described in Section 312.2.
- All facilities or sources within the 1,000-foot study area that have a heat input of 2.8 million Btu/hour or greater should be identified along with their stack parameters and emissions calculations.
- A search should be conducted beyond the 1,000-foot initial study area to identify any large existing sources that have the potential to add significantly to pollutant loadings at the identified sensitive receptors. Stack

parameters and emissions calculations of these facilities should be presented along with similar data for the proposed facility. It is the responsibility of the applicant to verify these parameters or to present the rationale behind modeling assumptions that will be used if verification data cannot be obtained. Similarly, all large sources that may add to pollutant loadings at the 1,000-foot study area's sensitive receptors and that may be constructed within similar timeframes as the proposed action should be identified. Proposals that have active permit applications should be included.

- A preliminary background source inventory should be submitted to DEP for review, including all identified sources within and beyond the primary 1,000-foot study area. A screening analysis may be conducted to determine which of the background sources beyond the 1,000-foot study area could be eliminated from further consideration. The screening analysis is recommended to determine carefully the final list of sources that will be included in the detailed cumulative dispersion modeling. Consensus should be reached with DEP regarding the source inventory prior to the commencement of a detailed dispersion analysis.

- The collection of permit data for such sources should generally follow the procedure outlined above in section 322.2.

- Detailed dispersion modeling should be conducted using the agreed upon list of sources, the same modeling parameters accepted by DEC for permitting purposes, and those described above in this chapter. In general, those include: (a) use of the latest five years of meteorological data; (b) examination of criteria pollutants: sulfur dioxide ($S0_2$), nitrogen dioxide (NO_2) and inhalable particulate matter (PM_{10}); (c) large source loads; (d) long- and short-term analyses; (e) use of ISC3 to determine the highest second highest short term concentration and the highest average annual concentration; and (f) use of appropriate backgrounds. Combined emissions of the existing and planned sources identified above and background concentrations should be examined at all sensitive receptors to determine if there are any projected NAAQS exceedances.

- Downwash and cavity analysis, where necessary, should be included in the studies.

- All the backup data necessary for DEP to be able to verify the results of the analysis should be submitted (as described below in Section 430).

Suitability of Fluid (Physical) Modeling Versus Mathematical Modeling. For most actions, screening (for single residential buildings) or full-scale mathematical modeling is appropriate for evaluating air quality impacts from stationary sources. The mathematical expressions and formulations that constitute the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all mathematical models contain simplifications and approximations of actual conditions and interactions, and because a worst-case condition is of most interest, these models are conservative and tend to over predict pollutant concentrations, particularly under adverse meteorological conditions. Typically, these models are too conservative to accurately account for such conditions as complex topography, and therefore may predict pollutant concentrations that are too high. Such conservative results are usually adequate in the analyses of small sources, such as residential or commercial boilers, but when larger sources are being considered, physical modeling can yield more accurate results.

Physical modeling, also called fluid or wind tunnel, modeling, involves constructing a scale model of the proposed buildings and any nearby existing and proposed buildings and surrounding terrain. This model is then subjected to wind tunnel studies, in which a tracer gas is emitted from the source. Measurements are taken at different locations (receptors) on the physical model to determine the dispersion of the gas. This method of physical modeling is sometimes selected because of concern that mathematical models do not always adequately account for complex topography. In other cases, fluid modeling is preferred because the dispersion created by either existing or proposed structures on air movement in the area under analysis predominates over the dispersion effects of regional atmospheric factors, such as thermal gradients. Recommended procedures for fluid modeling are outlined in EPA's *Guideline for Fluid Modeling of Atmospheric Diffusion*, (EPA-600/8-81-009), April 1981 and *Guideline for Use of Fluid Modeling to Determine Good Engineering Practice*

Stack Height (EPA-450/4-81-003), July 1981. It is recommended that DEP be contacted for assistance before performing any fluid modeling studies.

Background Concentrations. The monitored background levels of the principal pollutants of concern for stationary source air quality modeling—SO_2, NO_2, and PM_{10}—have remained relatively steady for some time. Summaries of the suggested background levels for these pollutants at various DEC monitoring locations throughout New York City can be obtained from DEP. Background pollutant concentrations for lead and non-criteria pollutants (for which there are only a limited amount of data available) should be obtained from DEC monitoring reports on ambient air monitoring. These DEC reports can be examined at the offices of DEP. New York State ambient air monitoring data can also be found at DEC's website: http://www.dec.state.ny.us/website/dar/index.html. To determine annual average background levels, the highest annual averages measured over the latest available 3-year period should be used. To determine worst-case short-term background levels, the highest second highest maximum yearly concentrations measured over the latest available 3-year period should be used.

Extended Analysis. The calculated maximum total pollutant concentrations at selected receptor locations usually consist of adding background pollutant level estimates (for the applicable time averaging periods and pollutants of concern) and the maximum predicted impacts from nearby significant sources under study. This procedure yields estimates of total pollutant concentrations at these locations. In some cases, it is possible to further refine this procedure, and still yield acceptable conservative estimates of pollutant concentrations. As an example, when the maximum daily (i.e., 24-hour) SO_2 concentration computed from 5 years of meteorological data is added to the recommended conservative 24-hour SO_2 background level, this might result in predicted violations of the 24-hour SO_2 ambient standard. However, the actual SO_2 monitored background levels on the days that resulted in the highest predicted 24-hour concentrations may have been significantly lower than the recommended background values. (Monitored ambient background levels of SO_2 significantly increase during cold weather periods, because the increased use of oil to supply heat for residential and commercial facilities significantly escalates the amount of SO_2 emitted into the local environment.) A limited extended analysis would be to sum the monitored daily SO_2 background values for the one or two days that had the highest predicted local concentrations (from either wind tunnel or mathematical modeling) to the modeled concentrations for these days, until there are no predicted violations of the SO_2 24-hour ambient standard. If there are many occurrences when the daily SO_2 predicted concentrations from local sources at a selected receptor location are added to the recommended background level and the resultant sums exceed the applicable standard, an acceptable refined extended analysis would be to sum all of the 24-hour local concentrations to the concurrent daily background levels at this receptor location. An analogous procedure may be followed for determining maximum total 3-hour SO_2 concentrations at receptor locations.

Chemical Spills. Some actions would result in the development of facilities that house operations with the potential to accidentally emit air toxics as the result of chemical spills. As an example, medical, chemical, or school laboratories with fume hoods are required to have a ventilation system that discharges pollutants released under the hoods or in the laboratories to exhaust points above the rooftop. Since chemicals can be accidentally spilled in these facilities, the dispersion of hazardous pollutants from these discharge points and potential impacts on the surrounding community are examined. The appropriate department responsible for establishing and enforcing safety procedures for the storage and use of all hazardous materials at the institution should be contacted for a complete list of chemicals to be used in the proposed laboratories. In addition, the project's mechanical engineers should be contacted to obtain specific mechanical information for the laboratory fume hood exhaust system. The techniques described below can be applied to chemical spills or to any other short-term releases of pollutants.

- *Evaporation rates.* Evaporation rates for volatile hazardous chemicals that are expected to be used in the labs can be estimated using a model developed by the Shell Development Company (M.T. Fleisher, *An Evaporation/Air Dispersion Model for Chemical Spills on Land*, Shell Development Company, December 1980). The Shell model, which was developed specifically to assess air quality impacts from chemical spills, calculates evaporation rates based on physical properties of the material, temperature, and rate of air flow over the spill surface. The evaporation rates for such scenarios are usually calculated assuming room temperature conditions (»70°F) and an air flow rate of 0.5 meters/second. A "worst-case" chemical spill is usually determined by reviewing the chemicals that are expected to be frequently used under the hoods, the amount and frequency of use for such chemicals, the container sizes for such chemicals, and the evaporation rates (from Shell model) and relative toxicities of these chemicals. Samples of how to perform such calculations are provided in the appendices (Guidelines for Calculating Evaporation Rate for Chemical Spills).

- *Recirculation.* Analysis of chemical spills or other sources of hazardous pollutants also considers the effects of recirculation of the pollutants from the vent back through nearby windows or air intake vents. This can occur any time exhaust vents are situated near operable windows or intake vents. The potential for recirculation of fume hood emissions or other sources of hazardous pollutants back into the nearest window or fresh air intake vent can be assessed using the method described by D.J. Wilson in *A Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents* ASHRAE TRANS 89, Part 2A, pp. 136-152 (1983). This empirical procedure, which has been verified by both wind tunnel and full-scale testing, is a refinement of the 1981 ASHRAE handbook procedure, and takes into account such factors as plume momentum, stack tip downwash, and cavity recirculation effects. Samples of how to perform such calculations are provided in the appendices (Guidelines for Recirculation for Chemical Spills).

- *Puff modeling.* Maximum pollutant concentrations at elevated receptors downwind of fume exhausts, or other short-term, instantaneous releases of pollutants, can be estimated using the latest EPA INPUFF model. The EPA INPUFF 2.5 model (Peterson, W.B., Inpuff *2.0 - A Multiple Source Gaussian Puff Dispersion Algorithm, EPA/600/8-86/024*, August 1986) is the most recent release of this model. The INPUFF model is used for such analyses because it considers short-term concentrations. This is appropriate because these types of emissions are typically present only for short periods of time. For example, most chemical spills are completely evaporated in considerably less than an hour. Under these conditions, maximum predicted pollutant concentrations from the recirculation calculations and INPUFF modeling at places of public access should be compared to the Short-Term Exposure Levels (STELs) or ceiling levels recommended by the U.S. Occupational Safety and Health Administration (OSHA) for these chemicals. STELs are usually 15-minute time-weighted average exposures that should not be exceeded at any time during an employee's work day. Ceiling levels are the exposure limits that should never be exceeded in an employee's work day. Stable atmospheric conditions and a 1 meter per second wind speed are usually assumed as input to the INPUFF model.

Future No Action Condition. The assessment of stationary sources in the future without the action takes into consideration expected changes by the action's build year. For existing stationary sources, existing emissions are usually assumed to continue in the future, unless there is reason to expect otherwise. (As noted above, when emissions are determined through a facility's operating permit(s), maximum allowable concentrations are assumed.) For assessments of the effects of future pollutant emissions on sensitive uses near an existing manufacturing district, it may be appropriate to consider expected future trends in that district, when no known new development is proposed.

Future Action Condition. This assessment considers conditions with the action in place, and compares them with conditions in the future no action scenario to determine the potential for significant impacts.

323. Construction Impacts

Construction impacts on air quality can occur because of particulate matter raised by construction activities or sandblasting, exhaust and emissions from construction equipment, and increased traffic to local roadways because of vehicles traveling to and from the construction site or because of temporary road closings. Because these impacts are only temporary, they usually need to be assessed quantitatively only when the action's construction period would be relatively long-term. However, the magnitude of construction activities is also considered—an analysis may be appropriate for certain activities, even if temporary, such as concrete batching plants.

For construction activities, the assessment of air quality impacts is an analysis, using the techniques described in Sections 321 and 322, above, of all the locations that may be affected by the construction activities. Usually, this will include intersections where traffic may be increased because of diversions from construction activity or congested due to capacity restrictions.

When appropriate, the effects of particulate matter from the construction site and earthmoving equipment can also be considered. If the action would involve an on-site concrete batching plant, this plant would be assessed as a new stationary source, using the methodologies described for stationary sources describe above and appropriate models, such as ISC3, and emission factors such as from *AP-42*. For construction-related actions, estimates of the types of vehicles that will be employed and materials that will be handled will help determine estimates of fugitive dust emissions from such operations. In addition to the estimates of emissions from the physical movement or from the tires of such equipment that entrain particulates into the air, exhaust emission factors (from combustion) for such equipment should be included in this analysis. The most recent AP-42 factors, NEVES Report or EPA NONROAD model should be used for nonroad mobile source emissions. Estimated activities, cycles of equipment operations, durations of operations, equipment types, emission factors, and load factors should be used to estimate emissions. Particulate matter impacts may need to address total suspended particulate matter levels. Credits for control measures should be documented.

324. Mesoscale Analyses

As described earlier, nitrogen oxides and hydrocarbons are examined on a regional level. These pollutants are of concern because they are precursors to ozone (both can react in sunlight to form photochemical oxidants, also known as ozone, or smog). The area for examination would typically be large, such as an entire borough, or the entire City of New York, or even the tri-state metropolitan area. Such an analysis is rarely performed, because few actions have the potential to affect ozone precursors over such large regions.

Actions that could affect nitrogen oxides or hydrocarbons in such a large region would be those that greatly increased the total number of vehicle miles traveled in the region (for example, a major roadway improvement or construction of new bridges), or changes in regulations that affect numerous stationary sources (such as changes in the type of fuel burned throughout the City). Most often, these analyses are performed for large transportation projects.

In a mesoscale analysis, the action's contributions to the total emissions over the area are considered. In the example of a major roadway improvement that greatly increased the total number of vehicle miles traveled, the analysis would consider whether the total amount of carbon monoxide, nitrogen oxides, and hydrocarbons emitted in the region would increase (because of the increased vehicle miles) or decrease (because the new roadway would alleviate existing congestion).

400. Determining Impact Significance

To determine whether an action would have a significant impact on ambient air quality, the analysis techniques described above are used to predict future concentrations in the chosen study area for the receptor locations, if the action is not implemented (the "no action" scenario). Then, concentrations predicted for the future with implementation of the action are compared to the no action levels using the impact criteria described below.

410. IMPACT CRITERIA

411.1. Comparison with Standards

The predicted pollutant concentrations for the pollutants of concern associated with a proposed action are compared with either the NAAQS for criteria air pollutants, or ambient guideline concentrations for noncriteria pollutants. For all pollutants causing the standards to be exceeded generally constitutes a significant adverse impact. In addition, for CO from mobile sources, the *de minimis* criteria (described below in Section 412) are also used to determine significant impacts.

To evaluate the potential air quality impacts for criteria pollutants and noncriteria pollutants from stationary sources, predictions for these pollutant concentrations must correspond to the appropriate NAAQS time averaging periods. These standards are for the average concentration during each of those time periods. Annual standards pertain to the average pollutant concentrations either predicted or measured in a calendar year, while 24-hour standards pertain to pollutant concentrations occurring in a calendar day. For short-term standards (i.e., 1-, 3-, 8-, and24-hour averaging periods), two exceedances of the corresponding short-term standard in one calendar year (at the same location) constitute a violation of the standard. Recommended SGCs and AGCs for noncriteria pollutants correspond to time-averaging periods of 1-hour and annual averages, respectively.

411.2. Conformity

For projects subject to conformity, to determine whether a proposed project meets applicable conformity requirements, potential air quality impacts should be evaluated to ensure that the action is consistent with the SIP and; (1) would not contribute to any new violation of the NAAQS; (2) would not increase the frequency or severity of existing violations; and (3) would not delay attainment or required emission reductions. For projects subject to general conformity, *de minimis* thresholds listed for such projects under federal regulations should be referenced.

412. De Minimis Criteria

For CO from mobile sources, the City's *de minimis* criteria are used to determine the significance of the incremental increase in CO concentrations that would result from a proposed action. These set the minimum *change* in 8-hour average CO concentration that constitutes a significant environmental impact. According to these criteria, significant impacts are defined as follows:

- An increase of 0.5 parts per million (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 8 ppm or between 8 ppm and 9 ppm; or

- An increase of more than half the difference between baseline (i.e., no action) concentrations and the 8-hour standard, when no action concentrations are below 8 ppm.

413. Odors

A significant odor impact would occur if an action results in maximum predicted 1-hour average malodorous pollutant levels above the applicable odor threshold at places of public access, or if it results in the development of a structure that would be subject to such malodorous pollutant levels from nearby sources of these pollutants. Peaking factors may be employed to convert predicted 1-hour concentrations to shorter-term durations. If a dilution to thresholds approach is employed, a significant odor impact would occur if the dilution to thresholds indicated that malodorous impacts would be detected by a substantial portion of the population exposed at the nearest sensitive receptor. This determination depends on the odor thresholds for the substances of concern, and on the emission rates for those substances (see discussion above in Section 322.2). While odors could still be detected for time periods from a few seconds to several minutes long, it would be unrealistic to define this as a significant impact unless the odor persisted, on average, for at least an hour. Generally, there are no other specific standards for odors as there are for other regulated pollutants.

420. TYPES OF POTENTIAL IMPACTS

For both mobile and stationary sources, significant impacts, as defined by the criteria above, can occur on surrounding uses because of the proposed action, or on the proposed action because of the surrounding uses. Both scenarios must be considered under CEQR and both constitute significant adverse air quality impacts.

421. Mobile Sources

An action would result in significant mobile source air quality impacts when the incremental increases in CO concentrations with the action in place, relative to those in the no action scenario, would exceed the *de minimis* criteria or when an action would result in the creation or exacerbation of a predicted violation of the NAAQS for the pollutants of concern. For example, if an action would add vehicles to a particular intersection and thereby change the 8-hour CO concentration at that intersection from 6 ppm in the no action condition to 7 ppm with the action, no significant impact would occur, because the increase caused by the project (1 ppm) is not equal to more than half the difference between the baseline and the 8-hour standard of 9 ppm. The action would have to increase the concentration by more than 1.5 ppm at that location to have a significant adverse impact. If the action raised the 8-hour CO concentrations at an intersection from 8 ppm to 9 ppm, a significant impact would occur because this increase would be greater than the *de minimis* criterion (of 0.5 ppm or greater when the no action concentration is 8 ppm or between 8 ppm and 9 ppm. In another example, a violation of the NAAQS would occur if an action causes an increase in the 8-hour CO concentration from 8.9 to 9.2 ppm, and this would constitute a significant adverse impact even though the increase would be within the *de minimis* criterion.

422. Stationary Sources

Sulfur dioxide, nitrogen dioxide, and respirable particulate matter are the principal pollutants associated with an action that could result in a significant stationary source impact, although significant impacts for lead and other toxic contaminants also could occur. A proposed action would have a significant adverse stationary source air quality impact if it results in the creation or exacerbation of a violation of the NAAQS for criteria pollutants or it causes the guidance values for noncriteria pollutants to be exceeded.

When a proposed action would cause the NAAQS to be exceeded at sensitive receptors, such as air intake vents, balconies, or operable windows, the potential for a significant adverse impact at such locations should be disclosed. Further analysis may be performed to determine the expected range of indoor concentrations. The indoor values could be lower, depending on the magnitude of the predicted concentration, the time of year, the outside temperature, and how the ventilation system operates (e.g., whether it mixed with other air intake locations). In this case, judgment is required to determine whether it is reasonable to assume the indoor concentration is the same, or lower than, the outdoor concentration. If the predicted range of indoor values would be lower than those outside, the potential for significant impacts resulting from exceeding standards outside is still disclosed.

Actions that cause the NAAQS or guidance values to be exceeded at locations to which the public will not have ongoing access, such as at elevated locations on a residential building that are not near operable windows, balconies, or air intake vents, would not result in significant adverse impacts. These locations are not considered ambient air and therefore are not valid receptors.

423. Odors

Most often, odor impacts result from stationary sources. Like other air quality impacts, these can occur because the proposed action would cause odors, or because the proposed action would add a sensitive use in an area subject to odors.

430. PRESENTATION OF RESULTS

As described above in Section 300, a typical air quality analysis considers a large number of receptors. Generally, the environmental assessment can limit its report on the analysis results to those receptors where the maximum predicted pollutant concentrations and maximum incremental impacts from the action are calculated. The results for all other receptors may be reported in an appendix, or be made available on request. Typically, when summarizing the results for CO analyses, values presented are rounded off to the nearest tenth of a part per million (ppm). For example, an 8-hour CO level at a receptor site would typically be reported as 6.5 ppm, not 6.464 ppm, nor 7 ppm. In many cases, only the 8-hour average CO values are reported, because the maximum predicted 1-hour CO concentrations are well below the applicable NAAQS. Comparisons to the *de minimis* criteria of 0.5 ppm are made to the nearest hundredth of a ppm (i.e., an increment of 0.49 ppm in the 8-hour CO average would not be a significant *de minimis* impact, but 0.51 ppm would be a significant adverse impact if the 0.5 ppm criterion was applicable in this instance).

All the backup data that is necessary for DEP or the review agency to verify the results of any analyses should be submitted. These data should be submitted on CD-ROMs or diskettes and should include a "read me" file with information describing the content and names of the files presented. The backup data should include:

1. Scaled maps with coordinates and receptor locations; and for stationary source analyses, buildings and dimensions of buildings that may create downwash, stack locations, etc.

2. Emissions calculations, and if applicable, a list of equipment, emission factors and

their sources, formulas, and assumptions or manufacturers' specifications, etc. used to develop the total emissions presented. A detailed sample calculation should be provided for each pollutant. Any assumptions made or any regulation or reduction applied to emissions should be stated and appropriately substantiated.

3. For mobile source analyses, supplemental traffic data should be included (e.g., speeds, vehicle classifications, etc.).

4. Tables or spreadsheets detailing any additional calculations (e.g. parking, chemical spills, AP-42 emission factors).

5. For a detailed cumulative impact analysis, the documentation should clearly reference how the emissions and stack parameters were obtained for the included sources.

6. Input and output files for all the models used in the analyses should be submitted.

500. Developing Mitigation

When a significant air quality impact (as defined above) is likely to result from an action or development facilitated as a result of the action, potential mitigation measures to eliminate such adverse impacts must be investigated.

510. MOBILE SOURCES

Measures that would mitigate the full increment of CO resulting from the action should be identified. If potential concentrations would exceed the 8-hour CO standard of 9 ppm, further measures that would allow the City to attain compliance should be identified. As discussed above, refined dispersion modeling with CAL3QHCR should be performed before identifying traffic mitigation measures for eliminating predicted impacts.

511. Roadways

Significant mobile source impacts due to pollutant concentrations would usually occur at a sidewalk adjacent to an intersection that encounters a significant amount of congested vehicular traffic. In many instances, the mitigation measures that would be recommended to eliminate a predicted significant traffic impact at an intersection would also eliminate any predicted significant air quality impacts at this location. Potential mitigation measures for eliminating adverse traffic impacts are presented in the traffic and parking chapter of the Manual.

At the same time, traffic mitigation measures, such as those that would increase the number of moving lanes at an approach to an intersection, increase red time at an intersection, or divert traffic to other intersections, may result in increasing pollutant levels near the affected intersections. All traffic mitigation measures, and any other measures to eliminate the action's impacts in other technical areas, should be assessed for their potential air quality impacts.

512. Parking Facilities

Significant air quality impacts from parking facilities can usually be mitigated using the same sort of options available to mitigate traffic impacts and significant air quality impacts related to roadways. If the vent(s) for an enclosed, mechanically ventilated parking facility could result in significant air quality impacts, restrictions on the placement of such vent(s) can be employed to mitigate these actions, and these restrictions would become part of the action.

520. STATIONARY SOURCES

There are several options available to mitigate the significant adverse impacts caused by stationary sources when the NAAQS are exceeded for the criteria pollutants of concern. One typical example of a significant stationary source impact would be the result of the emissions from a large boiler stack that would result in a violation of standards at a nearby, taller building. Examples of potential mitigation measures available for alleviating this adverse impact include the following:

- Restricting the fuel type burned and exhausted from this stack;
- Limiting the location of the new stack to ensure that there would be no significant impacts from the new stack exhaust on the nearby building(s); and
- Restricting the operating parameters and physical dimensions of the new stack (i.e., make the stack height taller or increasing the stack exhaust velocity, which may lessen the impact on a nearby structure).

These measures may be difficult to implement if the stack that would cause the impact is not part of the action, and is owned by another party than those involved in the action. As noted in Chapter 1 of this Manual, commitments to mitigation measures must be obtained before those measures can be considered adequate to mitigate an action's significant impacts.

Stationary source impacts ensuing from an action that facilitates the development of an industrial facility that would emit significant amounts of air toxics or malodorous pollutants could be mitigated by actions such as:

- Restricting the processing capacity at the facility;
- Requiring commitments on odor control mechanisms for the facility that ensure elimination of potential impacts; or
- Restrictions similar to those discussed for the new boiler stack impact example.

530. GENERIC ACTIONS

For generic actions, site-specific mitigation measures are often inappropriate, since the intersections or stationary sources assessed are often only prototypes. In these cases, mitigation would typically involve changes to the proposed action that would avoid the resulting significant impact.

600. Developing Alternatives

Alternatives that incorporate the potential mitigation options discussed above would also reduce or avoid significant impacts associated with an action. In addition to these mitigation measures, there are alternative options available that could also reduce or eliminate significant air quality impacts in these respective areas.

610. MOBILE SOURCES

Mobile source air quality impacts are usually directly related to the size and type of development, and consequently, the amount of traffic generated by development facilitated by such action. Therefore, alternatives that would diminish the magnitude of the action-generated traffic should also, in general, lessen the mobile source impacts associated with such actions.

In instances where the action-generated traffic would create significant parking facility impacts due to locations of the egress points at the site affected by the action, these impacts may be reduced by developing alternatives with relocated or multiple access/egress points.

620. STATIONARY SOURCES

In the cases where significant stationary source impacts would result from the structure facilitated by the action, alternatives that modify the dimensions of the structure could eliminate these adverse impacts (e.g., lower the maximum height of the structure if it is impacted by a nearby emission source, such as a power generating station).

700. Regulations and Coordination

710. REGULATIONS AND ADMINISTRATIVE RECORD

711. Federal Regulations

711.1. Clean Air Act

The CAA, which was first enacted in 1955 and later amended in 1963 and 1967, changed significantly with the passage of the 1970 amendments. That year, Congress passed amendments that significantly broadened the Federal role in air pollution control. In addition to establishing NAAQS for six criteria pollutants (sulfur dioxide, particulates, carbon monoxide, photochemical oxidants, nitrogen dioxide, and hydrocarbons), the 1970 amendments also established the new source performance standard (NSPS) program and the national emission standards for hazardous air pollutants (NESHAP). These programs gave EPA the authority to regulate emissions from new stationary sources as well as the ability to regulate hazardous air pollutants not covered by NAAQS. EPA added an NAAQS for lead in 1978 and rescinded the hydrocarbon NAAQS in 1983. In the 1977 amendments, two new programs were added: a nonattainment program was adopted for areas in violation of specific NAAQS and a prevention of significant deterioration (PSD) program was established for areas meeting NAAQS.

For CEQR, the most significant aspect of the CAA and its amendments has been the SIP program begun in 1970. Under this program, each state must demonstrate in a SIP the manner in which it will attain compliance with the NAAQS. Once a SIP has been approved by EPA it becomes Federally enforceable and subject to citizen suits.

EPA has developed many air quality regulations, which are reported in the Code of Federal Regulations (CFR). The most pertinent air quality regulations reported in the CFR are as follows:

- 40 CFR 50: National Primary and Secondary Ambient Air Quality Standards
- 40 CFR 51: Preparation of Implementation Plans
- 40 CFR 52: Approval and Promulgation of Implementation Plans (which includes Prevention of Significant Deterioration)
- 40 CFR 53: Ambient Air Monitoring Methods
- 40 CFR 60: Standards of Performance for New Stationary Sources
- 40 CFR 61: National Emission Standards for Hazardous Air Pollutants
- 40 CFR 93: Determining Conformity of Federal Actions to State or Federal Implementation Plans

In addition, as part of the 1990 Clean Air Act Amendments (CAAA), EPA has also established a list of 189 air toxics (HAPs) to be regulated (this list is found in Title III of the CAAA). This list is regulatory in nature: it is used to determine the levels of controls and permits required for different actions rather than to assess an action's impacts.

Other relevant CAAA issues include provisions for attainment and maintenance of NAAQS (Title I); provisions relating to mobile sources—these promulgated emission reductions are accounted for in the latest mobile source emission models (Title II); and provisions relating to stratospheric ozone protection (Title VI). The last title, relating to ozone protection, contains regulations governing various chlorofluorocarbons (commonly referred to as "CFCs"), including prohibitions against the use of certain CFCs and controls for the recycling and disposal of others.

711.2. OSHA and NIOSH Standards

The U.S. Occupational Safety and Health Administration (OSHA) regulates air pollutants in the workplace. The National Institute for Occupational Safety and Health (NIOSH) is the Federal agency responsible for conducting research and making recommendations for the prevention of work-related disease and injury. OSHA and NIOSH have promulgated standards for many air contaminants in the workplace. These standards are identified in 29 CFR 1910.1000, as amended. *The NIOSH's Pocket Guide to Chemical Hazards*, July 1996, also identifies recommended standards. Permissible Exposure Limits include Short Term Exposure Limits (the employee's 15-minute time-weighted average exposure that shall not be exceeded), 8-hour Time Weighted Average limits (the employee's average airborne exposure in any 8-hour work shift of a 40-hour work week that shall not be exceeded), and ceiling levels (the employee's exposure that shall not be exceeded during any part of the work day).

712. New York State Regulations

DEC provides applicable New York State air quality regulations under the New York Codes, Rules and Regulations, Title 6, Chapter III-Air Resources, Subchapter A-Prevention and Control of Air Contamination and Air Pollution:

- Part 200: General Provisions
- Part 201: Permits and Certifications
- Part 203: Indirect Sources of Air Contamination
- Part 211: General Prohibitions
- Part 212: General Process Emission Sources
- Part 218: Emissions Standards for Motor Vehicles and Motor Vehicle Engines
- Part 219: Incinerators
- Part 222: New Incinerators for New York City
- Part 231: New Source Review in Nonattainment Areas
- Part 232: Dry Cleaning
- Part 240: Transportation Conformity Rule
- Part 257: Air Quality Standards

713. New York City Regulations

- New York City Air Pollution Control Code, Section 1402.2-9.11, "Preventing Particulate Matter from Becoming Airborne; Spraying of Asbestos Prohibited; Spraying of Insulating Material and Demolition Regulated." These regulations govern fugitive dust.
- Building Code of the City of New York (Local Law No. 76 of 1968 and amendments), Title

27, Chapter 1, Subchapter 15, governs chimneys and gas vents.

- New York City Zoning Resolution, Article IV (Manufacturing Districts), Chapter 2, Section 42-20, provides performance standards in manufacturing districts that address smoke, dust, and other particulate matter, and odorous matter.

720. APPLICABLE COORDINATION

Consistency with the New York State Implementation Plan for air quality (SIP) is of critical importance to New York City. If the State is found to be inconsistent with this plan by the EPA, this could result in a suspension of Federal transportation funding for the City. DEP is the designated City agency for coordinating with EPA for SIP consistency. Therefore, under certain circumstances, the lead agencies will need to coordinate detailed air quality analyses with DEP.

Coordination between the lead agency and DEP is strongly recommended and DEP should be notified if the air quality analysis for CEQR actions indicates either of the following results: a violation of the 8-hour CO ambient air standard or PM_{10} standards predicted from mobile sources at any location in the project's build year(s); or an exceedance of any of the criteria ambient air quality standards due to stationary sources at any location.

The data used for any refined air quality impact studies for a proposed action should be examined for consistency with recent air quality studies performed in the same region affected by the proposed action. In addition, the air quality analysis requires careful coordination with the traffic and transportation analyses, both for data collection and for certain analysis techniques.

730. LOCATION OF INFORMATION

DEP, Office of Environmental Planning and Assessment is the main source that compiles readily available data that is commonly required to perform detailed mobile and stationary source air quality analyses. DEP can also provide sample air quality analyses for various types of applications.

- Requests for copies of the Bureau of Environmental Compliance (BEC) air contaminant permits should be addressed to DEP's Bureau of Environmental Compliance, 59-17 Junction Boulevard, Elmhurst NY 11373; requests for fee waivers for BEC searches should be addressed to DEP Bureau of Legal and Legislative Affairs at the same address as BEC.