4.11 AIR QUALITY

4.11.1 Introduction

This Section provides an assessment of the potential mobile and stationary source air quality impacts associated with the proposed construction and operation of Shaft 33B at the preferred shaft Site at E. 59th Street and First Avenue. Vehicular traffic represents the mobile sources. The construction sources included on-site construction equipment and material transporting vehicles (i.e., dump trucks, flatbed trucks, and concrete trucks). As noted in Chapter 2, "Purpose and Need and Project Overview," NYCDEP will require the contractor for Shaft 33B to reduce particulate matter emissions to the extent practicable by employing relatively new equipment (model years 2003 and newer), installing emissions controls on diesel equipment greater than 50 horsepower (hp), such as diesel particulate filters (DPFs) or diesel oxidation catalysts (DOCs), and using alternate means of powering the equipment, such as electricity. For diesel equipment greater then 50 hp in size that will likely not be able to implement DPFs, DOCs will be required. NYCDEP will require emission controls for the ventilated enclosure for concrete trucks. A discussion of the site-specific construction data, air quality modeling scenarios, and the results of the air dispersion modeling utilized to assess the effects of emissions from on-site construction sources are also presented in this Section. Potential combined impacts from the preferred Shaft Site and water main connections construction are included in Chapter 5, "Water Main Connections," Section 5.11, "Air Quality."

The methodology utilized to prepare this assessment, as well as air quality regulations applicable to the Study Area, is described in Chapter 3, "Impact Methodologies," Section 3.11 "Air Quality." Appendix 11 includes additional information regarding the development and documentation of emission factors, a detailed discussion of construction data, modeling inputs, and the presentation of equipment-specific emission rates with sample calculations.

4.11.2 Existing Conditions

Existing Monitored Air Quality Conditions (2004)

The New York State Department of Environmental Conservation (NYSDEC) monitors ambient air quality at a number of locations throughout New York State, including the New York City Boroughs. Each of the NYSDEC air monitoring stations monitors one or several regulated air pollutants. The most recent year of available data from these monitoring stations is the calendar year 2004. Ambient air quality data including concentrations of carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM), nitrogen dioxide (NO_2), lead, and ozone for the Study Area are presented in Table 4.11-1. While New York County is still a non-attainment region for ozone and PM, there were no monitored violations of the National Ambient Air Quality Standards (NAAQS) for any pollutants other than annual average $PM_{2.5}$ concentration at these sites in 2004.

Pollutant Background Data

Where needed to determine potential air quality impacts from the project, background ambient air quality data for pollutants were added to the predicted concentrations developed for the air quality impact analysis. As previously mentioned, the background data was obtained from NYSDEC monitoring stations. Background data utilized in these analyses are presented in Table 3.11-5.

Since peak project-induced traffic volumes were below screening thresholds, a quantitative mobile source analysis was not conducted to establish conditions in the Future Without the Project.

Table 4.11-1
Representative Monitored Ambient Air Quality Data (2004)

Pollutants	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	P.S. 59	ppm	8-hour	-	2.1	2.0	0	-
			1-hour	-	2.9	2.6	0	
SO_2	P.S. 59	ppm	Annual	0.010	-	-	0	-
			24-hour	-	.037	.033	0	-
			3-hour	-	.087	.056	-	0
Respirable Particulates (PM_{10})	JHS 126	$\mu g/m^3$	Annual	17	-	-	0	0
			24-hour	-	47	32	0	0
Fine Particulates ($PM_{2.5}$)	P.S. 59	$\mu g/m^3$	Annual	15.6	-	-	-	-
			24-hour	-	41.7*	-	-	-
NO_2	P.S. 59	ppm	Annual	0.035	-	-	0	0
Lead	Susan Wagner HS	$\mu g/m^3$	3-month	-	.01	.01	0	-
O_3	IS 52	ppm	1-hour	-	.094	.091	0	0

Note: * The 24-hour $PM_{2.5}$ concentration is a value representing the 98th percentile.

Source: 2004 Annual New York State Air Quality Report, NYSDEC 2004 (Draft).

4.11.3 Future Conditions Without the Project

In the Future Without the Project at the preferred Shaft Site, with respect to stationary (construction and operation) emission sources, air quality is anticipated to be similar to that under existing conditions. Land uses are expected to remain generally the same in this neighborhood and since air quality regulations mandated by the Clean Air Act are anticipated to maintain or improve air quality in the region, it can be expected that air quality conditions in the Future Without the Project would be no worse than those that presently exist. Therefore, no quantified analysis was performed for this scenario.

4.11.4 Future Conditions With the Project

This Section provides the summary of projected air quality impacts from the construction and operation of the shaft at E. 59th Street and First Avenue. Impacts from mobile sources at the Shaft Site did not require a detailed quantitative analysis since peak project-induced traffic volumes were below screening thresholds, and therefore, no significant adverse impacts from off-site mobile sources associated with the construction or operation of Shaft 33B at the preferred Site are expected. The air quality analysis for the site thus focuses on the possible effects of on-site construction activities at the preferred Shaft Site on local air quality.

While the EIS addresses two potential configurations of the preferred Site (See Chapter 2 "Purpose and Need and Project Overview") there would be no substantive changes in predicted air quality results between the base and the alternate site configurations. Under both configurations, a wall would initially be constructed at the selected Shaft Site. Therefore, only one set of results is presented in this Section. These predicted maximum impacts results are conservative estimates for both the base and alternate site configurations.

Construction

The most likely effects on local air quality during construction activities at the preferred Shaft Site would result from:

- Engine emissions generated by on-site construction equipment, and trucks entering/leaving the site during construction;
- Fugitive dust emissions generated by soil excavation and other construction activities; and,
- Fugitive dust emissions generated by construction trucks traveling on paved roads.

An analysis of the potential for air quality impacts from on-site construction equipment was performed for the preferred Shaft Site. The methodology described in Section 3.11 was followed to predict the potential construction-related impacts associated with the project. The potential impacts of construction emissions of the criteria pollutants (CO, SO_2, NO_2, $PM_{2.5,}$ and PM_{10}) were evaluated for construction stages with peak emissions. The construction period for the Shaft was divided into four distinct stages of activities; each lasting two to twelve months based on the construction equipment resource schedules (see Section 4.1 for information on construction activities that would occur during each Stage). An analysis of the expected $PM_{2.5}$ emissions over time for each stage of construction was performed to identify the stages with highest potential short- and long-term emissions from projected on-site construction activities. $PM_{2.5}$ emissions were utilized as the worst case pollutant for the evaluations of emissions over the construction phases, because $PM_{2.5}$ is known to be a major pollutant of concern for diesel construction equipment. The assessment required the use of reasonable estimates of equipment type and size, the number of operating hours and, as noted earlier in Chapter 2, "Purpose and Need and Project Overview," NYCDEP will require the contractor for Shaft 33B to reduce particulate matter emissions to the extent practicable for the on-site equipment at each stage of the construction period. Based on these analyses, Stage 1 was determined to be the period of maximum projected

short-term construction emissions and Stage 3 was determined to be the period of maximum projected annual construction emissions.

Potential maximum impacts are presented in this Section and potential impacts during the remainder of the construction period are discussed qualitatively, because they are expected to be less than those analyzed for Stages 1 and 3. A depiction of the site configuration used in the air quality analysis is provided in Figure 4.11-1.

On-Site Construction Equipment

During construction at the preferred Shaft Site, various types of fuel burning construction equipment would be used at different locations throughout the site. The release of airborne pollutants from the combustion of fuel and fugitive dust created by heavy vehicles traveling and operating in work areas are the two main sources of air emissions for the reasonable worst case analyses. The equipment would operate on an intermittent basis for 16 hours per day during the primary work shift (i.e., 7:00 a.m. to 3:00 p.m.) and the secondary work shift (3:00 p.m. to 11:00 p.m.). Table 4.11-2 presents a list of the construction equipment that would have engine or fugitive emissions and would be expected to be on-site during the peak short-term and annual construction periods.

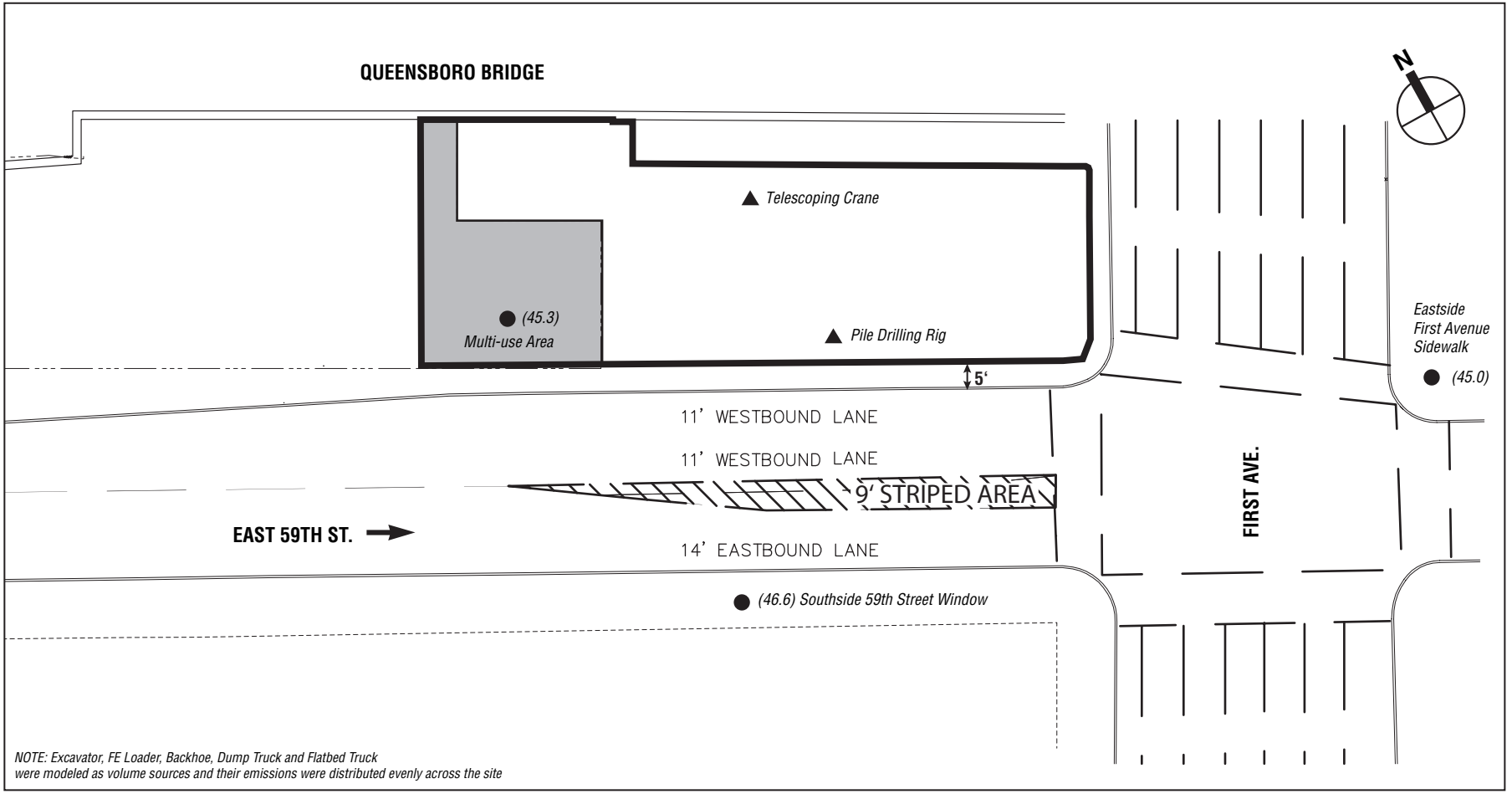
Table 4.11-2
On-Site Construction Equipment for Peak Short-Term and Annual Period[a]

Equipment Type	Analysis Period	Mobile or Stationary
Excavator	Short-Term and Annual	Mobile
FE Loader	Short-Term and Annual	Mobile
Derrick Crane	Annual Only	Stationary
Backhoe	Short-Term Only	Mobile
Telescoping Crane	Short-Term Only	Stationary
Concrete Pump	Annual Only	Stationary
Concrete Truck	Annual Only	Stationary
Dump Truck	Short-Term Only	Mobile
Flatbed Truck	Short-Term and Annual	Mobile
Pile Drilling Rig	Short-Term Only	Stationary

Note: **a.** Emissions for on-site equipment were estimated for each stage of construction. Some of the equipment would only operate during the peak short-term emissions period (Stage 1), some would be employed for the annual period with the greatest predicted annual emissions (Stage 3), and some equipment would be common to both Stage 1 and Stage 3 (short-term and annual in the 'Analysis Period' column of this table). Since concrete trucks would be in a ventilated enclosure on-site, they were considered to be stationary sources.

Engine Exhaust

As discussed in Section 3.11, the emission factors for combustion of fuel for on-site construction equipment (excluding heavy duty diesel trucks) were developed using the U.S. Environmental Protection Agency (USEPA) NONROAD Emissions Model for the analysis year 2006 (as the



NOT TO SCALE

Legend:

Additional Construction Area Only During Stages 2 and 3

(#.#) Maximum Predicted 24-Hour $PM_{2.5}$ Concentration in $\mu g/m^3$

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED SHAFT 33B TO CITY WATER TUNNEL NO. 3
STAGE 2-MANHATTAN LEG
PREFERRED SHAFT SITE

PREDICTED 24-HOUR $PM_{2.5}$ CONCENTRATIONS FOR CONSTRUCTION ACTIVITIES

FIGURE 4.11-1

construction contract begins in 2006). The model is based on source inventory data collected for specific categories of off-road equipment. Data provided in the output files from the NONROAD model were used to derive (i.e., calculate from regional emission estimates) these emission factors for each type of equipment that is expected to be present on-site during construction activities. Emission factors were developed for NO_x, PM (PM_{10} and $PM_{2.5}$), CO, SO_2, and were calculated using ultra-low sulfur diesel (ULSD).

NYCDEP will require several control measures to ensure that construction at the Shaft Site is conducted in a manner protective of the local air quality. The equipment used on-site will be fairly new, specifically model year 2003 and newer (the NONROAD emission factors derived from the model are based on year 2003 model equipment). As described in Section 3.11, NYCDEP will require the contractor for Shaft 33B to reduce particulate matter emissions to the extent practicable. For diesel equipment greater then 50 hp in size that will likely not be able to implement DPFs, DOCs will be required. Emission rates were estimated accounting for the use of air emissions control technology, specifically, utilizing a 90 percent PM reduction efficiency for DPFs and 25 percent PM reduction efficiency for DOCs. The benefits from NYCDEP's requirements to utilize newer equipment and reduce PM emissions to the extent practicable were incorporated into the analysis.

Emission rates of NO_x, PM, CO, and SO_2 from concrete trucks, dump trucks and flatbed trucks were developed using the USEPA MOBILE6.2 emissions model (a modeling year of 2006 was used. The on-site idling time was limited to three minutes for the flatbed and dump trucks, since these trucks are subject to the City's three minute idling law. The concrete trucks are exempt from the idling laws because their engines must keep running in order to keep the cement mixer operating. For analysis purposes, it was assumed that the concrete trucks would operate up to 90 percent of the time on-site for the 24 hour average emission rates. NYCDEP is evaluating the use of controls on the diesel fuel combustion-related emissions of concrete trucks. For analysis purposes in the EIS, the emissions from concrete trucks were simulated as uncontrolled.

Fugitive Emission Sources

On-site mobile construction equipment has the potential to generate fugitive dust by traveling on paved portions of the site. Emission rates for these activities were developed using equations presented in USEPA's AP-42 *A Compilation of Air Pollution Emission Factors*. The speeds for all on-site vehicles will be limited to a maximum of five miles per hour due to space restrictions. When speeds are less than five miles per hour (mph), fugitive emissions of $PM_{2.5}$ are negligible. The maximum distance traveled on-site is estimated to be 80 feet per vehicle (160 feet round trip). The maximum travel distances are a conservative approximation of the distance that most trucks would travel during soil transfer and concrete pouring operations.

During construction, the contractor would be required to implement a water spray dust control program, which would provide at least a 50 percent reduction in PM_{10} emissions.

On-site construction equipment also has the potential to generate fugitive dust during excavation activities. AP-42 emission factors for load/drop operations were used to estimate PM_{10} and $PM_{2.5}$ emission rates based on peak excavation volumes. Excavation activities would occur during

Stage 1. Therefore, fugitive emissions generated by excavation procedures were only addressed in the short-term analyses.

Construction Data

As stated above, the estimated emission rates for engine exhausts were calculated from the NONROAD model output files. The construction data necessary to perform these calculations included the type of non-road equipment, its rated size in horse power and the type of fuel used by the engine. The construction data needed to perform fugitive road dust calculations included the number of vehicle trips on-site, the distance traveled by those vehicles and the average vehicle weights. Excavation rates were required for calculations of fugitive dust from load/drop operations.

Once the source emissions were established, a dispersion modeling study was performed to determine ambient concentrations for the pollutants emitted by construction equipment following the methodology described in Section 3.11. Provided below in Table 4.11-3 is some construction equipment data relevant to the air quality analysis performed for the worst case (i.e., highest emissions) period in Stages 1 and 3.

Table 4.11-3
Construction Equipment Data

Stage 3 Equipment	Rated Size (Horse Power)	Stage 1 Usage Factor (percent)	Stage 3 Usage Factor (percent)
Excavator	200	25	5
FE Loader	150	30	5
Derrick Crane	275	N/A[a]	25
Backhoe	150	10	N/A[a]
Telescoping Crane	150	20	N/A[a]
Concrete Pump	100	N/A[a]	25
Concrete Truck[b]	300	N/A[a]	3 per hour
Dump Truck[b]	300	1.5 per hour	N/A[a]
Flatbed Truck[b]	300	1.5 per hour	1 per hour
Pile Drilling Rig	200	25	N/A[a]

Notes: **a.** N/A – Not required in this Stage.

b. The number of on-site trucks was conservatively estimated to equal the peak number of trucks traveling to and from the site for each of the 16 hours of the work day.

ISC Dispersion Modeling

A dispersion modeling analysis was performed to estimate incremental and total concentrations of air pollutants associated with emissions produced by on-site construction activities at the preferred Shaft Site. The analysis was conducted using the ISCST3 dispersion model and was performed in accordance with USEPA and the *CEQR Technical Manual*. The predicted incremental and total concentrations of pollutants were compared to applicable air quality

standards and interim guidance values to help evaluate the potential for significant adverse impacts.

Results

The maximum concentrations from on-site construction sources were predicted at receptors near the Shaft Site. This was true for all averaging periods, both short-term and annual, and for all pollutants modeled in the analysis. The maximum predicted increments from construction sources and the total concentrations including all baseline sources are presented in Table 4.11-4. The background levels obtained from the NYSDEC monitoring data, as described in Section 3.11, were added to the modeled local Future Without the Project mobile source contributions to obtain a total baseline concentration. As indicated in the table, the construction of the proposed shaft at this site would not cause an exceedance of the NAAQS. Since the predicted concentrations were modeled for stages of construction that are projected to result in the highest site-wide air pollutant emissions, the concentrations during other stages of construction are expected to be lower. The maximum predicted total local 24-hour $PM_{2.5}$ concentrations are depicted in Figure 4.11-1.

Table 4.11-4
Results of Dispersion Analysis for Construction Activities at the Preferred Shaft Site

Modeled Pollutant	Averaging Period	Units	Maximum Modeled Increment	Future Without the Project (Baseline) Concentration	Total Concentration	Ambient Air Quality Standards
NO_2	Annual	$\mu g/m^3$	5.6[a]	71	77	100
SO_2	3-Hour	$\mu g/m^3$	2	202	204	1,300
	24-Hour	$\mu g/m^3$	0.1	123	123	365
	Annual	$\mu g/m^3$	0.01	37	37	80
CO	1-Hour	ppm	0.6	7.3[b]	7.9	35
	8-Hour	ppm	0.05	4.0[b]	4.1	9
$PM_{2.5}$[c]	24-Hour	$\mu g/m^3$	3.0	43.6[b]	46.6	65
PM_{10}	24-Hour	$\mu g/m^3$	11	65.6[b]	76.6	150
	Annual	$\mu g/m^3$	0.2	24.6[b]	24.8	50

Notes:

a. NO_2 concentrations are based on the conservative assumption that 62 percent of NO_x emissions from the construction sources is NO_2.

b. Baseline concentrations of CO and PM are from the Future Without the Project mobile source modeling. Since the stationary analysis models the highest increment, the baseline presented for CO included the second highest monitored background values.

c. Total annual-average $PM_{2.5}$ concentration is not presented, since the ambient annual $PM_{2.5}$ concentrations currently exceed the NAAQS. The effects of construction activities are compared to the interim guidance criteria for determination of significance for the $PM_{2.5}$ annual averaging period.

In addition to the comparison of the total maximum local 24-hour average $PM_{2.5}$ concentration with the NAAQS, the maximum predicted annual incremental impact from the construction of the preferred Shaft Site was modeled for comparison with the annual neighborhood average interim guidance criterion. For this assessment, no background contributions from other sources of $PM_{2.5}$ in the Future Without the Project are required. The annual average neighborhood scale concentration increment from the construction of this Shaft Site was predicted to be 0.003 $\mu g/m^3$—considerably less than the 0.1 $\mu g/m^3$ criterion.

Since the predicted concentrations were modeled for periods that represent the highest site-wide air emissions, the increments and total predicted concentrations during other stages of construction would also be less than the applicable significance criteria. Therefore no significant adverse impacts from construction sources are expected with the raise bore method at this Shaft Site. As stated above, potential combined impacts from construction of Shaft 33B and its water main connections at the preferred Shaft Site are included in Chapter 5, "Water Main Connections," Section 5.11, "Air Quality."

Operation

Significant adverse air quality impacts are not anticipated from the operation of the shaft at the Shaft Site since project-induced traffic would be negligible and no appreciable stationary sources of air emissions would be on-site.

◆