5.11 AIR QUALITY

5.11.1 Introduction

This Section provides an assessment of the potential air quality impacts associated with the proposed construction and operation of the water main connections from the preferred Shaft Site. While the final route and construction timing for the water main connections have not yet been determined, for the purposes of EIS impact assessment, a number of reasonable water main connection routes were examined. The route which is most likely to have the worst air quality impacts for the preferred Shaft Site (the reasonable worst-case route) was analyzed quantitatively. Impacts of other reasonable routes were addressed by comparing their potential impacts with the reasonable worst-case route assessment. Potential air quality impacts for water main connections for the alternative Shaft Sites are included in their respective chapters.

Construction of the water main connections would likely occur in segments so that the entire route would not be disrupted concurrently (see details in Section 5.1, “Project Description”). The construction sequencing is generally anticipated to entail simultaneous construction in two non-adjacent City blocks, with construction at intersections occurring separately. The estimated time to undertake these efforts and the potential for non-contiguous street segments to be under construction on First Avenue simultaneously were considered in this analysis. In addition, an assessment of potential combined air quality impacts from the preferred Shaft Site and water main construction is also included in this Section.

As detailed in Section 5.1, the reasonable worst-case route would be along First Avenue from the preferred Shaft Site at E. 59th Street and west across E. 55th and E. 56th Streets to Third Avenue. Two scenarios are analyzed for the reasonable worst-case route: in the Base Scenario, all construction is assumed to occur in the street, and for Scenario A the construction area is assumed to include a narrower area of the street in addition to five feet of the eastern sidewalk of First Avenue. For the Sutton Place representative route, construction would likely occur along E. 59th Street from the preferred Shaft Site to Sutton Place, then proceed south along Sutton Place, and west on E. 55th and E. 56th Streets to Third Avenue. For the E. 59th Street/E. 61st Street representative route, construction of one water main would occur on E. 59th Street from First Avenue to Third Avenue and connect at a point between E. 59th and E. 60th Streets, and another main would be constructed north along First Avenue to E. 61st Street and proceed west to a connection point on Third Avenue between E. 60th and 61st Streets. The various routes are presented in Figures 5.1-1, 5.1-2, and 5.1-3.

Procedures implemented for water main construction would be generally identical within a construction segment irrespective of its location. Thus, the stationary source analysis undertaken for construction segments in the reasonable worst-case route (Base Scenario and Scenario A) are representative of potential stationary air quality impacts that could occur along a segment within these scenarios and other routes evaluated in this EIS. Similarly, the same magnitude of impacts would be anticipated along other potential future routes that have not yet been identified. To the extent necessary to make a determination of the likelihood for potential significant adverse impacts to occur, a combination of quantitative and qualitative analyses were performed to evaluate impacts for the reasonable worst-case route and the additional representative routes.

The potential impacts from mobile and stationary sources related to the construction and operation of the water main connections were assessed. Vehicles traveling on paved roads were analyzed as mobile sources. Construction sources, analyzed as stationary sources, included on-site equipment and support vehicles (i.e. dump trucks, flatbed trucks, and concrete trucks). A discussion of the 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 on air pollutant concentrations in the area, are presented in this Section.

The methodology utilized to prepare this assessment, as well as air quality benchmarks applicable to the Study Area, are described in Chapter 3, "Impact Methodologies," Section 3.11 "Air Quality." Detailed emissions calculations and data are presented in Appendix 11.

5.11.2 Existing Conditions

Existing Monitored Air Quality Conditions (2004)

Existing monitored air quality conditions are discussed in Chapter 4, "Preferred Shaft Site," Section 4.11,"Air Quality." Ambient air quality data including concentrations of CO, SO_2, particulate matter, NO_2, lead, and ozone for the project area are presented in Table 4.11-1.

Background Data for Criteria Pollutants

The background ambient air quality data used in these analyses is presented and discussed in Chapter 3, "Impact Methodologies," Section 3.11, "Air Quality." Where applicable, background ambient concentrations of pollutants were added to the local on-street mobile source contributions and with predicted concentration increments from the construction of the water main connections to produce total predicted concentrations.

5.11.3 Future Conditions Without the Project

In the Future Without the Project along the water main connection routes, air quality is anticipated to be similar to that described for 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. However, in order to develop comparisons with potential concentrations during construction of the water main connections for the Future With the Project, quantified analyses of local CO and PM concentrations near the intersections that were identified for the reasonable worst-case route were performed, following the methodology described in Section 3.11.

Mobile Sources

Traffic Intersections

An evaluation of the locations to analyze potential mobile and stationary source impacts from the construction of the water main connection was undertaken. This evaluation considered the relative amount of traffic on street segments for the Future Without the Project, the potential for construction activities along a common corridor (including whether or not one or two construction mains could be constructed along continuous segments along a corridor), the potential contribution of other nearby sources of on-street pollution (e.g., the Queensboro Bridge), the potential diversion of traffic, and the resultant potential impact on traffic level of service during the construction period. Base on this evaluation, two intersections were determined to represent the worst-case locations for analysis. These were the intersections of E. 59th Street and First Avenue and E. 57th Street and First Avenue for the reasonable worst-case route. The analysis results of the potential impacts from mobile sources and stationary sources and from the combined construction impacts from shaft and water main construction for the Base Scenario and Scenario A for the reasonable worst-case route, were used to determine potential impacts for other representative routes.

CO

CO concentrations near intersections were determined for the 2008 analysis year in the Future Without the Project (No Build). Maximum predicted 8-hour average CO concentrations at the analysis intersections for the Future Without the Project are presented in Table 5.11-1. The values shown are the highest predicted concentrations for all receptor locations.

Table 5.11-1
Total Maximum Predicted 8-Hour Average CO Concentrations (ppm)
Future Without the Project (2008)

Site	Location	1-Hour Average	8-Hour Average
1	E. 59th Street and First Avenue	7.3	4.0
2	E. 57th Street and First Avenue	7.1	3.7

Notes: Modeling was performed using the refined Tier II procedure with CAL3QHCR, and represents the second highest possible concentration.
Includes local traffic, and highest background concentration of 2.9 ppm.
National Ambient Air Quality Standards:
1-Hour: 35 ppm
8-hour: 9 ppm

PM

PM concentrations were determined for the 2008 analysis year in the Future Without the Project (No Build). The maximum predicted 24-hour PM_{10} and $PM_{2.5}$, and annual average PM_{10} concentrations at the analysis intersections in the Future Without the Project are presented in Table 5.11-2. Annual average $PM_{2.5}$ values are not presented to demonstrate compliance with the annual NAAQS, since the regional annual $PM_{2.5}$ concentrations already exceed the NAAQS in the existing condition, and as discussed in Section 3.11, annual $PM_{2.5}$ concentrations were evaluated by comparison to the applicable annual neighborhood scale average incremental criterion. The values shown are the highest predicted concentrations (including background levels) for all receptor locations for each of the time periods analyzed.

Table 5.11-2
Maximum Total Predicted PM Concentrations (µg/m^3)
Future Without the Project 2008

Site	Location	Pollutant	Averaging Period	Total Maximum Predicted Concentration	
				Sidewalk Receptors	Building Receptors
1	E. 59th Street and First Avenue	$PM_{2.5}$	24-Hour	43.5	42.8
		PM_{10}	24-Hour	65.6	59.3
			Annual	24.6	21.9
2	E. 57th Street and First Avenue	$PM_{2.5}$	24-Hour	42.5	42.2
		PM_{10}	24-Hour	56.5	53.8
			Annual	21.0	20.2

Notes: The maximum concentration includes the contribution of local traffic, and background PM_{10} concentrations of 50 µg/m^3 on a 24-hour average and 19 µg/m^3 on an annual average, 24-hour $PM_{2.5}$ background concentration of 41.7.

National Ambient Air Quality Standards:
$PM_{2.5}$ 24-Hour: 65 µg/m^3
PM_{10} 24-Hour: 150 µg/m^3
Annual Average: 50 µg/m^3

Local annual average total $PM_{2.5}$ concentrations in the Future Without the Project from nearby on-street sources are not presented, since potential adverse impacts from the potential $PM_{2.5}$ emissions from water main construction are evaluated only on an incremental basis for this time averaging period.

Stationary Sources

In the Future Without the Project, with respect to stationary emission sources (construction and operation), air quality is anticipated to be similar to that described for the existing conditions. Land uses are expected to remain generally the same in this neighborhood and 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 stationary emission sources in the Future Conditions Without the Project.

5.11.4 Future Conditions With the Project

A summary of potential air quality impacts from the construction and operation of the water main connections to the preferred Shaft Site is provided in this section. Possible effects on local air quality during construction of the water main connections are addressed, as well as potential combined impacts from construction at the Shaft Site and water main connections. Potential impacts from the operation of the water main connections did not require a detailed quantitative analysis since peak volumes were below screening thresholds suggested in the *CEQR Technical Manual*, and therefore, no significant adverse impacts from the operation of the water main connections are expected.

Construction

Both mobile and stationary source analyses were conducted to assess potential impacts associated with water main construction following the methodology described in Section 3.11. The assessment of potential impacts from mobile sources for the reasonable worst-case and additional representative routes is presented first, followed by the assessment of the potential impacts from stationary sources from water main connections construction. In addition, the assessment of potential combined impacts from water main connections and preferred Shaft Site construction is also presented.

Mobile Sources

Reasonable Worst-Case Route – Base Scenario

Carbon Monoxide (CO)

CO concentrations in the Future With the Project for the reasonable worst-case route (Base Scenario) were determined for the 2008 analysis year at two intersections, following the methodology described in Section 3.11. The maximum predicted CO concentrations in the Future Without and With the Project at the two analyzed intersections are presented in Table 5.11-3. The values shown are the highest predicted concentrations for each averaging period analyzed. Based on these results, the construction of water mains would not result in any predicted violations of the CO standard and *de minimis* concentrations would not be exceeded at any of the receptor locations as a result of the lane closures and additional construction vehicles for the Base Scenario. As indicated in the table, peak CO concentrations are not predicted to increase.

Predicted peak concentrations at Site 1 were largely impacted by emissions coming from the nearby Queensboro Bridge (Bridge), which do not change with the potential construction of the water main connections. In addition, in the Future Without the Project the peak concentrations near the avenue at both sites are predicted to occur on the east sidewalk due to the orientation of the street and the dominant winds. In the Future With the Project, the eastern sidewalk would be further from the moving traffic due to the lane closures, and therefore, peak concentrations (presented in Table 5.11-3) would be lower. On the west sidewalk at Site 2 (which is unaffected by Bridge emissions), 8-hour average concentrations which were predicted to range up to 3.6

ppm in the Future Without the Project were predicted to increase in the Future With the Project, ranging up to 3.7 ppm. These modeled increments reflect the potential slowdown of traffic and any additional queuing that could occur from the traffic impacts under this scenario. Based on the above, and the traffic analyses reported in Section 5.9, no significant adverse impacts on CO levels from potential traffic diversions during construction are expected, and no significant impacts on CO concentrations were predicted due to the construction vehicles and reduced traffic lanes under the Base Scenario.

Table 5.11-3
Maximum Predicted 8-Hour Average CO Concentrations (ppm)
Future Without and With the Proposed Project 2008
(Reasonable Worst Case Route – Base Scenario)

Site	Location	Averaging Period	Future Without the Project (Baseline)[a]	Build	Project Increment	*De Minimis* Criteria
1	E. 59th Street and First Avenue	8-hour	4.0	4.0	0.0	2.5
		1-hour	7.3	7.3	0.0	—
2	E. 57th Street and First Avenue	8-hour	3.7	3.7	0.0	2.7
		1-hour	7.1	6.9	-0.2 [b]	—

Notes: Modeling was performed using the refined Tier II procedure with CAL3QHCR, and represents the second highest predicted concentration.

Includes local traffic, and highest background concentration of 4.7 and 2.9 ppm, for the 1-hour and 8-hour time average periods, respectively.

National Ambient Air Quality Standards:
1-Hour: 35 ppm
8-hour: 9 ppm

a. The maximum values from on-street sources were utilized as the baseline for the stationary source impact analyses.

b. Since the eastern-most lanes would be closed to traffic during construction, the concentrations along the eastern sidewalk resulting from vehicular emissions would be lower at that location. Since the highest concentration at other locations is lower, the maximum 1-hour concentration was predicted to decrease.

Particulate Matter

Total PM concentrations in the Future With the Project were determined for the 2008 analysis year using the methodology described in Section 3.11. The future maximum 24-hour and annual average PM_{10} and 24-hour average $PM_{2.5}$ concentrations predicted at the analysis intersections with the construction of the water main connections are presented in Table 5.11-4. The total values shown are the highest concentrations predicted at the receptor locations for each of the time periods analyzed. As indicated in the table, the construction of the water main connections would not cause an exceedance of the NAAQS. Total annual-average $PM_{2.5}$ is not presented for comparison with the NAAQS, since ambient concentrations currently exceed the NAAQS. $PM_{2.5}$ annual concentrations are compared to the applicable interim guidance criteria.

The maximum predicted annual neighborhood scale increments in $PM_{2.5}$ concentrations at both sites were less than 0.005 µg/m^3 — well below the interim guidance values of 0.1 µg/m^3 for the annual neighborhood scale criterion.

Based on the above, and the traffic analyses reported in Section 5.9, "Traffic and Parking" (higher traffic volumes and more congestion are projected at these two intersections than for the Sutton Place route), no significant adverse impacts on PM levels from potential traffic diversions during construction are expected.

Therefore, the construction of water main connections was not predicted to result in significant adverse PM impacts due to the construction vehicles and reduced traffic lanes.

Table 5.11-4
Maximum Predicted PM Total Concentrations (µg/m^3)
Future With the Proposed Project 2008
(Reasonable Worst Case Route – Base Scenario)

Site	Location	Pollutant	Averaging Period	Total Concentration	
				Sidewalk Receptors	Building Receptors
1	E. 59th Street and First Avenue	$PM_{2.5}$	24-Hour	43.6	42.8
		PM_{10}	24-Hour	65.6	59.4
			Annual	24.6	22.0
2	E. 57th Street and First Avenue	$PM_{2.5}$	24-Hour	42.5	42.2
		PM_{10}	24-Hour	56.6	53.8
			Annual	21.1	20.2

Notes: Includes local traffic, and background PM_{10} concentrations of 50 µg/m^3 on a 24-hour average and 19 µg/m^3 on an annual average, 24-hour $PM_{2.5}$ background concentration of 41.7.

National Ambient Air Quality Standards:
$PM_{2.5}$ 24-Hour: 65 µg/m^3
PM_{10} 24-Hour: 150 µg/m^3
PM_{10} Annual Average: 50 µg/m^3

<u>Mobile Source Impact Conclusions for Reasonable Worst-Case Route — Base Scenario</u>

The construction of the reasonable worst-case route under the Base Scenario is predicted to have very little impact on air quality due to construction vehicles and reduced traffic lanes. No significant adverse impacts on air quality from mobile sources would be expected from the construction of the water main connections under the Base Scenario of the reasonable worst-case route.

Reasonable Worst Case Route – Scenario A

Scenario A was not subjected to quantitative mobile source analysis, because from an air quality perspective it would be similar to the Base Scenario, with potentially better traffic conditions for the midday period. Since there would be less disruption to traffic under this scenario (potentially one less traffic lane closure compared to the Base Scenario in the midday period) and based on the modeled results for the Base Scenario, no significant adverse impact on air quality would be expected from construction of Scenario A of the reasonable worst-case route on mobile sources.

Sutton Place Route

Under the Sutton Place route, the baseline traffic conditions and construction traffic impacts would be less than those projected for First Avenue under the reasonable worst-case route since the baseline traffic volumes are lower (see Section 5.9, "Traffic and Parking"). Since there would be less disruption to overall baseline traffic for the majority of the construction period under this scenario and based on the modeled results for the reasonable worst-case Base Scenario, no significant adverse impact on air quality would be expected from mobile sources with construction along the Sutton Place route.

E. 59th Street/E. 61st Street Route

Under this alternative, the largest and most frequent traffic impacts would occur along the E. 59th and E. 61st Street corridors. Traffic volumes along these corridors would be substantially less than those analyzed for the reasonable worst-case route. Since there would be less disruption to overall baseline traffic for most of the construction period under this scenario and based on the modeled results for the reasonable worst-case route (Base Scenario), no significant adverse impact on air quality would be expected from mobile sources with construction along the E. 59th Street/E. 61st Street representative route

Therefore, no significant adverse impact on air quality would be expected from mobile sources with the construction of the E. 59th Street/E. 61st Street route.

Mobile Source Impact Conclusions

The construction of the water main connections is predicted to have very little impact on air quality due to changes in vehicular emissions and lane closures for both reasonable worst-case route scenarios (Base Scenario and Scenario A). Potential impacts experienced due to diversions during construction or along other routes in the project area are anticipated to be similar. No significant adverse impacts on air quality from mobile sources would be expected from the construction of the water main connections.

Stationary Sources

The most likely effects on local air quality during construction activities for the water mains would result from:

- Engine emissions generated by on-site construction equipment and trucks entering the site; and
- Fugitive dust emissions generated by soil excavation and other construction activities.

A quantified analysis of the potential for air quality impacts from on-site construction equipment was performed for the reasonable worst-case water main connection route. The methodology described in Section 3.11 was followed to predict the potential construction-related impacts associated with the construction of water main connections. The potential impacts of construction emissions on concentrations of CO, SO_2, NO_2, and PM_{10} and $PM_{2.5}$ were evaluated for the peak stages of construction.

The assessment required the use of reasonable estimates of equipment type and size, the number of operating hours, and, as noted earlier in Section 3.11, the likely reduction in emissions from construction equipment utilized on future New York City capital projects in the future as a result of compliance with Local Law 77[1], which requires the use of best available emissions reduction technologies.

The overall water main construction sequence is described in Section 5.1. The water main connections would be constructed in Stage 5 of the project (Stages 1 through 4 are allocated to construction at the Shaft Site). Stage 5 was further broken down into 13 conceptual segments (see Section 5.1) based on a logical construction sequencing method for this type of work. Based on this construction sequencing, the first three segments would be constructed during the first 12 months of water main construction and are described below. The first 12 months were determined to be the reasonable worst-case period for analysis since construction at that time would coincide with and take place in close proximity to Shaft Site construction activity, as well as coincide with the worst traffic impacts related to the loss of moving lanes on First Avenue.

Activity taking place during the first 12 months include:

- Segment 1 would last up to 20 weeks (4.6 months) and would include construction on E. 59th to E. 58th Streets and E. 57th to E. 56th Streets on First Avenue.
- Segment 2 would last 10 weeks (2.3 months) and would include construction on the E. 58th and E. 56th Street intersections on First Avenue.
- Segment 3 would last 12 weeks (2.8 months) and would include construction on blocks E. 58th to E. 57th Streets and E. 56th to E. 55th Streets on First Avenue.

Total water main construction activity within the first year was estimated at a total of 42 weeks, with the remaining 10 weeks set aside for black-out dates, during seasonal holidays. The remaining segments of water main construction were assumed to follow a similar pattern of construction: two avenue blocks in a 12-week period, the intersection construction in a 10-week period, and then the next two avenue blocks in a 12 week period. As described in Section 5.1, each segment of water main construction would be comprised of four steps, identified here as a, b, c, and d (e.g., the first step in segment 3 is segment 3a).

An analysis of the expected $PM_{2.5}$ emissions during each of the steps in the construction of all segments of water main construction activity was performed to identify the periods with the highest potential emissions from projected on-site construction activities for each averaging period. The assessment required reasonable estimates of the equipment type and size, the number of operating hours and, as noted earlier in Chapter 2, “Purpose and Need and Project Overview”,

[1] New York City Administrative Code § 24-163.3, adopted December 22, 2003, also known as Local Law 77, requires that any diesel-powered non-road engine with a power output of 50 hp or greater that is owned by, operated by or on behalf of, or leased by a city agency shall be powered by ultra low sulfur diesel fuel (ULSD), and utilize the best available technology (BAT) for reducing the emission of pollutants, primarily particulate matter and secondarily nitrogen oxides. NYCDEP is charged with defining and periodically updating the definition of BAT.

emission controls in place (as a result of Local Law 77) for on-site equipment at any given time. Based on these analyses, Segment 1a of the construction period was determined to be the period of maximum predicted short-term construction emissions, and the first 12 months of construction, Segments 1 through 3, were determined to be the period of maximum projected annual construction emissions. As described in Section 5.1, step c of Segment 1, referred to for the purposes of this analysis as Segment 1c, would include the construction of the venturi chamber. Segment 1c would have higher emissions than any other step in all segments, and its impacts would not be representative of the construction of a typical segment for a short-term period (less than 24 hours). The impacts of Segment 1c are discussed separately as part of the Combined Assessment presented later in this Section.

As described in detail in Appendix 11, the site-wide emission rate for each step in each water main construction segment was calculated. The step with the highest potential for impacts was selected as the worst-case for modeling concentrations of all averaging periods shorter than annual (1-hour, 3-hour, 8-hour, and 24-hour). The worst-case step for the water mains construction was determined to be the first step, step a of Segment 1, referred to as Segment 1a. The annual model consisted of emissions from all Segment steps which would occur during the entire year—Segment 1a through 3d.

Potential maximum impacts from stationary sources (combined with mobile sources where appropriate) 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 anticipated for Segment 1a.

Reasonable Worst-Case Route – Base Scenario

On-Site Construction Equipment

During construction of the water mains, various types of construction equipment would be used at different locations. Engine emissions and fugitive dust created during excavation and transfer of materials in the work area would be the two main sources of air emissions.

The equipment would most likely operate for one 8-hour shift per day from 7:00 a.m. to 3:00 p.m. While analyzed for the daytime period, this 8-hour work shift could occur during other work shifts as required by the NYCDOT. Table 5.11-5 presents a list of the construction equipment expected to be on-site during the peak short-term and annual construction periods and would produce engine or fugitive pollutant emissions.

Engine Exhaust

Engine emission factors for on-site construction equipment (excluding heavy duty diesel trucks) were developed using the USEPA NONROAD Emissions Model for the analysis year 2008 (the year the water mains construction would likely begin), following the methodology presented in Section 3.11.

Emission rates of NO_X, CO, SO_2, and PM, from concrete trucks, dump trucks, and flatbed trucks were developed using the USEPA MOBILE6.2 emissions model (a modeling year of 2008 was used), utilizing ultra low sulfur diesel, as required by law.

Based on the engine emission factors described above, emissions rates were calculated for each type of equipment expected to be on site. A more detailed discussion of the emission rates for the analysis is included in Appendix 11 for $PM_{2.5}$, PM_{10}, NO_x, SO_2, and CO. The 8-hour, 24-hour and annual emission rates were adjusted from the peak hour emission values based on the expected hours of operation of each engine for the various stages, presented in Table 3.11-6. These factors are provided for all equipment used in Appendix 11.

Table 5.11-5
Water Main On-Site Construction Equipment for Peak Short-term and Annual Period

Equipment Type	Analysis Period	Mobile or Stationary
Excavator	Short term and Annual	Mobile
Front End Loader	Annual	Mobile
Telescoping Crane	Annual	Stationary
Concrete Truck	Annual	Stationary
Dump Truck	Short term and Annual	Mobile
Flatbed Truck	Short term and Annual	Mobile
Compressor	Short term and Annual	Stationary
Dewatering Pump	Short term and Annual	Stationary
Paver	Annual	Mobile
Compactor	Annual	Mobile
Pavement Cutter	Short term and Annual	Mobile
Chain saw, gasoline	Short term and Annual	Mobile
Generator for welding	Annual	Stationary

Note: As described later in this Section, emissions for on-site equipment were estimated for each step of each segment of construction. Some of the equipment would only be used during the peak short-term emissions period (Segment 1a), and some would be employed for other segments (Segments 1 through 3) and were included only in the annual analysis.

Fugitive Emission Sources

On-site construction equipment has the potential to generate fugitive dust emissions during excavation and transfer activities. Estimates of PM_{10} and $PM_{2.5}$ emission rates from these activities were developed using AP-42 emission factors for loading/drop operations based on peak excavation volumes. Excavation transfer rates were estimated based on the expected quantities and duration of the process in the construction schedule.

Re-suspended road dust is accounted for in the CAL3QHC dispersion modeling of mobile source emissions. Since the water main construction would occur within a narrow construction zone, there would be very little, if any, on-site truck travel. The trucks would drive in and out of the construction site along the avenue with the general traffic, and are accounted for in the mobile model. Since impacts from the mobile analysis were conservatively added to impacts from the stationary analysis in order to estimate the maximum combined impacts from mobile and stationary sources, road dust is accounted for in both the mobile and the combined results.

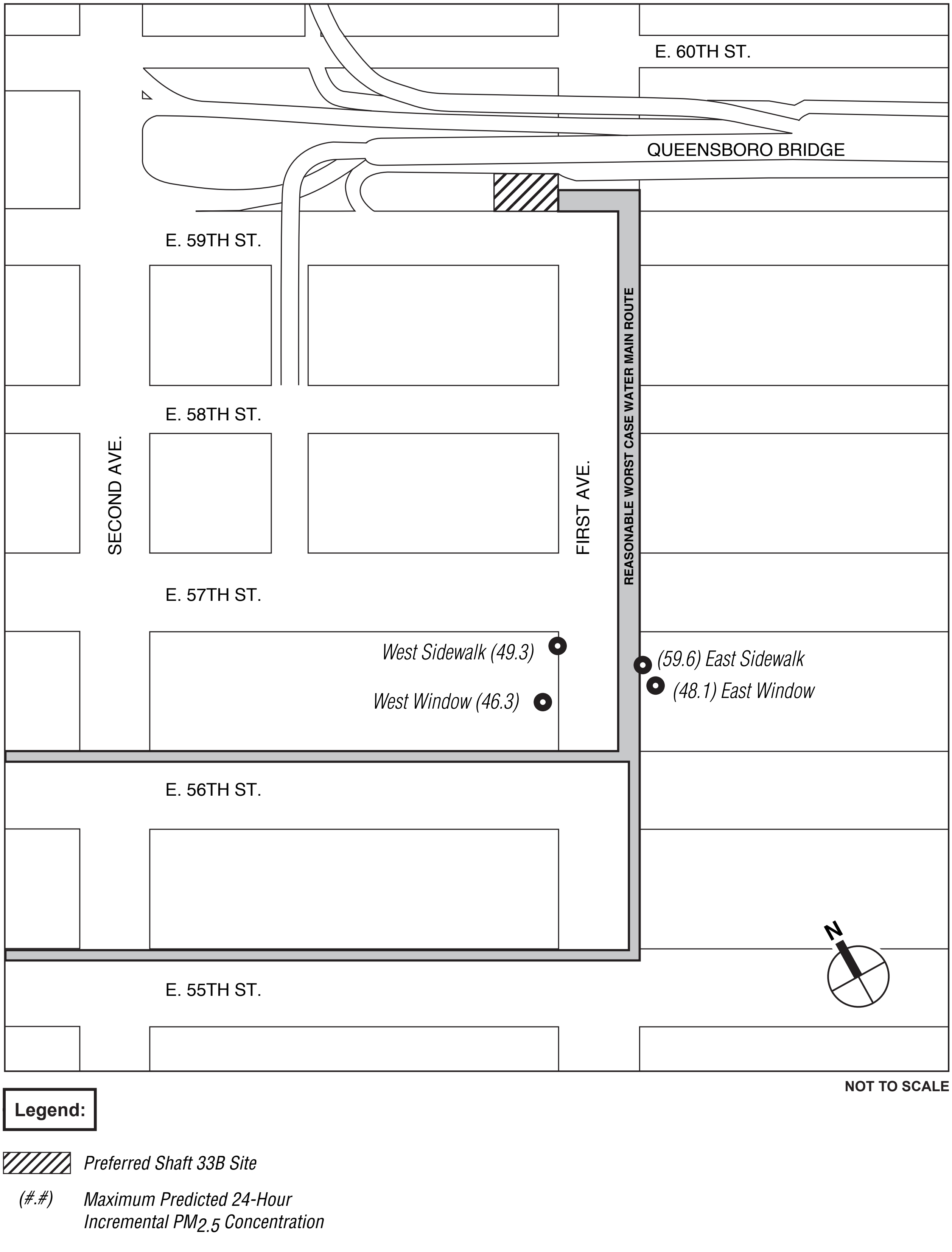
ISC Dispersion Modeling

A dispersion modeling analysis was performed to estimate concentrations of air pollutants associated with emissions produced by the water main connections construction activities. The analysis was conducted following the methodology described in Section 3.11 using the ISCST3 dispersion model and was performed in accordance with USEPA and the *CEQR Technical Manual*. Where applicable, the predicted incremental and total concentrations of pollutants were compared to applicable air quality standards and interim guidance values to evaluate the potential for significant adverse impacts.

Results

Maximum concentrations from on-site water main construction sources under the Base Scenario of the reasonable worst-case route were predicted to occur at receptors on the eastern sidewalk of First Avenue, which is immediately adjacent to the construction work. Locations with maximum predicted $PM_{2.5}$ concentrations are depicted in Figure 5.11-1. The highest concentrations were predicted on the eastern sidewalk, immediately adjacent to the water main construction site. The predicted maximum concentrations from the water main construction sources for the Base Scenario of the reasonable worst-case route are presented in Table 5.11-6. As indicated in the table, the construction of the water main connections would not cause an exceedance of the NAAQS. If NYCDOT required the water main construction to be undertaken outside the 7:00 a.m. to 3:00 p.m. period, this construction work would also not cause an exceedance of the NAAQS. The total concentrations include the maximum predicted increments from both mobile and stationary sources as well as background concentrations. Maximum SO_2 and CO increments from construction engines were predicted to be extremely low for the most part, since most construction engines use diesel fuel which emits very little CO, and engines utilizing ultra-low sulfur diesel emit very little SO_2. (An exception is the emissions from two-stroke gasoline engines, such as chain saws, which emit relatively larger quantities of CO and PM.)

In addition to the comparison of the total maximum local 24-hour average $PM_{2.5}$ concentration with the NAAQS, the predicted annual incremental impact from the construction of the reasonable worst-case route 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 predicted annual neighborhood scale $PM_{2.5}$ increments from on-site construction sources were less than 0.01 $\mu g/m^3$—considerably less than the applicable 0.1 $\mu g/m^3$ criterion. This value includes the predicted increments from both mobile and stationary sources.



NOTE: *This figure has been updated for the FEIS*

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

TOTAL PREDICTED 24-HOUR $PM_{2.5}$ CONCENTRATIONS FOR WATER MAIN CONSTRUCTION REASONABLE WORST-CASE - BASE SCENARIO ($\mu g/m^3$)

FIGURE 5.11-1

Table 5.11-6
Results of Dispersion Analysis for Water Main Construction
Reasonable Worst Case Route - Base Scenario

Modeled Pollutant	Averaging Period	Units	Maximum Modeled Increment	Future Without the Project (Baseline) Concentration	Total Concentration	Ambient Air Quality Standard
NO_2	Annual	$\mu g/m^3$	9.5[a]	71	81	100
SO_2	3-Hour	$\mu g/m^3$	8	202	210	1,300
	24-Hour	$\mu g/m^3$	0.7	123	124	365
	Annual	$\mu g/m^3$	0.02	37	37	80
CO	1-Hour	ppm	10.4[c]	7.3[b]	17.7	35
	8-Hour	ppm	1.4[c]	4.0[b]	5.4	9
$PM_{2.5}$[d]	24-Hour	$\mu g/m^3$	16.0[c]	43.6[b]	59.6	65
PM_{10}	24-Hour	$\mu g/m^3$	23.6[c]	65.6[b]	89.2	150
	Annual	$\mu g/m^3$	0.3[c]	24.6[b]	24.9	50

Notes:
a. NO_2 concentration is 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.
c. Predicted concentrations include contributions from both stationary and mobile sources.
d. 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.

Therefore, no significant adverse impacts are predicted for the reasonable worst case route Base Scenario. Since the predicted concentrations were modeled for periods of construction that are predicted to result in highest site-wide pollutant emissions, no significant adverse impacts would be expected during any periods of construction under this scenario.

Reasonable Worst-Case Route – Scenario A

In Scenario A of the reasonable worst-case water main construction route, an alternative to the Base Scenario, the construction area would be shifted five feet onto the eastern sidewalk (resulting in less lane closures). All of the water main on-site construction activity and equipment would remain the same as in the base scenario.

Onsite Construction Equipment

The on-site construction equipment is the same as in the Base Scenario.

Engine Exhaust

The stationary equipment engine exhausts are the same as in the Base Scenario.

Fugitive Sources

The fugitive dust sources are the same as in the Base Scenario.

ISC Dispersion Modeling

A dispersion modeling analysis was conducted as described in Section 3.11. The same inputs, emission rates, model options, and meteorological data as in the reasonable worst-case route Base Scenario were used. However, the on-site construction sources were shifted five feet onto the eastern sidewalk and the eastern sidewalk receptors were shifted by 2.5 feet to simulate mid-sidewalk locations.

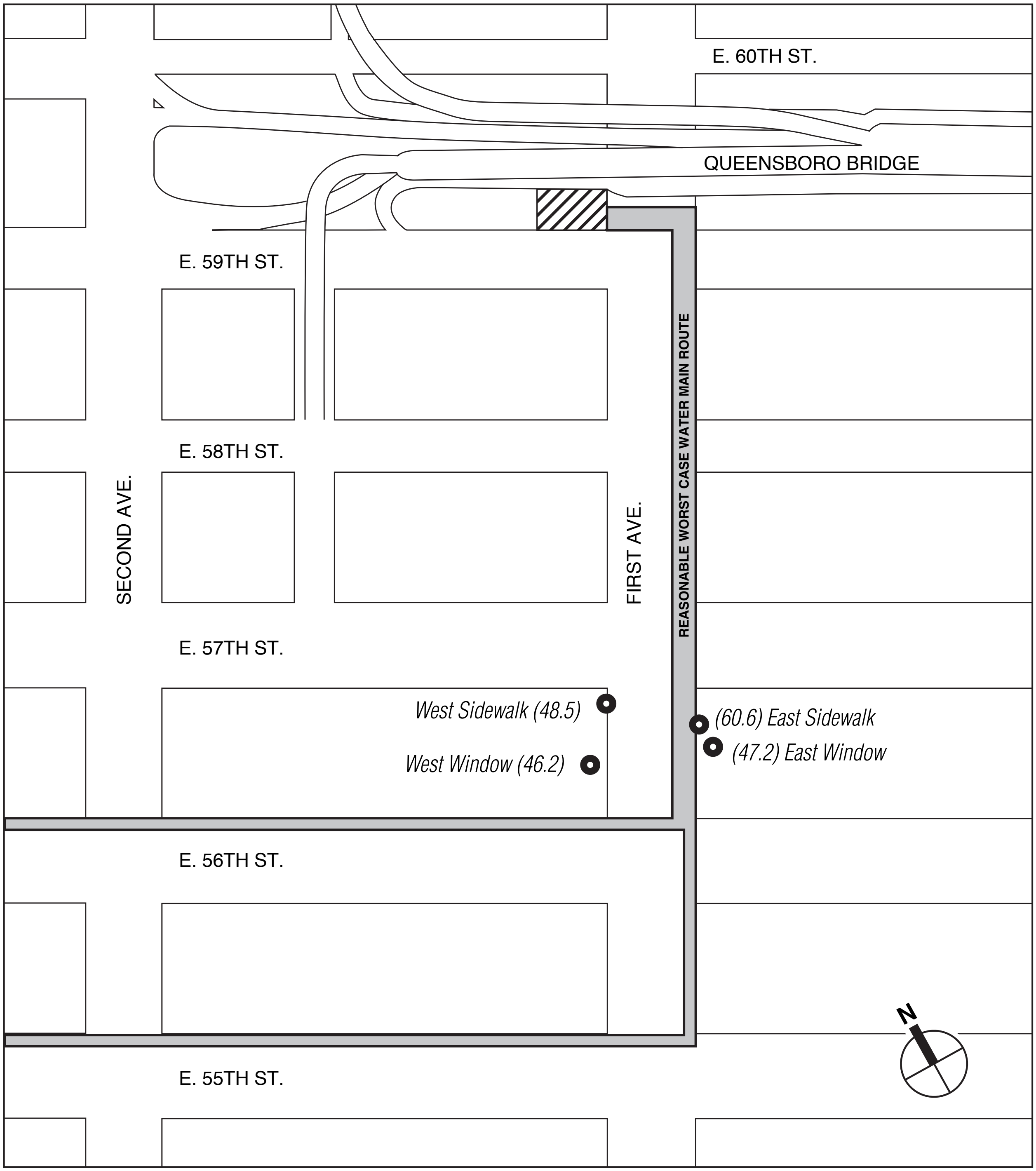
Results

The maximum concentrations from on-site water main construction sources in Scenario A of the reasonable worst-case route were predicted at receptors on the eastern sidewalk along First Avenue, which is immediately adjacent to the construction work. Locations with maximum predicted $PM_{2.5}$ concentrations are depicted in Figure 5.11-2. Maximum predicted concentrations from the water main construction sources for Scenario A of the reasonable worst-case route and baseline concentrations are presented in Table 5.11-7. As indicated in the table, the construction of the water main connections would not cause an exceedance of the NAAQS. If NYCDOT required the water main construction to be undertaken outside the 7:00 a.m. to 3:00 p.m. period, this construction work would also not cause an exceedance of the NAAQS.

Table 5.11-7
Results of Dispersion Analysis for Water Main Construction
Reasonable Worst-Case Route – Scenario A

Modeled Pollutant	Averaging Period	Units	Maximum Modeled Increment	Future Without the Project (Baseline) Concentration	Total Concentration	Ambient Air Quality Standard
NO_2	Annual	$\mu g/m^3$	10[a]	71	81	100
SO_2	3-Hour	$\mu g/m^3$	9	202	211	1,300
	24-Hour	$\mu g/m^3$	0.8	123	124	365
	Annual	$\mu g/m^3$	0.02	37	37	80
CO	1-Hour	ppm	11.4[c]	7.3[b]	18.7	35
	8-Hour	ppm	1.5[c]	4.0[b]	5.5	9
$PM_{2.5}$[d]	24-Hour	$\mu g/m^3$	17.0[c]	43.6[b]	60.6	65
PM_{10}	24-Hour	$\mu g/m^3$	25.2[c]	65.6[b]	90.8	150
	Annual	$\mu g/m^3$	0.4[c]	24.6[b]	25.0	50

Notes:
a. The NO_2 increment is based on the conservative assumption that 62 percent of the NO_x concentration from the construction sources would be NO_2.
b. Baseline concentrations of CO and PM are from the modeled Future Conditions Without the Project mobile source modeling.
c. Predicted concentrations include contributions from both stationary and mobile sources.
d. 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.



NOT TO SCALE

Legend:

Preferred Shaft 33B Site

(#.#) *Maximum Predicted 24-Hour Incremental $PM_{2.5}$ Concentration*

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

TOTAL PREDICTED 24-HOUR $PM_{2.5}$ CONCENTRATIONS FOR WATER MAIN CONSTRUCTION
REASONABLE WORST-CASE ROUTE - SCENARIO A ($\mu g/m^3$)

FIGURE 5.11-2

In addition to the comparison of the total maximum local 24-hour average $PM_{2.5}$ concentration with the NAAQS, the 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 predicted annual neighborhood scale $PM_{2.5}$ increments from on-site construction sources were less than 0.01 $\mu g/m^3$ — considerably less than the applicable 0.1 $\mu g/m^3$ criterion. This value includes the predicted increments from both mobile and stationary sources.

Therefore, no significant adverse impacts are predicted for the reasonable worst-case route (Scenario A). Since the predicted concentrations were modeled for periods of construction that are predicted to result in highest site-wide pollutant emissions, no significant adverse impacts would be expected during any periods of construction under this scenario.

Sutton Place Route

This alternative did not require a quantitative analysis, because all of the on-site construction equipment, pollutant emission rates, model inputs, and general receptor locations would be similar to those quantified for the reasonable worst-case route. The maximum predicted impacts would be very similar to the impacts presented for the reasonable worst-case route. By analogy with the reasonable worst-case route, there would be no predicted significant adverse impacts on air quality from water main construction activities with the Sutton Place additional representative route.

E. 59th Street/E. 61st Street Route

This alternative did not require a quantitative analysis, because all of the on-site construction equipment, pollutant emission rates, model inputs, and general receptor locations would be similar to those quantified for the reasonable worst-case route. The maximum predicted impacts would be very similar to the impacts presented for the reasonable worst-case route. By analogy with the reasonable worst-case route, there would be no predicted significant adverse impacts on air quality from water main construction activities with the E. 59th Street/E. 61st Street additional representative route.

Conclusions

Due to the conservative nature of the analyses, and the generic representation of the conditions in the emissions and dispersion modeling along First Avenue, the air quality analysis along the reasonable worst-case route would be representative of potential impacts experienced along the routes studied in the EIS and others that would ultimately be constructed in the future. Based on the analyses of the reasonable worst-case route, no significant adverse impacts on air quality would be expected due to the construction of water main connections.

Combined Assessment

Introduction

The construction of the water main connections and the final stages of the Shaft Site construction could occur concurrently. Therefore, a combined air quality impact analysis that assessed the overlapping time period between the water main and Shaft Site construction was conducted to assess potential combined impacts from these activities. The earliest water main work is anticipated to begin is 2008. Although water main work (Stage 5 of the project) could overlap with construction of Stages 3 and 4 at the preferred Shaft Site, Stage 4 at the Shaft Site would involve much less work than Stage 3, and would occur while water main activity would likely be further away from the preferred Shaft Site, than during Stage 3. Therefore, the concurrence of water main construction in close proximity to the site during Stage 3 was considered the worst-case for the analysis of combined construction impacts. The combined analysis also included the construction of the venturi chambers.

As described in detail in Appendix 11, the site-wide emission rate for each step within each segment of the combined construction was calculated. The steps with the highest potential for impacts were selected as the worst-case for modeling concentrations of all averaging periods shorter than annual (1-hour, 3-hour, 8-hour, and 24-hour). The combined analysis included the mobile and stationary emissions from the construction of the water main connections (the worst-case steps would be Segment 1a and 1c) and the Shaft Site (Stage 3). Since total potential emissions for Segment 1c were the highest, this period was analyzed as a potential worst-case for short-term impacts. In addition, since PM emissions from Segment 1a were similar, it was recognized that there was a similar potential for PM impacts from Segment 1a. Therefore, PM (PM_{10} and $PM_{2.5}$) was analyzed for Segment 1a as well as Segment 1c, and the highest results are presented. The locations of each element are described in Section 5.1 and Figure 4.1-1. The annual model consisted of emissions from all steps within water main construction Segments 1 through 3 which would occur during the entire year.

Reasonable Worst-Case Route – Base Scenario

<u>On-site Construction Equipment</u>

The equipment employed during Stage 3 of the preferred Shaft Site construction would operate on an intermittent basis for 16 hours per day during both 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.) The equipment employed during Segment 1 of the water main construction would operate for one work shift (7:00 a.m. to 3:00 p.m.) While analyzed for the daytime period, this 8-hour work shift could occur during other work shifts as required by the NYCDOT (i.e. 3:00 p.m. to 11:00 p.m. or 11:00 p.m. to 7:00 a.m.)

The list of construction equipment needed for Segment 1c of the water main connection, the venturi chamber and Stage 3 of the preferred Shaft Site for the peak short-term and annual construction periods is presented in Table 5.11-8. The equipment list for Segment 1a is presented above in Table 5.11-5.

Table 5.11-8
Water Main and Shaft Site On-site Construction Equipment for Peak Short-term and Annual Period

Equipment Type	Analysis Period	Mobile or Stationary
Stage 3		
Excavator (200 hp)	short-term and annual	Mobile
Front End Loader	short-term and annual	Mobile
Derrick Crane	short-term and annual	Stationary
Concrete Pump	short-term and annual	Stationary
Concrete Truck	short-term and annual	Stationary
Flatbed Truck	short-term and annual	Mobile
Segment 1c (short term) and 1a through 3d (annual)		
Excavator (400 hp)	short-term and annual	Mobile
Front End Loader	short-term and annual	Mobile
Telescoping Crane	short-term and annual	Stationary
Concrete Truck	short-term and annual	Stationary
Flatbed Truck	short-term and annual	Mobile
Dump Truck	short-term and annual	Mobile
Compressor	Annual	Stationary
Dewatering Pump	short-term and annual	Stationary
Paver	Annual	Mobile
Compactor	short-term and annual	Mobile
Pavement cutter	Annual	Mobile
Chain saw, gasoline	short-term and annual	Mobile
Generator for Welding	short-term and annual	Stationary

Notes: Stage 3 refers to the Shaft Site construction during Stage 3. Segment 1c refers to the third step of the first Segment of water main construction (Stage 5 is the entire water main construction period) under the reasonable worst-case route construction.

As described in this Section, emissions for on-site equipment were estimated for each segment of construction. Some of the equipment would only be used during the short-term emissions period (Segment 1c), and some would be employed for other segments (Segments 1a through 3d) and were included only in the annual analysis.

Engine Exhaust

The engine emission factors for on-site construction equipment (excluding heavy duty diesel trucks) at the preferred Shaft Site and water main construction were developed, as described in Section 3.11, using the USEPA NONROAD Emissions Model.

Fugitive Sources

Following the methodology presented in Section 3.11, the fugitive dust sources were simulated for the excavation procedures in Stage 3 and water main short-term and annual analyses.

ISC Dispersion Modeling

A dispersion modeling analysis was performed as described in Section 3.11 to determine potential combined air quality impacts from the construction of the preferred Shaft Site and the water main connections.

Results

The maximum predicted combined concentrations from the water main construction under the reasonable worst-case route Base Scenario and Shaft Site, which would occur in the vicinity of First Avenue near E. 59th Street, are presented in Table 5.11-9. As indicated in the table, the construction of the shaft and the water main connections would not cause an exceedance of the NAAQS. If NYCDOT required the water main construction to be undertaken outside the 7:00 a.m. to 3:00 p.m. period, this construction work would also not cause an exceedance of the NAAQS.

Table 5.11-9
Results of Dispersion Analysis for Combined Water Main and Stage 3 Construction
Reasonable Worst Case Route – Base Scenario

Modeled Pollutant	Averaging Period	Units	Maximum Modeled Increment	Future Without the Project (Baseline) Concentration	Total Concentration	Ambient Air Quality Standard
NO_2	Annual	μg/m³	9.9[a]	71	81	100
SO_2	3-Hour	μg/m³	10	202	212	1,300
	24-Hour	μg/m³	0.8	123	124	365
	Annual	μg/m³	0.02	37	37	80
CO	1-Hour	ppm	11.0[c]	7.3[b]	18.3	35
	8-Hour	ppm	2.1[c]	4.0[b]	6.1	9
$PM_{2.5}$[d]	24-Hour	μg/m³	16.6[c]	43.6[b]	60.2	65
PM_{10}	24-Hour	μg/m³	25.0[c]	65.6[b]	90.6	150
	Annual	μg/m³	0.3[c]	24.6[b]	24.9	50

Notes:
a. The NO_2 increment is based on the conservative assumption that 62 percent of the NO_x concentration from the construction sources would be NO_2.
b. Baseline concentrations of CO and PM are from the modeled Future Conditions Without the Project mobile source modeling.
c. Predicted concentrations include contributions from both stationary and mobile sources.
d. 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 NAAQS, the 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 predicted annual neighborhood scale $PM_{2.5}$ increments from on-site construction sources were less than 0.01 µg/m^3—considerably less than the applicable 0.1 µg/m^3 criterion. This value includes the predicted increments from both mobile and stationary sources.

Therefore, no significant adverse impacts are predicted for the combined construction activity at the preferred Shaft Site and the reasonable worst-case water main connection route for the Base Scenario. Since the predicted concentrations were modeled for periods of construction that are predicted to result in highest impacts, the effects of construction during other periods would be lower, and no significant adverse impacts would be expected during any periods of construction under this scenario.

Reasonable Worst-Case Route – Scenario A

The combined results of the analysis of water main connection construction under the reasonable worst-case route Scenario A and Stage 3 construction of the preferred Shaft Site are discussed here. Emissions and dispersion were modeled as described above for the Base Scenario combined analysis, aside from the shifting of the water main connection construction sources, as described above in the section regarding the reasonable worst-case route Scenario A emissions and dispersion in the water main only section.

Results

Results for the combined analysis under Scenario A, where the activity is shifted on to part of the eastern sidewalk of First Avenue, are presented in Tables 5.11-10. As indicated in the table, the construction of the water main connections would not cause an exceedance of the NAAQS. If NYCDOT required the water main construction to be undertaken outside the 7:00 a.m. to 3:00 p.m. period, this construction work would also not cause an exceedance of the NAAQS. These results are quite similar to the Base Scenario combined results, and although concentrations are predicted to be somewhat higher under this scenario in certain locations, the conclusions are the same.

In addition to the comparison of the total maximum local 24-hour average $PM_{2.5}$ concentration with the NAAQS, the 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 predicted annual neighborhood scale $PM_{2.5}$ increments from on-site construction sources were less than 0.01 µg/m^3—considerably less than the applicable 0.1 µg/m^3 criterion. This value includes the predicted increments from both mobile and stationary sources.

Table 5.11-10
Results of Dispersion Analysis for Combined Water Main and Stage 3 Construction
Reasonable Worst Case Route — Scenario A

Modeled Pollutant	Averaging Period	Units	Maximum Modeled Increment	Future Without the Project (Baseline) Concentration	Total Concentration	Ambient Air Quality Standard
NO_2	Annual	$\mu g/m^3$	10.6[a]	71	82	100
SO_2	3-Hour	$\mu g/m^3$	10	202	212	1,300
	24-Hour	$\mu g/m^3$	0.8	123	124	365
	Annual	$\mu g/m^3$	0.02	37	37	80
CO	1-Hour	ppm	12.0[c]	7.3[b]	19.3	35
	8-Hour	ppm	2.3[c]	4.0[b]	6.3	9
$PM_{2.5}$[d]	24-Hour	$\mu g/m^3$	17.5[c]	43.6[b]	61.1	65
PM_{10}	24-Hour	$\mu g/m^3$	26.4[c]	65.6[b]	92.0	150
	Annual	$\mu g/m^3$	0.4[c]	24.6[b]	25.0	50

Notes:
a. The NO_2 increment is based on the conservative assumption that 62 percent of the NO_x concentrations from the construction sources would be NO_2.
b. Baseline concentrations of CO and PM are from the Future Without the Project mobile source modeling.
c. Predicted concentrations include contributions from both stationary and mobile sources.
d. 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.

Therefore, no significant adverse impacts are predicted for the combined construction activity at the preferred Shaft Site and the reasonable worst-case water main connection route for Scenario A. Since the predicted concentrations were modeled for periods of construction that are predicted to result in highest impacts, the effects of construction during other periods would be lower, and no significant adverse impacts would be expected during any periods of construction under this scenario.

Sutton Place Route

This additional representative route did not require a quantitative cumulative analysis, because all of the water main construction equipment, pollutant emission rates, model inputs, and general receptor locations would be similar to those quantified for the reasonable worst-case route. The maximum predicted impacts would be very similar to the impacts presented for the reasonable worst-case route. By analogy with the reasonable worst-case route, there would be no predicted significant adverse impacts on air quality from water main construction activities with the Sutton Place additional representative route.

E. 59th Street/E. 61st Street Route

This alternative did not require a quantitative cumulative analysis, because all of the water main construction equipment, pollutant emission rates, model inputs, and general receptor locations would be similar to those quantified for the reasonable worst-case route. The maximum predicted impacts would be very similar to the impacts presented for the reasonable worst-case route. By analogy with the reasonable worst-case route, there would be no predicted significant adverse impacts on air quality from water main construction activities with the E. 59th Street/E. 61st Street additional representative route.

Overall Stationary Source and Combined Impact Conclusions

The construction of the water main connections is not predicted to have a significant adverse impact on air quality due to emissions from stationary sources. In addition, such emissions combined with changes in concurrent vehicular emissions and changes in traffic parameters associated with lane closures would not result in significant adverse air quality impacts. No significant adverse impacts on air quality would be expected from the concurrent construction of the shaft and water main connections due to construction emissions, on-road truck trips and lane closures.

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