6.0 CUMULATIVE EFFECTS

6.1 Introduction

This chapter provides an overview of the methods, data sources, results and conclusions of the project's cumulative effects analysis. This cumulative effects chapter focuses on five specific resource categories:

- Air Quality
- Pedestrian and Vehicular Access and Circulation
- Noise and Vibration
- Cultural and Historic Resources
- Business and Economic Interests

These resources have been analyzed for cumulative impacts because they have been identified as having the potential for interrelated effects, and the potential for being subject to cumulative effects associated with the South Ferry Terminal Project in combination with other Lower Manhattan Recovery Projects. These resources are also most likely to be impacted during construction while benefiting most from long-term revitalization of Lower Manhattan. As such, they directly relate to the challenge of minimizing short-term environmental impacts during construction, while maximizing long-term revitalization of Lower Manhattan.

It is useful to first review the definition of the term "cumulative effect" and general guidance on conducting a cumulative effects analysis, as well as the specific approach developed by the FTA for addressing the cumulative effects of the Lower Manhattan Transportation Recovery Projects.

6.1.1 Definition of Cumulative Effect and Guidance

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) define a cumulative effect (40 CFR 1508.7) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (Council on Environmental Quality, 1978). It should be noted that the terms "impacts" and "effects" as used in the CEQ regulations are synonymous (40 CFR 1508.9).

The CEQ subsequently produced the handbook entitled *Considering Cumulative Impacts Under the National Environmental Policy Act* (Council on Environmental Quality, 1997) to provide a framework for advancing environmental impact analysis by addressing cumulative effects in either an environmental assessment or an environmental impact statement. The handbook notes that cumulative effects may arise from single or multiple actions and may result in additive or interactive effects.

6.1.2 Lower Manhattan Approach to Cumulative Effects Analysis

Due to the confluence of projects that are likely to be undertaken during the rebuilding of Lower Manhattan, a key issue in the consideration of environmental consequences during the NEPA review process for each project is the evaluation of cumulative effects. The sponsoring agencies of the Lower Manhattan Transportation Recovery Projects (MTA/NYCT, NYSDOT, PANYNJ) had coordinated the development and issuance of the *Environmental Analysis Framework for Federal Transportation Recovery Projects in Lower Manhattan and the Lower Manhattan Federal Transportation Recovery Projects Common Environmental Performance Commitments* (see Appendix D). This document detailed the collective commitment of the agencies to the environment and communities of Lower Manhattan, and specified the elements of the coordinated cumulative effects analysis approach to be applied.

To guide the development and implementation of the analysis approach, the FTA prepared the *Approach to Cumulative Effects Analysis for the Lower Manhattan Recovery Effort* (Federal Transit Administration, 2003) to outline how the analysis of cumulative effects would be addressed during environmental review under NEPA for transportation restoration, reconstruction, and improvement projects in Lower Manhattan. The approach set forth in the FTA's guidance ensures consistency among projects by requiring the coordination of analysis assumptions and use of comparable technical analysis methodologies for all of the Lower Manhattan Recovery Projects.

The "coordinated cumulative effects analysis" approach outlined by FTA is founded on two important principles:

- A commitment to the application of a single, consistent framework, methodology and set of assumptions for the evaluation of cumulative effects across projects; and
- Adherence to Environmental Performance Commitments (EPCs) to reduce the potential for adverse impacts across projects, and to lower the potential severity or magnitude of the adverse impacts.

In a coordinated effort, the Federal partners and project sponsors initially identified the following critical environmental factors as resources of concern for cumulative effects: air quality, access and circulation, noise and vibration, cultural and historic resources, and economic factors. These factors were confirmed through the project scoping processes as those most likely to be subject to cumulative effects. The sponsoring agencies of the Lower Manhattan Transportation Recovery Projects along with the LMDC (sponsor of the WTC Memorial and Redevelopment Plan) subsequently coordinated the development and issuance of a coordination matrix specifying the elements of the coordinated cumulative effects analysis approaches to be applied. The coordination matrix is included in Appendix E of the EA.

6.1.3 Projects Included in the Cumulative Effects Analysis

Coordination among the Lower Manhattan Recovery Projects in the summer and fall of 2003 resulted in the development of a comprehensive set of assumptions for each of the Projects and shared by all of the Projects. This coordination enabled the project sponsors to proceed with the environmental analysis of their individual projects while including the data of the other Lower Manhattan Recovery Projects as part of the No Build condition.

To establish future background conditions, ongoing and other anticipated private development construction activities and operations are added to the inventory of existing conditions. Projections are made of private and other projects expected to be under construction or in operation by each analysis year (2005/2006: Peak Construction, 2008: Initial Operation, and 2025: Long Term or Full Operation), using land use projections among MTA/NYCT, PANYNJ, NYSDOT, and LMDC, consistent or compatible with forecasts developed by the New York Metropolitan Transportation Council (NYMTC) which is the Metropolitan Planning Organization (MPO) for the New York City area.

The following projects are included in the No Build (baseline) Condition for the environmental review of cumulative construction impacts because of their anticipated overlapping construction schedules:

- Route 9A/West Street reconstruction;
- Permanent WTC PATH Terminal;
- WTC Memorial and Redevelopment Plan; and
- Fulton Street Transit Center.

Although not a transportation recovery project, the WTC Memorial and Redevelopment Plan is included in the coordinated approach because of its overlapping construction schedule and commitment by its sponsor (LMDC) to support the coordinated cumulative analysis. In addition, the New York City Department of Transportation (NYCDOT) street reconstructions in Lower Manhattan are included in the baseline because NYCDOT adjusted its street reconstruction sequencing, based on coordination with the project sponsors, to avoid spatial and temporal overlaps of street reconstruction with the projects. Figure 39 at the end of this chapter shows the location of these projects.

The analysis of the South Ferry Terminal Project accounts for the potential impacts associated with the other Lower Manhattan Recovery Projects in several ways. First, the No Build analysis is a key part of the assessment of all major Lower Manhattan Recovery Projects. The No Build analysis assumes the simultaneous or overlapping construction of the other projects, and evaluates the potential effects of these projects *without the South Ferry Terminal Project* using the same or comparable background data and analysis methodologies as the other projects. This analysis, therefore, allows an accurate identification of potential impacts that are attributable to the other projects; this is the environmental background condition, or future, without the South Ferry Terminal Project. The No Build analysis can be regarded as the cumulative impact analysis of all

the Lower Manhattan Recovery Projects, excluding the South Ferry Terminal Project. Both the No Build and Build analyses allow for the identification of potential interactions between projects which are under construction and which will be operational at the same time.

Second, the Proposed Action or Build analysis, which adds the South Ferry Terminal Project to the future environmental background condition, represents the cumulative impact analysis of all Lower Manhattan Recovery Projects, including the South Ferry Project. The addition of the South Ferry Project to the No Build analysis allows for the identification of potential cumulative impacts that are attributable to the South Ferry Terminal Project.

The cumulative effects of all the projects are also taken into account via the use of comparative methodologies and agreed upon common baseline data, shared and common construction assumptions, and coordination between project sponsors prior to and during the preparation of technical analyses (see Appendix E). Through coordination on the planned construction schedules and sequencing of construction activities among the project sponsors, 2005/2006 was identified as the peak activity year for construction for the Lower Manhattan Recovery Projects. To ensure consistency between the projects, the project sponsors provided information to develop an overall schedule which included all major phases of construction for each project, and which was used throughout the analysis of the Lower Manhattan Recovery Projects. MTA/NYCT is continuing its construction coordination with the other Lower Manhattan Recovery Projects, and would update the construction assumptions as appropriate.

6.1.4 Other Projects in Vicinity of South Ferry Project

Other projects in the vicinity of the South Ferry Terminal Project that are either currently under construction or may be under construction concurrent with the South Ferry Project include the Museum of Jewish Heritage at 36 Battery Place in Battery Park City, the Castle Clinton redevelopment, and the Whitehall Ferry Terminal/Peter Minuit Plaza reconstruction project. The Museum of Jewish Heritage is scheduled to open in June 2004; therefore, its construction period will not overlap with the South Ferry Project and it is not directly considered in the peak construction period (2005/2006) cumulative effects analysis because its construction will be complete before that period. It is assumed in the 2025 long-term operation analysis year. The Castle Clinton redevelopment project is also a potential future project in the South Ferry vicinity; however, its implementation and construction schedule is not currently known as it is contingent on funding. Therefore, it is not considered to be under construction during the peak 2005/2006 construction year for South Ferry. The Whitehall Ferry Terminal reconstruction project is anticipated to be completed in early 2005, before the peak construction year (starting in mid-2005) for the South Ferry Terminal Project. Therefore, like the Museum of Jewish Heritage, it is not directly considered in the peak construction period (2005/2006) cumulative effects analysis because its construction will be complete before that period. Additional detail about the construction coordination between the

Whitehall Ferry Terminal and South Ferry Terminal projects is provided in Section 4.4 of the EA.

6.2 Air Quality

6.2.1 Coordinated Development of the Cumulative Air Quality Effects Analysis

Coordination on the development of the air quality analysis among MTA/NYCT, FTA, and the other Lower Manhattan Transportation Recovery Project sponsors occurred through several meetings in 2003 and 2004 during which potential issues, analytical methods to address the issues, and data to support the analysis were discussed.

The potential for construction activities to lead to temporary but adverse cumulative effects was recognized by the agencies. Specifically, there would be pollutant emissions from multiple stationary and mobile sources needed to construct the projects, e.g., heavy construction equipment, other off-road equipment used in construction, and on-road equipment (e.g., trucks) delivering materials to the projects and transporting waste from the projects, as well as traffic diversions and lane constrictions, that would not otherwise exist. The fact that much of this equipment operates on diesel fuel is of concern, because of the content of emissions produced during the fuel's combustion (e.g., sulfur and particulate matter). Additionally, demolition, earthwork, and vehicle movements associated with the projects' construction typically disseminate dust to the atmosphere. It was also recognized by the agencies that air quality could be worsened by the overlap of the projects' construction activities, either temporally or spatially or both.

Over the long-term, the increased potential for the use of transit modes resulting from the project, in combination with the other Lower Manhattan Transportation Recovery Projects, may contribute to an overall reduction in vehicular traffic and associated emissions. More specifically, the long-term cumulative effects on air quality from these projects are expected to be beneficial. Therefore, no further quantitative analysis of the long-term cumulative effects related to operations is essential.

The project's air quality analysis methodology, including the methodology for analyzing cumulative impacts on air quality during construction, was developed and refined through these discussions. The discussions also led to the development of common Environmental Performance Commitments (EPCs) for air quality for the Lower Manhattan Transportation Recovery Projects. Specifically, these EPCs include:

- Use ultra-low sulfur diesel (ULSD) fuel in off-road construction equipment with an engine horsepower (HP) rating of 60 HP or above.
- Where practicable, use diesel engine retrofit technology in off-road equipment to further reduce emissions. Such technology may include diesel oxidation catalyst/ diesel particulate filters, engine upgrades, engine replacements, or combinations of these strategies.
- Limit unnecessary idling times on diesel-powered engines to three minutes.
- Locate diesel-powered exhausts away from fresh air intakes.

- Control dust related to the construction site through a Construction Environmental Protection Program (CEPP), including a Soil Erosion and Sediment Control Plan that includes, among other things, spraying of a suppressing agent (non-hazardous, biodegradable) on dust piles, containing fugitive dust, and adjusting construction activities to respond to meteorological conditions, as appropriate.

MTA/NYCT has implemented an agency policy directing that contracts for capital construction projects use diesel emissions controls for off-road equipment. The controls include use of the ULSD fuel and diesel particulate filters, and other retrofit technology to reduce diesel emissions. In addition, idling time for off-road and on-road equipment is limited to three consecutive minutes, except in certain limited circumstances such as the need for concrete mixing trucks to keep engines running while mixing concrete. This policy is recommended by the New York State Department of Environmental Conservation (NYSDEC) and non-governmental organizations in an effort to reduce pollutant emissions. ULSD fuel not only reduces emissions of sulfur dioxide (SO_2) and related particulate matter (PM), but it also permits use of advanced pollution control technologies. According to the U.S. Environmental Protection Agency (EPA), implementation of a combination of both ULSD fuel and advanced pollution control technologies is expected to reduce emissions from the combustion process.

These EPCs are incorporated into the project's cumulative air quality effects analysis. The potential effectiveness in reducing emissions (and improving air quality) of combining two EPCs – use of ULSD fuel and diesel engine retrofit technology – is also estimated. In addition, MTA/NYCT would require the use of electrically powered equipment, where practicable. The selection of diesel retrofit technology and electrical equipment is currently being coordinated among MTA/NYCT, PANYNJ, NYSDOT and LMDC. For purposes of analysis, an overall emission reduction of 50 to 85 percent was assumed practicable, using a range of retrofit technologies with and without electrification.

6.2.2 2005/2006 Temporary Construction Condition – No Build Analysis

The construction baseline for the project's cumulative construction effects analysis consists of the estimated pollutant concentrations at receptor locations in the vicinity of the South Ferry Terminal site, taking into account the emissions of the other Lower Manhattan Transportation Recovery Projects in 2005/2006, excluding the South Ferry Terminal Project. Receptor locations were selected based on where project construction equipment and construction trucks would make the greatest contribution to pollutant concentrations. For each receptor location, the pollutant concentrations resulting from the construction emissions of other projects in Lower Manhattan were calculated and added to regional background concentrations monitored by the NYSDEC, as recommended by the New York City Department of Environmental Protection (NYCDEP). The total concentrations at the receptor locations were thus calculated for each pollutant.

As noted above, the use of ULSD was assumed within the calculations; thus the results represent a 10 percent reduction in PM concentrations over that which is achieved if standard fuel were used. The emission reduction effects of other EPCs, such as engine retrofitting technologies, were not included in the initial calculations of concentrations to enable an assessment of the effects of implementing different retrofit technologies. Because the actual implementation of retrofit technologies is subject to the availability of retrofit technology at the time of construction procurement, ultimate emission reductions may vary.

For each receptor location, the calculated pollutant concentrations were then compared to the National Ambient Air Quality Standards (NAAQS) or impact thresholds to determine the potential for exceedence of these standards. The projected emissions represent both off-road (stationary) and on-road (mobile) sources. The results of the analysis are summarized in Tables 5-17 through 5-20 in Section 5.10 Air Quality. The analysis results show that with the use of ULSD fuel, but without the use of engine retrofit technologies, the pollutant levels predicted for receptor locations within the South Ferry study area would not exceed any of the NAAQS for CO, NO_2, PM_{10}, and SO_2. These conditions include the emissions associated with changes in land use between 2003 and 2006 and also include the mobile and stationary source emissions associated with construction of the four other Lower Manhattan Recovery Projects. As such, they represent the conditions for the No Build Condition (without the South Ferry Terminal Project being constructed).

$PM_{2.5}$

In 1997, the EPA established NAAQS for fine particulates ($PM_{2.5}$). The annual standard is 15 micrograms per cubic meter, and the 24-hour standard is 65 micrograms per cubic meter($\mu g/m^3$). EPA has been working with the states to collect and analyze air quality monitoring data for $PM_{2.5}$ and the formal designations of nonattainment areas have not yet occurred. Formal designations are expected by the end of 2004, and states with areas so designated will have three years thereafter to revise the State Implementation Plan (SIP) to address fine particulates. Therefore, at present, Federal requirements for addressing $PM_{2.5}$ as part of the SIP are not yet applicable. However, the public concern over air quality in Lower Manhattan in the aftermath of the events of September 11, 2001 has prompted project sponsors to seek other means of assessing the $PM_{2.5}$ effects of project construction.[1]

The combined construction activity of the Lower Manhattan Recovery Projects is anticipated to result in an increase of $PM_{2.5}$ concentrations in the study area, resulting from emissions by construction equipment, including trucks. MTA/NYCT is committed to implementing measures to reduce $PM_{2.5}$ emissions, consistent with its organizational

[1] The implementation of the EPA's final revised NAAQS for fine particulate matter ($PM_{2.5}$) is ongoing in New York State with the validation and review of the requisite ambient air quality monitoring data to establish which areas in the state are in attainment with the new standards. Until NYSDEC proposes a SIP to address compliance with the new $PM_{2.5}$ standards, EPA's Office of Air Quality Planning and Region II have indicated that the states have no further obligations under the CAAA concerning $PM_{2.5}$. Policy CP-33 seeks to address impacts from $PM_{2.5}$ emissions until such time as NYSDEC adopts a SIP covering $PM_{2.5}$.

philosophy of continuous improvement and environmental sustainability, as embodied in its ISO14001 certification and in the spirit of the principles of the Environmental Analysis Framework for Lower Manhattan Transportation Recovery Projects; these principles were agreed upon by MTA/NYCT, PANYNJ, and NYSDOT.

To identify potential opportunities to reduce $PM_{2.5}$ emissions, an analysis was conducted of the contributions of different types of off-road construction equipment to $PM_{2.5}$ concentrations in the vicinity of the South Ferry Terminal Project. Concentrations of $PM_{2.5}$ were modeled for South Ferry construction activities and also for construction activities associated with the other Lower Manhattan Recovery Projects. This analysis approach provided for a primary focus on potential emission reduction measures specific to the South Ferry Project that could be directly implemented by MTA/NYCT. In addition, the analysis identified contributions to $PM_{2.5}$ concentrations from other Lower Manhattan Recovery Projects, reductions of which could be developed by those projects. Notwithstanding the focus from MTA/NYCT on emission reduction measures directly applicable to South Ferry, MTA/NYCT is also continuing its coordination with the other Lower Manhattan Recovery Project sponsors in developing emission reduction measures that would benefit all Lower Manhattan Recovery Projects.

Construction of the South Ferry Terminal Project would extend over a three-year time frame with a peak in construction activity in 2005/2006. Intensity of the combined construction activities of the Lower Manhattan Recovery Projects is expected to peak over a relatively short period of approximately 12 months within the multi-year overall construction period. No standards are currently available for assessing the impacts of $PM_{2.5}$ emissions during construction. NYSDEC Policy CP-33 was developed to assess impacts of long-term, permanent $PM_{2.5}$ emissions associated with the *operation* of a project and provides guidance to NYSDEC staff to review air permit applications. Policy CP-33 does not refer to the *construction* stage of a project, the $PM_{2.5}$ emissions of which are typically short-term and temporary. However, considering the public health questions regarding $PM_{2.5}$, the $PM_{2.5}$ values included in Policy CP-33 (and similar values used by NYCDEP) are presented in this section.

For the $PM_{2.5}$ analysis in this EA, the $PM_{2.5}$ values were calculated as follows:

- Predicted incremental (No Build/Build) change in $PM_{2.5}$ concentrations averaged over a 24-hour period at ground or elevated (above ground-level) locations (CP-33 value: incremental change greater than five $\mu g/m^3$);
- Predicted incremental ground-level (No Build/Build) change in $PM_{2.5}$ concentrations on an annual average basis at any discrete ground-level or elevated (above ground-level) location (CP-33 value: incremental change greater than 0.3 $\mu g/m^3$); and,
- Predicted incremental ground-level (No Build/Build) change in $PM_{2.5}$ concentrations on an annual average neighborhood-scale basis averaged over receptors placed over a one kilometer-by-one kilometer grid (NYCDEP value: incremental change greater than 0.1 $\mu g/m^3$).

The changes in $PM_{2.5}$ concentrations were calculated for 2005/2006, which is the peak of the combined construction activities for the Lower Manhattan Recovery Projects. These emission concentrations already reflect the reduction achieved by using only ULSD fuel for engines at 60 HP and above by the Lower Manhattan Recovery Projects.

Changes in $PM_{2.5}$ concentrations were calculated through computer modeling and are presented in Table 6-1. The changes in $PM_{2.5}$ concentrations for the South Ferry No Build condition reflect the emission contributions from the other Lower Manhattan Recovery Projects, but not the South Ferry Terminal Project.

Under the No Build condition, the change in 24-hour and annual average $PM_{2.5}$ concentrations at ground level and at street-level locations in the vicinity of the South Ferry Terminal Project would be less than the values referenced in CP-33 and by NYCDEP on a neighborhood-scale average. At locations above ground level, the change in annual $PM_{2.5}$ concentrations would be less than the values referenced in CP-33. In the absence of standards for assessing the impacts of $PM_{2.5}$ emissions during construction, the values referenced in CP-33 and by NYCDEP are included to provide a context for analysis. Implementation of construction equipment retrofit technologies by the Lower Manhattan Recovery Projects (other than the South Ferry Project) in accordance with the EPCs would reduce the predicted values under No Build conditions.

Table 6-1
Predicted Increase in Ambient $PM_{2.5}$ Concentrations in 2005/2006
No Build Condition

	24-Hour (ug/m^3)		Annual Avg. (ug/m^3)	
	Increase in Ambient Concentrations	**CP-33 Value* (NYSDEC)**	**Increase in Ambient Concentrations**	**CP-33 Value* (NYSDEC) (NYCDEP)**
Ground Level Locations				
Neighborhood-Scale Average (1 km x 1 km)	0.4	5.0	0.06	0.1
Public Access/Sidewalk	3.6		n/a	
Building Air Intakes and Elevated Receptors on State Street				
1 Broadway	0.1	5.0	0.04	0.3
Between Battery Place and Bridge St.	0.4		0.01	
Between Bridge Street and Pearl St.	0.2		0.03	
Between Pearl Street and State St.	0.2		0.01	
Corner of Pearl Street and State St.	0.2		0.01	

***Note:** No standards for $PM_{2.5}$ emissions from construction activities are currently available. The following values are included as a context for analysis: 1) predicted incremental increase of $PM_{2.5}$ concentration greater than five $\mu g/m^3$ averaged over a 24-hour period at ground or elevated locations; 2) predicted incremental increase of $PM_{2.5}$ concentration on an annual average basis greater than 0.3 $\mu g/m^3$ at any elevated location. 3) NYSDEC/NYCDEP values: predicted incremental increase of $PM_{2.5}$ concentration greater than 0.1 $\mu g/m^3$ on an annual average basis calculated in New York City on a neighborhood–scale basis.
Source: Louis Berger Group, 2004

6.2.3 2005/2006 Temporary Construction Condition – Cumulative Analysis

The cumulative construction effects analysis for the South Ferry Terminal Project consists of the addition of South Ferry construction emissions to the construction baseline emissions at the receptor locations in the vicinity of the project. These emissions are based on the detailed construction assumptions contained in Appendix F. The methodology used for this analysis is the same methodology described in Section 5.10: Air Quality. The projected emissions represent both stationary and on-road mobile sources. The emissions were calculated assuming use of ULSD fuel in off-road equipment use for construction of the South Ferry project as well as in off-road equipment used by the other Lower Manhattan Recovery Projects. The results of the analysis are summarized in Tables 5-22 through 5-25 in Section 5.10 for CO, NO_2, PM_{10}, and SO_2. The $PM_{2.5}$ emissions, which were not included in Section 5.10, are presented in Table 6-2. As described in Section 5.10, the emissions from South Ferry construction activities in combination with background emissions (including emissions of the other Lower Manhattan Recovery Projects) would not exceed any of the NAAQS for CO, NO_2, PM_{10}, and SO_2.

Table 6-2
Predicted Increase in Ambient $PM_{2.5}$ Concentrations in 2005/2006 Build Condition

	24-Hour (ug/m^3)		Annual Avg. (ug/m^3)	
	Increase in Ambient Concentrations	**CP-33 Value* (NYSDEC)**	**Increase in Ambient Concentrations**	**CP-33 Value* (NYSDEC) (NYCDEP)**
Ground Level Locations				
Neighborhood-Scale Average (1 km x 1 km)	18.6	5.0	0.72	0.1
Public Access/ Sidewalk	40.1		n/a	
Building Air Intakes and Elevated Receptors on State Street				
1 Broadway	15.3	5.0	1.0	0.3
Between Battery Place and Bridge St.	9.4		1.2	
Between Bridge Street and Pearl St.	14.3		1.2	
Between Pearl Street and State St.	5.3		0.1	
Corner of Pearl Street and State St.	10.6		0.1	

* **Note:** No standards for $PM_{2.5}$ emissions from construction activities are currently available. The following values are included as a context for analysis: 1) predicted incremental increase of $PM_{2.5}$ concentration greater than five µg/m^3 averaged over a 24-hour period at ground or elevated locations; 2) predicted incremental increase of $PM_{2.5}$ concentration on an annual average basis greater than 0.3 µg/m^3 at any elevated location. 3) NYSDEC/NYCDEP values: predicted incremental increase of $PM_{2.5}$ concentration greater than 0.1 µg/m^3 on an annual average basis calculated in New York City on a neighborhood–scale basis.
Source: Louis Berger Group, 2004

Under the Build Condition, the change in 24-hour $PM_{2.5}$ concentrations at all ground level locations and above-ground level locations would be greater than the values referenced in CP-33. The change in annual $PM_{2.5}$ concentrations at ground level locations would be greater than the values referenced in CP-33 and by NYCDEP on a neighborhood-scale average. At locations above ground level, the change in annual average $PM_{2.5}$ concentrations would be greater than the values referenced in CP-33 at three of the five locations analyzed. In absence of standards for assessing the impacts of $PM_{2.5}$ emissions associated with construction activities, the values referenced in CP-33 and by NYCDEP are included to provide a context for analysis.

The results reflect the emission reduction benefits of using only ULSD fuel in off-road construction equipment of 60 HP and above. Implementation of construction equipment retrofit technologies could reduce emissions further, as discussed below.

Emission Reduction Scenarios for South Ferry Terminal Project

As described in Section 5.10 Air Quality, and consistent with the EPCs, MTA/NYCT is committed to implementing retrofit technologies where practicable, to further reduce emissions. This would entail requiring that all off-road construction equipment of 60 HP and above onsite be Tier 2 compliant and reduce $PM_{2.5}$ emissions by as much as 85 percent of the Tier 2 emission standard, using technologies such as diesel particulate filters (DPFs). These technologies have been demonstrated to achieve a reduction by more than 90 percent on certain construction equipment. Where it can be demonstrated that such reduction cannot be practicably achieved, a minimum reduction by 50 percent of the Tier 2 standard would be considered, for example, by using technologies such as diesel oxidation catalysts (DOCs), or other technologies. MTA/NYCT would also require that electrically powered equipment be used onsite instead of diesel powered equipment, where practicable. A combination of these measures is expected to render substantial reductions in emissions of NO_2 and PM.

MTA/NYCT is committed to working with FTA, the other project sponsors, and the construction industry in creating opportunities for emissions reduction in the course of developing and constructing the project, e.g., in the event other technological advances are made, in an effort to minimize the construction effects on air quality. Specific measures would be translated into construction specifications for the South Ferry Terminal Project to ensure that the goals identified during the environmental review are met during construction to the greatest extent practicable.

To provide an indication of the potential benefits of emission reduction measures for the 24-hour $PM_{2.5}$ concentrations, computer modeling was conducted to simulate the upper and lower range of the three emission reduction scenarios, described below. The three scenarios were first modeled for 24-hour $PM_{2.5}$ with the assumption that retrofit technologies to reduce emissions would *only be applied to the South Ferry Terminal and Fulton Street Transit Center* (FSTC, the two Lower Manhattan Recovery Projects being implemented by MTA/NYCT) *and not* to the other Lower Manhattan Recovery Projects

(except for the use of ULSD fuel). The results of these scenarios are presented in Tables 6-3, 6-4, and 6-5.

The first emission reduction scenario (Scenario 1) assumed that only Tier 2 equipment was used; model inputs reflecting an 85 percent reduction of equipment PM emissions of the EPA Tier 2 standard were used. Based on the current status of retrofit technology and the expectations of further technological improvements, this scenario reflects a reasonable projection of the upper range of emission reduction that could be achievable by 2005/2006. The analysis approach thus recognizes that some equipment may reach emission reduction efficiencies higher than 85 percent of the Tier 2 emission standard and some may reach emission reduction efficiencies of somewhat less than 85 percent.

A second emission reduction scenario (Scenario 2) was modeled to account for the fact that alternative retrofit technologies would be considered by MTA/NYCT for some specialized equipment or operations for which it can be demonstrated that it may not be practicable to implement a retrofit technology that would achieve a reduction of 85 percent of the Tier 2 emission standard. Selection of such alternative retrofit technologies would still be based on the greatest reduction practicable, given the limitations of the equipment or operations to which they would be applied. Although predicted emission reductions would be closer to 85 percent of the Tier 2 standard, the effects of lower emission reductions were also modeled to provide an indication of the lower end of the emission reduction range. For this purpose, only 50 percent emission reduction of the Tier 2 standard was assumed.

A third scenario (Scenario 3) was modeled to reflect the potential benefits of electrification of construction equipment for reducing emissions. In addition to retrofit technologies and Tier 2 equipment, MTA/NYCT would also require that, where practicable, electrically powered equipment be used on the construction site instead of diesel-powered equipment. Such equipment would be directly electrically powered through connection to the power grid, or indirectly by connecting electrical equipment to generators equipped with Best Available Retrofit Technology (BART) emission reduction technologies. The emission reduction effects of implementation of electrification were simulated in the computer model by removing equipment that could be electrically powered (compressors, generators, pumps and welding equipment) from the model, and by applying a 50 percent reduction of the Tier 2 emission standard to the diesel powered equipment.

The analysis results show that under Scenario 1 (85% Tier 2 Retrofit Scenario) and Scenario 3 (50% Tier 2 retrofit and selective electrification scenario), the predicted highest increase in $PM_{2.5}$ concentration resulting from South Ferry Terminal construction alone and in the cumulative condition would be less than the CP-33 value of 5.0. Under Scenario 2 (50% Tier 2 Retrofit Scenario), two ground-level receptors would experience an increase in $PM_{2.5}$ concentration higher than the value referenced in CP-33. Again, the CP-33 value is included for context only.

Table 6-3
Scenario 1 $PM_{2.5}$ Reduction Analysis
Predicted Increase in Ambient $PM_{2.5}$ Concentrations in 2005/2006
South Ferry and FSTC 85% Reduction From Tier 2 Standard

		24-Hour (µg/m^3)		
		Increase in Ambient Concentration from South Ferry Terminal Project*	Cumulative Increase in Ambient Concentration**	CP-33 Value*** (NYSDEC)
	Ground Level Locations			
	Broadway & Battery Place	1.43	2.21	5.0
	Greenwich Street & Battery Place	0.77	1.19	
	South Street & Broad Street	1.10	1.10	
	Battery Maritime Building	1.18	1.18	
	Castle Clinton	0.50	0.82	
	Battery Place & west edge of construction zone	2.04	2.21	
	Battery Park, Battery Pl. & 1st Pl.	1.69	2.34	
	Building Air Intakes and Elevated Receptors			
	1 Broadway	0.52	1.84	5.0
	Between Battery Place and Bridge Street	0.36	1.17	
	Between Bridge Street and Pearl Street	0.63	1.37	
	Between Pearl Street and State Streets	0.22	0.43	
	Corner of Pearl Street and State Street	0.45	0.66	

*MTA/ NYCT would adopt engine retrofit and a policy that limits maximum PM emission rate from engines 60 HP and above not to exceed a rate of 85% reduction from EPA Tier 2 standards.

** No reduction beyond the use of ULSD fuel assumed for other Lower Manhattan projects (LMDC, PATH, 9A); Same emission reduction assumed for FSTC as for South Ferry Terminal.

***No standards for $PM_{2.5}$ emissions from construction activities are currently available. The following values are included as a context for analysis: 1) predicted incremental increase of PM2.5 concentration greater than five µg/m^3 averaged over a 24-hour period at ground or elevated locations; 2) predicted incremental increase of $PM_{2.5}$ concentration on an annual average basis greater than 0.3 µg/m^3 at any elevated location. 3) NYSDEC/NYCDEP values: predicted incremental increase of $PM_{2.5}$ concentration greater than 0.1 µg/m3 on an annual average basis calculated in New York City on a neighborhood–scale basis.

Source: Louis Berger Group, 2004

Table 6-4
Scenario 2 $PM_{2.5}$ Reduction Analysis
Predicted Increase in Ambient $PM_{2.5}$ Concentrations in 2005/2006
South Ferry and FSTC 50% Reduction From Tier 2 Standard

		24-Hour ($\mu g/m^3$)		
		Increase in Ambient Concentration from South Ferry Terminal Project*	**Cumulative Increase in Ambient Concentration****	**CP-33 Value*** (NYSDEC)**
	Ground Level Locations			
	Broadway & Battery Place	4.45	4.45	5.0
	Greenwich Street & Battery Place	2.13	2.17	
	South Street & Broad Street	3.10	3.10	
	Battery Maritime Building	3.36	3.36	
	Castle Clinton	1.56	1.70	
	Battery Place & west edge of construction zone	5.65	5.67	
	Battery Park, Battery Pl. & 1st Pl.	4.99	5.01	
	Building Air Intakes and Elevated Receptors			
	1 Broadway	1.51	2.14	5.0
	Between Battery Place and Bridge Street	1.04	1.47	
	Between Bridge Street and Pearl Street	1.80	1.80	
	Between Pearl Street and State Streets	0.63	0.63	
	Corner of Pearl Street and State Street	1.31	1.31	

*MTA/ NYCT would adopt engine retrofit and a policy that limits maximum PM emission rate from engines 60 HP and above not to exceed a rate of 85% reduction from EPA Tier 2 standards.

** No reduction beyond the use of ULSD fuel assumed for other Lower Manhattan projects (LMDC, PATH, 9A); Same emission reduction assumed for FSTC as for South Ferry Terminal.

***No standards for $PM_{2.5}$ emissions from construction activities are currently available. The following values are included as a context for analysis: 1) predicted incremental increase of $PM_{2.5}$ concentration greater than five $\mu g/m^3$ averaged over a 24-hour period at ground or elevated locations; 2) predicted incremental increase of $PM_{2.5}$ concentration on an annual average basis greater than 0.3 $\mu g/m^3$ at any elevated location. 3) NYSDEC/NYCDEP values: predicted incremental increase of $PM_{2.5}$ concentration greater than 0.1 µg/m3 on an annual average basis calculated in New York City on a neighborhood–scale basis.

Source: Louis Berger Group, 2004

Table 6-5
Scenario 3 $PM_{2.5}$ Reduction Analysis
Predicted Increase in Ambient $PM_{2.5}$ Concentrations in 2005/2006
South Ferry and FSTC 50% Reduction From Tier 2 Standard Plus use of Electric Equipment***

		24-Hour (µg/m^3)		
		Increase in Ambient Concentration from South Ferry Terminal Project*	Cumulative Increase in Ambient Concentration**	CP-33 Value**** (NYSDEC)
	Ground Level Locations			
	Broadway & Battery Place	2.59	2.59	5.0
	Greenwich Street & Battery Place	1.68	1.72	
	South Street & Broad Street	2.26	2.26	
	Battery Maritime Building	2.45	2.46	
	Castle Clinton	1.18	1.28	
	Battery Place & west edge of construction zone	4.29	4.30	
	Battery Park, Battery Pl. & 1st Pl.	3.97	4.08	
	Building Air Intakes and Elevated Receptors			
	1 Broadway	1.08	2.02	5.0
	Between Battery Place and Bridge Street	0.77	1.37	
	Between Bridge Street and Pearl Street	1.33	1.61	
	Between Pearl Street and State Streets	0.44	0.45	
	Corner of Pearl Street and State Street	0.96	0.96	

*MTA/ NYCT would adopt engine retrofit and a policy that limits maximum PM emission rate from engines 60 HP and above not to exceed a rate of 50% reduction from EPA Tier 2 Standard.

** No reduction beyond the use of ULSD fuel assumed for other Lower Manhattan projects (LMDC, PATH, 9A)

*** Electrical Power For Welding Machine, Generator, Pump, and Compressor

****No standards for $PM_{2.5}$ emissions from construction activities are currently available. The following values are included as a context for analysis: 1) predicted incremental increase of $PM_{2.5}$ concentration greater than five µg/m^3 averaged over a 24-hour period at ground or elevated locations; 2) predicted incremental increase of $PM_{2.5}$ concentration on an annual average basis greater than 0.3 µg/m^3 at any elevated location. 3) NYSDEC/NYCDEP values: predicted incremental increase of $PM_{2.5}$ concentration greater than 0.1 µg/m^3 on an annual average basis calculated in New York City on a neighborhood–scale basis.

Source: Louis Berger Group, 2004

Conclusion Regarding Construction Cumulative Impacts: Air Quality

The analysis shows that, cumulatively, regulated pollutant concentrations of CO, NO_2, PM_{10} and SO_2 would not exceed NAAQS. No standards are currently available for $PM_{2.5}$ emissions from construction. In the absence of such standards, the values referenced in NYSDEC Policy CP-33 (developed for project operation, not construction) have been included as a context for the $PM_{2.5}$ analysis. The maximum increase in $PM_{2.5}$ concentrations would be greater than the 24-hour CP-33 value under Scenario 2 only, but could be reduced by implementing a range of emission reduction measures.

The combined use of ULSD fuel, diesel engine retrofit technology, and selective electrification for the South Ferry Terminal Project would reduce $PM_{2.5}$ emissions of the South Ferry construction equipment. The predicted maximum cumulative concentration for affected pollutants would be reduced accordingly. The $PM_{2.5}$ levels at South Ferry receptor locations could be further reduced when the other Lower Manhattan Recovery Projects are also assumed to include emission reduction measures, reflecting the cumulative benefit of these measures. MTA/NYCT is coordinating with the sponsors of other Lower Manhattan Recovery Projects to develop emission reduction measures, similar to the coordination efforts undertaken for the development of EPCs earlier in the project phase. This coordination is undertaken from the perspective that the success of any of the Lower Manhattan Recovery Projects in reducing emissions can be substantially enhanced by coordination with the reduction measures of the other projects, to the greater benefit of the Lower Manhattan environment.

MTA/NYCT will include requirements in contract specifications for its Lower Manhattan Recovery Projects to ensure that the emission reduction measures described above are effectively implemented and achieve the desired results. These contract requirements will, at a minimum, be as protective of the environment as the EPCs and general policy described above. The contract specifications will also include specific requirements related to certification of engines and emission levels, documentation of equipment proposed to be used, compliance reporting, and contingency measures in cases where construction activities will be performed in close proximity to sensitive receptors.

6.2.4 2008 Short Term Operational Year Condition – No Build Analysis

Through 2008, the trend of conversion of commercial buildings to residential uses and the transformation of existing retail/service establishments to cater to the needs of the residential population is expected to continue in Lower Manhattan. No substantial land use changes are expected to occur by 2008 in the immediate vicinity of the South Ferry site. Lower Manhattan Recovery Projects that are expected to be completed by 2008 include the Memorial component of the WTC Memorial and Redevelopment Plan, the Fulton Street Transit Center, and certain construction activities associated with the reconstruction of Route 9A, including the segment on Battery Place between West Street and State Street. Projects still under construction in 2008 include the Permanent WTC PATH Terminal (scheduled for completion in 2009), and several components of the WTC Memorial and Redevelopment Plan, including the cultural space, open space elements (September 11 Place, Liberty Park), and Freedom Tower. As construction emissions (from construction trucks and construction equipment) in the immediate vicinity of the South Ferry receptor locations would be reduced after the 2005/2006 peak construction period, air quality is expected to improve over 2005/2006 conditions.

6.2.5 2008 Short Term Operational Condition – Cumulative Analysis

Operation of the South Ferry Terminal in 2008 would not generate vehicular traffic; therefore, no further mobile source analysis for operational impacts is warranted. The terminal would be a beneficial project with respect to mobile sources during operation, as it is expected to contribute to increased transit efficiency, which may indirectly result in

small and negligible reductions in traffic, and associated vehicular emissions in the locale and the region. Stationary source emissions associated with heating, ventilation, and air conditioning (HVAC) or air tempering systems for the terminal would be negligible.

Operation of the South Ferry Terminal in 2008 would provide improved transit access to Lower Manhattan, thereby supporting economic growth while reducing the potential environmental burden associated with the increase in traffic typically associated with such growth. The South Ferry Terminal would provide alternate sustainable transportation options for residents, visitors and workers. A flexible, safe, convenient, and attractive transit system in Lower Manhattan will provide a reliable commute for workers to and from Lower Manhattan's centers of commercial activity; a safe and reliable travel mode for residents, (in particular families and residents with disabilities), during all times of the day and week; and an easily navigable system for visitors to Lower Manhattan's many cultural amenities.

As noted above, the Route 9A Battery Place segment would be completed by 2008, and construction emissions in the immediate vicinity of the South Ferry receptor locations would be reduced from the 2005/2006 peak period. Several of the other Lower Manhattan Recovery Projects north of the South Ferry Terminal would still be under construction, and construction truck traffic associated with these projects would affect the overall flow of traffic in Lower Manhattan, causing temporary congested conditions and thereby affecting local air quality. Overall, it is anticipated that compared to the condition without the South Ferry Terminal in 2008, the South Ferry Terminal would have a beneficial cumulative effect on air quality in Lower Manhattan in 2008.

6.2.6 2025 Long Term Operational Condition – No Build Analysis

The baseline analysis assumes that by 2025 all the other Lower Manhattan Recovery Projects will have been constructed and operating for several years, but that the South Ferry Terminal Project would not have been constructed and that the conditions at the existing station would essentially remain as they are today.

Lower Manhattan by 2025 is expected to have returned to the economic growth levels projected for that year prior to September 11, 2001. Land uses in Lower Manhattan are expected to have diversified, following the trend established prior to 9/11 and accelerated after 9/11. It is anticipated that the economic growth of Lower Manhattan through 2025 will have led to an increase in vehicular traffic resulting in an increase in vehicular emissions over 2008.

Certain improvements to transportation functionality would have been realized by 2025, including the Permanent WTC PATH Terminal and the Fulton Street Transit Center, helping to reduce emissions from vehicular traffic. However, the inadequate conditions at the existing station would be exacerbated further due to the increase in patronage expected as a result of economic growth through 2025 and the continued absence of a modern facility to accommodate this growth. Over a period of more than two decades,

Lower Manhattan will have continued to function with an outdated transit connection to the major commute hubs and other parts of the subway system.

6.2.7 2025 Long Term Operational Condition – Cumulative Analysis

The South Ferry Terminal would not generate vehicular traffic; therefore no further mobile source analysis is warranted. The terminal would be a beneficial project with respect to mobile sources during operation, as it is expected to contribute to increased transit efficiency, which may indirectly result in small and negligible reductions in traffic, and associated vehicular emissions in the locale and the region. Stationary source emissions associated with heating, ventilation, and air conditioning (HVAC) or air tempering systems for the terminal would be negligible.

With the South Ferry Terminal in operation since 2008, Lower Manhattan will have been functioning with a modern, subway terminal facility for almost two decades, providing efficient connections to other transit modes. Operation of the South Ferry Terminal will have contributed to the perception that Lower Manhattan is a location to work, live, and recreate that is easily accessible via a public transportation system that is modern, reliable, easily navigable, and in close proximity to key destinations. The availability of such a public transportation system will have contributed to economic growth through increased mobility and will have helped reduce the environmental burden associated with vehicular travel, by providing alternate, sustainable means of transportation.

6.3 Pedestrian and Vehicular Access and Circulation

6.3.1 Coordinated Development of the Cumulative Access and Circulation Effects Analysis

Coordination on the development of the access and circulation analysis among MTA/NYCT, FTA, and the other Lower Manhattan Transportation Recovery Project sponsors occurred through several meetings in 2003 and 2004 during which potential issues, analytical methods to address the issues, and data to support the analysis were discussed.

As for potential issues, it was recognized during these discussions that the effects of the events of September 11, 2001 resulted in temporary impacts on access to and circulation within Lower Manhattan. As a result, Lower Manhattan is now faced with balancing the progression of previously planned transportation improvements with the actions required to reconstruct and replace damaged and destroyed transportation infrastructure. This circumstance has the potential to result in temporary, short-term construction impacts, including cumulative effects, on businesses and residents both in terms of reduced accessibility and mobility, e.g., from roadway, sidewalk, and subway station access restrictions, as well as the associated implications for air quality and economic vitality. The potential is greatest in locations where projects will overlap in the same geographic area, or occur during overlapping time periods.

It was also concluded through these discussions that over the long-term there would be an increased potential for the use of transit modes resulting from the project in combination with the other Lower Manhattan Transportation Recovery Projects. This circumstance has the potential to result in long-term beneficial impacts, including cumulative impacts, on businesses and residences in terms of improved accessibility and mobility in Lower Manhattan, as well as associated implications for businesses (e.g., from additional pedestrian traffic near transit facilities).

The project's traffic, transit, and pedestrian analysis methodology, including the methodology for analyzing cumulative impacts on access and circulation during construction, was developed for these discussions and was refined through these discussions. The discussions also led to the development of common EPCs for access and circulation for the Lower Manhattan Transportation Recovery Projects. Specifically, these EPCs include:

- Establish a project-specific pedestrian and vehicular maintenance and protection plan.
- Promote public awareness through such mechanisms as signage, telephone hotline, and web-site updates.
- Ensure sufficient alternate street, building, and station access during the construction period.
- Communicate regularly with the New York City Department of Transportation and participate in that agency's construction coordination efforts.

The need to incorporate additional project-specific measures beyond the EPCs outlined above is identified and analyzed, as appropriate.

6.3.2 2005/2006 Temporary Construction Condition – Vehicular Circulation No Build Analysis

The cumulative construction baseline analysis for the No Build Condition (without the South Ferry Terminal Project) was performed using the following assumptions, which were developed in coordination with the sponsors of the other Lower Manhattan Recovery Projects (see coordination matrix in Appendix E). A 16-hour work day (7:00 AM to 11:00 PM) was assumed for the Fulton Street Transit Center project. A 10-hour work day (7:00 AM to 5:00 PM) was assumed for the World Trade Center, Route 9A, and the Permanent WTC PATH Terminal projects. The primary travel routes to be used by construction vehicles for the Fulton Street Transit Center project would be Broadway and Church Street. For the WTC, Route 9A, and the Permanent WTC PATH Terminal projects, the primary travel route would be Route 9A. These routes are shown in Figure 40, and the location of the Lower Manhattan projects are shown in Figure 39. There were several goals in the assignment of construction vehicles to the Lower Manhattan traffic network. The first was to optimize the use of existing NYCDOT truck routes. The second was to limit the overlap of routes for each project so that individual roadways would not get overburdened with construction vehicles.

Key intersections were identified to describe the existing transportation network and assess potential impacts. Selection of the key intersection locations was based on proximity to the South Ferry Terminal Project, roadway traffic volumes, the relationship to air quality receptor locations, and the potential effect of construction activities on each intersection. The following eight intersections were selected for traffic analysis for the South Ferry project:

1. Chambers Street and Church Street
2. Chambers Street and Broadway
3. Church Street and Vesey Street
4. Broadway and Vesey Street/Park Row
5. Pearl Street and State Street
6. Water Street and Broad Street
7. Battery Place and Broadway/State Street
8. Battery Place and Greenwich Street

All of the eight intersections analyzed are signalized with the exception of the Battery Place and Greenwich Street intersection. Since this intersection is controlled by traffic enforcement officers during the AM and PM peak hours, it was analyzed as a signalized intersection. The level of service (LOS) criteria for signalized intersections, as defined in the Highway Capacity Manual is provided in Table 6-6.

Table 6-6
Signalized Intersection Level of Service Criteria

LOS	CONTROL DELAY PER VEHICLE (Seconds Per Vehicle)
A	≤ 10
B	> 10 to 20
C	> 20 to 35
D	> 35 to 55
E	> 55 to 80
F	> 80

Source: Highway Capacity Manual 2000.

Based on the work schedules and construction routes described above, the construction vehicles projected to be generated by the other Lower Manhattan Recovery Projects in 2005/2006 were added to the No Build traffic network, and balanced 2005/2006 No Build traffic flow volumes were developed for the weekday AM and PM peak hours. Tables 6-7 and 6-8 show the resulting projected LOS for the signalized intersections evaluated, for the AM peak period and PM peak period, respectively. As shown, only a few intersection segments would operate at unacceptable LOS (E or F) in the cumulative No Build condition.

6.3.3 2005/2006 Temporary Construction Condition – Vehicular Circulation Cumulative Analysis

The 2005/2006 cumulative condition was developed by adding the projected South Ferry construction vehicles to the 2005/2006 construction No Build condition volumes. A 16-hour work day (7:00 AM to 11:00 PM) was assumed for the South Ferry Terminal Project. The primary travel routes to be used by the South Ferry construction vehicles would be Broadway and Church Street, as shown on Figure 40 at the end of this chapter.

The analysis considers changes that would result from the addition of construction vehicle traffic to the roadway network. Criteria used to identify an impact are consistent with the traffic impact criteria used for other New York City-based transit projects, in particular the Second Avenue Subway SDEIS (FTA and MTA/NYCT, 2003). Traffic impacts are defined as follows:

- Intersections operating at LOS A, B, C, or D that deteriorate to LOS E or F from No Build to Build conditions, providing that the average vehicle delay increase is 10 seconds or more; or
- Intersections operating at LOS E that deteriorate to LOS F, providing that the average vehicle delay increases by 10 seconds or more; or
- Intersections remaining at either LOS E or F but with delay increases of 10 seconds or more.

The 2005/2006 construction No Build condition for the AM and PM peak hours was compared to the 2005/2006 cumulative condition to determine the impact of the South Ferry-generated construction traffic at the signalized intersections analyzed. The LOS results are also shown in Tables 6-7 and 6-8 for the AM and PM peak periods, respectively.

As shown in the tables, none of the intersections evaluated is forecast to experience an impact. Delay increases would be relatively minor and all would be within the tolerance of 10 seconds. The southbound segment of the Pearl and Broad Streets intersection would experience a change in level of service from LOS E to LOS F in the PM peak hour. However, there would be an increase of only one second of delay, which is below the impact threshold of 10 seconds. Since no traffic impacts are identified at any of the intersections analyzed, no mitigation measures would be required.

Table 6-7
Level of Service for Signalized Intersections
2005/2006 AM Peak Period

Intersection and Approach	Lane Group	No Build				Build			
		QL[1]	v/c Ratio	Delay[2]	LOS	QL[1]	v/c Ratio	Delay[2]	LOS
Chambers St./Church St.									
Eastbound (Chambers St.)	LT	648	1.40	170.70	F	648	1.40	170.70	F
Westbound (Chambers St.)	TR	192	0.82	15.00	B	192	0.82	15.00	B
Northbound (Church St.)	LTR	295	0.85	23.50	C	298	0.86	23.80	C
Intersection				52.30	D			52.00	D
Chambers St./Broadway									
Eastbound (Chambers St.)	TR	122	0.86	20.10	C	122	0.86	20.10	C
Westbound (Chambers St.)	L	154	1.20	141.60	F	154	1.20	141.60	F
Westbound (Chambers St.)	T	381	0.87	34.00	C	381	0.87	34.00	C
Southbound (Broadway)	LTR	502	0.98	38.30	D	508	0.99	40.10	D
Intersection				38.80	D			39.70	D
Vesey St./Church St.									
Eastbound (Vesey St.)	L	56	0.30	43.20	D	56	0.30	43.20	D
Eastbound (Vesey St.)	T	14	0.06	40.90	D	14	0.06	40.90	D
Northbound (Church St.)	LTR	356	0.83	26.90	C	359	0.84	27.10	C
Intersection				27.50	C			27.70	C
Vesey St./Broadway									
Eastbound (Vesey St.)	T	60	0.34	32.80	C	60	0.34	32.80	C
Southbound (Broadway)	L	108	1.02	23.90	C	55	1.02	23.90	C
Southbound (Broadway)	T	111	1.17	44.00	D	60	1.18	45.40	D
Intersection				36.80	D			37.70	D
Battery Pl./Broadway									
Eastbound (Battery Pl.)	R	199	0.69	36.60	D	199	0.69	36.50	D
Northbound (Broadway)	L	109	1.01	28.00	C	204	0.64	28.20	C
Southbound (Broadway)	LR	200	0.63	27.40	C	112	1.04	27.50	C
Intersection				30.40	C			30.50	C
Battery Pl./Greenwich St.									
Eastbound (Battery Pl.)	LT	191	1.23	10.60	B	192	1.25	10.70	B
Westbound (Battery Pl.)	TR	335	0.48	23.00	C	339	0.49	23.00	C
Intersection				17.50	B			17.50	B
Pearl St./Broadway									
Southbound (Pearl St.)	LR	193	0.64	25.20	C	193	0.64	25.20	C
South-Eastbound (Broadway)	T	144	0.28	15.40	B	147	0.29	15.60	B
North-Westbound (Broadway)	T	93	0.31	10.90	B	95	0.32	11.00	B
Intersection				16.00	B			16.00	B
Pearl St./Broad St.									
Eastbound (Broad St.)	LTR	82	0.39	22.20	C	82	0.39	22.20	C
Westbound (Broad St.)	LTR	212	0.69	25.30	C	212	0.69	25.30	C
Southbound (Pearl St.)	LTR	588	0.98	45.30	D	591	0.99	45.90	D
Northbound (Pearl St.)	LTR	102	0.64	13.80	B	103	0.64	13.80	B
Intersection				29.90	C			30.20	C

Source: Louis Berger Group, Inc. 2003. Notes: 1) Queue Length, feet; 2) Delay, Seconds per Vehicle

Table 6-8
Level of Service for Signalized Intersections
2005/2006 PM Peak Period

Intersection and Approach	Lane Group	No Build				Build			
		QL[1]	v/c Ratio	Delay[2]	LOS	QL[1]	v/c Ratio	Delay[2]	LOS
Chambers St./Church St.									
Eastbound (Chambers St.)	LT	498	1.43	179.30	F	625	1.43	179.30	F
Westbound (Chambers St.)	TR	91	0.69	11.80	B	182	0.69	11.80	B
Northbound (Church St.)	LTR	161	0.80	16.50	B	247	0.80	16.60	B
Intersection				53.70	D			53.70	D
Chambers St./Broadway									
Eastbound (Chambers St.)	TR	109	0.80	19.00	B	109	0.80	19.00	B
Westbound (Chambers St.)	L	113	0.66	37.90	D	113	0.66	37.90	D
Westbound (Chambers St.)	T	315	0.72	23.60	C	315	0.72	23.60	C
Southbound (Broadway)	LTR	397	0.86	21.80	C	410	0.86	22.20	C
Intersection				22.10	C			22.20	C
Vesey St./Church St.									
Eastbound (Vesey St.)	L	52	0.24	42.70	D	52	0.24	42.70	D
Eastbound (Vesey St.)	T	11	0.04	40.70	D	11	0.04	40.70	D
Northbound (Church St.)	LTR	246	0.61	23.00	C	248	0.62	23.00	C
Intersection				23.70	C			23.80	C
Vesey St./Broadway									
Eastbound (Vesey St.)	T	46	0.30	32.50	C	46	0.30	32.50	C
Southbound (Broadway)	L	71	1.19	48.00	D	71	1.19	48.00	D
Southbound (Broadway)	T	36	0.75	4.50	A	36	0.76	4.50	A
Intersection				26.00	C			26.00	C
Battery Pl./Broadway									
Eastbound (Battery Pl.)	R	122	0.44	36.30	D	122	0.44	36.30	D
Northbound (Broadway)	L	193	0.75	30.90	C	196	0.76	31.10	C
Southbound (Broadway)	LR	73	0.45	26.00	C	76	0.47	26.10	C
Intersection				30.90	C			31.00	C
Battery Pl./Greenwich St.									
Eastbound (Battery Pl.)	LT	63	0.35	6.70	A	63	0.35	6.70	A
Westbound (Battery Pl.)	TR	323	0.47	24.7	C	326	0.47	24.90	C
Intersection				19.30	B			19.4 0	B
Pearl St./Broadway									
Southbound (Pearl St.)	LR	154	0.53	23.80	C	154	0.53	23.80	C
South-Eastbound (Broadway)	T	100	0.19	15.00	B	102	0.20	15.10	B
North-Westbound (Broadway)	T	101	0.38	11.50	B	103	0.39	11.50	B
Intersection				15.10	B			15.10	B
Pearl St./Broad St.									
Eastbound (Broad St.)	LTR	90	0.35	21.70	C	90	0.35	21.70	C
Westbound (Broad St.)	LTR	198	0.75	29.10	C	198	0.75	29.10	C
Southbound (Pearl St.)	LTR	572	1.11	79.30	E	575	1.11	80.70	F
Northbound (Pearl St.)	LTR	78	0.47	12.80	B	78	0.47	12.80	B
Intersection				48.90	D			49.50	D

Source: Louis Berger Group, Inc. 2003. Notes: 1) Queue Length, feet; 2) Delay, Seconds per Vehicle

Construction of the South Ferry Terminal Project would directly affect traffic on Battery Place, Greenwich Street, and State Street. Battery Place is an important east-west thoroughfare both for vehicles and buses in Lower Manhattan. Various bus lines use Battery Place to access Greenwich Street or the Brooklyn Battery Tunnel. The buses use Greenwich Street to pick up or drop off passengers during the peak hours or to park in a designated layover zone during off-peak hours.

MTA/NYCT has committed to the establishment of a Maintenance and Protection of Traffic (MPT) Plan that will accommodate traffic and pedestrian flow throughout the project. For example, traffic in each direction on Battery Place and State Street will be maintained. The Plan will also permit continuous access to Greenwich Street from Battery Place. In addition to the MPT Plan, construction techniques such as decking and phasing/coordinating work with other agencies will eliminate redundant operations (e.g., excavation and utility relocation) by other projects (e.g., reconstruction of Battery Place by NYSDOT). This will ensure that inconvenience to the traveling public will be kept to a minimum. Pedestrian access to, from and between all modes of travel, including subway, bus, and ferry in the vicinity of the project will be maintained throughout the duration of construction. In addition, pedestrian access to major destinations in the vicinity of the project, e.g., Castle Clinton National Monument, will also be maintained.

The analysis shows that, cumulatively, construction-related traffic is not expected to adversely affect access and circulation in the vicinity of the project during construction. Implementation of the common EPCs will further improve access and circulation. Other EPCs will be investigated by MTA/NYCT in the course of developing, constructing, and monitoring the project in an effort to minimize the construction effects on access and circulation.

6.3.4 2005/2006 Temporary Construction Condition – Pedestrian Circulation No Build and Build Analyses

During the 2005/2006 peak construction year, the South Ferry and Whitehall Street Stations would operate as they do currently. The South Ferry Station street-level stairs to the platform and the fare control area would remain open throughout construction. The stairs and fare control area of the Whitehall Street Station (NR) will also remain open until the main South Ferry Terminal fare control area has been completed. Therefore, the 2005/2006 No Build and Build conditions would be the same. The South Ferry and Whitehall Street stations would not be affected by pedestrian flows assigned to other subway stations associated with the Lower Manhattan recovery projects due to the distance from those stations. Therefore, the pedestrian circulation analysis contained in Section 5.9.5.1 for the 2005/2006 construction year applies to the cumulative condition. The analysis indicates that all subway elements would operate at acceptable levels of service (LOS B or better) in the 2005/2006 No Build and Build Conditions during all peak hours analyzed.

6.3.5 2008 Short Term Operational Year – Pedestrian and Vehicular Circulation No Build and Build Analyses

As indicated above, the South Ferry and Whitehall Street stations would not be affected by pedestrian flows assigned to other subway stations associated with the Lower Manhattan recovery projects due to the distance from those stations. Therefore, the analysis contained in Section 5.9.5.2 for the 2008 operational year applies to the cumulative condition. The analysis indicates that all subway elements would operate at acceptable LOS B or better in the 2008 No Build and Build Conditions during all peak hours analyzed, except one South Ferry Terminal turnstile would operate at acceptable LOS C in the 2008 Build Condition.

The South Ferry Terminal Project is expected to have a negligible impact on vehicular traffic; therefore, cumulative effects on traffic in 2008 are not analyzed.

6.3.6 2025 Long Term Operational Year – Pedestrian Circulation No Build and Build Analyses

As indicated above, the South Ferry and Whitehall Street stations would not be affected by pedestrian flows assigned to other subway stations associated with the Lower Manhattan recovery projects due to the distance from those stations. Therefore, the analysis contained in Section 5.9.5.3 for the 2025 operational year applies to the cumulative condition. The analysis indicates that all subway elements would operate at acceptable LOS C or better in the 2025 No Build Condition during all peak hours analyzed. In the 2025 Build Condition, all stairways would operate at acceptable LOS C or better during all peak hours analyzed. One South Ferry Terminal turnstile would operate at acceptable LOS D during the AM peak hour.

The South Ferry Terminal Project is expected to have a negligible impact on vehicular traffic; therefore, cumulative effects on traffic in 2008 are not analyzed.

6.4. Noise and Vibration

6.4.1 Coordinated Development of the Cumulative Noise and Vibration Effects Analysis

Coordination on the development of the noise and vibration analysis among MTA/NYCT, FTA, and the other Lower Manhattan Transportation Recovery Project sponsors occurred through several meetings in 2003 and 2004 during which potential issues, analytical methods to address the issues, and data to support the analysis were discussed.

As for potential issues, it was acknowledged through these discussions that reconstruction and recovery projects associated with transportation infrastructure could potentially cause changes to existing noise and vibration levels, and could result in both short-term construction and long-term operational cumulative effects. Construction activities in the

same geographic vicinity or occurring at the same time, or both, could result in short-term cumulative effects to noise- and vibration-sensitive receptors, e.g., residences.

Long-term cumulative effects could result either directly from increased service (whether buses or rapid transit) or indirectly from changes in traffic patterns in the area. None of these impacts are anticipated for the South Ferry Terminal Project, since there are no proposed changes to bus or subway services in the immediate vicinity as part of the project. Any rapid transit or bus service changes would be independent of the project. In addition, the location of feeder-bus stops is not anticipated to change from those in the existing condition. Consequently, no analysis of long-term operational cumulative effects is necessary.

The project's noise and vibration methodology, including the methodology for analyzing cumulative impacts from noise and vibration during construction, was developed and refined through these discussions. The discussions also led to the development of common EPCs for noise and vibration for the Lower Manhattan Transportation Recovery Projects. Specifically, these EPCs include:

- Where practicable, schedule individual project construction activities to avoid or minimize adverse impacts.
- Coordinate construction activities with projects under construction in adjacent and nearby locations to avoid or minimize impacts.
- Consider condition of surrounding buildings, structures, infrastructure, and utilities, where appropriate.
- Prepare contingency measures in the event established limits are exceeded.

These EPCs are incorporated into the project's cumulative noise and vibration effects analysis. The need to incorporate additional project-specific measures beyond the EPCs outlined above is identified and analyzed, as appropriate.

6.4.2 2005/2006 Temporary Construction Condition – No Build Analysis

The cumulative construction No Build analysis for the project consists of the estimated noise levels at receptor locations in the vicinity of the project attributed to the other Lower Manhattan Transportation Recovery Projects in 2005/2006, not including the South Ferry Terminal Project. Noise from background construction activities, including both mobile and stationary sources, was evaluated based on detailed construction methods and schedules developed for those projects (see Appendix E). The methodology used for this analysis is the same as described in Section 5.11.

Noise from Mobile Sources – Noise levels from mobile sources during the peak construction year of 2005/2006 would increase over existing 2003 levels due to increased traffic (i.e. truck hauling, driving to work site, detouring and diversions) associated with construction of major development projects in the study area. To identify the potential for noise impacts at the South Ferry study area's sensitive receptors (shown in Figure 28 in Section 5.11), a screening analysis was conducted of mobile sources. As shown in Table

6-9, noise level increases due to mobile sources would be 1.2 dBA or less at all sites, which is below the 3 dB level of perceptible noise changes.

Table 6-9
Predicted 2005/2006 Construction Noise Level Increases
(Mobile Sources)

Site ID	Site Name & Address	Land Use	dBA Increase
1	17 Battery Place	Residential	1.2
2	Bowling Green Park	Park/Recreation	0.5
3	Battery Park	Park/Recreation	0.7
4	7 - 17 State Street	Commercial/ Church	0.7

Source: Louis Berger Group, 2003

Noise from Stationary Sources – Noise levels from stationary sources were also estimated for baseline construction activities. It should be noted that most construction activities associated with the major Lower Manhattan development projects, except for the Battery Place segment of the Route 9A project, would occur at relatively long distances (2,000 feet or more) from the receptors in the South Ferry Terminal Project study area. As a result, noise from the construction activities of the other Lower Manhattan Recovery Projects would be substantially reduced over larger distances and shielded by intervening buildings. Furthermore, the existing noise levels at receptors in the study area are in the range of 62 to 78 dBA. Construction baseline noise would therefore be masked by existing urban background noise most of the time. Noise level increases associated with most of the Lower Manhattan construction projects, therefore, would be minimal at the South Ferry Terminal Project receptor sites.

Peak one-hour L_{eq}, 8-hour L_{eq}, and 30-day L_{eq} for the cumulative No Build construction condition were calculated at the four receptor sites and are presented in Tables 6-10 through 6-12, using the methodologies and threshold criteria set forth in the FTA guidance manual. As shown, the cumulative construction No Build noise levels from stationary sources would not exceed any of the FTA construction noise criteria.

Table 6-10
Predicted 2005/2006 No Build Construction Noise Levels
(Stationary Sources, Peak 1-Hour)
FTA General Analysis

Site ID	Site Name & Address	Land Use Category	Distance from Noise Source	Criteria Threshold (dBA)	Peak-hour L_{eq} (dBA)
1	17 Battery Place	Residential	200	90	80
2	Bowling Green Park/US Custom House	Park/Museum	50	100	70
3	Battery Park	Park/Recreation	50	100	70
3a	Battery Park/Castle Clinton	Park/National Monument	300	100	70
4	7 & 17 State Street	Church/Historic Building Rectory	50	100 90	65

Source: Louis Berger Group, 2003

Table 6-11
Predicted 2005/2006 No Build Construction Noise Levels
(Stationary Sources, Peak 8-Hour)
FTA Detailed Analysis

Site ID	Site Name & Address	Land Use Category	Distance	Criteria Threshold (dBA)	Peak 8-hour L_{eq} (dBA)
1	17 Battery Place	Residential	200	80	74
2	Bowling Green Park/US Custom House	Park/Museum	50	85	64
3	Battery Park	Park/Recreation	50	85	64
3a	Battery Park/Castle Clinton	Park/National Monument	300	85	64
4	7 & 17 State Street	Church/Historic Building Rectory	50	85 80	59

Source: Louis Berger Group, 2003

Table 6-12
Predicted 2005/2006 No Build Construction Noise Levels
(Stationary Sources, Peak 30-Days)
FTA Detailed Analysis

Site ID	Site Name & Address	Land Use Category	Distance	Criteria Threshold (dBA)	Peak 30-Days L_{eq} (dBA)
1	17 Battery Place	Residential	200	88	81
2	Bowling Green Park/US Custom House	Park/Museum	50	78	71
3	Battery Park	Park/Recreation	50	76	71
3a	Battery Park/Castle Clinton	Park/National Monument	300	76	71
4	7 & 17 State Street	Church/Historic Building Rectory	50	81 85	66

Source: Louis Berger Group, 2003

6.4.3 2005/2006 Temporary Construction Condition – Cumulative Analysis

The cumulative construction analysis for the Proposed Action consists of the addition of South Ferry construction noise to the construction No Build noise levels at the receptor locations in the vicinity of the project. Noise from all construction activities, including both mobile and stationary sources, is evaluated based on construction methods and schedules developed for those projects.

Noise from Mobile Sources – Noise level increases were calculated at the four receptor sites based on the rate of construction traffic volume increases. The resultant noise level increases for the cumulative condition are presented in Table 6-13. As shown, noise level differences would be 1.3 dBA or less at all sites. This level is well below the 3 dB level of perceptible noise changes. Therefore, it can be concluded that there would be no noise impacts at the South Ferry receptors from mobile sources in the cumulative condition.

Table 6-13
Predicted 2005/2006 Cumulative Construction Noise Level Increases
(Mobile Sources)

Site ID	Site Name & Address	Land Use	dBA Increase
1	17 Battery Place	Residential	1.3
2	Bowling Green Park	Park/Recreation	0.5
3	Battery Park	Park/Recreation	0.8
4	7 - 17 State Street	Church/Rectory	0.8

Source: Louis Berger Group, 2003

Noise from Stationary Sources - As previously stated, most construction activities associated with the major Lower Manhattan Recovery Projects, except for the Battery Place segment of the Route 9A project, would occur at relatively long distances (2,000 feet or more) from the sensitive receptors in the South Ferry Terminal Project study area. As a result, noise from the cumulative construction activities would be substantially reduced over larger distances and shielded by intervening buildings. Furthermore, the existing noise levels at sensitive receptors in the study area are in the range of 62 to 78 dBA. Construction baseline noise would therefore be masked by existing urban background noise most of the time. Noise level increases associated with most of the Lower Manhattan construction projects, therefore, would be minimal at the South Ferry Terminal Project receptor sites.

Peak one-hour L_{eq}, 8-hour L_{eq}, and 30-day L_{eq} were calculated at the four receptor sites for the cumulative construction condition (construction noise sources from South Ferry Terminal Project and Route 9A Battery Place segment combined), and are presented in Tables 6-14 through 6-16. The calculations assume that the South Ferry and Route 9A projects are constructed concurrently. As shown, construction-related noise impacts would be the same in the 2005/2006 cumulative condition as they would for the project-only condition described in Section 5.11 of the EA, i.e., Sites 2, 3, and 4 would be affected by elevated noise levels during the peak 8-hour or peak 30-days construction periods analyzed.

Table 6-14
Predicted 2005/2006 Cumulative Construction Noise Levels
(Stationary Sources, Peak 1-Hour)
FTA General Analysis

Site ID	Site Name & Address	Land Use Category	Distance from Noise Source	Criteria Threshold (dBA)	Peak-hour L_{eq} (dBA)
1	17 Battery Place	Residential	200	90	80
2	Bowling Green Park/US Custom House	Park/Museum	50	100	88
3	Battery Park	Park/Recreation	50	100	94
3a	Battery Park/Castle Clinton	Park/National Monument	300	100	78
4	7 & 17 State Street	Church/Historic Building Rectory	50	100 90	93

Source: Louis Berger Group, 2003

Table 6-15
Predicted 2005/2006 Cumulative Construction Noise Levels
(Stationary Sources, Peak 8-Hour)
FTA Detailed Analysis

Site ID	Site Name & Address	Land Use Category	Distance	Criteria Threshold (dBA)	Peak 8-hour L_{eq} (dBA)
1	17 Battery Place	Residential	200	80	77
2	Bowling Green Park/US Custom House	Park/Museum	50	85	91
3	Battery Park	Park/Recreation	50	85	92
3a	Battery Park/Castle Clinton	Park/National Monument	300	85	75
4	7 & 17 State Street	Church/Historic Building Rectory	50	85 80	93

Source: Louis Berger Group, 2003

Table 6-16
Predicted 2005/2006 Cumulative Construction Noise Levels
(Stationary Sources, Peak 30-Days)
FTA Detailed Analysis

Site ID	Site Name & Address	Land Use Category	Distance	Criteria Threshold (dBA)	Peak 30-Days L_{dn} (dBA)
1	17 Battery Place	Residential	200	88	81
2	Bowling Green Park/US Custom House	Park/Museum	50	78	89
3	Battery Park	Park/Recreation	50	76	90
3a	Battery Park/Castle Clinton	Park/National Monument	300	76	74
4	7 & 17 State Street	Church/Historic Building Rectory	50	81 85	93

Source: Louis Berger Group, 2003

Conclusion – The analysis shows that, cumulatively, there would be no adverse noise impacts from mobile sources. There would be cumulative noise impacts from stationary construction sources (i.e., South Ferry and Route 9A Battery Place segment). These impacts would occur at the same receptors that would be affected by construction noise from the South Ferry Terminal Project alone. It should be noted, however, that individuals using the outdoor sensitive receptors (i.e., parks) do not experience the relatively prolonged noise exposure, specifically, eight-hour or 30-day exposure, reflected in the FTA methodology. In addition, noise levels at the U.S. Custom House (Site 2) and the Church and Rectory of our Lady of the Rosary (Site 4), represent predicted outdoor noise levels. As described in Section 5.11 Noise and Vibration, typical noise attenuation provided by structures and glazed windows would substantially reduce indoor noise levels at these two receptors such that adverse impacts would not be expected.

Targeted implementation of EPCs would minimize impacts on periodic receptors, e.g., to acceptable levels. The specific EPCs that would accomplish this minimization include scheduling individual project construction activities to avoid or minimize noise impacts during special events at the receptor sites, and coordinating the sequencing of construction activities with those of the Route 9A project to achieve further noise reductions by scheduling noisy operations to occur at the same time or by spreading them out. In addition, MTA/NYCT will include the noise specification described in Section 5.11.4.3 in the construction contract for the South Ferry Terminal Project to ensure adverse noise impacts do not occur.

Vibration – With regard to ground-borne vibration, these impacts are usually associated with instantaneous impacts of the construction equipment in operation; this vibration spreads through the ground and diminishes in strength with distance and over time after impact. High vibration equipment, such as impact pile drivers, would generate strong vibrations only at the moment of impact, which generally lasts for one tenth of one second in time. Therefore, cumulative effects of ground-borne construction vibration would not usually generate substantial impacts unless the equipment was operated simultaneously. As noted previously, the South Ferry Project is sufficiently distant from the other Lower Manhattan Recovery Projects to not have cumulative construction-related vibration effects. MTA/NYCT is closely coordinating construction of the South Ferry Terminal Project with NYSDOT's Route 9A Battery Place segment, to minimize construction-related vibration impacts that may be associated with that project.

6.4.4 2008 Short Term Operational Year – No Build Analysis

In 2008, land uses in the study area would have continued to evolve and follow established trends. Through 2008, the trend of conversion of commercial buildings to residential uses and the transformation of existing retail/service establishments to cater to the needs of the residential population is expected to continue. No substantial land use changes are expected to occur by 2008 in the immediate vicinity of the South Ferry site and no new noise-sensitive receptors are projected to exist in the vicinity of the terminal, compared to conditions in 2005/2006.

Changes in land use by 2008 and an overall rebound of development in Lower Manhattan are expected to result in increases in traffic volumes. The increase in traffic associated with land use changes would increase noise levels. However, by 2008, the construction of some of the Lower Manhattan Recovery Projects would have been completed, and others would be past their construction peak. As a result, the noise emissions associated with the construction of the Lower Manhattan Recovery Projects would have decreased compared to those emissions in 2005/2006, when those projects were at their combined construction peak.

Vibration levels in 2008 would be similar to those present prior to September 11, 2001, as no modifications to the existing station would have occurred.

6.4.5 2008 Short Term Operational Year – Cumulative Analysis

During operation, the South Ferry Terminal would not generate any vehicular traffic. To the extent that the South Ferry Terminal would contribute to a reduction in traffic as a result of alternative transit options, the operation of the terminal may contribute to a reduction in traffic-generated noise, thereby improving ambient noise conditions for residents, workers, and visitors to Lower Manhattan.

The only potential mobile source of noise associated with operation of the terminal would be the subway trains and the terminal itself. As stated in the FTA's assessment guidelines, subway noise is generally not an issue for surrounding sensitive receptors because the ground acts as a barrier to noise transmission. The subway lines and stations

are underground and fully covered, with the exception of ventilation gratings and shafts. As a result, the noise from underground fixed-rail operations can propagate through these openings to reach the surface. The project would not result in a substantial increase in train operations, and operational noise impacts are not anticipated.

The only potential sources of stationary noise would be the terminal's air tempering system and the tunnel emergency ventilation system. Noise associated with the air tempering equipment and ventilation shafts would be negligible and be masked by the background noise from street traffic and other noises, which are typical for an urban environment. Therefore, cumulative adverse effects on noise conditions from stationary sources would not be expected in 2008 with operation of the project.

The operation of the terminal in 2008 would involve the same type of trains currently in use (i.e., suspension and wheels would remain the same) and the track structure would be similar to the existing facilities, albeit with a straighter alignment. Therefore, operation of the terminal in 2008 is not anticipated to result in a change in vibration levels at adjacent receptors, and there would not be any adverse cumulative vibration effects associated with the operation of the terminal in 2008.

6.4.6 2025 Long Term Operational Year – No Build Analysis

The baseline analysis assumes that by 2025 all the other Lower Manhattan Recovery Projects would have been constructed and operating for several years, but that the South Ferry Terminal would not have been constructed and that the physical conditions at the existing station would essentially remain as they are today.

Lower Manhattan by 2025 is expected to have fully recovered from the economic effects of 9/11 and to have resumed its place on the growth trajectory that was predicted to 2025 prior to 9/11. Land uses in Lower Manhattan are expected to have diversified, following the trend established prior to 9/11 and accelerated after 9/11. The economic growth of Lower Manhattan through 2025 will have led to an increase in vehicular traffic, resulting in an increase in vehicular noise levels over 2008. However, by 2025, the construction of all of the Lower Manhattan Recovery Projects would have been completed for several years and noise generated by construction activities associated with these projects would no longer occur. Vibration levels in 2025 would be similar to those present prior to September 11, 2001, as no modifications to the existing station will have occurred.

6.4.7 2025 Long Term Operational Year – Cumulative Analysis

During operation in 2025, the South Ferry Terminal would not generate any vehicular traffic. To the extent that the South Ferry Terminal would contribute to a reduction in traffic as a result of alternative transit options, the operation of the terminal may contribute to a reduction in traffic-generated noise, thereby improving ambient noise conditions for residents, workers, and visitors to Lower Manhattan.

The only potential mobile noise source associated with operation of the terminal would be the subway trains and the terminal itself. As stated in the FTA's assessment guidelines, subway noise is generally not an issue for surrounding sensitive receptors because the ground acts as a barrier to noise transmission. The subway lines and stations are underground and fully covered, with the exception of ventilation gratings and shafts. As a result, the noise from underground fixed-rail operations can propagate through these openings to reach the surface. The project would not result in a substantial increase in train operations, and operational noise impacts are not anticipated.

The only potential source of stationary noise would be the terminal's air tempering system and the tunnel emergency ventilation system. Noise associated with the air tempering equipment and ventilation shafts would be negligible and be masked by the background noise from street traffic and other noises, which are typical for urban environment. Therefore, cumulative effects on noise conditions from stationary sources would not be expected in 2025 with operation of the project.

Operation of the terminal in 2025 would involve the same type of trains currently in use (i.e., suspension and wheels would remain the same) and the track structure would be similar to the existing facilities, albeit with a straighter alignment. Therefore, operation of the terminal in 2025 is not anticipated to result in a change in vibration levels at adjacent receptors, and there would not be any adverse cumulative vibration effects associated with the operation of the terminal in 2025.

6.5 Cultural and Historic Resources

6.5.1 Coordinated Development of the Cumulative Cultural and Historic Resources Effects Analysis

The cumulative cultural and historic resources effects analysis was developed through coordination among the MTA/NYCT, FTA, and the other Lower Manhattan Transportation Recovery Project sponsors. Potential issues, analytical methods to address the issues, and data to support the analysis were discussed in meetings held in 2003 and 2004. In addition, the analysis of the South Ferry Terminal Project's effects on archaeological and historic resources is being conducted in coordination with the New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) and the New York City Landmarks Preservation Commission (NYCLPC). MTA/NYCT and FTA will enter into a Programmatic Agreement with NYSOPRHP to address potential impacts to archaeological and historic resources related to the Proposed Action (see Appendix B).

The potential for construction activities to lead to temporary but adverse cumulative effects was recognized by the agencies. Specifically, these potential impacts could include visual impacts to historic structures or historic context; excavation and compaction damage to archaeological resources; direct physical effects such as demolition or alteration; impacts from construction activities (such as traffic, noise,

vibration, and air pollution increases) or traffic-induced vibrations; and changes in access.

The analysis methodology for cumulative effects on cultural resources was refined through these discussions, and includes the following steps:

- Determine Area of Potential Effect (APE) for cumulative effects (construction and operational) on both archaeological and historic resources.
- Identify archaeological and historic resources present within the cumulative APE that have the potential to be affected by other reasonably foreseeable actions.
- Determine the effect on the resource of the Proposed Action in combination with other reasonably foreseeable actions.
- Identify mitigation measures, if appropriate.

The discussions also led to the development of common EPCs for cultural and historic resources for the Lower Manhattan Transportation Recovery Projects. Specifically, these EPCs will be incorporated into the South Ferry Terminal Project and include:

- Establish coordination among projects to avoid or minimize interruption in access to cultural and historic sites.
- Initiate public information and involvement outreach with sensitivity to local cultural resources.
- Identify public information outlets that will receive and provide current information about access during construction.
- Consult with the New York State Office of Historic Preservation (SHPO) and the New York City Landmarks Preservation Commission regarding potentially impacted, culturally significant sites.
- Monitor noise and vibration during construction at such sites as appropriate.

6.5.2 2005/2006 Temporary Construction Condition – No Build Analysis

As indicated below, none of the other Lower Manhattan Recovery Projects has the potential to affect the same cultural and historic resources that would be affected by the South Ferry Terminal Project, with the exception of NYSDOT's Route 9A Battery Place segment. Therefore, the APE for cumulative effects on historic resources is the same APE for the Proposed Action (see Figure 29 and Table 5-48 in Section 5.13). The APE for cumulative effects on archaeological resources encompasses the areas where ground disturbance will occur; the APE can be considered equivalent to the Proposed Action's study area for archaeological resources (again, see Figure 29 in Section 5.13). Existing resources in the APEs are described in Section 5.13.

6.5.3 2005/2006 Temporary Construction – Cumulative Analysis

As indicated in Section 5.13, the South Ferry Terminal Project has the potential to affect three cultural resources: 1) the existing South Ferry Subway Station; 2) the vaults of the International Mercantile Marine Building at One Broadway; and 3) historic archaeological resources within the project's construction zone. The effects of the

project alone on those resources are described in Section 5.13. With the exception of the Battery Place segment of NYSDOT's Route 9A project, none of the other Lower Manhattan Recovery Projects has the potential to affect the same cultural and historic resources that would be affected by the South Ferry Terminal Project. Similarly, the South Ferry Terminal Project does not have the potential to affect the cultural resources that may be affected by other Lower Manhattan recovery projects, with the exception of the southern portion of the Route 9A Reconstruction Project. This is primarily due to the fact that the South Ferry Project is geographically separate from the other Lower Manhattan recovery projects (i.e., approximately 2,000 feet south of the FSTC and WTC sites).

The other project in the South Ferry vicinity with the potential for cumulative effects on cultural and historic resources is the Castle Clinton National Monument Redevelopment Project. Following is a description of the Route 9A and Castle Clinton projects and their potential for cumulative cultural and historic resources effects with the South Ferry Terminal Project.

Route 9A Reconstruction Project – Route 9A (also known as the West Side Highway or West Street) is a multi-modal, six- to eight-lane urban arterial highway, a continuous Class I bikeway, and continuous walkway. The Final Environmental Impact Statement (FEIS) for the Reconstruction of Route 9A from Battery Place to 59th Street was published in 1994, and a federal Record of Decision (ROD) was issued in July 1994. At the time of the September 11, 2001 attacks on the World Trade Center, the reconstruction of Route 9A was almost complete. The Battery Place segment of the Route 9A project had not yet been constructed, and to date has not been constructed. A Supplemental Draft EIS (SDEIS) is currently being prepared for alternatives to reconstruct the ½-mile section of Route 9A damaged in the September 11, 2001 attacks. This section runs between West Thames Street in the south to Chambers Street in the north. The Battery Place segment of the Route 9A project is not affected by the SDEIS.

The anticipated improvements to the Battery Place section of the Route 9A project include maintaining and straightening the existing two vehicular travel lanes in each direction (east and west), removing existing medians, and adding a bikeway/walkway along the northern edge of Battery Place. With regard to cultural and historic resources, the Route 9A FEIS concludes that the project would not require acquisition, demolition, or alteration of historic structures/properties along the Battery Place segment. The FEIS further concludes that traffic- and construction-induced vibration and noise would also not cause any impacts to historic properties/structures. With regard to archaeological resources, the Route 9A project is the subject of a Programmatic Agreement among the Federal Highway Administration (FHWA), NYSDOT, SHPO, and the Advisory Council on Historic Preservation (ACHP). The Agreement identifies the type of mitigation that would be required if archaeological resources are encountered during construction.

Castle Clinton Redevelopment Project – Castle Clinton is located in Battery Park approximately 300 feet west of the proposed South Ferry Terminal approach tunnel and tracks. The project proposes to redevelop Castle Clinton and its existing ferry ticketing

functions into a multi-use public facility integrating three major uses: intermodal transportation terminal with improved ticketing services and potential for new ferry routes; educational and cultural attraction with public exhibits and programs; and performance venue of up to 1,400 seats with a flexible design capable of accommodating a variety of seating and staging configurations. The Draft EA (NPS, 2003) for the project concludes that it would not have significant adverse impacts to either historic or archaeological resources.

As indicated in Section 6.1.4, the implementation and construction schedule for the Castle Clinton project is not currently known as it is contingent on funding. Therefore, it is not considered to be under construction during the peak 2005/2006 construction year, and its contribution to cumulative construction impacts for South Ferry have not been quantified. Nonetheless, because the South Ferry Terminal, Route 9A (Battery Place segment), and Castle Clinton Redevelopment projects have the potential to be under construction at the same time, MTA/NYCT is coordinating its construction activities with both of these projects.

As noted in the Access and Circulation section above, MTA/NYCT has committed to the establishment of a Maintenance and Protection of Traffic (MPT) Plan that will accommodate traffic and pedestrian flow in the vicinity of the South Ferry Terminal Project for the duration of construction. For example, traffic in each direction on Battery Place and State Street will be maintained. The Plan will also permit continuous access to Greenwich Street from Battery Place. In addition to the MPT Plan, construction techniques such as decking and phasing/coordinating work with other agencies will eliminate redundant operations (e.g., excavation and utility relocation) by other projects (e.g., reconstruction of Battery Place by NYSDOT). This will ensure that inconvenience to the traveling public will be kept to a minimum.

Pedestrian access to, from and among all modes of travel, including subway, bus, and ferry in the vicinity of the project will be maintained throughout the duration of construction. In addition, pedestrian access to major destinations in the vicinity of the project, e.g., Castle Clinton National Monument, will also be maintained. There are multiple pathways to access Castle Clinton through Battery Park and from Battery Place, and appropriate signage will be provided to ensure access and visibility are maintained.

Conclusions - Based on the foregoing analysis, the South Ferry Terminal Project, in combination with other reasonably foreseeable future actions, would not result in an adverse cumulative effect on cultural and historic resources. As indicated above, the Proposed Action would be implemented with cultural and historic resources EPCs. Implementation of these EPCs, especially those involving coordination among projects to avoid or minimize interruption in access to cultural and historic sites, would effectively reduce the potential for direct and indirect cumulative impacts to cultural resources.

6.5.4 2008 Short Term Operational Year – No Build Analysis

As of 2008, land uses in the study area would have continued to evolve and follow established trends. Through 2008, the trend of conversion of commercial buildings to residential uses and the transformation of existing retail/service establishments to cater to the needs of the residential population is expected to continue. No substantial land use changes are expected to occur by 2008 in the immediate vicinity of the South Ferry site, nor are any changes anticipated to the cultural resource context by 2008, with the possible exception of the Castle Clinton redevelopment, which could result in more subway passengers during the off-peak hours. Operation of the existing South Ferry Station in 2008 is not anticipated to affect cultural resources with vibration or noise.

6.5.5 2008 Short Term Operational Year – Cumulative Analysis

During operation in 2008, the existing historic South Ferry Station would be closed to public access with the opening of the new terminal. Because none of the other Lower Manhattan recovery projects has the potential to affect the South Ferry Terminal Project, the impact of closing the station is unique to the South Ferry project and there would be no cumulative cultural resources effects. The impacts of station closure are described in Section 5.13.

Operation of the terminal in 2008 would improve access to cultural resources in Lower Manhattan, and would contribute to the enjoyment of these resources by a greater number of people.

6.5.6 2025 Long Term Operational Year – No Build Analysis

As of 2025, land uses in the study area would have continued to evolve and follow established trends. Through 2025, the trend of conversion of commercial buildings to residential uses and the transformation of existing retail/service establishments to cater to the needs of the residential population is expected to continue. No substantial land use changes are expected to occur by 2025 in the immediate vicinity of the South Ferry site, nor are any changes anticipated to the cultural resource context by 2025, with the possible exception of the Castle Clinton redevelopment, which could result in more subway passengers during the off-peak hours. Operation of the existing South Ferry Station in 2025 is not anticipated to adversely affect cultural resources with vibration or noise.

6.5.7 2025 Long Term Operational Year – Cumulative Analysis

During operation in 2025, the existing historic South Ferry Station would be closed to public access. Because none of the other Lower Manhattan recovery projects has the potential to affect the South Ferry Terminal Project, the impact of closing the station is unique to the South Ferry project and there would be no cumulative cultural resources effects. The impacts of station closure are described in Section 5.13.

Operation of the terminal in 2025 would improve access to cultural resources in Lower Manhattan, and would contribute to the enjoyment of these resources by a greater number of people.

6.6 Business and Economic Interests

6.6.1 Coordinated Development of the Cumulative Economic Factors Analysis

The cumulative economic factors effects analysis was developed through coordination among the MTA/NYCT, FTA, and the other Lower Manhattan Transportation Recovery Project sponsors during 2003 and 2004. Potential issues, analytical methods to address the issues, and data to support the analysis were discussed.

As for potential issues, it was concluded that construction activities that have the potential to cause short-term economic impacts include utility disruptions to businesses; limitations on pedestrian, vehicular, and transit access to businesses; restricted visibility of businesses; losses or increases in jobs; potential increases or losses in retail sales; effects on the tax base; and effects on property valuations.

An intended long-term effect of the reconstruction and recovery efforts is to restore Lower Manhattan to its role as an important economic engine for the region, and position Lower Manhattan for an appropriate share of the region's growth. In addition, the projects will also improve the accessibility, livability, and economic vitality of Lower Manhattan. These factors typically lead to improved economic activity across various sectors, improved property values, and greater demand for living, shopping, and working in an area. The cumulative net effect of the projects over the long-term is expected to be beneficial.

The project's analysis of economic factors impacts from cumulative construction activities was developed from and refined through these discussions. The discussions also led to the development of common EPCs for economic factors related to the Lower Manhattan Transportation Recovery Projects. Specifically, these EPCs include:

- Coordination with the Lower Manhattan Development Corporation (LMDC), the Downtown Alliance, and other entities to minimize residential and retail impacts.

- Appropriate signage for affected businesses and amenities to maintain their visibility, when obscured as a result of construction activities.

In addition to these EPCs, which are specifically tailored to socioeconomic conditions, potential effects on socioeconomic conditions have also been proactively addressed through EPCs intended to avoid or minimize effects on access and circulation, noise and vibration, air quality, and cultural and historic resources, all of which may indirectly affect socioeconomic conditions. A discussion of the aforementioned EPCs is presented in their respective discussions in this chapter.

6.6.2 2005/2006 Temporary Construction Condition – No Build Analysis

The Lower Manhattan Recovery Project with the highest potential to have cumulative economic factors impacts with the South Ferry Terminal Project is the Battery Place segment of NYSDOT's Route 9A project; none of the other Lower Manhattan Recovery Projects has the potential to directly affect the local retail and other revenue-generating land uses that could be affected by the South Ferry Terminal Project. Similarly, the South Ferry Terminal Project does not have the potential to have cumulative construction-related economic impacts with the other Lower Manhattan Recovery Projects, with the exception of the southern segment of the Route 9A project. This is primarily due to the fact that the South Ferry Project is geographically separate from the other Lower Manhattan Recovery Projects (i.e., approximately 2,000 feet south of the FSTC and WTC sites).

The Battery Place segment of the Route 9A project is bordered by Battery Park on the south side of the street and a limited number of commercial operations on the north side of the street. These include the Ocean Apartment building, which houses a market (Amish Market) in a ground-floor space, the New York State Department of Motor Vehicles with an entrance at 11 Greenwich Street, and the Citibank offices at One Broadway with an entrance on Broadway. The Brooklyn Battery Tunnel portal building is located in the block between these two commercial blocks. Access to these properties, as well as to Battery Park and its cultural and transportation amenities (ferry service to the Statue of Liberty and Ellis Island) is expected to be maintained during construction. The Route 9A project is not expected to displace any businesses or residents along this portion of the project. In addition, the local transportation network, including both transit and roadways adjacent to the construction area, would be maintained; therefore, Lower Manhattan economic conditions on a whole would not be impacted by temporary transportation changes during construction.

6.6.3 2005/2006 Temporary Construction Condition – Cumulative Analysis

The one component of the South Ferry Terminal Project that has the potential to overlap with construction of the Route 9A project is the bellmouth and fan plant, which will be constructed in the area bounded by Greenwich Street, Battery Place, and Broadway. Commercial land uses along the construction zone are described above.

To address the potential for cumulative construction impacts to adjacent properties, the construction plan for the Route 9A and South Ferry bellmouth and fan plant are being closely coordinated among NYSDOT, NYCDOT, and MTA/NYCT. It is projected that pedestrian and vehicular access along Battery Place, Greenwich Street, and Broadway in the vicinity of the projects will be maintained during construction. Maintaining this access will be a part of the Maintenance and Protection of Traffic (MPT) Plan, as described in Section 5.9. Therefore, it is not anticipated that these commercial operations and public open space facilities would be significantly affected by cumulative construction activities. The projects will implement the EPC which requires appropriate

signage for affected businesses and amenities to maintain their visibility, when obscured as a result of construction activities.

Within the eastern edge of Battery Park, it is anticipated that mobile concessions and vendors in this area would be temporarily relocated to other areas of the park during the construction period. Thus, these vendors would be allowed to continue in operation and would not be significantly affected by construction activities.

Based on the foregoing analysis, the South Ferry Terminal Project, in combination with other reasonably foreseeable future actions, would not result in adverse cumulative construction effects on economic factors. Utility relocations would be coordinated to minimize disruptions to businesses; pedestrian, vehicular, and transit access would be maintained to businesses and other land uses; visual access to businesses would not be restricted; and there would be minimal effects on retail sales, the tax base, and property valuations during construction. Coordination with economic development interests on maintaining the attractiveness of Lower Manhattan as a place to live, work, and recreate, while maintaining a level of accessibility commensurate with that attractiveness will serve to minimize cumulative adverse economic effects.

6.6.4 2008 Short Term Operational Year – No Build Analysis

Through 2008, the trend of conversion of commercial buildings to residential uses and the transformation of existing retail/service establishments to cater to the needs of the residential population is expected to continue, assisting in Lower Manhattan's transformation into a 24-hour community. Construction would be ongoing at the WTC site. Continued operation of the existing South Ferry Station in its current condition would not support the revitalization of Lower Manhattan, as it would not improve access to Lower Manhattan and thereby would not support economic development.

6.6.5 2008 Short Term Operational Year – Cumulative Analysis

In 2008, the terminal would improve transit connectivity for existing residents and employees of the area, as well as tourists, and would be operational in time to support the growth in population anticipated with residential developments and conversions and the recovery of employment with the completion of office buildings damaged or destroyed on 9/11, as well as elements of the WTC site expected to be completed by 2009.

Essentially all of the facilities associated with the proposed South Ferry Terminal Project would be located underground, except for entry/exit features, vent structures, and emergency hatches. None of these aboveground facilities would be located in areas that would have permanent affects on surrounding commercial properties.

The operation of the South Ferry Terminal would be directly responsive to Federal, State, and City-stated public policy in that it would improve accessibility to Lower Manhattan, and facilitate the movement of pedestrians between destinations within Lower Manhattan. In summary, operation of the South Ferry Terminal would have a beneficial cumulative effect on business and economic interests in 2008.

6.6.6 2025 Long Term Operational Year – No Build Analysis

By 2025, the Lower Manhattan area would have undergone significant changes in land use compared to pre- and post-9/11 conditions. A substantial increase in commercial space is anticipated, the majority of which would be for office use. Substantial additions of both retail and institutional space are also expected. A large influx of new residential units would occur, both through new developments and through office-to-residential conversions. Without the South Ferry Terminal, the economic redevelopment of Lower Manhattan, as indicated above, would continue to be hampered by an inadequate, inefficient, and outdated subway station, detracting from the overall revitalization of Lower Manhattan and thus having a negative cumulative effect on business and economic interests in 2025.

6.6.7 2025 Long Term Operational Year – Cumulative Analysis

In 2025, the South Ferry Terminal would continue to support the revitalization of Lower Manhattan through improved transit connectivity for residents and employees of the area, as well as tourists.

6.7 Summary of Cumulative Effects

In the 2005/2006 peak construction period, construction of the South Ferry Terminal would contribute to temporary cumulative effects on noise and possibly air quality, but not in any of the other resources of concern. Noise effects would be temporary and short-term during the construction period, and would be addressed through the implementation of EPCs; these effects and would be more than offset by the long term cumulative benefits of the terminal with regard to this resource. These benefits would start to be realized immediately from the South Ferry Terminal's opening at the beginning of 2008 and continuing through its operation. Qualitative analyses conducted for 2025 operational conditions indicate that the benefits of improved transit access to Lower Manhattan from the transportation recovery projects would have accumulated over almost two decades and would have made a substantial positive contribution to the revitalization of Lower Manhattan over that that period. Operation of the South Ferry Terminal would contribute to the long term basis for sustained economic growth in Lower Manhattan and would support such growth in an environmentally sustainable way by providing environmentally-friendly transportation opportunities to residents, worker and visitors to Lower Manhattan for decades to come.

With regard to possible short-term cumulative air quality impacts, the analysis in Section 6.2.3 of this chapter indicates that under one $PM_{2.5}$ reduction scenario (50% reduction of Tier 2 emission standard), two ground-level receptors in the South Ferry study area would experience an increase in $PM_{2.5}$ concentration higher than the CP-33 value referenced by NYSDEC. This scenario was modeled to account for the fact that for some construction equipment, it may not be practicable to implement a retrofit technology that would achieve a reduction of 85 percent of the Tier 2 emission standard. As indicated in Section 6.2.3, this scenario was modeled to provide an indication of the lower end of the

emission reduction range; it is anticipated that MTA/NYCT would implement alternative retrofit technologies to the greatest extent practicable and that the predicted emission reductions would be closer to 85 percent of the Tier 2 standard. In addition, the CP-33 value is provided for context only; as noted previously, it was developed to assess the long-term $PM_{2.5}$ effects associated with operation of a project and does not refer to the construction stage of a project. The Scenario 2 values could be reduced by implementing a range of emission reduction measures.