

**WORLD TRADE CENTER  
MEMORIAL AND REDEVELOPMENT PLAN**

**DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT**

**Volume 1**

**January 2004**

---

## Table of Contents

---

### VOLUME 1

Executive Summary .....	S-1
-------------------------	-----

<b>1. Project Description .....</b>	<b>1-1</b>
1.1    Introduction .....	1-1
1.2    Background and Context.....	1-2
1.2.1    World Trade Center.....	1-2
1.2.2    Adjacent Sites.....	1-3
1.2.3    September 11.....	1-3
1.3    Purpose and Need for the Proposed Action.....	1-4
1.3.1    Recovery Efforts .....	1-4
1.3.2    Principles for Rebuilding .....	1-7
1.4    Planning for Development .....	1-7
1.4.1    Initial Steps .....	1-7
1.4.2    Preliminary Design Concepts.....	1-9
1.4.3    Listening to the City .....	1-11
1.4.4    Innovative Design Study .....	1-13
1.4.5    Plans in Progress .....	1-15
1.4.6    Selection of the Memorial and Redevelopment Plan.....	1-17
1.5    Description of the Proposed Action .....	1-19
1.5.1    Project Site .....	1-19
1.5.2    Building Program.....	1-19
1.5.3    Site Plan .....	1-20
1.5.4    Vehicular Entrances and Circulation.....	1-20
1.5.5    Southwest Quadrant/Memorial Area.....	1-21
1.5.6    Northwest Quadrant .....	1-22
1.5.7    Northeast Quadrant .....	1-22
1.5.8    Southeast Quadrant .....	1-22
1.5.9    Adjacent Sites.....	1-22
1.5.10    Below Grade .....	1-23
1.5.11    Site Design .....	1-23
1.5.12    Sustainable Design Guidelines.....	1-26
1.5.13    Completion Dates.....	1-27
1.6    Memorial Mission Statement, Program, and Design .....	1-28
1.7    Safety and Security.....	1-32
1.7.1    Construction Safety and Security.....	1-32
1.7.2    Emergency Safety .....	1-33
1.7.3    Operational Safety and Security.....	1-34
1.8    Other Lower Manhattan Recovery Projects .....	1-36
1.8.1    Governor's Immediate Action Items.....	1-36

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

1.8.2 7 World Trade Center .....	1-37
1.8.3 Permanent World Trade Center PATH Terminal .....	1-37
1.8.4 Route 9A Reconstruction.....	1-37
1.8.5 Fulton Street Transit Center .....	1-37
1.8.6 South Ferry Subway Station.....	1-38
1.9 Alternatives to the Proposed Action .....	1-38
1.9.1 No Action Alternative .....	1-38
1.9.2 Memorial-Only Alternative .....	1-38
1.9.3 Restoration Alternative.....	1-39
1.9.4 Rebuilding Alternative .....	1-39
1.9.5 WTC Site-Only Alternative.....	1-39
1.9.6 Enhanced Green Construction Alternative .....	1-40
1.9.7 Reduced Impact Alternative .....	1-40
1.10 Status of the Proposed Action.....	1-41
1.10.1 Agency Actions and Approvals .....	1-41
1.10.2 Federal .....	1-41
1.10.3 Bi-State .....	1-42
1.10.4 State .....	1-42
1.10.5 New York City.....	1-42
<b>2. Methodology.....</b>	<b>2-1</b>
2.1 Introduction.....	2-1
2.2 Role of the GEIS in the Approvals Process.....	2-1
2.3 GEIS Process/Schedule .....	2-1
2.4 Framework for Analysis .....	2-2
2.5 Two Analysis Scenarios .....	2-3
2.5.1 Current Conditions Scenario .....	2-3
2.5.2 Pre-September 11 Scenario .....	2-3
2.5.3 Two Analysis Years.....	2-3
2.6 Construction Period Cumulative Effects Analysis .....	2-5
2.6.1 Introduction .....	2-5
2.6.2 Overview of Cumulative Effects Approach .....	2-6
2.7 Background Projects.....	2-7
2.7.1 Current Conditions Scenario .....	2-7
2.7.2 Pre-September 11 Scenario .....	2-7
<b>3. Land Use and Public Policy .....</b>	<b>3-1</b>
3.1 Introduction.....	3-1
3.1.1 Context .....	3-1
3.1.2 Conclusions .....	3-2
3.2 Methodology.....	3-2
3.2.1 Scenarios and Analysis Years.....	3-2
3.2.2 Study Areas .....	3-2
3.2.3 Sources .....	3-4
3.3 Development History .....	3-4
3.4 Current Conditions Scenario.....	3-6
3.4.1 Existing Conditions 2003 .....	3-6

---

## Table of Contents

---

3.4.2	Future Without the Proposed Action 2009—Current Conditions Scenario .....	3-21
3.4.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario.....	3-24
3.4.4	Future Without the Proposed Action 2015—Current Conditions Scenario .....	3-26
3.4.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario.....	3-27
3.5	Pre-September 11 Scenario .....	3-29
3.5.1	Baseline Conditions .....	3-29
3.5.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	3-31
3.5.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	3-32
3.5.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	3-35
3.5.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	3-35
<b>4. Urban Design and Visual Resources .....</b>	<b>4-1</b>	
4.1	Introduction .....	4-1
4.1.1	Context.....	4-1
4.1.2	Conclusions .....	4-2
4.2	Current Conditions Scenario .....	4-4
4.2.1	Existing Conditions 2003 .....	4-4
4.2.2	Future Without the Proposed Action 2009—Current Conditions Scenario .....	4-10
4.2.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario.....	4-11
4.2.4	Future Without the Proposed Action 2015—Current Conditions Scenario .....	4-18
4.2.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario.....	4-18
4.3	Pre-September 11 Scenario .....	4-24
4.3.1	Baseline Conditions .....	4-24
4.3.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	4-27
4.3.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	4-28
4.3.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	4-32
4.3.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	4-32
<b>5. Historic Resources .....</b>	<b>5-1</b>	
5.1	Introduction .....	5-1
5.1.1	Context.....	5-1
5.1.2	Conclusions .....	5-2
5.2	Regulatory Context .....	5-6
5.2.1	National Historic Preservation Act (Section 106).....	5-6
5.2.2	Section 4(f) of the Federal Department of Transportation Act .....	5-8
5.2.3	State Historic Preservation Act .....	5-8
5.2.4	New York City Landmarks Law .....	5-8
5.3	Methodology .....	5-8
5.3.1	Identification of Historic Properties/Structures.....	5-8

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

5.3.2	Evaluation of Potential Effects on Historic Resources.....	5-9
5.4	Identification of the Area of Potential Effect.....	5-10
5.4.1	Archaeological Resources .....	5-10
5.4.2	Architectural Resources.....	5-10
5.5	Current Conditions Scenario.....	5-11
5.5.1	Existing Conditions 2003 .....	5-11
5.5.2	Future Without the Proposed Action 2009—Current Conditions Scenario.....	5-40
5.5.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	5-41
5.5.4	Future Without the Proposed Action 2015—Current Conditions Scenario.....	5-44
5.5.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	5-45
5.6	Pre-September 11 Scenario.....	5-46
5.6.1	Baseline Conditions.....	5-46
5.6.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	5-47
5.6.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	5-48
5.6.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	5-49
5.6.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	5-50
<b>6.</b>	<b>Open Space.....</b>	<b>6-1</b>
6.1	Introduction.....	6-1
6.1.1	Context .....	6-1
6.1.2	Conclusions .....	6-3
6.2	Methodology and Screening for Impacts.....	6-7
6.2.1	Open Space Impacts .....	6-7
6.2.2	Pedestrian-Level Wind Conditions.....	6-10
6.3	Current Conditions Scenario.....	6-12
6.3.1	Existing Conditions 2003 .....	6-12
6.3.2	Future Without the Proposed Action 2009—Current Conditions Scenario.....	6-17
6.3.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	6-19
6.3.4	Future Without the Proposed Action 2015—Current Conditions Scenario.....	6-22
6.3.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	6-24
6.4	Pre-September 11 Scenario.....	6-26
6.4.1	Baseline Conditions.....	6-26
6.4.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	6-29
6.4.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	6-30
6.4.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	6-32
6.4.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	6-33

---

## Table of Contents

---

<b>7. Shadows.....</b>	<b>7-1</b>
7.1    Introduction .....	7-1
7.1.1    Context .....	7-1
7.1.2    Conclusions .....	7-2
7.2    Methodology .....	7-5
7.3    Shadow Screening.....	7-5
7.4    Resources of Concern for Shadows Analysis.....	7-7
7.4.1    Public Open Spaces.....	7-7
7.4.2    Sun-Sensitive Historic Resources .....	7-9
7.5    Shadow Effects.....	7-10
7.6    Assessment of Shadow Impacts—Current Conditions Scenario 2009.....	7-10
7.6.1    Shadows by Season .....	7-10
7.6.2    Effect on Sensitive Resources .....	7-13
7.7    Assessment of Shadow Impacts—Current Conditions Scenario 2015.....	7-17
7.7.1    Shadows by Season .....	7-17
7.7.2    Effect on Sensitive Resources .....	7-19
7.8    Assessment of Shadow Impacts—Pre-September 11 Conditions Scenario 2009.....	7-22
7.8.1    Shadows by Season .....	7-22
7.8.2    Effect on Sensitive Resources .....	7-25
7.9    Assessment of Shadow Impacts—Pre-September 11 Conditions Scenario 2015.....	7-27
7.9.1    Shadows by Season .....	7-27
7.9.2    Effect on Sensitive Resources .....	7-29
<b>8. Community Facilities.....</b>	<b>8-1</b>
8.1    Introduction .....	8-1
8.1.1    Context .....	8-1
8.1.2    Conclusions .....	8-2
8.2    Methodology .....	8-3
8.2.1    Screening.....	8-3
8.2.2    Framework of Analysis .....	8-4
8.2.3    Study Area.....	8-5
8.3    Current Conditions Scenario .....	8-7
8.3.1    Existing Conditions 2003 .....	8-7
8.3.2    Future Without the Proposed Action 2009—Current Conditions Scenario .....	8-10
8.3.3    Probable Impacts of the Proposed Action 2009—Current Conditions Scenario.....	8-10
8.3.4    Future Without the Proposed Action 2015—Current Conditions Scenario .....	8-11
8.3.5    Probable Impacts of the Proposed Action 2015—Current Conditions Scenario.....	8-12
8.4    Pre-September 11 Scenario .....	8-13
8.4.1    Baseline Conditions .....	8-13
8.4.2    Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	8-15
8.4.3    Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	8-15
8.4.4    Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	8-16

8.4.5 Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	8-16
<b>9. Socioeconomic Conditions .....</b>	<b>9-1</b>
9.1 Introduction.....	9-1
9.1.1 Context .....	9-1
9.1.2 Conclusions .....	9-3
9.2 Methodology .....	9-6
9.2.1 Baseline Scenarios and Framework of Analyses .....	9-6
9.2.2 Study Areas .....	9-9
9.2.3 Sources .....	9-11
9.3 Current Conditions Scenario.....	9-13
9.3.1 Existing Conditions 2003 .....	9-13
9.3.2 Future Without the Proposed Action 2009—Current Conditions Scenario.....	9-55
9.3.3 Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	9-61
9.3.4 Future Without the Proposed Action 2015—Current Conditions Scenario.....	9-73
9.3.5 Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	9-77
9.3.6 Economic and Fiscal Benefits of Proposed Action: Current Conditions Scenario .....	9-82
9.3.7 Public Sector Operating Costs of Proposed Action .....	9-96
9.4 Pre-September 11 Scenario.....	9-97
9.4.1 Baseline Conditions.....	9-97
9.4.2 Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	9-107
9.4.3 Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	9-112
9.4.4 Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	9-118
9.4.5 Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	9-121
9.4.6 Economic and Fiscal Benefits of Proposed Action: Pre-September 11 Scenario .....	9-126
9.4.7 Public Sector Operating Costs of Proposed Action .....	9-127
<b>10. Neighborhood Character .....</b>	<b>10-1</b>
10.1 Introduction.....	10-1
10.1.1 Context .....	10-1
10.1.2 Conclusions .....	10-2
10.2 Methodology .....	10-4
10.3 Current Conditions Scenario.....	10-5
10.3.1 Existing Conditions 2003 .....	10-5
10.3.2 Future Without the Proposed Action 2009—Current Conditions Scenario.....	10-9
10.3.3 Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	10-11
10.3.4 Future Without the Proposed Action 2015—Current Conditions Scenario.....	10-14
10.3.5 Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	10-15

---

## Table of Contents

10.4	Pre-September 11 Scenario .....	10-16
10.4.1	Baseline Conditions .....	10-16
10.4.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario ....	10-19
10.4.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	10-20
10.4.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	10-23
10.4.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	10-24
<b>11.</b>	<b>Hazardous Materials .....</b>	<b>11-1</b>
11.1	Introduction .....	11-1
11.1.1	Context.....	11-1
11.1.2	Conclusions .....	11-2
11.2	Methodology .....	11-2
11.2.1	Hazardous Materials Screening Study .....	11-2
11.2.2	Environmental Sampling Plan.....	11-3
11.2.3	Regulatory Limits and Regulations.....	11-5
11.3	Project Site .....	11-8
11.3.1	Geology .....	11-8
11.4	Current Conditions Scenario .....	11-10
11.4.1	Existing Conditions 2003 .....	11-10
11.4.2	Future Without the Proposed Action 2009—Current Conditions Scenario ...	11-13
11.4.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario.....	11-13
11.4.4	Future Without the Proposed Action 2015—Current Conditions Scenario .....	11-16
11.4.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario.....	11-16
11.5	Pre-September 11 Scenario .....	11-16
11.5.1	Baseline Conditions .....	11-16
11.5.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario ....	11-17
11.5.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	11-17
11.5.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario ....	11-18
11.5.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	11-18
<b>12.</b>	<b>Infrastructure.....</b>	<b>12-1</b>
12.1	Introduction .....	12-1
12.1.1	Context.....	12-1
12.1.2	Conclusions .....	12-2
12.2	Methodology .....	12-3
12.2.1	Policies .....	12-3
12.2.2	Analysis Scenarios and Years .....	12-4
12.2.3	Criteria for Quantified Analysis.....	12-4
12.3	Current Conditions Scenario .....	12-5
12.3.1	Existing Conditions 2003 .....	12-5
12.3.2	Future Without the Proposed Action 2009—Current Conditions Scenario ....	12-8

12.3.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario.....	12-9
12.3.4	Future Without the Proposed Action 2015—Current Conditions Scenario....	12-12
12.3.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	12-13
12.3.6	Infrastructure Totals for Current Conditions Scenario .....	12-16
12.4	Pre-September 11 Scenario.....	12-16
12.4.1	Baseline Conditions.....	12-16
12.4.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario ....	12-22
12.4.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	12-22
12.4.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario ....	12-28
12.4.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	12-28
12.4.6	Infrastructure Totals for Pre-September 11 Scenario .....	12-31
<b>13A.</b>	<b>Traffic and Parking.....</b>	<b>13A-1</b>
13A.1	Introduction .....	13A-1
13A.1.1	Context .....	13A-1
13A.1.2	Conclusions .....	13A-1
13A.2	Methodology.....	13A-2
13A.2.1	Analysis Scenarios and Years.....	13A-3
13A.2.2	Roadway Network and Traffic Study Area .....	13A-3
13A.2.3	Traffic Level of Service Definitions.....	13A-4
13A.2.4	Trip Generation Procedures.....	13A-5
13A.2.5	Significant Impact Definitions.....	13A-7
13A.3	Roadway Network and Traffic Study Area .....	13A-7
13A.4	Current Conditions Scenario.....	13A-8
13A.4.1	Existing Conditions 2003.....	13A-8
13A.4.2	Future Without the Proposed Action 2009—Current Conditions Scenario .....	13A-15
13A.4.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	13A-20
13A.4.4	Future Without the Proposed Action 2015—Current Conditions Scenario... ..	13A-29
13A.4.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	13A-33
13A.5	Pre-September 11 Scenario.....	13A-38
13A.5.1	Baseline Conditions.....	13A-38
13A.5.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario.. ..	13A-43
13A.5.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	13A-48
13A.5.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario . ..	13A-50
13A.5.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	13A-53
13A.6	Projected Conditions with Greenwich and Fulton Street Extensions Closed to Vehicles .....	13A-55
13A.6.1	Projected Conditions and Impacts, 2009 .....	13A-55
13A.6.2	Projected Conditions and Impacts, 2015 .....	13A-57

---

## Table of Contents

13A.7	Projected Conditions for Alternative Scenario and Trip Generation		
Assumptions .....	.....	13A-58	
13A.7.1	Introduction .....	.....	13A-58
13A.7.2	Trip Generation and Modal Split Assumption Changes.....	.....	13A-59
13A.7.3	Traffic Level of Service and Significant Impact Findings.....	.....	13A-60
<b>13B.</b>	<b>Transit and Pedestrians .....</b>	<b>13B-1</b>	
13B.1	Introduction .....	.....	13B-1
13B.1.1	Context .....	.....	13B-1
13B.1.2	Conclusions .....	.....	13B-3
13B.2	Methodology .....	.....	13B-5
13B.2.1	Capacity Analysis Methodology .....	.....	13B-5
13B.2.2	Impact Criteria .....	.....	13B-9
13B.3	Current Conditions Scenario .....	.....	13B-10
13B.3.1	Data Collection .....	.....	13B-11
13B.3.2	Existing Conditions 2003 .....	.....	13B-12
13B.3.3	Future Without the Proposed Action 2009—Current Conditions Scenario .....	.....	13B-26
13B.3.4	Future Without the Proposed Action 2015—Current Conditions Scenario .....	.....	13B-29
13B.3.5	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	.....	13B-32
13B.3.6	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	.....	13B-37
13B.4	Pre-September 11 Scenario .....	.....	13B-43
13B.4.1	Data Collection .....	.....	13B-43
13B.4.2	Baseline Conditions .....	.....	13B-43
13B.4.3	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	.....	13B-50
13B.4.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	.....	13B-52
13B.4.5	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	.....	13B-55
13B.4.6	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	.....	13B-57
<b>14.</b>	<b>Air Quality .....</b>	<b>14-1</b>	
14.1	Introduction .....	.....	14-1
14.1.1	Context .....	.....	14-1
14.1.2	Conclusions .....	.....	14-1
14.2	Air Quality in the Context of September 11.....	.....	14-2
14.2.1	Pollutants Released on September 11 .....	.....	14-3
14.2.2	Monitored Concentrations.....	.....	14-3
14.2.3	Human Exposure and Health Impacts .....	.....	14-4
14.2.4	Relevance to the Future.....	.....	14-5
14.3	Methodology .....	.....	14-7
14.3.1	Pollutants for Analysis .....	.....	14-7
14.3.2	Air Quality Regulations, Standards, and Benchmarks .....	.....	14-9
14.3.3	Background Conditions.....	.....	14-13
14.3.4	Regional Emissions Analysis .....	.....	14-14
14.3.5	Analysis of Mobile Sources .....	.....	14-15
14.3.6	Analysis of Stationary Sources .....	.....	14-19

---

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

14.4	Predicted Impacts of the Proposed Action.....	14-19
14.4.1	Predicted Region-Wide Emissions .....	14-19
14.4.2	Predicted Impacts of Stationary Sources .....	14-20
14.4.3	Predicted Impacts of Mobile Sources .....	14-21
<b>15.</b>	<b>Noise .....</b>	<b>15-1</b>
15.1	Introduction.....	15-1
15.1.1	Context .....	15-1
15.1.2	Conclusions .....	15-2
15.2	Methodology.....	15-2
15.2.1	Noise Fundamentals .....	15-2
15.2.2	Guidelines and Regulations .....	15-5
15.3	Current Conditions Scenario.....	15-10
15.3.1	Existing Conditions 2003 .....	15-10
15.3.2	Future Without the Proposed Action 2009—Current Conditions Scenario....	15-12
15.3.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	15-12
15.3.4	Future Without the Proposed Action 2015—Current Conditions Scenario....	15-17
15.3.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	15-17
15.4	Pre-September 11 Scenario.....	15-19
15.4.1	Baseline Conditions.....	15-19
15.4.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario ....	15-20
15.4.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	15-21
15.4.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario ....	15-27
15.4.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	15-28
15.5	FTA Noise Analysis for the Proposed Underground Garage .....	15-30
<b>16.</b>	<b>Coastal Zone .....</b>	<b>16-1</b>
16.1	Introduction.....	16-1
16.1.1	Context .....	16-1
16.1.2	Conclusions .....	16-1
16.2	Regulatory Context.....	16-2
16.3	Methodology.....	16-3
16.4	Proposed Action 2009 and 2015 Conditions .....	16-3
16.4.1	Permanent Activities.....	16-3
16.4.2	Temporary (Construction) Activities.....	16-3
<b>17.</b>	<b>Floodplain.....</b>	<b>17-1</b>
17.1	Introduction.....	17-1
17.1.1	Context .....	17-1
17.1.2	Conclusions .....	17-1
17.2	Methodology.....	17-2
17.2.1	Analysis Scenarios and Years.....	17-2
17.2.2	Relevant Policies and Regulations.....	17-2

---

## Table of Contents

17.3	Current Conditions Scenario .....	17-3
17.3.1	Existing Conditions 2003 .....	17-3
17.3.2	Future Without the Proposed Action 2009—Current Conditions Scenario .....	17-4
17.3.3	Probable Impacts of the Proposed Action—Current Conditions Scenario 2009.....	17-5
17.3.4	Future Without the Proposed Action 2015.....	17-6
17.3.5	Probable Impacts of the Proposed Action 2015.....	17-6
17.4	Pre-September 11 Scenario .....	17-6
17.4.1	Baseline Conditions .....	17-6
17.4.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	17-7
17.4.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	17-7
17.4.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	17-8
17.4.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	17-9
17.5	HUD Floodplain Compliance.....	17-9
<b>18.</b>	<b>Natural Resources.....</b>	<b>18-1</b>
18.1	Introduction .....	18-1
18.1.1	Context .....	18-1
18.1.2	Conclusions .....	18-2
18.2	Regulatory Context .....	18-5
18.2.1	Federal.....	18-6
18.2.2	New York.....	18-7
18.3	Methodology .....	18-8
18.3.1	Water Quality and Aquatic Resources .....	18-8
18.3.2	Terrestrial Resources.....	18-14
18.4	Current Conditions Scenario .....	18-15
18.4.1	Baseline Conditions .....	18-16
18.4.2	Future Without the Proposed Action 2009—Current Conditions Scenario .....	18-36
18.4.3	Probable Impacts of the Proposed Action 2009—Current Conditions Scenario.....	18-40
18.4.4	Future Without the Proposed Action 2015—Current Conditions Scenario .....	18-46
18.4.5	Probable Impacts of the Proposed Action 2015—Current Conditions Scenario.....	18-46
18.5	Pre-September 11 Scenario Analysis .....	18-64
18.5.1	Baseline Conditions .....	18-64
18.5.2	Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	18-65
18.5.3	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	18-66
18.5.4	Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	18-69
18.5.5	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	18-70
18.6	References (see Appendix I.1) .....	18-74

<b>19. Radiofrequency Electromagnetic Fields.....</b>	<b>19-1</b>
19.1    Introduction.....	19-1
19.1.1    Context .....	19-1
19.1.2    Conclusions .....	19-1
19.2    Background.....	19-1
19.3    Current Conditons Scenario.....	19-4
19.3.1    Existing Conditions 2003 .....	19-4
19.3.2    Future Without the Proposed Action 2009—Current Conditions Scenario.....	19-4
19.3.3    Probable Impacts of the Proposed Action 2009—Current Conditions Scenario .....	19-4
19.3.4    Future Without the Proposed Action 2015—Current Conditions Scenario.....	19-5
19.3.5    Probable Impacts of the Proposed Action 2015—Current Conditions Scenario .....	19-5
19.4    Pre-September 11 Scenario.....	19-6
19.4.1    Baseline Conditions.....	19-6
19.4.2    Future Without the Proposed Action 2009—Pre-September 11 Scenario .....	19-6
19.4.3    Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario .....	19-6
19.4.4    Future Without the Proposed Action 2015—Pre-September 11 Scenario .....	19-7
19.4.5    Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario .....	19-7
<b>20. Environmental Justice .....</b>	<b>20-1</b>
20.1    Introduction.....	20-1
20.1.1    Context .....	20-1
20.1.2    Conclusions .....	20-3
20.2    Methodology.....	20-4
20.2.1    Policy Considerations and Guidance .....	20-4
20.2.2    Assessment Methods .....	20-5
20.2.3    Study Area .....	20-6
20.2.4    Public Outreach .....	20-6
20.2.5    Analysis Scenarios.....	20-8
20.3    Current Conditions Scenario Analysis.....	20-8
20.3.1    Existing Conditions 2003—Current Conditions Scenario.....	20-8
20.3.2    Future Without the Proposed Action, Construction Peak Period 2006—Current Conditions Scenario .....	20-9
20.3.3    Probable Impacts, Construction Period Peak Period 2006—Current Conditions Scenario.....	20-12
20.3.4    Future Without the Proposed Action, 2009—Current Conditions Scenario .....	20-15
20.3.5    Probable Impacts of the Proposed Action, 2009—Current Conditions Scenario .....	20-16
20.3.6    Future Without the Proposed Action, 2015—Current Conditions Scenario .....	20-17
20.3.7    Probable Impacts of the Proposed Action, 2015—Current Conditions Scenario .....	20-17
20.4    Pre-September 11 Scenario.....	20-18
20.4.1    Existing Conditions 2003—Pre-September 11 Scenario.....	20-19

---

## Table of Contents

20.4.2	Peak Construction Period —Pre-September 11 Scenario.....	20-19
20.4.3	Future Without the Proposed Action 2009—Pre-September 11 Scenario.....	20-19
20.4.4	Probable Impacts of the Proposed Action 2009—Pre-September 11 Scenario.....	20-19
20.4.5	Future Without the Proposed Action 2015—Pre-September 11 Scenario.....	20-20
20.4.6	Probable Impacts of the Proposed Action 2015—Pre-September 11 Scenario.....	20-20
<b>21.</b>	<b>Construction .....</b>	<b>21-1</b>
21.1	Introduction .....	21-1
21.1.1	Context .....	21-1
21.1.2	Conclusions .....	21-4
21.2	LMDC's Environmental Principles .....	21-7
21.2.1	Environmental Performance Commitments (EPCs) .....	21-7
21.2.2	Sustainable Design Guidelines .....	21-9
21.2.3	Cumulative Effects Analysis Approach .....	21-10
21.2.4	Methodology .....	21-10
21.2.5	Cumulative Effects Methodology .....	21-10
21.2.6	Construction Analysis Methodology .....	21-11
21.3	Overview of Construction Activities: Proposed Action .....	21-15
21.3.1	Utility Works .....	21-15
21.3.2	Demolition .....	21-15
21.3.3	Sub-Grade Excavation and Lateral Earth Retention .....	21-16
21.3.4	High-Rise Office Tower Construction .....	21-18
21.3.5	Sub-Grade Construction .....	21-20
21.3.6	Tunneling Beneath No. 1/9 IRT Line .....	21-20
21.3.7	Surface Finishes—Streets and Landscaping .....	21-21
21.4	Construction Methods: Other Lower Manhattan Projects .....	21-22
21.4.1	Construction Methods: Permanent WTC PATH Terminal .....	21-22
21.4.2	Construction Methods: Route 9A Short Bypass Alternative .....	21-24
21.4.3	Construction Methods: FSTC .....	21-27
21.4.4	Construction Methods: South Ferry Subway Station .....	21-31
21.4.5	Construction Methods: 130 Liberty Street .....	21-32
21.5	Staging and Lay-Down Areas, Street Closures, and Site Access .....	21-33
21.6	Cumulative Construction Effects During Peak Period 2006 .....	21-34
21.6.1	Vehicular and Pedestrian Traffic .....	21-35
21.6.2	Air Quality .....	21-44
21.6.3	Noise and Vibration .....	21-49
21.6.4	Noise .....	21-50
21.6.5	Vibration .....	21-69
21.6.6	Economic Effects .....	21-74
21.6.7	Cultural Resources .....	21-77
21.7	Other Construction Impacts of the Proposed Action .....	21-79
21.7.1	Land Use .....	21-79
21.7.2	Urban Design and Visual Resources .....	21-80
21.7.3	Open Space .....	21-80
21.7.4	Shadows .....	21-80
21.7.5	Community Facilities and Services .....	21-80

---

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

21.7.6 Neighborhood Character.....	21-80
21.7.7 Hazardous Materials .....	21-81
21.7.8 Infrastructure .....	21-81
21.7.9 Coastal Zone .....	21-82
21.7.10 Floodplain.....	21-82
21.7.11 Natural Resources.....	21-82
21.7.12 Environmental Justice.....	21-82
21.7.13 Water Quality .....	21-83
21.7.14 Waste Disposal .....	21-83
<b>22. Mitigation Measures.....</b>	<b>22-1</b>
22.1 Introduction.....	22-1
22.2 Archaeological Resources .....	22-1
22.3 Traffic and Parking .....	22-1
22.3.1 Introduction and Overview of Findings.....	22-1
22.3.2 2009 Traffic Mitigation .....	22-3
22.3.3 2015 Traffic Mitigation .....	22-7
22.3.4 Additional Areawide Traffic Management and Improvement Strategies.....	22-12
22.4 Pedestrian Conditions .....	22-14
22.5 Noise.....	22-15
22.6 Construction.....	22-15
22.6.1 Traffic .....	22-15
22.6.2 Air Quality.....	22-17
22.6.3 Noise.....	22-18
<b>23. Alternatives .....</b>	<b>23-1</b>
23.1 Introduction.....	23-1
23.2 No Action Alternative.....	23-2
23.2.1 Land Use and Public Policy.....	23-2
23.2.2 Urban Design and Visual Resources .....	23-3
23.2.3 Historic Resources.....	23-3
23.2.4 Open Space .....	23-4
23.2.5 Shadows.....	23-4
23.2.6 Community Facilities and Services .....	23-4
23.2.7 Socioeconomic Conditions .....	23-4
23.2.8 Neighborhood Character.....	23-5
23.2.9 Hazardous Materials .....	23-5
23.2.10 Infrastructure .....	23-5
23.2.11 Traffic and Parking .....	23-5
23.2.12 Transit and Pedestrians.....	23-6
23.2.13 Air Quality .....	23-6
23.2.14 Noise.....	23-6
23.2.15 Coastal Zone .....	23-6
23.2.16 Floodplain.....	23-6
23.2.17 Natural Resources.....	23-6
23.2.18 Electromagnetic Fields .....	23-7
23.2.19 Construction Impacts.....	23-7

---

## Table of Contents

23.3	Memorial Only Alternative .....	23-7
23.3.1	Land Use .....	23-8
23.3.2	Urban Design and Visual Resources.....	23-8
23.3.3	Historic Resources .....	23-8
23.3.4	Open Space .....	23-9
23.3.5	Shadows .....	23-9
23.3.6	Neighborhood Character .....	23-9
23.3.7	Hazardous Materials.....	23-10
23.3.8	Infrastructure .....	23-10
23.3.9	Traffic and Parking .....	23-10
23.3.10	Transit and Pedestrians .....	23-11
23.3.11	Air Quality .....	23-11
23.3.12	Noise .....	23-11
23.3.13	Construction Impacts .....	23-11
23.4	Restoration Alternative .....	23-11
23.4.1	Land Use and Public Policy .....	23-12
23.4.2	Urban Design and Visual Resources.....	23-13
23.4.3	Historic Resources .....	23-13
23.4.4	Open Space .....	23-14
23.4.5	Shadows .....	23-14
23.4.6	Community Facilities and Services.....	23-14
23.4.7	Socioeconomic Conditions.....	23-14
23.4.8	Neighborhood Character .....	23-15
23.4.9	Hazardous Materials.....	23-15
23.4.10	Infrastructure .....	23-15
23.4.11	Traffic and Parking .....	23-16
23.4.12	Transit and Pedestrians .....	23-17
23.4.13	Air Quality .....	23-17
23.4.14	Noise .....	23-17
23.4.15	Coastal Zone .....	23-17
23.4.16	Floodplain .....	23-17
23.4.17	Natural Resources .....	23-17
23.4.18	Electromagnetic Fields.....	23-18
23.4.19	Construction Impacts .....	23-18
23.5	Rebuilding Alternatives.....	23-18
23.5.1	Think World Cultural Center .....	23-19
23.5.2	Land Use and Public Policy .....	23-19
23.5.3	Urban Design and Visual Resources.....	23-20
23.5.4	Historic Resources .....	23-20
23.5.5	Open Space .....	23-21
23.5.6	Shadows .....	23-21
23.5.7	Community Facilities and Services.....	23-21
23.5.8	Socioeconomic Conditions.....	23-21
23.5.9	Neighborhood Character .....	23-21
23.5.10	Hazardous Materials.....	23-22
23.5.11	Infrastructure .....	23-22
23.5.12	Traffic and Parking .....	23-22
23.5.13	Transit and Pedestrians .....	23-22

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

23.5.14 Air Quality .....	23-23
23.5.15 Noise.....	23-23
23.5.16 Coastal Zone .....	23-23
23.5.17 Floodplain.....	23-23
23.5.18 Natural Resources.....	23-23
23.5.19 Electromagnetic Fields .....	23-23
23.5.20 Safety and Security .....	23-23
23.5.21 Construction Impacts.....	23-24
23.6 WTC Site Only Alternative .....	23-24
23.6.1 Four Tower Scheme.....	23-24
23.6.2 Five Tower Scheme .....	23-29
23.7 Enhanced Green Construction Alternative .....	23-32
23.7.1 Movement of Goods and Waste via PATH .....	23-33
23.7.2 Waterborne Goods and Waste Handling During Construction .....	23-34
23.7.3 Bio Fuel and Composting .....	23-36
23.8 Co-Generation Alternative.....	23-36
23.8.1 Infrastructure .....	23-37
23.8.2 Air Quality.....	23-37
23.8.3 Noise.....	23-44
23.9 Reduced Impact Alternative .....	23-44
<b>24. Unavoidable Significant Adverse Impacts .....</b>	<b>24-1</b>
24.1 Shadows.....	24-1
24.2 Traffic .....	24-1
24.3 Pedestrians .....	24-2
<b>25. Growth-Inducing Aspects of the Proposed Project.....</b>	<b>25-1</b>
<b>26. Irreversible and Irretrievable Commitment of Resources .....</b>	<b>26-1</b>
<b>Coastal Consistency Form</b>	
<b>List of Preparers</b>	
<b>List of Recipients</b>	
<b>Index</b>	

---

## Table of Contents

---

### **VOLUME 2—APPENDICES**

<b>Appendix A .....</b>	<b>Sustainable Design Guidelines</b>
<b>Appendix B .....</b>	<b>Community Facilities</b>
<b>Appendix C.....</b>	<b>Shadows</b>
<b>Appendix D.....</b>	<b>Hazardous Materials</b>
<b>Appendix E .....</b>	<b>Traffic and Parking</b>
E.1     Traffic Volume Networks	
E.2     Traffic Impact Analyses	
<b>Appendix F .....</b>	<b>Transit and Pedestrians</b>
<b>Appendix G.....</b>	<b>Air Quality</b>
<b>Appendix H.....</b>	<b>Noise</b>
<b>Appendix I .....</b>	<b>Natural Resources</b>
I.1     References	
I.2     Essential Fish Habitat Assessment	
<b>Appendix J.....</b>	<b>Construction</b>

## **List of Tables**

---

<b>2. Methodology</b>		
2-1	Elements of Proposed Action Assumed to Be Completed by 2009.....	2-4
2-2	Elements of Proposed Action Assumed to Be Completed Between 2009 and 2015 .....	2-5
2-3	Projects in Construction or Planned to Be Complete by 2009 Current Conditions Scenario .....	2-8
2-4	Potential and Proposed Projects 2010-2015, Current Conditions Scenario.....	2-10
2-5	Projects in Construction or Planned to Be Complete by 2009 Pre-September 11 Conditions Scenario.....	2-11
2-6	Potential and Proposed Projects 2010-2015, Pre-September 11 Conditions Scenario ..	2-13
<b>3. Land Use and Public Policy</b>		
3-1	Primary and Secondary Study Area Zoning .....	3-15
3-2	Zoning Districts by Subarea.....	3-16
<b>5. Historic Resources</b>		
5-1	Known Resources in the Primary and Secondary Areas of Potential Effect .....	5-20
5-2	Potential Resources in the Primary and Secondary Areas of Potential Effect.....	5-22
<b>6. Open Space</b>		
6-1	Adequacy of Open Space Quantities .....	6-4
6-2	Screening of Open Space Ratios for Residential Users Only .....	6-10
6-3	Inventory of Open Space in the Study Area, 2003 .....	6-14
6-4	Estimated Study Area Population 2003 .....	6-16
6-5	Study Area Projects in Construction or Planned to Be Complete by 2009 Current Conditions Scenario.....	6-19
6-6	Potential and Proposed Projects 2009—2015 Current Conditions Scenario .....	6-23
6-7	Open Space on the Project Site—Pre-September 11 .....	6-27
6-8	Study Area Population 2000 .....	6-28
6-9	Study Projects in Construction or Planned to Be Complete by 2009 Pre-September 11 Scenario .....	6-30
6-10	Potential and Proposed Projects Between 2009 and 2015 Pre-September 11 Scenario.	6-32
<b>7. Shadows</b>		
7-1	Shadows Screening: Open Spaces Within Maximum Shadow Sweep .....	7-6
7-2	Project Shadow Durations Current Conditions 2009.....	7-11
7-3	Project Shadow Durations Current Conditions 2015 .....	7-18
7-4	Project Shadow Durations Pre-September 11 Conditions 2009 .....	7-23
7-5	Project Shadow Durations Pre-September 11 Conditions 2015 .....	7-28
<b>8. Community Facilities</b>		
8-1	Fire Protection Services .....	8-7
<b>9. Socioeconomic Conditions</b>		
9-1	Population Characteristics at the World Trade Center Site, 1990 and 2000.....	9-14
9-2	Population Characteristics in the Primary Study Area, 1990 and 2000.....	9-15
9-3	Housing Characteristics in the Primary Study Area, 1990 and 2000.....	9-18
9-4	Household and Income Characteristics in the Primary Study Area, 1990 and 2000 .....	9-21

---

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

9-5	Population Characteristics in the Secondary Study Area, 1990 and 2000.....	9-23
9-6	Housing Characteristics in the Secondary Study Area, 1990 and 2000 .....	9-26
9-7	Household and Income Characteristics in the Secondary Study Area, 1990 and 2000	9-28
9-8	Lower Manhattan Historic Office Real Estate Trends.....	9-31
9-9	Office Space Destroyed by September 11 World Trade Center Attacks.....	9-32
9-10	Office Space Damaged by September 11 World Trade Center Attacks .....	9-33
9-11	Large Corporate Tenant Relocation Resulting from September 11 World Trade Center Attacks.....	9-34
9-12	Lower Manhattan Office Inventory and Rents, 2003 .....	9-37
9-13	Lower Manhattan Office Vacancy, 2003.....	9-38
9-14	Manhattan Office Inventory and Rents, 2003 .....	9-42
9-15	Manhattan Office Vacancy, 2003 .....	9-42
9-16	Retail Establishments in Lower Manhattan, August 2002.....	9-45
9-17	Employment Relocation Resulting from September 11 World Trade Center Attacks .	9-49
9-18	Lower Manhattan Employment .....	9-50
9-19	Manhattan and New York City Private Sector Insured Employment, 2002 .....	9-52
9-20	Residential Development, Primary Study Area: 2009 Future Without the Proposed Action Under Current Conditions Scenario .....	9-57
9-21	Residential Development, Secondary Study Area: 2009 Future Without the Proposed Action Under Current Conditions Scenario .....	9-58
9-22	Proposed Commercial Development in Lower Manhattan Study Area: 2009 Future Without the Proposed Action Under Current Conditions Scenario .....	9-59
9-23	Projected Employment in Lower Manhattan Study Area: 2009 Future Without the Proposed Action Under Current Conditions Scenario .....	9-60
9-24	Projected Typical Permanent Employment from Operation of the Proposed Action, 2009 .....	9-64
9-25	Residential Development, Primary Study Area: 2015 Future Without the Proposed Action Under Current Conditions Scenario .....	9-74
9-26	Residential Development, Secondary Study Area: 2015 Future Without the Proposed Action Under Current Conditions Scenario .....	9-74
9-27	Commercial Development, Primary Study Area: 2015 Future Without the Proposed Action Under Current Conditions Scenario .....	9-75
9-28	Projected Typical Permanent Employment from the Operation of the Proposed Action, 2015.....	9-78
9-29	Employment and Economic Benefits from Construction of the Infrastructure and Below Grade Investment: 2009 .....	9-83
9-30	Employment and Economic Benefits from Construction of the Commercial Office and Retail Development: 2009.....	9-84
9-31	Employment and Economic Benefits from Construction of the Museum, Cultural Facilities, Performing Arts Center, and Memorial: 2009.....	9-85
9-32	Summary of the Employment and Economic Benefits from Construction of the Entire 2009 Building Program .....	9-86
9-33	Typical Employment and Economic Benefits from the Annual Operation of the Completed 2009 Building Program .....	9-89
9-34	Employment and Economic Benefits from Construction of the Incremental 2015 Building Program.....	9-91
9-35	Summary of the Employment and Economic Benefits from Construction of the Entire Building Program .....	9-92

---

## List of Tables

---

9-36	Employment and Economic Benefits from the Annual Operation of the Incremental 2015 Building Program .....	9-94
9-37	Typical Employment and Economic Benefits from the Annual Operation of the Completed Building Program.....	9-95
9-38	Pre-September 11 Office Space Characteristics, World Trade Center Site .....	9-98
9-39	Lower Manhattan Office Inventory and Rents, 2001 .....	9-98
9-40	Lower Manhattan Office Vacancy, 2001 .....	9-99
9-41	Manhattan Office Market Characteristics, Year-End 2000.....	9-100
9-42	Employment on the WTC Site Before September 11, 2001 .....	9-102
9-43	Primary Study Area Employment, 2000 .....	9-103
9-44	Manhattan and New York City Employment, 2000.....	9-104
9-45	Residential Development, Primary Study Area: 2009 Future Without the Proposed Action Under Pre-September 11 Scenario .....	9-108
9-46	Residential Development, Secondary Study Area: 2009 Future Without the Proposed Action Under Pre-September 11 Scenario .....	9-109
9-47	Commercial Development, Lower Manhattan Study Area: 2009 Future Without the Proposed Action Under Pre-September 11 Conditions .....	9-110
9-48	Projected Employment in Lower Manhattan Study Area: 2009 Pre-September 11 Scenario .....	9-111
9-49	Projected Typical Permanent Employment from Operation of the Proposed Action, 2009 .....	9-115
9-50	Residential Development, Primary Study Area: 2015 Future Without the Proposed Action Under Pre-September 11 Conditions.....	9-119
9-51	Residential Development, Secondary Study Area: 2015 Future Without the Proposed Action Under Pre-September 11 Conditions.....	9-119
9-52	Projected Typical Permanent Employment from the Operation of the Proposed Action, 2015 .....	9-123
<b>11.</b>	<b>Hazardous Materials</b>	
11-1	RCRA Toxicity Characteristic Regulatory Limits .....	11-6
<b>12.</b>	<b>Infrastructure</b>	
12-1	Totals for Pre-September 11 Scenario.....	12-2
12-2	Totals for Current Conditions Scenario.....	12-3
12-3	Future Without the Proposed Action—Current Conditions Scenario 2009 .....	12-8
12-4	Water Supply and Sewage Generation in 2009 Under Current Conditions .....	12-10
12-5	Solid Waste Generation in 2009 Under Current Conditions .....	12-11
12-6	Energy Consumption in 2009 Under Current Conditions .....	12-11
12-7	Future Without the Proposed Action—Current Conditions Scenario 2015 .....	12-12
12-8	Water Supply and Sewage Generation in 2015 Under Current Conditions .....	12-13
12-9	Solid Waste Generation in 2015 Under Current Conditions .....	12-14
12-10	Energy Consumption in 2015 Under Current Conditions .....	12-15
12-11	Totals for Current Conditions Scenario.....	12-16
12-12	Water Supply and Sewage Generation—Pre-September 11 .....	12-18
12-13	Solid Waste Generation—Pre-September 11 .....	12-19
12-14	Energy Generation—Pre-September 11 .....	12-21
12-15	Water Supply and Sewage Generation of the Proposed Action in 2009 .....	12-22
12-16	Solid Waste Generation of the Proposed Action in 2009 .....	12-23
12-17	Estimates for Recycling Volumes .....	12-24
12-18	Energy Consumption of the Proposed Action in 2009 .....	12-25

## World Trade Center Memorial and Redevelopment Plan GEIS

---

12-19	Future Without the Proposed Action—Pre-September 11 Scenario 2015.....	12-28
12-20	Water Supply and Sewage Generation of the Proposed Action in 2015 .....	12-29
12-21	Solid Waste Generation of the Proposed Action in 2015 .....	12-29
12-22	Energy Consumption of the Proposed Action in 2015 .....	12-30
12-23	Totals for Pre-September 11 Scenario.....	12-32
<b>13.A</b>	<b>Traffic and Parking</b>	
13A-1	Current (Post-September 11) Traffic Level of Service Summary .....	13A-10
13A-2	Inventory of Current (Post-September 11) Public Parking Facilities Within ¼ Mile of the WTC Site .....	13A-12
13A-3	Inventory of Current (Post-September 11) Public Parking Facilities ¼ to ½ Mile from the WTC Site .....	13A-13
13A-4	Vehicle Trip Generation from Background Development Projects, Current Conditions 2009 Baseline (AM, Midday, and PM Peak Hours).....	13A-17
13A-5	Traffic Level of Service Summary Comparison Existing vs. Future No Action Conditions (2009) Current Conditions Scenario With at-Grade Route 9A.....	13A-19
13A-6	Vehicle Trips Generated by the Proposed WTC Development Program (2009) .13A-24	
13A-7	Traffic Level of Service Summary Comparison Future No Action vs. Future Build Conditions (2009) Current Conditions Scenario With at-Grade Route 9A.....	13A-28
13A-8	Vehicle Trip Generation from Background Development Projects, Current Conditions 2015 Baseline (AM, Midday, and PM Peak Hours).....	13A-31
13A-9	Traffic Level of Service Summary Comparison Existing vs. Future No Action Conditions (2015) Current Conditions Scenario With at-Grade Route 9A.....	13A-32
13A-10	Vehicle Trips Generated by the Proposed WTC Development Program (2015) .13A-35	
13A-11	Traffic Level of Service Summary Comparison Future No Action vs. Future Build Conditions (2015) Current Conditions Scenario With at-Grade Route 9A.....	13A-36
13A-12	Pre-September 11 Traffic Level of Service Summary .....	13A-39
13A-13	Inventory of Pre-September 11 Public Parking Facilities Within ¼ Mile of the WTC Site .....	13A-41
13A-14	Inventory of Pre-September 11 Public Parking Facilities ¼ to ½ Mile from the WTC Site .....	13A-42
13A-15	Vehicle Trip Generation from Background Development Projects, Pre-September 11 Conditions 2009 Baseline (AM, Midday, and PM Peak Hours) .....	13A-46
13A-16	Traffic Level of Service Summary Comparison Existing vs. Future No Action Conditions (2009) Pre-September 11 Scenario With at-Grade Route 9A .....	13A-47
13A-17	Vehicle Trip Generation from Background Development Projects, Pre-September 11 Conditions 2015 Baseline (AM, Midday, and PM Peak Hours).....	13A-51
13A-18	Traffic Level of Service Summary Comparison Existing vs. Future No Action Conditions (2015) Pre-September 11 Scenario With at-Grade Route 9A .....	13A-53
13A-19	Vehicle Trip Comparison of Alternative Trip Generation and Modal Split Assumptions .....	13A-60
<b>13.B</b>	<b>Transit and Pedestrians</b>	
13B-1	LOS Criteria for Stairways, Corridors, and Ramps.....	13B-7
13B-2	LOS Criteria for Escalators and Turnstiles.....	13B-8
13B-3	LOS Criteria for Crosswalks .....	13B-8
13B-4	LOS Criteria for Sidewalks/Walkways .....	13B-9
13B-5	Local Bus Routes Serving Lower Manhattan.....	13B-13
13B-6	Express Bus Routes Serving Lower Manhattan .....	13B-14

---

**List of Tables**

13B-7	Daily Weekday Ridership for Local Bus Routes Serving Lower Manhattan (Pre-September 11 Scenario vs. Current Conditions Scenario).....	13B-18
13B-8	Daily Weekday Ridership for Express Bus Routes Serving Lower Manhattan (Pre-September 11 Scenario vs. Current Conditions Scenario).....	13B-19
13B-9	Current Conditions Scenario 2003 Subway Line Haul Analysis .....	13B-22
13B-10	Current Conditions Scenario 2003 Ferry Routes Serving Lower Manhattan .....	13B-24
13B-11	Current Conditions Scenario 2003 Crosswalk Analysis (LOS E or F).....	13B-25
13B-12	Current Conditions Scenario—2003 Subway Pedestrian Analysis (LOS D, E, or F) .....	13B-26
13B-13	Future Without the Proposed Action—Current Conditions Scenario 2009 Subway Line Haul Analysis .....	13B-27
13B-14	Future Without the Proposed Action—Current Conditions Scenario 2009 Crosswalk Analysis (LOS E or F) .....	13B-28
13B-15	Future Without the Proposed Action—Current Conditions Scenario—2009 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-29
13B-16	Future Without the Proposed Action—Current Conditions Scenario 2015 Subway Line Haul Analysis .....	13B-30
13B-17	Future Without the Proposed Action—Current Conditions Scenario 2015 Crosswalk Analysis (LOS E or F) .....	13B-31
13B-18	Future Without the Proposed Action—Current Conditions Scenario 2015 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-31
13B-19	Future with the Proposed Action—Current Conditions Scenario 2009 Crosswalk Analysis (LOS E or F) .....	13B-33
13B-20	2009 Crosswalk Impact Assessment—AM Peak Period .....	13B-34
13B-21	2009 Crosswalk Impact Assessment—Midday Peak Period .....	13B-35
13B-22	2009 Crosswalk Impact Assessment—PM Peak Period.....	13B-36
13B-23	Future with the Proposed Action—Current Conditions Scenario 2009 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-37
13B-24	Future With the Proposed Action-Current Conditions Scenario 2015 Crosswalk Analysis (LOS E or F) .....	13B-38
13B-25	2015 Crosswalk Impact Assessment—AM Peak Period .....	13B-39
13B-26	2015 Crosswalk Impact Assessment—Midday Peak Period .....	13B-40
13B-27	2015 Crosswalk Impact Assessment—PM Peak Period.....	13B-41
13B-28	Future with the Proposed Action—Current Conditions Scenario 2015 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-42
13B-29	Pre-September 11 Scenario—2001 Subway Line Haul Analysis.....	13B-47
13B-30	Pre-September 11 Scenario—2001 Ferry Routes Serving Lower Manhattan .....	13B-48
13B-31	Pre-September 11 Scenario—2001 Crosswalk Analysis (LOS E or F).....	13B-48
13B-32	Pre-September 11 Scenario—2001 Subway Pedestrian Analysis (LOS D, E, or F) .....	13B-49
13B-33	Future Without the Proposed Action—Pre-September 11 Scenario 2009 Subway Line Haul Analysis .....	13B-51
13B-34	Future Without the Proposed Action—Pre-September 11 Scenario 2009 Crosswalk Analysis (LOS E or F) .....	13B-51
13B-35	Future Without the Proposed Action—Pre-September 11 Scenario 2009 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-52
13B-36	Future Without the Proposed Action—Pre-September 11 Scenario 2015 Subway Line Haul Analysis .....	13B-53

---

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

13B-37	Future Without the Proposed Action—Pre-September 11 Scenario 2015 Crosswalk Analysis (LOS E or F) .....	13B-54
13B-38	Future Without the Proposed Action—Pre-September 11 Scenario 2015 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-55
13B-39	Future with the Proposed Action—Pre-September 11 Scenario 2009 Crosswalk Analysis (LOS E or F) .....	13B-56
13B-40	2009 Crosswalk Impact Assessment—AM Peak Period.....	13B-58
13B-41	2009 Crosswalk Impact Assessment—Midday Peak Period.....	13B-59
13B-42	2009 Crosswalk Impact Assessment—PM Peak Period .....	13B-60
13B-43	Future with the Proposed Action—Pre-September 11 Scenario 2009 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-61
13B-44	Future with the Proposed Action—Current Conditions Scenario 2009 Crosswalk Mitigation .....	13B-62
13B-45	Future with the Proposed Action-Current Conditions Scenario 2015 Crosswalk Analysis (LOS E or F) .....	13B-62
13B-46	2015 Crosswalk Impact Assessment—AM Peak Period.....	13B-64
13B-47	2015 Crosswalk Impact Assessment—Midday Peak Period.....	13B-65
13B-48	2015 Crosswalk Impact Assessment—PM Peak Period .....	13B-66
13B-49	Future with the Proposed Action—Pre-September 11 Scenario 2015 Subway Pedestrian Analysis (LOS D, E, or F).....	13B-67
13B-50	Future with the Proposed Action—Pre-September 11 Scenario—2015 Crosswalk Mitigation .....	13B-67
<b>14.</b>	<b>Air Quality</b>	
14-1	Particulate Matter Concentrations Monitored at WTC Specific Monitors, 2001-2003	14-6
14-2	Ambient Air Quality Standards .....	14-10
14-3	Monitored Concentrations From the Nearest Air Quality Stations.....	14-14
14-4	Total Estimated Increase in Regional Emissions—2015 .....	14-20
14-5	Total Predicted Pollutant Concentrations Current Conditions at Grade Scenario, 2009 .....	14-21
14-6	Total Predicted Pollutant Concentrations Current Conditions Short Bypass Scenario, 2009 .....	14-21
14-7	Total Predicted Pollutant Concentrations Current Conditions at Grade Scenario, 2015.....	14-22
14-8	Total Predicted Pollutant Concentrations Current Conditions Short Bypass Scenario, 2015 .....	14-23
14-9	Total Predicted Pollutant Concentrations Pre-September 11 at Grade Scenario, 2009.....	14-24
14-10	Total Predicted Pollutant Concentrations Pre-September 11 at Grade Scenario, 2015.....	14-24
<b>15.</b>	<b>Noise</b>	
15-1	Examples of Common Sounds (A-Weighted Sound Level in Decibels [dBA]).....	15-3
15-2	Average Ability to Perceive Changes in Noise Levels .....	15-4
15-3	Community Response to Increases in Noise Levels .....	15-5
15-4	CEPO-CEQR Noise Exposure Standards for Use in City Environmental Impact Review .....	15-9
15-5	Required Attenuation Values to Achieve Acceptable Interior Noise Levels.....	15-10
15-6	Land Use Categories and Metrics for Transit Noise Impact Criteria.....	15-11
15-9	2003 Noise Measurement Results.....	15-13

15-11	2009 Future Without the Proposed Action and Future with the Proposed Action Noise Levels ( $L_{eq}$ in dBA) 2003 Current Conditions Scenario .....	15-17
15-12	2015 Future Without the Proposed Action and Proposed Action Noise Levels ( $L_{eq}$ in dBA).....	15-21
15-12	2015 Future Without the Proposed Action and Proposed Action Noise Levels ( $L_{eq}$ in dBA).....	15-22
15-13	Pre-September 11 Noise Levels .....	15-23
15-14	2009 Future Without the Proposed Action and Future with the Proposed Action Noise Levels ( $L_{eq}$ in dBA) Pre-September 11 Conditions Scenario.....	15-25
15-14	2009 Future Without the Proposed Action and Future with the Proposed Action Noise Levels ( $L_{eq}$ in dBA) Pre-September 11 Conditions Scenario.....	15-26
15-15	2015 Future Without the Proposed Action and Proposed Action Noise Levels ( $L_{eq}$ in dBA) Pre-September 11 Conditions Scenario.....	15-28
15-16	Noise Levels and Potential Impacts from the Proposed Garage FTA Detailed Analysis.....	15-30
<b>18.</b>	<b>Natural Resources</b>	
18-1	Aquatic Species Identified for Quantitative Evaluation of Potential Impact of the Proposed Action .....	18-11
18-2	NYCDEP Water Quality Data for the Pier A Sampling Station in the Hudson River (1998–2002) .....	18-17
18-3	Finfish Species Caught in New York Harbor 1982–2003.....	18-24
18-4	World Trade Center Cooling Water Outfall Discharge Limitations .....	18-42
18-5	Estimated Annual Impingement and Entrainment of Fish by World Trade Center Hudson River Water Intake 1991–1993.....	18-48
18-6	Estimated Annual Number of Invertebrates Impinged by the World Trade Center Hudson River Water Intake 1991–1993.....	18-50
18-7	Impingement and Entrainment Losses (1991–1993) Expressed as Potential Pounds Lost to the Fishery or Potential Reduction in Pounds of Bay Anchovy Available to Predators .....	18-51
18-8	Hudson River Riverwide Population Estimates .....	18-51
<b>19.</b>	<b>Radiofrequency Electromagnetic Fields</b>	
19-1	FCC Limits for Maximum Permissible Exposure (MPE) .....	19-3
<b>20.</b>	<b>Environmental Justice</b>	
20-1	Population and Income Characteristics for Impact Study Areas Comparison of Study Area With Surrounding Region.....	20-10
20-2	Population and Income Characteristics for Subareas in Secondary Study Area.....	20-11
20-1	Population and Income Characteristics for Impact Study Areas Comparison of Study Area With Surrounding Region .....	20-10
20-2	Population and Income Characteristics for Subareas in Secondary Study Area .....	20-11
<b>21.</b>	<b>Construction</b>	
21-1	Environmental Performance Commitments .....	21-8
21-2	Projected Construction Vehicle Percentages.....	21-36
21-3	2006 Daily Construction Vehicles .....	21-37
21-4	Typical Daily Construction Vehicle Distribution .....	21-37
21-5	Construction Vehicle Trips at Key Intersection Locations Future Without the Proposed Action (2006) Condition .....	21-39
21-6	Construction Vehicle Trips at Key Intersection Locations—Proposed Action Construction Only .....	21-40

---

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

21-7	Construction Vehicle Trips at Key Intersection Locations—Future with Proposed Action (2006) Condition.....	21-41
21-8	Traffic Level of Service Summary Comparison Future Without the Proposed Action (2006) vs. Future with the Proposed Action (2006) Scenarios .....	21-42
21-9	Traffic Impact Assessment 2006 Construction Conditions .....	21-43
21-10	Highest Predicted Total Increase in Particulate Matter Concentrations .....	21-48
21-11	Highest Predicted Total Particulate Matter Concentrations.....	21-49
21-12	FTA Construction Noise Criteria.....	21-52
21-13	Future Without the Proposed Action Noise Levels During Peak Hour CEQR Analysis.....	21-56
21-14	Future Without the Proposed Action Noise Levels During a Peak 8-Hour FTA Detailed Analysis .....	21-57
21-15	Future Without the Proposed Action Noise Levels During Peak 30-Day Period FTA Detailed Analysis .....	21-58
21-16	Traffic Volume, Pces, Noise Level Differences—Future with the Proposed Action 2006 vs. 2003 Existing.....	21-60
21-17	Traffic Volume, PCEs, Noise Level Differences (2006 vs. Pre-September 11)—(Proposed Action vs. Pre-September 11).....	21-61
21-18	Traffic Volume, PCEs, Noise Level Differences—Action 2006 vs. Future Without the Proposed Action 2006.....	21-62
21-19	Proposed Action Construction Equipment—Noise Emission Levels and Acoustical Usage Factors.....	21-64
21-20	Proposed Action Typical Noise Levels for Peak Hour Construction at Various Distances from Equipment Sources .....	21-65
21-21	Proposed Action 2006 Construction Noise Levels During Peak Hour CEQR Analysis.....	21-66
21-22	Proposed Action 2006 Construction Noise Levels During Peak 8-Hour FTA Detailed Analysis .....	21-67
21-23	Proposed Action 2006 Construction Noise Levels During Peak 30-Day Period FTA Detailed Analysis .....	21-68
21-24	Ground-Borne Vibration and Noise Impact Criteria.....	21-70
21-25	Summary of Future Without Proposed Action Vibration Levels.....	21-72
21-26	Proposed Action Vibration Levels for Construction Equipment from Equipment Source .....	21-73
21-27	2006 Monthly Maximum Construction Vibration PPV Level (Inch/Second) .....	21-74
<b>22.</b>	<b>Mitigation</b>	
22-1	Traffic Impact Mitigation Summary .....	22-2
22-2	Future with the Proposed Action—Current Conditions Scenario 2009 Crosswalk Mitigation.....	22-14
22-3	Future with the Proposed Action—Current Conditions Scenario 2015 Crosswalk Mitigation.....	22-14
22-4	Overview of Noise Impacts and Mitigation of Construction Activities in 2009 for Various Components and Locations .....	22-16
22-5	Overview of Noise Impacts and Mitigation of Construction Activities in 2006 for Various Components and Locations .....	22-24
<b>23.</b>	<b>Alternatives</b>	
23-1	Vehicle Trips Generated by the Memorial Only Alternative vs. Proposed Action....	23-11
23-2	Vehicle Trips Generated by the Restoration Alternative .....	23-16

---

**List of Tables**

23-3	Vehicle Trips Generated by the THINK Alternative .....	23-22
23-4	Vehicle Trips Generated by the WTC Site Only Alternative Four Tower Scheme ...	23-28
23-5	Vehicle Trips Generated by the WTC Site Only Alternative Five Tower Scheme....	23-32
23-6	Cogeneration Facility—Stack Parameters and Emission Rates .....	23-40
23-7	Boiler Facility—Stack Parameters and Emission Rates.....	23-40
23-8	Cogeneration Facility Alternative—Cogeneration Unit Scenario Maximum Predicted Total Concentrations .....	23-41
23-9	Cogeneration Facility Alternative—Centralized Units Scenario Maximum Predicted Total Concentrations .....	23-42
23-10	Boiler Plant Maximum Predicted Total Concentrations .....	23-43
23-11	Boiler Plant and Individual Cogeneration Unit Scenario Maximum Predicted Total Concentrations .....	23-43
23-12	Boiler Plant and Centralized Cogeneration Units Scenario Maximum Predicted Total Concentrations .....	23-44

## **List of Figures**

---

	Following Page
<b>Executive Summary</b>	
Figure S-1	World Trade Center Site, Pre-September 11, 2001 ..... S-2
Figure S-2	World Trade Center Site, Post-September 11, 2001..... S-2
Figure S-3	World Trade Center Site, Current Conditions ..... S-4
Figure S-4	Project Location..... S-4
Figure S-5	Proposed Site Plan..... S-10
<b>1. Project Description</b>	
Figure 1-1	Project Location..... 1-2
Figure 1-2	Proposed Site Plan..... 1-20
Figure 1-3	Reflecting Absence..... 1-22
Figure 1-4	View of Freedom Tower from New York Harbor..... 1-22
Figure 1-5	View of Wedge of Light Plaza .....
Figure 1-6	Lower Concourse Level .....
Figure 1-7	Other Major Projects .....
<b>2. Methodology</b>	
Figure 2-1	Land Use Study Area .....
Figure 2-2	No Build Sites: Current Conditions Scenario..... 2-10
Figure 2-3	No Build Sites: Pre-September 11 Scenario..... 2-12
<b>3. Land Use and Public Policy</b>	
Figure 3-1	Land Use Study Areas .....
Figure 3-2	Primary Study Area Land Use: Current Conditions Scenario..... 3-6
Figure 3-3	Existing WTC Site..... 3-6
Figure 3-4	Secondary Study Area Land Use: Current Conditions Scenario..... 3-10
Figure 3-5	Zoning Map .....
Figure 3-6	Primary Study Area Land Use: Pre-September 11 Scenario..... 3-30
Figure 3-7	Secondary Study Area Land Use: Pre-September 11 Scenario..... 3-32
<b>4. Urban Design and Visual Resources</b>	
Figure 4-1	Urban Design and Visual Resources Current Conditions Scenario..... 4-2
Figure 4-2	Urban Design and Visual Resources Current Conditions Scenario..... 4-4
Figure 4-3	Urban Design and Visual Resources Current Conditions Scenario..... 4-4
Figure 4-4	Urban Design and Visual Resources Current Conditions Scenario..... 4-4
Figure 4-5	Urban Design and Visual Resources Current Conditions Scenario..... 4-4
Figure 4-6	Urban Design and Visual Resources Current Conditions Scenario..... 4-6
Figure 4-7	Urban Design and Visual Resources Current Conditions Scenario..... 4-6
Figure 4-8	Urban Design and Visual Resources Current Conditions Scenario..... 4-8
Figure 4-9	Urban Design and Visual Resources Current Conditions Scenario..... 4-10
Figure 4-10	Urban Design and Visual Resources Pre-September 11 Scenario..... 4-24

---

## World Trade Center Memorial and Redevelopment Plan GEIS

---

Figure 4-11	Urban Design and Visual Resources Pre-September 11 Scenario .....	4-24
Figure 4-12	Urban Design and Visual Resources Pre-September 11 Scenario .....	4-24

### 5. Historic Resources

Figure 5-1	Historic Resources .....	5-10
Figure 5-2	Areas of Potential Archaeological Sensitivity-Project Site .....	5-12
Figure 5-3	Areas of Potential Archaeological Sensitivity-Southern Site .....	5-14
Figure 5-4	North of WTC Site.....	5-20
Figure 5-5	North of WTC Site.....	5-20
Figure 5-6	North of WTC Site.....	5-24
Figure 5-7	North of WTC Site.....	5-26
Figure 5-8	Broadway Corridor .....	5-28
Figure 5-9	Broadway Corridor .....	5-28
Figure 5-10	Broadway Corridor .....	5-28
Figure 5-11	Broadway Corridor .....	5-30
Figure 5-12	Broadway Corridor .....	5-30
Figure 5-13	Broadway Corridor .....	5-30
Figure 5-14	Greenwich South Corridor.....	5-32
Figure 5-15	Greenwich South Corridor.....	5-32
Figure 5-16	Greenwich South Corridor.....	5-34
Figure 5-17	Greenwich South Corridor.....	5-34
Figure 5-18	Greenwich South Corridor.....	5-34
Figure 5-19	Secondary Area of Potential Effect.....	5-38
Figure 5-20	Secondary Area of Potential Effect.....	5-38
Figure 5-21	Secondary Area of Potential Effect.....	5-38
Figure 5-22	Secondary Area of Potential Effect.....	5-38

### 6. Open Space

Figure 6-1	Open Space .....	6-2
Figure 6-2	Flow Field Around Structures.....	6-12
Figure 6-3	Frequency of Wind Speed and Direction.....	6-12
Figure 6-4	Proposed Project Site Open Spaces .....	6-20
Figure 6-5	World Trade Center Open Spaces Pre-September 11 .....	6-26

### 7. Shadows

Figure 7-1	Open Space and Sun-Sensitive Historic Resources .....	7-6
Figure 7-2	Shadow Diagrams Pre-September 11 Conditions	
Figure 7-3	March 21–7:45 AM EST .....	7-12
Figure 7-4	Proposed Action Conditions Compared to Pre-September 11 Conditions	
Figure 7-5	March 21–7:45 AM EST .....	7-12
Figure 7-6	Shadow Diagrams Current Conditions 2009 March 21–7:45 AM EST .	7-12
Figure 7-7	Shadow Diagrams Current Conditions 2009 March 21–11:30 AM EST	7-12
Figure 7-8	Shadow Diagrams Current Conditions 2009 May 6–10:00 AM DST ....	7-12
Figure 7-9	Shadow Diagrams Current Conditions 2009 May 6–12:00 PM DST.....	7-12
Figure 7-10	Shadow Diagrams Current Conditions 2009 June 21–10:00 AM DST ..	7-12
Figure 7-11	Shadow Diagrams Current Conditions 2009 June 21–12:00 PM DST... Shadow Diagrams Current Conditions 2009 December 21–10:00 AM EST .....	7-12
	December 21–12:00 PM EST .....	7-14
	Shadow Diagrams Current Conditions 2009 December 21–12:00 PM EST .....	7-14

---

**Table of Figures**

---

Figure 7-12	Shadow Diagrams Current Conditions 2015 March 21 – 7:45 AM EST .....	7-18
Figure 7-13	Shadow Diagrams Current Conditions 2015 March 21 – 11:30 AM EST .....	7-18
Figure 7-14	Shadow Diagrams Current Conditions 2015 March 21 – 3:30 PM EST .....	7-18
Figure 7-15	Shadow Diagrams Current Conditions 2015 May 6 – 10:00 AM DST .....	7-18
Figure 7-16	Shadow Diagrams Current Conditions 2015 May 6 – 12:00 PM DST .....	7-18
Figure 7-17	Shadow Diagrams Current Conditions 2015 May 6 – 5:30 PM DST .....	7-18
Figure 7-18	Shadow Diagrams Current Conditions 2015 June 21 – 10:00 AM DST .....	7-18
Figure 7-19	Shadow Diagrams Current Conditions 2015 June 21 – 12:00 PM DST .....	7-18
Figure 7-20	Shadow Diagrams Current Conditions 2015 June 21 – 4:00 PM DST .....	7-18
Figure 7-21	Shadow Diagrams Current Conditions 2015 June 21 – 6:30 PM DST .....	7-18
Figure 7-22	Shadow Diagrams Current Conditions 2015 December 21 – 10:00 AM EST .....	7-20
Figure 7-23	Shadow Diagrams Current Conditions 2015 December 21 – 10:00 AM EST .....	7-20
Figure 7-24	Shadow Diagrams Current Conditions 2015 December 21 – 1:00 PM EST .....	7-20
Figure 7-25	Shadow Diagrams Pre-September 11 Conditions 2009 March 21 – 7:45 AM EST .....	7-20
Figure 7-26	Shadow Diagrams Pre-September 11 Conditions 2009 March 21 – 11:30 AM EST .....	7-20
Figure 7-27	Shadow Diagrams Pre-September 11 Conditions 2009 May 6 – 10:00 AM DST .....	7-22
Figure 7-28	Shadow Diagrams Pre-September 11 Conditions 2009 May 6 – 12:00 PM DST .....	7-22
Figure 7-29	Shadow Diagrams Pre-September 11 Conditions 2009 June 21 – 10:00 AM DST .....	7-24
Figure 7-30	Shadow Diagrams Pre-September 11 Conditions 2009 June 21 – 12:00 PM DST .....	7-24
Figure 7-31	Shadow Diagrams Pre-September 11 Conditions 2009 December 21 – 10:00 AM EST .....	7-24
Figure 7-32	Shadow Diagrams Pre-September 11 Conditions 2009 December 21 – 12:00 PM EST .....	7-24
Figure 7-33	Shadow Diagrams Pre-September 11 Conditions 2015 March 21 – 7:45 AM EST .....	7-28
Figure 7-34	Shadow Diagrams Pre-September 11 Conditions 2015 March 21 – 11:30 AM EST .....	7-28
Figure 7-35	Shadow Diagrams Pre-September 11 Conditions 2015 March 21 – 3:30 PM EST .....	7-28

## World Trade Center Memorial and Redevelopment Plan GEIS

---

Figure 7-36	Shadow Diagrams Pre-September 11 Conditions 2015 May 6 – 10:00 AM DST .....	7-28
Figure 7-37	Shadow Diagrams Pre-September 11 Conditions 2015 May 6 – 12:00 PM DST.....	7-28
Figure 7-38	Shadow Diagrams Pre-September 11 Conditions 2015 May 6 – 5:30 PM DST.....	7-28
Figure 7-39	Shadow Diagrams Pre-September 11 Conditions 2015 June 21 – 10:00 AM DST .....	7-30
Figure 7-40	Shadow Diagrams Pre-September 11 Conditions 2015 June 21 – 12:00 PM DST.....	7-30
Figure 7-41	Shadow Diagrams Pre-September 11 Conditions 2015 June 21 – 4:00 PM DST.....	7-30
Figure 7-42	Shadow Diagrams Pre-September 11 Conditions 2015 June 21 – 6:30 PM DST.....	7-30
Figure 7-43	Shadow Diagrams Pre-September 11 Conditions 2015 December 21 – 10:00 AM EST .....	7-30
Figure 7-44	Shadow Diagrams Pre-September 11 Conditions 2015 December 21 – 12:00 PM EST .....	7-30
Figure 7-45	Shadow Diagrams Pre-September 11 Conditions 2015 December 21 – 1:00 PM EST .....	7-30

### 8. Community Facilities

Figure 8-1	Community Facilities.....	8-4
------------	---------------------------	-----

### 9. Socioeconomic Conditions

Figure 9-1	Project Location .....	9-10
Figure 9-2	Land Use Study Areas .....	9-10
Figure 9-3	Lower Manhattan Office Market Subareas.....	9-10
Figure 9-4	Manhattan Office Submarkets .....	9-10
Figure 9-5	Housing Units in Primary Study Area, 1990 and 2000 .....	9-19
Figure 9-6	Median Household Income, Primary Study Area, 1990 and 2000 .....	9-22
Figure 9-7	Median Household Income, Secondary Study Area, 1990 and 2000 .....	9-29
Figure 9-8	Buildings Affected by the September 11 Attacks on the World Trade Center .....	9-32
Figure 9-9	Class A Office Space by Lower Manhattan Submarket, 2003 .....	9-37
Figure 9-10	Lower Manhattan Office Vacancy Rates, 2003 .....	9-38
Figure 9-11	Location of Class A, B, and C Office Space in Manhattan, Second Quarter 2003 .....	9-41
Figure 9-12	Average Asking Rent and Available Space, Lower Manhattan Retail Market, Fall 2000 to Spring 2003 .....	9-44
Figure 9-13	Manhattan Retail Space (Millions of Square Feet) by Submarket, Spring 2003.....	9-48
Figure 9-14	Average Asking Rent and Available Space, Manhattan Retail Market, Fall 2000 to Spring 2003 .....	9-48
Figure 9-15	Employment in Lower Manhattan and Manhattan, 2002 .....	9-51
Figure 9-16	Number of Visitors to New York City, 1992-2000 .....	9-54
Figure 9-17	Total Visitors to New York City, 1998-2003 .....	9-55
Figure 9-18	Year-End Net Absorption, Manhattan Submarkets, 1998-2002 .....	9-101
Figure 9-19	Year-End Net Absorption, Lower Manhattan Submarkets, 1998-2002 .....	9-101
Figure 9-20	Total Private Sector Employment in Manhattan, 1990-2002 .....	9-105

**11. Hazardous Materials**

Figure 11-1	Soil Boring Locations .....	11-4
Figure 11-2	Sample Location Plan.....	11-4
Figure 11-3	Dust and Material Sampling Locations .....	11-4
Figure 11-4	Inferred Groundwater Flow .....	11-10

**13A. Traffic and Parking**

Figure 13A-1	Traffic Analysis Locations .....	13A-4
Figure 13A-2	Street Directions .....	13A-8
Figure 13A-3	Traffic Levels of Service Current 2003 Conditions AM Peak Hour..	13A-10
Figure 13A-4	Traffic Levels of Service Current 2003 Conditions Midday Peak Hour.....	13A-10
Figure 13A-5	Traffic Levels of Service Current 2003 Conditions PM Peak Hour...13A-10	13A-10
Figure 13A-6	Post 9/11 Off-Street Parking Facilities.....	13A-10
Figure 13A-7	Traffic Levels of Service 2009 No Action Conditions Current Conditions Scenario with Route 9A At-Grade AM Peak Hour.....	13A-18
Figure 13A-8	Traffic Levels of Service 2009 Conditions Current Conditions Scenario with Route 9A At-Grade Midday Peak Hour .....	13A-18
Figure 13A-9	Traffic Levels of Service 2009 Conditions Current Conditions Scenario with Route 9A At-Grade PM Peak Hour .....	13A-18
Figure 13A-10	Traffic Levels of Service 2009 Build Conditions Current Conditions Scenario with Route 9A At-Grade AM Peak Hour.....	13A-28
Figure 13A-11	Traffic Levels of Service 2009 Build Conditions Current Conditions Scenario with Route 9A At-Grade Midday Peak Hour.....	13A-28
Figure 13A-12	Traffic Levels of Service 2009 Build Conditions Current Conditions Scenario with Route 9A At-Grade PM Peak Hour .....	13A-28
Figure 13A-13	Traffic Levels of Service 2015 No Action Conditions Current Conditions Scenario with Route 9A At-Grade AM Peak Hour.....	13A-32
Figure 13A-14	Traffic Levels of Service 2015 No Action Conditions Current Conditions Scenario with Route 9A At-Grade Midday Peak Hour.....	13A-32
Figure 13A-15	Traffic Levels of Service 2015 No Action Conditions Current Conditions Scenario with Route 9A At-Grade PM Peak Hour .....	13A-32
Figure 13A-16	Traffic Levels of Service 2015 Build Conditions Current Conditions Scenario with Route 9A At-Grade AM Peak Hour.....	13A-36
Figure 13A-17	Traffic Levels of Service 2015 Build Conditions Current Conditions Scenario with Route 9A At-Grade AM Peak Hour.....	13A-36
Figure 13A-18	Traffic Levels of Service 2015 Build Conditions Current Conditions Scenario with Route 9A At-Grade PM Peak Hour .....	13A-36

---

## World Trade Center Memorial and Redevelopment Plan GEIS

---

Figure 13A-19	Traffic Levels of Service Pre-September 11 Existing Conditions AM Peak Hour .....	13A-40
Figure 13A-20	Traffic Levels of Service Pre-September 11 Existing Conditions Midday Peak Hour .....	13A-40
Figure 13A-21	Traffic Levels of Service Pre-September 11 Existing Conditions PM Peak Hour.....	13A-40
Figure 13A-22	Pre 9/11 Off-Street Parking Facilities.....	13A-40
Figure 13A-23	Traffic Levels of Service 2009 No Action Conditions Pre-September 11 Conditions Scenario with Route 9A At-Grade AM Peak Hour.....	13A-48
Figure 13A-24	Traffic Levels of Service 2009 No Action Conditions Pre-September 11 Conditions Scenario with Route 9A At-Grade Midday Peak Hour... ..	13A-48
Figure 13A-25	Traffic Levels of Service 2009 No Action Conditions Pre-September 11 Conditions Scenario with Route 9A At-Grade PM Peak Hour.....	13A-48
Figure 13A-26	Traffic Levels of Service and Significant Impacts 2009 Build Conditions with Route 9A At-Grade AM Peak Hour .....	13A-50
Figure 13A-27	Traffic Levels of Service and Significant Impacts 2009 Build Conditions with Route 9A At-Grade Midday Peak Hour .....	13A-50
Figure 13A-28	Traffic Levels of Service and Significant Impacts 2009 Build Conditions with Route 9A At-Grade PM Peak Hour .....	13A-50
Figure 13A-29	Traffic Levels of Service 2015 No Action Conditions Pre-September 11 Scenario with Route 9A At-Grade AM Peak Hour .....	13A-52
Figure 13A-30	Traffic Levels of Service 2015 No Action Conditions Pre-September 11 Scenario with Route 9A At-Grade Midday Peak Hour.....	13A-52
Figure 13A-31	Traffic Levels of Service 2015 No Action Conditions Pre-September 11 Scenario with Route 9A At-Grade PM Peak Hour .....	13A-52
Figure 13A-32	Traffic Levels of Service and Significant Impacts 2015 Build Conditions with Route 9A At-Grade AM Peak Hour .....	13A-54
Figure 13A-33	Traffic Levels of Service and Significant Impacts 2015 Build Conditions with Route 9A At-Grade Midday Peak Hour .....	13A-54
Figure 13A-34	Traffic Levels of Service and Significant Impacts 2015 Build Conditions with Route 9A At-Grade PM Peak Hour .....	13A-54

### **13B. Transit and Pedestrians**

Figure 13B-1	Current Conditions Scenario Local Bus Routes .....	13B-12
Figure 13B-2	Current Conditions Scenario Express Bus Routes.....	13B-18
Figure 13B-3	Current Conditions Scenario Subway Station Locations .....	13B-20
Figure 13B-4	Current Conditions Scenario Ferry Routes .....	13B-24
Figure 13B-5	Current Conditions Scenario Pedestrian Analysis Locations.....	13B-26
Figure 13B-6	Pre-September 11 Scenario Local Bus Routes .....	13B-44
Figure 13B-7	Pre-September 11 Scenario Express Bus Routes.....	13B-44
Figure 13B-8	Pre-September 11 Scenario Subway Station Locations .....	13B-44
Figure 13B-9	Pre-September 11 Scenario Pedestrian Analysis Locations.....	13B-48

### **14. Air Quality**

Figure 14-1	Background Air Quality Monitoring Stations.....	14-14
Figure 14-2	Mobile Source Analysis Locations .....	14-20

### **15. Noise**

Figure 15-1	Noise Measurement Sites.....	15-10
-------------	------------------------------	-------

### **16. Coastal Zone**

Figure 16-1	Coastal Zone Map.....	16-2
-------------	-----------------------	------

---

**Table of Figures**

---

**17. Floodplain**

Figure 17-1 Floodplain..... 17-2

**18. Natural Resources**

Figure 18-1 Austin J. Tobin Plaza Pre-September 11, 2001 ..... 18-2

**20. Environmental Justice**

Figure 20-1 Share of Minority Residents in Lower Manhattan Census Blocks ..... 20-6

Figure 20-2 Share of Minority Residents in Census Blocks Adjacent to  
WTC Truck Route ..... 20-14Figure 20-3 Share of Minority Residents Residing in Census Blocks  
Adjacent to all Truck Routes ..... 20-14**21. Construction**Figure 21-1 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2004..... 21-12Figure 21-2 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2005..... 21-12Figure 21-3 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2006..... 21-12Figure 21-4 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2007..... 21-12Figure 21-5 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2008..... 21-12Figure 21-6 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2009..... 21-12Figure 21-7 Proposed Action & Permanent WTC PATH Terminal Construction  
Activities: Year 2015..... 21-12Figure 21-8 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2004 ..... 21-12Figure 21-9 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2005 ..... 21-12Figure 21-10 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2006 ..... 21-12Figure 21-11 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2007 ..... 21-12Figure 21-12 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2008 ..... 21-12Figure 21-13 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2009 ..... 21-12Figure 21-14 Lower Manhattan Federal Recovery Projects Construction  
Activities: 2015 ..... 21-12

Figure 21-15 Staging and Laydown Areas 2004..... 21-34

Figure 21-16 Staging and Laydown Areas 2005..... 21-34

Figure 21-17 Staging and Laydown Areas 2006..... 21-34

Figure 21-18 Staging and Laydown Areas 2007..... 21-34

Figure 21-19 Staging and Laydown Areas 2008..... 21-34

Figure 21-20 2006 Traffic Analysis Locations ..... 21-36

Figure 21-21 Proposed Construction Vehicle Haul Routes—Other Lower  
Manhattan Projects ..... 21-38

---

## **World Trade Center Memorial and Redevelopment Plan GEIS**

---

Figure 21-22	Proposed Construction Vehicle Haul Routes World Trade Center Memorial and Redevelopment Project.....	21-38
Figure 21-23	2006 Peak Hour Construction Vehicle Trips Future Without Proposed Action.....	21-38
Figure 21-24	2006 Peak Hour Construction Vehicle Trips Proposed Action Only ...	21-38
Figure 21-25	2006 Peak Hour Construction Vehicle Trips Future with Proposed Action.....	21-38
Figure 21-26	Traffic Levels of Service 2006 Future Without the Proposed Action Conditions AM Peak Hour .....	21-42
Figure 21-27	Traffic Levels of Service 2006 Future with the Proposed Action Conditions AM Peak Hour .....	21-42
Figure 21-28	Traffic Levels of Service 2006 Future Without the Proposed Action Conditions Midday Peak Hour .....	21-42
Figure 21-29	Traffic Levels of Service 2006 Future with the Proposed Action Conditions Midday Peak Hour .....	21-42
Figure 21-30	Traffic Levels of Service 2006 Future Without the Proposed Action Conditions PM Peak Hour .....	21-42
Figure 21-31	Traffic Levels of Service 2006 Future with the Proposed Action Conditions PM Peak Hour .....	21-42
<b>22. Mitigation</b>		
Figure 22-1	Traffic Mitigation Overview 2009 AM Peak Hour with Route 9A At-Grade.....	22-2
Figure 22-2	Traffic Mitigation Overview 2009 Midday Peak Hour with Route 9A At-Grade.....	22-2
Figure 22-3	Traffic Mitigation Overview 2009 PM Peak Hour with Route 9A At-Grade.....	22-2
Figure 22-4	Traffic Mitigation Overview 2015 AM Peak Hour with Route 9A At-Grade .....	22-2
Figure 22-5	Traffic Mitigation Overview 2015 Midday Peak Hour with Route 9A At-Grade .....	22-2
Figure 22-6	Traffic Mitigation Overview 2015 PM Peak Hour with Route 9A At-Grade .....	22-2
<b>23. Alternatives</b>		
Figure 23-1	THINK World Cultural Center Alternative .....	23-18
Figure 23-2	WTC Site Only Alternative—Four Tower Scheme.....	23-24
Figure 23-3	WTC Site Only Alternative—Five Tower Scheme .....	23-28