CHAPTER 23. ALTERNATIVES

23.1 INTRODUCTION

As detailed in Chapter 1, "Project Description," the World Trade Center Memorial and Redevelopment Plan (the Proposed Action) has been developed by the Lower Manhattan Development Corporation (LMDC), in cooperation with the Port Authority of New York and New Jersey (the Port Authority), to: (1) create an appropriate memorial to honor the victims and heroes of September 11, 2001, and February 26, 1993, and provide opportunities for quiet reflection for all those touched by those tragic events; (2) restore the historic role of the WTC Site in the commercial life of the city, state, and nation; and (3) contribute to the growing residential, retail, and cultural vitality of Lower Manhattan. The Proposed Action that emerged from LMDC's planning process—after unprecedented public involvement—seeks to realize these goals by combining the proposed Memorial and *Memorial Center* with commercial, cultural, open space, street, and infrastructure uses in a comprehensive plan.

The Proposed Action is not, however, the only option considered by or open to LMDC. In addition to the extensive planning process described in Chapter 1, this chapter describes and analyzes a broad range of alternatives to the Proposed Action and assesses each of these alternatives in terms of its ability to achieve the overall purpose and need of the Proposed Action. These alternatives, described in greater detail in the discussion that follows, include:

- The No Action Alternative, in which none of the proposed development takes place and the WTC Site is left in approximately its current condition. The permanent WTC PATH Terminal and interim improvements would continue independently at the site by Port Authority. The *Southern* Site would likely be developed independently over time by *its* respective owners.
- A Memorial Only Alternative, in which only the Memorial, *the Memorial Center*, and open space components of the Proposed Action would be constructed at the WTC Site. The *Southern* Site would be developed independently over time by their respective owners.
- A Restoration Alternative that would restore the WTC Site substantially as it existed before September 11, 2001, with updated technology and possibly relocated footprints for the Twin Towers. With this alternative, the *Southern* Site would be developed independently by *its* respective owners.
- Rebuilding Alternatives that were previously considered by LMDC during the final stages of its Innovative Design Study. These include the preliminary design concepts that were considered and the nine additional designs that were released in December 2002, including an alternative plan similar to the "tower of culture" proposal considered during that study.
- A WTC Site Only Alternative that would locate the entire Memorial and Redevelopment Plan (except possibly a bus parking garage) on the 16-acre WTC Site. Under this alternative, the *Southern* Site would not be included and the WTC Site would include up to 10 million

square feet of commercial office space in four or five towers. *The five-tower scheme previously analyzed in the DGEIS is no longer under consideration.*

- An Enhanced Green Construction Alternative that considers the potential environmental benefits and costs of feasible construction, waste disposal, and other environmental management practices not already incorporated into the Proposed Action.
- A Reduced Impact Alternative that would vary the uses, density, or other major components of the Proposed Action to eliminate or reduce any of its significant adverse impacts.
- *An At-Grade Loading Alternative in which trucks servicing Freedom Tower, the Memorial and cultural uses, as well as passenger cars for Freedom Tower would be separated from the remainder of the Project Site's below-grade network.*

In the following discussion, each of these alternatives is compared with the Proposed Action in terms of the substantive environmental impacts described in Chapters 4 through 21 of this GEIS. For this analysis, the fully completed Proposed Action in 2015 is the basis for comparison with the various alternatives. Likewise, the alternatives are *examined* in their totality, with construction and operation completed by 2015. This provides a reasonable evaluation of the potential impacts of both the Proposed Action and the alternatives. *Battery Park City Site 26, while not evaluated in this chapter, was considered as a potential location for a below-grade bus parking garage and was evaluated as such in the DGEIS. Since the DGEIS, LMDC has continued to refine its plan and has eliminated Site 26 as a possible location for the bus garage.*

As described in greater detail in Chapter 1, the Proposed Action would provide for the construction on the Project Site of a WTC Memorial and memorial-related improvements, up to 10 million square feet of commercial office space, up to 1 million square feet of retail space, up to 800 hotel rooms and up to 150,000 square feet of conference facilities, new open space areas, *the Memorial Center* and cultural facilities, and certain infrastructure improvements, including a bus parking garage.

23.2 NO ACTION ALTERNATIVE

This alternative is essentially that which is discussed and analyzed as "The Future Without the Proposed Action—Current Conditions Scenario" in each of the technical areas of Chapters 4 through 22 of the GEIS. Under the No Action Alternative, none of the proposed development would take place, and the WTC Site would be left in approximately its current condition after completion of the permanent WTC PATH Terminal and interim improvements. 130 and 140 Liberty Street would not be redeveloped with office and open space uses as part of the Proposed Action under this alternative. It is assumed that, if market conditions warrant their redevelopment, *they* could, over time, be redeveloped by their respective owners with office and other uses independent of the Proposed Action.

Overall, with this alternative the WTC Site would remain substantially underutilized and would not achieve the purpose and need of the Proposed Action, would not result in a significant redevelopment opportunity for Lower Manhattan in general and the WTC Site in particular, and would not restore commercial space, employment, and open space and other amenities to the area. Most importantly, the primary purpose and need for the Proposed Action—the creation of a Memorial on the site—would be unfulfilled. As detailed in the respective sections of the GEIS

and in the summary that follows, overall this alternative would not meet the Proposed Action's purpose and need.

23.2.1 LAND USE AND PUBLIC POLICY

Unlike the Proposed Action, this alternative would have no beneficial land use effects. The site would remain underutilized and essentially undeveloped, with no Memorial, *Memorial Center*, cultural, office, retail, or other uses that are part of the Proposed Action. The purpose and need of the Proposed Action—including the creation of a Memorial to those who died on September 11, 2001, and February 26, 1993, the rebuilding of the WTC Site, and the revitalization of the surrounding area—would not be fulfilled.

23.2.2 URBAN DESIGN AND VISUAL RESOURCES

Since there would be no improvements to the Project Site other than those that would be undertaken independently absent the Proposed Action, the Project Site would remain largely vacant. The sites at 130 and 140 Liberty Street could be redeveloped independently or by their respective owners with office towers *or other permissible uses*.

This alternative would not create new open spaces that would enliven the Project Site and surrounding area, would not create smaller blocks that better relate to the surrounding street grid, would not enliven the streetscape with retail and public amenities, and would not reintroduce dense development to an area appropriate for such development. Since there would be no Memorial, *Memorial Center*, and other related uses, these important aspects of the Proposed Action would not contribute to the visual quality of the Project Site. The iconic Freedom Tower and other modern structures would not be created on the WTC Site and would not contribute to the skyline of Lower Manhattan. Among others, the purpose of the Proposed Action to create a memorial, build a new iconic skyline symbol, re-establish a street grid, include public open spaces, and create better pedestrian connections would not be met by this alternative.

23.2.3 HISTORIC RESOURCES

Unlike the Proposed Action, the No Action Alternative would not result in any disturbance of potential archaeological resources on the Southern Site. *However, potential archeological resources on the WTC Site could be disturbed by the independent construction of the permanent WTC PATH Terminal.*

This alternative would not further alter the remaining below-grade elements of the WTC Site, which *has been determined eligible* for listing on the National Register of Historic Places through a *coordinated* Section 106 process. On the other hand, it would not create a Memorial or open spaces commemorating the events of September 11. *There would be no Programmatic Agreement and access would not be provided to the slurry wall or box-beam column bases.* In time the slurry walls surrounding the bathtub would have to be reinforced, replaced, or allowed to collapse as they were not built to stand alone and open to the elements.

Unlike the Proposed Action, the No Action Alternative would not restore the street linkage between the historic resources to the north and south of the WTC Site. The resources south of Liberty Street would remain isolated. The WTC Site would remain largely undeveloped in contrast both to its history of towers and to the surrounding historic resources, many of which are skyscrapers of an earlier era. Thus, the WTC Site would not be in keeping with the historic

resources context. However, views across the WTC Site to the surrounding historic resources would not be blocked by the buildings to be created by the Proposed Action.

Liberty Park, an integral part of the Proposed Action, would not be created, and historic resources nearest its location (90 West Street and the Beard Building) would not benefit from its presence. There would be no Wedge of Light Plaza *and PATH Plaza* to link the WTC Site to St. Paul's Chapel and other historic resources east of the WTC Site.

Since this alternative would not involve any construction, excavation, or dewatering on the WTC Site, there would be no potential for such construction-related impacts on surrounding properties and no need for construction protection plans for work on the WTC Site. However, it is assumed that the permanent WTC PATH Terminal would be constructed and that 130 and 140 Liberty Street would be redeveloped independently. As a result, construction protection plans would be required by the Building Code of the City of New York in order to avoid impacts to New York City Landmarks and properties listed on the State and National Registers of Historic Places.

23.2.4 OPEN SPACE

This alternative would neither add a significant amount of open space users nor create new open space amenities. Like the Proposed Action, this alternative would not have significant adverse impacts on open space. However, none of the open space amenities included as part of the Proposed Action—totaling *approximately 5.6*2 acres—would be provided. Thus, the project goal of creating a variety of new open spaces on the Project Site would not be met.

23.2.5 SHADOWS

The No Action Alternative would not result in development of any standing structures with the potential to cast shadows. Therefore, none of the Proposed Action's increases in shadows, including those with the potential to impact Washington Market Park and the open spaces on the east side of Church Street, would occur.

23.2.6 COMMUNITY FACILITIES AND SERVICES

Under this alternative, there would be no additional demand for community facilities (except for that generated by *independent* redevelopment of the *Southern* Site). However, the demands for community facilities generated by the Proposed Action would not place significant burdens on those services to the degree that it would constitute a significant adverse impact. Therefore, neither this alternative nor the Proposed Action would have significant adverse impacts on community facilities.

23.2.7 SOCIOECONOMIC CONDITIONS

The Proposed Action would result in substantial redevelopment, including new office and retail space and new non-commercial land uses. With the exception of potential development on the *Southern* Site that would be independent of the Proposed Action, none of these proposed components would be realized under the No Action Alternative.

Therefore, the significant economic benefits associated with the construction and operation of the proposed uses—including direct and indirect employment, wages and salaries, business and sales tax, and total economic output—would not be realized. As described in Chapter 9, "Socioeconomic Conditions," these include a total of approximately 96,000 person-years of

direct and indirect employment in New York City and State. During construction that would have a total effect on the local economy of almost $16 billion in New York State, of which about $12 billion would occur in New York City. Additionally, during operation, the combined direct and indirect employment generated by the Proposed Action would be almost 97,000 full-time equivalent jobs in New York City and State. The total effect from the operation of the Proposed Action is estimated at more than $31 billion annually in New York State, of which almost $27 billion would occur in New York City. Finally, the completed building program is estimated to generate non-property tax revenues estimated at approximately $1.2 billion annually. None of these benefits of the Proposed Action would be realized under the No Action Alternative.

23.2.8 NEIGHBORHOOD CHARACTER

The No Action Alternative would leave a mostly vacant WTC Site at the center of a bustling business district. This will have a blighting effect on the surrounding community, impairing the sound growth and development of Lower Manhattan. While the reopening of Liberty and Vesey Streets to traffic and the completion of the permanent WTC PATH Terminal will restore some activity to the immediate area, without redevelopment, the WTC Site will remain barren and unpopulated with the exception of commuters traveling to and from the permanent WTC PATH Terminal at the beginning and end of the day. The long-term presence of an essentially empty, excavated space in the heart of New York's Financial District is likely to make the area less attractive for businesses, residents, and visitors and impede investment by potential developers. This lack of development would likely result in adverse effects on overall neighborhood character in the immediate vicinity of the WTC Site.

23.2.9 HAZARDOUS MATERIALS

Without the Proposed Action, it is likely further site preparation work would be conducted on the site since the WTC Site's current form is as a construction pit, in some cases as deep as 70 feet below street level on the western side. Though no significant threats are known to be present, any hazardous materials present at the WTC Site would be remediated or managed as necessary to protect public health and the environment and in accordance with the applicable requirements and policies of the EPA, NYSDEC, and NYCDEP. Development of the Southern Site would be performed independently and subject to EPA, NYSDEC, and NYCDEP requirements.

23.2.10 INFRASTRUCTURE

Under this alternative, development on the WTC Site would be limited to the permanent WTC PATH Terminal, which would require substantially less infrastructure than the Proposed Action. There would be no water supply or sewage generation introduced to the WTC Site, as the building lots would remain vacant and connections through the slurry wall to water mains would remain idle. Pumps currently in place on the WTC Site would continue to transfer the stormwater from the site to the city's sewer system, and any overflow would continue to spill into the Hudson River. The monitoring system in place would continue to guard against flooding. Stormwater runoff and basin drainage needs would remain at a maximum since the entire site within the slurry wall bathtub is a paved surface. *In this alternative, the WTC Site's energy and telecommunication needs would not change*.

The *Southern* Site *would be independently developed and would be* expected to produce sewage and solid waste, and require water and energy supplies, and telecommunications *services*.

23.2.11 TRAFFIC AND PARKING

The Proposed Action would generate a substantial volume of new vehicular traffic within Lower Manhattan as well as create significant traffic impacts at up to 18 of the *40* locations analyzed for 2009 conditions, and up to 25 of the *40* locations analyzed for 2015. Under the No Action Alternative, these significant impacts would not occur, since the Project Site would not generate any traffic beyond that described as the future without the Proposed Action under the Current Conditions Scenario. Also under the No Action Alternative, the extension of Greenwich and Fulton Streets through the WTC Site would not occur, so the grid network of Lower Manhattan would not be restored and traffic patterns would remain largely unchanged.

23.2.12 TRANSIT AND PEDESTRIANS

The Proposed Action would generate a substantial number of pedestrians in the vicinity of the WTC Site. As a result, a total of *8* crosswalks in 2009 and *13* crosswalks in 2015 were identified with impacts as a result of the Proposed Action. Of these, *three* crosswalks in 2009 and *six* in 2015 could not be fully mitigated. Under the No Action Alternative, none of the significant crosswalk impacts associated with the Proposed Action would occur, since this alternative would not generate any new pedestrian trips beyond that described as the future without the Proposed Action under the Current Conditions Scenario.

23.2.13 AIR QUALITY

Increases in traffic under this alternative would be substantially less than with the Proposed Action. As with the Proposed Action, this alternative would not result in significant adverse air quality impacts.

23.2.14 NOISE

Under this alternative, the WTC Site *would* be left in its present condition after completion of the permanent WTC PATH Terminal and interim improvements. The *Southern* Site would be developed independently. The increases in traffic volumes and stationary sources would be less than those associated with the Proposed Action. Therefore, significant adverse noise impacts would not be expected to occur under this alternative.

23.2.15 COASTAL ZONE

This alternative would not be inconsistent with coastal resources policies. However, no development on the site would also result in a lost opportunity to restore the views of the New York City coastline and skyline. This alternative would also not provide support of coastal policies, such as providing supporting revitalization and access to the waterfront areas.

23.2.16 FLOODPLAIN

Under this alternative, chronic flooding during large storm events may result in flooding within the WTC Site, particularly in areas that may receive runoff from rainwater running down the

construction ramps. As discussed in Chapter 2, "Methodology," it is likely that the Southern Site would be redeveloped independently with office buildings.

23.2.17 NATURAL RESOURCES

This alternative would have no impact on natural resources or water quality. Likewise, as described in Chapter 18, "Natural Resources," with certain measures in place the Proposed Action is also not expected to result in significant adverse impacts to water quality or natural resources. Under this alternative there would be no reactivation of the Hudson River pumping station. None of the modest habitat benefits associated with the Proposed Action would be achieved under this alternative. Since there would be no structures associated with this alternative, it would not have the Proposed Action's potential for bird strikes.

23.2.18 ELECTROMAGNETIC FIELDS

There would be no transmission facilities under this alternative. Therefore, as with the Proposed Action, there would be no significant adverse impacts associated with EMFs at the WTC Site. However, arrangements would have to be made somewhere in the New York City region to provide permanent broadcast transmission facilities to replace those lost on September 11, 2001.

23.2.19 CONSTRUCTION IMPACTS

Without the Proposed Action, there would be no impacts from construction activities. The potential traffic, noise, and air quality impacts during construction that would occur with the Proposed Action would not occur under the No Action Alternative. However, planning for and mitigation of traffic, air quality, noise, and other impacts from the development of 130 and 140 Liberty Street by their respective owners would likely not be coordinated with those of other Lower Manhattan recovery projects.

23.3 MEMORIAL ONLY ALTERNATIVE

Although it would fulfill part of the need for the Proposed Action through the creation of a Memorial to those lost on September 11, 2001 and February 26, 1993, this alternative would not address significant factors that together form the purpose and need of the Proposed Action. Under this alternative, development would be limited on the WTC Site to the Memorial as well as *the Memorial Center* and open space uses. There would be no office, retail, non-Memorial cultural uses, or other such uses. This alternative would not recall the historic commercial use of the site and its important role as a center of international commerce. It would not result in redevelopment that is symbolic of the resilience of the city, state, and nation and the determination to overcome physical, emotional, and financial tragedy. In addition, it would not create a vibrant presence in both physical and psychological ways, to heal the wounds resulting from the tragic events of September 11. Moreover, as described below, this alternative would not serve as a catalyst for the larger recovery of Lower Manhattan.

As described in greater detail in Chapter 1, "Project Description," the purpose and need for the Proposed Action includes not only the remembrance of the victims of the terrorist attacks, but also the rebuilding of the Project Site and the revitalization of Lower Manhattan. The principles for rebuilding that are at the heart of the Proposed Action advance the broad objectives of the LMDC, the mission of the Port Authority, and the goals articulated by the Governor and the

Mayor: to remember and honor the victims of the terrorist attacks while revitalizing Lower Manhattan.

The immediate need for physical, financial, and emotional recovery efforts following the attacks on September 11, 2001, has now been articulated in the development of the Proposed Action. In contrast to the Proposed Action, this alternative would do little to realize the goals of rebuilding the physical heart of Lower Manhattan, restoring a vital part of the economy, renewing the New York City skyline, and contributing in a significant way to the ongoing revitalization of Lower Manhattan. Unlike the Proposed Action, this alternative would not re-establish the Project Site as a center of commerce, civic space, and amenities, including appropriate commercial and retail uses, as well as supporting utilities and infrastructure, for the Lower Manhattan area.

There also would be no broadcast transmission facilities to replace those lost on September 11 under this alternative, which would need to be permanently located somewhere in the New York City region.

The *Southern* Site would not be included as part of the Project Site under this alternative. Greenwich and Fulton Streets would not be extended through the WTC Site under this alternative, and the surrounding neighborhoods would not be reconnected. The independent permanent WTC PATH Terminal and other interim improvements would be completed. With the large number of visitors expected at the site, the demand for a bus parking garage would continue, but under this alternative that garage would either need to be located on the WTC Site or not included as part of the building program.

Overall, the Memorial Only Alternative does not meet the purpose and need of the Proposed Action.

23.3.1 LAND USE

Unlike the Proposed Action, which would contain a rich mix of land uses and activities on the Project Site, this alternative would result in development with a single purpose. There would be no office, retail, non-memorial cultural, or any of the other uses that are part of the Proposed Action. The site would remain largely underused, and many of the benefits associated with the Proposed Action would not be realized.

23.3.2 URBAN DESIGN AND VISUAL RESOURCES

Since there would be no improvements to the WTC Site other than the Memorial and related uses, the WTC Site would remain largely underdeveloped above-grade, with the exception of the independent permanent WTC PATH Terminal.

This alternative would not create smaller blocks that better relate to the surrounding street grid, would not enliven the streetscape with retail uses, and would not reintroduce dense development to an area appropriate for such development. The iconic Freedom Tower and other modern structures would not be created on the WTC Site and would not contribute to the skyline of Lower Manhattan. Among others, the purpose of the Proposed Action to create a Memorial, build a new iconic skyline symbol, re-establish a street grid, and create better pedestrian connections would not be met by this alternative.

23.3.3 HISTORIC RESOURCES

Unlike the Proposed Action, the Memorial Only Alternative might be designed to avoid any disturbance of potential archaeological resources on the WTC Site depending on the location of the below-grade bus garage. Potential archaeological resources beneath 140 Liberty Street, however, would not be monitored under this alternative since the lot would be developed as-of-right. *Under this alternative, LMDC would still consider a Programmatic Agreement that would include certain commitments and address any potential adverse effects on historic resources.*

This alternative could potentially be designed to avoid alteration of the remaining below-grade elements of *the* WTC Site that *has been determined eligible* for listing on the National Register of Historic Places through a coordinated Section 106 process. However, in time the slurry walls surrounding the bathtub would have to be reinforced or allowed to collapse as they were not built to stand alone and open to the elements. Similar to the Proposed Action, this alternative would create a Memorial and open spaces commemorating the events of September 11. A Programmatic Agreement would likely be needed under this alternative.

Unlike the Proposed Action, the Memorial Only Alternative would not restore the street linkage between the historic resources to the north and south of the WTC Site. The resources south of Liberty Street would remain isolated. The WTC Site would remain largely undeveloped in contrast both to its history of towers and to the surrounding historic resources, many of which are skyscrapers of an earlier era. Thus, the WTC Site would not be in keeping with the historic resources context. However, views across the WTC Site to the surrounding historic resources would not be blocked by the buildings to be created by the Proposed Action.

Liberty Park, an integral part of the Proposed Action, would not be created, and historic resources nearest its location (90 West Street and the Beard Building) would not benefit from the presence of Liberty Park. Most likely a large building would be built on the 140 Liberty Street block blocking views of the WTC Site from 90 West Street.

This alternative would involve less construction on the WTC Site than the Proposed Action. Therefore, the potential for construction-related impacts due to this alternative would be less that those of the Proposed Action. However, it is assumed that the permanent PATH Terminal would be constructed and that 130 and 140 Liberty Street would be developed independently of the Memorial Only Alternative. As a result, construction protection plans would be required by the Building Code of the City of New York to avoid impacts to New York City Landmarks and properties listed on the State and National Registers of Historic Places.

23.3.4 OPEN SPACE

Liberty Park, a significant part of the Proposed Action, would not be created under this alternative. Given the nature of a memorial, this alternative would create less traditional open space than the Proposed Action but would also have less demand for open space, since there would be less development and fewer potential non-Memorial users.

23.3.5 SHADOWS

The Memorial Only Alternative would most likely not result in any development of any structures tall enough to cause any substantial shadows. Therefore, none of the Proposed Action's increases in shadows, including those with the potential to impact Washington Market Park and the open spaces on the east side of Church Street, would occur.

23.3.6 NEIGHBORHOOD CHARACTER

The Memorial Only Alternative would impact neighborhood character by dedicating a substantial area to a new more somber use in the midst of established commercial and residential communities. Moreover, it would limit opportunities for evening activities in the immediate area, and, as discussed below, some of the benefits expected to result from the Proposed Action would not occur under this Alternative.

The Memorial would succeed in remembering and honoring the victims of the terrorist attacks. There would be an increase in pedestrian and vehicular traffic on area sidewalks and streets due to visitors to the Memorial, related cultural uses, and open space. However, without the office, retail, additional cultural, and hotel uses, activity at the site would be limited, and area workers and residents would not be expected to visit the area on a daily basis. Under the Proposed Action, the cultural and performing arts uses would complement the office and residential uses in surrounding areas, creating a more cohesive neighborhood.

Without the extension of Fulton and Greenwich Streets *that* would *occur* under the Proposed Action, this alternative would fail to better connect the neighborhoods surrounding the site, and the site would continue to act as a barrier between these neighborhoods. In contrast to the Proposed Action, this alternative would do little to realize the goals of rebuilding the physical heart of Lower Manhattan, restoring a vital part of the economy, renewing the Lower Manhattan skyline, and contributing in a significant way to the ongoing revitalization of Lower Manhattan. Unlike the Proposed Action, this alternative would not re-establish the Project Site as a center of commerce, civic space, and amenities, including appropriate commercial and retail uses, as well as supporting utilities and infrastructures. Thus, this alternative would not be in keeping with the densely developed urban character of the area.

23.3.7 HAZARDOUS MATERIALS

As with the Proposed Action, hazardous materials that would be encountered would be identified, remediated, or isolated during construction in accordance with the requirements and policies of the EPA, NYSDEC, and NYCDEP. Hazardous materials impacts to workers, the general public, and the environment would be avoided through implementation of soil and groundwater management plans and a site-specific health and safety program. Neither this alternative nor the Proposed Action is expected to results in significant adverse impacts.

23.3.8 INFRASTRUCTURE

The infrastructure requirements for the Memorial Only Alternative would be substantially less than *those* for the Proposed Action. *Under this alternative, there would be no need for the existing CWIS.*

23.3.9 TRAFFIC AND PARKING

Even though the Memorial Only Alternative can be expected to generate substantially less vehicular traffic than the Proposed Action, the majority of locations that would experience significant impacts under the Proposed Action could also have significant impacts under this alternative. This is because baseline traffic conditions at many traffic study area intersections in 2009 and 2015 would already be at or near congested levels of service and any appreciable increase in traffic could result in significant impacts.

As shown in Table 23-1, the volume of vehicular traffic that would be expected under the Memorial Only Alternative would be substantially lower than under the Proposed Action. In 2009, this alternative would generate approximately 456 vehicle trips in the AM peak hour, 510 vehicle trips in the midday peak hour, and 723 vehicle trips in the PM peak hour. These volumes represent about 35 percent, 31 percent, and 42 percent, *respectively*, of the volume of vehicular traffic that would be generated under the Proposed Action in 2009. In 2015, the Memorial Only Alternative would generate fewer vehicular trips than it would in 2009, since fewer visitors would be expected under a non-surge condition several years after the Memorial first opens. In 2015, there would be approximately 290 vehicle trips in the AM peak hour, 334 vehicle trips in the midday peak hour, and 464 vehicle trips in the PM peak hour. These generated volumes represent about 11 percent, 12 percent, and 18 percent, *respectively*, of the volume of vehicular traffic that would be generated under the Proposed Action in 2015.

Table 23-1
Vehicle Trips Generated by the Memorial Only Alternative vs. Proposed Action

Analysis Period	Memorial Only Alternative	Proposed Action
2009 AM Peak Hour	456	1,307
2009 Midday Peak Hour	510	1,666
2009 PM Peak Hour	723	1,709
2015 AM Peak Hour	290	2,558
2015 Midday Peak Hour	334	2,904
2015 PM Peak Hour	464	2,559

Unlike the Proposed Action, the extension of Greenwich and Fulton Streets through the WTC Site would not occur under the Memorial Only Alternative, so the grid network of Lower Manhattan would not be restored, and there would be additional, unnecessary circulation around the Project Site. Memorial-bound traffic would need to drop off and pick up visitors along Church Street or other locations farther away from the Memorial.

23.3.10 TRANSIT AND PEDESTRIANS

The volume of pedestrian traffic that would be expected under the Memorial Only Alternative would be substantially lower than under the Proposed Action. As a result, there would likely be fewer impacted or unmitigable crosswalk locations for this alternative, compared with the Proposed Action.

23.3.11 AIR QUALITY

Under this alternative, the increases in traffic volumes and stationary sources would be substantially less than those associated with the Proposed Action. *Operation of* the Proposed Action would not result in any significant air quality impacts. Therefore, no significant adverse air quality impacts are anticipated to occur under this alternative.

23.3.12 NOISE

Under this alternative, the increases in traffic volumes and stationary sources would be substantially less than those associated with the Proposed Action. The Proposed Action would not result in any significant *operational* noise impacts. Therefore, noise impacts are not anticipated to occur under this alternative.

23.3.13 CONSTRUCTION IMPACTS

Because it would involve far less construction than the Proposed Action, particularly because it would not include Freedom Tower or other office buildings, this alternative would avoid most of the traffic, air quality, and noise impacts of the Proposed Action in 2006.

23.4 RESTORATION ALTERNATIVE

The Restoration Alternative would restore the WTC Site substantially as it existed before September 11, 2001, with updated technology and likely relocated footprints for the Twin Towers. Under this alternative, the *Southern* Site would not be developed as part of the Proposed Action, although 130 and 140 Liberty Streets could be developed independently over time by their respective owners with office and other uses, based on market conditions at the time. Fulton and Greenwich Streets would not be extended through the WTC Site. As with the other alternatives, the permanent WTC PATH Terminal and interim improvements would be completed independently. Thus, overall, conditions under this alternative would be similar to those described in the GEIS analyses as "The Future Without the Proposed Action—Pre-September 11 Scenario."

As with the Proposed Action, this alternative would seek to avoid, to the maximum extent possible, encroaching on the footprints of the former towers. LMDC has analyzed a potential location for two new towers that would avoid the footprints while recreating the approximate relationship of the two buildings. Due to site planning constraints, the only location for two towers in this alternative would be on the north and east portion of the WTC Site. Each tower would contain roughly 4.7 million square feet of space. Therefore, the northwest and southeast portions of the site would each need to contain an additional approximately 600,000 square feet of commercial and cultural space. The south and west would contain the Memorial and *the Memorial Center*. Overall, achieving the necessary square footage while incorporating two towers, a plaza, and additional development that approximates the program of the former WTC while avoiding the footprints would result in denser development than a scenario in which the towers are rebuilt in their original location. In either case, the Restoration Alternative would be denser than the Proposed Action.

In avoiding the footprints, this alternative would duplicate the relationship of the former towers in terms of the spatial arrangement of the buildings' footprints, but the two new towers would be shifted to the north and east. Doing so would preclude the extension of the street grid that is part of the Proposed Action. In addition, bus parking and security would need to be located on-site, presenting issues in terms of separation of uses as well as safety concerns. Unlike the Proposed Action, this alternative would concentrate retail below grade, and as a result the streetscape would not become as active and enlivened as with the Proposed Action. The new towers would be relatively close to the street and sidewalks along Church and Vesey Streets.

Rather than avoid the footprints, this alternative could also rebuild directly over the former footprints of the Twin Towers. This would more closely approximate the development that

existed on the former WTC Site prior to September 11. However, given the public's expressed desire for some meaningful recognition of these footprints, and the Proposed Action's intention to do so, this option is not desirable and has not been given further consideration. Therefore, the analysis that follows is based on a footprint recognition plan for this alternative.

23.4.1 LAND USE AND PUBLIC POLICY

Under this alternative, an approximation of the former WTC would be in place on the Project Site that would contain approximately 10 million square feet of office space, approximately 500,000 square feet of retail space, an 820-room hotel, and public plaza areas. The Southern Site could contain office uses, ground-floor retail, and other uses developed independently of the Proposed Action.

In terms of building program and uses, this alternative would present issues that the Proposed Action would not; bus parking and security would need to be located on-site, meaning that security checkpoints would not be ideally located. In addition, most retail uses would be concentrated underground, as with the former WTC. This would mean that little of the street-level retail activity associated with the Proposed Action would be created under this alternative. As a result, land use activity and related programming at the pedestrian level (e.g., cafes or seating areas) would be significantly less than with the Proposed Action. Uses for pedestrian and/or vehicular access would also differ from the Proposed Action, since Fulton or Greenwich Streets would not be extended through the site. As described below, open spaces under this alternative would not provide the benefits of those under the Proposed Action.

23.4.2 URBAN DESIGN AND VISUAL RESOURCES

On the WTC Site would be two approximately 110-story towers, one with a broadcast antenna at the top, that would restore a presence to the New York City skyline. While these would be considered important visual resources, they would, like the former WTC, block certain view corridors on Greenwich and Washington Streets, West Broadway, and Fulton, Dey, and Cortlandt Streets. They would also be shorter than the proposed Freedom Tower, which would reach 1,776 feet and become a prominent feature of the skyline designed to reflect and complement the geometry of the Statue of Liberty and the Brooklyn Bridge. Unlike the plan of the Proposed Action, which would reopen Fulton and Greenwich Streets, under this alternative the WTC Site would continue to be a superblock that stands in sharp contrast to the surrounding street grid.

With this alternative, the potential would exist for a new plaza or other open spaces to be re-created. All of the Proposed Action's open spaces would likely be at street level and would be found across Fulton and Liberty Streets immediately adjacent to major east-west pedestrian paths. However, under this alternative, they would be concentrated in the center of the WTC Site and along Church Street. In contrast to the open spaces that formerly existed on the WTC and which would largely be re-created under this alternative to the extent feasible, the open spaces of the Proposed Action would be designed specifically to be attractive, lively, and inviting to the surrounding community.

23.4.3 HISTORIC RESOURCES

The Restoration Alternative would disturb any potential archaeological resources on the WTC Site, as with the Proposed Action. Testing for the presence or absence of resources and, if

necessary, mitigation would be required. This alternative would not disturb potential resources on the Southern Site, but they would instead be disturbed by the independent development of 140 Liberty Street, which might not be required to include testing and mitigation.

Similar to the Proposed Action, this alternative would further alter the remaining below-grade elements of WTC Site, which *has been determined eligible* for listing on the National Register of Historic Places through a coordinated Section 106 process, and a Programmatic Agreement *would make certain commitments and address any potential adverse effects on historic resources that* would likely be needed. It would also create a Memorial and open spaces commemorating the events of September 11, though it is unlikely that it would be able to do so in the manner and to the extent planned for the Proposed Action. Unlike the Proposed Action, the Restoration Alternative would not restore the street linkage between the historic resources to the north and south of the WTC Site. The resources south of Liberty Street would remain isolated. The WTC Site would be redeveloped in keeping with the historic resources context. However, views across the WTC Site to historic resources to the surrounding historic resources would be blocked by the buildings to be created by the Restoration Alternative, similar to the Proposed Action.

Liberty Park, an integral part of the Proposed Action, would not be created, and historic resources nearest its location (90 West Street and the Beard Building) would not benefit from its presence.

Since this alternative would involve massive construction and excavation similar to the Proposed Action, there would be a potential for construction-related impacts on surrounding historic resources and construction protection plans would be necessary. It is assumed that the permanent PATH Terminal would be constructed and that 130 and 140 Liberty Street would be developed independently of this alternative. As a result, construction protection plans would be required by the Building Code of the City of New York to avoid impacts to New York City Landmarks and properties listed on the State and National Registers of Historic Places.

23.4.4 OPEN SPACE

As described in greater detail in Chapter 6, "Open Space," although the Proposed Action would result in small decreases in open space ratios, the accessibility, amenities, and comfortable human scale offered in the new WTC open spaces would be such that overall the Proposed Action would not have a significant adverse impact on open spaces in the area. Although it would not substantially affect open space user ratios, this alternative would also not provide the same amount or quality of open space afforded by the Proposed Action. Unlike the Proposed Action, this alternative would not include *Liberty Park*—a new large open space south of Liberty Street that would extend open space into the neighborhood to the south—*and* would not have ample street-level open spaces that would be attractive, lively, and inviting.

23.4.5 SHADOWS

The Restoration Alternative would result in the development of two towers similar to the former WTC. These structures would cast shadows similar to those prior to September 11. Depending on the location of the towers and any lower structures, however, shadows would potentially fall on different open spaces at different times. As with the Proposed Action, there would be the potential for increases in shadows, including those with the potential to impact Washington Market Park and the open spaces on the east side of Church Street.

23.4.6 COMMUNITY FACILITIES AND SERVICES

Like the Proposed Action, this alternative would not be expected to have significant adverse impacts to community facilities. Although redevelopment of the Project Site would restore a significant number of workers and visitors to the site, it would be about the same as pre-September 11 conditions, and community facilities serving the site and surrounding area would be capable of accommodating those needs. Similar to the Proposed Action, this alternative could incorporate some community facility uses on the Project Site.

23.4.7 SOCIOECONOMIC CONDITIONS

As with the Proposed Action, this alternative would result in redevelopment that would include new office and retail space. Therefore, many of the economic benefits associated with the construction and operation of the proposed uses—including direct and indirect employment, wages and salaries, business and sales tax, and total economic output—would be expected to be similar.

Under this alternative, the feasibility of leasing space at the higher floors of the towers would be uncertain due to the nature of the events of September 11. Except for this possibility, this alternative would not be expected to result in significant adverse socioeconomic impacts.

23.4.8 NEIGHBORHOOD CHARACTER

While the Restoration Alternative would not have any significant adverse impacts to neighborhood character, many of the benefits expected to result from the Proposed Action would not occur under this alternative. In addition, in terms of neighborhood character, this alternative would present issues that the Proposed Action would not.

This alternative would preclude the reopening of the street grid that is part of the Proposed Action. Although it was a busy nexus of transportation and an important destination itself, the WTC Site was often a barrier for residents, workers, and visitors of the three distinct neighborhoods surrounding it—Tribeca to the north, BPC to the west, and the Financial District to the east and south. The WTC Site would continue to form a superblock that stands in sharp contrast to the surrounding street grid. As with the former WTC complex, view corridors would be blocked.

The redevelopment of office and retail uses would result in many of same economic benefits associated with the construction and operation of the proposed uses—including direct and indirect employment, wages and salaries, business and sales tax, and total economic output. However, retail uses would be concentrated underground, as with the former WTC, and none of the street-level retail activity associated with the Proposed Action would be created under this alternative. Land use activity and related programming at the pedestrian level (e.g., cafes or seating areas) would be significantly less than with the Proposed Action. As a result, the streetscape would not become more active and enlivened.

In contrast to the open spaces that formerly existed on the WTC and that would not largely be re-created under this alternative, the open spaces of the Proposed Action would be designed specifically to be attractive, lively, and inviting. The accessibility, amenities, and comfortable human scale offered in the new WTC open spaces would have substantial benefits to neighborhood character which would not be realized under this alternative.

23.4.9 HAZARDOUS MATERIALS

As with the Proposed Action, hazardous materials that would be encountered would be identified, remediated or isolated during construction in accordance with the requirements and policies of EPA, NYSDEC, and NYCDEP. Hazardous materials impacts to workers, the general public, and the environment would be avoided through implementation of soil and groundwater management plans and a site-specific health and safety program. Neither this alternative nor the Proposed Action is expected to result in significant adverse impacts.

23.4.10 INFRASTRUCTURE

The Restoration Action's water system would be similar to what existed on site pre-September 11. *The system would comprise* a potable water supply brought in by mains running north-south through the site parallel to the No. 1/9 IRT subway line, along with a water main, which would feed into the site via the three-utility rack that would also carry parallel steam and sanitary sewer mains. A gravity sewer system would be in place, as would a pump system to move wastewater into the city's sewage system.

Solid waste facilities would be similar to the ones that existed on the WTC Site before September 11, comprising truck services, waste sorting, recycling, and compacting facilities.

Energy, steam, and natural gas lines would enter the WTC Site by feeders, distribution mains, and service manholes, provided by Con Edison. A diesel generator plant on the WTC Site would provide emergency electrical service.

Cooling system needs would be similar to those required by the Proposed Action. The cooling system would use water from the Hudson River that would circulate through a central refrigeration plant. The plant would use the Hudson River water pump station located along the Hudson River north of Liberty Street, with access points through the slurry wall.

The telecommunications infrastructure of the Restoration Action would include a similar mast on 1 WTC supporting television and radio antennae for major public and private broadcasters in New York City. In addition, the existing access points and manhole facilities would be utilized and rewired to allow for newer technology, such as fiber optic cable.

It is expected that this alternative would have similar impacts as the Proposed Action on infrastructure demands in and around the Project Site.

23.4.11 TRAFFIC AND PARKING

The volume of vehicular traffic generated at the WTC Site under the Restoration Alternative would be only moderately lower than under the Proposed Action in 2009. Upon the redevelopment of the Southern Site in 2015, traffic generated during the midday and PM peak hours under the Restoration Alternative would remain slightly lower than under the Proposed Action, but would exceed 2015 AM peak hour traffic volumes for the Proposed Action. As shown in Table 23-2, the Restoration Alternative would generate approximately 80 to 90 percent of the volume of vehicular traffic expected to be generated under the Proposed Action in 2009, and generate about 5 percent more traffic in the AM peak hour and 3 percent less traffic volume in the midday and PM peak hours in 2015. This level of traffic would likely produce about the same number of significant impacts as the Proposed Action**.**

Table 23-2
Vehicle Trips Generated by the Restoration Alternative

Analysis Period	Restoration Alternative (Including Southern Site Redevelopment)	Proposed Action
2009 AM Peak Hour	1,143	1,307
2009 Midday Peak Hour	1,301	1,666
2009 PM Peak Hour	1,411	1,709
2015 AM Peak Hour	2,684	2,558
2015 Midday Peak Hour	2,853	2,904
2015 PM Peak Hour	2,485	2,559

Unlike with the Proposed Action, the extension of Greenwich and Fulton Streets through the WTC Site would not occur under this alternative, so the street grid would not be restored and there would be no direct access to the Memorial and other uses.

23.4.12 TRANSIT AND PEDESTRIANS

The number of pedestrians generated under the Restoration Alternative would be moderately lower than those with the Proposed Action. As a result, there could be fewer impacted or unmitigated crosswalk locations for this alternative, compared with the Proposed Action. Overall conditions in the area could be worse, however, taking into account the independent full development of the Southern Site.

23.4.13 AIR QUALITY

This alternative would result in a similar amount of traffic and stationary sources as the Proposed Action. Neither this alternative nor the Proposed Action would be expected to have significant air quality impacts except, during construction as noted below and in Chapter 21, "Construction."

23.4.14 NOISE

Under this Alternative, the WTC Site would be fully restored to its pre-September 11 conditions. The increases in traffic volumes and stationary sources would be similar to or more than those associated with the Proposed Action. However, it is not anticipated that traffic volumes and stationary sources would be substantially greater than pre-September 11 conditions. Therefore, significant adverse noise impacts are not anticipated to occur under this alternative except during construction, as noted below and in Chapter 21, "Construction."

23.4.15 COASTAL ZONE

Under this alternative, there would be very similar coastal resource policies as described under the Proposed Action.

23.4.16 FLOODPLAIN

Under this alternative, impacts would be similar to those discussed in Chapter 17, "Floodplain." There would be no impact on the floodplain within the WTC Site. However, there may be

additional impervious surfaces than the open spaces with pervious surfaces under the Proposed Action. The conceptual nature of this alternative does not permit specificity in open space comparison. It is likely that the development of the Southern Site would occur as described in the "Future Without the Proposed Action" scenarios discussed in Chapters 4 through 22. As a result, no impact on floodplain conditions is anticipated. Under this alternative, no significant impacts are anticipated, the same analysis result as discussed for the Proposed Action.

23.4.17 NATURAL RESOURCES

Like the Proposed Action, this alternative would not be expected to have a significant adverse impact on natural resources or water quality. The potential for bird strikes may be higher under this alternative when compared to the Proposed Action. The new towers would extend more physical structure into the primary flight altitudes of migratory birds. As described in Chapter 18, "Natural Resources," certain measures can be taken to avoid or minimize significant adverse impacts.

23.4.18 ELECTROMAGNETIC FIELDS

Under this alternative, EMF conditions would be substantially similar to those with the Proposed Project. In either scenario, there would not be significant adverse impacts resulting from EMFs.

23.4.19 CONSTRUCTION IMPACTS

Although the construction program and phasing would be different from those of the Proposed Action (see Chapter 21, "Construction"), effects during the construction period would be expected to be similar under this alternative. The potential traffic, noise, and air quality impacts during construction that would occur with the Proposed Action would also occur under this alternative, although they may be at different times and locations and for varying periods of time. Private development at 130 and 140 Liberty Street could produce noise impacts equal to or greater than the Proposed Action's construction on the Southern Site.

23.5 REBUILDING ALTERNATIVES

LMDC and the Port Authority have given a great deal of thought and consideration to the rebuilding of the *Project Site*. As described below, a thorough evaluation has been undertaken throughout the process of selecting a design to form the basis of the WTC Memorial and Redevelopment Plan. This section describes that process and discusses the designs for rebuilding that were considered but ultimately not chosen. In particular, the THINK World Cultural Center, chosen along with the Libeskind proposal for more detailed consideration, is analyzed in greater detail for each of the GEIS technical areas.

As described in Chapter 1, "Project Description," in April 2002 LMDC released its *Preliminary Principles for Development and Blueprint for Renewal.* This document presented planning concepts for traffic and transportation, commercial and residential development, open space, and other principles to be considered in the formulation of a plan for the redevelopment of the WTC Site and surrounding area.

Six initial concept plans, developed by LMDC and Beyer Blinder Belle Architects & Planners, were released to the public in July 2002. The six original plans are described in greater detail in Chapter 1. After the release of these six plans, LMDC and the Port Authority conducted an extensive outreach program to solicit public comment. Strong public sentiment was expressed

for additional design choices. Leading comments from the public called for a more significant Memorial space, filling the void in Lower Manhattan's skyline with a powerful symbol, better overall design, and reducing the required amount of commercial space on the WTC Site.

In response to the strong public sentiment, LMDC and the Port Authority called for a new round of design proposals and sponsored an international design competition. In addition, based on public comments, and site planning and other goals of the Proposed Action, LMDC and the Port Authority encouraged the new designs to incorporate the Southern Site into the Project Site. The LMDC received 406 submissions from around the globe, from which seven teams were selected to take part in a new Innovative Design Study for the WTC Site. The program called for, among other elements, an appropriate setting for a memorial, a bold new skyline to rise in Lower Manhattan, a better-connected downtown, and a range of uses on the site. Nine designs by seven teams were released for public comment and further study in December 2002.

Nine designs (described in greater detail in Chapter 1) were evaluated against a series of quantitative and qualitative factors, including the comprehensive record of public comment. The evaluation was based on numerous factors, including but not limited to the setting for the Memorial, development program, street pattern, connectivity with the surrounding area, phasing, cost, and public response. A separate competition for the design of the Memorial was announced in April 2003.

Although all of the designs had positive elements, two of the design concepts were found to best satisfy the criteria—Studio Daniel Libeskind's Memory Foundations and the THINK World Cultural Center. After additional design efforts by these teams, and after discussion and evaluation by the LMDC, the Port Authority, and other officials, Governor Pataki and Mayor Bloomberg announced on February 27, 2003, that the Studio Daniel Libeskind design had been selected as the basis for the proposed World Trade Center Memorial and Redevelopment Plan. With the incorporation of additional refinements since that time, the Libeskind plan is analyzed in this GEIS as the Proposed Action. The other finalist in the design competition, the THINK World Cultural Center, is described and analyzed below for each technical area covered in the GEIS.

23.5.1 THINK WORLD CULTURAL CENTER

As shown in Figure 23-1, the World Cultural Center design would center around two open-lattice towers built around the footprints of the former towers. In each tower, a memorial would be located toward the top of the latticework, with other cultural uses, including a museum and performing arts center below. A series of pedestrian bridges would cross through the site, intersect at the heart of the two towers, and extend across Route 9A to BPC. Commercial development would take place in office towers surrounding the memorial site. Fulton and Greenwich Streets would be extended through the WTC Site for pedestrian and vehicular traffic. The area south of Liberty Street would contain a mix of office, hotel, and retail uses. This proposal would create approximately 11,644,000 square feet of built space, including an 80,000-square-foot memorial (with 3.2 acres of additional area), 780,000 square feet of cultural space, 8.6 million square feet of office, 1 million square feet of retail, and 658,000 square feet of hotel/conference space. This plan would also create open space and other areas for transportation, transit, and other uses.

After careful consideration, the Libeskind design was determined to better meet the purpose and need of the Proposed Action than the THINK proposal. Major contributing factors included engineering issues and the associated high cost of construction, structural conflicts between the

proposed towers and the PATH lines, a potential need to subsidize operating costs of the proposed cultural uses and institutions, and the towers' location directly above the footprints. In addition, during the consideration of potential designs for the site, this alternative received mixed reviews, with some critics feeling (among other opinions expressed at the time) that the open framework was not substantial enough.

LAND USE AND PUBLIC POLICY

Like the Proposed Action, this alternative would redevelop the Project Site with a mix of active uses and open space. Likewise, the major structures would be placed around the perimeter of the site, leaving the central part of the WTC Site largely for Memorial and open space uses. However, there are major differences in the two plans. Under this alternative, the portion of the Southern Site along Liberty Street would be developed with buildings and would not become public open space. In addition, the area for the Memorial would be sited directly around and above the footprints of the former towers, somewhat limiting the latitude for incorporating potential Memorial design concepts. Within the latticework above the footprints would be a combination of cultural components "inserted" into the structural frame.

Overall, neither this alternative nor the Proposed Action would be expected to result in significant adverse land use impacts.

URBAN DESIGN AND VISUAL RESOURCES

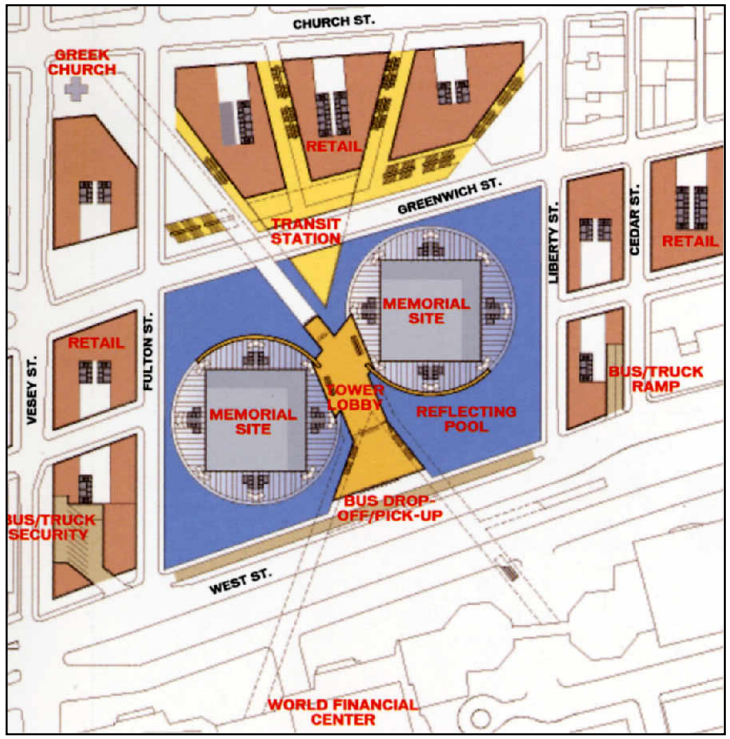
In terms of design, this alternative would have a substantially different appearance compared to the Proposed Action. With the Proposed Action, the center of the WTC Site would not be dominated by two large structures, but would remain largely open with fairly low-scale structures associated with the Memorial and *the Memorial Center.* Views from and across the site would be primarily of the two framework structures, rather than the more open plan of the Proposed Action. Similar to the Proposed Action, Fulton and Greenwich Streets would extend through the WTC Site. In addition, a network of elevated pedestrian platforms would stretch across the site from Church Street to the WFC.

HISTORIC RESOURCES

Similar to the Proposed Action, the THINK World Cultural Center Alternative would disturb any potential archaeological resources on the WTC Site and the Southern Site. Testing for the presence or absence of resources and, if necessary, mitigation would be required.

Similar to the Proposed Action, this alternative would further alter the remaining below-grade elements of WTC Site, which *has been determined eligible* for listing on the National Register of Historic Places through a coordinated Section 106 process. It would also create a Memorial and open spaces commemorating the events of September 11. *With its location over the tower footprints, however, it is likely that no access to the perimeter column bases would be possible. Exposure of a portion of the slurry wall would be possibile, and a Programmatic Agreement that would make certain commitments and address any potential adverse impacts to historic resources would likely be needed.*

Similar to the Proposed Action, the THINK World Cultural Center Alternative would restore the street linkage between the historic resources to the north and south of the WTC Site. The resources south of Liberty Street would no longer be isolated. The WTC Site would be redeveloped in keeping with the historic resources context. However, views across the WTC Site



Source: THINK

Source: THINK

THINK World Cultural Center Alternative

Figure 23-1

to historic resources to the surrounding historic resources would be blocked by the buildings to be created by this alternative.

Liberty Park, an integral part of the Proposed Action, would not be created, and historic resources nearest its location (90 West Street and the Beard Building) would not benefit from its presence. There would be no Wedge of Light Plaza and PATH Plaza to link the WTC Site to St. Paul's Chapel and other historic resources east of the WTC Site.

Since this alternative would involve construction, excavation, or dewatering on the WTC Site—similar to the Proposed Action—there would be a potential for construction-related impacts on surrounding properties, and construction protection plans would be required for development of this alternative.

OPEN SPACE

Although this alternative would provide some open space on the WTC Site, the Southern Site along Liberty Street would be developed with buildings rather than open space, as with the Proposed Action. Overall, this alternative would generate a similar number of open space users as the Proposed Action, but would not include Liberty Park, which is seen as an important component of the Proposed Action and a significant open space amenity.

SHADOWS

Since the towers under this alternative would not be as tall as Freedom Tower, the shadows would not reach as far as those of the Proposed Action. This alternative would avoid the potential impacts on more distant open spaces, such as Washington Market Park. However, closer open spaces, such as those on the east side of Church Street, would be shadowed in a manner similar to the Proposed Action.

COMMUNITY FACILITIES AND SERVICES

Like the Proposed Action, this alternative would not be expected to have significant adverse impacts to community facilities. Although redevelopment of the Project Site would result in a population increase (largely as a result of visitors), community facilities serving the Project Site and surrounding area would be capable of accommodating additional needs. As with the Proposed Action, this alternative could incorporate some community facility uses on the Project Site. Overall, neither this alternative nor the Proposed Action would result in significant adverse impacts to community facilities.

SOCIOECONOMIC CONDITIONS

As with the Proposed Action, this alternative would result in substantial redevelopment, including new office and retail space and new non-commercial land uses. Therefore, many of the economic benefits associated with the construction and operation of the proposed uses—including direct and indirect employment, wages and salaries, business and sales tax, and total economic output—would be expected to be similar. Overall, neither this alternative nor the Proposed Action is expected to result in significant adverse socioeconomic impacts.

NEIGHBORHOOD CHARACTER

As with the Proposed Action, this alternative would represent a substantial improvement to the WTC Site and surrounding area by replacing a largely vacant and inactive site that is a detriment to the character of the area, with a mix of active uses, new urban design elements, improved

transportation connections, and new open spaces. Although this alternative would have a substantially different appearance compared with the Proposed Action, it would be in keeping with the traditional character of the WTC Site, which is located in a densely developed urban setting. Similar to the Proposed Action, the amenities associated with this alternative would make the area livelier and would serve as a key component of the broader initiative to make Lower Manhattan a more attractive place to live, work, and visit. By removing the post-disaster blighted conditions that currently exist at the WTC Site and replacing them with a memorial, new cultural uses, open spaces, and office, retail, and hotel uses, this alternative would help to revitalize the Project Site and the surrounding neighborhoods. Overall, both this alternative and the Proposed Action would result in substantial benefits to neighborhood character, and no significant adverse impacts to neighborhood character would result.

HAZARDOUS MATERIALS

As with the Proposed Action, hazardous materials that would be encountered would be identified, remediated, or isolated during construction in accordance with the requirements and policies of the EPA, NYSDEC, and NYCDEP. Hazardous materials impacts to workers, the general public, and the environment would be avoided through implementation of soil and groundwater management plans and a site-specific health and safety program. Neither this alternative nor the Proposed Action is expected to result in any significant adverse impacts.

INFRASTRUCTURE

Similar to the Proposed Action, this alternative would not be expected *to result in* impacts *to* infrastructure *in and around* the Project Site. *It is assumed that the existing CWIS would be utilized under this alternative.* The overall demand and generation rates for infrastructure are not expected to be different from the Proposed Action.

TRAFFIC AND PARKING

The volume of vehicular traffic generated under the THINK World Cultural Center Alternative would be only moderately lower than under the Proposed Action. As shown in Table 23-3, this alternative would generate approximately 80 to 85 percent of the volume of vehicular traffic expected to be generated under the Proposed Action in 2009, and 90 to 95 percent of the traffic generated by the Proposed Action in 2015.

Table 23-3
Vehicle Trips Generated by the THINK Alternative

Analysis Period	THINK Alternative	Proposed Action
2009 AM Peak Hour	1,027	1,307
2009 Midday Peak Hour	1,412	1,666
2009 PM Peak Hour	1,348	1,709
2015 AM Peak Hour	2,451	2,558
2015 Midday Peak Hour	2,596	2,904
2015 PM Peak Hour	2,520	2,559

This level of traffic would likely produce about the same number of significant impacts as the Proposed Action, although average delay increases at each location would be somewhat lower, more so in 2009 than in 2015. The extension of Greenwich and Fulton Streets through the WTC Site would be provided under this alternative, so the street grid would be restored and direct

access could be provided to the Memorial and other uses. However, at times when vehicular traffic is not permitted on the extensions of Greenwich and Fulton Streets, Memorial-bound traffic would need to drop off and pick up visitors along Church Street and other locations farther away from the Memorial.

TRANSIT AND PEDESTRIANS

The number of pedestrians generated under the THINK World Cultural Center Alternative would be moderately lower than under the Proposed Action. Under this alternative, there could be fewer impacted or unmitigable crosswalk locations for this alternative, compared with the Proposed Action.

AIR QUALITY

Under this alternative, the WTC Site would be substantially redeveloped and the increases in traffic volumes and stationary source emissions would be similar to those associated with the Proposed Action. Traffic volumes and stationary sources *are not expected to* be substantially greater than *in* pre-September 11 conditions. Therefore, no significant adverse air quality impacts are anticipated to occur with this alternative.

NOISE

Increases in traffic volumes and stationary sources would be similar to those associated with the Proposed Action. However, traffic volumes and stationary sources *are not expected to* be substantially greater than pre-September 11 conditions. Therefore, noise impacts are not anticipated to occur under this alternative.

COASTAL ZONE

Under this alternative, there would be very similar coastal resource conditions as those described under the Proposed Action.

FLOODPLAIN

Under this alternative, there would be very similar floodplain conditions as those described under the Proposed Action.

NATURAL RESOURCES

This alternative would be expected to have *effects similar to those* under the Proposed Action.

ELECTROMAGNETIC FIELDS

Under this alternative, EMF conditions would be substantially similar to those with the Proposed Action. As a result, there would be no significant adverse impacts resulting from EMFs with this alternative.

CONSTRUCTION IMPACTS

Although the construction program and phasing would be different from those of the Proposed Action, effects during the construction period would be expected to be similar. The potential traffic, parking, noise, and air quality impacts during construction that would occur with the Proposed Action would also occur under this alternative, although they may be at different times and for varying periods of time.

23.6 WTC SITE ONLY ALTERNATIVE

The WTC Site Only Alternative would locate the entire program of the Proposed Action on the 16-acre WTC Site; the *Southern* Site would not be included but could be redeveloped independently at some future time. Under this alternative, the WTC Site would include up to 10 million square feet of commercial office space in four or five towers, as well as other uses. The four and five tower scenarios are each described below.

23.6.1 FOUR TOWER SCHEME

The site plan of a four tower scheme would be similar to that of the Proposed Action in that Towers 1 through 4 would be in approximately the same locations. However, since there would be no development south of Liberty Street, the additional floor area needed to satisfy program requirements would be concentrated on the WTC Site only. As a result, each of the buildings under this alternative would be larger compared with those under the Proposed Action. In addition, the below-grade access improvements and bus parking on the *Southern* Site would not be part of this alternative. A garage would either be located on the WTC Site itself or would not be part of the redevelopment.

Tower 1—on the block bounded by Route 9A and Vesey, Fulton, and Greenwich Streets—would include approximately 70 floors of office, mechanical and function space, three floors of retail space, and a total of approximately 2.8 million square feet of development. Tower 2—on the block bounded by Greenwich, Vesey, Church, and Liberty Streets—would include approximately 65 floors of office space and two floors of retail space, for a total of approximately 2.6 million square feet of development. Tower 3—on the block bounded by Greenwich and Church Streets and just south of the permanent WTC PATH Terminal—would include approximately 62 floors of office space, three floors of retail space, and a total of approximately 2.4 million square feet of development. Tower 4—north of Liberty Street and south of Tower 3—would contain approximately 62 floors of office space, three floors of retail space, and a total of approximately 2.2 million square feet of development. This alternative would also include an 800-room hotel at a location on the Project Site to be determined.

Overall, the program for this scenario would include approximately 10 million square feet of office space and approximately 480,000 square feet of retail. Building heights would range from approximately 58 to 75 stories. The quantity of open space would be the same as with the Proposed Action, but would not include Liberty Park.

LAND USE AND PUBLIC POLICY

Compared with the Proposed Action, the significant difference with this alternative would be on the Southern Site; there would be no new development of an office tower south of Cedar Street and no new open space created along Liberty Street. As a result, uses under this alternative on the WTC Site would be similar to the Proposed Action, but each of the four towers would need to be larger to accommodate the floor area displaced from the Southern Site, resulting in excessive building bulk. A major amenity that would be created under the Proposed Action—*Liberty Park*, the open space on the Southern Site—would not be realized under this alternative. There would also be no potential to locate bus parking off the WTC Site.

The Southern Site was incorporated into the Project Site in order to locate the bus parking off the WTC Site, to reduce the density of office towers on the WTC Site, and to increase the open

space component of the Proposed Action. These benefits would not be achieved with this alternative.

URBAN DESIGN AND VISUAL RESOURCES

Compared with the Proposed Action, all of the buildings on the WTC Site would be bulkier and/or taller under this alternative, with approximately 1.5 million square feet shifted to the remaining buildings. The size and density of development under this alternative would be far less preferable in terms of urban design than conditions with the Proposed Action and would significantly impact the surrounding environment.

This alternative would also not have a significant feature of the Proposed Action—*Liberty Park,* the public open space along the south side of Liberty Street. This space is expected to function as both an open space and visual amenity.

HISTORIC RESOURCES

Similar to the Proposed Action, the four tower scheme of the WTC Site Only Alternative would result in the disturbance of potential archaeological resources on the WTC Site. Testing for the presence or absence of resources and, if necessary, mitigation would be required. As the Southern Site would not be included, this alternative would not disturb any potential resources located there. However, since it would likely be developed independently, the resources might be disturbed by that construction.

Similar to the Proposed Action, this alternative would further alter the remaining below-grade elements of WTC Site, which *has been determined eligible* for listing on the National Register of Historic Places through a coordinated Section 106 process and a Programmatic Agreement would likely be needed. *The scheme would allow access to the tower perimeter column bases and expose a portion of the slurry wall.* Further, the bus garage would have to be located on the WTC Site possibly limiting any below-grade portions of the Memorial. Without the Southern Site, the Memorial would be more crowded by surrounding development, and there would be much less open space.

As with the Proposed Action, the four tower scheme would restore the street linkage between the historic resources to the north and south of the WTC Site. The resources south of Liberty Street would no longer be isolated. The WTC Site would be redeveloped in keeping with the historic resources context. However, views across the WTC Site to the surrounding historic resources would be blocked by the buildings to be created by this alternative.

Liberty Park, an integral part of the Proposed Action, would not be created, and historic resources nearest its location (90 West Street and the Beard Building) would not benefit from its presence. However, Wedge of Light Plaza *and the PATH Plaza* would link the WTC Site to St. Paul's Chapel and other historic resources east of the WTC Site.

Since this alternative would involve extensive construction, excavation, or dewatering on the WTC Site, there would be potential construction-related impacts on surrounding properties, and construction protection plans would be required. Since it is assumed that the permanent WTC PATH Terminal would constructed and that 130 and 140 Liberty Street would be developed independently, construction protection plans would be required by the Building Code of the City of New York in order to avoid impacts to New York City Landmarks and properties listed on the State and National Registers of Historic Places.

OPEN SPACE

In terms of potential open space users, this alternative would be about the same as the Proposed Action. However, there would be less new open space provided, since the area south of Liberty Street would not include *Liberty Park,* a new large open space that would extend into the neighborhood to the south. Therefore, open space ratios would be lower under this scenario than with the Proposed Action. Thus, this alternative would also not provide a major open space benefit included in the Proposed Action and open space conditions would be worse.

SHADOWS

The four tower scheme of the WTC Site Only Alternative would result in substantially taller structures with the potential to cast longer shadows than the Proposed Action. In particular, open spaces to the northeast and east are likely to receive more shadow compared with conditions with the Proposed Action.

COMMUNITY FACILITIES AND SERVICES

Although redevelopment of the Project Site under this alternative would result in a population increase (largely as a result of visitors), community facilities serving the site and surrounding area would be capable of accommodating additional needs. Similar to the Proposed Action, this alternative could potentially incorporate some community facility uses on the Project Site. Overall, neither this alternative nor the Proposed Action would result in significant adverse impacts to community facilities.

SOCIOECONOMIC CONDITIONS

Like the Proposed Action, this alternative would result in substantial redevelopment, including new office and retail space and new non-commercial land uses. However, there would be no development on the Southern Site as part of the Proposed Action. On the WTC Site, the economic benefits associated with the construction and operation of the proposed uses—including direct and indirect employment, wages and salaries, business and sales tax, and total economic output—would be expected to be similar to those under the Proposed Action. Overall, neither this alternative nor the Proposed Action is expected to result in significant adverse socioeconomic impacts.

NEIGHBORHOOD CHARACTER

Compared with the Proposed Action, the significant difference in terms of neighborhood character with this alternative would be the lack of open space on the Southern Site. The area south of Liberty Street would not include *Liberty Park,* a new large open space that would extend into the neighborhood to the south, and no new office development would be constructed south of Cedar Street. As a result, this alternative would not create better connections between the neighborhoods south of the WTC Site with other neighborhoods throughout Lower Manhattan as would be expected with the Proposed Action. However, like the Proposed Action, this alternative would establish a critical mass of mixed-use development at the WTC Site that would help to restore Lower Manhattan as a vibrant central business district that attracts and retains businesses, residents, and visitors. These uses would be consistent with the uses that surround the WTC Site today as well as new developments anticipated in the future in the surrounding neighborhoods. Overall, this alternative would result in positive benefits to neighborhood character, but not to the extent expected with the Proposed Action.

HAZARDOUS MATERIALS

As with the Proposed Action, hazardous materials that would be encountered would be identified, remediated, or isolated during construction in accordance with the requirements and policies of the EPA, NYSDEC, and NYCDEP. Hazardous materials impacts to workers, the general public, and the environment would be avoided through implementation of soil and groundwater management plans and a site-specific health and safety program. Neither this alternative nor the Proposed Action is expected to result in any significant adverse impacts.

INFRASTRUCTURE

This alternative differs from the Proposed Action, as the buildings would be larger to accommodate the office space proposed for the Southern Site. Infrastructure requirements would be substantially similar to the Proposed Action, as the amount of developed space and uses would remain the same. The configuration of the infrastructure might be affected if a garage were to be added below grade.

TRAFFIC AND PARKING

Either the four tower or five tower scheme of the WTC Site Only Alternative would have traffic effects that would be much the same as those under the Proposed Action (see Table 23-4). Overall vehicular trip generations and significant level of service impacts would be the very similar, although there would be a slight variation in the routing of tour buses would take if no bus parking were provided on the WTC Site. The benefits of extending Greenwich and Fulton Streets through the WTC Site would result from this alternative, much the same as under the Proposed Action. Overall, conditions in the area could be worse, however, when considered with independent development of the Southern Site.

Table 23-4
Vehicle Trips Generated by the WTC Site Only Alternative Four Tower Scheme

Analysis Period	WTC Site Only Four Tower Scheme Alternative (Including Southern Site Redevelopment)	Proposed Action
2009 AM Peak Hour	1,129	1,307
2009 Midday Peak Hour	1,489	1,666
2009 PM Peak Hour	1,589	1,709
2015 AM Peak Hour	2,718	2,558
2015 Midday Peak Hour	3,092	2,904
2015 PM Peak Hour	2,697	2,559

TRANSIT AND PEDESTRIANS

The number of pedestrians generated under the four or five tower scheme of the WTC Site Only Alternative would be similar to those with the Proposed Action. Under this alternative, there could be fewer impacted or unmitigable crosswalk locations, compared with the Proposed Action. Since all of the development would be on the WTC Site, a larger percentage of pedestrians could use the underground concourse, compared with the Proposed Action. Overall, conditions in the area could be worse, however, when considered with independent development of the Southern Site.

AIR QUALITY

Under this alternative, the WTC Site would be substantially redeveloped and the increases in traffic volumes and stationary source emissions would be similar to or greater than those associated with the Proposed Action. However, traffic volumes and stationary sources *are not expected to* be substantially greater than pre-September 11 conditions. Therefore, no significant adverse air quality impacts are anticipated to occur under this alternative.

NOISE

Under this alternative, the WTC Site would be substantially redeveloped. The increases in traffic volumes and stationary source noise would be similar to or more than those associated with the Proposed Action. However, traffic volumes and stationary sources *are not expected to* be substantially greater than pre-September 11 conditions. Therefore, significant noise impacts are not anticipated to occur under this alternative.

COASTAL ZONE

Under this alternative, there would be very similar coastal resource conditions as those described under the Proposed Action.

FLOODPLAIN

Impacts to the floodplain within the WTC Site would be identical *to* those discussed for the Proposed Action. Under this alternative, the 130 and 140 Liberty Street site on the Southern Site would be developed independently, resulting in a lost opportunity for open space on the northern portion of 130 Liberty Street site and the entire 140 Liberty Street site.

NATURAL RESOURCES

This alternative *would* be expected to have effects similar to those under the Proposed Action.

ELECTROMAGNETIC FIELDS

Under this alternative, EMF conditions would be substantially similar to those with the Proposed Action. In either case, there would be no significant impacts.

SAFETY AND SECURITY

As with the Proposed Action, this alternative would promote security upgrades and improved safety. Features would be included to enhance and maximize the safety and security systems and procedures. Planning for the WTC Site Only Alternative would promote security and protection as well as emergency preparedness programs and systems. During construction, health and safety programs would identify preventative and emergency response procedures to be implemented in the management and control of hazards and safety issues. Appropriate security measures would be implemented to address site needs prior to the completion and implementation of operational security structures and systems. Once completed, the facilities for operational safety and security would include security, control, and communication systems aimed *at maintaining* a safe environment during everyday and emergency situations. Emergency response systems would be tailored to anticipate security and life safety needs of each space or structure.

CONSTRUCTION IMPACTS

Although the construction plan under this alternative may be somewhat different from that of the Proposed Action, effects during the construction period would be expected to be similar. The potential traffic, parking, noise, and air quality impacts during construction that would occur with the Proposed Action would also occur under this alternative, although they may be at different times and for varying periods of time.

23.6.2 FIVE TOWER SCHEME *(NO LONGER UNDER CONSIDERATION)*

This scenario would be similar to the four tower scheme, except the space would be distributed among five towers rather than four, and the fifth tower totaling 1.2 million square feet would be constructed over the permanent WTC PATH Terminal. Even with the addition of a fifth tower, the floor area of Towers 1, 2, and 3 would still be larger than that under the Proposed Action. (Tower 4 would be slightly smaller, at 1.6 million square feet.) The five tower configuration would have lower buildings than the four tower design.

The program for Tower 1 would be the same as that for the four tower scenario and would include approximately 70 floors of office, mechanical and function space, and a total of approximately 2.6 million square feet of development. Tower 2 would include approximately 65 floors of office space and two floors of retail space, for a total of approximately 2.4 million square feet of development. Tower 3 would include approximately 62 floors of office space, three floors of retail space, and a total of approximately 2 million square feet of development. Tower 4 would contain approximately 58 floors of office space, three floors of retail space, and a total of approximately 1.8 million square feet of development. Tower 5 would contain approximately 1 million square feet of office space. This alternative would also include an 800-room hotel at a location to be determined on or near the Project Site.

Overall, the program for this scenario would include approximately 10 million square feet of office space, approximately 500,000 square feet of retail, and approximately 10.46 acres of open space. Building heights would range from approximately 47 to 70 stories. Lower-floor retail would not be possible in Tower 5, since the building would be constructed over the permanent WTC PATH Terminal. Additionally, under this alternative, planning, design, and construction would have to be closely coordinated with that for the permanent WTC PATH Terminal.

This five tower scheme was considered and evaluated in the DGEIS, but is no longer under consideration as an alternative to the Proposed Action.

23.7 ENHANCED GREEN CONSTRUCTION ALTERNATIVE

As described in Chapter 1, "Project Description," and Chapter 12, "Infrastructure," many environmental management practices, construction practices, and design measures have been incorporated into the Proposed Action. LMDC has sought to advance sustainable environmental excellence in design, construction, and function of buildings and related infrastructure at the Project Site. Sustainable environmental design addresses energy utilization, air emissions, water utilization, materials management, and outdoor and indoor environmental quality. To that end, LMDC established a working "green group" dedicated to identifying and establishing potential measures of sustainability that could be incorporated into the redevelopment of the Project Site. Some of the group's goals were:

- To identify flexible and non-prescriptive performance-based green building guidelines (building on the U.S. Green Building Council's Leadership in Energy and Environmental Design [LEED] Guidelines and other appropriate guidelines) to be followed to the extent appropriate on all projects at the WTC Site;
- To minimize energy consumption, and to explore and investigate cogeneration and other alternative energy sources;
- To minimize air emissions associated with energy consumption;
- To minimize use of potable water and optimize water usage and discharge;
- To consider methods for the movement of goods and waste that minimize emissions and congestion;
- To develop a plan to provide high-quality sustainable open and green spaces that are aesthetically pleasing to residents, workers, and tourists;
- To minimize emissions from construction vehicles during construction;
- To minimize emissions from cars, buses, and trucks associated with activities at the Project Site after construction; and
- To develop, document, and share the environmental lessons learned in the redevelopment of the Project Site.

As a result of these efforts, LMDC has developed a series of sustainable design guidelines that establish a blueprint for sustainable design to be incorporated into the future structures and practices on the Project Site. The *Sustainable Design Guidelines* are attached as Appendix A. The guidelines address in a comprehensive way the overall objectives for potential sustainable measures on the Project Site. These include air quality, energy conservation, water quality and conservation, material conservation, solar resource management, and construction practices.

Since many sustainable design measures, including wind turbines at the top of Freedom Tower, have been incorporated into the Proposed Action, this alternative considers the environmental benefits and costs of noteworthy measures and practices *not* already incorporated into the Proposed Action, and describes the reasons why they have not been employed.

23.7.1 MOVEMENT OF GOODS AND WASTE VIA PATH

Ways to enhance goods delivery and waste management have been examined by LMDC and the Port Authority. Some comments received expressed interest in seeing the handling of goods and waste by using the PATH lines that run under the WTC Site.

PATH is among the busiest rapid transit systems in the country, and, as such, its use for non-passenger rail activities poses significant safety, operational, and regulatory issues. Since PATH operates 24-hour service seven days a week, scheduling would require that freight service either be interspersed with passenger service, or confined to late night hours when existing PATH service could be operated through a single tunnel. Because PATH operates its trains at higher speeds than freight trains, and given that the PATH operates on a single-track system, a mixed freight/PATH service would have to operate at the slower speed of freight movement, degrading the capacity and attractiveness of the transit service. Moreover, the Federal Railroad Administration (FRA) imposes significant requirements on mixed-service operators that are not currently applicable to PATH. If a mixed service were introduced, FRA would require the

wholesale replacement of PATH's car fleet with different vehicles that meet the mixed-use standards, or would require that all passenger service be discontinued while freight movement was in operation. New passenger cars would not only be costly, but their design would present significant challenges since PATH operates uniquely sized cars.

PATH uses the late-night period to suspend service in one of its two tunnels to perform essential repairs and maintenance. During winter storms, cars are also stored in the tunnels to avoid snow accumulation. Use of one tunnel for freight only would eliminate the potential for these important activities.

The introduction of freight operations onto the PATH system creates some risk of at least occasional disruption of passenger service. Since PATH operates at such a high capacity—with almost 67,000 weekday passengers at the WTC PATH Terminal prior to September 11—even a loss of service for a short period of time would add significantly to congestion in Lower Manhattan.

Initial indications are that the ability to shift a significant proportion of WTC goods delivery services to a consolidated service via PATH may be limited due to business requirements. The logistics of goods delivery make the use of PATH unattractive for many types of deliveries because of the inefficiency of the transfer. Goods movements are highly sensitive to transfers due to the added operating costs and liability of loss or damage that transfers introduce. Industry experts in a focus group, moderated by the Port Authority, identified trucks that contain less than full loads as candidates for consolidation, making them a candidate for transfer if a consolidation facility were linked to the PATH rail network. Other types of goods movements are not candidates due to price sensitivity and client expectations of timeliness.

Other long-term operational considerations include added costs of goods handling and the extra infrastructure and space necessary for rail freight transfers. The loss of service even for one day would create significant disruptions for commuters and would add significantly to chronic congestion in Lower Manhattan, at the Holland Tunnel, and Hudson County communities where displaced PATH riders would shift to autos, buses, and ferries as alternative means of travel. A decrease in PATH ridership by commuters who shift to single occupancy vehicles because of a deterioration in PATH service could even approximate reductions in air emissions and traffic congestion from truckless delivery and waste removal at the WTC Site, depending on origin and destination emissions of individual vehicles. Conversely, a fractional increase in ridership on PATH from single occupancy vehicles would roughly offset the congestion and emissions of unconstrained truck delivery and waste removal from the WTC Site.

Waste does not account for a significant number of trips. At 18 to 24 daily trips, waste management will account for less than 3 percent of the site's estimated trips required to service the WTC Site.

Waste handling via PATH raises additional concerns. Waste movements would require special facilties and high maintenance to avoid adverse impacts on the passenger stations and tracks. Trash on tracks is a fire hazard as well as maintenance problem. Putrescible waste in particular presents a problem in that it is a human health hazard. Transit systems spend significant operating dollars keeping their systems clean to attract ridership and preserve facilities. Despite containerization of waste, these problems would still occur. Experience has shown that the strain of loading and unloading containers routines results in cracks and leaks that allow spillage.

Overall, the Port Authority/PATH does not consider the use of the PATH system for goods movement and waste removal to be in the public interest, and does not consider this alternative feasible.

23.7.2 WATERBORNE GOODS AND WASTE HANDLING DURING CONSTRUCTION

Waterborne transportation is an alternative for construction goods and waste movement that might offer benefits in the form of reduced traffic congestion and improved air quality outside of Lower Manhattan. However, the Project Site is not directly accessible by water for goods movement, and some form of access would need to be established. Suppliers or distributors sending goods to the site would also have to have such access.

For purposes of the evaluation of this alternative, it is assumed that just over 1 million cubic yards (CY) of excavated material would result from the Proposed Action. Given this amount of material, it would not be cost-effective to construct or refurbish an existing pier that is in disrepair. The closest existing New York City Department of Sanitation marine transfer stations in Manhattan to the Project Site are located at West 59th Street and East 91st Street. Given their distance from the Project Site, they are not considered viable options as transfer points for the project. Therefore, barging would need to be performed from an existing pier. Since access to the Hudson River is precluded due to larger construction projects that are planned for a similar timeframe (e.g., Route 9A), it is assumed for this analysis that the barges would operate from a pier on the east side of Lower Manhattan.

Two barge transport options are as follows: truck material through the Brooklyn Battery Tunnel (distance approximately 2.5 miles) to piers in Brooklyn with barging to a disposal site in New Jersey, which would be approximately 14.5 miles; or truck material to Pier 6 (distance approximately 1 mile) with barging to a disposal site in New Jersey, which would be approximately 13 miles.

Since this Project Site does not have an inherent easement to Pier 6, trucking the material from the WTC Site to Pier 6 is assumed. Trucks would transport material taken from the site to Pier 6 via Broadway and Church, Whitehall, and South Streets. The proposed construction of the Fulton Street Transit Center would preclude use of Fulton Street.

A barging facility just north of Pier 6 would involve the placement of three barge cranes; these would be fixed in the water for the duration of material removal operations (approximately 12 months). One crane barge, approximately 240 feet long and 70 feet wide, would be adjacent to the existing bulkhead to allow vehicles to drive over the water to facilitate their loading and unloading. Two barge cranes (120 feet by 60 feet) placed to the north and to the east of this storage barge would be used to load and unload materials to and from the vehicles. Piles would be used to secure the crane barges. Only one hopper barge (140 feet long by 40 feet) would be moored at any time. In contrast, the crane barges would remain as fixed platform coverage, totaling approximately 30,000 square feet, for the duration of the construction period.

Although the ultimate location and end use of the material would need to be determined, based on discussions with Weeks Marine, it is assumed for this alternative analysis that the material would be barged to a transfer area located at Port Newark. In addition, the DSNY Comprehensive Solid Waste Management Plan FEIS (October 2000) identified Linden, New Jersey, as an out-of-city barge-to-rail unloading facility.

Based on a screening evaluation of potential transportation scenarios for the excavated material from the WTC Site, and potential delivery of construction materials to the Project Site, it appears that conventional trucking would be the most cost-effective method and result in the least environmental impact to Lower Manhattan. Results of the analysis of this alternative are as follows:

- Trucking would be required for the transport of the excavated material to the barge facility (Pier 6) or the delivery of construction materials and equipment from the barge facility to the Project Site. Therefore, environmental impacts to air quality and noise to Lower Manhattan would be approximately the same for both conventional trucking and barging scenarios. However, barging would result in higher NO_x emissions in the region; approximately 27,250 kg/yr vs. 19,919 kg/yr. Trucking the material to the barge transfer point at Pier 6 would contribute approximately 8,897 kg/yr of the NO_x emissions. Therefore, if alternative transport methods could be devised to deliver the material to Pier 6, barging emissions would comparable (or lower) than trucking alone.
- Barging would introduce additional impacts to Lower Manhattan in the form of noise emissions from tug and offloading equipment not realized under a trucking only scenario.
- Barging would present potential conflicts with current uses at existing piers such as the heliport operations at Pier 6.
- Barge transport is approximately $5.25/CY more expensive than conventional trucking. Therefore, assuming approximately 1.2 million CY of excavated material and construction and demolition debris, total barge transport costs would be approximately $5,670,000 more than trucking.
- Barging may become more cost effective if larger quantities of materials are handled in conjunction with other major projects in Manhattan. However, the timing of the projects and anticipated waste removal schedules are currently unknown.
- Barging may require additional regulatory approvals in the form of USACE Section 404 and Section 10 permits if dredging of the berthing area and pier rehabilitation, respectively, are required.
- Barging would minimize impacts to neighborhoods adjacent to roadways outside Lower Manhattan by keeping additional trucks off the roadways. However, wherever the final barge destination point is located, trucks would be required to transport the material to its final destination point. Areas adjacent to the barge offloading facility would realize impacts to air quality and noise from the offloading and transfer operations.

For all reasons discussed above, this alternative is not considered feasible.

23.7.3 BIO-FUEL AND COMPOSTING

Through anaerobic digestion, waste can be broken down into a methane-rich gas and burned to generate electricity. Four main types of waste can be treated in this way: food, low-quality paper, biodegradable plastics, and waste water/sewage. Additional byproducts are water and compost.

It is estimated that a bio-fuel plant would require approximately 100,000 square feet, would process 130 tons of waste and 800 gallons of water a day, and could generate 1 to 2 MWh of electricity. Given the severe space constraints of the site and uncertainties about this

technology's environmental impacts in the setting of a major office building context, this option is not deemed feasible.

23.7.4 ENHANCED COGENERATION

To minimize energy consumption and air emissions associated with energy consumption, LMDC could explore the possibility of locating a cogeneration facility on the Project Site as project design continues. Cogeneration represents a more efficient use of power generated by fossil fuel than that available through reliance on local electrical grids. A full analysis of either a 30 megawatt (MW) centralized cogeneration facility or smaller individualized generation plants is provided below in section 23.8. To enhance the energy savings and overall benefits from cogeneration, as part of this Enhanced Green Construction Alternative, LMDC is also considering the possibility of the construction of a larger cogeneration facility on the Project Site, such as a facility that could provide up to 70 MW of clean power for all the uses under the Proposed Action. While this alternative would have higher emissions than shown in Table 23-7 for a smaller cogeneration facility, the emissions per kilowatt hour of electricity would likely be less. The predicted impacts to ambient air quality from a 30 MW cogeneration facility, shown in Tables 23-8 and 23-9, are well below ambient air quality standards and significant impact levels. In addition, the impacts are well below the NYCDEP and NYSDEC $PM_{2.5}$ interim guidance thresholds. Impacts from the 70 MW are likewise expected to be less than these thresholds and thus would not be expected to result in a significant adverse air quality impact.

The construction of the larger cogeneration facility that could rely on the existing cooling water intake may not be feasible because the cooling water requirements for a 70 MW plant are likely to exceed the design capacity of the CWIS. Therefore, to construct a larger cogeneration facility, alternative technologies, including closed-cycle cooling, fine-mesh wire screens, modifying screens, fish avoidance systems, and others that are discussed in Chapter 18, "Natural Resources," would need to be considered. Any potential impact to aquatic biota under this enhanced cogeneration facility alternative is expected to be minimized through the Best Technology Available (BTA) review that would be required through New York's SPDES permitting process.

23.8 COGENERATION ALTERNATIVE

A cogeneration facility would be constructed on the Project Site under this alternative to serve as a source of energy for the Proposed Action. Cogeneration involves the simultaneous production of both electric and thermal energy from a single source of fuel. In all fossil fuel generation activities, there is a high level of secondary "waste energy" that is discharged into the environment. While electricity is then delivered to the end-user through transmission lines, the thermal byproduct may be discarded. By generating electricity on-site rather than at a remote generation facility, significant amounts of the thermal waste energy byproduct can be utilized for such purposes as heating and steam-driven refrigeration machines. In this manner, portions of heating, air conditioning, and electric power requirements for the Proposed Action would be satisfied by cogeneration, with increased efficiency and potentially lesser effects on the surrounding environment. The cogeneration facilities considered are anticipated to present a more efficient use of power generated by fossil fuel than that available through reliance on local

electric grids. A cogeneration facility would also add an increased level of reliability in the case of a local or regional power failure.

For the purposes of this analysis, a centralized cogeneration facility with a maximum generation of 30 megawatts (MW) is considered under this alternative. The centralized plant could be located below Liberty Park with the exhaust expelled either through a sculptural element within the park or through a floor level or roof area of Tower 5 on the Southern Site. Building code requirements dictate a minimum distance from adjacent buildings for smokestack discharge, and this distance is a function of flue diameter. Air quality considerations relating to the ventilation air intake placement of local buildings would also be considered in the design of a cogeneration facility.

A variation to the centralized plant would be smaller, individual generation plants generating between approximately 7.5 MW and 15 MW each. The individual plants would be located in each of the five towers with the smokestack exhaust expelled through an appropriate floor level or the roof area of each building.

With the exception of the cogeneration facility, this alternative would have the same basic program elements and site design as the Proposed Action. Therefore, its effects would be largely the same except in the technical areas of infrastructure, air quality, and noise. Each of these is described in greater detail below.

23.8.1 INFRASTRUCTURE

This alternative would result in the decrease of traditional infrastructure needed to supply the various elements of the Proposed Action. A centralized cogeneration plant on the WTC Site would decrease the demand for electric and thermal energy from Con Edison.

23.8.2 AIR QUALITY

Although the cogeneration facility alternative would likely represent a more efficient use of energy than a complete reliance on utility electrical and steam service under the basic program, the facility's emissions would result in localized increased levels of combustion-related air compounds. To assess whether the cogeneration facility alternative could result in any potential significant air quality impacts, a dispersion modeling analysis was conducted. The methodology and results of the air dispersion modeling performed for the mobile and stationary sources associated with the cogeneration facility alternative are presented. The criteria air pollutants of concern include carbon monoxide (CO), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). In addition to these analyses, an analysis was performed to evaluate the impacts of particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$) on the surrounding communities (see Chapter 14, "Air Quality," for a discussion of $PM_{2.5}$ significant impact criteria).

The cogeneration facility alternative examined would have a total installed capacity of approximately 30 MW, and would primarily combust natural gas. In the event that natural gas was temporarily unavailable, distillate fuel oil would be used. A second analysis scenario considered the possibility of a boiler plant to supply the steam for heating purposes at the proposed WTC Site, instead of utilizing Con Edison steam. The boiler plant would also combust natural gas, with distillate fuel oil as a backup. The combined impacts of the cogeneration facility and boiler plant were analyzed in the event that both systems are desired.

At this time, only general information on the design of the cogeneration facility is available. However, the following information and assumptions were used:

- The cogeneration plant would be configured as either one individual plant with a capacity of 15 MW and four individual plants with a capacity of approximately 7.5 MW each, or a centralized facility with a maximum total generation capacity of 30 MW.
- The cogeneration facility would utilize combustion turbine generators.
- The combustion turbine generators utilize a selective catalytic reduction (SCR) system for control of nitrogen oxides (NO_x).
- The combustion turbine generators utilize an oxidation catalyst system for control of CO and volatile organic compounds (VOCs).
- Fuel oil would be used in the event that natural gas was unavailable. To minimize impacts, annual usage would be limited to 720 hours per year (30 days).

In addition, to minimize potential impacts of sulfur dioxide, and to a lesser, particulate matter, the cogeneration facility alternative would utilize fuel oil with a maximum sulfur content of 0.05 percent by weight.

For the boiler plant, general information was used to derive emission rates and stack parameters. As with the cogeneration facility alternative, fuel oil was assumed to be used no more than 720 hours per year. However, to ensure that impacts from the boiler plant do not result in any potential adverse impacts, the plant would utilize ultra low sulfur fuel with a maximum sulfur content of 0.003 percent by weight. Note that for analysis of the combined impacts of the cogeneration facility and the boiler plant, SO_2 impacts were also calculated assuming ultra-low sulfur fuel.

MODEL SELECTION

Air quality impacts from were evaluated using the Industrial Source Complex (ISC) dispersion model developed by EPA and described in *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models* (EPA-454/B-95-003a). The ISC3 model calculates pollutant concentrations from one or more point, area, or volume sources based on hourly meteorological data. The ISC3 model has the capability of calculating pollutant concentrations at locations where the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by nearby structures. Computations with the ISC3 model were made assuming stack tip downwash, buoyancy-induced dispersion, gradual plume rise, urban dispersion coefficients, wind profile exponents (without building downwash), and elimination of calms. The meteorological data set consisted of five years of meteorological data: surface data collected at La Guardia Airport (1998 to 2002) and concurrent upper air data collected at Brookhaven, New York. This meteorological data provides hour-by-hour wind speeds and directions, stability states and temperature inversion elevation over the five-year period.

As discussed in the *CEQR Technical Manual*, the ISC3 model is not capable of evaluating impacts within the cavity recirculating region, which occurs when emissions from a source are trapped in the wake of a building. In order to quantify impacts from multiple stacks at receptor locations within the cavity impact region, the ISC Plume Rise Model Enhancements (PRIME) model was utilized. The PRIME model is a modification of the ISC3 model specifically designed to predict impacts in the cavity region. For modeling without downwash conditions, the standard ISC3 model was used.

The Building Profile Input Program for the PRIME model (BPIPPRM) was used to determine the projected building dimensions for the PRIME modeling with the building downwash algorithm enabled. The BPIPPRM program is a modification of the EPA's Building Profile Input Program (BPIP), which is described in the *User's Guide to the Building Profile Input Program*, EPA, Research Triangle Park, North Carolina. The modeling of downwash from the cogeneration and boiler facilities' sources accounts for all obstructions within a radius equal to five obstruction heights of the stacks.

METEOROLOGICAL CONDITIONS

The meteorological data set consisted of five years of meteorological data: surface data collected at LaGuardia Airport (1998 to 2002) and concurrent upper air data collected at Brookhaven, New York. This meteorological data provides hour-by-hour wind speeds and directions, stability states and temperature inversion elevations over the five-year period.

RECEPTOR LOCATIONS

Discrete receptors (i.e., locations with operable windows) were placed on nearby buildings that were identified as having operable windows. Receptors were not placed on the towers proposed for the WTC Site since they would not have operable windows, and the cogeneration stacks would be located on the roof of the towers, away from any potential building intake or publicly accessible outdoor elevated areas. The receptor network consisted of receptors located along the sides of the buildings and on the roofs of the buildings. Rows of receptors were placed at spaced intervals at different sections of the buildings at multiple elevations. In addition, to simulate impacts at ground level, a 1 kilometer polar grid was used, centered on the WTC Site.

EMISSIONS DATA

Criteria pollutant emission estimates and stack exhaust parameters for the cogeneration facility alternative are presented in Table 23-6.

Stationary source emissions of NO_x and CO from the combustion turbines were determined based on manufacturer's performance data for equipment having a similar capacity to the predicted energy output of the cogeneration facility. The emission rates were adjusted based on the predicted capacity of the individual generating units (7.5 MW). To determine the stack emissions rates, the SCR system was assumed to reduce emissions of NO_x to 2.5 parts per million (ppm) at 15 percent oxygen when firing natural gas and 9.0 ppm at 15 percent oxygen when firing oil, while the oxidation catalyst was assumed to reduce emissions of CO to 5.0 parts per million (ppm) at 15 percent oxygen when firing natural gas and 10.0 ppm at 15 percent oxygen when firing oil. For PM_{10} and SO_2, stationary source emissions were calculated based on the total predicted heat input capacity and the emission factors provided by the equipment vendor or as published in EPA AP-42. To be conservative, the combustion turbines were assumed to operate at 100 percent load on a short-term and annual basis. It was assumed for the $PM_{2.5}$ impact analysis that all PM_{10} emitted would be smaller than 2.5 micrometers, and would therefore constitute $PM_{2.5}$.

Table 23-6
Cogeneration Facility - Stack Parameters and Emission Rates

Parameter	Value	
	Gas	Oil
Stack Height (feet) [1]	Tower 1: 1,302 [(2)] Tower 2: 1,204 Tower 3: 1,083 Tower 4: 956 Tower 5: 858 [(3)]	Tower 1: 1,302 [(2)] Tower 2: 1,204 Tower 3: 1,083 Tower 4: 956 Tower 5: 858 [(3)]
Stack Exit Velocity (feet per minute)	4,988	4,936
Stack Exit Temperature (^{o}F)	300	300
Short Term Emission Rates – 100 Percent Load (Per Individual Source)		
PM_{10} (lb/hr)	0.57	1.05
SO_2 (lb/hr)	0.29	4.40 [(4)]
CO (lb/hr)	1.05	2.17
Annual Emission Rates – 100 Percent (Per Individual Source)		
PM_{10} (lb/hr)	0.61[(5)]	
SO_2 (lb/hr)	4.40[(4)]	
NO_x (lb/hr)	1.21[(5)]	

Notes:
[1] Stack heights were assumed to be 3 feet above the roof of the building (based on *CEQR Technical Manual* guidance).
[2] The stack was assumed to terminate above the 70-story level of the building.
[3] Under the centralized cogeneration scenario, the combustion turbines would be located on Tower 5.
[4] Emissions are based on a maximum fuel sulfur content of 0.05 percent by weight. Note that if used in conjunction with the boiler plant, however, the fuel sulfur content would be limited to 0.003 percent by weight.
[5] Based on 720 hours of operation per year using oil.

Table 23-7 presents the estimated stack parameter and emission rates for the boiler plant scenario. The boiler plant emissions are based on a maximum total heat input capacity of 100 million BTU per hour. Stationary source emissions in the above table were calculated based on the total predicted heat input capacity and the emission factors provided by the equipment vendor or published in EPA AP42.

Since information on the proposed stack exhaust system is not yet available, a preliminary stack height of 250 feet was chosen. If a lower stack height is designed, additional modeling would need to be performed to ensure that the boiler plant does not result in any significant air quality impacts.

RESULTS

Using the procedures described above, the ISC3 and PRIME models were used to estimate the maximum off-site pollutant concentrations that would result from the cogeneration facility alternative, an on-site boiler plant and the combined operation of the cogeneration facility and boiler plant. The maximum predicted concentrations from the modeling were added to the background concentrations (see Chapter 14, "Air Quality," for a discussion of background air concentrations) to estimate the ambient air quality at the locations near the project site. Short-term concentrations (i.e., 24-hours or less) were calculated by adding maximum (high first-high)

impacts to the second-highest background concentrations. Annual concentrations were calculated using the highest impacts added to the highest background concentrations.

Table 23-7
Boiler Facility - Stack Parameters and Emission Rates

Parameter	Value	
	Gas	Oil
Stack Height (feet) [1]	250	250
Stack Exit Velocity (feet per minute)	997	997
Stack Exit Temperature (^oF)	250	250
Short Term Emission Rates – 100 Percent Load (Per Individual Source)		
PM_{10} (lb/hr)	0.56	2.36
SO_2 (lb/hr)	0.059	0.30(1)
CO (lb/hr)	8.24	3.57
Annual Emission Rates - Maximum Load (Per Individual Source)		
PM_{10} (lb/hr)	0.71(2)	
SO_2 (lb/hr)	0.30(1)	
NO_x (lb/hr)	5.49(2)	

Notes:
[1] Emissions are based on a maximum fuel sulfur content of 0.003 percent by weight.
[2] Based on 720 hours of operation per year using oil.
Sources: EPA AP-42, 6 NYCRR Part 227-2.

Cogeneration Facility

Tables 23-8 and 23-9 present the maximum impacts due to the cogeneration facility alternative under the individual and centralized cogeneration scenarios, respectively.

As presented in the tables, the maximum predicted total criteria pollutant concentrations from the cogeneration facility alternative for all of the pollutant time averaging periods are less than their respective standards. In addition, impacts are below established EPA Significant Impact Levels (SILs).

The air quality modeling analysis determined that the highest predicted increase in the 24-hour average and annual average $PM_{2.5}$ concentrations is 0.11 $\mu g/m^3$ and 0.0069 $\mu g/m^3$, respectively. These concentrations are below the NYCDEP interim guidance criteria and NYSDEC draft policy of 5 µg/m3 on a 24-hour basis and the NYSDEC draft policy criteria of 0.3 $\mu g/m^3$ on an annual basis. In addition, since the maximum annual average $PM_{2.5}$ impact is also less than the 0.1 $\mu g/m^3$ NYCDEP interim guidance criteria, a neighborhood scale analysis of $PM_{2.5}$ was not necessary.

As presented in the table, the maximum predicted total criteria pollutant concentrations from the boiler plant scenario for all of the pollutant time averaging periods are less than their respective standards. In addition, impacts are below established EPA SILs.

The air quality modeling analysis determined that the highest predicted increase in the 24-hour average and annual average $PM_{2.5}$ concentrations is 4.6 $\mu g/m^3$ and 0.21 $\mu g/m^3$, respectively. These concentrations are below the NYCDEP interim guidance criteria and NYSDEC draft policy of 5 $\mu g/m^3$ on a 24-hour basis and the NYSDEC draft policy criteria of 0.3 $\mu g/m^3$ on an annual basis. Although the annual concentration exceeds the NYCDEP interim guidance criteria for

neighborhood scale impacts at some discrete locations, on a neighborhood scale basis the predicted incremental impact is 0.034 µg/m^3, which is less than the interim guidance of 0.1 µg/m^3.

Table 23-8
Cogeneration Facility Alternative
Individual Cogeneration Unit Scenario
Maximum Predicted Total Concentrations

Pollutant	Averaging Period	Background Concentration (µg/m^3)	Maximum Predicted Impact (µg/m^3)[1]	Significant Impact Level (µg/m^3)	Maximum Total Concentration (µg/m^3)	Ambient Standard (µg/m^3)
PM_{10}	24 hour	50	0.11	5	50.1	150
	Annual[3]	22	0.0069	1	22.01	50
SO_2	3 hour	212	1.8	25	213.8	1,300
	24 hour	121	0.46	5	121.5	365
	Annual	37	0.05	1	37.1	80
CO	8 hour	3,206	0.57	500	3,206.6	10,000
	1 hour	4,695	1.6	2,000	4,696.7	40,000
NO_2 [2]	Annual[3]	71	0.008	1	71.01	100

Notes:
[1] The higher of the ISC3 and PRIME model concentrations were reported.
[2] NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.58.
[3] Impacts were determined assuming a maximum of 720 hours operation per year using oil.

Table 23-9
Cogeneration Facility Alternative
Centralized Units Scenario
Maximum Predicted Total Concentrations

Pollutant	Averaging Period	Background Concentration (µg/m^3)	Maximum Predicted Impact (µg/m^3)[1]	Significant Impact Level (µg/m^3)	Maximum Total Concentration (µg/m^3)	Ambient Standard (µg/m^3)
PM_{10}	24 hour	50	0.31	5	50.3	150
	Annual[3]	22	0.019	1	22.02	50
SO_2	3 hour	212	4.0	25	216.0	1,300
	24 hour	121	1.29	5	122.3	365
	Annual	37	0.13	1	37.1	80
CO	8 hour	3,206	1.0	500	3,207.0	10,000
	1 hour	4,695	2.5	2,000	4,697.5	40,000
NO_2 [2]	Annual[3]	71	0.019	1	71.02	100

Notes:
[1] The higher of the ISC3 and PRIME model concentrations were reported.
[2] NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.58.
[3] Impacts were determined assuming a maximum of 720 hours operation per year using oil.

Boiler Plant

Table 23-10 presents the maximum predicted impacts from the boiler plant alone.

Cogeneration Facility and Boiler Plant

Tables 23-11 and 23-12 present the maximum combined impacts due to the cogeneration facility and boiler plant under the individual and centralized cogeneration scenarios, respectively.

Table 23-10
Boiler Plant Maximum Predicted Total Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Maximum Predicted Impact ($\mu g/m^3$)[1]	Significant Impact Level ($\mu g/m^3$)	Maximum Total Concentration ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
PM_{10}	24 hour	50	4.6	5	54.6	150
	Annual[3]	22	0.20	1	22.2	50
SO_2	3 hour	212	1.40	25	213.4	1,300
	24 hour	121	0.59	5	121.6	365
	Annual	37	0.090	1	37.1	80
CO	8 hour	3,206	25.3	500	3,231.3	10,000
	1 hour	4,695	75.1	2,000	4,770.1	40,000
NO_2 [2]	Annual[3]	71	0.95	1	72.0	100

Notes:
[1] The higher of the ISC3 and PRIME model concentrations were reported.
[2] NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.58.
[3] Impacts were determined assuming a maximum of 720 hours operation per year using oil.

Table 23-11
Boiler Plant and Individual Cogeneration Unit Scenario
Maximum Predicted Total Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Maximum Predicted Impact ($\mu g/m^3$)[1]	Significant Impact Level ($\mu g/m^3$)	Maximum Total Concentration ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
PM_{10}	24 hour	50	4.6	5	54.6	150
	Annual[3]	22	0.21	1	22.2	50
SO_2	3 hour	212	1.4	25	213.4	1,300
	24 hour	121	0.59	5	121.6	365
	Annual	37	0.090	1	37.1	80
CO	8 hour	3,206	29.1	500	3,235.1	10,000
	1 hour	4,695	73.0	2,000	4,768.0	40,000
NO_2 [2]	Annual[3]	71	1.0	1	72.0	100

Notes:
[1] The higher of the ISC3 and PRIME model concentrations were reported.
[2] NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.58.
[3] Impacts were determined assuming a maximum of 720 hours operation per year using oil.

Table 23-12
Boiler Plant and Centralized Cogeneration Units Scenario
Maximum Predicted Total Concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Maximum Predicted Impact ($\mu g/m^3$)[1]	Significant Impact Level ($\mu g/m^3$)	Maximum Total Concentration ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
PM_{10} [1]	24 hour	50	4.6	5	54.6	150
	Annual[3]	22	0.21	1	22.2	50
SO_2	3 hour	212	1.4	25	213.4	1,300
	24 hour	121	0.59	5	121.6	365
	Annual	37	0.090	1	37.1	80
CO	8 hour	3,206	29.1	500	3,235.1	10,000
	1 hour	4,695	73.0	2,000	4,768.0	40,000
NO_2 [2]	Annual[3]	71	0.95	1	72.0	100

Notes:
[1] The higher of the ISC3 and PRIME model concentrations were reported.
[2] NO_2 impacts were estimated using a NO_2/NO_x ratio of 0.58.
[3] Impacts were determined assuming a maximum of 720 hours operation per year using oil.

As presented in the tables, the maximum predicted total criteria pollutant concentrations from the cogeneration facility and boiler plant for all of the pollutant time averaging periods are less than their respective standards. In addition, impacts are below established EPA SILs.

The air quality modeling analysis determined that the highest predicted increase in the 24-hour average and annual average $PM_{2.5}$ concentrations is 4.6 $\mu g/m^3$ and 0.21 $\mu g/m^3$, respectively. These concentrations are below the NYCDEP interim guidance criteria of 5 $\mu g/m^3$ on a 24-hour basis and the NYSDEC draft policy criteria of 0.3 $\mu g/m^3$ on an annual basis. Although the annual concentration exceeds the NYCDEP interim guidance criteria for neighborhood scale impacts at some discrete locations, on a neighborhood scale basis the predicted incremental impact is 0.035 $\mu g/m^3$, which is less than the interim guidance of 0.1 $\mu g/m^3$.

23.8.3 NOISE

Under this alternative, the noise from the proposed co-generation facility would not significantly affect the sensitive receptors at or adjacent to the facility site, since the facility would be placed at an underground location and designed with sufficient applicable noise reduction devices to comply with applicable noise regulations and standards conditions. Therefore, noise impacts are not anticipated to occur under this alternative.

23.9 REDUCED IMPACT ALTERNATIVE

A Reduced Impact Alternative would seek to reduce or vary the use, density, and timing of one or more major components of the Proposed Action in order to reduce or avoid unmitigated significant environmental impacts of the Proposed Action in 2009 and 2015, while still satisfying the overall purpose and need of the Proposed Action. As the analyses in Chapter 13A, "Traffic and Parking," Chapter 13B, "Transit and Pedestrians," Chapter 21, "Construction," and Chapter 22, "Mitigation Measures," make clear, the principal adverse environmental impacts of the Proposed Action reflect (1) high background traffic levels in the vicinity of the Project Site in both 2009 and 2015; (2) the addition of a tremendous number of visitor trips to the Memorial in both of these years; and (3) the cumulative effects of the Proposed Action and other Lower Manhattan recovery projects during the 2006 construction period.

Defining a Reduced Impact Alternative therefore presents a number of challenges. The Memorial and the Memorial Center are fundamental to the goals of the Proposed Action, but so are the office, retail, and cultural uses that seek to revitalize Lower Manhattan and contribute to the renewal of its neighborhoods. Commercial office space within the Project Site has already been effectively reduced by approximately 15 percent below pre-September 11 levels because of the proposed inclusion of the Southern Site within the Project Site. For this reason, a Reduced Impact Alternative might seek to reduce either the retail, hotel and conference facility, or cultural spaces within the Proposed Action or to defer for a year or more construction in order to reduce noise and air quality impacts in 2006.

Preliminary analysis of potential traffic, noise and construction impacts from such an alternative indicated, however, that there would continue to be significant impacts in each of these areas, even with the substantial reduction of one or more of such uses. For example, the vehicular traffic generated even with a 40 percent reduction of retail uses and a reduced hotel and

conference facility would be only 5-10 percent lower than with the Proposed Action and would likely produce about the same number of significant impacts as the Proposed Action.

On balance, a Reduced Impact Alternative is unlikely to sufficiently reduce traffic and construction impacts to avoid or mitigate any of the Proposed Action's significant environmental impacts. However, such an alternative could make more difficult the realization of the Proposed Action's goals. Depending on market conditions, such an alternative would reduce the economic benefits to the state and city and would also reduce the employment opportunities in Lower Manhattan as compared with the Proposed Action. Depending on the configuration of the remaining retail space, this alternative could reduce the opportunity for street-level retail on the Project Site. Construction of essential foundation components of the Proposed Action that are scheduled to occur in 2006 could not be deferred. Deferral of such construction beyond 2006 would only increase or prolong noise levels in subsequent years, when the Memorial is in operation, and could also delay or limit the ability of the Proposed Action to contribute to the renewed economic vitality of Lower Manhattan.

23.10 AT-GRADE LOADING ALTERNATIVE

Under this alternative, vehicular circulation for Freedom Tower, the Performing Arts Center and cultural uses, as well as for the Memorial and Memorial Center, would be separated from the remainder of the Project Site's below-grade network. Truck elevators would transport trucks to below-grade loading areas. Similarly, passenger autos for Freedom Tower employees would use at-grade elevators to access below-grade parking. Other features and components of this alternative would be the same as with the Proposed Action.

Delivery vehicles would enter along the south side of Vesey Street between Washington and Greenwich Streets and take elevators down to the loading docks. Prior to entering the elevator area, vehicles would be inspected along the east curb lane of Washington Street between Barclay and Vesey Streets, or at another location to be selected on or in the immediate vicinity of the site. Additional queuing and possibly curbside drop-offs and pick-ups would need to be accommodated along Barclay and Vesey Streets. Trucks would move eastbound on Vesey Street, northbound on Church Street, and westbound on Barclay Street. A signal would be added at the intersection of Vesey and Washington Streets. Trucks could also approach the Washington Street screening area by traveling eastbound on Murray Street, southbound on Greenwich Street, and westbound on Barclay Street.

Passenger cars accessing a 300-space below-grade parking garage would also use the Vesey Street entrance. These would be vehicles of Freedom Tower tenants and their employees. Inside the entrance there would be a screening area for cars where they would be inspected before proceeding into elevators that would take them to the below-grade parking area. Departing cars would also exit onto Vesey Street. Passenger car access for below-grade parking beneath Towers 2 through 5 would use the Liberty Street ramp as designed for the Proposed Action.

This alternative would not require construction of certain below-grade roadway elements that are part of the Proposed Action. Compared to the Proposed Action, areas that would be modified and/or eliminated include the roadway and security area west of and parallel to Greenwich Street that connects the north part of the Project Site with the Liberty Street ramp, as well as portions of the roadway/delivery area between Freedom Tower and Tower 2.

Overall, the At-Grade Loading Alternative would permit construction of Freedom Tower, the performing arts center, and cultural uses to proceed in advance of completion of the larger sub-grade infrastructure, access, and loading facilities planned for the balance of the Project Site, and could permit earlier completion of the Memorial, Memorial Center and cultural facilities. By reducing the required sub-grade vehicle connections between the Southern Site and the northern portion of the WTC Site, this alternative would simplify and reduce construction activities in the sub-grade area between Greenwich Street and Route 9A. In addition to simplifying the construction of these components, this alternative would permit exploration of other uses such as enhanced sustainable components for sub-grade portions of the Proposed Action that would have been associated with expanded sub-grade access and loading facilities.

LAND USE AND PUBLIC POLICY

Like the Proposed Action, this alternative would redevelop the Project Site with a mix of active uses and open space. The construction of at-grade vehicular access points would result in a slightly altered configuration of uses at the Project Site compared to the Proposed Action, namely the passenger car parking facility below Freedom Tower and reconfigured truck loading area. However, the land uses introduced with this alternative would be the same as those introduced under the Proposed Action. These uses would be consistent with and supportive of the existing and future land uses and public policies in the surrounding Lower Manhattan central business district, as well as those uses and policies which existed at the Project Site prior to September 11. No significant adverse impacts to land use or public policy would result from this alternative.

URBAN DESIGN AND VISUAL RESOURCES

With the at-grade loading alternative as compared to the Proposed Action, trucks, vehicle elevators, and automobile parking garage access would become a part of the streetscape at the Performing Arts Center and on Vesey, Washington, Barclay and Greenwich Streets. Trucks would be seen queuing on Washington Street for security checks before entering the truck elevators. Automobiles would also enter and exit the parking garage on Vesey Street. On the Project Site, sidewalks on Vesey Street would be interrupted by driveways and active vehicular movement. The Performing Arts Center might be a taller building because of this at-grade use. Otherwise, this alternative would have visual and urban design impacts similar to the Proposed Action.

HISTORIC RESOURCES

The increased visual presence of trucks in the at-grade loading alternative would change the context of the Barclay-Vesey Building along its south façade on Vesey Street and its east façade on Washington Street. Although the trucks would be most evident on Washington Street, they would not be new to the area. The loading docks for 7 WTC also open on this street and the truck docks for the Church Street Station/Federal Office Building facing West Broadway. Otherwise, this alternative would not have any additional effect on historic resources.

OPEN SPACE

Compared to the Proposed Action, this alternative would have the same amount and type of open space as well as the same number of potential open space users. Overall, open space conditions would be the same as those under the Proposed Action, and there would not be a significant adverse impact to open space.

SHADOWS

Although there would be some at-grade (and below-grade) differences between this alternative and the Proposed Action related to loading and vehicular circulation, there would be no substantial difference in building height, bulk or volume. Therefore the effect of shadows resulting from new structures would be the same for either this alternative or the Proposed Action.

COMMUNITY FACILITIES AND SERVICES

Compared to the Proposed Action, this alternative would have the same potential users of community facilities. Overall, conditions would be the same as those under the Proposed Action, and there would not be a significant adverse impact to community facilities.

SOCIOECONOMIC CONDITIONS

As with the Proposed Action, this alternative would result in substantial redevelopment, including equal amounts of new office and retail space and new non-commercial land uses. Therefore, many of the economic benefits associated with the construction and operation of the proposed uses—including direct and indirect employment, wages and salaries, business and sales tax, and total economic output—would be expected to be similar. Given that below-grade construction requirements would be somewhat reduced under this alternative, the economic benefits generated by this aspect of construction would be similarly reduced. Overall, neither this alternative nor the Proposed Action is expected to result in significant adverse socioeconomic impacts.

NEIGHBORHOOD CHARACTER

As with the Proposed Action, this alternative would represent a substantial improvement to the WTC Site and surrounding area by replacing a largely vacant and inactive site that is a detriment to the character of the area, with a mix of active uses, new urban design elements, improved transportation connections, and new open spaces. The construction of at-grade vehicular access points which would result from this alternative would not change the benefits to neighborhood character that would result from the redeveloped Project Site. Similar to the Proposed Action, the amenities associated with this alternative would make the area livelier and would serve as a key component of the broader initiative to make Lower Manhattan a more attractive place to live, work, and visit. By removing the post-disaster blighted conditions that currently exist at the WTC Site and replacing them with the Memorial, new cultural uses, open spaces, and office, retail, and hotel uses, this alternative would help to revitalize the Project Site and the surrounding neighborhoods. As discussed below, truck queuing on Vesey and Barclay Streets would have adverse effects on the immediate neighborhood. In other respects, this alternative would result in substantial benefits to neighborhood character that are similar to those of the Proposed Action.

HAZARDOUS MATERIALS

Compared to the Proposed Action, this alternative would have the same hazardous materials conditions. Overall, conditions and potential mitigation measures would be the same as those for the Proposed Action, and there would not be a significant adverse hazardous materials impact.

INFRASTRUCTURE

Under this alternative, there would be small changes to infrastructure conditions compared to the Proposed Action though as noted above, the alternative could provide an opportunity for LMDC, the Port Authority, and Silverstein Properties to explore more efficient uses of sub-grade space on the Project Site in order to enhance the Environmental Performance Commitments incorporated in the Proposed Action. Nonetheless, with either this alternative or the Proposed Action, there would not be a significant adverse impact to infrastructure.

TRAFFIC AND PARKING

Under this alternative, traffic and parking patterns would most likely remain the same north of Chambers Street and south of Rector Street on Route 9A when compared to the Proposed Action. Under the Proposed Action's site plan, at-grade ingress and egress maneuvers for vehicles would be concentrated at the Vesey Street and Liberty Street accesses; underground, each tower would be accessed by a series of ramps and roadways for autos and trucks. The At-Grade Loading Alternative would provide direct access to Freedom Tower, cultural buildings, the Memorial and Memorial Center. The remainder of the Project Site would have the same service vehicle access system as the Proposed Action. At-grade access would be provided midblock on Vesey Street between Washington and Greenwich Streets for trucks serving Freedom Tower, the cultural buildings, and the Memorial. Freedom Tower autos would also access the site midblock at this location. Buses would circulate in approximately the same way as the Proposed Action. Passenger cars for Towers 2 through 5 would enter the below-grade system via the ramp at Liberty Street instead of at Vesey Street.

The At-Grade Loading Alternative calls for the use of the east curb of Washington Street between Vesey and Barclay Streets or at another location for security inspection. This would be problematic because this curb space and all of Washington Street on this one block is already dedicated for the 7 WTC truck docks and the extensive maneuvering on Barclay and Washington Streets that will be needed for trucks to access those docks. Since the 7 WTC truck docks are already constructed, security inspections and the queuing of trucks waiting for inspection would have to take place on Vesey or Barclay Streets. In this case, a curb lane of one of these two streets would be blocked, and could not be used as a travel lane or for taxis and black cars picking up or discharging passengers. Under the Proposed Action all delivery vehicle activity would take place underground and the curb lane would be

Traffic patterns on Route 9A between Rector and Chambers Streets would be comparable to the Proposed Action, with a larger portion of autos destined to the Liberty Street garage entrance under this alternative. Traffic delays on Vesey, Greenwich and Fulton Streets bordering or within the site would be increased compared to the Proposed Action, since autos wanting to park in the 300-car garage would be using these streets rather than going directly into the underground garage via Liberty Street.

TRANSIT AND PEDESTRIANS

The At-Grade Loading Alternative is expected to result in approximately 50 truck movements (total entering and leaving) at the truck elevators on the south side of Vesey Street during the am peak hour. The truck movements during this period amount to less than one per minute. In general, pedestrians are projected to move in platoons as a result of the potential signal located east and west of the truck driveway on Vesey Street. This would include those proposed at the east-west crosswalk on northern side of the Vesey Street and Washington Street and the north-south crosswalk at the eastern side of the Vesey Street and Washington Street to serve to control the number and frequency of trucks entering the Vesey Street and Washington Street intersection. Truck movements are not expected to have a significant impact on pedestrians assuming trucks would not block the Vesey Street and Washington Street intersection or the south sidewalk on Vesey Street It is expected that pedestrians may be required to wait an additional 15-20 seconds while trucks temporarily stack along Vesey Street queue to enter the elevators. The security staging areas along Washington Street north of Vesey Street could also moderately increase pedestrian delays. Passenger car entrances and exits at Vesey Street would not add significantly to pedestrian delay.

AIR QUALITY

The At-Grade Loading alternative would replace the Vesey Street sub grade vehicular portal, with vehicle elevators for cars and trucks serving the Freedom Tower and trucks servicing the Memorial and cultural facilities. Since sub-grade vehicular activity would still occur, the emissions predicted from the below grade facilities, presented in Chapter 14, "Air Quality," would be similar, and the ventilation system could still be planned in such a manner so as to ensure that no significant adverse air quality impacts occur due to ventilation.

Since the alternative would be expected to increase truck traffic in the area of Vesey and Washington streets, would cause queuing of trucks on Washington and Vesey Streets for security inspection prior to entering, and possibly queuing of trucks and cars in general due to the use of elevators, additional emissions would be expected at street level. The layout of the queue locations, and other planning measures such as strict enforcement of engine shut-down during queuing, would need to be considered in such a way as to minimize any potential air quality impacts.

NOISE

Noise associated with the proposed alternative would be mostly attributed to the truck idling at the inspection station on Washington Street. The noise associated with truck idling would be minimal since each truck entering the garage would be limited to maximum of 3-minute idling. The elevators and entry/exit ramps would be underground and covered by the surface pavement and would not generate any noise at the street level. In addition, there are no sensitive receptors in the immediate vicinity of the proposed screening, access, or elevator area.

COASTAL ZONE

Like the Proposed Action, this alternative would be consistent with coastal resources policies, including those aimed at supporting revitalization and providing access to waterfront areas.

FLOODPLAIN

As with the Proposed Action, development of this alternative would not have an impact on floodplain conditions.

NATURAL RESOURCES

Compared to the Proposed Action, this alternative would have the same potential for impacts to natural resources.

ELECTROMAGNETIC FIELDS

Under this alternative, EMF conditions would be substantially similar to those with the Proposed Action. In either case, there would be no significant impacts.

CONSTRUCTION IMPACTS

The development of this alternative would have impacts similar to those described for the Proposed Action, except that Freedom Tower, the performing arts center, and cultural facilities, and truck servicing for the Memorial would be less dependant on completion of sub-grade infrastructure on the balance of the Project Site. For this reason it is possible that construction of some of that infrastructure would be deferred or modified under the alternative.

23.11 COOLING TOWERS ALTERNATIVE

Under this alternative, individual cooling towers with refrigeration plants would be constructed in each of the office towers and other principal structures of the Proposed Action. A cooling tower removes heat from water that has been used in an air conditioning system. The water is cooled by contact with air, causing a small amount of the water to evaporate and the rest of the water to be cooled. The refrigeration plant contains the condenser, compressor and evaporator. From the refrigeration plant the cooled water circulates throughout the building by pipes and back to the cooling tower. Use of conventional cooling towers would replace the proposed reactivation of the Hudson River cooling water intake system (CWIS) that served the WTC complex prior to September 11.

For most analysis areas examined in the FGEIS, this alternative would have impacts that would be substantially the same as those under the Proposed Action. However, as discussed below, this alternative would avoid the potential adverse impacts on aquatic organisms of the CWIS described in Chapter 18, "Natural Resources." On the other hand, this alternative would forego the energy efficiency for which the CWIS was designed, would consume significant quantities of potable water and electricity, and would also require substantial amounts of space in each of the office towers and other principal structures of the Proposed Action, with the potential for new or increased adverse impacts on visual resources and shadows.

INFRASTRUCTURE

Water

Compared to the Proposed Action, consumption of potable water would increase with individual cooling towers and refrigeration plants by approximately 290 million gallons per year.

Energy

This alternative would result in a substantial increase in energy needs for the Project Site. A cooling tower system can typically account for up to 35 percent of a building's electricity use. It is estimated that the cooling towers would require 7.2 million kilowatt hours per year, representing an approximate 23 percent increase over the electricity required by the CWIS with the Proposed Action.

URBAN DESIGN AND SHADOWS

This alternative would require more above-grade space than the existing CWIS. Without the CWIS, individual cooling towers would be required in each building on the Project Site. Each of the cooling towers would require approximately 18,000 to 24,000 square feet of floor area and add approximately 30 to 50 feet to the height of each building. This could have significant adverse visual effects and would likely increase the adverse shadow impacts noted in Chapter 7, "Shadows." ✷