Chapter 23: Mitigation

A. INTRODUCTION

The preceding chapters of this Environmental Impact Statement (EIS) discuss the potential for significant adverse environmental impacts to result from the Proposed Actions. Such potential impacts were identified in the areas of socioeconomic conditions (indirect residential displacement), open space; historic resources, shadows, traffic, parking, subway stations, bus line haul, noise, and construction (traffic and noise). Measures have been examined to minimize or eliminate these anticipated impacts. These mitigation measures are discussed below. The effect of the proposed traffic mitigation measures on air quality is also discussed.

This chapter has been updated since the Draft EIS (DEIS) to reflect the results of additional efforts to mitigate significant adverse impacts. The following contains full information and commitments on all mitigation measures to be implemented with the Proposed Actions. Because the identified impacts would occur as the development progressed and not all at one time, the following also describes the anticipated schedule for the implementation of specific mitigation measures. Specific mechanisms for implementation of the mitigation measures will be set forth in a Restrictive Declaration.

B. SOCIOECONOMIC CONDITIONS

OVERVIEW

The socioeconomic conditions analysis in Chapter 4, "Socioeconomic Conditions," finds that the Proposed Actions would not result in significant adverse impacts with respect to four of the five City Environmental Quality Review (CEQR) areas of socioeconomic concern: (1) direct residential displacement; (2) direct business and institutional displacement; (3) indirect business and institutional displacement; and (4) adverse effects on a specific industry.

The following section summarizes the impacts and describes mitigation measures for significant adverse impacts that could result due to indirect residential displacement in the primary study area.

INDIRECT RESIDENTIAL DISPLACEMENT MITIGATION

As described in Chapter 4, the projected University demand in the socioeconomic reasonable worst-case development scenario (for an estimated 839 non-University housing units in the primary study area), combined with potential demand generated by a non-University population due to the increased livability and overall residential appeal of the neighborhood, could place upward pressure on market-rate rents, which could result in significant adverse indirect residential displacement impacts in the primary study area by 2030.

Residential demand generated by the Proposed Actions would be partially absorbed by individuals' purchases of owner-occupied housing in the study area, and by turnover within the

rent-regulated housing stock in the study area. The remaining demand could place upward rent pressure on the 1,318 units in the primary study area that would be vulnerable to rent increases, which in turn could lead to the indirect displacement of approximately 3,293 residents of these at-risk units by 2030. While it is impossible to quantify the exact number of at-risk residents who would be indirectly displaced as a result of the Proposed Actions, there is the potential for the indirect residential displacement impact within the primary study area to be significant and adverse.

The significant impacts would not extend to the portion of the secondary study area outside the primary study area for the following reasons: there would be much less University-generated housing demand in this area (in the socioeconomic reasonable worst-case development scenario, only 26 percent of University-generated housing demand, or 292 units, is projected to occur outside the primary study area); the general upgrading influence of the new university area would be somewhat limited by the Project Area's relatively isolated location, surrounded by transportation viaducts and taller institutional and residential redevelopment such as the Riverside Community Complex, and the large structures that constitute the New York City Housing Authority (NYCHA) Manhattanville Houses, and General Grant Houses; and the Project Area's influence on the overall residential attractiveness of the secondary study area would be limited because this area is farther from the Project Area. Overall, in the northern and southern portions of the secondary study area, other market forces would play a larger role in shaping development trends in the future with and without the Proposed Actions.

Potential mitigation measures for indirect residential displacement that are listed in the *CEQR Technical Manual* include: providing appropriate, comparable space as part of the project, either on-site or off-site but within a reasonable distance of the current location of the units that would be displaced; contributions to tenant advocacy groups; or enacting laws and regulations to prevent indirect displacement from occurring. The potential mitigation measures listed in the *CEQR Technical Manual* are not necessarily appropriate for the Proposed Actions, because they focus primarily upon limiting the adverse impacts created by a single development program, in which a new population is being introduced to a neighborhood by means of new residential development. In the case of the Proposed Actions, the factor that would have a greater influence on study area rents is the off-site housing demand that may be created by a University-affiliated population, as well as by the general population due to the likely increased residential desirability of the neighborhood.

Recognizing that the Proposed Actions may result in upward pressure on market rents, Columbia has agreed to address the need for affordable housing within Community Board 9 (CB9). Specifically, Columbia has proposed to: (1) establish a $20 million fund to develop or preserve affordable housing; (2) enact a range of programs to reduce University-generated housing demand; and (3) fund anti-eviction/anti-harassment legal services for Manhattanville residents, as discussed below. Collectively, these measures would partially mitigate the significant adverse impacts of the Proposed Actions.

DEVELOP OR PRESERVE AFFORDABLE HOUSING

The Fund

Columbia has committed $20 million toward the establishment of the Manhattanville Neighborhood Preservation Fund (the "Fund"), an independent not-for-profit loan fund whose purpose would be to provide financing to encourage and facilitate the preservation and development of affordable housing in CB9. In accordance with the provisions of the Fund, $10

million would be deposited in the Fund at the time of the issuance of the first Phase 1 New Building Permit, and the remaining $10 million would be deposited in the Fund at the time of the issuance of the first Phase 2 New Building Permit.

The Fund is intended to provide a range of flexible and affordable financing products to community-based and private developers to fill financing gaps and leverage other sources of public and private debt, equity, and subsidy for the development and preservation of affordable housing. A preliminary list of financing products includes (further information about the Fund is provided in Appendix P.1):

- **Below-Market Acquisition Loans.** These 1 percent acquisition loans are expected to be used in conjunction with the New York City Acquisition Fund to write down the cost of loans originated by the Acquisition Fund and/or to permit acquisition of sites with costs that exceed the limitations of the Acquisition Fund. These loans would have a maximum term of 3 years with a loan amount averaging $50,000 per unit.
- **Land Write-Down Grants.** These grants are expected to be used in conjunction with any available New York City, State, or federal subsidy programs to write down the cost of land acquisition. These grants are expected to average $50,000 per unit.
- **Capital Improvement Loans.** According to the New York City Department of Housing Preservation and Development (HPD), there are over 3,000 units in limited-equity cooperatives in CB9. Many of these cooperatives are at risk of failure due to significant building code violations and/or a need for substantial capital repairs. The Fund could provide low-interest capital loans to stabilize and repair these at-risk properties. Preliminary plans call for 1 percent loans with an average size of $20,000 per unit and an average loan term of 10 years.
- **Working Capital for Pre-Development.** The Fund could provide a source of inexpensive short-term capital to not-for-profit affordable housing developers to undertake financial feasibility, architectural, engineering, environmental, and planning studies and other carrying costs while construction and permanent financing sources are being assembled. Preliminary estimates identify a need for an average of $10,000 per unit with an average loan term of 3 years.
- **Flexible Gap Financing for Preservation Transactions.** Even with low-income housing tax credits, tax-exempt financing, and various HPD and New York City Housing Development Corporation (HDC) subsidy programs, preservation transactions often have financing gaps. The Fund could provide flexible below-market financing to close such gaps and to help preserve at-risk affordable housing projects. Preliminary estimates identify an average loan size of $60,000 per unit with an average loan term of 15 years.
- **Homebuyer Assistance Loans.** These would be low-interest subordinate loans for the purchase of co-ops and condominiums by low- and moderate-income homebuyers. The purpose of these loans would be to expand homeownership opportunities to a broader band of households and to help defray closing costs. These 1 percent loans are expected to average $25,000 per unit with an average loan term of 15 years.

Using a reasonably conservative portfolio mix and default scenario, it is expected that approximately 1,110 affordable units would be created or preserved. To help ensure that this projection would be met and that financing opportunities would be oriented toward mitigation of the indirect residential displacement impact, the Fund would be organized with the following purposes:

1. To maximize the number of affordable housing units preserved and/or created by the Fund within CB9; and

2. To operate in manner consistent with City housing policies.

Incremental Affordable Units at Relocation Sites

In addition, as described in Appendix B.2, residential development on Project Area relocation sites would result in 31 additional affordable housing units in the study area (above the 75 units for directly displaced residents).

Total

Taken together, the Fund and this incremental affordable housing would result in the preservation and/or development of an estimated 1,141 units (see Table 23-1). While some of the 1,141 units could be located outside of the primary study area within CB9, the total amount (1,141 units) represents approximately 87 percent of the total number of at-risk units in the primary study area.

Table 23-1
Columbia Mitigation for Indirect Residential Displacement Impacts: Preservation and/or Development of Affordable Housing in CB9

At-risk units	
Maximum at-risk units in primary study area	**1,318**
Units preserved and/or developed	
$20 million housing fund	1,110
Incremental units on project relocation sites	31
Subtotal (affordable housing developed or preserved)	**1,141**

Source: Columbia University; Forsythe Street Advisors.

ANTI-EVICTION/ANTI-HARASSMENT LEGAL ASSISTANCE

Starting in 2009 and continuing through 2030, Columbia would commit to provide funding for anti-eviction/anti-harassment legal assistance for Manhattanville residents. Starting in 2015, Columbia would commit to provide additional funding for this legal assistance. Funding would be provided for staff lawyers at legal assistance provider(s) serving the Manhattanville area, acceptable to HPD. Funding would continue through 2030 and would total approximately $4 million.

PROGRAMS TO REDUCE UNIVERSITY-GENERATED HOUSING DEMAND

Under the socioeconomic reasonable worst-case development scenario, the maximum unmet demand for Columbia students and faculty within the primary study area is estimated to be 839 units. In addition to the $20 million fund to develop or preserve affordable housing described above, Columbia proposed three measures in the DEIS to reduce the potential demand for housing in the study area by its employees and graduate students. Since the DEIS, Columbia has established the details of each and in doing so, has refined the estimated mitigation effect of each program.

1. **University Retiree Units.** Currently, more than 200 University units within the secondary study area are occupied by retirees and their spouses. Beginning in 2012, Columbia would

reserve and allocate some portion of the units vacated by University retirees for housing new faculty members of the faculties of Arts and Sciences and other schools that would have programs in the Project Area.

2. **Develop a Graduate Student Residence Outside the Project Area.** Columbia would utilize a development site located on Broadway and West 172nd Street. The site has a lot area of approximately 10,566 square feet and could accommodate at least 200 graduate students and post-doctorate researchers in 159 units, an increase over the 110 units estimated in the DEIS. Columbia would commit to developing this site no later than 2013 to accommodate graduate students and post-doctorate researchers associated with Phase 1 and Phase 2 programs. An analysis of the potential environmental impacts that could result from the construction and operation of the new University housing building is provided in Appendix P.2.

3. **Residential Loan Program for Faculty.** Columbia launched a pilot residential loan assistance program in the spring of 2007 to encourage ownership by faculty outside the primary and secondary study areas. In the first six months of this pilot program, six residential loans were issued to newly recruited faculty who would have otherwise sought University housing. Based on the success of this pilot program, Columbia has committed to a faculty residential loan program to satisfy an average demand of 15 residential loans per year. Columbia would reserve and allocate some portion of the 15 residential loans per year to new faculty members of the faculties of Arts and Sciences and other schools that would have programs in the Project Area.

The development of a graduate student residence would reduce University-generated demand in the primary study area in 2030 by at least 159 units (200 students). The two additional measures would further reduce University-generated demand.

In addition, the socioeconomic reasonable worst-case development scenario minimizes on-site housing for graduate students, faculty, and other employees (562 units only), generating the greatest potential off-site demand for housing and thereby maximizing the potential indirect residential displacement impact. The Illustrative Plan[1]—which is the program currently envisioned by the University—contains 87 additional on-site housing units for University affiliates (for a total of 649 units). Columbia would commit to develop these additional units, which—when combined with the mitigation measures detailed above—could reduce the University-generated demand for off-site housing within the primary study area by at least 246 units. These units would satisfy at least 29 percent of the maximum Columbia off-site housing demand within the primary study area.

SUMMARY

The mechanisms proposed by Columbia to provide additional University housing and preserve and develop affordable housing for area residents would partially mitigate the Proposed Actions' potential significant adverse indirect residential displacement impact. As shown in Table 23-1, the $20 million fund—combined with the incremental affordable units at relocation sites—would preserve and/or develop an estimated 1,141 units in CB9, an amount representing approximately 87 percent of the total number of at-risk units in the primary study area. The programs to provide additional University housing would result in at least 246 additional

[1] The Illustrative Plan in the DEIS has been revised in the FEIS to reflect the addition of the School of International and Public Affairs to Site 7.

housing units, which would satisfy at least 29 percent of the maximum Columbia off-site demand in the primary study area under the socioeconomic reasonable worst-case development scenario.

With these mitigation measures in place, there would be some remaining off-site housing demand from the University-generated population, and there would be demand generated by the non-University population due to the increased livability and overall residential appeal of the neighborhood. While indirect displacement could still occur with the Proposed Actions, with the preservation and/or development of a substantial amount of affordable housing within CB9 and other mitigations described above, the amount of displacement would likely be less.

These measures will be set forth in a Restrictive Declaration.

C. OPEN SPACE

OVERVIEW

Chapter 6, "Open Space," identifies both direct and indirect impacts on open spaces. Specifically, the Proposed Actions would result in the following significant adverse impacts on open space:

- Direct shadow impacts in the 2030 analysis year on the I.S. 195 Playground during the March and December analysis periods, when large incremental shadows would cover the playground for long durations.
- Indirect significant adverse impacts on the passive open space ratios in the non-residential study area in both the 2015 and 2030 analysis years, and an indirect significant adverse impact on the active open space ratio in the residential study area in the 2030 analysis year.

MITIGATION FOR SHADOWS ON OPEN SPACE

The *CEQR Technical Manual* identifies several different measures that could mitigate significant adverse shadow impacts on open spaces. These measures could include relocating facilities within an open space to avoid sunlight loss, relocating or replacing vegetation, undertaking additional maintenance to reduce the likelihood of species loss, or replacement facilities on another nearby site. CEQR guidelines also discuss alternatives that may reduce or eliminate shadow impacts, including reorientation of the building's bulk or reorientation of the site plan.

The I.S. 195 Playground contains six paved basketball courts and other paved areas for active recreation activities. This open space is primarily used by school students, but it is open to the public after school. There are five to six basketball hoops (half court only) and a jungle gym. Some of the pavement is marked for courts, but there are no nets. The walls are painted with murals, and the pavement is also painted with a map of the United States. Even though it is designed for active play and is entirely paved, this 0.68-acre open space would be considerably less attractive in the cooler months of the fall, winter, and spring with the additional shadows created by the Proposed Actions.

Since issuance of the DEIS, several options were considered to mitigate the shadow impacts on the I.S. 195 Playground. The I.S. 195 Playground is small, 0.68 acres, and rectangular shaped, extending narrowly between the edge of the I.S. 195 school building and Broadway (see Figure 7-3). The use of the space in the playground is maximized to accommodate several active recreation features. Based on the extent of the shadow coverage in the March and December

analysis periods and the size and shape of the playground, the existing recreational facilities could not be relocated within the playground space itself to avoid sunlight loss. The playground is located within the I.S. 195 school property, and therefore it would not be desirable to relocate or replace the facilities at another nearby site, particularly since that would require crossing Broadway or another street from I.S. 195. After considering these options, it was determined that mitigation measures to reduce the loss of sunlight on the playground could not be achieved.

Other options were also explored with the New York City School Construction Authority (SCA), acting as Agent for the Department of Education (DOE), as well as the Manhattan Borough President regarding potential enhancements to the I.S. 195 Playground. Although the specific enhancements have not been determined at this time, those enhancements would be designed with the intention of increasing the overall attractiveness and usability of the playground when it would be in shadow. Columbia will work with DOE and SCA to determine the details of the process for implementing the funding and executing the enhancements.

This funding would not directly address the significant adverse shadow impacts at the playground because it would not decrease the loss of sunlight at the I.S. 195 Playground during the March and December analysis periods. Therefore, the funding for enhancements would only partially mitigate the significant adverse shadow impacts on this open space. Columbia's funding commitment described above will be set forth in a Restrictive Declaration.

Chapter 24, "Alternatives," also considers alternatives to reduce or eliminate the shadow impact on the I.S. 195 Playground. As noted in Chapter 24 of the DEIS, to eliminate the shadow impact, the academic research building on Site 17 would have to be reduced by four stories overall and several floors from Site 17 would have to be accommodated in the other academic research buildings (on Sites 2, 6, 6b, 8, or 15). Also being considered in Chapter 24 of the FEIS, as a result of comments made during DEIS and project review, is the option to place University housing on Sites 17 and 11, which would greatly reduce the height of buildings on those sites, would reconfigure and lower the height of the academic research building on Site 12, and would proportionally reduce shadows. The alternative use and height scenario described in Chapter 24 of the FEIS would substantially reduce the extent and duration of incremental shadow during the March/September analysis period, particularly during the late morning and early afternoon.

As noted in Chapter 24 of the FEIS, after reviewing each of the potential options for reducing or eliminating the impact, this FEIS concludes that the two realistic options to address the shadow impacts on the I.S. 195 Playground are either to maintain the project and building heights as proposed, allowing the impact to occur, but applying the funding for enhancements as partial mitigation to the playground, or to seek a modification to the Proposed Actions to change the uses and related building heights and configuration and thus the building sizes on Sites 17, 12, and 11.

INDIRECT EFFECTS MITIGATION

Because the Proposed Actions could result in indirect significant adverse impacts on passive and active open spaces, it is necessary to identify measures to mitigate these impacts to the greatest extent practicable. The *CEQR Technical Manual* lists potential on- and off-site mitigation measures. These measures include creating new public open spaces on-site or elsewhere in the study area of the type needed to serve the proposed population and offset their impact on existing open spaces in the study area, and improving existing open spaces in the study area to increase their utility, safety, and capacity to meet identified needs in the study area.

Since issuance of the DEIS, several options were considered to mitigate the significant adverse indirect open space impacts. Columbia University has agreed to create publicly accessible open space on Block 1996, Lot 1, the location of development Site 5 of the Illustrative Plan (see Figure 23-1). This site is currently occupied by the Cotton Club and, as described in Chapter 1, "Project Description," is identified for development of commercial and/or retail space in the Illustrative Plan. Columbia proposes to acquire Block 1996, Lot 1, through either: (a) negotiation with the Cotton Club and relocating the Cotton Club within the immediate area (if reasonable terms can be agreed upon); or (b) through the subsequent discretionary exercise by the New York State Urban Development Corporation (doing business as the Empire State Development Corporation [ESDC]) of condemnation of such lot, subsequent to the adoption of a General Project Plan (GPP) and compliance with the Eminent Domain Procedure Law. Assuming that the site is acquired by Columbia, and subject to the approval of the New York City Department of Parks and Recreation (DPR), Columbia would convey the site to the City and would be responsible for up to $30,000 per year for 25 years to be used for site maintenance. Columbia would construct the new publicly accessible open space in accordance with all DPR requirements. It is anticipated that the new publicly accessible open space would be constructed and open by 2015, subject to acquisition of the site by Columbia.

This site would provide an additional 6,300 sf of open space, which would result in a total of approximately 2.3 acres of new publicly accessible open space in the Project Area. The size, triangular shape, and location of this open space (see Figure 23-1) would not be appropriate to accommodate any active open space facilities. Therefore this space would be developed as passive open space. Although the specific passive open space programming for this site has not been determined at this time, it is anticipated that passive open space features such benches and landscaping would be included to create new high quality open space. This amount of new passive open space would not substantially increase the passive open space ratios in the future conditions with the Proposed Actions to eliminate the significant adverse indirect impact. As noted above, this new open space could not accommodate active open space features; therefore it would not directly address the significant adverse indirect active open space impact. However, the additional open space would serve as partial mitigation because it would improve the overall availability of passive open space in the study area. This new publicly accessible open space would enhance the open space network of the Project Area and connection to the West Harlem Waterfront park. Development of this new triangular open space would further the transformation of West 125th Street into a gateway to the waterfront.

Additional options were also explored with DPR to create new open space elsewhere in the study area and/or improve existing open spaces in the study area to increase their utility, safety, and capacity to meet identified needs in the study area. Columbia has agreed to contribute $500,000 per year, increasing at 3 percent annually, for the West Harlem Waterfront park (currently under construction) for a period of 25 years. The funding would commence following the approval of the proposed rezoning but not later than the opening of the park. This funding would not directly address the significant adverse indirect open space impacts because it would not result in a decrease in the demand on existing open spaces in the study area. However, the funding is intended to allow DPR to hire dedicated staff and to provide services to promote the attractiveness of the space for increased usage, access, convenience, safety. This funding would only partially mitigate the significant adverse indirect open space impacts. Additional details regarding the funding will be included in an agreement between DPR, the New York City Economic Development Corporation (EDC), and Columbia. Columbia's funding commitment described above will be embodied in a legally binding instrument.

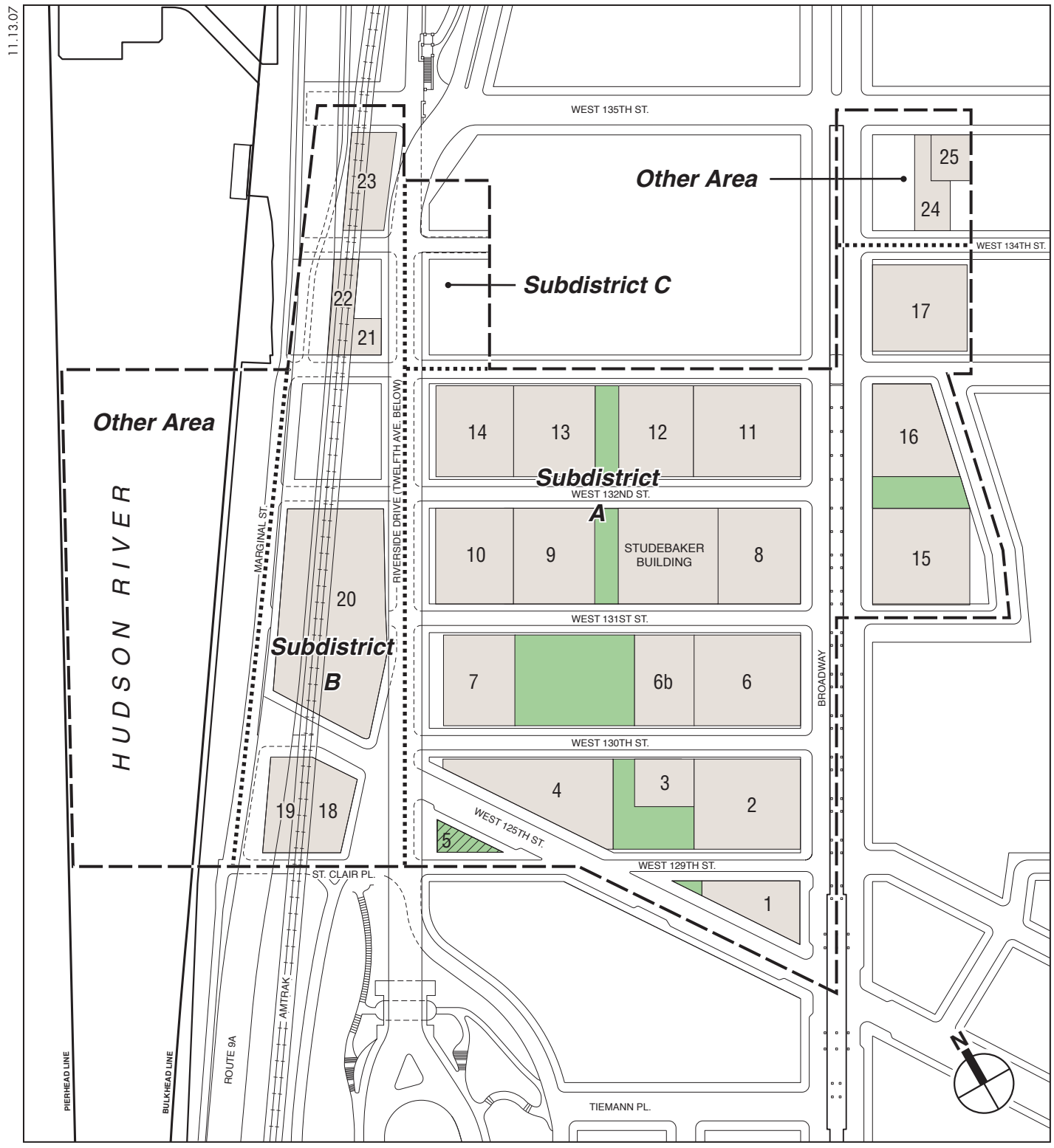

Figure 23-1

New Project Area Open Space with Mitigation: 2030 Future with the Proposed Actions

MANHATTANVILLE IN WEST HARLEM REZONING AND ACADEMIC MIXED-USE DEVELOPMENT

Overall, the measures described above would only partially mitigate the indirect significant adverse impacts on open space. Columbia's commitments described above will be set forth in a Restrictive Declaration.

ANALYSIS OF MITIGATION

The following analyzes the potential environmental effects the partial mitigation of developing Site 5 in the Project Area as new publicly accessible open space instead of a commercial and/or retail space (approximately 10,970 sf) in the Illustrative Plan, would result in fewer employees than that of the Proposed Actions. Therefore, as compared with the Proposed Actions, this partial mitigation would result in fewer or no changes in the effects related to socioeconomic conditions, infrastructure, solid waste, energy, traffic and parking, transit and pedestrians, or air quality. The partial mitigation of developing Site 5 of the Illustrative Plan as new publicly accessible open space would not affect the analysis of community facilities, historic resources, natural resources, waterfront revitalization, and public health.

With regard to land use, neighborhood character, and urban design, the partial mitigation of developing Site 5 as new publicly accessible open space would enhance the open space network of the Project Area and connection to the West Harlem Waterfront park. Development of this new triangular park as mitigation would further the transformation of West 125th Street into a gateway to the waterfront, and would result in a total of approximately 2.3 acres of publicly accessible open space in the Project Area.

As described in Chapter 12, "Hazardous Materials," an E-designation, pursuant to Section 11-15 of the New York City Zoning Resolution, would be placed on this lot to address hazardous materials conditions. Pursuant to this E-designation, appropriate environmental testing and remediation would be required in consultation with the New York City Department of Environmental Protection (DEP) before this site would be redeveloped as a commercial/retail building in the Illustrative Plan. Such an E-designation would also apply to the development of Site 5 as new publicly accessible open space.

As shown in Chapter 20, "Noise," noise levels within this new open space area would be above the *CEQR Technical Manual* noise exposure guideline of 55 dBA $L_{10(1)}$ for outdoor areas requiring serenity and quiet. Although noise levels in the new open space area would be above the CEQR guideline, they would be comparable to noise levels in several other New York City open space areas and parks, including all or portions of Hudson River Park, Riverside Park, Central Park, Bryant Park, and Paley Park, and would not result in a significant adverse noise impact.

As described in Chapter 21, "Construction," Site 5 is proposed to be under construction for commercial and/or retail space between 2020 and 2021. It is anticipated that the new publicly accessible open space would be constructed and open by 2015, subject to acquisition of the site by Columbia. The construction of this new publicly accessible open space would involve minimal construction activities, such as demolition of the existing structure and construction of new passive open space amenities. Therefore, the change to the construction schedule for this site would result in fewer or no change in the environmental effects associated with construction, as compared to the Proposed Actions.

Therefore, the partial mitigation of developing Site 5 of the Illustrative Plan as new publicly accessible open space would not result in any significant adverse environmental impacts not already identified in this FEIS.

D. SHADOWS

The only identified significant shadow impact of the Proposed Actions is the impact on the I.S. 195 Playground in 2030 in the December and March/September time periods. Mitigation for this impact is discussed above, in "Open Space."

E. HISTORIC RESOURCES

OVERVIEW

As described in Chapter 8, "Historic Resources," demolition of the former Sheffield Farms Stable at 3229 Broadway in the Academic Mixed-Use Area (Subdistrict A) for the initial (2015) phase of development constitutes a significant adverse impact. Measures that would partially mitigate adverse impacts on this resource are described below. Redevelopment by 2030 would result in the removal of the West Market Diner in the Academic Mixed-Use Area. To avoid any adverse impacts, Columbia University, in consultation with OPRHP, would relocate the 1948 dining car of the West Market Diner to a new site in the Project Area or study area and restore the diner to the extent practicable.

HISTORIC RESOURCES: 2015

The portion of the Academic Mixed-Use Development assumed to occur by 2015 (the "2015 development area") would directly affect one architectural resource, the former Sheffield Farms Stable at 3229 Broadway. Specifically, development of the academic research building proposed on the site of the former Sheffield Farms Stable would require the demolition of the former stable. Demolition of this historic resource constitutes a significant adverse impact on architectural resources. Proposed measures that would partially mitigate the impact of the demolition of this historic resource include the following:

- Historic American Buildings Survey (HABS) Level I documentation of the former Sheffield Farms Stable, to be conducted by a recognized professional credentialed for preparing such reports, to be submitted to OPRHP, the New York Historical Society, and the Museum of the City of New York.
- Development and installation of a permanent interpretive exhibit or exhibits in or near the Project Area to document the history of the former Sheffield Farms Stable and to encompass the larger historic of the Manhattanville neighborhood. Elements that would be considered for the exhibit include the HABS documentation; salvaged elements representative of the design of the façade of the Sheffield Farms Stable and of its interior related to its use as a stable; historic and current photographs, drawings, and narratives depicting the social, industrial, and architectural history of Manhattanville; historic industrial element salvaged from the rehabilitation of the Studebaker Building; and interactive and multimedia features, which could include 3-D mapping, audio recordings of oral histories and neighborhood sounds, film/video recordings of neighborhood elements, and on-line database of neighborhood information.

Also, to avoid construction-related impacts on architectural resources within 90 feet of project construction, including the West Market Diner, the Manhattan Valley IRT viaduct, the 125th Street IRT Subway Station, the Riverside Drive viaduct, and—to the extent necessary—the former Warren Nash Service Station building and the Studebaker Building, a construction protection plan (CPP) was developed, and the protection measures contained in the CPP were

approved by OPRHP and the New York City Landmarks Preservation Commission (LPC). The approved CPP would be implemented by a professional engineer before any demolition, excavation, and construction.

As described in Chapter 18, "Transit and Pedestrians," modifications would need to be made at the 125th Street IRT Subway Station and the Manhattan Valley IRT viaduct. These modifications would involve replacing the existing escalators with larger capacity escalators. Since the existing escalators are not contributing historic features, having replaced original circulation elements, their removal and replacement with new escalators would not adversely impact the historic character or integrity of the station or the Manhattan Valley IRT viaduct. To avoid any adverse impacts to these historic resources, OPRHP would be consulted with respect to how the new escalators connect to the historic material of the station and the viaduct, if applicable. A CPP would also be prepared to avoid any inadvertent construction-related impacts on these historic structures.

HISTORIC RESOURCES: 2030

Full build-out of the Proposed Actions would require the removal of the West Market Diner at 659 West 131st Street to permit development of an academic or academic research building. To avoid any adverse impacts, Columbia University, in consultation with OPRHP, would relocate the 1948 dining car of the West Market Diner to a new site in the Project Area or study area and restore the diner to the extent practicable. As described in Chapter 8, the relocation of the diner and any restoration would be limited to the 1948 dining car fronting on West 131st Street, since this part of the diner appears to retain many of its original interior features, and it is possible that the original exterior metal cladding of the diner could be present beneath the 1970s brick veneer. However, until the diner is more closely evaluated and the brick cladding removed, the condition of the original exterior material beneath the brick cladding cannot be confirmed, and, therefore, the extent to which it may be restored is not yet known. Due to the extremely deteriorated condition of the 1921 dining car located in the rear, which was converted to the kitchen and stripped of its details, and the lack of historic qualities of the later east addition, OPRHP has determined that these portions of the diner retain little historic integrity and, therefore, these portions of the diner would not be relocated and restored. Where possible, any materials in the 1921 dining car, such as wood roof members, would be salvaged for possible reuse in other historic diners requiring repair or replacement materials.

The former Warren Nash Service Station building would be adaptively reused for academic space. To avoid any adverse impacts, Columbia University has submitted a preservation approach to OPRHP, which would guide Columbia's rehabilitation of the historic structure, and Columbia would implement the preservation approach approved by OPRHP. Once a specific program has been chosen and a design for the adaptive reuse developed by Columbia, a detailed preservation plan would be submitted to OPRHP, and OPRHP would be consulted regarding the proposed alterations to the building.

To avoid adverse impacts on historic resources located within 90 feet of project construction, including the former Warren Nash Service Station building, the Studebaker Building, the Claremont Theater building, the Manhattan Valley IRT viaduct, the 125th Street IRT Subway Station, and the Riverside Drive viaduct, the approved PP would be implemented by a professional engineer before any demolition, excavation, and construction.

F. TRAFFIC AND PARKING

OVERVIEW

The analysis of the Proposed Actions' traffic impacts included a number of traffic improvements as part of the Build condition. These improvements were developed for locations within and bordering the Project Area as part of the project design process to address overall site access, traffic circulation, and pedestrian movement needs. These improvements would also alleviate potential traffic impacts at these locations that would otherwise occur with the Proposed Actions without these improvements. (Appendix M contains an analysis of the potential traffic impacts without these improvements and discusses measures necessary to mitigate impacts of the Proposed Actions without the proposed traffic improvements.) This section discusses the additional measures that would be necessary to eliminate significant adverse traffic impacts at analysis locations within the primary and secondary study areas that are not within or bordering the Project Area.

As described in Chapter 17, "Traffic and Parking," a number of intersections in the primary and secondary study areas would experience significant adverse traffic impacts as a result of the Proposed Actions under the reasonable worst-case transportation development scenario. While the Illustrative Plan would likely result in fewer impacts, the transportation analyses provide a conservative assessment of future conditions with the Proposed Actions and outline viable measures that could mitigate potential significant adverse impacts. The discussion below demonstrates that standard traffic mitigation measures (e.g., revised signal timings, daylighting[1], etc.) would be adequate to fully mitigate these impacts. The implementation of these measures would be conducted in close coordination with the New York City Department of Transportation (NYCDOT) as development proceeds to ensure that projected impacts would not remain unmitigated.

As detailed in the "Operational Analysis Methodology" section of Chapter 17, the operation of an intersection is characterized by its level-of-service (LOS), average vehicle delay, and volume-to-capacity (v/c) ratio. The criteria used for defining significant adverse impacts are based on a sliding scale for various LOS and delay measures. A significant adverse impact is fully mitigated when the projected delay for an intersection lane group or movement under the Proposed Actions is brought back to its No Build level or to marginally acceptable mid-LOS D (45 seconds for signalized intersections and 30 seconds for unsignalized intersections). In some cases, viable mitigation measures for a particular movement could result in additional delay or LOS deterioration for other movements. Such increase in delay and deterioration in LOS do not constitute a significant adverse impact as long as the mid-LOS D threshold is not exceeded, or the increase in delay does not exceed the limits of the sliding scale mentioned above.

With regard to parking, while adequate parking supply would be provided for the Columbia University demand projected for the Proposed Actions, significant adverse parking impacts attributable to the displacement of existing parking facilities within the Project Area were identified.

[1] Daylighting is a measure used to create a limited travel lane for improved traffic operations. This measure would require the removal of several parking spaces, typically for a distance of approximately 100 feet, to allow for transitioning of vehicle movement.

TRAFFIC: 2015

PRIMARY STUDY AREA

In the 2015 Build condition, two locations in the primary study area would experience significant adverse traffic impacts during one or more of the analyzed peak periods:

- Riverside Drive and West 135th Street during the PM peak period; and
- Amsterdam Avenue and West 125th Street during the AM, midday, and PM peak periods.

Each of the above significant adverse impacts could be fully mitigated as outlined below. A comparison of the analysis results is presented in Tables 23-2, 23-3, and 23-4.

Table 23-2
Comparison of 2015 No Build, Build, and Mitigated AM Peak Hour Conditions
Primary Study Area Signalized Intersection Level-of-Service Analysis

	2015 No Build AM Peak Hour				2015 Build AM Peak Hour				2015 Mitigated Build AM Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Riverside Drive @ West 135th Street													
Westbound	L	0.59	35.0	C	L	0.33	28.2	C	L	0.33	28.2	C	Provide 2 Thru & 1 Right NB.
	R	0.43	31.7	C	R	0.45	32.1	C	R	0.45	32.1	C	
Northbound	TR	0.23	8.2	A	TR	0.23	8.2	A	T	0.16	7.7	A	
									R	0.20	8.4	A	
Southbound	LT	0.86	13.6	B	LT	0.88	14.5	B	LT	0.85	12.7	B	
	Int.		15.5	B	Int.		14.9	B	Int.		13.7	B	
Amsterdam Avenue @ West 125th Street													
Eastbound	L	1.39	264.3	F	L	1.39	264.3	F	L	1.39	262.8	F	Restripe to add one NB right turn
	TR	0.99	60.5	E	TR	1.05	75.6	E+	TR	0.95	48.8	D	lane.
Westbound	L	1.08	148.3	F	L	1.20	194.1	F+	L	0.97	110.5	F	Transfer 3 seconds from NS to EW.
	TR	1.02	66.8	E	TR	1.12	100.5	F+	TR	1.02	62.6	E	
Northbound	L	0.35	15.7	B	L	0.37	16.1	B	L	0.40	18.9	B	
	TR	0.73	28.6	C	TR	0.73	28.5	C	T	0.43	23.5	C	
									R	0.77	42.7	D	
Southbound	L	0.53	26.7	C	L	0.54	27.1	C	L	0.50	22.9	C	
	TR	0.44	21.6	C	TR	0.44	21.7	C	TR	0.48	24.4	C	
	Int.		56.1	E	Int.		70.7	E	Int.		51.9	D	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-3

Comparison of 2015 No Build, Build, and Mitigated Midday Peak Hour Conditions
Primary Study Area Signalized Intersection Level-of-Service Analysis

	2015 No Build Midday Peak Hour				2015 Build Midday Peak Hour				2015 Mitigated Build Midday Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Riverside Drive @ West 135th Street													
Westbound	L	0.23	26.5	C	L	0.21	26.2	C	L	0.21	26.2	C	Provide 2 Thru & 1 Right NB.
	R	0.38	30.1	C	R	0.46	32.2	C	R	0.46	32.2	C	
Northbound	TR	0.21	8.0	A	TR	0.20	8.0	A	T	0.17	7.8	A	
									R	0.11	7.6	A	
Southbound	LT	0.11	7.4	A	LT	0.13	7.6	A	LT	0.13	7.5	A	
	Int.		12.8	B	Int.		13.4	B	Int.		13.3	B	
Amsterdam Avenue @ West 125th Street													
Eastbound	L	1.10	145.3	F	L	1.33	235.8	F+	L	1.09	140.2	F	Restripe to add one NB right turn
	TR	1.00	62.1	E	TR	1.08	87.3	F+	TR	0.99	55.2	E	lane.
Westbound	L	0.51	45.7	D	L	0.51	45.7	D	L	0.51	43.8	D	Transfer 3 seconds from NS to EW.
	TR	0.84	38.0	D	TR	0.93	48.3	D+	TR	0.85	36.0	D	
Northbound	L	0.07	10.1	B	L	0.08	10.2	B	L	0.09	12.0	B	
	TR	0.52	23.3	C	TR	0.51	23.2	C	T	0.31	21.9	C	
									R	0.54	30.7	C	
Southbound	L	0.62	25.0	C	L	0.62	25.0	C	L	0.61	23.8	C	
	TR	0.33	20.2	C	TR	0.34	20.2	C	TR	0.37	22.6	C	
	Int.		44.0	D	Int.		58.4	E	Int.		41.8	D	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-4

Comparison of 2015 No Build, Build, and Mitigated PM Peak Hour Conditions
Primary Study Area Signalized Intersection Level-of-Service Analysis

	2015 No Build PM Peak Hour				2015 Build PM Peak Hour				2015 Mitigated Build PM Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Riverside Drive @ West 135th Street													
Westbound	L	0.20	26.0	C	L	0.17	25.6	C	L	0.20	29.2	C	Shift 4 seconds from EW and 5
	R	0.61	38.4	D	R	0.67	41.2	D	R	0.56	31.6	C	seconds from NS to new SB only
Northbound	TR	1.07	51.8	D	TR	1.02	34.3	C	T	1.04	47.1	D	phase.
									R	0.49	14.8	B	Provide 2 Thru & 1 Right NB.
Southbound					DefL	0.90	90.7	F+	DefL	0.50	32.9	C	Provide a new phase for SB only.
	LT	0.21	8.2	A	T	0.20	8.1	A	T	0.18	6.4	A	
	Int.		46.3	D	Int.		33.9	C	Int.		38.4	D	
Amsterdam Avenue @ West 125th Street													
Eastbound	L	1.06	144.6	F	L	1.13	168.5	F+	L	0.99	119.2	F	Restripe to add one Northbound right
	TR	1.08	84.5	F	TR	1.18	125.2	F+	TR	1.02	62.4	E	turn only lane.
Westbound	L	0.60	54.1	D	L	0.60	54.1	D	L	0.60	51.6	D	Transfer 4 seconds from NS to EW
	TR	0.96	52.1	D	TR	1.05	75.0	E+	TR	0.93	43.8	D	phase.
Northbound	L	0.23	16.9	B	L	0.24	17.5	B	L	0.24	15.5	B	Daylight SB approach.
	TR	0.90	38.5	D	TR	0.90	38.0	D	T	0.73	30.5	C	
									R	0.60	32.5	C	
Southbound	L	0.75	45.0	D	L	0.78	47.8	D	L	0.76	44.3	D	
	TR	0.81	38.6	D	TR	0.83	40.7	D	TR	0.44	24.5	C	
	Int.		56.2	E	Int.		74.0	E	Int.		44.7	D	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Riverside Drive and West 135th Street

Although no significant adverse impacts were identified for the AM and midday peak hours, restriping Riverside Drive to provide two through lanes and one right-turn lane at the northbound approach would be necessary to conform to the mitigation measures proposed for the PM peak hour.

During the PM peak hour, restriping Riverside Drive to provide two through lanes and one right-turn lane at the northbound approach would be necessary. In addition, an exclusive left-turn phase for the southbound approach and shifting 4 seconds of green time from West 135th Street and 5 seconds of green time from the north–south Riverside Drive phase to the new southbound-only phase would be necessary. With these changes, the southbound *de facto* left-turn movement would improve from LOS F (90.7 seconds of delay, 0.90 v/c ratio) to LOS C (32.9 seconds of delay, 0.50 v/c ratio).

Amsterdam Avenue and West 125th Street

During the AM peak hour, shifting the centerline to create an exclusive northbound left-turn bay and restriping to add an exclusive northbound right-turn lane would be necessary. In addition, a 3-second shift in green time from Amsterdam Avenue to West 125th Street would be necessary. With these changes, the eastbound through-right movement would improve from LOS E (75.6 seconds of delay, 1.05 v/c ratio) to LOS D (48.8 seconds of delay, 0.95 v/c ratio), the westbound left-turn movement would improve within LOS F, with delay decreasing from 194.1 seconds (1.20 v/c ratio) to 110.5 seconds (0.97 v/c ratio), and the westbound through-right movement would improve from LOS F (100.5 seconds of delay, 1.12 v/c ratio) to LOS E (62.6 seconds of delay, 1.02 v/c ratio).

During the midday peak hour, shifting the centerline to create an exclusive northbound left-turn bay and restriping to add an exclusive northbound right-turn lane, along with a 3-second shift in green time from Amsterdam Avenue to West 125th Street, would be necessary. With these changes, the eastbound left-turn movement would improve within LOS F, with delay decreasing from 235.8 seconds (1.33 v/c ratio) to 140.2 seconds (1.09 v/c ratio), and the eastbound through-right movement would improve from LOS F (87.3 seconds of delay, 1.08 v/c ratio) to LOS E (55.2 seconds of delay, 0.99 v/c ratio). The westbound through-right movement would improve within LOS D, with delay decreasing from 48.3 seconds (0.93 v/c ratio) to 36.0 seconds (0.85 v/c ratio).

During the PM peak hour, shifting the centerline to create an exclusive northbound left-turn bay and restriping to add an exclusive northbound right-turn lane, along with a 4-second shift in green time from Amsterdam Avenue to West 125th Street, would be necessary. Daylighting the southbound approach would be necessary as well. With these changes, the eastbound left-turn movement would improve from within LOS F, with delay decreasing from 168.5 seconds (1.13 v/c ratio) to 119.2 seconds (0.99 v/c ratio), and the eastbound through-right movement would improve from LOS F (125.2 seconds of delay, 1.18 v/c ratio) to LOS E (62.4 seconds of delay, 1.02 v/c ratio). The westbound through-right movement would improve from LOS E (75.0 seconds of delay, 1.05 v/c ratio) to LOS D (43.8 seconds of delay, 0.93 v/c ratio).

SECONDARY STUDY AREA

In the 2015 Build condition, four locations in the secondary study area would experience significant adverse traffic impacts during one or more of the analyzed peak periods:

- Frederick Douglass Boulevard and West 125th Street during the AM and PM peak periods;

- Madison Avenue and East 125th Street during the AM, midday, and PM peak periods;
- Second Avenue and East 125th Street during the AM, midday, and PM peak periods; and
- Broadway and West 145th Street during the midday peak period.

Each of the above significant adverse impacts could be fully mitigated as outlined below. A comparison of the analysis results is presented in Tables 23-5, 23-6, and 23-7.

Frederick Douglass Boulevard and West 125th Street

A 2-second shift in green time from Frederick Douglass Boulevard to West 125th Street would be necessary during the AM peak hour. With this change, the eastbound approach would improve from LOS F (84.2 seconds of delay, 1.08 v/c ratio) to LOS E (60.2 seconds of delay, 1.01 v/c ratio).

A 4-second shift in green time from Frederick Douglass Boulevard to West 125th Street would be necessary during the PM peak hour. With this change, the eastbound approach would improve within LOS F, with delay decreasing from 214.5 seconds (1.40 v/c ratio) to 134.2 seconds (1.22 v/c ratio). The westbound approach would improve within LOS F, with delay decreasing from 334.2 seconds (1.67 v/c ratio) to 237.5 seconds (1.46 v/c ratio).

Table 23-5
Comparison of 2015 No Build, Build, and Mitigated AM Peak Hour Conditions
Secondary Study Area Signalized Intersection Level-of-Service Analysis

	2015 No Build AM Peak Hour				2015 Build AM Peak Hour				2015 Mitigated Build AM Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Frederick Douglass Boulevard @ West 125th Street													
Eastbound	LTR	1.01	61.0	E	LTR	1.08	84.2	F+	LTR	1.01	60.2	E	Transfer 2 seconds from NB/SB phase to EB/WB phase.
Westbound	LTR	0.86	32.4	C	LTR	0.92	38.4	D	LTR	0.87	31.8	C	
Northbound	LT	0.19	15.5	B	LT	0.19	15.5	B	LT	0.20	16.7	B	
	R	0.30	17.6	B	R	0.30	17.6	B	R	0.31	19.2	B	
Southbound	LT	0.57	17.6	B	LT	0.57	17.6	B	LT	0.60	19.8	B	
	R	0.24	14.3	B	R	0.24	14.3	B	R	0.26	16.0	B	
	Int.		33.2	C	Int.		41.5	D	Int.		33.9	C	
Madison Avenue @ East 125th Street													
Eastbound	LT	1.14	102.5	F	LT	1.22	134.4	F+	LT	1.10	86.9	F	Transfer 3 seconds from NB phase to EB/WB phase.
Westbound	TR	0.80	28.9	C	TR	0.85	32.0	C	TR	0.79	26.0	C	
Northbound	LTR	0.59	17.4	B	LTR	0.59	17.4	B	LTR	0.64	20.7	C	
	Int.		50.4	D	Int.		62.6	E	Int.		45.4	D	
Second Avenue @ East 125th Street													
Eastbound	T	1.46	252.1	F	T	1.51	274.2	F+	TR	1.10	97.1	F	Shift 4 seconds from SB phase - 2 seconds to EW phase and 2 seconds to SWB phase. Restripe EB Approach.
	R	0.37	36.1	D	R	0.40	36.8	D					
Westbound	DefL	1.13	128.5	F	DefL	1.13	128.5	F	DefL	1.02	91.6	F	
	T	1.35	217.2	F	T	1.43	248.2	F+	T	1.29	187.7	F	
Southbound	LTR	0.59	20.6	C	LTR	0.59	20.6	C	LTR	0.66	25.2	C	
Southwestbound	TR	1.22	149.2	F	TR	1.29	178.7	F+	TR	1.17	125.8	F	
	Int.		119.2	F	Int.		134.0	F	Int.		81.6	F	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-6
Comparison of 2015 No Build, Build, and Mitigated Midday Peak Hour Conditions
Secondary Study Area Signalized Intersection Level-of-Service Analysis

Intersection	2015 No Build Midday Peak Hour				2015 Build Midday Peak Hour				2015 Mitigated Build Midday Peak Hour				Changes
	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	
Madison Avenue @ East 125th Street													
Eastbound	LT	1.02	60.1	E	LT	1.10	85.4	F+	LT	1.01	56.2	E	Transfer 3 seconds from NB
Westbound	TR	0.63	22.3	C	TR	0.69	23.8	C	TR	0.64	20.6	C	phase to EB/WB phase.
Northbound	LTR	0.48	15.9	B	LTR	0.48	15.9	B	LTR	0.52	18.9	B	
	Int.		34.7	C	Int.		45.4	D	Int.		34.0	C	
Second Avenue @ East 125th Street													
Eastbound	T	1.47	257.3	F	T	1.55	291.3	F+	TR	1.20	136.4	F	Shift 4 seconds from SB phase -
	R	0.60	43.8	D	R	0.66	46.7	D					2 seconds to EW phase and 2
Westbound	LT	0.91	67.2	E	LT	0.99	85.4	F+	LT	0.83	51.8	D	second to SWB phase.
Southbound	LTR	0.38	18.3	B	LTR	0.38	18.3	B	LTR	0.43	22.1	C	Restripe EB Approach.
Southwestbound	TR	0.76	42.3	D	TR	0.82	45.8	D	TR	0.74	39.3	D	
	Int.		103.1	F	Int.		118.0	F	Int.		70.3	E	
Broadway @ West 145th Street													
Eastbound	LTR	0.27	25.9	C	LTR	0.27	25.9	C	LTR	0.26	25.1	C	Transfer 1 second from NS
Westbound	LTR	0.97	69.3	E	LTR	1.00	75.2	E+	LTR	0.96	64.7	E	phase to EW phase.
Northbound	LTR	0.69	23.0	C	LTR	0.72	23.9	C	LTR	0.74	25.1	C	
Southbound	L	0.36	12.4	B	L	0.37	12.7	B	L	0.38	13.4	B	
	TR	0.54	12.0	B	TR	0.56	12.3	B	TR	0.57	13.0	B	
	Int.		26.8	C	Int.		28.2	C	Int.		27.1	C	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-7
Comparison of 2015 No Build, Build, and Mitigated PM Peak Hour Conditions
Secondary Study Area Signalized Intersection Level-of-Service Analysis

Intersection	2015 No Build PM Peak Hour				2015 Build PM Peak Hour				2015 Mitigated Build PM Peak Hour				Changes
	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	
Frederick Douglass Boulevard @ West 125th Street													
Eastbound	LTR	1.25	149.6	F	LTR	1.40	214.5	F+	LTR	1.22	134.2	F	Transfer 4 seconds from NB/SB
Westbound	LTR	1.49	255.6	F	LTR	1.67	334.2	F+	LTR	1.46	237.5	F	phase to EB/WB phase.
Northbound	LTR	0.72	21.9	C	LTR	0.73	22.3	C	LTR	0.82	30.5	C	
Southbound	LT	0.44	18.5	B	LT	0.45	18.6	B	LT	0.50	21.9	C	
	R	0.34	19.3	B	R	0.34	19.3	B	R	0.38	23.0	C	
	Int.		125.5	F	Int.		170.7	F	Int.		120.9	F	
Madison Avenue @ East 125th Street													
Eastbound	LT	1.45	234.8	F	LT	1.61	303.3	F+	LT	1.41	215.2	F	Transfer 4 seconds from NB only
Westbound	TR	0.71	24.7	C	TR	0.77	26.8	C	TR	0.70	21.6	C	phase to EB/WB phase.
Northbound	LTR	0.74	20.4	C	LTR	0.74	20.5	C	LTR	0.83	26.9	C	
	Int.		99.2	F	Int.		128.0	F	Int.		96.2	F	
Second Avenue @ East 125th Street													
Eastbound	T	1.34	196.3	F	T	1.43	233.2	F+	TR	1.14	109.3	F	Shift 3 seconds from SB phase -
	R	0.33	31.7	C	R	0.41	33.5	C					1 second to EW phase and 2
Westbound	LT	0.91	63.8	E	LT	0.97	76.1	E+	LT	0.91	61.1	E	second to SWB phase.
Southbound	LTR	0.89	30.5	C	LTR	0.89	30.5	C	LTR	0.95	37.6	D	Restripe EB Approach.
Southwestbound	TR	1.06	88.6	F	TR	1.13	112.4	F+	TR	1.02	74.0	E	Daylight WB approach.
	Int.		81.8	F	Int.		97.3	F	Int.		64.4	E	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Madison Avenue and East 125th Street

During the AM peak hour, a transfer of 3 seconds of green time from the northbound-only phase on Madison Avenue to East 125th Street would be necessary. With this change, the eastbound approach would improve within LOS F with delay decreasing from 134.4 seconds (1.22 v/c ratio) to 86.9 seconds (1.10 v/c ratio).

During the midday peak hour, a transfer of 3 seconds of green time from the northbound-only phase on Madison Avenue to East 125th Street would be necessary. With this change, the eastbound approach would improve from LOS F (85.4 seconds of delay, 1.10 v/c ratio) to LOS E (56.2 seconds of delay, 1.01 v/c ratio).

During the PM peak hour, a transfer of 4 seconds of green time from the northbound-only phase on Madison Avenue to East 125th Street would be necessary. With this change, the eastbound approach would improve within LOS F, with delay decreasing from 303.3 seconds (1.61 v/c ratio) to 215.2 seconds (1.41 v/c ratio).

Second Avenue and East 125th Street

During the AM peak hour, a shift of 2 seconds of green time to the eastbound/westbound phase from the southbound phase and 2 seconds to the southwest bound phase from the southbound phase would be necessary. In addition, the eastbound approach would be restriped from two through and one right-turn lanes to three shared through-right lanes. With these changes, the eastbound through movement would improve within LOS F, with delay decreasing from 274.2 seconds (1.51 v/c ratio) to 97.1 seconds (1.10 v/c ratio). The westbound through movement would improve within LOS F, with delay decreasing from 248.2 seconds (1.43 v/c ratio) to 187.7 seconds (1.29 v/c ratio). The southwest bound approach would improve within LOS F, with delay decreasing from 178.7 seconds (1.29 v/c ratio) to 125.8 seconds (1.17 v/c ratio).

During the midday peak hour, restriping the eastbound approach, as described above, and shifting 2 seconds of green time to the eastbound/westbound phase from the southbound phase and 2 seconds to the southwest bound phase from the southbound phase would be necessary. With these changes, the eastbound through movement would improve within LOS F, with delay decreasing from 291.3 seconds (1.55 v/c ratio) to 136.4 seconds (1.20 v/c ratio). The westbound approach would improve from LOS F (85.4 seconds of delay, 0.99 v/c ratio) to LOS D (51.8 seconds of delay, 0.83 v/c ratio).

During the PM peak hour, restriping the eastbound approach, as described above, and shifting 1 second of green time to the eastbound/westbound phase from the southbound phase and 2 seconds to the southwest bound phase from the southbound phase would be necessary. With these changes, the eastbound through movement would improve within LOS F, with delay decreasing from 233.2 seconds (1.43 v/c ratio) to 109.3 seconds (1.14 v/c ratio). The westbound approach would improve within LOS E, with delay decreasing from 76.1 seconds (0.97 v/c ratio) to 61.1 seconds (0.91 v/c ratio). The southwest bound approach would improve from LOS F (112.4 seconds of delay, 1.13 v/c ratio) to LOS E (74.0 seconds of delay, 1.02 v/c ratio).

Broadway and West 145th Street

During the midday peak hour, a 1 second shift of green time to the eastbound/westbound phase from the northbound/southbound phase would be necessary. With these changes, the eastbound through movement would improve within LOS E, with delay decreasing from 75.2 seconds (1.00 v/c ratio) to 64.7 seconds (0.96 v/c ratio).

TRAFFIC: 2030

PRIMARY STUDY AREA

In the 2030 Build condition, three locations in the primary study area would experience significant adverse traffic impacts during one or more of the analyzed peak periods:

- Riverside Drive and West 135th Street during the PM peak period;
- Amsterdam Avenue and West 135th Street during the PM peak period; and
- Amsterdam Avenue and West 125th Street during the AM, MD and PM peak periods.

Each of the above significant adverse impacts could be fully mitigated as outlined below. A comparison of the analysis results is presented in Tables 23-8, 23-9 and 23-10.

Riverside Drive and West 135th Street

Although no significant adverse impacts were identified for the AM and midday peak hours, restriping the northbound approach to provide two through lanes and one right-turn lane would be necessary to conform to the mitigation measures proposed for the PM peak hour. In addition, shifting 4 seconds of green time from the westbound phase and 9 seconds of green time from the north–south phase to create a new protected southbound-only phase would be necessary.

Table 23-8
Comparison of 2030 No Build, Build, and Mitigated AM Peak Hour Conditions
Primary Study Area Signalized Intersection Level-of-Service Analysis

	2030 No Build AM Peak Hour				2030 Build AM Peak Hour				2030 Mitigated Build AM Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Riverside Drive @ West 135th Street													
Westbound	L	0.62	35.9	D	L	0.30	27.4	C	L	0.36	31.6	C	Transfer 4 seconds from WB phase
	R	0.47	32.8	C	R	0.51	33.9	C	R	0.61	42.6	D	and 9 seconds from NS phase to SB
Northbound	TR	0.25	8.3	A	TR	0.23	8.2	A	T	0.20	12.2	B	only phase.
									R	0.23	13.0	B	Provide a new SB protected phase.
Southbound	LT	0.94	19.8	B	LT	0.97	24.6	C	LT	0.88	11.4	B	Restripe NB from 2 TR to 2T and 1 R
	Int.		19.7	B	Int.		22.0	C	Int.		14.4	B	
Amsterdam Avenue @ West 135th Street													
Eastbound	LT	0.44	28.8	C	LT	0.55	32.1	C	L	0.34	29.1	C	Change EB 1 LT & 1 R to 1 L, 1 T &
	R	0.41	30.6	C	R	0.58	37.1	D	T	0.29	25.6	C	1 R. Restripe and Daylight EB
									R	0.60	38.2	D	approach.
Westbound	LTR	0.47	29.6	C	LTR	0.51	30.8	C	LTR	0.51	30.7	C	
Northbound	LTR	0.53	8.4	A	LTR	0.58	9.4	A	LTR	0.58	9.4	A	
Southbound	LTR	0.62	9.6	A	LTR	0.72	11.6	B	LTR	0.72	11.6	B	
	Int.		14.2	B	Int.		16.6	B	Int.		16.1	B	
Amsterdam Avenue @ West 125th Street													
Eastbound	TR	1.18	125.8	F	TR	1.33	188.6	F+	TR	0.87	39.7	D	Restripe EB from 2TR to 3 TR and
Westbound	TR	1.21	139.4	F	TR	1.49	260.7	F+	TR	0.99	56.1	E	restripe WB from 2TR to 3TR.
Northbound	L	0.39	16.7	B	L	0.47	18.9	B	L	0.47	18.9	B	Daylight EB and WB approach.
	TR	0.82	30.4	C	TR	0.82	30.3	C	TR	0.82	30.3	C	
Southbound	L	0.60	31.6	C	L	0.60	31.5	C	L	0.60	31.5	C	
	TR	0.53	21.1	C	TR	0.53	21.3	C	TR	0.53	21.3	C	
	Int.		79.4	E	Int.		134.9	F	Int.		38.3	D	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-9

Comparison of 2030 No Build, Build, and Mitigated Midday Peak Hour Conditions
Primary Study Area Signalized Intersection Level-of-Service Analysis

	2030 No Build Midday Peak Hour				2030 Build Midday Peak Hour				2030 Mitigated Build Midday Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Riverside Drive @ West 135th Street													
Westbound	L	0.25	26.8	C	L	0.23	26.5	C	L	0.28	30.4	C	Transfer 4 seconds from WB phase and 9
	R	0.40	30.6	C	R	0.52	33.9	C	R	0.62	42.4	D	seconds from NS phase to SB only phase.
Northbound	TR	0.22	8.1	A	TR	0.21	8.1	A	T	0.22	12.5	B	Provide new SB protected phase.
									R	0.14	12.0	B	Provide 2 Thru & 1 Right NB.
Southbound	LT	0.12	7.5	A	LT	0.15	7.7	A	LT	0.14	6.1	A	
	Int.		12.9	B	Int.		13.9	B	Int.		17.3	B	
Amsterdam Avenue @ West 135th Street													
Eastbound	LT	0.25	25.5	C	LT	0.35	27.6	C	L	0.32	28.0	C	Change EB 1 LT & 1 R to 1 L, 1 T & 1 R.
	R	0.25	26.2	C	R	0.49	32.3	C	T	0.08	22.9	C	Restripe and Daylight EB approach.
									R	0.51	32.9	C	
Westbound	LTR	0.57	33.2	C	LTR	0.61	34.4	C	LTR	0.60	34.1	C	
Northbound	LTR	0.60	9.7	A	LTR	0.70	12.0	B	LTR	0.70	12.0	B	
Southbound	LTR	0.53	8.4	A	LTR	0.59	9.2	A	LTR	0.59	9.2	A	
	Int.		13.7	B	Int.		16.0	B	Int.		16.0	B	
Amsterdam Avenue @ West 125th Street													
Eastbound	TR	1.19	130.8	F	TR	1.36	201.1	F+	TR	0.89	41.2	D	Restripe EB from 2TR to 3 TR and
Westbound	TR	1.00	64.3	E	TR	1.15	113.3	F+	TR	0.76	33.4	C	restripe WB from 2TR to 3TR.
Northbound	L	0.08	9.2	A	L	0.11	9.6	A	L	0.11	9.6	A	Daylight EB and WB approaches.
	TR	0.62	23.4	C	TR	0.62	23.3	C	TR	0.62	23.3	C	
Southbound	L	0.69	30.1	C	L	0.68	29.7	C	L	0.68	29.7	C	
	TR	0.37	18.7	B	TR	0.37	18.8	B	TR	0.37	18.8	B	
	Int.		65.4	E	Int.		102.4	F	Int.		31.3	C	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-10

Comparison of 2030 No Build, Build, and Mitigated PM Peak Hour Conditions
Primary Study Area Signalized Intersection Level-of-Service Analysis

	2030 No Build PM Peak Hour				2030 Build PM Peak Hour				2030 Mitigated Build PM Peak Hour				
Intersection	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Changes
Riverside Drive @ West 135th Street													
Westbound	L	0.21	26.3	C	L	0.18	25.8	C	L	0.22	29.5	C	Shift 4 seconds from WB to SB and Shift 5
	R	0.66	40.9	D	R	0.74	46.3	D+	R	0.55	30.5	C	seconds from NS phase to SB only phase.
Northbound	TR	1.15	83.7	F	TR	1.10	62.2	E	T	1.13	77.8	E	Provide 2 Thru & 1 Right NB.
									R	0.52	15.5	B	Provide a new phase for SB only.
Southbound					DefL	0.98	110.7	F+	DefL	0.55	35.0	D	Daylight the WB approach.
	LT	0.14	7.6	A	T	0.21	8.2	A	T	0.20	6.5	A	
	Int.		72.6	E	Int.		57.3	E	Int.		59.8	E	
Amsterdam Avenue @ West 135th Street													
Eastbound	LT	0.65	39.0	D	LT	1.12	122.9	F+	L	0.76	44.9	D	Transfer 4 seconds from NB/SB phase to
	R	0.28	26.9	C	R	0.46	31.4	C	T	0.16	21.1	C	EB/WB phase. Change EB 1 LT & 1 R to
									R	0.40	26.5	C	1 L, 1 T & 1 R. Restripe and Daylight EB
Westbound	LTR	0.70	39.1	D	LTR	0.89	60.9	E+	LTR	0.61	30.9	C	approach.
Northbound	LTR	0.76	13.4	B	LTR	0.82	16.3	B	LTR	0.89	25.4	C	
Southbound	LTR	0.61	9.5	A	LTR	0.67	10.6	B	LTR	0.73	15.1	B	
	Int.		18.0	B	Int.		33.5	C	Int.		24.1	C	
Amsterdam Avenue @ West 125th Street													
Eastbound	TR	1.14	108.5	F	TR	1.44	235.8	F+	TR	0.95	44.8	D	Restripe EB from 2TR to 3 TR and
Westbound	TR	1.02	66.3	E	TR	1.15	109.4	F+	TR	0.76	31.0	C	restripe WB from 2TR to 3TR.
Northbound	L	0.27	20.5	C	L	0.31	21.6	C	L	0.31	21.6	C	Daylight EB and WB approaches.
	TR	1.07	74.9	E	TR	1.07	76.9	E	TR	1.07	76.9	E	
Southbound	L	0.81	54.2	D	L	0.81	54.3	D	L	0.81	54.3	D	
	TR	0.98	63.8	E	TR	0.99	67.1	E	TR	0.99	67.1	E	
	Int.		77.1	E	Int.		126.5	F	Int.		52.8	D	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

During the PM peak hour, restriping the northbound approach to provide two through lanes and one right-turn lane would be necessary. In addition, shifting 4 seconds of green time from the westbound phase and 5 seconds from the north–south phase to create a new protected southbound-only phase would be necessary. Daylighting the westbound approach would be necessary as well. With these changes, the southbound *de facto* left-turn movement would improve from LOS F (110.7 seconds of delay, 0.98 v/c ratio) to LOS D (35.0 seconds of delay, 0.55 v/c ratio). The westbound right-turn movement would improve within from LOS D (46.3 seconds of delay, 0.74 v/c ratio) to LOS C (30.5 seconds of delay, 0.55 v/c ratio).

Amsterdam Avenue and West 135th Street

Although no significant adverse impacts were identified for the AM and midday peak hours, daylighting the eastbound approach and restriping it to provide one left-turn lane, one through lane, and one right-turn lane would be necessary to conform to the mitigation measures proposed for the PM peak hour.

During the PM peak hour, daylighting the eastbound approach and restriping it to provide one left-turn lane, one through lane, and one right-turn lane would be necessary. In addition, shifting 4 seconds of green time from Amsterdam Avenue to West 135th Street would be necessary. With these changes, the eastbound left-through movement would improve from LOS F (122.9 seconds of delay, 1.12 v/c ratio) to a left-turn movement operating at LOS D (44.9 seconds of delay, 0.76 v/c ratio) and a through movement operating at LOS C (21.1 seconds of delay, 0.16 v/c ratio). At the same time the westbound approach would improve from LOS E (60.9 seconds of delay, 0.89 v/c ratio) to LOS C (30.9 seconds of delay, 0.61 v/c ratio).

Amsterdam Avenue and West 125th Street

During the AM peak hour, daylighting the eastbound and westbound approaches would be necessary to restripe both approaches from two shared through and right-turn lanes to provide three shared through and right-turn lanes. With these changes, the eastbound through-right movement would improve from LOS F (188.6 seconds of delay, 1.33 v/c ratio) to LOS D (39.7 seconds of delay, 0.87 v/c ratio). The westbound through-right movement would improve from LOS F (260.7 seconds of delay, 1.49 v/c ratio) to a through movement operating at LOS E (56.1 seconds of delay, 0.99 v/c ratio).

During the midday peak hour, with the same changes mentioned above, the eastbound through-right movement would improve from LOS F (201.1 seconds of delay, 1.36 v/c ratio) to LOS D (41.2 seconds of delay, 0.89 v/c ratio). The westbound through-right movement would improve from LOS F (113.3 seconds of delay, 1.15 v/c ratio) to a through movement operating at LOS C (33.4 seconds of delay, 0.76 v/c ratio).

During the PM peak hour, with the same changes mentioned above, the eastbound through-right movement would improve from LOS F (235.8 seconds of delay, 1.44 v/c ratio) to LOS D (44.8 seconds of delay, 0.95 v/c ratio). The westbound through-right movement would improve from LOS F (109.4 seconds of delay, 1.15 v/c ratio) to a through movement operating at LOS C (31.0 seconds of delay, 0.76 v/c ratio).

SECONDARY STUDY AREA

In the 2030 Build condition, four locations in the secondary study area would experience significant adverse traffic impacts during one or more of the analyzed peak periods:

- Madison Avenue and East 125th Street during the AM and PM peak periods;
- Second Avenue and East 125th Street during the AM, midday and PM peak periods;
- First Avenue and East 125th Street during the PM peak period; and
- Broadway and West 145th Street during the midday and PM peak periods.

Each of the above significant adverse impacts could be fully mitigated as outlined below. A comparison of the analysis results is presented in Tables 23-11, 23-12, and 23-13.

Table 23-11
Comparison of 2030 No Build, Build, and Mitigated AM Peak Hour Conditions
Secondary Study Area Signalized Intersection Level-of-Service Analysis

Intersection	2030 No Build AM Peak Hour				2030 Build AM Peak Hour				2030 Mitigated Build AM Peak Hour				Changes
	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	
Madison Avenue @ East 125th Street													
Eastbound	T	0.87	32.7	C	T	0.91	37.2	D	T	0.89	33.9	C	Transfer 1 second from NB to EB/WB phase.
Westbound	TR	0.85	32.0	C	TR	0.97	47.8	D+	TR	0.95	42.2	D	
Northbound	LTR	0.68	19.0	B	LTR	0.69	19.3	B	LTR	0.71	20.5	C	
	Int.		27.1	C	Int.		33.8	C	Int.		31.5	C	
Second Avenue @ East 125th Street													
Eastbound	T	1.55	290.0	F	T	1.59	310.7	F+	TR	1.18	127.9	F	Transfer 2 seconds from SB to EB/WB phase. Transfer 3 seconds from SB to SWB.
	R	0.39	36.4	D	R	0.49	40.2	D					
Westbound	DefL	1.21	158.7	F	DefL	1.21	158.7	F	DefL	1.10	116.8	F	
	T	1.44	251.3	F	T	1.62	329.3	F+	T	1.43	244.4	F	Restripe EB approach.
Southbound	L	0.52	26.2	C	L	0.52	26.2	C	L	0.61	33.0	C	
	TR	0.69	24.2	C	TR	0.69	24.2	C	TR	0.81	31.8	C	
Southwestbound	TR	1.18	129.1	F	TR	1.31	186.0	F+	TR	1.15	115.2	F	
	Int.		129.8	F	Int.		155.0	F	Int.		97.4	F	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-12
Comparison of 2030 No Build, Build, and Mitigated Midday Peak Hour Conditions
Secondary Study Area Signalized Intersection Level-of-Service Analysis

Intersection	2030 No Build Midday Peak Hour				2030 Build Midday Peak Hour				2030 Mitigated Build Midday Peak Hour				Changes
	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	
Second Avenue @ East 125th Street													
Eastbound	T	1.41	228.1	F	T	1.48	258.0	F+	TR	1.22	144.5	F	Transfer 1 second from SB to EB/WB. Transfer 2 seconds from SB to SWB.
	R	0.56	39.3	D	R	0.67	45.1	D+					
Westbound	LT	0.87	59.0	E	LT	0.95	71.8	E+	LT	0.85	53.6	D	
Southbound	L	0.56	27.7	C	L	0.56	27.7	C	L	0.62	32.2	C	Restripe EB approach.
	TR	0.39	20.1	C	TR	0.39	20.1	C	TR	0.43	23.1	C	Daylight WB approach.
Southwestbound	TR	0.81	45.3	D	TR	0.88	50.6	D+	TR	0.79	41.8	D	
	Int.		94.2	F	Int.		107.0	F	Int.		74.4	E	
Broadway @ West 145th Street													
Eastbound	LTR	0.29	26.2	C	LTR	0.29	26.2	C	LTR	0.28	25.3	C	Transfer 1 second from NS phase to EW phase.
Westbound	LTR	1.05	89.1	F	LTR	1.09	102.0	F+	LTR	1.05	87.6	F	
Northbound	LTR	0.75	24.7	C	LTR	0.80	27.0	C	LTR	0.82	28.8	C	
Southbound	L	0.40	13.5	B	L	0.41	14.1	B	L	0.42	14.9	B	
	TR	0.58	12.6	B	TR	0.62	13.4	B	TR	0.63	14.2	B	
	Int.		31.1	C	Int.		34.2	C	Int.		32.7	C	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Table 23-13
Comparison of 2030 No Build, Build, and Mitigated PM Peak Hour Conditions
Secondary Study Area Signalized Intersection Level-of-Service Analysis

Intersection	2030 No Build PM Peak Hour				2030 Build PM Peak Hour				2030 Mitigated Build PM Peak Hour				Changes
	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	Lane Group	V/C	Delay (spv)	LOS	
Madison Avenue @ East 125th Street													
Eastbound	T	1.02	56.6	E	T	1.18	114.1	F+	T	1.01	51.6	D	Transfer 3 seconds from NB
Westbound	TR	0.75	26.0	C	TR	0.81	28.7	C	TR	0.75	24.0	C	phase to EW/WB phase.
Northbound	LTR	0.86	24.7	C	LTR	0.86	24.9	C	LTR	0.93	33.8	C	Daylight EB approach.
	Int.		35.5	D	Int.		57.7	E	Int.		37.9	D	
Second Avenue @ East 125th Street													
Eastbound	T	1.30	175.0	F	T	1.45	242.4	F+	TR	1.28	166.6	F	Transfer 1 second from EB/WB
	R	0.31	29.6	C	R	0.45	32.8	C					to SB. Transfer 1 second from
Westbound	LT	0.86	53.4	D	LT	0.92	62.1	E+	LT	0.84	50.1	D	EB/WB to SWB.
Southbound	L	1.87	431.8	F	L	1.87	431.8	F	L	1.81	402.3	F	Restripe EB approach.
	TR	0.83	31.4	C	TR	0.83	31.4	C	TR	0.80	29.4	C	Daylight WB approach.
Southwestbound	TR	1.07	90.8	F	TR	1.12	109.9	F+	TR	1.07	89.2	F	
	Int.		146.3	F	Int.		166.9	F	Int.		140.5	F	
First Avenue @ East 125th Street													
Eastbound	L	1.13	106.7	F	L	1.23	145.4	F+	L	1.13	104.4	F	Transfer 3 seconds from NB
	LT	0.59	26.0	C	LT	0.66	28.2	C	LT	0.61	24.4	C	Only phase to EB Only phase.
Northbound	L	0.18	10.0	B	L	0.19	10.1	B	L	0.20	12.2	B	
	T	0.70	14.8	B	T	0.70	14.8	B	T	0.75	18.1	B	
	R	0.52	15.0	B	R	0.52	15.0	B	R	0.56	18.2	B	
	Int.		33.1	C	Int.		42.2	D	Int.		35.8	D	
Broadway @ West 145th Street													
Eastbound	LTR	0.28	26.0	C	LTR	0.28	26.0	C	LTR	0.27	25.2	C	Transfer 1 second from NS
Westbound	LTR	1.00	71.7	E	LTR	1.03	79.1	E+	LTR	0.99	66.7	E	phase to EW phase.
Northbound	LTR	0.91	33.5	C	LTR	0.93	37.0	D	LTR	0.96	41.6	D	
Southbound	L	0.47	16.9	B	L	0.48	17.5	B	L	0.49	18.4	B	
	TR	0.51	11.6	B	TR	0.53	11.8	B	TR	0.54	12.5	B	
	Int.		33.1	C	Int.		36.0	D	Int.		36.1	D	

Notes:
L = Left Turn; T = Through; R = Right Turn; DefL = Defacto Left Turn; Int. = Intersection
V/C = Volume to Capacity; LOS = Level of Service; + indicates movements with significant impacts in Build condition

Madison Avenue and East 125th Street

During the AM peak hour, shifting 1 second of green time from the Madison Avenue to East 125 Street would improve the westbound approach within LOS D from 47.8 seconds of delay (0.97 v/c ratio) to 42.2 seconds (0.95 v/c ratio).

During the PM peak hour, daylighting the eastbound approach and shifting 3 seconds of green time from the Madison Avenue to East 125 Street would improve the eastbound approach within LOS F (114.1 seconds of delay, 1.18 v/c ratio) to LOS D (51.6 seconds of delay, 1.01 v/c ratio).

Second Avenue and East 125th Street

During the AM peak hour, a 2-second shift in green time from the southbound phase to the eastbound/westbound phase and a shift of 3 seconds from the southbound phase to the southwest bound phase would be necessary. In addition, the eastbound approach would be restriped from two through and one right-turn lanes to three shared through-right lanes. With these changes, the eastbound through movement would improve within LOS F, with a delay of 258.0 seconds (1.48 v/c ratio), to 144.5 seconds (1.22 v/c ratio). The westbound approach would improve from LOS E (71.8 seconds of delay, 0.95 v/c ratio) to LOS D (53.6 seconds of delay, 0.85 v/c ratio). The

southwest bound approach would improve within LOS D, with delay decreasing from 50.6 seconds (0.88 v/c ratio) to 41.8 seconds (0.79 v/c ratio).

During the midday peak hour, a shift of 1 second from the southbound phase to the eastbound/westbound and a shift of 2 seconds from the southbound phase to the southwest bound phase would be necessary. In addition to the restriping of the eastbound approach, as described above, daylighting the westbound approach to create an additional travel lane would be necessary. With these changes, the eastbound through movement would improve within LOS F, with delay decreasing from 310.7 seconds (1.59 v/c ratio) to 127.9 seconds (1.18 v/c ratio). The westbound through movement would improve within LOS F with delay decreasing from 329.3 seconds (1.62 v/c ratio) to 244.4 seconds of delay (1.43 v/c ratio). The southwest bound approach would improve within LOS F, with delay decreasing from 186.0 seconds (1.31 v/c ratio) to 115.2 seconds (1.15 v/c ratio).

During the PM peak hour, a shift of 1 second from the eastbound/westbound phase to the southbound phase and a shift of 1 second from the eastbound/westbound phase to the southwest bound phase would be necessary. In addition to the restriping of the eastbound approach, as described above, daylighting the westbound approach to create an additional travel lane would be necessary. With these changes, the eastbound through movement would improve within LOS F, with delay decreasing from 242.4 seconds (1.45 v/c ratio) to 166.6 seconds (1.28 v/c ratio). The westbound approach would improve from LOS E (62.1 seconds of delay, 0.92 v/c ratio) to LOS D (50.1 seconds of delay, 0.84 v/c ratio). The southwest bound approach would improve within LOS F, with delay decreasing from 109.9 seconds (1.12 v/c ratio) to 89.2 seconds (1.07 v/c ratio).

First Avenue and East 125th Street

During the PM peak hour, a transfer of 3 seconds of green time from the northbound-only phase to the eastbound-only phase would be necessary. With this change, the eastbound left-turn movement would improve within LOS F (145.4 seconds of delay, 1.23 v/c ratio to 104.4 seconds of delay, v/c ratio 1.13).

Broadway and West 145th Street

During the midday peak hour, a 1 second shift in green time from Broadway to West 145th Street would be necessary. With this change, the westbound approach would improve within LOS F, with delay decreasing from 102.0 seconds (1.09 v/c ratio) to 87.6 seconds (1.05 v/c ratio).

During the PM peak hour, a 1 second shift in green time from Broadway to West 145th Street would be necessary. With this change, the westbound approach would improve within LOS E, with delay decreasing from 79.1 seconds (1.03 v/c ratio) to 66.7 seconds (0.99 v/c ratio).

PARKING: 2015

As described in Chapter 17, the Proposed Actions are expected to result in an off-street parking shortfall of up to approximately 260 spaces[1] in 2015 due to the displacement of existing public

[1] As discussed in Chapter 17, "Traffic and Parking," 64 off-street spaces would be freed up for the use by the public as a result of using the surplus from the four Columbia University interim parking facilities to accommodate some of the parking demand from Columbia University's other area uses.

parking facilities within the Project Area. While the projected shortfall has been identified as a significant adverse parking impact, it is possible that market forces may result in the construction of new off-street parking facilities to satisfy this demand for additional parking. Furthermore, these same market forces are likely to result in increased fees at existing parking facilities in the area, which may encourage people who currently park in facilities in the Project Area because they are inexpensive to seek parking in facilities outside of the Project Area that may be less expensive.

To address the shortfall, Columbia University, working with the New York City Department of Environmental Protection (DEP), has developed a plan to license, under a revocable license to be agreed upon by the parties, portions of the DEP property between West 135th and West 145th Streets beneath the Henry Hudson Parkway for use as a public parking facility. This area would accommodate approximately 400 parking spaces.

An analysis was performed to determine the effect of traffic entering and exiting this proposed parking lot on the Project Area intersections. As shown in Appendix Figures P.3-1 to P.3-3, the rerouting of peak hour trips associated with the entire projected parking shortfall in 2015 would result in increases of fewer than 50 peak hour vehicle trips at all intersections within the Project Area. Therefore, no further detailed analysis is warranted. Implementation of this parking mitigation would fully mitigate the projected significant adverse parking impact while not resulting in the potential for significant adverse traffic impacts.

Columbia University is also prepared to add up to 72 parking spaces through an improvement of operational efficiency and parking configuration at its 560 Riverside Drive parking garage, thereby providing additional supply at area public parking facilities. This measure would partially mitigate the projected significant adverse parking impact in 2015 if the above public parking facility is not developed. Since the additional parking spaces at 560 Riverside Drive would amount to fewer than the number of spaces that would be occupied by redirected traffic at the above public parking facility, there would also not be a potential for significant adverse traffic impacts associated with this mitigation option.

PARKING: 2030

The Proposed Actions are expected to result in an off-street parking shortfall of just over 120 spaces[1] in 2030 attributable to the displacement of existing public parking facilities within the Project Area. As with 2015, the proposed public parking facility under the Henry Hudson Parkway north of West 135th Street would fully mitigate the projected significant adverse parking impacts identified for 2030. As shown in Appendix Figures P.3-4 to P.3-6, the rerouting of traffic resulting from the provision of this parking facility would not have the potential for significant adverse traffic impacts. As discussed above, Columbia University is also prepared to reconfigure the 560 Riverside Drive Columbia University parking garage to add up to 72 parking spaces. This measure would partially mitigate the projected significant adverse parking impact in 2030 if the above parking facility is not developed.

[1] As discussed in Chapter 17, "Traffic and Parking," approximately 300 off-street spaces would be freed up for the use by the public due to Columbia University relinquishing monthly parking leases and accommodating this demand within the below-grade on-site parking facility.

G. TRANSIT AND PEDESTRIANS

OVERVIEW

As discussed in Chapter 18, the Proposed Actions would result in significant adverse bus line-haul impacts on the Bx15 cross-town route in the 2015 interim analysis year. When the Proposed Actions are fully completed in 2030, significant adverse transit impacts are expected at the E101 down escalator and the E102 up escalator at the 125th Street No. 1 line subway station during the AM and PM peak hours, respectively. In addition, significant adverse bus line-haul impacts would occur on the Bx15 cross-town route. No subway line-haul and pedestrian impacts would result in either the 2015 or the 2030 Build year. Potential measures to mitigate the above significant adverse impacts are described below.

SUBWAY STATION OPERATIONS

Under the 2030 Build condition, the two escalators connecting the station mezzanine and the west side of Broadway would operate above their capacity. The existing escalators both operate with single-lane 24-inch treads. To increase capacity, these escalators would need to be converted to 40-inch tread operation, thereby allowing double-file standing or lanes for passing. This type of escalator would require machinery casing that, combined with the treads, would total a minimum of 6 feet 6 inches. The existing escalators with the machinery casing are each 5 feet 6 inches wide. Housing them are brick structures that are 7½ inches wide throughout, except at the base, where they are 1 foot wide. While more spatially efficient construction could potentially be achieved, it was assumed that the 40-inch tread escalators could add 1 foot in width to the escalator structures. Because the curb line along the west side of Broadway between West 125th Street and Tiemann Place would be extended into the roadway by approximately 5 feet as part of the Proposed Actions, the escalator replacement would shift the escalator structure toward the future curb line, thereby creating additional contiguous pedestrian space between the escalator structure and the building lines. Hence, while this mitigation would require a structure for the escalator at least 1 foot wider than the existing structure, its proposed placement would take advantage of the widened sidewalk, so that the increase in effective sidewalk width with the Proposed Actions could still be maintained.

MTA/NYCT reviewed these mitigation measures (see attached letter in Appendix P). The implementation of these mitigation measures would be coordinated with MTA/NYCT to allow enough time for design and specification approvals by MTA/NYCT and for the construction in order to address the increased demand that would result from development of the Proposed Actions by 2030. The cost of the escalator replacement would be borne by Columbia University, and the mitigation would occur at the beginning of Phase 2 development.

NYCT BUS LINE HAUL

As discussed in Chapter 18, the Proposed Actions would result in a significant adverse impact to the operation of the Bx15 bus route. The analysis showed that the bus route would operate above its guideline capacity of 65 passengers during the 2015 PM, 2030 AM, and 2030 PM peak periods. More specifically, the Bx15 route would experience the following increases in passengers per bus between No Build and Build conditions.

- 2015 eastbound line-haul increasing from 61 to 69 average passengers per bus in the PM peak period;

- 2030 westbound line-haul increasing from 56 to 69 average passengers per bus in the AM peak period; and,
- 2030 eastbound line-haul increasing from 45 to 95 average passengers per bus in the PM peak period.

To mitigate these significant adverse impacts, one, one, and four additional buses would need to be scheduled in the eastbound direction during the 2015 PM peak period, in the westbound direction during the 2030 AM peak period, and in the eastbound direction during the 2030 PM peak period, respectively. MTA/NYCT would evaluate these needs and make the necessary adjustments where warranted, subject to financial and operational constraints (see Appendix P). With these increases in service, the Bx15 route would have adequate capacity to accommodate the projected increase in bus ridership.

H. AIR QUALITY

EFFECTS OF PROPOSED TRAFFIC MITIGATION MEASURES

Chapter 19, "Air Quality," predicts the maximum predicted carbon monoxide (CO) and particulate matter (PM_{10} and $PM_{2.5}$) concentrations related to traffic generated from the Proposed Actions, and concludes that the Proposed Actions would not result in any significant adverse air quality impacts. Therefore, no air quality mitigation is required. This section considers the effects on air quality of the Proposed Actions with implementation of the traffic mitigation measures discussed above. The results (presented in Appendix I) show that with the proposed traffic mitigation measures, future concentrations of pollutants with the Proposed Actions would be below the National Ambient Air Quality Standards (NAAQS) and would not result in any significant adverse air quality impacts using the *de minimis* thresholds for CO impacts and the $PM_{2.5}$ interim guidance criteria. Appendix I presents the tables summarizing these results.

I. NOISE

EFFECTS OF PROPOSED TRAFFIC MITIGATION MEASURES

The proposed traffic mitigation measures would not have any appreciable effect on noise levels at any of the 14 receptor sites used for the operational noise analysis. All 14 noise receptor locations used in the operational noise analysis are located within or immediately adjacent to the Project Area. The proposed traffic mitigation measures would affect traffic conditions at locations that are not adjacent to the Project Area. At the locations where traffic mitigation measures are proposed, the increase in traffic due to the Proposed Actions would not be large enough to result in a significant noise impact. Consequently, no receptor locations were located at those locations, and the proposed traffic mitigation would not significantly affect noise levels.

NOISE MITIGATION AT SIGNIFICANTLY IMPACTED LOCATIONS

The Proposed Actions would have a significant noise impact at Noise Receptor 10, located on West 125th Street at St. Clair Place and West 129th Street. This impact would result from a combination of project-generated traffic and the effects of adding a traffic light midblock on West 125th Street between Twelfth Avenue and Broadway to facilitate pedestrian crossings at this location. There are no effective mitigation measures that could be implemented to eliminate the noise impact predicted at this location. The impact at this location would affect pedestrians and would be considered an

unmitigated significant adverse impact. Buildings adjacent to the proposed site are either existing buildings owned by Columbia University (e.g., 560 Riverside Drive) or new buildings that would be constructed by Columbia University as part of the Proposed Actions (e.g., Sites 4 and 5). These existing buildings already have double-glazed windows, and the new buildings would be designed to have double-glazed windows and central air conditioning (i.e., alternative ventilation), and, consequently, noise levels within these buildings would satisfy CEQR interior noise level requirements.

J. CONSTRUCTION

TRAFFIC

As detailed in Chapter 21, "Construction," during Phase 1 construction in 2011, when West 130th Street would be closed, significant adverse traffic impacts were identified at one and five study area intersections during the 6–7 AM and 3–4 PM analysis hours, respectively. In 2022 when West 131st Street would be closed, significant adverse traffic impacts were identified at one and two study area intersections during the 6–7 AM and 3–4 PM analysis hours, respectively. All projected impacts in 2011 and 2022 could be mitigated with either an early implementation of Build condition mitigation strategies, or applying other operational mitigation measures. For peak Phase 2 construction in 2027, when West 132nd Street would be closed, significant adverse traffic impacts were identified at two and four study area intersections during the 6–7 AM and 3–4 PM analysis hours, respectively. In addition to early implementation of Build condition mitigation strategies or the application of other standard traffic engineering measures, operational strategies involving lane channelization and the deployment of a traffic control officer (TCO) during the 3–4 PM analysis hour would be required at the Broadway and West 130th Street intersection to fully mitigate the projected significant adverse traffic impacts in 2027.

NOISE

As described in Chapter 21, "Construction," during Phase 1, construction activities would be expected to result in significant noise impacts at:

- Residences at elevated locations of Riverside Park Community (3333 Broadway) which have a direct line-of-sight to areas of Phase 1 construction (receptor Sites 5, and 5b); and
- Residences at 560 Riverside Drive which have a direct line-of-sight to the areas of Phase 1 construction (Receptor Sites 7 and 8).

During Phase 2, construction activities would be expected to result in significant noise impacts at:

- Residences at Riverside Park Community (3333 Broadway) which have a direct line-of-sight to areas of Phase 2 construction (receptor Sites 1, 4, 5, 5a, and 5b);
- Residences at 560 Riverside Drive (receptor Site 8[1]); and

[1] The impact at this location during Phase 2 is principally due to the installation of a traffic light midblock on West 125th Street between Broadway and Twelfth Avenue, and not due to Phase 2 construction-related activities.

- Residences at two buildings of Manhattanville Houses (95 Old Broadway and 1430 Amsterdam Avenue) which has a direct line-of-sight to the areas of Phase 2 construction (receptor Site 14).

With regard to the residential locations identified above where significant noise impacts are predicted to occur—3333 Broadway (Riverside Park Community), 95 Old Broadway and 1430 Amsterdam Avenue (two buildings of Manhattanville Houses), and 560 Riverside Drive—all of these residences have double-glazed windows, which with a closed window condition would produce approximately 30–35 dBA of noise attenuation. Riverside Park Community contains sleeves for air-conditioning units, and some, but not all, of the units contain air conditioning; Manhattanville Houses does not contain air-conditioning sleeves, but some units do contain window air-conditioning units; and 560 Riverside Drive, a Columbia University-owned building, contains packaged air-conditioning units. At 560 Riverside Drive, the combination of double-glazed windows and air-conditioning units would provide approximately 35 dBA of attenuation. While the building construction at all of the residential structures cited above would provide a significant amount of sound attenuation during cold weather months when windows are closed, except for 560 Riverside Drive and the units in the other buildings with air conditioning, the buildings would provide only limited attenuation (i.e., approximately 10 dBA) during time periods when windows are open for ventilation.

To address the significant adverse noise impacts to residents at the 3333 Broadway (Riverside Park Community) and 95 Old Broadway and 1430 Amsterdam Avenue (Manhattanville Houses), the buildings with direct line-of-sight to the Subdistrict A construction, Columbia University would make available to tenants in apartments that would be significantly impacted by construction activities, air conditioning units (e.g. sleeve units for residents of 3333 Broadway and window units for residents of 95 Old Broadway and 1430 Amsterdam Avenue), at no cost to the residents for the units, as mitigation for construction impacts. Prior to the commencement of construction in the vicinity of the affected sites, Columbia would notify each of the affected residents that they are eligible to receive an air condition unit. Columbia would have in place an arrangement with a vendor and the residents would notify the vendor of their desire to receive a unit. The vendor would, at Columbia's expense, install the air conditioners. If the air conditioners would become the property of the residents and a resident were to remove the air conditioner upon vacating his or her apartment, Columbia would provide a replacement unit during the time period when project impacts are predicted to occur.

This commitment would partially mitigate temporary noise impacts due to construction activities. Even with these air conditioning units, for some periods of time, construction noise may result in noise levels which would be above the 45 dBA L_{10} noise level recommended by CEQR for residences, and are noisy and intrusive. In addition, some residents in buildings either with existing air conditioning units or with air conditioning units provided as mitigation by Columbia University, which have a direct line-of-sight to the areas of construction may be significantly impacted because of insufficient window/wall attenuation.

With regard to the one institutional location where significant noise impacts are predicted to occur—Prentis Hall (which is being renovated)—the design for this building will incorporate sufficient sound attenuation measures (e.g., double-glazed windows and alternative ventilation [air conditioning], which would provide approximately 35 dBA of attenuation), to mitigate the significant impacts due to construction activities for users of this facility. ✶