Chapter 4: Shadows

A. INTRODUCTION

This chapter examines the potential for the proposed Lenox Hill Hospital (LHH) Redevelopment project (the Proposed Project) to cast new shadows on sunlight sensitive resources, which include publicly accessible parks and other public open spaces, sunlight-dependent features of historic resources, and natural resources that depend on sunlight.

As described in Chapter 1, "Project Description," Lenox Hill Hospital (the Applicant) is requesting a series of discretionary actions from the City Planning Commission (CPC) to facilitate the enlargement and modernization of the existing LHH on Block 1411, Lots 1 and 113 (Projected Development Site 1), bounded by Park and Lexington Avenues and East 76th and East 77th Streets in Manhattan. The Proposed Project would include a new building fronting on Lexington Avenue, as well as additions and modifications to portions of the existing hospital complex on Projected Development Site 1 and connections between the new hospital building and the renovated buildings. Two building envelopes are proposed, each of which would accommodate the Proposed Project's program. Envelope 1 would include a new approximately 771,000-gross-square-foot (gsf) building on Lexington Avenue and 56,000 gsf of additions to the existing hospital. Envelope 2 would include a new approximately 867,000-gsf building and 8,000 gsf of additions to the existing hospital. With the existing buildings to remain, the overall gross floor area of the Proposed Project on Projected Development Site 1 would be approximately 1.4 million gsf with either envelope. The program, project population (staff, patients, visitors), site access, zoning actions, and construction duration would be the same for both Envelope 1 and Envelope 2.

This Environmental Impact Statement (EIS) also considers the as-of-right development of a building with hospital support functions at 111-115 East 77th Street between Lexington and Park Avenues (Block 1412, Lots 9, 10, and 11) (Projected Development Site 1a) as part of the Proposed Project. It would be connected to Projected Development Site 1 by a utility tunnel under East 77th Street. In addition, the Applicant proposes to provide improvements to the 77th Street subway station of the Lexington Avenue (No. 6) line, providing Americans with Disabilities Act (ADA) access to the downtown platform and improving sidewalk conditions in the immediate area.

Following the guidelines of the 2021 *City Environmental Quality Review (CEQR) Technical Manual*, a shadow study is required if a proposed project would result in structures greater than 50 feet in height, or of any height if the project site is located adjacent to, or across the street from, a sunlight-sensitive resource. The Proposed Project would include the development of a new building on the Lexington Avenue. With Envelope 1, the new building would reach a maximum height of 436 feet along Lexington Avenue and could reach a height of up to 210 feet in the midblock. With Envelope 2 , the new building would reach a maximum height of 395 feet along Lexington Avenue and a maximum height of 360 feet in the midblock. Further, Projected Development Site 1a, directly across East 77th Street from Projected Development Site 1, would

be redeveloped with an approximately 75-foot-tall building.[1] Given these height increases and the Eighth Church of Christ, Scientist's publicly accessible garden adjacent to Projected Development Site 1a (across the street from Projected Development Site 1), a shadows analysis was conducted.

PRINCIPAL CONCLUSIONS

The Proposed Project would cause significant adverse shadow impacts to the trees and plantings in the publicly accessible garden on the north side of East 77th Street, for the reasons described in detail below. The Proposed Project would cast new shadows on several other sunlight-sensitive resources in the vicinity, but the analysis concluded, after quantifying the extent and duration of those new shadows and assessing the sensitivity of the affected resources, that these new shadows would not cause a significant adverse impact to those resources.

B. DEFINITIONS AND METHODOLOGY

This analysis has been prepared in accordance with New York City (NYC) CEQR procedures and follows the guidelines of the *CEQR Technical Manual*.

DEFINITIONS

Incremental shadow is the additional, or new, shadow that a structure resulting from a proposed project would cast on a sunlight-sensitive resource.

Sunlight-sensitive resources of concern are those that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. Such resources generally include the following:

- *Public open space* such as parks, beaches, playgrounds, plazas, schoolyards (if open to the public during non-school hours), greenways, and landscaped medians with seating. Planted areas within unused portions of roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources.
- *Features of architectural resources that depend on sunlight for their enjoyment by the public.* Only the sunlight-sensitive features need be considered, as opposed to the entire resource. Such sunlight-sensitive features might include: design elements that depend on the contrast between light and dark (e.g., recessed balconies, arcades, deep window reveals); elaborate, highly carved ornamentation; stained-glass windows; historic landscapes and scenic landmarks; and features for which the effect of direct sunlight is described as playing a significant role in the structure's importance as a historic landmark.
- *Natural resources* where the introduction of shadows could alter the resource's condition or microclimate. Such resources could include community gardens, surface water bodies, wetlands, and designated resources such as coastal fish and wildlife habitats.

Resources not subject to shadows analyses include the following, for the purposes of CEQR:

- *City streets and sidewalks* (except Greenstreets).

[1] Redevelopment of Projected Development Site 1a may occur independent of the Proposed Project to support overall LHH growth; however, for a conservative analysis, it is being analyzed as part of the Proposed Project.

- *Private open space* (e.g., front and back yards, stoops, vacant lots, and any private, non-publicly accessible open space).
- *Project-generated open space*, which cannot experience a significant adverse shadow impact from the project, according to CEQR, because without the project the open space would not exist. However, a discussion of how shadows would affect the new space may be warranted.

A significant adverse shadow impact occurs when the incremental shadow added by a proposed project falls on a sunlight-sensitive resource and substantially reduces or completely eliminates direct sunlight, thereby significantly altering the public's use of the resource or threatening the viability of vegetation or other resources. Each case must be considered on its own merits based on the extent and duration of new shadow, an analysis of the resource's sensitivity to reduced sunlight, and seasonal conditions.

METHODOLOGY

Following the guidelines of the *CEQR Technical Manual*, a preliminary screening assessment must first be conducted to ascertain whether a project's shadow could reach any sunlight-sensitive resources at any time of year. The preliminary screening assessment consists of three tiers of analysis. The first tier determines a simple radius around the proposed building, representing the longest shadow that could be cast. If there are sunlight-sensitive resources within this radius, the analysis proceeds to the second tier, which reduces the area that could be affected by project shadow by accounting for the fact that shadows can never be cast between a certain range of angles south of the project site due to the path of the sun through the sky at the latitude of NYC.

If the second tier of analysis does not eliminate the possibility of new shadows on sunlight-sensitive resources, a third tier of screening analysis further refines the area that could be reached by a project's shadow by looking at specific representative days in each season and determining the maximum extent of shadow over the course of each representative day.

If the third tier of analysis does not eliminate the possibility of new shadows on sunlight-sensitive resources, a detailed shadow analysis is required to determine the extent and duration of the incremental shadow resulting from a project. Incremental shadows are determined by establishing a baseline condition in the future *without* the proposed project (the No Action condition) and comparing it to the future condition *with* the proposed project (the With Action condition), thus illustrating the baseline shadows cast by existing (or future No Action) buildings and distinguishing the additional (incremental) shadows cast by a proposed project. The detailed analysis provides the data needed to assess the shadow impacts. The effects of the new shadows on the sunlight-sensitive resources are described, and their degree of significance is considered. The results of the analysis and assessment are documented with graphics, a table of incremental shadow durations, and narrative text.

C. PRELIMINARY SCREENING ASSESSMENT

A base map was developed using Geographic Information Systems (GIS)[2] to show the location of the Project Site and the surrounding street layout and topography. Mapped databases of parks and other public open spaces; city, state, and national historic resources; and natural resources were

[2] Software: Esri ArcGIS Pro 3.0

added to the map.[3] In coordination with the land use and historic and cultural resources assessments presented in other sections of this ~~Draft~~ Final EIS (~~DEIS~~FEIS), potential sunlight-sensitive resources were identified.

TIER 1 SCREENING ASSESSMENT

The Tier 1 assessment calculates the longest shadow that the Proposed Project could cast and uses this length as the radius to draw a perimeter around the Project Site. Anything outside this perimeter, which represents the longest possible shadow, could never be affected by project-generated shadows, while anything inside the perimeter needs additional assessment.

According to the *CEQR Technical Manual*, the longest shadow that a structure can cast at the latitude of NYC occurs on December 21, the winter solstice, at the start of the analysis day (90 minutes after sunrise[4]) and is equal to 4.3 times the height of the structure.

Envelope 1 has a taller maximum height than Envelope 2 and generates a longer shadow with the 360-foot-tall midblock. To ensure a conservative assessment, Envelope 1 was used to generate the worst-case longest-shadow study area and the resulting sunlight-sensitive resource inventory.

At a maximum height of 436 feet above curb level, including rooftop mechanical structures, the Proposed Project for Envelope 1 could cast a shadow up to 1,875 feet in length (436 × 4.3). Using 1,875 feet as the radius, a perimeter was generated around the Project Site, as shown in **Figure 4-1**. The Tier 1 assessment showed that a number of publicly accessible open spaces and historic resources with sunlight-sensitive features were located in the longest shadow study area. Therefore, the next tier of assessment was required.

TIER 2 SCREENING ASSESSMENT

Because of the path that the sun travels across the sky in the northern hemisphere, no shadow can be cast in a triangular area south of any given project site. In NYC, this area lies between -108 and +108 degrees from true north. **Figure 4-1** illustrates this triangular area south of the project site. This triangular area would be the same for Envelope 1 and Envelope 2. The complementary area to the north within the longest shadow study area represents the remaining area that could potentially experience new project-generated shadows.

The Tier 2 assessment concluded that nine publicly accessible open spaces are in the remaining longest-shadow study area and require further assessment. This inventory of open spaces includes a small portion of Central Park, a number of the Park Avenue Malls (planted medians running along the center of Park Avenue), and seven privately owned plazas, courtyards, or other such spaces associated with office or residential buildings that are open to the public.

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[3] Data: City, State, and Federal agencies including New York City Department of Parks and Recreation (NYC Parks); New York City Department of Information Technology and Telecommunications (DoITT); New York City Department of City Planning (DCP); New York City Landmarks Preservation Commission; New York City Department of Transportation; New York State Office of Parks, Recreation, and Historic Preservation; New York State Department of Environmental Conservation (NYSDEC); U.S. Fish and Wildlife Service; and others, supplemented by Nearmap hi-resolution imagery and AKRF site visits.

[4] As explained in more detail below in the "Tier 3 Screening Assessment" section, shadows occurring within 90 minutes of sunrise or sunset are not considered significant under CEQR.

9.19.23



0 1,000 FEET

Project Site

Study Area Perimeter after Tier 1 and Tier 2 Assessments

Tier 2: Area South of Site That Could Never Be Shaded by Proposed Project

Building Footprints

\# *Publicly-Accessible Open Space (see Table 4-2)*

A *Historic Resource with Sunlight-Sensitive Features (see Table 4-2)*

XA *Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis (see Table 4-1)*

Preliminary Shadow Study Area

Lenox Hill Hospital Redevelopment **Figure 4-1**

In addition, four historic buildings with sunlight-dependent architectural features are located in the Tier 2 longest shadow study area and require further assessment to ascertain whether they could be affected by project-generated shadows.

Three historic resources with sunlight-sensitive features located in the remaining study area were eliminated from the next tier of assessment because their sunlight-sensitive features face away from the Project Site and could not be affected by project-generated shadows. These resources are listed in **Table 4-1**.

The nine open spaces and four historic resources requiring a Tier 3 assessment are listed in **Table 4-2**, along with the Tier 3 assessment results.

Table 4-1
Historic Resources Eliminated from Further Analysis

Map Reference	Resource	Sunlight-Sensitive Features
XA	9 East 72nd Street	Entire front (south) façade
XB	7-15 East 73rd Street	Entire front (south) façade – entry portico, detailing on upper floors
XC	4 East 78th Street	Deeply recessed balconies on front (north) façade
Note: These historic resources have sunlight-sensitive features that face away from the Project Site and cannot receive project-generated shadows.		

Table 4-2
Tier 3 Assessment

Map Reference	Name	Potential Incremental Shadow			
		December 21	March 21/ September 21	May 6/ August 6	June 21
Publicly Accessible Open Spaces					
1	Park Avenue Malls	Potential	Potential	Potential	Potential
2	Central Park	Potential	No	No	No
3	980 Fifth Avenue POPS	No	No	No	No
4	985 Fifth Avenue POPS	No	No	No	No
5	Church garden at 103 East 77th Street	Potential	Potential	Potential	Potential
6	900 Park Avenue POPS	Potential	No	No	No
7	178 East 80th Street POPS	No	Potential	No	No
8	200 East 82nd Street POPS	No	No	No	No
9	301 East 79th Street POPS	No	No	No	No
Historic Architectural Resources with Sunlight-Sensitive Features					
A	The Frick Collection	No	No	No	No
B	20 East 74th Street	No	No	Potential	Potential
C	Metropolitan Museum	No	No	No	No
D	Church of St. Ignatius Loyola	No	No	No	No

Notes:
See **Figure 4-2** for corresponding resource locations and shadow sweeps.
"POPS'" = Privately owned public space.
In the columns representing the representative analysis dates, "No" means that project-generated shadows could not reach the resource, even without accounting for intervening buildings. "Potential" means that project-generated shadows could potentially reach the resource on this date and requires further assessment.

TIER 3 SCREENING ASSESSMENT

The direction and length of shadows vary throughout the course of the day and differ depending on the season. In order to determine whether project-generated shadows could fall on a sunlight-sensitive resource, the Tier 3 assessment used three-dimensional (3D) computer modeling software[5] to calculate and display the Proposed Project's shadows on individual representative days of the year. A computer model was developed containing 3D representations of the elements in the base map used in the preceding assessments, the topographic information of the study area, and a reasonable worst case 3D representation of the massing of the Proposed Project with Envelope 1 and Envelope 2.

REPRESENTATIVE DAYS FOR ANALYSIS

Following the guidance of the *CEQR Technical Manual*, shadows on the summer solstice (June 21), winter solstice (December 21), and spring and fall equinoxes (March 21 and September 21, which are approximately the same in terms of shadow patterns) are modeled to represent the range of shadows over the course of the year. An additional representative day during the growing season is also modeled, generally the day halfway between the summer solstice and the equinoxes (i.e., May 6 or August 6, which have approximately the same shadow patterns).

TIMEFRAME WINDOW OF ANALYSIS

The shadow assessment considers shadows occurring between one and a half hours after sunrise and one and a half hours before sunset. At times earlier or later than this timeframe window of analysis, the sun is down near the horizon and the sun's rays reach the Earth at very tangential angles, diminishing the amount of solar energy and producing shadows that are very long, move fast, and generally blend with other shadows. Consequently, shadows occurring outside the timeframe window of analysis are not considered significant under CEQR, and their assessment is not required.

TIER 3 SCREENING ASSESSMENT RESULTS

Figure 4-2 illustrates the range of shadows that would occur, in the absence of intervening buildings, from the Proposed Project on the four representative days for analysis. As they move clockwise and generally west to east over the landscape, the shadows are shown occurring approximately every 60 minutes from the start of the analysis day (90 minutes after sunrise) to the end of the analysis day (90 minutes before sunset). **Table 4-2** summarizes which analysis day or days each resource could potentially receive project-generated shadows.

The Tier 3 assessment concluded that on all four representative analysis dates, two open space resources could potentially be affected by project-generated shadows: portions of the Park Avenue Malls and the garden associated with the Eighth Church of Christ, Scientist across East 77th Street from the Project Site. In addition, a portion of Central Park could potentially be reached on the winter analysis date, but not on the other representative dates, and two privately owned public spaces (POPS) could each potentially be reached on one of the four analysis dates (the winter date in one case and the spring and fall equinox date in the other). The architecturally significant balconies on the north and east façades of 20 East 74th Street, a residential building in the Upper East Side Historic District, could potentially be reached by project-generated shadows on the two

[5] Bentley MicroStation

6.26.23



Proposed Project

Publicly-Accessible Open Space (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis (see Table 4-1)

This figure illustrates the range of potential shadows that would occur from the Proposed Project on the analysis day representing the winter. The shadows are shown occurring approximately every 60 minutes from the start of the analysis day (90 minutes after sunrise) to the end of the analysis day (90 minutes before sunset).

The Tier 3 assessment does not account for existing or future No Action shadows, and the shadows shown in this figure do not represent incremental shadows. The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed building's shadows across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.

Tier 3 Assessment:
December 21

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-2a

6.26.23



Proposed Project

Publicly-Accessible Open Space (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis (see Table 4-1)

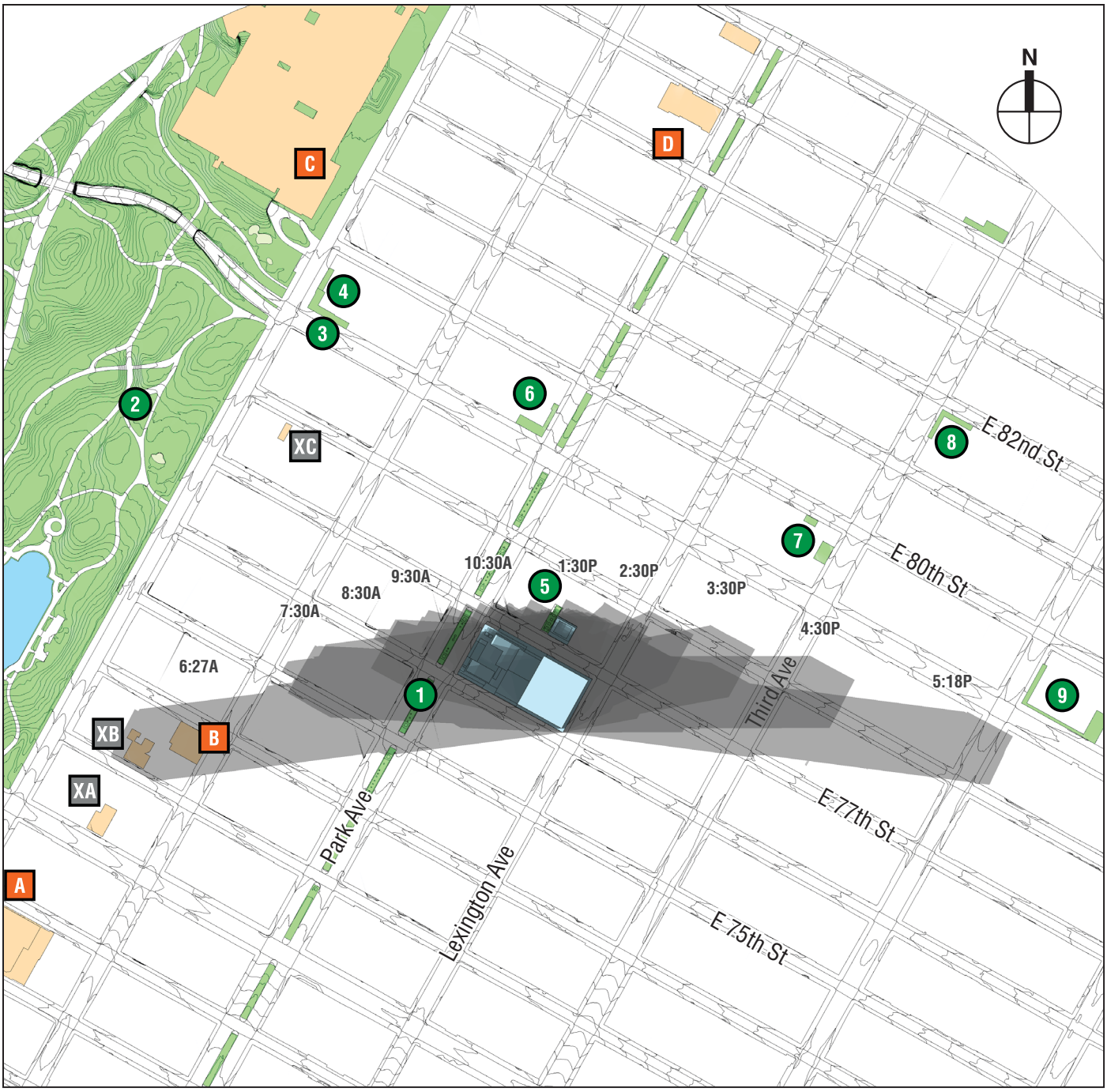
This figure illustrates the range of potential shadows that would occur from the Proposed Project on the analysis day representing the early spring and the fall. The shadows are shown occurring approximately every 60 minutes from the start of the analysis day (90 minutes after sunrise) to the end of the analysis day (90 minutes before sunset).

The Tier 3 assessment does not account for existing or future No Action shadows, and the shadows shown in this figure do not represent incremental shadows. The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed building's shadows across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.

Daylight Saving Time was not used, per *CEQR Technical Manual* guidelines.

Tier 3 Assessment:
March 21 / September 21

6.26.23



Proposed Project

Publicly-Accessible Open Space (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis (see Table 4-1)

This figure illustrates the range of potential shadows that would occur from the Proposed Project on the analysis day representing the spring and summer growing season period. The shadows are shown occurring approximately every 60 minutes from the start of the analysis day (90 minutes after sunrise) to the end of the analysis day (90 minutes before sunset).

The Tier 3 assessment does not account for existing or future No Action shadows, and the shadows shown in this figure do not represent incremental shadows. The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed building's shadows across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.

Daylight Saving Time was not used, per *CEQR Technical Manual* guidelines.

Tier 3 Assessment:
May 6 / August 6

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-2c

6.26.23



Proposed Project

Publicly-Accessible Open Space (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features (see Table 4-2)

Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis (see Table 4-1)

This figure illustrates the range of potential shadows that would occur from the Proposed Project on the analysis day representing summer. The shadows are shown occurring approximately every 60 minutes from the start of the analysis day (90 minutes after sunrise) to the end of the analysis day (90 minutes before sunset).

The Tier 3 assessment does not account for existing or future No Action shadows, and the shadows shown in this figure do not represent incremental shadows. The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed building's shadows across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.

Daylight Saving Time was not used, per *CEQR Technical Manual* guidelines.

Tier 3 Assessment:
June 21

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-2d

dates representing the late spring and the summer. Therefore, a detailed analysis was required for the five open spaces and one historic resource noted above. No other sunlight-sensitive resources could be affected by project-generated shadows.

D. DETAILED SHADOW ANALYSIS

A detailed analysis is warranted when the screening analysis does not rule out the possibility that project-generated shadows would reach sunlight-sensitive resources. The detailed analysis establishes a baseline condition, the future without the Proposed Project (the "No Action" condition), to illustrate the shadows cast by existing buildings (and other future planned buildings). This baseline is then compared with the future condition with the Proposed Project (the "With Action" condition) to distinguish the additional (incremental) shadow cast by the Proposed Project. The purpose of the detailed analysis is to determine the extent and duration of new incremental shadows that would be cast on a sunlight-sensitive resource as a result of the Proposed Project. Because existing (or future No Action condition) buildings may already cast shadows on a sunlight-sensitive resource, the Proposed Project may not result in additional, or incremental, shadows on that resource.

Following the analysis framework described in Chapter 1, "Project Description," a detailed analysis was performed for the anticipated completion year of 2036, comparing the Proposed Project with the future No Action condition. In the No Action condition, the hospital complex would remain in its current form. To represent future baseline conditions, 3D representations of existing buildings and future planned developments in the study area, as well as the Proposed Project with the massing of Envelope 1 and Envelope 2, were added to the baseline 3D model using best-available spatial data and imagery data from the City, Nearmap, and publicly available filings with the New York City Department of Buildings.

Shadows are in constant movement. The computer simulation software utilized produces a minute-by-minute animation showing the movement of shadows over the course of each analysis period. The analysis determines the time when incremental shadow would enter each resource, and the time it would exit. Shadow analyses were performed for each of the representative days and analysis periods indicated in the Tier 3 assessment for the massing of both Envelope 1 and Envelope 2.

DETERMINATION OF IMPACT SIGNIFICANCE

The determination of significance of shadow impacts on a sunlight-sensitive resource is based on (1) the information resulting from the detailed shadow analysis describing the extent and duration of incremental shadows; and (2) an analysis of the resource's sensitivity to reduced sunlight. The goal of the assessment is to determine whether the effects of incremental shadows on a sunlight-sensitive resource are significant under CEQR.

A shadow impact occurs when the incremental shadow from a proposed project falls on a sunlight-sensitive resource or feature and reduces its direct sunlight exposure. Determining whether this impact is significant or not depends on the extent and duration of the incremental shadow and the specific context in which the impact occurs.

Per CEQR, a significant shadow impact generally occurs when an incremental shadow of 10 minutes or longer falls on a sunlight-sensitive resource and results in one of the following:

- **Vegetation:**
  - A substantial reduction in sunlight available to a sunlight-sensitive feature of the resource to less than the minimum time necessary for its survival (when there was sufficient sunlight in the No Action condition). In the growing season, six to eight hours of direct sunlight is typically a minimum requirement for vegetation. Four to six hours a day of sunlight is a minimum requirement for vegetation that can tolerate partial sun, such as established tree canopies, shrubs, or perennials.
  - A reduction in direct sunlight exposure where the sensitive feature of the resource is already subject to substandard sunlight (i.e., less than the minimum time necessary for its survival).
- **Historic and Cultural Resources:**
  - A substantial reduction in sunlight available for the enjoyment or appreciation of the sunlight-sensitive features of a historic or cultural resource.
- **Open Space Utilization:**
  - A substantial reduction in the usability of open space as a result of increased shadows, accounting for anticipated new users and the open space's utilization rates throughout the affected time periods.
- **For Any Sunlight-Sensitive Feature of a Resource:**
  - Complete elimination of all direct sunlight on the sunlight-sensitive feature of the resource, when the complete elimination results in substantial effects on the survival, enjoyment, or, in the case of open space or natural resources, the use of the resource.

SUMMARY OF ANALYSIS RESULTS

The detailed analysis concluded that incremental shadows from the Proposed Project (both Envelope 1 and Envelope 2) would fall on portions of the Park Avenue Malls during the morning in all seasons, although they would reach different blocks in different seasons, and at times the incremental shadow would amount to no more than the elimination of a sliver of sunlight between two areas of existing shadow. Incremental shadow would also reach the church garden (from the top of Projected Development Site 1a, which abuts the garden, as well as from Projected Development Site 1) in the spring, summer, and fall seasons (in winter the garden is already in existing shadows all day).

Beside the Malls and the church garden, only three other resources would be affected by incremental shadow from the Proposed Project with Envelope 1, none substantially: a portion of Central Park for 19 minutes on winter mornings but not in other seasons; a POPS associated with the 900 Park Avenue residential building that is essentially a semi-circular driveway with landscaping around it, on the winter analysis day only; and portions of the façade of 20 East 74th Street, a building in the Upper East Side Historic District with sunlight-sensitive features (balconies), for 15 to 18 minutes during the early morning hours on late spring and summer days. The detailed analysis also concluded that the 178 East 80th Street POPS, the fifth open space that the Tier 3 assessment indicated could potentially receive incremental shadow, would not receive incremental shadow due to intervening buildings. The extent and duration of new (incremental) shadow from the Proposed Project with Envelope 2 would be similar to those of the Proposed Project with Envelope 1, with certain minor differences (described in detail below), and with respect to all affected resources the conclusions would remain the same. As with Envelope 1, with

Envelope 2 incremental shadow from Proposed Development Sites 1 and 1a would cause significant adverse shadow impacts to the trees and plantings in the publicly accessible church garden at 103 East 77th Street. The Proposed Project with either Envelope 1 or Envelope 2 would affect other sunlight-sensitive resources, but the added shadow would not result in significant adverse shadows impacts on those resources.

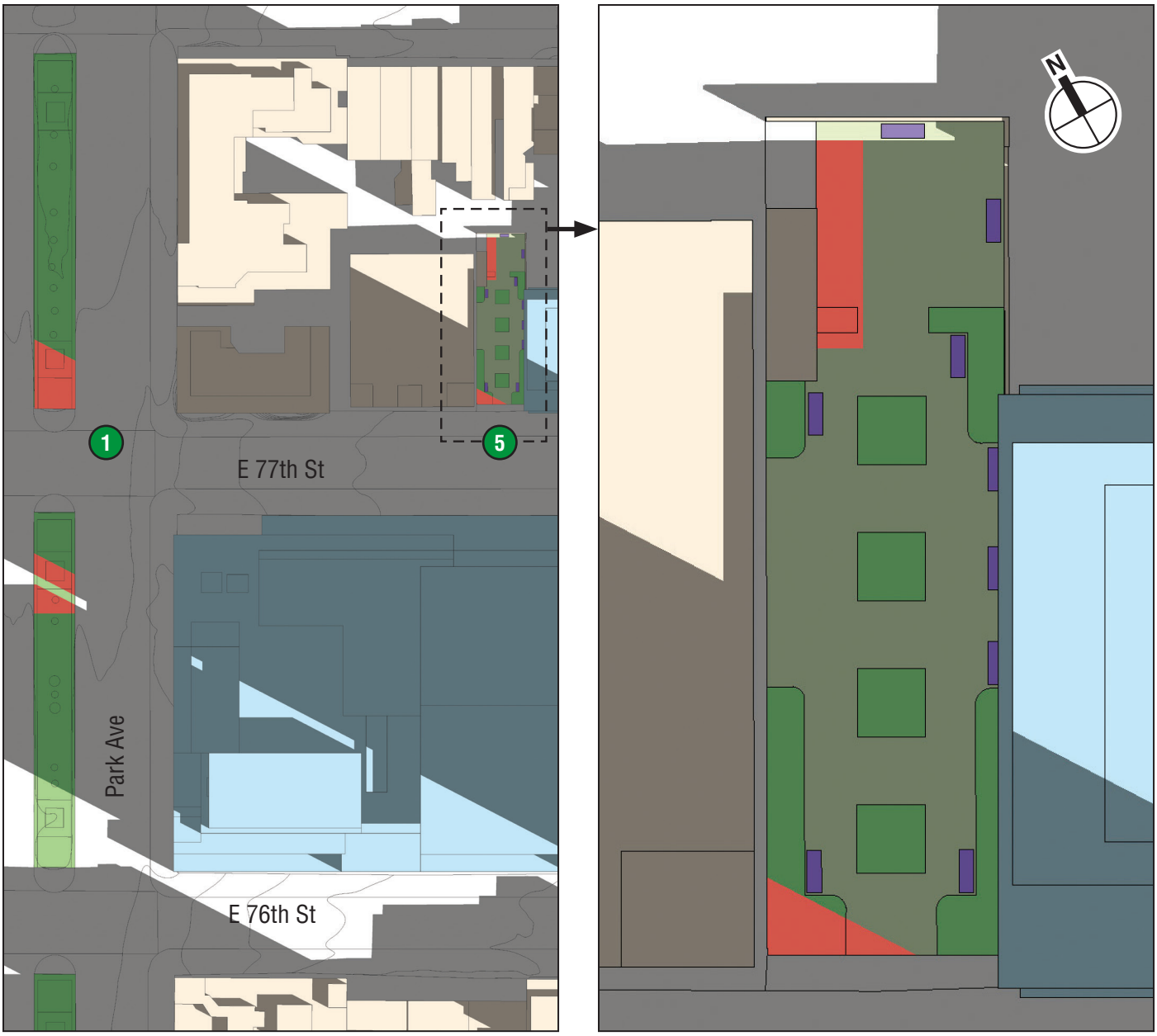
Tables 4-3a and 4-3b summarize the entry and exit times and total duration of incremental shadows on each affected sun-sensitive resource for Envelope 1 and Envelope 2, respectively. **Figures 4-3 to 4-18** document the results of the Envelope 1 analysis and **Figures 4-19 to 4-21** document the results of the Envelope 2 analysis by providing graphic representations of times when incremental shadow would fall on a sun-sensitive resource. The figures illustrate the extent of additional, incremental shadow at that moment in time (highlighted in red) and show existing shadow and remaining areas of sunlight. **Figure 4-22** presents leaf-off and leaf-on aerial photos of the church garden on East 77th Street, as well as a site plan.

Table 4-3a
Incremental Shadow Durations—Envelope 1

Map Reference	Name	Dec. 21	Mar. 21 / Sept. 21	May 6 / Aug. 6	Jun. 21
Publicly Accessible Open Spaces					
1	Park Avenue Malls	9:20am to 10:20am 12:55pm to 1:10pm Total 1 hr 15 min	7:45am to 8:20am 8:35am to 9:20am 9:25am to 12:15pm Total 4 hr 10 min	7:40am to 11:15am Total 3 hr 35 min	6:10am to 7:00am 7:35am to 11:00am Total 4 hr 15 min
2	Central Park	8:51am to 9:10am Total 19 min	—	—	—
5	Church Garden at 103 East 77th Street	—	9:45am to 1:55pm Total 4 hr 10 min	8:00am to 3:00pm Total 7 hr	7:30am to 12:35pm 1:15pm to 3:45pm Total 7 hr 35 min
6	900 Park Avenue POPS	11:00am to 12:10pm Total 1 hr 10 min	—	—	—
Historic Resources with Sunlight-Sensitive Features					
B	20 East 74th Street	—	—	6:27am to 6:45am Total 18 min	6:10am to 6:25am Total 15 min

Notes: Table indicates entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.
"—" indicates that no incremental shadow would fall on the resource, due either to intervening buildings or because the project-generated shadows would not reach the resource.
Daylight saving time is not used—times are Eastern Standard Time, per *CEQR Technical Manual* guidelines. However, as Eastern Daylight Time is in effect for the March/September, May/August, and June analysis periods, add one hour to the given times to determine actual clock time.

5.14.24



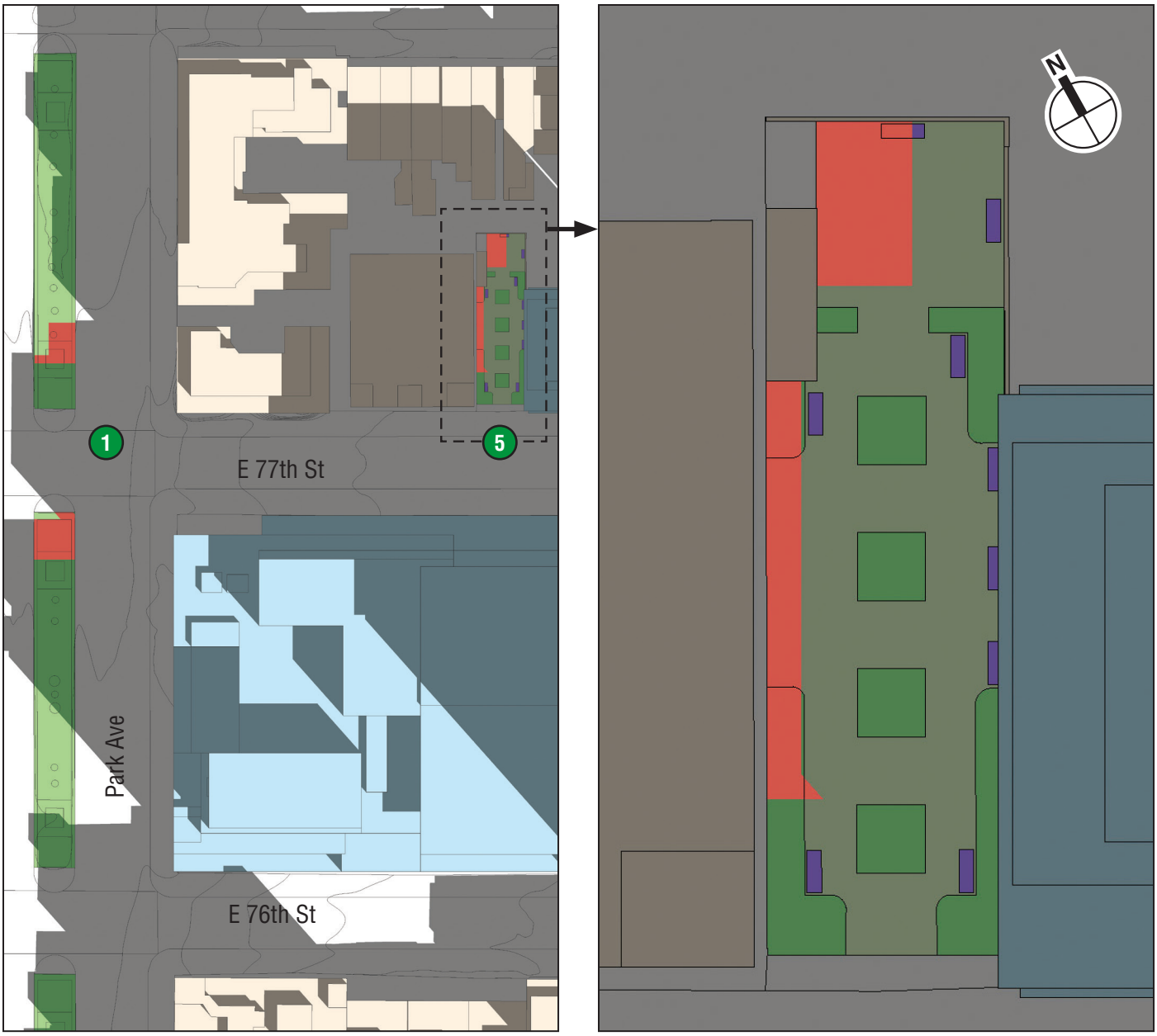
March 21 / September 21
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Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis
Envelope 1

5.14.24



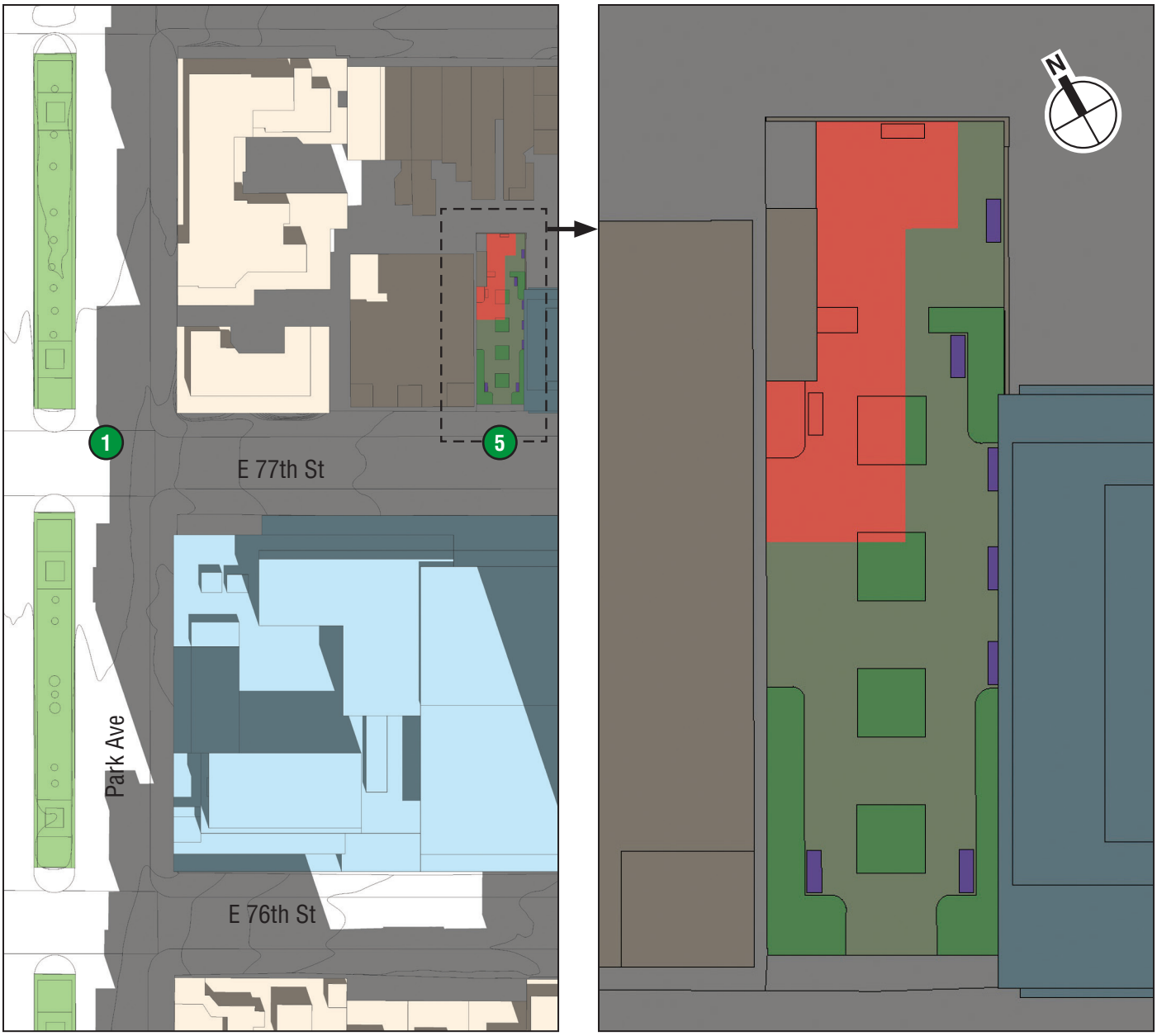
March 21 / September 21
11:30 AM EST / 12:30 PM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis
Envelope 1

5.14.24



March 21 / September 21
12:30 PM EST / 1:30 PM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis
Envelope 1

5.14.24



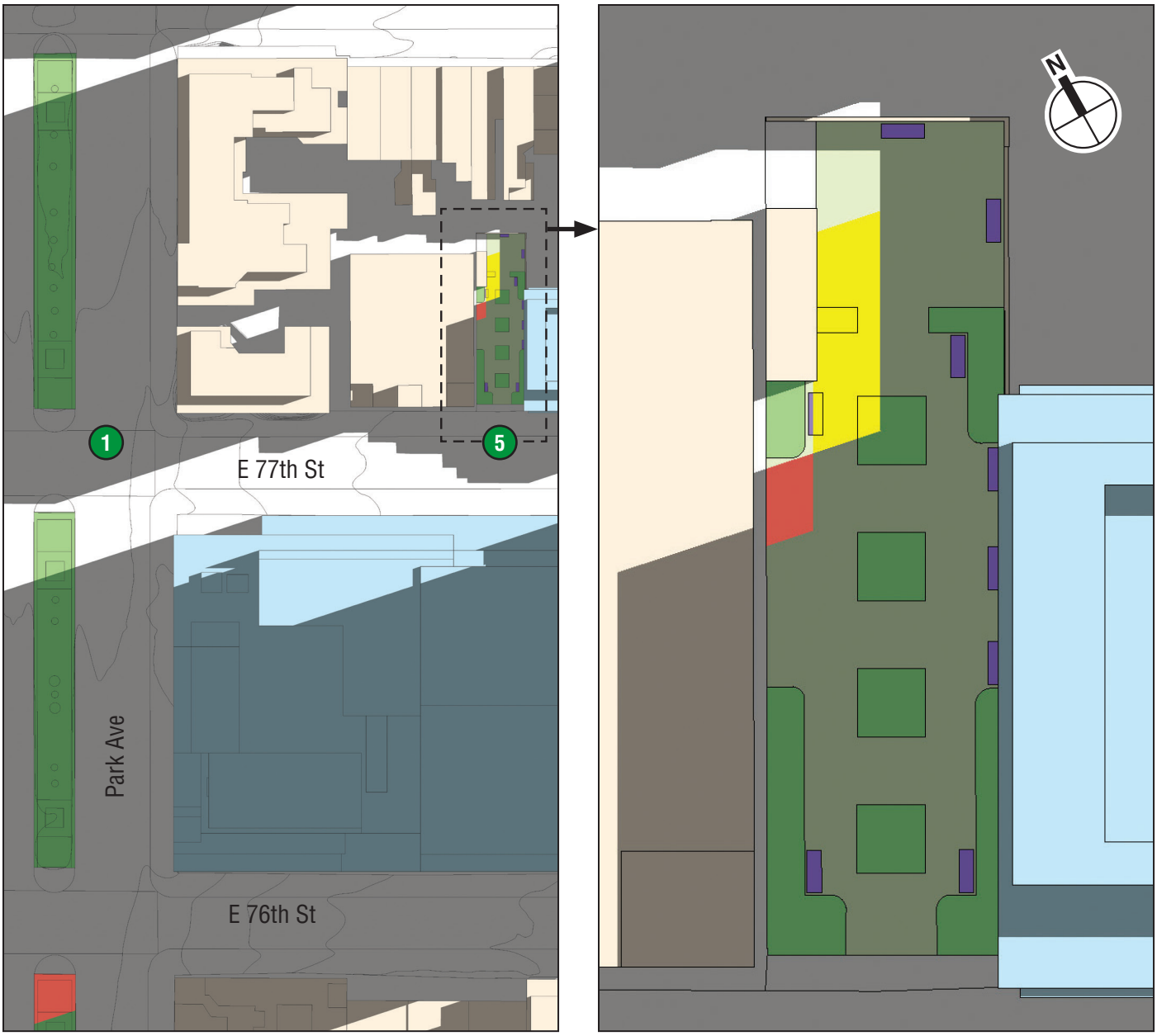
March 21 / September 21
1:30 PM EST / 2:30 PM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis
Envelope 1

5.14.24



May 6 / August 6
8:15 AM EST / 9:15 AM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

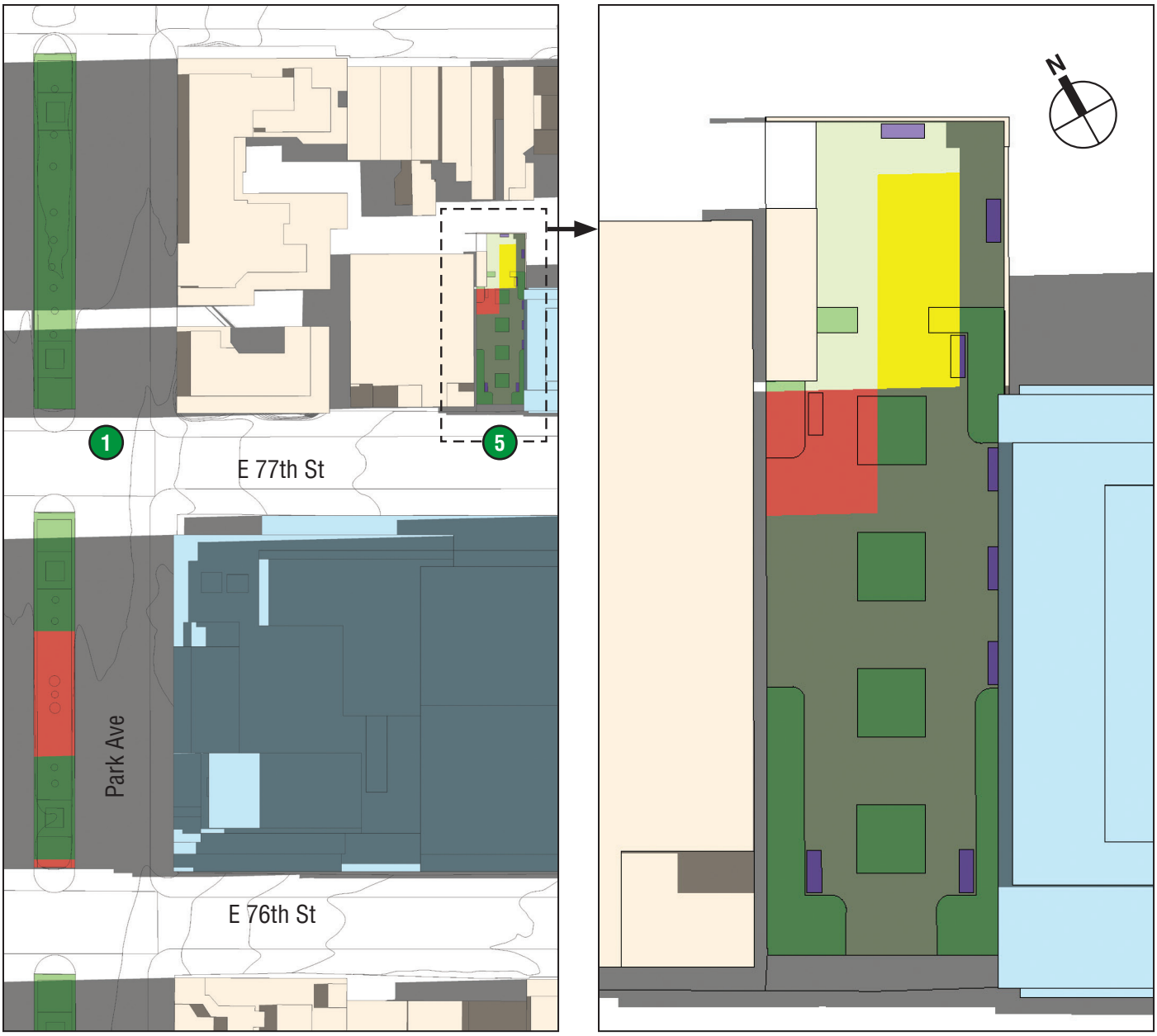
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-7

5.14.24



May 6 / August 6
9:30 AM EST / 10:30 AM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-8

5.14.24



May 6 / August 6
10:45 AM EST / 11:45 AM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

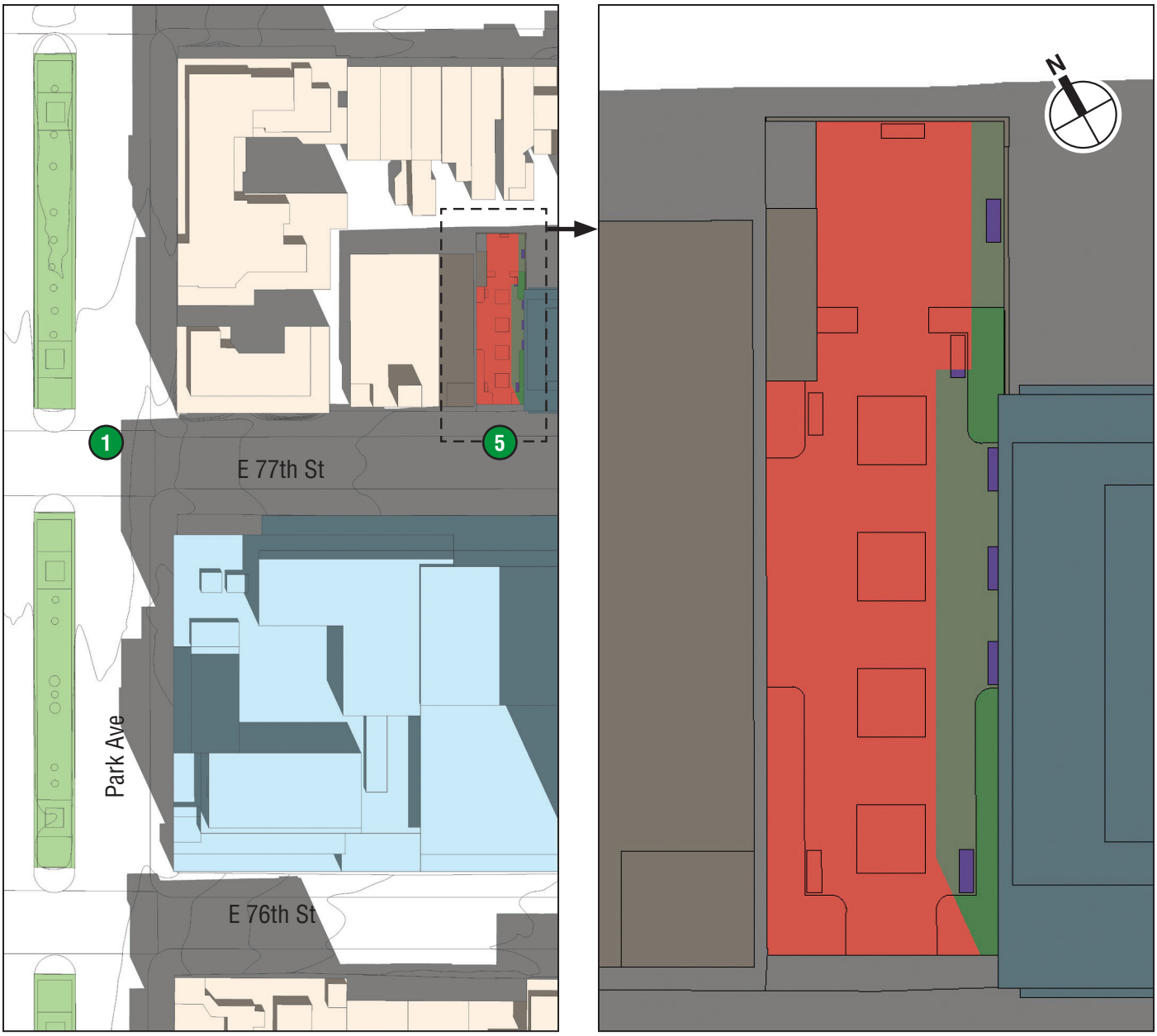
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-9

5.14.24



May 6 / August 6
12:00 PM EST / 1:00 PM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-10

5.14.24



May 6 / August 6
1:15 PM EST / 2:15 PM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

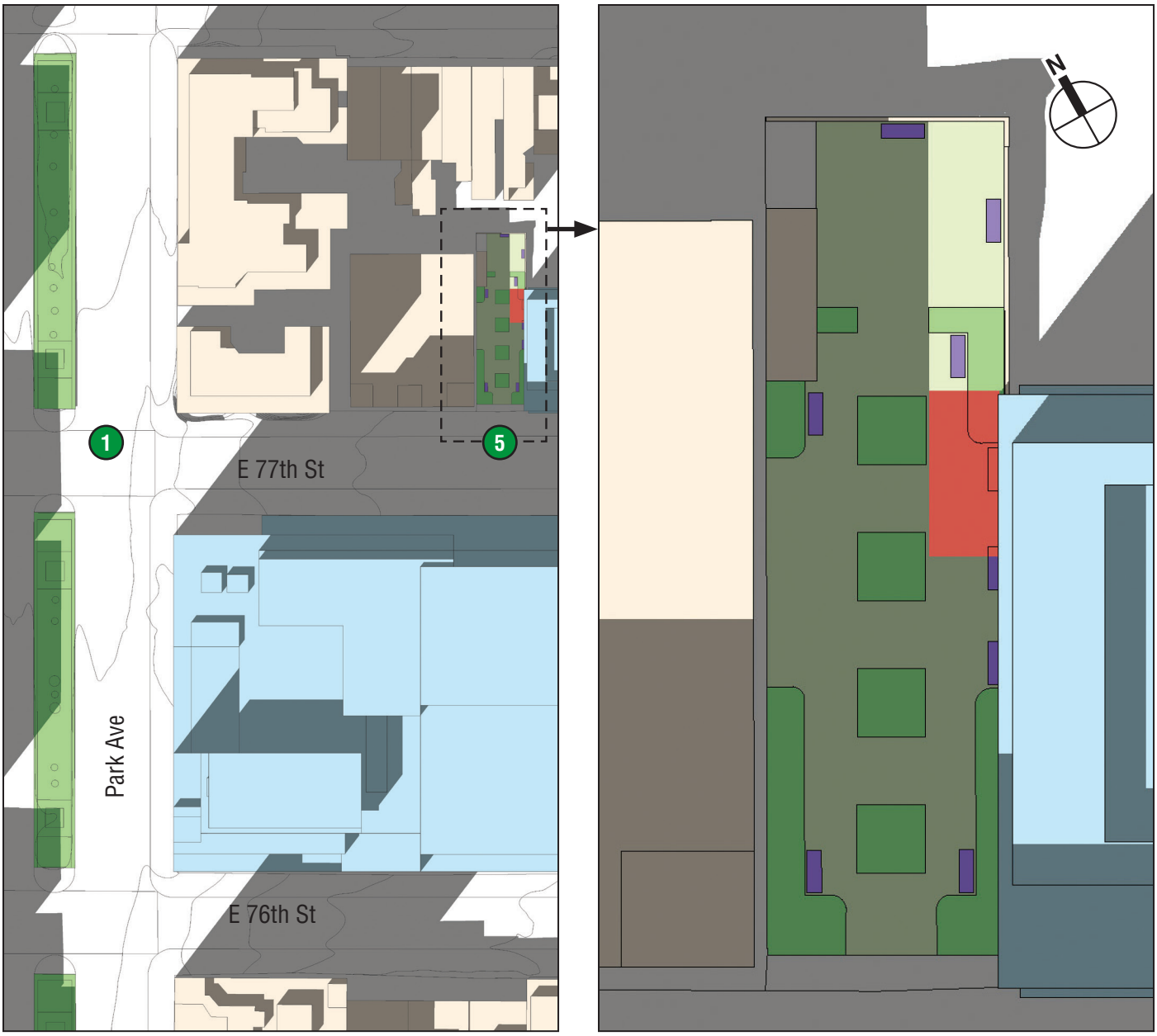
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-11

5.14.24



May 6 / August 6
2:30 PM EST / 3:30 PM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

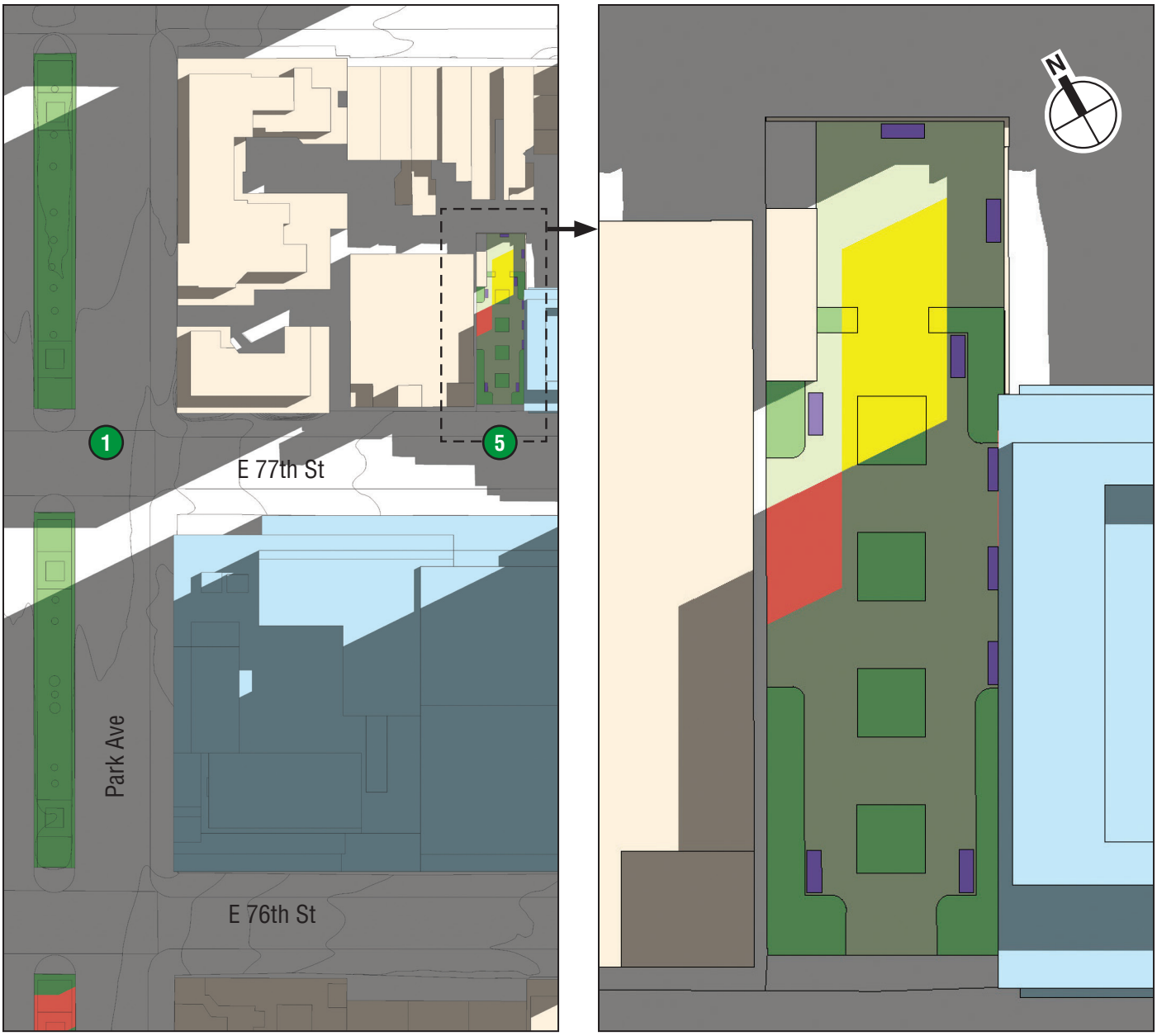
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-12

5.14.24



June 21
8:15 AM EST / 9:15 AM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

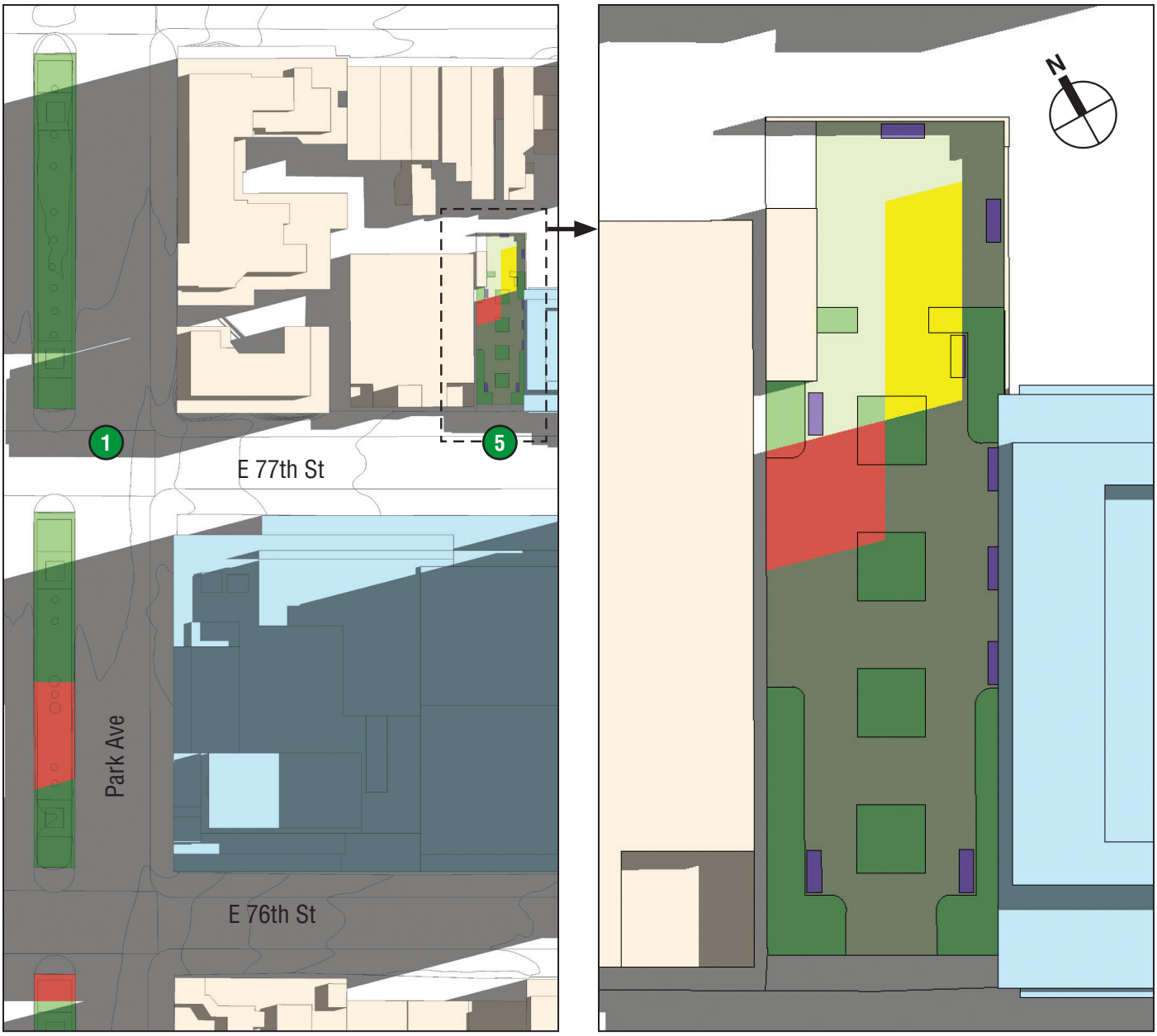
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-13

5.14.24



June 21
9:15 AM EST / 10:15 AM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

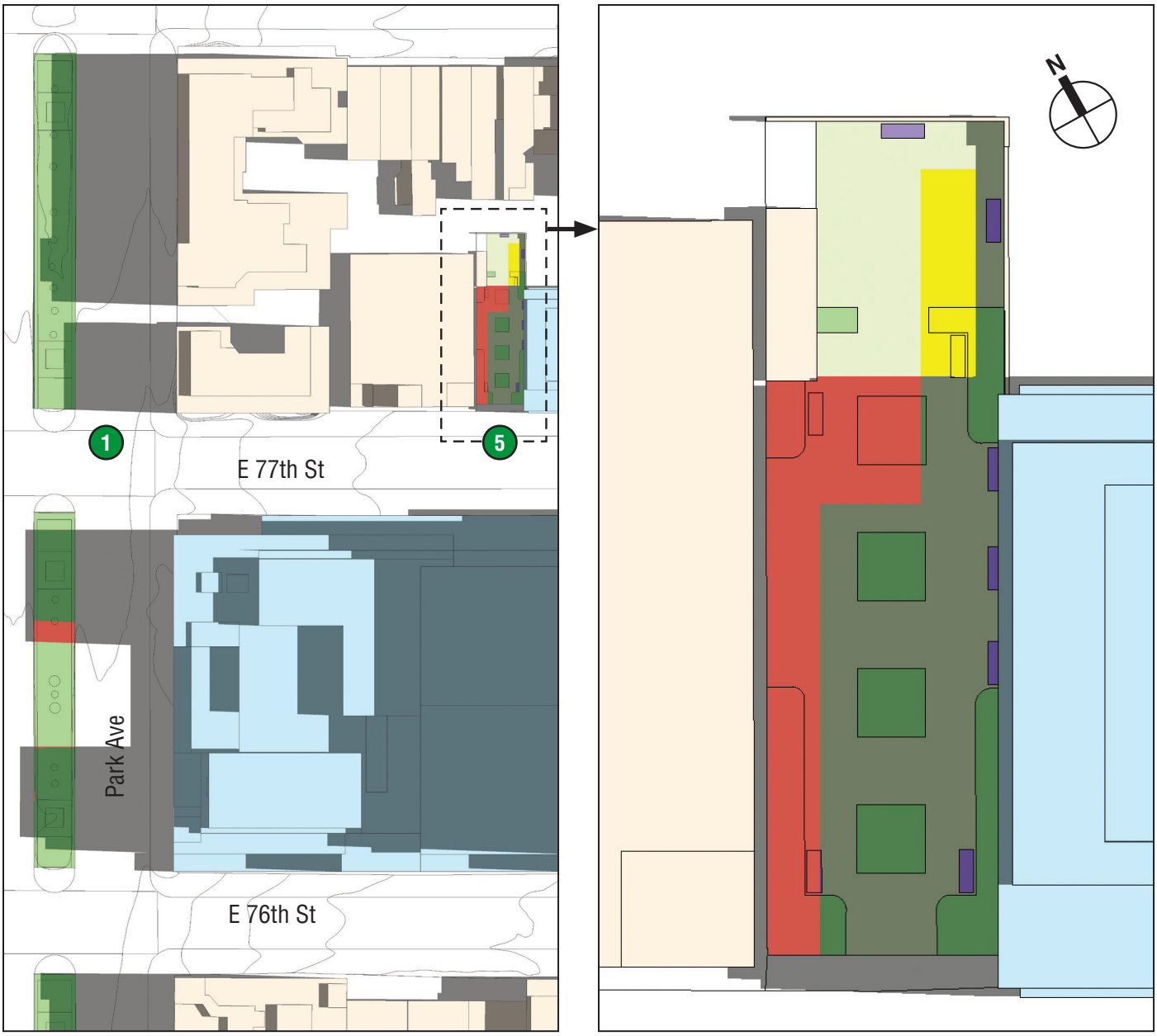
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-14

5.14.24



June 21
10:15 AM EST / 11:15 AM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-15

5.14.24



June 21
11:15 AM EST / 12:15 PM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-16

5.14.24



June 21
12:15 PM EST / 1:15 PM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

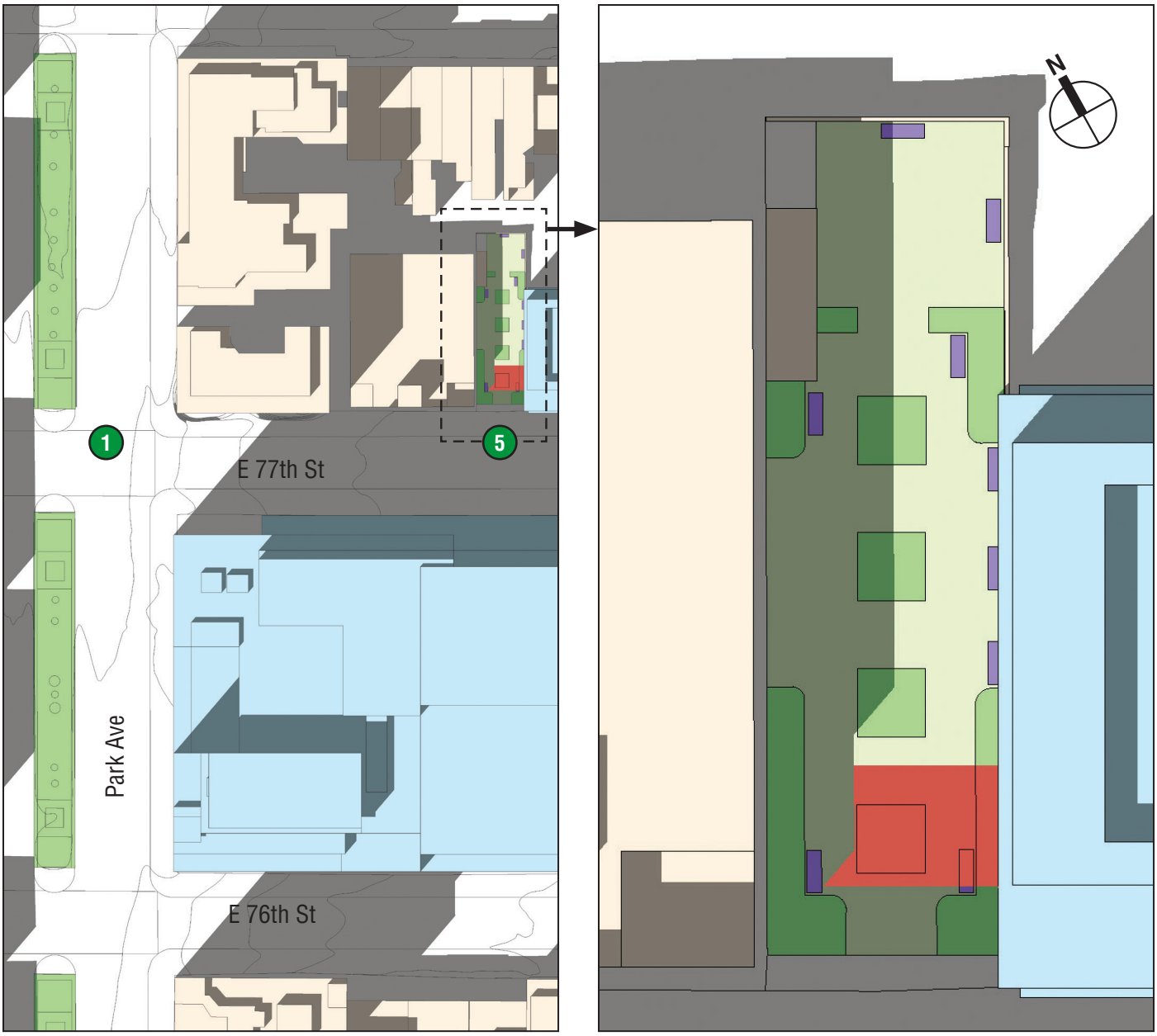
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-17

5.14.24



June 21
2:15 PM EST / 3:15 PM EDT

Proposed Project

Publicly Accessible Open Space (see Table 4-2)

Incremental shadow on Sunlight-Sensitive Resource

*Reduced Shadow**

Benches

Paved

Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings. EST - Eastern Standard Time. EDT = Eastern Daylight Time.

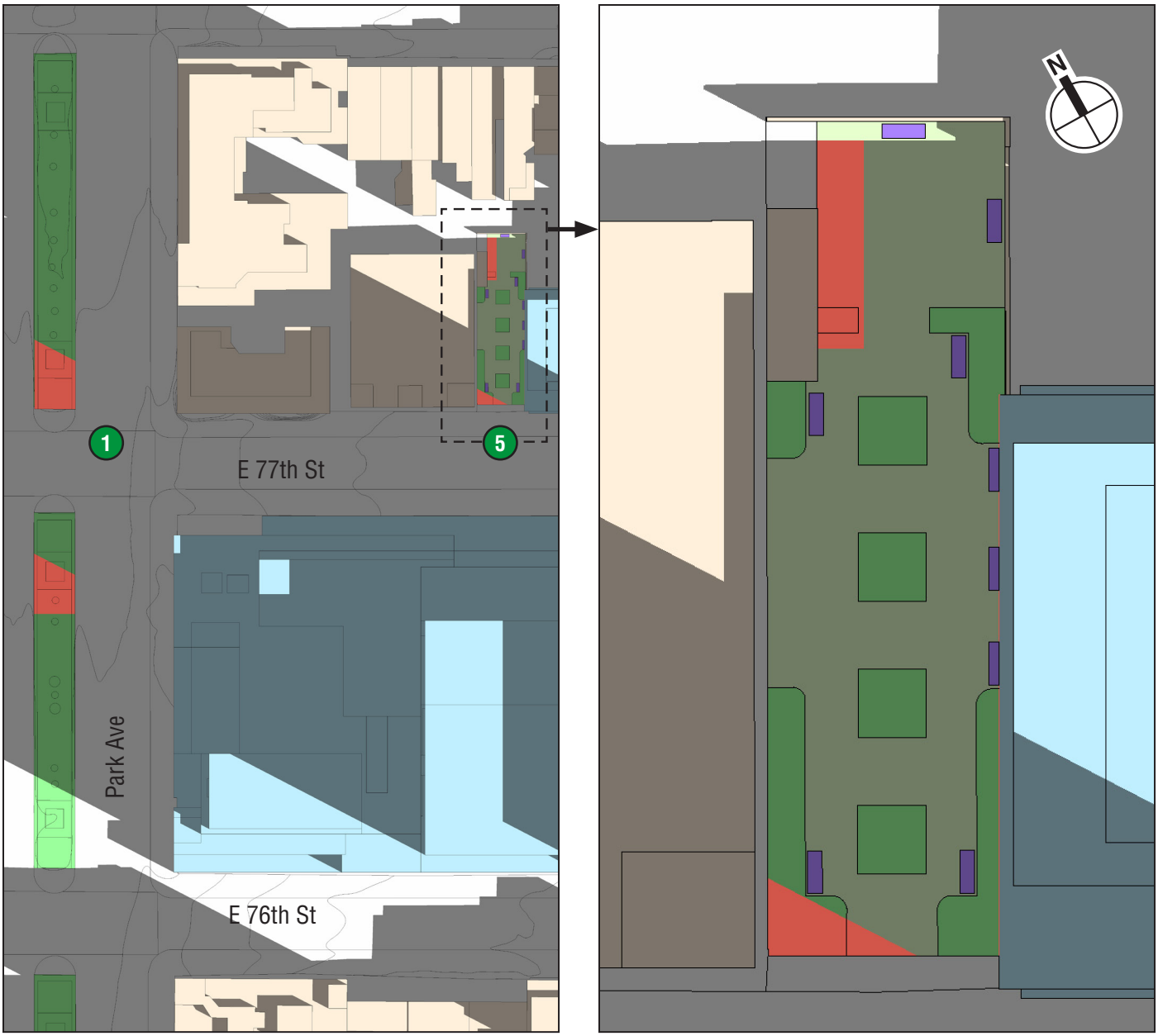
* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 1

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-18

5.14.24



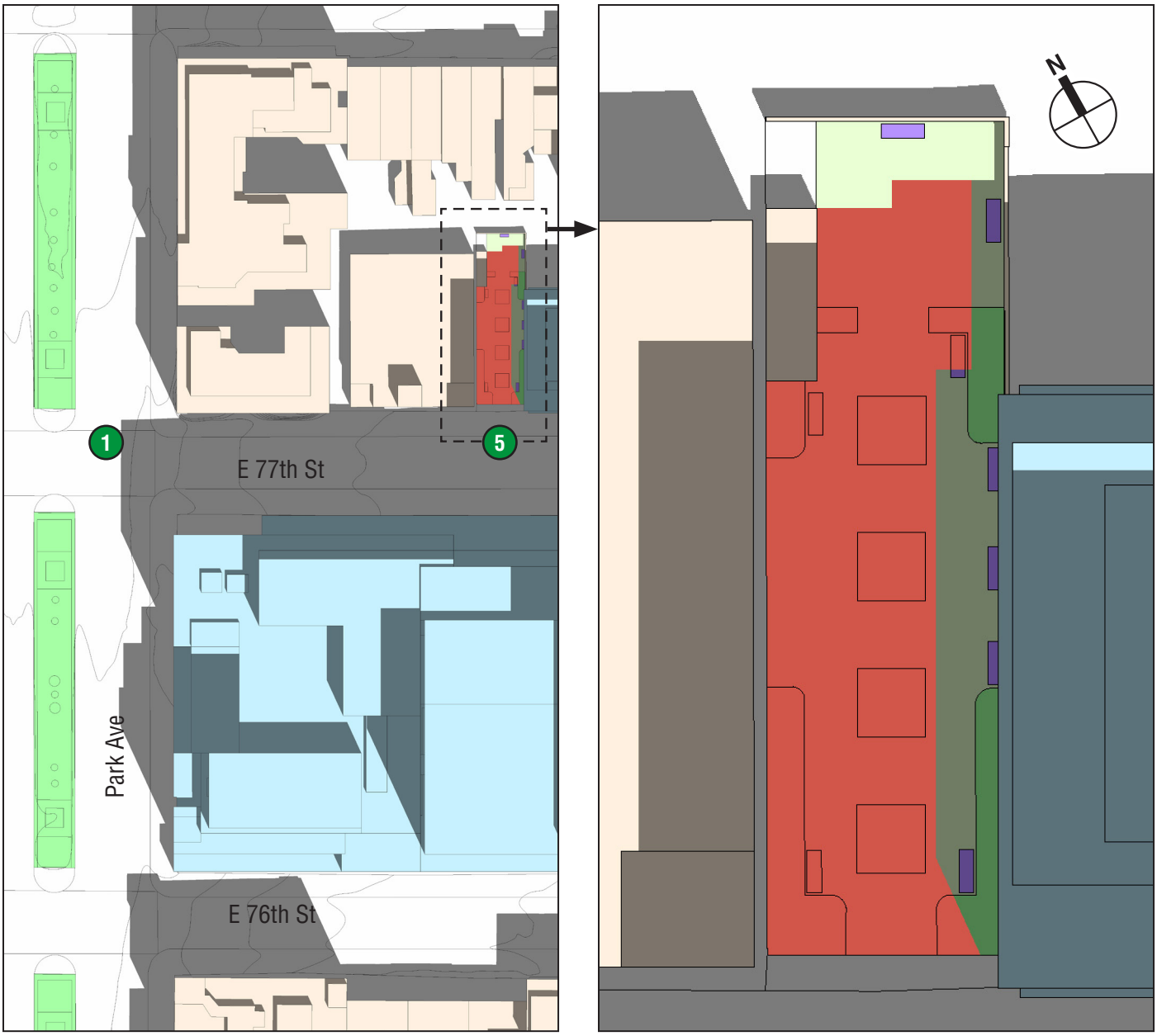
March 21 / September 21
10:30 AM EST / 11:30 AM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis
Envelope 2

5.14.24



May 6 / August 6
12:00 PM EST / 1:00 PM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

Detailed Analysis
Envelope 2

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-20

5.14.24



June 21
12:15 PM EST / 1:15 PM EDT

Proposed Project
Publicly Accessible Open Space (see Table 4-2)
Incremental shadow on Sunlight-Sensitive Resource
*Reduced Shadow**
Benches
Paved
Planted Area

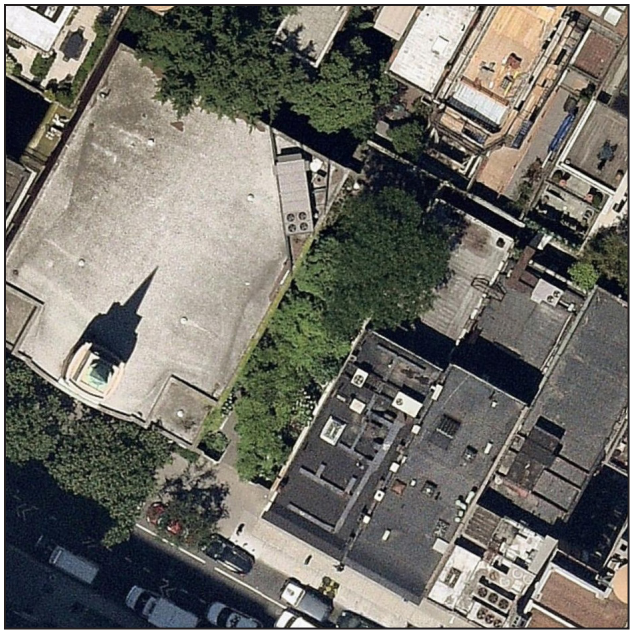
NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST - Eastern Standard Time. EDT = Eastern Daylight Time.

* "Reduced Shadow" refers to shadow that would be cast in the No Action condition, by the existing building on Projected Development Site 1a, but not in the With Action condition.

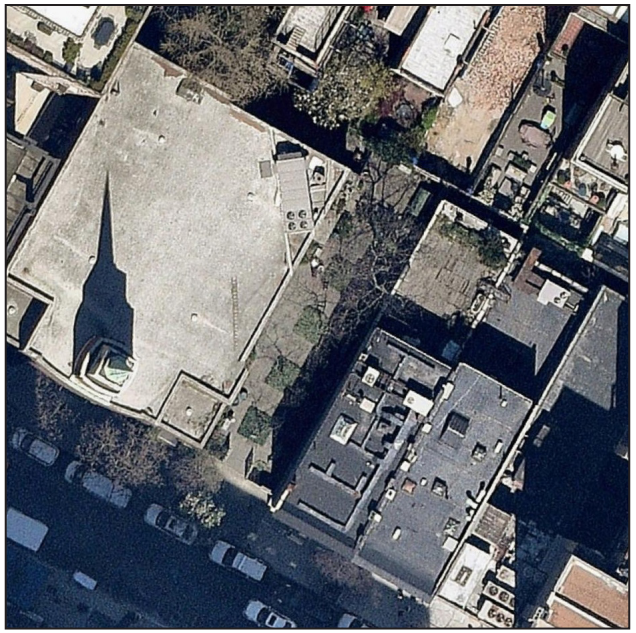
Detailed Analysis
Envelope 2

LENOX HILL HOSPITAL REDEVELOPMENT

Figure 4-21



Leaf-on
June 12, 2018



Leaf-off
April 16, 2016



Site plan
(shadows reflect April 16/October 16 12:00 PM EST/1:00 PM EDT)

Benches
Paved
Planted Area

Aerial Photographs and Site Plan

Figure 4-22

Table 4-3b
Incremental Shadow Durations—Envelope 2

Map Reference	Name	Dec. 21	Mar. 21 / Sept. 21	May 6 / Aug. 6	Jun. 21
Publicly Accessible Open Spaces					
1	Park Avenue Malls	9:20am to 10:20am 12:55pm to 1:10pm Total 1 hr 15 min	7:45am to 8:20am 8:35am to 9:20am 9:25am to 12:15pm Total 4 hr 10 min	7:40am to 11:15am Total 3 hr 35 min	6:10am to 7:00am 7:35am to 11:00am Total 4 hr 15 min
2	Central Park	8:51am to 9:05am Total 14 min	—	—	—
5	Church Garden at 103 East 77th Street	—	9:45am to 1:55pm Total 4 hr 10 min	8:00am to 3:00pm Total 7 hr	7:30am to 12:35pm 1:15pm to 3:45pm Total 7 hr 35 min
6	900 Park Avenue POPS	11:20am to 11:55am Total 35 min	—	—	—
Historic Resources with Sunlight-Sensitive Features					
B	20 East 74th Street	—	—	6:27am to 6:40am Total 13 min	6:10am to 6:20am Total 10 min

Notes: Table indicates entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.
"—" indicates that no incremental shadow would fall on the resource, due either to intervening buildings or because the project-generated shadows would not reach the resource.
Daylight saving time is not used—times are Eastern Standard Time, per *CEQR Technical Manual* guidelines. However, as Eastern Daylight Time is in effect for the March/September, May/August, and June analysis periods, add one hour to the given times to determine actual clock time.

ASSESSMENT OF SHADOW IMPACTS BY RESOURCE

The following section briefly describes each affected resource that would receive more than 10 minutes of incremental shadow;[6] the degree and nature of its sunlight sensitivity; and the extent, duration, and potential effects of incremental shadow. Descriptions of resource conditions and utilization rates were taken from Chapter 3, "Open Space." Map reference numbers are included with the name, for convenience.

Times are given in Eastern Standard Time (EST) in all seasons, as mandated by the *CEQR Technical Manual*, but Eastern Daylight Time (EDT) is in effect for all representative analysis days except for December 21, and times are also provided parenthetically in EDT when relevant, for informational purposes.

OPEN SPACE RESOURCES

Park Avenue Malls (Map #1)

These wide, raised, landscaped medians separating the northbound and southbound roadbeds of Park Avenue contain trees, flowers and other plantings, and lawn areas. They are inaccessible to pedestrians and do not contain benches at the crosswalks or any other amenities beyond the plantings and landscaping and are therefore visual resources rather than usable recreational

[6] Per *CEQR Technical Manual* guidelines, incremental shadow is not considered significant when its duration is no more than 10 minutes, and the resource otherwise continues to receive substantial sunlight. *CEQR Technical Manual*, 2021 edition, page 8-28.

resources. The medians are therefore evaluated in terms of how the incremental shadows would affect the vegetation.

The detailed analysis concluded that incremental shadows would fall on portions of the Park Avenue Malls during the morning in all seasons, although they would reach different blocks in different seasons, and at times the incremental shadow would amount to no more than the elimination of a sliver of sunlight between two areas of existing shadow. The total duration of incremental shadow would be the same with either Envelope 1 or Envelope 2 in all seasons (see **Tables 4-3a and 4-3b**, respectively).

Envelope 1

On the winter analysis date, shadows are longest and, except for about an hour and a half in the early afternoon, the Malls are generally in existing shadows throughout the day, with only slivers of sun reaching them now and then. There would be a sliver of incremental shadow from 9:20 AM to 10:20 AM on the block between East 76th and 77th Streets, and then two slivers on the two blocks between East 77th and 79th Streets (one sliver each), lasting 15 minutes, 12:55 PM to 1:10 PM. These incremental shadows would not significantly impact the vegetation of the Malls, given their limited extent, duration, and the fact that they occur outside NYC's growing season.

On the March 21/September 21 analysis date, incremental shadow would fall intermittently during the morning on different portions of the Malls between East 75th and 78th Streets, for a total duration of 4 hours and 10 minutes. From 7:45 AM to 9:30 AM, the incremental shadows would be in the form of slivers or narrow bands between existing shadows. From 9:30 AM to 11:45 AM, the incremental shadow would fall in two somewhat wider bands, one north and one south of the East 77th Street intersection, generally covering the full width (east-west) of the Mall and ranging in length (north-south) over time between roughly 12 and at maximum 45 linear feet (see **Figures 4-3 and 4-4**). Some trees or plantings in the affected areas would receive an hour to an hour and 40 minutes less sun.

On the May 6/August 6 analysis date, there would be an area of incremental shadow at the north end of the Mall between East 75th and 76th Streets from 7:40 AM to 8:55 AM, generally small in size but reaching a maximum length (north-south) of about 30 feet, while spanning the full width of the Mall between 8:00 AM and 8:15 AM (see **Figure 4-7**). There would then be an incremental shadow on the Mall between East 76th and 77th Streets from 8:50 AM to 11:15 AM, beginning small and increasing in size until it covers the middle third (lengthwise, north-south) of the Mall for about 40 minutes (9:10 AM to 9:40 AM), then decreasing rapidly to a small area and finally a sliver (see **Figures 4-8 and 4-9**). The total duration of incremental shadow across all the Malls over the course of the morning would be 3 hours and 35 minutes. Some individual trees and plants in the affected areas would receive 1 hour to 1 hour and 40 minutes of new shadow.

On the June 21 analysis date, there would be an incremental shadow on the Mall between East 74th and 75th Streets from 6:10 AM to 7:00 AM, changing in size over the 50-minute duration from a sliver to an approximately 30-foot-long shadows that spans most of the Mall width, and then back to a sliver. Then, as shadows shorten and move clockwise, there would be another area of incremental shadow at the north end of the next Mall to the north, between East 75th and 76th Streets, beginning as a sliver at 7:35 AM and increasing in size until 8:15 AM to 8:30 AM when it would reach its maximum length (north-south) of about 35 feet while spanning the Mall's width, and then decreasing in size again to a sliver and exiting at 9:20 AM. On the next Mall to the north, between East 76th and 77th Streets, incremental shadow would enter the middle of the Mall at 8:20 AM, small at first but increasing in size to cover a maximum of nearly a third of the Mall at 9:15 AM, and then decreasing rapidly to a narrow band across the Mall by 9:40 AM and remaining

so until it exits at 11:00 AM. The total duration of incremental shadow across all the Malls over the course of the morning would be 4 hours and 15 minutes. Some individual trees and plants would receive 1 hour to 1 hour and 20 minutes of new shadow.

Like many traffic islands and medians in the densely developed areas of NYC, the Park Avenue Malls tend to get limited direct sunlight under existing (and future No Action) conditions, particularly on the March 21/September 21 "shoulders" of the growing season when shadows are longer than in the later spring and the summer. Therefore, any duration of incremental shadow could cause additional stress to the vegetation; however, these Malls tend to contain plants chosen for their hardiness and plantings that can thrive in the current environment of suboptimal sunlight and surrounding traffic. Through the heart of the growing season (May to August), all areas of the Malls that would be affected by incremental shadow would continue to receive approximately four to six hours of direct sunlight per day. Therefore, the maximum hour and 40 minutes of new shadow that any individual tree or planting could receive would not significantly impact its viability. Further, most of the trees and plantings in the Malls between East 74th and East 79th Streets would receive minimal or no new shadow from the proposed project; the incremental shadow would affect only limited portions of any one Mall, and different areas in different seasons.

Envelope 2

On the December 21 analysis date, the extent and duration of incremental shadow would be the same under Envelope 2 as Envelope 1. On the March 21/September 21 analysis date, there would be minimal difference: the duration would be the same, while there would be a small sliver more of incremental shadow with Envelope 2 for 35 minutes, from 10:25 AM to 11:00 AM (see **Figure 4-19** compared with **Figure 4-3**), and a slight reduction in the size of the increment, compared to Envelope 1, from 11:00 AM to 11:10 AM. On the May 6/August 6 analysis date, there would similarly be minimal difference with Envelope 2, with the same total duration and small differences in extent at certain times: a small reduction of incremental shadow from 8:45 AM to 8:55 AM; another small reduction of incremental shadow from 9:45 AM to 9:55 AM; and a small increase in incremental shadow from 10:00 AM to 10:20 AM. On the June 21 analysis date, there would again be minimal difference with Envelope 2, with the same total duration as Envelope 1 and slight differences in extent at certain times: a sliver less of incremental shadow from 9:10 AM to 9:20 AM and a small increase in incremental shadow from 9:30 AM to 9:55 AM. Overall, the reduction in incremental shadow would be greater in size than the increase on this analysis date.

In conclusion, with Envelope 2, the incremental shadow would be the same in total duration as Envelope 1. There would be small reductions and increases in incremental shadow coverage at certain brief times in the spring, summer, and fall seasons, resulting from the massing differences (less height along Lexington Avenue and more height in the midblock), but they would not change the conclusion that the incremental shadow would not cause significant adverse impacts to the Malls.

Central Park (Map #2)

At the southwest corner of the intersection of Fifth Avenue and East 79th Street, where the 79th Street Traverse enters Central Park, there is a pedestrian path entrance to the park. This area contains broad paths lined at intervals by long benches, and lawn, trees, and other vegetation between the paths and the perimeter sidewalk on Fifth Avenue.

Envelope 1

At the start of the winter analysis date at 8:51 AM, incremental shadow from the top of the Proposed Project would reach this area of the park, momentarily falling on portions of the bench-

lined paths and lawn areas with trees and plantings (see **Table 4-3a**). Early morning shadows in winter move rapidly, and the incremental shadow would move east, decreasing rapidly in size and exiting completely 19 minutes later. There would be plenty of sunlit benches within sight farther up the paths during this period for park users seeking sun. Given the brief duration, early morning occurrence, and availability of nearby sunlit seating, this increment would not significantly affect the use of this area of the park. The shadow would have no meaningful impact on the vegetation, as it would occur outside of the growing season.

Incremental shadow would not reach the park in other seasons.

Envelope 2

With Envelope 2, there would be five minutes less of shadow when compared to Envelope 1, and the coverage area would be smaller during that period (see **Table 4-3b**). Therefore, the limited incremental shadow with Envelope 2 would not cause significant adverse shadow impacts to Central Park.

Church Garden at 103 East 77th Street (Map #5)

The garden space owned and operated by the adjacent church occupies a narrow lot between the church building and Proposed Development Site 1a. The garden is generally open to the public most days during the warm-weather months. However, there is no posted schedule, and it has been observed to be more frequently closed during colder weather. There are several trees running down the center of the space, front to back, at intervals in tree pits with additional plantings. Two narrow paths of paving stones run from the entrance toward the back on either side of the tree pits and between the trees. There are a total of nine small benches accommodating one or two people located at intervals along the outer perimeter of the two paths (i.e., against or adjacent to the walls of the garden) and planted areas with dense, low plantings (see **Figure 4-22** for leaf-off and leaf-on aerial photos as well as a site plan). Given the narrowness of the lot and the adjacent buildings, the space is generally shady, and the tree canopy provides additional shade during the growing season months.

It should be noted that, per *CEQR Technical Manual* guidelines, the shade created by trees and other natural features is not considered to be shadow of concern for the impact analysis; however, incremental shadow on a tree-shaded environment may create a significant impact as the incremental shadow is not redundant with tree shade, and the tree canopy can be considered a sunlight-sensitive resource. Therefore, the following descriptions do not account for existing shade on the garden from the garden's tree canopy; the baseline shadow described below, except where explicitly noted, is cast by buildings and other structures only. Further, the assessment considers incremental shadow effects on the tree canopy and other plantings.

In winter, the space is in existing shadows throughout the day, and no incremental shadow would occur as a result of the Proposed Project.

On the March 21/September 21 analysis date, in the No Action condition, the garden will be entirely in shadow until 10:00 AM (11:00 AM EDT) and mostly in shadow for another hour. From approximately 11:00 AM to 1:30 PM (12:00 PM to 2:30 PM EDT), while the garden is still more in shadow than in sun, there are some sunlit areas, primarily in the rear and on the western side, with one or two benches in the sun (the benches along the eastern garden wall and near the entrance would be in existing shadow during this time). By 2:00 PM (3:00 PM EDT), the garden will be entirely in shadow again, and will remain so for the rest of the day.

Envelope 1

In the With Action condition, incremental shadows with Envelope 1 would enter the garden at 9:30 AM (10:30 AM EDT), would gradually increase in size, and would eliminate all the sunlight from 10:40 AM (11:40 AM EDT) until 2:00 PM (3:00 PM EDT), after which the garden would be entirely in shadow in both the No Action and With Action conditions (see **Figures 4-3 to 4-6**).

With regard to sun and shadow on the garden's tree canopy, a solar exposure analysis[7] showed that the trees would receive between two hours and five hours of new shadow as a result of the Proposed Project. Some portions of the tree canopy would be reduced from five to six hours of daily sunlight to none; other portions would be reduced from five to six hours to two or three; and other portions from two to three hours to none.

With regard to incremental shadow effects on the recreational use of the garden, the analysis concluded the following:

- Only one to two of the nine benches would be affected by the incremental shadow, which would mean potentially up to four people at any given moment. The other seven to eight benches would be in shadow in both the existing/No Action and With Action conditions (i.e., would be unchanged in terms of sunlight/shadow conditions). In a neighborhood of thousands of residents and workers, and with Central Park three blocks away, affecting up to two out of nine small benches would not be considered significant.
- Under existing and future No Action conditions, the character and look and feel of the garden is that of a shady, intimate oasis between buildings. Most of the space is in shadow throughout March 21 and September 21 under existing/No Action conditions and the additional shadow affecting a small proportion of the space would not change the character of the space or the way it is used.
- As noted above, Central Park is three blocks away, with large areas in sun during the affected midday period.

The assessment concluded that the project-generated incremental shadow would not cause a significant adverse impact to the recreational use of the garden on the March 21/September 21 analysis day.

However, with regard to the garden's tree canopy and other plantings, given the substantial reduction in direct sunlight to the tree canopy and planted areas described above, the Proposed Project would likely cause significant adverse impacts to the garden's vegetation on the March 21/September 21 analysis day.

The proposed building on Projected Development Site 1a would be taller toward the front of the property than the existing/No Action condition building that it would replace, but shorter in the rear of the property. Consequently, in the late spring and summer months, May to August, when shadows are shortest, there generally would be less shadow with the Proposed Project in the rear of the garden in the mornings, but more shadow on the west side of the garden. In the early afternoon during this period, there would be more shadow with the Proposed Project as a result of Projected Development Site 1.

[7] In a solar exposure analysis, the study area and all of its objects (including, in this case, the garden's tree canopies) are divided into one-meter grid cells, and the software calculates (using a location-specific weather file from the United States Department of Energy) for each one-meter-square cell the total amount of sunlight received for a given day, with and without the project.

On the May 6/August 6 analysis day, specifically, there would be areas of incremental and reduced shadow through the mid to late mornings. Up until about 10:00 AM (11:00 AM EDT), there would be similar-sized areas of incremental and reduced shadow, with one to two benches toward the rear of the garden in direct sun in both the existing/No Action and With Action conditions. From 10:00 AM to 12:00 PM (11:00 AM to 1:00 PM EDT), the area covered by incremental shadow on the west side of the garden would be larger than the area of reduced shadow in the rear; there would be one bench in the sun (against the rear wall) rather than between two and four benches in sun in the existing/No Action condition. From 12:00 PM to 12:15 PM (1:00 PM to 1:15 PM EDT), project-generated incremental shadow would eliminate all the sunlight, whereas under the existing/No Action condition, four to five benches would be in sun during that 15-minute period. Between 12:30 PM (1:30 PM EDT) and 3:00 PM (4:00 PM EDT), most of the garden would be in sun in the With Action condition, similar to the existing/No Action conditions, albeit with one to two fewer benches in sun. After 3:00 PM (4:00 PM EDT), the garden would be entirely in shadow in the existing/No Action and With Action conditions (see **Figures 4-7 to 4-12**).

Regarding the garden's vegetation, a solar exposure analysis showed that certain areas of the landscaping and plantings on the ground would receive less than an hour of sun with the Proposed Project, reduced from three hours in some locations and from five hours in others. The smaller trees toward the front of the garden would receive four or five hours less sun on this analysis date, a reduction from nine or more hours to four or five hours, and from five hours down to one.

With regard to incremental shadow effects on the recreational use of the garden, the analysis concluded the following:

- Sun and shadow patterns and their effects on the garden's benches would be similar in the existing/No Action and With Action conditions before 10:00 AM (11:00 AM EDT) and after 12:30 PM (1:30 EDT).
- In the With Action condition, direct sun would be totally eliminated for only 15 minutes, between 12:00 PM and 12:15 PM (1:00 PM and 1:15 PM EDT).
- Aside from that 15-minute period, between 10:00 AM and 12:30 PM (11:00 AM and 1:30 PM EDT), there would be at least one bench in sun in the With Action condition, rather than two to four in the existing/No Action condition.
- As noted for March 21 and September 21, given the small size of the space and limited number and size of the benches, the potential number of users that would be affected is limited. Multiple site visits showed approximately five people in the space around midday.
- As noted for March 21 and September 21, Central Park is three blocks away and contains many sunlit areas during the midday affected period.

The assessment concluded that the project-generated incremental shadow would not cause a significant adverse impact to the recreational use of the garden on the May 6/August 6 analysis day.

However, with regard to the garden's tree canopy and other plantings, given the substantial reduction in direct sunlight to the tree canopy and planted areas described above, the Proposed Project would likely cause significant adverse impacts to the garden's vegetation on the May 6/August 6 analysis day.

On the June 21 analysis date, there would be areas of both incremental and reduced shadow from midmorning to early afternoon resulting from the taller front and shorter rear of the With Action building on Proposed Development Site 1a compared with the No Action (i.e. existing) building on that site. There would be somewhat more reduced shadow earlier in the period and more

incremental shadow later in the period, but unlike on May 6/August 6, the incremental shadow would never eliminate the remaining sunlight. A small incremental shadow would move across the front of the garden over the course of two and a half hours in the mid-to-late afternoon, but areas of sun would remain during this period (see **Figures 4-13 to 4-18**).

Regarding the garden's vegetation, a solar exposure analysis showed that certain areas of the landscaping and plantings on the ground would receive more than two hours of new shadow with the Proposed Project. The smaller trees toward the front of the garden would receive three to five hours less sun on this June 21 analysis date, a reduction from nine or more hours to four or five, and from six hours down to three.

The Proposed Project would result in extensive durations of new shadow on certain areas of the garden's plantings and tree canopy and would likely cause significant adverse impacts to those resources on the June 21 analysis date.

With regard to incremental shadow effects on the recreational use of the garden, the analysis concluded the following:

- On June 21, when shadows are shortest, the incremental shadow would be smaller than on May 6 and August 6 and there would always be sunlit areas, including one or more benches throughout the period when incremental shadow would occur.
- June 21 tends to be a hot day and benches in the shade are more desirable to the garden's users, as observed on site visits in the summer months.
- As noted for the other spring, summer, and fall dates, given the small size of the space and limited number and size of the benches, the potential number of users that would be affected is limited. Multiple site visits showed approximately five people in the space around midday.
- As noted for the other spring, summer, and fall dates, Central Park is three blocks away and contains many sunlit areas during the midday affected period.

Envelope 2

With Envelope 2, there would be no incremental shadow on the garden on the winter analysis date (see **Table 4-3b**), as with Envelope 1. On the March 21/September 21 date representing the early spring and the fall, there would be 40 minutes more of incremental shadow on the tree canopy (1:00 PM to 1:40 PM) but no difference in incremental shadow duration or extent at ground level when compared to Envelope 1. On the May 6/August 6 analysis date under Envelope 2, there would be a little less incremental shadow coverage at ground level during the period 11:15 AM to 12:30 PM (12:15 PM to 1:30 PM EDT), and, notably, from noon to 12:15 PM (1:00 PM to 1:15 PM EDT) the increment would not eliminate all the sunlight as it would with Envelope 1 (see **Figure 4-20** compared to **Figure 4-10**). There would also be 15 minutes less shadow on the tree canopy at that time, around noon (1:00 PM EDT). On the June 21 analysis date under Envelope 2, the size of incremental shadow coverage would be smaller at ground level for about an hour in the early afternoon when compared to Envelope 1, and a portion of the tree canopy would receive 15 minutes less shadow (see **Figure 4-21** compared to **Figure 4-17**).

With Envelope 2, the garden's tree canopy would receive 40 minutes more of incremental shadow on the March 21/September 21 analysis date and 15 minutes less of shadow in the late spring and summer months when compared to Envelope 1. With regard to the plantings and benches at ground level in the garden, with Envelope 2, the overall incremental shadow durations would be the same throughout the year, but the coverage area would be smaller at times during the late spring and summer months.

As with Envelope 1, the incremental shadow from the Proposed Project with Envelope 2 would result in significant adverse impacts to the garden's tree canopy and plantings (however, the severity of the impact to the ground-level plantings would be slightly reduced), but would not cause significant adverse impacts to the recreational use of the garden; with Envelope 2, there would be less incremental shadow coverage at ground level in the spring and summer months than with Envelope 1.

900 Park Avenue POPS (Map #6)

There is a semi-circular driveway with landscaping around it in front of the entrance to the 900 Park Avenue residential building, and a strip of fenced plantings along the Park Avenue frontage of the building, that together officially comprise a POPS. There are no benches, no seating of any kind, or any other usable amenities.

Envelope 1

This space would receive an hour and 10 minutes of incremental shadow on the winter analysis day. The shadow would have no meaningful impact on the landscaping, as it would occur outside the growing season, nor would it impact any recreational amenities, passive or active, as there are none in the space.

Incremental shadow would not reach the space in other seasons.

Envelope 2

With Envelope 2, on the December 21 analysis date, incremental shadow would enter this space 20 minutes later than Envelope 1 and exit 15 minutes earlier (see **Table 4-3b**). As with Envelope 1, there would be no incremental shadow on this space on the other representative dates, and therefore the limited incremental shadow with Envelope 2 would not cause significant adverse impacts to this space.

HISTORIC RESOURCES

20 East 74th Street (Map #B)

This residential building located on the southwest corner of East 74th Street and Madison Avenue is within the Upper East Side Historic District, and the balconies on its north and east façades facing the Project Site have been identified as architecturally significant in a way that is enhanced by sunlight.

Envelope 1

On the May 6/August 6 analysis date, incremental shadow would fall on portions of both the north and the east façades for the first 18 minutes of the analysis period, exiting at 6:45 AM (7:45 AM EDT). On the June 21 analysis date, incremental shadow would fall on the east façade for 15 minutes, exiting at 6:25 AM (7:25 AM EDT). At no time during these periods would the new shadow eliminate all the sun from the façades.

Given the brief duration (under 20 minutes), early occurrence, and availability of sunlight on remaining portions of the façades, the incremental shadow would not cause a significant adverse impact to this historic architectural resource.

Envelope 2

With Envelope 1, there would be brief incremental shadow on the façade of this resource in the early mornings of the late spring and summer analysis dates (see **Table 4-3b**). Under Envelope 2,

the increment would be smaller and would be 5 minutes shorter in duration, and like Envelope 1, would not be significant.

E. CONCLUSIONS

Following the methodology described in the *CEQR Technical Manual*, a shadow study was conducted to ascertain whether new shadows resulting from the Proposed Project would significantly affect any sunlight-sensitive resources. The analysis found that the Proposed Project with either Envelope 1 or Envelope 2 would cast new shadows on the church garden located across the street from Projected Development Site 1, and abutting Projected Development Site 1a, in the spring, summer, and fall, causing significant adverse impacts to the vegetation of the garden. Incremental shadows would also fall on portions of the Park Avenue Malls during the morning in all seasons, but their limited duration and coverage would not significantly affect their trees and plantings. Two other sunlight-sensitive resources would receive incremental shadow lasting less than 20 minutes and the limited duration would not have any meaningful effect. A fifth resource with landscaping and no usable amenities would receive new shadow in winter, which would not significantly affect the landscaping (being outside the growing season). As discussed in Chapter 18, "Mitigation," potential mitigation measures could include all new site paving, all new site lighting, all new site furniture, and a vertical green wall on the west facing façade of the new building on Projected Development Site 1a. The Applicant has begun consultation with church representatives with regard to mitigation, and the Applicant will enter into a Restrictive Declaration that will require mitigation measures. Because the significant adverse shadow impact would not be fully mitigated, the Proposed Project would result in an unavoidable significant adverse shadow impact to the vegetation in the Eighth Church of Christ, Scientist garden during the spring, summer, and fall analysis periods.~~are being explored and will be refined between the Draft EIS and Final EIS.~~ ✷