Chapter 6: Shadows

A. INTRODUCTION

Approvals being requested for the East Site and Triangle Site are necessary to permit the reuse and redevelopment of the former hospital buildings on the East Site for residential use in the form approved by the Landmarks Preservation Commission (LPC).

On the East Site, the Coleman and Link Pavilions would be demolished and replaced by a 16-story residential building. While the new building would be approximately the same height (within 2 feet) as the Coleman Pavilion, it would be more than 50 feet taller than the four-story Link Pavilion. Since proposed buildings would be over 50 feet taller than an existing building, a shadow assessment is required, per *City Environmental Quality Review (CEQR) Technical Manual* guidelines. None of the proposed developments at the other East Site locations or at the Triangle Site would be more than 50 feet higher than the existing buildings at the same location, however due to the location of a sensitive receptor immediately to the north, a shadows analysis is warranted. To create the Center for Comprehensive Care, the six-story O'Toole Building would be renovated with expansions at the ground floor and a new mechanical penthouse rising approximately 18 feet above the existing sixth-floor roof.

This chapter considers whether new shadows from the proposed projects would fall on any sunlight-sensitive resources, and evaluates what impacts, if any, would likely result. Following the summary of conclusions below, this chapter provides an overview of the methodology utilized in modeling the extent and duration of project-generated shadows and assessing the effects of those shadows on sunlight-sensitive resources.

PRINCIPAL CONCLUSIONS

The analysis concludes that there would be no significant adverse shadow impacts on public open space, natural resources or architectural resources with sunlight-dependent features. While there would be minor incremental shadows, these new shadows would not be substantial enough in extent or duration to cause a significant adverse impact.

B. DEFINITIONS AND METHODOLOGY

DEFINITIONS

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

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

- *Public open space* (e.g., parks, beaches, playgrounds, plazas, schoolyards, greenways, 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 surface water bodies, wetlands, or designated resources such as coastal fish and wildlife habitats.

Non-sunlight-sensitive resources include:

- *City streets and sidewalks* (except Greenstreets);
- *Private open space* (e.g., front and back yards, stoops, vacant lots, and any private, non-publicly accessible open space);
- *Project-generated open space* cannot experience a significant adverse shadow impact from the project, according to CEQR, because without the project the open space would not exist. However, if the project-generated open space is included in the detailed qualitative analysis in Chapter 5, "Open Space," shadows that fall on it must be assessed and documented with the same level of detail as the other sunlight-sensitive resources. Therefore, this analysis includes a discussion of shadows that would fall on the proposed publicly accessible open space on the Triangle Site.

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 and an analysis of the resource's sensitivity to reduced sunlight.

METHODOLOGY

First, a preliminary screening assessment must 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 area due to the path of the sun through the sky at the latitude of New York City. 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 project shadow by looking at specific representative days of the year 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 the 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.

According to the *CEQR Technical Manual*, project-generated open space is not considered a sunlight-sensitive resource, and shadows on project-generated open space are not considered significant under CEQR. However, when the project-generated open space is included in the qualitative open space analysis, a discussion of how shadows would affect the new space may be warranted. Therefore this chapter includes a discussion of shadows that would fall on the publicly accessible open space that would be created on the Triangle Site as part of the proposed East Site project.

C. PRELIMINARY SCREENING ASSESSMENT

A base map was developed (see **Figure 6-1**) showing the location of the proposed projects and the surrounding street layout. In coordination with the open space, historic and cultural resources, and natural resources assessments presented in other chapters of this EIS, potentially sunlight-sensitive resources were identified and shown on the map. Topographic information was also added to the map, in the form of spot elevations published in Geographic Information Systems (GIS) format by the Department of Information Technology and Telecommunications (DoITT).

On the East Site, only the proposed residential building that would be located on Seventh Avenue, replacing the Coleman and Link Pavilions, would be greater than 50 feet in incremental height above one of the buildings to be replaced; the rest of the new construction on the East Site would be less than 50 feet in incremental height. Therefore, the proposed Seventh Avenue residential building is the only component of the East Site development that requires a shadows assessment.

The proposed mechanical penthouse on the O'Toole Building would not be 50 feet or more in incremental height. However, it would be located adjacent to a potentially sunlight-sensitive resource (see **Figure 6-1**), and therefore its shadows and their effects must be assessed.

TIER 1 SCREENING ASSESSMENT

For the Tier 1 assessment, the longest shadow that the proposed structures could cast is calculated, and, using this length as the radius, a perimeter is drawn around the proposed footprints. Anything outside this perimeter representing the longest possible shadow could never be affected by project-generated shadow, while anything inside the perimeter needs additional assessment.

The longest shadow that a structure can cast occurs on December 21, the winter solstice, at the start of the analysis day, and is equal to 4.3 times the height of the structure (*2010 CEQR Technical Manual*, page 8-4).

The proposed residential building replacing the Coleman/Link Pavilions on the East Site would be about 205 feet above curb level at the top of its mechanical bulkhead and its longest shadow



Project Area

Proposed new structures greater than 50 feet in height or adjacent to sun-sensitive resource

Publicly acessible open space

Potential sunlight-sensitive cultural resource

Proposed Triangle Site open space

Longest shadow study area boundary

Area too far south to ever be shaded by project

Figure 6-1

Tier 1 & Tier 2 Screening Assessments

would be 882 feet. The top of the proposed mechanical penthouse on the O'Toole Building would be about 87 feet above curb level, and therefore the longest shadow it could ever cast would reach 374 feet. **Figure 6-1** presents the results of the Tier 1 assessment, indicating the longest shadow study area for the two proposed structures. Several resources with sunlight-sensitive features are located within the perimeter or longest shadow study area, and therefore the next tier of assessment must be conducted.

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 area. In New York City this area lies between -108 and +108 degrees from true north. **Figure 6-1** illustrates this triangular area south of the two proposed structures being assessed. The complementing area to the north within the longest shadow study area represents the remaining area that could potentially experience new project-generated shadow.

Several resources with sunlight-sensitive features are located within the remaining shadow study area, and therefore additional assessment is required.

OPEN SPACE RESOURCES OF CONCERN

Jackson Square is a triangular-shaped space located northwest of the project area at the intersection of Eighth and Greenwich Avenues and West 13th Street. It contains benches and landscaping.

As part of the proposed projects, the open space on the Triangle Site would be expanded, improved, and made publicly accessible. Therefore, this analysis also includes a discussion of shadows that would fall on the proposed Triangle Site open space.

HISTORIC RESOURCES OF CONCERN

Just north of the O'Toole Building, across West 13th Street, is the Church of the Village, a Gothic-styled stone church that is a historic resource located in the Greenwich Village Historic District. The south façade of the church facing the O'Toole Building has four arched, stained glass windows, the upper halves of which are exposed to direct sunlight and visible from the main sanctuary (see **Figure 6-2**). The east façade, which includes the main entrance and more stained glass windows, faces away from the project area and would not experience any incremental shadow.

As noted in Chapter 7, "Historic and Cultural Resources," the Church of Our Lady of Guadalupe has been identified as a potential historic resource. It is located in a brownstone at 229 West 14th Street. Gustav Steinback of Reiley and Steinback designed the lower three floors of the façade in the Spanish Baroque style. The upper two floors of the building feature a standard brownstone façade, identical to the adjacent building, with no sunlight-sensitive features. The church has a double-height, central arched entrance which contains a stained glass window. This entrance is protected by an ornamental metal grille. The upper floors contain narrow, stained glass windows that flank the central arched opening at the second story. At the third story level, a stained glass window is positioned above a shallow balcony with an iron balustrade.

The Manhattan Seventh-Day Adventist Church is located to the southwest of the project area at 232 West 11th Street. Designed in the Queen Anne style by Laurence B. Valk and completed in 1881 it has large has large diamond-lighted windows facing north-northwest onto West 11th





Figure 6-2
The Church of the Village

Street. Just to the east of this church, is St. John's-in-the-Village Church at the corner of Waverly place. Although it is in the historic district, it is a modern 1972-1974 replacement. It has vertical strip windows also facing north-northwest onto West 11th Street. Its Waverly Place façade is blank. The LPC report indicates that its nave is equipped with lighting which allows it to be transformed into a theatre. Similar to many Greenwich Village streets West 11th Street has street trees which cast shade on the sidewalks and the façades and windows of the small scale buildings that line them.

The New York City Landmarks Designation Report as well as the National Register Nomination Form for the Greenwich Village Historic District were searched for references to sunlight in streetscapes and public spaces. There was a reference to Washington Mews enjoying an unusual amount of light and air; however, Washington Mews is well outside the shadow sweep (as shown in **Figure 6-1**). There were also references to the removal of the elevated railroad along Sixth Avenue having restored its sunlight and air. For a brief period at the very end of the day on June 21 the shadows of both buildings could potentially reach Sixth Avenue—except for the intervening buildings, particularly the taller buildings along the west side of Sixth Avenue, which are already casting shadows across the avenue.

D. DETAILED ANALYSIS

ANALYSIS FRAMEWORK

A three dimensional computer model was developed for the detailed shadows analysis. The model contains the buildings and topography within the study area delineated in the screening analysis above.

Existing buildings, including those that would continue to exist in the project area absent the proposed projects, were used to determine the baseline shadows cast on the sun-sensitive resources in the future without the proposed projects ("No Build condition"). Then shadows were rendered again using the proposed buildings (see **Figure 6-3**) to determine the extent and duration of new or incremental shadow on the resources of concern.

REPRESENTATIVE DAYS FOR ANALYSIS

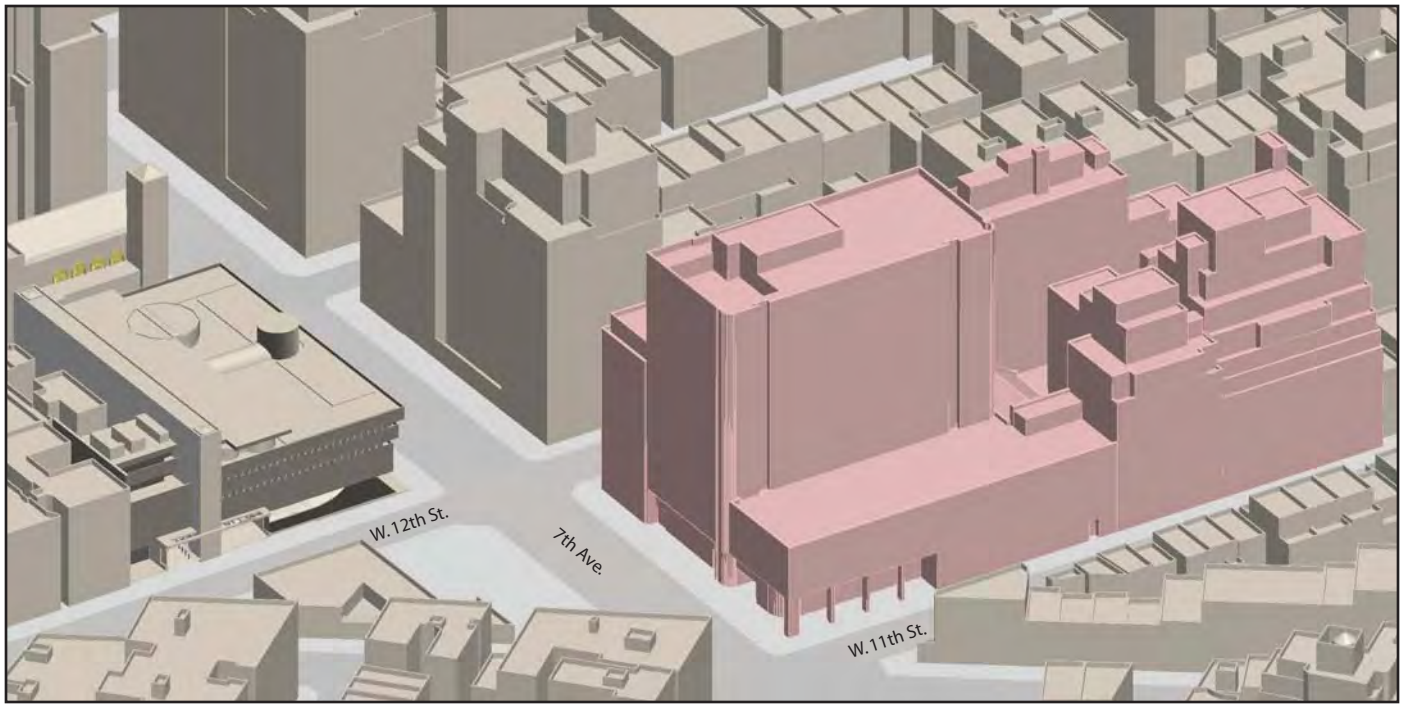
The direction and length of shadows vary throughout the course of the day and also differ depending on the season. In order to determine if and when project-generated shadow could fall on a sunlight-sensitive resource, three-dimensional computer software was used to calculate and display the proposed projects' shadows over the course of individual representative days of the year.

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 are approximately the same.

TIMEFRAME WINDOW OF ANALYSIS

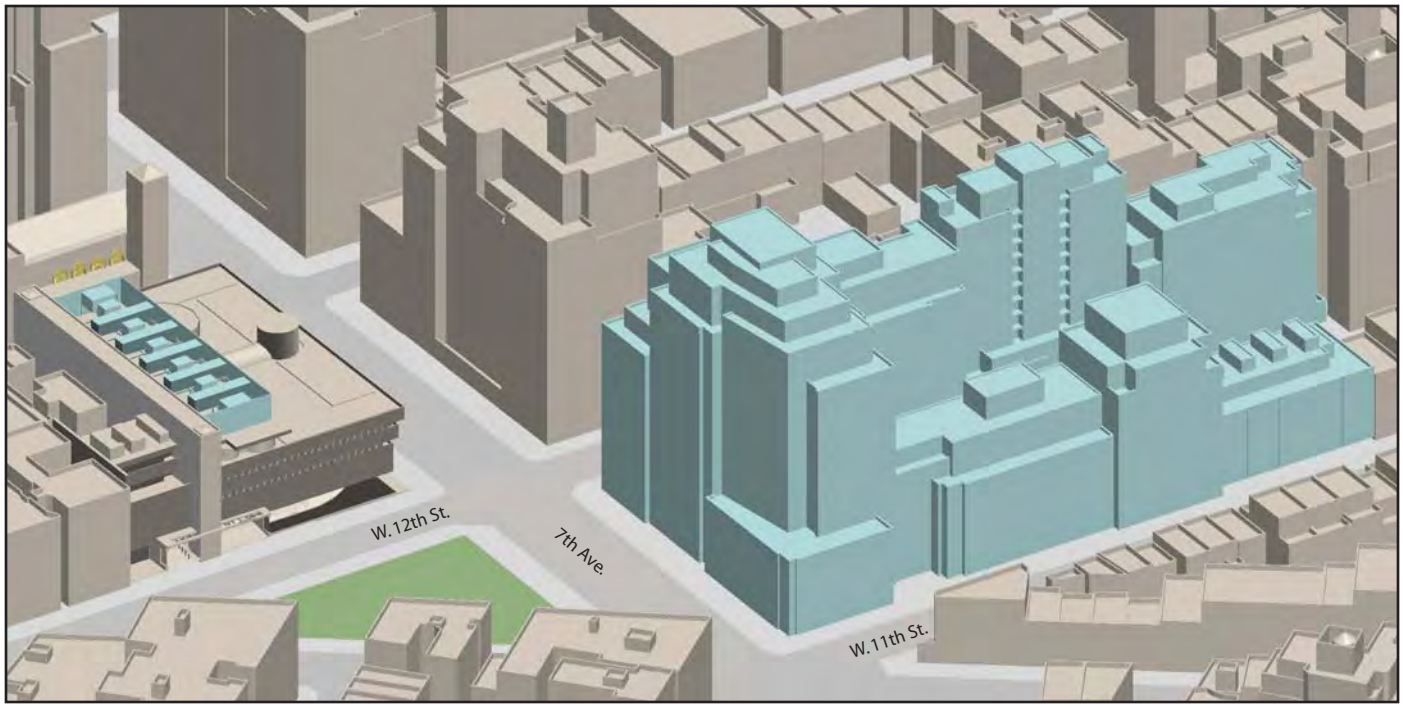
The shadow assessment considers shadows occurring between 1.5 hours after sunrise and 1.5 hours before sunset. At times earlier or later than this timeframe window of analysis, the sun is

8.9.11



Existing East Site Buildings

Future Without Proposed Projects
View Northeast



Proposed Projects

Proposed Triangle Site Open Space

Future With Proposed Projects
View Northeast

Figure 6-3
Three-Dimensional Computer Model

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 shadows from existing structures until the sun reaches the horizon and sets. Consequently, shadows occurring outside the timeframe window of analysis are not considered significant under CEQR, and their assessment is not required.

ANALYSIS RESULTS

The detailed analysis showed that two sunlight-sensitive architectural resources would experience incremental shadow as a result of the proposed projects, the Manhattan Seventh-Day Adventist Church and the Church of the Village. **Table 6-1** shows the entry and exit times and total durations of new shadows on these resources.

Table 6-1
Incremental Shadow Durations

Analysis day and timeframe window	December 21 8:51 AM-2:53 PM	March 21 / Sept. 21 7:36 AM-4:29 PM	May 6 / August 6 6:27 AM-5:18 PM	June 21 5:57 AM-6:01 PM
Sunlight-Sensitive Resources				
Manhattan Seventh-Day Adventist Church (north façade)	—	—	—	5:57 AM–6:05 AM Total: 7 min
Church of the Village (sanctuary windows on south façade)	12:20 PM–2:30 PM Total: 10 min	3:55 PM–4:25 PM Total: 30 min	—	—

Notes:
Table indicates entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.
Daylight saving time is not used.

In addition, as described below, shadows would also fall on the project-generated open space on the Triangle Site. Other sunlight-sensitive resources would not be affected; the detailed analysis shows that project-generated shadows would not be long enough on any day to reach the Church of Our Lady of Guadeloupe or Jackson Square, and would not fall on St. John's-in-the-Village Church due to intervening buildings.

MANHATTAN SEVENTH-DAY ADVENTIST CHURCH

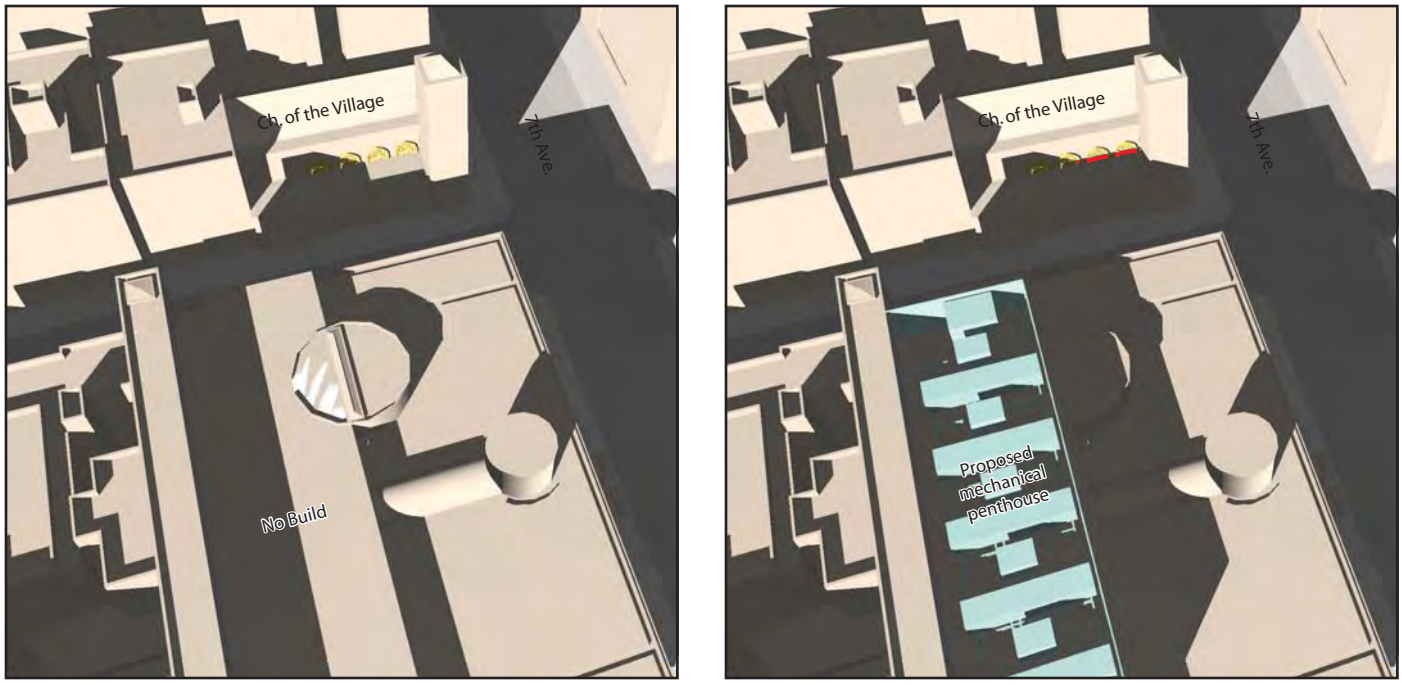
The front, north-facing façade of the Manhattan Seventh-Day Adventist Church would experience less than ten minutes of project-generated shadow early in the morning of the June 21 analysis day only, from the proposed residential building on the East Site. This minimal amount of new shadow would not result in significant adverse impacts on the church windows.

CHURCH OF THE VILLAGE

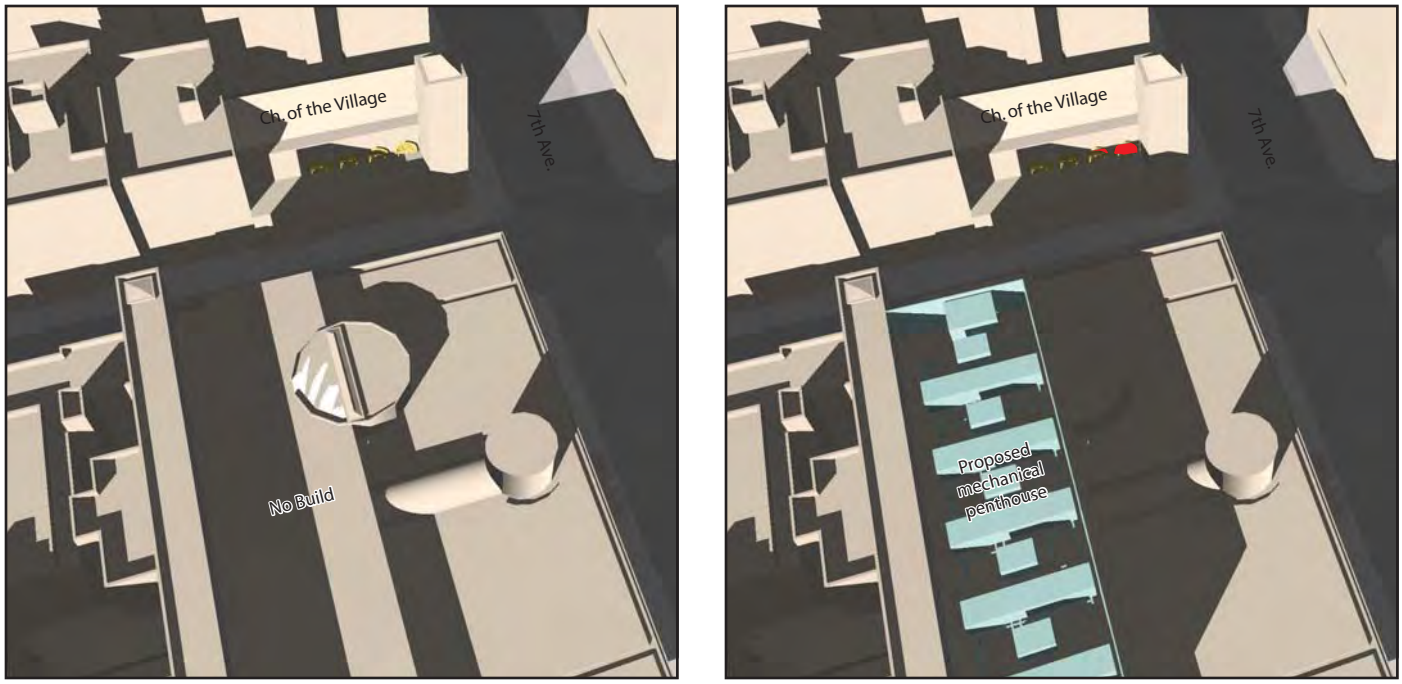
Portions of the arched, stained-glass sanctuary windows on the south façade of the Church of the Village would experience project-generated shadows from the proposed mechanical penthouse on the O'Toole Building in the afternoon of the March 21/September 21 analysis day, and very briefly in the afternoon of the December 21 analysis day. Shadow from the proposed penthouse would not be long enough to reach the windows on the late spring and summer analysis days.

On the March 21/September 21 analysis day, incremental shadow from the proposed mechanical penthouse atop the O'Toole Building would pass across portions of three of the four arched sanctuary windows between 3:55 PM and 4:25 PM (see **Figure 6-4**). The analysis day would then end four minutes later, at 4:29 PM. The new shadow would eliminate all sunlight on the

5.18.11



March 21 / Sept. 21 - 4:00 PM



March 21 / Sept. 21 - 4:15 PM

Stained-glass windows of Church of the Village

Incremental shadow

Note: Daylight Saving Time not used.

Figure 6-4

O'Toole Building - View North

windows for only five minutes during this 30-minute period and would block light to a portion of the windows for the remainder of the 30 minute period. The limited extent and duration of incremental shadow would not cause significant adverse shadow impacts to the Church windows on this analysis day.

On the December 21 analysis day, shadow from the proposed mechanical penthouse on the roof of the O'Toole Building would fall on a very small area at the top of the westernmost arched sanctuary window for 10 minutes from 2:20 PM until 2:30 PM. This very small extent and duration of new shadow would not cause any significant adverse shadow impacts to the Church windows on December 21.

PROPOSED TRIANGLE SITE OPEN SPACE

The proposed East Site project would create a 15,102-square-foot privately owned open space that would be accessible to the public. The new open space would be an at-grade plaza with planting, seating, and lighting, with the goal of providing an attractive and secure area for the surrounding community. The availability and duration of sunlight that this open space would experience is being taken into account in its design and selection of plantings.

As discussed above, according to CEQR methodology, shadows cast on open spaces that are part of a proposed project are not considered impacts of an action because, without the action, the open space would not exist. However, the following discussion provides a discussion of shadows on the proposed open space. The shadows described below would result from existing buildings to the east, west and south, and new development on the East Site.

On the December 21 analysis day, shadow from the East Site would fall across the space in the morning, but by 10:15 AM most of the space would be in sun. The space would remain mostly in sun until just before 2:00 PM, when shadows from the south begin to stretch across it. The space would be completely in shadow from the south from 2:30 PM to the end of the analysis day at 2:53 PM.

The East Site would cast shadow across most of the Triangle Site open space from the start of the March 21/September 21 analysis day until about 10:15 AM, after which most of the space would be in sun. The space would be completely in sun from approximately 11:00 AM to 2:30 PM. From 2:30 PM until the end of the analysis day at 4:29 PM the space would be partially in sun and partially in shadow from the south.

On the May 6/August 6 analysis day, the space would be partially in sun and partially shaded from the start of the analysis day at 6:27 AM until about 9:30 AM, from buildings to the east, primarily the East Site development. The space would be mostly in sun from 9:30 AM to 10:15 AM, fully in sun from 10:15 AM to 3:00 PM, and mostly in sun from 3:00 PM until 4:30 PM. During the final hour of the analysis day (until 5:18 PM) the space would be mostly in shadow from the west, though with some sun remaining.

On the June 21 analysis day, the Triangle Site open space would be completely in shadow for the first hour of the analysis day from buildings to the east and northeast, including the East Site development. From 7:00 AM to 8:00 AM there would be some sun, and after 8:00 AM most of the space would be in sun as shadow from the East Site buildings would become shorter and move east. The space would be completely in sun from 10:00 AM to 3:30 PM, and would remain partially in sun until nearly the end of the analysis day at 6:01 PM. ✷