Chapter 6: Shadows

A. INTRODUCTION

This chapter examines whether the proposed project would result in a significant adverse shadow impact on any sunlight-sensitive resources. Sunlight-sensitive resources are defined in the 2014 *City Environmental Quality Review (CEQR) Technical Manual* as publicly accessible open spaces, sunlight-dependent features of historic architectural resources, and natural resources that depend on sunlight.

SHADOW ASSESSMENT REQUIREMENT

The proposed project would redevelop the project site with new buildings and parking garages and new additions to the existing Thompson and Parker Buildings, as described in Chapter 1, "Project Description." Pursuant to CEQR, a shadow assessment is required only for new project structures or additions reaching 50 feet or taller in height (including rooftop mechanical equipment) or those that are adjacent to a sunlight- sensitive resource. **Figure 6-1** illustrates the locations of the separate proposed project structures, their individual proposed maximum heights above grade and whether they require a shadow assessment. Because the precise location of rooftop mechanical equipment and bulkheads is unknown, an additional 15 feet has been added to the proposed maximum development height of each structure to account for their placement. As shown on the figure, Buildings 3, 4, 5, 6 and 7; Parking Garages 2; 3, and 5; and the addition to the Parker Building would be above 50 feet tall and therefore required shadows assessments.

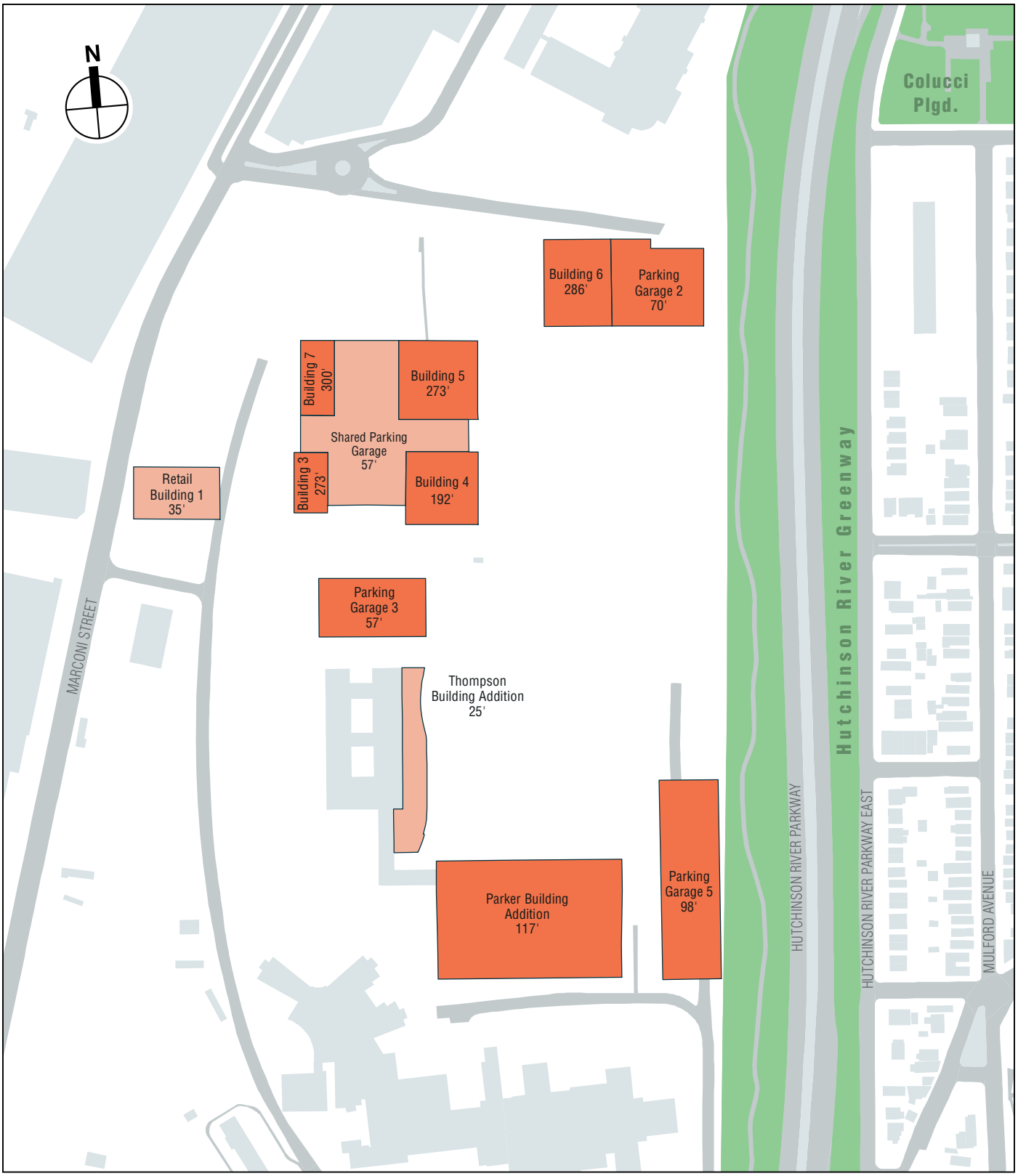
PRINCIPAL CONCLUSIONS

A detailed shadow analysis determined that the proposed project would cast new shadow on portions of two open space resources: the Hutchinson River Greenway for several hours of the afternoon on all days throughout the year and on Colucci Playground in late afternoons in the spring and fall. The exact duration and placement of the new shadow on the Hutchinson River Greenway would vary throughout the year but would generally fall between Buhre and Wilkinson Avenues, two streets located directly east of and perpendicular to the Hutchinson River Greenway. Shadows on Colucci Playground would be less extensive and contained within the park's southwest corner and adjacent to the intersection of Hutchinson River Parkway East and Wilkinson Avenue. The areas of both resources affected by new shadow would continue to receive sufficient durations of direct sunlight throughout the morning and neither the usability of their resource nor their ability to support vegetation would be significantly altered. Therefore, the proposed project would not result in a significant adverse shadows impact on the Hutchinson River Greenway and on Colucci Playground.

B. DEFINITIONS AND METHODOLOGY

This analysis has been prepared in accordance with CEQR procedures and follows the guidelines of the *CEQR Technical Manual*.

7/18/2019



Proposed Structure - Shadow Assessment Required

Proposed Structure - No Shadow Assessment Required

0 400 FEET

Proposed Project Structures

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Figure 6-1

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 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* 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 surface water bodies, wetlands, or designated resources such as coastal fish and wildlife habitats.

Non-sunlight-sensitive resources include, for the purposes of CEQR:

- *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.

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

Following the guidelines of the *CEQR Technical Manual*, a preliminary screening assessment is first 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 each project structure requiring shadow assessment, 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 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 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 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.

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. Within the 90 minutes after sunrise and the 90 minutes before sunset, the sun is low on the horizon, and its rays reach the vicinity of the project site at low angles, 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 in these two 90-minute periods are not considered significant under CEQR, and their assessment is not required.

C. PRELIMINARY SCREENING ASSESSMENT

A base map was developed using Geographic Information Systems (GIS)[1] showing the location of the proposed project structures requiring a shadow assessment and the surrounding street layout (see **Figure 6-2**). Potential sunlight-sensitive resources were identified based on information from the land use and historic and cultural resources assessments presented in this environmental impact statement (EIS), and shown on the map.

TIER 1 SCREENING ASSESSMENT

For the Tier 1 assessment, the longest shadow that the proposed project structures could cast is calculated, and using this length as the radius, a perimeter is drawn around the structures. 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.

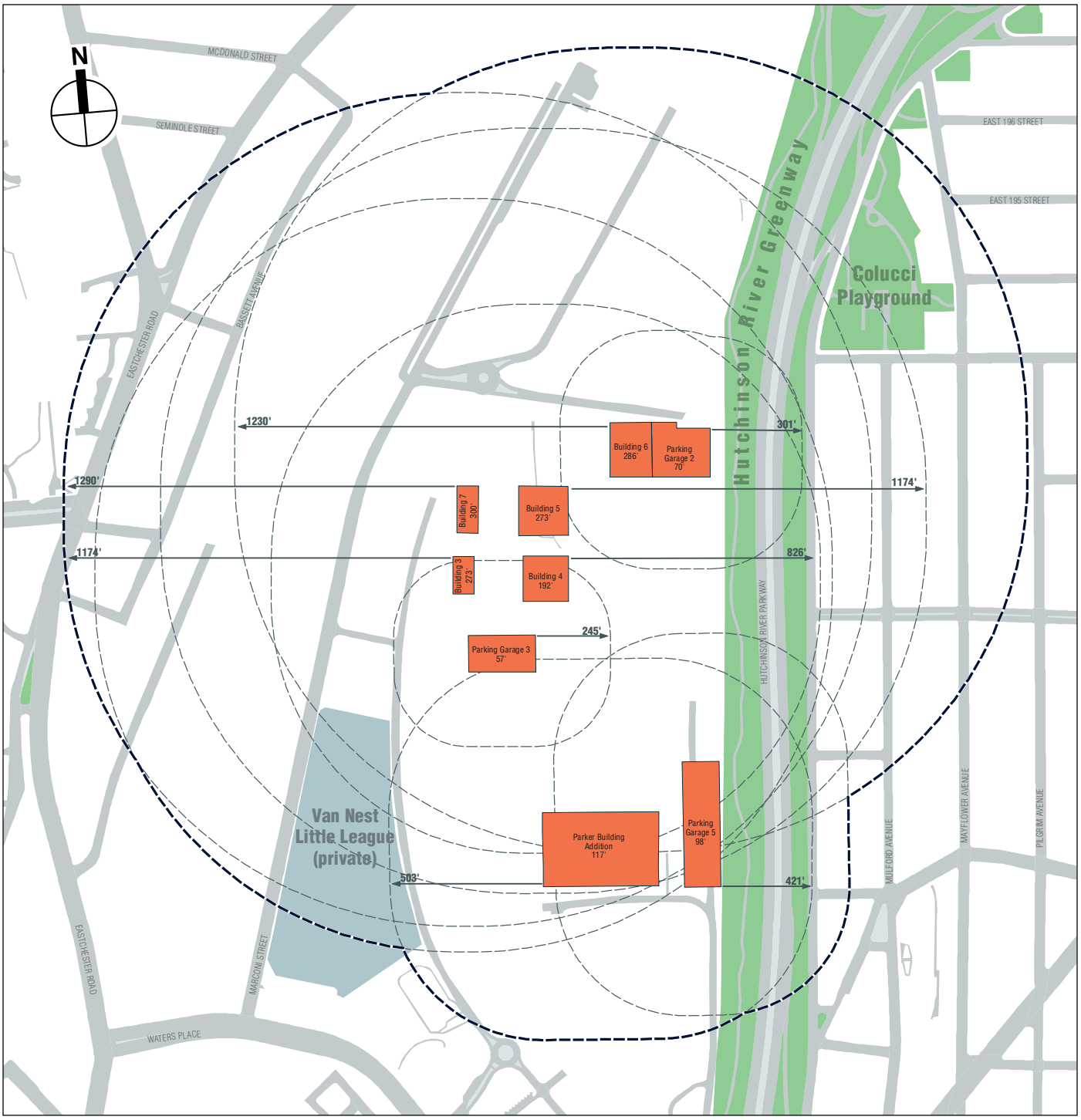
According to the *CEQR Technical Manual*, the longest shadow that a structure can cast at the latitude of New York City occurs on December 21, the winter solstice; it begins at the start of the analysis day, or 8:51 AM and is equal to 4.3 times the height of the structure.

Accounting for the maximum potential height for each building as permitted in the General Project Plan (GPP) for the proposed project,[2] and including an additional 15 feet of vertical bulk for

[1] Software: Esri ArcGIS 10.3; Data: New York City Department of Information Technology and Telecommunications (DoITT) and other City agencies, and AKRF site visits.

[2] As noted in Chapter 1, "Project Description," the GPP would allow approximately 25 feet in height (two stories) and associated floor area to be shifted among buildings within each phase. Any increases in height and floor area for one building would be accompanied by a commensurate decrease in height and floor area for another building in the same phase. Within Phase I, the shifts in height and floor area would be

7/18/2019



Proposed Structure - Shadow Assessment Required

Publicly-Accessible Open Space

Longest Shadow Study Area - Individual Structure

Longest Shadow Study Area - All Structures

0 400 FEET

Tier 1 Assessments

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Figure 6-2

rooftop mechanical equipment, maximum heights of the proposed project structures requiring a shadow assessment range from approximately 57 to 300 feet above grade. The maximum length of shadows would range from 245 feet (57 x 4.3) to 1,290 feet (300 x 4.3). **Figure 6-2** illustrates the individual maximum shadow length of all proposed project structures requiring a shadow assessment as well as the complete longest-shadow study area. As shown on the figure, the longest-shadow study area would fall on the Hutchinson River Greenway and Colucci Playground, two publicly accessible open spaces. Therefore, a Tier 2 Assessment is 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 New York City, this area lies between -108 and +108 degrees from true north. **Figure 6-3** illustrates this triangular area south of the proposed project structures requiring Tier 2 assessment. The complementing areas to the north within the longest-shadow study area represent the remaining area that could potentially experience new project generated shadow. As illustrated in **Figure 6-3**, the Hutchinson River Greenway and Colucci Playground remain within the area that could potentially experience new, project-generated shadows. Therefore, a Tier 3 assessment is required to model project- generated shadows on specific representative days of the year.

TIER 3 SCREENING ASSESSMENT

The direction and length of shadows vary throughout the course of the day and also differ depending on the season. In order to determine whether project-generated shadow could fall on a sunlight-sensitive resource, three-dimensional computer mapping software is used in the Tier 3 assessment to calculate and display the incremental shadows from the proposed project structures on individual representative days of the year. A computer model was developed containing three-dimensional representations of the elements in the base map used in the preceding assessments, the topographic information of the study area, and the massing of the proposed project structures.

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, the day halfway between the summer solstice and the equinoxes, i.e., May 6 or August 6, which have approximately the same shadow patterns.

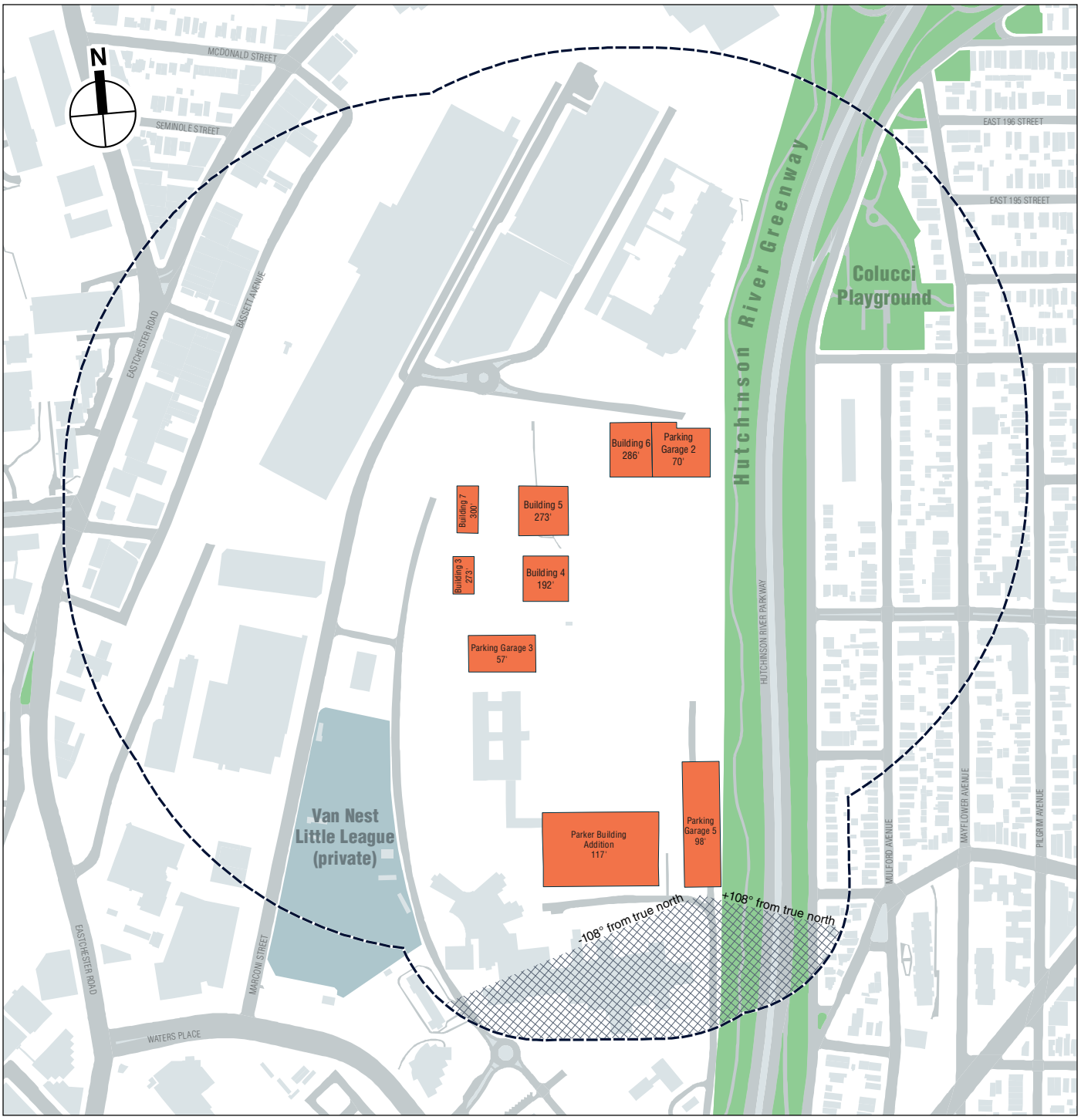
TIER 3 SCREENING ASSESSMENT RESULTS

Figure 6-4 illustrates the range of shadows that would occur, in the absence of intervening buildings, from the proposed project structures that required shadow assessments on the four representative days for analysis. The extent of shadow for the entire analysis day (one and a half hours after sunrise to one and a half hours before sunset) is illustrated in grey.

---

permitted between the Parker Building, Building 3, and Building 4. Within Phase II, the shifts in height and floor area would be permitted between Buildings 5, 6, and 7. This analysis accounts for the maximum permitted height for each building plus potential rooftop mechanical space.

7/18/2019



Proposed Structure - Tier 2 Shadow Assessment Required

Publicly-Accessible Open Space

Longest Shadow Study Area - All Structures

Tier 2 - Area of No Potential Shadow

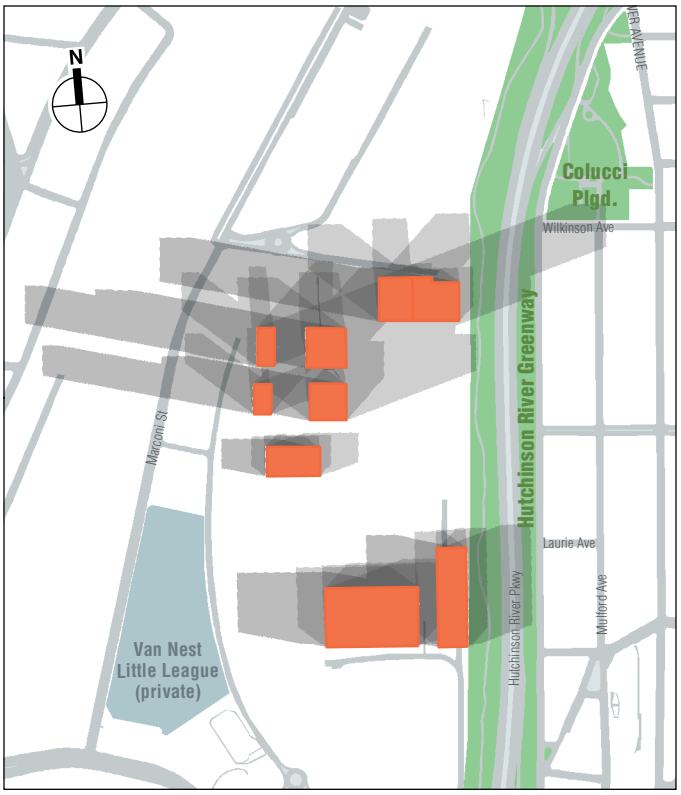
0 400 FEET

Tier 2 Assessment

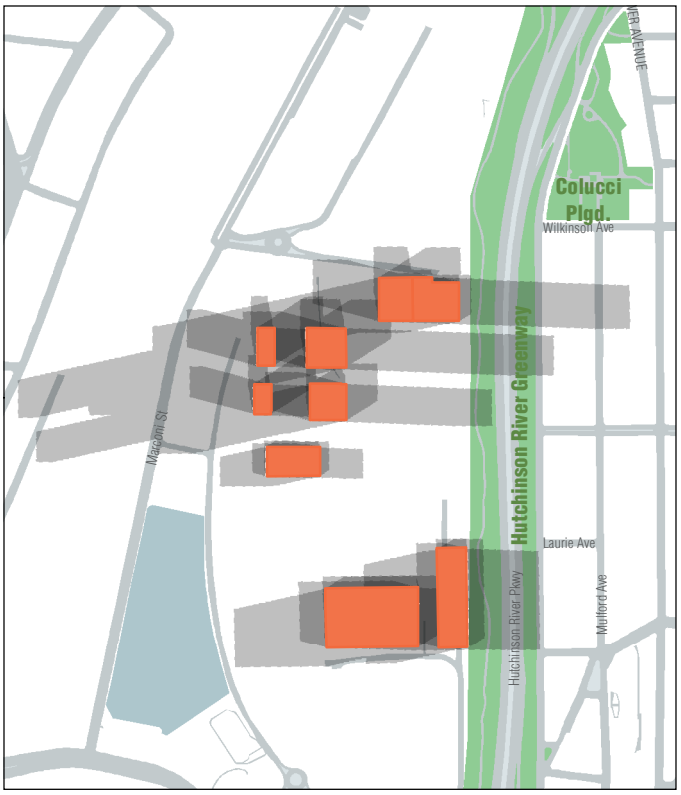
BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Figure 6-3

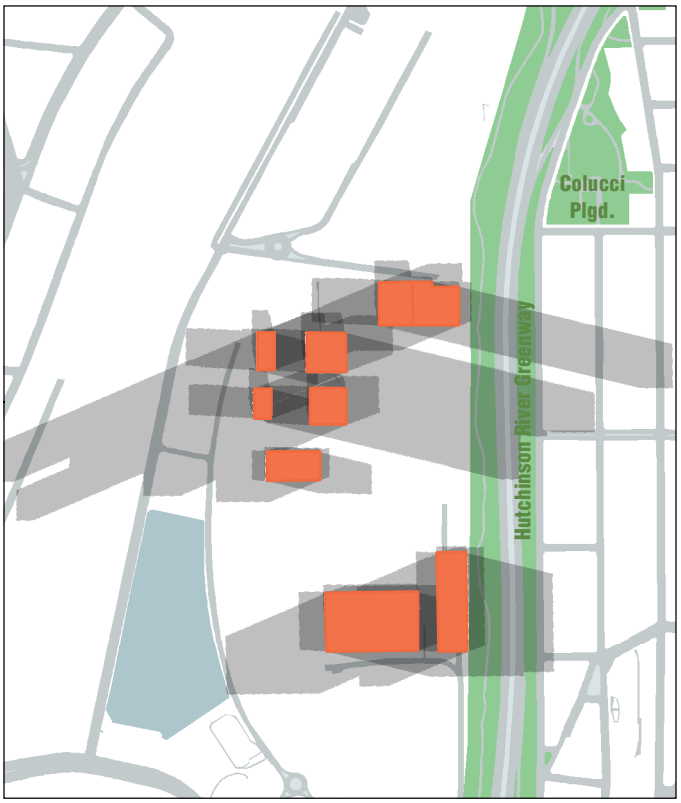
7/18/2019



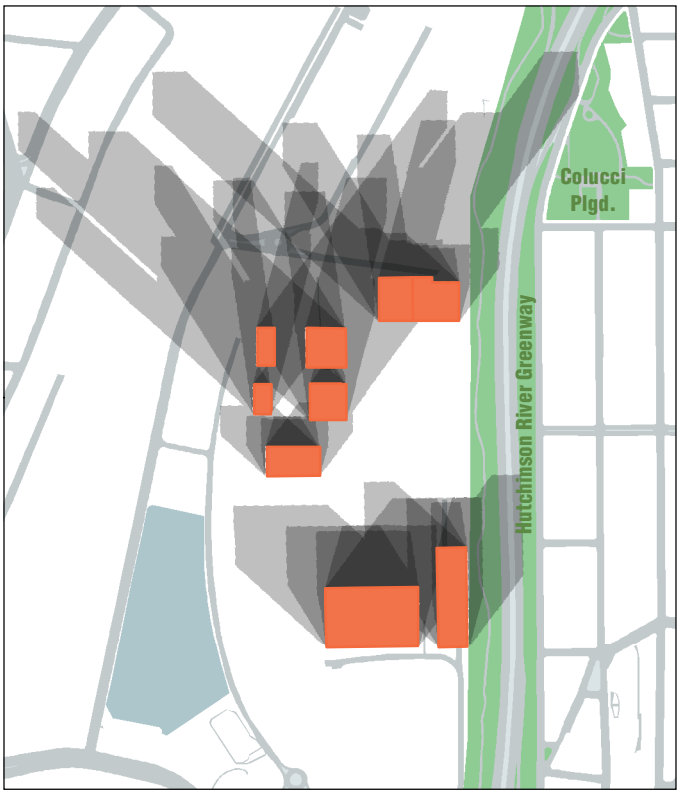
March 21/September 21



May 6/August 6



June 21



December 21

0 1,000 FEET

Proposed Structure - Shadow Assessment Required

Publicly-Accessible Open Space

Shadow Extent

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Tier 3 Assessment

Figure 6-4

The Tier 3 assessment found that on all analysis days, project-generated shadows could potentially reach the Hutchinson River Greenway and on the March 21 analysis day could potentially fall on the southwest corner of Colucci Playground. Therefore, a detailed analysis was performed to provide additional information on the potential extent and duration of incremental shadow on the two sunlight-sensitive resources.

D. DETAILED ANALYSIS

The purpose of the detailed analysis is to determine the extent and duration of incremental shadows that fall on sunlight-sensitive resources as a result of the proposed project and to assess their potential effects. To complete the assessment, a baseline or future No-Action condition is established by appending three-dimensional representations of the existing buildings and planned future developments within the vicinity of the project site to the three-dimensional model used in the Tier 3 assessment. The future condition with the proposed project (With-Action) and its shadows can then be compared with the baseline condition to determine the incremental shadows that would result with the proposed project.

Figure 6-5 illustrates the computer models used in the detailed analysis of the future No-Action condition and With-Action condition. As noted above, according to CEQR guidance, project-generated open space cannot experience a significant adverse shadow impact from the project because without the project the open space would not exist. Therefore, this analysis does not assess the potential for shadows on the proposed baseball fields.

ANALYSIS RESULTS

The analysis found that the Hutchinson River Greenway would receive incremental shadow originating from the proposed project on all analysis days and that a new shadow would fall on the southwest corner of Colucci Playground on late afternoons in the fall and spring. **Table 6-1** shows the entry and exit times and total duration of project-generated incremental shadow on the Hutchinson River Greenway.

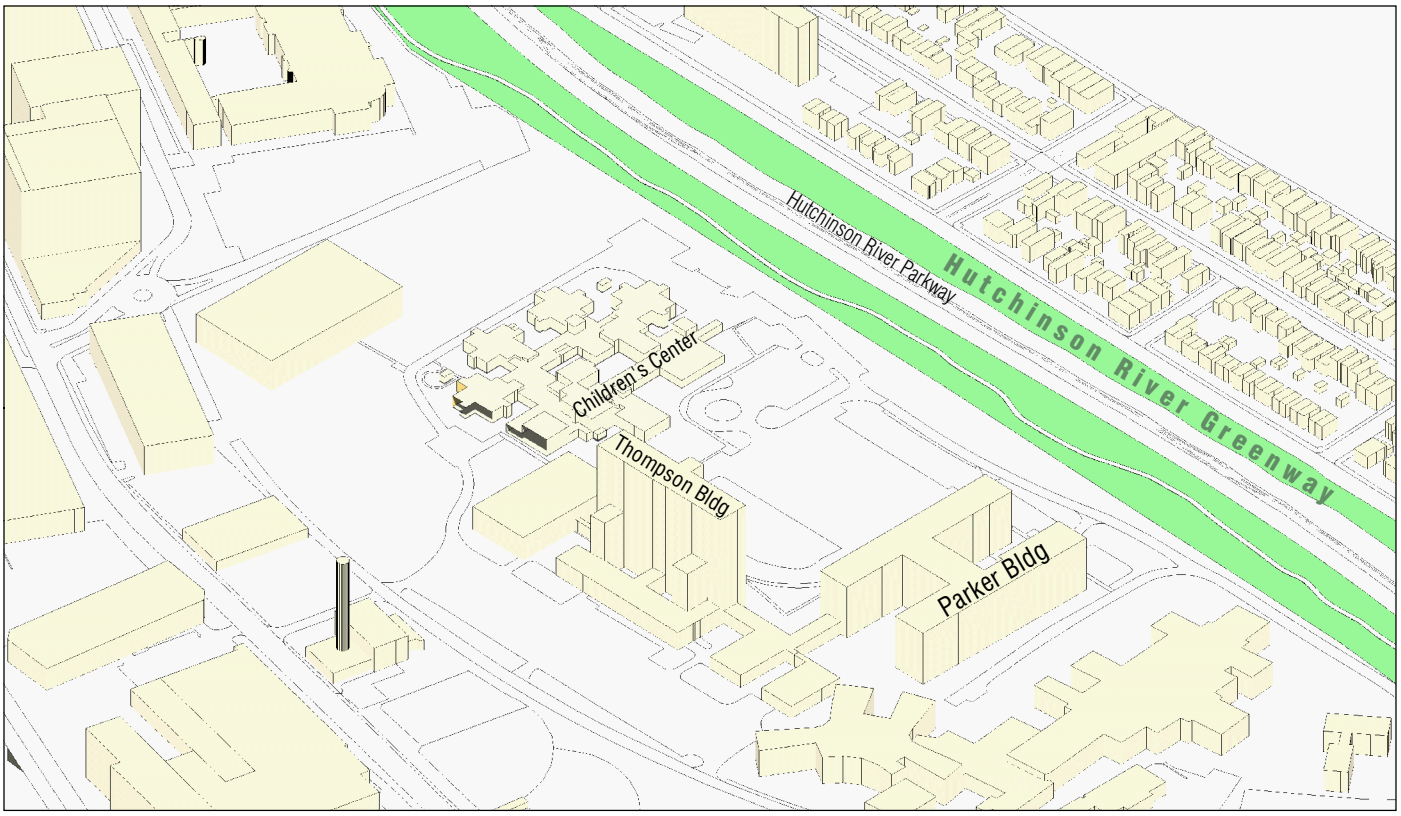
Table 6-1
Incremental Shadow Durations

	March 21/Sept. 21 7:36 AM–4:29 PM	May 6/Aug. 6 6:27 AM–5:18 PM	June 21 5:57 AM–6:01 PM	Dec. 21 8:51 AM–2:53 PM
Open Space Resources				
Colucci Playground	3:55 PM–4:29 PM Total: 34 min	--	--	--
Hutchinson River Greenway	12:25 PM–4:29 PM Total: 4 hr 4 min	12:15–5:18 PM Total: 6 hr 3 min	12:20–6:01 PM Total 5 hr 41 min	12:20–2:53 PM Total: 2 hr 23 min

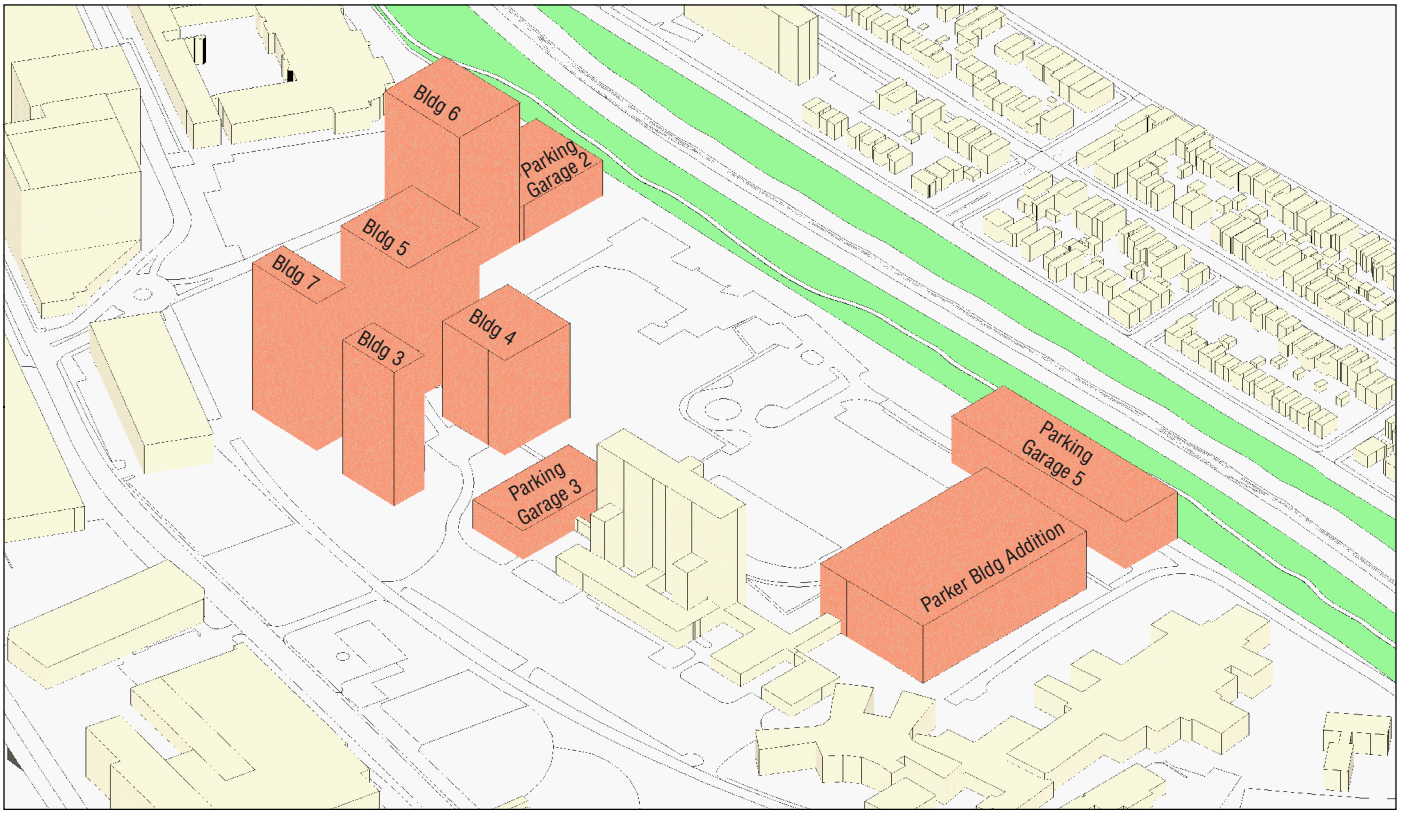
Notes: Table indicates entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource. Daylight saving time is not used—times are Eastern Standard Time, per *CEQR Technical Manual* guidelines. However, in reality, Eastern Daylight Time is in effect for the March/September, May/August, and June analysis periods. Therefore, add one hour to the given times to determine the actual clock time.

The results of the detailed analysis are illustrated in **Figures 6-6 through 6-9**. Within the figures, incremental shadow is illustrated in red. Below is a description of the affected resource and the duration and extent of incremental shadows originating from the proposed project.

7/18/2019



No Action Condition



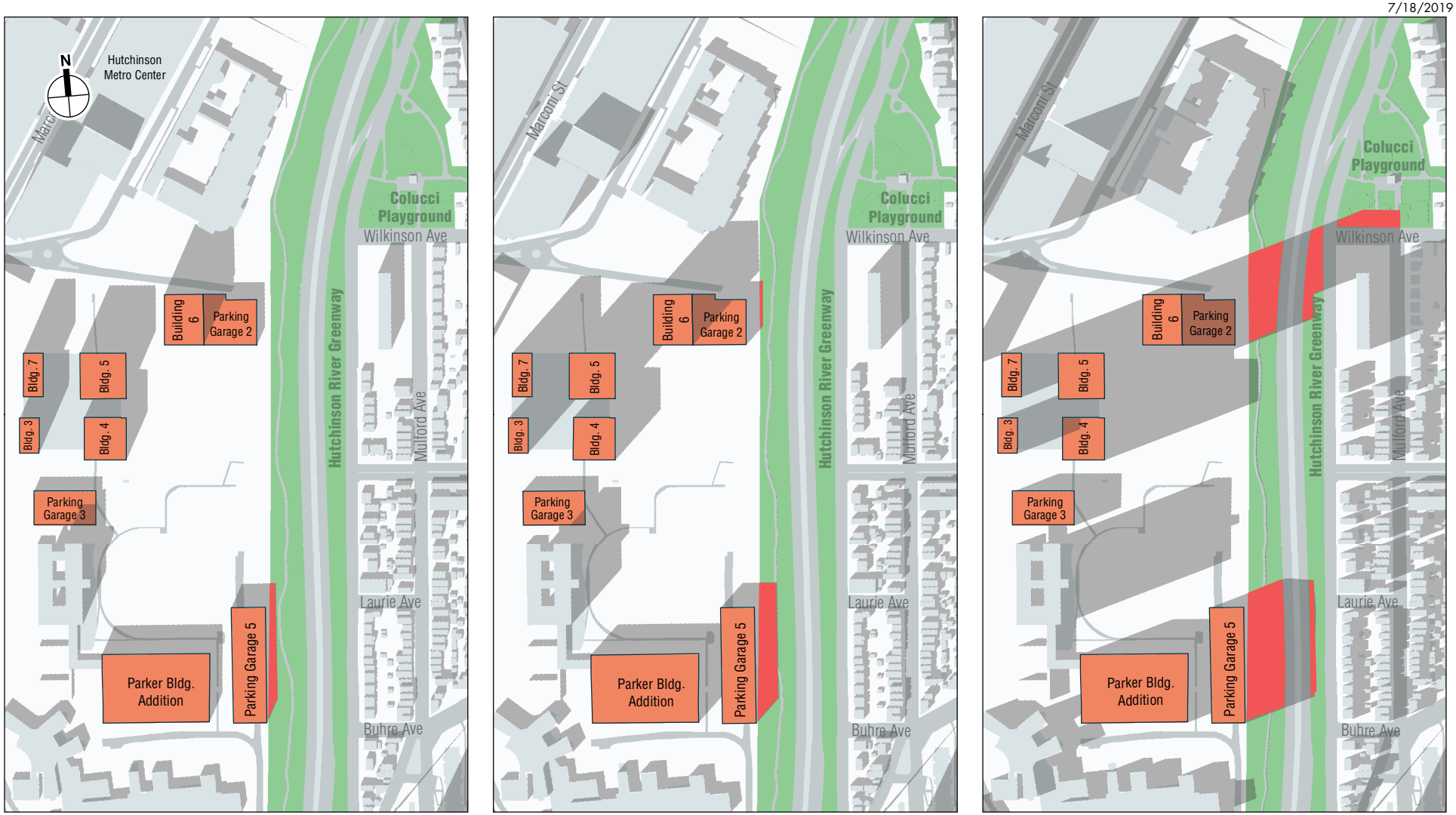
With Action Condition

Shadow Analysis Model

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Figure 6-5

7/18/2019



1:30 PM

2:30 PM

4:00 PM

Proposed Project Structures Requiring Shadow Analysis

Publicly-Accessible Open Space

Incremental Shadows on Sunlight-Sensitive Resources

Detailed Analysis
March 21/Sept. 21

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Figure 6-6

7/18/2019

2:00 PM

3:30 PM

5:00 PM

Proposed Project Structures Requiring Shadow Analysis

Publicly-Accessible Open Space

Incremental Shadows on Sunlight-Sensitive Resources

Detailed Analysis
May 6/August 6
Figure 6-7

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

7/18/2019

1:30 PM

3:00 PM

5:30 PM

Proposed Project Structures Requiring Shadow Analysis

Publicly-Accessible Open Space

Incremental Shadows on Sunlight-Sensitive Resources

Detailed Analysis
June 21
Figure 6-8

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

7/18/2019

1:00 PM

2:00 PM

2:45 PM

Proposed Project Structures Requiring Shadow Analysis

Publicly-Accessible Open Space

Incremental Shadows on Sunlight-Sensitive Resources

Detailed Analysis
December 21

BRONX PSYCHIATRIC CENTER LAND USE IMPROVEMENT PROJECT

Figure 6-9

HUTCHINSON RIVER GREENWAY

The Hutchinson River Greenway is a New York City Department of Parks and Recreation-operated open space that runs along the Hutchinson River Parkway from the Cross Bronx Expressway to Pelham Parkway. The portion of the resource affected by incremental shadows from the proposed project includes a bike/walking trail and vegetation on either side of the parkway. The detailed shadow analysis found that new shadow from the proposed project would fall on the Hutchinson River Greenway throughout the afternoon of all four analysis days. For the first few hours of the afternoon the extent of new shadow would be relatively small, falling on a small portion of the resource's vegetation located immediately adjacent to Parking Garage 5. As the afternoons progress, shadows originating from Parking Garage 5 would grow in size and also fall on the Greenway's biking/walking trail. Eventually, by the end of the analysis days incremental shadows originating from proposed project structures in the northern portion of the project site would also be cast on the Greenway, falling on the resource's vegetation and biking/walking trail (see **Figures 6-6 through 6-9**).

The incremental shadow identified in the detailed analysis would not adversely affect the usability of the resource or its ability to support vegetation. Although the incremental shadow durations on each analysis day are approximately two to six hours long, the shadow extent would be relatively small during the initial hours of the afternoon. Furthermore, users of the biking/walking trail would be in motion and pass through the shaded areas quickly. Other park users seeking sunlight could elect to move to a sunlit section of the Hutchinson River Greenway or to other nearby open spaces such as Colucci Playground. The areas of the Greenway affected by new shadow would continue to receive sufficient durations of direct sunlight to support vegetation. Therefore, the proposed project would not result in a significant adverse shadows impact on the Hutchinson River Greenway.

COLUCCI PLAYGROUND

Colucci Playground is a publicly accessible open space resource located across Hutchinson River Parkway from the proposed project and to the northeast of Tower 6. The detailed shadow analysis found that new shadow originating from Tower 6 would fall within Colucci Playground from 3:55 PM to 4:29 PM on the March 21/September 21 analysis day (see **Figure 6-6**). The extent of new shadow would be limited to the southwest corner of the open space and adjacent to the intersection of Hutchinson River Parkway East and Wilkinson Avenues. This open space resource features swings, fitness equipment and several mature trees.

The incremental shadow identified in the detailed analysis would not adversely affect the usability of Colucci Playground nor its ability to support vegetation. The duration of incremental shadow would be short and limited to early fall and spring. Because few very tall structures are located east of the playground, the affected sunlight-sensitive park features would continue to receive hours of direct sunlight earlier in the day. The shadow extent over the park would be small relative to the entire area of open space and users seeking sunlight could move to sunlit sections of the playground. The areas of the Colucci Playground affected by new shadow would continue to receive sufficient durations of direct sunlight to support vegetation. Therefore, the proposed project would not result in a significant adverse shadows impact on Colucci Playground.

✷