

## 6 Shadows

### Introduction

This chapter considers the potential for the Proposed Actions to result in incremental shadows long enough to reach any nearby publicly accessible open spaces or other sunlight-sensitive resources. The chapter is closely linked to the information presented in other chapters of the EIS, particularly **Chapter 5**, *Open Space*; **Chapter 7**, *Historic and Cultural Resources*; and **Chapter 9**, *Natural Resources*.

Per the guidance included in the 2014 *CEQR Technical Manual*, a shadows assessment is required if a proposed action would result in structures (or additions to existing structures) of 50 feet in height or greater, or those that would be located adjacent to, or across the street from, a sunlight-sensitive resource. As discussed in **Chapter 1**, *Project Description*, the RWCDs for the Proposed Actions identifies four prototypical analysis sites. At some sites, new developments or enlargements are expected to result in increases in height compared to the No Action scenario. As such, a shadows assessment was prepared, following *CEQR Technical Manual* guidelines, to determine the potential for the Proposed Actions to result in significant, adverse impacts on sunlight-sensitive resources.

### Principal Conclusions

A detailed shadows analysis using the prototypical analysis sites concludes that new developments and enlargements resulting from the Proposed Actions would not result in significant, adverse shadow impacts. In accordance with the methodology outlined in the *CEQR Technical Manual*, a detailed shadow analysis was conducted to assess the extent and duration of the incremental shadow resulting from the Proposed Actions. The Proposed Actions are expected to affect small, peripheral areas of sunlight-sensitive resources in the immediate vicinity of the prototypical analysis sites. All affected resources would continue to receive direct sunlight throughout the day, and no natural resources are expected to be permanently shaded to a degree that would impact public use and enjoyment or plant and animal survival. The Proposed Actions

would not result in changes to development that would substantially reduce or completely eliminate direct sunlight exposure. Therefore, significant, adverse impacts related to shadows are unlikely to occur. Additionally, although the exact sites where the Proposed Actions would facilitate new development or enlargement are difficult to predict, the provisions of the Proposed Actions would not result in changes to permitted building height, bulk, or yard requirements that are likely to significantly alter shadow coverage or duration compared to existing conditions. In addition, while the Proposed Action may eliminate or modify certifications or authorizations required for development on certain sites, they are not anticipated to alter which sites are developed in either the No Action or With Action scenario.

## Methodology

According to the *CEQR Technical Manual*, the longest shadow a structure will cast in New York City, except for periods close to dawn or dusk, is 4.3 times its height. For projects or actions resulting in structures less than 50 feet tall, a shadow assessment is generally not necessary, unless the site is adjacent to a park, historic resource, or important natural feature (if the feature that makes the structure significant depends on sunlight).

First, a preliminary screening assessment must be conducted to ascertain whether shadows resulting from a project would reach any sunlight-sensitive resource at any time of year. The *CEQR Technical Manual* defines sunlight-sensitive resources as those resources that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. The following are sunlight-sensitive resources:

- **Public open space** (e.g., parks, playgrounds, plazas, schoolyards, greenways, and landscaped medians with seating). Planted areas in unused portions or roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources. The use of vegetation in an open space establishes its sensitivity to shadows. Sensitivity is assessed for both (1) warm-weather dependent features, like wading pools and sandboxes, or vegetation that would be affected by loss of sunlight during the growing season (i.e., March through October); and (2) features, such as benches, that would be affected by a loss of winter sunlight. Uses that rely on sunlight include passive use, such as sitting or sunning; active use, such as on playfields or paved courts; and activities such as gardening or those involving children's wading pools and sprinklers. Where lawns are actively used, the turf requires extensive sunlight. Vegetation requiring direct sunlight includes the tree canopy, flowering plants, and plots in community gardens. Generally, four to six hours a day of

sunlight, particularly in the growing season, is a minimum requirement.

- **Features of historic architectural resources that depend on sunlight for their enjoyment by the public.** For these resources, only the sunlight-sensitive features are considered, as opposed to the entire architectural resource. Sunlight-sensitive features include the following: design elements that are part of a recognized architectural style that depends on the contrast between light and dark (e.g., deep recesses or voids, such as open galleries, arcades, recessed balconies, deep window reveals, and prominent rustication); elaborate, highly carved ornamentation; stained glass windows; exterior building materials and color that depend on direct sunlight for visual character (e.g., the polychromy [multicolored] features found on Victorian Gothic Revival or Art Deco facades); historic landscapes, such as scenic landmarks, including vegetation recognized as a historic feature of the landscape; and structural 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 waterbodies, wetlands, or designated resources, such as coastal fish and wildlife habitats.

Per CEQR guidance, private open spaces are not considered sunlight-sensitive and are excluded from consideration in a shadows assessment. Private open spaces include open space that is not publicly accessible such as front and back yards, stoops, and vacant lots.

According to the *CEQR Technical Manual*, the preliminary screening analysis consists of three tiers of analysis. The first tier determines a simple radius around the RWCDs buildings representing the longest shadow that would be cast. If sunlight-sensitive resources are within the radius, the analysis proceeds to the second tier, which reduces the area that would be affected by action-generated shadows by accounting for a specific range of angles that can never receive shade in New York City due to the path of the sun in the northern hemisphere. 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 would be reached by new shadows 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 (the additional, or

new, shadow that a building or other built structure resulting from a proposed project would cast on a sunlight-sensitive resource) resulting from the project.

To be conservative, a screening was performed to determine which prototypical analysis sites would result in structures taller than 50 feet in incremental height or increases in height at sites located adjacent to sunlight-sensitive resources. No other screening assessments were conducted before preparing the detailed shadow impact assessment for the identified sites.

In accordance with the *CEQR Technical Manual*, shadows on sunlight-sensitive resources of concern were modeled for four representative days of the year. For the New York City area, the months of interest for an open space resource encompass the growing season (i.e., March through October) and one month between November and February representing a cold-weather month (usually December). Representative days for the growing season are generally the March 21 vernal equinox (or the September 21 autumnal equinox, which is approximately the same); the June 21 summer solstice; and a spring or summer day halfway between the summer solstice and equinoxes, such as May 6 or August 6 (which are approximately the same). For the cold-weather months, the December 21 winter solstice is included to demonstrate conditions when open space users rely most heavily on available sunlight warmth. Because these months and days represent the full range of possible shadows, they are also used for assessing shadows on sunlight-sensitive historic and natural resources.

The *CEQR Technical Manual* defines the temporal limits of a shadow analysis period to fall from an hour and a half after sunrise to an hour and a half before sunset.

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. As described in the *CEQR Technical Manual*, an incremental shadow is generally not considered significant when its duration is no longer than 10 minutes at any time of year and the resource continues to receive substantial direct sunlight. 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 sunlight-sensitive features of the resource to less than the minimum time necessary for its survival (when there would be sufficient sunlight in the future without the project) or 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 shadow, including information regarding 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.

In general, a significant, adverse shadow impact occurs when the incremental shadow added by a proposed action falls on a sunlight-sensitive resource and substantially reduces or completely eliminates direct sunlight exposure, thereby significantly altering the public's use of the resource or threatening the viability of vegetation or other resources.

### ***Prototypical Analysis Sites***

The four prototypical analysis sites were assessed to determine which sites required further analysis. As noted above, pursuant to CEQR guidance, only new developments or enlargements that would result in an incremental increase of 50 feet or more compared to the No Action scenario require assessment. In addition, any development site adjacent to, or across the street from, a sunlight-sensitive resource requires a preliminary screening, regardless of its height.

As **Table 6-1** shows, none of the prototypical analysis sites would result in new structures taller than 50 feet in incremental height. Of the remaining sites that would be developed with incremental heights of less than 50 feet, one was located adjacent to sunlight-sensitive resources, as defined in the *CEQR Technical Manual*, and therefore, further analysis is warranted for this site. For conservative analysis purposes, a detailed analysis of this site is provided

**Table 6-1. Prototypical Analysis Sites Warranting Analysis**

Sites Warranting Shadow Analysis		Sites Not Warranting Shadow Analysis
Sites with 50-foot or Greater Height Increment	Sites with Less than 50-foot Height Increment Adjacent to Sunlight-Sensitive Resources	Sites with Less than 50-foot Height Increment Not Adjacent to Sunlight-Sensitive Resources
N/A	4	1, 2, 3

\* This table has been modified for the FEIS.

### Detailed Analysis

Per *CEQR Technical Manual* guidance, a detailed shadows analysis was prepared for one prototypical analysis site identified above on four representative days of the year: March 21/September 21, the equinoxes; May 6, the midpoint between the summer solstice and the equinox (and equivalent to August 6); June 21, the summer solstice and the longest day of the year; and December 21, the winter solstice and shortest day of the year. These four representative days indicate the range of shadows over the course of the year. CEQR guidance defines the temporal limits of a shadow analysis period to fall from an hour and a half after sunrise to an hour and a half before sunset. As discussed above, the results of the shadows analysis show the incremental difference in shadow impact between the No Action and With Action scenarios (see **Table 6-2**).

**Table 6-2** shows that prototypical analysis site 4 would result in incremental action-generated shadows on a sunlight-sensitive resource during all four representative days. The figures provided at the end of this chapter show representative shadow views of the sunlight-sensitive resource of concern on each of the four representative analysis days.

Note that, per the *CEQR Technical Manual*, all times reported herein are Eastern Standard Time and do not reflect adjustments for daylight savings time that is in effect from mid-March to early November. As such, the times reported in this chapter for March 21/September 21, May 6/August 6, and June 21 should have one hour added to reflect Eastern Daylight-Saving Time.

**Table 6-2. Duration of Shadows on Sunlight-Sensitive Resources (Increment Compared to No Action)**

Site	Future Ecological Subarea	Analysis Day	March 21/September 21	May 6/August 6	June 21	December 21
			7:36 a.m.–4:29 p.m.	6:27 a.m.–5:18 p.m.	5:57 a.m.–6:01 p.m.	8:51 a.m.–2:53 p.m.
4	Resource Adjacent	Shadow enter-exit time	7:36–8:56 a.m.	6:27–7:33 a.m.	5:57–7:03 a.m.	8:51–10:36 a.m.
		Incremental shadow duration	1 hour 20 minutes	1 hour 6 minutes	1 hour 6 minutes	1 hour 45 minutes

\* This table has been modified for the FEIS.

### ***Prototypical Analysis Site 4***

Under the With Action scenario, prototypical analysis site 4 would be developed with a 40-foot-tall building. Absent the Proposed Actions under the No Action scenario, prototypical analysis site 4 would be developed with a 30-foot-tall building, a difference of 10 feet. The site is in an R1-2 zoning district characterized by single-family homes on large lots of at least 5,700 square feet and a maximum FAR of 0.5. The site is located adjacent to a generic natural area in existing SNAD NA-2. This natural resource is assumed to be thickly forested areas, wetlands, swamps, and ponds. Public access to these areas is assumed to be limited to walking trails.

The Proposed Actions would result in new incremental shadows of varying duration and coverage at this natural resource on all four representative analysis days. Incremental shadows would last for about 1 hour and 20 minutes (from 7:36 to 8:56 a.m.) on March 21, 1 hour and 6 minutes (from 6:27 to 7:33 a.m.) on May 6, 1 hour and 6 minutes (from 5:57 to 7:03 a.m.) on June 21, and 1 hour and 45 minutes (from 8:51 to 10:36 a.m.) on December 21 (see **Table 6-2**).

On all analysis days, incremental shadows would affect small areas along the eastern edge of the natural resource in the immediate vicinity of prototypical analysis site 4 during the morning hours. Shadow coverage would be greatest during the early morning, generally before 8:00 a.m., and incremental shadows would exit the natural resource completely by about 10:30 a.m. on all days (see **Figures 6-1 through 6-4**). No incremental shadow coverage would reach the natural resource after about 10:30 a.m.



Figure 6-1. Prototypical Analysis Site 4: December 21


December 21<sup>st</sup>



9:15 AM



10:15 AM

 Prototypical Analysis Site

 Natural Area


 Incremental Shadow

Figure 6-2. Prototypical Analysis Site 4: March 21

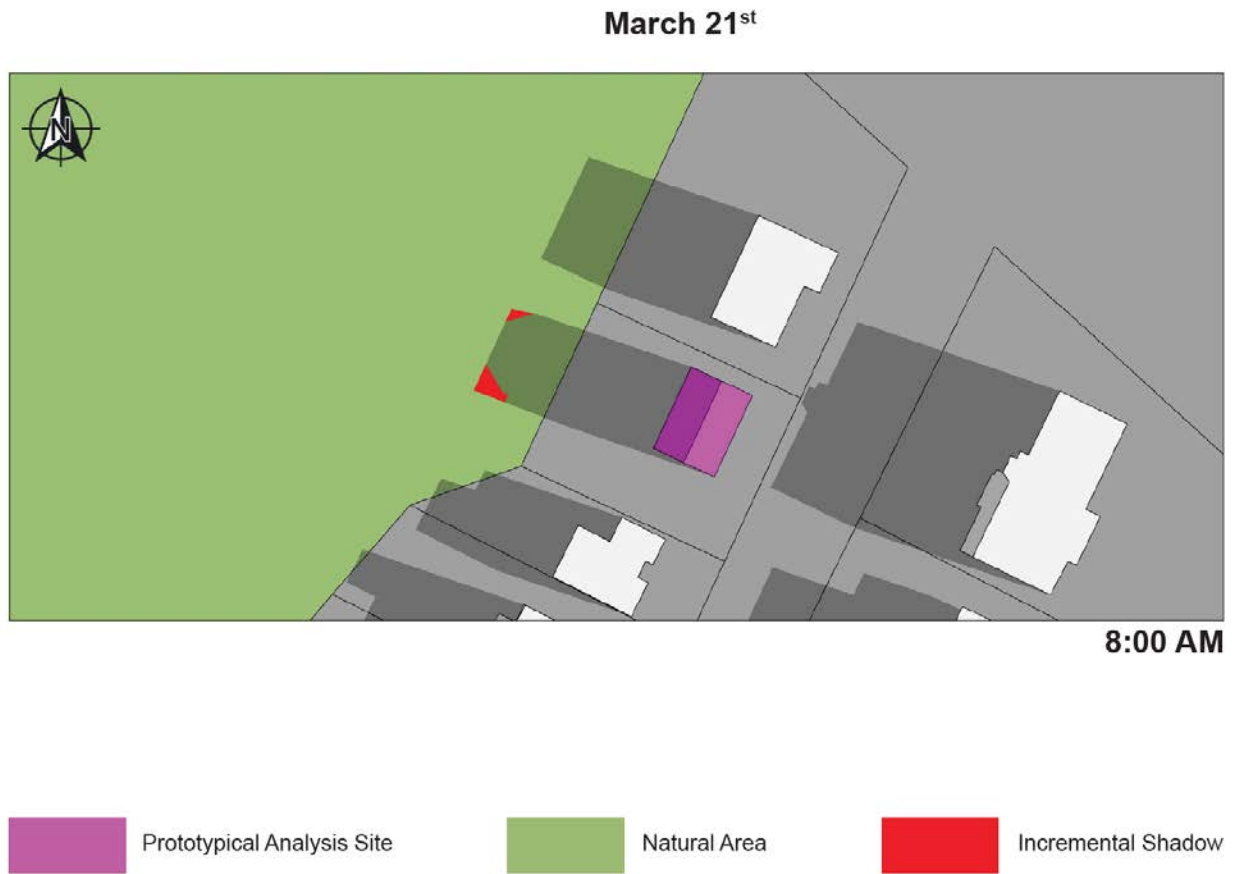


Figure 6-3. Prototypical Analysis Site 4: May 6



Figure 6-4. Prototypical Analysis Site 4: June 21

June 21<sup>st</sup>



### Assessment

On March 21, May 6, and June 21, no incremental shadows would enter the natural resource after about 10:30 a.m., and affected areas would continue to receive direct sunlight throughout the morning and afternoon hours. Incremental shadow coverage would primarily affect trees and other vegetation in an estimated 20-foot by 30-foot area (600 square feet). Because shadows are not static and move from west to east throughout the day, public use and enjoyment of this resource would not be affected, and vegetation would continue to receive some direct sunlight on representative analysis days (see **Figures 6-1 through 6-4**). Also, the natural resource would still receive adequate sunlight during the growing season (at least the four to six hours specified in the *CEQR Technical Manual*), and vegetation would not be affected. Because the December 21 analysis day falls outside the plant growing season defined by the *CEQR Technical Manual*, trees and vegetation would not be affected by incremental shadows on this day.

Given the limited extent and temporary nature of incremental shadow coverage on this resource, habitat conditions are not expected to change as a result of increases to incremental shadow coverage. As discussed in **Chapter 9, Natural Resources**, no area would be permanently in shade or shaded to a degree that would affect plant or animal survival. Sunlight reaching the resource would be neither substantially reduced nor completely eliminated. Action-generated shadows are not expected to result in significant, adverse impacts on species in the natural area and would not constitute a significant, adverse impact.

### **Conclusion**

The Proposed Actions would not result in new structures taller than 50 feet in incremental height. However, one of the prototypical analysis sites would be located adjacent to a sunlight-sensitive resource. A detailed analysis of this site concludes that public use and enjoyment of the adjacent resource would not be adversely affected, and vegetation would continue to receive some direct sunlight on these representative analysis days. No area would be permanently in shade or shaded to a degree that would affect plant or animal survival. Sunlight reaching the resource would be neither substantially reduced nor completely eliminated. The Proposed Actions would not result in significant, adverse shadow impacts.

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