Zoning For Coastal Flood Resiliency
Chapter 6: Shadows

A. INTRODUCTION

This chapter considers the potential for the Proposed Action to result in incremental shadows long enough to reach any nearby publicly accessible open spaces or other sunlight-sensitive resources. Public open spaces, historic resources, and natural resources are all potentially sunlight-sensitive resources, and thus, this chapter is closely linked to the information presented in other chapters of this Environmental Impact Statement (EIS), particularly **Chapter 5, "Open Space," Chapter 7, "Historic & Cultural Resources,"** and **Chapter 9, "Natural Resources."**

According to the 20202014 *City Environmental Quality Review* (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 detailed in **Chapter 1, "Project Description,"** the New York City Department of City Planning (DCP) is proposing a zoning text amendment to update the Special Regulations Applying in Flood Hazard Areas (Article VI, Chapter 4) of the New York City Zoning Resolution (ZR), which includes the "Flood Resilience Zoning Text" (the "2013 Flood Text") and "Special Regulations for Neighborhood Recovery" (the "2015 Recovery Text"). These temporary zoning rules were adopted on an emergency basis to remove zoning barriers that were hindering the reconstruction and retrofitting of buildings affected by Hurricane Sandy and to help ensure that new construction there would be more resilient. The 2013 Flood Text provisions are set to expire with the adoption of new and final Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), which is anticipated to occur within the next few years. Applicability of the 2015 Recovery Text expired in July 2020. Therefore, DCP is proposing a citywide zoning text amendment, "Zoning for Coastal Flood Resiliency" (the "Proposed Action"), to improve upon and make permanent the relevant provisions of the existing temporary zoning rules of the 2013 Flood Text and 2015 Recovery Text. In addition, the Proposed Action includes special provisions to help facilitate the city's long-term recovery from the COVID-19 pandemic and its associated economic effects by providing more time for existing non-conforming uses to reopen and builders to undertake certain construction projects. The Proposed Action also includes updates to other sections of the ZR, including the Special Regulations Applying in the Waterfront Area (Article VI, Chapter 2) and provisions within various Special Purpose Districts. The Proposed Action would mostly affect New York City's current 1% annual and 0.2% annual chance floodplains. However, select provisions of the Proposed Action would be applicable citywide. To help the City prepare for or respond to other disasters, select provisions in the Proposed Action regarding power systems and other mechanical equipment, ramps and lifts, vulnerable populations, and disaster recovery rules, would be applicable citywide.

Due to the broad applicability of the Proposed Action, it is difficult to predict the sites where development would be facilitated. In addition, the Proposed Action is not in-and-of-itself expected to induce development where it would not otherwise have occurred absent the Proposed Action. Although the Proposed Action may allow developments and existing buildings to retrofit to resilient standards, the overall amount, type, and location of construction within the affected area is not anticipated to change. Owing to the generic nature of this action, there are no known or projected as-of-right development sites identified as part of the Proposed Action's Reasonable Worst-Case Development Scenario (RWCDS). To produce a reasonable analysis of the likely effects of the Proposed Action, 14 representative Prototypical Analysis Sites containing either new developments, infill, reconstructions, or retrofits of existing buildings in the city's

1% and 0.2% annual chance floodplains were identified to demonstrate the wide range of proposed regulations for sites that would be able to develop as-of-right in the future with the Proposed Action, as detailed further in **Chapter 1**. As the Proposed Action would result in increases in height compared to the No-Action scenarios on several of the Prototypical Analysis Sites, some of which may be adjacent to or across the street from sunlight-sensitive resources, a shadows assessment was prepared, and is provided below.

B. PRINCIPAL CONCLUSIONS

The Proposed Action 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 incremental shadows resulting from the Proposed Action. As detailed below, the Proposed Action would generate limited shadows on 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 Action 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 as a result of the Proposed Action.

C. 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 could 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 considered to be sunlight-sensitive resources[1]:

- ***Public open space (e.g., parks, playgrounds, plazas, schoolyards, greenways, and landscaped medians with seating).*** Planted areas within unused portions or roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources. Sunlight sensitivity is assessed for both (1) warm-weather dependent features, like wading pools and sandboxes, or vegetation that could be affected by loss of sunlight during the growing season (i.e., March through October); and (2) features, such as benches, that could 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 playfields or paved courts; and such activities as gardening, or 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.

[1] According to the *CEQR Technical Manual*, city streets, sidewalks, and private open spaces (such as private residential front and back yards, stoops, and vacant lots) are not considered to be sunlight-sensitive resources.

- ***Features of historic architectural resources that depend on sunlight for their enjoyment by the public.*** Only the sunlight-sensitive features of an architectural resource are considered in a shadows analysis. 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 an 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 an 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.

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 assessment consists of three tiers of analysis. The first tier determines a simple radius around the buildings representing the longest shadow that could be cast in the future with the Proposed Action. If there are sunlight-sensitive resources within the radius, the analysis proceeds to the second tier, which reduces the area that could 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 could 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 – or the additional, or new, shadow that a building or other built structure resulting from a proposed project would cast on a sunlight-sensitive resource during the year – resulting from the project. Incremental shadows are determined by establishing a baseline condition (the No-Action condition) and comparing it to the future condition resulting from the Proposed Action (the With-Action condition), thus illustrating the shadows cast by existing or future buildings and distinguishing the additional (incremental) shadows cast by a proposed action.

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. As these months and days are representative of the full range of possible shadows, they are also used for assessing shadows on sunlight-sensitive 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 incremental shadows on the sunlight-sensitive resources are described, and their degree of significance is considered. The result 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 an 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.

Pursuant to CEQR guidance, a shadow assessment is required only an action would: (a) result in new developments or enlargements (including the addition of rooftop mechanical equipment) that would result in an incremental increase of 50 feet or more compared to the No-Action scenario, or (b) be located adjacent to, or across the street from, a sunlight-sensitive resource. However, when an action's incremental height increase is 10 feet or less and it is located adjacent to or across the street from a sunlight-sensitive resource, which is not a designated New York City Landmark (NYCL), listed on the State/National Registers of Historic Places (S/NR), or eligible for these programs, the lead agency may determine, in consultation with New York City Department of Parks and Recreation (DPR), whether a shadow assessment is required.

Prototypical Analysis Sites

As detailed in **Chapter 1, "Project Description"** and summarized in **Tables 6-1a** and **6-1b** below, the Proposed Action would not result in changes to land uses on the Prototypical Analysis Sites as compared

to the No-Action scenarios. In the future with the Proposed Action, it is expected that new buildings on the Prototypical Analysis Sites would exceed the minimum flood-resistant construction standards of Appendix G for buildings in both the 1% and 0.2% annual chance floodplains. Additionally, it is expected that existing buildings would retrofit to either meet the minimum flood-resistant construction standards of Appendix G or exceed it, depending on the cost and structural feasibility of construction for both the 1% and the 0.2% annual chance floodplain.

It is assumed that the 14 Prototypical Analysis Sites would maximize their development under the Proposed Action. As detailed in **Chapter 1**, developments in the 0.2% annual chance floodplain generally follow the development rationale for the 1% annual chance floodplain, unless the limited height flexibility in the 0.2% annual chance floodplain does not allow for it. As detailed in **Table 6-1a** and **6-1b**, in both the 1% and 0.2% annual chance floodplains, five Prototypical Analysis Sites (Nos. 2, 5, 7, 9, and 11) would accommodate new development under With-Action conditions, and the remaining nine sites (Nos. 1, 3, 4, 6, 8, 10, 12, 13, and 14) would be retrofitted, reconstructed, or would undergo site modifications in the future with the Proposed Action.

Table 6-1a: Prototypical Analysis Sites – With-Action Condition: 1% Annual Chance Floodplain

Site	Zoning District	Lot Area (SF)	1% Annual Chance Floodplain With-Action Scenario	With-Action FAR	Change between No-Action and With-Action Scenarios
1	R3-1	4,000	**RETROFIT** Three-story residential building w/ one DU (2,835 gsf / 1,800 zsf)	0.45	*- 65 gsf* **+ 8 feet**
2	R3-1	2,500	**NEW** Three-story residential building w/ one DU (2,231 gsf / 1,500 zsf)	0.60	**+ 250 zsf (+ 0.1 FAR)** **+ 631 gsf** **+ 5 feet**
3	R4	2,000	**RECONSTRUCTION** Four-story residential building w/ two DUs (3,927 gsf / 2,700 zsf)	1.35	**+ 1,092 gsf** **+ 15 feet**
4	R5	2,500	**RETROFIT** Four-story residential building w/ three DUs (5,630 gsf / 4,125 zsf)	1.65	**+ 130 gsf** **+ 9 feet**
5	R7A	11,500	**NEW** Eight-story residential building w/ 54 DUs (60,980 gsf / 46,000 zsf)	4.0	**+ 4,650 gsf** **+ 7 feet**
6	R6	100,000	**RETROFIT** Eight-story residential building w/ 320 DUs (247,200 gsf / 240,000 zsf)	2.4	*- 22,800 gsf*
7	R5 / C1-2	12,000	**NEW** Four-story mixed residential/commercial building w/ 10 DUs (19,800 gsf / 15,000 zsf)	1.25	*- 1,800 gsf* **+ 5 feet**
8	R7A / C1-2	2,500	**RETROFIT** Eight-story mixed residential/ commercial building w/ 13 DUs (12,105 gsf / 10,000 zsf)	4.0	*- 210 gsf* **+ 10 feet**
9	R3-1 / C1-2	10,000	**NEW** One-story commercial building (6,000 gsf / 4,510 zsf)	0.45	**+ 310 zsf (+ 0.03 FAR)** **+ 960 gsf**
10	M1-1	10,000	**RETROFIT** One-story industrial building (12,000 gsf / 10,000 zsf)	1.0	**+ 500 gsf**
11	R4	2,500	**NEW** Three-story + attic residential building w/ one DU (3,461 gsf / 2,250 zsf)	0.90	**+ 50 zsf** **+ 266 gsf** *- 5 feet*
12	R3A	2,500	**RETROFIT** Two-story residential building w/ one DU (2,254 gsf / 1,102 zsf)	0.44	**+ 50 zsf (+ 0.02 FAR)** **+ 50 gsf** **+ 8 feet**
13	R3X	2,000	**RETROFIT** Three-story residential building w/ two DUs (2,130 gsf / 1,400 zsf)	0.50	**+ 30 zsf (+ 0.01 FAR)** **+ 30 gsf** **+ 9 feet**
14	R8 / C2-4	50,000	**SITE MODIFICATION** Waterfront Site	N/A	**N/A**

Note: Refer to **Appendix A** for illustrative renderings of the Prototypical Analysis Sites.
*Site 14 illustrates the proposed modifications to waterfront regulations for open space (see **Appendix A**).

As detailed in **Chapter 1, "Project Description,"** the Proposed Action would not result in incremental increases of 50 feet or more on any of the 14 Prototypical Analysis Sites. However, due to their generic nature, it is not known whether any of these sites would be located adjacent to or across the street from a sunlight-sensitive resource. Therefore, for conservative analysis purposes, it was assumed that the Prototypical Analysis Sites that would experience an incremental increase of 10 or more feet between the No-Action and With-Action scenarios would be located adjacent to or across the street from sunlight-sensitive resources for the purposes of the shadows analysis, as defined in the *CEQR Technical Manual*.

Table 6-1b: Prototypical Analysis Sites – With-Action Condition: 0.2% Annual Chance Floodplain

Site	Zoning District	Lot Area (SF)	0.2% Annual Chance Floodplain With-Action Scenario	With-Action FAR	Change between No-Action and With-Action Scenarios
1	R3-1	4,000	**RETROFIT** Three-story residential building w/ one DU (2,835 gsf / 1,800 zsf)	0.45	*- 65 gsf* **+ 6 feet**
2	R3-1	2,500	**NEW** Three-story + attic residential building w/ one DU (2,231 gsf / 1,500 zsf)	0.60	**+ 250 zsf (+ 0.1 FAR)** **+ 631 gsf** **+ 8 feet**
3	R4	2,000	**RECONSTRUCTION** Three-story residential building w/ two DUs (2,835 gsf / 2,700 zsf)	1.35	**+ 9 feet**
4	R5	2,500	**RETROFIT** Four-story residential building w/ three DUs (5,630 gsf / 4,125 zsf)	1.65	**+ 130 gsf** **+ 9 feet**
5	R7A	11,500	**NEW** Eight-story residential building w/ 54 DUs (60,980 gsf / 46,000 zsf)	4.0	**+ 2,940 gsf** **+ 10 feet**
6	R6	100,000	**RETROFIT** Eight-story residential building w/ 320 DUs (247,200 gsf / 240,000 zsf)	2.4	*- 22,800 gsf*
7	R5 / C1-2	12,000	**NEW** Four-story mixed residential/commercial building w/ 10 DUs (19,800 gsf / 15,000 zsf)	1.25	*- 190 gsf* **+ 5 feet**
8	R7A / C1-2	2,500	**RETROFIT** Eight-story mixed residential/ commercial building w/ 13 DUs (12,105 gsf / 10,000 zsf)	4.0	**+ 1,305 gsf** **+ 10 feet**
9	R3-1 / C1-2	10,000	**NEW** One-story commercial building (6,000 gsf / 4,510 zsf)	0.45	**+ 310 zsf (+0.03 FAR)** **+ 960 gsf** **+ 6 feet**
10	M1-1	10,000	**RETROFIT** One-story industrial building (12.000 gsf / 10,000 zsf)	1.0	**+ 500 gsf**
11	R4	2,500	**NEW** Two-story + attic residential building w/ one DU (3,182 gsf / 1,925 zsf)	0.77	**+ 45 zsf (+ 0.02 FAR)** **+ 1,072 gsf** *- 1 foot*
12	R3A	2,500	**RETROFIT** Two-story residential building w/ one DU (2,254 gsf / 1,102 zsf)	0.44	**+ 50 zsf (+ 0.02 FAR)** **+ 50 gsf** **+ 8 feet**
13	R3X	2,000	**RETROFIT** Three-story residential building w/ two DUs (2,130 gsf / 1,400 zsf)	0.50	**+ 30 zsf (+0.01 FAR)** **+ 30 gsf** **+ 9 feet**
14	R8 / C2-4	50,000	**SITE MODIFICATION** Waterfront Site	N/A	**N/A**

Note: Refer to **Appendix A** for illustrative renderings of the Prototypical Analysis Sites.
*Site 14 illustrates the proposed modifications to waterfront regulations for open space (see **Appendix A**).

As discussed in **Chapter 1** and detailed in **Table 6-1a**, it is expected that the building on Prototypical Analysis Site 3 in the 1% annual chance floodplain scenario would increase approximately 15 feet in height between the No-Action and With-Action scenarios, from a 22-foot-tall No-Action building to a 37-foot-tall With-Action building. Additionally, it is expected that the building on Prototypical Analysis Site 5 in the 0.2% annual chance floodplain scenario and the building on Prototypical Analysis Site 8 in the 1% annual chance floodplain scenario would each increase approximately 10 feet in height between the No-Action and With-Action conditions. As detailed in **Table 6-1b**, the building on Site 5 in the 0.2% annual chance

floodplain scenario would increase from a 70-foot-tall No-Action building to an 80-foot-tall With-Action building. As detailed in **Table 6-1a**, the building on Site 8 in the 1% annual chance floodplain scenario would increase from a 75-foot-tall No-Action building to an 85-foot-tall With-Action building. As such, detailed analyses of these three Prototypical Analysis Sites were conducted and are provided below.

D. DETAILED ASSESSMENT

Per *CEQR Technical Manual* guidelines, a shadow analysis was performed for the three Prototypical Analysis Sites 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 1.5 hours after sunrise to 1.5 hours 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 conditions, the results of which are summarized in **Table 6-2**.

Table 6-2: Duration of With-Action Shadows on Sunlight-Sensitive Resources (Incremental Shadow by Prototype)

Prototypical Analysis Site	Analysis Day	March 21/ September 21	May 6/ August 6	June 21	December 21
		7:36 AM – 4:29 PM	6:27 AM – 5:18 PM	5:57 AM – 6:01 PM	8:51 AM – 2:53 PM
Site 3 *(1% annual chance floodplain scenario)*	Shadow enter-exit time	-	-	**OS01** 5:35 – 6:01PM	**HR01** 11:50AM–2:53PM
	Incremental shadow duration	-	-	**OS01** 26 mins	**HR01** 3 hours 3 mins
Site 5 *(0.2% annual chance floodplain scenario)*	Shadow enter-exit time	**OS02** 7:36 – 9:26AM **OS03** 12:36 – 3:34PM	**OS02** 6:27 – 10:45AM	**OS02** 5:57 – 11:34AM	**OS03** 11:08AM–2:53PM
	Incremental shadow duration	**OS02** 1 hour 50 mins **OS03** 2 hours 58 mins	**OS02** 4 hours 18 mins	**OS02** 5 hours 37 mins	**OS03** 3 hours 45 mins
Site 8 *(1% annual chance floodplain scenario)*	Shadow enter-exit time	**OS02** 2:26 – 4:29PM	**OS02** 2:10 – 5:18PM	**OS02** 2:14 – 5:39PM	-
	Incremental shadow duration	**OS02** 2 hours 3 mins	**OS02** 3 hours 8 mins	**OS02** 3 hours 25 mins	-

Note: All times are Eastern Standard Time; Daylight Savings Time was not accounted for per *CEQR Technical Manual* guidance.
Table indicates the entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.

Table 6-2 shows that all three analyzed Prototypical Analysis Sites would result in incremental action-generated shadows on sunlight-sensitive resources. Increases in shadow coverage would occur on four sunlight-sensitive resources – three of which are open space resources and one of which is a historic resource – including two resources on March 21/September 21; one resource on May 6/August 6; two resources on June 21; and two resources on December 21. **Figures 6-1, 6-2,** and **6-3** show representative shadow views at each of the sunlight-sensitive resources on each of the representative analysis days on which incremental shadows would occur (refer to **Table 6-2**).

It should be noted 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 attachment for March 21/September 21, May 6/August 6, and June 21 need to have one hour added to reflect the Eastern Daylight Saving Time.

Prototypical Analysis Site 3

In the future with the Proposed Action, Prototypical Analysis Site 3 in the 1% annual chance floodplain would be retrofitted. The building would continue to be a two-family attached residence. However, the building height would increase from 22 feet in the No-Action scenario to 37 feet in the With-Action scenario. Refer to **Chapter 1, "Project Description"** for further discussion and illustrative renderings of Prototypical Analysis Site 3 in the No-Action and With-Action conditions.

Open Space 1 (OS 01)

For conservative analysis purposes, Prototypical Analysis Site 3 is assumed to be located across the street from a generic, small, publicly accessible open space (OS 01) that is 0.17 acres in size. OS 01 is assumed to function as a playground with multiple jungle gyms surrounded by bench seating and plantings.

The Proposed Action would result in new incremental shadows of varying duration and coverage at this open space on one of the four analysis days: June 21. As detailed above in **Table 6-2**, on June 21, action-generated shadows on OS 01 would last for approximately 26 minutes. Shadow coverage during this time would generally be limited, as shown in **Figure 6-1a**. Incremental shadows would enter OS 01 at 5:35 PM, affecting the eastern corner of the park, and would move in an eastern direction until the end of the analysis period at 6:01 PM.

Assessment

On June 21, incremental shadows from Prototypical Analysis Site 3 would cover very limited portions of OS 01 for a very limited amount of time at the end of the analysis period. As the duration of incremental shadow coverage on the open space resource would be less than 30 minutes, and OS 01 would continue to receive substantial direct sunlight throughout the remainder of the representative analysis day, incremental shadows on OS 01 are not expected to result in significant adverse impacts, in accordance with *CEQR Technical Manual* guidance.

Historic Resource 1 (HR 01)

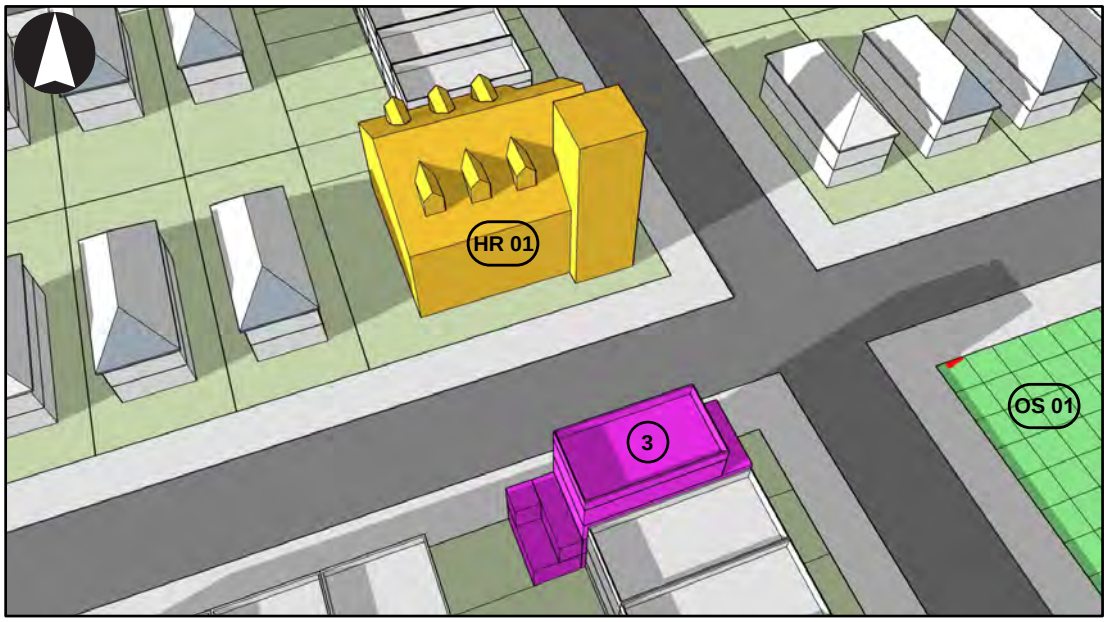
Prototypical Analysis Site 3 is also assumed to be located across the street from a generic house of worship, which is assumed to have historic significance and contain sunlight-sensitive features, which may include stained-glass windows and/or architectural design elements (HR 01).

The Proposed Action would result in new incremental shadows of varying duration and coverage on this historic resource on one of the four representative analysis days: December 21. As detailed above in **Table 6-2**, on December 21, action-generated shadows on HR 01 would last for approximately three hours and three minutes. Incremental shadows on HR 01 would begin at 11:50 AM and would move in an eastern direction until the end of the analysis period at 2:53 PM (refer to **Figure 6-1b**).

Assessment

On December 21, the winter solstice, when shadows would be stretched farthest from their origin, the Proposed Action would result in incremental shadow coverage on HR 01. However, the historic resource would continue to receive direct sunlight as such stretched shadows move from east to west quickly throughout the day and are only expected to reach the southern areas of the building's façade. Action-generated shadows on HR 01 would not stop on any sunlight-sensitive features of the historic resource, such as stained-glass windows, for an extended period of time during the analysis day. Therefore, these action-generated shadows are not expected to significantly affect the utilization or enjoyment of HR 01 in

Figure 6-1a
Prototypical Analysis Site 3
Incremental Shadows on June 21

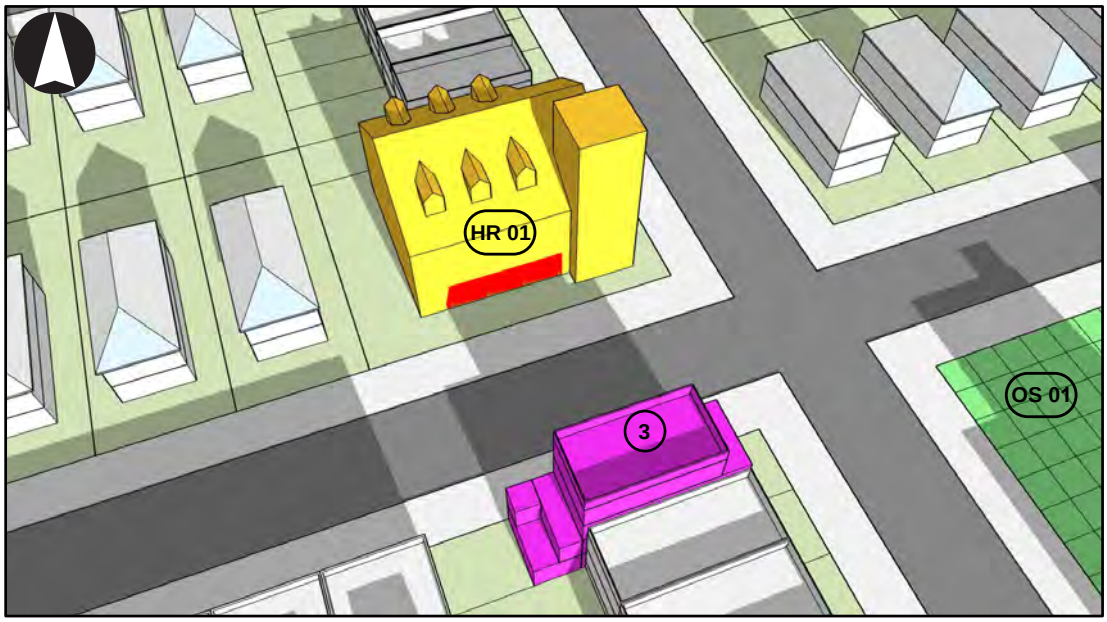


5:45 PM

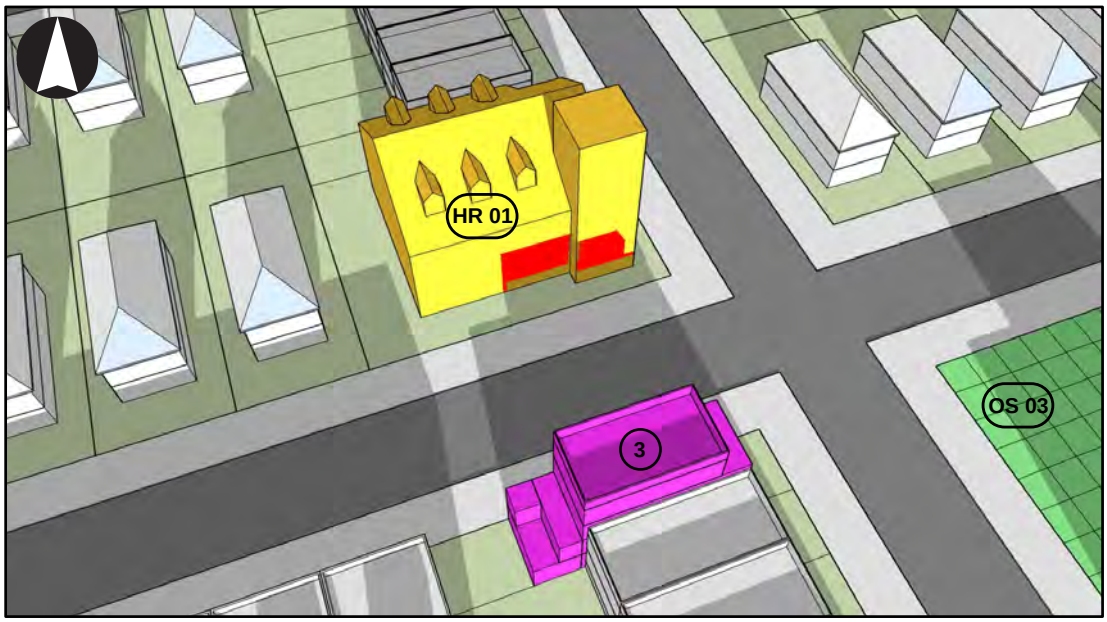
**Each grid cell on open space represents approximately 10'x10' land area.*

#	Prototypical Analysis Site	OS ##	Open Space	HR ##	Historic Resource		Incremental Shadow

Figure 6-1b
Prototypical Analysis Site 3
Incremental Shadows on December 21



1:30 PM



2:30 PM

**Each grid cell on open space represents approximately 10'x10' land area.*

Prototypical Analysis Site
OS ## Open Space
HR ## Historic Resource
Incremental Shadow

the future with the Proposed Action.

Prototypical Analysis Site 5

In the future with the Proposed Action, Prototypical Analysis Site 5 in the 0.2% annual chance floodplain would be developed with a multi-family residential building. The building height on Site 5 would increase from 70 feet in the No-Action scenario to 80 feet in the With-Action scenario. Refer to **Chapter 1, "Project Description"** for further discussion and illustrative renderings of Prototypical Analysis Site 5 in the No-Action and With-Action conditions.

Open Space 2 (OS 02)

For conservative analysis purposes, Prototypical Analysis Site 5 is assumed to be located immediately adjacent to a generic, publicly accessible open space (OS 02) that is 0.87 acres in size. OS 02 is assumed to function as a ballfield.

The Proposed Action would result in new incremental shadows of varying duration and coverage at this open space on three of the four analysis days: March 21/September 21, May 6/August 6, and June 21. As detailed above in **Table 6-2**, on March 21/September 21, action-generated shadows on OS 02 would last for approximately one hour and 50 minutes. As shown in **Figure 6-2a**, shadow coverage during this time would generally be limited. Incremental shadows would enter OS 02 at 7:36 AM, affecting small areas of the northern portion of the ballfields, and would move in a northeastern direction until exiting the ballfields at 9:26 AM.

As shown in **Table 6-2**, on May 6/August 6, action-generated shadows on OS 02 would last approximately four hours and 18 minutes. As shown in **Figures 6-2b** and **6-2c**, shadow coverage during this time would generally be limited. Incremental shadows would enter OS 02 at 6:27 AM on May 6/August 6, affecting small areas of the ballfields, and would move in a northeastern direction until existing the ballfields at 10:45 AM.

Additionally, as shown in **Table 6-2**, on June 21, action-generated shadows on OS 02 would last approximately five hours and 37 minutes. Shadow coverage during this time would generally be limited. Incremental shadows would enter OS 02 at 5:57 AM, affecting small areas of the ballfields, and would move in a northeastern direction until existing the ballfields at 11:34 AM (refer to **Figure 6-2d** and **6-2e**).

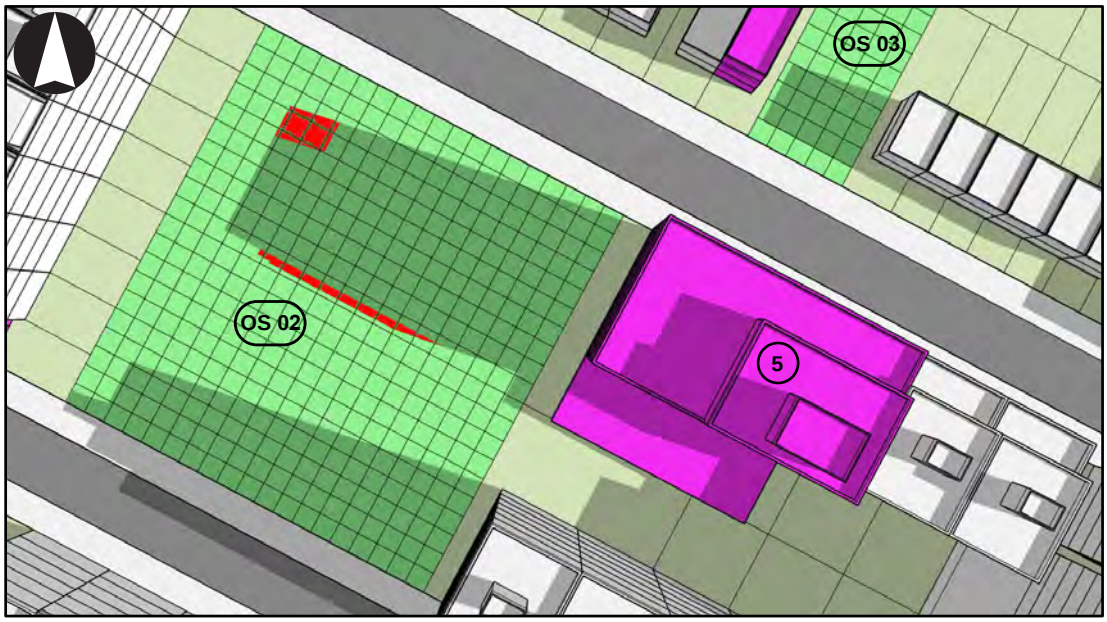
Assessment

On March 21/September 21, May 6/August 6, and June 21, incremental shadows from Prototypical Analysis Site 5 would cover small portions of OS 02 in the morning hours, all exiting the ballfields well before noon. As the OS 02 would continue to receive substantial direct sunlight throughout the remainder of the representative analysis day, these incremental shadows on are not expected to result in significant adverse impacts, in accordance with *CEQR Technical Manual* guidance. As the majority of ballfield users would utilize the space in the afternoon and evening hours, the limited incremental shadows coverage in the morning hours on OS 02 as a result of With-Action development on Prototypical Analysis Site 5 would not adversely affect public utilization or enjoyment of this open space resource. Additionally, any vegetation on OS 02 would continue to receive adequate direct sunlight (a minimum of four to six hours during the growing season) in the future with the Proposed Action.

Open Space 3 (OS 03)

For conservative analysis purposes, Prototypical Analysis Site 5 is also assumed to be located across the

Figure 6-2a
Prototypical Analysis Site 5
Incremental Shadows on March 21/September 21



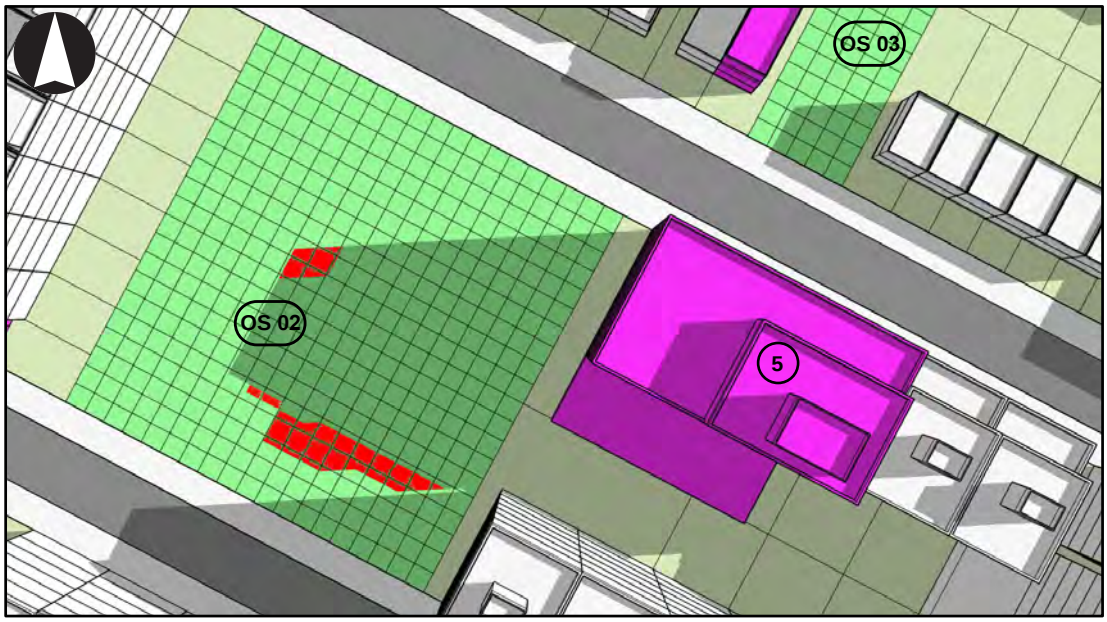
8:00 AM

9:00 AM

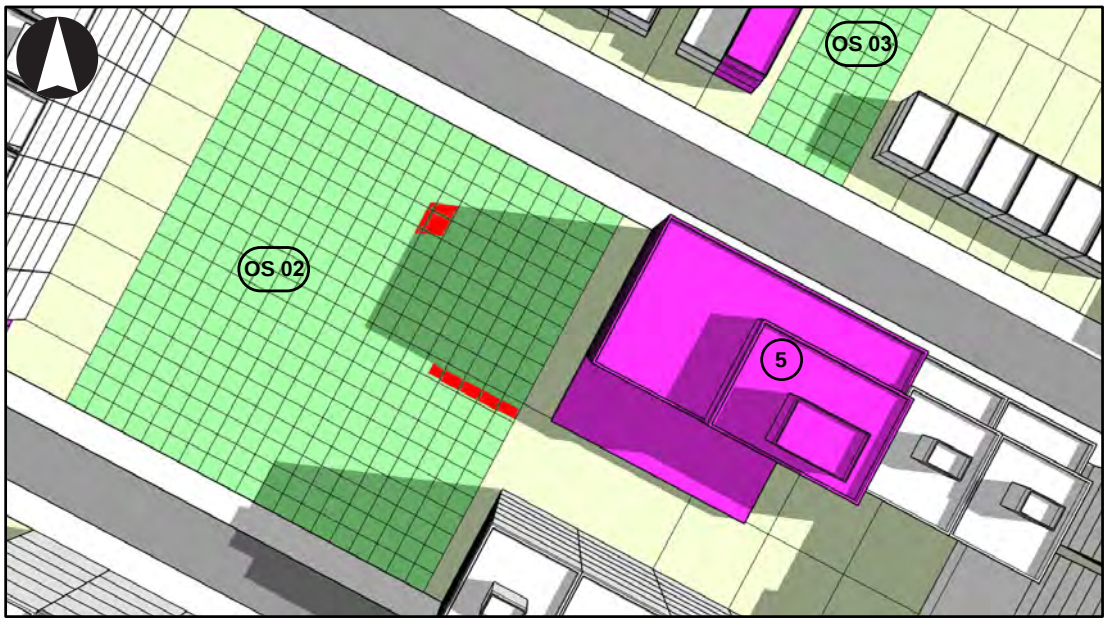
**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site** | (OS ##) **Open Space** | (HR ##) **Historic Resource** | **Incremental Shadow**

Figure 6-2b
Prototypical Analysis Site 5
Incremental Shadows on May 6/August 6



7:00 AM

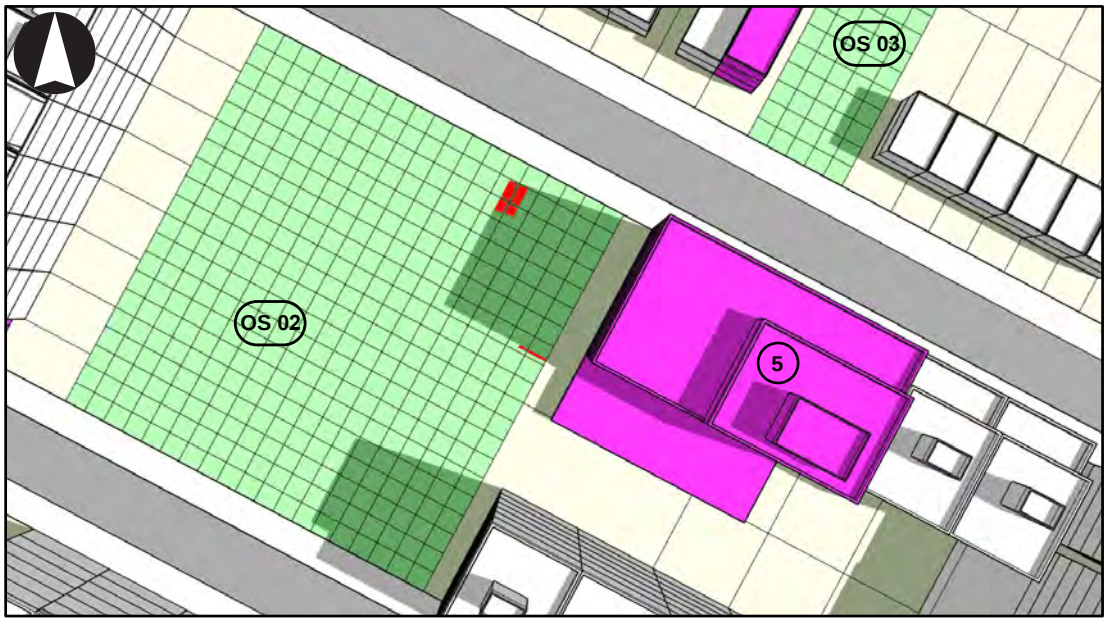


8:00 AM

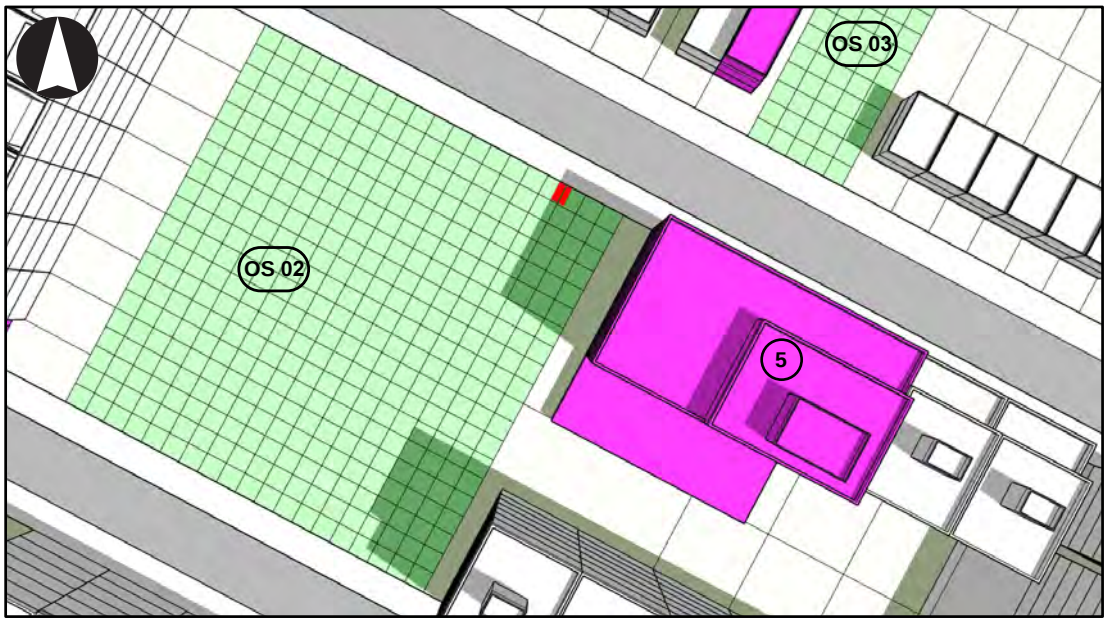
**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow

Figure 6-2c
Prototypical Analysis Site 5
Incremental Shadows on May 6/August 6



9:00 AM

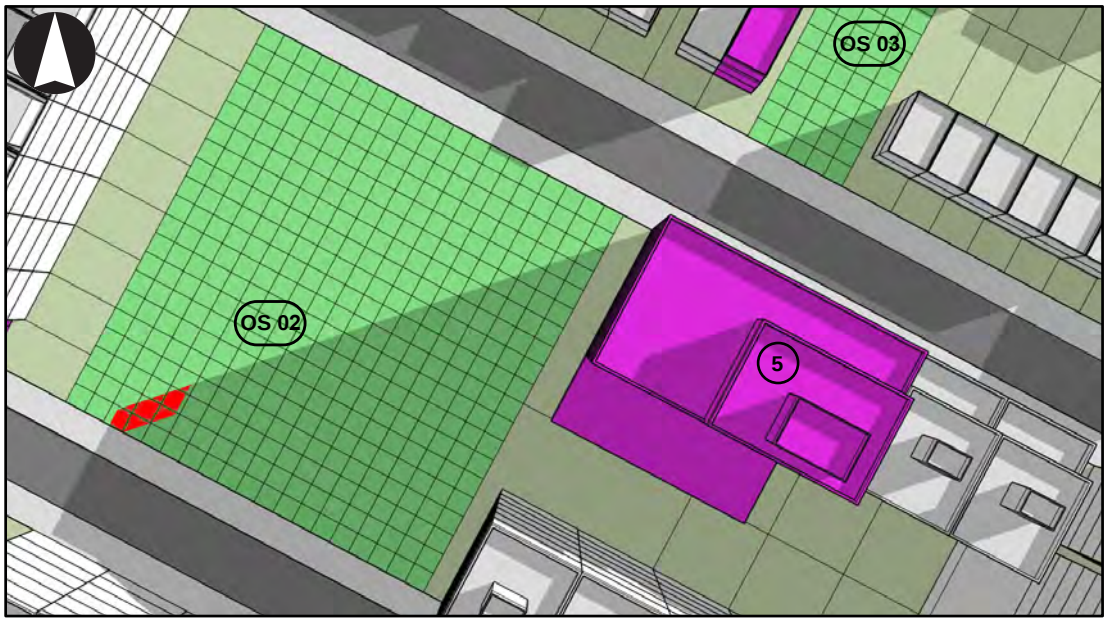


10:00 AM

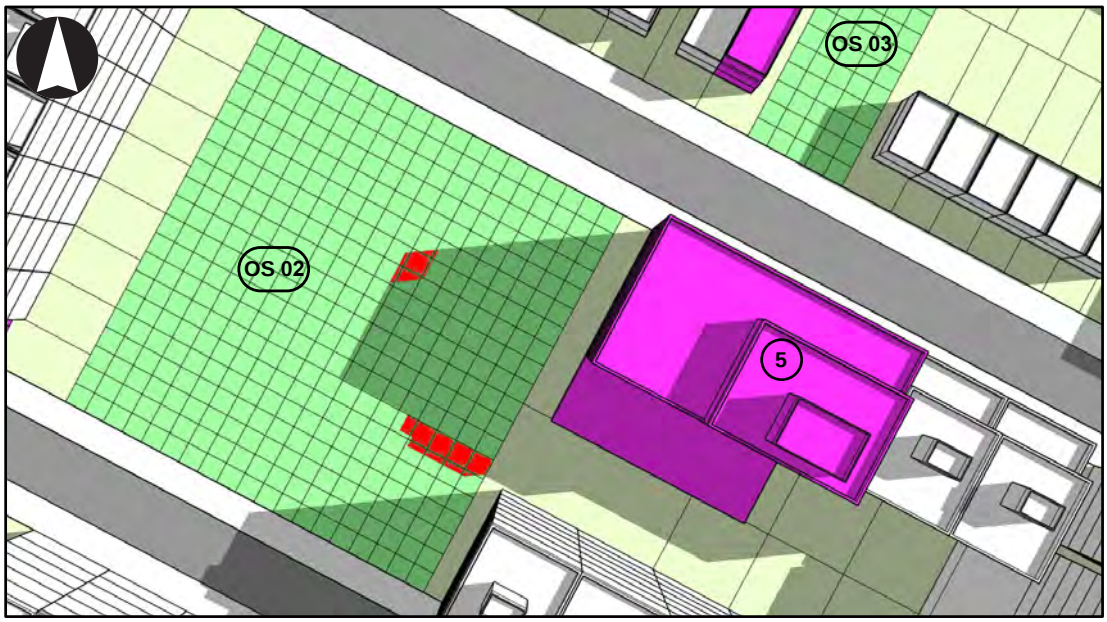
**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow

Figure 6-2d
Prototypical Analysis Site 5
Incremental Shadows on June 21



6:00 AM



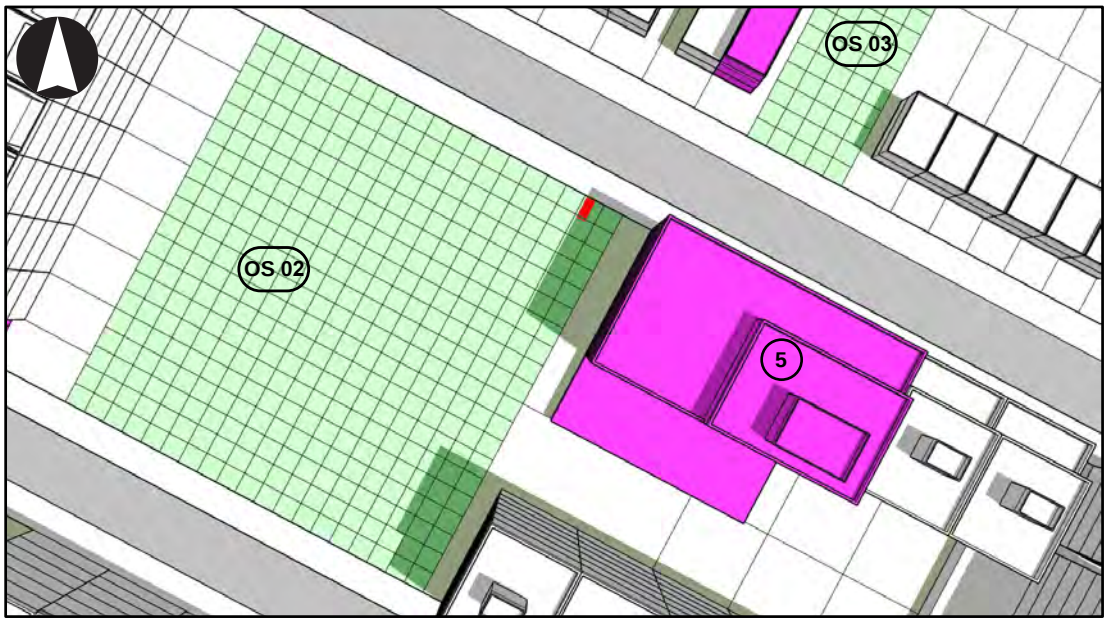
7:30 AM

**Each grid cell on open space represents approximately 10'x10' land area.*

Prototypical Analysis Site
OS ## Open Space
HR ## Historic Resource
Incremental Shadow

Figure 6-2e
Prototypical Analysis Site 5
Incremental Shadows on June 21

9:00 AM



10:30 AM

**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow

street from a generic, publicly accessible open space (OS 03) that is 0.23 acres in size. OS 3 is assumed to function as a community garden with plantings, raised beds, and bench seating.

The Proposed Action would result in new incremental shadows of varying duration and coverage at this open space on two of the four analysis days: March 21/September 21 and December 21. As detailed above in **Table 6-2**, on March 21/September 21, action-generated shadows on OS 03 would last for approximately two hours and 58 minutes. As shown in **Figure 6-2f**, shadow coverage during this time would generally be limited. Incremental shadows would enter OS 03 at 12:36 PM, affecting small areas of the southern portion of the garden, and would move in a northeastern direction until exiting the garden at 3:34 PM.

As shown in **Table 6-2**, on December 21, action-generated shadows on OS 03 would last approximately three hours and 45 minutes. Shadow coverage during this time would generally be limited. Incremental shadows would enter OS 03 at 11:08 AM on December 21, affecting small areas of the garden, and would move in a northern direction until the end of the analysis period at 2:53 PM (refer to **Figures 6-2g** and **6-2h**).

Assessment

On March 21/September 21 and December 21, incremental shadows from Prototypical Analysis Site 5 would cover small portions of OS 03. As shown in **Figure 6-2g**, shadow coverage would generally be limited, and would shade small areas of the community garden in the mid-afternoon period. Nevertheless, OS 03 would continue to receive substantial direct sunlight throughout the remainder of the representative analysis day, including the minimum of four to six hours required during the growing season. As such, action-generated shadows from Prototypical Analysis Site 5 would not adversely affect public utilization or enjoyment of this open space resource on the March 21/September 21 analysis day.

On December 21, the winter solstice, when shadows would be stretched farthest from their origin, incremental shadows from Prototypical Analysis Site 5 would result in limited shadows coverage on OS 03 in the mid-afternoon period. However, the community garden would continue to receive direct sunlight as such stretched shadows move from east to west quickly throughout the day. In addition, existing vegetation in OS 03 is not expected to be affected by incremental action-generated shadows, as the December 21 analysis day falls outside of the plant growing season defined by the *CEQR Technical Manual*. Therefore, action-generated incremental shadows during the cold winter season are not expected to significantly affect the utilization or enjoyment of OS 03.

Prototypical Analysis Site 8

In the future with the Proposed Action, Prototypical Analysis Site 8 in the 1% annual chance floodplain would be retrofitted. The building would continue to be a mixed-use structure. However, the building height would increase from 75 feet in the No-Action scenario to 85 feet in the With-Action scenario. Refer to **Chapter 1, "Project Description"** for further discussion and illustrative renderings of Prototypical Analysis Site 8 in the No-Action and With-Action conditions.

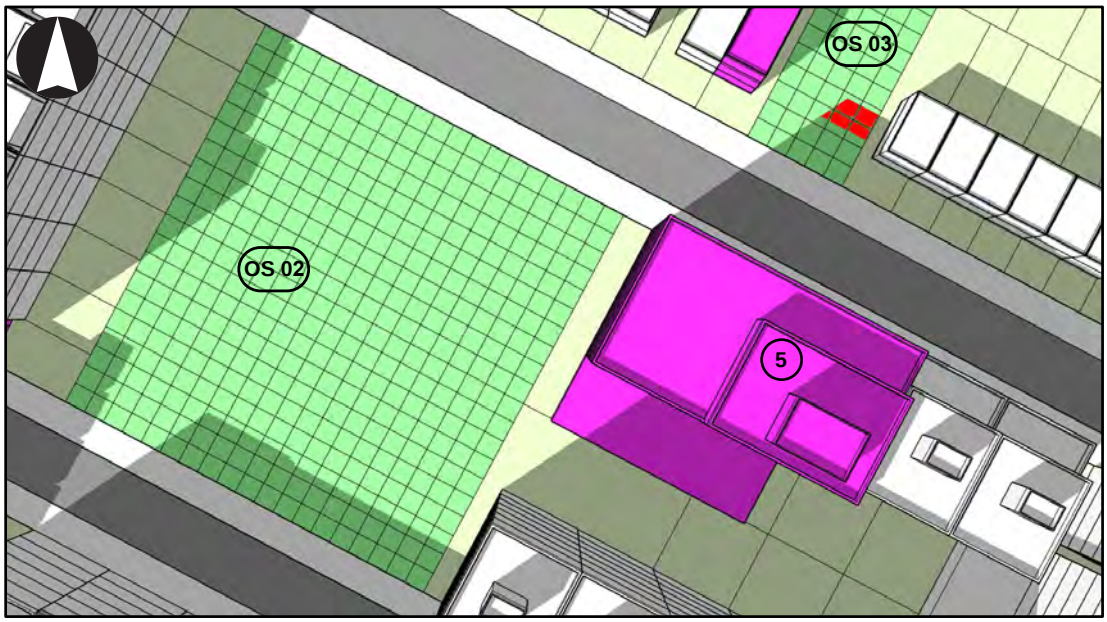
Open Space 2 (OS 02)

For conservative analysis purposes, Prototypical Analysis Site 5 is assumed to be located immediately adjacent to a generic, publicly accessible open space (OS 02) that is 0.87 acres in size. OS 02 is assumed to function as a ballfield.

The Proposed Action would result in new incremental shadows of varying duration and coverage at this open space on three of the four analysis days: March 21/September 21, May 6/August 6, and June 21. As detailed above in **Table 6-2**, on March 21/September 21, action-generated shadows on OS 02 would last

Figure 6-2f
Prototypical Analysis Site 5
Incremental Shadows on March 21/September 21

1:30 PM



3:00 PM

**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow

Figure 6-2g
Prototypical Analysis Site 5
Incremental Shadows on December 21

11:30 AM

1:00 PM

**Each grid cell on open space represents approximately 10'x10' land area.*

Prototypical Analysis Site
OS ## Open Space
HR ## Historic Resource
Incremental Shadow

Figure 6-2h
Prototypical Analysis Site 5
Incremental Shadows on December 21

2:30 PM

**Each grid cell on open space represents approximately 10'x10' land area.*

Prototypical Analysis Site
OS ## Open Space
HR ## Historic Resource
Incremental Shadow

for approximately two hours and three minutes. As shown in **Figure 6-3a**, shadow coverage during this time would generally be limited. Incremental shadows would enter OS 02 at 2:26 PM, affecting small areas of the northwestern portion of the ballfields, and would move in a northeastern direction until the end of the analysis period at 4:29 PM.

As shown in **Table 6-2**, on May 6/August 6, action-generated shadows on OS 02 would last approximately three hours and eight minutes. As shown in **Figure 6-3b**, shadow coverage during this time would generally be limited. Incremental shadows would enter OS 02 at 2:10 PM on May 6/August 6, affecting small areas of the ballfields, and would move in an eastern direction until the end of the analysis period at 5:18 PM.

Additionally, as shown in **Table 6-2**, on June 21, action-generated shadows on OS 02 would last approximately three hours and 25 minutes. Shadow coverage during this time would generally be limited. Incremental shadows would enter OS 02 at 2:14 PM, affecting small areas of the ballfields, and would move in a northeastern direction until existing the ballfields at 5:39 PM (refer to **Figure 6-3c**).

Assessment

On March 21/September 21, May 6/August 6, and June 21, incremental shadows from Prototypical Analysis Site 8 would cover small portions of OS 02 in the late afternoon and early evening hours. As the OS 02 would continue to receive substantial direct sunlight throughout the remainder of the representative analysis days, these incremental shadows on are not expected to result in significant adverse impacts, in accordance with *CEQR Technical Manual* guidance. Any vegetation on OS 02 would continue to receive adequate direct sunlight (a minimum of four to six hours during the growing season) in the future with the Proposed Action. Additionally, incremental shadows from Prototypical Analysis Site 8 in the future with the Proposed Action on OS 02 would be limited in size, and are not expected to adversely affect public utilization or enjoyment of the ballfields in the late afternoon or early evening hours, and would not substantially reduce the usability of the open space. Therefore, action-generated shadows from Prototypical Analysis Site 8 would not result in significant adverse impacts to OS 02 on any of the representative analysis days.

E. CONCLUSIONS

The Proposed Action would not result in significant adverse shadow impacts. As detailed above, the Proposed Action would generate limited shadows on 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 Action 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 as a result of the Proposed Action.

Figure 6-3a
Prototypical Analysis Site 8
Incremental Shadows on March 21/September 21

3:00 PM

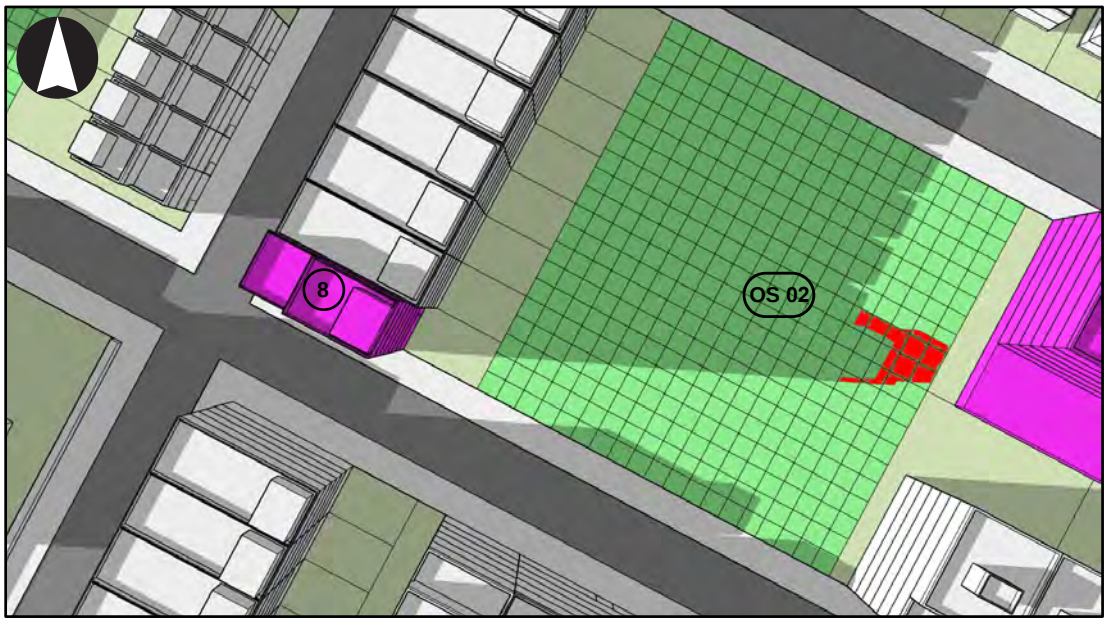
4:00 PM

**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow

Figure 6-3b
Prototypical Analysis Site 8
Incremental Shadows on May 6/August 6

3:00 PM

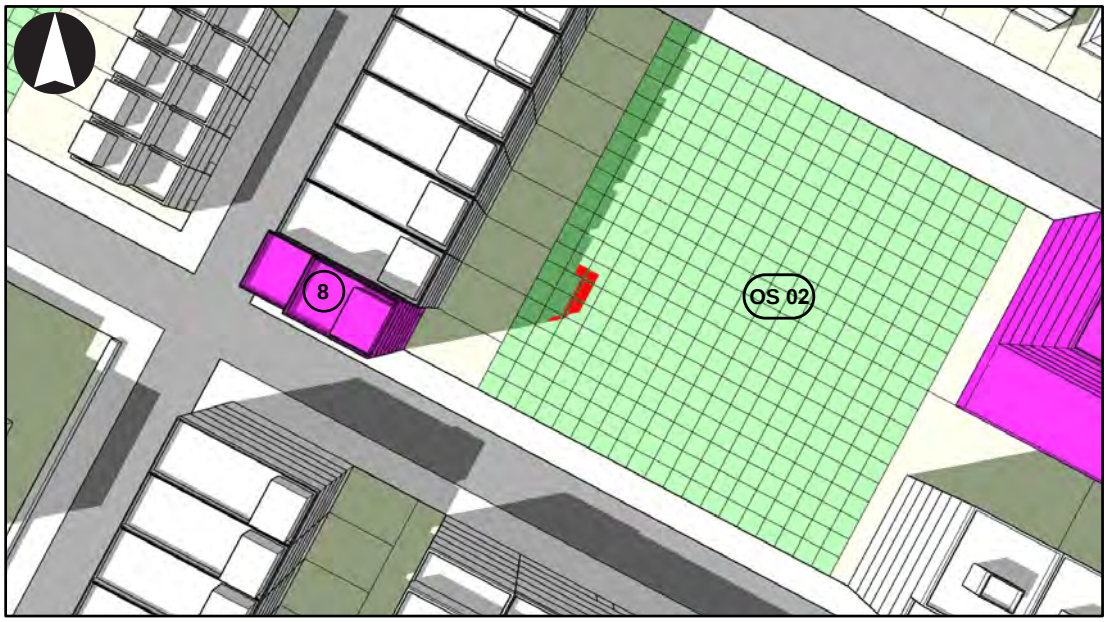


5:00 PM

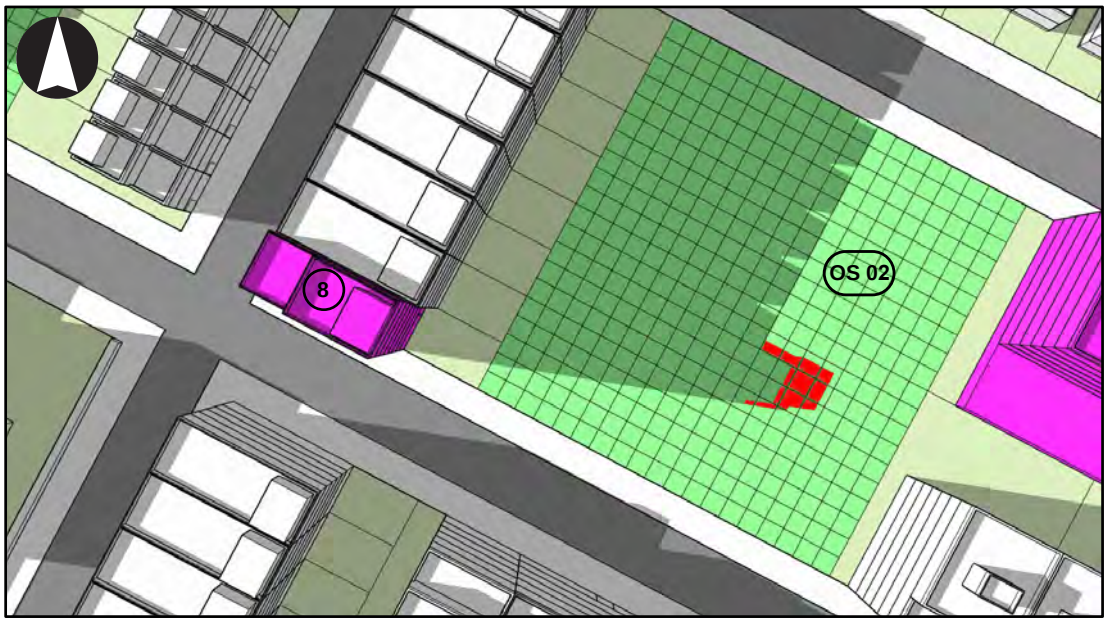
**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow

Figure 6-3c
Prototypical Analysis Site 8
Incremental Shadows on June 21



3:00 PM



5:00 PM

**Each grid cell on open space represents approximately 10'x10' land area.*

(#) **Prototypical Analysis Site**
(OS ##) **Open Space**
(HR ##) **Historic Resource**
Incremental Shadow