RIVER RING
Chapter 6: Shadows

A. INTRODUCTION

This chapter assesses 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. 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 the environmental impact statement (EIS), particularly Chapter 5, "Open Space," and Chapter 7, "Historic and Cultural Resources." According to the 2020 *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 discussed in Chapter 1, "Project Description," the Proposed Actions would facilitate the construction of a building, on the Proposed Development Site, with a height of 50 feet or greater compared to the No-Action condition. As such, a detailed shadows analysis was prepared to determine the potential for the Proposed Actions to result in significant adverse impacts on sunlight-sensitive resources[1].

B. PRINCIPAL CONCLUSIONS

A detailed analysis was conducted based on the methodology set forth in the *CEQR Technical Manual*, and determined that the Proposed Actions would not result in a significant adverse impact related to shadows. The Proposed Actions would result in incremental shadow coverage (i.e., additional, or new, shadow coverage) on portions of five sunlight-sensitive open space/natural resources: John V. Lindsay East River Park, the East River, North 5th Street Pier and Park, Bushwick Inlet Park, and Bushwick Inlet Pop-up Park. The extent and duration of the incremental shadows on these open space/natural resources would (1) not significantly reduce direct sunlight exposure on any of the sunlight-sensitive features found within these five open spaces; and (2) would not significantly alter the public's use or enjoyment of the open spaces or threaten the viability of vegetation or other elements located within the open spaces. Therefore, incremental shadows as a result of the Proposed Development on these sunlight-sensitive resources would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* methodology.

[1] Although the reasonable worst-case development scenario (RWCDS) for the Proposed Actions includes a non-Applicant-owned Projected Development Site, as stated in the Environmental Assessment Statement (EAS) and Draft Scope of Work for the Proposed Actions (issued on 3/22/2021), the Projected Development Site would be redeveloped under both No-Action and With-Action conditions, and the development on the Projected Development Site would increase 15 feet in height as a result of the Proposed Actions (45-feet-tall). ~~As the Projected Development Site is not adjacent to any sunlight-sensitive resources~~Accordingly, the shadows analysis in this chapter focuses exclusively on the Applicant's Proposed Development ~~Site~~.

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[2]:

- *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.
- *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.

The preliminary screening assessment consists of three tiers of analysis. The first tier determines a simple radius around the proposed buildings representing the longest shadow that could be cast. 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 project-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

[2] 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.

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 Actions (the With-Action condition), thus illustrating the shadows cast by existing or future buildings and distinguishing the additional (incremental) shadows cast by a proposed project. 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 ten 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 ten 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 project 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.

D. PRELIMINARY SCREENING

Tier 1 Screening Assessment

According to the *CEQR Technical Manual*, the longest shadow that a structure will cast in New York City, except for periods close to dawn or dusk, is 4.3 times its height. The maximum shadow radius for the Development was determined using the zoning envelope of the tallest building of the Proposed Development (approximately 750 feet) which represents the tallest reasonable worst case development scenario (RWCDS). Based on the maximum height of the Proposed Development the maximum shadow radius was determined to be approximately 3,225 feet (Tier 1 Assessment).

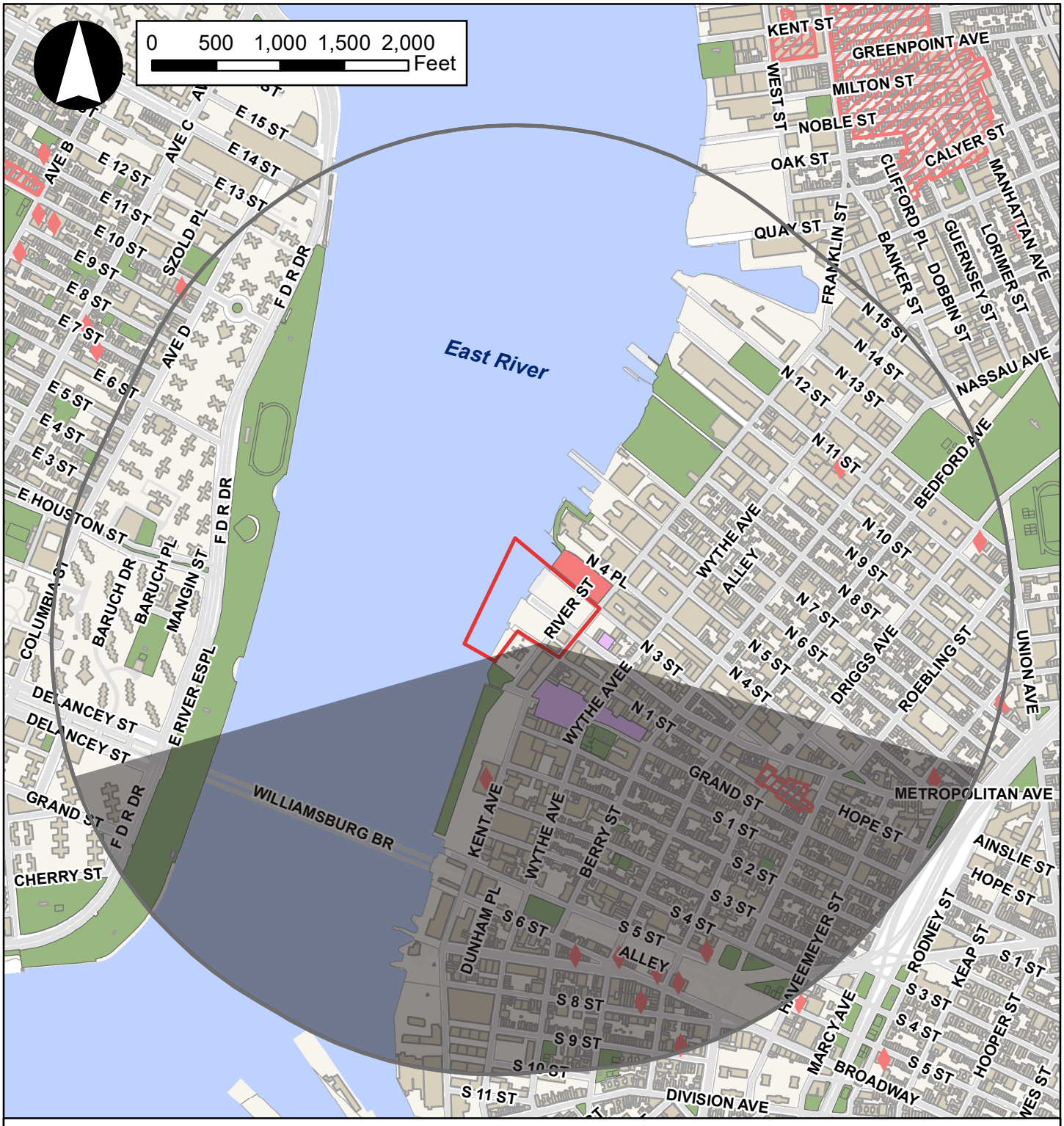
Tier 2 Screening Assessment

Due to the path of the sun 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. The purpose of the Tier 2 screening is to determine whether the sunlight-sensitive resources identified in the Tier 1 screening are located within portions of the longest shadow study area that can receive shade from the Proposed Project.

Figure 6-1 provides a base map illustrating the results of the Tier 1 and Tier 2 screening assessments (i.e., the portion of the longest shadow study area lying within -108 degrees from the true north and +108 degrees from true north as measured from the southernmost corner of the Development Site). As shown in **Figure 6-1**, several open spaces resources including Grand Ferry Park, Domino Park, and William Sheridan Playground, among others, would not experience incremental shadows from the Proposed Development. Within this longest shadow study area, 11 potentially sunlight-sensitive open space/natural resources/historic resources are excluded from this Tier 2 area. These resources include Baruch Playground, Wald Playground, John V. Lindsay East River Park, the East River, North 5th Street Pier and Park, Marsha P. Johnson State Park, Bushwick Inlet Park, Bushwick Inlet Pop-up Park, McCarren Park, the Russian Orthodox Cathedral of the Transfiguration of Our Lord, and Shrine Church of Our Lady of Mount Carmel. Further analysis for these resources is warranted and provided below.

The longest shadow study area also includes three historic resources that are not within the Tier 2 area. These resources include the LPC-designated Hecla Iron Works Building, the S/NR-Listed, NYCL-Eligible, Austin, Nichols & Co. Warehouse, and the S/NR-Eligible Metropolitan Avenue Warehouse. As none of these historic resources are sunlight-sensitive, further analysis of these resources is not warranted.

Figure 6-1
Tier I & II Shadows Assessment



Legend

- Project Area
- Existing Buildings
- Tier I: Longest Shadow Study Area (3,225')
- Tier II: Area that Cannot be Shaded
- Open Space
- East River
- NYCL-Eligible Resource
- S/NR - and NYCL-Eligible Resource
- LPC-Designated Individual Historic Landmark
- LPC-Designated Historic Districts

Sunlight-sensitive resources requiring further analysis are listed below in **Table 6-1**.

TABLE 6-1:
Sunlight-Sensitive Resources Warranting Further Analysis Based on Tier 1 and 2 Screening

No.	*Open Space/Natural Resource*
1	Baruch Playground
2	Wald Playground
3	John V. Lindsay East River Park
4	East River
5	North 5th Street Pier and Park
6	Marsha P. Johnson State Park
7	Bushwick Inlet Park
8	Bushwick Inlet Pop-up Park
9	McCarren Park
10	Russian Orthodox Cathedral of the Transfiguration of Our Lord
11	Shrine Church of Our Lady of Mount Carmel

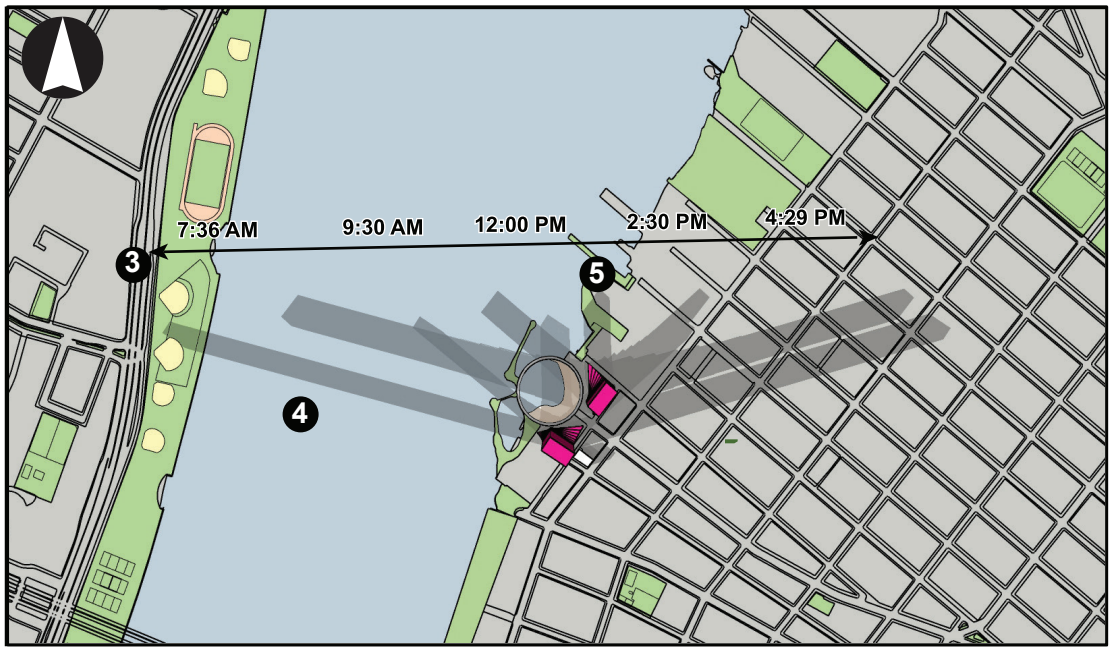
*(refer to **Figure 6-1**)

Tier 3 Screening Assessment

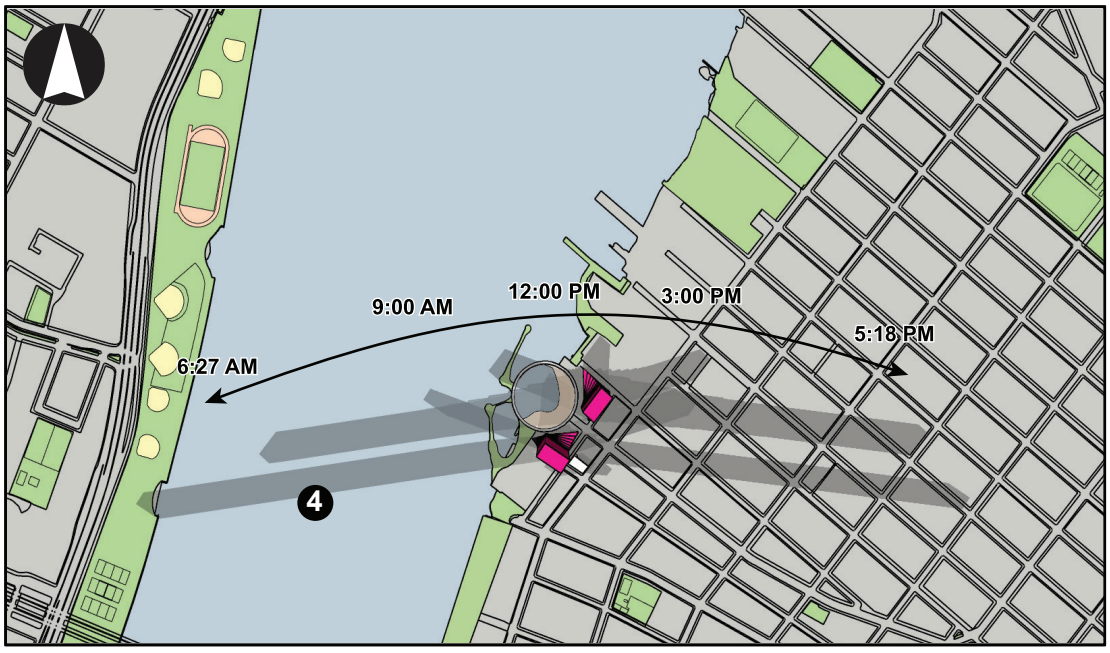
According to the *CEQR Technical Manual*, a Tier 3 screening assessment should be performed to determine if, in the absence of intervening buildings, shadows resulting from a proposed project can reach a sunlight-sensitive resource, thereby warranting a detailed shadow analysis. The Tier 3 screening assessment is used to determine if shadows resulting from a proposed project can reach a sunlight-sensitive resource at any time between 1.5 hours after sunrise and 1.5 hours before sunset on representative analysis dates.

As project-generated shadows could reach a number of sunlight-sensitive resources, a Tier 3 assessment was performed using three dimensional (3D) computer mapping software. A 3D model of the Proposed Project was used to calculate and display project-generated shadows on individual representative analysis dates. The model contained 3D representations of the elements in the base map used in the preceding assessments and a 3D model of the Proposed Development. At this stage of the assessment, surrounding buildings within the study area were not included in the model so that it may be determined whether project-generated shadows would reach any sunlight sensitive resources.

As shown in **Figures 6-2a** and **6-2b**, the Tier 3 results determined that six sunlight-sensitive open space/natural resources could potentially receive project-generated shadows on at least one of the four analysis days and, therefore, require further analysis. **Table 6-2** presents a summary of the Tier 3 assessment, showing the five sunlight-sensitive resources that could, in the absence of intervening buildings, receive project-generated shadows in the future with the Proposed Actions, and on which analysis days the new shadows could occur. As presented in **Table 6-2**, based on the Tier 3 screening assessment, the potential for new incremental shadows to be cast on John V. Lindsay East River Park, the East River, North 5th Street Pier, Marsha P. Johnson State Park, Bushwick Inlet Park, and Bushwick Inlet Pop-up Park on at least one of the four analysis days could not be ruled out, and a detailed shadows analysis is warranted for these sunlight-sensitive resources.



MARCH 21/SEPTEMBER 21



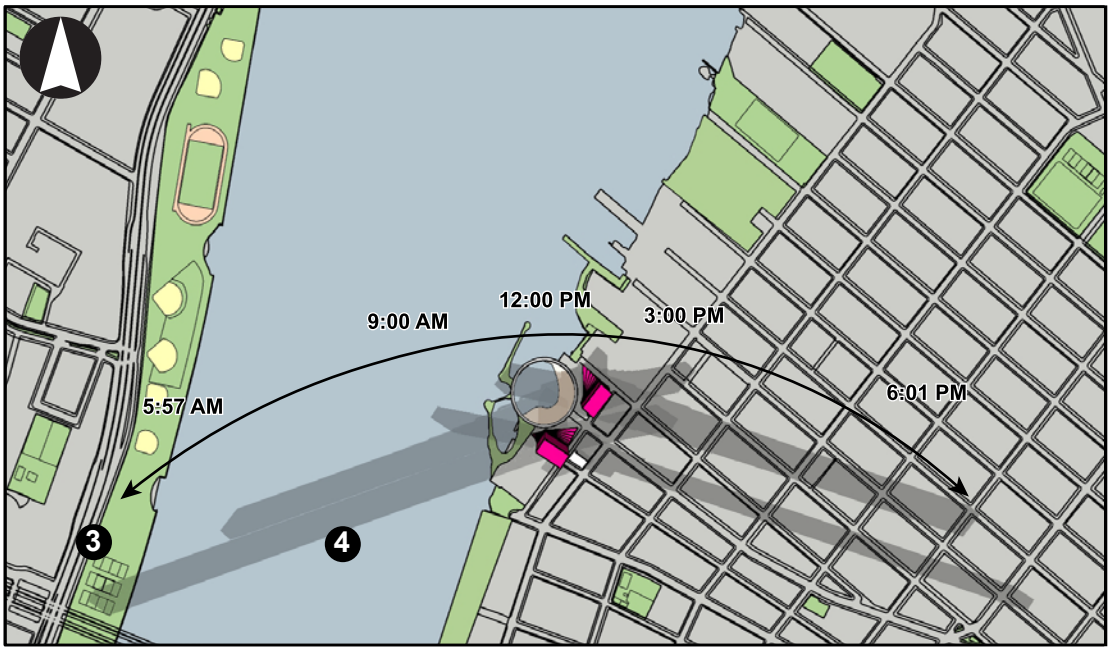
MAY 6/AUGUST 6

Proposed Development

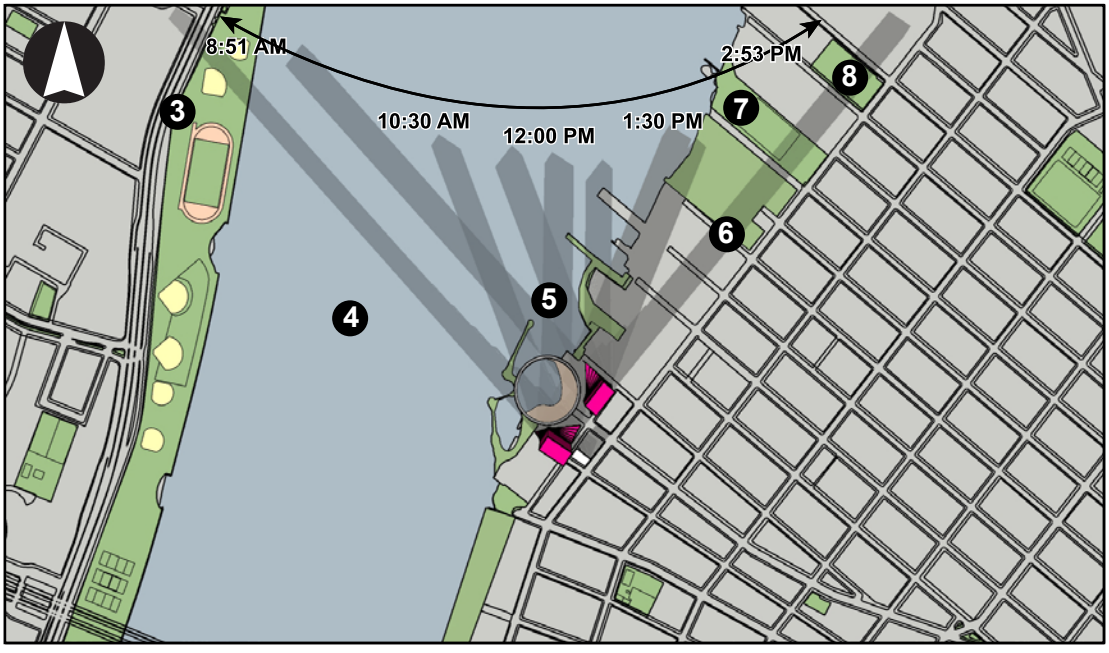
1 Sunlight-Sensitive Resource

Project-Generated Shadow

Note: Resources keyed to Table 6-1



JUNE 21



DECEMBER 21

Proposed Development

1 Sunlight-Sensitive Resource

Project-Generated Shadow

Note: Resources keyed to Table 6-1

TABLE 6-2
Sunlight-Sensitive Resources Warranting Further Analysis Based on Tier 3 Screening

No.[1]	Name	March 21/ Sept. 21 7:36 AM - 4:29 PM	May 6/August 6 6:27 AM - 5:18 PM	June 21 5:57 AM - 6:01 PM	December 21 8:51 AM - 2:53 PM	Number of Analysis Days
1	Baruch Playground	NO	NO	NO	NO	**0**
2	Wald Playground	NO	NO	NO	NO	**0**
3	John V. Lindsay East River Park	**YES**	**YES**	**YES**	**YES**	**4**
4	East River	**YES**	**YES**	**YES**	**YES**	**4**
5	North 5th Street Pier and Park	YES	YES	YES	**YES**	**4**
6	Marsha P. Johnson State Park	NO	NO	NO	**YES**	**1**
7	Bushwick Inlet Park	NO	NO	NO	**YES**	**1**
8	Bushwick Inlet Pop-up Park	NO	NO	NO	**YES**	**1**
9	McCarren Park	NO	NO	NO	NO	**0**
10	Russian Orthodox Cathedral of the Transfiguration of Our Lord	NO	NO	NO	NO	**0**
11	Shrine Church of Our Lady of Mount Carmel	NO	NO	NO	NO	**0**

Notes:
[1] Numbers keyed to **Figures 6-2a** and **6-2b.**

E. DETAILED ANALYSIS OF SHADOW IMPACTS

Per *CEQR Technical Manual* guidance, a shadow analysis was performed for the six sunlight-sensitive open space/natural resources 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. As noted previously, *CEQR Technical Manual* guidance define the temporal limits of a shadow analysis period to fall from 1.5 hours after sunrise to 1.5 hours before sunset. 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 6-3**. It should also be noted that the Proposed Development represents the worst-case shadow impacts for all sunlight-sensitive resources on each analysis day.

As shown in **Table 6-3**, in the future with the Proposed Actions, incremental project-generated shadows would reach five of the six sunlight-sensitive open space/natural resources identified in the Tier 3 assessment. Increases in shadow coverage would occur at three open space/natural resources on March 21/September 21 (John V. Lindsay East River Park, the East River, and North 5th Street Pier and Park), three resources on May 6/August 6 (the East River), three resources on June 21 (John V. Lindsay East River Park and the East River), and five resources on December 21 (John V. Lindsay East River Park, the East River, North 5th Street Pier and Park, Bushwick Inlet Park, and Bushwick Inlet Pop-up Park). **Figures 6-3** through **6-5** (all provided at the end of this chapter) 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 6-3**). Incremental project-generated shadows would not reach East River State Park and therefore, would not warrant further analysis.

TABLE 6-3
Duration of With-Action Shadows on Sunlight Sensitive Resources (Increment Compared to No-Action)

Resource	Analysis Day	March 21/Sept. 21 7:36 AM – 4:29 PM	May 6/August 6 6:27 AM – 5:18 PM	June 21 5:57 AM – 6:01 PM	December 21 8:51 AM – 2:53 PM
John V. Lindsay East River Park	Shadow enter-exit time	7:36 – 7:47 AM	6:27 – 6:32 AM	5:57 – 6:08 AM	8:51 – 9:11 AM
	Incremental shadow duration	11 minutes	5 minutes	11 minutes	20 minutes
East River	Shadow enter-exit time	7:36 AM – 1:11 PM	6:27 AM – 12:08 PM	5:57 AM – 12:00 PM	8:51 AM – 1:42 PM
	Incremental shadow duration	5 hours 35 minutes	5 hours 41 minutes	6 hours 3 minutes	4 hours 51 minutes
North 5th Street Pier and Park	Shadow enter-exit time	11:06 AM – 1:28 PM	10:17 – 11:54 AM	10:44 – 11:38 AM	10:36 AM – 1:46 PM
	Incremental shadow duration	2 hours 22 minutes	1 hour 37 minutes	54 minutes	3 hours 10 minutes
Marsha P. Johnson State Park	Shadow enter-exit time				
	Incremental shadow duration				
Bushwick Inlet Park	Shadow enter-exit time				2:10 – 2:45 PM
	Incremental shadow duration				35 minutes
Bushwick Inlet Pop-up Park	Shadow enter-exit time				2:39 – 2:47 PM
	Incremental shadow duration				8 minutes

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.
Cells of **Table 6-3** shown in grey indicate that the sunlight-sensitive resource would not experience any incremental shadow coverage on that analysis day.

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.

Resources Affected by Project-Generated Incremental Shadows

John V. Lindsay East River Park

John V. Lindsay East River Park is a 45.88-acre park located along the East River waterfront in the Lower East Side neighborhood of Manhattan. The park is located between Montgomery Street and East 12th Street along the Franklin Delano Roosevelt (FDR) Drive. The park was designed in the 1930s in tandem with the FDR Drive by then Parks Commissioner Robert Moses. John V. Lindsay East River Park is owned and operated by the New York City Department of Parks and Recreation (DPR), and features barbecuing areas, baseball fields, basketball courts, bathrooms, bicycle paths and walkways, fishing areas, fitness equipment, football fields, playgrounds, running tracks, soccer fields, spray showers, and tennis courts. The park's operating hours are from 6 AM to 1 AM.

The Proposed Actions would result in new incremental shadow coverage of limited duration on three of the four representative analysis days at John V. Lindsay East River Park. Incremental shadows would last for a total of approximately 11 minutes (7:36 – 7:47 AM) on March 21/September 21, approximately five minutes (6:27 – 6:32) on May 6/August 6, approximately 11 minutes (5:57 – 6:08 AM) on June 21, and approximately 20 minutes (8:51 – 9:11 AM) on December 21 (see **Table 6-3**).

On March 21/September 21, incremental shadows would cover a limited portion of the northern half of John V. Lindsay East River Park. The peripheral area would be impacted for a total of approximately 11 minutes, between 7:36 and 7:47 AM. The space covered in incremental shadow by the Proposed Development contains the outfield of a baseball field, and a portion of East River Promenade, which has bicycle/walking paths, and tables with seating (refer to **Figure 6-3a**). By 7:47 AM, any incremental shadow created by the Proposed Development would exit John V. Lindsay East River Park

On May 6/August 6, incremental shadows would cover a small portion of the East River Promenade. As shown in **Table 6-3** and **Figure 6-3c**, incremental shadows would be limited in size and would exit the open space by 6:32 AM, for a total duration of 5 minutes.

On June 21, incremental shadow from the Proposed Development would be cast on John V. Lindsay East River Park for approximately 11 minutes (5:57 – 6:08 AM). As shown in **Figure 6-3e**, incremental shadows from the Proposed Development would reach a limited portion of the southern half of John V. Lindsay East River Park. The area to be covered by incremental shadow from the Proposed Development for approximately 11 minutes on the June 21 analysis day includes a portion of the East River Promenade and several tennis courts. By 6:08 AM, any incremental shadow from the Proposed Development would exit the open space.

On December 21, which is considered outside the growing season in New York City, incremental shadow coverage would cover a limited portion of the northern half of John V. Lindsay East River Park (refer to **Figure 6-3h**). Incremental shadows would exist on the open space at the beginning of the analysis day (8:51 AM), covering a limited portion of the East River Promenade and a baseball field. Incremental shadows would move eastward, eventually leaving the open space at approximately 9:~~0~~11 AM for a total incremental shadow duration of approximately 20 minutes.

ASSESSMENT

John V. Lindsay East River Park would experience incremental shadow coverage on each of the four representative analysis days. Incremental shadow duration would be limited, ranging from five minutes on the May 6/August 6 analysis day (6:27 – 6:32 AM) to 20 minutes on the December 21 analysis day (8:51 – 9:11 AM). During the growing season, shadow coverage would generally be limited to the southern portions of the open space and would not be cast on a single part of the park for more than 11 minutes, allowing the open space's sunlight-sensitive resources to receive ~~(~~at least the four- to six-hour minimum of direct sunlight specified in the *CEQR Technical Manual*. Vegetation in the park would not be significantly threatened (see **Figures 6-3a, 6-3c, and 6-3e**). On December 21, which is outside the growing season in New York City, shadow coverage would be concentrated on the northern portions of the park (see **Figure 6-3h**). As shadows are not static and move from west to east throughout the day, the park's sunlight-sensitive features would continue to receive direct sunlight on these four representative analysis days. At no point during any of the representative analysis days would an incremental shadow result in the complete loss of sunlight on the park. Incremental shadows on active recreational uses during the warmer months surrounding the summer solstice are not expected to significantly affect the usability of the open space, as these incremental shadows would only be cast in the early morning hours (refer to **Table 6-3**). Incremental shadow coverage on December 21, when temperatures are colder and the use of the active recreational space would not be as high (compared to warmer months), are not expected to affect the utilization or enjoyment of this open space resource.

It should also be noted that for the three representative analysis days where incremental shadow would occur, most of the park's sunlight-sensitive features would be unaffected by incremental shadows and, thus, the open space would largely contain areas unaffected by project-generated shadows at all times of

the day. In addition, the open space's active (i.e., athletic fields/courts and playgrounds) and passive recreational amenities (i.e., barbecue and picnic areas, tables and bench seating) would continue to receive direct sunlight throughout the majority of the representative analysis days, and incremental shadows would not significantly affect the utilization or enjoyment of this open space resource. Therefore, as the extent and duration of the incremental shadows would (1) not significantly reduce direct sunlight exposure on any of the sunlight-sensitive resources found within this open space, and (2) would not significantly alter the public's use of the park or threaten the viability of vegetation or other resources, incremental shadows on John V. Lindsay East River Park as a result of the Proposed Actions would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* methodology.

East River

The East River is a salt water tidal estuary that connect Upper New York Bay to the south and Long Island South to the north. The lower East River is classified by the NYSDEC as a Class I water, with aquatic life suspected to existing within this portion of the East River adjacent to the Project Area. As the Project Area is located on the eastern shore of the East River, the Proposed Development would result in incremental shadows on portions of the East River during the morning hours.

On the March 21/September 21 analysis day, the Proposed Development would cast long shadows westward across adjacent areas of the river (refer to **Figures 6-4a** and **6-4b**). Incremental shadows would exist over the East River at the beginning of the analysis day (7:36 AM). As the morning progresses, incremental shadows from the Proposed Development would move eastward and decrease in size, finally exiting the natural resource at approximately 1:11 PM (refer to **Table 6-3**). Incremental shadows from the Proposed Development would exist over the East River for a total of approximately five hours and 35 minutes.

On the May 6/August 6 analysis day, incremental shadows from the Proposed Development would be cast over the East River from approximately 6:27 AM to 12:08 PM, for a total of approximately 5 hours and 41 minutes. As shown in **Figures 6-3c** and **6-3d**, incremental shadows from the Proposed Development would move to the east as the morning progresses.

On the June 21 analysis day incremental shadows from the Proposed Development would be cast on the East River from approximately 5:57 AM to 12:00 PM for a total of approximately 6 hours and 3 minutes. Incremental shadows would be at their largest in the early morning hours, decreasing in size as the morning progresses (refer to **Figures 6-3e, 6-3f** and **6-3g**).

On the December 21 analysis day, the shortest day of the year, shadows are longest. Incremental shadows from the Proposed Development would be cast on the East River from approximately 8:51 AM to 1:42 PM for a total of approximately four hours and 51 minutes (refer to **Figures 6-3h** and **6-3i**).

ASSESSMENT

The current moves swiftly in the East River and would move phytoplankton and other natural elements quickly through the area to be affected by any incremental shadows. Therefore, project-generated shadows would not be expected to affect primary productivity. Due to the tall, thin dimensions of the Proposed Development's two buildings, and the movement of the sun throughout the morning and early afternoon hours, incremental shadows would not affect one specific area of the East River. Because there are no intervening structures to the west, the areas that receive the longest durations of new shadow would continue to receive more than four hours of direct sunlight in parts of the morning and afternoon. Therefore, as the extent and duration of the incremental shadows would (1) not significantly reduce direct

sunlight exposure on the natural resource, and (2) would not ~~significantly alter the public's use of the East River or~~ threaten the viability of vegetation or other resources, incremental shadows on the East River as a result of the Proposed Actions would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* methodology.

North 5th Street Pier and Park

North 5th Street Pier and Park is a 3.08-acre waterfront park located between North 4th and North 7th Street north of the Project Area. The open space includes a promenade, benches, trees, an artificial lawn, and the North Williamsburg NYC Ferry Stop. The Proposed Development would result in new incremental shadows of varying duration and coverage on each of the four representative analysis days at North 5th Street Pier and Park. Incremental shadows would last for a total of approximately two hours and 22 minutes on the March 21/September 21 analysis day (11:06 AM – 1:28 PM), approximately one hour and 37 minutes (10:17 – 11:54 AM) on the May 6/August 6 analysis day, approximately 54 minutes (10:44 – 11:38 AM) on the June 21 analysis day, and approximately 3 hours and 10 minutes on the December 21 analysis day (10:36 AM – 1:46 PM) (refer to **Table 6-3**).

On the March 21/September 21 analysis, day incremental shadows would enter the southern tip of the North 5th Street Pier and Park at 11:06 AM (refer to **Figure 6-4a**). Incremental shadow coverage would decrease in size through the late morning and early afternoon before exiting the open space at 1:28 PM (refer to **Figure 6-4b**). The area to be covered in incremental shadow on the March 21/September 21 analysis day includes a portion of the promenade, benches/tables, and a small patch of grass with planted trees.

On the May 6/August 6 analysis day, incremental shadows would enter the southernmost point of the open space at approximately 10:17 AM. The area to be covered in incremental shadow is occupied by a walkway that connects North 5th Street Pier and Park to the Proposed Development's waterfront open space. Incremental shadow coverage would be limited in size and would decrease as the morning progresses (refer to F**igure 6-4c**).

On the June 21 analysis day, incremental shadows would enter the southernmost point of the open space at approximately 10:44 AM. Incremental shadows would remain over the open space by approximately 11:38 PM (a total of approximately 54 minutes). The area to be covered in incremental shadow is occupied by a walkway that connects North 5th Street Pier and Park to the Proposed Development's waterfront open space. Incremental shadow coverage would be limited in size and would decrease as the morning progresses (refer to F**igure 6-4d**).

On the December 21 analysis day, the shortest day of the year, shadows are longest. As shown in **Figure 6-4e**, incremental shadows from the Proposed Development would enter the southern tip of the open space at approximately 10:36 AM. Shadows from existing buildings and incremental shadows from the Proposed Development would result in a complete elimination of all direct sunlight on the open space resource from approximately 10:56 to 11:33 AM (37 minutes). Incremental shadows from the Proposed Development would move eastward until exiting the open space at approximately 1:46 PM (refer to **Figure 6-4f**). Overall, incremental shadows would be cast on this open space resource for approximately three hours and seven minutes on the December 21 analysis day. Similar to the March 21/September 21 analysis day, incremental shadows from the Proposed Development would be cast on ~~a limited~~ portion<u>s</u> of the promenade, benches, tables, and a small patch of grass with planted trees.

ASSESSMENT

Incremental shadows from the Proposed Development would reach North 5th Street Pier and Park on each of the four representative analysis days. These incremental shadows would range in duration from approximately 54 minutes on the June 21 analysis day (10:44 – 11:38 AM) to approximately three hours and 10 minutes on the December 21 analysis day (10:36 AM – 1:46 PM). During the March 21/September 21 analysis day, which is within the growing season, shadow coverage would generally be limited to the southern portions of the open space. This area contains vegetation, paved walkways and seating. The open space's sunlight-sensitive resources would continue to receive adequate direct sunlight throughout the day (at least the four- to six-hour minimum specified in the *CEQR Technical Manual*), and vegetation in the park would not be significantly threatened (see **Figures 6-4a** and **6-4b**). On the May 6/August 6 and June 21 analysis days, incremental shadows would cover a small portion of walkway that would connect the North 5th Street Pier and Park to the Proposed Development's waterfront open space. Incremental shadows on these analysis days would be limited in duration (refer to **Table 6-3**). The open space's sunlight-sensitive resources would continue to receive adequate direct sunlight throughout the day (at least the four- to six-hour minimum specified in the *CEQR Technical Manual*), and vegetation in the park would not be significantly threatened (see **Figures 6-4c** and **6-4d**).

On the December 21 analysis day, outside the growing season, incremental shadows from the Proposed Development would be cast on the open space for approximately three hours and 10 minutes. While the open space would experience a complete loss of sunlight on the December 21 analysis day (approximately 37 minutes) the Proposed Development would not result in substantial effects to the survival, enjoyment, or use of the resource. As described below, the Proposed Actions would create new publicly accessible waterfront open space. This project-generated open space would provide open space that has direct sunlight during the period in which shadows would eliminate direct sunlight to the North 5th Street Pier and Park on the December 21 analysis day (from approximately 10:56 – 11:33 AM). Under With-Action conditions, North 5th Street Pier and Park would continue to receive approximately three hours of direct sunlight without any incremental shadows cast on the sunlight-sensitive resource.~~Further, as the areas affected by incremental shadows are predominantly paved and used for passive uses, incremental shadows are not expected to have a significant effect on the utilization or enjoyment of this resource.~~

Therefore, as the extent and duration of the incremental shadows would not significantly alter the public's use of the open space or threaten the viability of vegetation or other resources, incremental shadows from the Proposed Development on the North 5th Street Pier and Park would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* methodology.

Bushwick Inlet Park

Bushwick Inlet Park is a 4.15-acre park that is located between North 9 and North 10th Streets between Kent Avenue and the East River waterfront. The park is open from 6 AM – 1AM seven days a week and is operated by NYC Parks. The open space includes a building with bathrooms, football and soccer fields, playgrounds, and spray showers. Incremental shadows from the Proposed Development would be cast over the open space on one of the four representative analysis days (December 21) for a total of approximately 35 minutes (2:10 – 2:45 PM) (refer to **Table 6-3**).

On the December 21 analysis day, incremental shadows from the Proposed Development would extend beyond existing shadows over the park to cover a limited portion of the northern half of the open space. As shown in **Figure 6-5**, incremental shadow coverage over the open space would be limited in size and duration. The area cast in incremental shadow is the soccer/football field.

ASSESSMENT

Incremental shadows from the Proposed Development would reach Bushwick Inlet Park on the December 21 analysis day for a total of 35~~nine~~ minutes (refer to **Figure 6-5**). Therefore, as the extent and duration of the incremental shadows would (1) not significantly reduce direct sunlight exposure on the open space resource, and (2) would not significantly alter the public's use of the open space or threaten the viability of vegetation or other resources, incremental shadows on Bushwick Inlet Park as a result of the Proposed Actions would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* methodology.

Bushwick Inlet Pop-up Park

Bushwick Inlet Pop-up Park is a 1.8-acre park located at 50 Kent Avenue between North 11th and North 12th Streets. The park includes an open field, which is used for active uses including mini-frisbee golf, and badminton, as well as lawns and picnic tables for passive recreation. NYC Parks operates Bushwick Inlet Pop-up Park. As shown in **Table 6-3**, incremental shadows from the Proposed Development would reach the open space on one of the four representative analysis days (December 21).

On the December 21 analysis day, incremental shadows from the Proposed Development would reach Bushwick Inlet Pop-up Park at 2:39 PM. Incremental shadows from the Proposed Development would be limited to the northern portion of the open space and would remain in the open space until 2:47 PM, lasting a total of approximately eight minutes (refer to **Figure 6-5**). The area that would be covered in incremental shadow contains the open field used for a variety of active and passive uses. ~~In total, incremental shadows from the Proposed Development would last for eight minutes.~~ The area that would covered in incremental shadow contains the open field used for a variety of active and passive uses.

ASSESSMENT

As discussed above, incremental shadows from the Proposed Development would reach the open space on the December 21 analysis day for approximately eight minutes (2:39 – 2:47 PM). As the extent and duration of the incremental shadows would (1) not significantly reduce direct sunlight exposure on the open space resource, and (2) would not significantly alter the public's use of the open space nor threaten the viability of vegetation or other resources, incremental shadows on Bushwick Inlet Pop-up Park as a result of the Proposed Actions would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* methodology.

Proposed Open Space

According to the *CEQR Technical Manual*, shadows on project-generated open space are not considered significant. However, a qualitative discussion of the shadow on the project-generated open space is provided below.

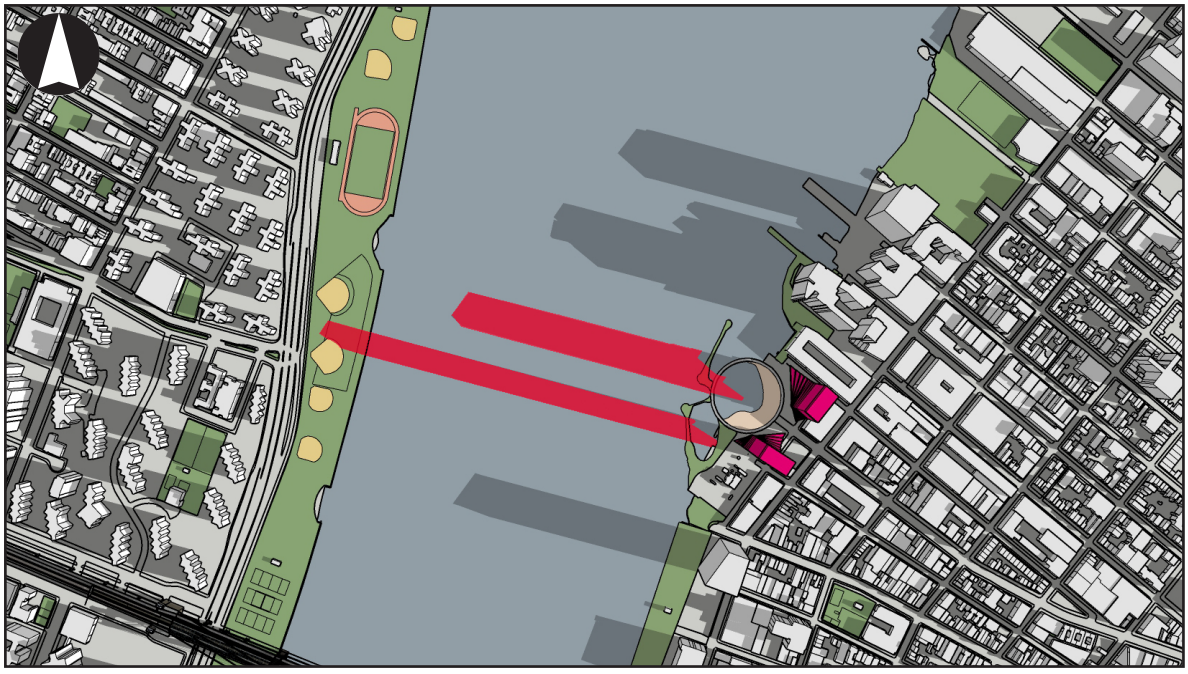
As discussed in Chapter 1, "Project Description" and Chapter 6, "Open Space," the Proposed Actions would facilitate the development of approximately 126,308 sf (2.9 acres) of new waterfront public space (plus 2.32 acres of secondary contact accessible in-river space and 0.86 acres of intertidal area), establishing a continuous link of waterfront areas running from Bushwick Inlet Park to the north, to Grand Ferry Park and Domino Park to the south. The waterfront public space will be fully accessible to the public and would offer in-water experiences, educational programming and a variety of other opportunities for enjoyment of the waterfront by the community at large. The beach is designed to provide secondary contact recreation access, and per NYS Department of Health regulations, swimming will be prohibited.

Due to the location of the project-generated open space west of the Proposed Development, the project-generated open space would experience shadows during the morning hours. However, because of the thin, tall dimensions of the Proposed Development, the project-generated open space would never be completely covered in shadow, and areas receiving direct sunlight would be available during the morning and early afternoon hours. Vegetation within the project-generated open space would receive the four to six hours of direct sunlight necessary for plant survival as recommended in the *CEQR Technical Manual*. No shadows would be cast over the project-generated open space during the afternoon hours. Shadows cast by the Proposed Development over the project-generated open space would not affect the usability or enjoyment of the open space.

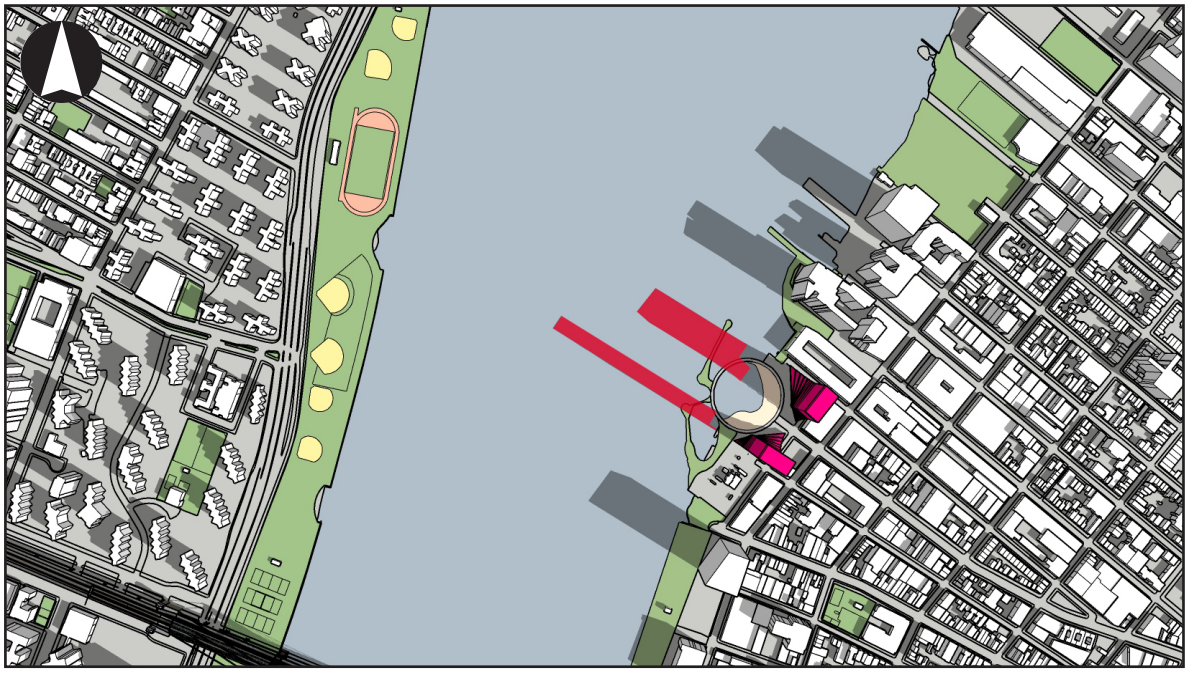
During all seasons, the project-generated open space would provide new sunlit areas during times when other open space resources are experiencing areas of incremental shadows from the Proposed Development. For Instance, on the December 21 analysis day, when the North 5th Street Park and Pier would be completely cast in shadow for approximately 37 minutes (10:56 – 11:33 AM), the project-generated open space would provide areas with direct sunlight including areas along two of the proposed breakwaters and circular platforms and within the two cove areas along the waterfront.

Figure 6-3a

East River & John V. Lindsay East River Park
Incremental Shadows on March 21/September 21



7:36 AM



9:00 AM

Proposed Development

Open Space

East River

Incremental Shadow

Figure 6-3b
East River & John V. Lindsay East River Park
Incremental Shadows on March 21/September 21

11:00 AM

1:00 PM

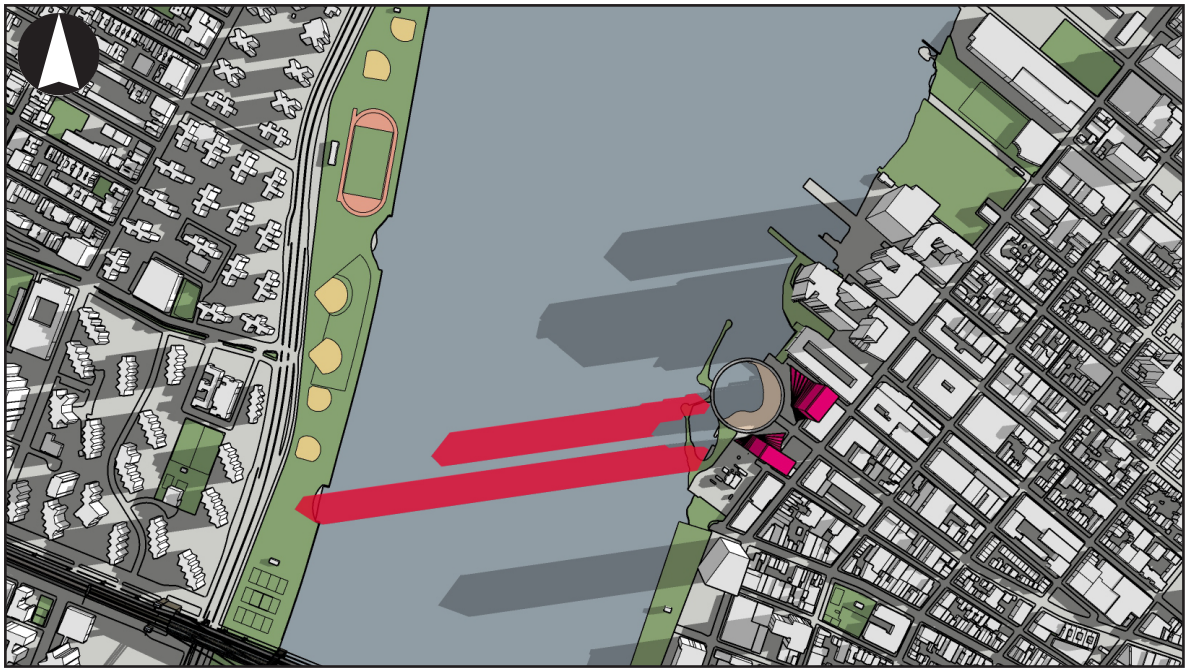
Proposed Development

Open Space

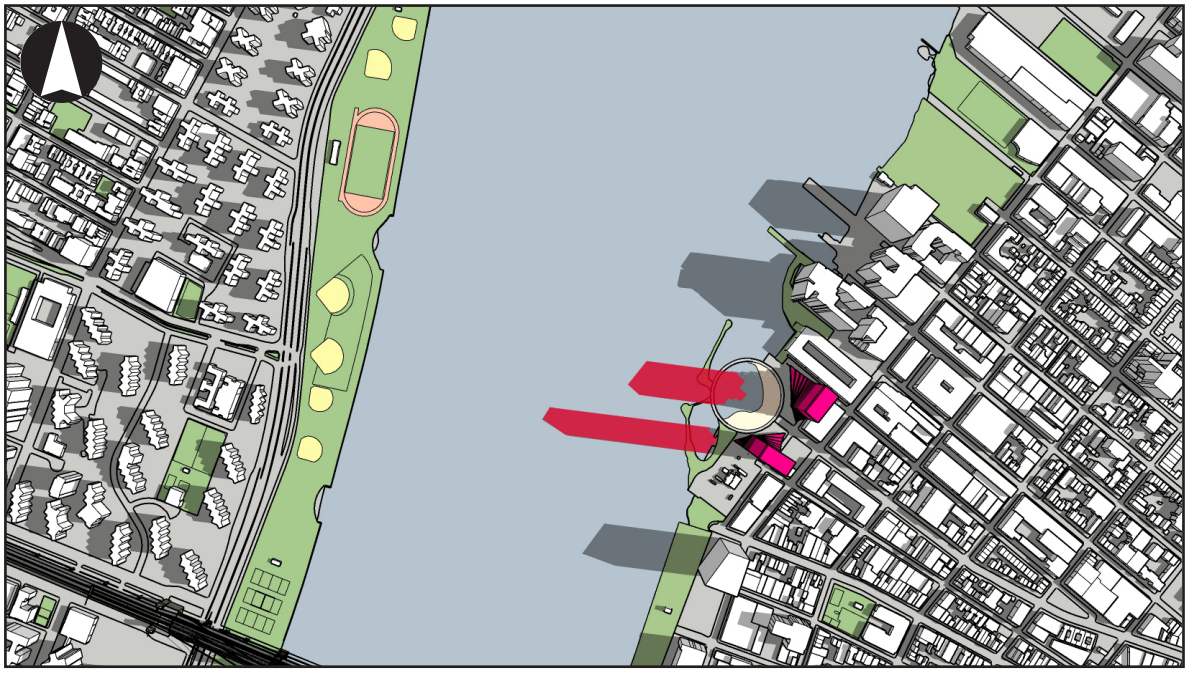
East River

Incremental Shadow

Figure 6-3c
East River & John V. Lindsay East River Park
Incremental Shadows on May 6/August 6



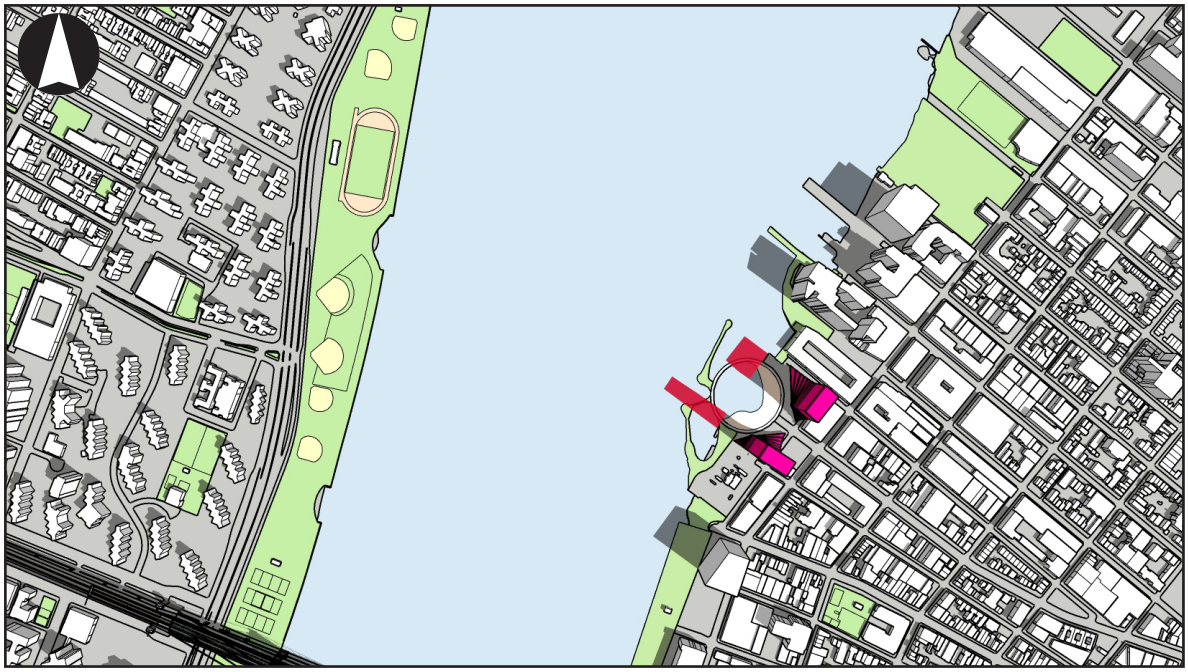
6:27 AM



8:00 AM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-3d
East River & John V. Lindsay East River Park
Incremental Shadows on May 6/August 6

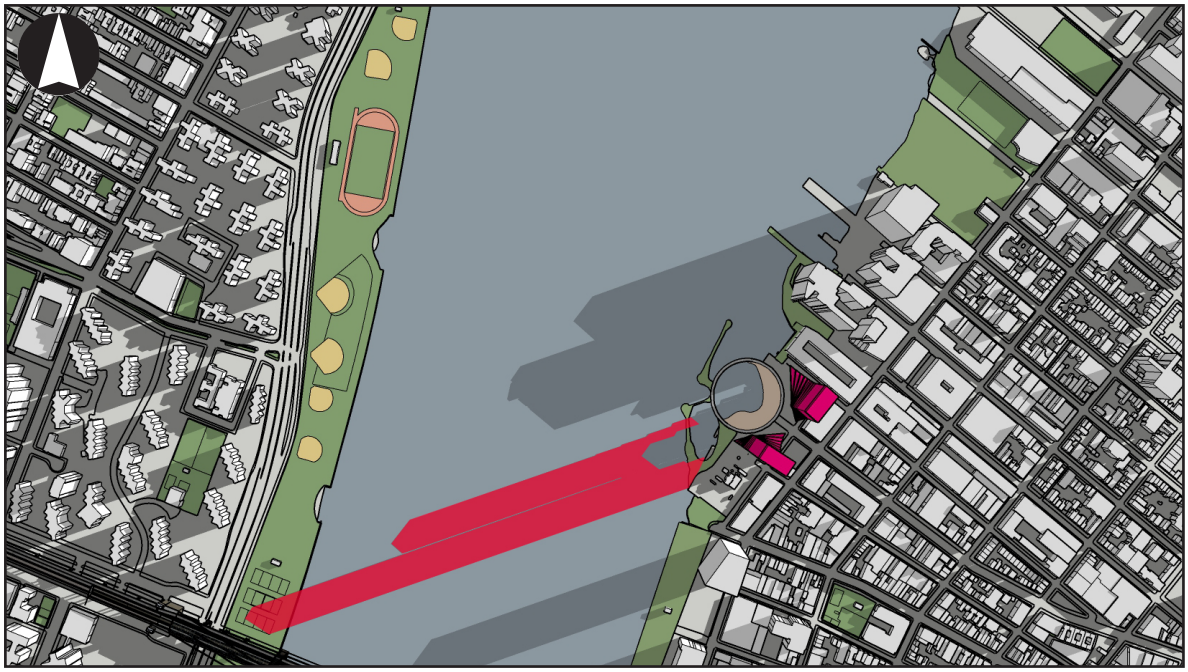


10:00 AM

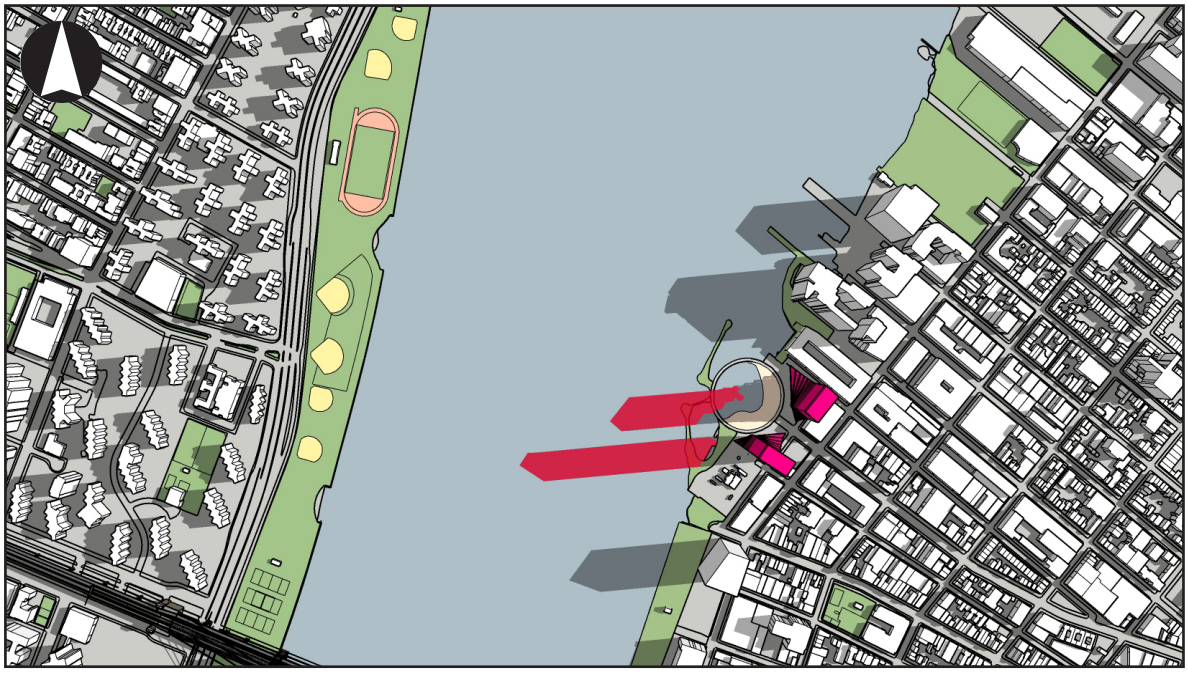
12:00 PM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-3e
East River & John V. Lindsay East River Park
Incremental Shadows on June 21



5:57 AM



7:30 AM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-3f
East River & John V. Lindsay East River Park
Incremental Shadows on June 21

9:00 AM

10:30 AM

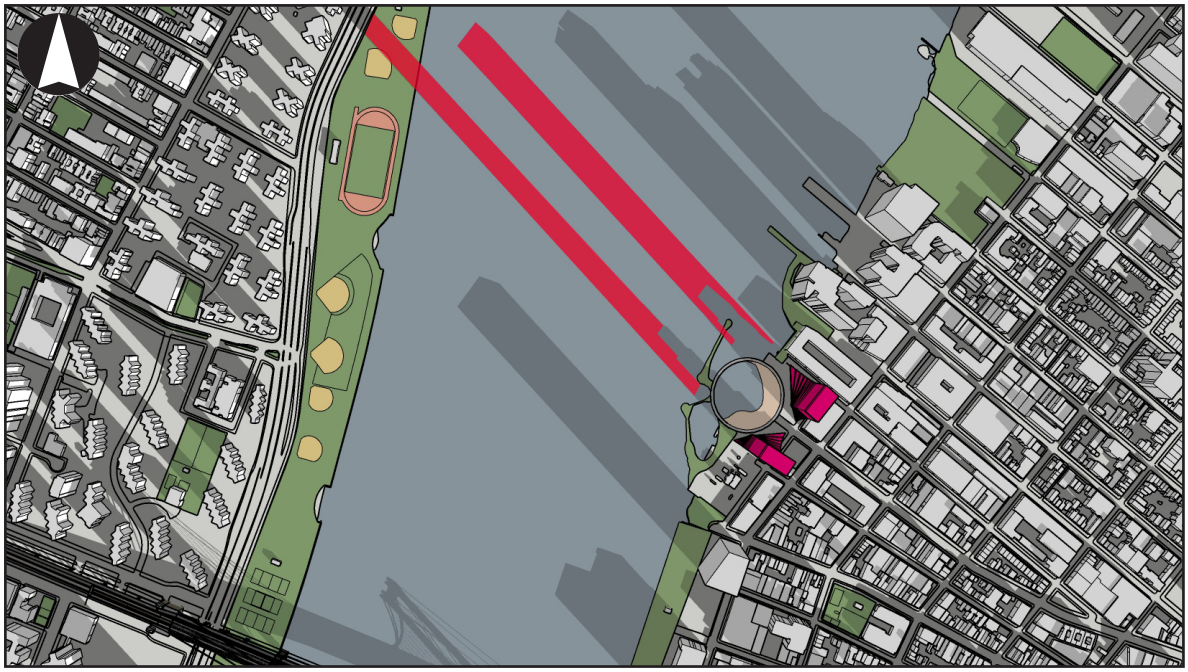
Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-3g
East River & John V. Lindsay East River Park
Incremental Shadows on June 21

11:45 AM

Proposed Development | **Open Space** | **East River** | **Incremental Shadow**

Figure 6-3h
East River & John V. Lindsay East River Park
Incremental Shadows on December 21



8:51 AM

10:30 AM

Proposed Development
Open Space
East River
Incremental Shadow

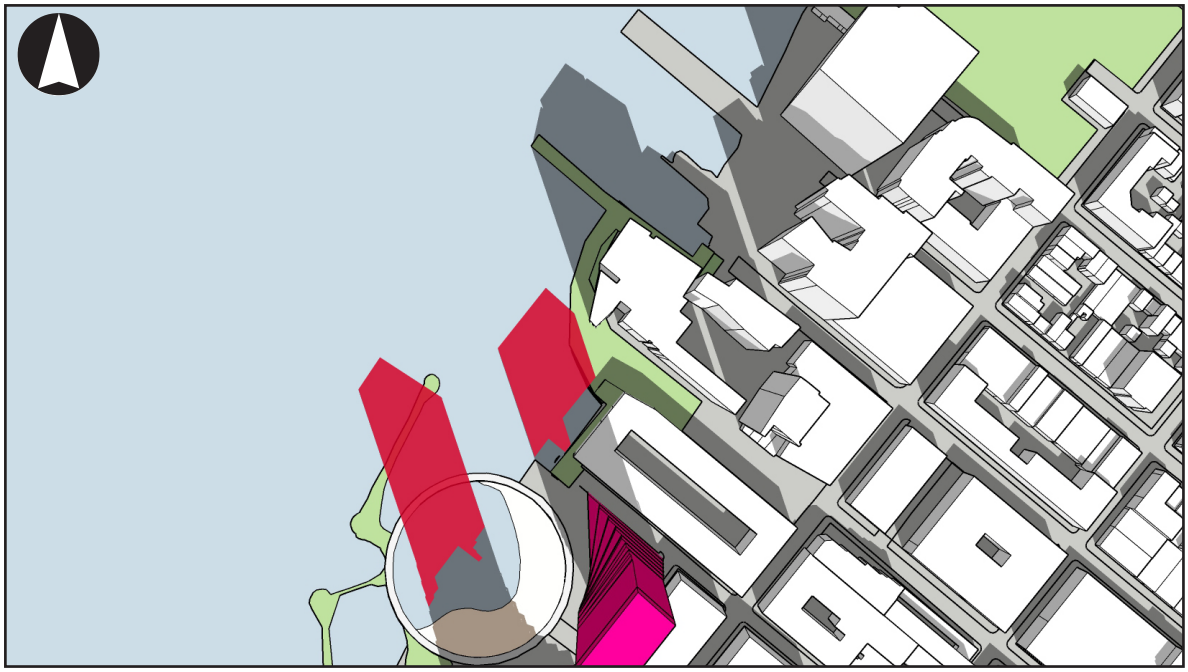
Figure 6-3i
East River & John V. Lindsay East River Park
Incremental Shadows on December 21

12:00 PM

1:30 PM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-4a
North 5th Street Pier and Park
Incremental Shadows on March 21/September 21



11:15 AM

12:15 PM

Proposed Development
Open Space
East River
Incremental Shadow

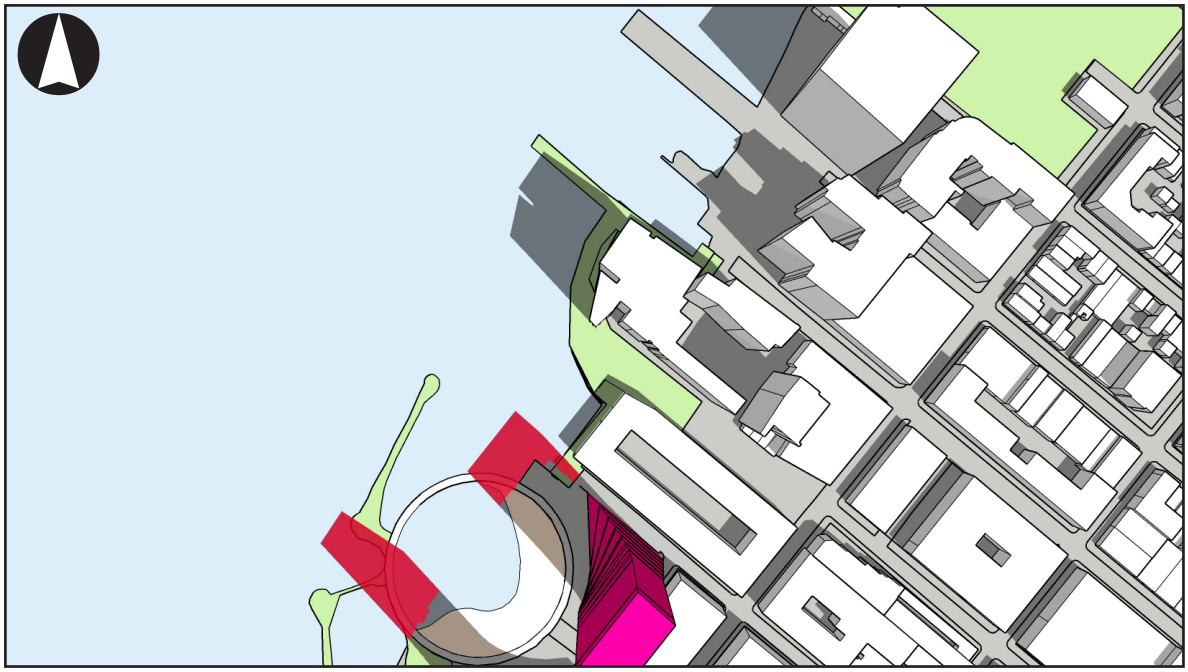
Figure 6-4b
North 5th Street Pier and Park
Incremental Shadows on March 21/September 21

1:15 PM

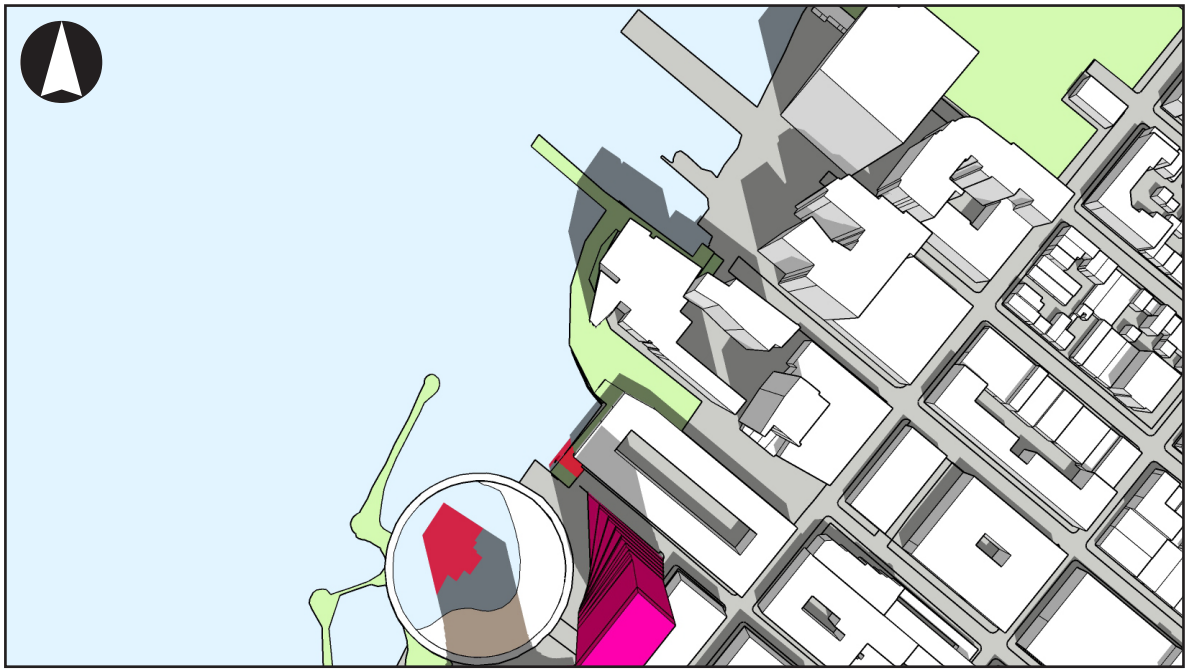
1:15 PM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-4c
North 5th Street Pier and Park
Incremental Shadows on May 6/August 6



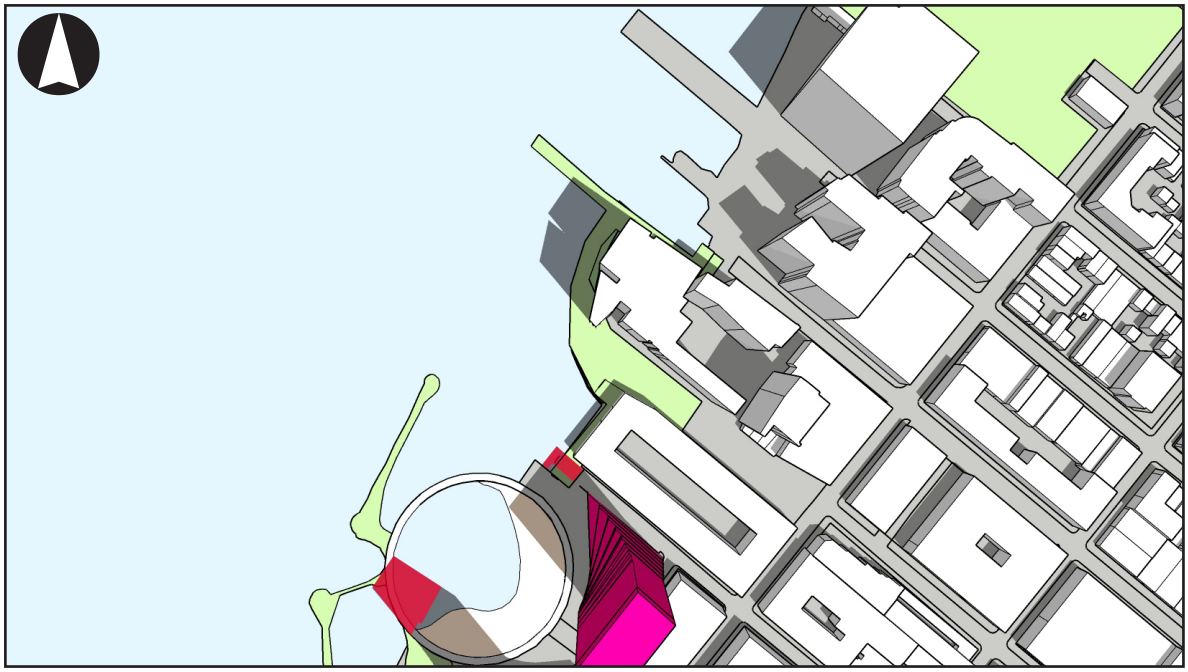
10:30 AM



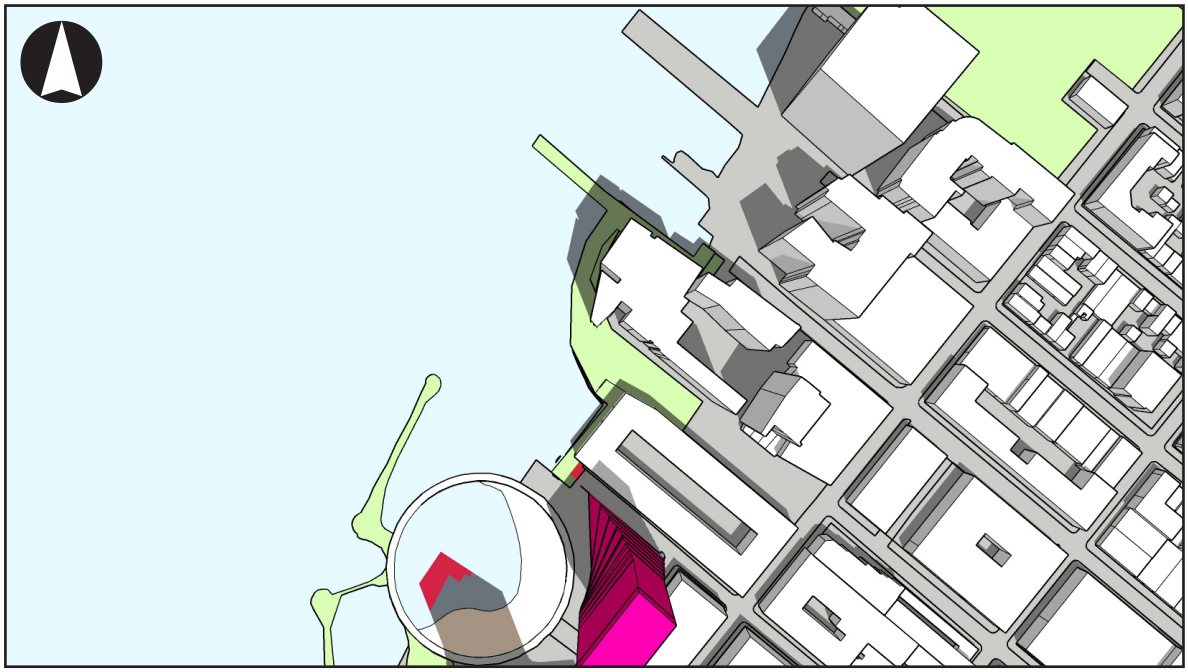
11:30 AM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-4d
North 5th Street Pier and Park
Incremental Shadows on June 21



11:00 AM



11:30 AM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-4e
North 5th Street Pier and Park
Incremental Shadows on December 21

11:00 AM

12:15 PM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-4f
North 5th Street Pier and Park
Incremental Shadows on December 21

1:30 PM

Proposed Development
Open Space
East River
Incremental Shadow

Figure 6-5
Bushwick Inlet Park & Bushwick Inlet Popup Park
Incremental Shadows on December 21

2:15 PM

2:45 PM

Proposed Development
Open Space
East River
Incremental Shadow