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. According to the 202014 *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 Development would facilitate a new building greater than 50 feet in height over the No-Action condition and is located one block east of mapped parkland which is part of the future phases of Bushwick Inlet Park, and Bushwick Inlet (East River), a sunlight sensitive natural resource. As such, a detailed shadows analysis was prepared to determine the potential for the Proposed Development to result in significant adverse impacts on the future portion of Bushwick Inlet Park, Bushwick Inlet, or any other sunlight-sensitive resources in the surrounding area.

B. PRINCIPAL CONCLUSIONS

A detailed shadows analysis was conducted and found that the Proposed Actions would not have a significant adverse shadows impact. The Proposed Development would result in incremental shadow coverage (i.e. additional, or new, shadow coverage compared to No-Action conditions) on one open space resource, the future phase of Bushwick Inlet Park, and one natural resource, the Bushwick Inlet section of the East River. Project-generated shadows would not affect the utilization, enjoyment, or character of these sunlight-sensitive resources and all vegetation would continue to receive a minimum of four to six hours of direct sunlight throughout the growing season. Additionally, project-generated shadows would not have any adverse impacts on the aquatic biota in the East River.

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:

- *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. The use of vegetation in an open space establishes its sensitivity to shadows. This 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 are considered, as opposed to the entire architectural resource. Sunlight-sensitive features include the following: design elements that are part of a recognized architectural style that depends on the contrast between light and dark (e.g., deep recesses or voids, such as open galleries, arcades, recessed balconies, deep window reveals, and prominent rustication); elaborate, highly carved ornamentation; stained glass windows; exterior building materials and color that depend on direct sunlight for visual character (e.g., the polychromy [multicolored] features found on Victorian Gothic Revival or Art Deco facades); historic landscapes, such as scenic landmarks, including vegetation recognized as 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 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 resulting from the project.

In accordance with the *CEQR Technical Manual*, shadows on sunlight-sensitive resources of concern are 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 21st vernal equinox (or the September 21st autumnal equinox, which is approximately the same), the June 21st summer solstice, and a spring or summer day halfway between the summer solstice and equinoxes, such as May 6th or August 6th (which are approximately the same). For the cold- weather months, the December 21st 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 historic and natural resources.

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

The detailed analysis provides the data needed to assess the shadow impacts. The effects of the new shadows on the sunlight-sensitive resources are described, and their degree of significance is considered. The 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 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.

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 Proposed Development (875 feet) was determined using the Proposed Development's maximum height of approximately 203.5 feet, which includes bulkhead and rooftop mechanical equipment (Tier 1 Assessment).[1] Within this longest shadow study area, there are five potentially sunlight-sensitive open space resources, one sunlight-sensitive natural resource, and one potentially sunlight-sensitive historic

[1] In accordance with *CEQR Technical Manual* guidance, the maximum shadow radius was calculated by combining the maximum building envelope height of the Proposed Development (approximately 178.5 feet) and the proposed bulkhead and rooftop mechanical equipment (25 feet) (totaling approximately 203.5 feet), and multiplying that number by 4.3.

resource. Therefore, further screening was warranted in order to determine whether any resources could be affected by project-generated shadows.

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 Development.

Figure 5-1 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 southernmost portions of the Development Site). A total of six resources were identified as sunlight-sensitive resources that warranted further assessment. A list of these resources is provided below in Table 5-1.

TABLE 5-1
Sunlight-Sensitive Resources Warranting Further Assessment Based on Tier 1 and 2 Screening

No.[1]	Sunlight-Sensitive Open Space Resources
1	P.S. 31 Playground
2	61 Franklin Street Community Garden
3	Greenstreet (Franklin St. & Banker St. & Calyer St.)
4	Bushwick Inlet Park[2]
No.[1]	**Sunlight-Sensitive Natural Resources**
5	East River (Lower)
No.[1]	**Potentially Sunlight-Sensitive Historic Resources**
6	Greenpoint Historic District

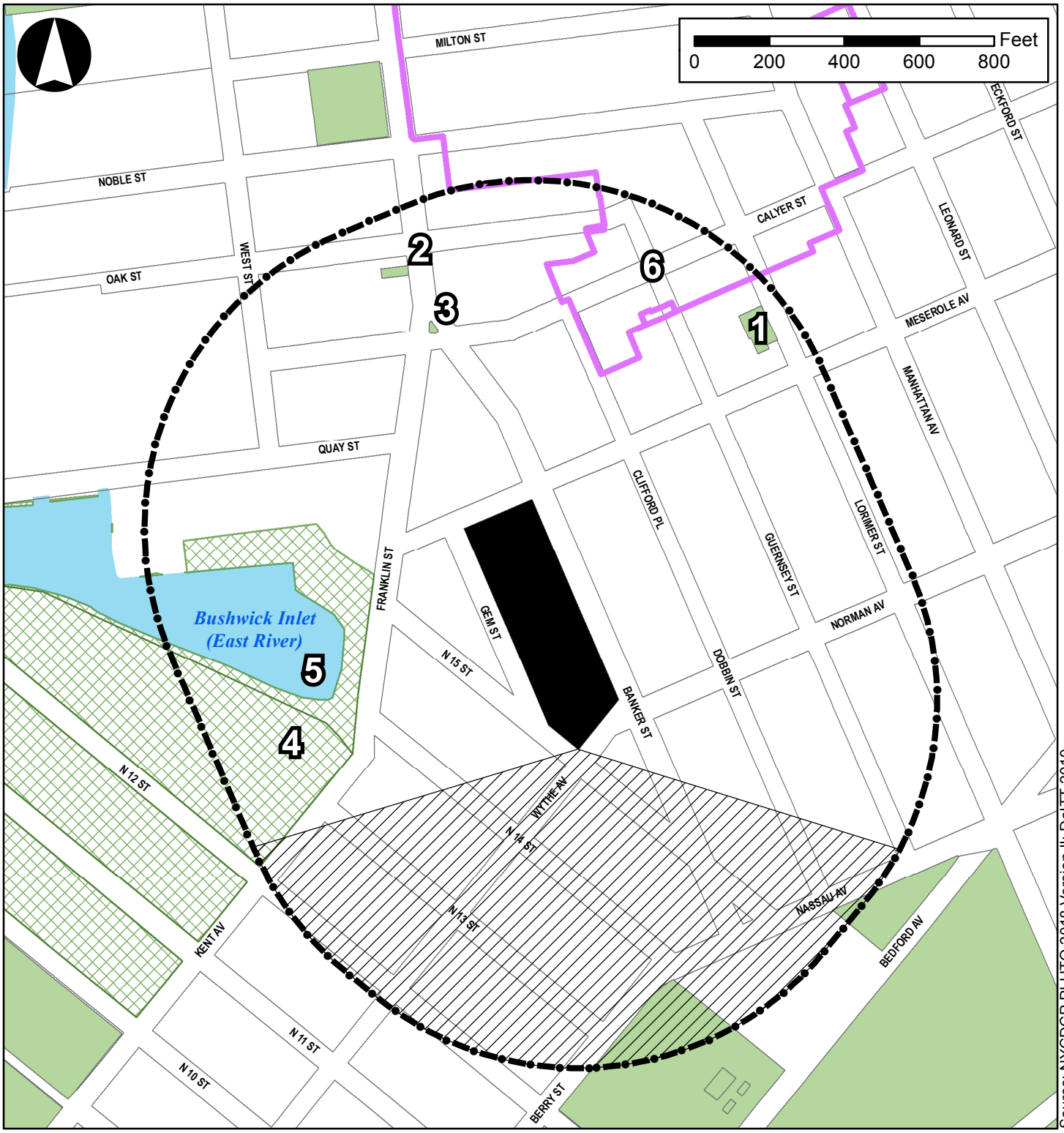
[1] Numbers keyed to **Figure 5-1**
[2] Refers to the future portion of Bushwick Inlet Park

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 action 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 action 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 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 project. Per *CEQR Technical Manual* guidance, 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.

Tier 1 and Tier 2 Shadows Screening Assessment



Source: NYCDCP PLUTO 2018 Version II; DoITT 2019

Legend

- Development Site
- Tier 1: Longest Shadow Study Area
- Tier 2: Area That Cannot Be Shaded
- 1 Open Space Resource
- 4 Future Bushwick Inlet Park
- 5 Natural Resource (East River)
- 6 Greepoint Historic District (S/NR-listed; LPC-designated)

As shown in Figure 5-2, three sunlight-sensitive resources would not receive project-generated shadows on any of the four analysis days, and therefore do not require any further analysis: the P.S. 31 Schoolyard/Playground, the 61 Franklin Street Community Garden, and the greenstreet located at the intersection of Franklin Street, Banker Street, and Calyer Street. Table 5-2 presents a summary of the Tier 3 assessment, showing the one open space resource, one natural resource, and one historic resource that could, in the absence of intervening buildings, receive project-generated shadows, and on which analysis days the new shadows would occur.

TABLE 5-2
Tier 3 Assessment Results

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	P.S. 31 Playground	**NO**	**NO**	**NO**	**NO**	**0**
2	61 Franklin Street Community Garden	**NO**	**NO**	**NO**	**NO**	**0**
3	Greenstreet (Franklin St. & Banker St. & Calyer St.)	**NO**	**NO**	**NO**	**NO**	**0**
4	Bushwick Inlet Park[2]	**YES**	**YES**	**YES**	**NO**	**3**
5	East River (Lower)	**YES**	**YES**	**YES**	**NO**	**3**
6	Greenpoint Historic District	**NO**	**NO**	**NO**	**YES**	**1**

[1] Numbers keyed to **Figure 5-1**
[2] Refers to the future portion of Bushwick Inlet Park

E. DETAILED ASSESSMENT

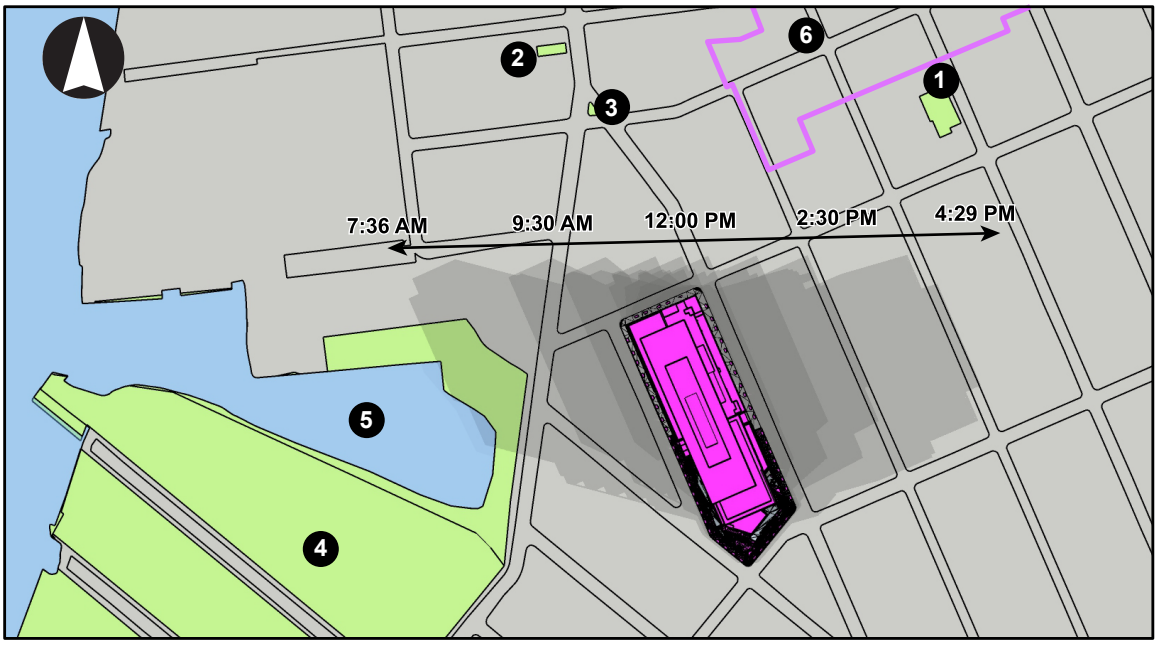
Resources of Concern

Bushwick Inlet Park (Future Phase)

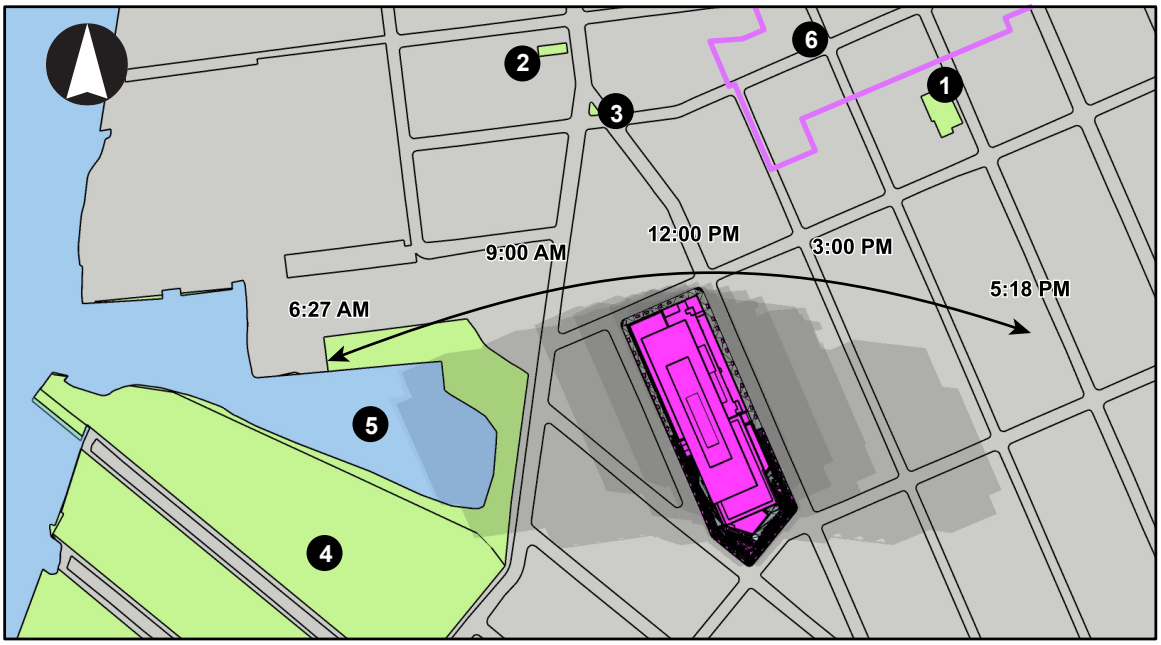
The area one block to the west of the Development Site is designated to become the ~~31~~27.3-acre Bushwick Inlet Park (west of Franklin Street between North 9th Street and Quay Street). To facilitate the creation of this future waterfront park, portions of several streets to the west and southwest of the Development Site were de-mapped in conjunction with the 2005 Greenpoint-Williamsburg Rezoning. The resultant parcel was mapped as Bushwick Inlet Park bounded by North 9th Street to the south, Kent Avenue/Franklin Street to the east, Quay Street to the north, and the U.S. Pierhead Line to the west.

The City has been proceeding with the phased acquisition, remediation, and development of those parcels as park space. The first phase of the park is complete and open to the public and the existing portion of the park currently occupies the area between North 9th and North 10th streets (the "BIP Building & Soccer Field" parcel). The ~~4.15~~3.9–acre park currently contains many active recreational uses, including a synthetic turf multipurpose sports field and playgrounds, as well as passive recreation uses, such as a comfort station, a viewing platform, and a lawn surrounded by benches. Additionally, the eastern portion of the block bounded by North 11th and North 12th streets and Kent Avenue (the "50 Kent" parcel) has been operating as a pop-up park since summer 2018, and is planned to undergo a redesign which will include an entry plaza with café table seating, a large open, elevated lawn, and a family gathering area with a water play station. Once the final design of the 50 Kent parcel has been set, the project will enter a one-year procurement period, followed by approximately three years of construction.

The Bayside parcel, which is located approximately one block west of the Development Site and is roughly bounded by North 12th Street to the south, Kent Avenue to the east, and Bushwick Inlet to the north, was



MARCH 21/SEPTEMBER 21



MAY 6/AUGUST 6

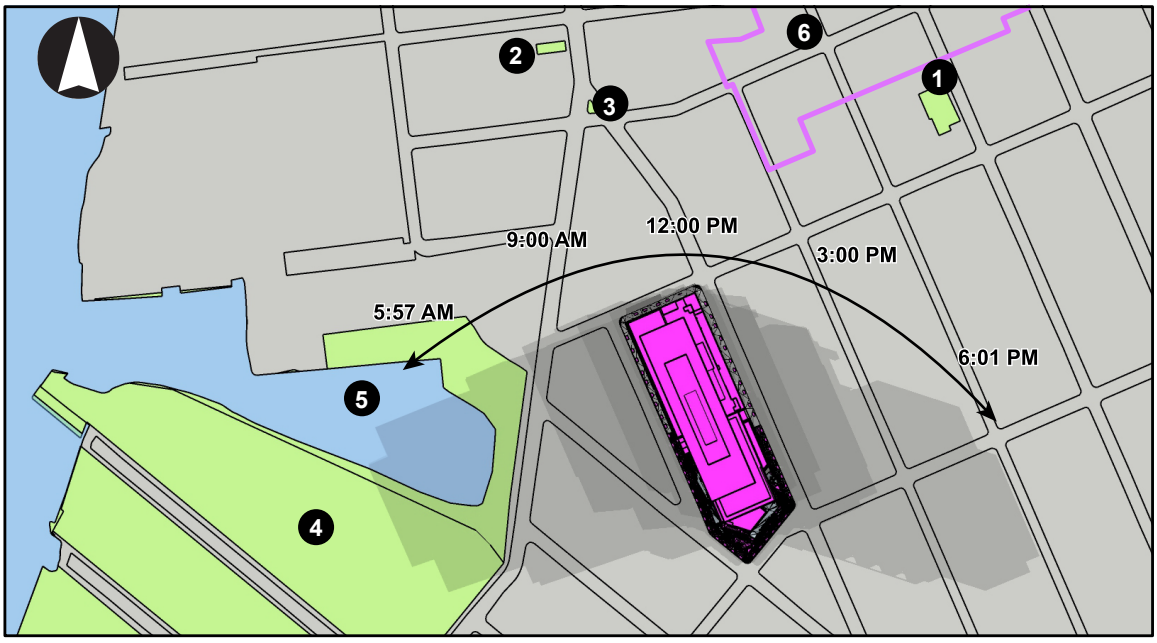
Proposed Development

Project-Generated Shadow

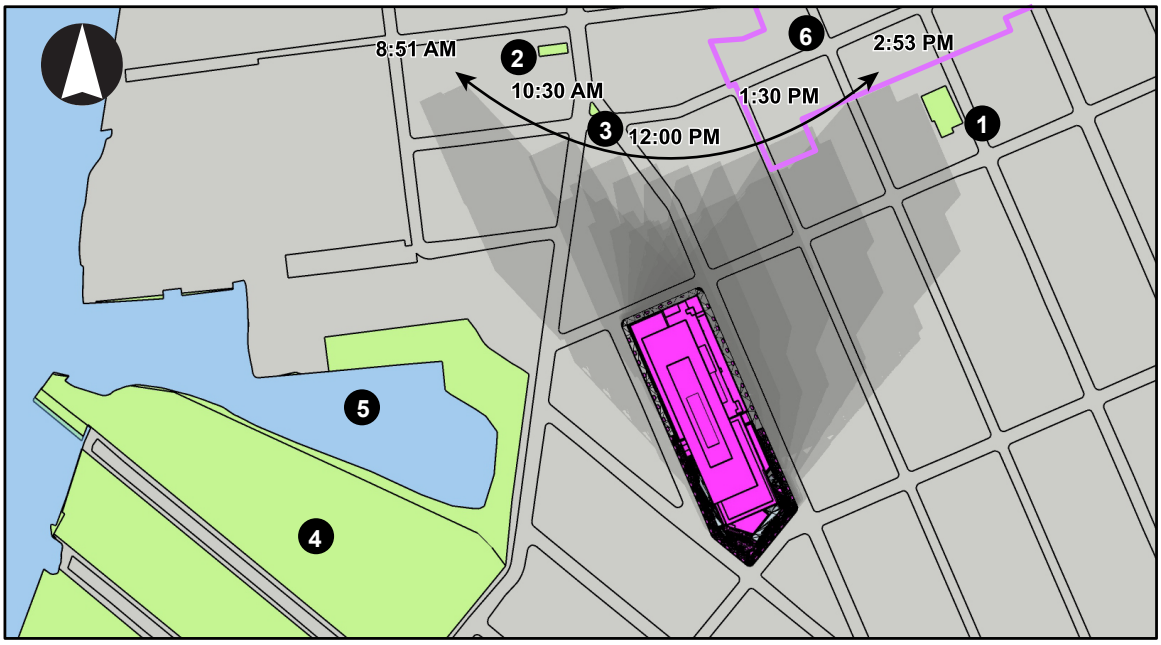
1 Open Space
Note: Resources keyed to Table 5-1

5 Natural Resource
Note: Resources keyed to Table 5-1

6 Historic District
Note: Resources keyed to Table 5-1



JUNE 21



DECEMBER 21

Proposed Development

Project-Generated Shadow

1 Open Space
Note: Resources keyed to Table 5-1

5 Natural Resource
Note: Resources keyed to Table 5-1

6 Historic District
Note: Resources keyed to Table 5-1

acquired by the City in March 2016. On November 21, 2016 the City of New York finalized a deal with the owner of the 11-acre CitiStorage site located on the block bounded by North 10th and North 11th streets and the western portion of the block bounded by North 11th and North 12th streets to acquire the final piece of the planned Bushwick Inlet Park. Although the first phase of the park is complete and open to the public, much of the land comprising the future phases of Bushwick Inlet Park will require remediation from industrial contaminants before completion of the park's future phases can get underway. The final programming and design of the park has yet to be determined.

East River (Lower)

The lower portion of the East River, part of the greater Hudson/East River Watershed, is located west of the Development Site. This portion of the East River is a degraded natural resource and does not consistently meet standards for good ecological health. According to the New York State Department of Environmental Conservation (NYSDEC) the lower portion of the East River is assessed as an impaired waterbody ("Class I") due to recreational uses and fish consumption that are considered to be impaired by floatable debris, as well as PCBs and other toxics. Urban stormwater runoff, combined sewer overflows (CSOs), contaminated sediment, and the industrial use of the waterway result in conditions that negatively impact recreational use. However, recent data shows dissolved oxygen levels in this segment of the East River typically meet applicable water quality standards for support of aquatic life.[2]

Greenpoint Historic District (S/NR-listed; LPC-designated)

The Greenpoint Historic District was designated by the New York City Landmarks Preservation Commission (LPC) in 1982 and listed on the State/National Registers of Historic Places (S/NR) in 1983, and consists of 363 contributing commercial and residential buildings built in the mid- to late-nineteenth-century. The portion of the Greenpoint Historic District located within the longest shadow study area includes buildings along Calyer Street (between Clifford Place and Lorimer Street), Clifford Place (between Meserole Avenue and Calyer Street), and Guernsey Street (between Meserole Avenue and Oak Street).

The majority of the buildings along the portion of Calyer Street that could potentially be affected by project-generated shadows were built between 1868 and 1880. Most of the buildings are frame houses originally built in the Italianate or neo-Grec style, but are now re-sided, obscuring much of the original architectural details. Clifford Place, a short block extending between Meserole Avenue and Calyer Street, contains a row of neo-Grec houses constructed in 1880. The buildings along Guernsey Street were all built between 1865 and 1870 in the Italianate style, and includes the Greenpoint Home for the Aged at the street's terminus at Oak Street.

Based on the Tier 3 screening assessment presented above in Table 5-2 and Figure 5-2, project-generated shadows would only reach the buildings at 8 and 10 Clifford Place within the Greenpoint Historic District. These two buildings are part of a series of five neo-Grec rowhouses built in 1880. The brick houses have stone trim and rise two stories above low basements. The windows and entrances are crowned with incised lintels. To the side of each entrance are two-window wide projecting oriels. The oriels are topped by modillioned cornices, while the wooden roof cornices are carried on brackets. Both buildings do not contain any sunlight-sensitive architectural or historic features.

While this portion of the Greenpoint Historic District contains well-preserved nineteenth-century frame, brick, and stone buildings of several types erected between the 1865 and 1880 that display features of the Italianate and neo-Grec styles, the two buildings (8 and 10 Clifford Place) that could be affected by

[2] NYSDEC. 2017. "Waterbody Inventory/Priority Waterbodies List: Hudson/East River Watershed."

project-generated shadows do not contain any sunlight-sensitive features. As such, incremental shadows would not result in significant adverse impacts to these historic resources, and therefore, no further analyses are required.

Shadows Analysis

Per ~~2014~~ *CEQR Technical Manual* guidance, shadow analyses were performed for the two sunlight-sensitive resources identified above on three of the 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); and June 21, the summer solstice and the longest day of the year (based on the Tier 3 assessment detailed above, analyses of the two sunlight-sensitive resources were not required for the December 21 representative analysis day, which is the winter solstice and shortest day of the year). CEQR guidance define 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 (see Table 5-3).

As shown in Table 5-3, incremental project-generated shadows would reach the two sunlight-sensitive resources identified in the Tier 3 assessment. Increases in shadow coverage would occur at both the future phase of Bushwick Inlet Park and the East River on the March 21/September 21, May 6/August 6, and June 21 representative analysis days. As described above, no incremental shadow coverage would occur at either resource on the December 21 representative analysis day. Figures 5-3 through 5-5, provided at the end of this chapter, show representative shadow views for each sunlight-sensitive resource of concern on each of the three representative analysis days mentioned above.

It should be noted that, per the ~~2014~~ *CEQR Technical Manual*, all times reported herein are Eastern Standard Time and do not reflect adjustments for daylight savings time that is in effect from mid-March to early November. As such, the times reported in this chapter for March 21/September 21, May 6/August 6, and June 21 need to have one hour added to reflect the Eastern Daylight Saving Time.

TABLE 5-3
Duration of Shadows on Sunlight Sensitive Resources (Increment Compared to No-Action)

Resource	Analysis Day	March 21/Sept. 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
Bushwick Inlet Park (future phase)	Shadow enter-exit time	7:36 – 8:02 AM	6:27 – 7:15 AM	5:57 – 7:02 AM	N/A
	Incremental shadow duration	26 minutes	48 minutes	1 hour 5 minutes	N/A
East River	Shadow enter-exit time	7:36 – 7:43 AM	6:27 – 6:59 AM	5:57 – 6:46 AM	N/A
	Incremental shadow duration	7 minutes	32 minutes	49 minutes	N/A

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.

March 21/September 21

On March 21/September 21 the time period for shadows analysis begins at 7:36 AM and continues until 4:29 PM. March is considered the beginning of the growing season in New York City, and September 21, which has the same shadow patterns as March 21, is also within the growing season. On the March 21/September 21 analysis day, incremental shadows from the Proposed Development would reach both the future phase of Bushwick Inlet Park and a portion of the Bushwick Inlet section of the East River.

The Proposed Development would cast incremental shadows on the future phase of Bushwick Inlet Park beginning at 7:36 AM and continuing until 8:02 AM, for a duration of approximately 26 minutes. After 8:02 AM the planned open space would not experience any incremental shadow coverage as a result of the Proposed Development. As indicated in Figure 5-3, incremental shadows would enter the open space from the west before moving in an easterly direction across the park towards Franklin Street. By 8:00 AM, the extent of incremental shadow coverage would decrease, and the majority of the open space would receive direct sunlight. As the programming for the future phases of Bushwick Inlet Park is yet to be determined, it is difficult to project what types of features and amenities would experience incremental shadow coverage on this representative analysis day. It is possible that there would be no sunlight sensitive features in the affected sections of the park, or that the park design would account for future development along Kent Avenue and Franklin Street.

The Proposed Development would also cast incremental shadows on a small portion of the East River's Bushwick Inlet beginning at 7:36 AM and continuing until 7:43 AM, for a duration of approximately 7 minutes. After 7:43 AM the natural resource would not experience any incremental shadow coverage as a result of the Proposed Development. As indicated in Figure 5-3, incremental shadows would enter a small portion of the natural resource for only a brief period of time from the west before moving in an easterly direction towards Franklin Street.

May 6/August 6

On May 6/August 6 the time period for shadows analysis begins at 6:27 AM and continues until 5:18 PM. On the midpoint between the equinoxes and the solstices, incremental shadows from the Proposed Development would reach both the future phase of Bushwick Inlet Park and a portion of the Bushwick Inlet section of the East River.

The Proposed Development would cast incremental shadows on the future phase of Bushwick Inlet Park beginning at 6:27 AM and continuing until 7:15 AM, for a duration of approximately 48 minutes. After 7:15 AM the open space would not experience any incremental shadow coverage as a result of the Proposed Development. As indicated in Figure 5-4, by 6:27 AM incremental shadows would enter the open space from the west before moving in an easterly direction across the park towards Franklin Street. By 7:00 AM incremental shadow coverage would decrease, continuing in an eastward direction towards Franklin Street. As the programming for the future phase of Bushwick Inlet Park is yet to be determined, it is difficult to project what types of features and amenities would experience incremental shadow coverage on this representative analysis day. It is possible that there would be no sunlight sensitive features in the affected sections of the park, or that the park design would account for future development along Kent Avenue and Franklin Street.

The Proposed Development would also cast incremental shadows on a small portion of the East River's Bushwick Inlet beginning at 6:27 AM and continuing until 6:59 AM, for a duration of approximately 32 minutes. After 6:59 AM the natural resource would not experience any incremental shadow coverage as a result of the Proposed Development. As indicated in Figure 5-4, incremental shadows would enter a small portion of an eastern segment of the natural resource, moving in an easterly direction towards Franklin Street during the early morning hours until exiting the natural resource at 6:59 AM.

June 21

On June 21 the time period for shadows analysis begins at 5:57 AM and continues until 6:01 PM. On the summer solstice, which is the day of the year with the longest period of daylight, the sun is most directly overhead and generally shadows are shortest and move across the widest angular range from west to

east. On this date the Proposed Development would cast incremental shadows on both the future phase of Bushwick Inlet Park and a portion of the East River's Bushwick Inlet.

The Proposed Development would cast incremental shadows on the future phase of Bushwick Inlet Park beginning at 5:57 AM and continuing until 7:02 AM, for a duration of approximately 1 hour and five minutes. After 7:02 AM the open space would not experience any incremental shadow coverage as a result of the Proposed Development. As indicated in Figures 5-5a and 5-5b, by 5:57 AM incremental shadows would enter an eastern portion of the open space, and by 6:45 AM incremental shadow coverage would decrease, and the majority of the open space would receive direct sunlight. As the programming for the future phase of Bushwick Inlet Park is yet to be determined, it is difficult to project what types of features and amenities would experience incremental shadow coverage on this representative analysis day. As indicated above, it is possible that there would be no sunlight sensitive features in the affected sections of the park, or that the park design would account for future development along Kent Avenue and Franklin Street.

The Proposed Development would also cast incremental shadows on a small portion of the East River's Bushwick Inlet beginning at 5:57 AM and continuing until 6:46 AM, for a duration of approximately 49 minutes. After 6:46 AM the natural resource would not experience any incremental shadow coverage as a result of the Proposed Development. As indicated in Figure 5-5a, at 5:57 AM incremental shadows would enter a small portion of an eastern segment of the natural resource, moving in a northeasterly direction towards Franklin Street during the early morning hours until exiting the natural resource at 6:46 AM.

Assessment

As described above, a shadow impact occurs when the incremental shadow from a proposed project falls on a sunlight sensitive resource or feature and reduces its direct sunlight exposure. Determining whether this impact is significant or not depends on the extent and duration of the incremental shadow and the specific context in which the impact occurs. For open spaces, the uses and features of the space indicate its sensitivity to shadows. Shadows occurring during the cold-weather months of interest generally do not affect the growing season of outdoor vegetation; therefore, this sensitivity is assessed for both (1) warm-weather-dependent features or vegetation that could be affected by a loss of sunlight during the growing season; 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. Generally, 4 to 6 hours a day of sunlight, particularly in the growing season, is often a minimum requirement. Consequently, the assessment of an open space's sensitivity to increased shadow focuses on identifying the existing conditions of its facilities, plantings, and uses, and the sunlight requirements for each.

Bushwick Inlet Park (Future Phase)

The Proposed Development would cast incremental shadows on the future phase of Bushwick Inlet Park on three of the four representative analysis days: March 21/September 21, May 6/August 6, and June 21. Incremental shadow duration would range from 26 minutes on March 21/September 21 to 1 hour on June 21 and would generally be limited to the early morning hours before 8:00 AM. As shadow coverage would be confined to small portions of the open space near the eastern portion of Bushwick Inlet Park (see Figures 5-3 through 5-5), and the open space would primarily be used for a mixture of active- and passive-recreational uses, incremental shadows are not expected to have a significant effect on the utilization or

enjoyment of this resource.[3] Additionally, it is expected that the open space would still obtain adequate sunlight during the plant growing season (at least the four to six hour minimum specified in the *CEQR Technical Manual*), and any future features dependent on sunlight would not be affected. Furthermore, project-generated shadows would be limited to a small portion of the open space's planned ~~35.53~~27.3 total acres and would not have a noticeable effect on the use and character of this resource as a whole. Finally, it is possible that the design of the park would account for ongoing and planned development along the Kent Avenue and Franklin Street so that no sunlight sensitive resources would be located within areas that would be in shadows. Therefore, the incremental shadows that could result from the Proposed Actions are not anticipated to adversely impact the future phase of Bushwick Inlet Park.

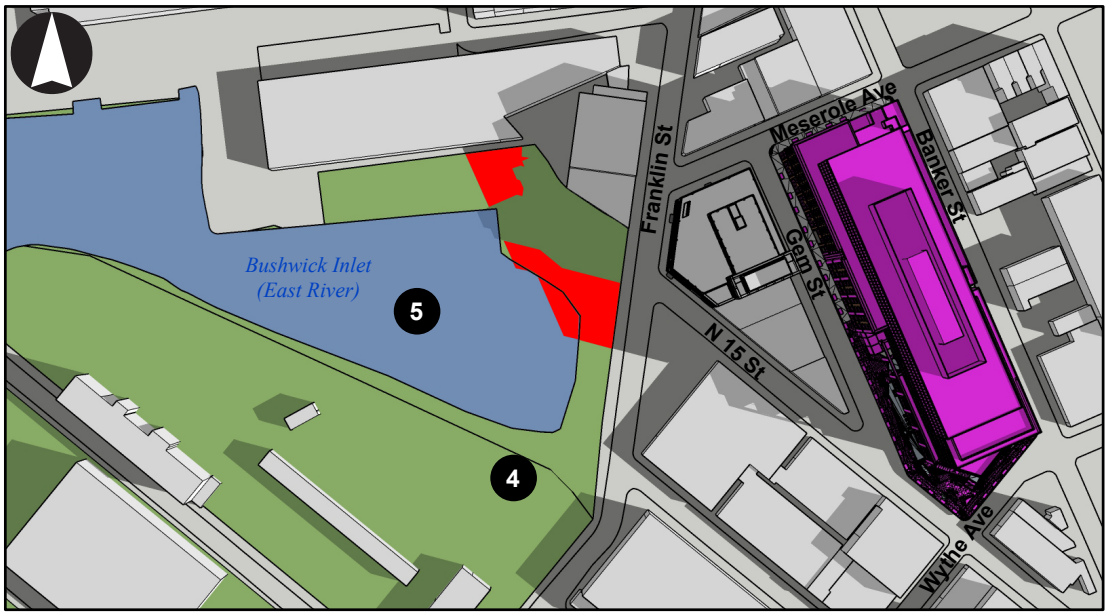
East River (Lower)

The Proposed Development would cast incremental shadows on a portion of the East River's Bushwick Inlet on three of the four representative analysis days: March 21/September 21, May 6/August 6, and June 21. Incremental shadow duration would range from 4 minutes on March 21/September 21 to 46 minutes on June 21 and would generally be limited to the early morning hours before 7:40 AM. Shadow coverage would be confined to small portions of the natural resource west of the intersections at Franklin Street and North 14th and 15th streets (see Figures 5-3 through 5-5), and these areas would continue to receive many hours of direct sunlight as there are no intervening structures to the west and minimal intervening structure to the south.[4] It is important to note that this area of the East River is a degraded natural resource and does not consistently meet standards for good ecological health. The East River currently retains a "Class I, Impaired designation" under NYSDEC regulations regarding recreational uses and fish consumption, meaning communities surrounding the river cannot fully utilize this natural resource. Furthermore, any wildlife present in the area is tolerant of urban conditions and low-quality habitat. As incremental shadow coverage and durations would be one hour or less on each of the representative analysis days (refer to Table 5-3 and Figures 5-3 through 5-5), with the shortest durations on the days with less overall sunlight, and would continue to receive adequate sunlight throughout the year (including the four- to six-hour minimum during the growing season specified in the *CEQR Technical Manual*), and as shadows are not static and move from west to east throughout the day, no area of the East River would be permanently in shade or shaded to a degree that would impact aquatic biota as a result of incremental shadows. Therefore, the incremental shadows that could result from the Proposed Actions are not anticipated to adversely impact the East River.

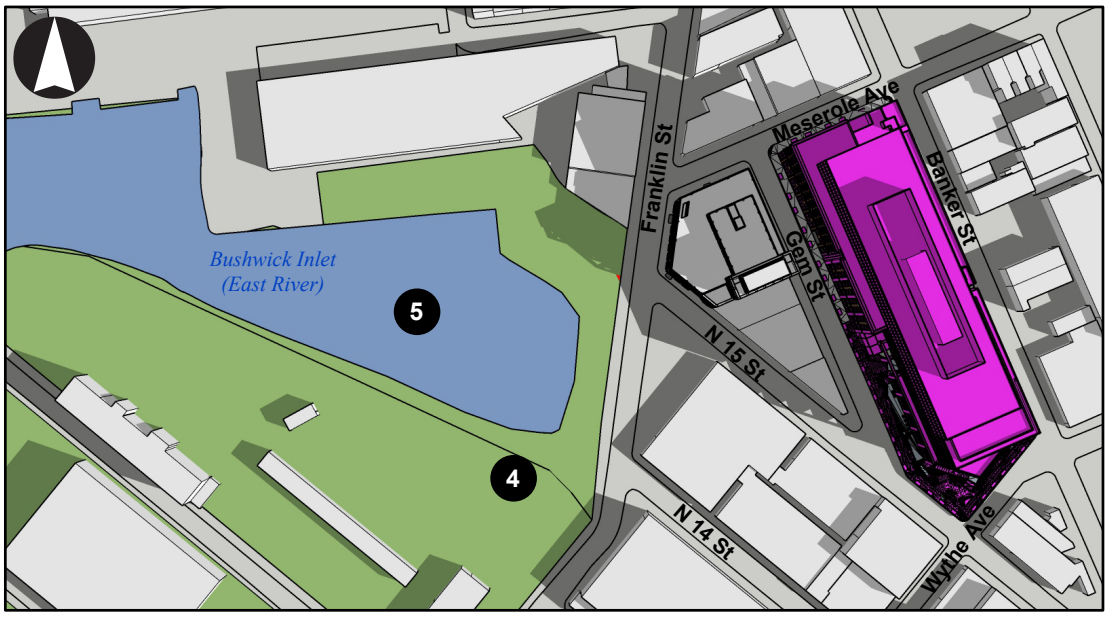
[3] It should be noted that the programming for the future phase of Bushwick Inlet Park is yet to be determined; as such, any projections regarding the level of active and passive recreational uses is based on the existing portions of Bushwick Inlet Park.

[4] While it is unknown at this time, it is unlikely that the future phase of the Bushwick Inlet Park located directly south of Bushwick Inlet (East River) would contain structures that would result in shadow coverage on this portion of the East River.

Bushwick Inlet Park (Future) & East River (Lower)
Incremental Shadows on March 21/September 21



7:36 AM



8:00 AM

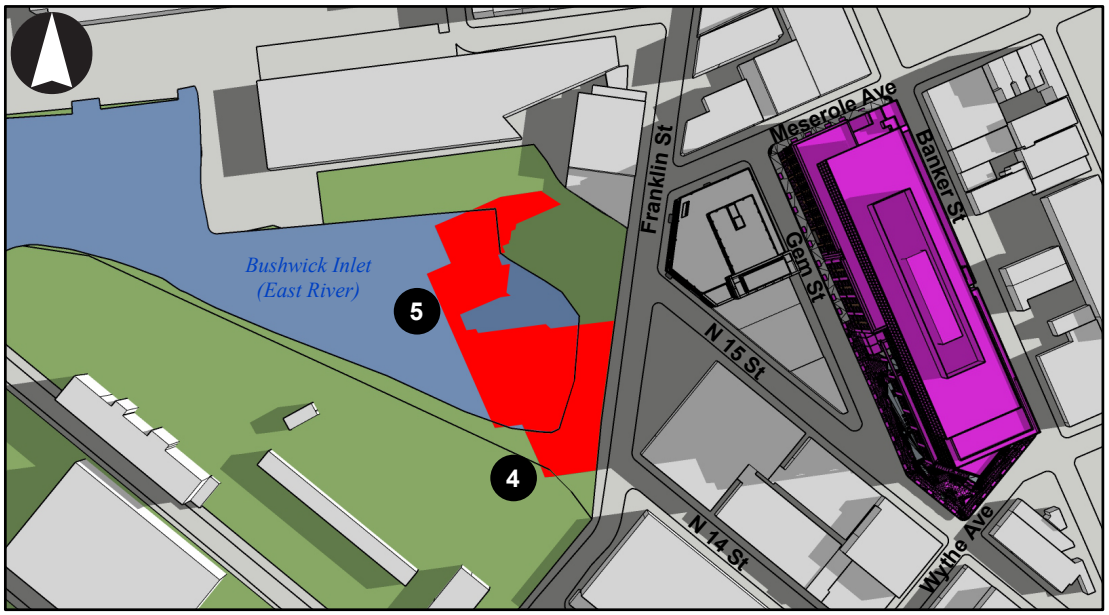
Proposed Development

Incremental Shadow

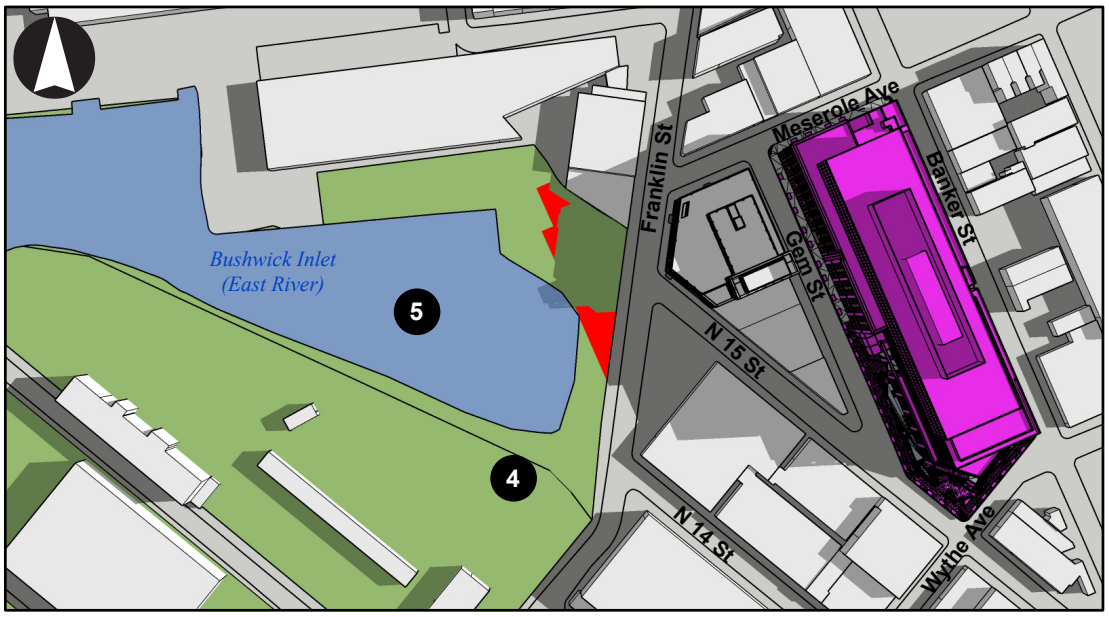
4 Open Space
Note: Resources keyed to Table 5-1

5 Natural Resource
Note: Resources keyed to Table 5-1

Bushwick Inlet Park (Future) & East River (Lower)
Incremental Shadows on May 6/August 6



6:27 AM



7:00 AM

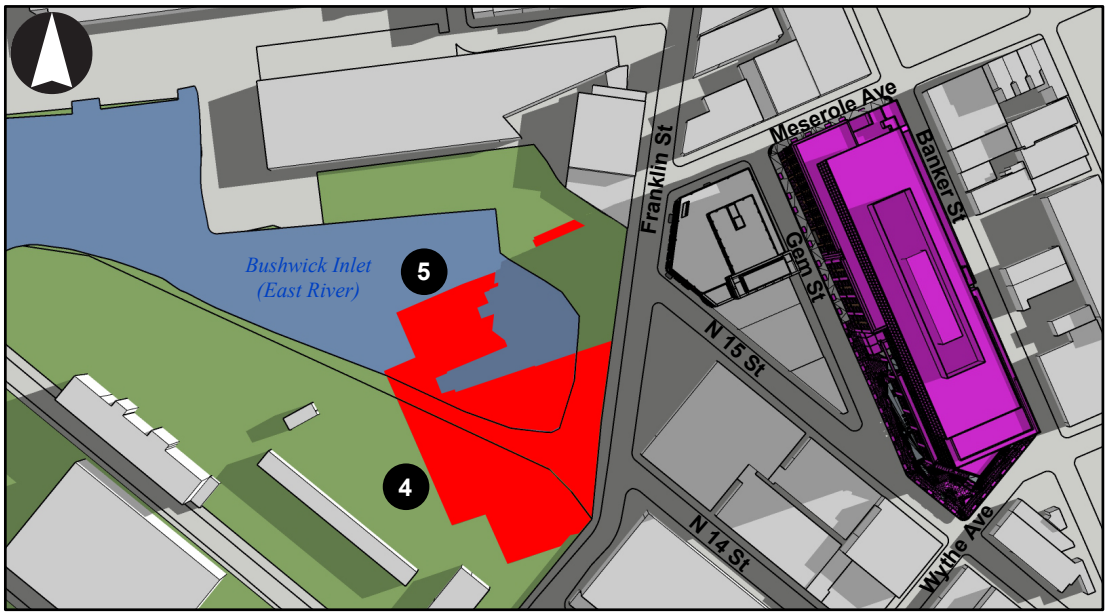
Proposed Development

Incremental Shadow

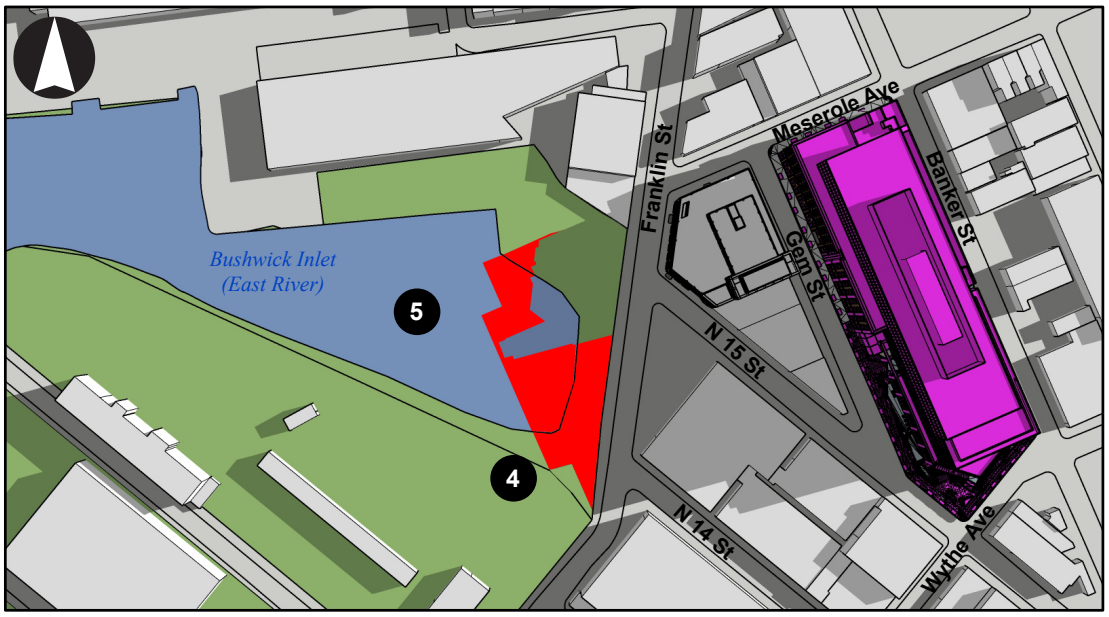
4 Open Space
Note: Resources keyed to Table 5-1

5 Natural Resource
Note: Resources keyed to Table 5-1

Bushwick Inlet Park (Future) & East River (Lower)
Incremental Shadows on June 21



5:57 AM



6:20 AM

Proposed Development

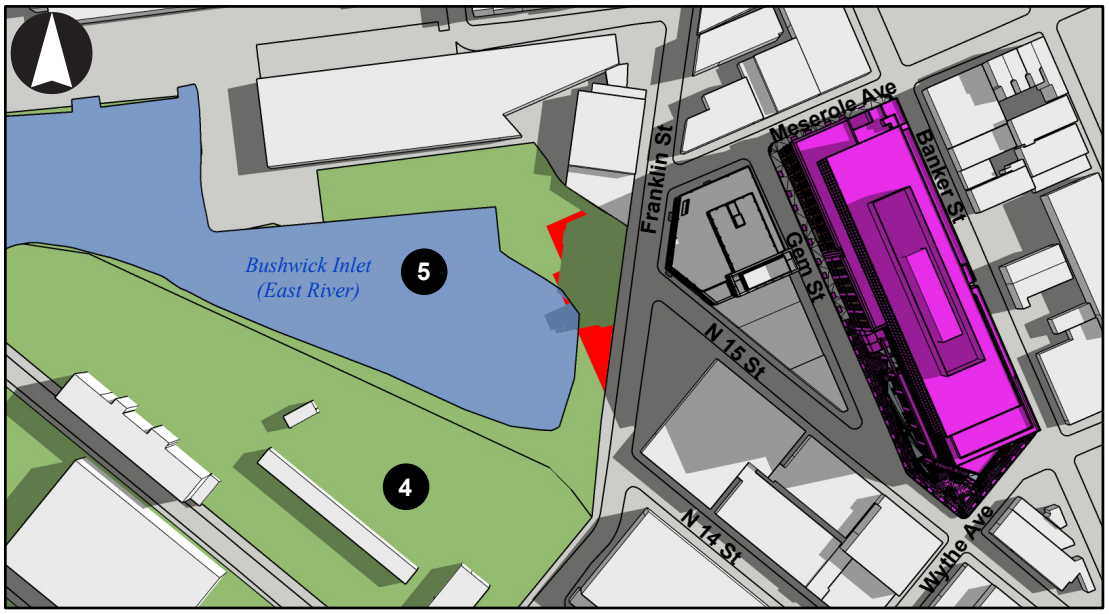
Incremental Shadow

4 Open Space
Note: Resources keyed to Table 5-1

5 Natural Resource
Note: Resources keyed to Table 5-1

Acme Fish Expansion **Figure 5-5b**

Bushwick Inlet Park (Future) & East River (Lower)
Incremental Shadows on June 21



6:45 AM

Proposed Development

Incremental Shadow

4 Open Space
Note: Resources keyed to Table 5-1

5 Natural Resource
Note: Resources keyed to Table 5-1