A. INTRODUCTION

This chapter assesses the potential for the proposed project to result in incremental shadows long enough to reach any nearby publicly accessible open spaces or other sunlight-sensitive resources. As described in Chapter 1, "Project Description," the proposed project is a mixed-use predominantly residential, development of five buildings in Astoria, Queens. Buildings comprising the proposed project would range in height from approximately 80 to 320 feet in height. As the proposed project would be located adjacent to several sunlight-sensitive resources, a shadow assessment is required pursuant to CEQR guidelines and is provided in this chapter.

B. PRINCIPAL CONCLUSIONS

The proposed project would cast incremental shadows on Whitey Ford Field on May 6/August 6 and June 21, Astoria Park on December 21, and the East River on March 21/September 21, May 6/August 6, June 21, and December 21. On all analysis days, project-generated incremental shadows would not be large enough in extent or long enough in duration to result in significant adverse shadow impacts. Project-generated shadows would not affect the utilization or enjoyment of any sunlight-sensitive resources and all open spaces would continue to receive a minimum of four hours of direct sunlight throughout the growing season. Therefore, the proposed project would not result in a significant adverse shadows impact on any nearby sunlight-sensitive resources.

C. METHODOLOGY

First, a preliminary screening assessment must be conducted to ascertain whether the shadows resulting from the proposed project could reach any sunlight-sensitive resource at any time of year. The preliminary screening assessment consists of three tiers of analysis. The first tier identifies the longest shadow study area based on the height of the proposed project. If there are sunlight-sensitive resources within this radius, the analysis proceeds to the second tier, which reduces the area that could be affected by project-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 looking at specific representative days of the year and determining the maximum extent of shadows 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 shadows analysis is required to determine the extent and duration of the incremental shadow resulting from the proposed project. The detailed analysis provides the data needed to assess the shadow impacts. The effects of the new shadows on the sunlight-sensitive resources are described, and their degree of significance is considered. The result of the analysis and assessment are documented with graphics, a table of incremental shadow durations, and narrative text.

D. FUTURE WITHOUT THE PROPOSED ACTION (NO-ACTION CONDITION)

As discussed in Chapter 1, "Project Description," in the future without the Proposed Action, the project site would not be rezoned and it is expected that the existing light industrial and warehousing uses would remain on the project site. These structures are approximately 30 feet in height and contain 194,700 sf of warehouse and storage space. It is assumed that the upland portions of the project site, which are currently zoned R6, would be redeveloped on an as-of-right basis in the future without the Proposed Action. For conservative analysis purposes, both of these upland parcels are assumed to be built to the maximum allowable FAR under R6 zoning (2.43 FAR) and would reach a maximum of four stories in height.

E. FUTURE WITH THE PROPOSED ACTION (WITH-ACTION CONDITION)

In the future with the Proposed Action, the Applicant would construct a new 2,189,068 gsf mixed-use, predominantly residential, development on the project site. The buildings comprising the proposed project would range in height from 80 feet on the upland parcels to a maximum of 320 feet on the waterfront. The buildings located along the waterfront would have base heights between 80 to 102 feet that would be topped with towers ranging in height from 120 to 320 feet. This scenario represents the reasonable worst-case for shadows and will be compared with the No-Action condition in order to determine the extent and duration of incremental project-generated shadows.

F. PRELIMINARY SCREENING ASSESSMENT

Tier 1 Screening Assessment

A base map was developed (see Figure 6-1) showing the location of the project site, the surrounding street layout, and all potentially sunlight-sensitive resources (publicly accessible open spaces, architectural resources, natural resources, and Greenstreets). 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. The height of the tallest building (320 feet) was used to determine the maximum shadow radius of 1,376 feet (Tier 1 Assessment).

Within this longest shadow area, there are several existing public open spaces and additional planned open spaces expected under the 2023 No-Action condition. Therefore, further screening is warranted in order to determine whether they would be affected by any project-generated shadows.

Tier 2 Screening Assessment

For the Tier 2 screening assessment, according to the *CEQR Technical Manual*, shadows cast by proposed project fall to the north, east, and west. In New York City, the shadow area is between -108 degrees from true north and +108 degrees from true north. Conversely, any area lying to the south of a site in the triangular area beyond these angles cannot be shaded by a proposed project. The purpose of the Tier 2 screening is to determine whether the sunlight-sensitive resources identified in the Tier 1 screening lie within the portion of the longest shadow study area that potentially can be shaded by the proposed project.

Figure 6-1

Longest Shadow Study Area

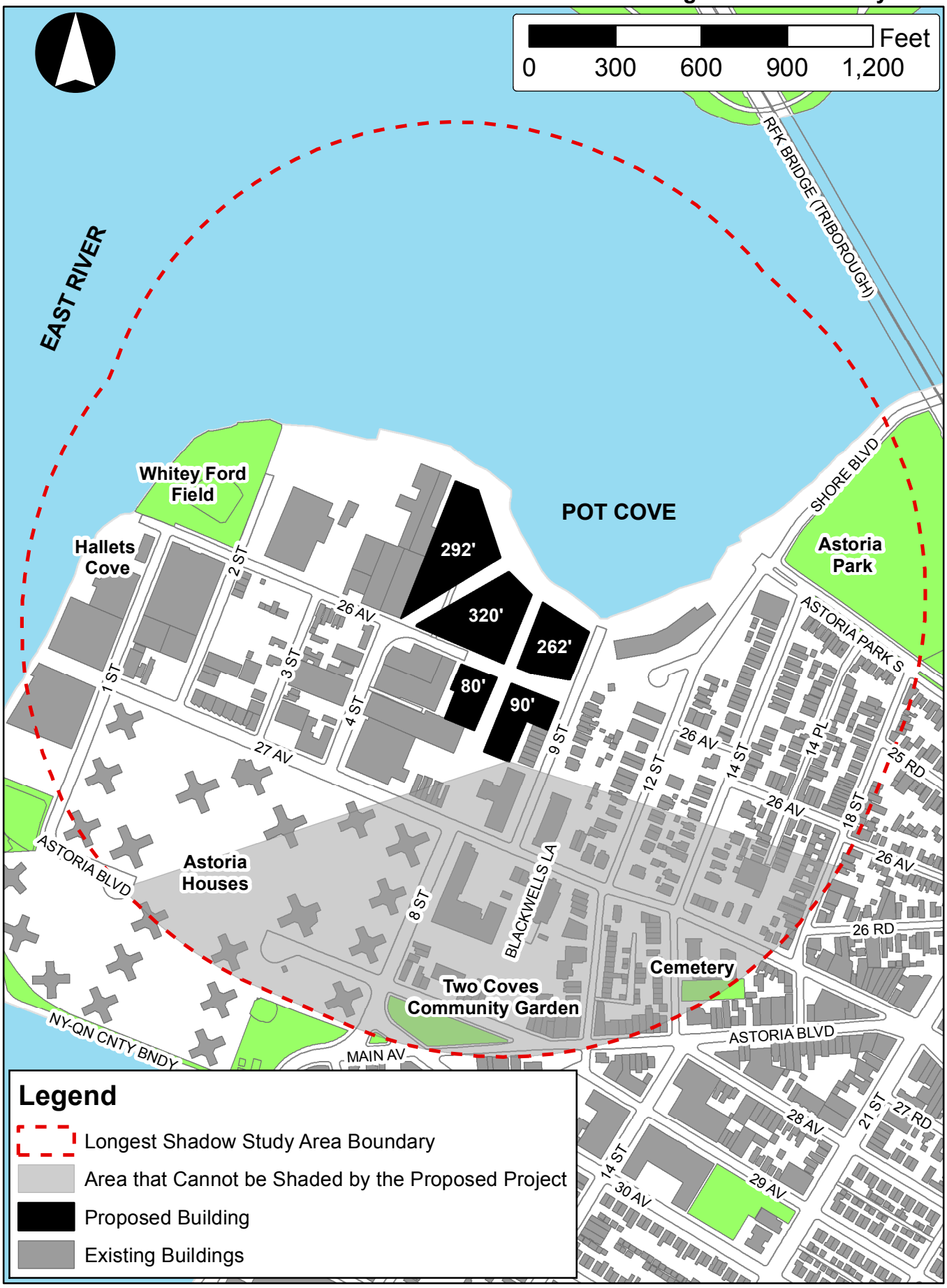


Figure 6-1 presents the results of the Tier 1 and 2 screening assessments, i.e., the portion of the longest shadow study area lying within -108 degrees from the true north and +108 degrees from true north as measured from southernmost portions of the project site. As illustrated in Figure 6-1, there are seven existing and planned open space resources that fall within the maximum shadow radius including Whitey Ford Field, Astoria Park, the cemetery of St. George Pentecostal Episcopal Church, Two Coves Community Garden, Astoria Houses (NYCHA), the planned Halletts Point waterfront public access area, and the East River.

It should be noted that the open space component of the proposed project, comprising the area to the north of the project site along Pot Cove, is also located within the longest shadow study area. However, per *CEQR Technical Manual* guidelines, shadows on project-generated open space are not considered significant under CEQR and their assessment for shadow impacts is not required. Therefore, this analysis only provides qualitative discussion of the proposed project's potential shadow impacts on the proposed open space.

Tier 3 Screening Assessment

Based on the results of the Tier 2 screening assessment, a Tier 3 screening assessment was performed to determine if shadows resulting from the proposed project can reach either of the sunlight-sensitive resources at any time between 1.5 hours after sunrise and 1.5 hours before sunset on representative analysis days. The proposed project represents the worst-case scenario for environmental analysis and was used for all three-dimensional computer modeling of shadows. As shadows from the proposed project would reach three of the sunlight-sensitive open space resources identified in the Tier 2 screening assessment on one or more of the four representative analysis days, a detailed shadow analysis is required.

G. DETAILED ANALYSIS OF SHADOW IMPACTS

Resources of Concern

Whitey Ford Field

Whitey Ford Field is a 3.62-acre open space located to the west of the project site along the waterfront. Amenities at the field include a baseball diamond, bleachers, benches, and fitness equipment. The field offers panoramic views of Manhattan and Randall's Island.

Astoria Park

Astoria Park is located to the northeast of the project site along the waterfront. This 59.96-acre community park is widely known for its approximately 330-foot long swimming pool, one of the largest and most popular swimming facilities in the City. Amenities at the park include tennis and bocce courts, multiple trails, a skate park, tennis courts, running tracks, spray showers, fitness equipment, playgrounds, and a designated off-leash area for dogs. The park also offers panoramic views of Manhattan.

The East River[1]

The East River is located to the north and west of the project site. Despite the relatively low value of the East River as a residential fish habitat, the waterway serves as a major migratory route from the Hudson

[1] Information in this section is from the *East River Esplanade and Piers FEIS* (2007)

River to the Long Island Sound. Harsh conditions within the lower East River, including its swift currents, lack of shoals and protected habitat, and reduced water quality partly explain why the East River experiences only limited utilization by fish at various times of the year. During the summer months, diminished water quality—particularly low levels of dissolved oxygen (oxygen gas dissolved in water that is required by fish to breathe)—can also limit fish presence in this area of the lower East River.

Shadows Analysis

Per *CEQR Technical Manual* guidelines, shadow analyses were performed for the three existing open space 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. CEQR guidelines define the temporal limits of a shadow analysis period to fall from an hour and a half after sunrise to an hour and a half before sunset. As discussed above, the results of the shadow analysis show the incremental difference in shadow impact between the No-Action and With-Action conditions (see Table 6-1).

Table 6-1: Duration of Shadows on Sunlight Sensitive Resources (Increment Compared to No-Action)

Resource	Analysis Date			
	March 21/September 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**
Whitey Ford Field Beginning – Ending Time	--	6:27 – 6:57	5:57 – 6:41	--
Duration (hours:minutes)	--	0:30	0:44	--
Astoria Park Beginning – Ending Time	--	--	--	14:36 – 14:53
Duration (hours:minutes)	--	--	--	0:17
East River Beginning – Ending Time	7:36 – 16:29	6:27 – 8:23 9:00 – 17:18	5:57 – 6:05 7:40 – 8:12 12:31 – 18:01	8:51 – 14:53
Duration (hours:minutes)	8:53	1:56 8:18	0:08 0:32 5:20	6:02

Note: All times are Eastern Standard Time; Daylight Savings Time was not accounted for per *CEQR Technical Manual* guidelines.

As shown in Table 6-1, the proposed project would increase shadow coverage at Whitey Ford Field on May 6/August 6 and June 21, Astoria Park on December 21, and the East River on March 21/September 21, May 6/August 6, June 21, and December 21. Figures 6-2, 6-3, 6-4, and 6-5 show representative shadow views for the three open space resources of concern.

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 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.



8:00 AM



10:00 AM



2:00 PM



4:00 PM

Project Site Incremental Shadow Open Space

Astoria Cove

Figure 6-2

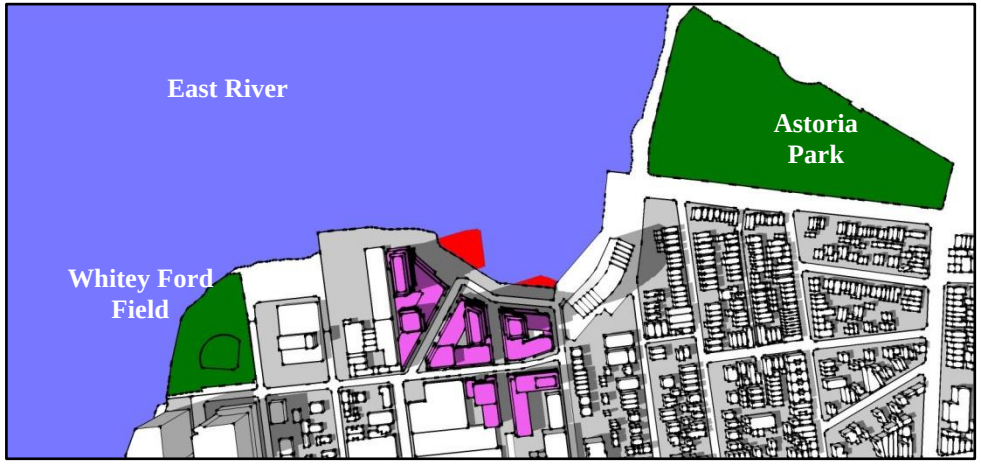
Incremental Shadows on March 21/September 21



6:45 AM



12:00 PM



3:00 PM



5:00 PM

Project Site Incremental Shadow Open Space

Astoria Cove

Figure 6-3

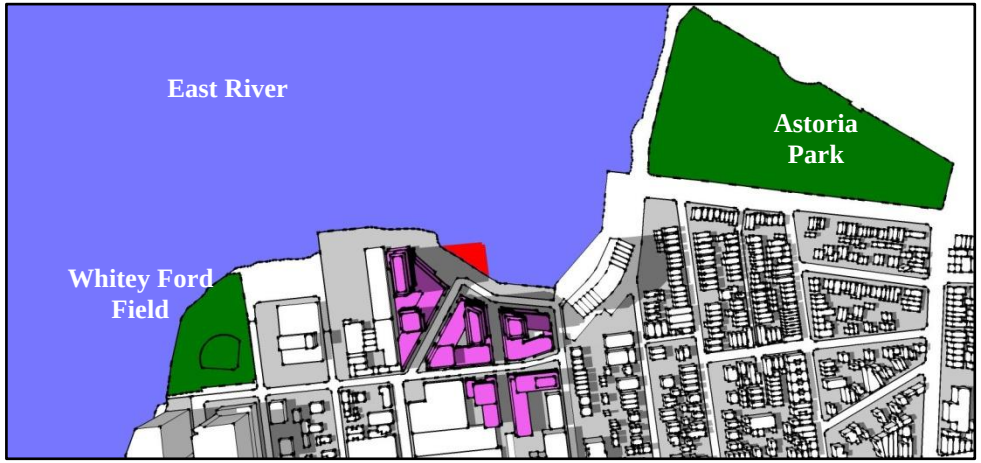
Incremental Shadows on May 6/August 6



6:15 AM



1:00 PM



3:30 PM

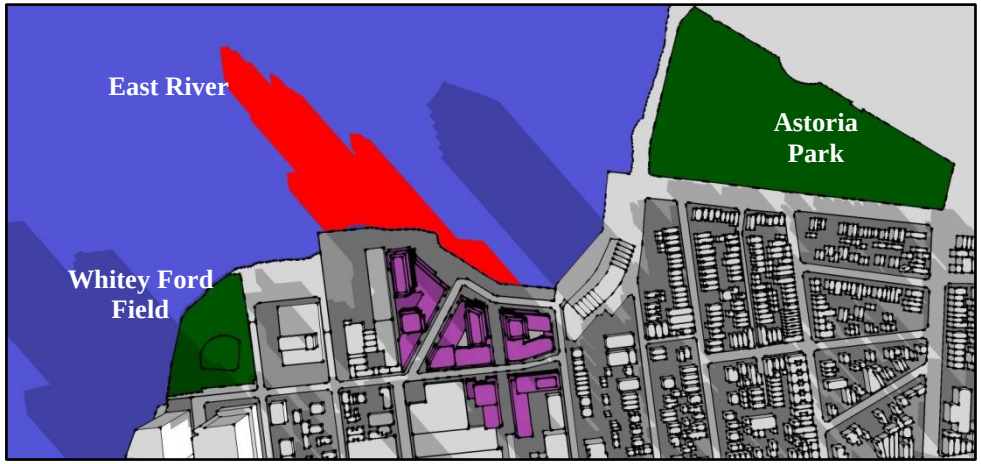


6:00 PM

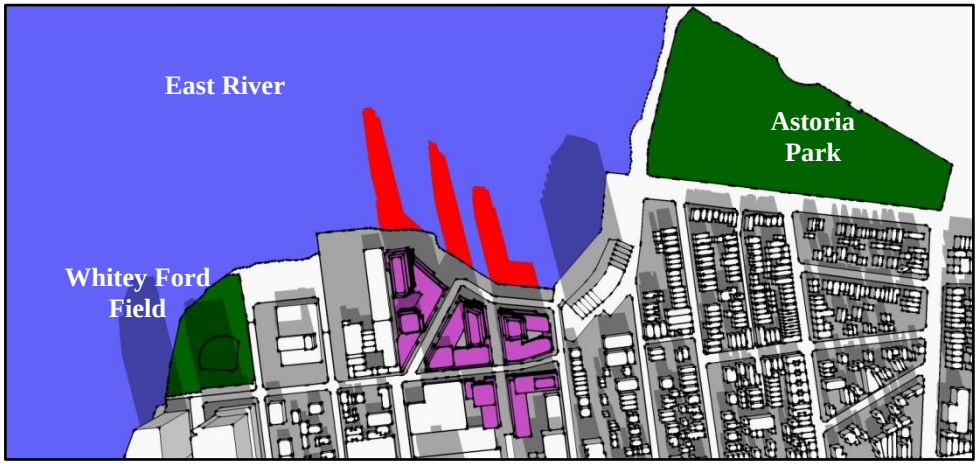
Project Site Incremental Shadow Open Space

Astoria Cove

Figure 6-4
Incremental Shadows on June 21



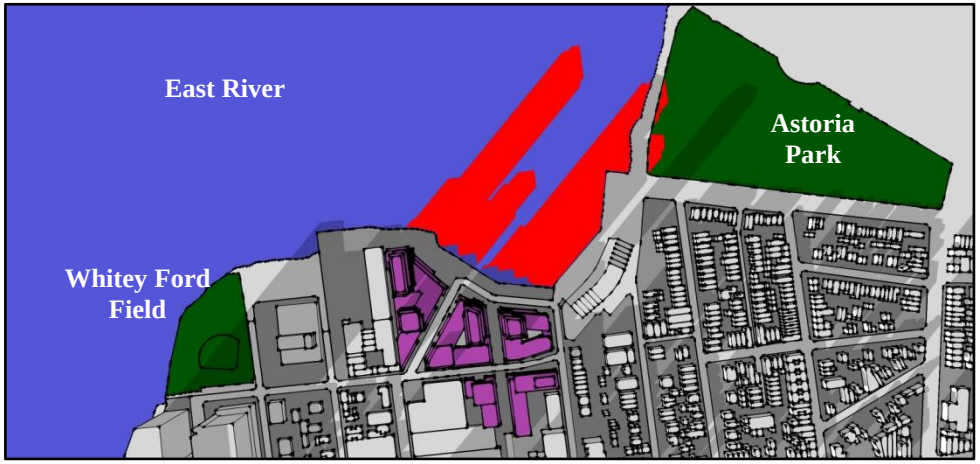
9:00 AM



11:00 AM



1:00 PM



2:45 PM

Project Site Incremental Shadow Open Space

Astoria Cove

Figure 6-5
Incremental Shadows on December 21

March 21 (September 21)

On the equinoxes, the time period for shadows analysis begins at 7:36 AM and continues until 4:29 PM. On the equinoxes, no shadows from the proposed project would be cast on Whitey Ford Field or Astoria Park.

The East River

The proposed project would cast incremental shadows on the East River beginning at 7:36 AM and continuing until the end of the analysis period at 4:29 PM, for a duration of 8 hours and 53 minutes. As shown in Figure 6-2, the majority the East River and Pot Cove would not be shaded and only a small portion immediately north of the project site would be cast in shade.

May 6 (August 6)

On May 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, the proposed project would not cast any shadows on Astoria Park.

Whitey Ford Field

The proposed project would cast incremental shadows on Whitey Ford Field beginning at 6:27 AM and continuing until 6:57 AM, for a duration of 30 minutes. As shown in Figure 6-3, only a small northeastern portion of the field would be cast in shade. The field would experience no incremental shadow coverage after 6:57 AM.

The East River

The proposed project would cast incremental shadows on the East River from 6:27 AM to 8:23 AM and from 9:00 AM to 5:18 PM, for a duration of 1 hour and 56 minutes and 8 hours and 18 minutes, respectively. As shown in Figure 6-3, the portions of the East River and Pot Cove cast in shade would be small and located immediately north of the project site.

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, the proposed project would not cast any shadows on Astoria Park.

Whitey Ford Field

The proposed project would cast incremental shadows on Whitey Ford Field beginning at 5:57 AM and continuing until 6:41 AM, for a duration of 44 minutes. As shown in Figure 6-4, incremental shadows on the field would be restricted to the northeastern corner. The field would experience no incremental shadow coverage after 6:41 AM.

The East River

The proposed project would cast incremental shadows on the East River from 5:57 AM to 6:05 AM, 7:40 AM to 8:12 AM, and from 12:41 PM to 6:01 PM, for durations of 8 minutes, 32 minutes, and 5 hours and

20 minutes, respectively. As shown in Figure 6-4, only small portions of the East River and Pot Cove would experience incremental shadows.

December 21

On December 21 the time period for shadows analysis begins at 8:51 AM and continues until 2:53 PM. On the winter solstice, the proposed project would not cast any shadows on Whitey Ford Field.

Astoria Park

The proposed project would cast incremental shadows on Astoria Park beginning at 2:36 PM and continuing until 2:53 PM, for a duration of 17 minutes. As shown in Figure 6-5, the majority of the park would not be shaded and only a small southwestern portion of the park would be cast in shade. The park would experience no incremental shadow coverage throughout the morning and early afternoon.

The East River

The proposed project would cast incremental shadows on the East River beginning at 8:51 AM and continuing until 2:53 PM for a duration of 6 hours and 2 minutes. As shown in Figure 6-5, only small portions of the East River and Pot Cove would experience incremental shadows.

Assessment

Whitey Ford Field

The proposed project would cast incremental shadows on Whitey Ford Field for approximately 30 minutes on May 6/August 6 and 44 minutes on June 21. Shadow coverage would be limited to a relatively small area of the field and would only occur in the early morning shortly after sunrise. There would be no incremental shadows cast on the field on the other two representative analysis days.

Project-generated incremental shadows would only occur on the May 6/August 6 and June 21 analysis days and would not be large enough in extent or long enough in duration to result in significant adverse shadow impacts. On these analysis days, only the northeastern corner and a small southeastern portion of the field would receive incremental shade as a result of the proposed project (see Figures 6-3 and 6-4). All incremental shadows would exit the field before 7 AM, long before the primary hours of utilization and enjoyment. Furthermore, the field would still obtain adequate sunlight for its vegetation during the growing season (at least the 4 to 6 hour minimum specified in the *CEQR Technical Manual*). Therefore, the incremental shadows cast by the proposed project would not adversely affect the utilization or enjoyment of this resource.

Astoria Park

The proposed project would cast incremental shadows on Astoria Park for approximately 17 minutes on December 21. Shadow coverage would be limited to a relatively small area of the park and would only occur in the late evening shortly before sunset. There would be no incremental shadows cast on the park on the other three representative analysis days.

Project-generated incremental shadows would only occur on the December 21 analysis day and would not be large enough in extent or long enough in duration to result in significant adverse shadow impacts. On December 21, only a very small area of the park would receive incremental shade as a result of the proposed project (see Figure 6-5). As incremental shadows would only reach the park on the December

21 analysis day, outside of the plant growing season, the proposed project would not have an effect on vegetation. Furthermore, the incremental shadows created as a result of the proposed project are not expected to substantially reduce the usability of this open space, as the affected areas contain walking paths, grass, trees, and do not contain any playgrounds or other recreational activities that may be adversely affected by a reduction in sunlight during this period. Therefore, the incremental shadows cast by the proposed project would not adversely affect the utilization or enjoyment of this resource.

The East River

The proposed project would cast incremental shadows on the East River and Pot Cove on all four representative analysis days, primarily affecting areas adjacent to the shoreline. While the extent of shadow coverage would be greatest on December 21, shadow coverage would be limited to relatively small areas on the other three representative analysis days. The areas that would receive the longest durations of new shadows would continue to receive several hours of sunlight over the course of each analysis day, as there are few other nearby structures casting shadows on the river.

The East River experiences only limited utilization by fish at various times of the year due to its swift currents, lack of shoals and protected habitat, and poor water quality. Therefore, incremental shadows would not be large enough in extent or long enough in duration to significantly increase the shading of aquatic habitats and fish populations, and the proposed project would not have an adverse shadow impact on this resource.

Proposed Open Space Component of the Proposed Project

The proposed waterfront public access area would generally experience large areas of direct sunlight during the morning and midday periods in all seasons. Shadows would generally be limited to the eastern portion of the park during the early mornings, but would exit by late morning, leaving the waterfront public access area almost completely in sun. By early afternoon, as shadows move from west to east, the majority of the open space would be cast in shade.

As with all waterfront open space required under the City's waterfront zoning regulations, such spaces are built in connection with new buildings on waterfront lots. Given the proximity between waterfront buildings and the waterfront public access area, there is an inherent interconnection between the two that should be accounted for in design of park elements, including accounting for the affects of shadows from waterfront buildings. As such, the Applicant is developing its public open space to be compatible with the context of the surrounding area including the expected shadow conditions from the proposed project.