

A. INTRODUCTION

This chapter considers the potential of the proposed Memorial Sloan-Kettering Cancer Center (MSK)/The City University of New York (CUNY)-Hunter project to cast new shadows on sunlight-sensitive resources. As defined in the 2012 *City Environmental Quality Review (CEQR) Technical Manual*, sunlight-sensitive resources can include publicly accessible open space, sunlight-dependent features of historic resources, and important natural features.

According to the 2012 *CEQR Technical Manual*, a shadows assessment is required if the project would result in structures (or additions to existing structures) of 50 feet or more, or if the project site is located adjacent to, or across the street from, a sunlight-sensitive resource. The proposed project would occupy a largely vacant site along the Franklin Delano Roosevelt Drive (FDR) Drive on the Upper East Side of Manhattan, and would result in the construction of a 23-story MSK ambulatory care center (MSK ACC) on the eastern portion of the site, and an 16-story building for the Hunter College Science and Health Professions program (CUNY-Hunter Building) adjacent to the proposed MSK ACC. The eastern building (MSK ACC) would reach at total height of approximately 453 feet including the rooftop mechanical screen while the western building (CUNY-Hunter Building) would reach a height of approximately 346.25 feet including the rooftop mechanical screen. Therefore, a shadows assessment was warranted.

PRINCIPAL CONCLUSIONS

The analysis concluded that the proposed project would cast new shadows on portions of the adjacent East River Esplanade in the spring, summer, and fall afternoons for durations between two hours and 20 minutes and up to three hours and 40 minutes depending on the season, but that most of the new shadow would fall on a section of the esplanade containing only a narrow bikeway/walkway connector extending between the FDR Drive and a two-story structure related to the Con Edison East 74th Street Steam Plant (Con Edison Steam Plant). Therefore, the proposed project would not cause a significant adverse impact to the esplanade. New project-generated shadow would also fall on John Jay Park, a few blocks north of the project site, on the winter analysis day only. The new shadow would last for a total of two hours and 38 minutes and would fall on different areas as it moves across the space, but would never eliminate all the remaining sun and would not significantly impact the use of the space. A few other resources, including the East River, would also receive project-generated shadow but would not experience significant adverse shadow impacts.

B. DEFINITIONS AND METHODOLOGY

This analysis has been prepared in accordance with CEQR procedures and follows the guidelines of the 2012 *CEQR Technical Manual*.

DEFINITIONS

Incremental shadow is the additional, or new, shadow that a structure resulting from a proposed project would cast on a sunlight-sensitive resource.

Sunlight-sensitive resources are those resources that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. Such resources generally include:

- *Public open space* (e.g., parks, beaches, playgrounds, plazas, schoolyards, greenways, landscaped medians with seating). Planted areas within unused portions of roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources.
- *Features of architectural resources that depend on sunlight for their enjoyment by the public.* Only the sunlight-sensitive features need to be considered, as opposed to the entire resource. Such sunlight-sensitive features might include: design elements that depend on the contrast between light and dark (e.g., recessed balconies, arcades, deep window reveals); elaborate, highly carved ornamentation; stained glass windows; historic landscapes and scenic landmarks; and features for which the effect of direct sunlight is described as playing a significant role in the structure's importance as a historic landmark.
- *Natural resources* where the introduction of shadows could alter the resource's condition or microclimate. Such resources could include surface water bodies, wetlands, or designated resources such as coastal fish and wildlife habitats.

Non-sunlight-sensitive resources include, for the purposes of CEQR:

- *City streets and sidewalks* (except Greenstreets);
- *Private open space* (e.g., front and back yards, stoops, vacant lots, and any private, non-publicly accessible open space);
- *Project-generated open space* cannot experience a significant adverse shadow impact from the project, according to CEQR, because without the project the open space would not exist. However, a qualitative discussion of shadows on the project-generated open space should be included in the analysis.

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, thereby significantly altering the public's use of the resource or threatening the viability of vegetation or other resources. Each case must be considered on its own merits based on the extent and duration of new shadow and an analysis of the resource's sensitivity to reduced sunlight.

METHODOLOGY

Following the guidelines of the 2012 *CEQR Technical Manual*, a preliminary screening assessment must first be conducted to ascertain whether a project's shadow could reach any sunlight-sensitive resources at any time of year. 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 this radius, the analysis proceeds to the second tier, which reduces the area that could be affected by project shadow by accounting for the fact that shadows can never be cast between a certain range of angles south of the project site due to the path of the sun through the sky at the latitude of New York City.

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 project shadow by looking at specific representative days in each season 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. The detailed analysis provides the data needed to assess the shadow impacts. The effects of the new shadows on the sunlight-sensitive resources are described, and their degree of significance is considered. The results of the analysis and assessment are documented with graphics, a table of incremental shadow durations, and narrative text.

C. PRELIMINARY SCREENING ASSESSMENT

A base map was developed using Geographic Information Systems (GIS)¹ showing the location of the proposed project and the surrounding street layout (see **Figure 4-1**). In coordination with the open space and historic and cultural resources assessments presented in other chapters of this EIS, potential sunlight-sensitive resources were identified and shown on the map.

TIER 1 SCREENING ASSESSMENT

For the Tier 1 assessment, the longest shadow that the proposed structure could cast is calculated and, using this length as the radius, a perimeter is drawn around the project site. Anything outside this perimeter representing the longest possible shadow could never be affected by project generated shadow, while anything inside the perimeter needs additional assessment.

According to the *CEQR Technical Manual*, the longest shadow that a structure can cast at the latitude of New York City occurs on December 21, the winter solstice, at the start of the analysis day at 8:51 AM, and is equal to 4.3 times the height of the structure.

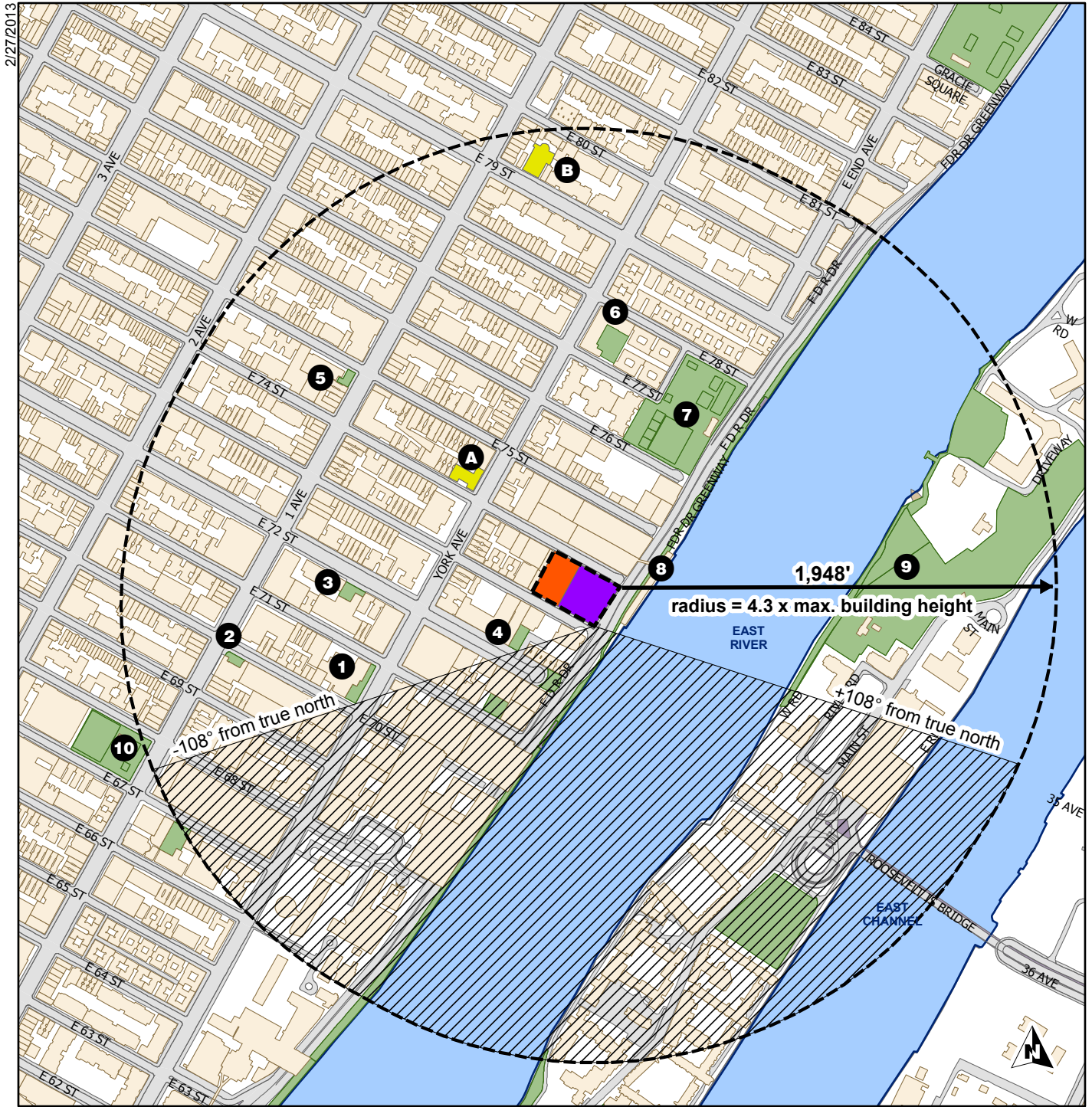
Therefore, at a maximum height of 453 feet above curb level, including rooftop mechanical structures, the proposed MSK ACC could cast a shadow up to 1,948 feet in length (453×4.3). Using this length as the radius, a perimeter was drawn around the MSK portion of the project site. The proposed CUNY-Hunter Building, at a maximum height of 346.25 feet, could cast a shadow of up to 1,489 feet in length, and a corresponding perimeter was drawn around the CUNY-Hunter portion of the project site. **Figure 4-1** shows the combined longest shadow study area of the proposed project.² Since a number of sunlight-sensitive resources lay within the perimeter or longest shadow study area, the next tier of screening assessment was conducted.

TIER 2 SCREENING ASSESSMENT

Because of the path that the sun travels 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

¹ Software: Esri ArcGIS 10.1; Data: New York City Department of Information Technology and Telecommunications (DoITT) and other City agencies, and AKRF site visits.

² The longest shadow study area of the MSK ACC encompassed that of the shorter CUNY-Hunter Building. In other words, the longest shadow study area of both buildings combined is the same as that for the MSK ACC.



- Project Site
- Proposed Project: CUNY portion (max. ht.: 346.25')
- Proposed Project: MSK portion (max. ht. 453')
- Tier 1: Longest Shadow Study Area Boundary
- Tier 2: Area south of site that could never be shaded by Proposed Project
- Publicly-accessible open space (see Table C-1)
- Historic resources with sun-sensitive features (see Table C-1)

Tier 1 and Tier 2 Assessment
Figure 4-1

between -108 and +108 degrees from true north. **Figure 4-1** illustrates this triangular area south of the project site. The complementing area to the north within the longest shadow study area represents the remaining area that could potentially experience new project generated shadow.

The assessment showed that nine publicly accessible open spaces, a schoolyard, and two historic resources with sunlight-dependent features were located within the remaining longest shadow study area. In addition, a portion of the East River was located in the longest shadow study area. Therefore, the next tier of assessment was conducted.

Table 4-1 shows the sunlight-sensitive resources that correspond to the numbered resources on **Figure 4-1**.

Table 4-1
Sunlight-Sensitive Resources

Fig. Ref. ¹	Name/Address	Features	Condition/ Utilization
OPEN SPACES			
1	Herman Stich Medical Building Plaza	Seating ledges, benches, planters	Good/Low
2	Kingsley residential plaza	Benches, planting areas	Good/Low
3	Oxford residential plaza	Seating ledges, planting areas	Good/Low
4	One East River Place residential plaza	Fountain, tables and chairs	N/A ²
5	Saratoga residential plaza	Planters, seating ledges, benches	Good/Low
6	East Side Middle School schoolyard	Hard surface ball courts and play equipment	N/A ³
7	John Jay Park	Benches, basketball and handball courts, playground, pool	Good/High
8	East River Esplanade	Walkway/bikeway, benches	Fair/Moderate
9	Roosevelt Island open spaces: Western Promenade/Manhattan Park/Octagon Park	Walkway/bikeway, athletic fields, landscaping, swimming pool	Good/High
10	St. Catherine's Park	Playgrounds, ball courts, benches and tables, plantings and landscaping	Good/High
HISTORIC RESOURCES WITH SUNLIGHT-DEPENDENT FEATURES			
A	Church of the Epiphany, NW corner of E. 74th St. and York Ave.	Stained glass windows on east and south façades of tower, south façade of first floor	Good condition ⁴
B	Church of Saint Monica, north side of E. 79th St. between York and First Ave	Large stained glass windows on front south façade	Good condition ⁴
NATURAL FEATURES			
	East River	N/A	N/A
Notes: <ol style="list-style-type: none"> 1. See Figure 4-1 2. As of December, 2012, the One East River Place plaza was temporarily closed to the public due to construction on the adjacent building; it is expected to reopen in early 2013. 3. Not accessible during site visit 4. Utilization rate not applicable Sources: AKRF Field Survey, December, 2012; DPR website, September 2012; Jerold S. Kayen, <i>Privately Owned Public Spaces</i> (The New York City Department of City Planning and the Municipal Art Society of New York, 2000); NYC DoITT and DCP GIS data			

TIER 3 SCREENING ASSESSMENT

The direction and length of shadows vary throughout the course of the day and also differ depending on the season. In order to determine whether project-generated shadow could fall on a sunlight-sensitive resource, three-dimensional (3D) computer-mapping software¹ is used in the

¹ MicroStation V8i (SELECTSeries 3)

Tier 3 assessment to calculate and display the proposed project's shadows on individual representative days of the year. A computer model was developed containing three-dimensional representations of the elements in the base map used in the preceding assessments, the topographic information of the study area, and a reasonable worst-case, three-dimensional representation of the proposed project.

REPRESENTATIVE DAYS FOR ANALYSIS

Following the guidance of the *CEQR Technical Manual*, shadows on the summer solstice (June 21), winter solstice (December 21), and spring and fall equinoxes (March 21 and September 21, which are approximately the same in terms of shadow patterns) are modeled to represent the range of shadows over the course of the year. An additional representative day during the growing season is also modeled, generally the day halfway between the summer solstice and the equinoxes, i.e., May 6 or August 6, which have approximately the same shadow patterns.

TIMEFRAME WINDOW OF ANALYSIS

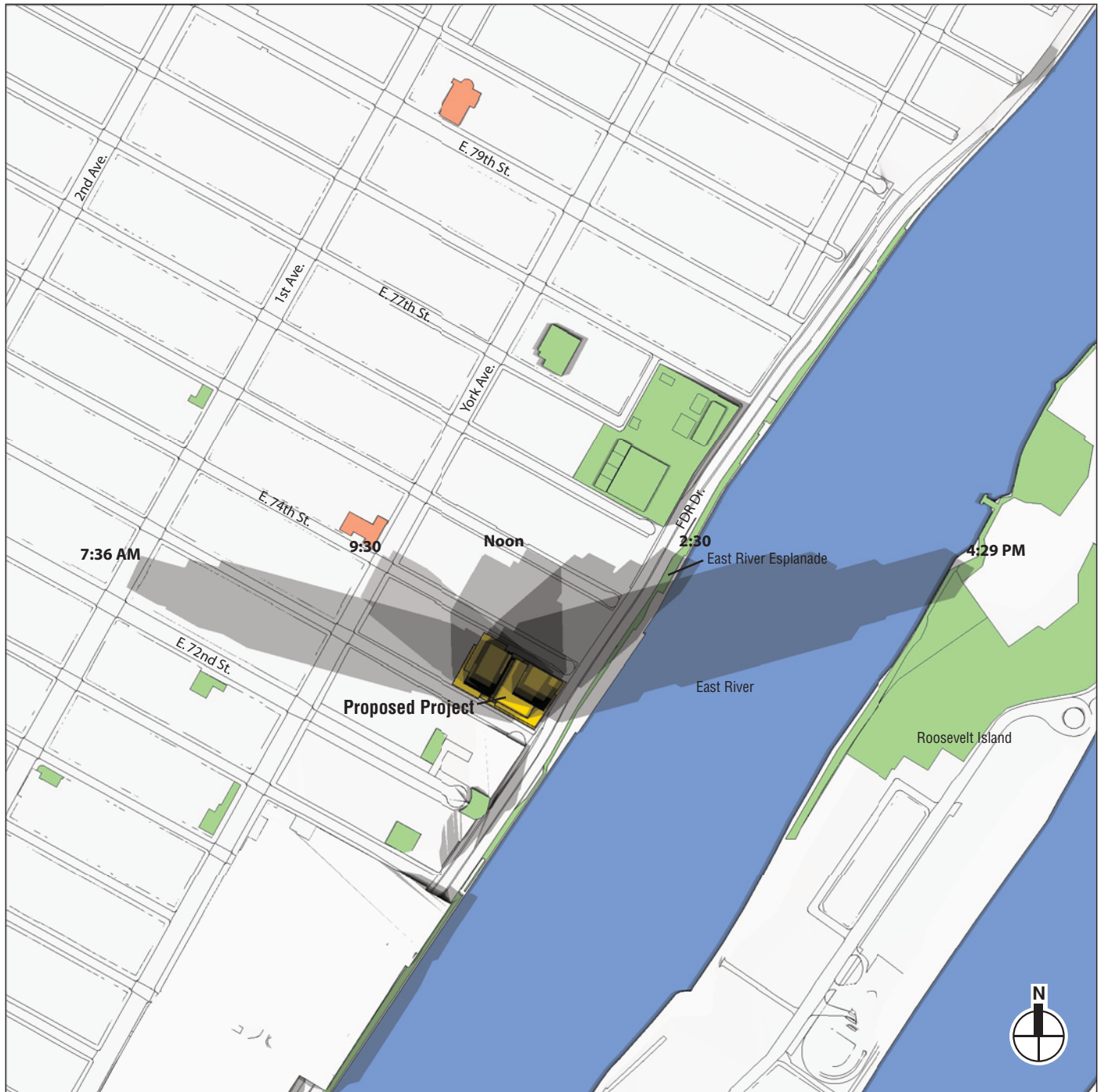
The shadow assessment considers shadows occurring between one and a half hours after sunrise and one and a half hours before sunset. At times earlier or later than this timeframe window of analysis, the sun is down near the horizon and the sun's rays reach the Earth at very tangential angles, diminishing the amount of solar energy and producing shadows that are very long, move fast, and generally blend with shadows from existing structures until the sun reaches the horizon and sets. Consequently, shadows occurring outside the timeframe window of analysis are not considered significant under *CEQR*, and their assessment is not required.

TIER 3 SCREENING ASSESSMENT RESULTS

Figures 4-2 to 4-5 illustrate the range of shadows that would occur, in the absence of intervening buildings, from the proposed buildings on the four representative days for analysis. As they move east and clockwise over the landscape, the shadows are shown occurring approximately every two hours from the start of the analysis day (one and a half hours after sunrise) to the end of the analysis day (one and a half hours before sunset). Each diagram shows the daily path of the proposed buildings' shadow across the landscape, indicating which resources could potentially be affected on that analysis day, without accounting for existing shadows.

On March 21/September 21 the proposed buildings' shadow would not be long enough to fall on any sunlight-sensitive resources in the morning or midday. In the afternoon it would be long enough to pass across a section of the East River Esplanade, and the East River, and, at the very end of the analysis day, a small area of Roosevelt Island's Western Promenade and adjacent Octagon Park.

Early in the morning of the May 6/August 6 analysis day the proposed buildings' shadow would be long enough to reach One East River Place plaza and the Oxford residential plaza. In the afternoon it would be long enough to pass across the section of the East River Esplanade directly to the east that consists only of a narrow bikeway/walkway between the FDR Drive and the two-story Con Edison Steam Plant. The proposed buildings' shadow could also move across the East River in the afternoon, and, at the end of the analysis day, an area of Roosevelt Island's Western Promenade, Octagon Park, and a lawn associated with the Manhattan Park development.



Note: Daylight Saving Time not used.

- Publicly-Accessible Open Space (see Figure 4-1/Table 4-1)
- Historic Resource with Sunlight-Sensitive Features
- Shadow

0 200 1000 FEET
SCALE

This figure illustrates the range of shadows that would occur, absent intervening structures, from the proposed project on this representative day. The shadows are shown occurring approximately every two to three hours from the start of the analysis day (one and a half hours after sunrise) to the end of the analysis day (one and a half hours before sunset). The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed project's shadow across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.



Note: Daylight Saving Time not used.

- Publicly-Accessible Open Space (see Figure 4-1/Table 4-1)
- Historic Resource with Sunlight-Sensitive Features
- Shadow

0 200 1000 FEET
SCALE

This figure illustrates the range of shadows that would occur, absent intervening structures, from the proposed project on this representative day. The shadows are shown occurring approximately every two to three hours from the start of the analysis day (one and a half hours after sunrise) to the end of the analysis day (one and a half hours before sunset). The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed project's shadow across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.



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- Publicly-Accessible Open Space (see Figure 4-1/Table 4-1)
- Historic Resource with Sunlight-Sensitive Features
- Shadow

0 200 1000 FEET
SCALE

This figure illustrates the range of shadows that would occur, absent intervening structures, from the proposed project on this representative day. The shadows are shown occurring approximately every two to three hours from the start of the analysis day (one and a half hours after sunrise) to the end of the analysis day (one and a half hours before sunset). The Tier 3 assessment serves to illustrate the daily path or "sweep" of the proposed project's shadow across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow.

Early in the morning of the June 21 analysis day the proposed buildings' shadow would be long enough to reach the Herman Stich Medical Building plaza and the Oxford residential plaza. In the afternoon, similar to the May 6/August 6 analysis day, it would be long enough to pass across the section of the East River Esplanade directly to the east that consists only of a narrow bikeway/walkway between the FDR Drive and the two-story Con Edison Steam Plant. The proposed buildings' shadow could also fall on the East River in the afternoon, and, at the end of the analysis day, an area of Roosevelt Island's Western Promenade and an adjacent lawn associated with the Manhattan Park development.

On December 21 project-generated shadow could reach the Saratoga plaza briefly at the start of the analysis period. It could also reach the Church of the Epiphany, absent intervening buildings. In the afternoon the proposed buildings' shadow would be long enough to move across John Jay Park and—at the end of the analysis day—the East River Esplanade and a small portion of the river itself.

In summary, the Tier 3 assessment concluded that, in the absence of intervening buildings, shadow from the proposed buildings could reach portions of the East River Esplanade and the East River on all four analyses day afternoons, and portions of Roosevelt Island's Western Promenade at the end of three of the four analyses days. Project-generated shadow could potentially also reach three residential plazas west of the project site early in the mornings of the late spring and summer analysis days, and small portions of Roosevelt Island's Octagon Park and Manhattan Park open space at the end of two analysis days. On the winter analysis day project-generated shadow would be long enough to reach the south and east façades of the Church of the Epiphany in the morning, and John Jay Park in the afternoon. Therefore, a detailed analysis is warranted.

D. DETAILED SHADOW ANALYSIS

The purpose of the detailed analysis is to determine the extent and duration of new incremental shadows that fall on sunlight-sensitive resources as a result of the project, and to assess their effects. A baseline or future No Build condition is established, containing existing buildings and sunlight-sensitive resources and any future developments planned in the area, to illustrate the baseline shadows from buildings and other structures in the study area defined in the preliminary assessment. The future condition with the proposed project and its shadows can then be compared to the baseline condition, to determine the incremental shadows that would result with the proposed project.

Three-dimensional representations of the existing buildings in the study area were developed using data obtained from NYC DoITT GIS data, Fugro EarthData, Sanborn maps, and photos taken during project site visits, and were added to the three-dimensional model used in the Tier 3 assessment. **Figure 4-6** shows a view of the computer model used in the analysis.

Shadows are in constant movement. The computer simulation software produces an animation showing the movement of shadows over the course of each analysis period. The analysis determines the time when incremental shadow would enter each resource, and the time it would exit.

Following the analysis framework described in Chapter 1, "Project Description," the shadows assessment was performed for the 2019 analysis year, comparing the proposed development with the future No Build condition in which the site would remain as in the existing condition.

Shadow analyses were performed for each of the representative days and analysis periods indicated in the Tier 3 assessment.



- Proposed Project*
- Publicly-Accessible Open Space*

3D Computer Model for Detailed Analysis
View Southwest

Table 4-2 summarizes the entry and exit times and total duration of incremental shadows on each affected sun-sensitive resource. **Figures 4-7 to 4-25** document the results of the analysis by providing graphic representations from the computer animation of times when incremental shadow would fall on a sunlight-sensitive resource. The figures illustrate the extent of additional, incremental shadow at that moment in time, highlighted in red, and also show existing shadow and remaining areas of sunlight.

Table 4-2
Incremental Shadow Durations

Analysis day and timeframe window	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
OPEN SPACES				
One East River Place plaza	—	—	5:57 AM–6:10 AM Total: 13 min	—
John Jay Park	—	—	—	12:15 PM–2:53 PM Total: 2 hr 38 min
East River Esplanade	2:10 PM–4:29 PM Total: 2 hr 19 min	1:40 PM–5:00 PM Total: 3 hr 20 min	1:40 PM–5:20 PM Total: 3 hr 40 min	—
Roosevelt Island: Western Promenade	4:25 PM–4:29 PM Total: 4 min	4:45 PM–5:18 PM Total: 33 min	5:05 PM–6:01 PM Total: 56 min	—
Roosevelt Island: Octagon Park	4:27 PM–4:29 PM Total: 2 min	4:50 PM–5:18 PM Total: 28 min	—	—
Roosevelt Island: Manhattan Park open space	—	4:50 PM–5:18 PM Total: 28 min	5:10 PM–5:50 PM Total: 40 min	—
HISTORIC RESOURCES				
Church of the Epiphany – tower's east façade windows	—	—	—	8:51 AM–8:57 PM Total: 6 min
NATURAL FEATURES				
East River	2:20 PM–4:29 PM Total: 2 hr 9 min	2:00 PM–5:18 PM Total: 3 hr 18 min	2:00 PM–6:01 PM Total: 4 hr 1 min	—
Notes: Table indicates entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource. Daylight saving time is not used—times are Eastern Standard Time, per <i>CEQR Technical Manual</i> guidelines. However, as Eastern Daylight Time is in effect for the March/September, May/August and June analysis periods, add one hour to the given times to determine the actual clock time.				

MARCH 21/SEPTEMBER 21 (FIGURES 4-7 TO 4-9)

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. Shadows on March 21 and September 21 are of moderate length.



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



March 21/September 21 - 2:20 PM
Figure 4-7



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



March 21/September 21 - 3:20 PM

Figure 4-8



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



March 21/September 21 - 4:20 PM

Figure 4-9



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



May 6/August 6 - 2:10 PM
Figure 4-10



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



May 6/August 6 - 3:10 PM
Figure 4-11



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



May 6/August 6 - 4:10 PM
Figure 4-12



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



May 6/August 6 - 5:10 PM
Figure 4-13



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



June 21 - 6:00 AM
Figure 4-14



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



June 21 - 2:00 PM
Figure 4-15



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*





Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



June 21 - 4:00 PM
Figure 4-17



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



June 21 - 5:00 PM
Figure 4-18



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



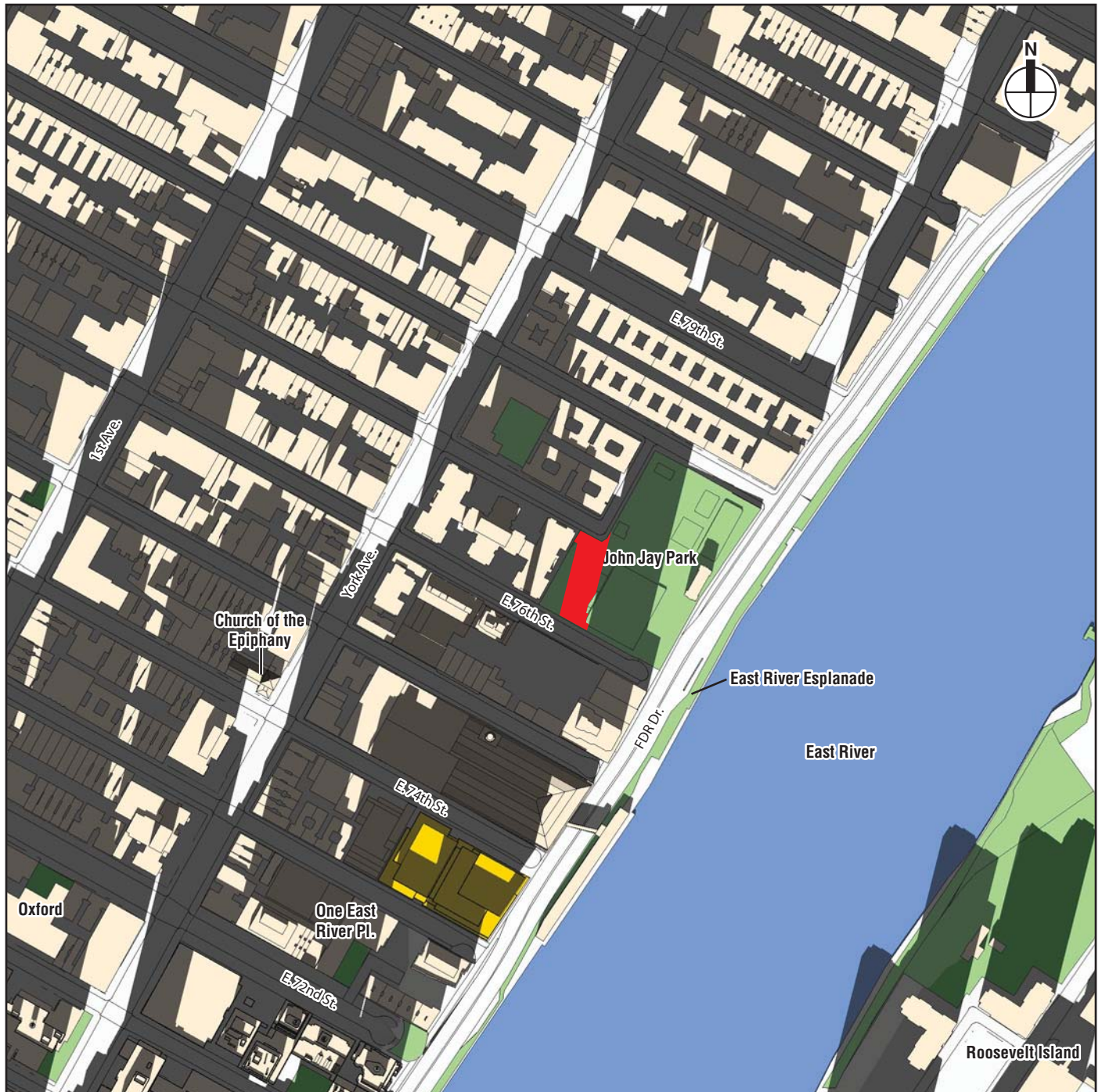


Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



December 21 - 12:20 PM
Figure 4-20



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



December 21 - 12:50 PM
Figure 4-21

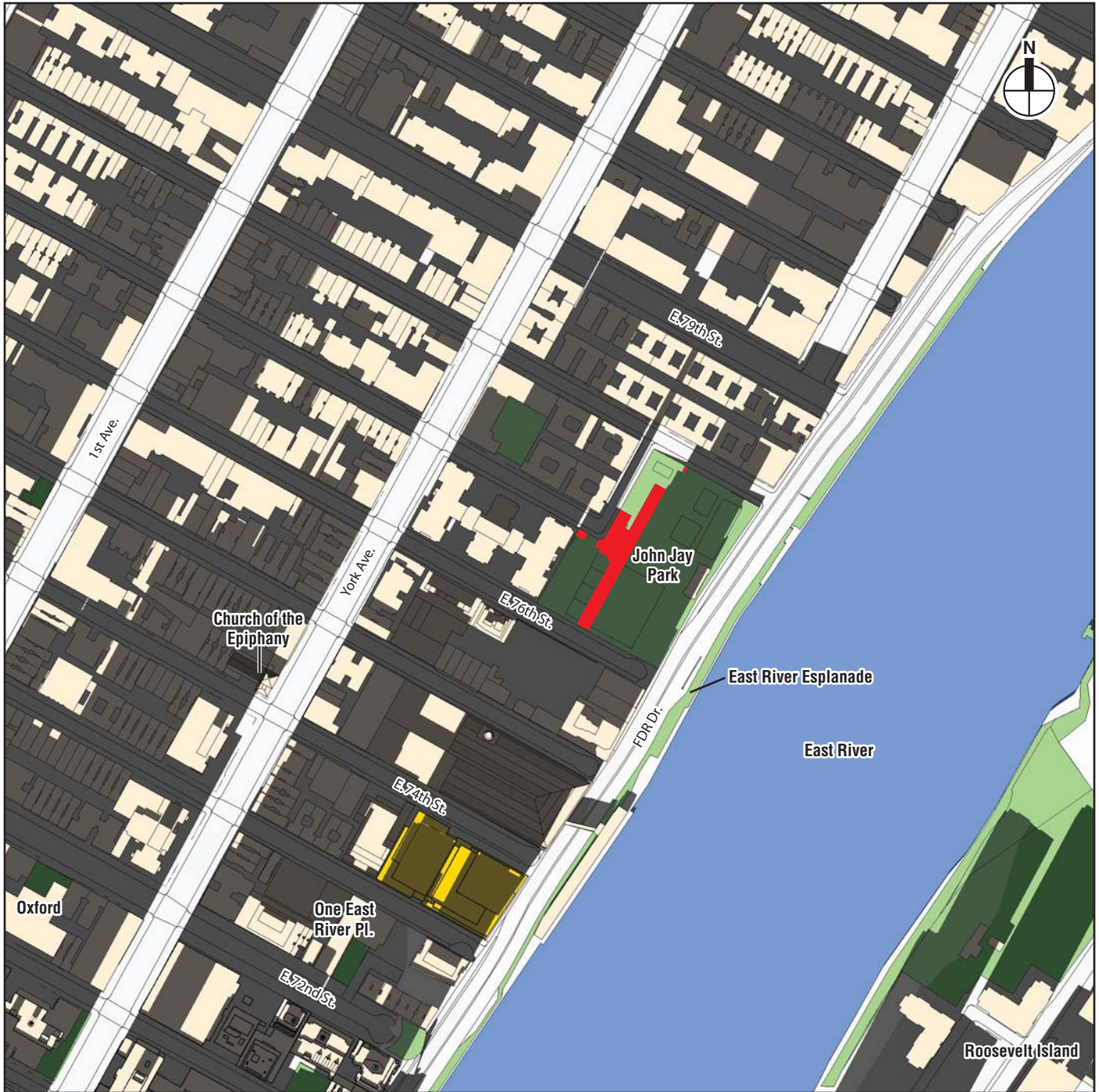


Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



December 21 - 1:20 PM
Figure 4-22



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



December 21 - 1:50 PM
Figure 4-23



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



December 21 - 2:20 PM
Figure 4-24



Note: Daylight Saving Time not used.

- Proposed Project*
- Publicly-Accessible Open Space*
- Incremental Shadow*



December 21 - 2:50 PM
Figure 4-25

At 2:10 PM, shadow from the proposed buildings would move eastward onto a portion of the East River Esplanade between East 75th and East 76th Streets. It would remain on this section of the esplanade until just before 4:00 PM, when existing shadows cover it until the end of the analysis day at 4:29 PM. From around 3:00 PM until the end of the analysis day incremental shadow would also fall on the adjacent portion of the esplanade to the south, between East 75th and East 74th Streets, where there is only a walkway/bikeway connector fenced off between the FDR Drive and the two-story Con Edison Steam Plant.

Incremental shadow would also fall on the East River, small at first beginning at 2:20 PM and growing large, similar to shadows from adjacent existing buildings, by the end of the analysis day at 4:29 PM.

Project-generated shadow would reach a small area of Roosevelt Island's Western Promenade and Octagon Park for the final few minutes of the analysis day.

MAY 6/AUGUST 6 (FIGURES 4-10 TO 4-13)

May 6 falls halfway between the March 21 equinox and the June 21 summer solstice. August 6 falls halfway between June 21 and the September 21 equinox, and has the same shadow patterns as May 6. The May 6/August 6 analysis day is representative of the growing season in the city. Shadows on this day are shorter than on the equinoxes, and the length of the day is longer.

Project-generated shadow would not fall on the Oxford or One East River Place residential plazas in the morning because they would already be in existing shadow at the time when project shadow could otherwise shade them.

Shadow would fall on sections of the East River Esplanade between East 75th and East 73rd Streets, where there is only a walkway/bikeway connector fenced off between the FDR Drive and the two-story Con Edison Steam Plant. The new shadow would fall on this area from 1:40 PM to 5:00 PM, after which existing shadows would cover it.

Incremental shadow would fall on portions of the East River from 2:00 PM to 5:18 PM.

Incremental shadow would fall on a small portion of Roosevelt Island's Western Promenade, a lawn area that is part of the Manhattan Park development, and a small area of Octagon Park for approximately the final half-hour of the analysis day.

JUNE 21 (FIGURES 4-14 TO 4-19)

June 21 has the longest amount of daylight of the year, with an analysis period of 12 hours. Shadows fall to the southwest early in the morning and to the southeast late in the afternoon, and shadows at midday on June 21 are shorter than at any other time of year. June 21 is also in the growing season.

At the start of the analysis day at 5:57 AM the thin remaining stripe of sunlight falling across the One East River Place plaza would be eliminated by project-generated shadow. Thirteen minutes later, however, the incremental shadow would be gone.

Incremental shadow would fall across sections of the East River Esplanade between East 75th and East 73rd Streets over the three hour 40 minute period between 1:40 PM and 5:20 PM. As noted above this section of the esplanade comprises only a bikeway/walkway connector between other portions of the esplanade to the north and south.

Incremental shadow would also fall across the East River for four hours between 2:00 PM and 6:01 PM.

Project-generated shadow would fall on Roosevelt Island's Western Promenade for the final 56 minutes of the analysis day and part of a lawn area associated with the Manhattan Park development from 5:10 PM to 5:50 PM.

DECEMBER 21 (4-20 TO 4-25)

December 21, representing the winter months, does not fall within New York's growing season, according to the *CEQR Technical Manual*. Shadow falling on vegetation in winter is not generally considered to cause a significant adverse impact. However, winter shadow can adversely impact users of open space who may rely on sunlight for warmth.

At the start of the analysis day, much of the east and south façades of the Church of the Epiphany are in existing shadow; only a small area at the top of the tower's east façade is in sun. Shadow from the proposed buildings would fall on this small sunlit area, potentially shading the windows in the center of the façade for the first six minutes of the analysis day, from 8:51 AM to 8:57 AM. By 9:00 AM the incremental shadow would be gone because the façade windows and virtually the entire façade are in existing shadow. The east and south façade windows remain in existing shadow from the tall building immediately south of the proposed buildings until after 10:00 AM, when the proposed buildings' shadow would have moved too far to the east to fall on them any more.

Incremental shadow would move onto the western portion of John Jay Park at 12:15 PM. The proposed buildings' shadow would move across the park, falling mostly on areas already shaded by existing buildings but also on sunlit areas, from 12:10 PM to the end of the analysis day at 2:53 PM. In the winter, shadows are long and move quickly. At times, the extent of incremental shadow would be small, for example at 1:20 PM and at 2:20 PM. At other times it would be larger, such as at 1:50 PM and 2:50 PM. The incremental shadow would never eliminate all the remaining sunlight, though for the final few minutes of the analysis day (2:50 PM to 2:53 PM) it would come close.

Shadow would not move far enough to the east to fall on the East River Esplanade or the East River before the end of the analysis day at 2:53 PM.

E. CONCLUSIONS

ONE EAST RIVER PLACE PLAZA

This privately owned, publicly accessible plaza would not receive incremental shadow in the winter, on the equinoxes or even May 6/August 6. It would receive incremental shadow from 5:57 AM to 6:10 AM on June 21 that would eliminate the remaining stripe of sun during that 13 minute period. However, given the brief duration and the very early time of day, when use would likely be low, this would not result in a significant adverse impact.

JOHN JAY PARK

This is a well-used, well-maintained park. In the southwest section, an area with benches, trees and plantings connects East 76th and East 77th Streets. Much of the southern half of the park contains hard surface handball and basketball courts. In the southeast section there is another

open area with benches and trees. Playground areas with seating and trees occupy most of the northern half of the park, and an outdoor swimming pool is in the northeast section of the park. **Figure 4-26** (top image) shows the layout of all these amenities in the park.

In the spring, summer and fall, the proposed buildings' shadow would not be long enough to reach this well-used, well-maintained park. On December 21, areas of new shadow would fall on different portions of the park, large at times, small at other times. At no point would the incremental shadow eliminate all the remaining sunlight from the park, although from 2:45 PM for eight minutes until the end of the analysis day at 2:53 PM only a very narrow sliver of sunlight would remain.

December 21 does not fall within the growing season and, therefore, the new shadows would not affect the trees and other vegetation of the park.

The new shadows would likely not substantially affect the use of the ball courts, or the children's playgrounds; these uses are only moderately or minimally sensitive to sunlight and shadows. Further, there are several areas containing playground equipment, and some of them would remain in sun during the period when others are in incremental shadow. Passive recreational uses, i.e., sitting on the benches, are not heavy during the winter, and site visits in winter 2012/2013 indicate that most benches are unused in the early afternoon. Any users who would seek sunlit seating areas in John Jay Park at this time would very likely have available sunlit seating at any given time, even during the period when certain areas are in existing or project-generated shadow. Therefore the new shadows would not significantly impact the use of the park.

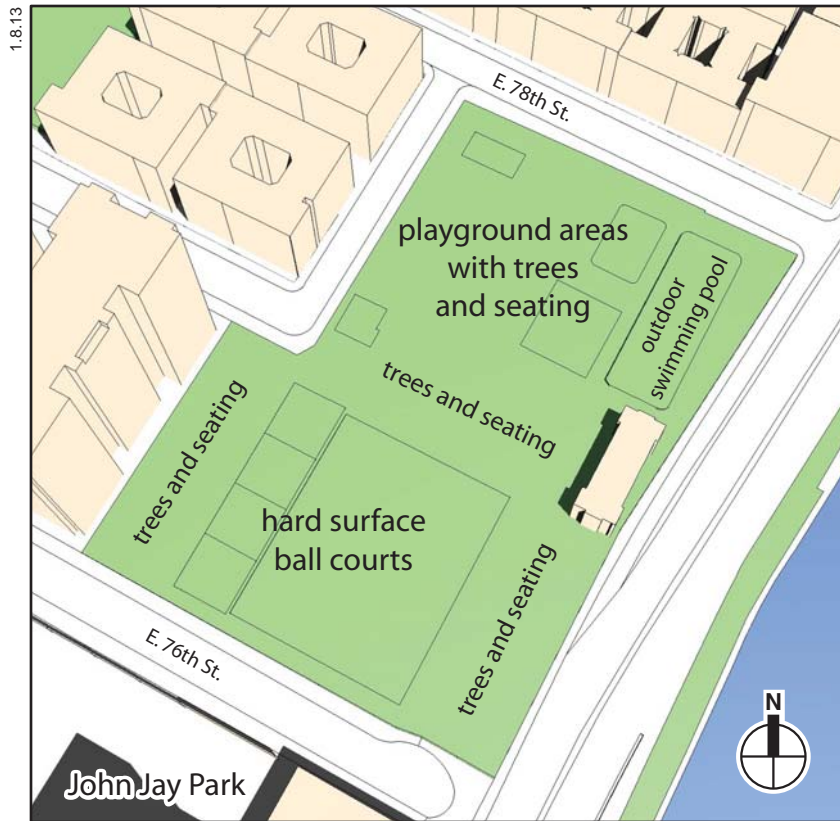
EAST RIVER ESPLANADE

The East River Esplanade is a linear space between the East River and the FDR Drive. The section of the esplanade north of East 75th Street contains seating and plantings. This area would receive incremental shadow on March 21/September 21, for about an hour and 50 minutes. Adjacent areas to the north would continue to be in sun. The affected area containing plantings would continue to receive sun throughout the morning and midday on this and the other analysis days in the growing season. Therefore, the project would not result in significant adverse shadow impacts on this area.

South of East 75th Street to East 72nd Street, the esplanade comprises only a connector walkway/bikeway that extends, fenced, between the highway and a utility building related to the Con Edison Steam Plant and closed-off area (see **Figure 4-26**, bottom image). This section would be only minimally sensitive to sun and shadows. The new shadows falling in the afternoons of the spring summer and fall on this section would not result in a significant adverse impact.

ROOSEVELT ISLAND'S WESTERN PROMENADE, OCTAGON PARK, AND MANHATTAN PARK

Across the West Channel of the East River from the project site, the Western Promenade on Roosevelt Island would receive a few minutes of incremental shadow on March 21/September 21, about a half-hour on May 6/August 6, and 56 minutes on June 21. A small section of Octagon Park containing trees and a path, located south of the park's soccer field and north of the adjacent Manhattan Park development, would receive 23 minutes of new shadow at the end of the May 6/August 6 analysis day. The Manhattan Park complex contains an outdoor



John Jay Park and
East River Esplanade at East 74th Street
Figure 4-26

swimming pool (for members only) and just to its south, a lawn area accessible to users of the promenade. This lawn area would receive 28 minutes of new shadow on May 6/August 6 and 40 minutes of new shadow on June 21.

These Roosevelt Island open spaces generally get abundant direct sunlight throughout the late mornings and afternoons throughout the year, and even during these periods of project-generated shadow there would be adjacent area that would continue to be in sun. Therefore, the project would not cause significant adverse shadow impacts on these spaces.

CHURCH OF THE EPIPHANY WINDOWS

This church is located on the northwest corner of York Avenue and East 74th Street, and its location is about ten feet higher in elevation than the project site. This church is a potential historic resource and has stained glass windows, sunlight-sensitive features that face the project site on the east and south façades of its tower, and on the south façade of the first floor on East 74th Street. The proposed buildings' shadow would not be long enough to reach the church on the spring, summer, and fall analysis days. On December 21, the tower's east façade windows could only receive about six minutes of new shadow before existing shadow falls across them and remains on them until after the proposed buildings' shadow moves eastward away from the building. The south façade windows would not receive any incremental shadow. Therefore, the proposed project would not cause significant adverse shadow impacts on this potential historic resource.

EAST RIVER

The proposed project would cast new shadows on portions of the west channel of the East River in the afternoons in the spring, summer, and fall. While the total duration of new shadow would be generally between two and four hours, depending on the season, most affected areas would receive shorter durations as the shadows move west to east and clockwise over the course of the afternoons. The areas that would receive the longest durations of new shadows would continue to receive more than six hours of sunlight over the course of each analysis day, because there are few other structures casting shadows on the river in the mornings and midday.

The current flows swiftly in the East River and would move phytoplankton and other natural elements quickly through the shaded areas. Therefore, given their limited duration and extent over the course of each analysis day, incremental shadows generated by the proposed project would not have significant adverse impacts on primary productivity within the East River. *