

**A. INTRODUCTION**

This chapter examines whether the proposed project would result in new shadows cast on any nearby sunlight-sensitive publicly accessible resources or other resources of concern, and whether these new shadows would have the potential for resulting in significant adverse project impacts. According to the 2012 *City Environmental Quality Review (CEQR) Technical Manual*, a shadows assessment is required if a project would result in new structures (or additions to existing structures) 50 feet or more in height, or be located adjacent to a sunlight-sensitive resource.

The proposed project would develop three new buildings on the Rockefeller University campus—a new two-story laboratory building; a one-story Interactive Conference Center (ICC) on the North Terrace; and a new one-story fitness center. The laboratory building would also have two exhaust stacks located on its roof abutting the north façade of the Hospital and the south façade of the Flexner Hall Extension. The new laboratory building would be constructed on a platform spanning a portion of the Franklin Delano Roosevelt (FDR) Drive. Adjacent to the laboratory building at the north end of the platform structure would be the North Terrace. The proposed project would also include a new one-story fitness center that would be located in the northwest corner of the campus near demapped East 68th Street and York Avenue, as described in Chapter 1, “Project Description.”

The roof of the proposed laboratory building would be approximately 66 feet above the portion of the East River Esplanade adjacent to the project site, and the two small one-story rooftop pavilions would be an additional 18 feet in height. The rooftop stacks would be slightly taller than the buildings they abut. The one-story fitness center would replace an existing one-story concrete canopy structure, and would be less than 50 feet tall. However, it is located within the Rockefeller University Historic District (State and National Register-eligible [S/NR-eligible] and New York City Landmark-eligible [NYCL-eligible]), and is within and adjacent to part of the campus’s Dan Kiley-designed landscape, which is within the eligible historic district boundary, and contains sunlight-dependent features.

**PRINCIPAL CONCLUSIONS**

A detailed shadows analysis was conducted. The shadow analysis concludes that the proposed laboratory building and North Terrace would cast between approximately three and five and a half hours of new shadows on portions of the East River Esplanade in the afternoons in the spring, summer, and fall, and 33 minutes on the winter analysis day. These new shadows would eliminate the remaining areas of direct sunlight on the esplanade adjacent to the project site for between 50 minutes in the early spring and fall and up to two hours and 40 minutes on the summer solstice. Therefore, the proposed project would cause significant adverse shadow impacts in those seasons to users of the open space seeking direct sun. All affected portions of the esplanade would continue to receive a minimum of five and a half hours of direct sunlight each day throughout the growing season, and, consequently, any vegetation in planters would

not be adversely impacted by the new shadows. Further, any new plantings would be shade tolerant. In addition, the esplanade is adjacent to the East River, and would continue to receive ambient skylight and reflected sunlight from the river throughout the periods when new project-generated shadow would fall within the esplanade. Further, shadows cast by the proposed project would not result in any significant adverse impacts to aquatic resources of the East River. No other sunlight-sensitive resources would be substantially affected by the proposed project.

As described in Chapter 13, “Mitigation,” the significant adverse shadow impact would be partially mitigated through a substantial upgrade to the portion of the East River Esplanade adjacent to the project site and would extend an additional approximately 150 feet south of the project site. Partial mitigation would also include bulkhead repair and rebuilding that would be undertaken where deficiencies have been identified in studies undertaken by the New York City Department of Parks and Recreation (DPR). The bulkhead repair and rebuilding would extend the entire length of the esplanade adjacent to the project site and would extend an additional approximately 150–222 feet south of the project site. In addition to the measures identified above, partial mitigation will also include at least a 12-year commitment by the applicant to maintain plantings on the portion of the esplanade that would be improved with the proposed project. These partial mitigation measures are included in a Restrictive Declaration and are described in Chapter 13, “Mitigation.”

Between the Draft and Final Environmental Impact Statement (EIS), the applicant will considered, in consultation with DPR and DCP, whether there are additional mitigation measures that are feasible and practicable that could be implemented to further alleviate the significant adverse shadows impact. As noted above, additional partial mitigation measures for the significant adverse shadows impact have been identified and are described in Chapter 13, “Mitigation.”

## **B. DEFINITIONS AND METHODOLOGY**

### **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 New York City 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 be considered, as opposed to the entire resource. Such sunlight-sensitive features may 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*, which cannot experience a significant adverse shadow impact from the project according to CEQR because without the project the open space would not exist. However, if project-generated open space is included in a detailed qualitative analysis, the extent and duration of shadows that fall on it must be assessed and documented in the same fashion as for other sunlight-sensitive resources.

**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.

## **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. The first tier determines a simple radius around the proposed building representing the longest shadow that could be cast. If there are sunlight-sensitive resources within this radius, the assessment 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 assessment does not eliminate the possibility of new shadows on sunlight-sensitive resources, the third tier further refines the area that could be reached by project shadow by examining representative days in each season and determining the maximum extent of shadow over the course of each day.

If the third tier assessment 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 shadows resulting from the project. The effects of the new shadows on sunlight-sensitive resources are described, and their degree of significance is considered. The results of the screening assessment and detailed analysis are documented with graphics, a table of incremental shadow durations, and narrative text.

## C. PRELIMINARY SCREENING ASSESSMENT

A base map was developed using a Geographic Information System (GIS)<sup>1</sup> showing the location of the proposed project and the surrounding street layout and waterfront. Potentially sunlight-sensitive resources were identified on the map.

### TIER 1 SCREENING ASSESSMENT

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

According to the 2012 *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 8:51 AM, and is equal to 4.3 times the height of the structure.

#### *PROPOSED LABORATORY BUILDING*

At its maximum height, the roof heights of the proposed laboratory building's two rooftop pavilions would be approximately 84 feet above the adjacent East River Esplanade. Therefore, relative to the esplanade, the roof heights of the rooftop pavilion structures could potentially cast a shadow up to approximately 361 feet in length (84 x 4.3). Using this length as the radius, a perimeter was drawn around the proposed laboratory building and North Terrace<sup>2</sup> to determine the longest shadow study area at the grade of the esplanade and East River below (see **Figure 4-1**).

As described in Chapter 1, "Project Description," the roof of the laboratory building would be approximately 18 feet above the elevation of the eastern edge of the current Rockefeller University campus, with the two one-story rooftop pavilion structures reaching an additional 18 feet higher. Shadows from these pavilions could not reach westward beyond the tall intervening buildings of the eastern campus to the Dan Kiley-designed landscape in the central area of the campus (see **Figure 4-2**).

#### *STACKS*

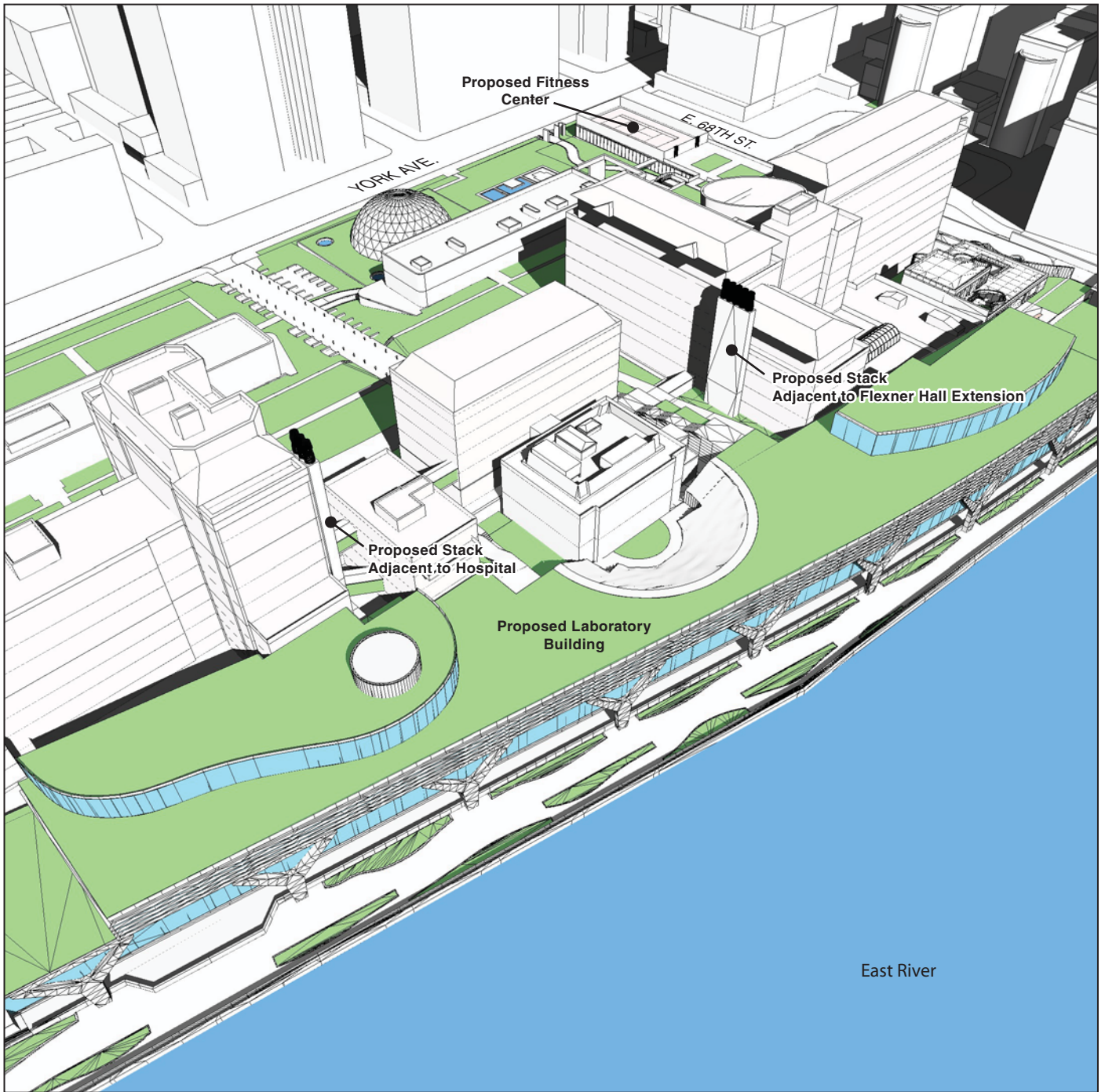
There would also be two exhaust stacks located on the roof of the laboratory building, one abutting the north façade of the Hospital, and the other abutting the south façade of the Flexner Hall Extension (see **Figure 4-2**). The stacks would be slightly taller than the buildings they abut, but their footprints would be small, approximately seven feet wide and between 18 and 28 feet long. **Figure 4-3** illustrates the longest shadow study area for the two stacks, relative to the grade of the Kiley-designed landscape at the center of the campus, which is approximately 45 feet above datum.

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<sup>1</sup> Software: ESRI ArcGIS 10; Data Sources: New York City Department of Information Technology and Telecommunications (DoITT) and other City agencies, as well as AKRF site visits.

<sup>2</sup> The 361-foot radius was conservatively used to determine the longest shadow study area for the entire platform structure which includes the laboratory building and the North Terrace.



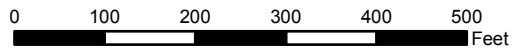


 Landscaping or public open space (Existing and proposed)

Note: For Illustrative Purposes Only. Between the DEIS and FEIS the esplanade design was modified through discussions with DCP and DPR. The shadows analysis and conclusions are not affected by the design modifications.



- Proposed development sites
- Existing building footprints
- Rockefeller University Historic District boundary (S/NR-eligible, NYCL-eligible)
- Historic landscape
- Publicly accessible open space
- Tier 1: Longest shadow study area (relative to center of campus)



### *PROPOSED FITNESS CENTER*

The proposed one-story fitness center would be 16 feet tall relative to the campus grade on its western side next to York Avenue. However, because of the rising grade of the campus from west to east, the roof of the fitness center would be the same height as the Kiley-designed campus landscaping and paths. The western half of the proposed fitness center would also include a rooftop tennis court with a ten-foot fence around its perimeter, so that portion of the building would really be 26 feet tall relative to the western side of the site including the fence. Therefore the Tier 1 assessment conservatively assumed a 26-foot building height for the western portion of the fitness center site and a 16-foot height for the eastern portion. **Figure 4-4** shows the resulting longest shadow study area for the western portion (26 x 4.3 = 112 feet) and the eastern portion (16 x 4.3 = 69 feet).

The Tier 1 assessment concluded that there were three sunlight-sensitive resources located within the longest shadow study areas: a portion of the East River Esplanade adjacent to the project site (see **Figure 4-2**), which is a public open space; a portion of the East River, an important natural feature; and small sections of the historic landscaped area in the central part of the campus.

### **TIER 2 SCREENING ASSESSMENT**

Because of the path the sun travels across the sky in the northern hemisphere, no shadow can be cast within a certain triangular area south of any given structure. In New York City, this area lies between -108 and +108 degrees from true north. The complementary area to the north within the longest shadow study area represents the area that could potentially experience new project generated shadow.

After delineating these triangular areas to the south of each proposed building, the Tier 2 assessment concluded that portions of all three sunlight-sensitive resources of concern noted above were located within the remaining longest shadow study area. Therefore, the next tier of assessment was conducted.

### **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 shadows could fall on a sunlight-sensitive resource, three-dimensional (3D) computer mapping software<sup>1</sup> was used in the Tier 3 assessment to calculate and display the proposed project's shadows on 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 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) were modeled, to represent the range of shadows over the course of the year. An additional representative day during the growing season was also modeled—the day halfway between the summer solstice and the

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<sup>1</sup>MicroStation V8i (SELECTSeries 3).



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-  Proposed development site
-  Proposed Fitness Center footprint
-  Existing building footprints
-  Rockefeller University Historic District boundary (S/NR-eligible, NYCL-eligible)
-  Historic landscape
-  Publicly accessible open space
-  Tier 1: Longest shadow study area



equinoxes, i.e., May 6 or August 6, either of 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 outside 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. Consequently, shadows occurring outside this timeframe window of analysis are not considered significant under CEQR, and their assessment is not required.

*TIER 3 SCREENING ASSESSMENT RESULTS*

The proposed laboratory building would cast shadows long enough to reach portions of the East River Esplanade and portions of the East River in the afternoons of the four assessment days: March 21/September 21, May 6/August 6, June 21, and December 21. A more detailed analysis was required to determine the extent and duration of incremental shadows on the esplanade and East River, compared to shadows cast by the existing schist retaining wall and campus buildings (see below).

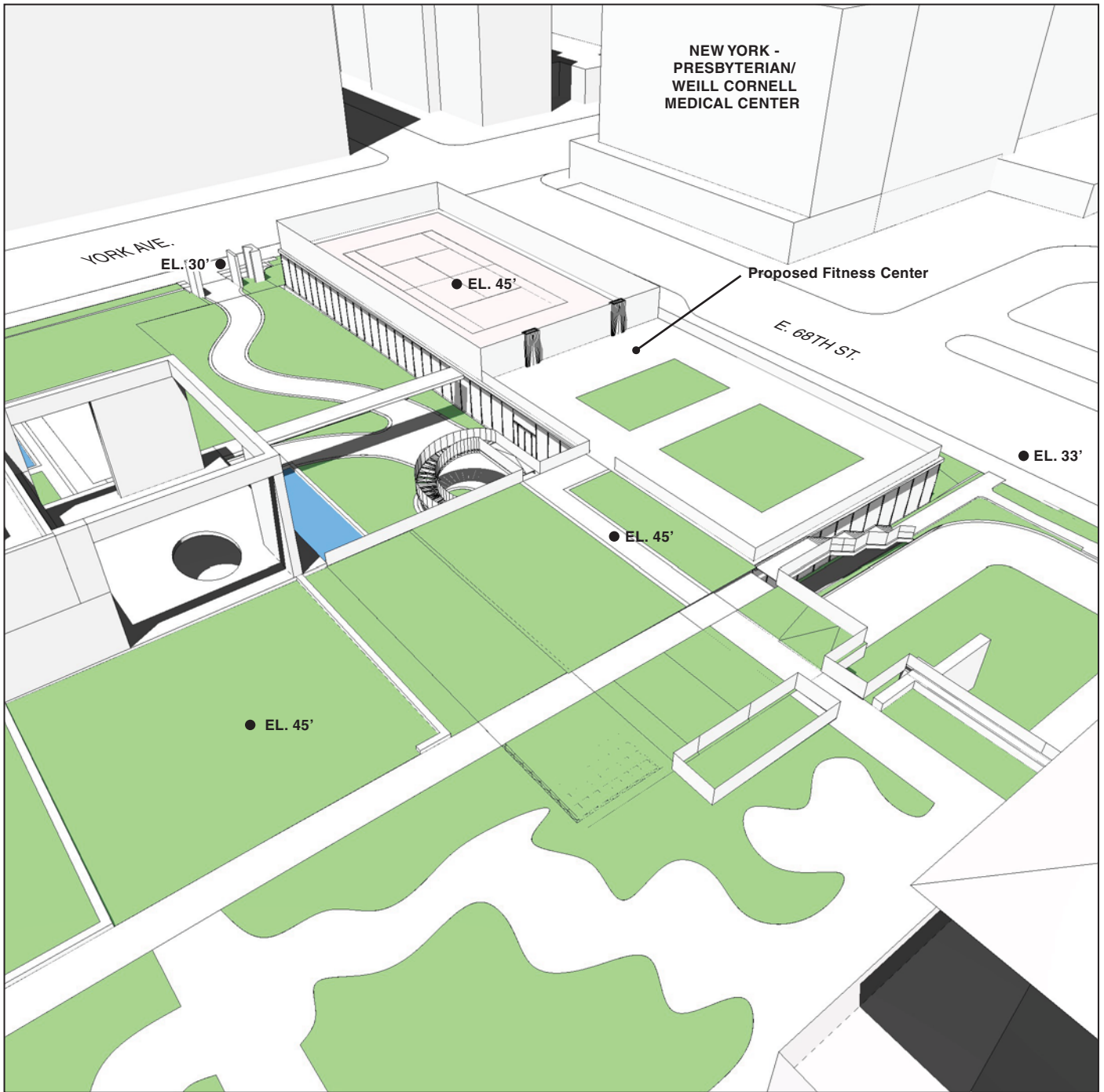
Shadows from the proposed laboratory building would not be long enough to fall westward beyond the intervening campus buildings and onto the historic landscape in the central part of the campus on any assessment day.

Shadows from the two proposed stacks on the roof of the laboratory building would be long enough, absent intervening buildings, to fall on portions of the historic landscaped areas, and on the East River Esplanade and the East River.

As described above in the Tier 1 Screening Assessment, the proposed fitness center would be located in the northwest corner of the campus. Analysis of the 3D model showed that the proposed facility roof would be at an elevation of approximately 45'-0" above datum. The campus ground elevation would be about 29'-0" at the northwest and southwest corners of the proposed building, 32'-0" at the northeast corner, but 45'-0" at the southeast corner; i.e. the ground would rise to meet the roof grade of the proposed facility at the southeast corner, where the historic landscape is located (see **Figure 4-5**). Therefore, the proposed fitness center would not cast shadows onto the historic landscape to the southeast on any analysis day. Nor would shadows fall far enough to the southwest in the early mornings on any analysis day to reach beyond the area to be redeveloped as part of the proposed project, to affect the existing landscaping north of Caspary Hall. Therefore, no further analysis of the proposed fitness center is required.

**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 No Action condition was established, incorporating existing buildings and sunlight-sensitive resources and any other future developments planned in the study area, to illustrate the baseline shadows without the project. The future condition with the proposed project and its shadows were then compared to the baseline condition, to determine the incremental shadows that would result with the proposed project.



Landscaping (Existing and proposed)

Elevations are approximate.

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.

The shadows analysis was performed following the methodology described in the 2012 *CEQR Technical Manual*, comparing the proposed development with the No Action condition. Shadow analyses were performed for each of the representative days and analysis periods indicated in the Tier 3 assessment.

**Table 4-1** summarizes the entry and exit times and total duration of incremental shadows on each affected sun-sensitive resource. **Figures 4-6 to 4-23** document the results of the analysis by providing graphic representations from the computer animation of times when incremental shadow would fall on a sun-sensitive resource. The figures illustrate the extent of incremental shadow at that moment in time, highlighted in red, and also show existing shadow and remaining areas of sunlight.

**Table 4-1  
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
<b>HISTORIC RESOURCES</b>				
Kiley Landscape	7:36 AM–10:30 AM Total: 2 hr 54 min	6:27 AM–7:45 AM Total: 1 hr 48 min	7:10 AM–7:15 AM Total: 5 min	9:15 AM–11:30 AM Total: 2 hr 15 min
<b>OPEN SPACES</b>				
East River Esplanade <sup>1</sup>	1:15 PM–4:10 PM Total: 2 hr 55 min	12:30 PM–5:00 PM Total: 4 hr 30 min	12:15 PM–5:40 PM Total: 5 hr 25 min	2:20 PM–2:53 PM Total: 33 min
<b>NATURAL FEATURES</b>				
East River	2:30 PM –4:29 PM Total: 1 hr 59 min	2:05 PM –5:18 PM Total: 3 hr13 min	2:00 PM–6:01 PM Total: 4 hr 1 min	–
<b>Notes:</b>				
The 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.				
<sup>1</sup> The project would include support columns for the proposed laboratory building and North Terrace that would be located at the western edge of the esplanade, flush with the FDR Drive. In the mornings and early afternoons, these support columns would cast narrow shadows onto the FDR Drive and very small adjacent areas of the esplanade. The durations presented in this table only reflect new shadows cast by the proposed laboratory building and North Terrace structures.				

**MARCH 21/SEPTEMBER 21 (FIGURES 4-6 TO 4-11)**

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.

The northern stack abutting the Flexner Hall Extension would cast a small shadow southwestward onto a small portion of the historic landscape from the start of the analysis day at 7:36 AM until about 8:45 AM (see **Figure 4-6**). Then, beginning at the same time of about 8:45 AM, the southern stack abutting the Hospital would cast a small shadow northwestward onto the landscape until about 10:30 AM (see **Figure 4-7**).

The East River Esplanade and adjacent areas of the East River would be fully in sun from the start of the analysis day at 7:36 AM through the morning and middle of the day, until 1:00 PM



- Publicly-Accessible Open Space or Historic Landscape
- East River
- Incremental Shadow

Note: Daylight Saving Time not used.

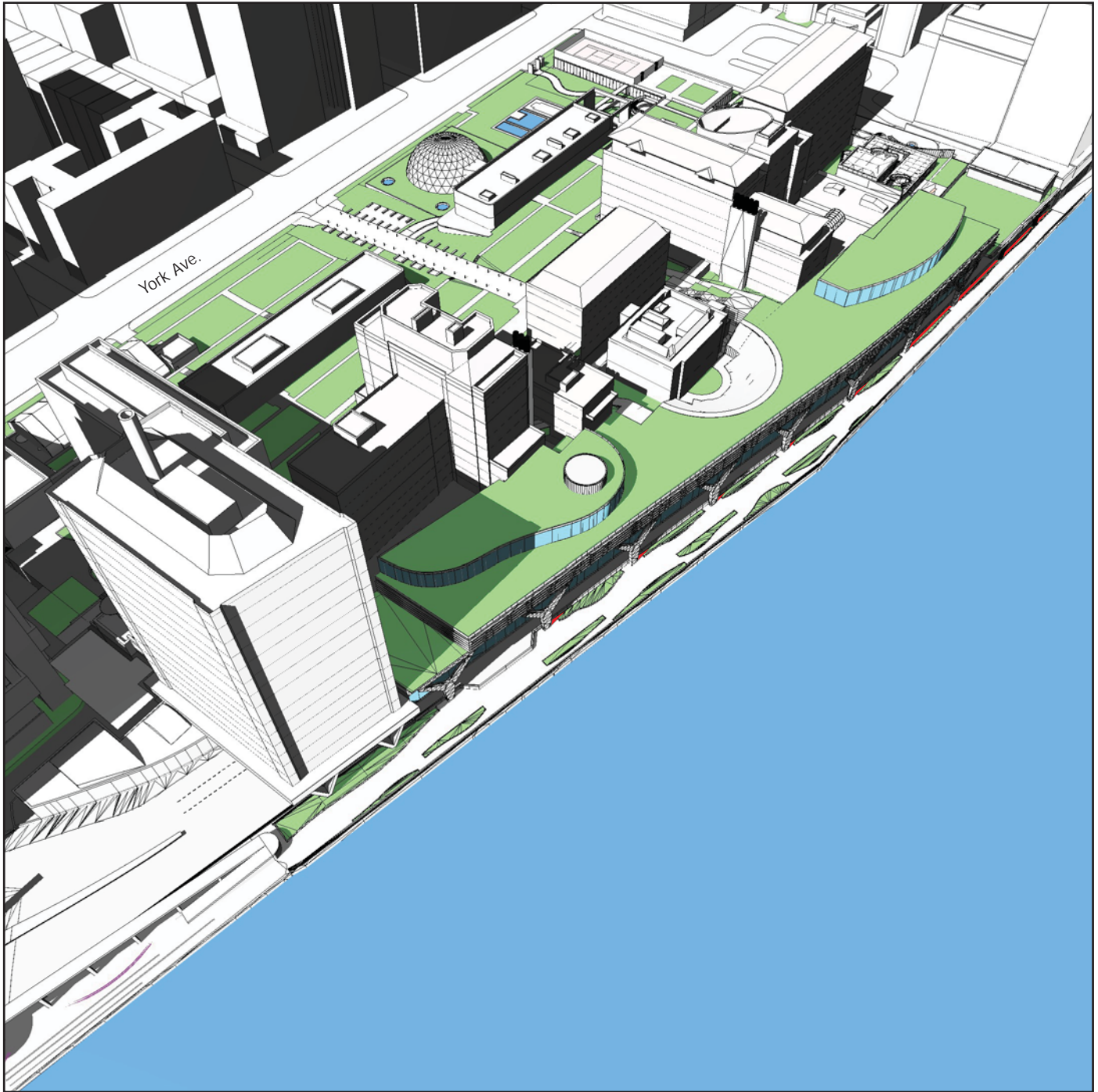
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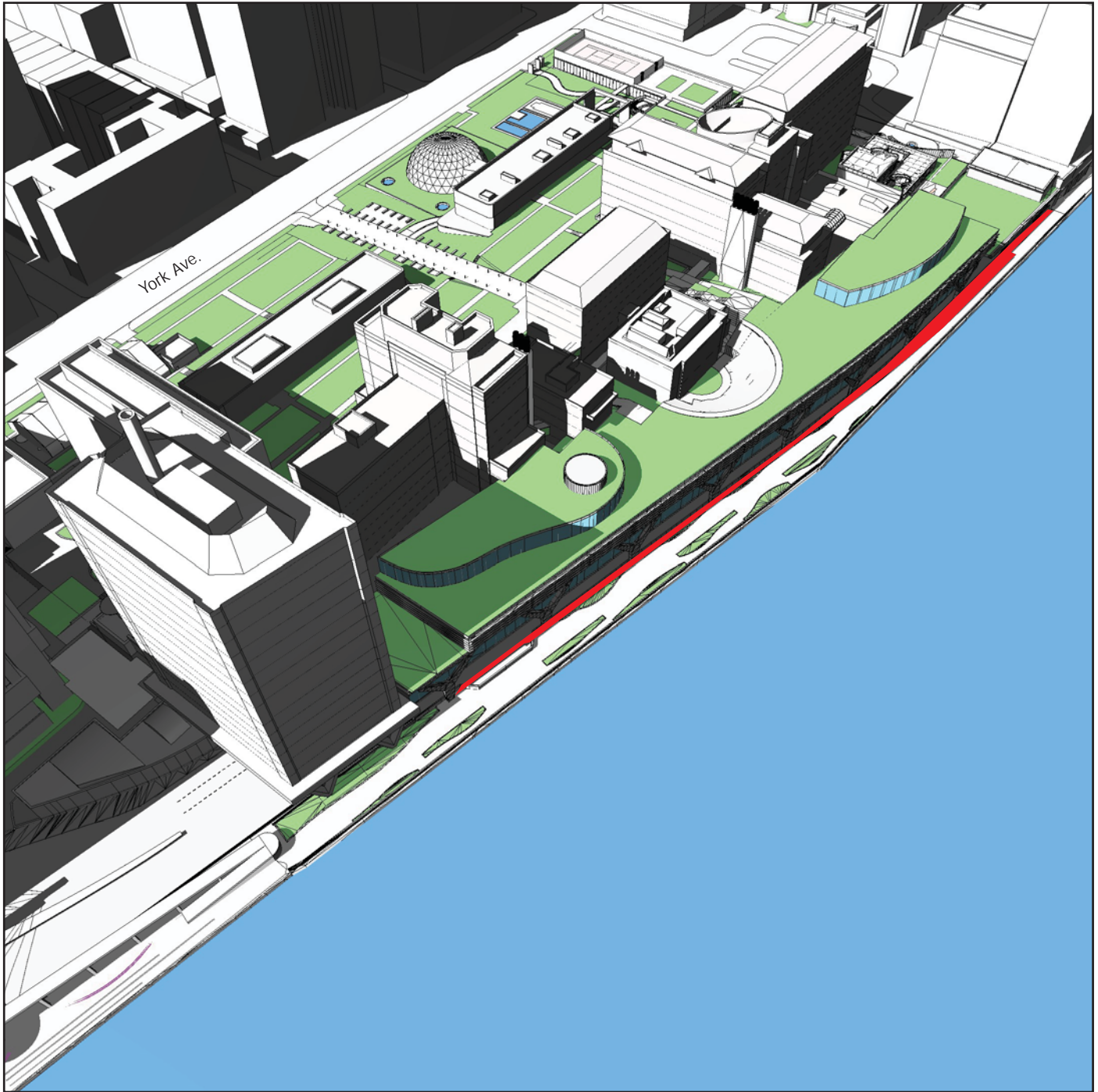
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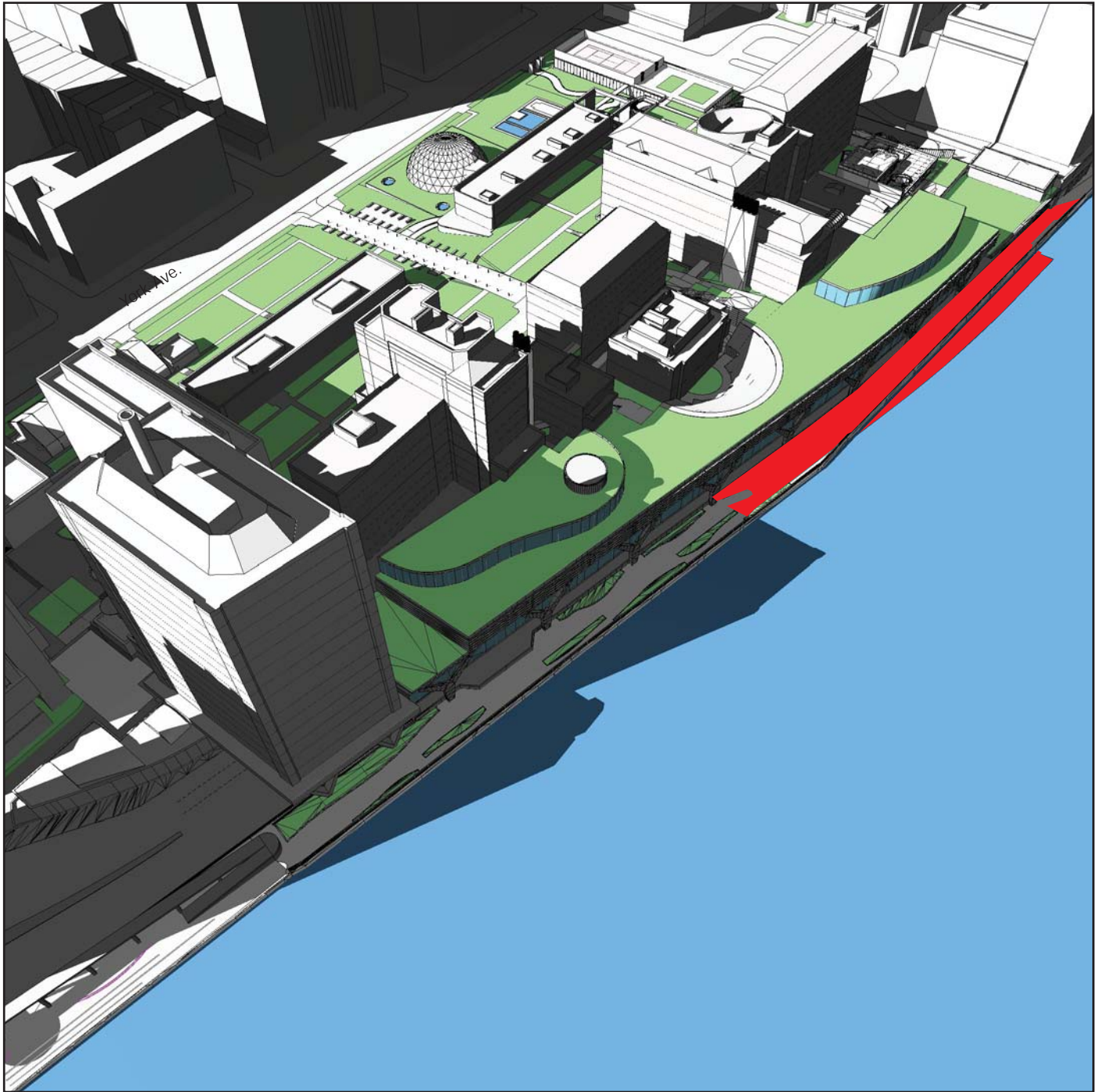


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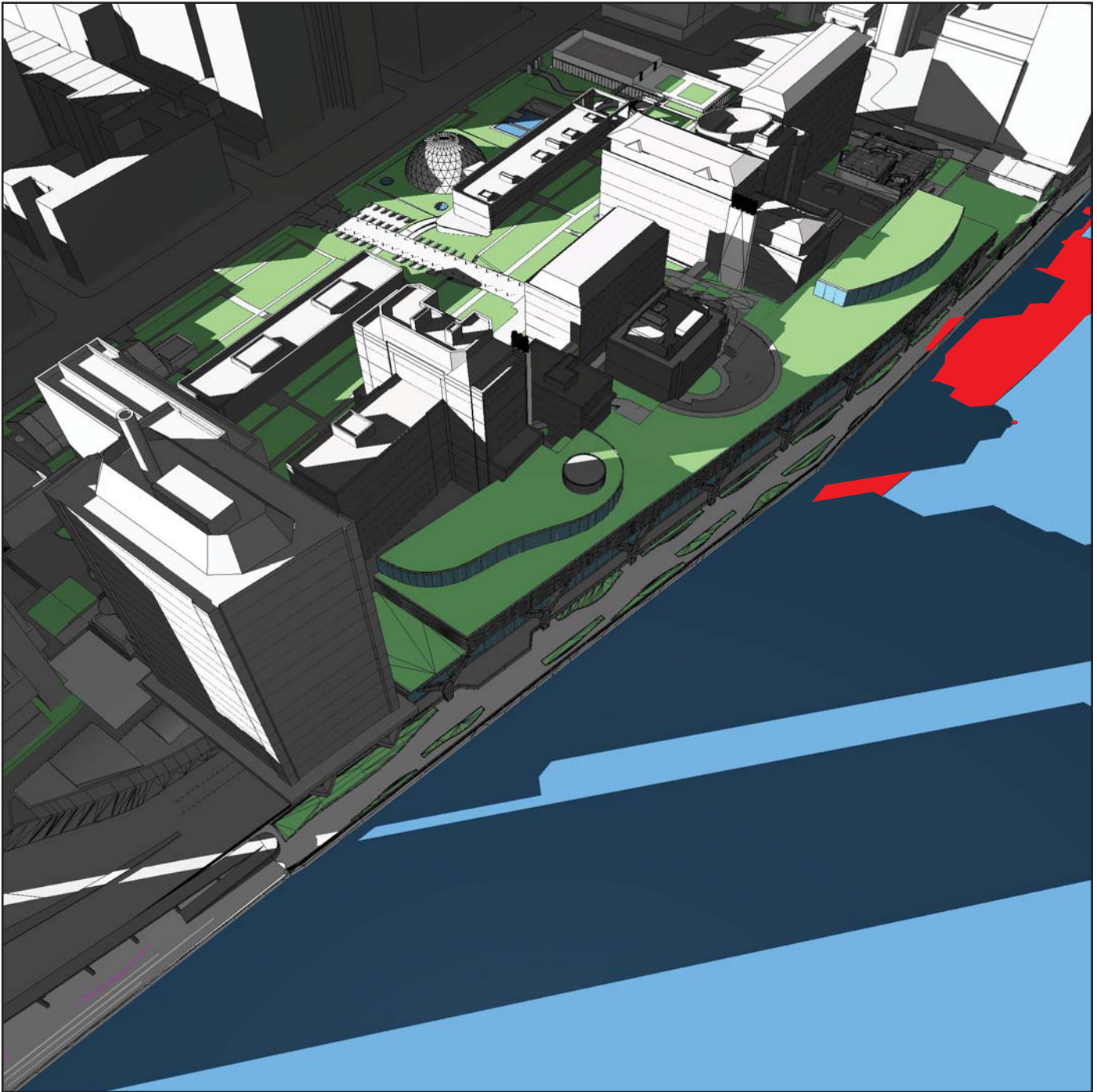




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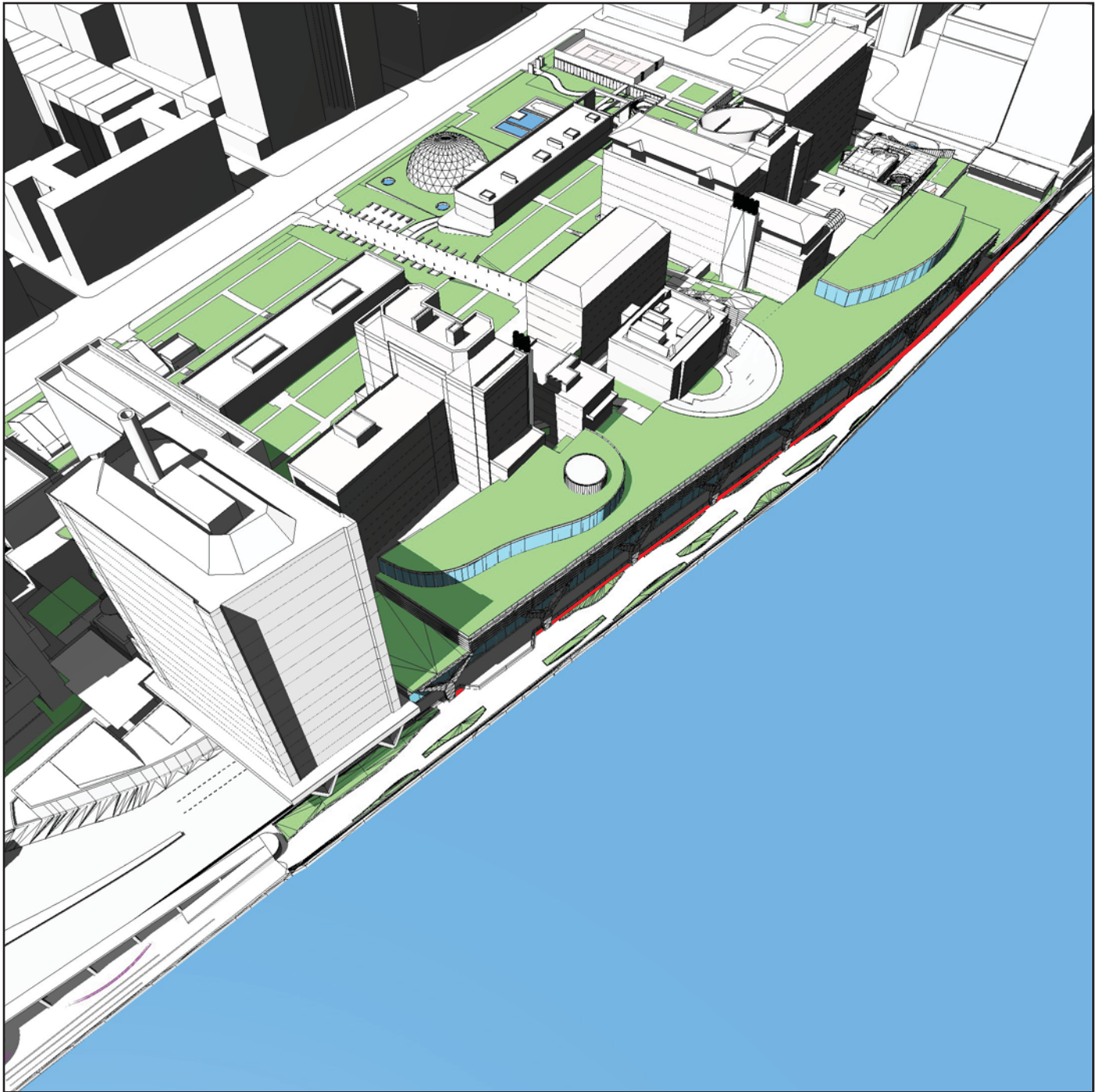
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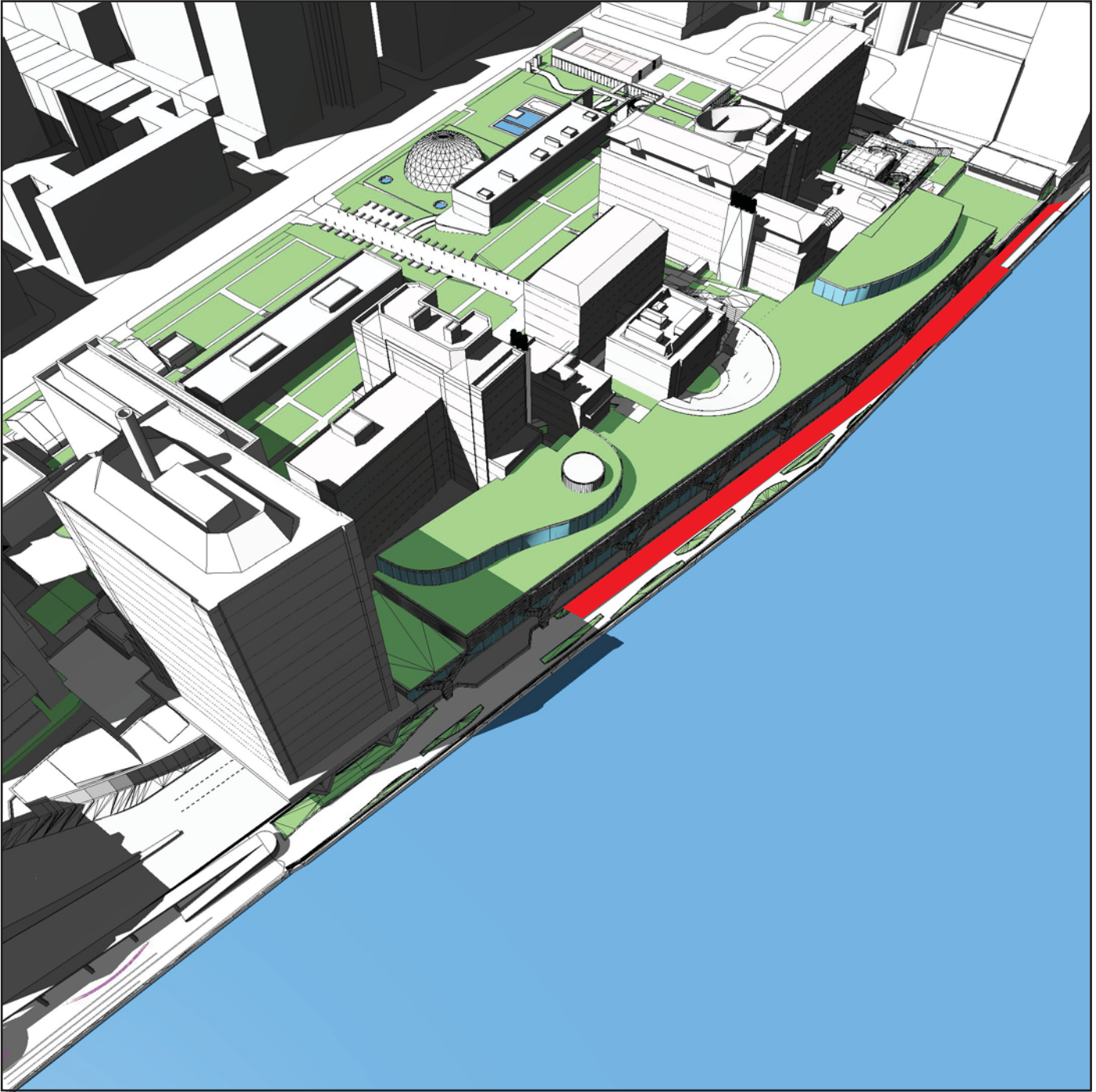
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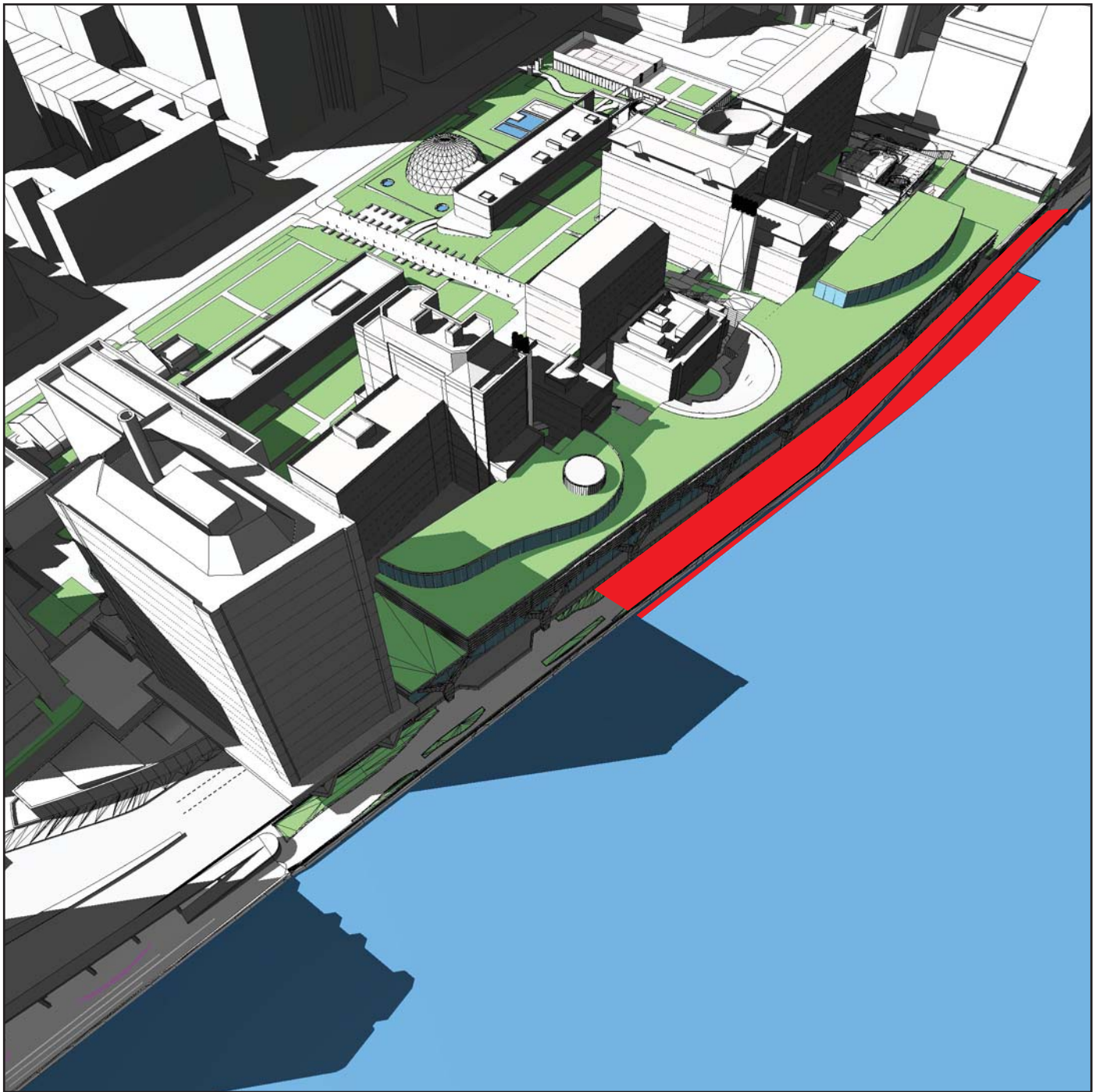
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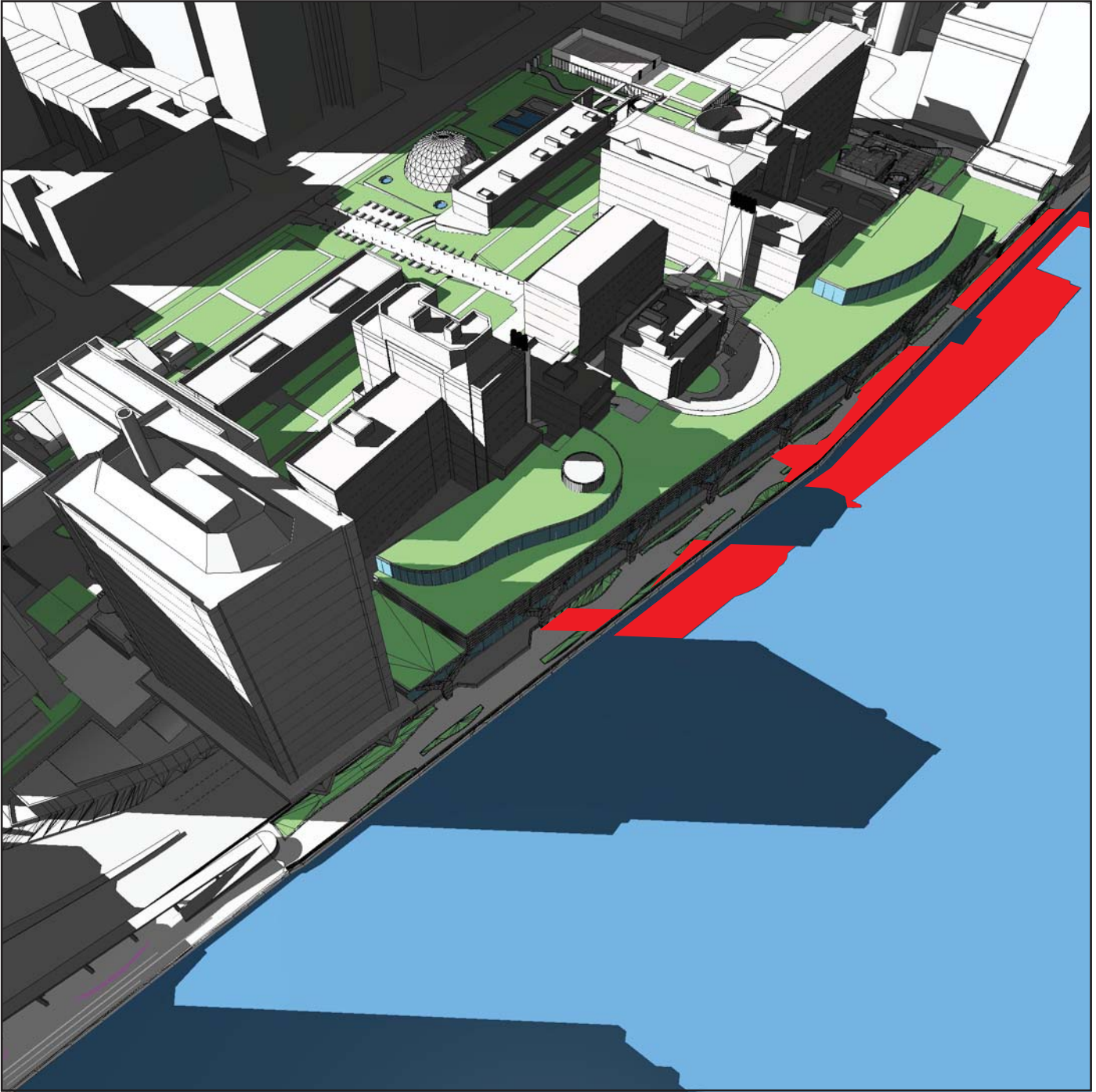
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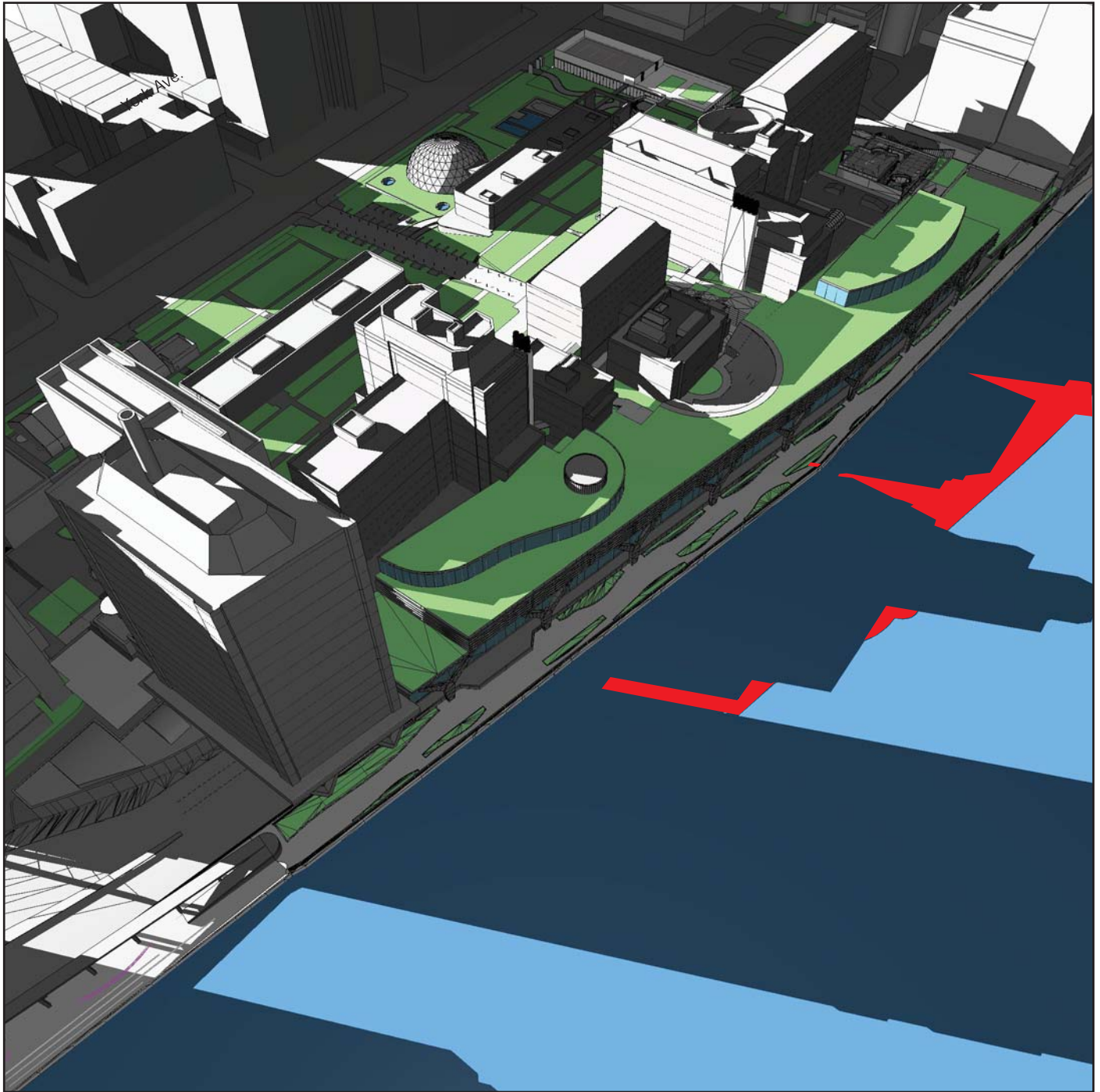
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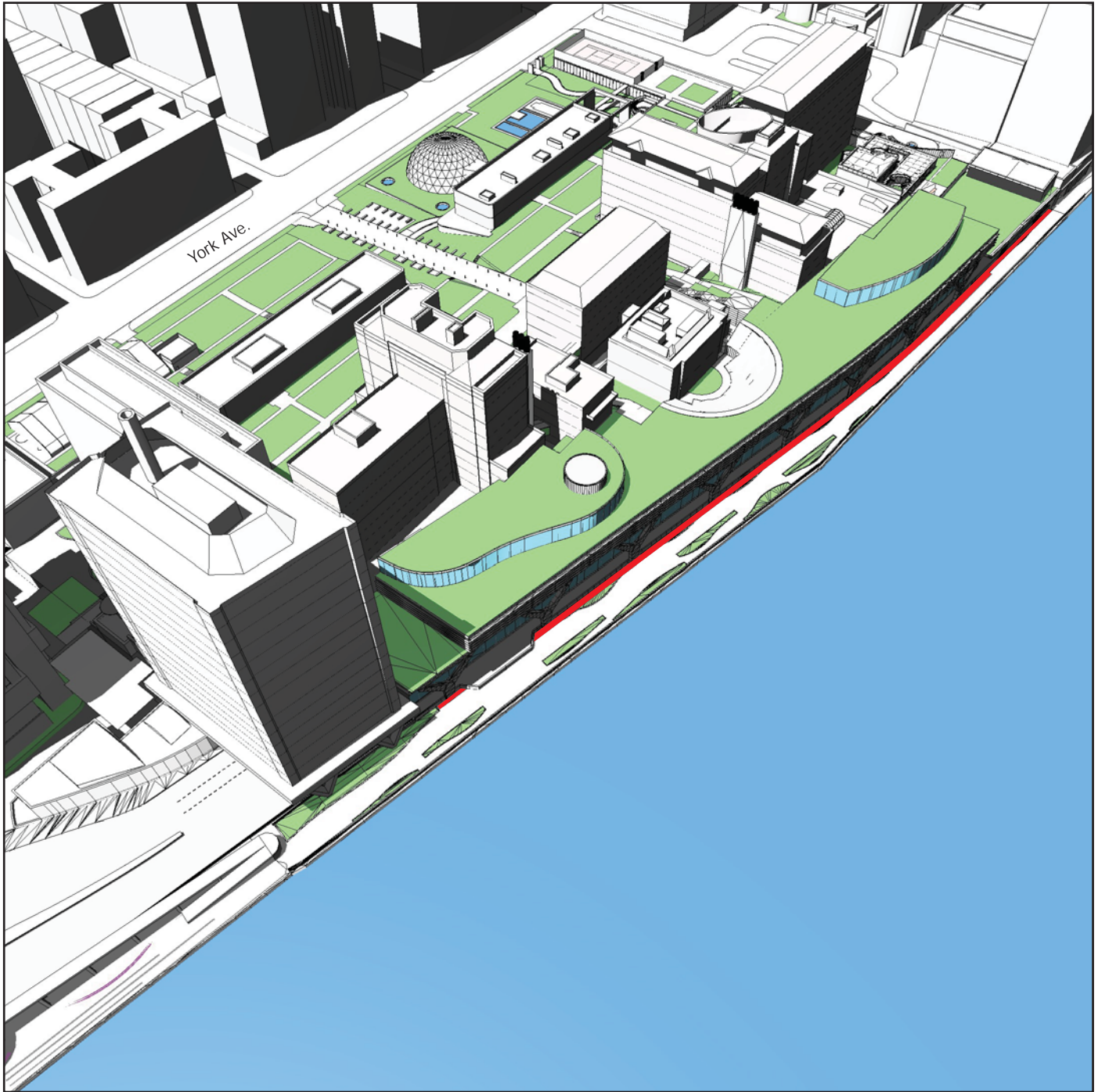
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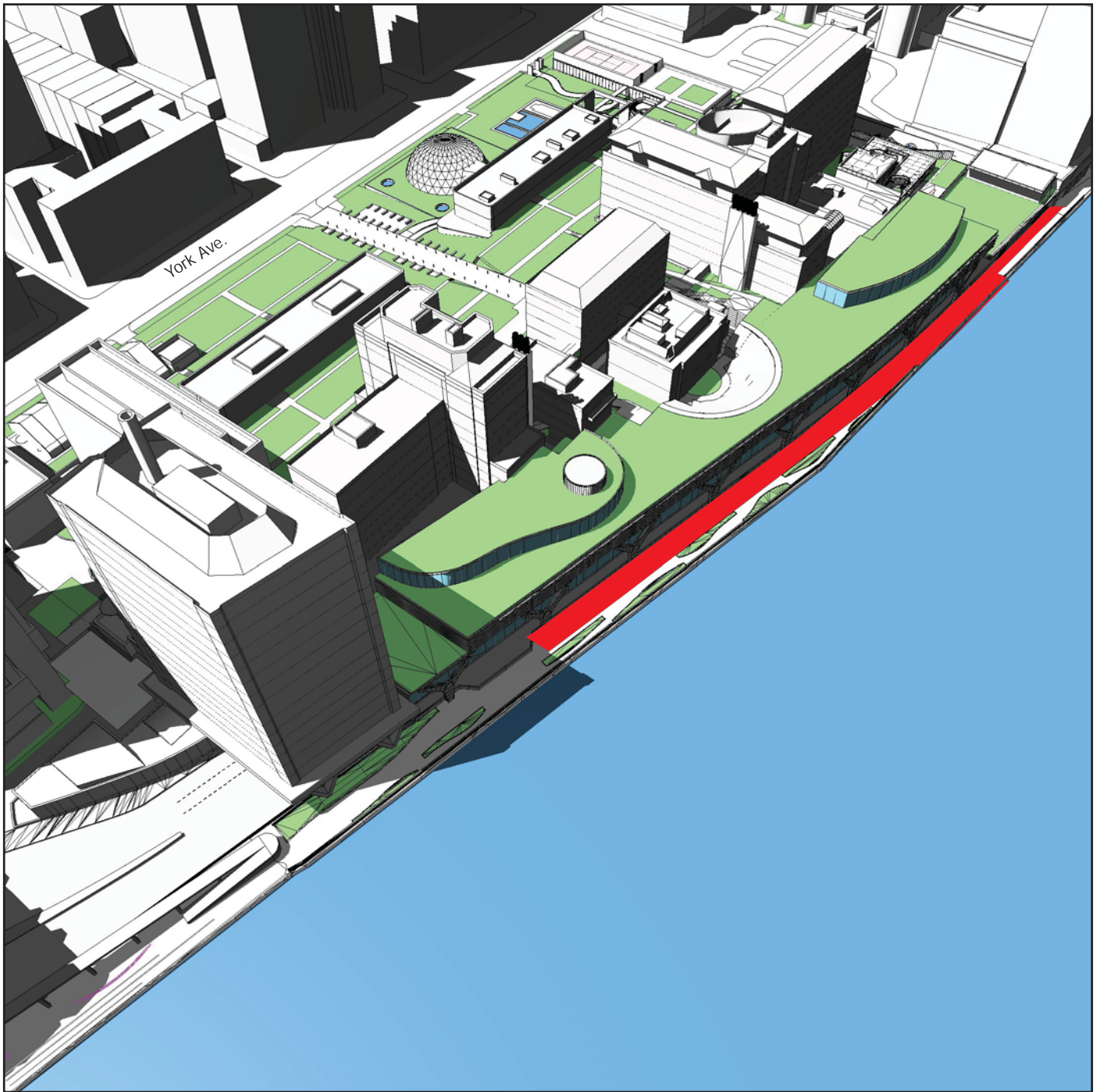


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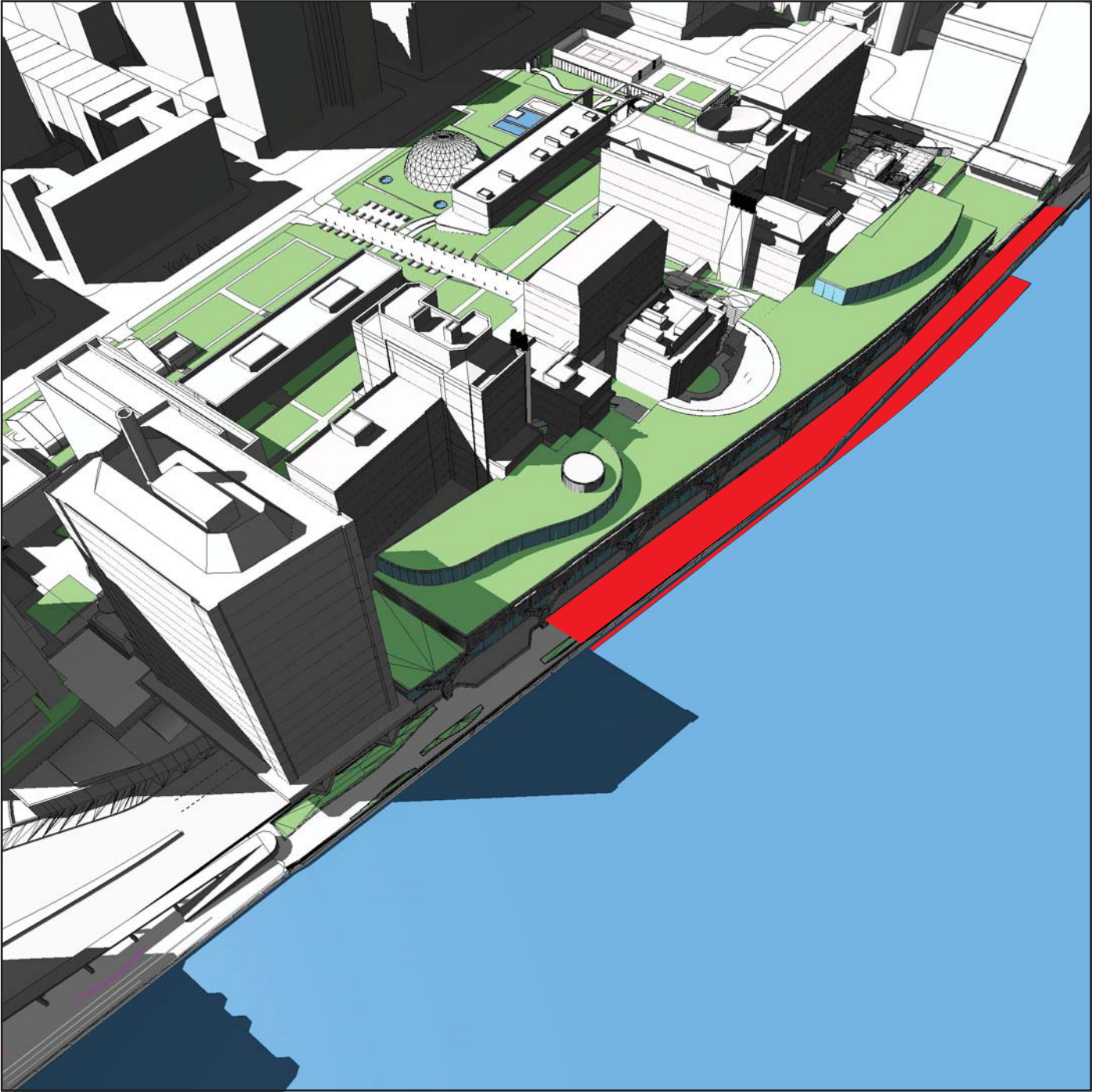




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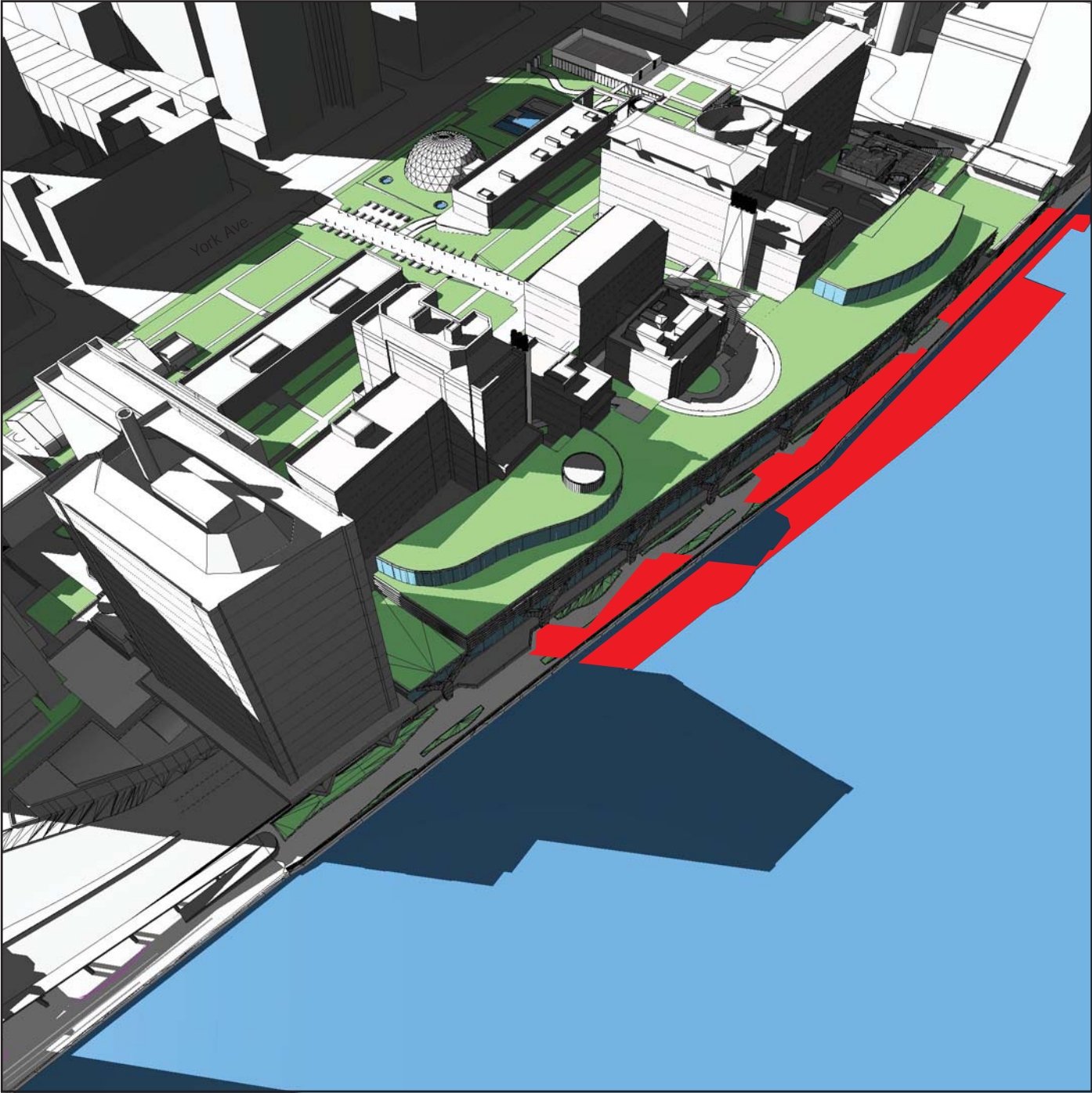
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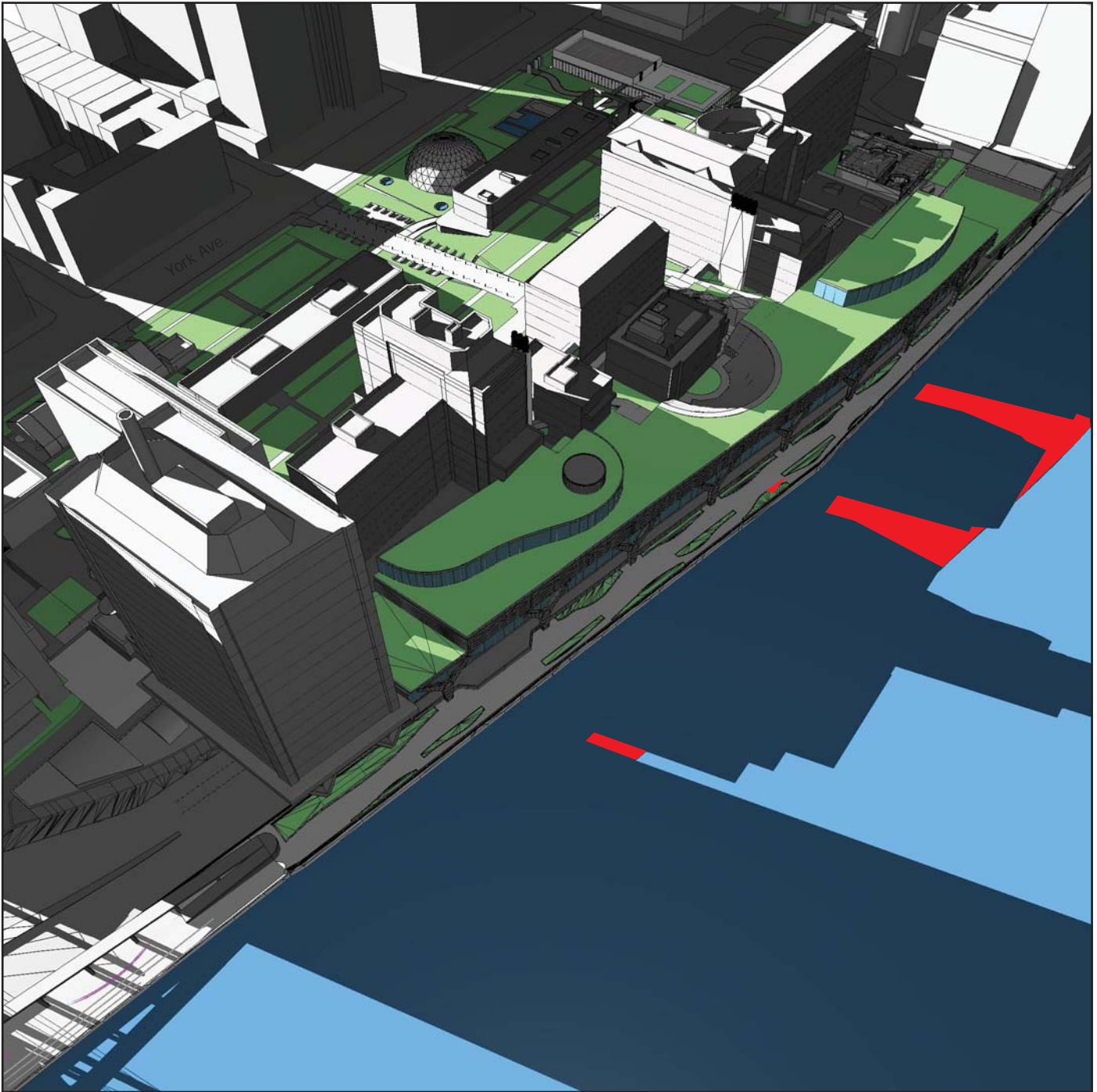
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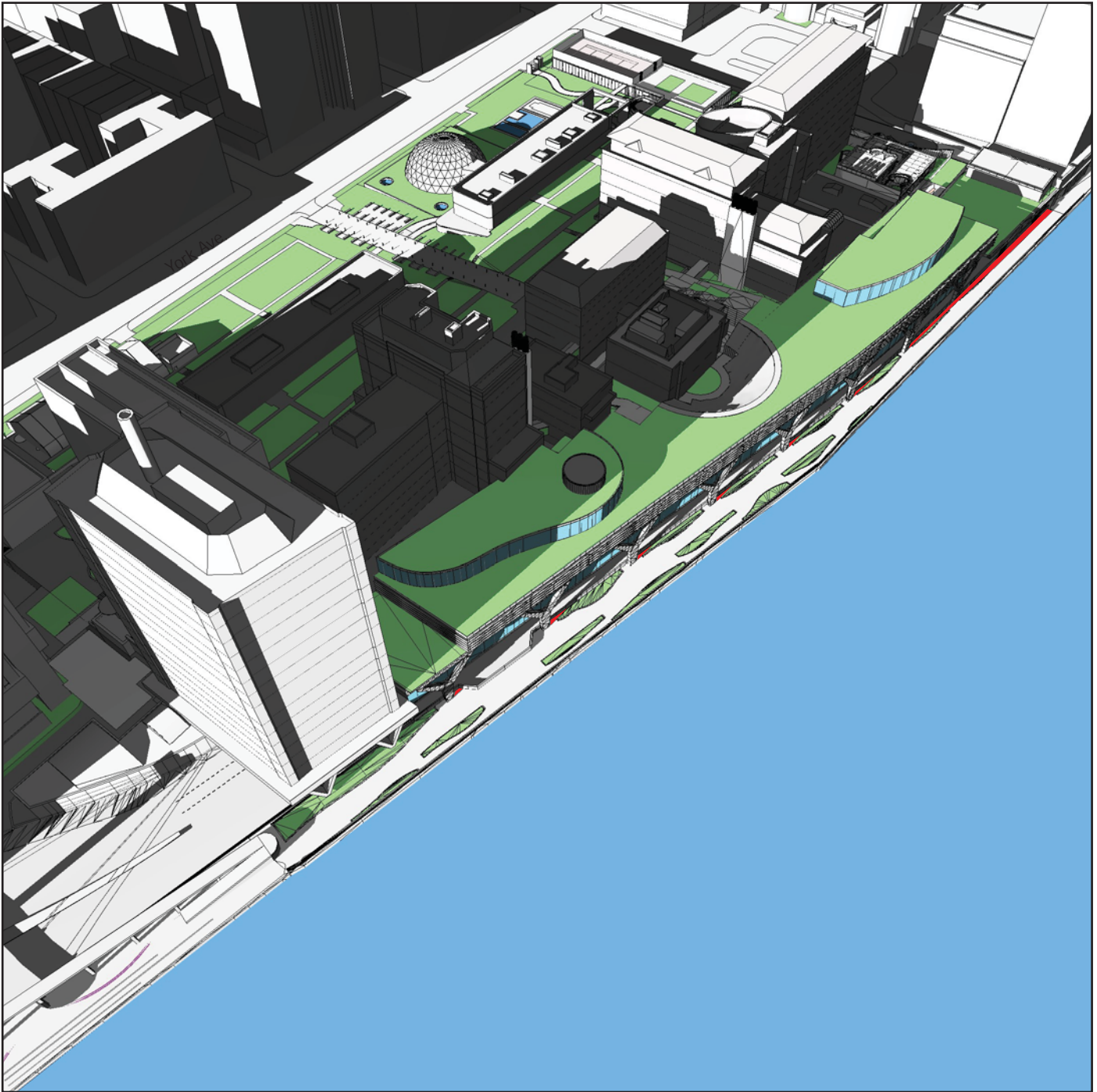
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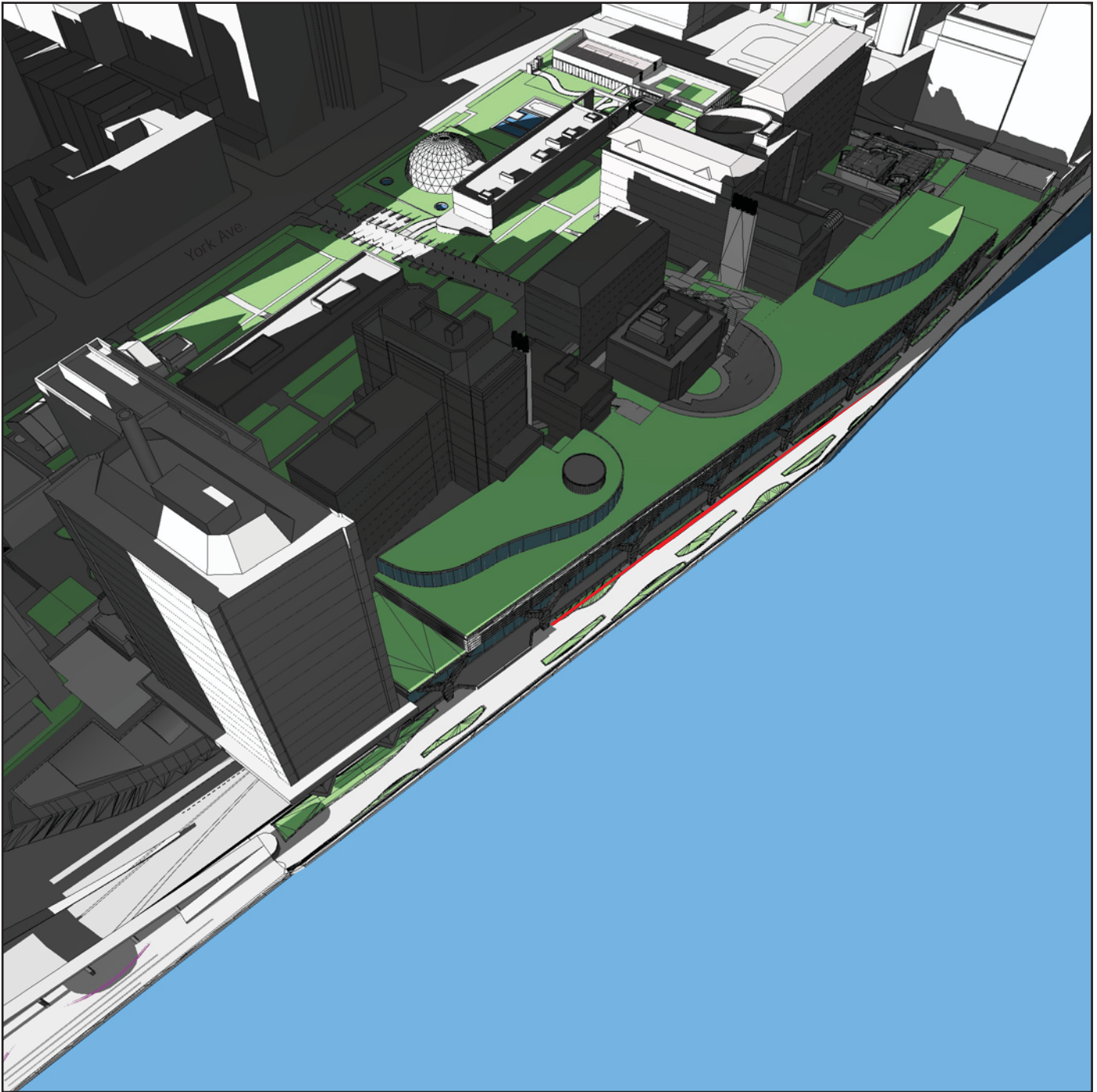
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- Incremental Shadow*

Note: Daylight Saving Time not used.

Note: For Illustrative Purposes Only. Between the DEIS and FEIS the esplanade design was modified through discussions with DCP and DPR. The shadows analysis and conclusions are not affected by the design modifications.



- Publicly-Accessible Open Space or Historic Landscape*
- East River*
- Incremental Shadow*

Note: Daylight Saving Time not used.

Note: For Illustrative Purposes Only. Between the DEIS and FEIS the esplanade design was modified through discussions with DCP and DPR. The shadows analysis and conclusions are not affected by the design modifications.

(except for the very narrow incremental shadows from the support columns of the proposed laboratory building and North Terrace).

Beginning at 1:15 PM small shadows from the proposed North Terrace would move onto the western edges of the esplanade. Fifteen minutes later, shadow from the proposed laboratory building itself would move onto the esplanade (see **Figure 4-8**). At 2:00 PM, incremental shadow would remain fairly minimal on the esplanade (see **Figure 4-9**). The incremental shadow would continue to spread eastward across the esplanade, and at 2:30 PM would reach a small section of the East River. Starting at about 3:00 PM the incremental shadow would eliminate all remaining areas of sunlight on the esplanade in the study area except a small area at the eastern edge of the esplanade (see **Figure 4-10**). By 3:20 PM the small remaining sunlit area would be in shadow as well, and the project would continue to eliminate remaining sunlight until 4:10 PM, after which point the esplanade would be entirely in existing shadows (see **Figure 4-11**).

#### **MAY 6/AUGUST 6 (FIGURES 4-12 TO 4-17)**

May 6 falls halfway between the March 21 equinox and the June 21 summer solstice. August 6 falls halfway between June 21 solstice 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 day is longer.

The stack abutting the Flexner Hall Extension would cast a small incremental shadow on the historic landscape from the start of the analysis day at 6:27 AM until about 7:45 AM. Shadow from the stack abutting the Hospital would be too short to reach the central landscaped area by the time the shadow would move off the Hospital's roof and fall northwest.

The East River Esplanade and adjacent areas of the East River would be fully in sun from the start of the analysis day at 6:27 AM until early afternoon, except for the narrow incremental shadows on the esplanade from the proposed laboratory building's support columns.

Beginning at about 12:30 PM, incremental shadow from the North Terrace would move onto the western edges of the esplanade, and fifteen minutes after that, incremental shadow from the proposed laboratory building would enter the adjacent portion of the esplanade. At 1:00 PM the incremental shadows would continue to be limited to small areas adjacent to the FDR Drive while most of the esplanade would continue to be in sun (see **Figure 4-12**). Just after 2:00 PM incremental shadow would enter a small section of the East River (see **Figure 4-13**). Starting at about 3:00 PM the incremental shadow would eliminate all remaining areas of sunlight on the esplanade in the study area (see **Figure 4-14**). The project would continue to eliminate remaining sunlight until 5:00 PM, after which the esplanade would be entirely in existing shadows (see **Figures 4-15 and 4-16**). South of the project site, a small area of the esplanade, between East 62nd and East 63rd Streets, would remain in sunlight until about 4:00 PM.

#### **JUNE 21 (FIGURES 4-18 TO 4-23)**

June 21 has the longest daylight duration 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 mid-day are shorter than at any other time of year. June 21 is also in the growing season.

The stack abutting the Flexner Hall Extension would cast a small incremental shadow on the historic landscape for about five minutes, from 7:10 AM to 7:15 AM.

The East River Esplanade and adjacent areas of the East River would be fully in sun from the start of the analysis day at 5:57 AM until noon, except for the narrow incremental shadows from the proposed laboratory building's and North Terrace's support columns that extend onto small areas at the esplanade.

Beginning at 12:15 PM shadow from the North Terrace would move onto the western edges of the esplanade. About 15 minutes later, shadow from the proposed laboratory building would also move onto the adjacent portion of the esplanade. Incremental shadows would remain small at first (see **Figure 4-17** showing 1:00 PM), but would gradually spread eastward across the esplanade, and at 2:00 PM would enter a small section of the East River (see **Figure 4-18**). Starting at about 3:00 PM the incremental shadow would eliminate all remaining areas of sunlight on the esplanade in the study area (see **Figure 4-19**). The project would continue to eliminate remaining sunlight until 5:40 PM, after which the esplanade would be entirely in existing shadows (see **Figures 4-20 and 4-21**). South of the project site, a small area of the esplanade, between East 62nd and East 63rd Streets, would remain in sunlight until about 5:15 PM.

#### **DECEMBER 21**

December 21, representing the winter months, does not fall within New York City'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. December 21 has the shortest daylight duration of the year; shadows are longer than at any other time of year, and they move quickly over the course of the day.

The stack abutting the Hospital would cast a long but narrow shadow to the northwest across portions of the historic landscape in the center of the campus from 9:15 AM to 11:30 AM.

The esplanade and adjacent areas of the East River would be fully in sun from the start of the analysis day at 8:51 AM until 2:20 PM, except for the narrow incremental shadows from the proposed laboratory building's support columns on small adjacent areas of the esplanade. From 2:20 PM until the end of the analysis day at 2:53 PM, a narrow band of incremental shadow would fall on the esplanade, while most of the esplanade in the study area would remain in the sun (see **Figures 4-22 and 4-23**).

### **E. CONCLUSIONS**

This section summarizes the potential shadow effects for each resource of concern.

#### **EAST RIVER ESPLANADE**

Separated from Manhattan's street grid by the FDR Drive and the superblocks containing Rockefeller University and New York Presbyterian Hospital-Weill Cornell Medical College (NYPH-Weill Medical College), the portion of the East River Esplanade adjacent to the project site contains small planted areas, some trees, and benches. The esplanade is predominantly used for active recreation—not as a primary connector between two points—that walkers, runners, and bike riders move through. The esplanade does not appear to be a destination for passive open space use as the benches experience limited use, as described in Chapter 3, "Open Space."

The proposed laboratory building and North Terrace would cast shadows in the afternoon onto the adjacent portion of the esplanade to the east. The esplanade would continue to receive direct sunlight throughout the morning, and on its eastern half into the early afternoon. Incremental



shadows from the laboratory building and North Terrace would enter the western edges of the esplanade in the early afternoon. The incremental shadows would spread gradually eastward across the esplanade, and in the spring, summer and fall would remove all sunlight beginning in the midafternoon around 3:00 PM. The esplanade would remain in existing and incremental shadow for the remainder of the analysis day in these seasons.

Any vegetation, including the small planted areas and trees on the esplanade in addition to any new plantings that would be located on the esplanade as part of the proposed project, would continue to receive a minimum of five and a half hours of direct sunlight throughout the growing season. Further any new plantings on the esplanade would be shade tolerant.

The incremental shadow would eliminate most or all of the sunlight on the esplanade within the study area for 50 minutes on March 21 and September 21, two hours on May 6 and August 6, and two hours and 40 minutes on June 21. Therefore, the proposed project would result in significant adverse shadow impacts in those seasons to users of the open space seeking direct sun. In winter, portions of the esplanade in the study area would remain in sun until the end of the analysis day. In all seasons, views to the sky and the East River to the east would remain totally unobstructed throughout the afternoons, and would continue to provide much ambient daylight and reflected sunlight from the East River, unlike most urban parks and plazas at that time of day. Further, as identified in Chapter 3, "Open Space," the esplanade is predominantly used for active recreation, including walking, running, and biking, and most users of the esplanade would pass through the affected areas of the esplanade adjacent to the project site.

As described in Chapter 13, "Mitigation," the significant adverse shadows impact would be partially mitigated through a substantial upgrade to the portion of the East River Esplanade adjacent to the project site and would extend an additional approximately 150 feet south of the project site. Partial mitigation would also include bulkhead repair and rebuilding that would be undertaken ~~adjacent to the project site, in addition to a 150 linear foot area south of the project site,~~ where deficiencies have been identified in studies undertaken by ~~the New York City Department of Parks and Recreation (DPR)~~. The bulkhead repair and rebuilding would extend the entire length of the esplanade adjacent to the project site and would extend an additional approximately ~~150-222~~ feet south of the project site. In addition to the measures identified above, partial mitigation will also include at least a 12-year commitment by the applicant to maintain plantings on the portion of the esplanade that would be improved with the proposed project. These measures are included in a Restrictive Declaration.

Between the Draft and Final EIS, the applicant ~~will considered~~, in consultation with DPR and DCP, whether there are additional mitigation measures that are feasible and practicable that could be implemented to further alleviate the significant adverse shadows impact. No further mitigation measures for the significant adverse shadows impact have been identified beyond those described in Chapter 13, "Mitigation."

## **EAST RIVER**

The proposed project would increase the extent of existing shadows on this section of the East River by a maximum of only 1.1 total acres, and for only two to four hours in the mid-afternoon during spring, summer, and fall. As shadow coverage incrementally shifts with the movement of the sun, no single area would be shaded for extended periods of time, and these areas would continue to receive more than six hours of sunlight over the course of each analysis day in all seasons. Further, the current in the East River is swift (3 to 4 feet/second), and light-dependent

phytoplankton would be moved through newly shaded areas quickly.<sup>1</sup> The negligible spatial and temporal increase in existing shadow coverage of the river would not significantly alter primary productivity or other properties of the system to impact aquatic biota. The areas would be expected to continue to support the same assemblage of aquatic organisms as at present. Overall, shadows cast by the proposed project would not have significant adverse impacts to aquatic resources of the East River. \*

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<sup>1</sup> Source: U.S. National Oceanic and Atmospheric Administration: <http://tidesandcurrents.noaa.gov/currents07/tab2ac4.html>