

A. INTRODUCTION

The Proposed Project would create a series of retail buildings of up to four stories in height, a six-level parking garage, and a hotel. This chapter describes the potential effect of the incremental shadows from the proposed buildings on surrounding open spaces and sun-sensitive historic resources.

As described below, the analysis shows that the Proposed Project would have no significant adverse shadow impacts. The proposed buildings would cast shadows on Macombs Dam Park, but these shadows would be cast during the midday hours of the winter months and would mostly fall on paved areas, and thus would not affect park usage or vegetation growth. The open space to be created by the City on the west side of Exterior Street would receive incremental shadows throughout the year; however, the open space would be only covered by project-generated shadows in the early morning hours. Incremental shadows would not meet any of the criteria that would lead to a significant adverse impact based on shadow coverage.

B. METHODOLOGY

Following the guidelines of the 2001 *New York City Environmental Quality Review (CEQR) Technical Manual*, this analysis considers shadows on four representative days of the year: March 21st/September 21st, the equinoxes; May 6th/August 6th, the midpoints between the summer solstice and the equinox; June 21st, the summer solstice and the longest day of the year; and December 21st, the winter solstice and shortest day of the year. In identifying potential effects, CEQR focuses on uses and users of the open space, landscaping and vegetation, and, if there are historic resources, features or details that are both sunlight-dependent and make such resources significant. The CEQR methodology does not consider shadows and incremental increases in shadows within 1½ hours of sunrise or sunset. Therefore, the analysis period is between 1½ hours after sunrise and 1½ hours before sunset.

The *CEQR Technical Manual* identifies the following as situations when a significant shadow impact may occur:

- Substantial reduction in sunlight where a sensitive use is already subject to substandard sunlight (i.e., less than the minimum time necessary for survival);
- Reduction in sunlight available to a sensitive use from more to less than the minimum time necessary for its survival;
- Substantial reduction in sunlight to a sun-sensitive use or feature; and
- Substantial reduction in the usability of the open space.

C. SHADOW SCREENING

Because of the heights of the proposed buildings and the location of several open spaces near the project site, a shadow screening analysis was performed to identify those open spaces or historic resources that could be affected by shadows from the Proposed Project. Following the guidelines of the *CEQR Technical Manual*, a complete list of all sun-sensitive historic resources and open spaces was created within the area of the potential shadow sweep of the proposed buildings.

To identify resources of concern, the potential maximum length of the shadows is first considered. A building has a maximum shadow length factor equal to 4.3 times its height during the December analysis. This occurs during the beginning and end of the analysis period when shadows are cast in a west and east direction, respectively. Towards midday, the shadow length factor becomes smaller as the sun rises in the sky and at noon shadows are cast 2.07 times the height of the building. For example, since the proposed hotel would be approximately 230 feet in height, it would have a maximum shadow length factor of approximately 989 feet at the beginning and end of the analysis period and approximately 476 feet at noon. In general, shadow length factors for the remainder of the analysis periods are shorter than they are in December. However, the days are longer, resulting in a larger analysis period and thus a larger shadow sweep. This means that during the December analysis period, shadows can only be cast up to 43 degrees east and west, and in June, the longest analysis period, shadows can be cast up to 108 degrees, allowing for open spaces to have a potential effect in June that would not be reached by shadow in December. After the maximum shadow length of the Proposed Project was determined, open spaces and sun-sensitive historic resources within the shadow sweep were identified.

OPEN SPACES & HISTORIC RESOURCES

Table 6-1 lists all of the open spaces that fall within the ¼-mile open space study area. Eliminated from further analysis are open spaces that would be out of shadow range of the proposed buildings (e.g., any resources directly south of the project site) or that would not be affected by project shadows because they are already covered by shadows from existing buildings.

Table 6-1
Shadows Screening:
Open Spaces Within Maximum Shadow Distance

Map Ref.	Open Spaces Within ¼-Mile Study Area	Outside Reach of Potential Shadows
Open Spaces Included in Analysis		
2	Macombs Dam Park	NO
Open Spaces Screened out of Analysis		
1	Joyce Kilmer Park	YES
3	John Mullaly Park	YES
4	Franz Sigel Park	YES

For a complete list and description of the open spaces and historic resources in the area see Chapter 5, “Open Space” and Chapter 7, “Historic Resources,” respectively. There are no historic resources with sun-sensitive features or historic landscapes expected to be affected by the shadow sweep of the Proposed Project.

D. RESOURCES OF CONCERN FOR FURTHER ANALYSIS

The only publicly accessible open space that was identified as being potentially affected by project shadows was Macombs Dam Park. Macombs Dam Park is divided into several segments. The segment north of East 161st Street contains a track, a football field with bleachers, and two baseball fields. South of East 161st Street adjacent to Yankee Stadium, the park contains handball courts, basketball courts, a baseball field with bleachers, a comfort station, and several paved plazas with benches. The eastern portion of the park is a parking area. Along East 161st Street west of Jerome Avenue are several small landscaped areas that are part of Macombs Dam Park. The triangle between the Macombs Dam Bridge approach and Jerome Avenue contains trees and a lawn area with a walking path. The portion of the park between Anderson and Woodcrest Streets contains benches and a game table; the portion between Woodcrest and Ogden Streets contains a grassy hill slope, game tables, and benches; and the portion between Ogden Street and Summit Avenue contains Summit Playground and a grassy hill.

In the future with the Proposed Project, the City—with contributions from the project sponsor—would develop a new, approximately 2-acre publicly accessible waterfront open space on a portion of the Bronx Terminal Market area west of Exterior Street. While the programming of this open space and the actions required for its development are yet to be determined, the City is committed to developing the off-site public open space by the Proposed Project's 2009 Build year. Therefore, this analysis accounts for this new open space (see Figure 6-1).

E. ASSESSMENT OF SHADOW IMPACTS

The sun rises in the east and casts its earliest (and longest) shadows towards the west. Later in the morning, the sun rises higher in the sky, casting shorter shadows towards the northwest. At noon (1:00 PM DST), the sun is at its highest point in the sky and casts the shortest shadows of the day to the north. In the afternoon, the sun continues to move west and begins to descend, casting longer shadows toward the northeast and east.

In its yearly cycle, the height of the sun in the sky and the time and directional location at which it rises and sets varies by season. In the winter, the sun travels in a low arc across the southern sky, rising late in the southeast and setting early in the southwest. Because it is so low in the sky, it casts longer shadows. In the spring and fall, the sun arcs through the sky at a somewhat higher angle, rises earlier in the east, and sets later in the west. In these seasons, shadows are of moderate length. In the summer, the sun arcs through the sky at its highest angle, rising almost directly overhead at noon. For this reason, summer shadows are shortest. However, in the summer, the sun rises earliest and sets latest; it also travels farther, from the northeast to the northwest. Thus, the summer sun casts shadows in more directions than those seen in other seasons and its late sunset and early sunrise creates shadows earlier in the morning and later in the evening than in other seasons.

MARCH 21/SEPTEMBER 21 ANALYSIS PERIOD: 7:36 AM TO 4:29 PM EASTERN STANDARD TIME (EST)

On the equinoxes (March 21 and September 21), shadows from the Proposed Project would not create incremental shadows on Macombs Dam Park. The proposed buildings' shadows would not reach the park.

The Proposed Project would begin to cast shadows on the open space to be created by the City starting at 7:36 AM (see Table 6-2 and Figure 6-2). By 8:15 AM the shadows would have moved off of the open space.

**Table 6-2
Project Shadow Durations**

Open Space	March 21/ September 21 7:36 AM – 4:29 PM EST	May 6/August 21 7:27 AM – 6:18 PM DST	June 21 6:57 AM – 7:01 PM DST	December 21 8:51 AM – 2:53 PM EST
Macombs Dam Park	—	—	—	11 AM – 2:30 PM EST
<u>City-Created Public Open Space</u>	<u>7:36 AM – 8:15 AM EST</u>	<u>7:27 AM – 8:30 AM DST</u>	<u>6:57 AM – 8:15 AM DST</u>	<u>8:51 AM – 9:30 AM EST</u>
Notes: September 21 is the equivalent of March 21, but one hour later. August 6 is the equivalent of May 6.				

MAY 6/AUGUST 6 ANALYSIS PERIOD: 7:27 AM TO 6:18 PM DAYLIGHT SAVINGS TIME (DST)

During this analysis period, shadows from the Proposed Project would not create incremental shadows on Macombs Dam Park. The proposed buildings' shadows would not reach the park.

The open space to be created by the City would be in shadow from Retail Building B/F of the Proposed Project starting at 7:27 AM (see Table 6-2). By 7:45 AM the shadows from the proposed Retail Building B/F would have moved east, covering a small portion of the open space (see Figure 6-3). Incremental shadows would remain on the open space until 8:30 AM.

JUNE 21 ANALYSIS PERIOD: 6:57 AM TO 7:01 PM DST

On the summer solstice, the longest day of the year, the Proposed Project would not cast incremental shadows on Macombs Dam Park. The proposed buildings' shadows would not reach the park.

The Proposed Project would begin to cast shadow on the open space to be created by the City starting at 6:57 AM (see Table 6-2 and Figure 6-4). By 8:15 AM the shadows would have moved off of the open space.

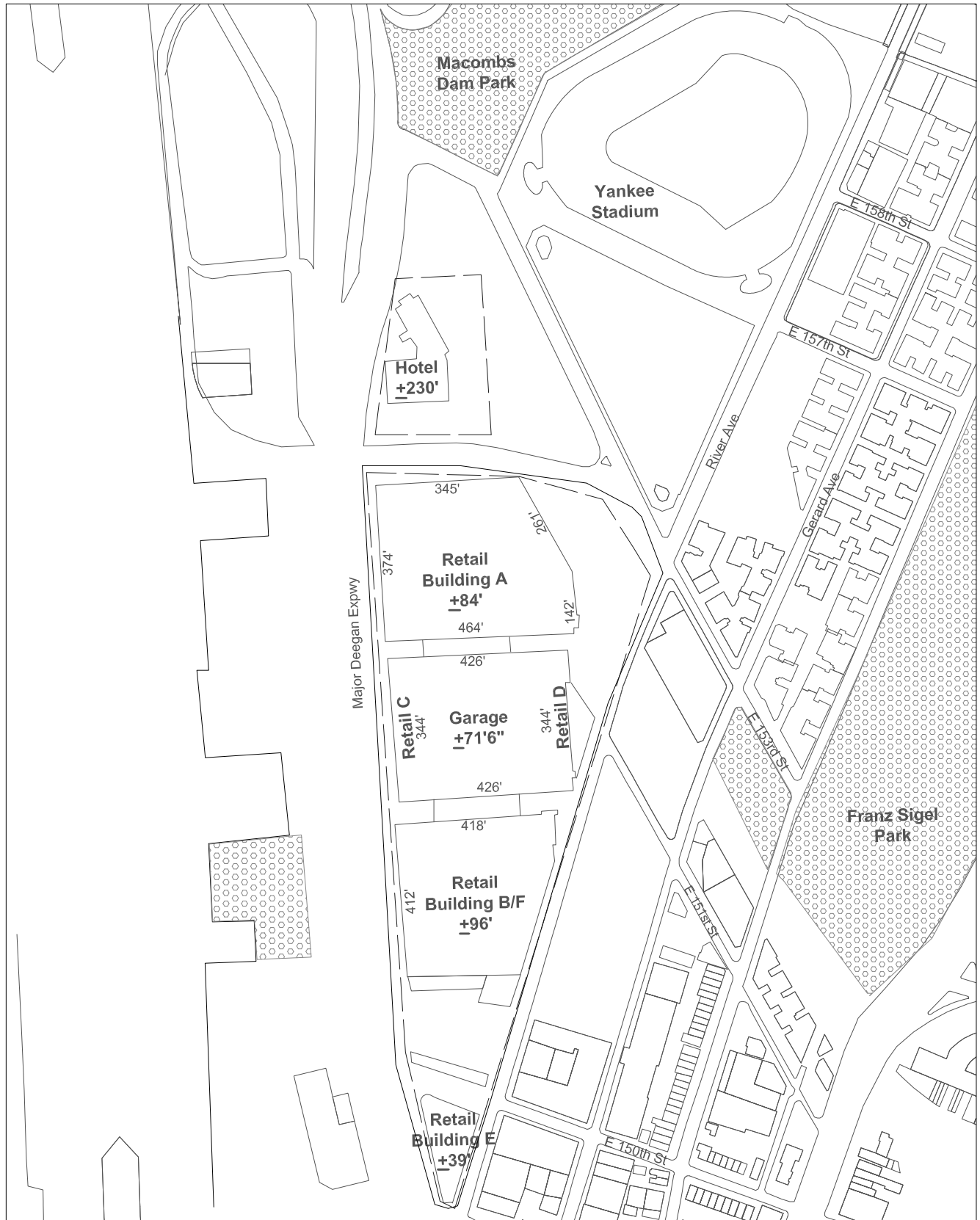
DECEMBER 21 ANALYSIS PERIOD: 8:51 AM TO 2:53 PM EST

On the shortest day of the year, the winter solstice, the open space to be created by the City would be cast into shadow in the beginning of the analysis period (see Figure 6-5). By 9:30 AM the incremental shadows would have moved off of the open space.

The proposed hotel would begin to cast shadows on the southwest corner of Macombs Dam Park (below East 161st Street) at 11:45 AM (see Table 6-2 and Figure 6-6). The incremental shadows would increase in size as they move across the bottom of the park (see Figure 6-7). By 2:30 PM, the last of the incremental shadow would be off the park (see Figure 6-8).

CONCLUSIONS

Based on the guidelines of the *CEQR Technical Manual*, the Proposed Project would have no significant adverse shadow impacts. There would be new shadow increments on Macombs Dam Park during the midday hours in the December analysis period, but not so much of an increase as to cause a substantial reduction of usage for the open space or to limit the available sunlight so that vegetation would not be able to survive. These shadows would mostly fall on paved areas. The open space to be created by the City would receive incremental shadows throughout the year; however, it would only be covered by project-generated shadows in the early morning hours. In summary, incremental shadows would not meet any of the criteria that would lead to a significant adverse impact based on shadow coverage. *

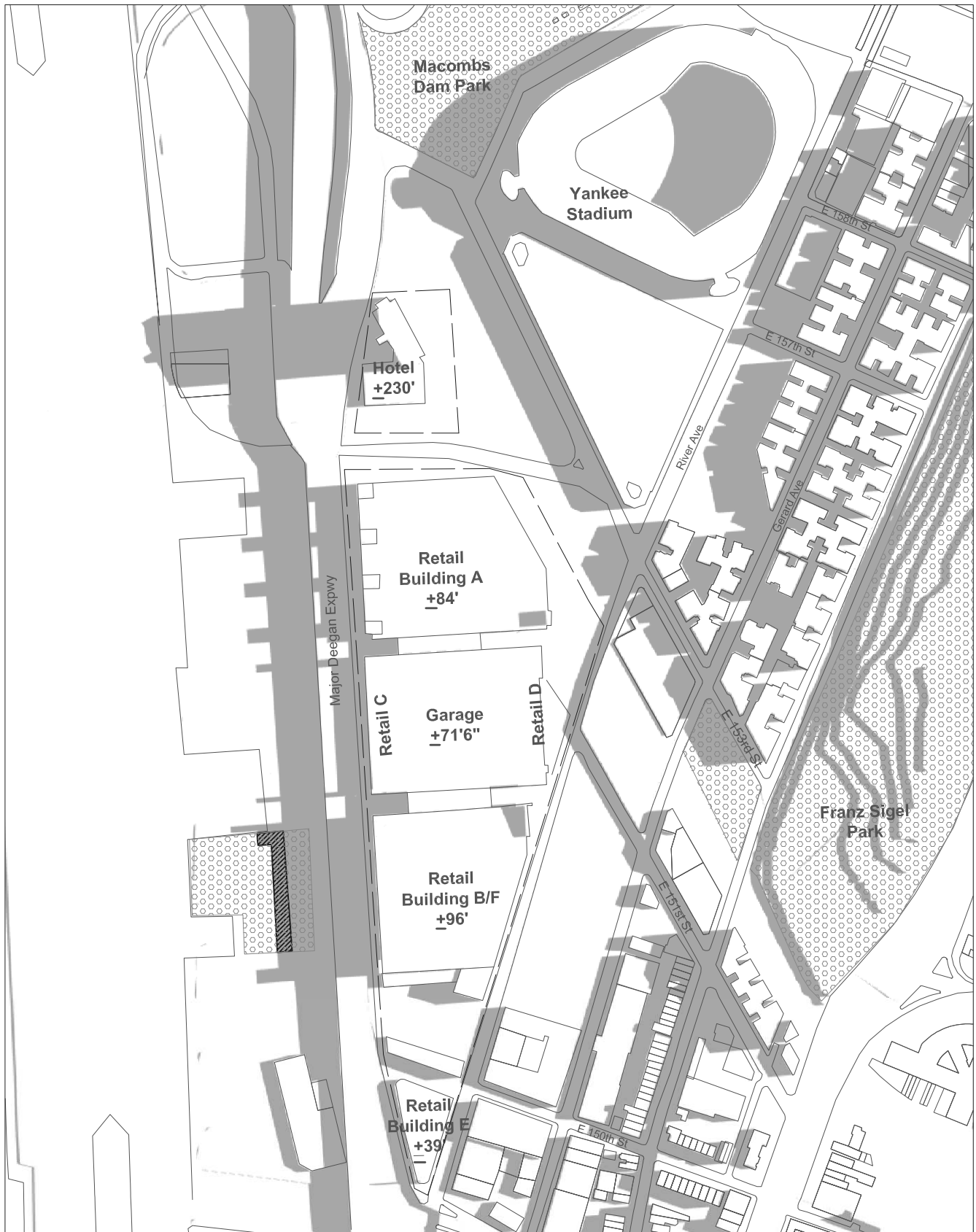


LEGEND

- Project Site
- Open Space

SCALE
0 300 600 IN FEET

Approximate Heights and Dimensions of
Proposed Buildings
Figure 6 - 1

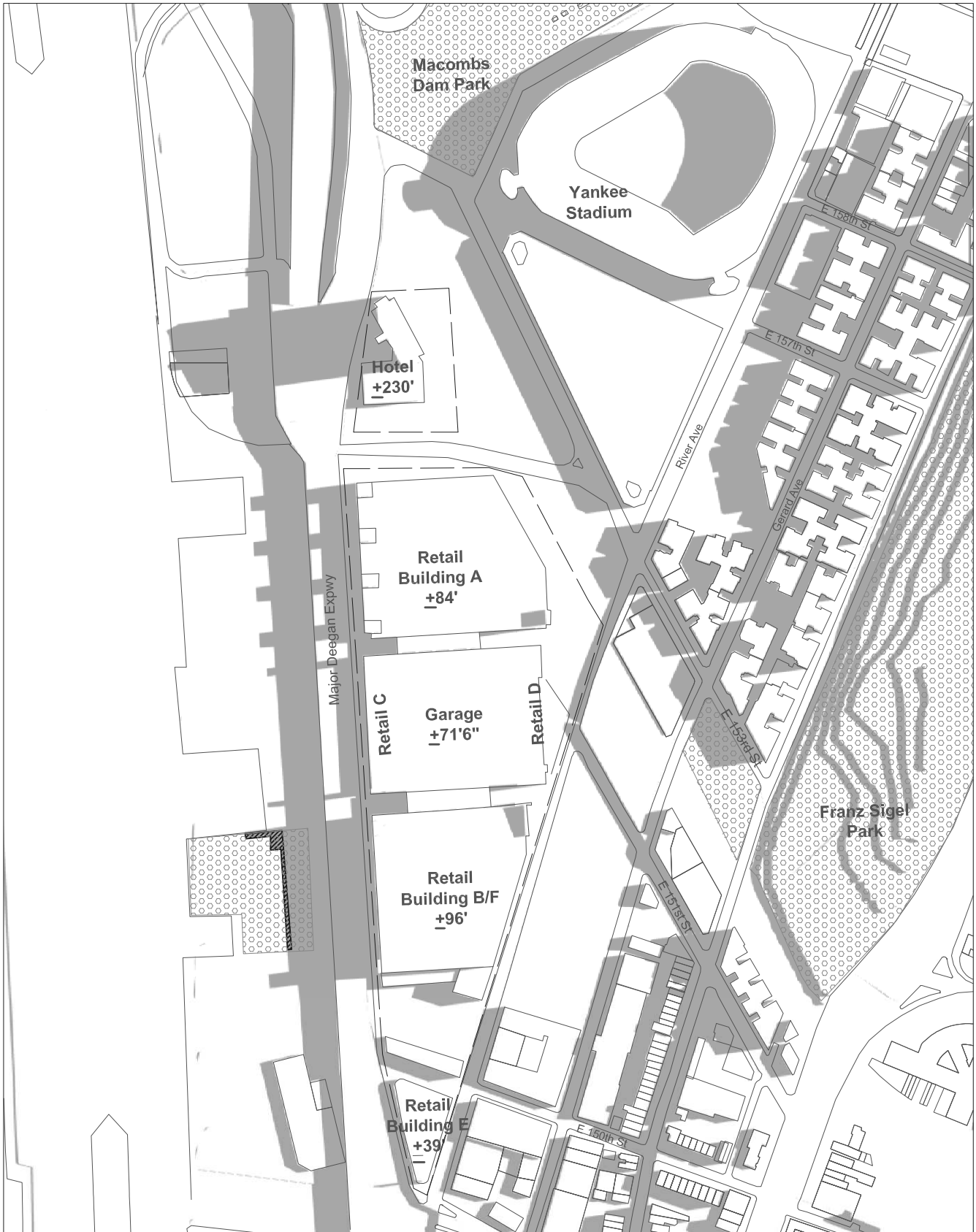


LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
 March 21 - 7:45 AM EST
 Figure 6 - 2

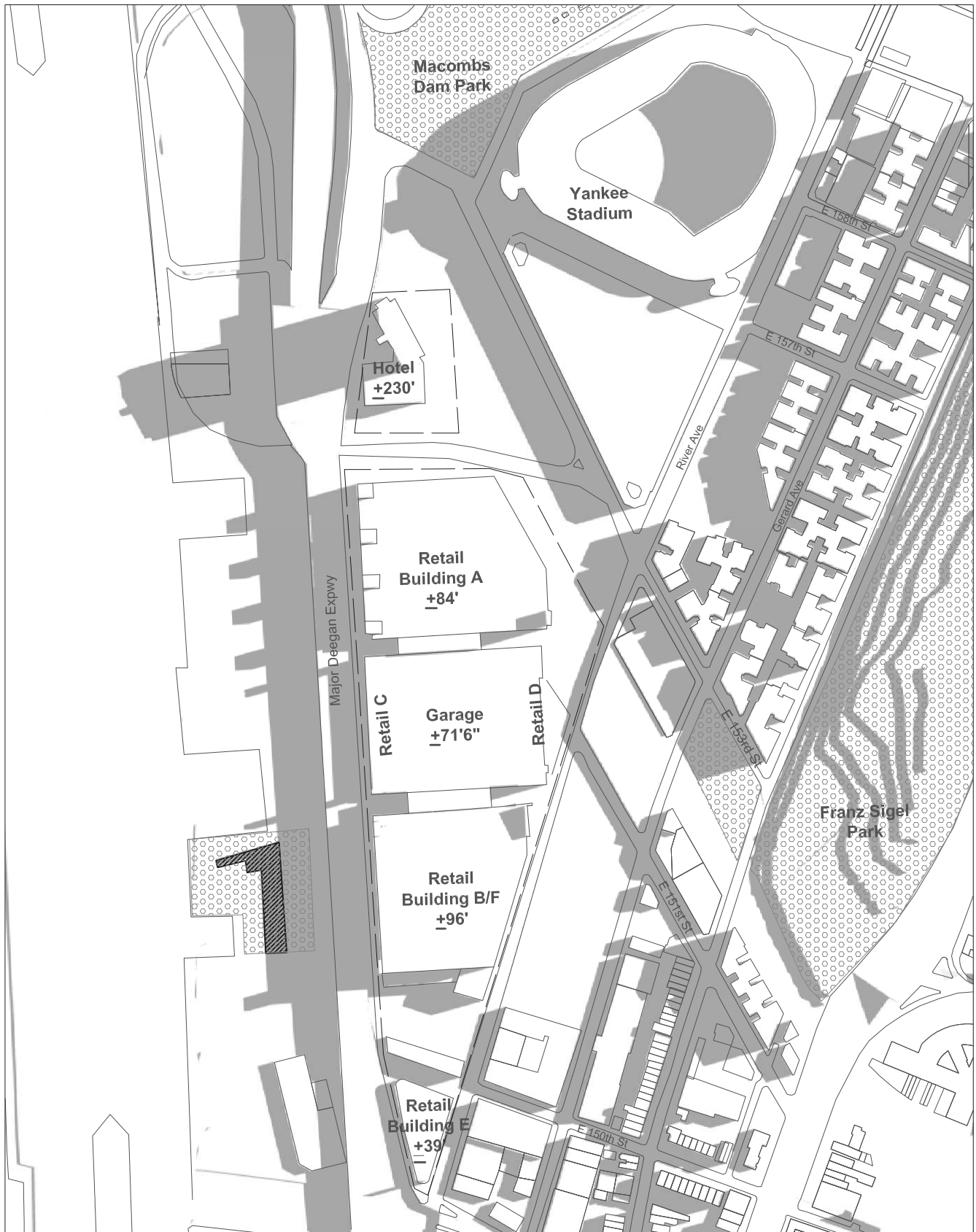


LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
May 6 - 7:45 AM DST
Figure 6 - 3

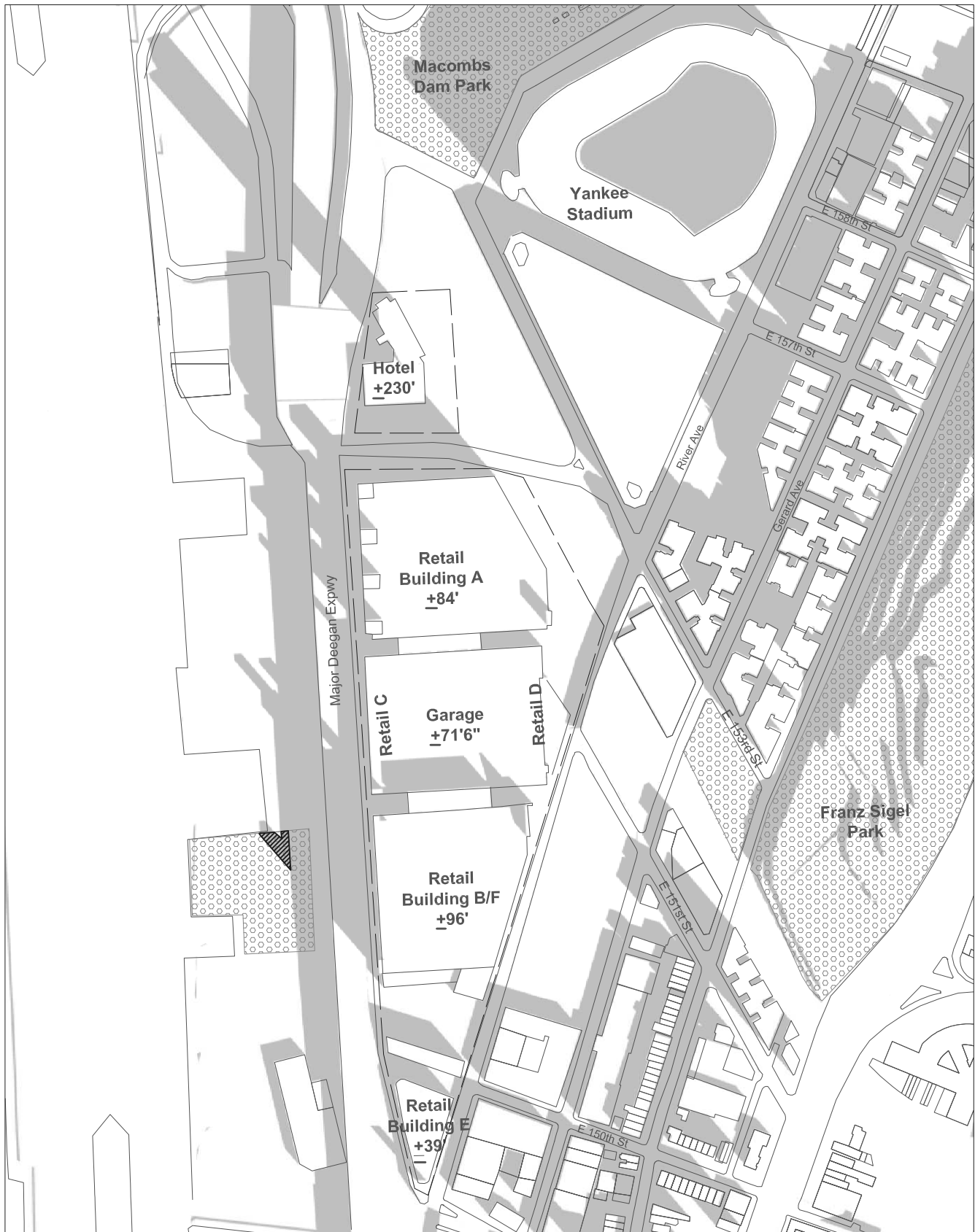


LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
June 21 - 7:15 AM DST
Figure 6 - 4

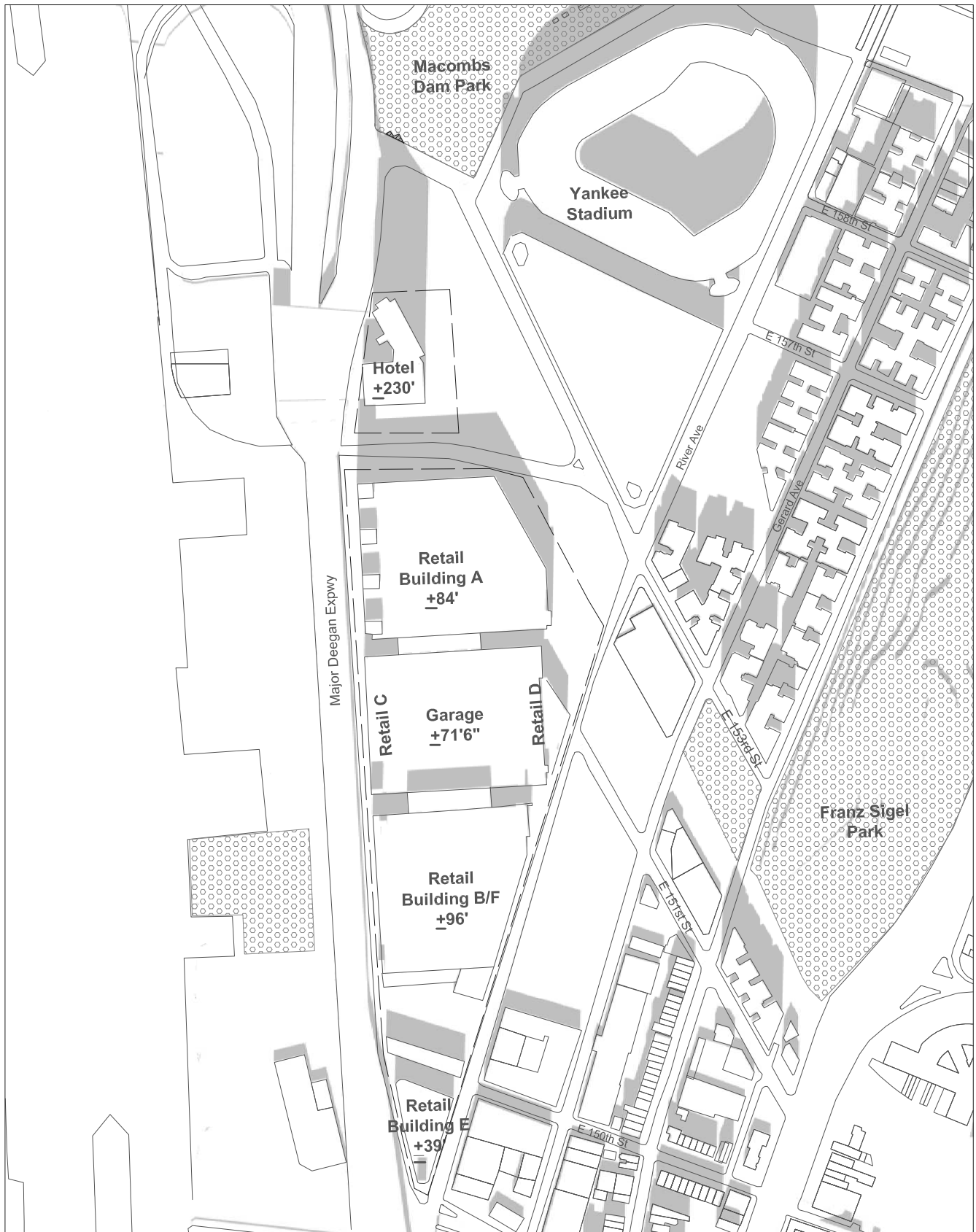


LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
December 21 - 9:00 AM EST
Figure 6 - 5

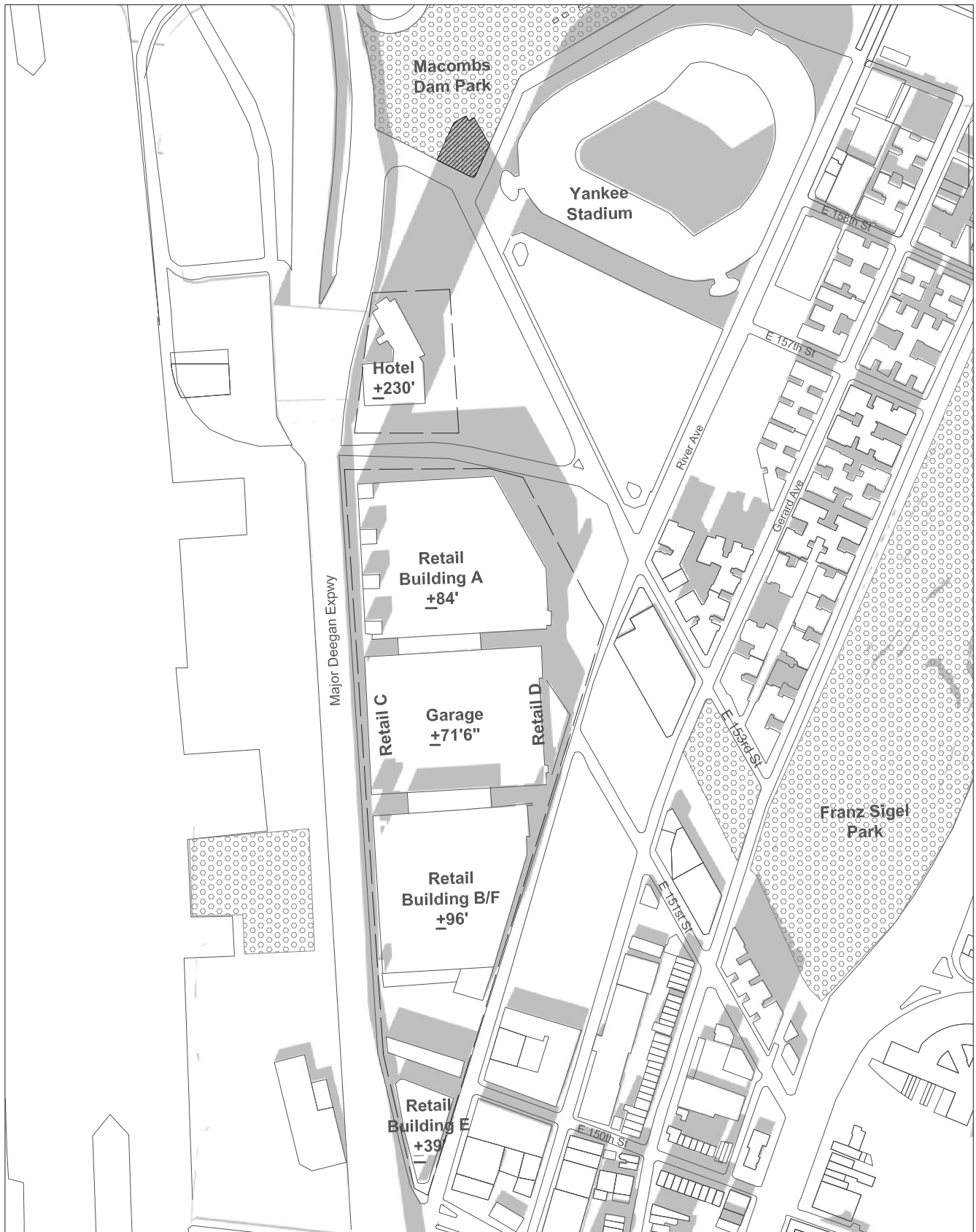


LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
December 21 - 12:00 PM EST
Figure 6 - 6

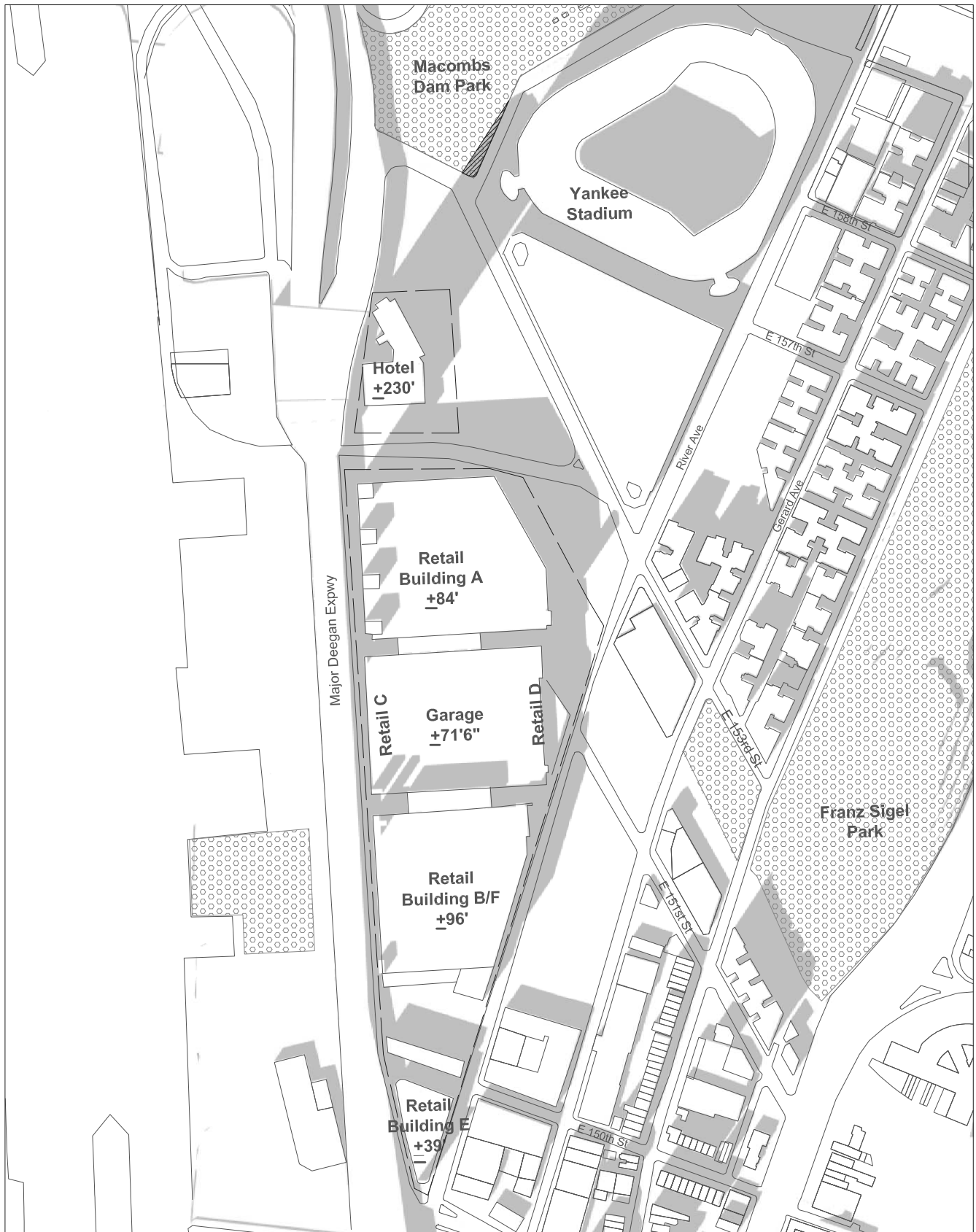


LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
December 21 - 1:30 PM EST
Figure 6 - 7



LEGEND

- Project Site
- Open Space
- Shadows
- Incremental Shadows on Open Space

0 300 600 IN FEET SCALE

Shadow Diagrams
December 21 - 2:15 PM EST
Figure 6 - 8