

A. INTRODUCTION

This chapter examines the potential for the Proposed Actions to result in new shadows on sunlight-sensitive resources, which include publicly accessible parks, plazas, and other open spaces, sunlight-sensitive features of historic resources, and natural resources that depend on sunlight. Following the guidelines of the 2021 *City Environmental Quality Review (CEQR) Technical Manual*, a shadow study is required if a proposed project would result in new structures or additions 50 feet or more in height.

As described in Chapter 1, “Project Description,” the Applicant is seeking discretionary approvals (the “Proposed Actions”) to facilitate the development of the Western Rail Yard (Block 676, Lots 1 and 5) in the Hudson Yards neighborhood of Manhattan (the “WRY Site” or the “Development Site”) with approximately 6.2 million gross square feet of new mixed use development including residential, commercial, and community facility space, a hotel resort with gaming, and new public open space (the “Proposed Project”). There is a state process underway to designate locations for downstate gaming licenses; therefore, the Applicant is also presenting for environmental analysis purposes an Alternative Scenario that reflects a similar density and the same open space configuration as the Proposed Project but includes residential and commercial buildings in place of the hotel resort with gaming.

With both the Proposed Project and the Alternative Scenario, the heights of the buildings to be developed would be greater than 50 feet, and in some cases would be more than 50 feet taller than what was approved in the 2009 *Western Rail Yards Final Environmental Impact Statement* (2009 FEIS). Therefore, a detailed shadow study was conducted, and the analysis provided below considers the potential shadow impacts of both “With Action” scenarios.

PRINCIPAL CONCLUSIONS

The Proposed Actions would result in significant adverse shadow-related impacts to two open space resources: the High Line and the Hudson Yards Public Square and Gardens open space. The Proposed Actions would result in project-generated shadows on several other public open spaces and historic resources with sunlight-sensitive features; however, in those cases the shadows would be limited in extent and duration and would not result in a significant adverse impact.

The shadows on the High Line are consistent with those anticipated from the new towers on the Development Site in the 2009 FEIS; however, the 2009 FEIS accounted for project-generated shadows from the Site 5 development (current Site A), while the current No Action scenario assumes that Site A would not be developed before 2031, resulting in a larger increment of project-generated shadow from Site A. Furthermore, the

final design for the portion of the High Line that extends through the Development Site is still in development. As the owner of this resource, NYC Parks will determine the specific program and design in consideration of the shadow effects noted above and the context of the resource within an area with multiple tall, large-scale buildings. The Applicant would coordinate with NYC Parks and Friends of the High Line to ensure that appropriate mitigation for the shadow impact is implemented in connection with the future design, construction, and operation of the High Line on the Development Site.

The Hudson Yards Public Square and Gardens is under the control of the Applicant, and the Applicant could monitor and evaluate plant health to determine if and how project-generated shadow affects existing plantings and vegetation. Should changes to the existing plantings and vegetation be warranted, shade-tolerant plant species that thrive in low-light conditions could be introduced, along with a diverse mix of trees, shrubs, and groundcovers with varying tolerances to create visual interest and ecological resilience.

B. DEFINITIONS AND METHODOLOGY

This analysis has been prepared in accordance with New York City CEQR procedures and follows the guidelines of the *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 of concern are those that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. Such resources generally include the following:

- *Public open space* such as parks, beaches, playgrounds, plazas, schoolyards (if open to the public during non-school hours), greenways, and 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 of architectural resources need be considered, as opposed to the entire resource. Such sunlight-sensitive features might include the following: 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 community gardens, surface water bodies, wetlands, and designated resources such as coastal fish and wildlife habitats.

Resources not subject to shadows analyses include the following, 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); and
- *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 discussion of how shadows would affect the new space may be warranted.

METHODOLOGY

Following the guidelines of the *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 development 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 dates in each season and determining the maximum extent of shadow over the course of each representative date.

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. Incremental shadows are determined by establishing a baseline condition in the future *without* the proposed development (the No Action condition) and comparing it to the future condition *with* the proposed development (the With Action condition), thus illustrating the baseline shadows cast by existing (or future No Action) buildings and distinguishing the additional (incremental) shadows cast by the proposed development. 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.

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, and seasonal conditions.

ANALYSIS FRAMEWORK

As described in Chapter 1, "Project Description," the Development Site consists of Manhattan Block 676, Lots 1 and 5, and occupies the entire area bounded by West 30th

and West 33rd Streets and Eleventh and Twelfth Avenues. The northernmost section of the High Line public open space runs along the western and southern edges of the Development Site, along Twelfth Avenue and West 30th Street, respectively. The Affected Area consists of the Development Site and the portion of West 33rd Street and the sidewalks between Eleventh and Twelfth Avenues, which would be affected by the proposed City Map amendment and revocable consent. The development parcels on the Development Site are Site A, located in the southwest portion of the Development Site, Site B, located in the southeast portion of the Development Site, and Site C, located along the north side of the Development Site. Under both With Action scenarios, Site A would be developed with a primarily residential building (Building A) and Site B would be developed with a primarily commercial building (Building B). The massing of these two buildings would be the same in both With Action scenarios. In the Proposed Project, Site C would be developed with a hotel resort with gaming, in the form of a podium and single tower. In the Alternative Scenario, Site C would be developed with up to three adjacent buildings (Buildings C-1, C-2, and C-3).

In order to ensure a conservative analysis, the shadow study presented below analyzed the maximum bulk envelopes for Sites A, B, and C in both With Action scenarios. In reality, the building to be developed on these sites would be shorter and/or narrower than the maximum envelopes in either With Action scenario, because there would not be enough allowable floor area available to occupy all the space in the maximum bulk envelopes. Therefore, the analysis provides a worst-case assessment, and the extent and duration of new shadow resulting from the Proposed Actions would be less than what is presented below.

C. PRELIMINARY SCREENING ASSESSMENT

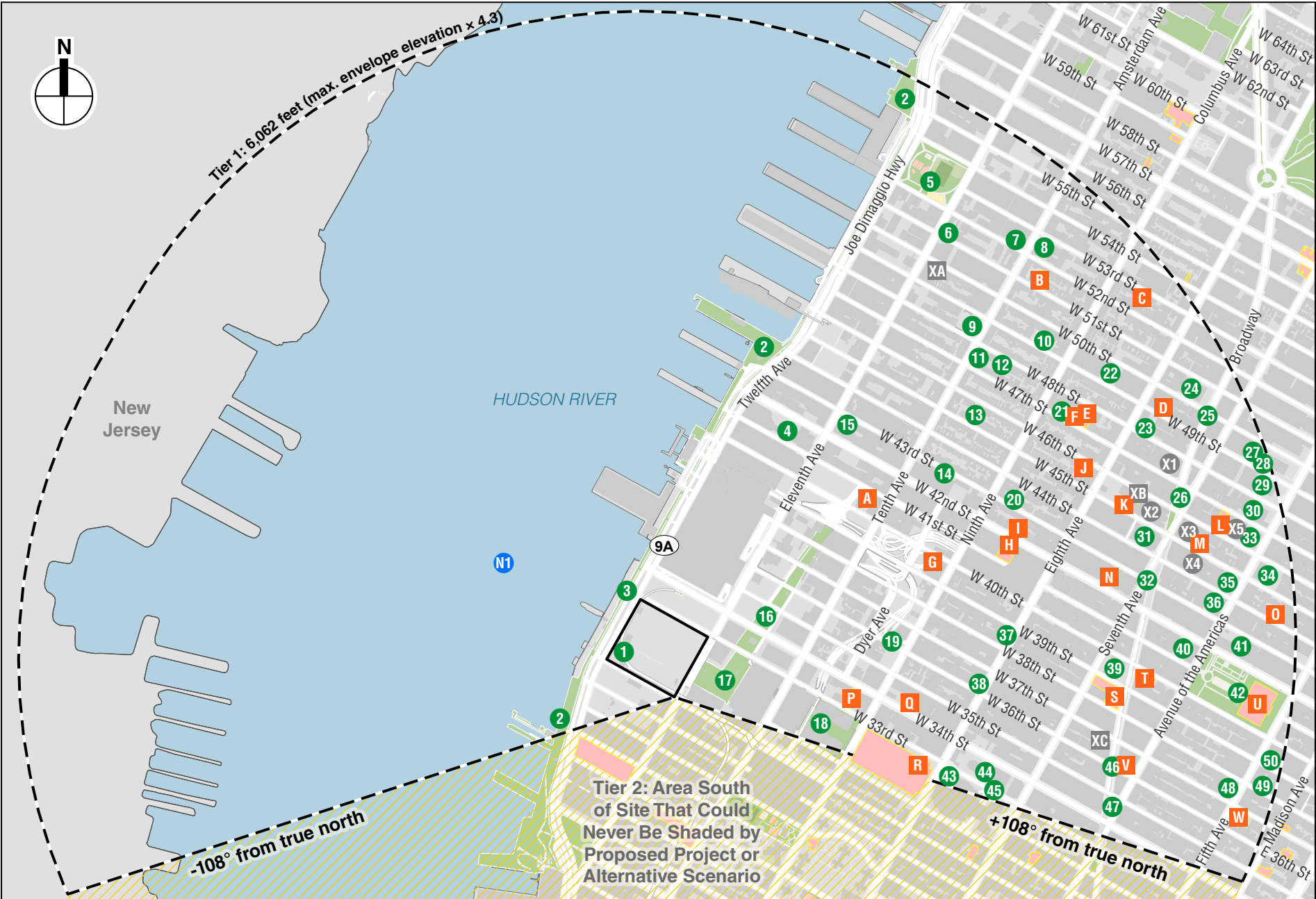
A base map was developed for the preliminary screening assessment using Geographic Information Systems (GIS),¹ showing the location of the Development Site and the surrounding street layout and topography (see **Figure 6-1**). Mapped databases of parks and other public open spaces, City, state, and national historic resources, and natural resources were added to the map.² Potential sunlight-sensitive resources were identified in coordination with the open space, historic and cultural resources, and natural resources assessments presented in other sections of this EIS.

TIER 1 SCREENING ASSESSMENT

For the Tier 1 assessment, the longest shadow that the proposed development could cast is calculated, and, using this length as the radius, a perimeter is drawn around the development 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.

¹ Software: Esri ArcGIS Pro 3.2

² Data: City, State, and Federal agencies including New York City Parks Department; New York City Office of Technology & Innovation (OTI), New York City Department of City Planning, New York City Landmarks Preservation Commission, New York City Department of Transportation, New York State Office of Parks, Recreation, and Historic Preservation, New York State Dept. of Environmental Conservation (NYSDEC), U.S. Fish and Wildlife Service, and others; supplemented by Nearmap hi-resolution imagery, and AKRF site visits.



- Development Site
- Study Area Perimeter after Tier 1 and Tier 2 Assessments
- Tier 2: Area South of Development Site That Could Never Be Shaded by Proposed Project or Alternative Scenario

- #

Publicly Accessible Open Space
- X#

Publicly Accessible Open Space, No Sky Exposure: Eliminated from Further Analysis
- A

Historic Resource with Sunlight-Sensitive Features
- XA

Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis
- N#

Natural Resource

Notes: Maximum height of Proposed Project or Alternative Scenario = 1,376'. Maximum elevation of Proposed Project or Alternative Scenario = 1,409.66' (referencing North American Vertical Datum of 1988 [NAVD88]). The Tier 1 elevation-based preliminary shadow study area is highly conservative because it assumes the maximum elevation of the proposed development casting its longest shadow (occurring 90 minutes after sunrise on December 21) onto a surrounding flat surface at 0' NAVD88, which is approximately the mean tidal elevation of the nearby Hudson River. Shadows falling on upland areas would be shorter. See Chapter 6, "Shadows," Section C "Tier 1 Screening Assessment" for details.

Map Key Open Space Resource	
1	The High Line
2	Hudson River Park
3	Hudson River Park Bikeway and Greenway
4	650 West 42nd St POPS
5	DeWitt Clinton Park
6	Juan Alonso Community Garden
7	Oasis Community Garden
8	P.S. 111 Community Playground
9	Lorraine Hansberry Plaza
10	Gutenberg Playground
11	Hell's Kitchen Park
12	Clinton Community Garden
13	Mathews-Palmer Playground
14	400/484 West 43rd St POPS
15	560 West 43rd St POPS
16	Bella Abzug Park
17	Hudson Yards POPS
18	Manhattan West POPS
19	Canoe Plaza
20	McCaffrey Playground
21	Ramon Aponte Park
22	825 Eighth Ave POPS
23	235 West 48th St POPS
24	1633 Broadway POPS
25	Broadway Malls, West 47th to West 57th Streets

Map Key Open Space Resource	
26	Father Duffy Square
27	745 Seventh Avenue POPS
28	1251 Sixth Avenue POPS
29	1221 Sixth Avenue POPS
30	1211 Sixth Avenue POPS
31	1515 Broadway POPS
32	Times Square
33	1185 Sixth Avenue POPS
34	1166 Sixth Avenue POPS
35	1155 Sixth Avenue POPS
36	1133 Sixth Avenue POPS
37	585 Eighth Avenue POPS
38	525 Eighth Avenue POPS
39	1411 Broadway POPS
40	1095 Sixth Avenue POPS
41	1114 Sixth Avenue POPS
42	Bryant Park
43	MSG POPS
44	1 Penn Plaza POPS
45	West 33rd Street Plaza
46	Broadway Boulevard Plaza
47	Herald Square
48	420 Fifth Avenue POPS
49	425 Fifth Avenue POPS
50	445 Fifth Avenue POPS

Map Key Historic Resource	
A	St. Raphael's Church
B	Sacred Heart of Jesus Church
C	St Benedict the Moor Church
D	St. Malachy's Church
E	P.S. 17/Professional Performing Arts School
F	The Actors' Temple
G	Metro Baptist Church
H	McGraw-Hill Building
I	Holy Cross Church
J	Saint Luke's Lutheran Church
K	Music Box Theatre
L	The Free Church of St. Mary the Virgin
M	Lyceum Theatre
N	Times Square Theatre
O	N.Y. Yacht Club
P	St Michael's Catholic Church
Q	West Side Jewish Center
R	James A Farley Building
S	1407 Broadway
T	1430 Broadway
U	NYPL Stephen A. Schwarzman Building
V	former Greenwich Savings Bank
W	former Tiffany Building

Map Key Resource (Eliminated from Analysis)	
X1	1585 Broadway POPS
X2	1535 Broadway POPS
X3	1548 Broadway POPS
X4	145 West 44th Street POPS
X5	114 West 47th Street POPS

Map Key Natural Resource	
N1	Hudson River

Map Key Resource (Eliminated from Analysis)	
XA	St. Kyril & Metodi Bulgarian Eastern Orthodox Cathedral
XB	Richard Rogers Theater
XC	Church of the Holy Innocents

Tier 1 and Tier 2 Assessments

Western Rail Yard Modifications

Figure 6-1

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 date (90 minutes after sunrise³) and is equal to 4.3 times the height of the structure.

In both the Proposed Project and the Alternative Scenario, the tallest maximum envelope (Site B) would be approximately 1,376 feet tall above ground level, including rooftop mechanical structures, reaching a maximum elevation of approximately 1,409.66' NAVD88.⁴ Using the maximum elevation above sea level rather than height above ground level to ensure a conservative preliminary catchment area for the analysis, the proposed development could cast a shadow up to approximately 6,062 feet in length (1409.66×4.3). Using this length as a radius, a perimeter was drawn around the Development Site (see **Figure 6-1**).

It should be noted that the preliminary shadow study area is highly conservative, and not necessarily an indication of where project-generated shadow will actually reach, because:

- As noted in the Analysis Framework section above, the shadows assessment is conservative in that it analyzes the maximum bulk envelopes for Sites A, B, and C in both With Action scenarios. In reality, the buildings to be developed on these sites would be shorter and/or narrower than the maximum envelopes in either With Action scenario, because there would not be enough floor area available to occupy all the space in the maximum bulk envelopes. Therefore, the analysis presents a worst-case assessment, and the extent and duration of new shadow resulting from the Proposed Actions would be less than what is presented below.
- The radius of the preliminary shadow study area is based on the elevation above sea level rather than height above ground level.⁵
- As also noted above, the radius of the preliminary shadow study area is based on the elevation of the tallest maximum envelope within the Development Site (Site B, located in the southeast portion of the Development Site). The elevations of the maximum bulk envelopes of the other Sites (Site A and Site C) would be shorter.

The Tier 1 assessment showed that a number of publicly accessible open spaces and historic resources with sun-sensitive features, as well as a portion of one natural resource (the Hudson River), are located in the longest shadow study area. Therefore, the next tier of assessment was required.

³ As explained in more detail below in the "Tier 3 Screening Assessment" section, shadows occurring within 90 minutes of sunrise or sunset are not considered significant under CEQR.

⁴ North American Vertical Datum of 1988. 0' NAVD88 is approximately mean sea level and the average tidal elevation of the nearby Hudson River.

⁵ Calculating the longest-shadow study area based on height above grade or ground floor assumes that the Development Site and surrounding cityscape are located on a flat base plane that extends throughout the study area, whereas in reality there is substantial topographic variation. The study area generally slopes from sea level west of the Development Site up to higher elevations in midtown Manhattan east of the Development Site. Shadows cast onto lower elevations (i.e. "downhill," or in this case west onto the surface of the Hudson River) are longer in horizontal distance than they would be on a flat plane, and shadows cast on to higher elevations (i.e. east toward midtown Manhattan) would be shorter.

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 between -108 and +108 degrees from true north. **Figure 6-1** illustrates this triangular area south of the Development Site. The complementary area to the north within the preliminary shadow study area represents the remaining area that could potentially experience new project-generated shadow.

The Tier 2 assessment concluded that 50 publicly accessible open spaces are located in the remaining longest-shadow study area and require further assessment. More than half of the resources are privately owned residential or commercial plazas that are open to the public. In addition, 23 historic resources with sunlight-sensitive features are located in the remaining preliminary shadow study area and require further assessment to ascertain whether they could be affected by project-generated shadow. A portion of the Hudson River, an important natural resource, is also in the remaining longest-shadow study area of the Development Site and requires further assessment.

Five other publicly accessible open spaces identified in the remaining study area were found to be interior spaces with minimal or no sky exposure and consequently needed no further analysis for shadows. These resources are listed in **Table 6-1**. Interior spaces with skylights, transparent roofs, or significant sky exposure through windows or open arcades remained in the inventory of open spaces for further assessment. In addition, three other historic resources with sunlight-sensitive features located in the remaining study area were eliminated from the next tier of assessment because their sunlight-sensitive features face away from the Development Site and thus could not be affected by project-generated shadow. These resources are listed in **Table 6-2**.

Table 6-1
Open Space Resources Eliminated from Further Analysis

Map Reference	Resource
X1	1585 Broadway POPS
X2	1535 Broadway POPS
X3	1548 Broadway POPS
X4	145 West 44th Street POPS
X5	114 West 47th Street POPS
Note: These open space resources are interior spaces with no significant sky exposure and therefore do not require assessment for shadows.	

Table 6-2
Historic Resources Eliminated from Further Analysis

Map Reference	Resource / Location	Sunlight-Sensitive Features
XA	St. Kyril & Metodi Bulgarian Eastern Orthodox Cathedral 552 West 50th Street	Stained glass windows, north façade
XB	Forty-Sixth Street Theater (Richard Rogers Theater) 226 West 46th Street	Colonnade, north façade
XC	Church of the Holy Innocents 128 West 37th Street	Stained glass windows and façade, north façade
Note: These historic resources have sunlight-sensitive features that face away from the Development Site and cannot receive project-generated shadow.		

The resources requiring a Tier 3 assessment are listed in **Table 6-3**, along with the Tier 3 assessment results.

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 computer modeling software⁶ is used in the Tier 3 assessment to calculate and display a proposed project's shadows on individual representative dates 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 reasonable worst-case three-dimensional representations of the Proposed Project and the Alternative Scenario.

REPRESENTATIVE DATES 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 date during the growing season is also modeled, generally the date halfway between the summer solstice and the equinoxes, i.e., May 6 or August 6, which have approximately the same shadow patterns.

Table 6-3
Tier 3 Assessment

Map Reference	Name	Dec. 21	March 21 / Sept. 21	May 6 / August 6	June 21
Publicly Accessible Open Spaces					
1	The High Line	Potential	Potential	Potential	Potential
2	Hudson River Park	Potential	Potential	Potential	Potential
3	Hudson River Park Greenway	Potential	Potential	Potential	Potential
4	650 West 42nd St POPS	Potential	No	No	No
5	DeWitt Clinton Park	No	No	No	No
6	Juan Alonso Community Garden	No	No	No	No
7	Oasis Community Garden	No	No	No	No
8	P.S. 111 Community Playground	No	No	No	No
9	Lorraine Hansberry Plaza	Potential	No	No	No
10	Gutenberg Playground	No	No	No	No
11	Hell's Kitchen Park	Potential	No	No	No
12	Clinton Community Garden	No	No	No	No
13	Mathews-Palmer Playground	No	No	No	No
14	400/484 West 43rd St POPS	No	No	No	No
15	560 West 43rd St POPS	Potential	No	No	No
16	Bella Abzug Park	No	Potential	Potential	Potential
17	Hudson Yards Public Square and Gardens	Potential	Potential	Potential	Potential
18	Manhattan West POPS	No	No	Potential	Potential
19	Canoe Plaza	No	No	Potential	No
20	McCaffrey Playground	No	No	No	No
21	Ramon Aponte Park	No	No	No	No
22	825 Eighth Ave POPS	No	No	No	No
23	235 West 48th St POPS	No	No	No	No
24	1633 Broadway POPS	No	No	No	No
25	Broadway Malls, West 47th to West 57th Streets	No	No	No	No

⁶ Bentley MicroStation

Western Rail Yard Modifications

Table 6-3
Tier 3 Assessment

26	Father Duffy Square	No	No	No	No
27	745 Seventh Avenue POPS	No	No	No	No
28	1251 Sixth Avenue POPS	No	No	No	No
29	1221 Sixth Avenue POPS	No	No	No	No
30	1211 Sixth Avenue POPS	No	No	No	No
31	1515 Broadway POPS	No	No	No	No
32	Times Square	No	No	No	No
33	1185 Sixth Avenue POPS	No	No	No	No
34	1166 Sixth Avenue POPS	No	No	No	No
35	1155 Sixth Avenue POPS	No	No	No	No
36	1133 Sixth Avenue POPS	No	No	No	No
37	585 Eighth Avenue POPS	No	No	No	No
38	525 Eighth Avenue POPS	No	No	No	Potential
39	1411 Broadway POPS	No	No	No	No
40	1095 Sixth Avenue POPS	No	No	No	No
41	1114 Sixth Avenue POPS	No	No	No	No
42	Bryant Park	No	No	No	No
43	MSG POPS	No	No	No	Potential
44	1 Penn Plaza POPS	No	No	No	Potential
45	West 33rd Street Plaza	No	No	No	Potential
46	Broadway Boulevard Plaza	No	No	No	Potential
47	Herald Square	No	No	No	Potential
48	420 Fifth Avenue POPS	No	No	No	No
49	425 Fifth Avenue POPS	No	No	No	No
50	445 Fifth Avenue POPS	No	No	No	No
Historic Resources with Sunlight-Sensitive Features					
A	St. Raphael's Church	No	No	No	No
B	Sacred Heart of Jesus Church	Potential	No	No	No
C	St Benedict the Moor Church	No	No	No	No
D	St. Malachy's Church	No	No	No	No
E	P.S. 17/Professional Performing Arts School	No	No	No	No
F	The Actors' Temple	No	No	No	No
G	Metro Baptist Church	No	Potential	No	No
H	McGraw-Hill Building	No	Potential	No	No
I	Holy Cross Church	No	Potential	No	No
J	Saint Luke's Lutheran Church	No	No	No	No
K	Music Box Theatre	No	No	No	No
L	The Free Church of St. Mary the Virgin	No	No	No	No
M	Lyceum Theatre	No	No	No	No
N	Times Square Theatre	No	No	No	No
O	N.Y. Yacht Club	No	No	No	No
P	St Michael's Catholic Church	No	No	Potential	Potential
Q	West Side Jewish Center	No	No	Potential	Potential
R	James A Farley Building	No	No	No	Potential
S	1407 Broadway	No	No	No	No
T	1430 Broadway	No	No	No	No
U	NYPL Stephen A. Schwarzman Building	No	No	No	No
V	former Greenwich Savings Bank	No	No	No	No
W	former Tiffany Building	No	No	No	No
Natural Resources with Sunlight-Sensitive Features					
N1	Hudson River	Potential	Potential	Potential	Potential
Notes: See Figures 6-2 to 6-5 for corresponding resource locations and shadow sweeps. In the columns representing the representative analysis dates, "No" means project-generated shadow could not reach the resource, even without accounting for intervening buildings. "Potential" means project-generated shadows could potentially reach the resource on this date and requires further assessment. POPS = Privately Owned Open Space.					

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 other shadows. Consequently, shadows occurring outside the timeframe window of analysis are not considered significant under CEQR, and their assessment is not required.

PROPOSED PROJECT AND ALTERNATIVE SCENARIO

As noted above, the maximum bulk envelopes for Buildings A and B are the same in both With Action scenarios. With regard to Site C, the cumulative daily path or "sweep" of Site C's shadow is similar in both With Action scenarios. In order to conduct and present a simple and conservative screening assessment, the Site C maximum bulk envelopes for both With Action scenarios were combined to generate the representative daily shadow sweeps. Anything outside the sweeps could not be affected by shadow from either With Action scenario and could therefore be eliminated from further analysis.

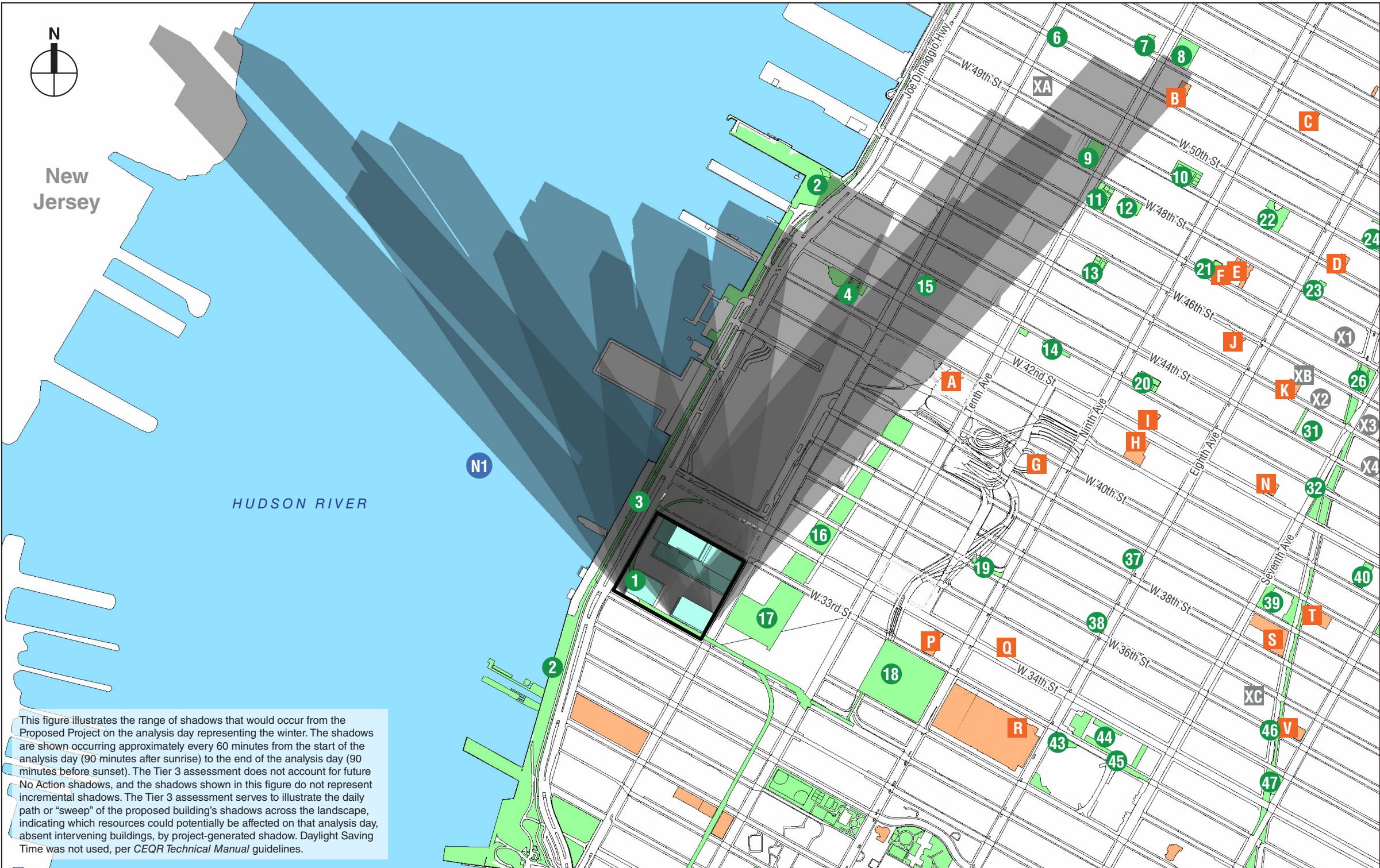
TIER 3 SCREENING ASSESSMENT RESULTS

Figures 6-2 to 6-5 illustrate the range of shadows that could occur, in the absence of intervening buildings, from the Proposed Project and Alternative Scenario maximum bulk envelopes on the four representative dates for analysis. As they move clockwise and generally west to east over the landscape, the shadows are shown occurring approximately every 60 minutes from the start of the analysis period (90 minutes after sunrise) to the end of the analysis period (90 minutes before sunset). **Table 6-3** summarizes on which analysis date(s) each resource could potentially receive project-generated shadow.

The Tier 3 assessment concluded that 17 of the 50 publicly accessible open spaces and 7 of the 23 historic resources could potentially receive incremental shadow on one or more of the representative analysis dates, and these resources (indicated in **Table 6-3**) required a detailed analysis. The other 59 open space and historic resources could not receive project-generated shadow on any representative date and do not require further assessment. The Hudson River also required further assessment for all four representative dates.

D. DETAILED SHADOW ANALYSIS

A detailed analysis is warranted when the screening assessment does not rule out the possibility that project-generated shadows would reach sunlight-sensitive resources. A detailed analysis establishes a baseline condition, the future without the proposed project (the "No Action" condition), to illustrate the shadows cast by existing buildings and other planned developments in the vicinity expected to be completed by the proposed project's build year. This baseline is then compared to the future condition with the proposed project (the "With Action" condition) to distinguish the additional (incremental) shadow cast by the proposed project. The purpose of the detailed analysis is to determine the extent and duration of new incremental shadow that would be cast on a sunlight-sensitive



- Development Site
- Publicly Accessible Open Space
- Publicly Accessible Open Space, No Sky Exposure: Eliminated from Further Analysis
- Historic Resource with Sunlight-Sensitive Features
- Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis
- Natural Resource

Map Key Historic Resource (Eliminated from Further Analysis)

- | | | | |
|---|---|---|-------------------------------------|
| A | St. Raphael's Church | M | Lyceum Theatre |
| B | Sacred Heart of Jesus Church | N | Times Square Theatre |
| C | St. Benedict the Moor Church | O | N.Y. Yacht Club |
| D | St. Malachy's Church | P | St Michael's Catholic Church |
| E | P.S. 17/Professional Performing Arts School | Q | West Side Jewish Center |
| F | The Actors' Temple | R | James A Farley Building |
| G | Metro Baptist Church | S | 1407 Broadway |
| H | McGraw-Hill Building | T | 1430 Broadway |
| I | Holy Cross Church | U | NYPL Stephen A. Schwarzman Building |
| J | Saint Luke's Lutheran Church | V | former Greenwich Savinos Bank |
| K | Music Box Theatre | W | former Tiffany Building |
| L | The Free Church of St. Mary the Virgin | | |

Map Key Resource (Eliminated from Further Analysis)

- XA St. Kyril & Metodi Bulgarian Eastern Orthodox Cathedral
- XB Richard Rogers Theater
- XC Church of the Holy Innocents

Map Key Natural Resource (Eliminated from Further Analysis)

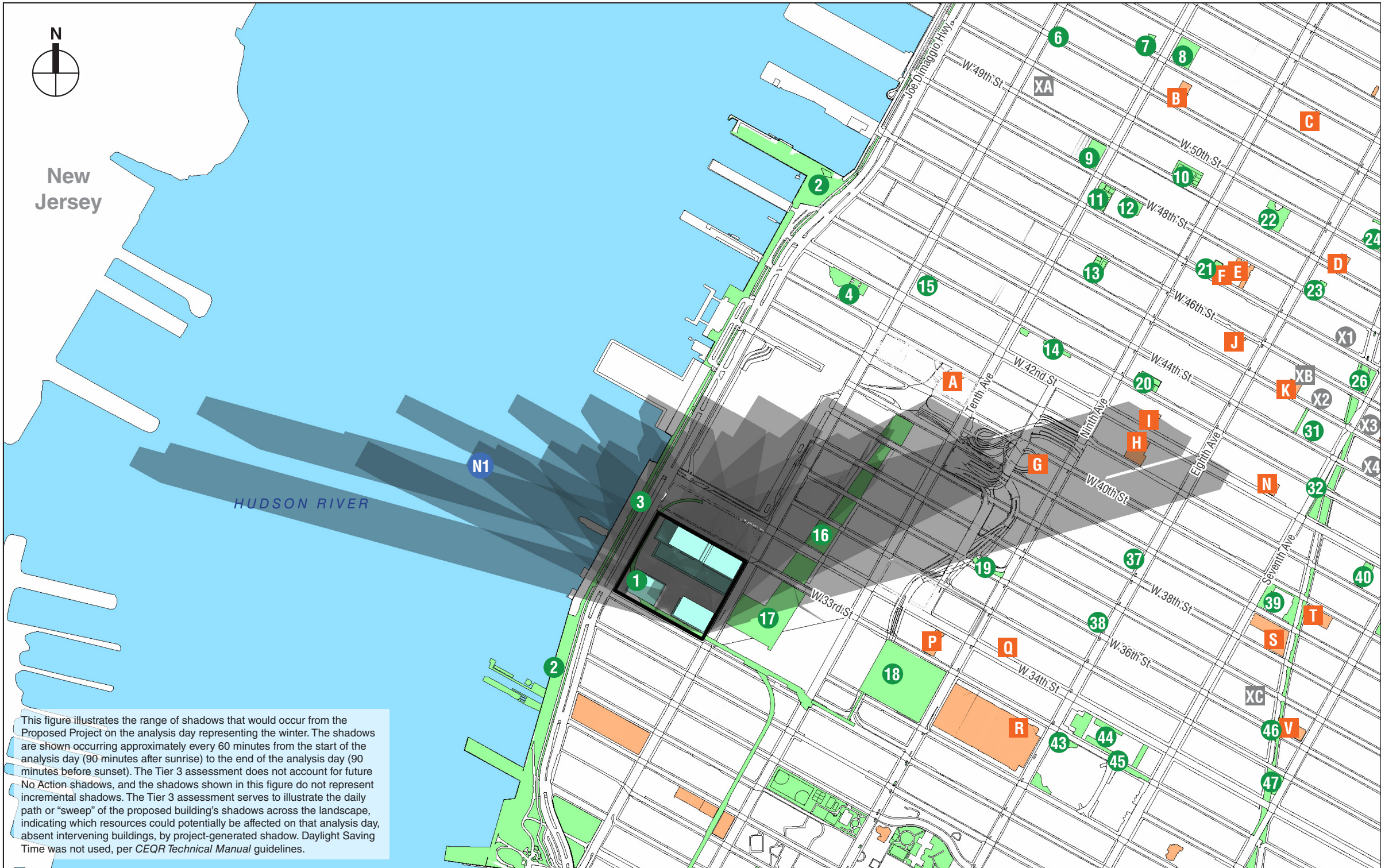
- N1 Hudson River

Map Key Open Space Resource (Eliminated from Further Analysis)

- The High Line
- Hudson River Park
- Hudson River Park Bikeway and Greenway
- 650 West 42nd St POPS
- DeWitt Clinton Park
- Juan Alonso Community Garden
- Oasis Community Garden
- P.S. 111 Community Playground
- Lorraine Hansberry Plaza
- Gutenberg Playground
- Hell's Kitchen Park
- Clinton Community Garden
- Mathews-Palmer Playground
- 400/484 West 43rd St POPS
- 560 West 43rd St POPS
- Bella Abzug Park
- Hudson Yards POPS
- Manhattan West POPS
- Canoe Plaza
- McCaffrey Playground
- Ramon Aponte Park
- 825 Eighth Ave POPS
- 235 West 48th St POPS
- 1633 Broadway POPS
- Broadway Malls, West 47th to West 57th Streets
- Father Duffy Square
- 745 Seventh Avenue POPS
- 1251 Sixth Avenue POPS
- 1221 Sixth Avenue POPS
- 1211 Sixth Avenue POPS
- 1515 Broadway POPS
- Times Square
- 1185 Sixth Avenue POPS
- 1166 Sixth Avenue POPS
- 1155 Sixth Avenue POPS
- 1133 Sixth Avenue POPS
- 585 Eighth Avenue POPS
- 525 Eighth Avenue POPS
- 1411 Broadway POPS
- 1095 Sixth Avenue POPS
- 1114 Sixth Avenue POPS
- Bryant Park
- MSG POPS
- 1 Penn Plaza POPS
- West 33rd Street Plaza
- Broadway Boulevard Plaza
- Herald Square
- 420 Fifth Avenue POPS
- 425 Fifth Avenue POPS
- 445 Fifth Avenue POPS

Map Key Open Space Resource (Eliminated from Further Analysis)

- X1 1585 Broadway POPS
- X2 1535 Broadway POPS
- X3 1548 Broadway POPS
- X4 145 West 44th Street POPS
- X5 114 West 47th Street POPS



- Development Site
- Publicly Accessible Open Space
- Publicly Accessible Open Space, No Sky Exposure: Eliminated from Further Analysis
- Historic Resource with Sunlight-Sensitive Features
- Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis
- Natural Resource

Map Key Historic Resource (Eliminated from Further Analysis)

- | | |
|---|---------------------------------------|
| A St. Raphael's Church | M Lyceum Theatre |
| B Sacred Heart of Jesus Church | N Times Square Theatre |
| C St. Benedict the Moor Church | O N.Y. Yacht Club |
| D St. Malachy's Church | P St Michael's Catholic Church |
| E P.S. 17/Professional Performing Arts School | Q West Side Jewish Center |
| F The Actors' Temple | R James A Farley Building |
| G Metro Baptist Church | S 1407 Broadway |
| H McGraw-Hill Building | T 1430 Broadway |
| I Holy Cross Church | U NYPL Stephen A. Schwarzman Building |
| J Saint Luke's Lutheran Church | V former Greenwich Savinos Bank |
| K Music Box Theatre | W former Tiffany Building |
| L The Free Church of St. Mary the Virgin | |

Map Key Resource (Eliminated from Further Analysis)

- XA St. Kyril & Metodi Bulgarian Eastern Orthodox Cathedral
- XB Richard Rogers Theater
- XC Church of the Holy Innocents

Map Key Natural Resource (Eliminated from Further Analysis)

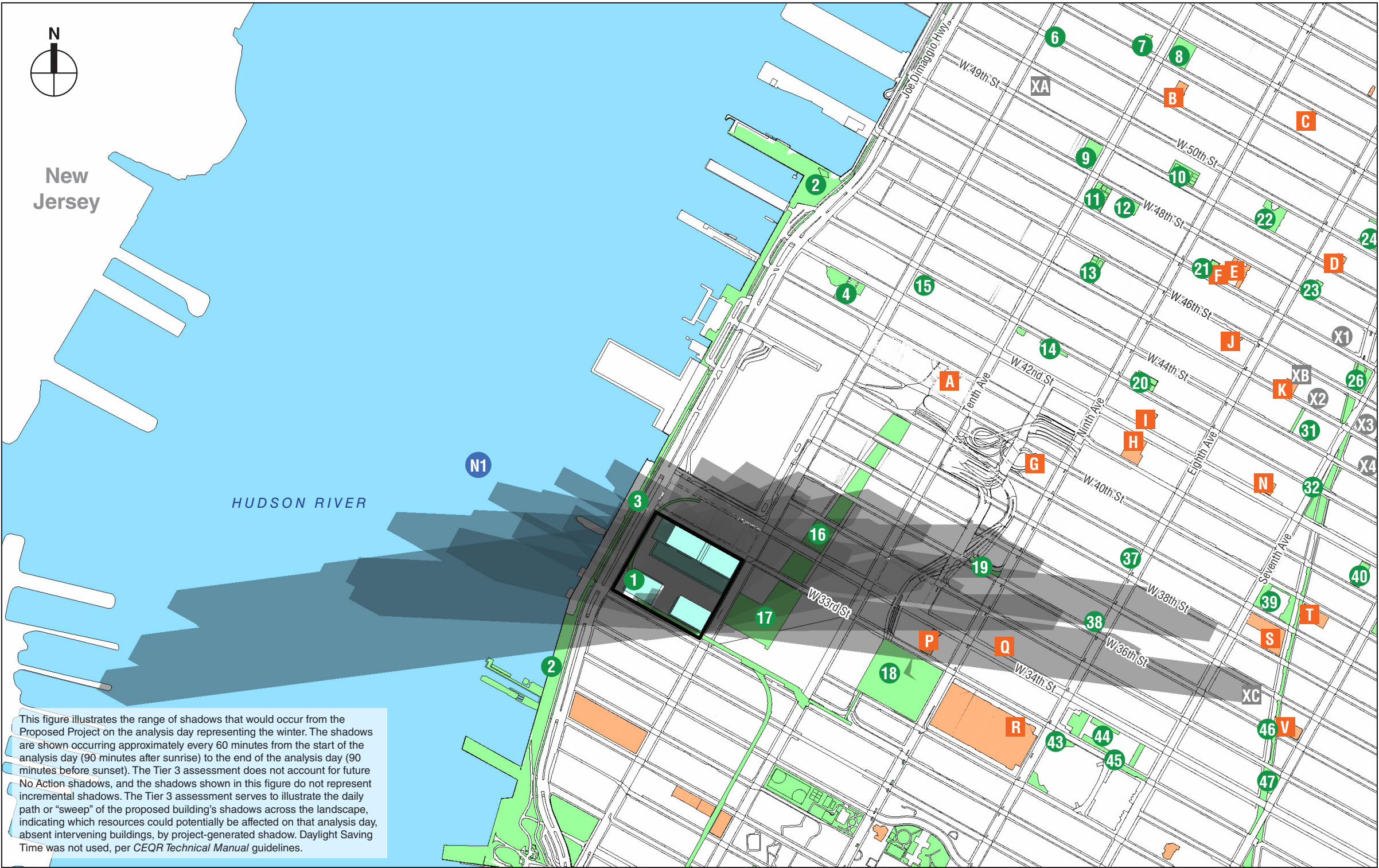
- N1 Hudson River

Map Key Open Space Resource (Eliminated from Further Analysis)

- The High Line
- Hudson River Park
- Hudson River Park Bikeway and Greenway
- 650 West 42nd St POPS
- DeWitt Clinton Park
- Juan Alonso Community Garden
- Oasis Community Garden
- P.S. 111 Community Playground
- Lorraine Hansberry Plaza
- Gutenberg Playground
- Hell's Kitchen Park
- Clinton Community Garden
- Mathews-Palmer Playground
- 400/484 West 43rd St POPS
- 560 West 43rd St POPS
- Bella Abzug Park
- Hudson Yards POPS
- Manhattan West POPS
- Canoe Plaza
- McCaffrey Playground
- Ramon Aponte Park
- 825 Eighth Ave POPS
- 235 West 48th St POPS
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- 1095 Sixth Avenue POPS
- 1114 Sixth Avenue POPS
- Bryant Park
- MSG POPS
- 1 Penn Plaza POPS
- West 33rd Street Plaza
- Broadway Boulevard Plaza
- Herald Square
- 420 Fifth Avenue POPS
- 425 Fifth Avenue POPS
- 445 Fifth Avenue POPS

Map Key Open Space Resource (Eliminated from Further Analysis)

- X1 1585 Broadway POPS
- X2 1535 Broadway POPS
- X3 1548 Broadway POPS
- X4 145 West 44th Street POPS
- X5 114 West 47th Street POPS



- Development Site
- Publicly Accessible Open Space
- Publicly Accessible Open Space, No Sky Exposure: Eliminated from Further Analysis
- Historic Resource with Sunlight-Sensitive Features
- Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis
- Natural Resource

Map Key Historic Resource (Eliminated from Further Analysis)

- | | |
|---|---------------------------------------|
| A St. Raphael's Church | M Lyceum Theatre |
| B Sacred Heart of Jesus Church | N Times Square Theatre |
| C St. Benedict the Moor Church | O N.Y. Yacht Club |
| D St. Malachy's Church | P St Michael's Catholic Church |
| E P.S. 17/Professional Performing Arts School | Q West Side Jewish Center |
| F The Actors' Temple | R James A Farley Building |
| G Metro Baptist Church | S 1407 Broadway |
| H McGraw-Hill Building | T 1430 Broadway |
| I Holy Cross Church | U NYPL Stephen A. Schwarzman Building |
| J Saint Luke's Lutheran Church | V former Greenwich Savinos Bank |
| K Music Box Theatre | W former Tiffany Building |
| L The Free Church of St. Mary the Virgin | |

Map Key Resource (Eliminated from Further Analysis)

- XA St. Kyril & Metodi Bulgarian Eastern Orthodox Cathedral
- XB Richard Rogers Theater
- XC Church of the Holy Innocents

Map Key Natural Resource (Eliminated from Further Analysis)

- N1 Hudson River

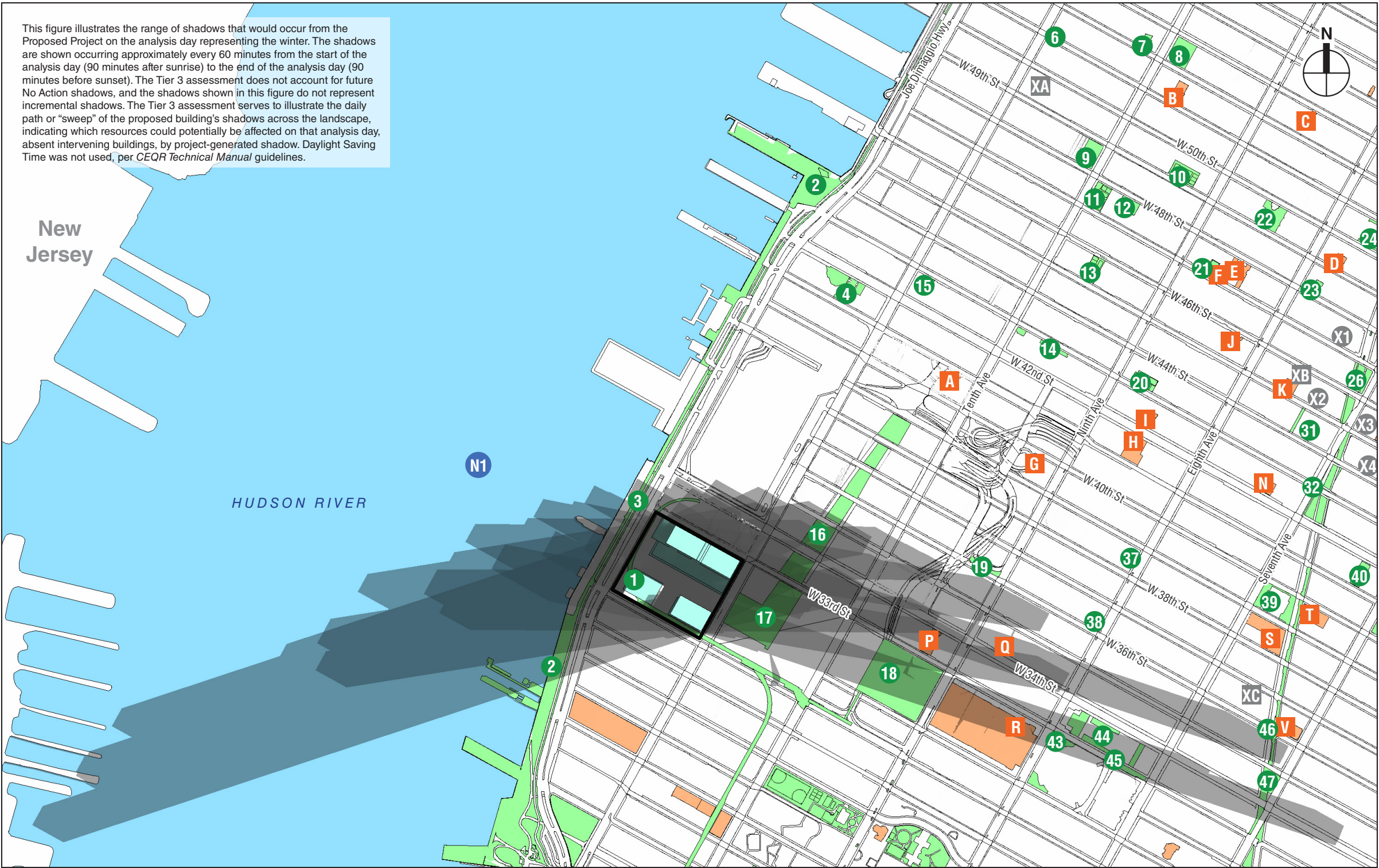
Map Key Open Space Resource (Eliminated from Further Analysis)

- The High Line
- Hudson River Park
- Hudson River Park Bikeway and Greenway
- 650 West 42nd St POPS
- DeWitt Clinton Park
- Juan Alonso Community Garden
- Oasis Community Garden
- P.S. 111 Community Playground
- Lorraine Hansberry Plaza
- Gutenberg Playground
- Hell's Kitchen Park
- Clinton Community Garden
- Mathews-Palmer Playground
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- Bryant Park
- MSG POPS
- 1 Penn Plaza POPS
- West 33rd Street Plaza
- Broadway Boulevard Plaza
- Herald Square
- 420 Fifth Avenue POPS
- 425 Fifth Avenue POPS
- 445 Fifth Avenue POPS

Map Key Open Space Resource (Eliminated from Further Analysis)

- X1 1585 Broadway POPS
- X2 1535 Broadway POPS
- X3 1548 Broadway POPS
- X4 145 West 44th Street POPS
- X5 114 West 47th Street POPS

This figure illustrates the range of shadows that would occur from the Proposed Project on the analysis day representing the winter. The shadows are shown occurring approximately every 60 minutes from the start of the analysis day (90 minutes after sunrise) to the end of the analysis day (90 minutes before sunset). The Tier 3 assessment does not account for future No Action shadows, and the shadows shown in this figure do not represent incremental shadows. The Tier 3 assessment serves to illustrate the daily path or “sweep” of the proposed building’s shadows across the landscape, indicating which resources could potentially be affected on that analysis day, absent intervening buildings, by project-generated shadow. Daylight Saving Time was not used, per *CEQR Technical Manual* guidelines.



- Development Site
- Publicly Accessible Open Space
- Publicly Accessible Open Space, No Sky Exposure: Eliminated from Further Analysis
- Historic Resource with Sunlight-Sensitive Features
- Historic Resource with Sunlight-Sensitive Features Facing Away from Project Site: Eliminated from Further Analysis
- Natural Resource

Map Key Historic Resource (Eliminated from Further Analysis)

- | | |
|---|---------------------------------------|
| A St. Raphael's Church | M Lyceum Theatre |
| B Sacred Heart of Jesus Church | N Times Square Theatre |
| C St. Benedict the Moor Church | O N.Y. Yacht Club |
| D St. Malachy's Church | P St. Michael's Catholic Church |
| E P.S. 17/Professional Performing Arts School | Q West Side Jewish Center |
| F The Actors' Temple | R James A Farley Building |
| G Metro Baptist Church | S 1407 Broadway |
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| I Holy Cross Church | U NYPL Stephen A. Schwarzman Building |
| J Saint Luke's Lutheran Church | V former Greenwich Savinos Bank |
| K Music Box Theatre | W former Tiffany Building |
| L The Free Church of St. Mary the Virgin | |

Map Key Resource (Eliminated from Further Analysis)

- XA St. Kyril & Metodi Bulgarian Eastern Orthodox Cathedral
- XB Richard Rogers Theater
- XC Church of the Holy Innocents

Map Key Natural Resource (Eliminated from Further Analysis)

- N1 Hudson River

Map Key Open Space Resource (Eliminated from Further Analysis)

- 1 The High Line
- 2 Hudson River Park
- 3 Hudson River Park Bikeway and Greenway
- 4 650 West 42nd St POPS
- 5 DeWitt Clinton Park
- 6 Juan Alonso Community Garden
- 7 Oasis Community Garden
- 8 P.S. 111 Community Playground
- 9 Lorraine Hansberry Plaza
- 10 Gutenberg Playground
- 11 Hell's Kitchen Park
- 12 Clinton Community Garden
- 13 Mathews-Palmer Playground
- 14 400/484 West 43rd St POPS
- 15 560 West 43rd St POPS
- 16 Bella Abzug Park
- 17 Hudson Yards POPS
- 18 Manhattan West POPS
- 19 Canoe Plaza
- 20 McCaffrey Playground
- 21 Ramon Aponte Park
- 22 825 Eighth Ave POPS
- 23 235 West 48th St POPS
- 24 1633 Broadway POPS
- 25 Broadway Malls, West 47th to West 57th Streets
- 26 Father Duffy Square
- 27 745 Seventh Avenue POPS
- 28 1251 Sixth Avenue POPS
- 29 1221 Sixth Avenue POPS
- 30 1211 Sixth Avenue POPS
- 31 1515 Broadway POPS
- 32 Times Square
- 33 1185 Sixth Avenue POPS
- 34 1166 Sixth Avenue POPS
- 35 1155 Sixth Avenue POPS
- 36 1133 Sixth Avenue POPS
- 37 585 Eighth Avenue POPS
- 38 525 Eighth Avenue POPS
- 39 1411 Broadway POPS
- 40 1095 Sixth Avenue POPS
- 41 1114 Sixth Avenue POPS
- 42 Bryant Park
- 43 MSG POPS
- 44 1 Penn Plaza POPS
- 45 West 33rd Street Plaza
- 46 Broadway Boulevard Plaza
- 47 Herald Square
- 48 420 Fifth Avenue POPS
- 49 425 Fifth Avenue POPS
- 50 445 Fifth Avenue POPS

Map Key Open Space Resource (Eliminated from Further Analysis)

- X1 1585 Broadway POPS
- X2 1535 Broadway POPS
- X3 1548 Broadway POPS
- X4 145 West 44th Street POPS
- X5 114 West 47th Street POPS

Western Rail Yard Modifications

resource as a result of the proposed project. Because existing (or future No Action) buildings may already cast shadows on a sunlight-sensitive resource, the proposed project may not result in additional, or incremental, shadows on that resource.

Following the analysis framework described in Chapter 1, "Project Description," a detailed analysis was performed for the analysis year of 2031, comparing the Proposed Project and the Alternative Scenario to the future No Action condition. In the No Action scenario, it is assumed that the Development Site will be developed with several new buildings. This No Action scenario is based on the development scenario analyzed in the 2009 FEIS and is allowable under the Development Site's current zoning; however, the 2009 FEIS accounted for project-generated shadows from the Site 5 development (current Site A), while the current No Action scenario assumes that Site A would not be developed before 2031. The No Action scenario assumes development on Site B, Site C-1, and Site C-2. Site B would contain a new primarily residential building reaching a maximum height of 810 feet; Site C-1 would contain an office tower reaching a maximum height of 865 feet and Site C-2 would contain a residential building reaching a maximum height of 825 feet. The southwest portion of the Development Site would remain vacant in the No Action scenario.

To represent 2031 baseline conditions, three-dimensional representations of existing buildings and future planned developments in the study area were added to the baseline 3D model using best-available spatial and imagery data from the City, Nearmap, and other sources, and information from publicly available filings with the New York City Department of Buildings.

Shadows are in constant movement. The computer simulation software utilized produces a minute-by-minute 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. Shadow analyses were performed for each of the representative dates and analysis periods indicated in the Tier 3 assessment.

DETERMINATION OF IMPACT SIGNIFICANCE

The determination of significance of shadow impacts on a sunlight-sensitive resource is based on (1) the information resulting from the detailed shadow analysis describing the extent and duration of incremental shadows; and (2) an analysis of the resource's sensitivity to reduced sunlight. The goal of the assessment is to determine whether the effects of incremental shadows on a sunlight-sensitive resource are significant under CEQR.

A shadow impact occurs when the incremental shadow from a proposed project falls on a sunlight-sensitive resource or feature and reduces its direct sunlight exposure. Determining whether this impact is significant or not depends on the extent and duration of the incremental shadow and the specific context in which the impact occurs.

Per CEQR, a significant shadow impact generally occurs when an incremental shadow of 10 minutes or longer falls on a sunlight-sensitive resource and results in one of the following:

- **Vegetation:**
 - A substantial reduction in sunlight available to a sunlight-sensitive feature of the resource to less than the minimum time necessary for its survival (when there was sufficient sunlight in the No Action condition). In the growing season, six to eight hours of direct sunlight is typically a minimum requirement for vegetation. Four to six hours a day of sunlight is a minimum requirement for vegetation that can tolerate partial sun, such as established tree canopies, shrubs, or perennials.
 - A reduction in direct sunlight exposure where the sensitive feature of the resource is already subject to substandard sunlight (i.e., less than the minimum time necessary for its survival).
- **Sunlight-Sensitive Features of Historic and Cultural Resources:**
 - A substantial reduction in sunlight available for the enjoyment or appreciation of the sunlight-sensitive features of a historic or cultural resource.
- **Open Space Utilization:**
 - A substantial reduction in the usability of open space as a result of increased shadows, accounting for anticipated new users and the open space's utilization rates throughout the affected time periods.
- **For Any Sunlight-Sensitive Feature of a Resource:**
 - Complete elimination of all direct sunlight on the sunlight-sensitive feature of the resource, when the complete elimination results in substantial effects on the survival, enjoyment, or, in the case of open space or natural resources, the use of the resource.

SUMMARY OF ANALYSIS RESULTS

Of the 17 open space resources that were analyzed, 9 would receive incremental shadows on one or more representative analysis dates. As described in detail below, these include the High Line, Hudson River Park and the adjacent Greenway, the Hudson Yards Public Square and Gardens, Bella Abzug Park, and four small- to moderate-sized urban plazas. The portion of the High Line extending along the western perimeter of the Development Site would receive incremental shadows in the mid to late mornings and mid-day throughout the year. (This is consistent with the timing of shadows anticipated from the development analyzed in the 2009 FEIS; however, the 2009 FEIS accounted for project-generated shadows from the Site 5 development (current Site A), while the current No Action scenario assumes that Site A would not be developed before 2031, resulting in a larger increment of project-generated shadow from Site A.⁷) Hudson River Park and the adjacent Greenway would receive incremental shadows in the mornings and midday hours, but those shadows would be limited to a connecting path with no amenities during the spring, summer, and fall months, and most of the winter date as well. The Hudson Yards Public Square and Gardens would receive incremental shadow

⁷ The 2009 FEIS concluded that "Like the other proposed open spaces on the Development Site, these sections of the High Line [on the Development Site] would generally be shady in the mornings and sunny during the afternoons."

Western Rail Yard Modifications

in the mid to late afternoons in the late spring and summer months. The other open spaces would receive less substantial new shadows.

Of the 7 historic resources that were analyzed, 3 would receive incremental shadows, limited to less than 30 minutes and in only certain months.

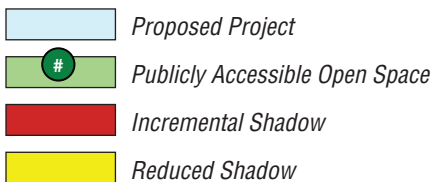
The other 8 open space resources and 4 historic resources that were analyzed would not receive any incremental shadows. This was generally due to the fact that the Development Site is situated in an area densely developed with tall and often bulky buildings, which limit the size and the reach of incremental shadow.

Portions of the Hudson River would receive incremental shadows in the mornings (and early afternoons in certain months).

Table 6-4 summarizes the entry and exit times and total duration of incremental shadows on each affected sun-sensitive resource. **Figures 6-6 to 6-44** 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 additional, incremental shadow at that moment in time (highlighted in red), and also show existing shadow and remaining areas of sunlight.

Table 6-4
Incremental Shadow Durations

Map Reference	Resource	Dec. 21	March 21/Sept. 21	May 6/August 6	June 21
Publicly Accessible Open Spaces					
1	The High Line	Proposed Project			
		10:15 am to 1:30 pm Total: 3 hr 15 min*	8:00 am to 1:55 pm Total: 5 hr 55 min*	7:00 am to 7:10 am 8:15 am to 12:50 pm Total: 4 hr 45 min*	7:25 am to 12:45 pm Total: 5 hr 20 min*
		Alternative Scenario			
		10:15 am to 1:30 pm Total: 3 hr 15 min*	8:00 am to 1:55 pm Total: 5 hr 55 min*	7:00 am to 7:10 am 8:15 am to 1:10 pm Total: 5 hr 5 min*	7:25 am to 12:55 pm Total: 5 hr 30 min*
2	Hudson River Park	Proposed Project			
		8:51 am to 8:55 am 9:50 am to 1:35 pm Total: 3 hr 49 min*	8:00 am to 12:40 pm Total: 4 hr 40 min*	7:00 am to 7:10 am 8:05 am to 11:55 am Total: 4 hr 5 min*	7:05 am to 11:40 pm Total: 4 hr 35 min*
		Alternative Scenario			
		8:51 am to 8:55 am 9:50 am to 1:30 pm Total: 3 hr 44 min*	8:00 am to 12:40 pm Total: 4 hr 40 min*	7:00 am to 7:10 am 8:05 am to 11:55 am Total: 4 hr 5 min*	7:05 am to 11:40 pm Total: 4 hr 35 min*
3	Hudson River Park Greenway	Proposed Project			
		8:51 am to 8:55 am 9:50 am to 1:45 pm Total: 3 hr 59 min*	8:00 am to 12:45 pm Total: 4 hr 45 min*	7:00 am to 7:10 am 8:05 am to 12:00 pm Total: 4 hr 10 min*	7:05 am to 11:50 pm Total: 4 hr 45 min*
		Alternative Scenario			
		8:51 am to 8:55 am 9:50 am to 1:40 pm Total: 3 hr 54 min*	8:00 am to 12:45 pm Total: 4 hr 45 min*	7:00 am to 7:10 am 8:05 am to 12:00 pm Total: 4 hr 10 min*	7:05 am to 11:50 pm Total: 4 hr 45 min*
4	650 West 42nd St POPS	Proposed Project			
		1:25 pm to 2:35 pm Total: 1 hr 10 min	—	—	—
		Alternative Scenario			
		1:20 pm to 2:35 pm Total: 1 hr 15 min	—	—	—
9	Lorraine Hansberry Plaza	Proposed Project			
		2:40 pm to 2:53 pm Total: 13 min	—	—	—
		Alternative Scenario			
		2:40 pm to 2:53 pm Total: 13 min	—	—	—



Map Key Open Space Resource

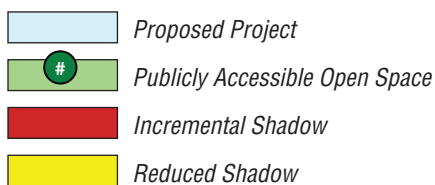
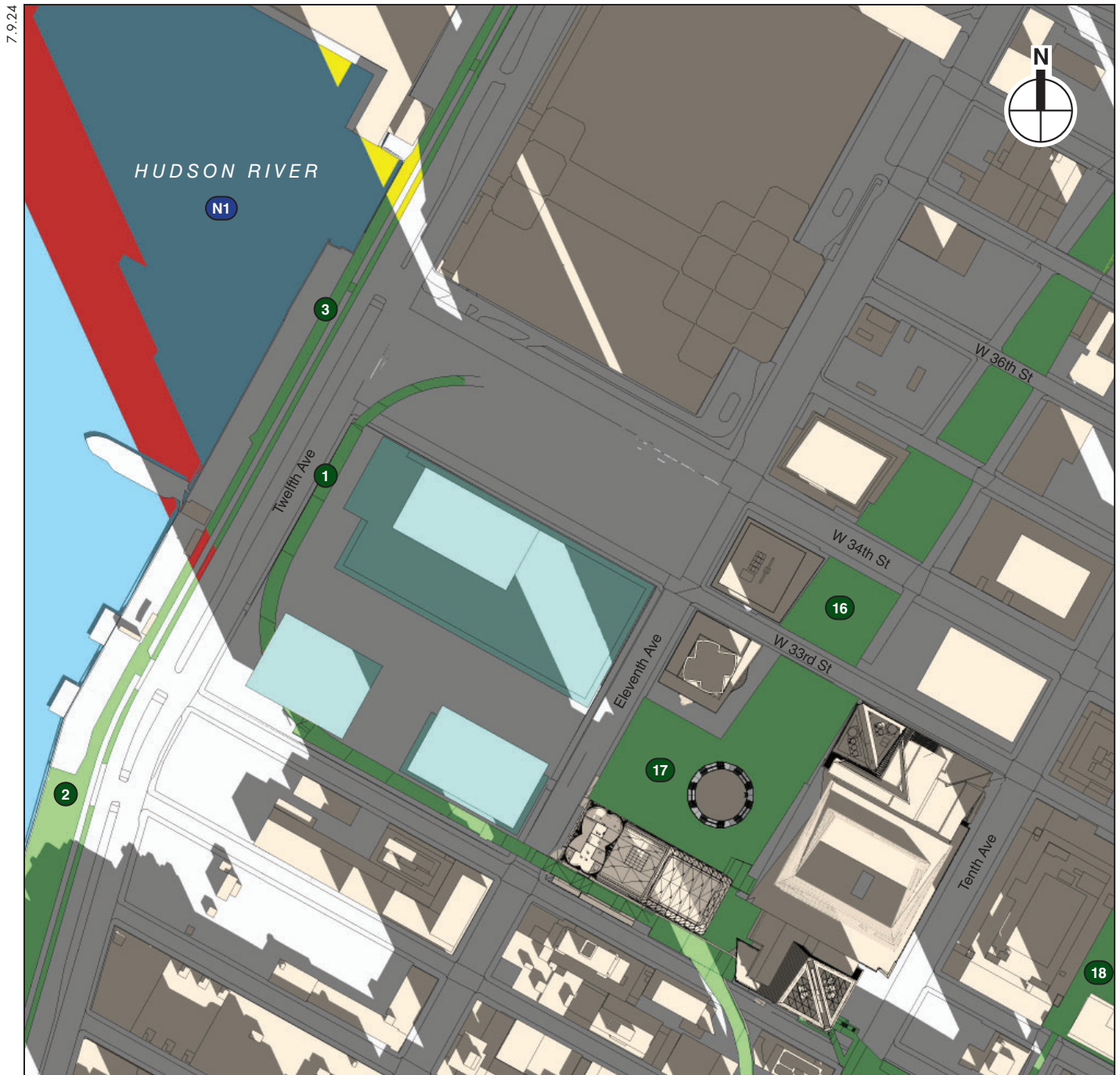
1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

9:30 AM

NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
December 21



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

10:15 AM

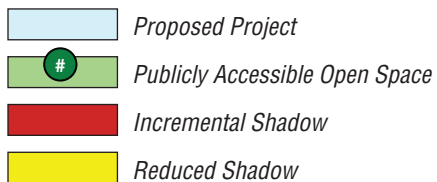
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Detailed Analysis—Proposed Project
December 21



11:00 AM

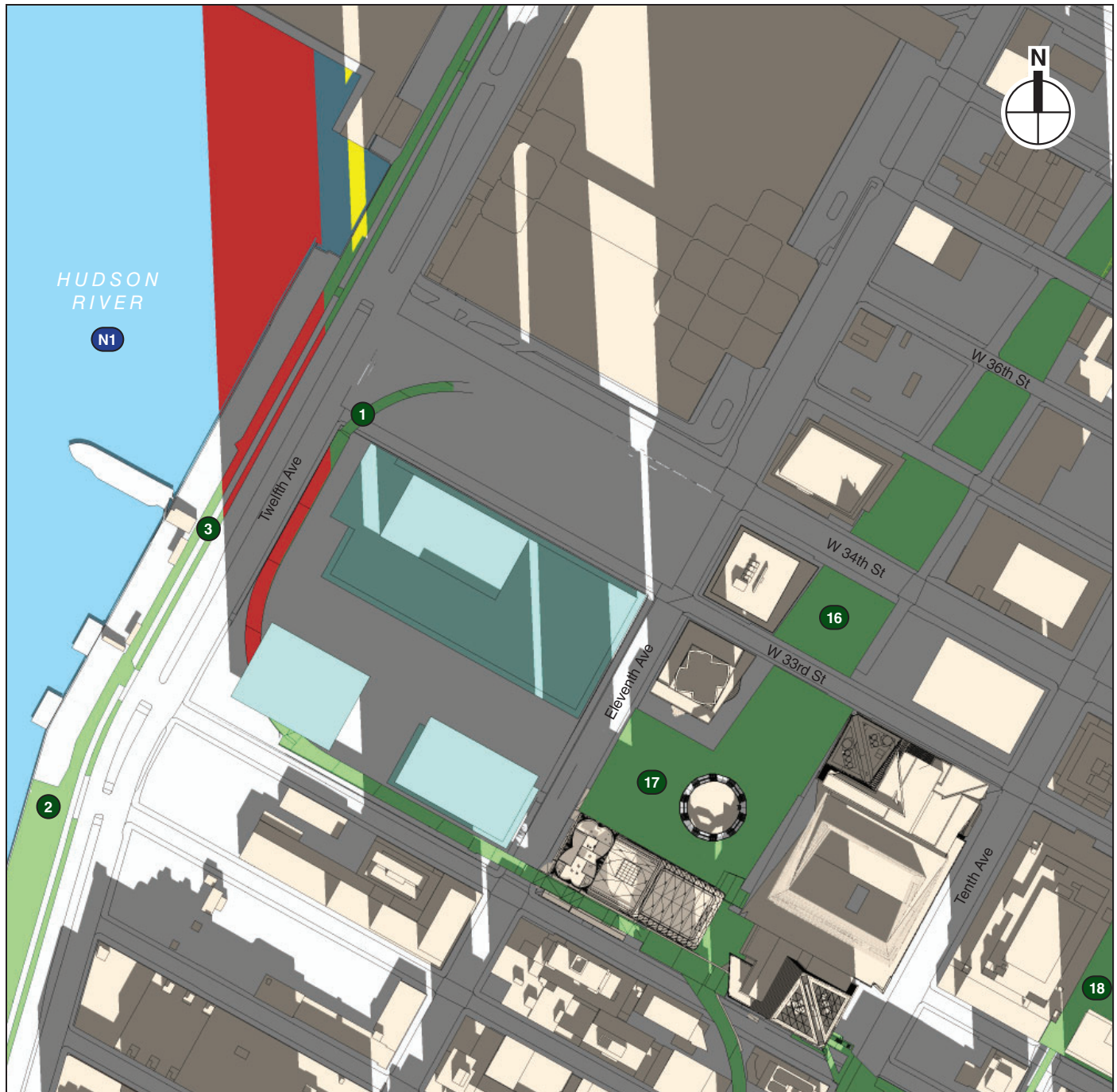
**Map Key Open Space Resource**

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

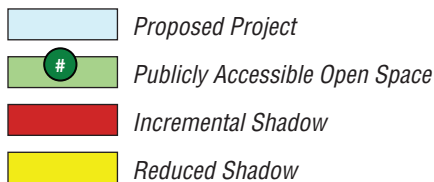
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther north on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
December 21



11:45 AM



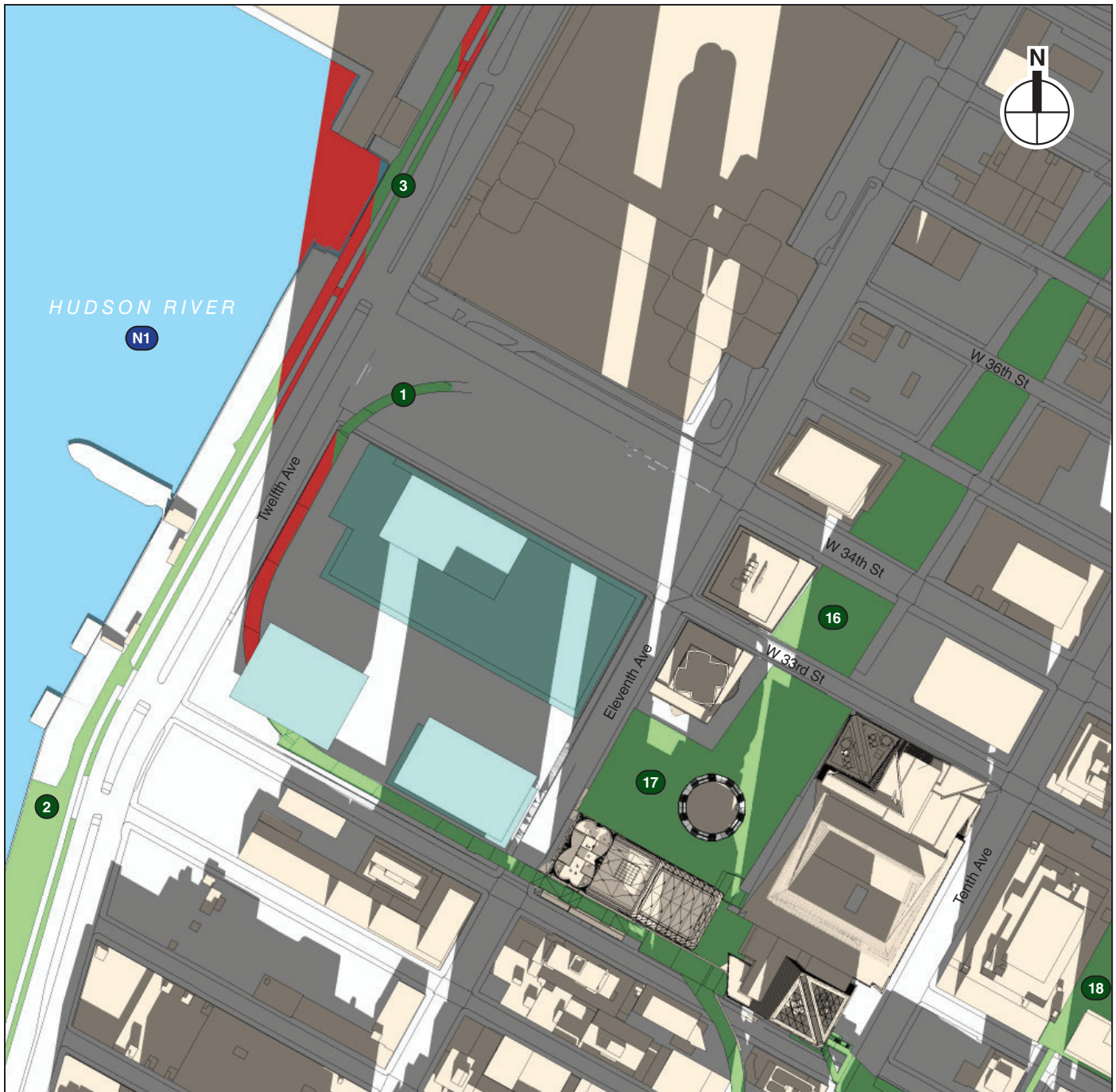
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

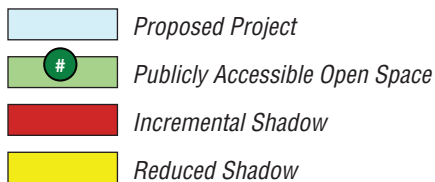
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther north on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
December 21



12:30 PM

**Map Key Open Space Resource**

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

NOTES:

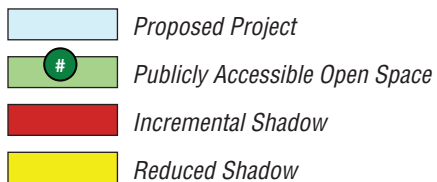
- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther north on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
December 21

Figure 6-10



1:15 PM

**Map Key Open Space Resource**

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

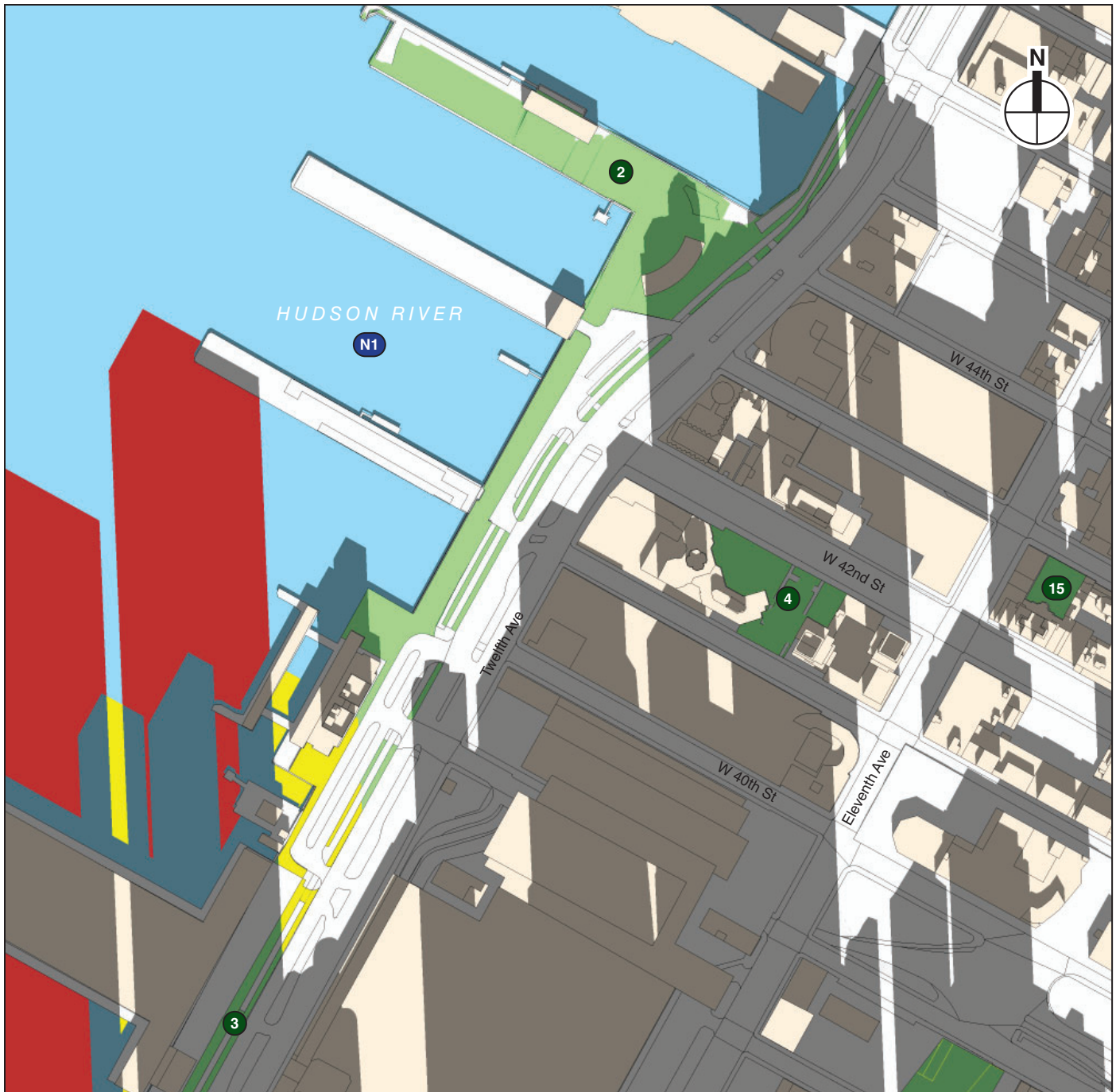
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther north on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

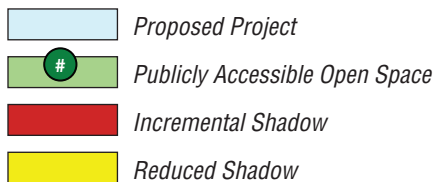
Detailed Analysis—Proposed Project

December 21

Figure 6-11



11:45 AM

**Map Key Open Space Resource**

- 2. Hudson River Park
- 3. Hudson River Park Bikeway and Greenway
- 4. 650 West 42nd St POPS
- 15. 560 West 43rd St POPS

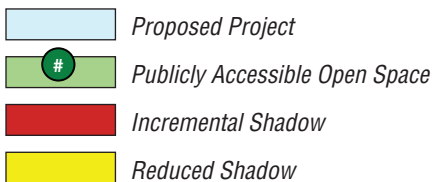
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project

December 21

Figure 6-12



Map Key Open Space Resource

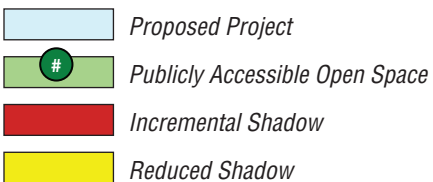
- 2. Hudson River Park
- 3. Hudson River Park Bikeway and Greenway
- 4. 650 West 42nd St POPS
- 15. 560 West 43rd St POPS

12:30 PM

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.

Detailed Analysis—Proposed Project
December 21

Figure 6-13



Map Key Open Space Resource

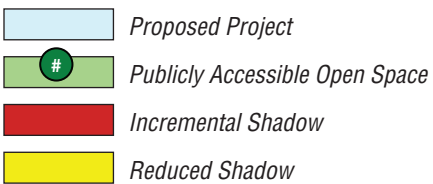
- 2. Hudson River Park
- 3. Hudson River Park Bikeway and Greenway
- 4. 650 West 42nd St POPS
- 15. 560 West 43rd St POPS

1:15 PM

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.

Detailed Analysis—Proposed Project
December 21

Figure 6-14



Map Key Open Space Resource

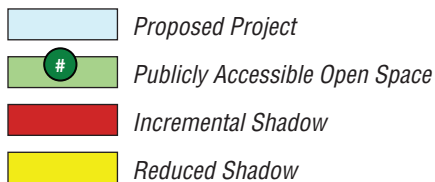
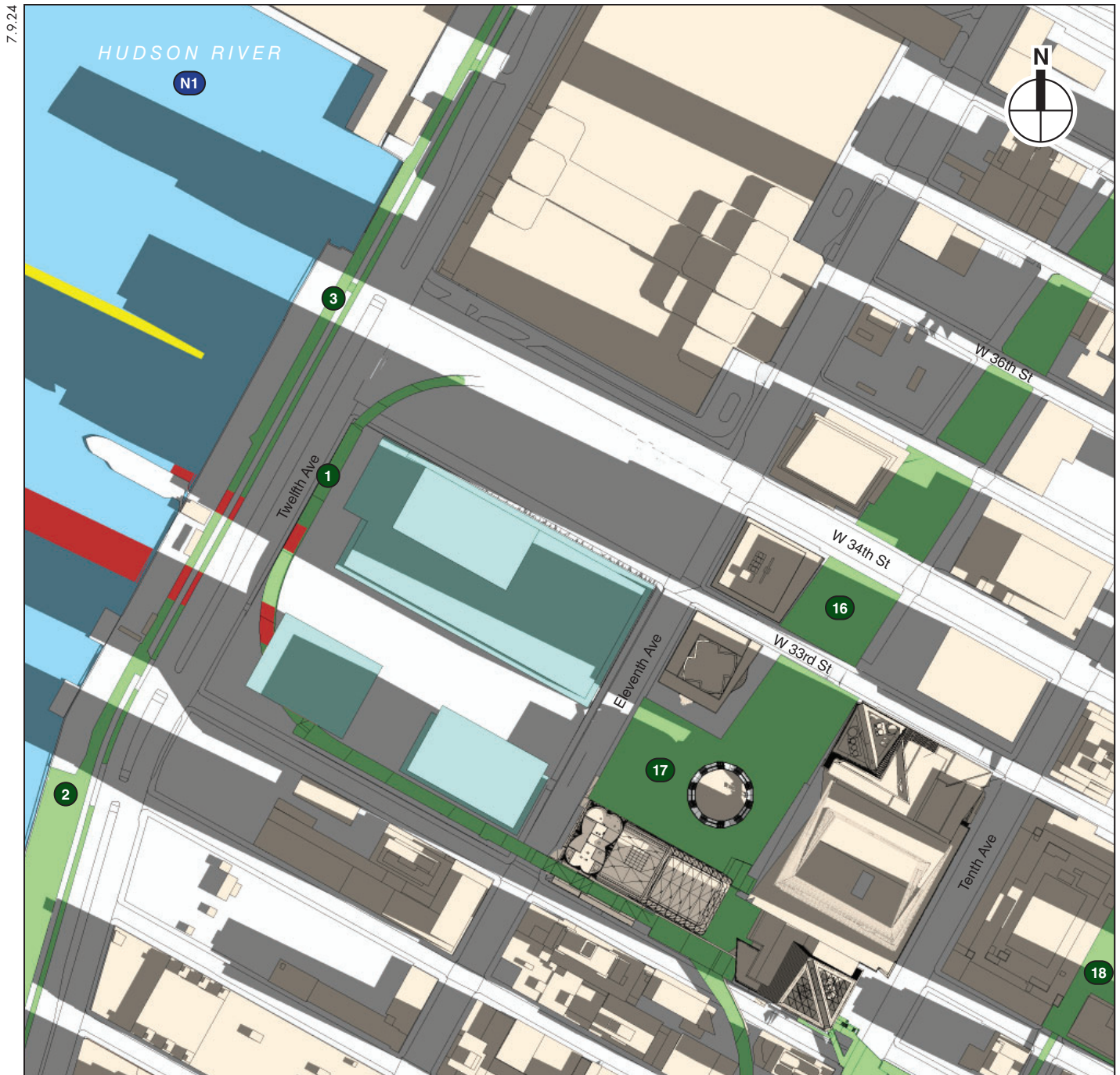
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
4. 650 West 42nd St POPS
15. 560 West 43rd St POPS

2:00 PM

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.

Detailed Analysis—Proposed Project
December 21

Figure 6-15



Map Key Open Space Resource

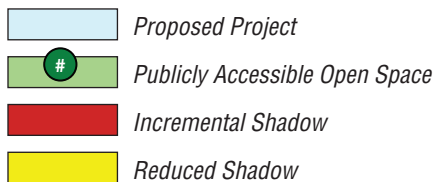
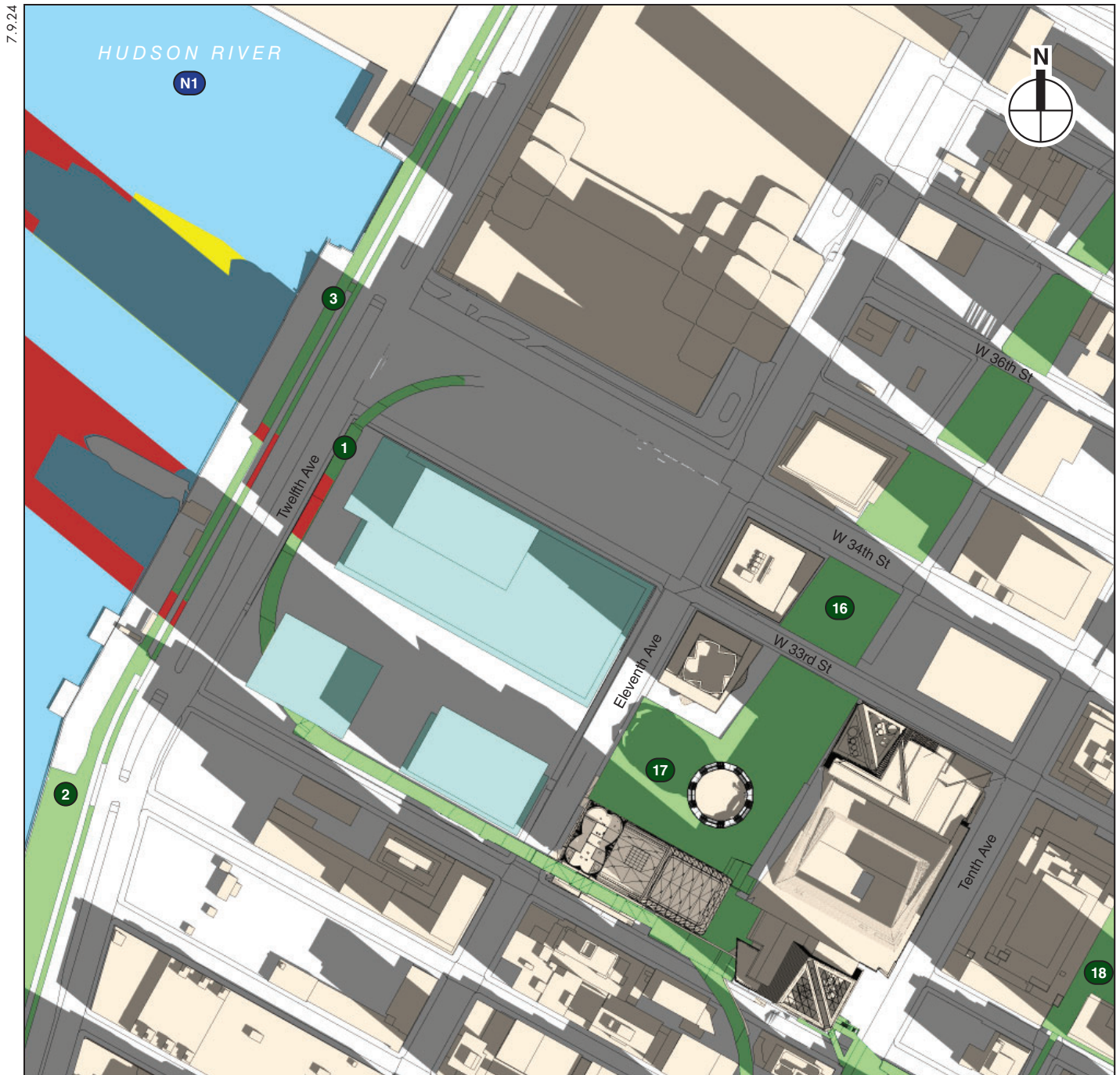
1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

8:30 AM EST (9:30 AM EDT)

NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
March 21 / September 21



Map Key Open Space Resource

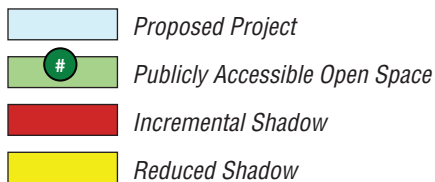
1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

9:30 AM EST (10:30 AM EDT)

NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
March 21 / September 21



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

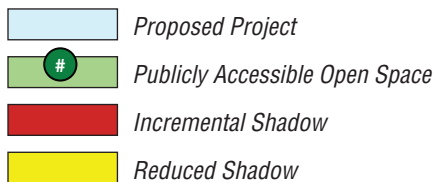
10:30 AM EST (11:30 AM EDT)

NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
March 21 / September 21

Figure 6-18



Map Key Open Space Resource

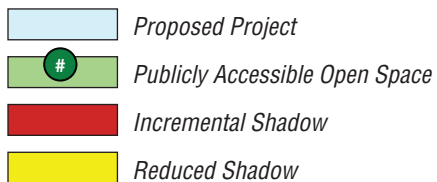
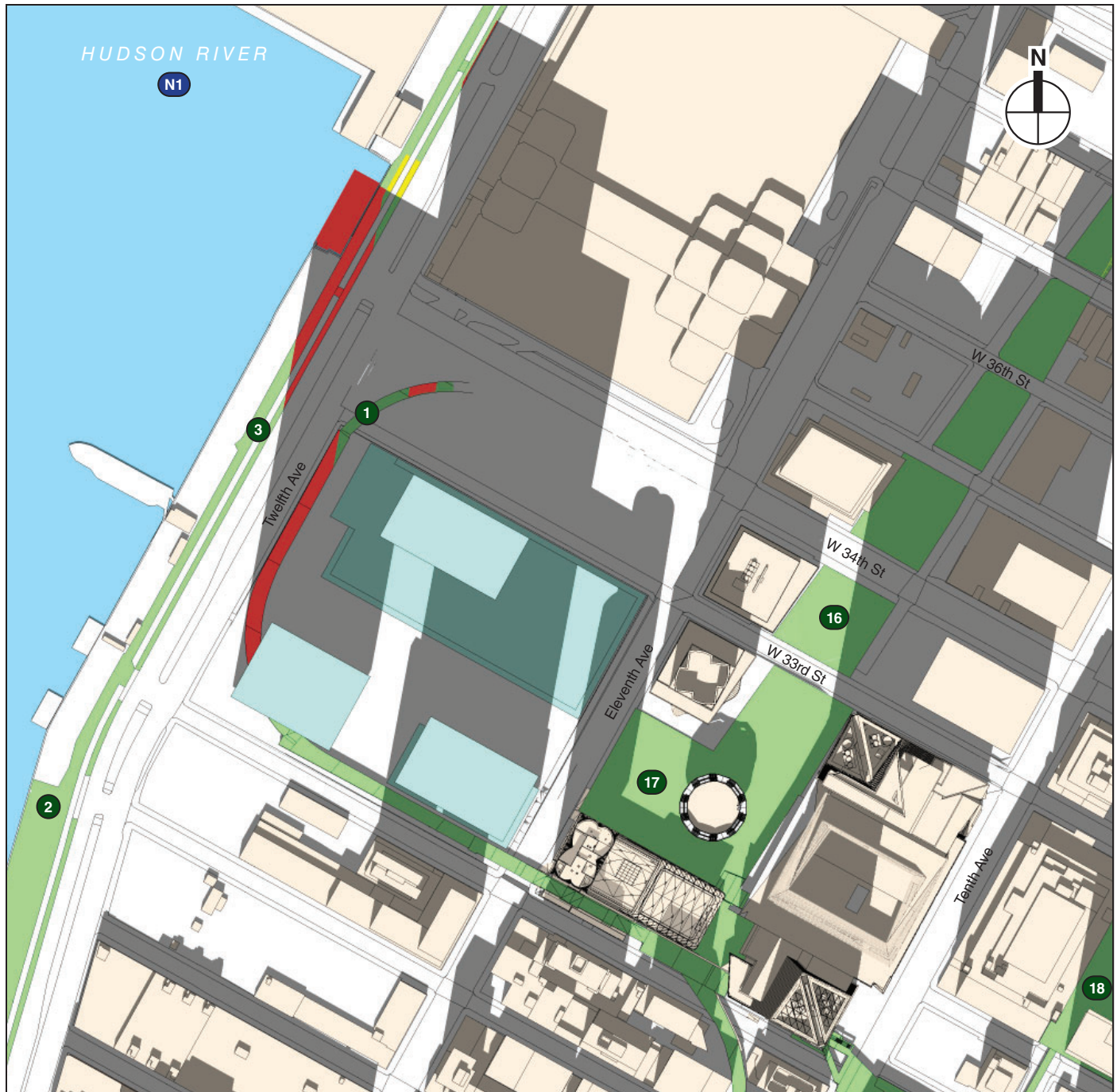
1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

11:30 AM EST (12:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
March 21 / September 21

Figure 6-19



Map Key Open Space Resource

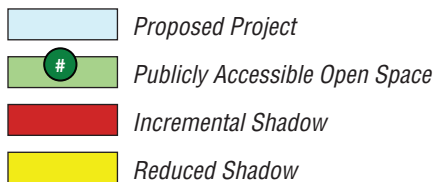
1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

12:30 PM EST (1:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
March 21 / September 21

Figure 6-20



Map Key Open Space Resource

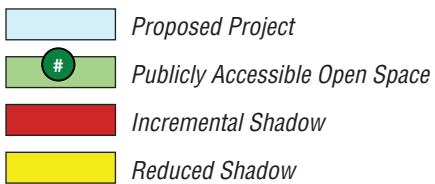
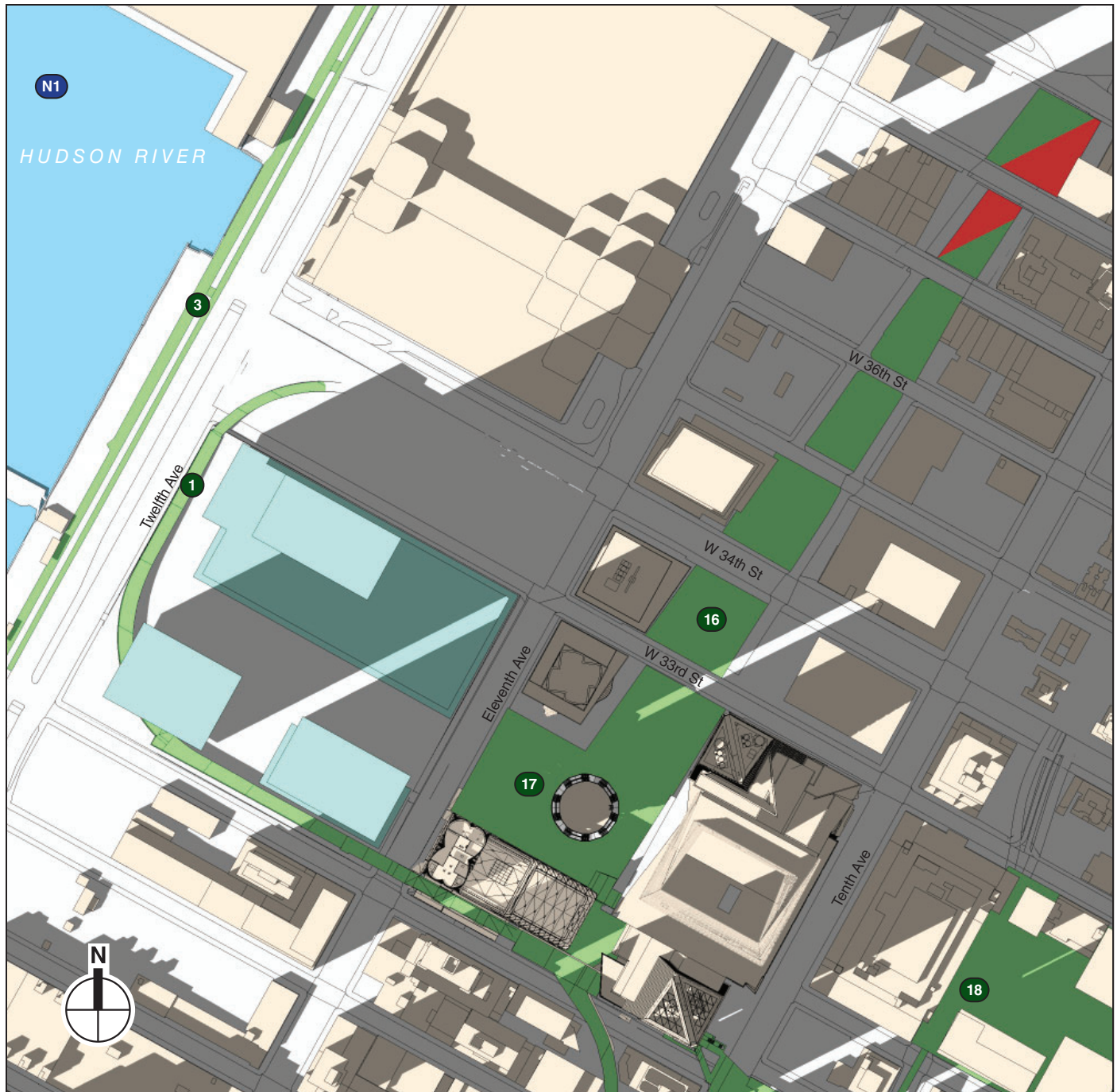
1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

1:30 PM EST (2:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
March 21 / September 21

Figure 6-21



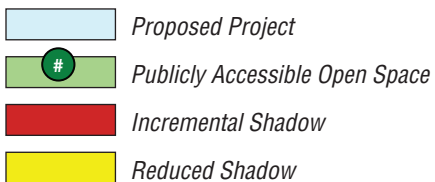
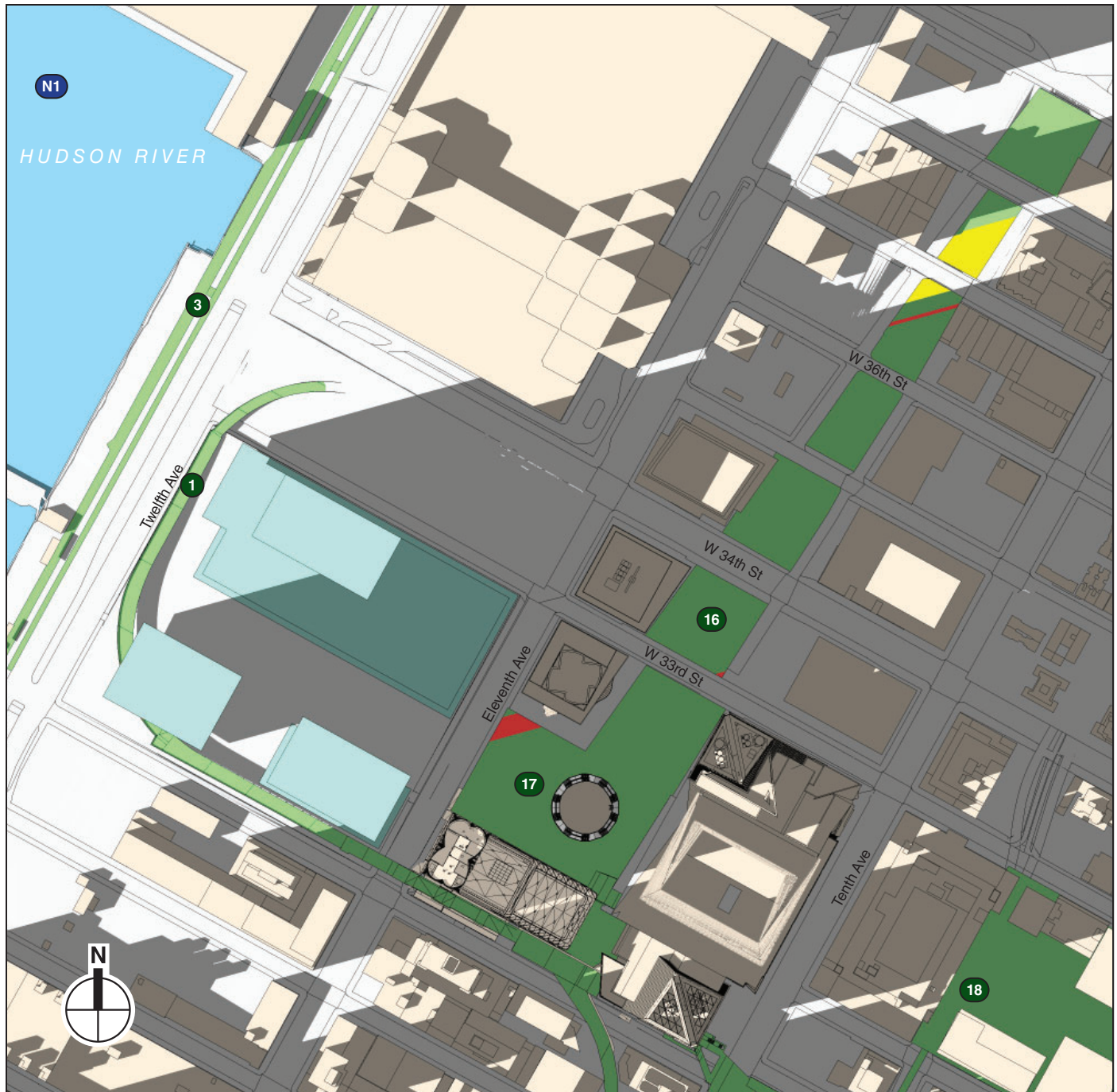
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

3:30 PM EST (4:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
March 21 / September 21



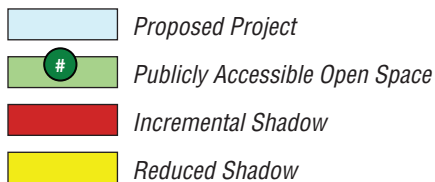
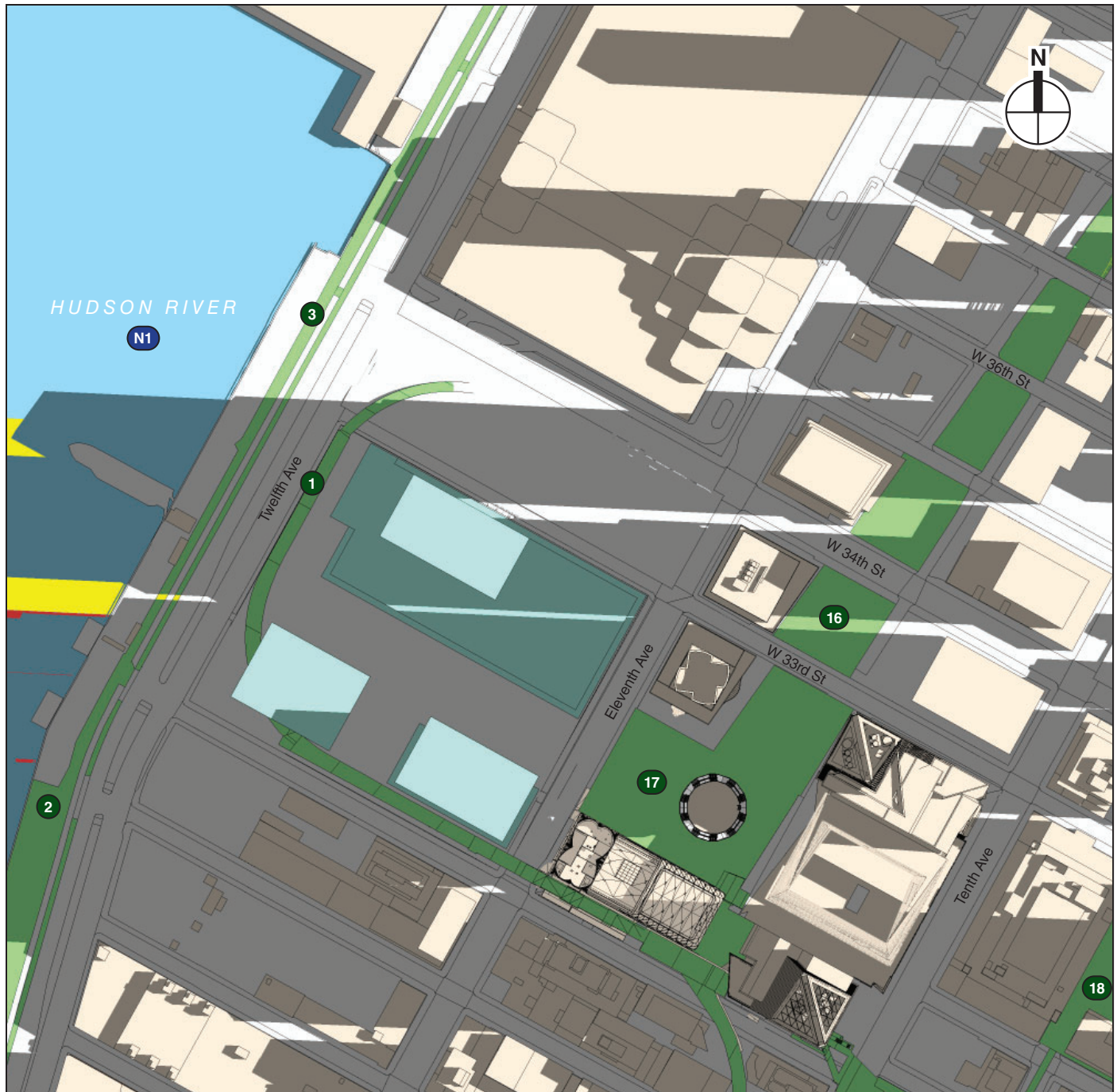
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

4:29 PM EST (5:29 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
March 21 / September 21



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

7:30 AM EST (8:30 AM EDT)

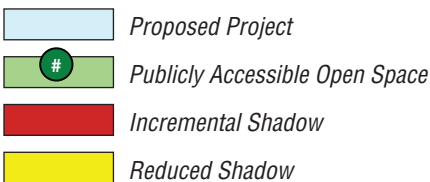
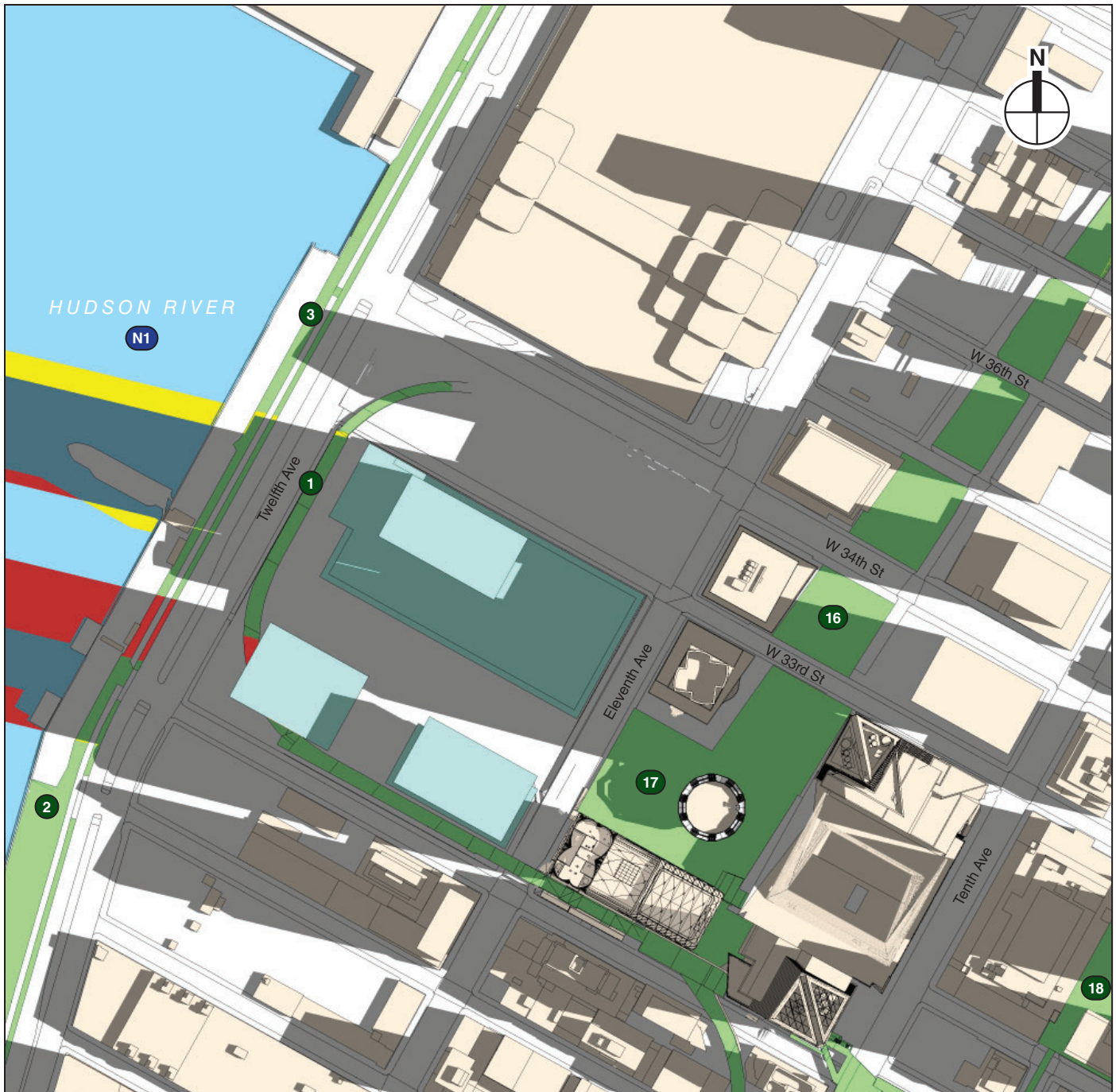
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project

May 6 / August 6

Figure 6-24



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

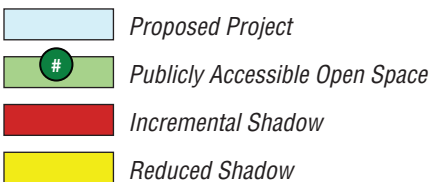
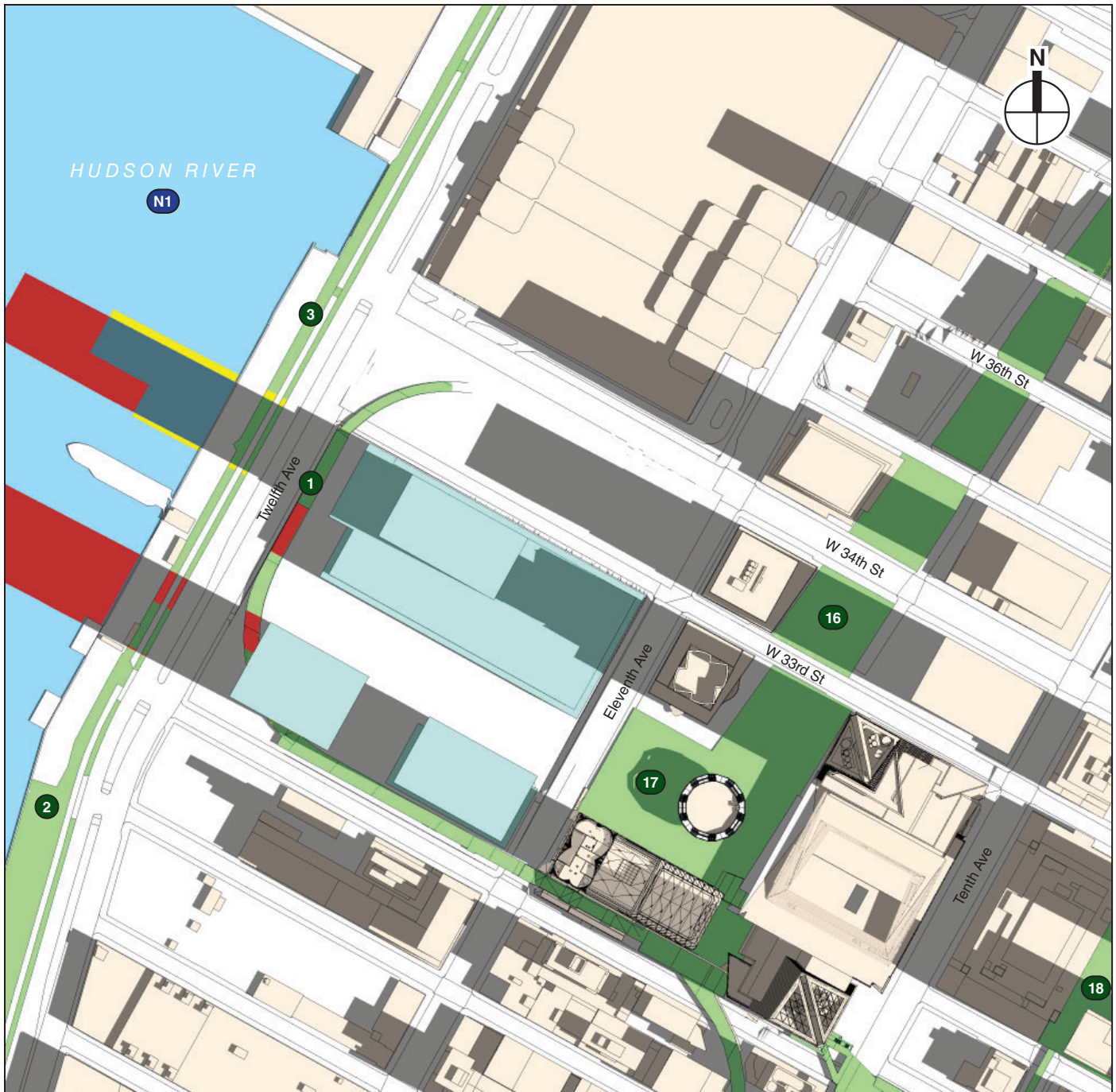
8:30 AM EST (9:30 AM EDT)

NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
May 6 / August 6

Figure 6-25



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

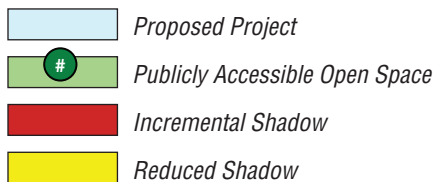
9:30 AM EST (10:30 AM EDT)

NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project
May 6 / August 6

Figure 6-26



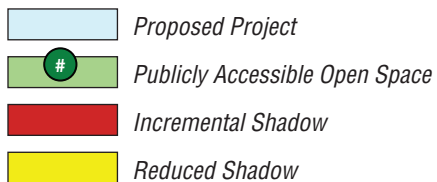
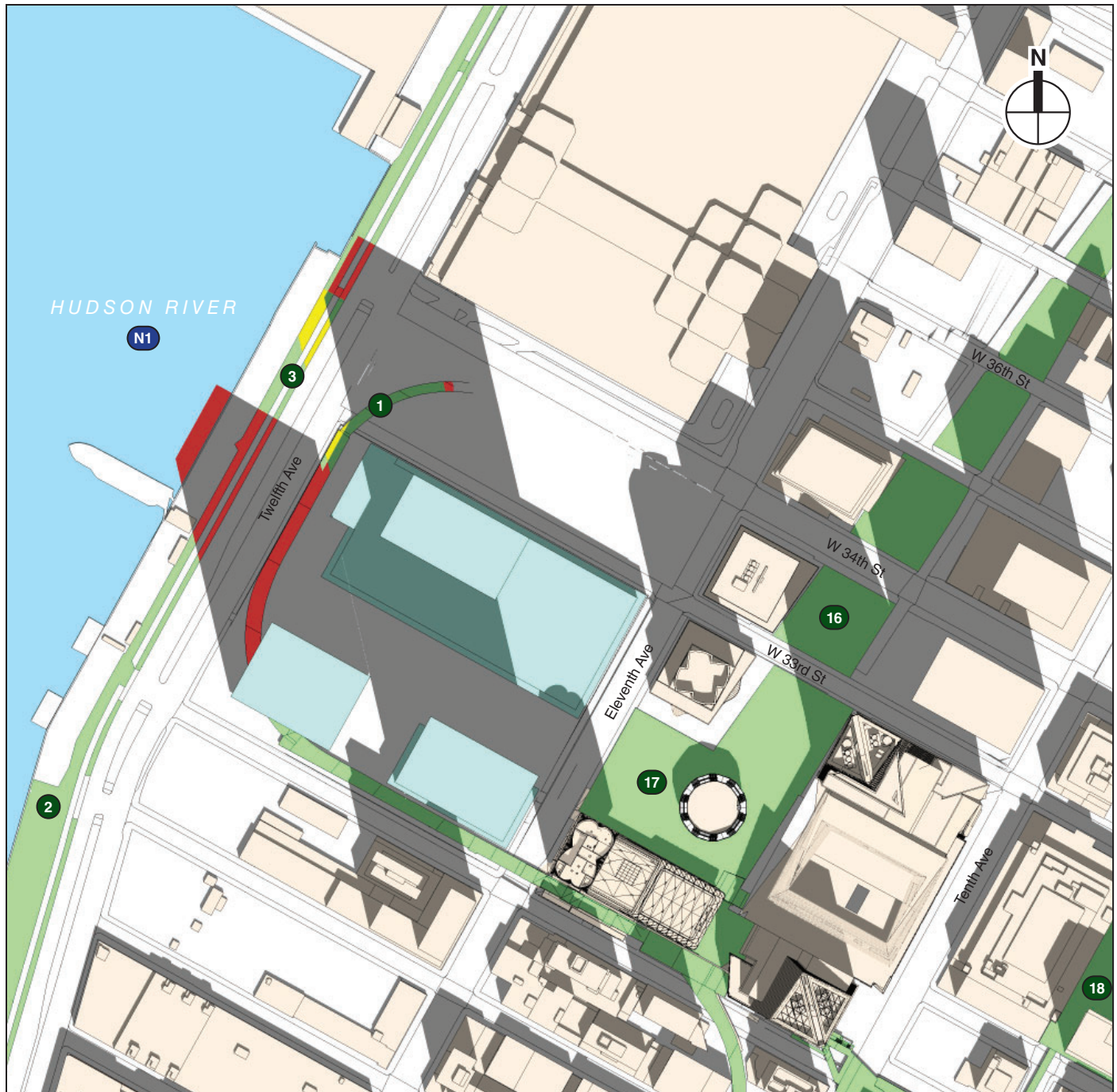
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

10:30 AM EST (11:30 AM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
 EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
 May 6 / August 6
Figure 6-27



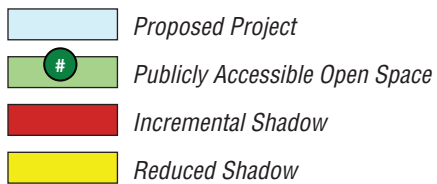
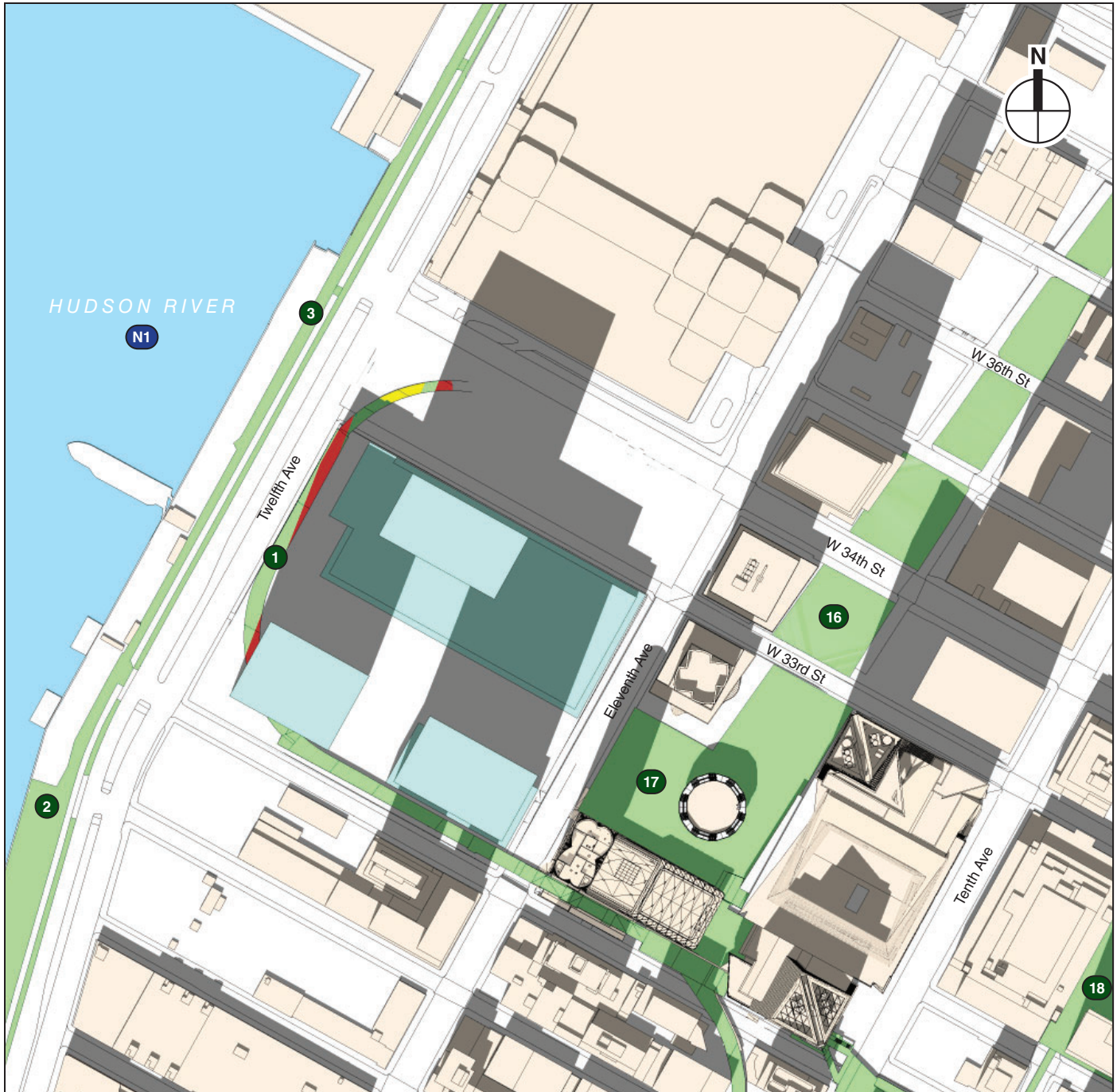
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

11:30 AM EST (12:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
May 6 / August 6
Figure 6-28



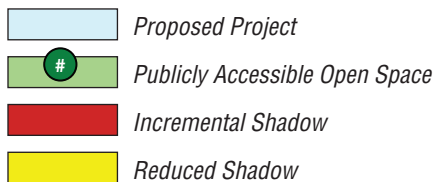
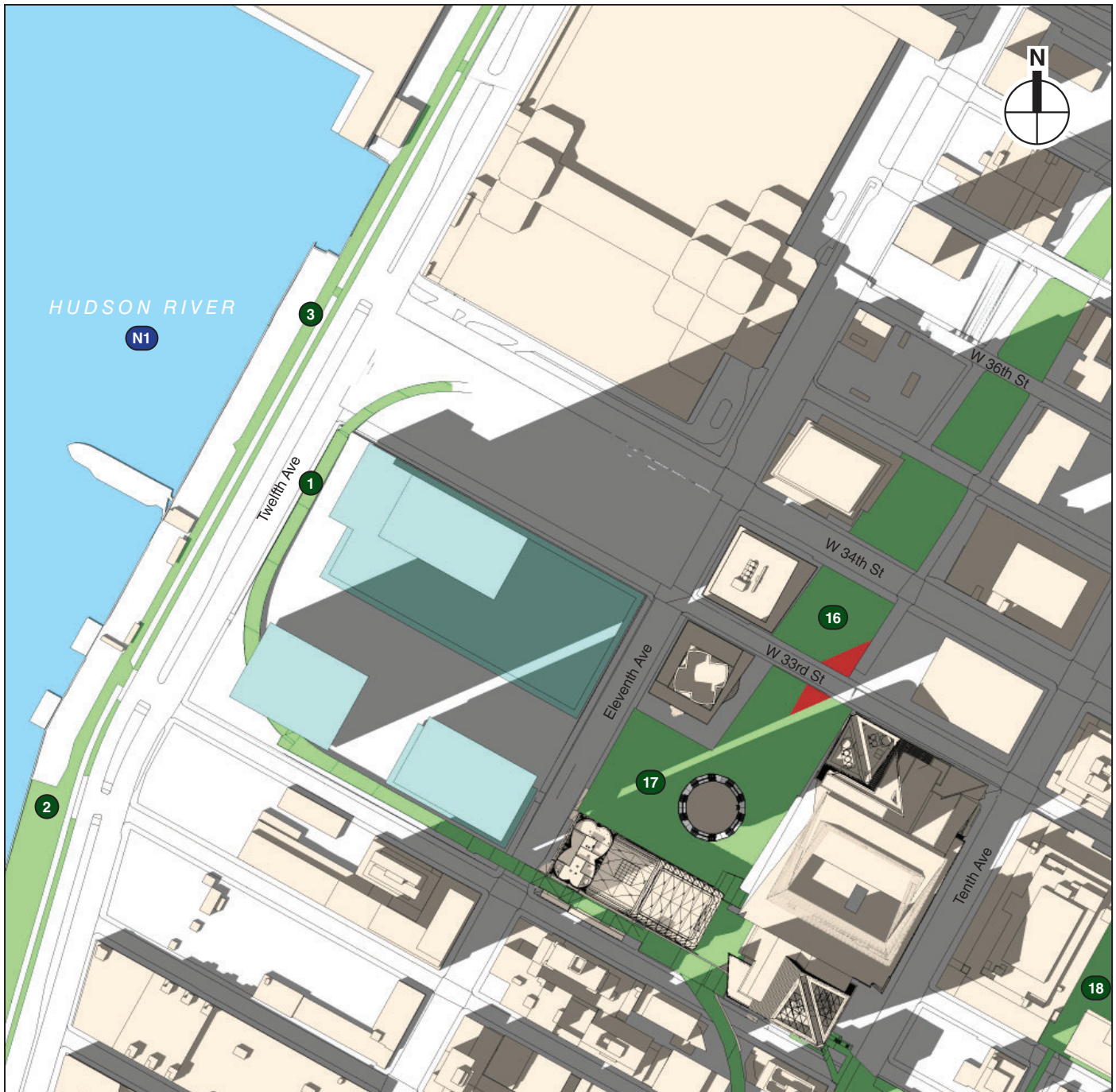
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

12:30 PM EST (1:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
May 6 / August 6
Figure 6-29



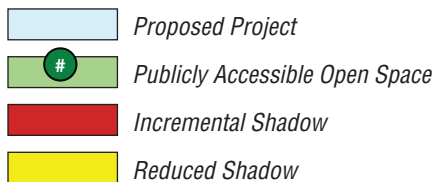
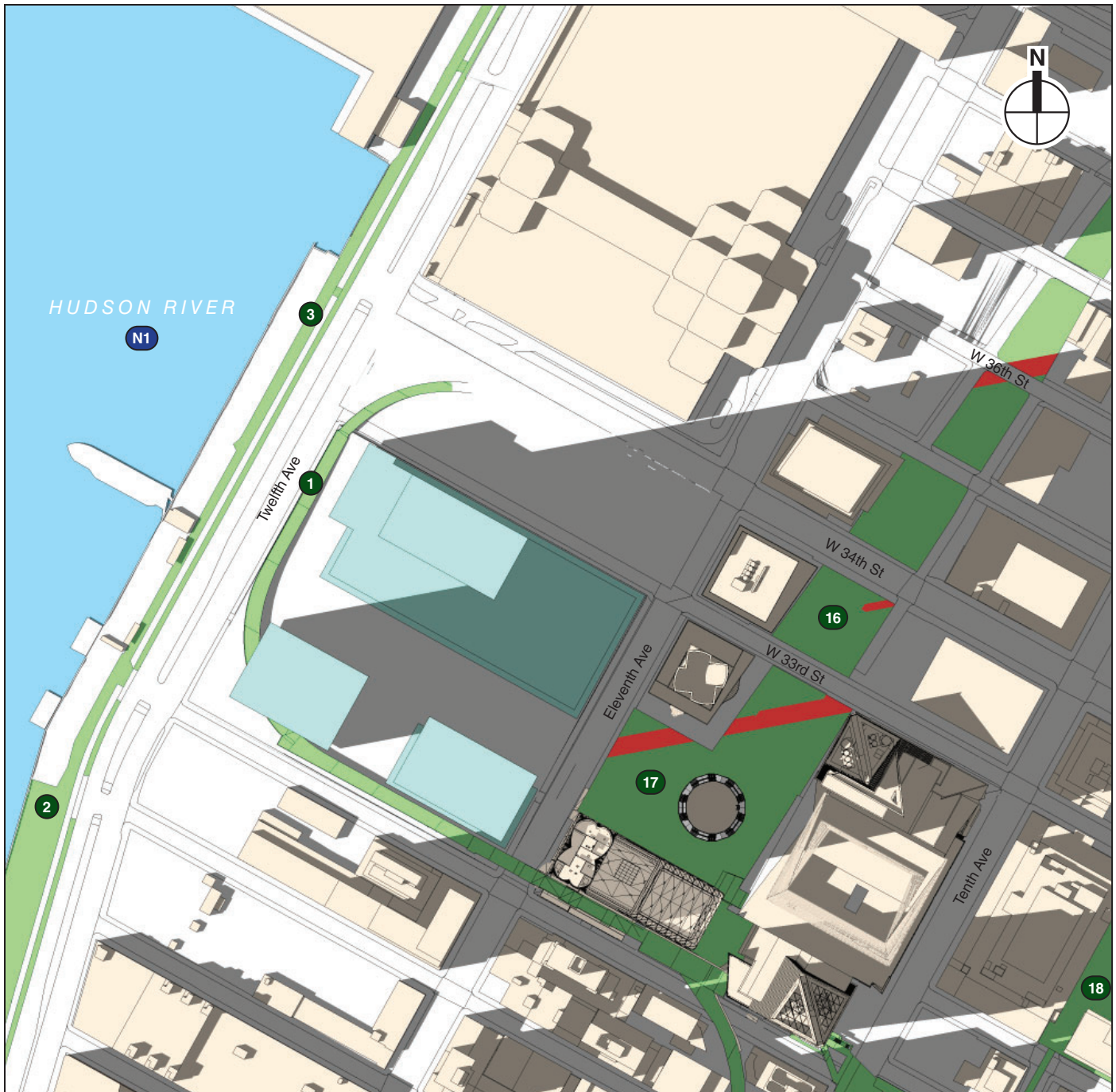
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

2:30 PM EST (3:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
May 6 / August 6
Figure 6-30



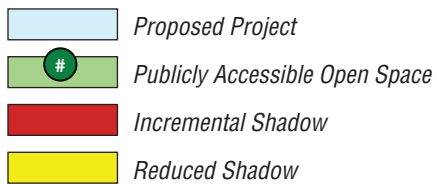
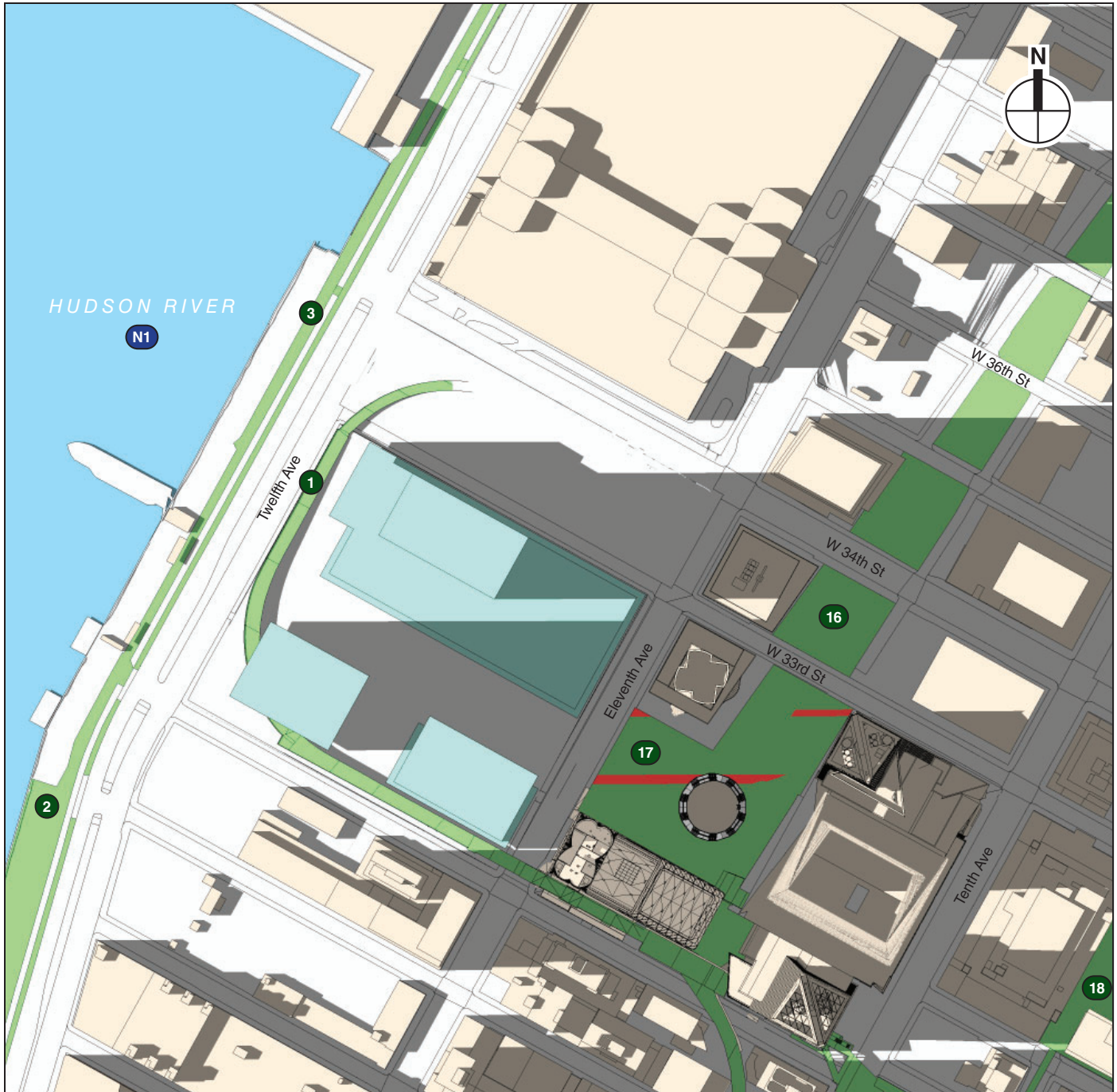
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

3:30 PM EST (4:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
May 6 / August 6
Figure 6-31



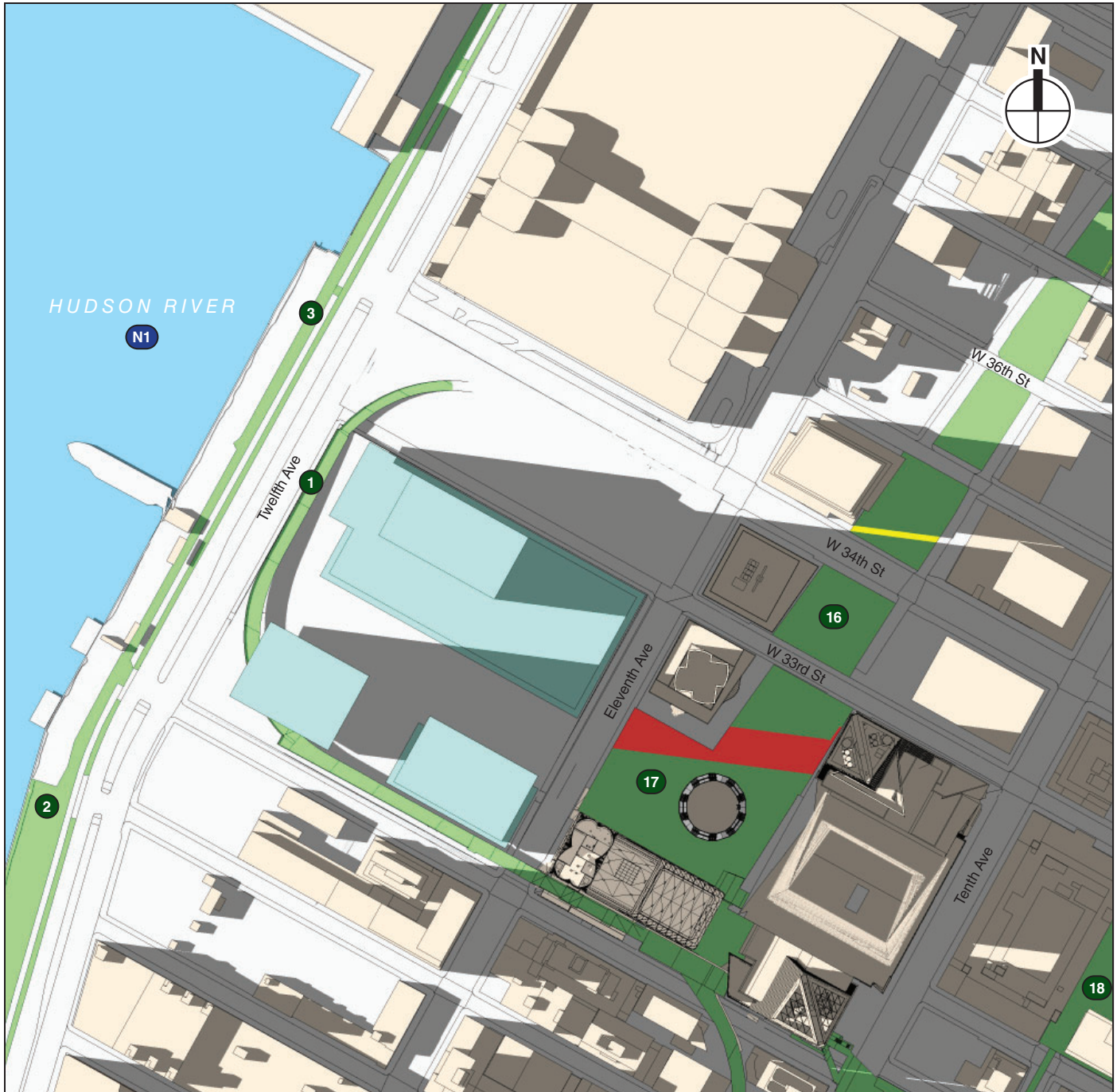
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

4:30 PM EST (5:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
May 6 / August 6
Figure 6-32



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

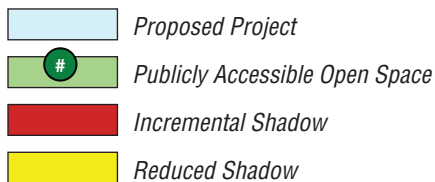
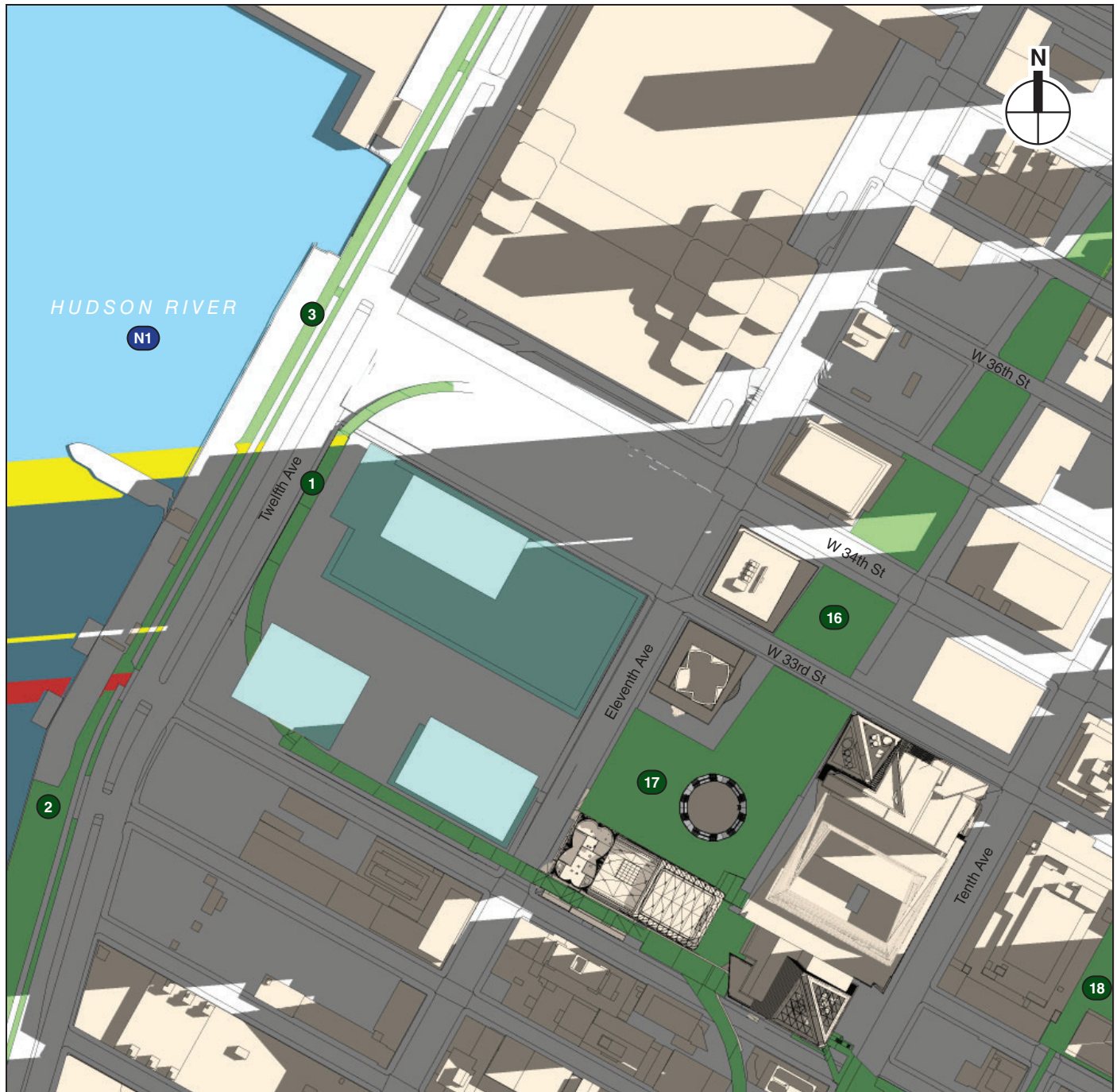
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

5:18 PM EST (6:18 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
May 6 / August 6
Figure 6-33



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

7:30 AM EST (8:30 AM EDT)

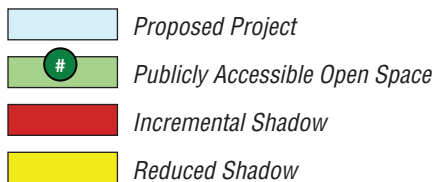
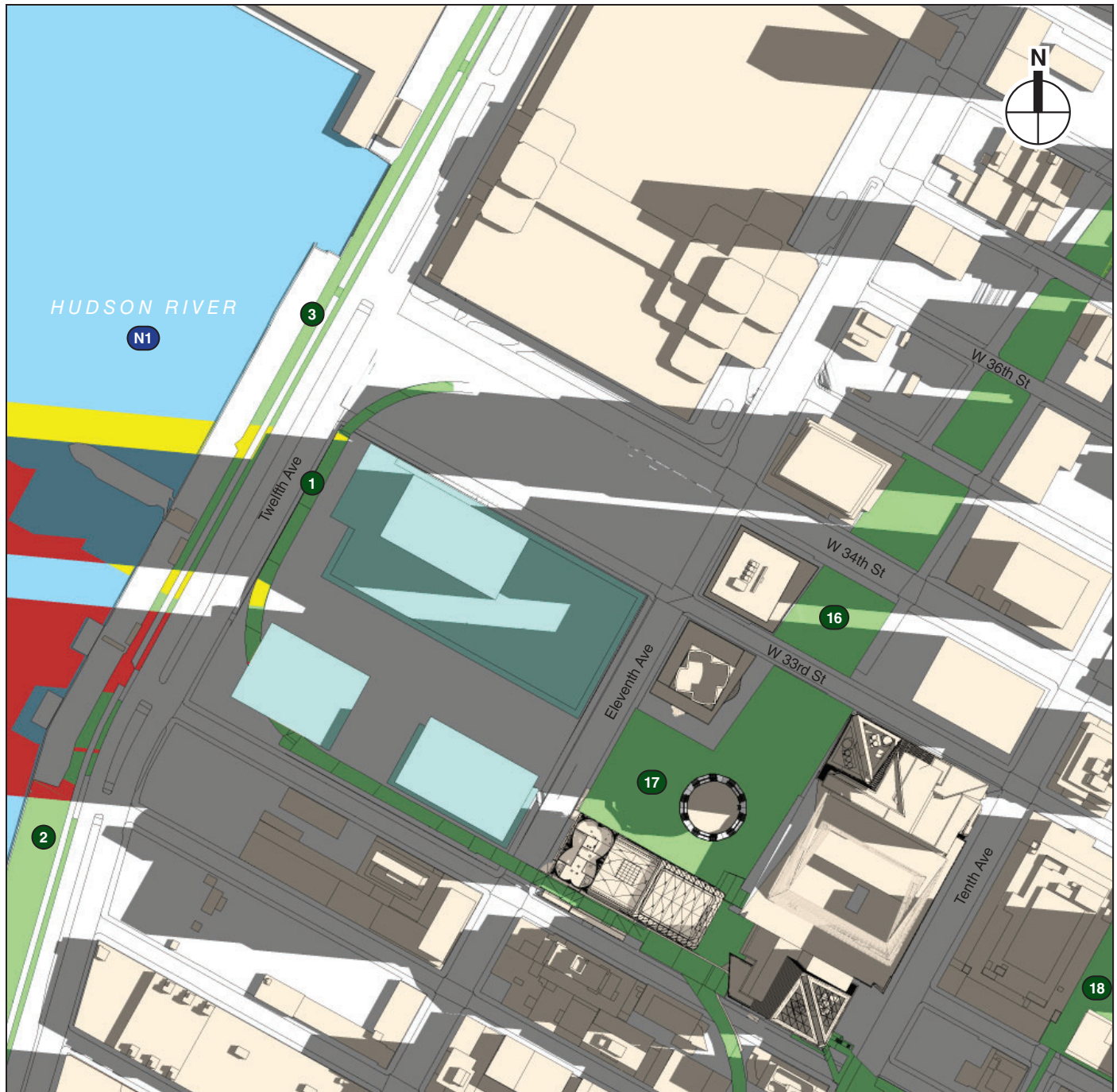
NOTES:

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EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project

June 21

Figure 6-34



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

8:30 AM EST (9:30 AM EDT)

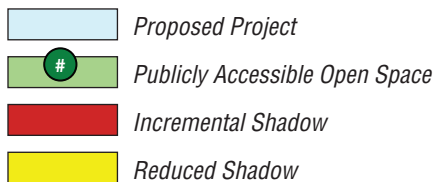
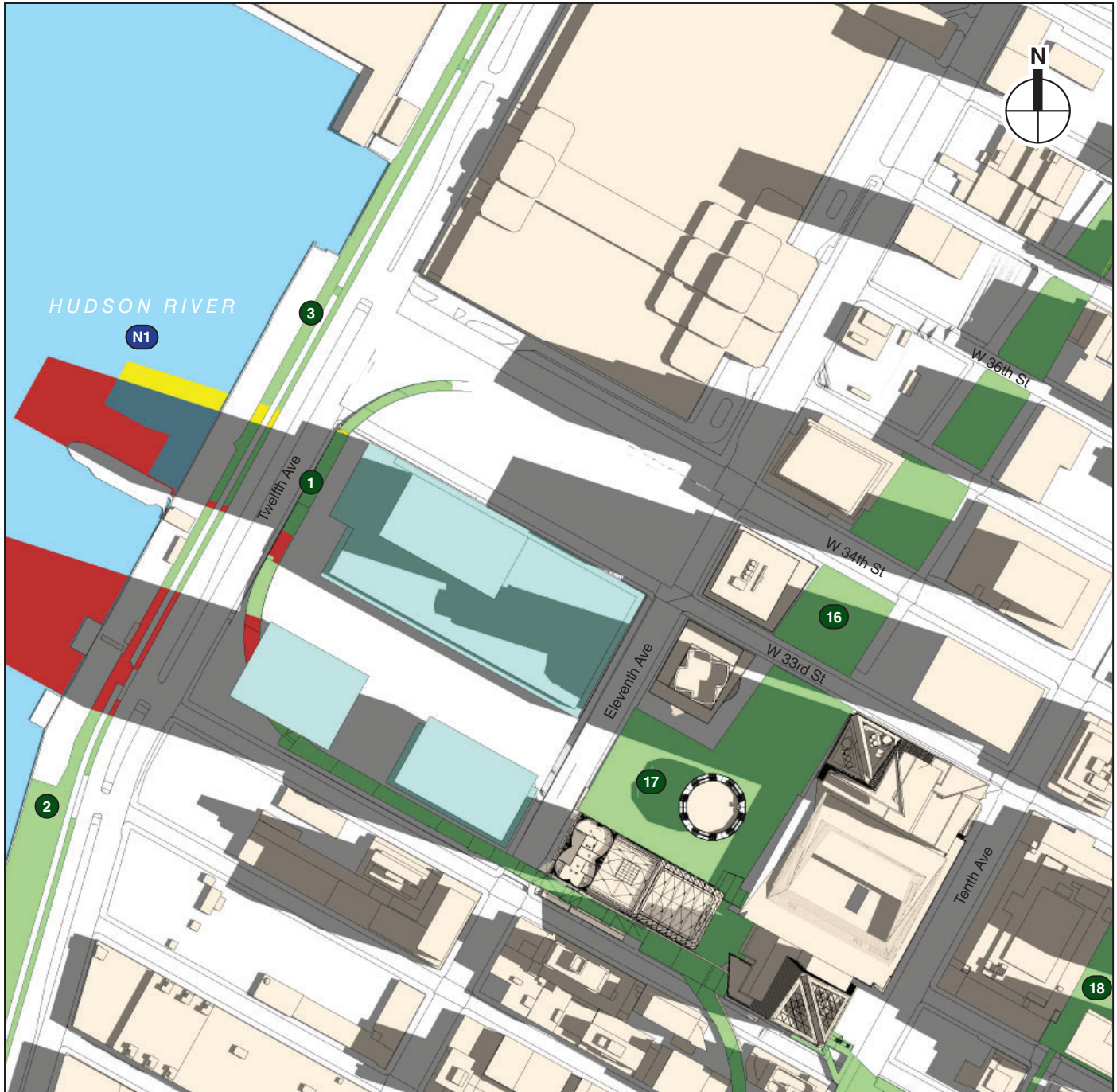
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project

June 21

Figure 6-35



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

9:30 AM EST (10:30 AM EDT)

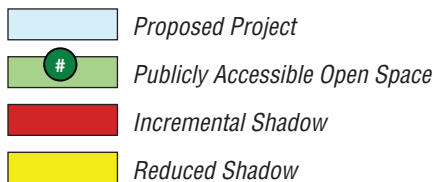
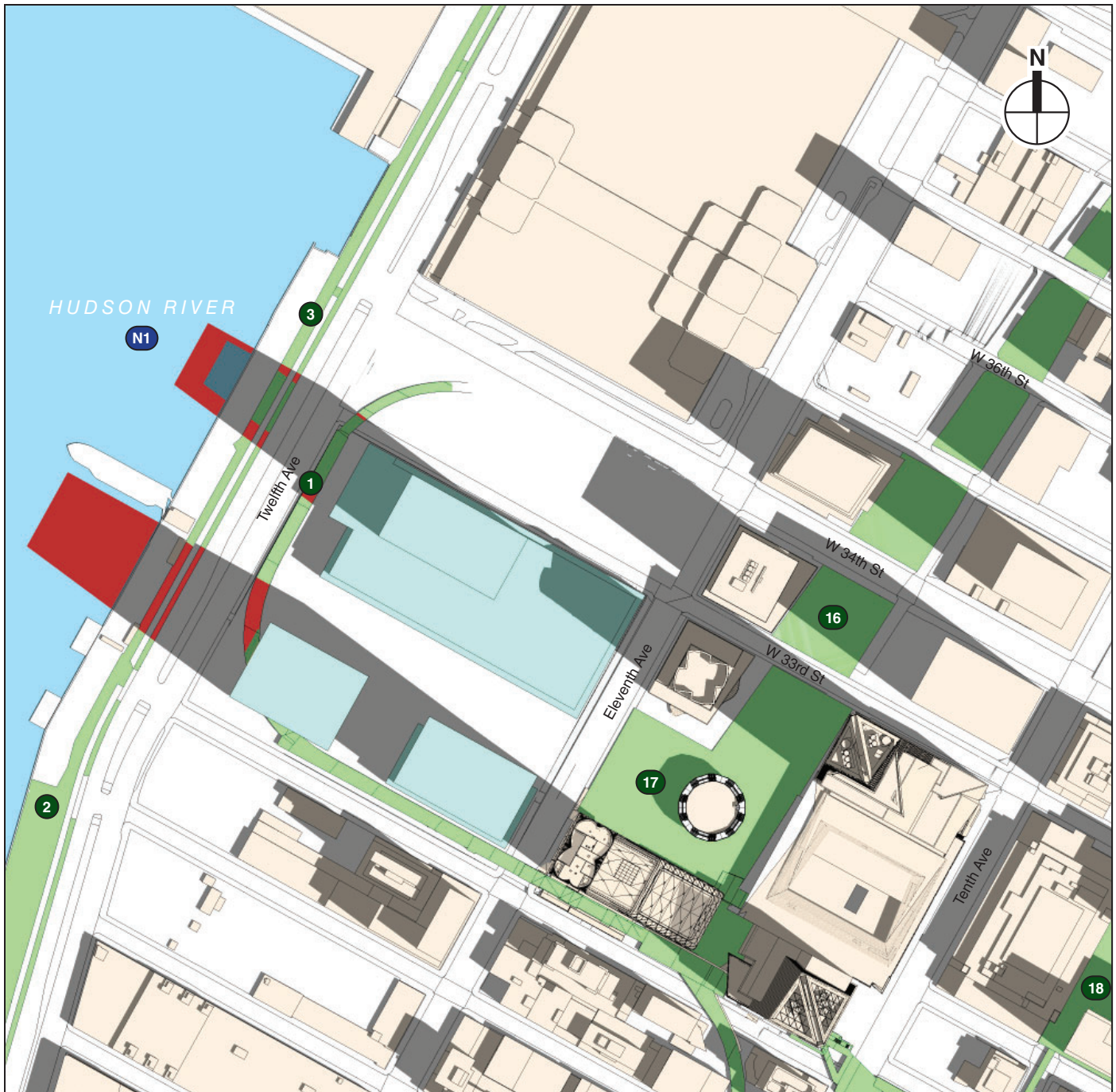
NOTES:

- Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.
- Shadow increment extends farther west on the Hudson River at this time, beyond the edge of the map frame. To view the full extent of the shadow on the river cast by the Proposed Project and Alternative Scenario, please refer to Figures 6-2 to 6-5.

Detailed Analysis—Proposed Project

June 21

Figure 6-36



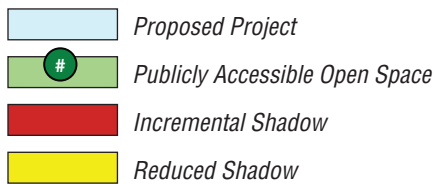
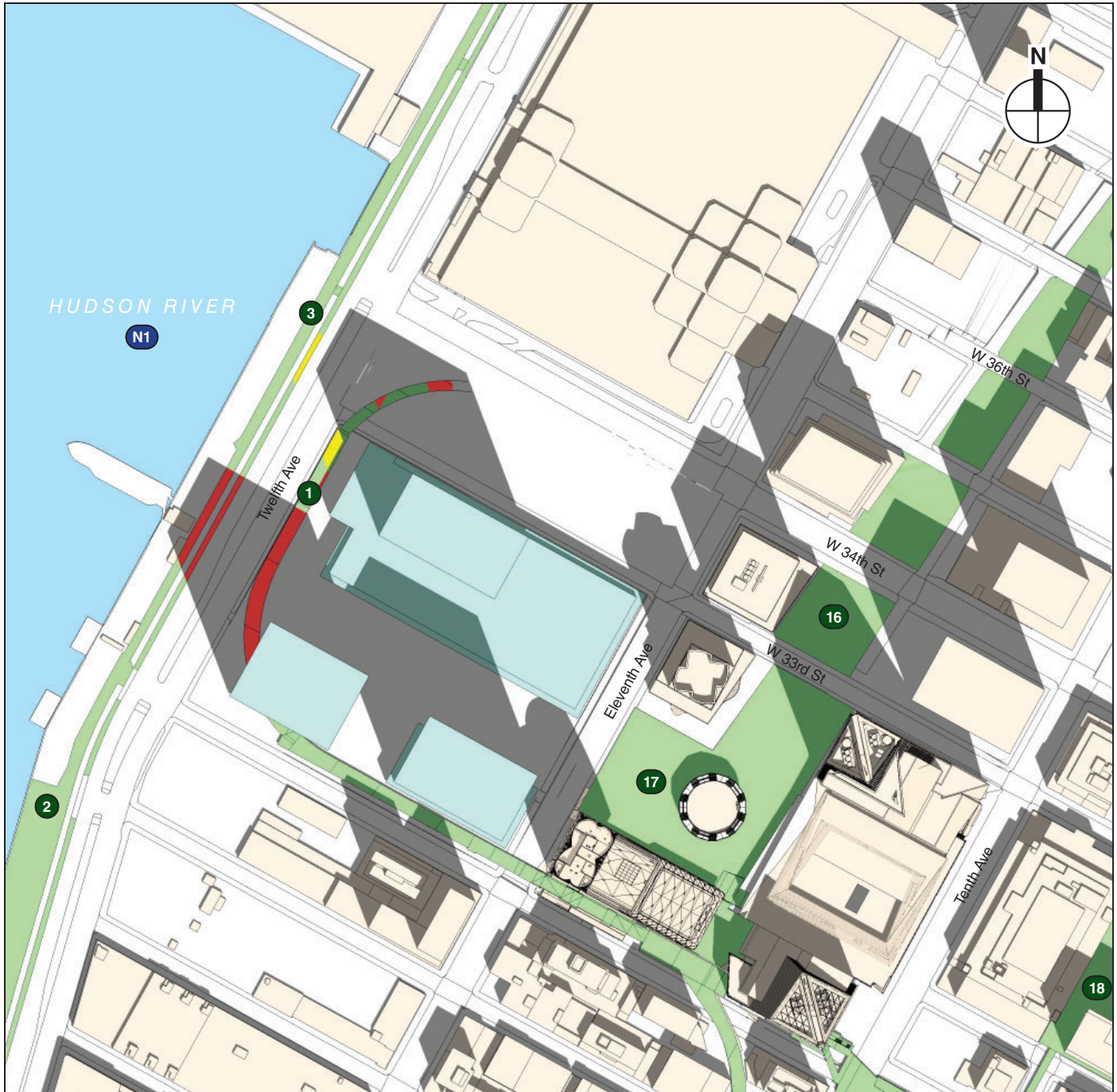
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

10:30 AM EST (11:30 AM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
June 21
Figure 6-37



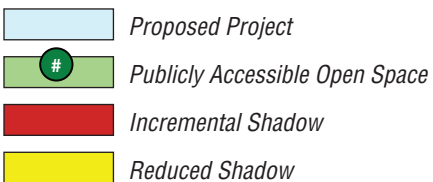
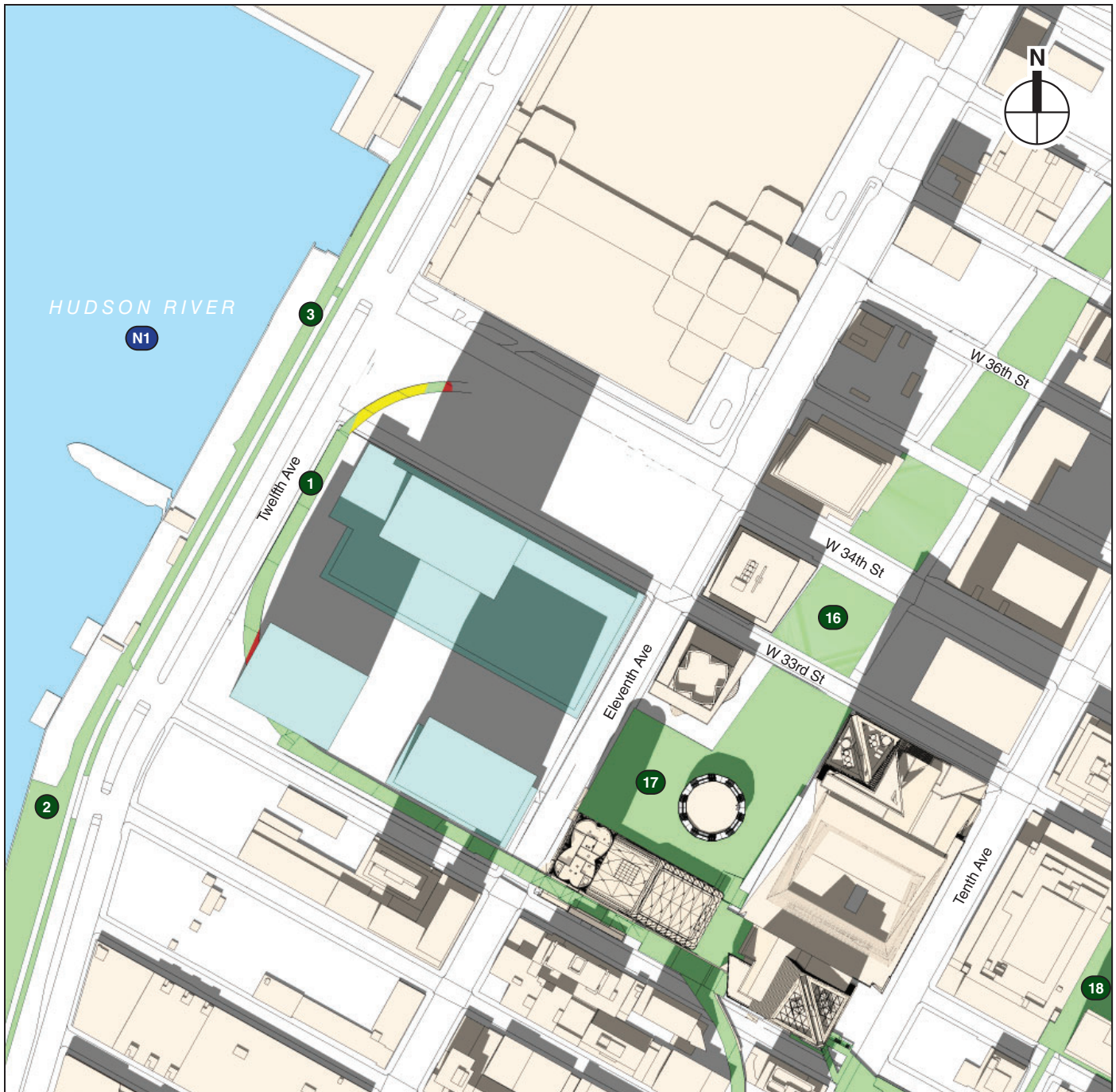
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

11:30 AM EST (12:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
June 21
Figure 6-38



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

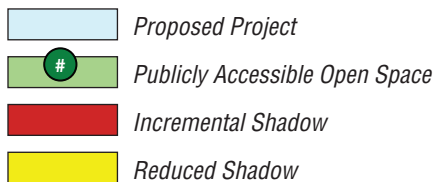
12:30 PM EST (1:30 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project

June 21

Figure 6-39



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

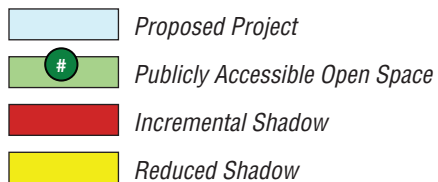
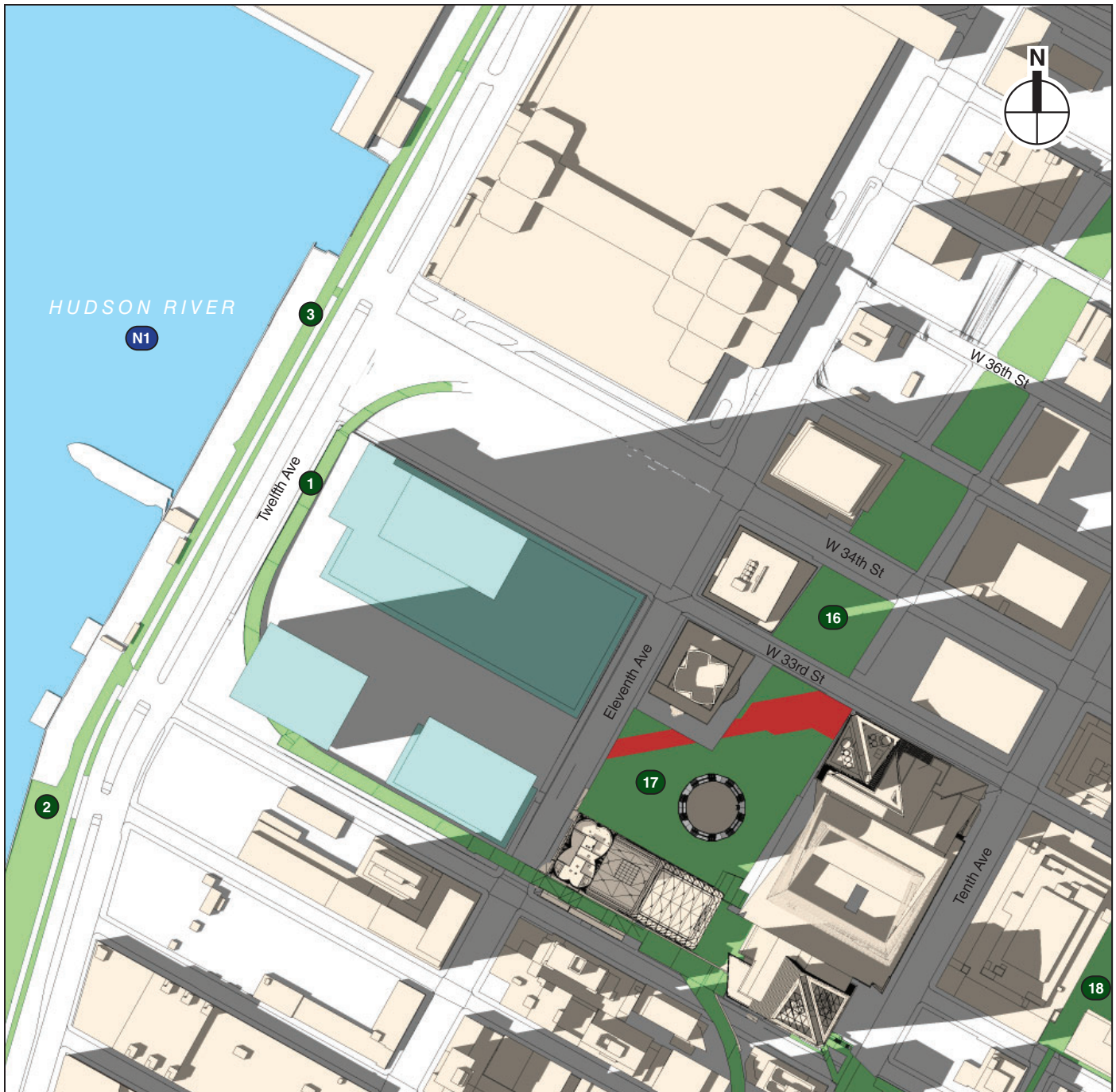
2:00 PM EST (3:00 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project

June 21

Figure 6-40



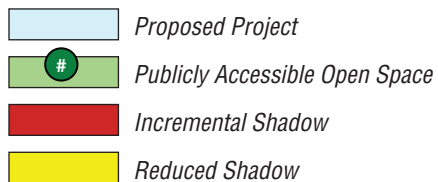
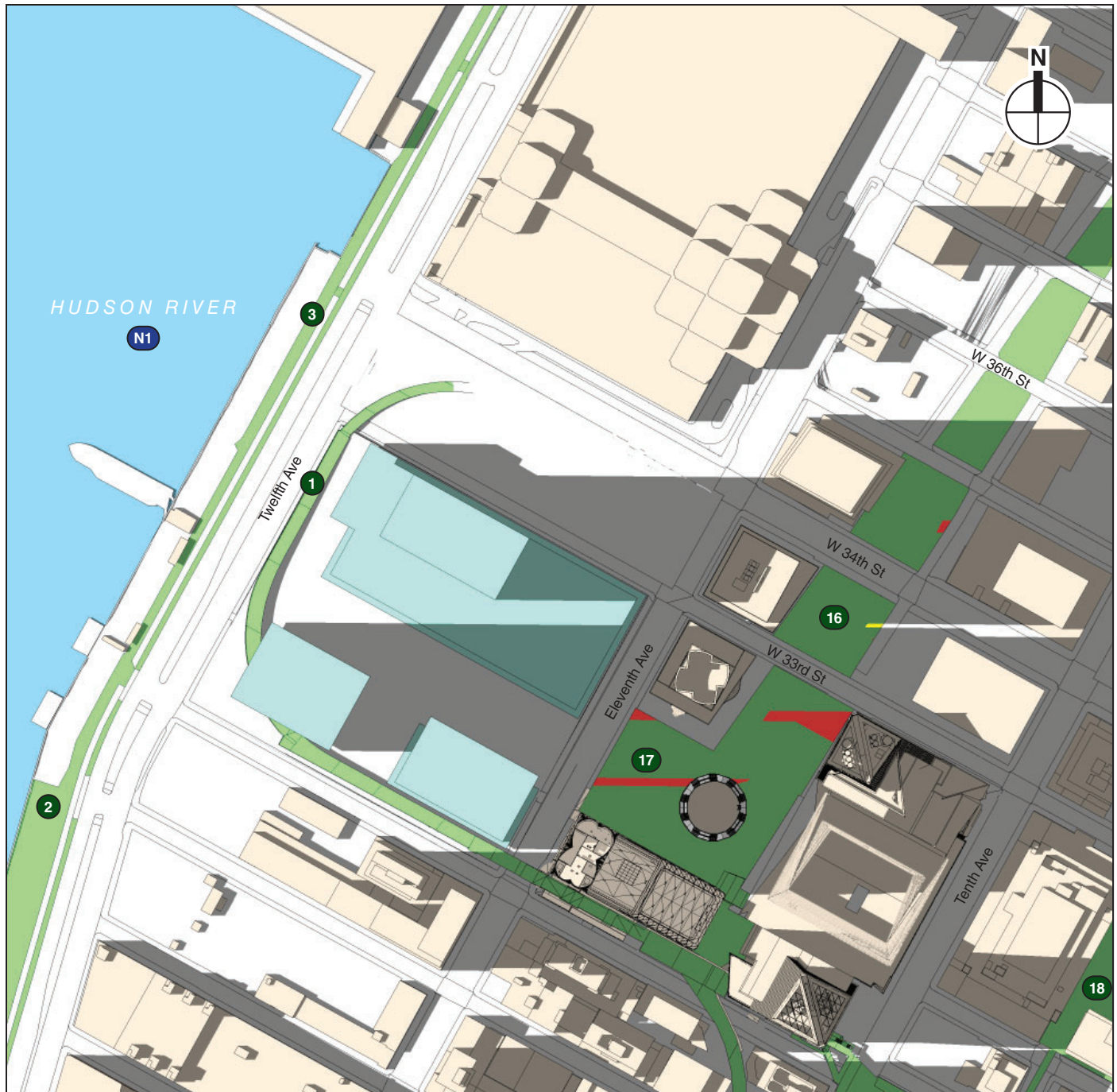
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

3:00 PM EST (4:00 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
June 21
Figure 6-41



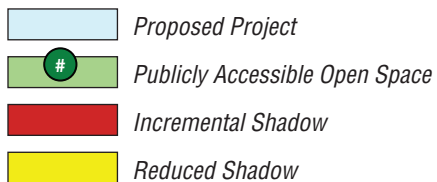
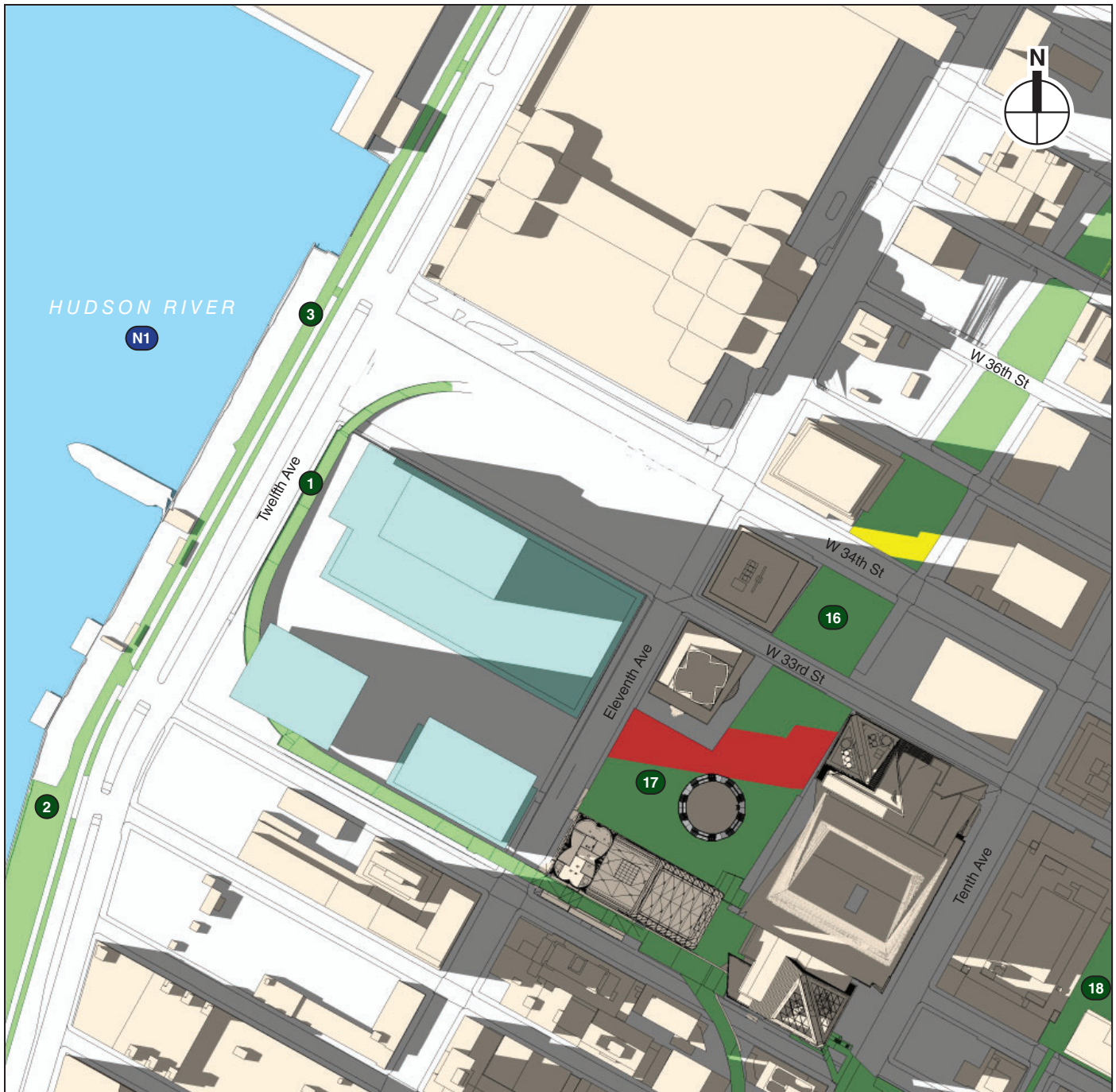
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

4:00 PM EST (5:00 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
June 21
Figure 6-42



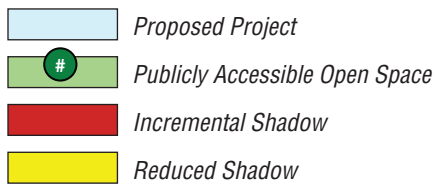
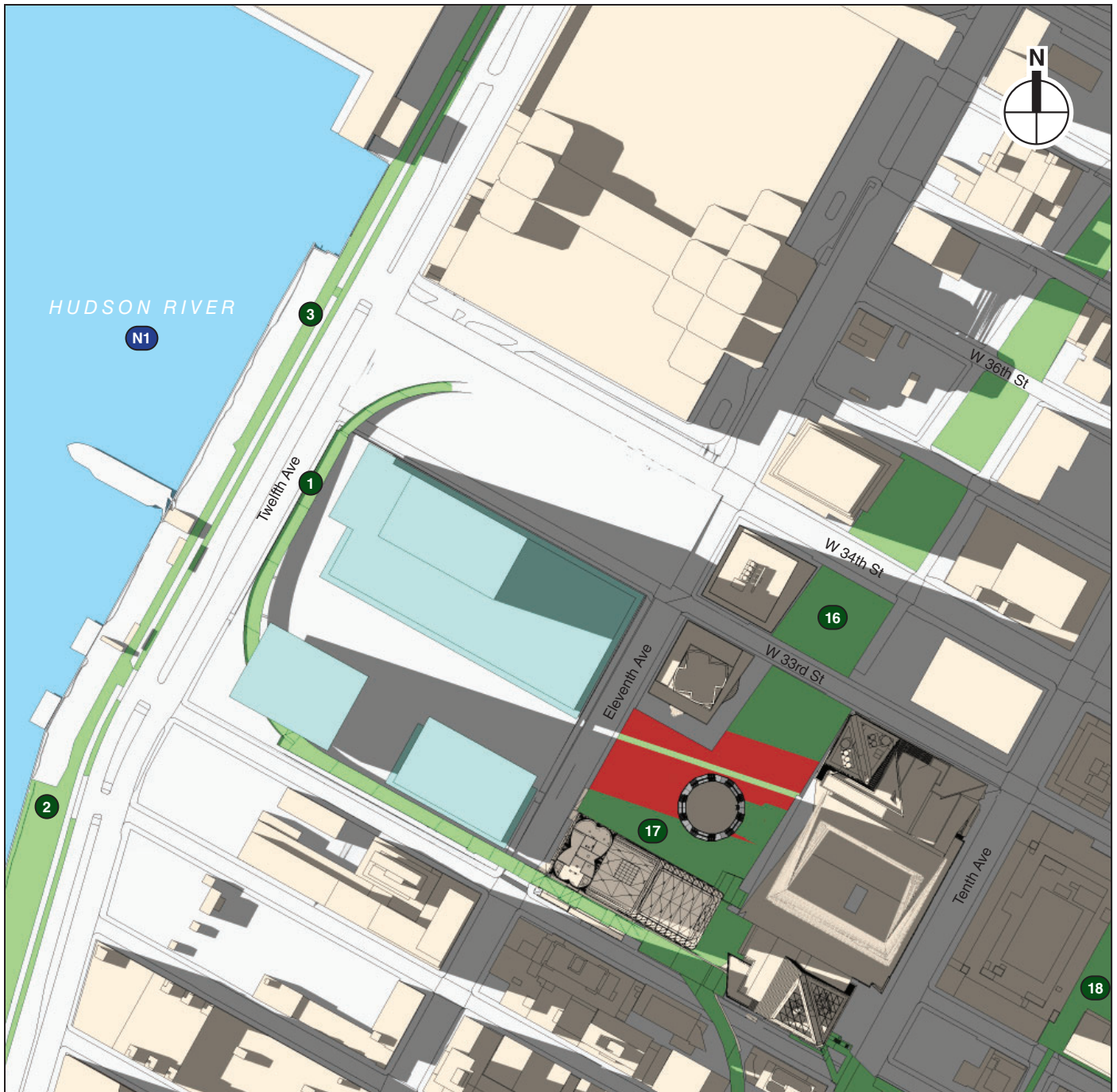
Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

5:00 PM EST (6:00 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
June 21
Figure 6-43



Map Key Open Space Resource

1. The High Line
2. Hudson River Park
3. Hudson River Park Bikeway and Greenway
16. Bella Abzug Park
17. Hudson Yards POPS
18. Manhattan West POPS

6:00 PM EST (7:00 PM EDT)

NOTES: Only the areas of shadow highlighted in red represent incremental shadow resulting from the Proposed Project. All other shadow is future No Action shadow, i.e. baseline shadow from existing and future No Action buildings.
EST = Eastern Standard Time. EDT = Eastern Daylight Time.

Detailed Analysis—Proposed Project
June 21
Figure 6-44

Table 6-4
Incremental Shadow Durations

Map Reference	Resource	Dec. 21	March 21/Sept. 21	May 6/August 6	June 21
11	Hell's Kitchen Park	Proposed Project			
		—	—	—	—
		Alternative Scenario			
15	560 West 43rd St POPS	—	—	—	—
		Alternative Scenario			
		—	—	—	—
16	Bella Abzug Park	Proposed Project			
		—	2:55 pm to 4:29 pm Total: 1 hr 34 min*	2:00 pm to 4:00 pm Total: 2 hr*	1:50 pm to 2:40 pm 3:05 pm to 4:00 pm Total: 1 hr 45 min*
		Alternative Scenario			
17	Hudson Yards Public Square and Gardens	—	2:30 pm to 4:29 pm Total: 1 hr 59 min*	2:00 pm to 4:10 pm Total: 2 hr*	1:50 pm to 4:00 pm Total: 2 hr 10 min*
		Proposed Project			
		—	3:55 pm to 4:29 pm Total: 34 min	2:00 pm to 5:18 pm Total: 2 hr	1:10 pm to 6:01 pm Total: 4 hr 51 min
18	Manhattan West POPS	Alternative Scenario			
		—	3:55 pm to 4:29 pm Total: 34 min	2:00 pm to 5:18 pm Total: 2 hr	1:10 pm to 6:01 pm Total: 4 hr 51 min
		Proposed Project			
19	Canoe Plaza	—	—	—	—
		Alternative Scenario			
		—	—	4:15 pm to 4:45 pm Total: 30 min	—
38	525 Eighth Avenue POPS	Proposed Project			
		—	—	—	—
		Alternative Scenario			
43	MSG POPS	—	—	—	—
		Alternative Scenario			
		—	—	—	—
44	1 Penn Plaza POPS	Proposed Project			
		—	—	—	5:40 pm to 5:50 pm 5:56 pm to 6:01 pm Total: 15 min
		Alternative Scenario			
45	West 33rd Street Plaza	Proposed Project			
		—	—	—	—
		Alternative Scenario			
46	Broadway Boulevard Plaza	—	—	—	—
		Proposed Project			
		—	—	—	—
47	Herald Square	Proposed Project			
		—	—	—	5:50 pm to 6:00 pm Total: 10 min
		Alternative Scenario			
B	Sacred Heart of Jesus Church	—	—	—	5:50 pm to 6:00 pm Total: 10 min
		Historic Resources with Sunlight-Sensitive Features			
		Proposed Project			
B	Sacred Heart of Jesus Church	2:52 pm to 2:53 pm Total: 1 min	—	—	—
		Alternative Scenario			
		2:52 pm to 2:53 pm Total: 1 min	—	—	—

**Table 6-4
Incremental Shadow Durations**

Map Reference	Resource	Dec. 21	March 21/Sept. 21	May 6/August 6	June 21
G	Metro Baptist Church	Proposed Project			
		—	3:45 pm to 4:00 pm 4:15 pm to 4:20 pm Total: 20 min	—	—
		Alternative Scenario			
—	3:45 pm to 4:20 pm Total: 35 min	—	—		
H	McGraw-Hill Building	Proposed Project			
		—	—	—	—
		Alternative Scenario			
—	—	—	—		
I	Holy Cross Church	Proposed Project			
		—	—	—	—
		Alternative Scenario			
—	—	—	—		
P	St Michael's Catholic Church	Proposed Project			
		—	—	—	4:05 pm to 4:30 pm Total: 25 min
		Alternative Scenario			
—	—	—	—	4:05 pm to 4:30 pm Total: 25 min	
Q	West Side Jewish Center	Proposed Project			
		—	—	4:45 pm to 5:00 pm 5:10 pm to 5:18 pm Total: 23 min	4:40 pm to 4:50 pm Total: 10 min
		Alternative Scenario			
—	—	4:45 pm to 5:00 pm 5:10 pm to 5:18 pm Total: 23 min	4:40 pm to 4:50 pm Total: 10 min		
R	James A Farley Building**	Proposed Project			
		—	—	—	—
		Alternative Scenario			
—	—	—	—		
Sunlight-Sensitive Natural Resources					
N1	Hudson River	Proposed Project			
		8:51 am to 1:20 pm Total: 4 hr 29 min*	7:36 am to 12:35 pm Total: 4 hr 59 min	6:27 am to 11:35 am Total: 5 hr 8 min	5:57 am to 11:20 am Total: 5 hr 23 min
		Alternative Scenario			
8:51 am to 1:20 pm Total: 4 hr 29 min*	7:36 am to 12:35 pm Total: 4 hr 59 min	6:27 am to 11:35 am Total: 5 hr 8 min	5:57 am to 11:20 am Total: 5 hr 23 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.					
* There would be less shadow in the With Action condition at certain locations within the resource at certain times as described below, compared with the No Action scenario. The size and/or duration of reduced shadow would generally be smaller than the size and/or duration of additional shadow, resulting in a net increase in shadow, with some exceptions as described below.					
** Sunlight-sensitive features of the Farley Building include the two skylights, the Eighth Avenue colonnade, and the Eighth Avenue steps. The latter two features face away from the Development Site. This analysis assessed the potential for new shadows reaching the skylights.					

ASSESSMENT OF SHADOW IMPACTS BY RESOURCE

The following section briefly describes each affected resource that would receive more than 10 minutes of incremental shadow;⁸ its sunlight sensitivity; and the extent, duration, and potential effects of incremental shadow.

⁸ Per *CEQR Technical Manual* guidelines, incremental shadow is not considered significant when its duration is no more than 10 minutes and the resource otherwise continues to receive substantial sunlight. *CEQR Technical Manual*, 2014 edition, page 8-27.

OPEN SPACE RESOURCES

The High Line (Map #1)

The High Line is a linear park spanning approximately 1.45 miles along the west side of Manhattan that was formed by a repurposed railroad viaduct. The park operates as an elevated greenway and is a popular destination for both tourists and local users. Only a small portion of the overall park—the northern end of the open space, extending west from Eleventh Avenue along West 30th Street and the southern perimeter of the Development Site, then extending north along the western side of the Development Site to its terminus at West 34th Street—is within the area potentially affected by project-generated shadows. The portion of the High Line from its southern terminus at Gansevoort Street to where it enters the Development Site at Eleventh Avenue and West 30th Street contains many seating areas, plant beds, and viewing areas. The portion of the High Line that extends along the southern and western perimeters of the Development Site and continuing to its terminus at West 34th Street has not yet been renovated consistent with the rest of the resource and is currently open to the public as an “interim walkway” through October 2024. The ultimate renovation for this portion of the High Line has not yet been planned.

In both With Action scenarios, Site A in the southwest section of the Development Site would be developed with an approximately 80-story building adjacent to and above the High Line, whereas in the No Action scenario, that portion of the Development Site would not be developed by 2031. (As detailed above, the 2009 FEIS accounted for project-generated shadows from the Site 5 development [current Site A]; since the current No Action scenario assumes that Site A would not be developed before 2031, this results in a larger increment of project-generated shadow from Site A for the current analysis.⁹) This difference results in nearly all the meaningful incremental shadow on this portion of the High Line in all seasons. Shadow from Site A would fall on portions of the High Line where it extends along the western perimeter of the Development Site during the morning and mid-day hours. As noted above, this portion of the High Line has not yet been renovated consistent with the rest of the resource; however, it is anticipated that this portion of the High Line will be renovated by 2031. In the mid to late afternoons in the spring, summer, and fall months, a very small shadow increment from Site A would fall on the adjacent portion of the High Line to the east.

In both With Action scenarios, Site C development would be set back farther from the High Line compared with the No Action scenario, resulting in less shadow at times on that portion of the High Line (west and north of Site C) in the With Action scenarios.

On the analysis date representing winter, incremental shadow would fall across much of the High Line where it extends along the western perimeter of the Development Site during the late morning and early afternoon (10:15 AM to 1:30 PM), at a time when most other portions of this open space are also in shadow (see **Figures 6-7 to 6-11**). There would be less shadow on the High Line north of Site C from approximately 1:45 PM to 2:53 PM because Site C is shorter and farther away from the High Line in the northwest corner of the Development Site compared to the No Action condition.

⁹ The 2009 FEIS concluded that “Like the other proposed open spaces on the Development Site, these sections of the High Line [on the Development Site] would generally be shady in the mornings and sunny during the afternoons.”

Western Rail Yard Modifications

Incremental shadow on the High Line with the Alternative Scenario would be exactly the same as with the Proposed Project in winter.

In the spring, summer, and fall months, from approximately 8:00 AM EST (9:00 AM EDT) to 1:00 PM EST (2:00 PM EDT), incremental shadow from the Proposed Project would fall on various portions of the High Line where it extends along the western perimeter of the Development Site and north to its terminus (see **Figures 6-16 to 6-21, and 6-25 to 6-44**). The increment would be small at times and large at other times, generally covering the most area around noon to 1:15 PM EDT. At certain times there would be a reduction in shadow at certain locations in the With Action scenarios, mostly as a result of Site C development being farther away from the High Line and less bulky than in the No Action condition; however, overall there would be a substantial net increase in shadow in the With Action scenarios, primarily as a result of the new building on Site A (which would not be developed in the 2031 No Action scenario).

Incremental shadows with the Alternative Scenario would be the same as with the Proposed Project on the fall and early spring representative date, and very similar but slightly greater on the late spring and summer representative dates, with the increase in incremental shadow occurring primarily on the portion of the High Line northwest and north of Site C, and on the midsummer analysis day, west of Site C briefly around 9:45 AM EDT.

Given the substantial extent and duration of incremental shadow on the High Line as described above, the Proposed Actions would result in significant adverse shadow impacts to this resource.

Given the High Line's urban context, adjacencies to pre-existing buildings and the dense development constructed in close proximity to the resource after its opening, the extent and duration of incremental shadow experienced as a result of the With Action scenarios described above is likely not a unique condition along the park's 1.45-mile-long extent. In this situation, effective park landscape is achieved through a comprehensive understanding and integration of environmental factors such as wind, sun exposure, and shade distribution. These factors play a pivotal role in shaping the microclimatic conditions, influencing plant species composition and placement to optimize both aesthetic appeal and hardiness.

Recognizing where there are areas of shade is crucial for planning vegetation and amenities for lower-light environments. Selecting shade-adapted plant species are a part of a healthy planting structure (that includes emergent, canopy, understory and groundcover layers) to help create lush understory layers. Aligning hardscape features, such as pathways and seating, with shaded spaces encourages park visitors to take advantage of the benefits of shade, while preserving vegetation and soil conditions.

The final design for the portion of the High Line that extends through the Development Site is still in development. As the owner of this resource, NYC Parks will determine the specific program and design in consideration of the factors noted above and the context of the resource within an area with multiple tall, large-scale buildings. The Applicant would coordinate with NYC Parks and Friends of the High Line to ensure that appropriate mitigation for the shadow impact is implemented in connection with the future design, construction, and operation of the High Line on the Development Site.

Hudson River Park and Greenway (Map #2 and #3)

Hudson River Park is a collection of esplanade and park-covered piers spanning Manhattan's western waterfront along the Hudson River from Tribeca to the Upper West Side. The Hudson River Park Greenway, a multi-use trail that serves as a popular bicycle route along the Hudson River and is part of the larger Empire State Trail system, runs parallel and adjacent to the park proper, between the park and Twelfth Avenue. A landscaped barrier with plantings separates the Bikeway and Twelfth Avenue, and another separates the Bikeway and Hudson River Park proper. Hudson River Park and the adjacent Greenway are in excellent condition and experience high usage on weekdays and weekends.

Improvements are being proposed for an approximately 17-block section of Hudson River Park including the portion that traverses the study area; however, the project is currently in the planning stages and the timing of these improvements is unknown. Therefore, no changes were assumed for this open space for future No Action and With Action conditions.

In the spring, summer, and fall, the section of the Hudson River Park affected by project-generated shadow would be primarily limited to the path that extends between the West 30th Street Heliport (Heliport) and the waterfront Community Compost Center on its west side and the Greenway on its east side.

On the date representing winter, there would be an area of incremental shadow on a portion of the pathway adjacent to the Heliport and the Compost Center at West 34th Street during the mid- and late morning, from the Site A development, but also a similar (or larger) area of reduced shadow resulting from the comparatively less bulky Site C development (see **Figures 6-6 to 6-9 and 6-12**). After approximately noon, the incremental shadow would have moved farther north, covering areas near the Lincoln Tunnel vent structure and Pier 81 and continuing to move fairly quickly up to areas near Piers 83 and 84 for about 20 minutes before exiting at 1:35 PM (see **Figures 6-10 to 6-14**).

Incremental shadow with the Alternative Scenario would be the same on the pathway adjacent to the Heliport and the Compost Center, but a little farther north there would be less of a reduction in shadow with the Alternative Scenario, compared to the No Action, from approximately 10:15 AM to 11:30 AM on the pathway adjacent to Pier 76, and from approximately 11:30 AM to 12:15 PM near the Lincoln Tunnel vent structure. There would be more incremental shadow with the Alternative Scenario on the upland areas of the park near Piers 81 and 83 from approximately 12:05 PM to 12:35 PM, compared to the Proposed Project, and less incremental shadow with the Alternative Scenario from 12:45 PM to 1:30 PM on the upland areas near Piers 81, 83 and 84.

On the March 21/September 21 analysis date, incremental shadow would fall on sections of the path adjacent to the Heliport and Compost Center at West 34th Street and later to Pier 76, from approximately 8:00 AM to 12:40 PM (9:00 AM to 1:40 PM EDT). The increment would be very small earlier in the morning and larger later, reaching its maximum coverage around 12:30 PM EDT (see **Figures 6-16 to 6-20**). At times small areas of the path would see a reduction in shadow due to the different configuration of the No Action scenario.

With the Alternative Scenario, the incremental shadow would be the same for the first two hours and then from 10:00 AM to 11:15 AM (11:00 AM to 12:15 PM EDT) the increment would be larger on the walkway near the Compost Center and then Pier 76,

Western Rail Yard Modifications

compared to the Proposed Project. However, from 11:30 AM to 12:30 PM (12:30 PM to 1:30 PM EDT) there would be less incremental shadow with the Alternative Scenario. The increment would exit at 12:40 PM (1:40 PM EDT) similar to the Proposed Project (because the shadow increment from Site A, which is the same in both With Action conditions, would be the last project-generated shadow to leave the park).

On the dates representing the late spring and summer months, similar to March 21 and September 21, the Proposed Project would cast small shadow increments in the early and midmorning on the path between the West 30th Street Heliport and the Compost Center at West 34th Street and the Greenway, and a somewhat larger increment in the late morning and around noon (see **Figures 6-24 to 6-28 and 6-34 to 6-38**).

With the Alternative Scenario, shadows would follow a similar pattern in these months, but there would be more incremental shadow on the pathway adjacent to the Heliport and Compost Center for most of the affected period, and particularly from approximately 8:00 AM to 10:00 AM (9:00 AM to 11:00 AM EDT), due to the Alternative Scenario's three towers compared to the single taller tower of the Proposed Project). The total duration would be the same.

Incremental shadow on the Greenway would follow the same pattern as on the Park throughout the year, as shown in the figures referenced above, covering small stretches in the early or midmorning and larger stretches in the late morning and early afternoon, with adjacent areas remaining sunlit and available for use. The shadow increment would exit the Greenway 5 to 10 minutes later than the Park proper. The differences between the Proposed Project and the Alternative Scenario would be the same as with the Park described above, as the Greenway runs parallel to the Park, which, as noted above, in this stretch is primarily a walking path providing circulation between south of West 29th Street and north of West 43rd Street where recreational amenities are located.

In the winter, with the Proposed Project, there would be roughly equivalent area of added and reduced shadow in the morning until the period from approximately 12:00 PM to 1:30 PM, when the incremental shadow would be larger. By that time, most of the Greenway near the affected areas farther north and south would be in sun and therefore the comparatively smaller areas of incremental shadow would not be significant, as users (primarily cyclists but also pedestrians) move through the shaded areas to sunnier areas.

With the Alternative Scenario, there would be less of a reduction in shadow on the Greenway from 10:15 AM to 12:15 PM, but no change in incremental shadow, compared to the Proposed Project. However, there would be more incremental shadow from 12:15 PM to 12:45 PM on the upland areas near Piers 81 and 83 compared to the Proposed Project, and more incremental shadow in those same areas from 12:45 PM to 1:30 PM. Overall, the net amount of incremental shadow would be similar but slightly greater than the Proposed Project, and would not be significant for the same reasons noted above.

In the spring, summer, and fall months, under both With Action scenarios, virtually all incremental shadow would be limited to the portion of the Greenway adjacent to the West 30th Street Heliport and the Compost Center at West 34th Street. Areas of the Greenway north and south of this stretch would be in sun during the affected period. Given these factors, the incremental shadow would not be significant in either With Action scenario.

With regard to the Greenway, given the limited net size of the incremental shadows in all seasons, the fact that sunlit areas would remain near the areas affected by incremental

shadow, and the transience of the Greenway's active users through areas of shadow and sun, the incremental shadow would not significantly affect this resource or its users in either With Action scenario.

650 West 42nd Street (Silver Towers) POPS (Map #4)

The Silver Towers are twin residential buildings located nine blocks north of the Development Site, occupying the eastern half of the block bounded by West 41st and 42nd Streets and Eleventh and Twelfth Avenues. The Silver Towers property includes a large through-block area open to the public containing landscaping, seating, and—on the West 41st Street side—a 30-foot-long Tom Otterness sculpture that is a playground, other play equipment, seating, and a dog park.

On the analysis date representing winter, this playground and plaza would be in existing shadows for much of the day, as is typical for midtown spaces like this one, surrounded as it is by tall buildings. Between approximately 1:30 PM and 2:30 PM, when incremental shadow (from both With Action scenarios) would pass across this space, most of the open space would be in existing shadow, including the playground areas, and incremental shadow would eliminate most or all of the limited remaining sun on the West 42nd Street side of the space where there is lawn, planters, seating, and tables (see **Figure 6-15**).

This resource would be unaffected by project-generated shadow in the spring, summer, and fall. Given that the incremental shadow would occur only in winter when usage would be expected to be lower than in other seasons due to the cold weather, and would be limited in duration to about an hour, the impact would not significantly impact the character and use of this open space.

Lorraine Hansberry Plaza (Map #5)

Long a vacant lot owned by the New York City Department of Environmental Protection, this space is anticipated to be developed with affordable housing and a public plaza by 2031.

This future open space would be expected to receive 13 minutes of incremental shadow on the winter analysis date only, under both With Action scenarios. The limited duration of incremental shadow would not significantly impact the use of this future plaza.

Bella Abzug Park (Map #16)

Bella Abzug Park is located approximately two blocks east of the Development Site, midblock between Tenth and Eleventh Avenues and currently spanning the six blocks from West 33rd Street to West 37th Street within the Hudson Yards neighborhood. An extension of the park north to West 39th Street is planned for completion by 2031. The existing park contains trees, landscaping, and abundant seating, with tables, chairs, and circular fountains. A playground is located on West 35th Street. The planned two-block expansion will contain landscaping, multiple playscapes, a water feature, and seating. Bella Abzug Park is in excellent condition and experiences high usage on weekdays and weekends.

Sections of this park would receive limited incremental shadows during spring, summer, and fall afternoons under both With Action conditions. On the March 21/September 21 analysis date, incremental shadow from the Proposed Project would reach portions of

this park, primarily the two blocks between West 37th and 39th Streets planned to be acquired and completed by 2031, in the late afternoon for approximately the last hour and a half of the day (2:55 PM to 4:29 PM [3:55 PM to 5:29 PM EDT]); there would also be reductions in shadow compared with the No Action scenario during this period (see **Figures 6-22 and 6-23**). With the Alternative Scenario, incremental shadow would be similar but would enter 25 minutes earlier. With both With Action scenarios, after approximately 4:00 PM (5:00 PM EDT), for the last half-hour of the day, only slivers of incremental shadow would affect the park, offset by larger areas of reduced shadow (compared to the No Action scenario).

In the late spring and summer months, under both With Action scenarios, the duration of incremental shadow on this open space would be longer (about 2 hours) but the size of the shadow increment would remain small throughout, and sunlit areas of the park would remain during the affected afternoon period for users seeking sun, particularly the three blocks north of West 36th Street (see **Figures 6-30 to 6-33 and 6-40 to 6-44**). There would also be areas of reduced shadow at times, more so with the Proposed Project than with the Alternative Scenario.

Given the factors described above—the limited size of the incremental shadow, the remaining sunlit areas, and the reduced shadow at other times, decreasing the net increment—the Proposed Actions would not result in significant adverse shadow impacts to this park.

Hudson Yards Public Square and Gardens (Map #17)

The publicly accessible open space at Hudson Yards, located directly east of the Development Site, contains green spaces and seating, and at its center is a 150-foot-tall sculpture known as the “Vessel,” which is an interactive artwork that includes public staircases. There are several food trucks in the plaza, as well as restaurants and cafes bordering it. The Hudson Yards Public Square and Gardens is in excellent condition and is heavily utilized on weekdays and weekends.

Shadow impacts to this space would be minimal to nonexistent in the fall, winter, and early spring months.

On the May 6/August 6 analysis date, under both With Action scenarios, incremental shadow would enter the open space at 2:00 PM (3:00 PM EDT). While the extent of incremental shadow would never become large due to existing and No Action shadows, it would eliminate the remaining sunlit areas of the open space from 3:15 PM to the end of the analysis period at 5:18 PM (4:15 PM to 6:18 PM EDT). See **Figures 6-30 to 6-33**.

On the June 21 analysis date, under both With Action scenarios, incremental shadow would enter the open space at 1:10 PM (2:10 PM EDT). The extent of incremental shadow would remain small until after 2:00 PM (3:00 PM EDT), and then would increase to moderate size. The incremental shadow would continue to cover areas of the plaza until 6:01 PM (7:01 PM EDT), ranging in size from small to moderate/large in the late afternoon, and would eliminate the remaining sun for a period. See **Figures 6-40 to 6-44**.

In summary, the Proposed Actions would result in a significant adverse shadows impact to the Hudson Yards Public Square and Gardens in the late afternoons during the late spring and summer months, under either With Action scenario.

The Hudson Yards Public Square and Gardens is under the control of the Applicant, and the Applicant could monitor and evaluate plant health to determine if and how the impact described above affects existing plantings and vegetation. Should changes to the existing plantings and vegetation be warranted, shade-tolerant plant species that thrive in low-light conditions could be introduced, along with a diverse mix of trees, shrubs, and groundcovers with varying tolerances to create visual interest and ecological resilience.

Canoe Plaza (Map #19)

Located along a former stretch of widened sidewalk and parking strip on the north side of West 35th Street between Ninth Avenue and Dyer Avenue, near a Lincoln Tunnel entrance/exit, this space contains plantings, landscaping, and seating.

This resource would be unaffected by Proposed Project shadow.

The Alternative Scenario would cast 30 minutes of incremental shadow on the May 6/August 6 analysis day only, eliminating the sliver of remaining sunlight during that time, 4:15 PM to 4:45 PM (5:15 PM to 5:45 PM EDT). Given the limited duration and very limited size of the increment, and its occurrence on only one of the four representative dates, the Alternative Scenario would not cause a significant adverse shadow impact to this resource.

HISTORIC RESOURCES

Metro Baptist Church (Map #G)

The Metro Baptist Church at 408 West 40th Street is located within the Paddy's Market Historic District, which is listed on the State and National Registers of Historic Places. The church has stained glass windows on its west façade, which faces the Development Site (albeit somewhat obliquely), as well as its front façade which faces north and away from the Development Site.

Incremental shadow would reach the west façade of the church on the March 21/September 21 analysis date, and not on the other dates. On March 21/September 21 the incremental shadow would pass across the west façade for a total of 20 minutes in the late afternoon with the Proposed Project, and for 35 minutes total with the Alternative Scenario. Given the distance separating the church and the Development Site, the orientation and resulting oblique angle of sunlight and shadows hitting the west façade at that time of day, the brief duration of the incremental shadow and the occurrence on only one of the four representative dates, the incremental shadow would not significantly affect this historic resource.

St. Michael's Catholic Church (Map #P)

St. Michael's Catholic Church at 424 West 34th Street has been determined eligible for listing on the State/National Registers and for New York City Landmark (NYCL) designation. The building has stained glass windows on all façades, including the west façade facing toward the Development Site, and its south (rear) façade, which faces the Development Site very obliquely.

Incremental shadow would reach the west façade of the church on the June 21 analysis date, and not on the other dates. On June 21, under both With Action scenarios, the incremental shadow would pass across the façade for a total of 25 minutes in the late

Western Rail Yard Modifications

afternoon. Given the brief duration of the incremental shadow and the occurrence on only one of the four representative dates, the incremental shadow would not significantly affect this historic resource.

West Side Jewish Center (Map #Q)

Renamed the Hudson Yards Synagogue in 2016, this S/NR-eligible building at 347 West 34th Street between Eighth and Ninth Avenues has a large and elaborate stained glass window at the rear (north) end of its west façade, facing toward the Development Site, and smaller stained-glass windows on the front (south) façade facing rather obliquely toward the Development Site.

Under both With Action scenarios, incremental shadow would pass across the window at the rear of the west façade on the May 6/August 6 analysis day in the late afternoon for 15 minutes, and beginning 10 minutes later would pass across the front (south) façade for 10 minutes. Sunlight and solar shadows reach the south façade at a rather oblique angle in the late afternoon, coming from the west in the summer. This would substantially reduce the effects of any incremental shadow on the south façade.

Given the brief duration of the incremental shadow on the synagogue and the occurrence on only one of the four representative dates, the incremental shadow would not significantly affect this historic resource.

NATURAL RESOURCES

Hudson River (Map #N1)

The Hudson River is a tidally influenced water body supporting a diverse and productive aquatic community of primary producers (phytoplankton, zooplankton, submerged aquatic vegetation (SAV) and benthic algae and invertebrates) and fish. Sunlight penetration is an important factor in determining phytoplankton, SAV, and benthic algae productivity and biomass.

Under both With Action scenarios, areas of incremental shadow, and to a lesser extent, areas of reduced shadow, would fall on portions of the Hudson River for approximately 4 to 5 hours during the first half of the day in all seasons, decreasing in size gradually as it moves east and off the river. The incremental shadow would move over the course of the day, falling on different areas of the river at different times, so that no portion of the river is within the incremental shadow for the entire duration it is cast. All the areas of the river affected by incremental shadow would receive direct sun for much of the day despite the incremental shadow, on all analysis days, particularly in the afternoon, due to the acres of river to the southwest and west, and the open sky above unobstructed by buildings.

The current flows swiftly in the tidal waters of this area of the river, not far north from the Upper New York Bay and the confluence of the Hudson and East Rivers, and would move phytoplankton and other natural elements quickly through the shaded areas into areas with sufficient sunlight. Therefore, project-generated shadows would not be expected to affect primary productivity. Incremental shadows would therefore not be likely to significantly affect aquatic resources (plankton or fish) in these areas of the river. Consequently, under both With Action scenarios, incremental shadows would not cause significant adverse impacts to the Hudson River.

PROJECT-GENERATED OPEN SPACE

As described in Chapter 1, “Project Description,” under the Proposed Project and the Alternative Scenario, the Development Site would contain approximately 5.63 acres of publicly accessible open space, including approximately 4.58 acres of new open space and 1.05 acres of existing open space on-site that is part of the High Line. The new public open space would introduce both active and passive space and amenities to the site. The new open space also would provide attractive pedestrian and visual connections between the Development Site, the High Line, Hudson Yards Public Square and Gardens to the east and Hudson River Park to the west, and surrounding neighborhoods. It is anticipated that in the future with the Proposed Actions, the open space would be concentrated into a continuous, cohesive area oriented through the center of the Development Site to maximize the public experience. The open space would widen as it meets the High Line between Site A and Site B and would connect to West 33rd Street along the western edge of Site C. The central open space would contain a pedestrian pathway to connect residents and visitors from Eleventh Avenue through the Development Site to the western portion of the open space. This main circulation path would provide access to a variety of diverse landscapes and the programmed spaces, each with their own distinct character and function, which may include lawns, landscaped areas, seating areas, plazas, a playground, sport courts, and a dog run (see Figure 1-7). The specifics of these amenities would be finalized in close coordination with the City. At the southwest corner of the Development Site, at street level, the open space would continue under the High Line on West 30th Street and Twelfth Avenue. Two new connections to the High Line are planned: one at West 30th Street and Twelfth Avenue, and one at West 33rd Street and Twelfth Avenue.

In comparison, in the future absent the Proposed Actions (the No Action condition), the Development Site will be developed with approximately 4.31 acres of publicly accessible open space including approximately 3.26 acres of new open space and 1.05 acres of existing open space (on-site portion the High Line). The publicly accessible open space will be located primarily at the center of the Development Site, spanning the width of the site from Eleventh Avenue to Twelfth Avenue. There will also be open space in the southwestern corner of the site and a narrow strip leading to West 33rd Street. It is currently contemplated that the open space will contain a playground, walking paths, landscaping, and seating and lawn areas.

Per *CEQR Technical Manual* guidelines, the Proposed Actions could not cause a significant adverse shadow impact to open space that would be developed as part of the project, because without the project the open space would not exist. However, shadow effects on the proposed open space should be assessed for disclosure purposes, and potentially to inform the open space’s programming.

The analysis showed that the new open space on the Development Site would generally be shady for much of the day in all seasons under both With Action scenarios. In winter it would be in shadow throughout the day except briefly in the early afternoon in an area in the center and between Sites A and B, in both With Action scenarios. In the spring, summer, and fall, the space would follow similar patterns of being shady in the early mornings, partially sunny in the mid to late mornings, mostly in shadow around noon, and partially sunny in the afternoons, particularly on the west side of the space, in both With Action scenarios. This is consistent with the projected shadow coverage on the

Development Site's new open space as detailed in the 2009 FEIS. The design of the new open space on the Development Site under both With Action scenarios would take into consideration the shadows generated by the proposed buildings. Such designs could include the use of shade tolerant vegetation for landscaping and the placement of features that may require sunlight in areas of the open space with greater direct sun.

E. CONCLUSIONS

The detailed shadows analysis showed that portions of the High Line within and adjacent to the Development Site and the Hudson Yards Public Square and Gardens east-adjacent to the Development Site would receive significant new shadows resulting from the Proposed Actions, under both With Action scenarios. (This is consistent with the shadows anticipated from the development analyzed in the 2009 FEIS; however, the 2009 FEIS accounted for project-generated shadows from the Site 5 development (current Site A), while the current No Action scenario assumes that Site A would not be developed before 2031, resulting in a larger increment of project-generated shadow from Site A.) The final design for the portion of the High Line that extends through the Development Site is still in development. As the owner of this resource, NYC Parks will determine the specific program and design in consideration of the factors noted above and the context of the resource within an area with multiple tall, large-scale buildings. The Applicant would coordinate with NYC Parks and Friends of the High Line to ensure that appropriate mitigation for the shadow impact is implemented in connection with the future design, construction, and operation of the High Line on the Development Site.

The Hudson Yards Public Square and Gardens is under the control of the Applicant, and the Applicant could monitor and evaluate plant health to determine if and how project-generated shadow affects existing plantings and vegetation. Should changes to the existing plantings and vegetation be warranted, shade-tolerant plant species that thrive in low-light conditions could be introduced, along with a diverse mix of trees, shrubs, and groundcovers with varying tolerances to create visual interest and ecological resilience.

Several other open spaces would receive incremental shadows as a result of the Proposed Actions, but these would be limited in extent and/or duration and would not be significant. Three historic resources would receive less than 30 minutes of new shadow in certain months and none at all in most months, which would not be significant.

The analysis concluded that the Proposed Actions would result in significant adverse shadow impacts to the High Line and to the Hudson Yards Public Square and Gardens.

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