Shadow Impact Study

Petrie's Landing I – Towers 3, 4, & 5

Ottawa, Ontario

REPORT: GWE18-091-SHADOWS

Prepared For:

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July 17, 2018

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1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Brigil to undertake a shadow impact study in support of simultaneous Zoning By-Law Amendment (ZBA) and Site Plan Approval (SPA) for Towers 3, 4 and 5 of the proposed Petrie's Landing I development in Ottawa, Ontario. This report summarizes the methodology, results and recommendations related to the shadow impact study based on a site plan concept provided by NEUF architect(e)s in June 2018, surrounding street layouts and existing and approved future building massing information obtained from the City of Ottawa, as well as recent site imagery. It is noteworthy that, since the wind analysis was performed, the roof configurations of the various buildings have undergone massing changes that are not reflected in the renderings. Despite these changes, results of the shadow analysis are not expected to differ significantly, and therefore remain applicable to the current rooftop design provided by NEUF architect(e)s in July 2018.

2. TERMS OF REFERENCE

The focus of this shadow impact study is Towers 3, 4 and 5 of the proposed Petrie's Landing I development in Ottawa, Ontario. The development site occupies a triangular parcel of land located north of Highway 174, approximately 375 m east of Trim Road and bound by green space in all directions. The Ottawa River is located approximately 300 m north of the study site.

Towers 3 and 4 are located to the east of the existing Towers 1 and 2, while Tower 5 is located to the southwest. Tower 3, to the immediate east of Tower 2, is a 22-storey building that features a nearly rectangular planform with rectangular/triangular protrusions. To the east of Tower 3, Tower 4 is an 18-storey building that features an irregular planform with a curved north wall. Tower 5 occupies the southwest corner of the site and is formed by two components: 22-storey Tower 5B on the north and 32-storey Tower 5A on the south, connected by a two-storey podium to create an 'L'-shape building planform. Towers 5A and 5B feature square and rectangular planforms, respectively. An extension of Inlet Private begins at the northwest corner of the site and curves south to extend along the southeast perimeter of the property. Outdoor amenity areas and pedestrian pathways are located throughout the overall development site at grade, including an amenity area directly east of Tower 5B across the Inlet Private extension, and various spaces between Towers 1, 2, 3 and 4. Further, the rooftops of Towers 3, 4, 5A, and 5B will feature outdoor amenity areas. This study has also considered the podium rooftop of Tower 5 as a potential rooftop amenity area.

3. OBJECTIVES

In accordance with the requirements of the City of Ottawa Terms of Reference for Shadow Analysis[1], the principal objectives of this study are to simulate shadow patterns cast during specific dates and times in order to illustrate: (i) the net new ground shadows formed by the proposed building, and (ii) the shadows cast on the proposed building by the surrounding massing and the study building itself, where applicable.

4. METHODOLOGY

4.1 Background

Shadow analyses are performed to determine the extent of shadows cast by a proposed development onto the existing surroundings, as well as those cast by the existing surrounding buildings on the proposed development. A shadow analysis, or shadow impact study, involves three-dimensional computer modelling of the proposed site massing and surrounding buildings. This process generates shadow renderings that are analyzed with detailed knowledge of existing adjacent lands. Shadow patterns are determined for selected dates and times at a specific geographic location on the Earth's surface, which is defined by the latitude and longitude of the site.

For the purposes of this study, shadow-sensitive areas may be defined as public spaces (such as parks and open spaces), communal amenity areas (such as communal rooftop terraces), traditional or arterial main streets, and ground level private residential amenity spaces, as defined by the Terms of Reference[1]. The consequences of shadows cast by new uses of existing land may be beneficial, such as through cooling effects during warm weather, or adverse, such as the loss of natural light. The guidelines for acceptable shadow coverage as defined by the terms of reference[1] are as follows:

1. The new net shadow coverage over ***public open spaces*** must not meet or exceed an average of 50% for 5 or more hourly interval times during September 21st.
2. The new net shadow coverage over ***communal amenity areas*** must permit at least 50% exposure to sunlight during two consecutive hourly interval times per day between 11 am and 3 pm during all three test dates (June 21st, Spetember 21st and December 21st). Exceptions are pools and rooftop amenity areas, which need only meet this criteria for June and September test dates.

[1] City of Ottawa Terms of Reference for Shadow Analysis

3. No new net shadow coverage in any one spot on the sidewalk of a ***traditional or arterial main street***, on the opposite side of the street from the study building, for more than 3 consecutive hourly test times during September 21st.
4. No new net shadow coverage within the "no impact zone" of any ***grade-level residential, private outdoor amenity space*** of a low-rise building for more than two consecutive hourly test times during June and September. No impact zones, with respect to low-rise residential buildings, are measured as the space from the most appropriate wall abutting a private amenity area extending 7.5 m *or* to the property line, whichever is less.

The shadow sensitive areas over the present site are as follows:

1. **Communal Amenity Areas:** pedestrian spaces between and adjacent to the towers; the grade-level amnity area east of Tower 5B; potential Tower 5 podium rooftop outdoor amenity areas; rooftop amenity areas over Towers 3, 4, 5A and 5B.

Although Highway 174 will experience shadow coverage due to the proposed development, it does not require consideration as a shadow sensitive area as it does not meet the classification of a street, and does not feature sidewalks. Further, as the gazebo lookout is already covered by a roof, it is not considered to be a shadow-sensitive space.

4.2 Shadow Modelling

Computer simulations were undertaken to predict the shadow patterns surrounding the study site, as influenced by the introduction of the proposed development. The computer model was based on a site plan concept provided by NEUF architect(e)s in June 2018, surrounding street layouts and existing and approved future building massing information obtained from the City of Ottawa, as well as recent site imagery. All relevant architectural details that could affect shadow patterns were included.

Shadow patterns were simulated for the future site configuration on three representative days during the year and for multiple times for each day. The geographic coordinates of the site (latitude and longitude, in degrees(°) / minutes(') / seconds(")), which determine the maximum altitude that the sun reaches above the horizon, are taken to be 45° 29' 57" north and 75° 28' 44 " west. The simulated dates and times are summarized in Appendix A, preceeding the pictorial results.

5. SHADOW ASSESSMENT SUMMARY

The results of this shadow analysis are illustrated by the figures in Appendix A, which depict the influence of the proposed buildings on the surroundings. Reference markers (Tags A-F) have been added to Figure 1 to indicate grade-level amenity areas and facilitate discussion. Shadows cast by Towers 1 and 2, although illustrated, are not considered as new net shadows in this analysis, as these buildings do not form part of the current phase of development. The results of the shadow analysis indicate that Towers 3, 4, and 5 of the Petrie's Landing I development will satisfy the City of Ottawa's criteria for new shadow coverage, except for the amenity areas north of Tower 4 (Tag F) and east of Tower 3 (Tag D). Specifically:

At Grade,

- The **amenity area to the east of Tower 5B (Tag A)** experiences more than 50% exposure to sunlight during the consecutive hours of 11 am to 1 pm in September, 11 am and 12 pm in December, and 11 am to 3 pm in June, which is acceptable.
- The **amenity area between Towers 1 and 2 (Tag B)** will not experience any significant new net shadow coverage from the proposed phase of development during June 21st and September 21st. Although this space will not achieve 50% exposure to sunlight for two consecutive hours between 11 pm and 3 pm on December 21st, the majority of shading is due to the existing Tower 1. New net shadow covers less than 50% of the space between the hours of 12 pm and 3 pm on this date, and therefore meets criteria.
- The **amenity area between Towers 2 and 3 (Tag C)** will not experience any significant new net shadow coverage from the proposed phase of development during June 21st and September 21st. Although this space will not achieve 50% exposure to sunlight for two consecutive hours between 11 am and 3 pm on December 21st, the majority of shading is due to the existing Tower 2. New net shadow covers less than 50% of the space at 1 pm, and virtually none of the space for the remaining hours on this date, and therefore meets criteria.
- The **amenity areas east of Tower 3 (Tag D)** will experience more than 50% exposure to sunlight on June 21st at hours 11 am and 12 pm, but will not meet criteria for September 21st, with more than 50% new net shadow coverage experienced after 12 pm. New net shadow covers less than 50% of the space between the hours of 2 pm and 3 pm on December 21st, and therefore meets criteria.
- The **amenity area west of Tower 4 (Tag E)** will experience more than 50% exposure to sunlight after 1 pm on June 21st, and less than 50% new net shadow coverage from 2 pm to 3pm on

December 21st, which is acceptable. However, this space will not meet criteria for September 21st, experiencing more than 50% new net shadow coverage during 11 am to 3 pm.

- The **amenity area north of Tower 4 (Tag F)** will experience more than 50% exposure to sunlight from 11 am to 12 pm for all three study dates, and is therefore acceptable.

At Elevated Spaces,

- The Tower 5 podium rooftop experiences more than 50% exposure to sunlight during the consecutive hours of 11 am and 12 pm in June and September, and therefore meets criteria as a potential communal amenity area.
- The rooftop areas of Towers 3, 4, 5A, and 5B experience more than 50% exposure to sunlight for all hours between 11 am and 3 pm during June and September, and therefore meet criteria as communal amenity areas.

Furthermore, from a shadow perspective, the proposed heights of the buildings are not substantially taller than the respective permitted maximum heights. Therefore, the incremental increase in height for Towers 3, 4, and 5 and above their permitted maximums will not have a significant influence on net new shadows cast by the development.

It is noteworthy that, since the wind analysis was performed, the roof configurations of the various buildings have undergone massing changes that are not reflected in the renderings. Despite these changes, results of the shadow analysis summarized above are not expected to differ significantly, and therefore remain applicable to the current design provided by NEUF architect(e)s in July 2018.

This concludes our assessment and report. If you have any questions or wish to discuss our findings, please contact us.

Sincerely,

Gradient Wind Engineering Inc.

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Project Manager

Vincent Ferraro, M.Eng., P.Eng.,
Managing Principal

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Assistant Project Manager

GWE18-091-SHADOWS

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GRADIENT WIND ENGINEERING INC

PROJECT	PETRIE'S LANDING 1, OTTAWA SHADOW ANALYSIS
SCALE	1:1600 (APPROX.)
DRAWING NO.	GWE18-091-SHADOW-1
DATE	JULY 4, 2018
DRAWN BY	B.J.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

APPENDIX A

SHADOW RENDERINGS

TABLE A1: SHADOW RENDERING DATES AND TIMES

TIME	September 21st		December 21st		June 21st	
	Figure	Page #	Figure	Page #	Figure	Page #
8:00 AM	S1	A3	*N/A*		J1	A13
9:00 AM	S2	A3	D1	A9	J2	A13
10:00 AM	S3	A4	D2	A9	J3	A14
11:00 AM	S4	A4	D3	A10	J4	A14
12:00 PM	S5	A5	D4	A10	J5	A15
1:00 PM	S6	A5	D5	A11	J6	A15
2:00 PM	S7	A6	D6	A11	J7	A16
3:00 PM	S8	A6	D7	A12	J8	A16
4:00 PM	S9	A7	*N/A*		J9	A17
5:00 PM	S10	A7			J10	A17
6:00 PM	S11	A8			J11	A18
7:00 PM	*N/A*				J12	A18
8:00 PM					J13	A19

FIGURE S1: SEPTEMBER 21ST, 8:00 AM

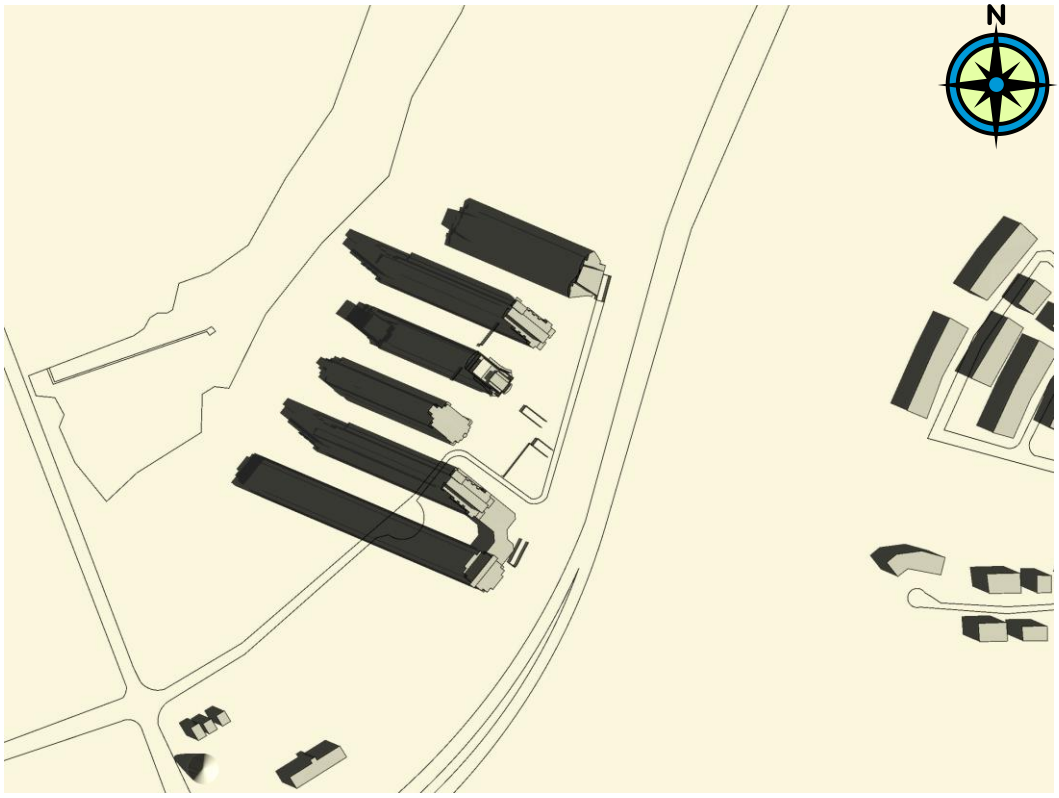

FIGURE S2: SEPTEMBER 21ST, 9:00 AM

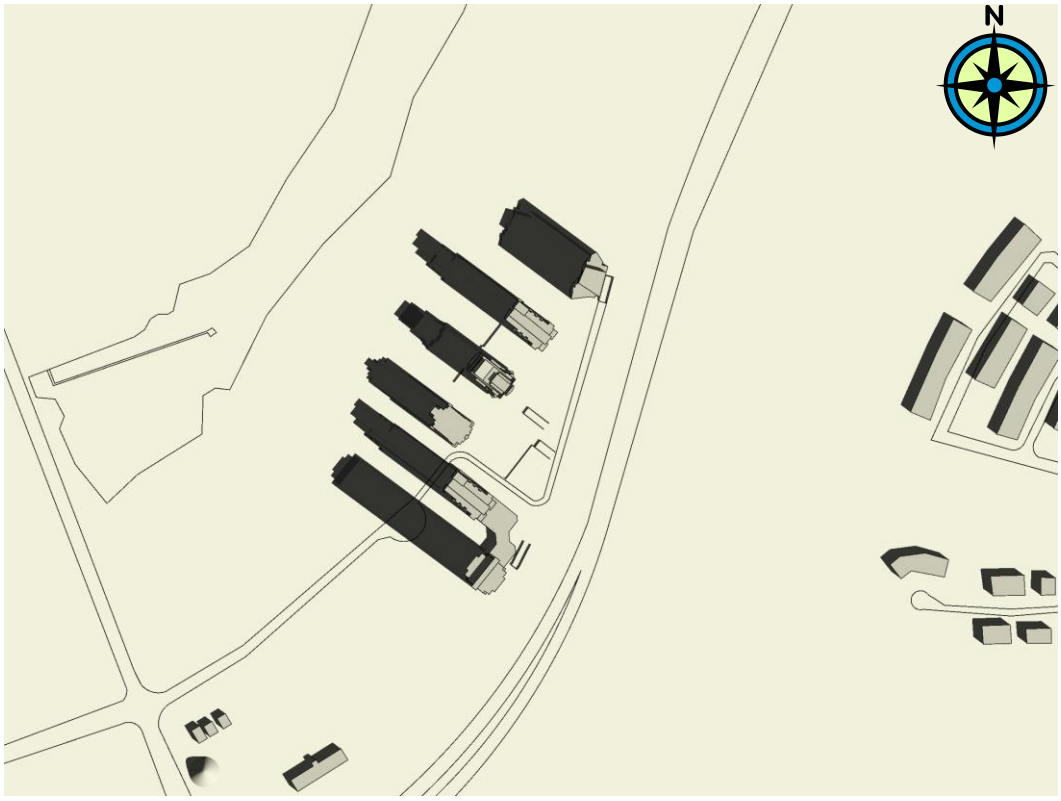

FIGURE S3: SEPTEMBER 21ST, 10:00 AM

FIGURE S4: SEPTEMBER 21ST, 11:00 AM

FIGURE S5: SEPTEMBER 21ST, 12:00 PM

FIGURE S6: SEPTEMBER 21ST, 1:00 PM

FIGURE S7: SEPTEMBER 21ST, 2:00 PM

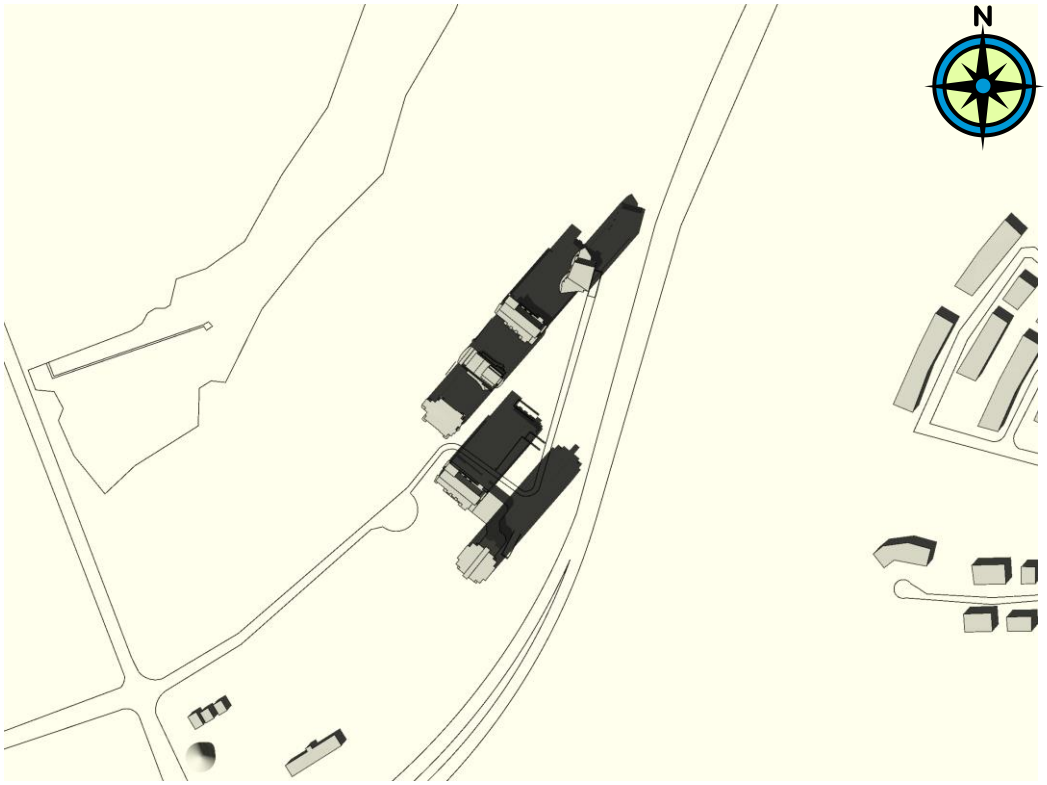

FIGURE S8: SEPTEMBER 21ST, 3:00 PM

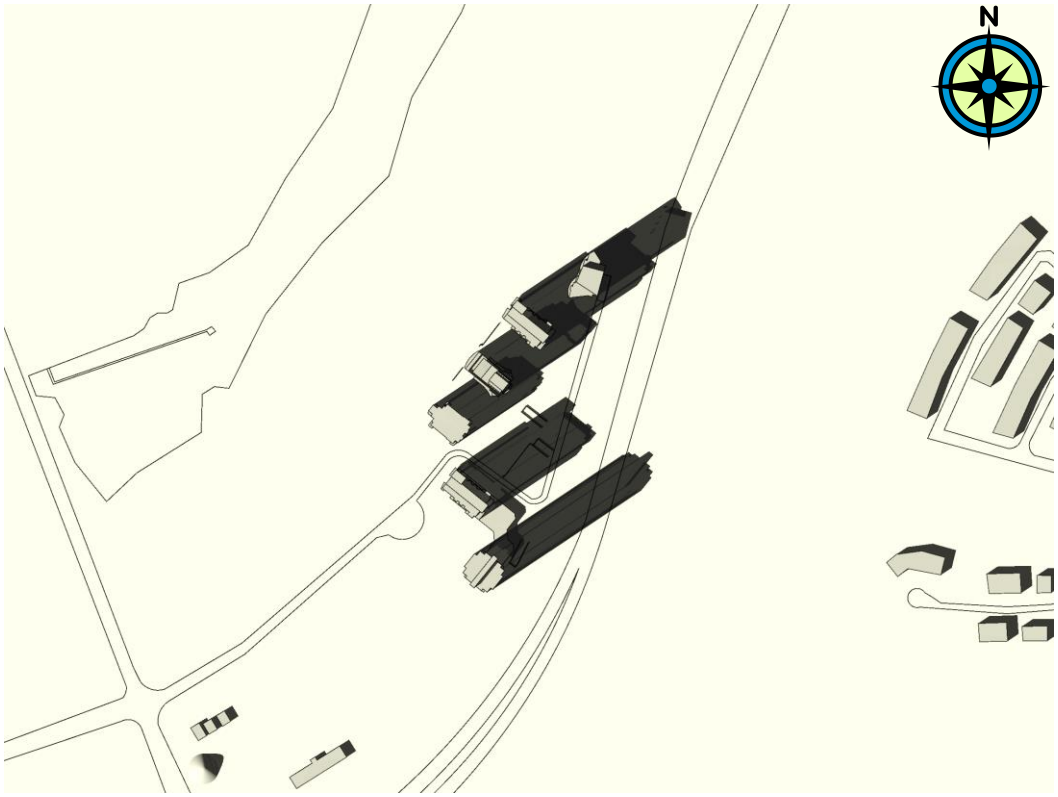

FIGURE S9: SEPTEMBER 21ST, 4:00 PM

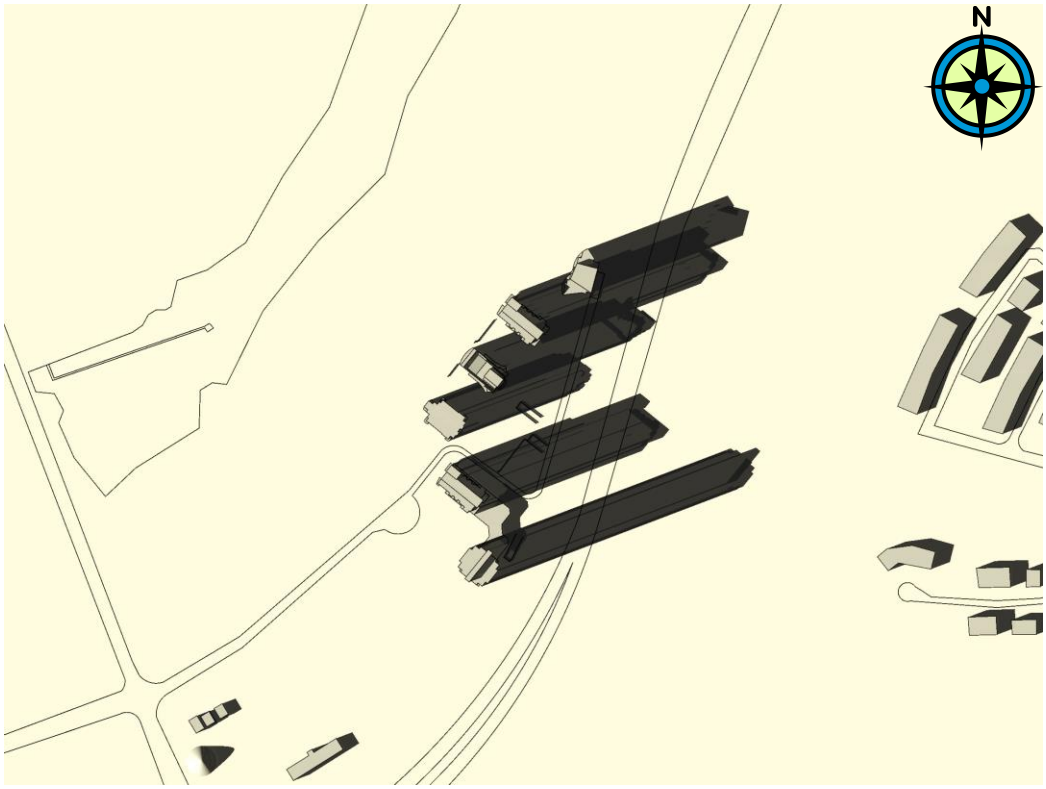

FIGURE S10: SEPTEMBER 21ST, 5:00 PM

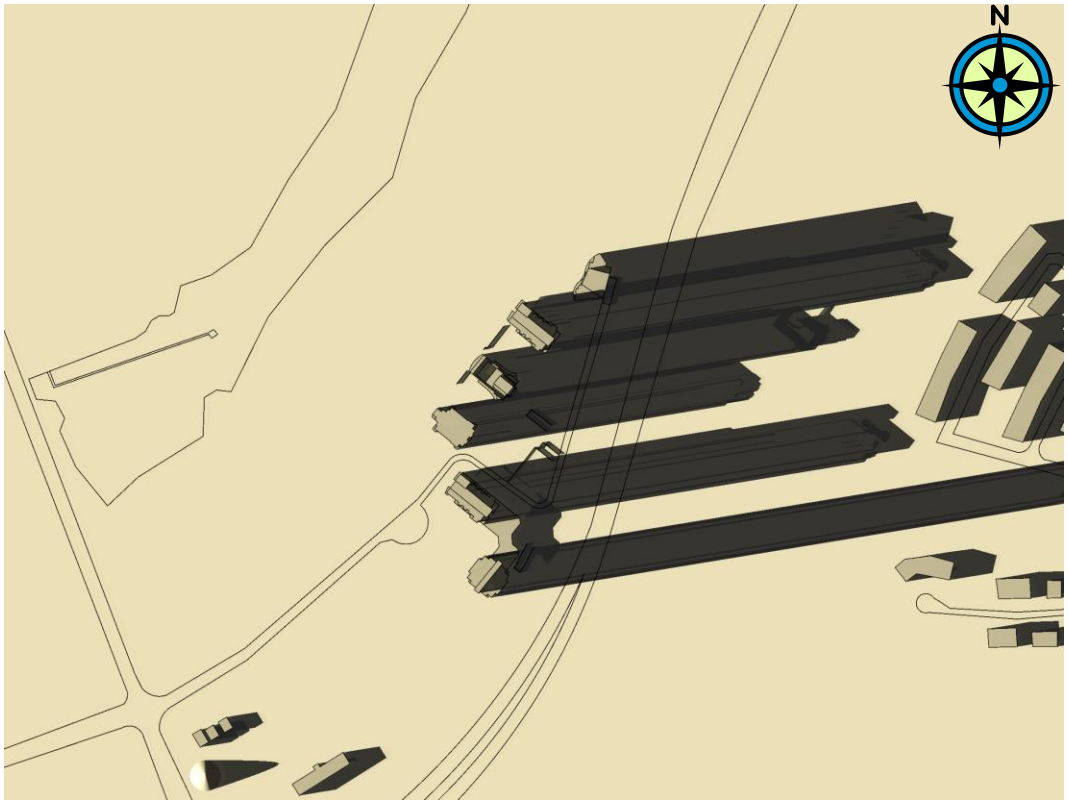

FIGURE S11: SEPTEMBER 21ST, 6:00 PM

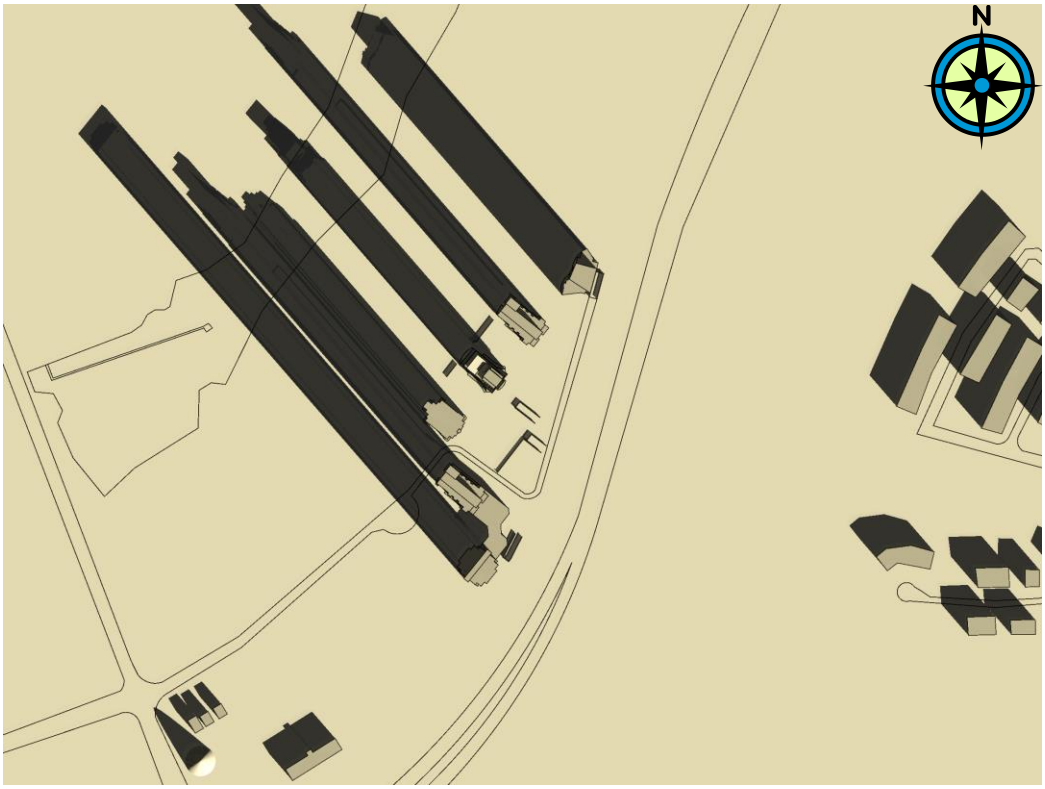

FIGURE D1: DECEMBER 21ST, 9:00 AM

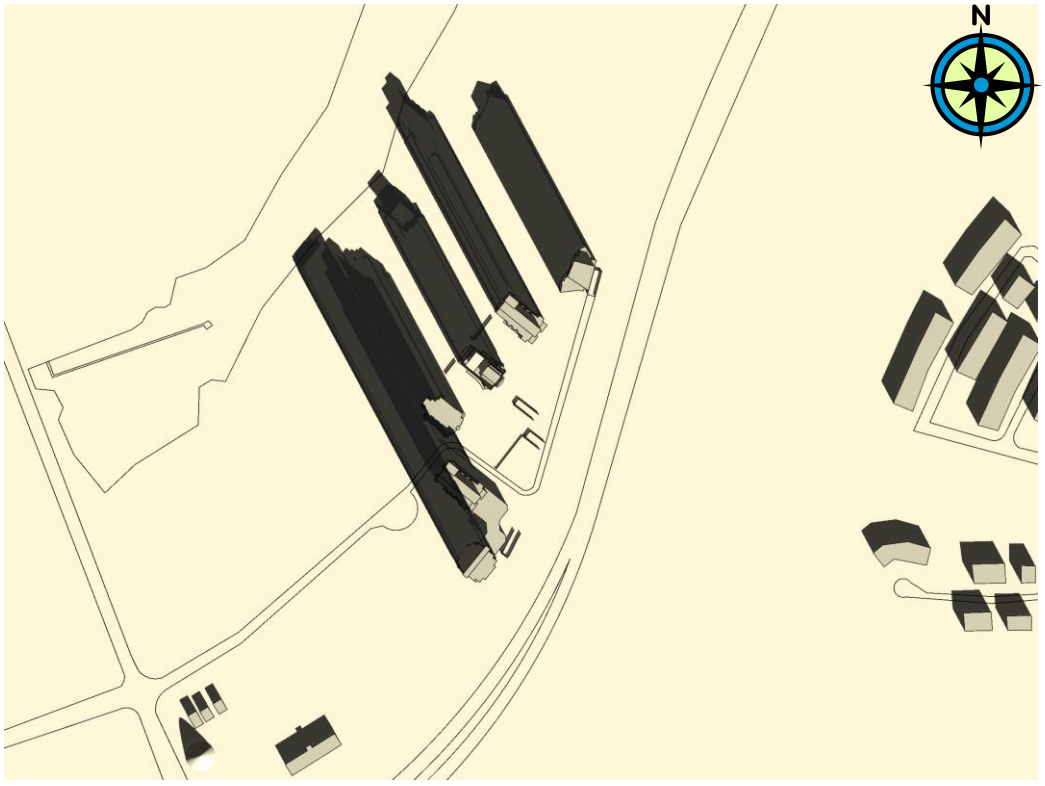

FIGURE D2: DECEMBER 21ST, 10:00 AM

FIGURE D3: DECEMBER 21ST, 11:00 AM

FIGURE D4: DECEMBER 21ST, 12:00 PM

FIGURE D5: DECEMBER 21ST, 1:00 PM

FIGURE D6: DECEMBER 21ST, 2:00 PM

FIGURE D7: DECEMBER 21ST, 3:00 PM

FIGURE J1: JUNE 21ST, 8:00 AM

FIGURE J2: JUNE 21ST, 9:00 AM

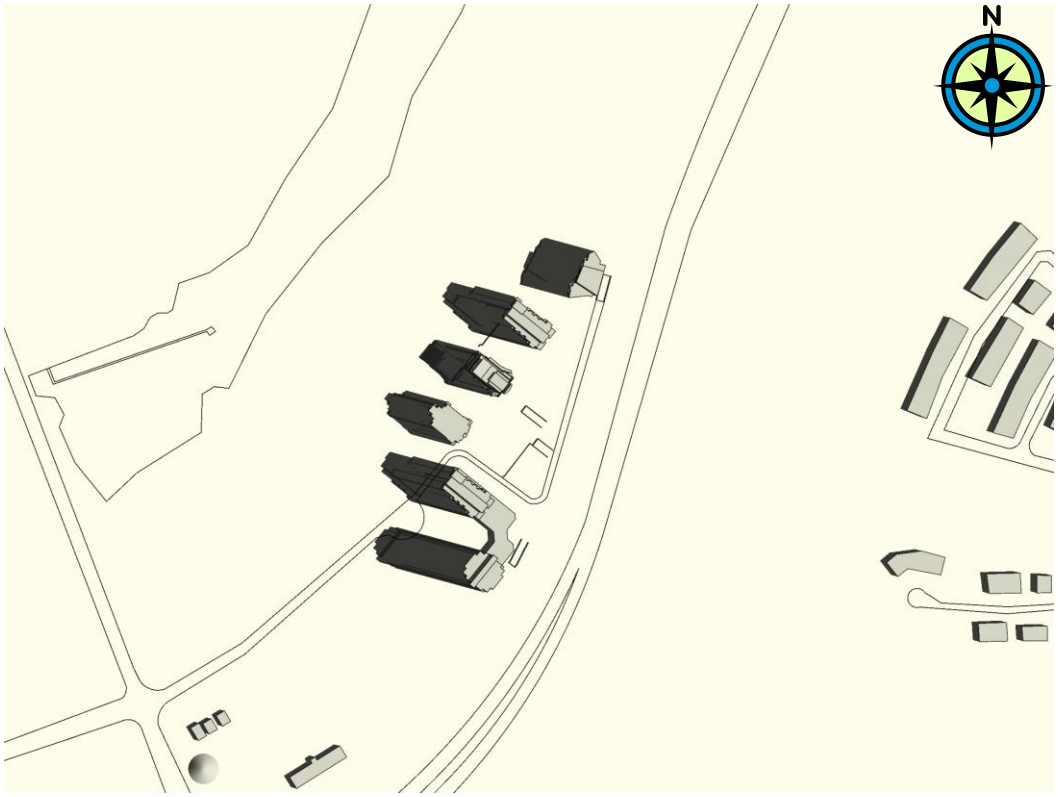

FIGURE J3: JUNE 21ST, 10:00 AM

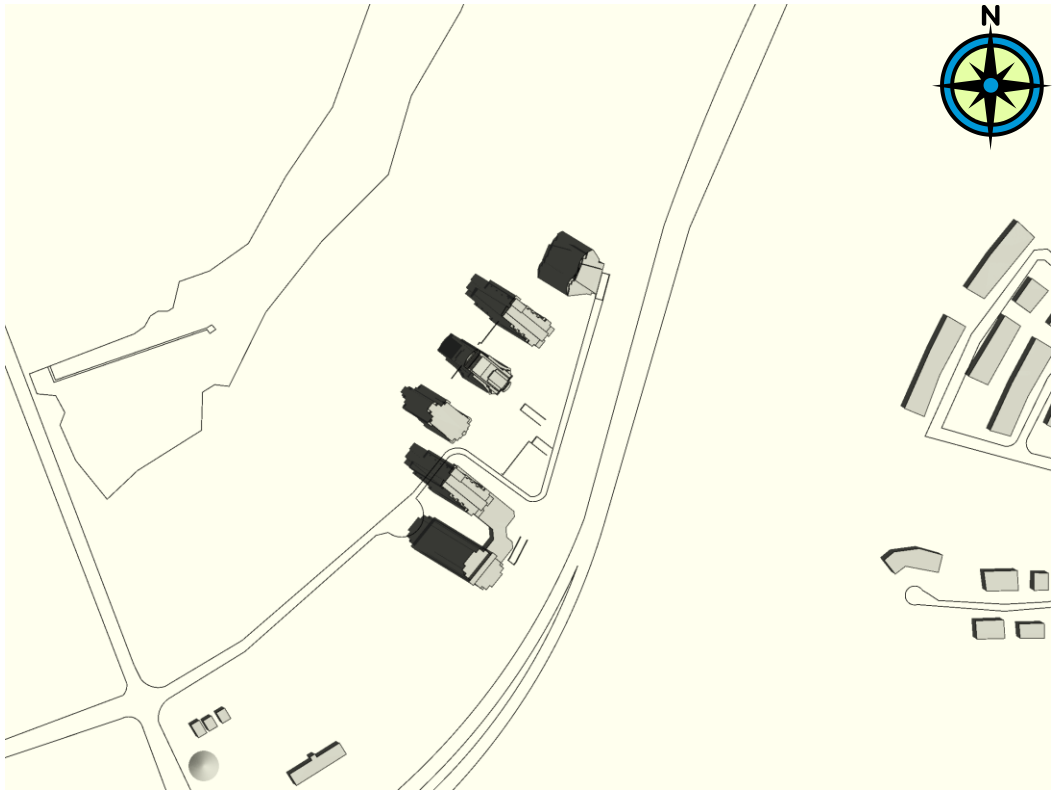

FIGURE J4: JUNE 21ST, 11:00 AM

FIGURE J5: JUNE 21ST, 12:00 PM

FIGURE J6: JUNE 21ST, 1:00 PM

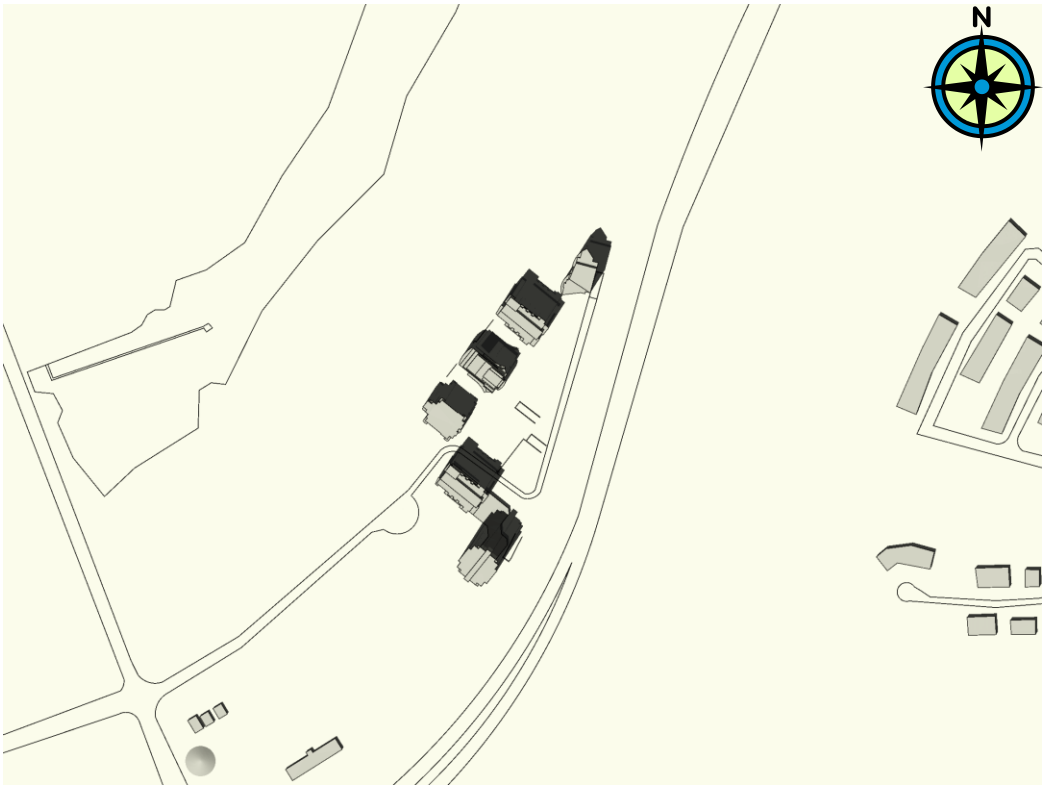

FIGURE J7: JUNE 21ST, 2:00 PM

FIGURE J8: JUNE 21ST, 3:00 PM

FIGURE J9: JUNE 21ST, 4:00 PM

FIGURE J10: JUNE 21ST, 5:00 PM

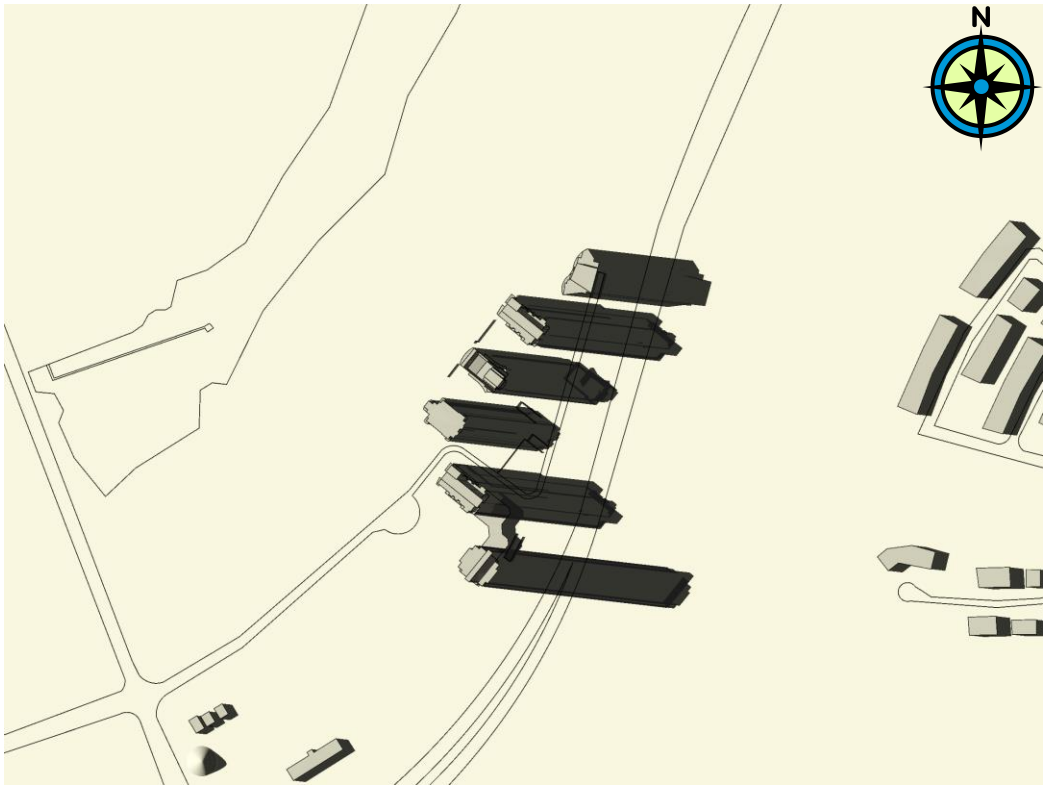

FIGURE J11: JUNE 21ST, 6:00 PM

FIGURE J12: JUNE 21ST, 7:00 PM

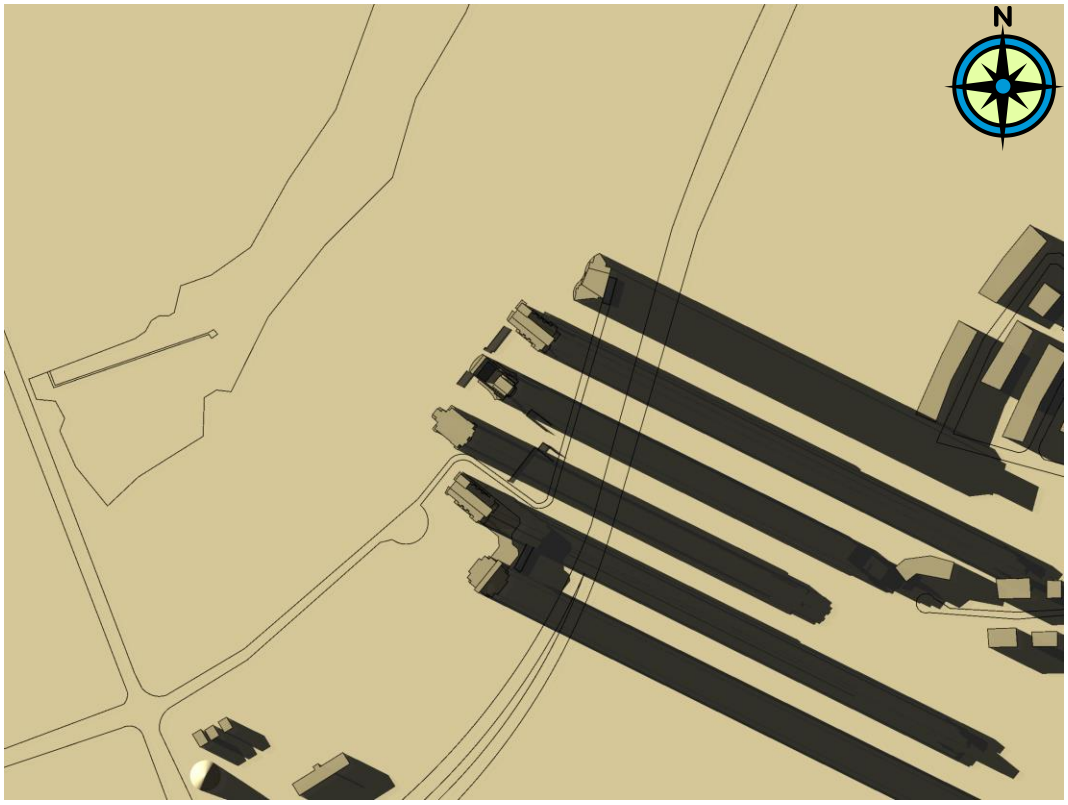

FIGURE J13: JUNE 21ST, 8:00 PM