

# SOLAR AND DAYLIGHT ACCESS STUDY ONE SYDNEY HARBOUR

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SOLAR AND DAYLIGHT ACCESS STUDY- DEVELOPMENT APPLICATION  
FEBRUARY 2017

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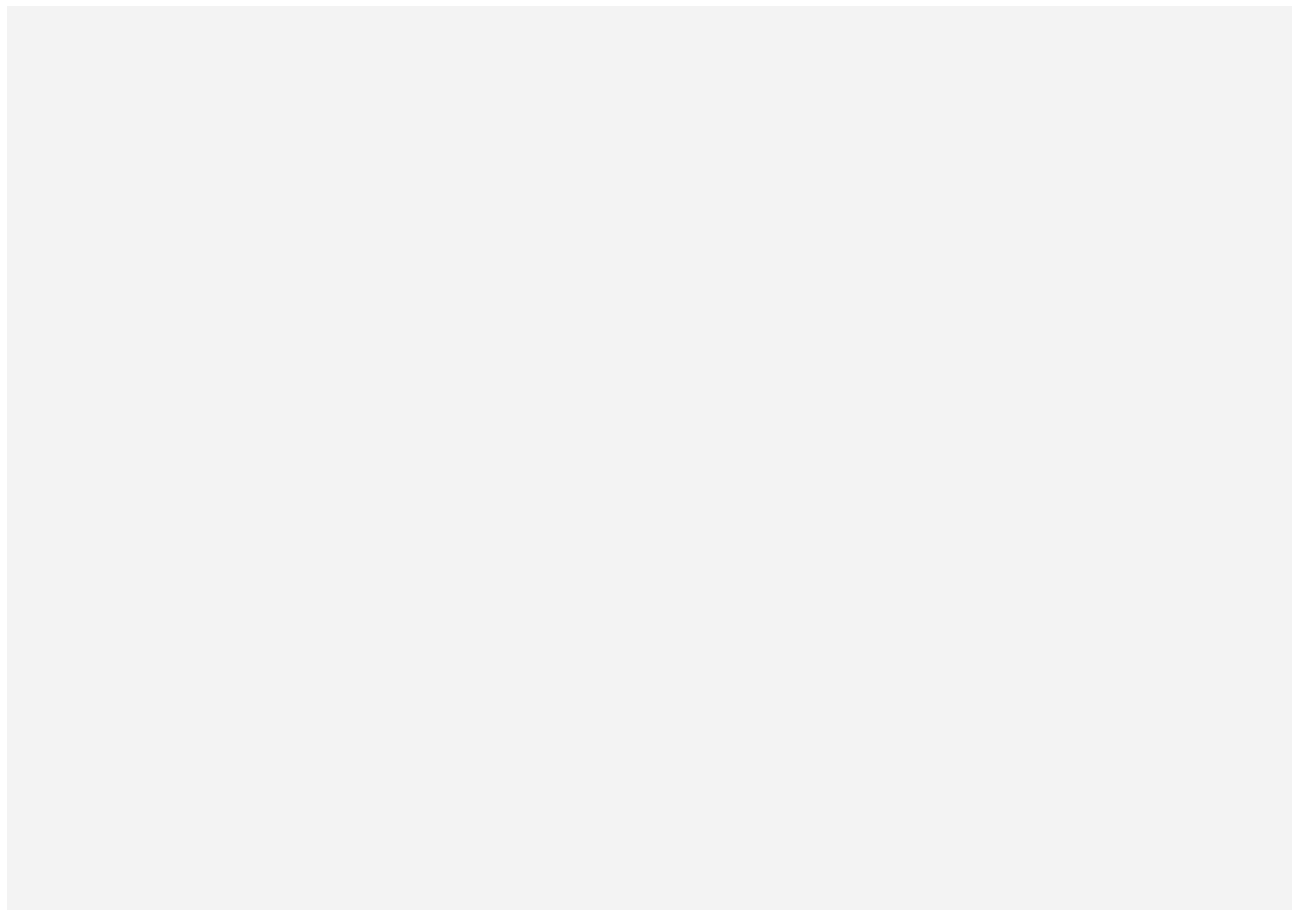


**lendlease**



## Document History

Revision	Date	Prepared By	Checked By	Description
01	13/02/2017	Kalai Valliappan	Graham Carter	
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## Executive Summary

This report has been prepared in response to the Department of Planning's submission regarding the One Sydney Harbour development. It provides additional explanatory information regarding the compliance with the Apartment Design Guide 4A Solar and daylight access design criteria.

The total development achieves reasonable solar access for a site located within the density of the Sydney Metropolitan Area with excellent daylight access due to the highly transparent façade and north-east and west facing façade of all three buildings.

Across the development, 66% of apartments receive direct sunlight between 9am-3pm for living rooms and private open spaces on the winter solstice; and 85% of apartments receive direct sunlight when considering an extended 9am-4:45pm time frame. An extended solar time frame was considered in the assessment of R8 and R9 residential buildings on the waterfront. Accepting that Residential Building R4A, R4B and R5 are required to be generally in accordance with the Concept Plan (Mod 8), the proposed buildings' massing, scale and orientation could not be designed differently, and achieve significantly improved solar access. Importantly, all apartments receive some solar access between 9am-3:30pm. These results now include the Crown Sydney Hotel Resort to the north west of the Stage 1B development site.



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## Introduction

This report supports three State Significant Development Applications (SSD 6964, 6965, 6966) submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Collectively the Development Applications seeks approval for construction of the residential flat buildings (known as Residential Building R4A, R4B and R5) and associated works at Barangaroo South as described in the Overview of Proposed Development section of this report.

### 1.1 Site Location

Barangaroo is located on the north western edge of the Sydney Central Business District, bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development dominated by large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – Barangaroo Reserve, Barangaroo Central and Barangaroo South. The DA Sites are located on land generally known and identified in the approved Concept Plan as Block 4A and 4B.

### 1.2 Overview of Proposed Development

The Residential Buildings R4A, R4B and R5 seeks approval for the construction and use of 72, 59 and 28 storey residential flat buildings comprising of 327, 297 and 151 apartments respectively, ground floor retail, the allocation of car parking, services, plant and storage within the Stage 1B Basement (subject of a separate concurrent DA), and the construction of ancillary landscaping and temporary public domain.

Approval for the construction of the Residential Building's cores and associated plants and services within the basement is being sought as part of the concurrent Stage 1B Basement DA and do not form part of this DA.

### 1.3 Purpose of this Report

The One Sydney Harbour Residential Buildings have been studied in relation to the SEPP65 Solar and Daylight Access guidance. The 'Design Criteria' included in the Apartment Design Guide (July 2015) relevant to this guidance recommends that:

- *Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9am and 3pm at mid-winter in the Sydney Metropolitan Area.*
- *A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid winter.*

The total development achieves reasonable solar access for a site located within the density of the CBD with excellent daylight access due to the highly transparent façade.

The Residential Buildings have been assessed with the inclusion of the Crown Resort to the west of the DA site.

The overall development achieves 66% of apartments receiving at least 2 hours of direct sunlight between 9am-3pm for living rooms and private open spaces with the inclusion of the

Crown Resort; and 85% of apartments when considering a 9am-4:45pm time frame, as shown in Table 1.

Table 2 demonstrates that the development achieves the second design criteria requiring a maximum of 15% of apartments to receive no direct sunlight between 9am and 3pm. This criteria is achieved by the development as a whole with only 4% of apartments receiving no direct solar access to living areas, bedrooms and/or balconies/wintergardens which could be considered habitable rooms. All apartments receive some solar access between 9am-3:30pm on the winter solstice with the minimum amount being 15 minutes. This is achieved as the development has no south facing apartments.

Each residential building is analysed further in this report.

## Methodology

The R4A, R4B and R5 buildings consist of a typical low rise, mid rise, high rise and penthouse floor plates. This study has analysed the solar access for the following floors which provides representative results for every apartment within the development:

R4A and R4B	R5
▪ Low Rise L01,	▪ Podium level P2
▪ Low Rise L07	▪ Low Rise L01,
▪ Low Rise L08	▪ Low Rise L09,
▪ Mid Rise L33,	▪ Mid Rise L14.
▪ High Rise L53, and	▪ Mid Rise L15.
▪ Penthouse levels L68 and L69 (R4A), L56 and L57 (R4B)	▪ Penthouse L26

Autodesk's Ecotect software was used to visually determine solar access in 15 minute time steps to determine the duration of solar access. We have interpreted mid-winter as being the winter solstice, June 21<sup>st</sup>, which provides conservative results as it is the shortest day of the year.

As the One Sydney Harbour towers are positioned near the harbour edge, they are unlikely to be built out in the future and thus will receive sunlight even at low solar altitudes. For this reason results have been presented for an extended time frame beyond 3pm to capture all the solar access the apartments will receive.

The modelled apartments have been based on the latest drawings – Revisions 18 (R4A and R4B) and Revision 16 (R5). The façade elevations (north-east and west for R4A and R4B, east and north-west for R5) all have high light transmittance glazing with a minimum glazing height of 2.7m, and some floors with a glazing height of 3m.

## Results

The results presented in the tables below have been presented for each Residential Building against the Apartment Design Guide criteria, as well as for the development as a whole. Note, these results represent the inclusion of the Crown Resort.

# One Sydney Harbour Solar and Daylight Access Study



Table 1: Solar access greater than 2 hours in residential buildings R4A, R4B, and R5 on 21 June with the inclusion of Crown Resort

	R4A		R4B		R5		Total	
	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments
Between 9am-3pm								
Living Rooms and Private Open Spaces <sup>1</sup>	65%	212	64%	191	70%	105	66%	508
Extended time period	9am – 4:45pm		9am – 4:45pm		9am – 3pm		9am – 4:45pm	
Living Rooms and Private Open Spaces <sup>1</sup>	96%	313	80%	237	70%	105	85%	655

<sup>1</sup> Results indicate the percentage of apartments receiving at least 2 hours of solar access in the living rooms and balconies/wintergardens.

Table 2: Apartments receiving no solar access in residential buildings R4A, R4B, and R5 on 21 June with the inclusion of Crown Resort

	R4A		R4B		R5		Total	
	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments	%	No. of Apartments
Between 9am-3pm								
Living Rooms and Private Open Spaces <sup>2</sup>	0%	0	9%	28	0%	0	4%	28
Between 9am-3:30pm								
Living Rooms and Private Open Spaces <sup>2</sup>	0%	0	0%	0	0%	0	0%	0

<sup>2</sup> Results indicate the percentage of apartments receiving some solar access in the living rooms, bedrooms and/or balconies/wintergardens.

The main factors leading to 66% compliance for the whole development for the 9am-3pm criteria include:

- North-east and west facing façade of all three Residential Buildings
- Shading from the existing CBD to the east to lower levels of the buildings in the morning
- Shading from Crown resort onto all three buildings in the afternoon
- Shading of R4A onto R4B in the afternoon
- Shading of R4B onto R5 in the afternoon.

The R4A tower achieves 65% of apartments receiving two hours of direct solar access between 9am-3pm; when considering an extended time period of 9am-4:45pm the number of apartments receiving two or more hours of solar access increases to 96%. Importantly, all apartments of R4A receive some solar access in the living room, bedroom and/or balcony/wintergarden between 9am-3pm.

The R4B tower achieves 64% of apartments receiving two hours of direct solar access between 9am-3pm, increasing to 80% between 9am-4:45pm. The difference between R4A and R4B results is primarily due to the afternoon shading of the R4A tower onto R4B. All apartments of R4B receive some solar access between 9am-3:30pm in the living room, bedroom and/or balcony/wintergarden.

R5 achieves 70% of apartments receiving two hours of direct solar access between 9am-3pm, with all apartments also receiving some solar access in this time frame. All three towers exceed the design criteria between 9am-4:45pm, achieving reasonable solar access for a site located within the Sydney Metropolitan Area.

R4A achieves a significant increase in compliance with the extended time frame as the entire vertical height of the building ceases to be overshadowed by the Crown Resort after 3pm. A visual representation of this is apparent in the sun perspective diagrams included in this report.

As the Apartment Design Guide design criteria is about both Solar and Daylight Access to habitable rooms and private open space, it is important to interpret the winter solar access results within the broader context of the building design, in particular:

- **High Light Transmission Façade** – The façade typologies proposed will allow high light transmission glass to be used with automated cavity blinds providing solar control when needed. The main façade elevations (the east and north-west for R5 and north and west for R4A and R4B) all have high light transmittance glazing with a minimum glazing height of 2.7m, and some floors with a glazing height of 3m. With the Crown Resort to the west of the development, there will also be light reflected off this building into the One Sydney Harbour apartments. Furthermore, the towers are positioned with parkland to the north and with unobstructed views to the west unlikely to be built out in the future. These considerations mean that the One Sydney Harbour living areas, private open space and bedrooms will experience much higher daylight levels year round than many other residential buildings within the Sydney CBD.
- **Outlook** – The views to the west and northeast are primary resulting in unobstructed views of Sydney Harbour and with the high performance façade typologies proposed, high daylight levels and amenity under diffuse sky conditions will be provided for the west facing apartments.

For these reasons we believe the proposed One Sydney Harbour meets the intent of SEPP65's Daylight Access principle.



## Sun Patch Diagrams

To further demonstrate solar access to the apartments, sun patch diagrams are provided in this report. These sun path diagrams have been modelled on the following typical floor plates:

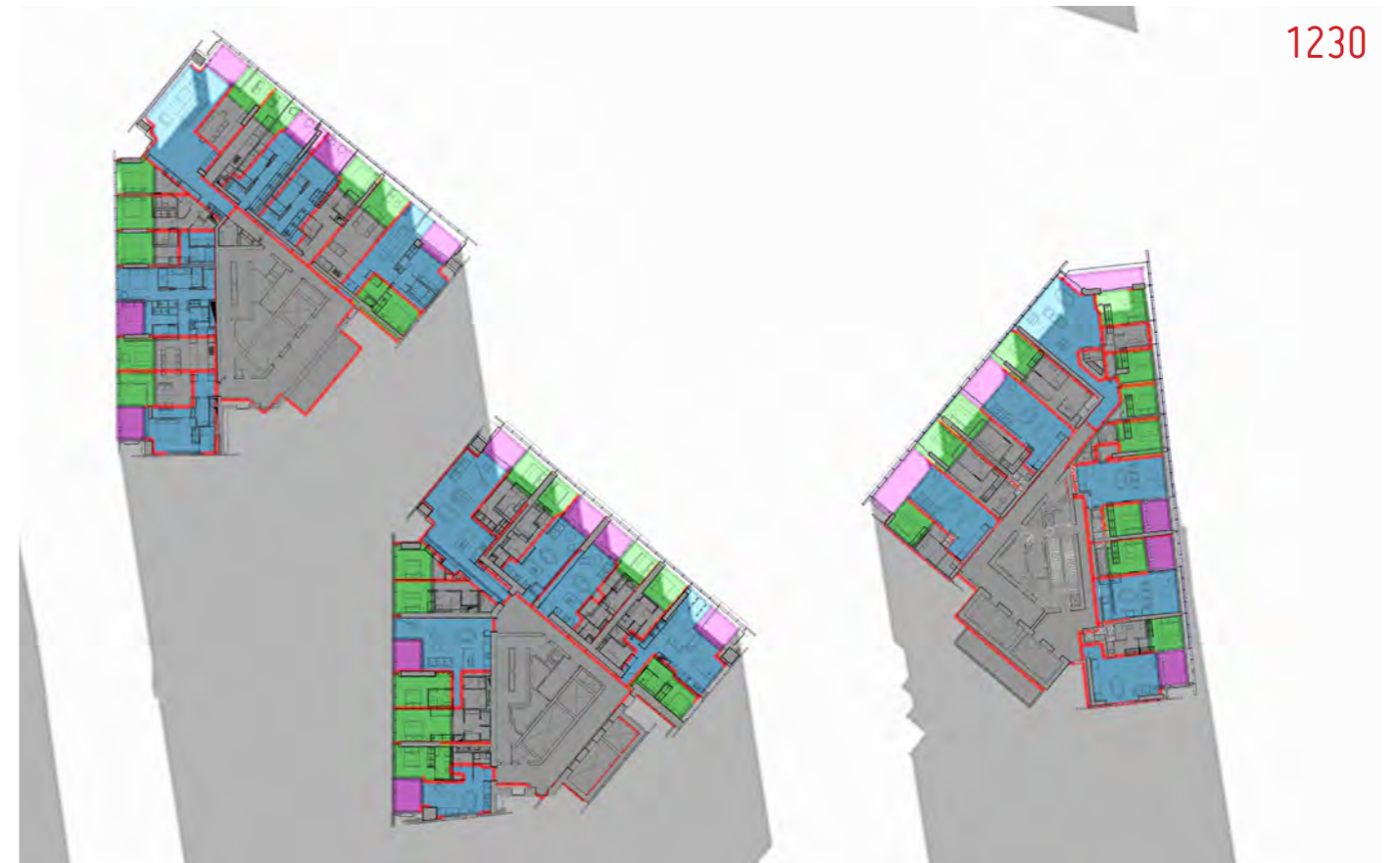
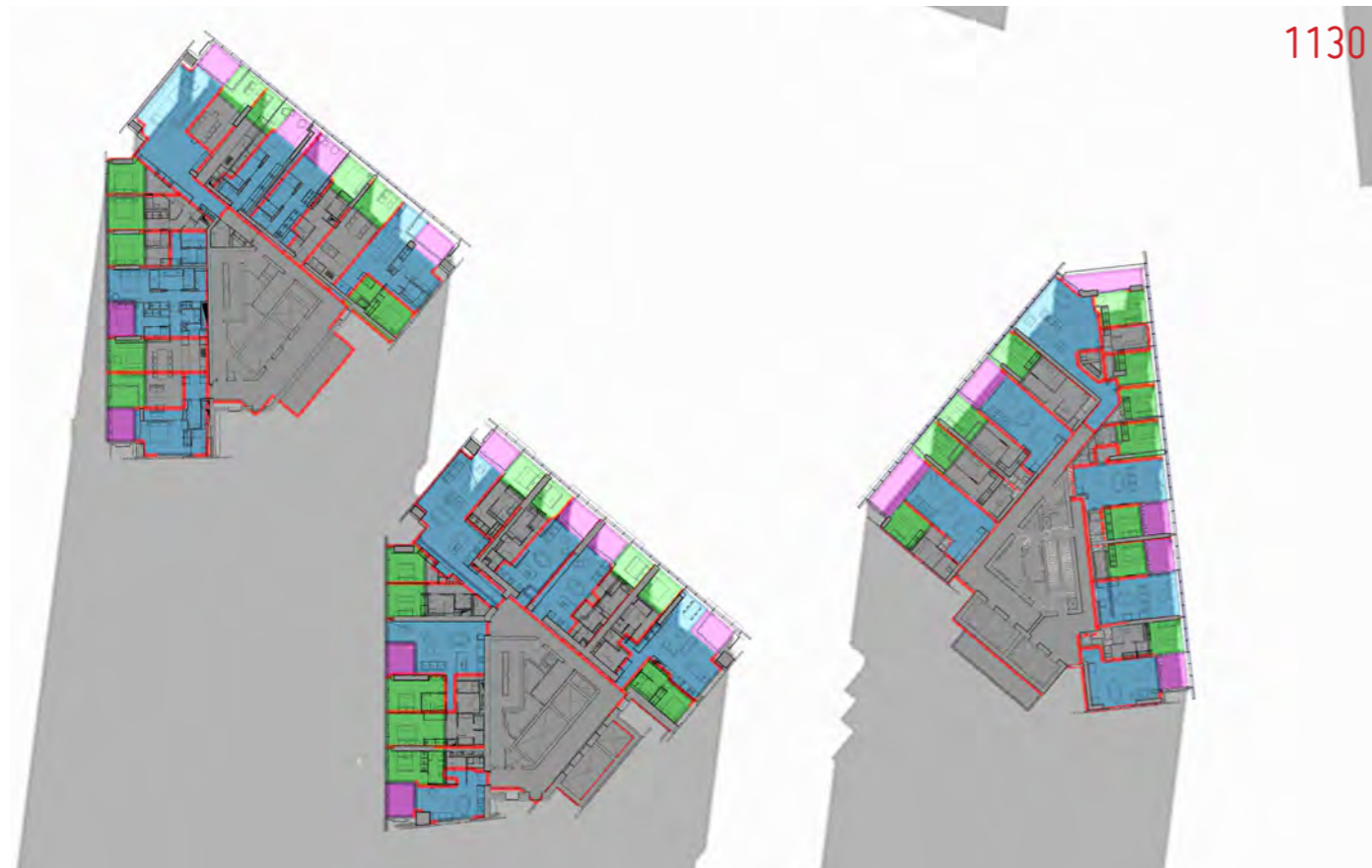
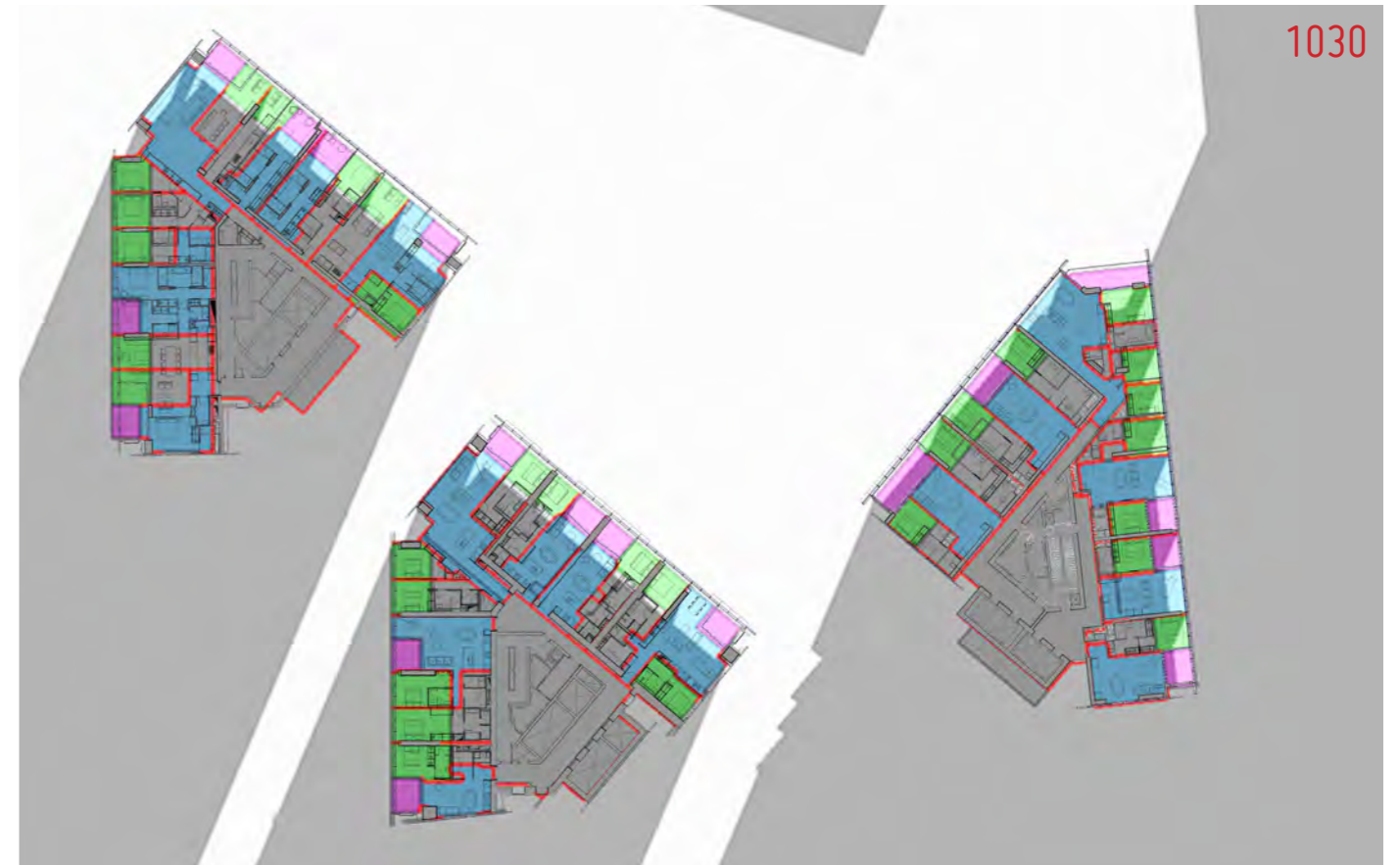
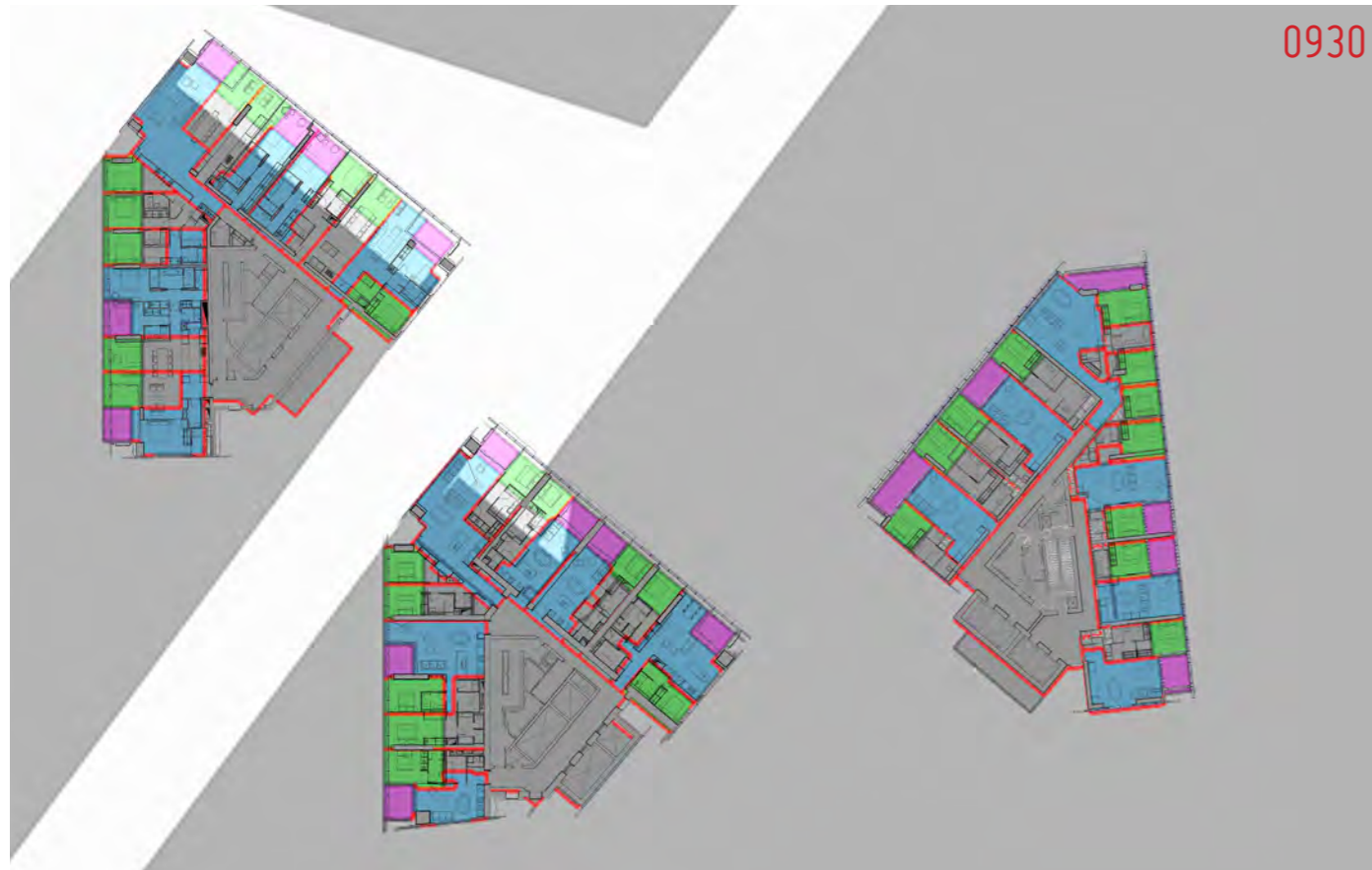
- Level 01 R4A, R4B and R5
- Level 14 R5
- Level 33 R4A and R4B
- Level 53 R4A and R4B

These diagrams show the direct sunlight on the apartment floor plates and overshadowing as a result of local shades and external buildings. It is important to note that these diagrams do not illustrate the daylight level that will be experienced due to the high light transmission facade and unobstructed views, which increase the overall amenity in the apartments.

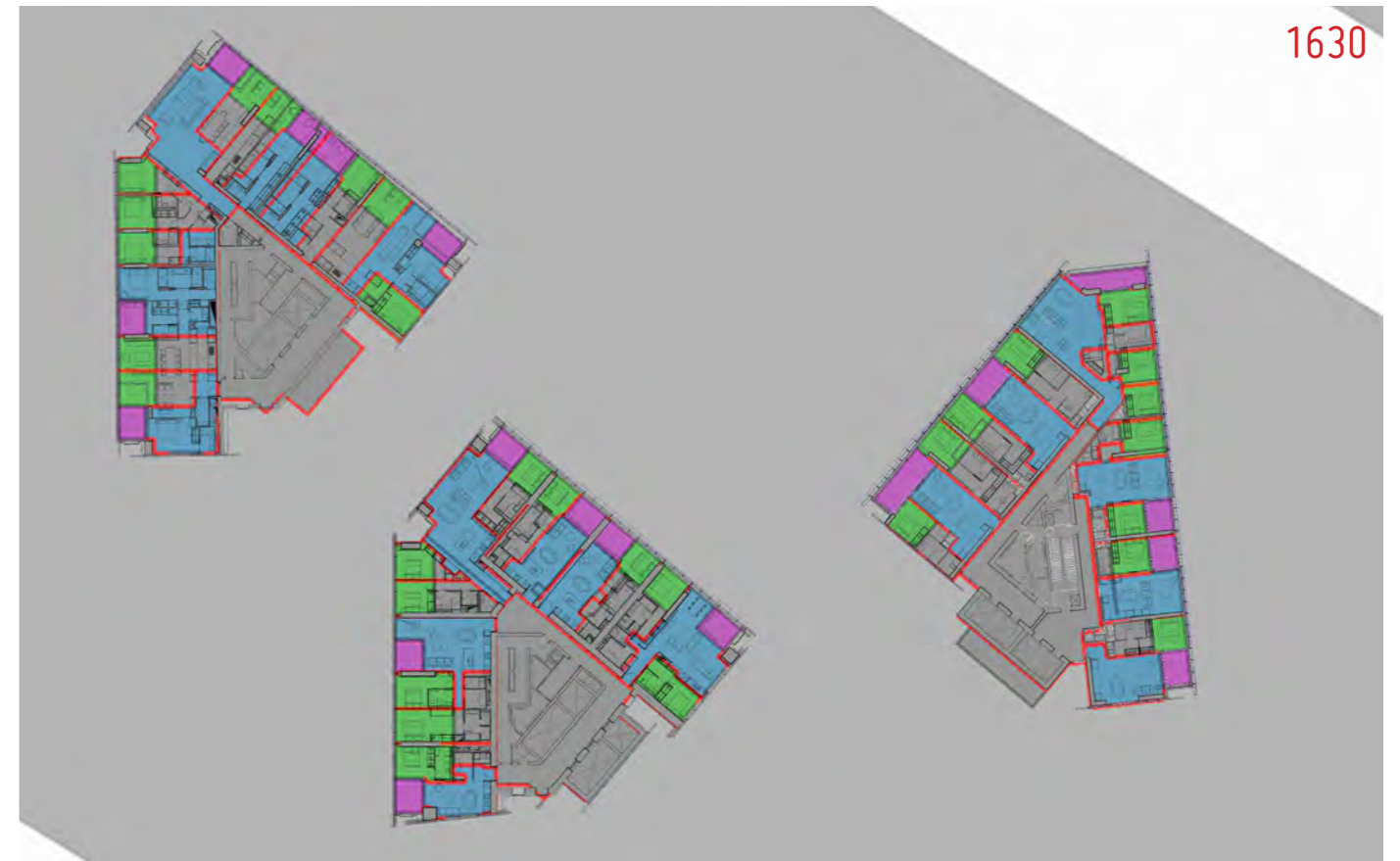
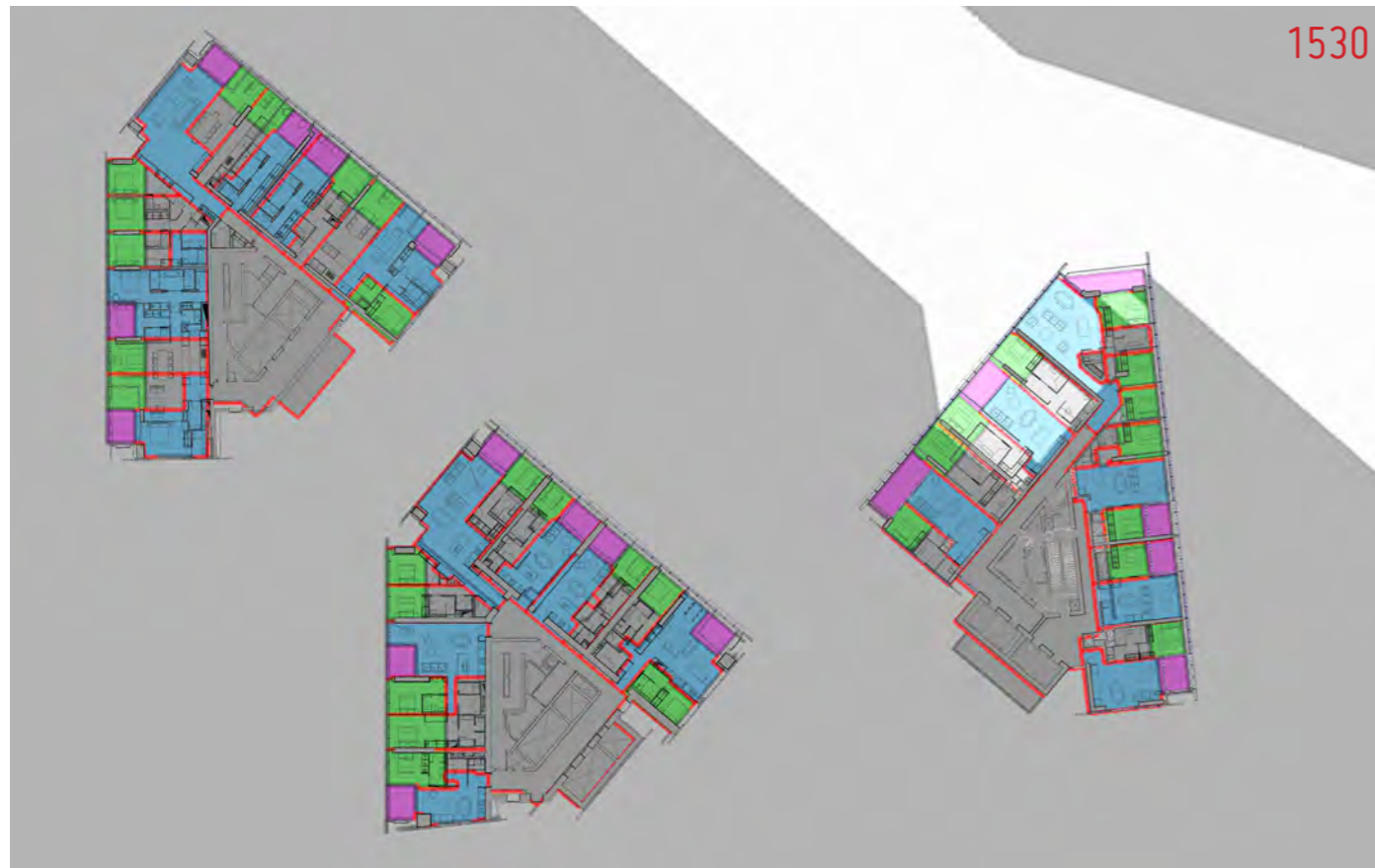
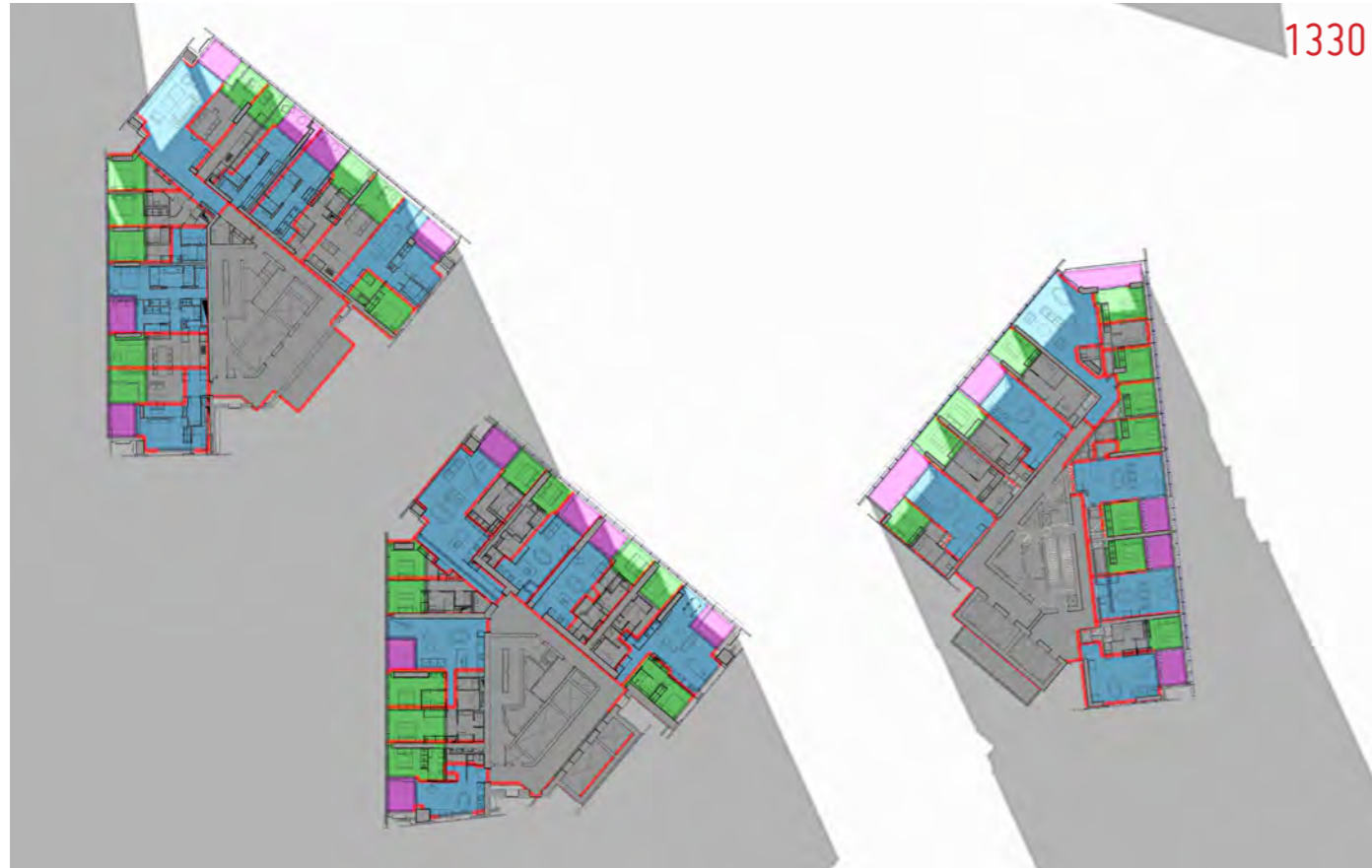
- Living areas have been highlighted in blue, wintergardens/balconies in pink and bedrooms in green
- Within the diagrams, R4A is in the top left of each sun patch diagram, R4B in the middle and R5 to the right.
- Shading from the surrounding CBD, Crown resort or the One Sydney Harbour buildings is shown in light grey.

Diagrams from the suns positions have also been included to provide an overall view of the level of solar access and overshadowing from external buildings on the development.

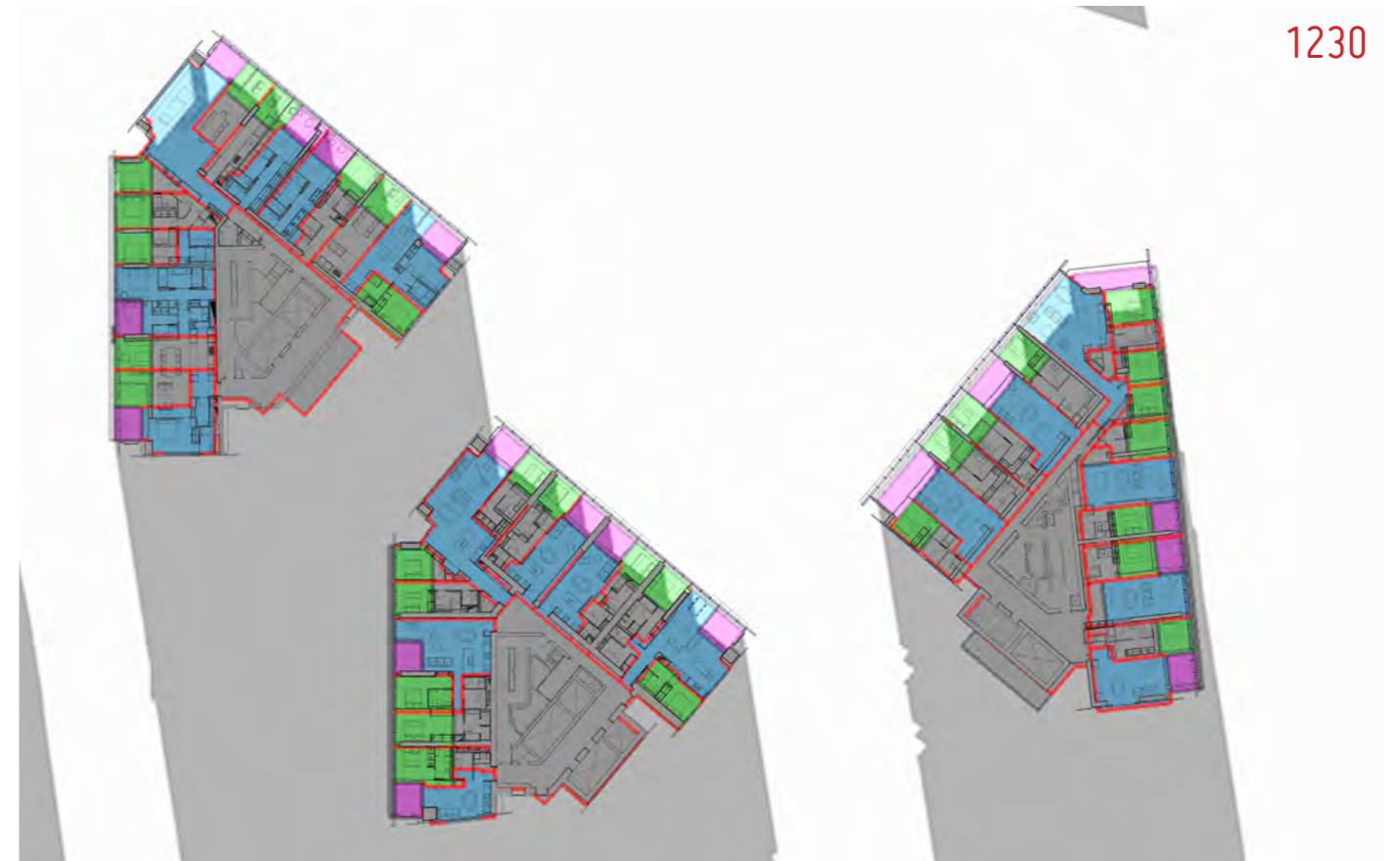
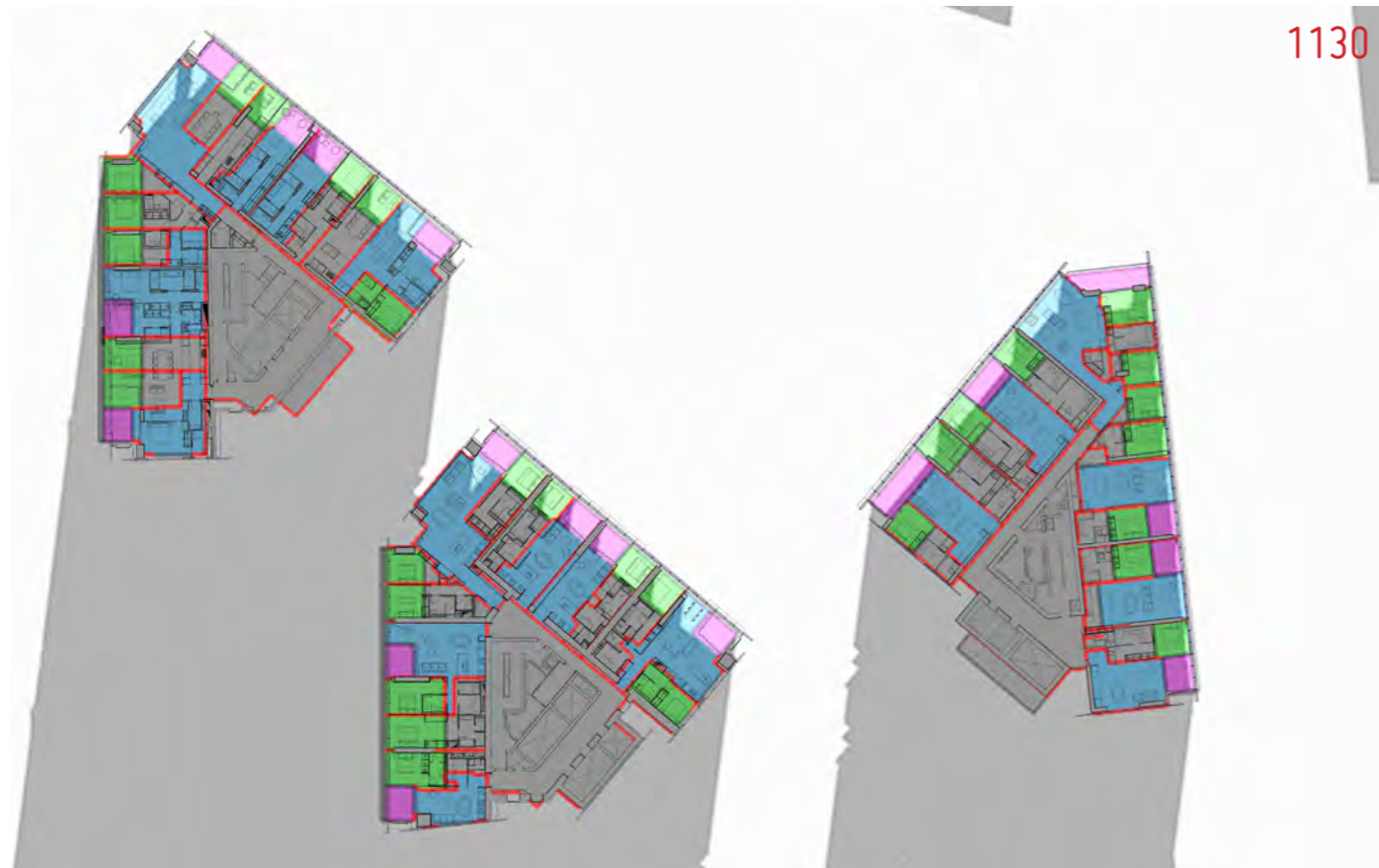
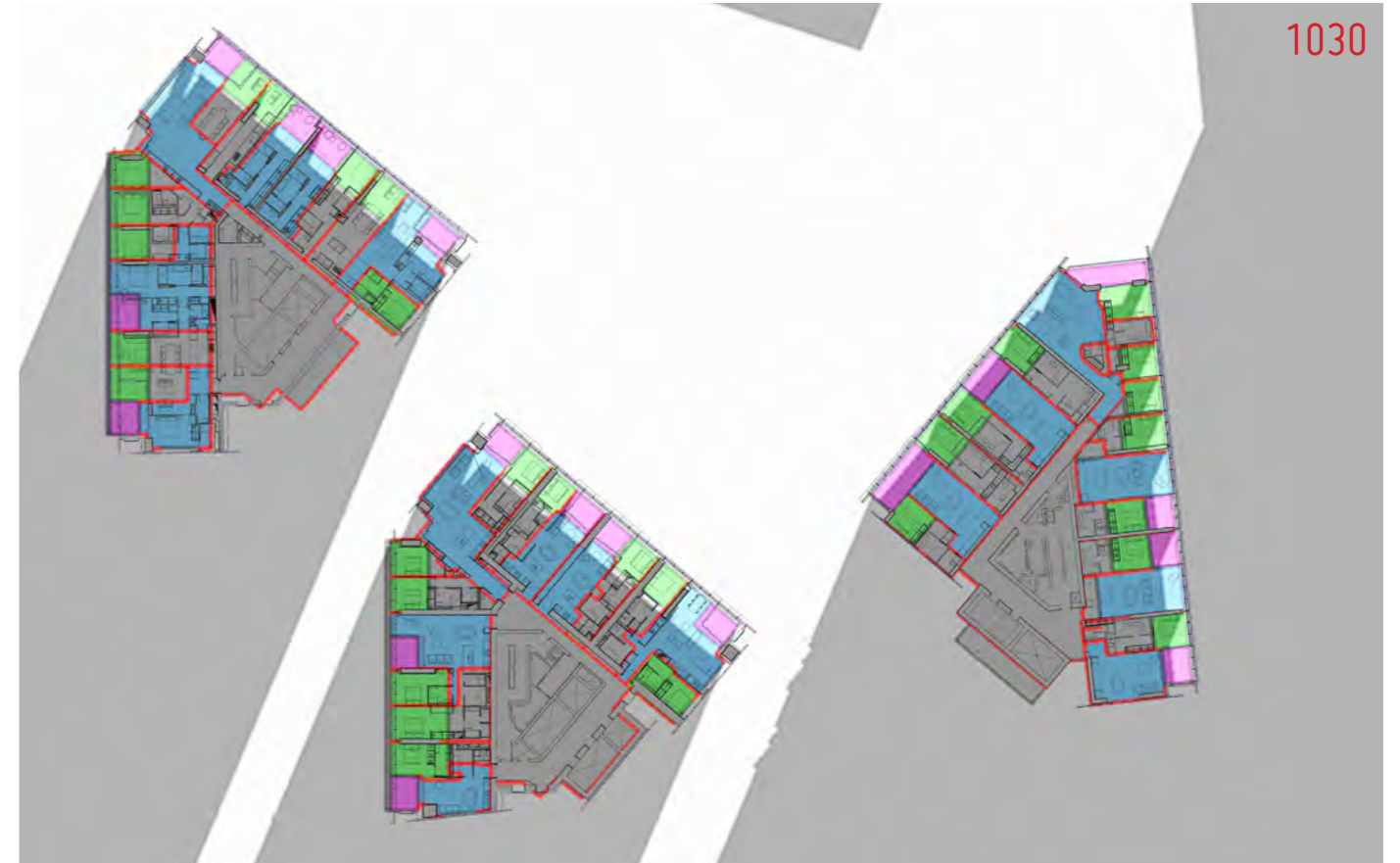
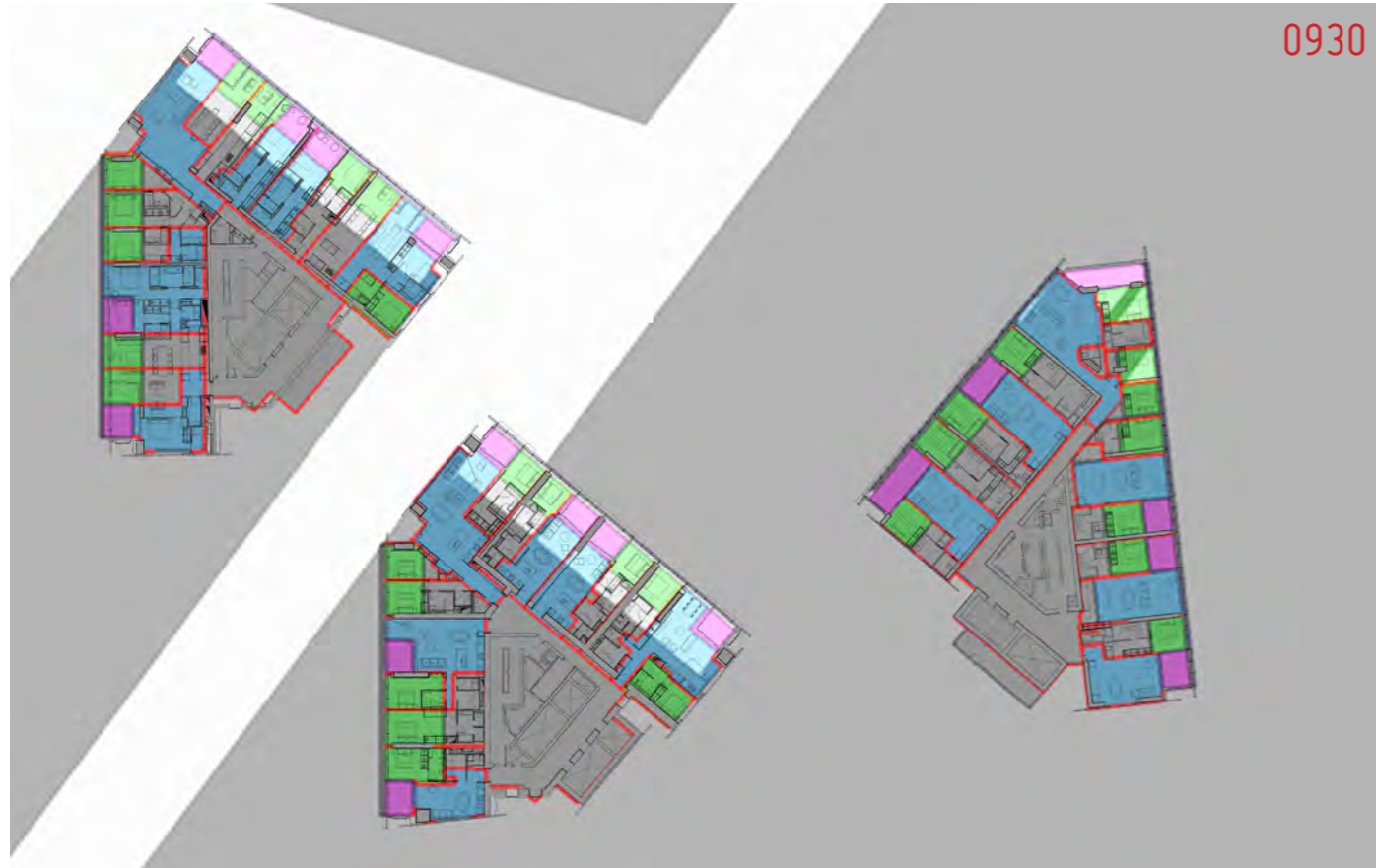
JUNE 21 - LEVEL 01



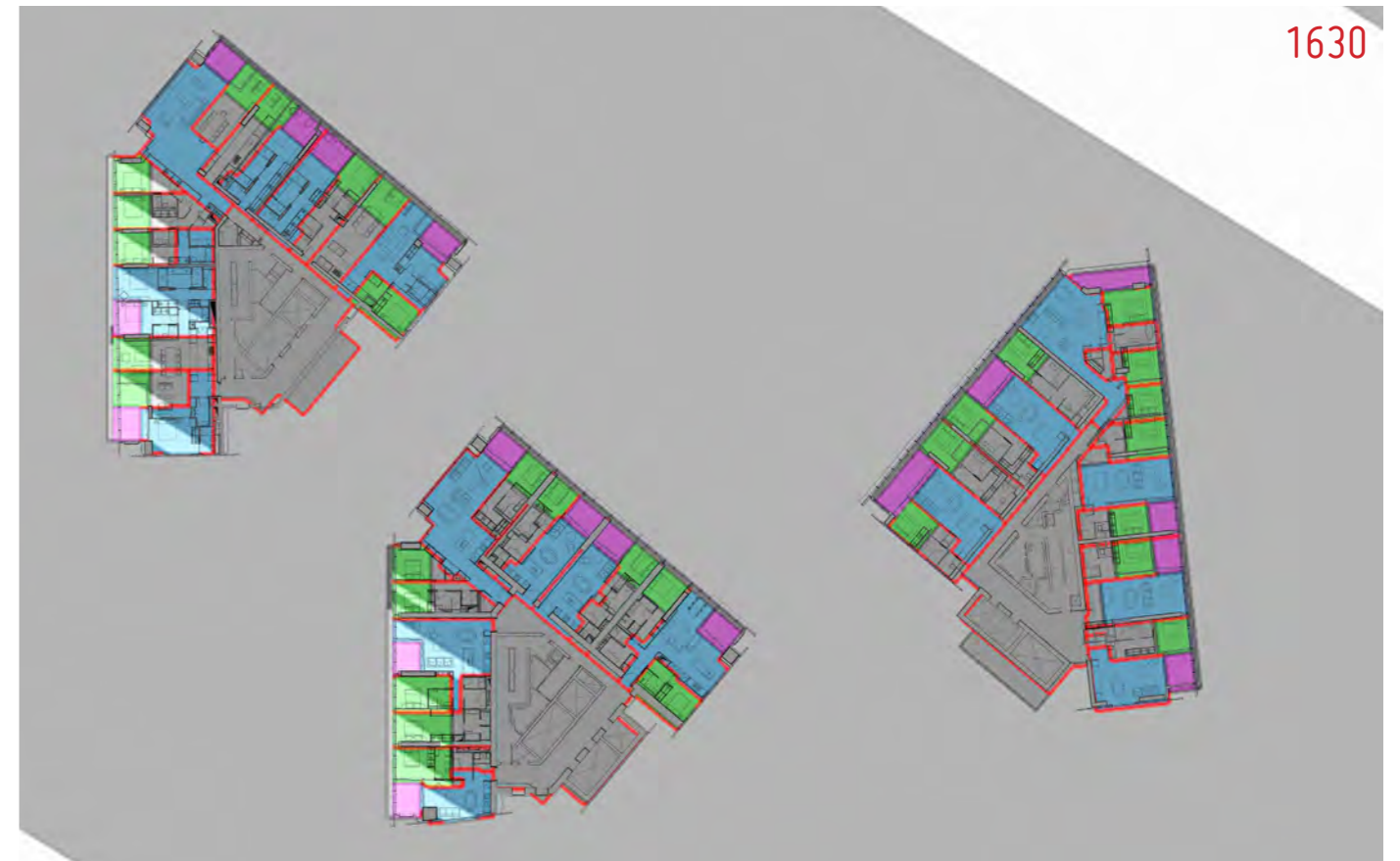
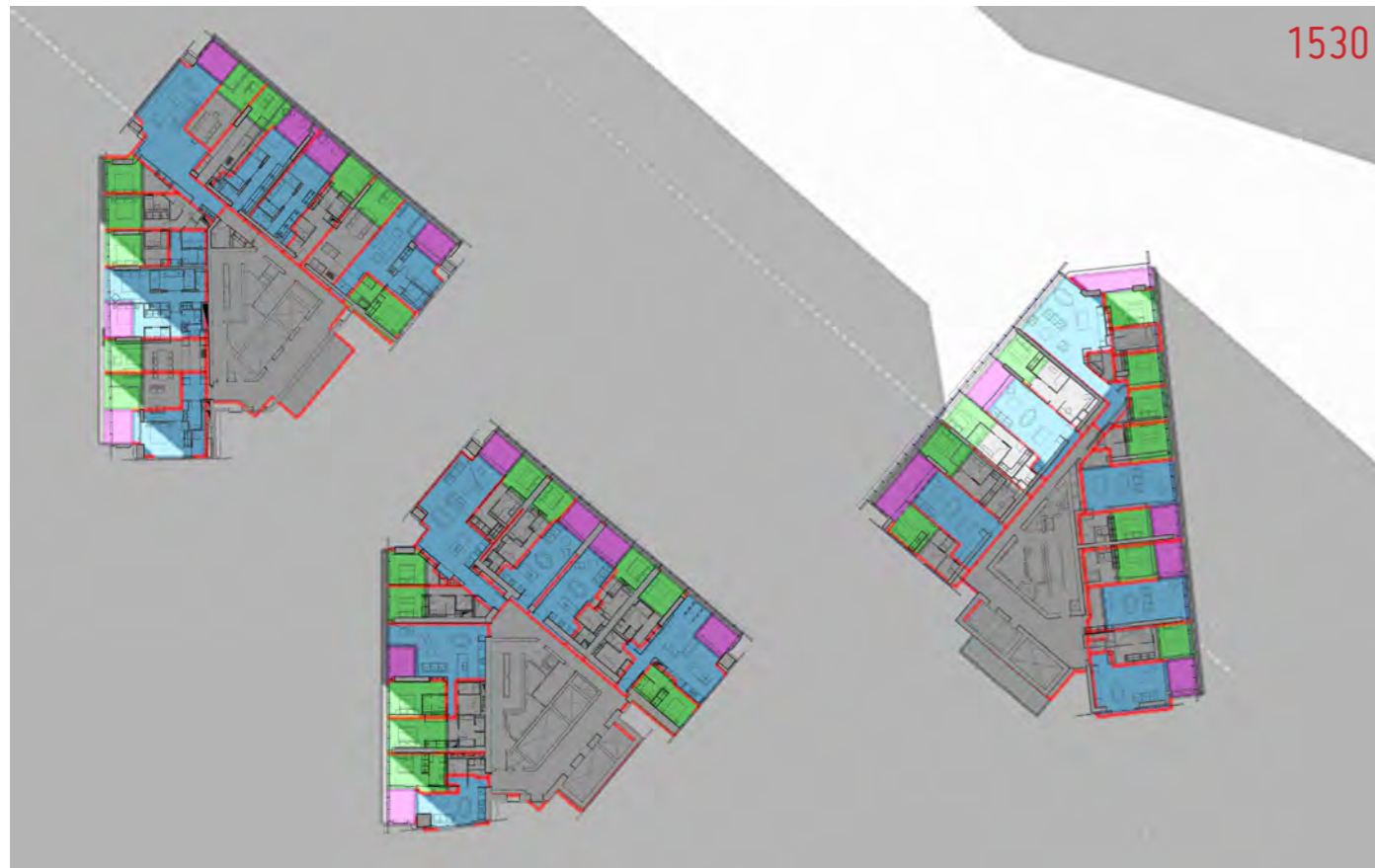
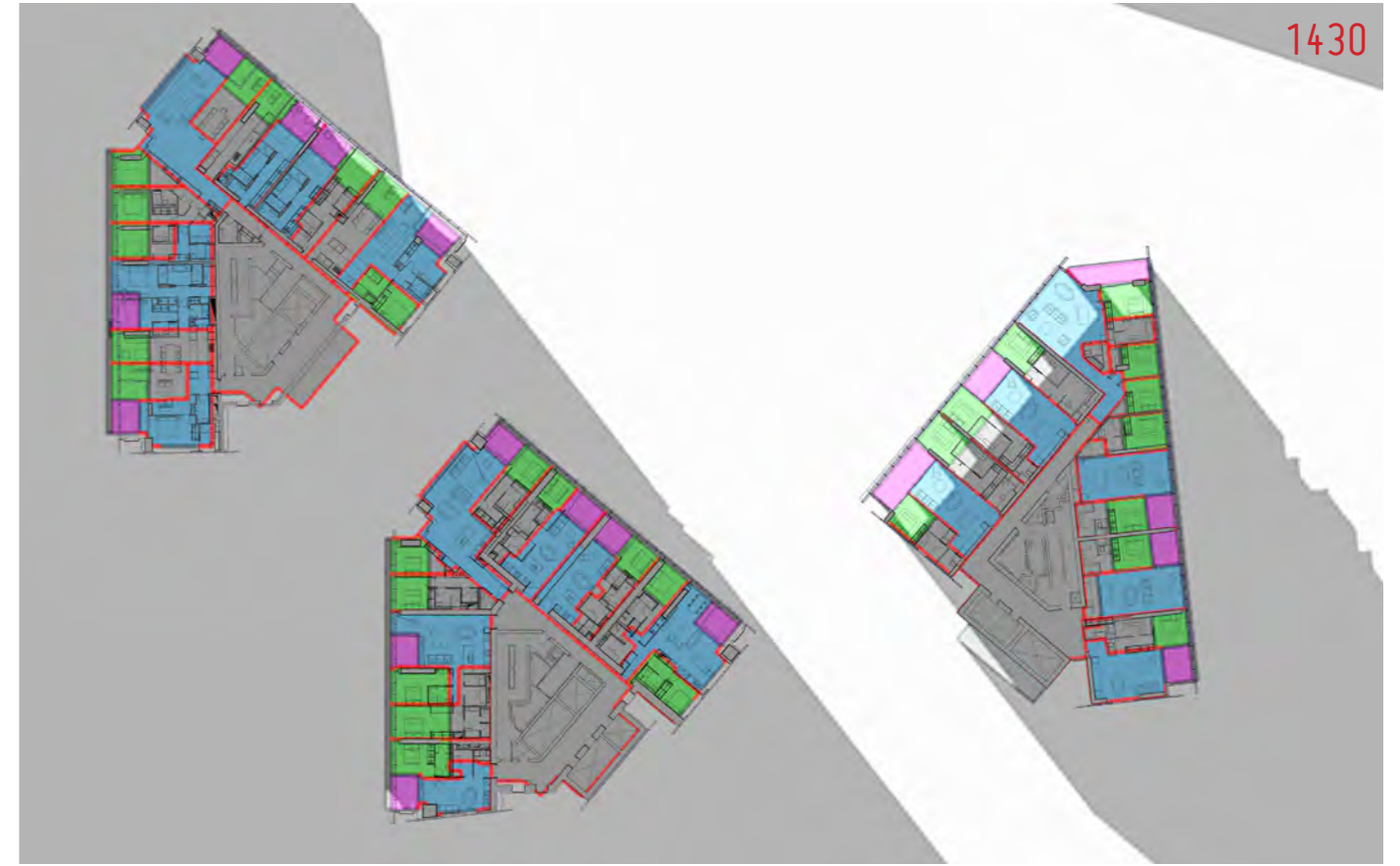
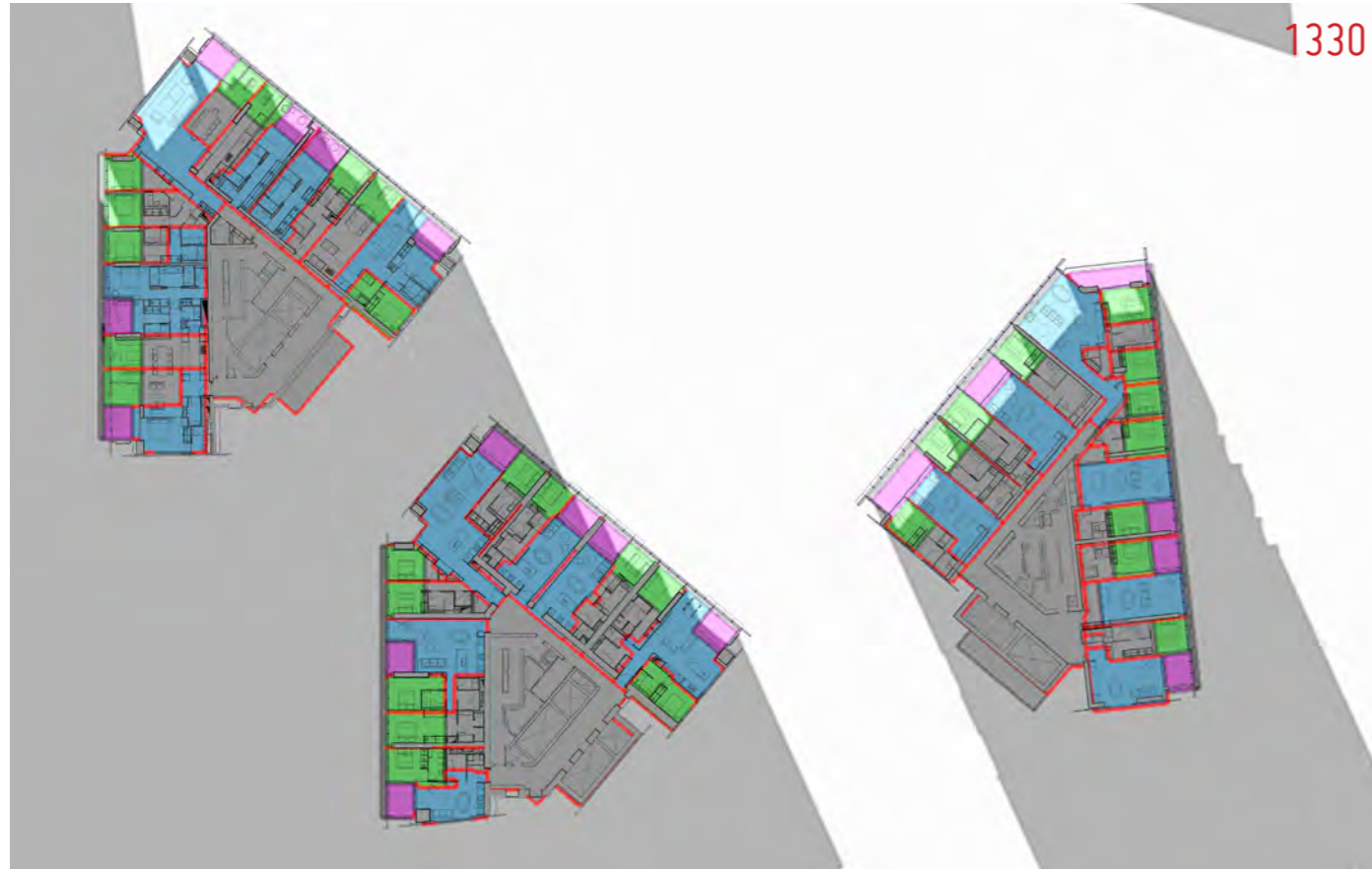
JUNE 21 - LEVEL 01



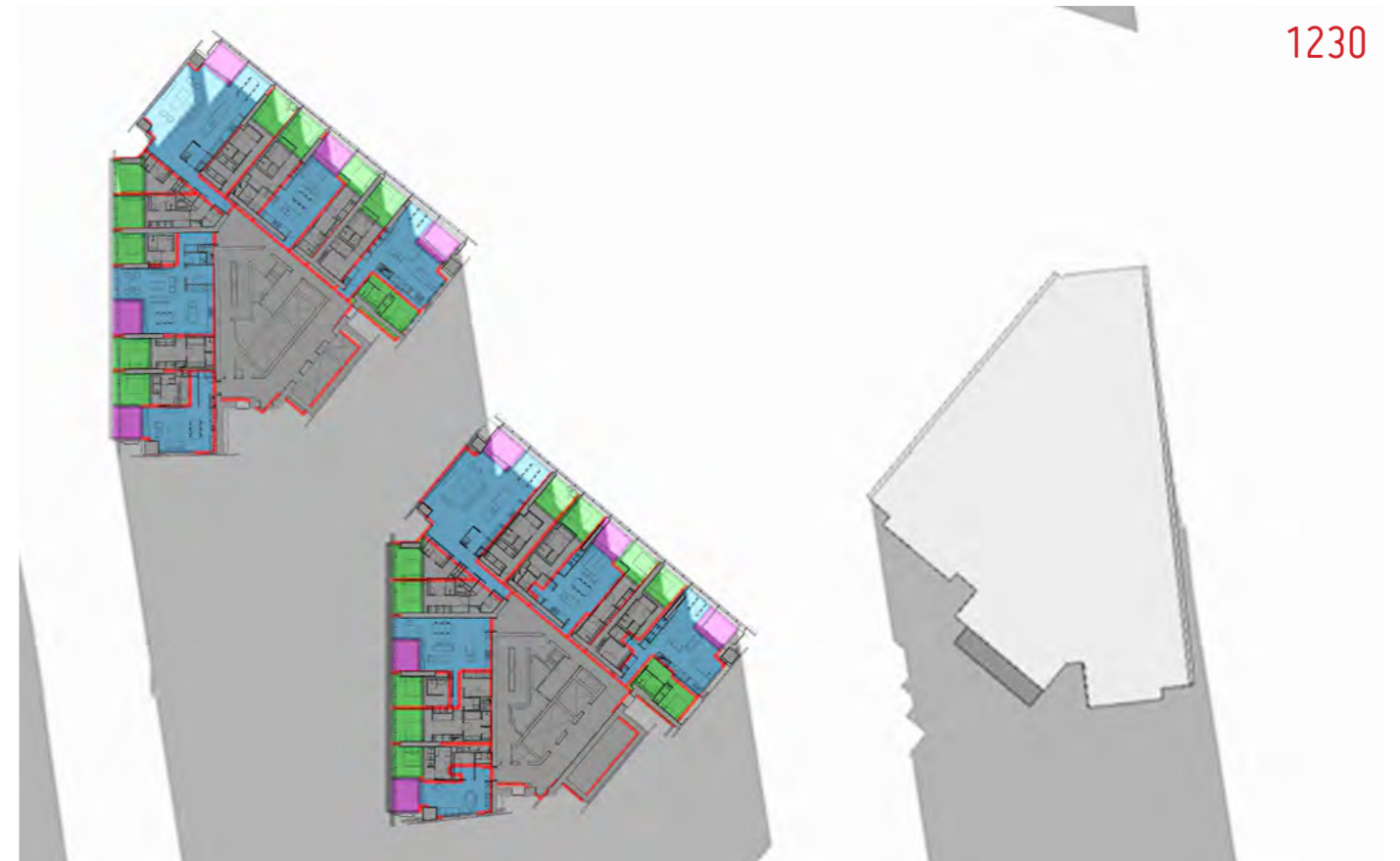
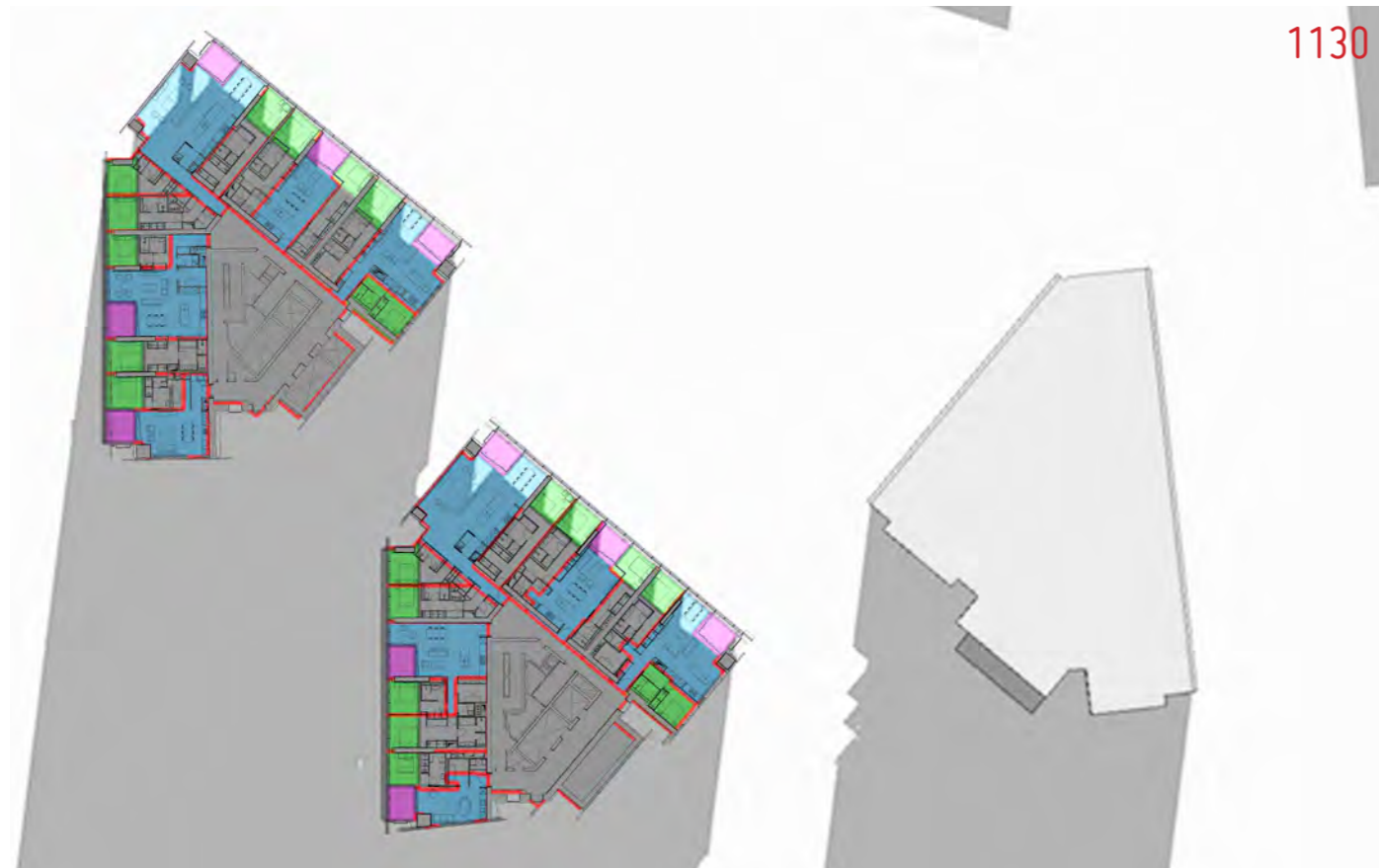
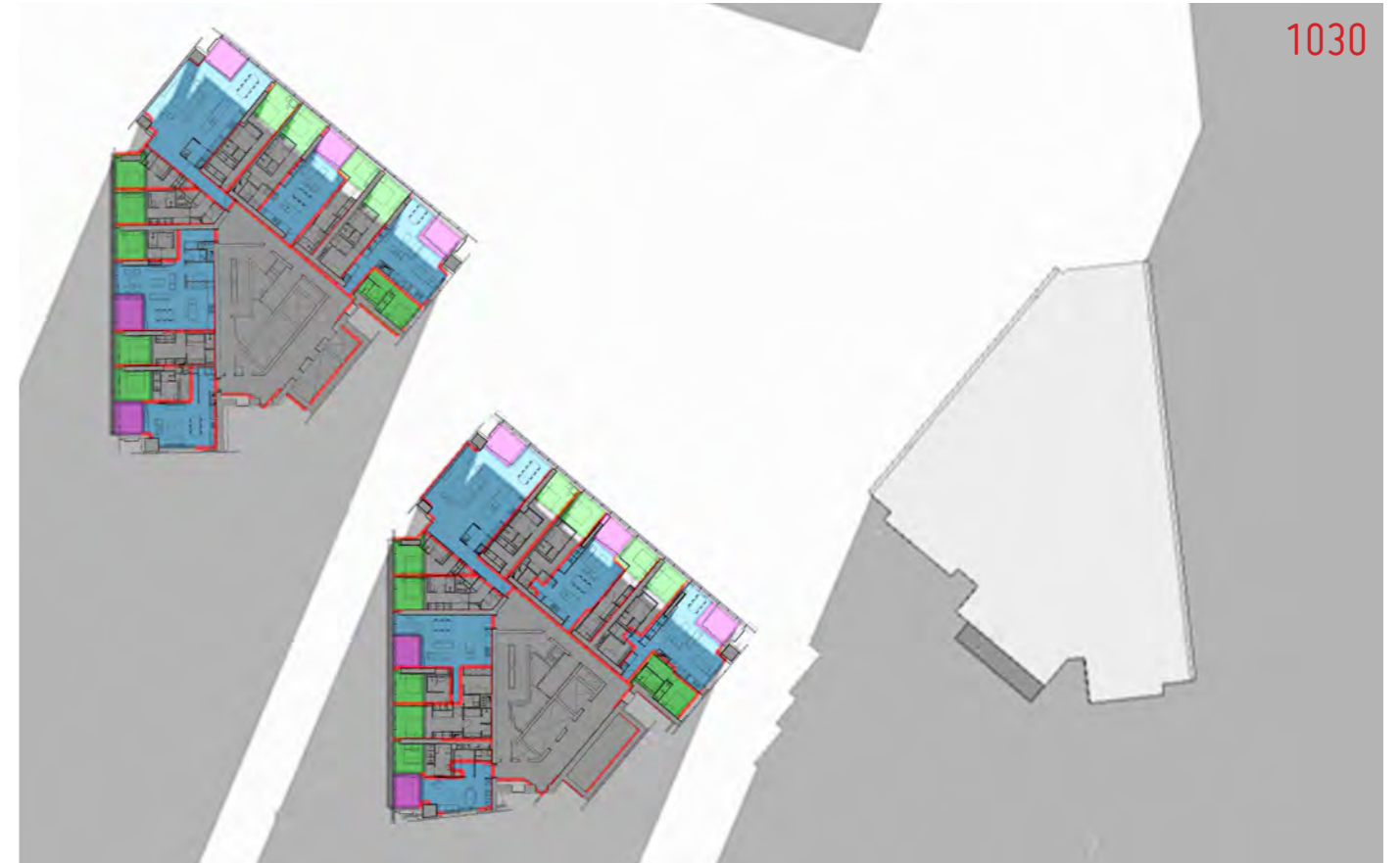
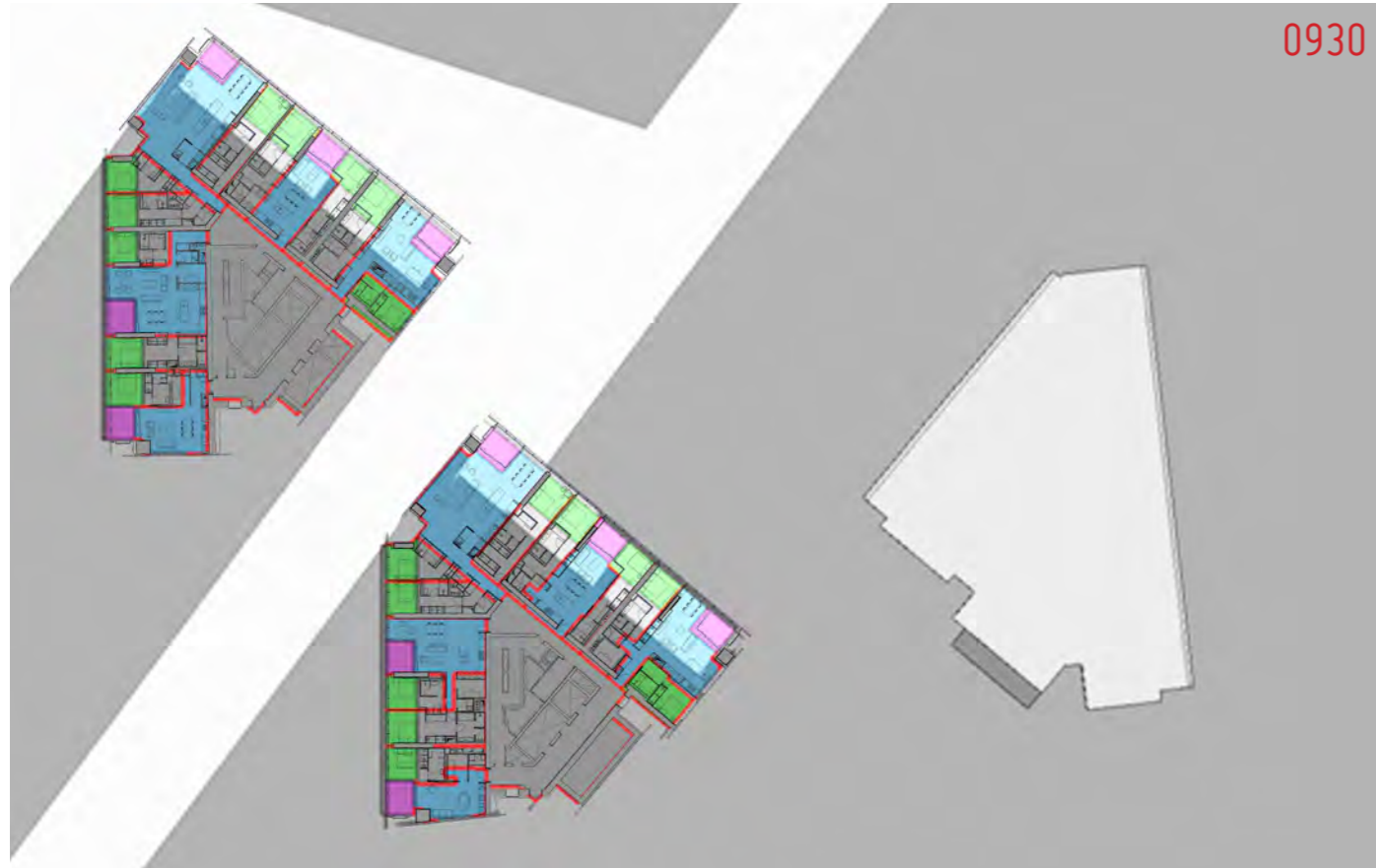
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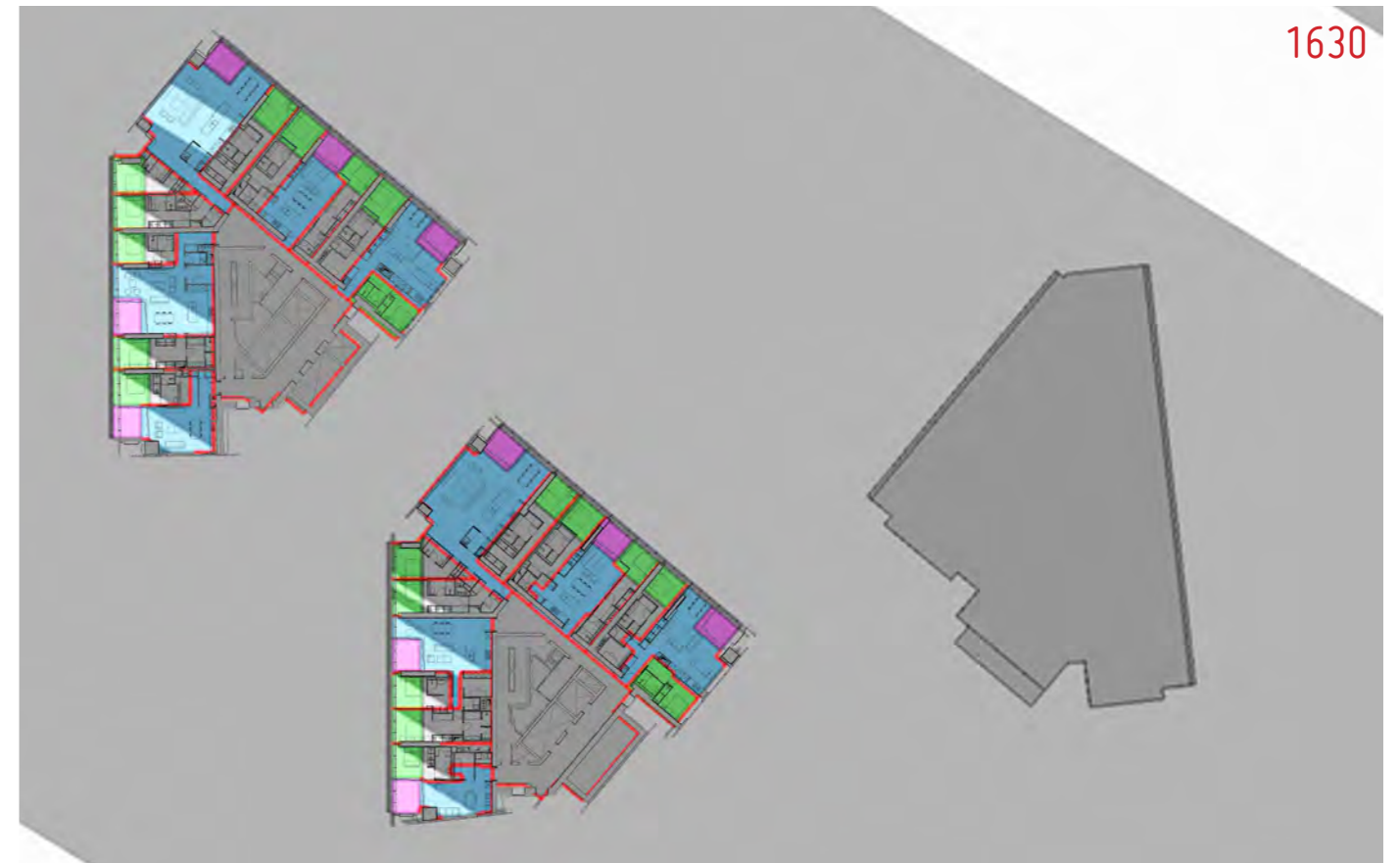
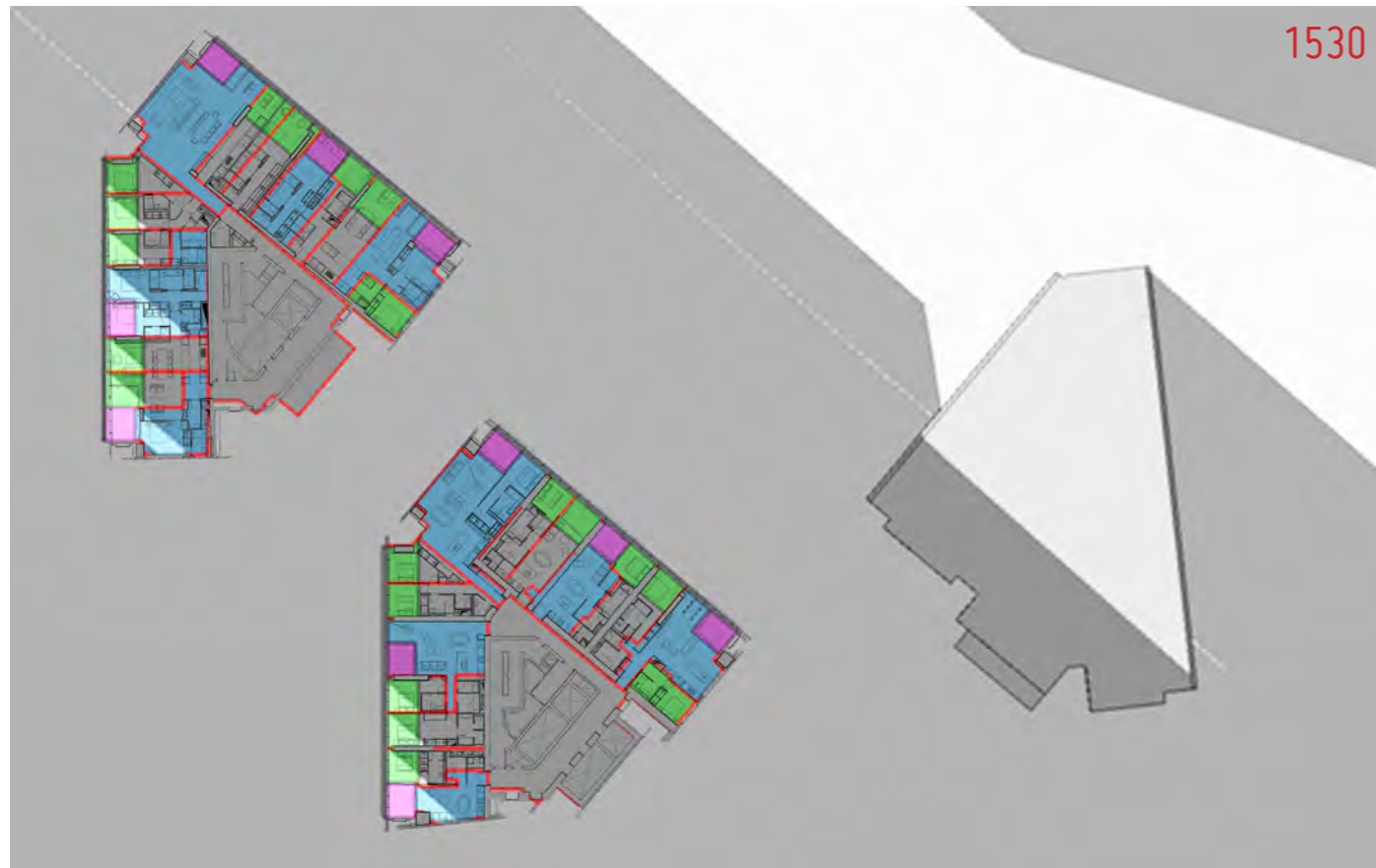
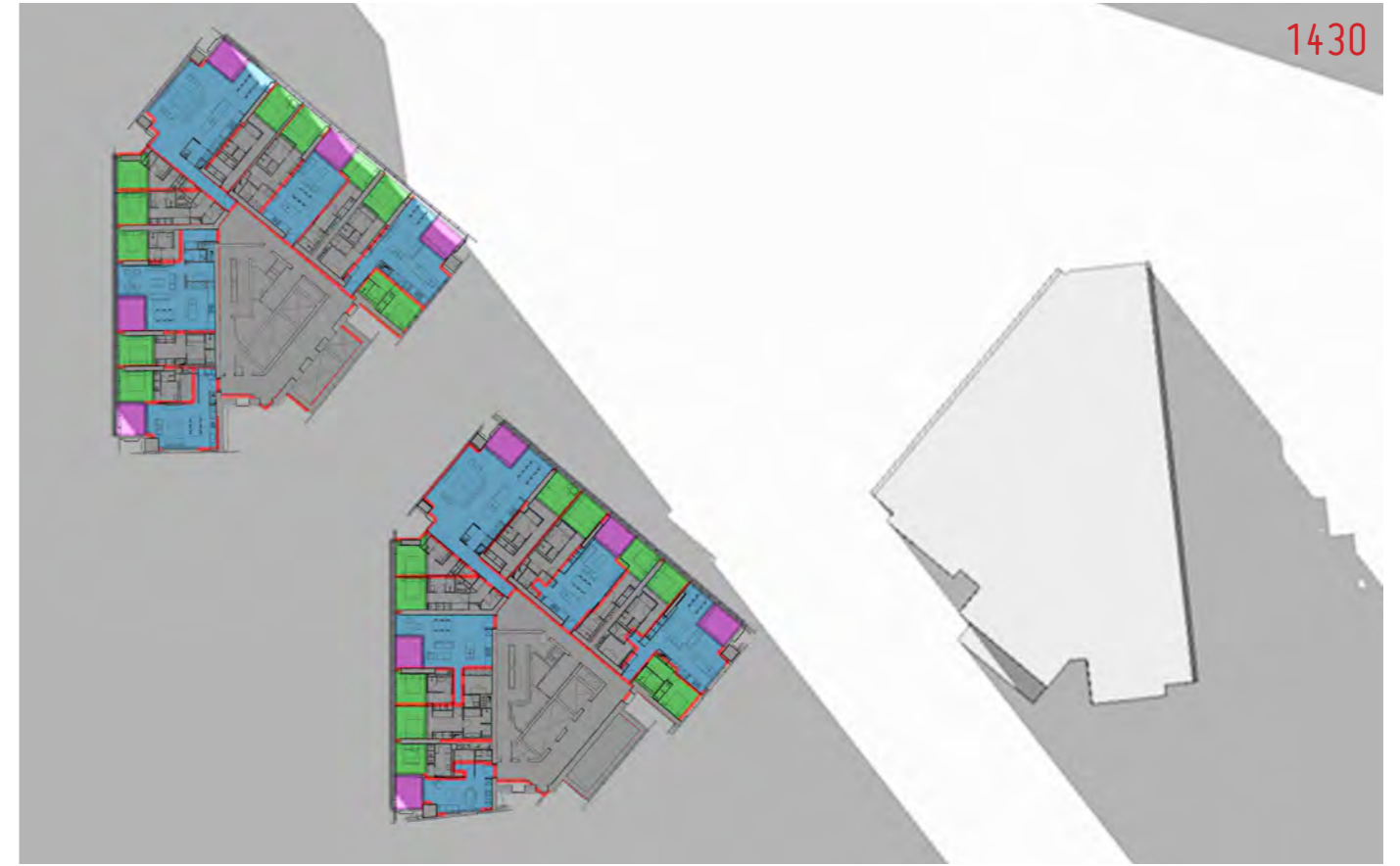
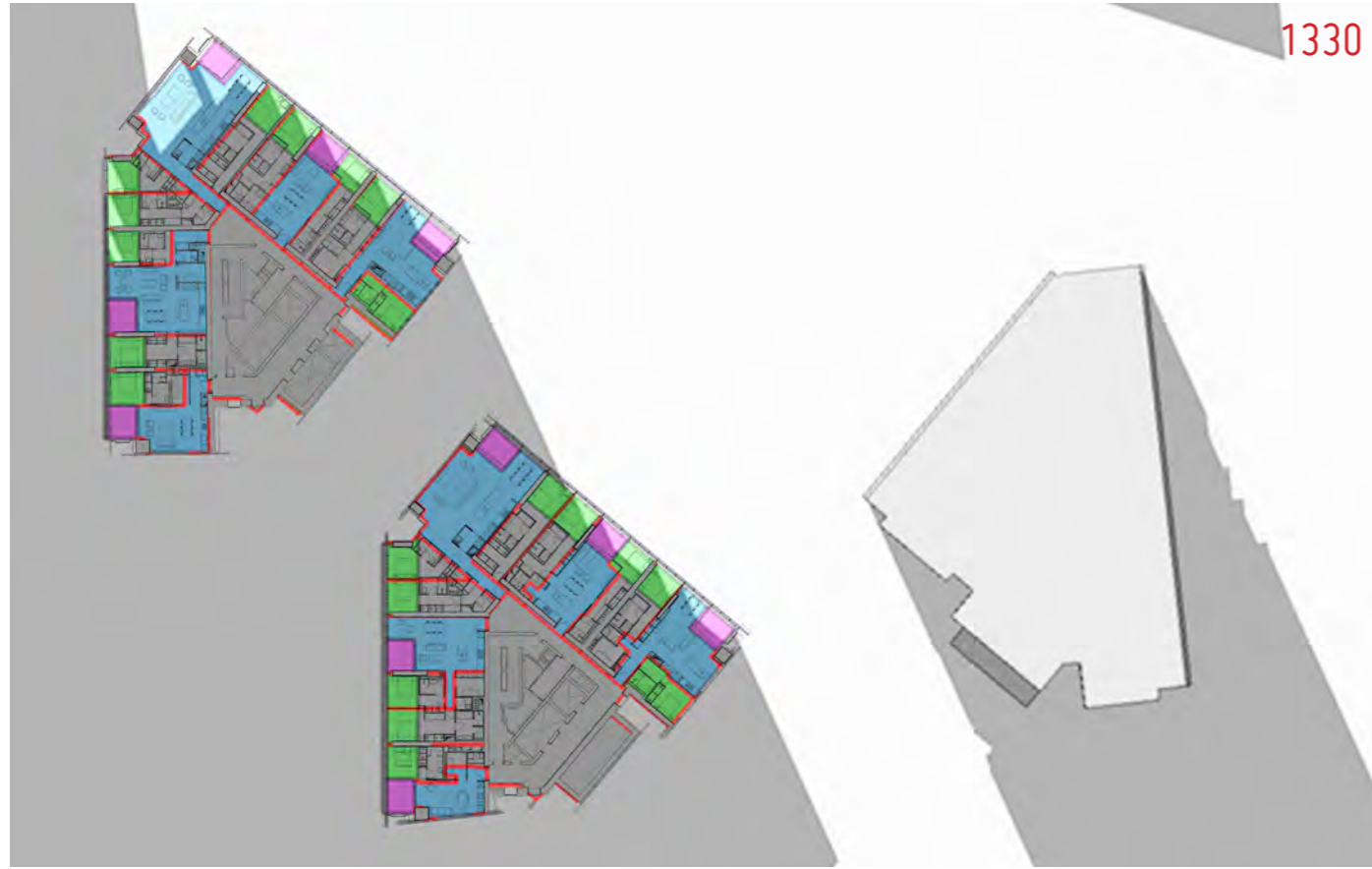
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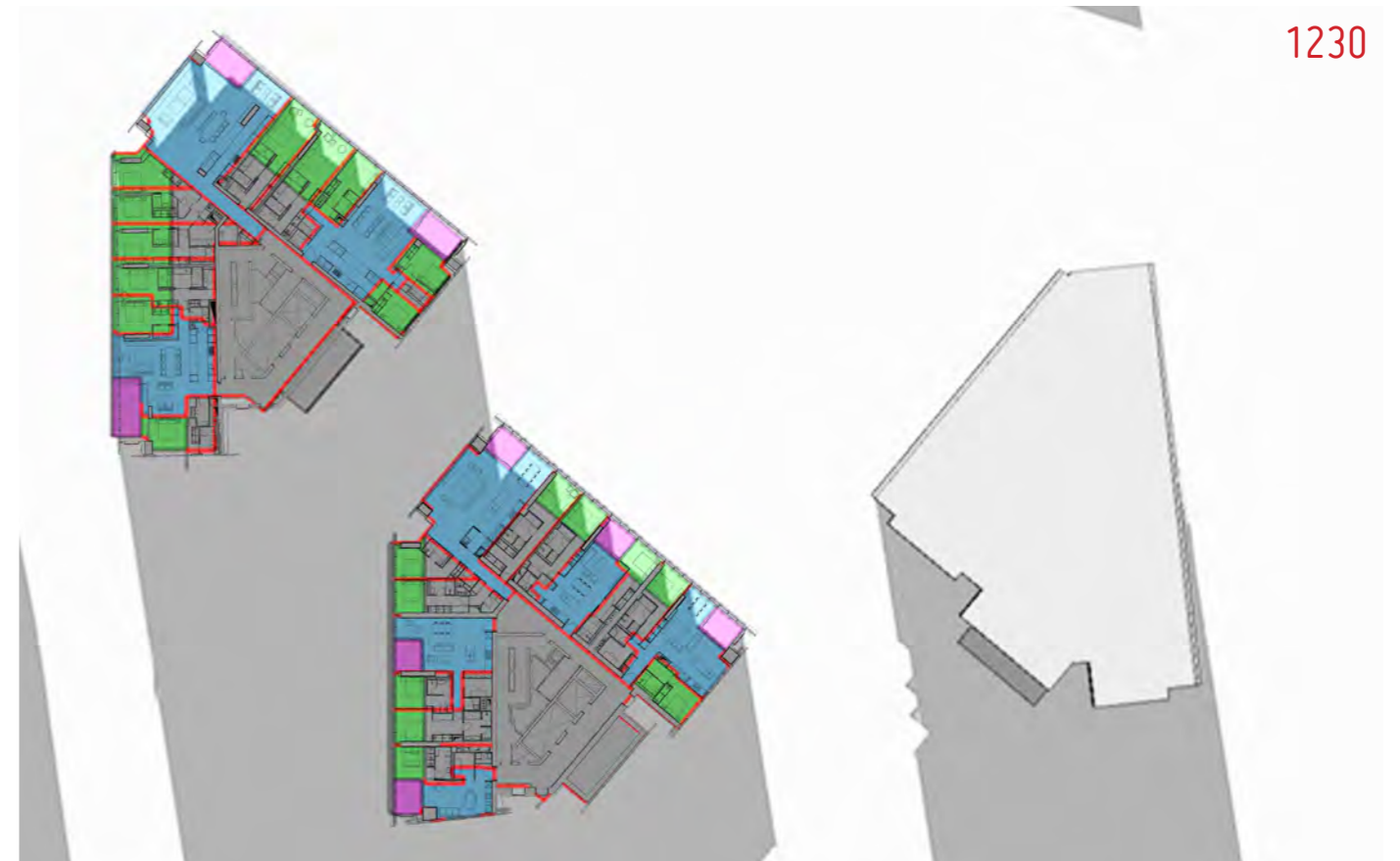
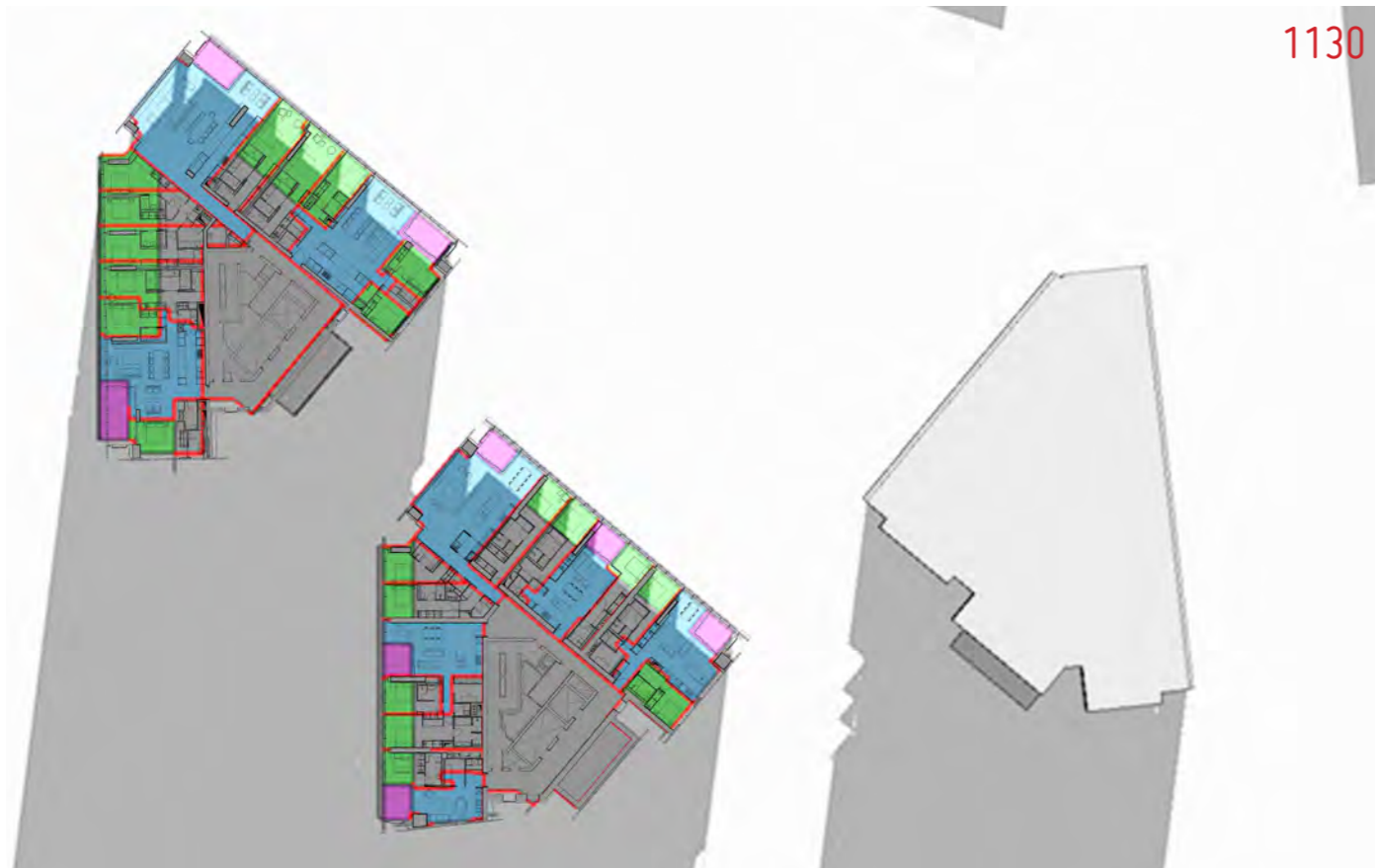
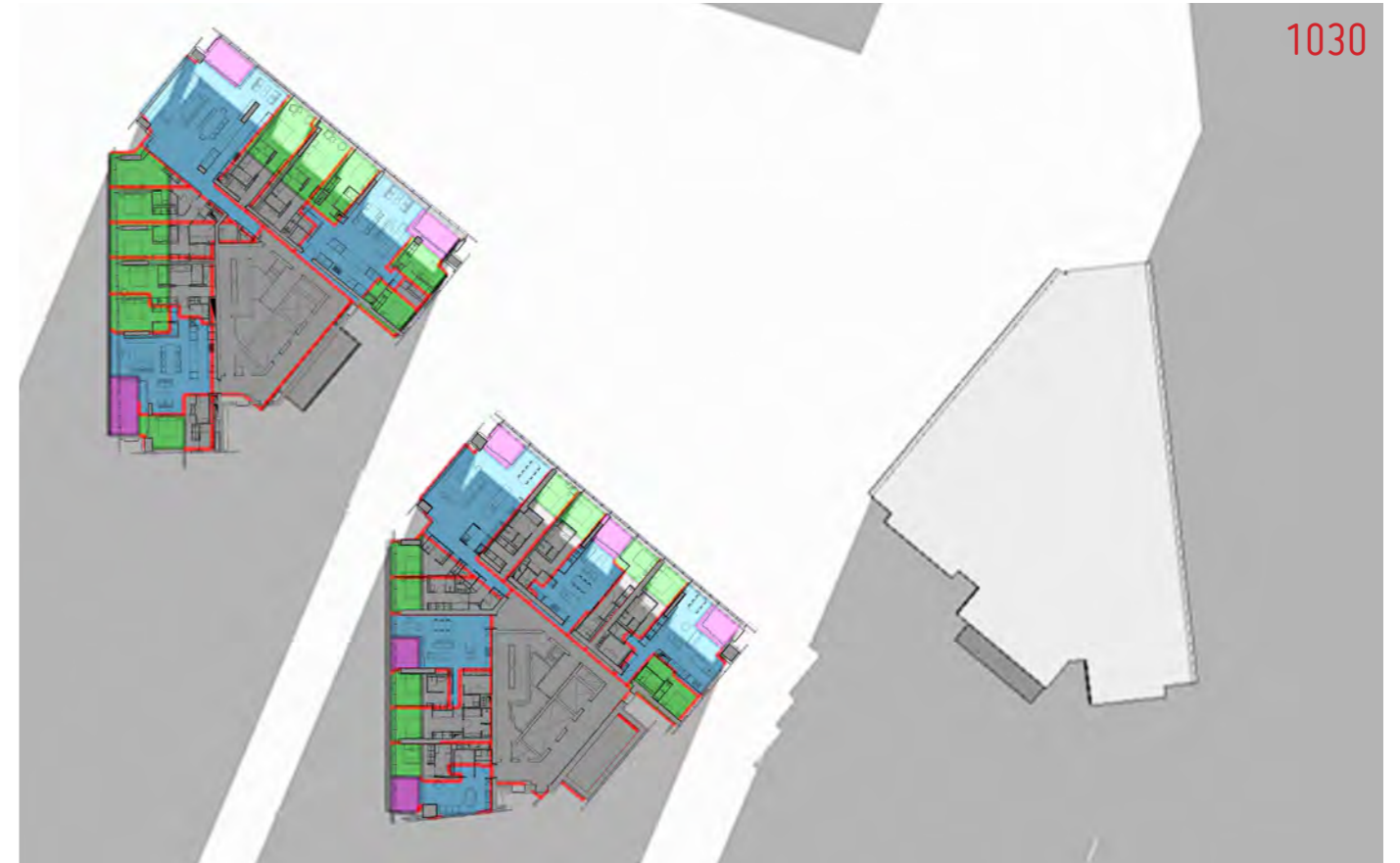
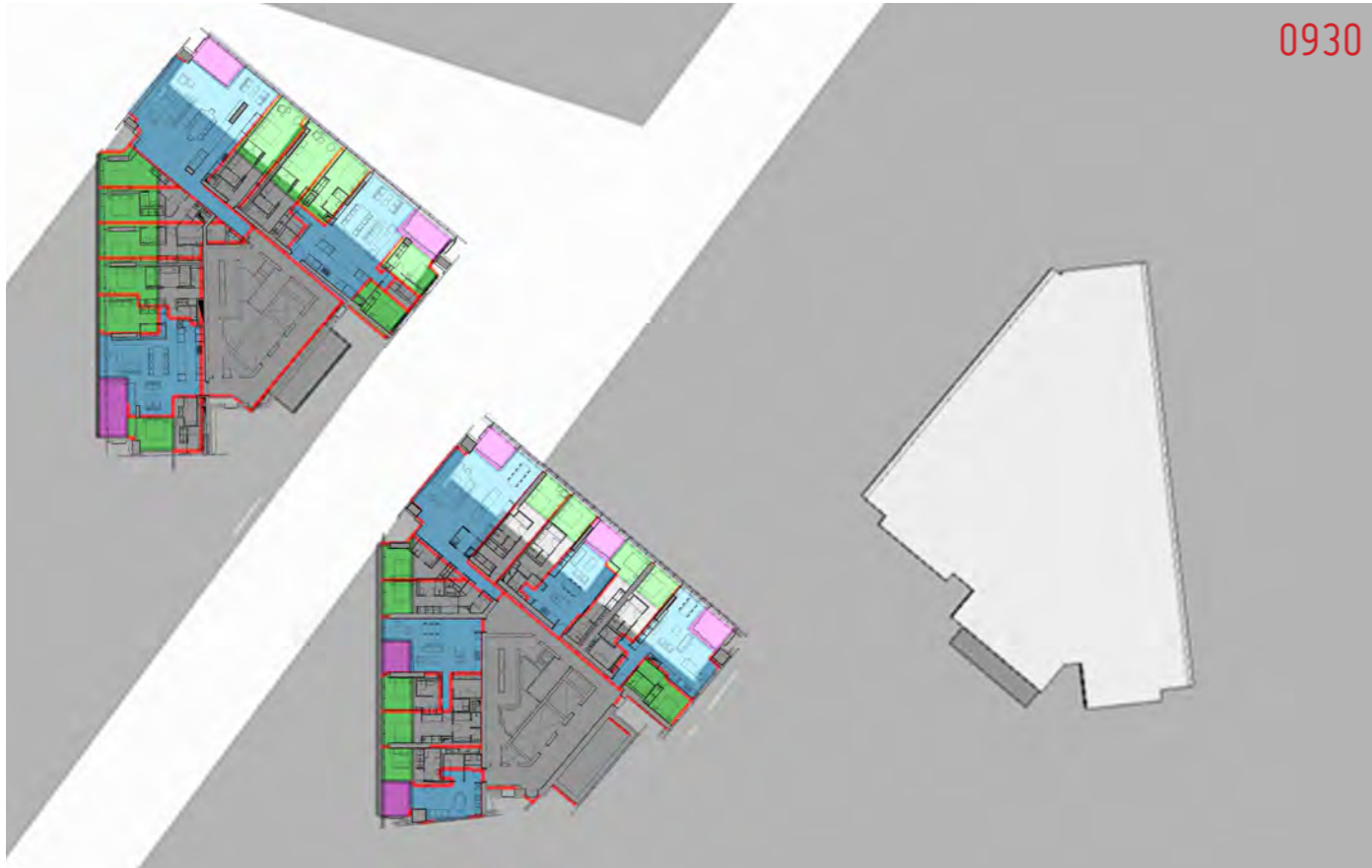
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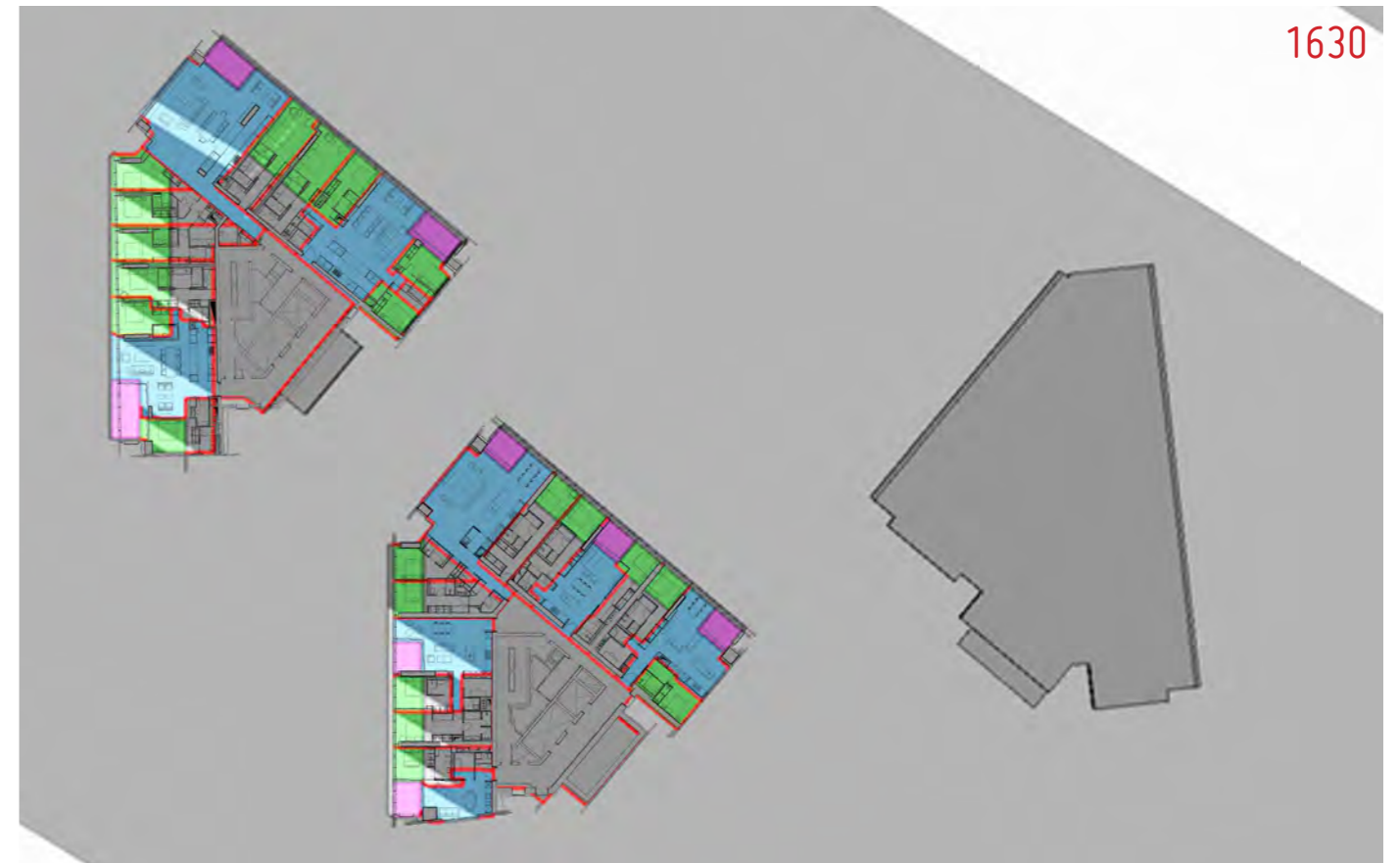
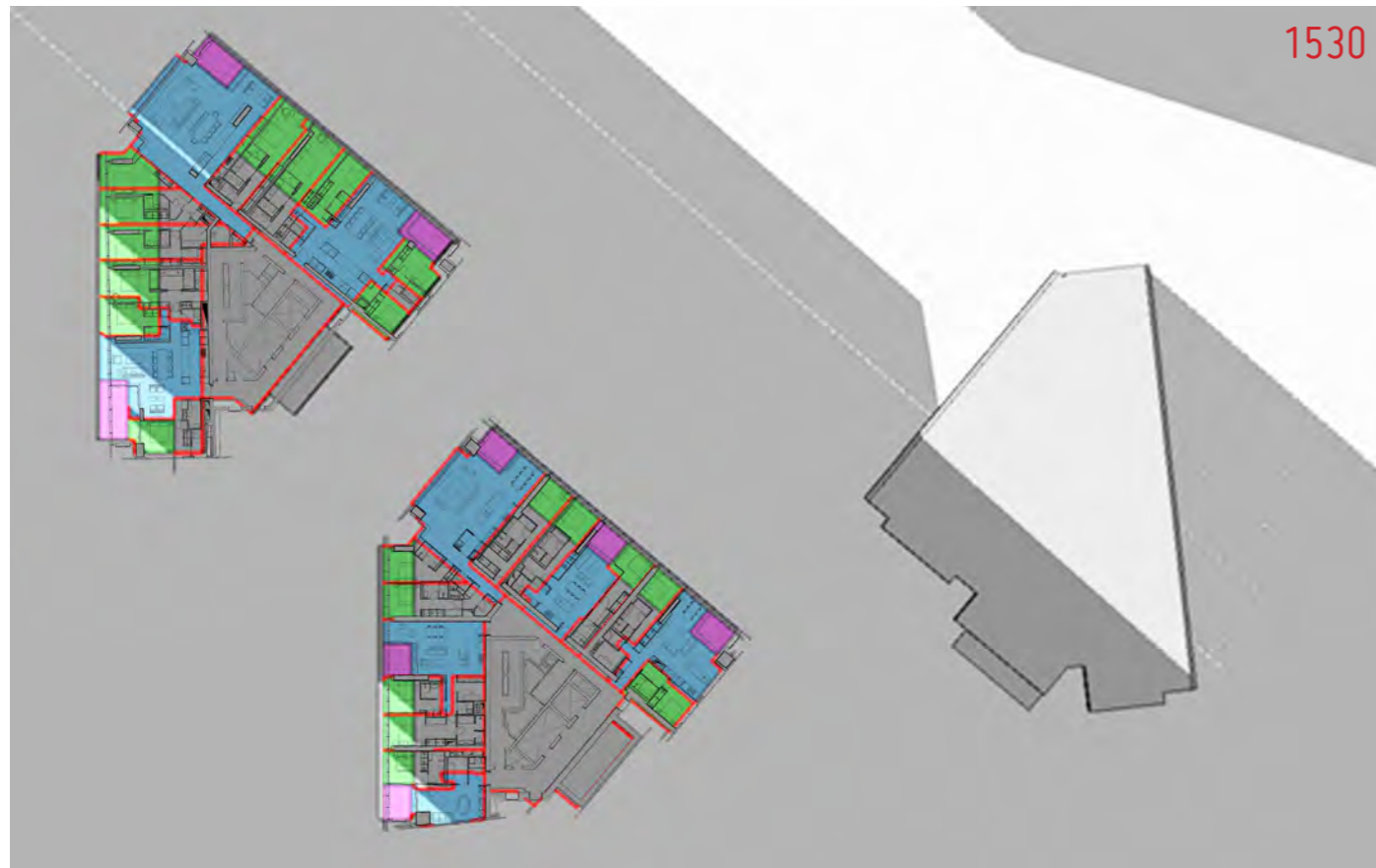
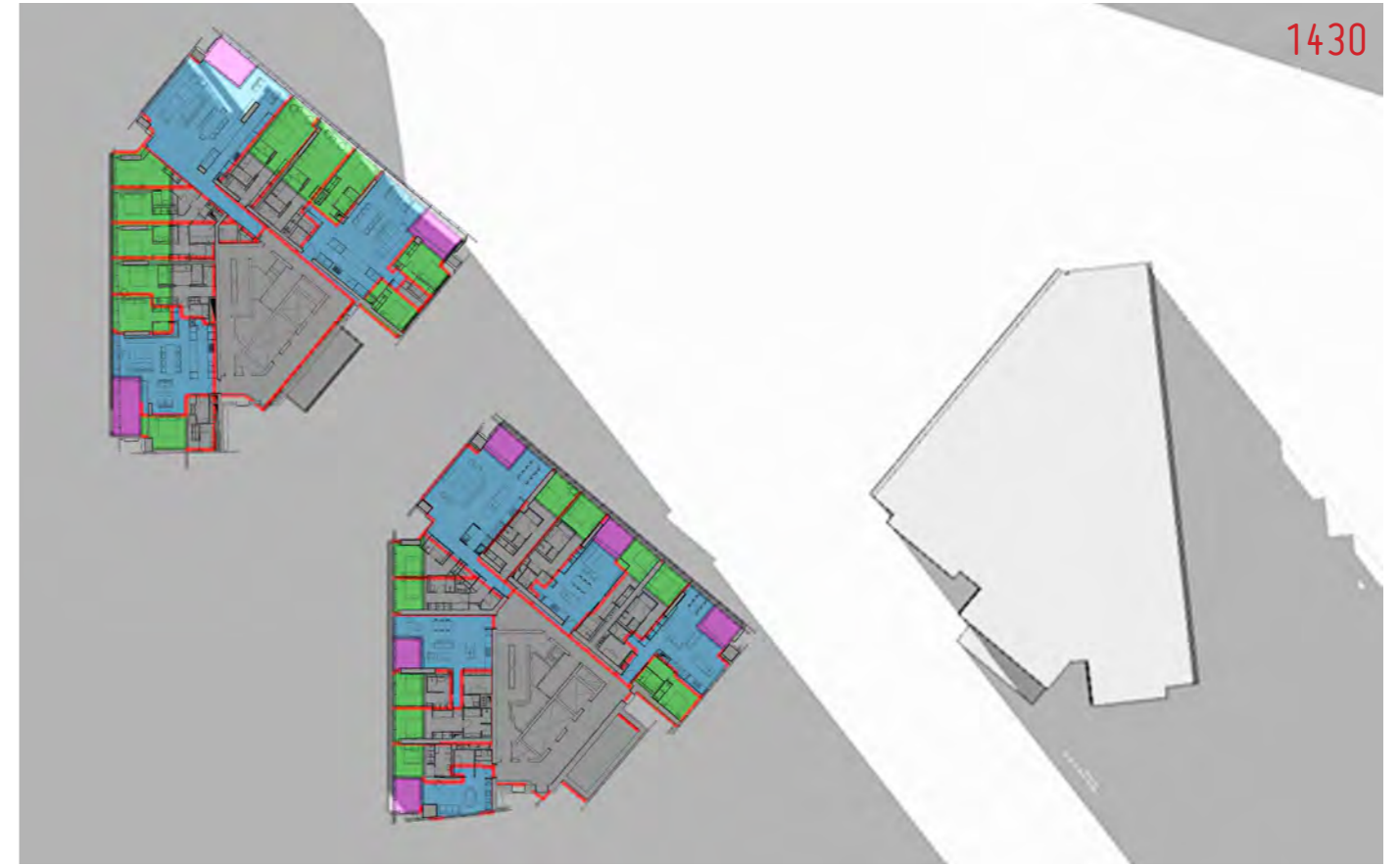
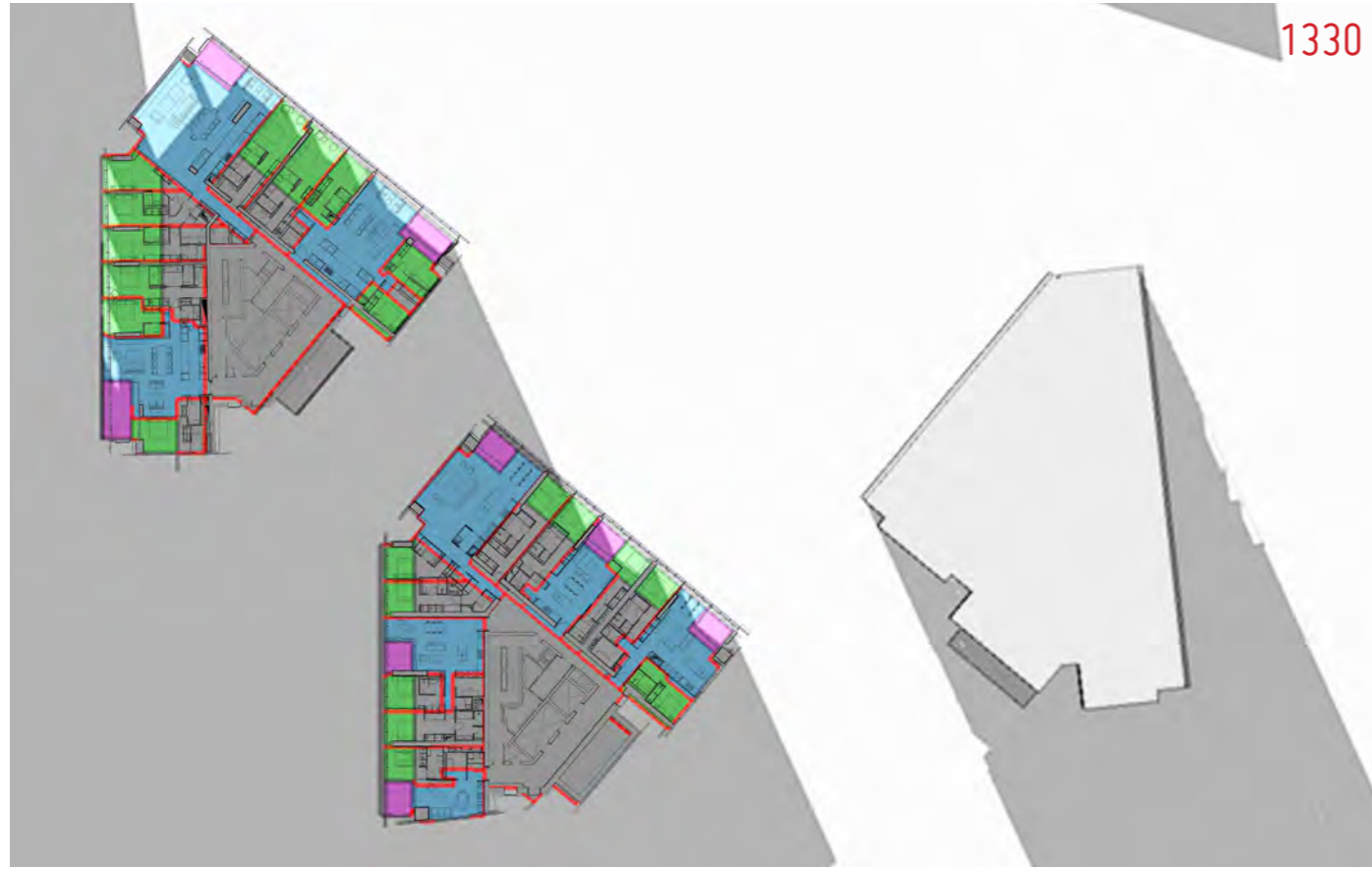
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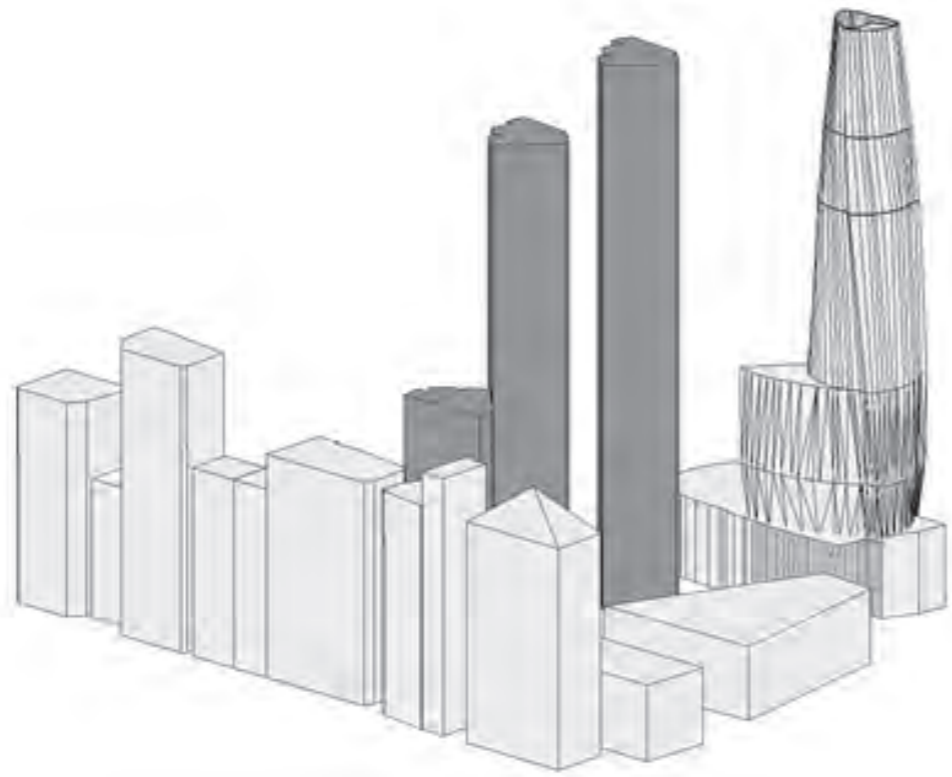
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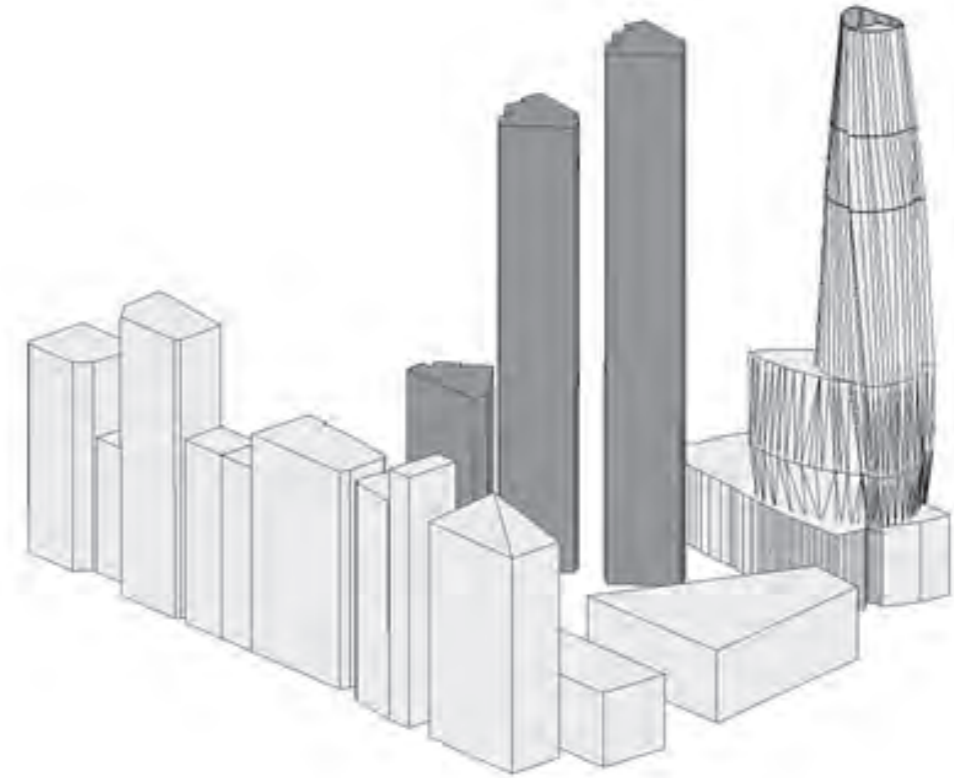
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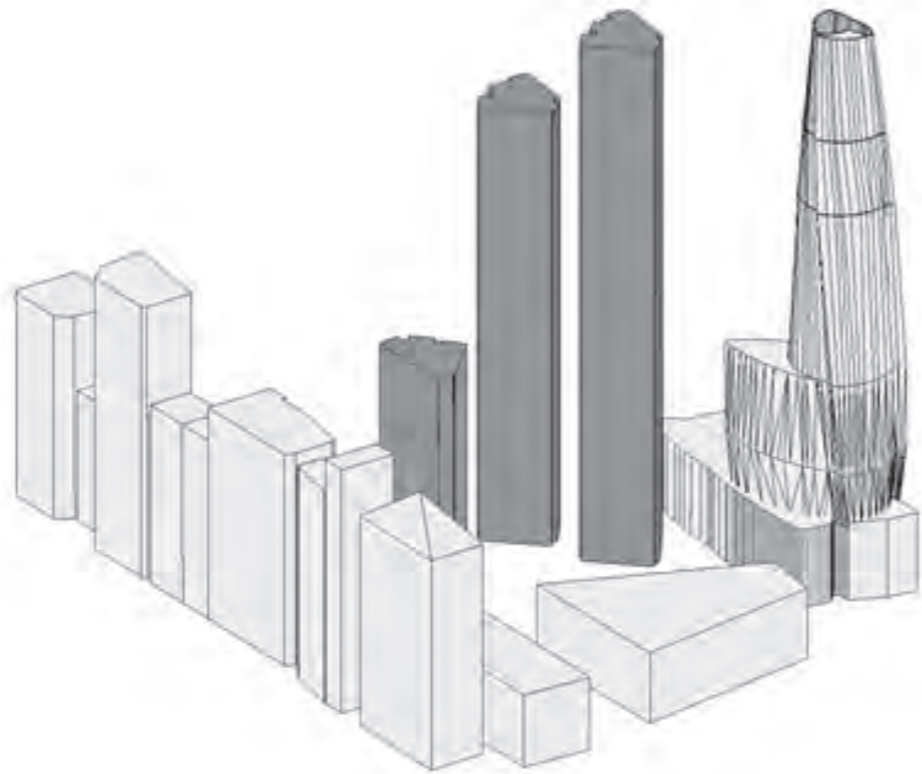
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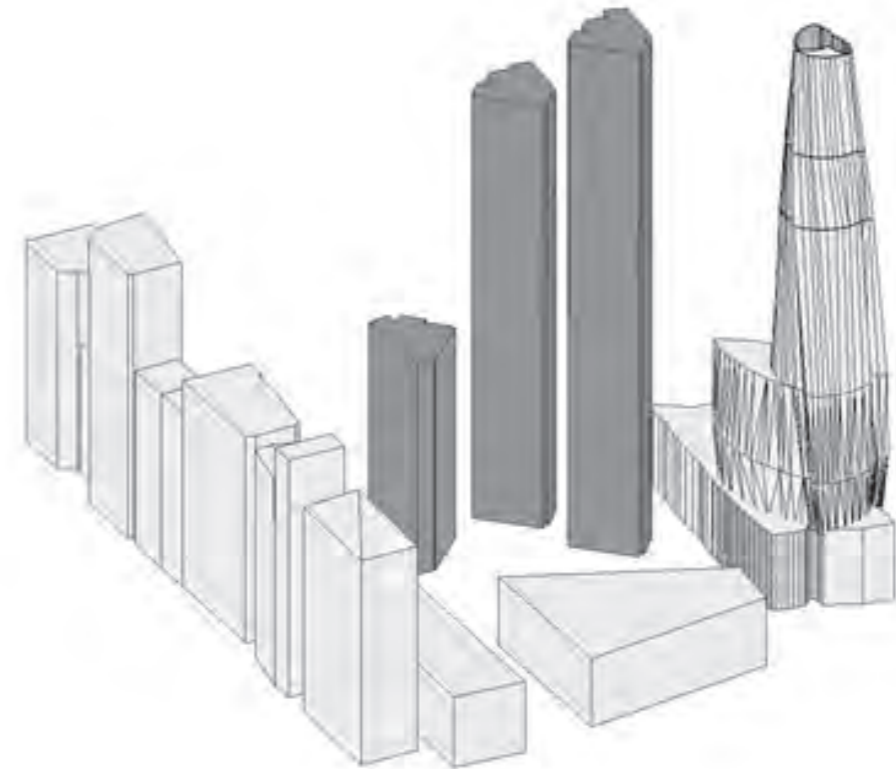
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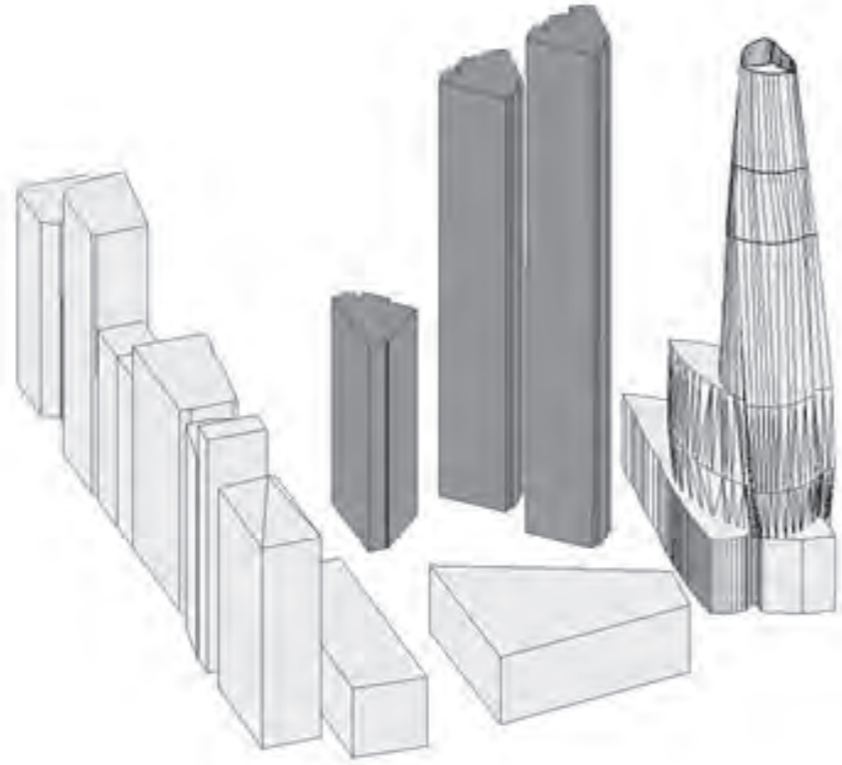
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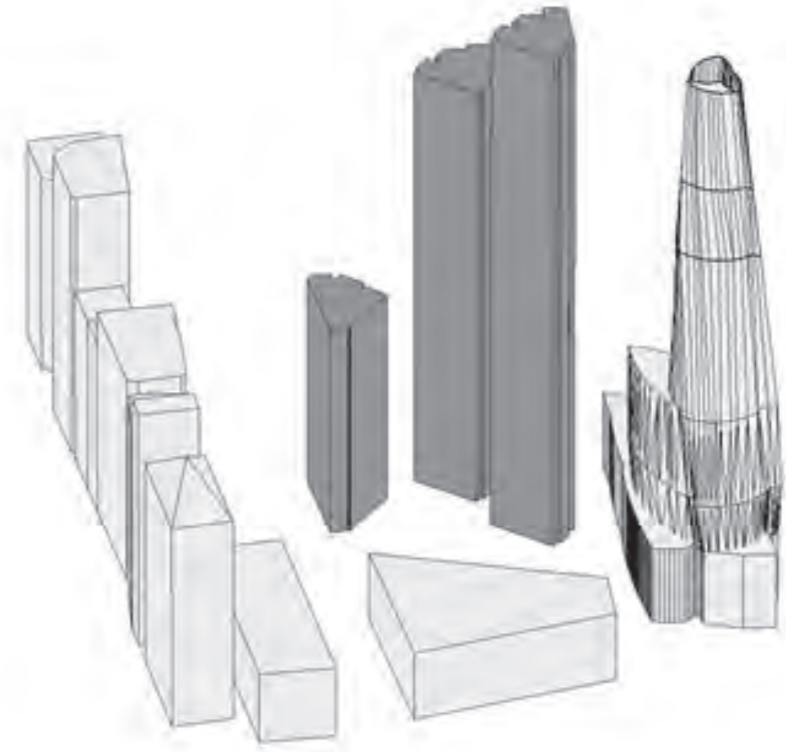
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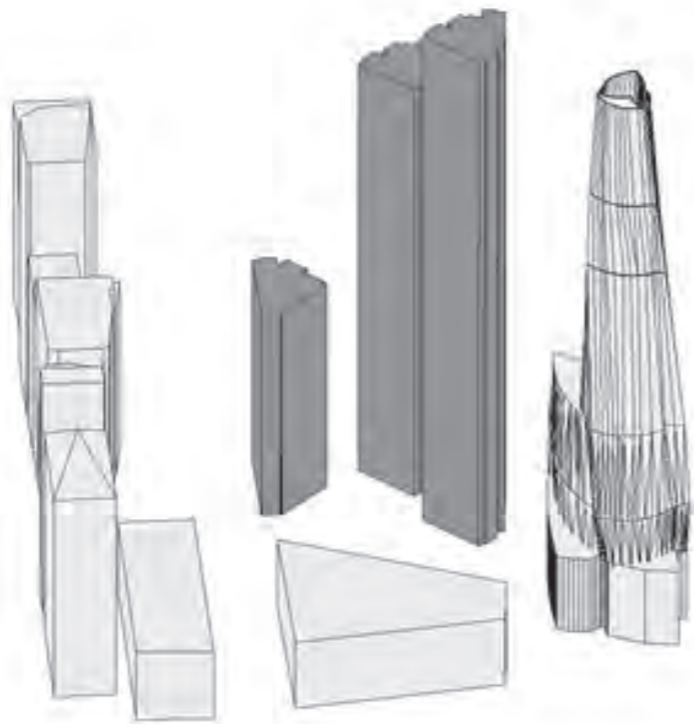
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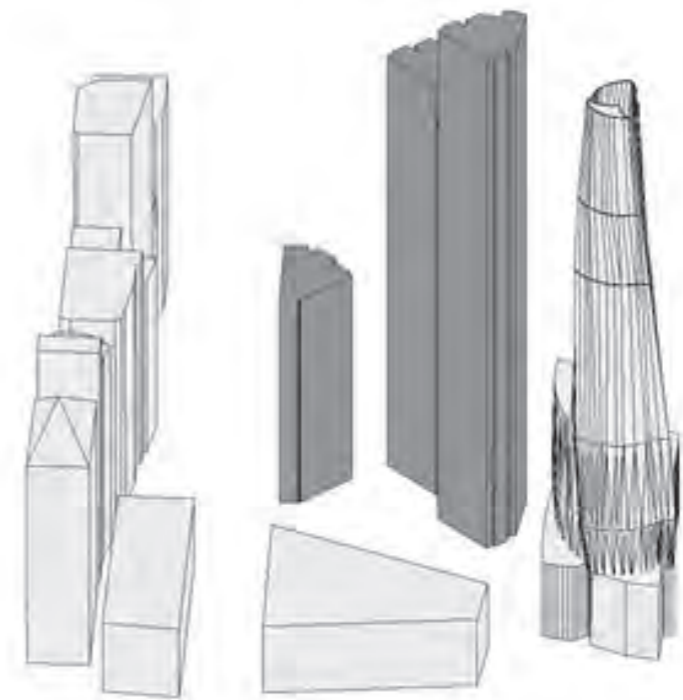
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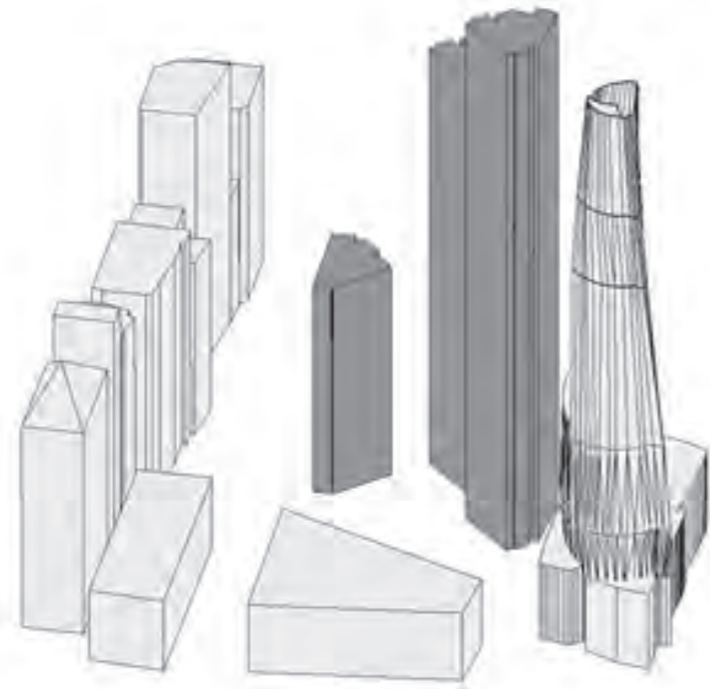


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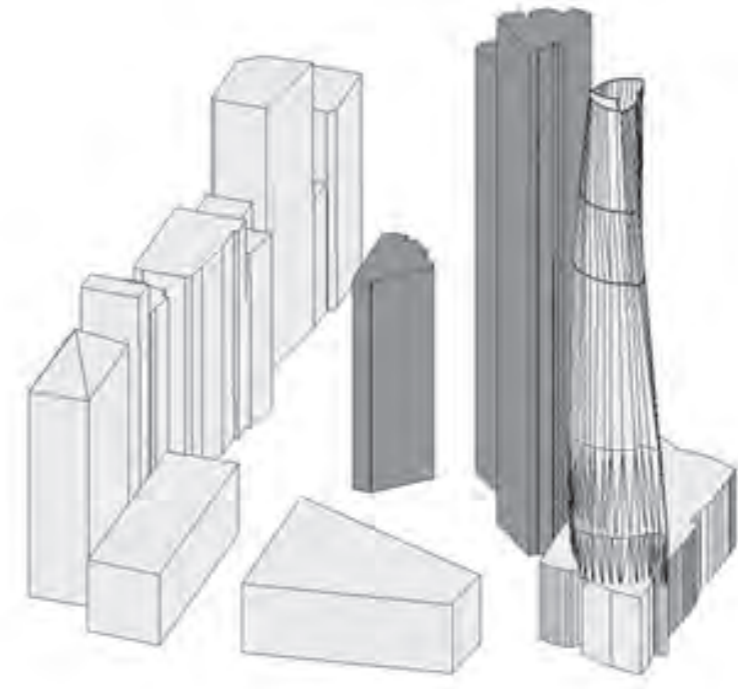


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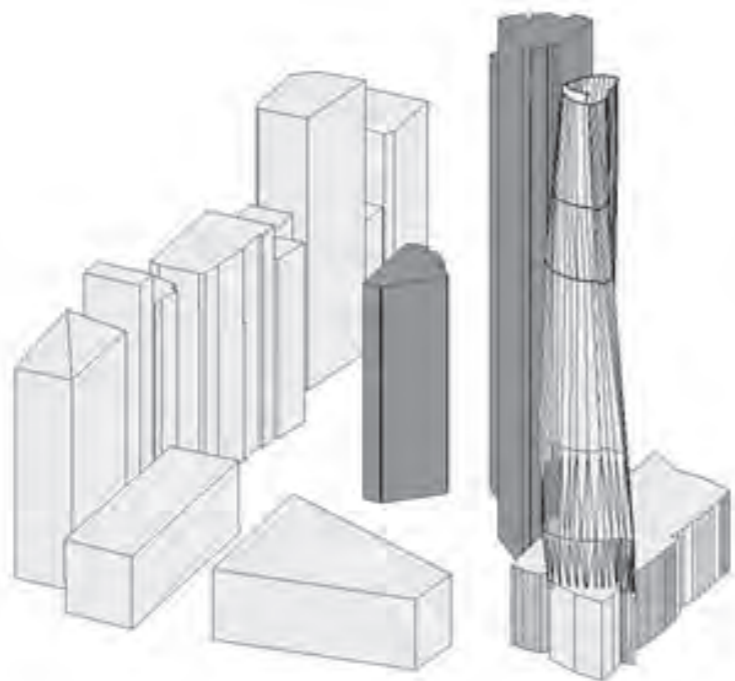
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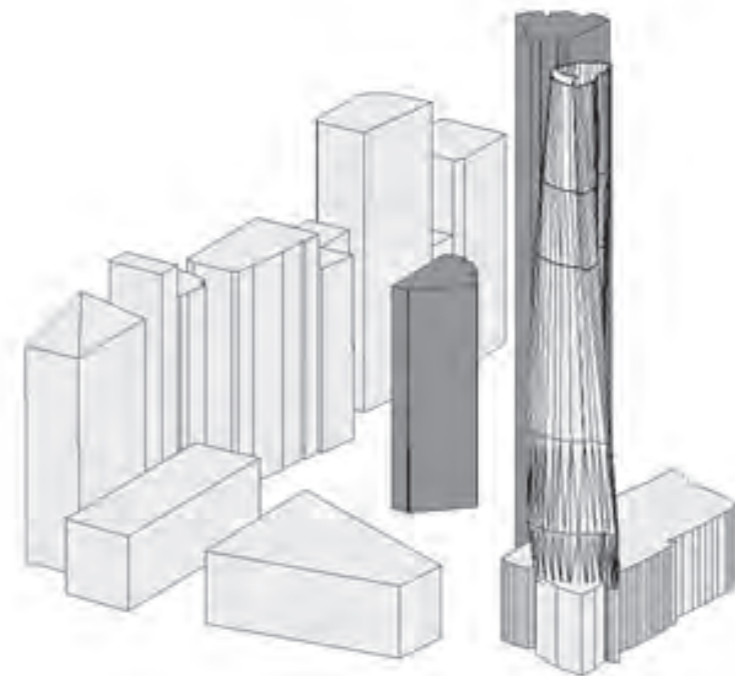
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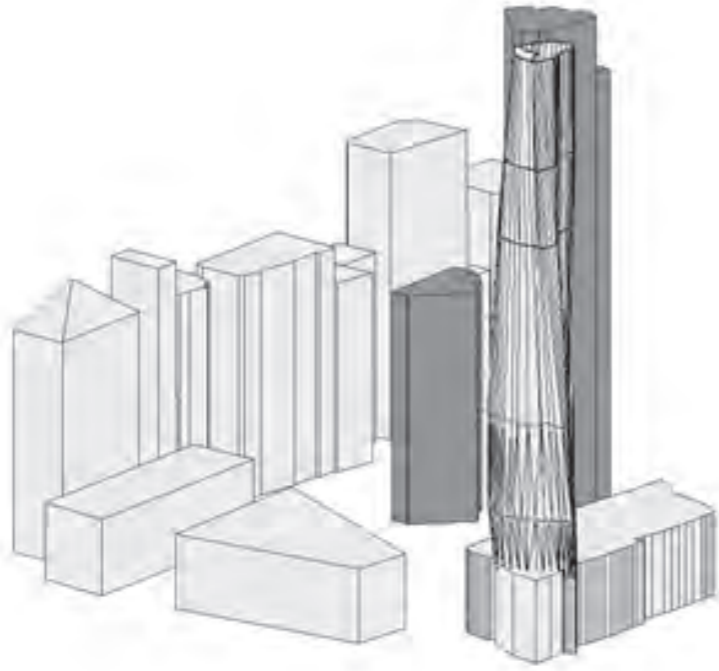


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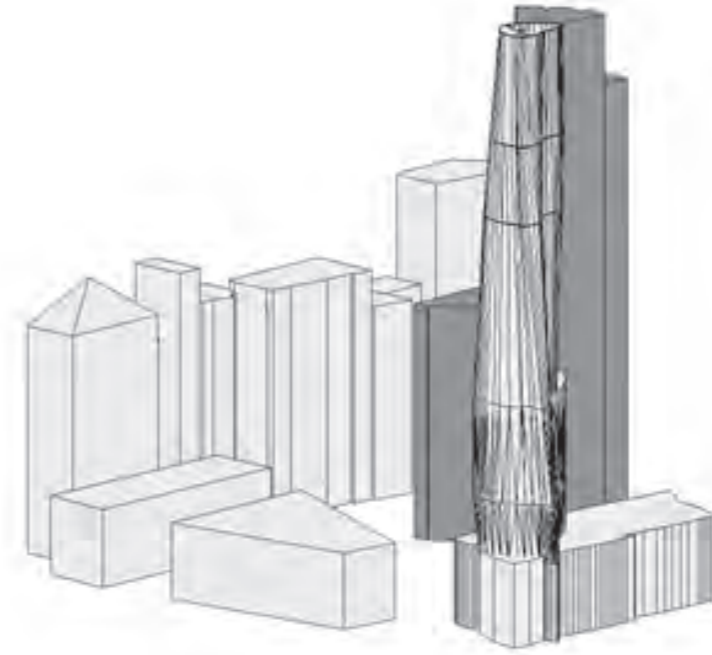


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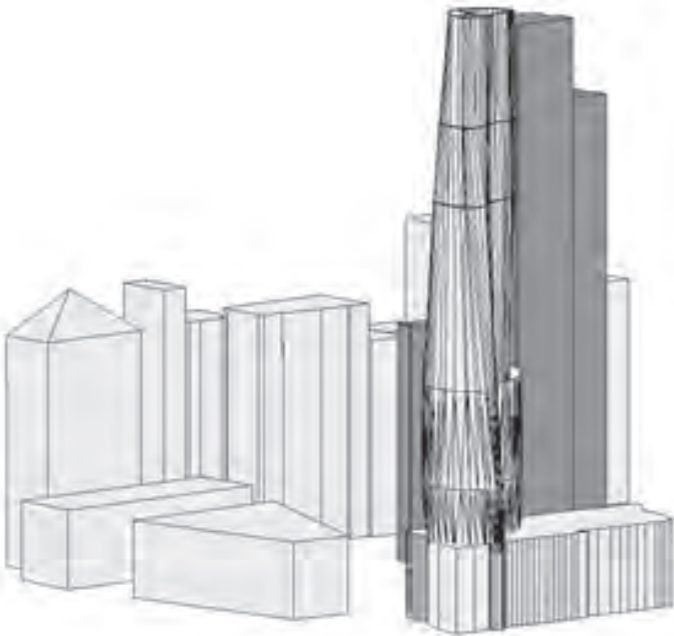
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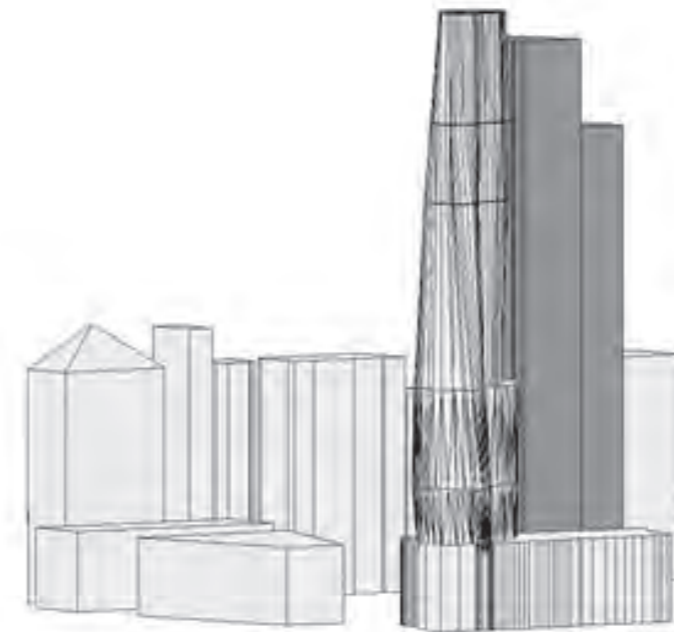
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1600



1630





## Conclusion

The Apartment Design Guide 4A Solar and daylight access criteria is achieved for the One Sydney Harbour development through optimisation of the orientation and aspect of the buildings and use of a high performance façade. The development achieves 66% of apartments receiving direct solar access between 9am-3pm for living rooms and private open spaces on the winter solstice; and 85% of apartments receive direct solar access when considering an extended 9am-4:45pm time frame. Also, all apartments receive some solar access between 9am-3:30pm. These results are considered reasonable given this development is located in a CBD environment.