# ONE SYDNEY HARBOUR, BUILDING R4B BARANGAROO SOUTH - SECTION 4.55(2) MODIFICATION APPLICATION FOR STATE SIGNIFICANT DEVELOPMENT SSD 6965

SOLAR AND DAYLIGHT ACCESS STUDY

INTEGRATED SOLUTIONS AUSTRALIA

## Document History

| | |
|---|---|
| **Prepared by** | Thomas Fang, Kalai Valliappan |
| **Checked by** | Kalai Valliappan |
| **Approved by** | Dan Grunbaum |
| **Project Manager** | Tom Kirkham, Henrietta Francis, Tom Cushway |
| **File Path:** | G:\Sustainability\Projects\Committed Projects\Barangaroo 1B\D_Reports\Drafts\Solar Access Studies |

| Issue | Addendum | Revision | Date |
|---|---|---|---|
| **1** | | Issued for DA Submission | 13/02/2017 |
| **2** | | Draft issued for S4.55(2) internal review | 09/06/2020 |
| **3** | | Issued for S4.55(2) Modification Application | 29/06/2020 |
| **3** | B | Reissued for S4.55(2) Modification Application | 21/07/2020 |
| **3** | C | Reissued for S4.55(2) Modification Application | 09/09/2020 |
| | | | |
| | | | |
| | | | |
| | | | |



| | |
|---|---|
| **Technical Enquires** | Kalai Valliappan |
| **Telephone** | +61 2 9236 6965 |
| **Email** | Kalai.Valliappan@lendlease.com |

| | |
|---|---|
| **General Enquires** | Daniel Grunbaum |
| **Mobile** | +61 412 447 511 |
| **Email** | Daniel.Grunbaum@lendlease.com |

# Executive Summary

This report has been prepared to support a S4.55(2) Modification Application for State Significant Development SSD 6965 to the Department of Planning regarding Building R4B located within the One Sydney Harbour development at Barangaroo South. This provides additional explanatory information regarding performance against the Apartment Design Guide Part 4A Solar and daylight access design criteria and the solar access guidance of Part 3D Communal and public open space.

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 façades.

Analysis undertaken confirms that 63% of R4B apartments receive a minimum of 2 hours of direct sunlight between 9am and 3pm to the finished floor level of living rooms and private open spaces on the winter solstice. If extending the analysis period to between 9am and 5pm, 80% of apartments receive direct sunlight for 2 hours. Accepting that this residential building is required in accordance with the Concept Plan (Mod 8), the proposed building massing and orientation could not be designed differently to achieve significantly improved solar access to the 70% minimum Apartment Design Guide requirement. Importantly, 99% of apartments receive some direct sunlight between 9am and 5pm.

While only 2% of the podium level P2 communal open space will receive more than two hours of direct sunlight between 9am and 3pm in mid-winter, 30% of the space will receive one hour of direct sunlight and the space will naturally have good access to diffuse skylight, and receive significant sunlight at other times of the year.

# Table of Contents

# 1.0 Introduction

This report supports a S4.55(2) Modification to Building R4B (SSD 6965). Building R4B forms part of the One Sydney Harbour development located at Barangaroo South. In 2017, planning approval was granted by the Planning Assessment Commission.

## 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 planning application site are located on land generally known and identified in the approved Concept Plan as Block 4A and 4B.

Block 4B is where One Sydney Harbour (OSH) is located. OSH consists of three residential buildings, R4A, R4B and R5. R4B is in the middle of the three buildings, with the

- City CBD and R5 to the east,
- Barangaroo central to the north,
- R4A and the Crown resort to the west, and
- Barangaroo Block 4A to the south.

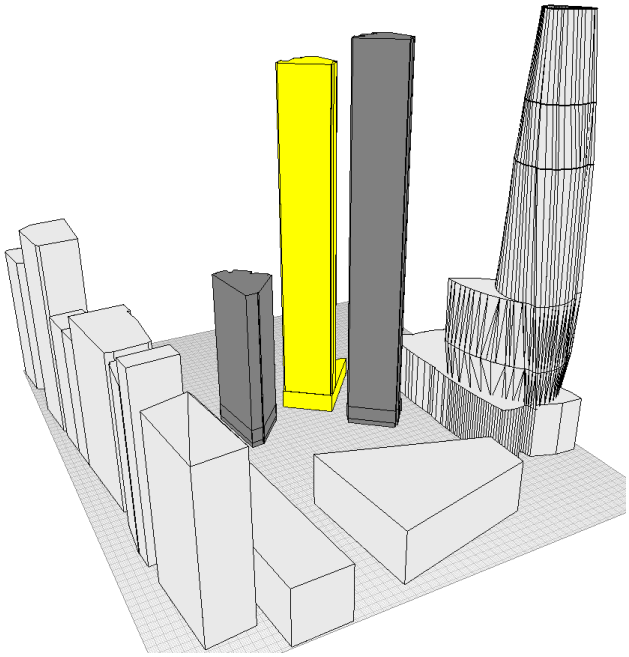


**Figure 1- Image of R4B (in yellow) and surrounding buildings from the north east perspective.**

### Overview of Proposed Development

The Residential Building R4B seeks approval for the construction and use of a 60 storey residential flat building comprising of 290 apartments and 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 planning approval and do not form part of this modification.

## 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 associated with apartments and communal open spaces. 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 development achieves a minimum of 50% direct sunlight to the principal usable part of the communal open space for a minimum of 2 hours between 9 am and 3 pm on 21 June (mid-winter).*

The total development achieves reasonable solar access for a site located within the density of the site context with excellent daylight access due to the highly transparent façade. In 2017 when planning approval was granted, it was noted that a reduction in the Solar Access criteria within the Apartment Design Guide was acceptable, with 64% of apartments receiving 2 hours direct sunlight to living rooms and private open spaces between 9am and 3pm mid-winter.

## 2.0 Methodology

The R4B building consists of a typical low rise, mid-rise, high-rise and skyhome floor plates. This study has analysed the solar access for the following floors which provides representative results for every apartment within the development, as well as accessible communal open terraces.

Solar access varies by level given the site context of the project. Each level with a different apartment mix and/or receiving different solar access due to the site context has been analysed. While only typical floors are modelled, these are sufficient to confirm solar access to all apartments given that they are representative of all floors and apartments within the project. The table below summarises the floors modelled together with the floors that they represent. While the modelled floors are representative, the lower floor is always taken as the modelled floor to ensure that the analysis can be considered conservative.

**Table 1 - Floors included in model and the floors they represent**

| Modelled Floor | Representative Floors |
|---|---|
| L01 (Low Rise) | L01 – L03 |
| L04 (Low Rise) | L04 – L05 |
| L07 | L07 - L19, L21 - L32 |
| L33 | L33 - L46 |
| L48 | L48 – L55 |
| Skyhomes | L56 - L57 |

Autodesk's Ecotect software was used to visually determine solar access in 15-minute time steps. Direct sunlight to the areas of analysis was determined at finished floor level. We have interpreted mid-winter as being the winter solstice, June 21st, which provides conservative results as it is the shortest day of the year.

The modelled apartments have been based on the latest drawings – Section 4.55 Revision 20 Issued 19/06/2020. The façade elevations (north-east and west) all have high light transmittance glazing with a minimum glazing height of 2.7m.

# 3.0 Results

The results presented in the tables below have been presented for R4B against the Apartment Design Guide criteria.

## 3.1 Apartment Results

The apartment results tables show both the current proposed SDD 6965 results and previously submitted and approved 2017 and 2020 results.

**Table 2: Solar access greater than 2 hours in residential building R4B on 21 June**

| | Approved 2017 SSD 6965 | | Approved 2020 SSD 6965 MOD 1 | | Current Proposed SSD 6965 | |
|---|---|---|---|---|---|---|
| | % | No. of Apartments | % | No. of Apartments | % | No. of Apartments |
| Living Rooms and Private Open Spaces (9AM – 3PM)[1] | 64% | 191 | 65% | 184 | 63% | 184 |
| Living Rooms and Private Open Spaces (9AM – 5PM)[1] | 80% | 237 | 82% | 231 | 80% | 231 |

[1] Results indicate the percentage of apartments receiving as least 2 hours of solar access in the living rooms and balconies/wintergardens.

**Table 3: Apartments receiving no direct solar access in residential building R4B on 21 June**

| | Approved 2017 SSD 6965 | | Approved 2020 SSD 6965 MOD 1 | | Current Proposed SSD 6965 | |
|---|---|---|---|---|---|---|
| | % | No. of Apartments | % | No. of Apartments | % | No. of Apartments |
| Living Rooms, Bedrooms, and Private Open Spaces[2] (9AM – 3PM) | 9% | 28 | 16% | 45 | 18% | 53 |
| Living Rooms, Bedrooms and Private Open Spaces[2] (9AM – 5PM) | 0% | 0 | 0% | 0 | 1% | 3 |

[2] Results indicate the percentage of apartments receiving no direct solar access in the living rooms, bedrooms and/or balconies/wintergardens.

## 3.2 Communal Open Spaces Results

Podium level 2 consists of an outdoor communal open space which is accessible to all R4B residential tenants. During mid-winter, the podium level P2 communal open space receives some access to direct sunlight between 9am and 3pm.

**Table 4: Percentage of area receiving more than 1 or 2 hours of direct solar access in Open Terrace of residential R4B on 21 June between 9am and 3pm**

| | Period | Podium Open Space |
|---|---|---|
| 2 Hours of Direct Sunlight | Winter: 9am – 3pm | 2% |
| 1 Hour of Direct Sunlight | Winter: 9am – 3pm | 30% |

The table below details the area and percentage of communal open space that receives direct sunlight between 9am and 3pm in 15-minute increments.

**Table 5: Percentage and area of Open Terrace receiving direct solar access from 9AM to 3PM in 15-minute increments**

| Time | Podium P2 Open Space | |
|---|---|---|
| | Area ($m^2$) | % of Area |
| 9:00 AM | - | 0% |
| 9:15 AM | - | 0% |
| 9:30 AM | 42 | 7% |
| 9:45 AM | 88 | 14% |
| 10:00 AM | 148 | 23% |
| 10:15 AM | 161 | 25% |
| 10:30 AM | 157 | 25% |
| 10:45 AM | 98 | 15% |
| 11:00 AM | 49 | 8% |
| 11:15 AM | 2 | 0% |
| 11:30 AM | - | 0% |
| 11:45 AM | - | 0% |
| 12:00 PM | - | 0% |
| 12:15 PM | 4 | 1% |
| 12:30 PM | 20 | 3% |
| 12:45 PM | 37 | 6% |
| 1:00 PM | 17 | 3% |
| 1:15 PM | - | 0% |
| 1:30 PM | - | 0% |
| 1:45 PM | - | 0% |
| 2:00 PM | 3 | 0% |
| 2:15 PM | 31 | 5% |
| 2:30 PM | 87 | 14% |
| 2:45 PM | 47 | 7% |
| 3:00 PM | 2 | 0% |
| 3:15 PM | - | 0% |

Although only a small area will receive sunlight for more than two hours, the space will still receive plenty of diffuse sunlight, as further detailed in the discussion (Section 4).

**Table 6: Percentage of area receiving more than 1 or 2 hours of direct solar access in Open Terraces of residential R4B on 21 December**

| | Period | Podium Open Space |
|---|---|---|
| 2 Hours of Direct Sunlight | Summer: 9am – 3pm | 75% |
| 1 Hour of Direct Sunlight | Summer: 9am – 3pm | 83% |

During mid-summer, 75% of the podium communal open space receives more than two hours of direct sunlight between 9am to 3pm; this increases to 83% when considering a 1-hour threshold.

# 4.0 Discussion

The main factors leading to 63% solar access for the apartments for the 9am to 3pm criteria include:

- North-east and West facing façade of R4B building
- Shading from the existing CBD to the east to lower levels of the building in the morning
- Shading from Crown resort and the R4A building onto R4B building in the afternoon

The Apartment Design Guide design criteria is about both Solar and Daylight Access to habitable rooms and private open space. While 63% of apartments receive the minimum of 2 hours direct sun to living rooms and private open spaces, this is believed to be further enhanced by the following building attributes that enhance daylight and views:

- **High Light Transmission Façade** – The main façade elevations (the north-east and west for R4B) all have high light transmittance glazing with a minimum glazing height of 2.7m. Where the open cavity façade typology is proposed automated cavity blinds will also be provided to enable solar control when needed.

- **Daylight versus Sunlight** – The Apartment Design Guide quantifies a recommended amount of direct sunlight access, which does not fully characterise daylight (diffuse natural light) access. The One Sydney Harbour towers are positioned with parkland to the north and the Crown Resort to the west, therefore the access to diffuse natural light to all apartments as well as the private and communal open spaces will be high.

- **Outlook** – The views to the northeast are primary resulting in views of Sydney Harbour to the north of the hotel. With the high performance façade typologies proposed, high daylight levels and amenity under diffuse sky conditions will be provided for the northwest facing apartments.

These considerations mean that the One Sydney Harbour living areas, open space and bedrooms will experience higher daylight levels year-round than many other residential buildings within the Sydney CBD. Therefore, we believe the proposed One Sydney Harbour exceeds the intent of SEPP65's Daylight Access principle.

## 5.0 Conclusion

The intent of the Apartment Design Guide 4A Solar and daylight access criteria is achieved for the R4B development through optimisation of the orientation and aspect of the buildings and use of a high-performance façade. 63% of apartments receive a minimum of 2 hours of direct solar access between 9am and 3pm to the finished floor level of living rooms and private open spaces on the winter solstice, 19 apartments short of meeting the 70% ADG requirement; and 80% of apartments receive direct solar access when considering an extended time frame between 9am and 5pm. Also, 99% of apartments receive some direct sunlight between 9am and 5pm. These results are considered reasonable given this development is located in a dense urban environment.

It has been found that 2% of the area of the accessible podium level P2 open space will receive more than two hours of direct sunlight between 9am and 3pm in mid-winter. However, 30% of the space will receive one hour of direct sunlight and the space will naturally have good access to diffuse skylight and receive significant sunlight at other times of the year.

When planning approval was granted in 2017, it was noted that a reduction against the solar access criteria of the Apartment Design Guide was acceptable. The proposed Modification largely maintains solar access as approved, with minor adjustments

# Appendix A – Sun Path Diagrams

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

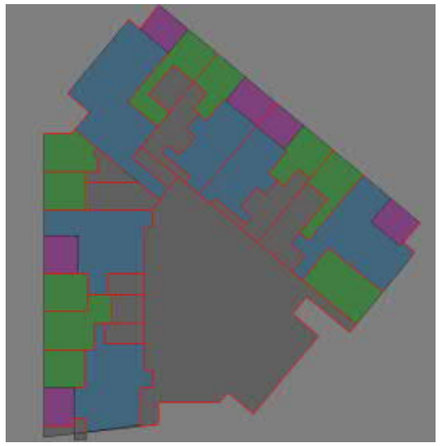
- R4B Low Rise L01
- R4B Low Rise L04
- R4B Low Rise L07
- R4B Mid Rise L33,
- R4B High Rise L48,
- R4B Skyhomes L57
- R4B Open Terraces on Podium Level P2

These diagrams show the direct sunlight on the apartment floor plates and overshadowing as a result of local shades and surrounding 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. The time increments have been selected to clearly show when the criteria for 2 hours of access have been achieved.

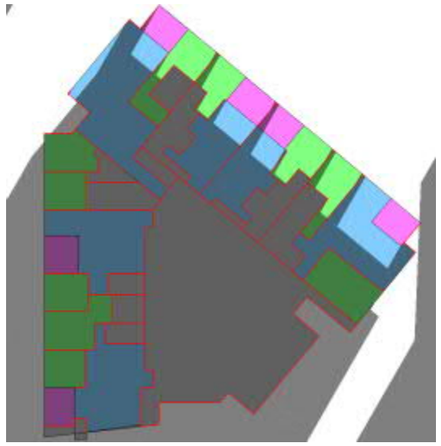
- Living areas have been highlighted in blue, wintergardens/balconies in pink and bedrooms in green
- Communal areas have been shaded in Dark Green
- Shading from the surrounding CBD, Crown resort or the One Sydney Harbour buildings is shown in light grey.

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

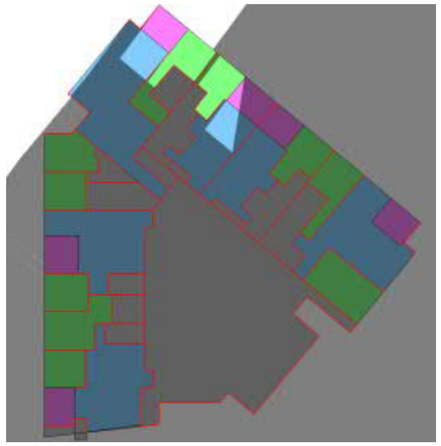
**Level 01**



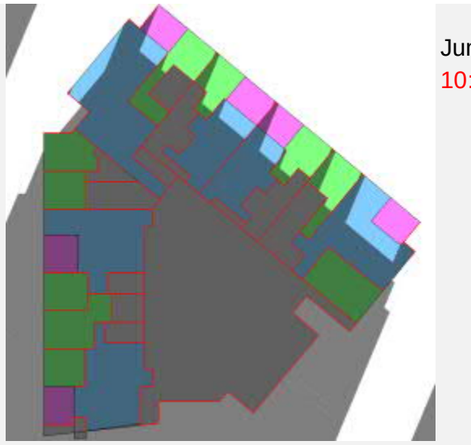
June 21
9:00 AM



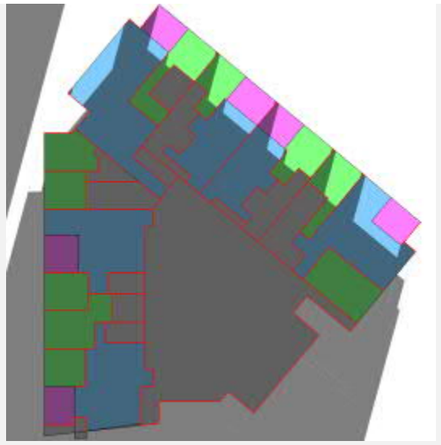
June 21
9:30 AM



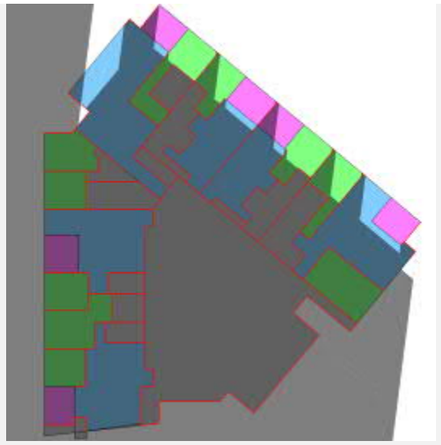
June 21
10:00 AM



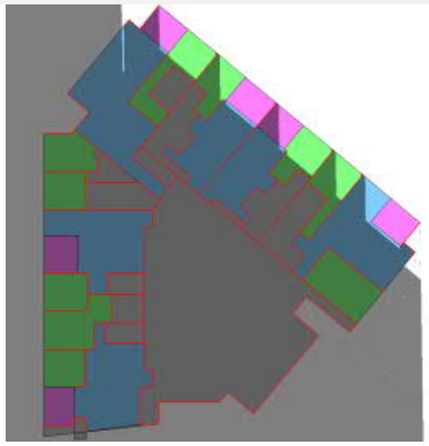
June 21
10:30 AM



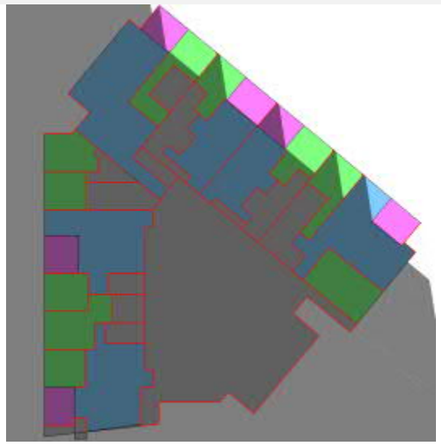
June 21
11:00 AM



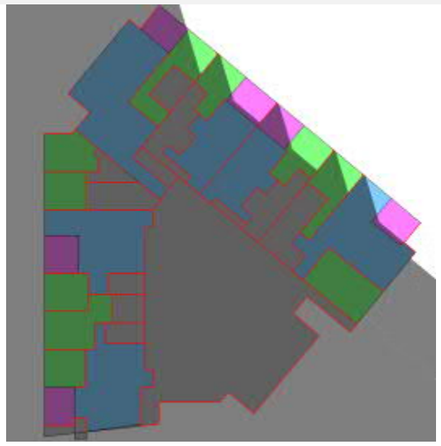
June 21
11:30 AM



June 21
12:00 AM

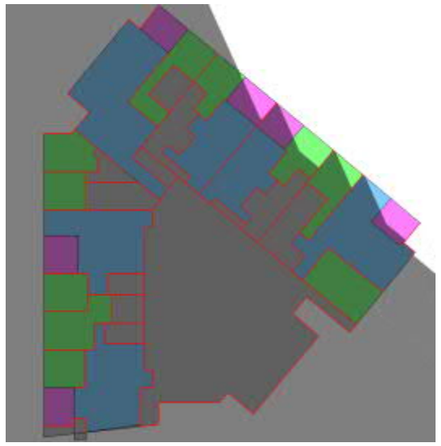


June 21
12:30 AM

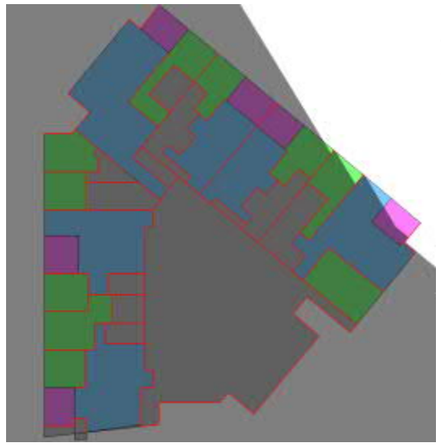


June 21
1:00 PM

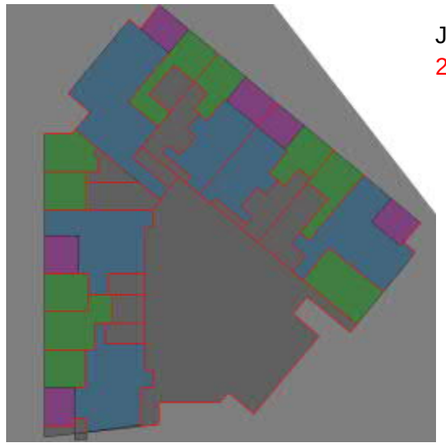
## A.2 Level 01 (Continued)



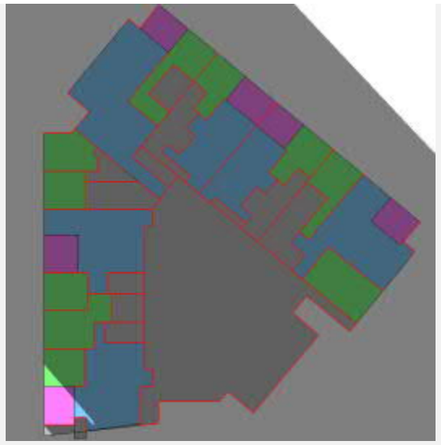
June 21
1:30 PM



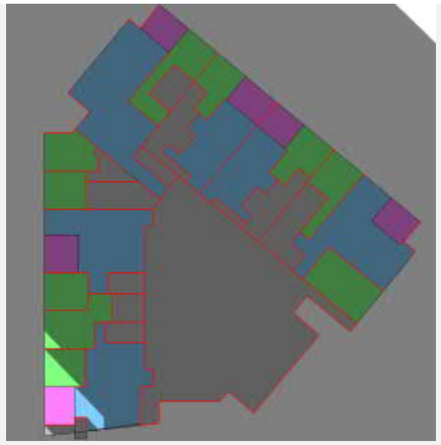
June 21
2:00 PM



June 21
2:30 PM

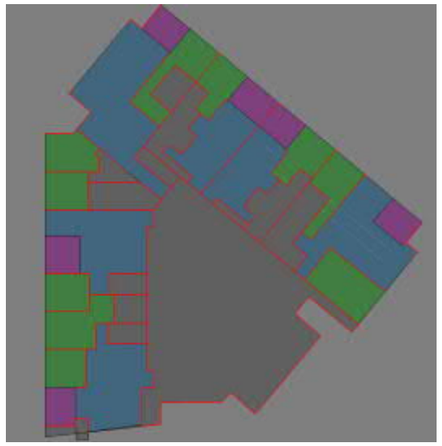


June 21
2:45 PM

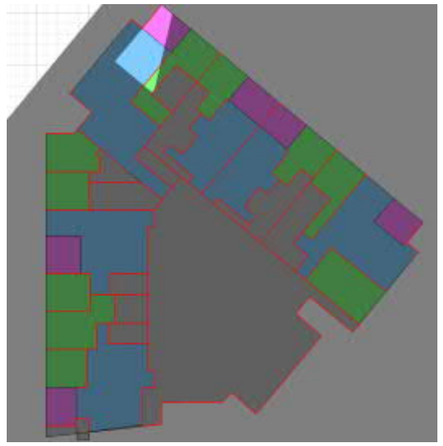


June 21
3:00 PM

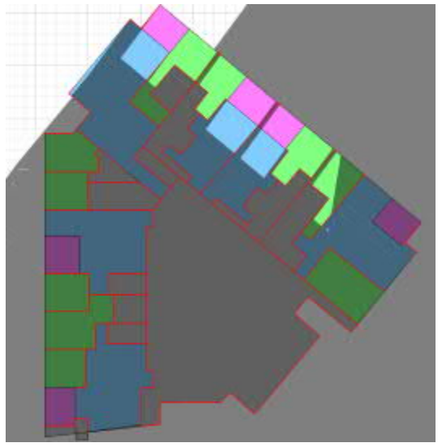
## A.3 **Level 04**



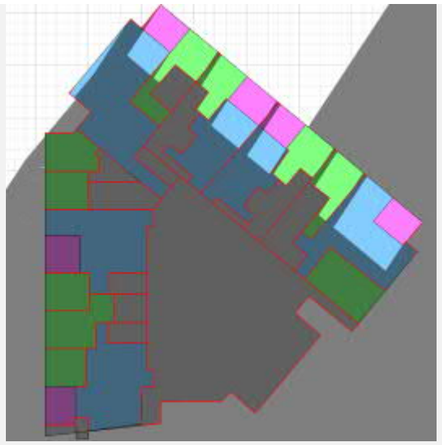
June 21
9:00 AM



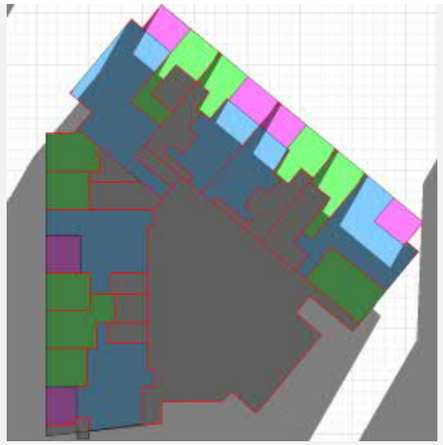
June 21
9:15 AM



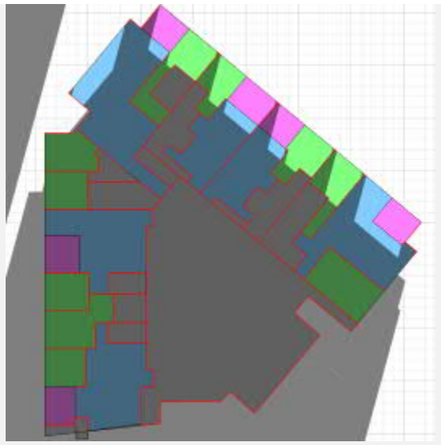
June 21
9:30 AM



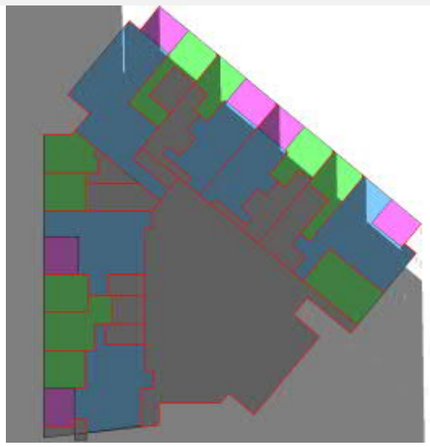
June 21
9:45 AM



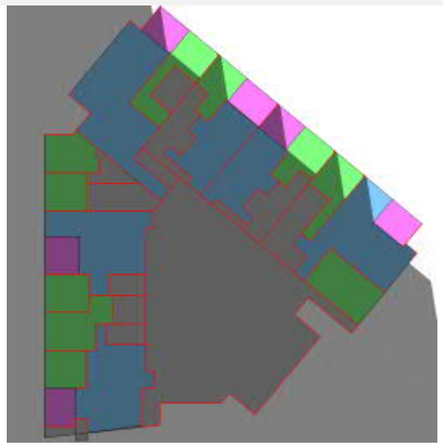
June 21
10:00 AM



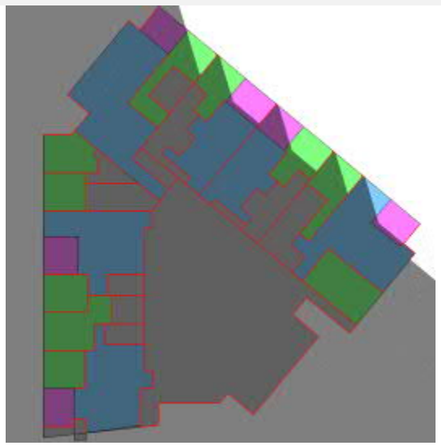
June 21
11:00 AM



June 21
12:00 PM

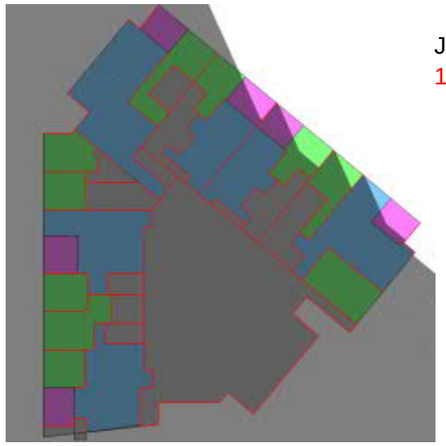


June 21
12:30 PM

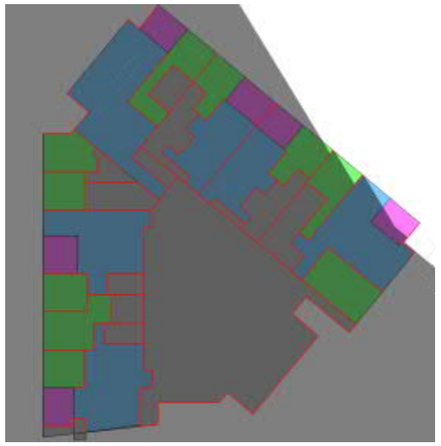


June 21
1:00 PM

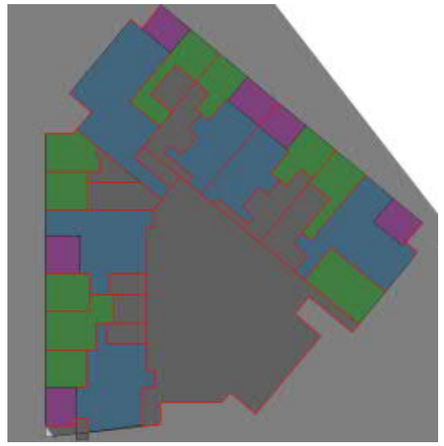
## A.4 Level 04 (Continued)



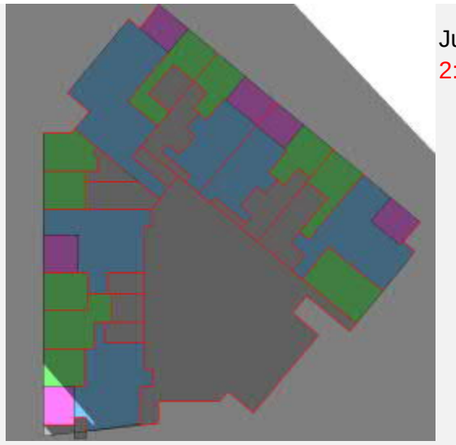
June 21
1:30 PM



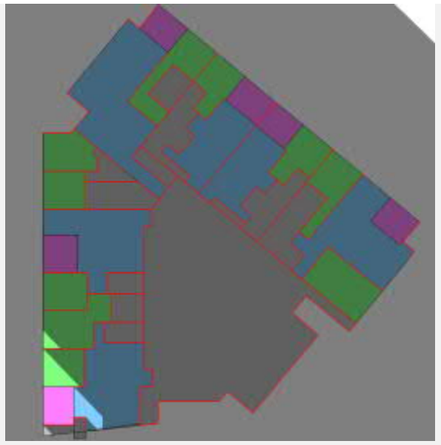
June 21
2:00 PM



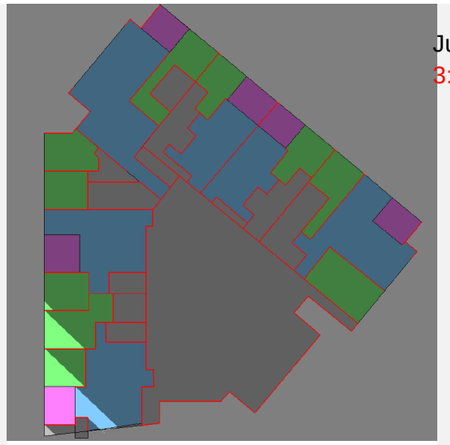
June 21
2:30 PM



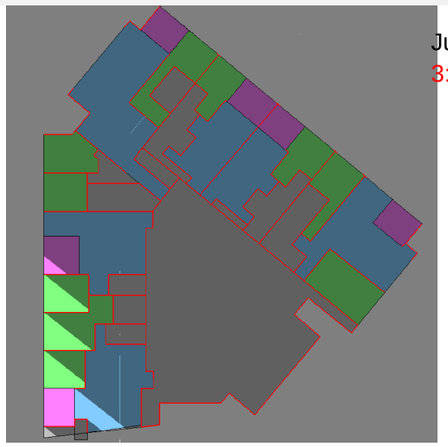
June 21
2:45 PM



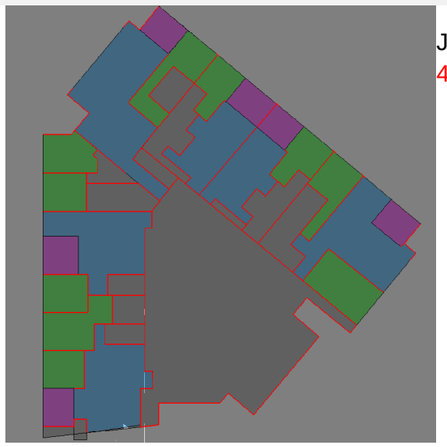
June 21
3:00 PM



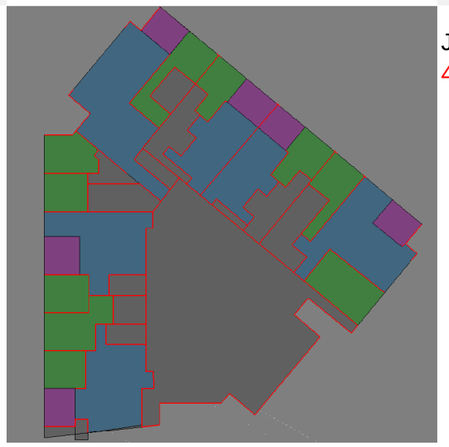
June 21
3:15 PM



June 21
3:45 PM

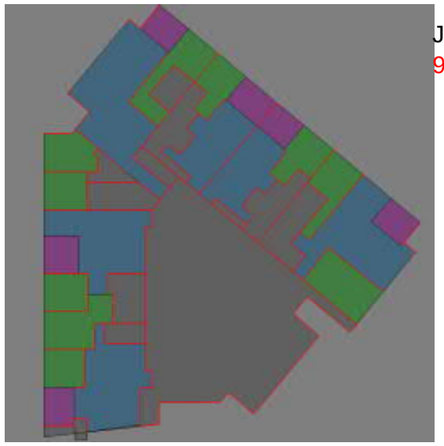


June 21
4:00 PM

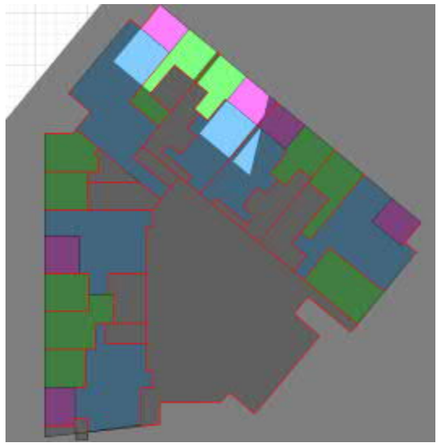


June 21
4:45 PM

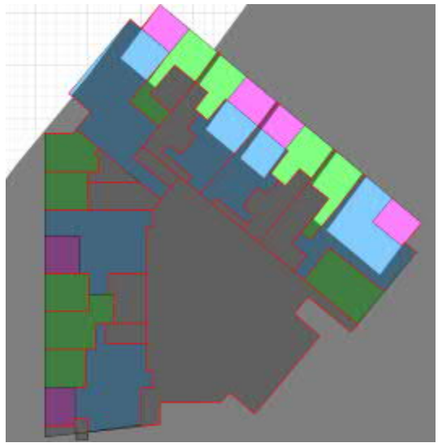
## A.5 **Level 07**



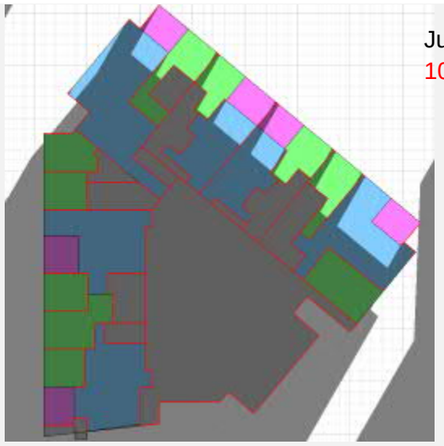
June 21
9:00 AM



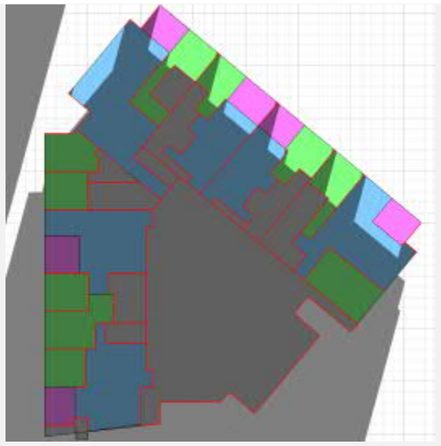
June 21
9:15 AM



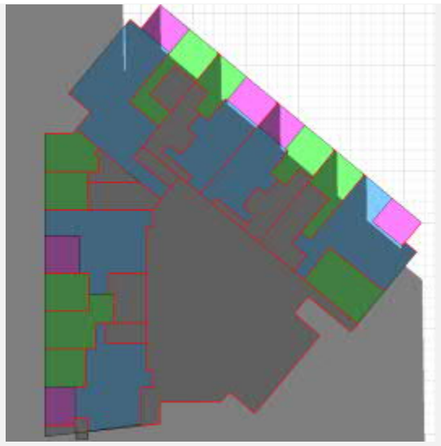
June 21
9:30 AM



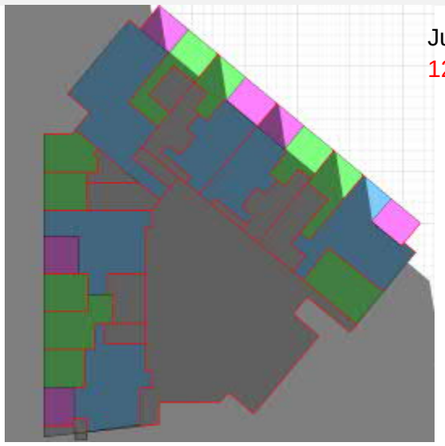
June 21
10:00 AM



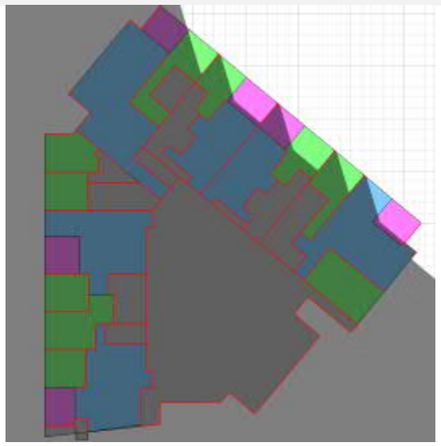
June 21
11:00 AM



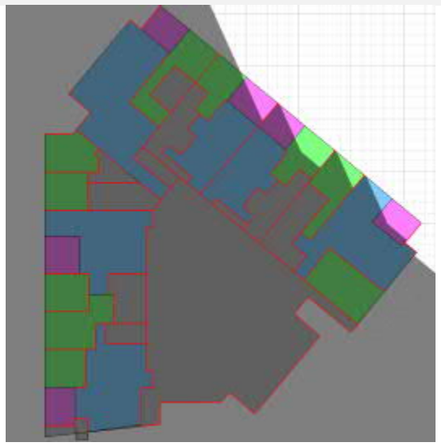
June 21
12:00 PM



June 21
12:30 PM

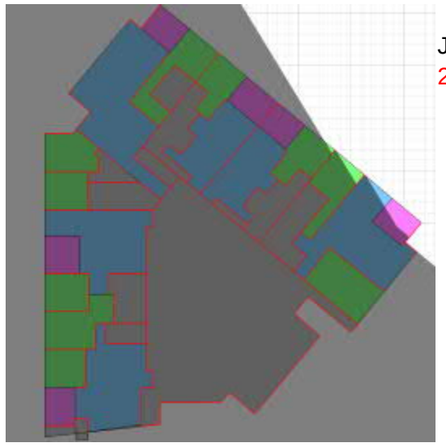


June 21
1:00 PM

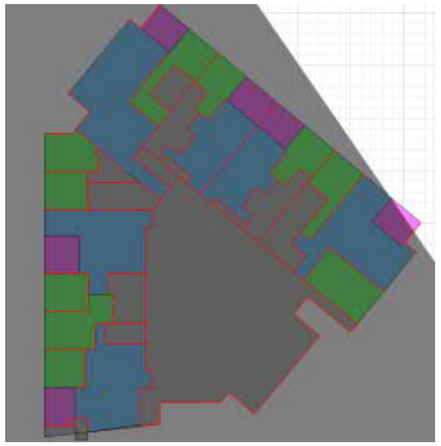


June 21
1:30 PM

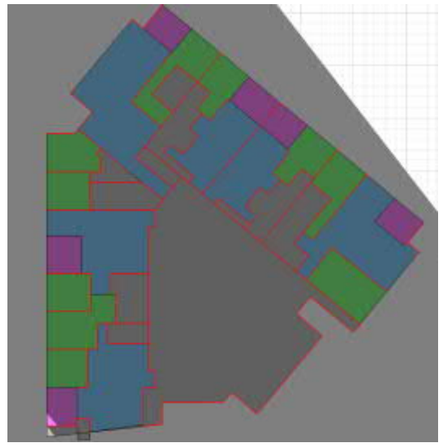
## A.6 Level 07 (Continued)



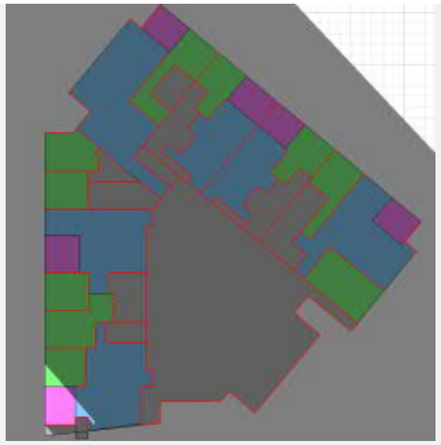
June 21
2:00 PM



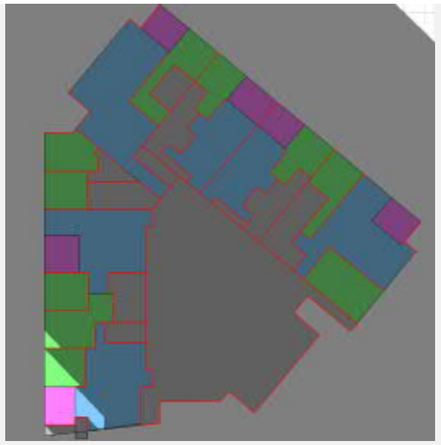
June 21
2:15 PM



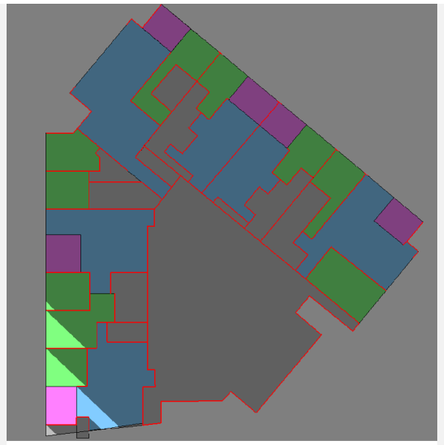
June 21
2:30 PM



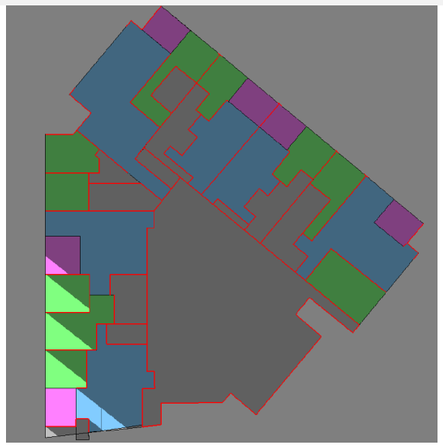
June 21
2:45 PM



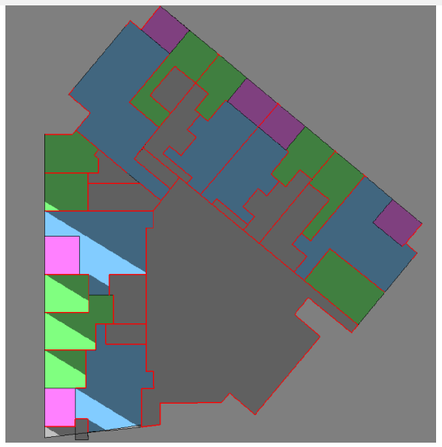
June 21
3:00 PM



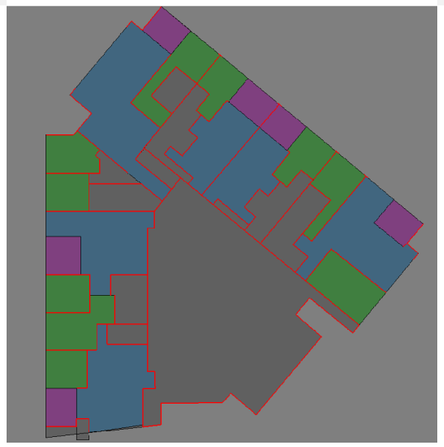
June 21
3:15 PM



June 21
3:45 PM

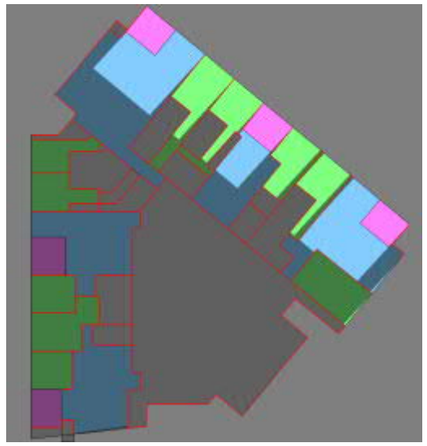


June 21
4:30 PM

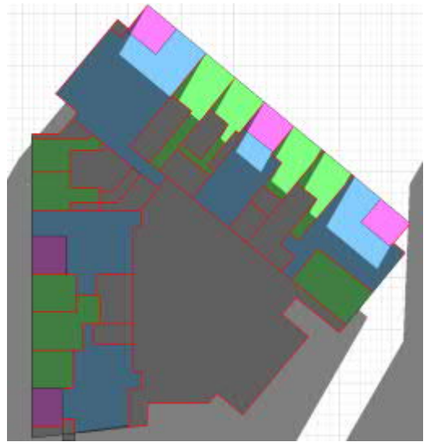


June 21
4:45 PM

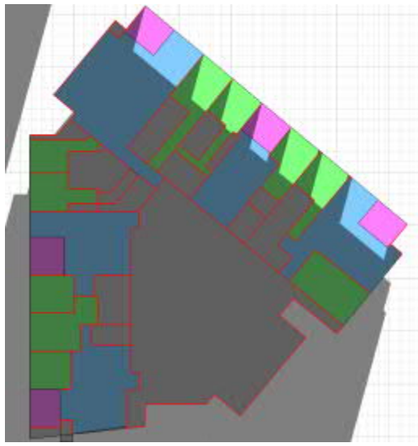
## A.7 Level 33



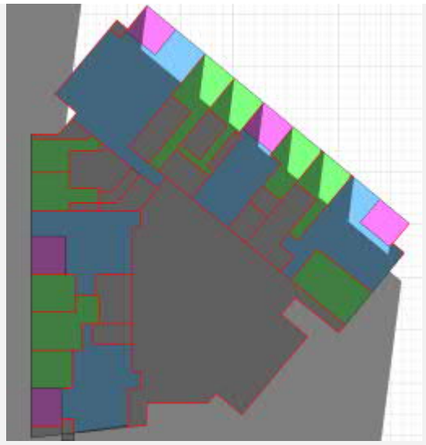
June 21
9:00 AM



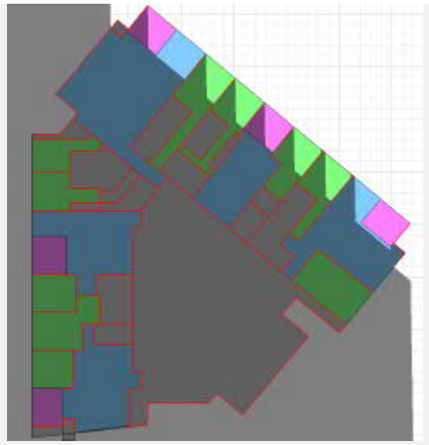
June 21
10:00 AM



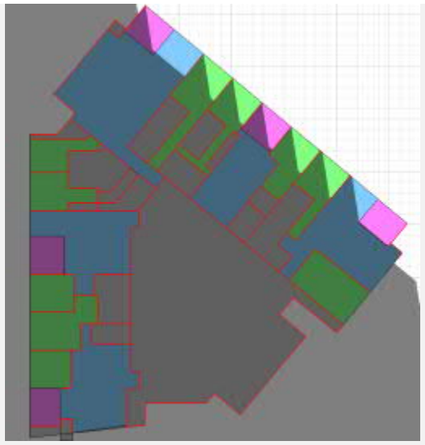
June 21
11:00 AM



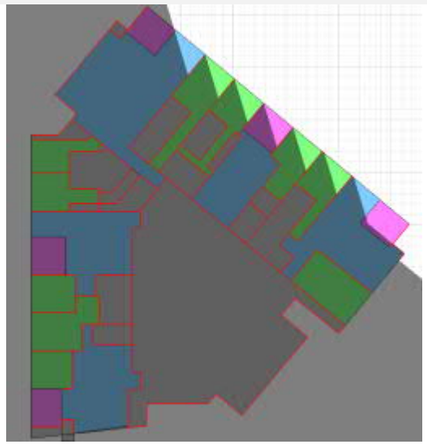
June 21
11:30 AM



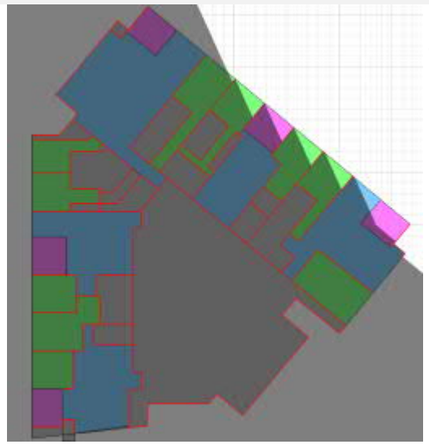
June 21
12:00 PM



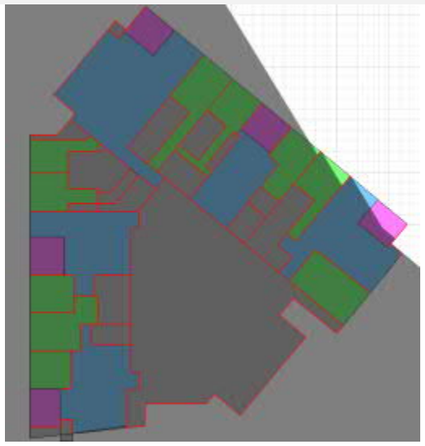
June 21
12:30 PM



June 21
1:00 PM

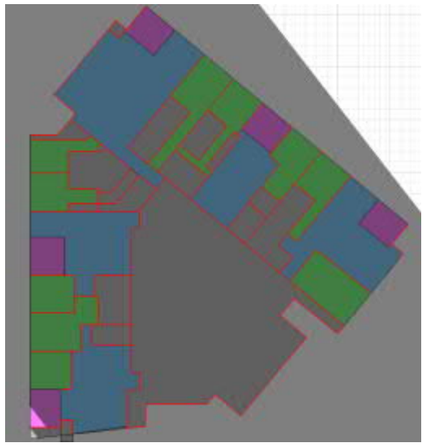


June 21
1:30 PM

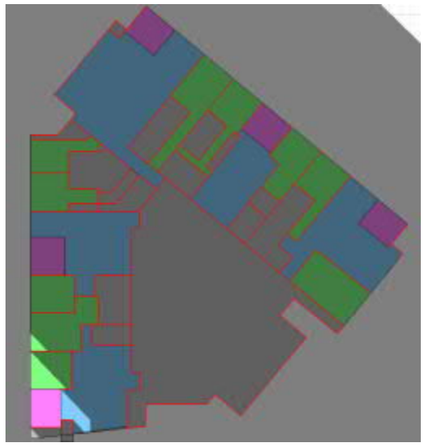


June 21
2:00 PM

## A.8 Level 33 (Continued)

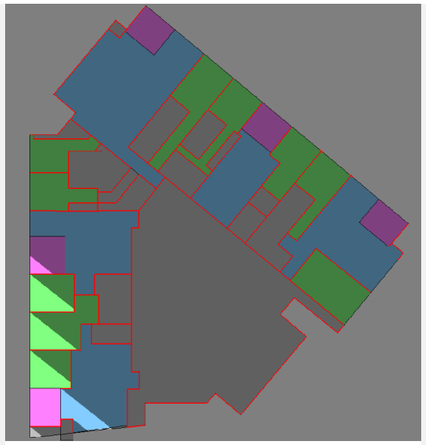


June 21
2:30 PM

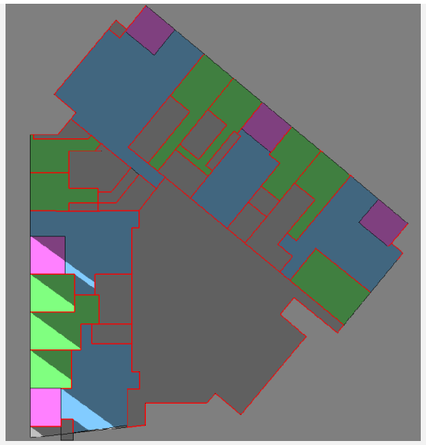


June 21
3:00 PM

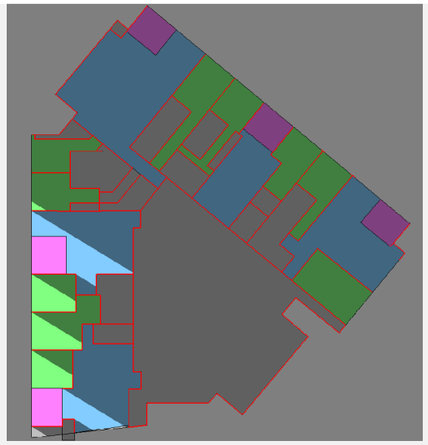
June 21
3:15 PM



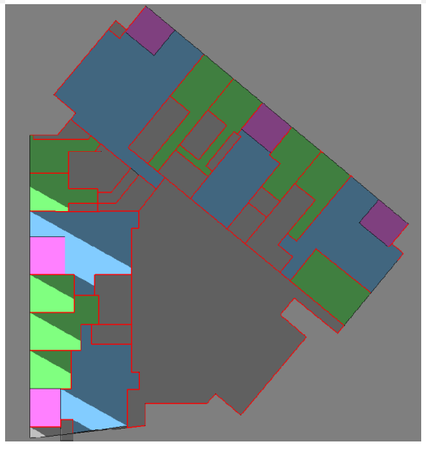
June 21
3:45 PM



June 21
4:00 PM

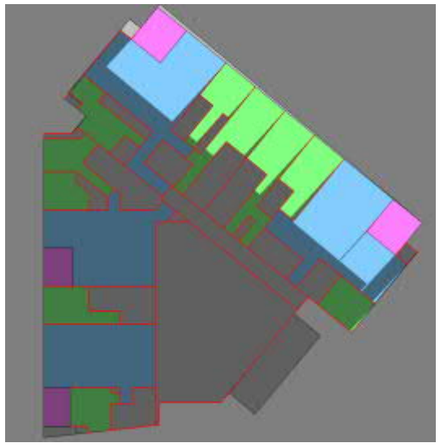


June 21
4:30 PM

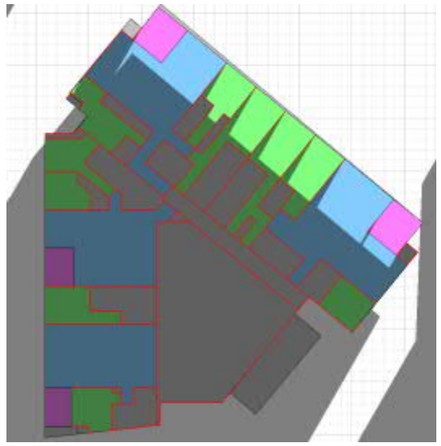


June 21
4:45 PM

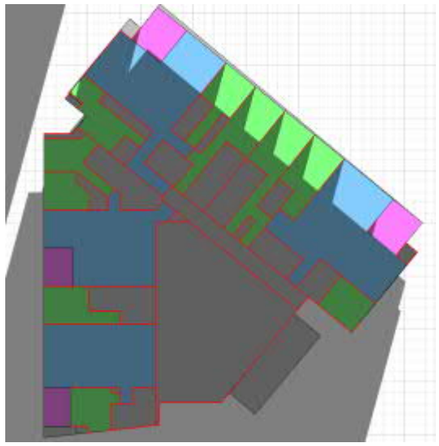
## A.9 Level 50



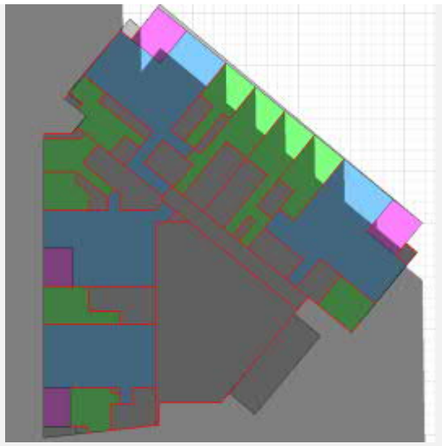
June 21
9:00 AM



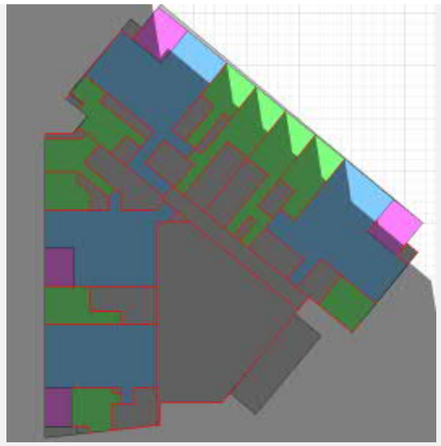
June 21
10:00 AM



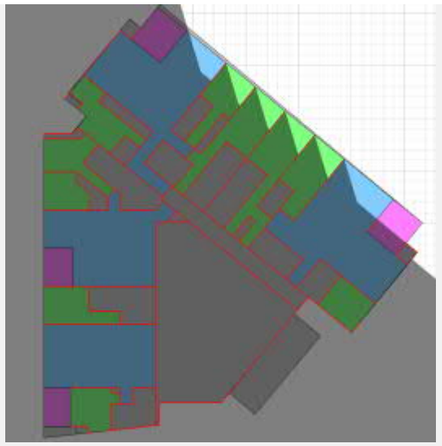
June 21
11:00 AM



June 21
12:00 PM

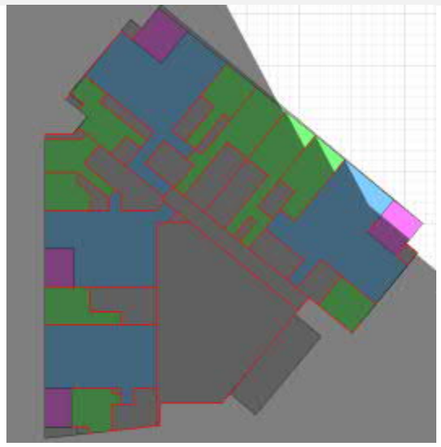


June 21
12:30 PM

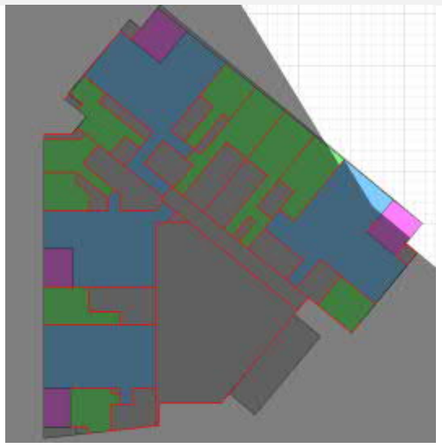


June 21
1:00 PM

June 21
1:30 PM

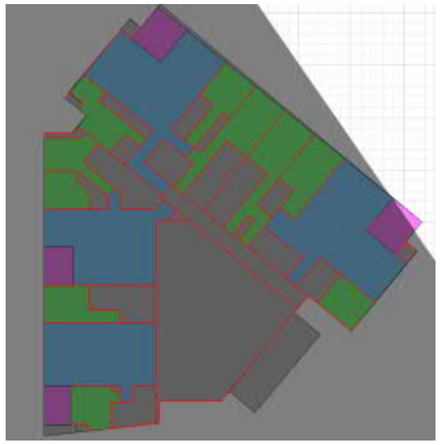


June 21
1:45 PM

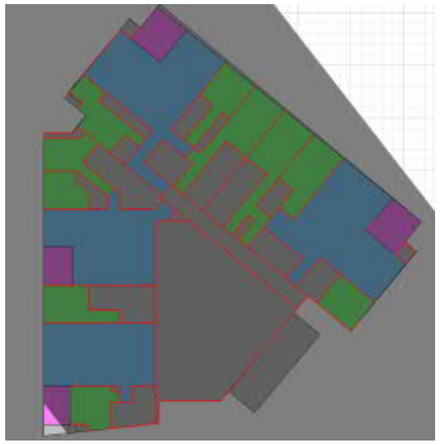


June 21
2:00 PM

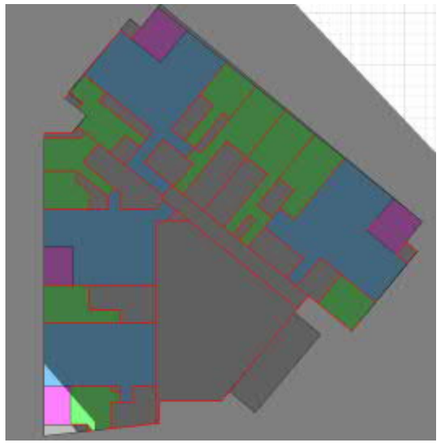
## A.10 Level 50 (Continued)



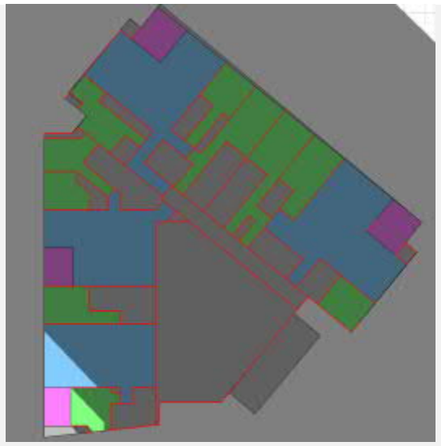
June
2:15 PM



June 21
2:30 PM



June 21
2:45 PM

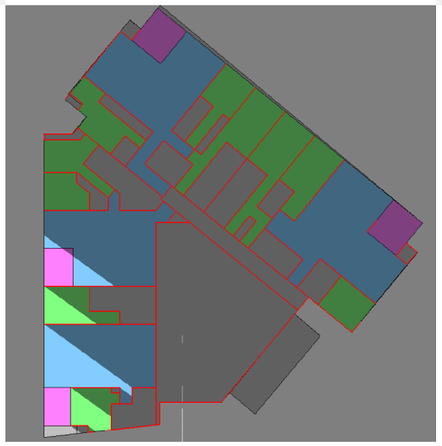


June 21
3:00 PM

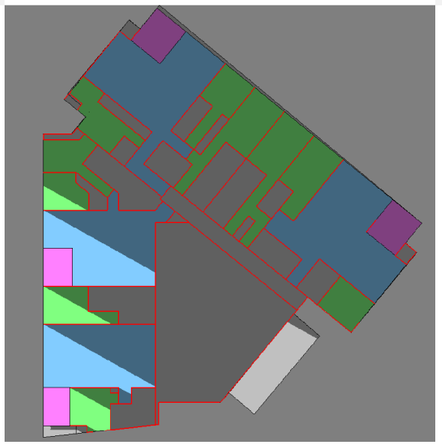
June 21
3:15 PM

June 21
3:30 PM

June 21
3:45 PM

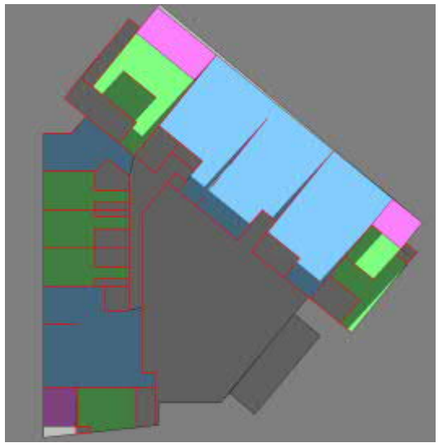


June 21
4:00 PM

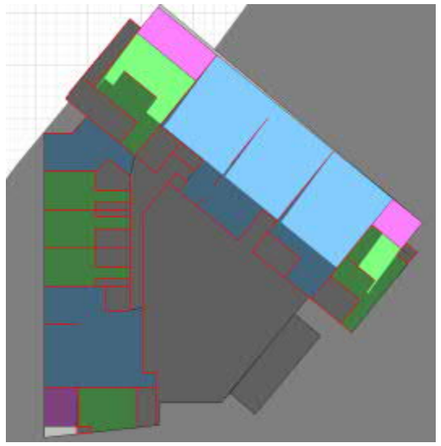


June 21
4:45 PM

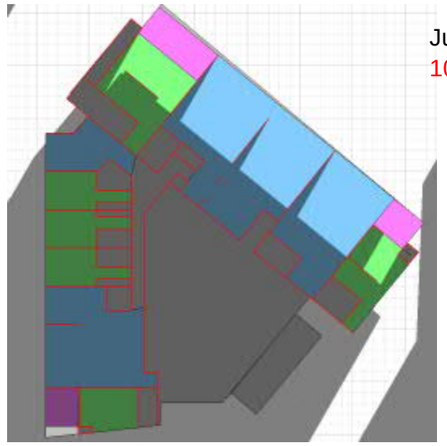
## Level 56 Skyhomes



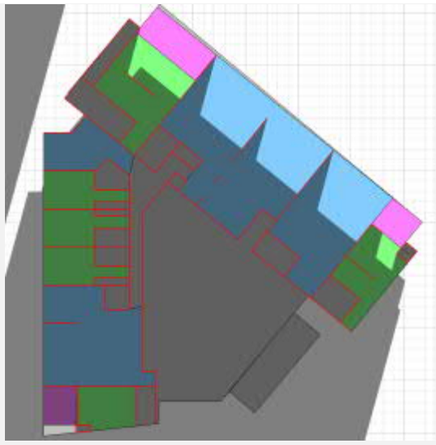
June 21
9:00 AM



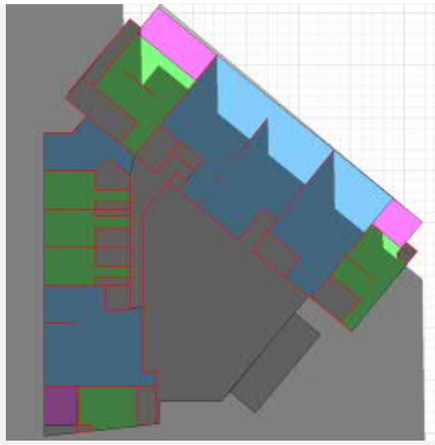
June 21
9:30 AM



June 21
10:00 AM

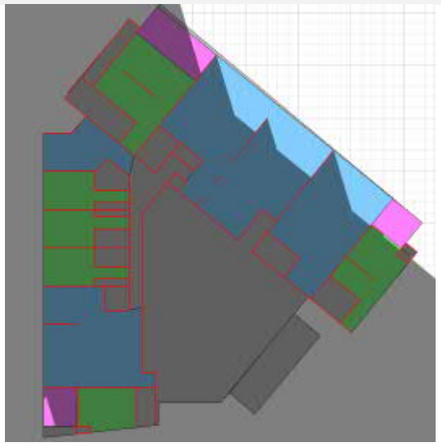


June 21
11:00 AM

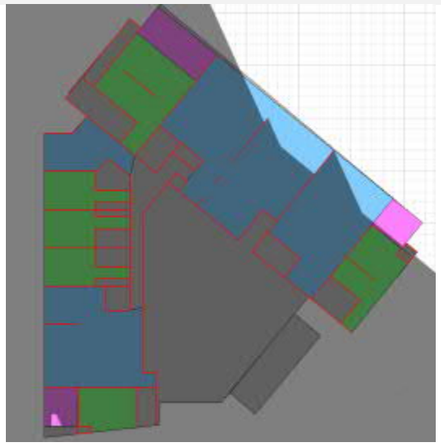


June 21
12:00 PM

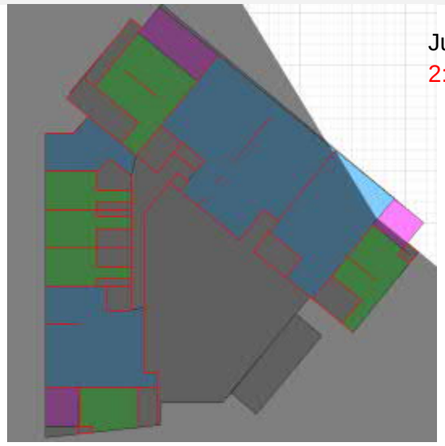
June 21
12:30 PM



June 21
1:00 PM

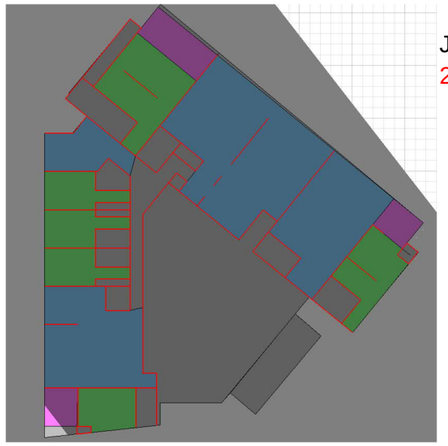


June 21
1:30 PM

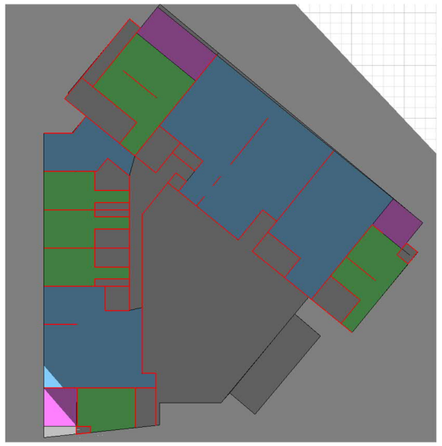


June 21
2:00 PM

## A.12 Level 56 Skyhomes (Continued)



June 21
2:30 PM



June 21
2:45 PM

June 21
3:00 PM

June 21
3:15 PM

June 21
3:30 PM

June 21
4:00 PM

June 21
4:30 PM

June 21
4:45 PM