WATERLOO METRO QUARTER OVERSTATION DEVELOPMENT

Environmental Impact Statement
Appendix EE Overshadowing Analysis

SSD-10441 Amending Concept DA

State Significant Development
Development Application

Prepared for **WL Developer Pty Ltd**

30 September 2020

Reference	Description
Applicable SSD Applications	SSD-10441 Amending Concept DA
Author	RWDI Anemos Rupak Banerjee, Ryan Danks, Michael Pieterse, Kevin Peddie
Reviewed	Waterloo Developer Pty Ltd Nick Owen
Document Number	WMQ-SITE-RWDII-WR-RPT-0003
Status	Final
Version	2
Date of Issue	30 July 2020

Table of contents

List of Figures

List of Tables

1. Glossary and abbreviations

Reference	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ADG	Apartment Design Guide
AHD	Australian height datum
AQIA	Air Quality Impact Assessment
BC Act	Biodiversity Conservation Act 2016
BCA	Building Code of Australia
BC Reg	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
CEEC	critically endangered ecological community
CIV	capital investment value
CMP	Construction Management Plan
Concept DA	A concept DA is a staged application often referred to as a 'Stage 1' DA. The subject application constitutes a detailed subsequent stage application to an approved concept DA (SSD 9393) lodged under section 4.22 of the EP&A Act.
Council	City of Sydney Council
CPTED	Crime Prevention Through Environmental Design
CSSI approval	critical State significant infrastructure approval
CTMP	Construction Traffic Management Plan
DA	development application
DPIE	NSW Department of Planning, Industry and Environment
DRP	Design Review Panel
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPA Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999

Reference	Description
ESD	ecologically sustainable design
GANSW	NSW Government Architect's Office
GFA	gross floor area
HIA	Heritage Impact Assessment
IAP	Interchange Access Plan
LGA	Local Government Area
NCC	National Construction Code
OSD	over station development
PIR	Preferred Infrastructure Report
POM	Plan of Management
PSI	Preliminary Site Investigation
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
SEPP 65	State Environmental Planning Policy No. 65 – Design Quality of Residential Apartment Development
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2009
SREP Sydney Harbour	State Regional Environmental Plan (Sydney Harbour Catchment) 2005
SSD	State significant development
SSD DA	State significant development application
SLEP	Sydney Local Environmental Plan 2012
Transport for NSW	Transport for New South Wales
TIA	Traffic Impact Assessment

Reference	Description
The proposal	The proposed development which is the subject of the detailed SSD DA
The site	The site which is the subject of the detailed SSD DA
VIA	Visual Impact Assessment
WMQ	Waterloo Metro Quarter
WMP	Waste Management Plan
WSUD	water sensitive urban design

2. Executive summary

This report has been prepared by RWDI Anemos Ltd (RWDI) to accompany a concept State significant development (SSD) development application (DA) for the Waterloo Metro Quarter over station development (OSD). This concept SSD DA is submitted as an 'amending DA', that modifies the previously approved concept SSD DA issued for the site (SSD 9393). The modifications contained within the amending DA relate to the northern precinct and central building only. No change is proposed to the original concept SSD DA as it relates to the southern precinct of the Waterloo Metro Quarter site.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the amending concept SSD DA (SSD 10441).

This report concludes that overshadowing caused by the proposed development was found to comply with the Waterloo Metro Quarter Design and Amenity Guidelines FINAL (March 2020). The conclusions in respect of the individual areas assessed are summarised below.

Alexandria Park

- The Amended Envelope has significantly reduced overshadowing of Alexandria Park as demonstrated by the Detailed Design Scheme contained wholly within the Amended Envelope.
- The Amended Envelope allows for a Detailed Design Scheme which will not create new shadowing on Alexandria Park between 10:00 am and 3:00 pm on 21 June; and not exceed the 30% overshadowing of Alexandria Park at 9:00 am.

Cope Street Plaza

- The Amended Envelope significantly improves the amount of sunlight onto Cope Street Plaza as compared to the Approved DA Envelope as demonstrated by the Detailed Design Scheme contained wholly within the Amended Envelope.
- The Amended Envelope allows for a Detailed Design Scheme which achieves 2 hours of direct sunlight between 9 am and 3 pm on June 21 on over 50% of Cope Street Plaza.

Neighbouring Developments and Waterloo Heritage Precinct

- The Amended Envelope has significantly reduced overshadowing of the Waterloo Heritage Precinct and other neighbouring developments as demonstrated by the Detailed Design Scheme contained wholly within the Amended Envelope.

3. Introduction

This report has been prepared to accompany a concept SSD DA for the over station development (OSD) at the Waterloo Metro Quarter site. The concept DA seeks consent for an amended building envelope and description of development for the northern precinct and central building of the Waterloo Quarter site approved under SSD 9393. For clarity, this concept DA (formerly referred to as a 'Stage 1' DA) is made under Section 4.22 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning, Industry and Environment (DPIE) for assessment.

The concept DA seeks to modify the approved building envelope for the northern precinct (previously comprising 'Building A', 'Building B', 'Building C' and 'Building D' under SSD 9393) through:

- increasing the maximum building height for the southern portion of the building envelope from RL56.2 to RL72.60
- removing the 'tower component' of the northern precinct, reducing the overall height of the tower envelope from RL116.9 to RL90.40, to enable the redistribution of floor space to commercial office floor plates
- amending the description of development to refer to a mid-rise (approximately 17 storey) commercial office building, comprising approximately 34,125sqm of commercial office floor space within the northern portion of the site, rather than a third residential tower.

The concept DA seeks to modify the central building approved building envelope (previously comprising 'Building E' under SSD 9393) through:

- modifying the eastern extent of the podium envelope.

This proposal will not exceed the permissible building height for the site under the Sydney Local Environmental Plan 2012 (SLEP) or the maximum height approved under SSD 9393. Separate detailed SSD DA (s) will be lodged concurrently for the detailed design, construction and operation of the northern precinct and central building. No changes are proposed to the original concept DA as it relates to the southern precinct.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 9 April 2020 and issued for the detailed SSD DA. Specifically, this report has been prepared to respond to the SEARs requirements summarised below.

Item	Description of Requirement	Section Reference (this report)
6 Visual and Amenity Impacts	provide a solar access and overshadowing analysis, comparing the overshadowing impacts of the proposal to the existing situation and the approved envelopes having regard to the impact of the proposal on solar access to Alexandria Park and Alexandria Heritage Conservation Area. This shall include a statement on the benefits and issues of any alternative design options that was considered with respect to shadow impacts to Alexandria Park.	8, 9, 10, 11

Table 1 - SEARs Requirements

4. The site

The site is located within the City of Sydney Local Government Area (LGA). The site is situated approximately 3.3 kilometres south of Sydney CBD and approximately 8 kilometres northeast of Sydney International Airport within the suburb of Waterloo.

The Waterloo Metro Quarter site comprises land to the west of Cope Street, east of Botany Road, south of Raglan Street and north of Wellington Street (refer to Figure 1). The heritage listed Waterloo Congregational Church located at 103–105 Botany Road is within this street block but does not form a part of the Waterloo Metro Quarter Site boundaries.

The Waterloo Metro Quarter site (the site) is a rectangular shaped allotment and an overall site area of approximately 1.287 hectares.

The Waterloo Metro Quarter site comprises the following allotments and legal description at the date of this report. Following consolidation by Sydney Metro (the Principal) the land will be set out in deposited plan DP1257150.

- 1368 Raglan Street (Lot 4 DP 215751)
- 59 Botany Road (Lot 5 DP 215751)
- 65 Botany Road (Lot 1 DP 814205)
- 67 Botany Road (Lot 1 DP 228641)
- 124–128 Cope Street (Lot 2 DP 228641)
- 69–83 Botany Road (Lot 1, DP 1084919)
- 130–134 Cope Street (Lot 12 DP 399757)
- 136–144 Cope Street (Lots A-E DP 108312)
- 85 Botany Road (Lot 1 DP 27454)
- 87 Botany Road (Lot 2 DP 27454)
- 89–91 Botany Road (Lot 1 DP 996765)
- 93–101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)
- 156–160 Cope Street (Lot 31 DP 805384)
- 107–117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 170–174 Cope Street (Lot 2 DP 205942).

The boundaries of the site the subject of the amending concept DA is identified at Figure 5.1. The site is reasonably flat with a slight fall to the south.

The site previously included three to five storey commercial, light industrial and shop top housing buildings. All previous structures except for an office building at the corner of Botany Road and Wellington Street have been demolished to facilitate construction of the new Sydney Metro Waterloo station. As such the existing site is predominately vacant and being used as a construction site.

Construction of the Sydney metro is currently underway on site in accordance with critical State significant infrastructure approval (CSSI 7400).

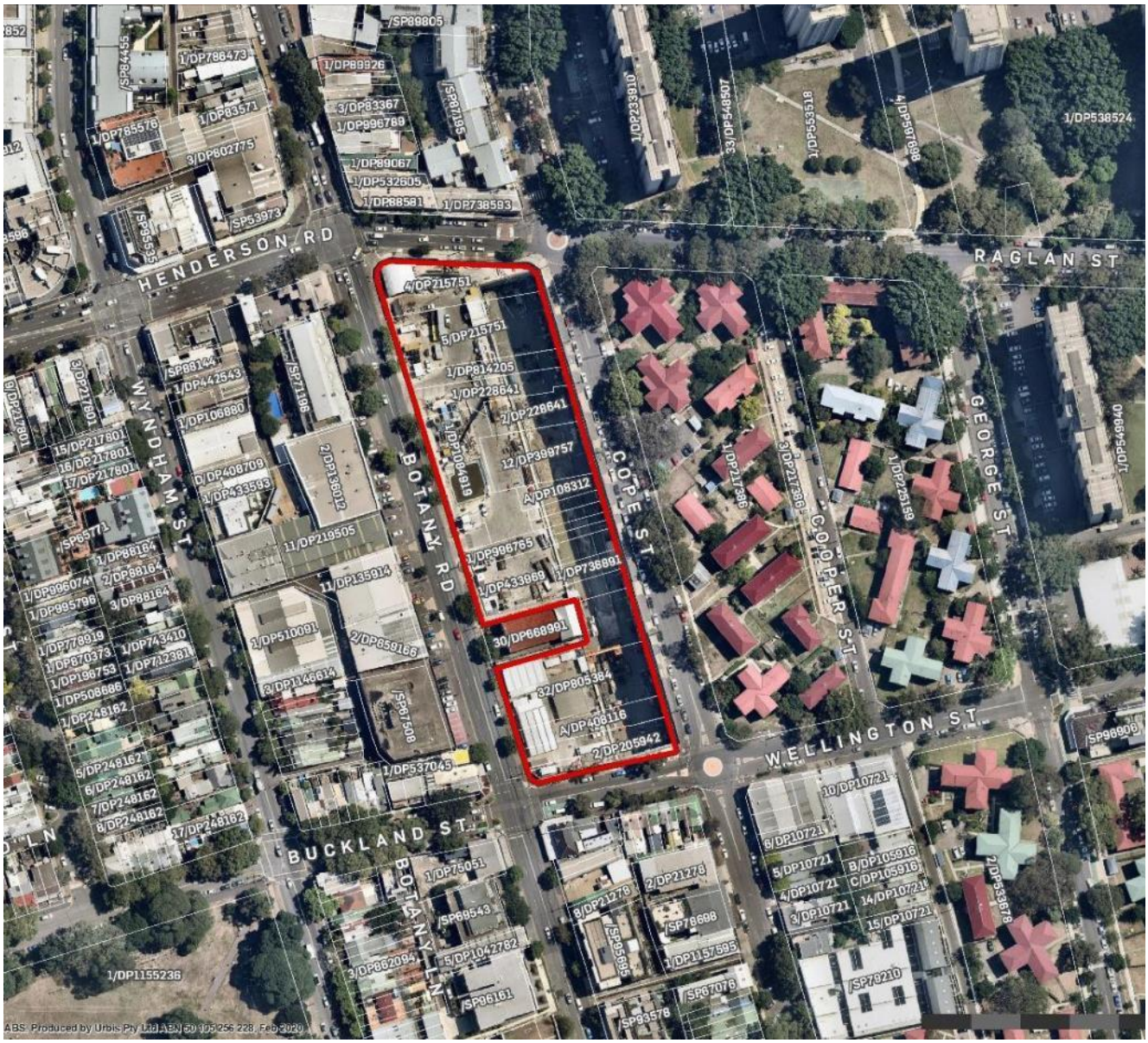


Figure 1 - Aerial of the site
Source: Urbis

The area surrounding the site consists of commercial premises to the north, light industrial and mixed-use development to the south, residential development to the east and predominantly commercial and light industry uses to the west.

5. Background

5.1 About Sydney Metro

Sydney metro is Australia's biggest public transport project. Services started in May 2019 in the city's North-west with a train every four minutes in the peak. A new standalone railway, this 21st century network will revolutionise the way Sydney travels. There are four core components:

5.1.1 Sydney Metro North West

This project is now complete and passenger services commenced in May 2019 between Rouse Hill and Chatswood, with a metro train every four minutes in the peak. The project was delivered on time and $1 billion under budget.

5.1.2 Sydney Metro City & Southwest

Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of Metro Northwest at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.

Sydney Metro City & Southwest will deliver new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition, it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.

5.1.3 Sydney Metro West

Sydney Metro West is a new underground railway connecting Greater Parramatta and the Sydney CBD. This once-in-a-century infrastructure investment will transform Sydney for generations to come, doubling rail capacity between these two areas, linking new communities to rail services and supporting employment growth and housing supply between the two CBDs.

The locations of seven proposed metro stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays.

The NSW Government is assessing an optional station at Pyrmont and further planning is underway to determine the location of a new metro station in the Sydney CBD.

5.1.4 Sydney Metro Greater West

Metro rail will also service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new railway line will become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service. The Australian and NSW governments are equal partners in the delivery of this new railway.

The Sydney Metro project is illustrated in Figure 2.

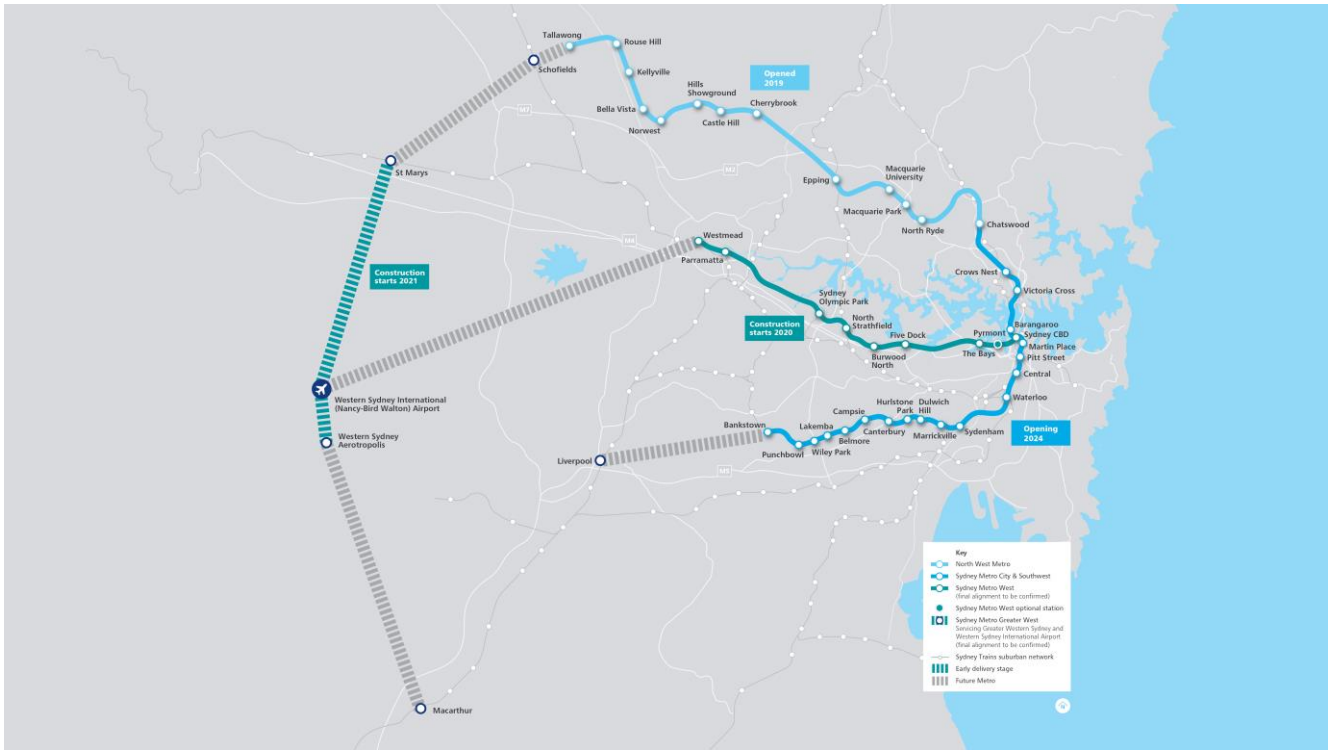


Figure 2 - Sydney Metro alignment map
Source: Sydney Metro

5.2 Sydney Metro CSSI Approval (SSI 7400)

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham project as a critical State significant infrastructure (CSSI) project (reference SSI 7400) (CSSI approval). The terms of the CSSI approval includes all works required to construct the Sydney Metro Waterloo Station. The CSSI approval also includes the construction of below and above ground works within the metro station structure for appropriate integration with the OSD.

With regards to CSSI related works, any changes to the 'metro station box' envelope and public domain will be pursued in satisfaction of the CSSI conditions of approval and do not form part of the scope of the concept SSD DA or detailed SSD DA for the OSD.

Except to the extent described in the EIS or Preferred Infrastructure Report (PIR) submitted with the CSSI application, any OSD buildings and uses do not form part of the CSSI approval and will be subject to the relevant assessment pathway prescribed by the EP&A Act.

The delineation between the approved Sydney metro works, generally described as within the two 'metro station boxes' and surrounding public domain works, and the OSD elements are illustrated in Figure 3.

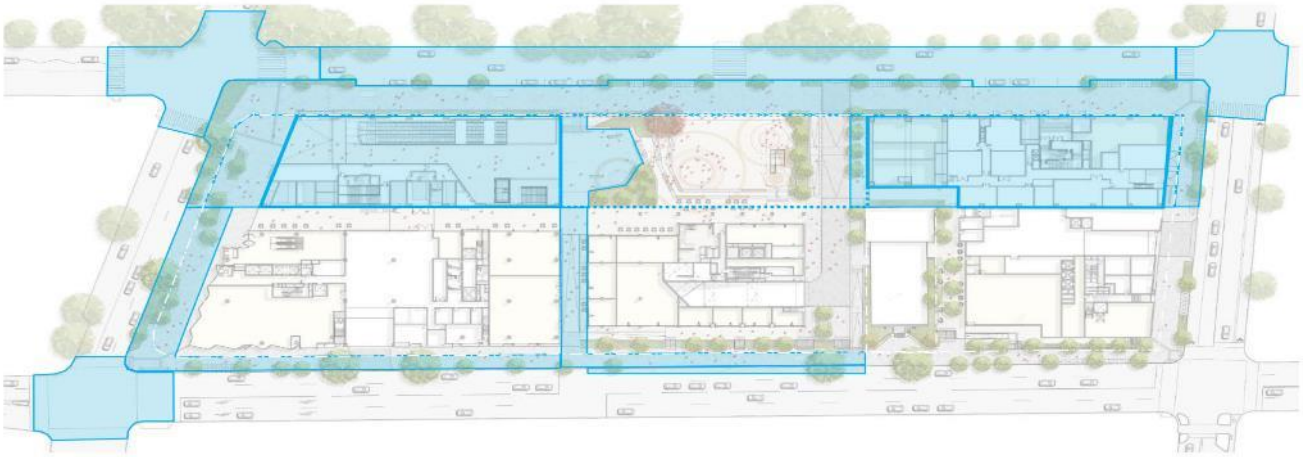


Figure 3 - CSSI Approval scope of works
Source: WL Developer Pty Ltd

5.3 Concept Approval (SSD 9393)

As per the requirements of clause 7.20 of the *Sydney Local Environmental Plan 2012* (SLEP), as the OSD exceeds a height of 25 metres above ground level (among other triggers), development consent is first required to be issued in a concept DA (formerly known as Stage 1 DA).

Development consent was granted on 10 December 2019 for the concept SSD DA (SSD 9393) for the Waterloo Metro Quarter OSD including:

- a maximum building envelope for podium, mid-rise and tower buildings
- a maximum gross floor area of 68,750sqm, excluding station floor space
- conceptual land use for non-residential and residential floor space
- minimum 12,000sqm of non-residential gross floor area including a minimum of 2,000sqm of community facilities
- minimum 5% residential gross floor area as affordable housing dwellings
- 70 social housing dwellings
- basement car parking, motorcycle parking, bicycle parking, and service vehicle spaces.

This concept DA has been prepared and submitted to the DPIE and proposes to make modifications to the approved building envelopes at the northern precinct and central building. This amending concept SSD DA does not impact the proposed development within the southern precinct.

A concurrent detailed SSD DA will seek development consent for the OSD located within the southern precinct of the site, consistent with the parameters of the original concept approval. Separate SSD DAs have been prepared and will be submitted for the northern precinct, central building, and basement proposed across the Waterloo Metro Quarter site consistent with the amending concept DA.

6. Proposed development

The amending concept DA seeks consent for an amended building envelope and description of development for the northern precinct of the Waterloo Metro Quarter site approved under SSD 9393. Specifically, the proposal seeks to modify the approved building envelope for the northern precinct (previously comprising 'Building A', 'Building B', 'Building C' and 'Building D' under SSD 9393) through:

- increasing the maximum building height for the southern portion of the Northern Precinct from RL56.2 to RL72.60
- removing the 'tower component' of the Northern Precinct, reducing the overall height of the tower envelope from RL116.9 to RL90.40, to enable the redistribution of floor space to commercial office floor plates
- amending the description of development to refer to a mid-rise (approximately 17 storey) commercial office building, comprising approximately 34,125sqm of commercial office floor space within the northern portion of the site, rather than a third residential tower.

The concept DA seeks to modify the central building approved building envelope (previously comprising 'Building E' under SSD 9393) through:

- modifying the eastern extent of the podium envelope.

The modification of the approved concept SSD DA will enable the detailed design of a new commercial building (comprising office and retail premises) to be pursued on the site, significantly increasing the proportion of employment generating floor space on the Waterloo Metro Quarter site. This new commercial building is proposed in replacement of four building envelopes approved under SSD 9393, which comprised one residential tower, and three mid-rise residential buildings.

This proposal will not exceed the permissible building height for the site under the SLEP or the maximum height approved under SSD 9393. As noted above, separate detailed SSD DA(s) will be lodged concurrently for the detailed design, construction and operation of the northern precinct, and central building.

This amending concept DA does not propose to the amend the original concept approval as it relates to the southern precinct.

7. Methodology

An assessment has been undertaken to determine the effect of the proposed development on the contribution of additional shadowing to the nearby parks, specifically Alexandria Park, as well as neighbours including the Waterloo Heritage Precinct, and a proposed public pedestrian plaza fronting Cope Street. The analysis was based on computational 3D modelling of the proposed development and its surrounding context combined with climate data for Sydney.

The Approved Envelope causes significant overshadowing to the neighbouring properties and plaza. For the purposes of this assessment, and to support the proposed amendment to this envelope a reference scheme that is wholly contained within the proposed amended envelope (Proposed Detailed Design Scheme) has been assessed to demonstrate the ability for a detailed scheme to comply with the WMQ Design and Amenity Guidelines with the Reference Design Scheme for the Approved Envelope included for reference. The onus remains on the Detailed Applications to demonstrate overall compliance.

The analysis was conducted using RWDI's in-house proprietary Eclipse software, as per the steps outlined below:

- The assessment began with the development of a 3D model of the area of interest (as shown in Figure 4). This includes LIDAR data for the area to account for topographic changes, with calibration to survey plans for the area (provided by Veris, dated 20 April 2020, included as Appendix 1). The park spaces and the ground were then subdivided into many triangular patches approximately 0.125 m² in area (see Figure 5).
- At 15-minute increments from 9:00am to 3:00pm on June 21, the expected solar position was determined, and "virtual rays" were drawn from the sun to each triangular patch of the park surfaces. Any rays which were not obstructed by a building are considered exposed to direct sunlight.
- This analysis is conducted with and without the proposed building and the results subtracted to compute the total minutes of net-new shadowing caused by the proposed development (i.e. not including existing shadows) on the park during this period.
- Point-in-time shadow diagrams at the 15-minute increments for the 21st of December (Summer Solstice), March (Autumn Equinox), and June (Winter Solstice) were also generated for a large area around the site.

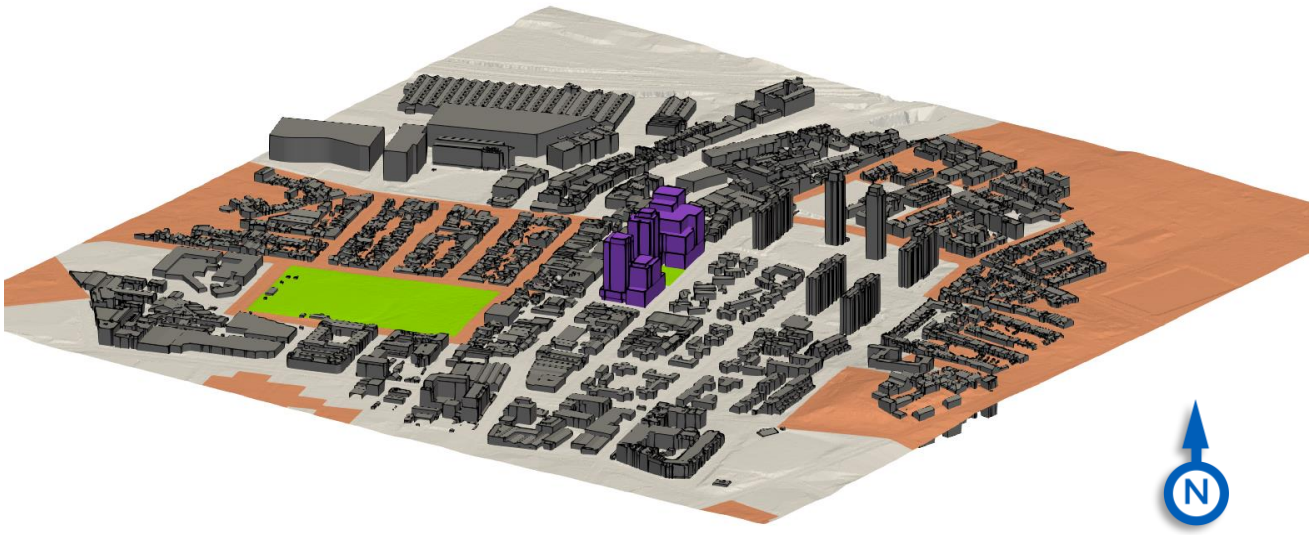


Figure 4 - 3D Computer Model of the Proposed Building (purple), Key Park Surfaces (green), Waterloo Heritage Precinct (orange), and Surrounding Urban Context (grey)

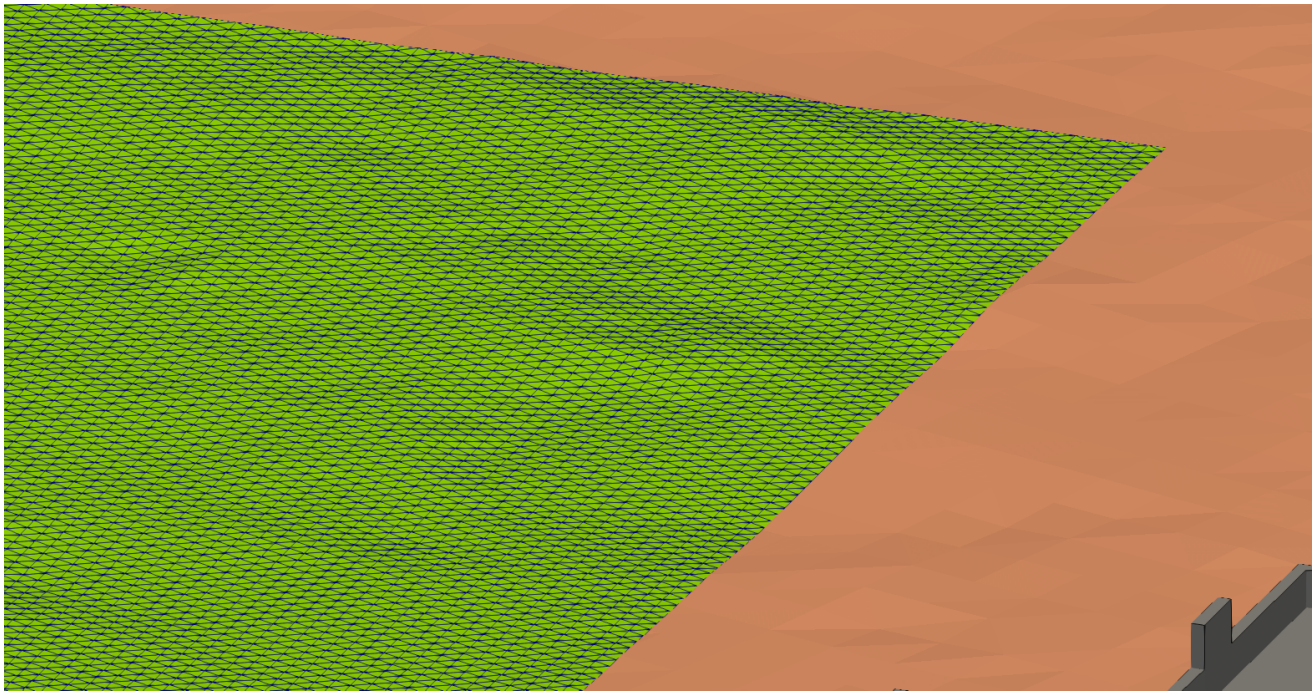


Figure 5 Close-up View of a Park Surface, Showing Surface Subdivisions

7.1 Assumptions and Limitations

Meteorological Data
This model has been geolocated to a reference latitude and longitude of (-33.89778, 151.2000).

Study Building and Surrounds Models
The analysis was conducted based on information provided by Bates Smart, Hassell, and Woods Bagot, and Waterloo Developer to RWDI as listed in Section 10 of this report. The surrounds and local topography were developed using a combination of survey and other data provided to RWDI by the design team and confirmed with LIDAR data. The spatial relationship between the development site and Alexandria Park and elevations of the park were confirmed based on the survey provided by Veris, dated 20 April 2020, included as Appendix 1. All data which was provided in MGA coordinates have been corrected to true north for the purposes of this study.

All elements of the proposed buildings have been treated as fully opaque to light and any shading provided by vegetation (i.e., trees) was neglected. Figure 6 illustrates the 3D model used in this study and Figure 7 presents approximate spot heights of the buildings investigated.

Applicability of Results
The results presented in this report are highly dependent on the form of the proposed development. Should there be any changes to the design of the building, it is recommended that RWDI be contacted and requested to review their potential effects on the findings of this report.

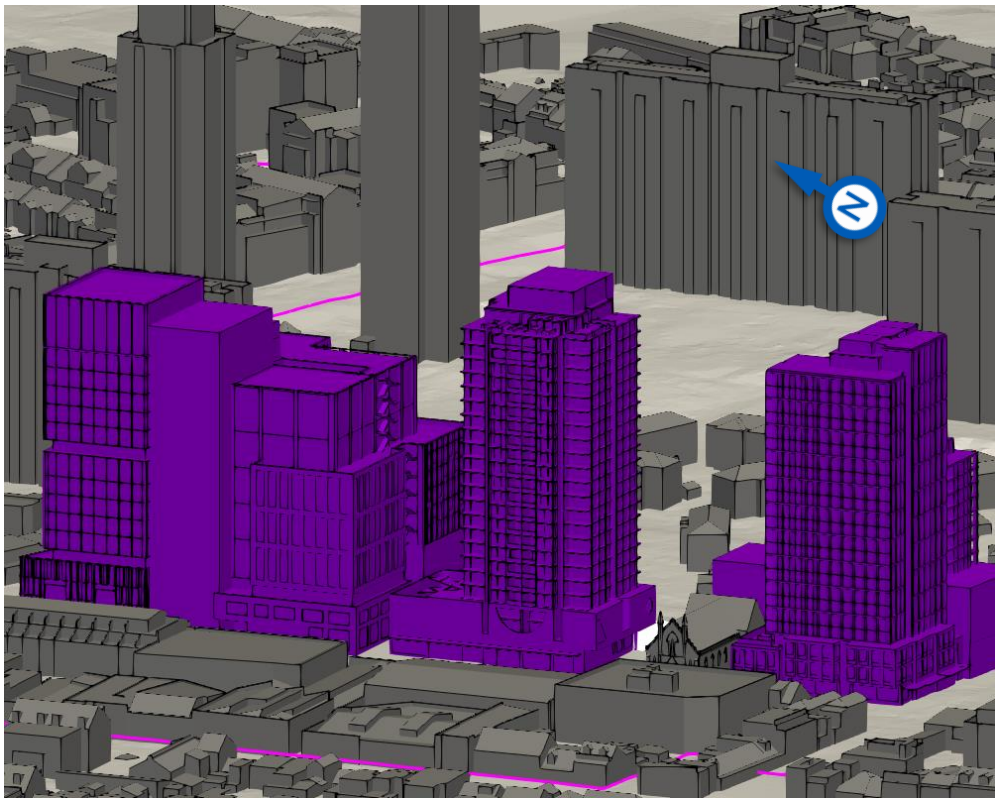


Figure 6 Close-up View of the Proposed Development

7.2 Overshadowing Objectives & Criteria

The Waterloo Metro Quarter Design and Amenity Guidelines FINAL (March 2020) provide guidance on the acceptable level of shadow impact by the development. The following Objectives and Criteria are stipulated:

Section 3M Solar access and amenity

- Objectives
  - **Objective 1** - Ensure solar access to the public domain on the site including Cope St Plaza and Raglan St Plaza
  - **Objective 2** - Minimise overshadowing on Alexandria Park and the wider public domain
- Design Criteria
  - **Design Criteria 1** - The development does not result in any additional overshadowing of Alexandria Park after 10am on 21 June
  - **Design Criteria 2** - No more than 30% of Alexandria Park excluding the oval is overshadowed by the development as measured at any time after 9am on 21 June.
  - **Design Criteria 3** - Proposed apartments in a development and neighbouring developments including the Waterloo Heritage Precinct must achieve a minimum of 2 hours direct sunlight between 9am and 3pm on 21 June onto at least 1m² of living room windows and a minimum 50% of the required minimum area of private open space area. Note: This applies to at least 70% of the apartments in a development in accordance with the NSW Apartment Design Guide.
  - **Design Criteria 4** - The new development does not create any additional overshadowing onto a neighbouring dwelling where that dwelling currently receives less than 2 hours direct sunlight to habitable rooms and 50% of the private open space between 9am and 3pm on 21 June.

Design criteria for Cope Street Plaza states:

- **Section 3C Public Domain**
  - **Design Criteria** 4 - At least 50 percent of the area of the Cope Street plaza receives at least two hours sunlight between 9am and 3pm on 21 June.

The results of the analysis regarding these requirements is presented for each space (Alexandria Park, Cope Street Plaza, Waterloo Heritage Precinct and other neighbouring buildings) in the following sections.

8. Assessment and findings

8.1 Approved DA Envelope Design and Proposed Scheme

Comparison is made between the Approved DA Envelope Design Scheme and the Amended Envelope in Figure 7 below. The Proposed Design Scheme has responded to the Objectives and Criteria of the Waterloo Metro Quarter Design and Amenity Guidelines FINAL (March 2020) in order to improve overshadowing to the neighbours.

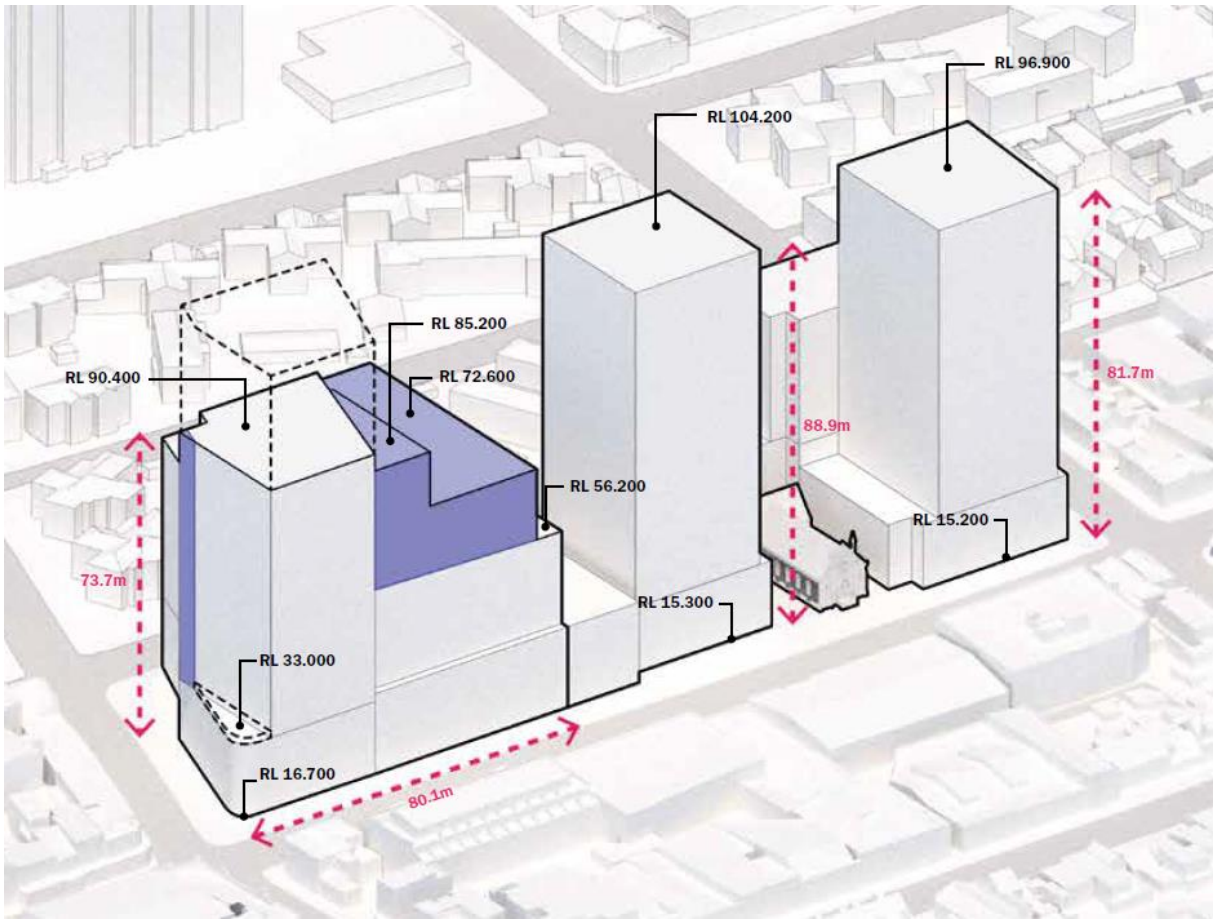


Figure 7 – Comparison of Approved DA Envelope and Amended Envelope (Amendments Highlighted)

Objective 2 of Section 3M (Solar access and amenity) of the Waterloo Metro Quarter Design and Amenity Guidelines FINAL (March 2020) requires minimising the overshadowing on Alexandria Park and the wider public domain. The detailed design of the development incorporates initiatives to minimise overshadowing on Alexandria Park and nearby developments including:

- A reduction in the height of Building 2 as compared to the approved envelope by approximately 6 m on east side and approximately 12 m on the west and south; and,
- A reduction in the height of Building 3 as compared to the approved envelope by approximately 3.5 m on the east side and approximately 10 m on west and south.

Objective 1 of Section 3M (Solar access and amenity) of the Waterloo Metro Quarter Design and Amenity Guidelines FINAL (March 2020) seeks to ensure solar access to the public domain on the site including Cope Street Plaza and Raglan Street Plaza. The detailed design of the development incorporates initiatives to achieve these objectives:

- Cope Street plaza sits on the eastern side of the site with the stepped form of the northern station box and Building 1 to the north and Building 2 to the west, as such is exposed primarily to morning sunlight.
- Raglan Street Plaza sits along the north side of Building 1 and the northern station box, as such is minimally impacted by the proposed development in terms of solar access.

Results of the technical assessments to demonstrate the performance of the spaces with respect to the objectives and criteria are discussed in the following sections. Reference is made to the improvement in performance compared to the Approved DA Envelope Design Scheme as applicable.

8.2 Cumulative impacts

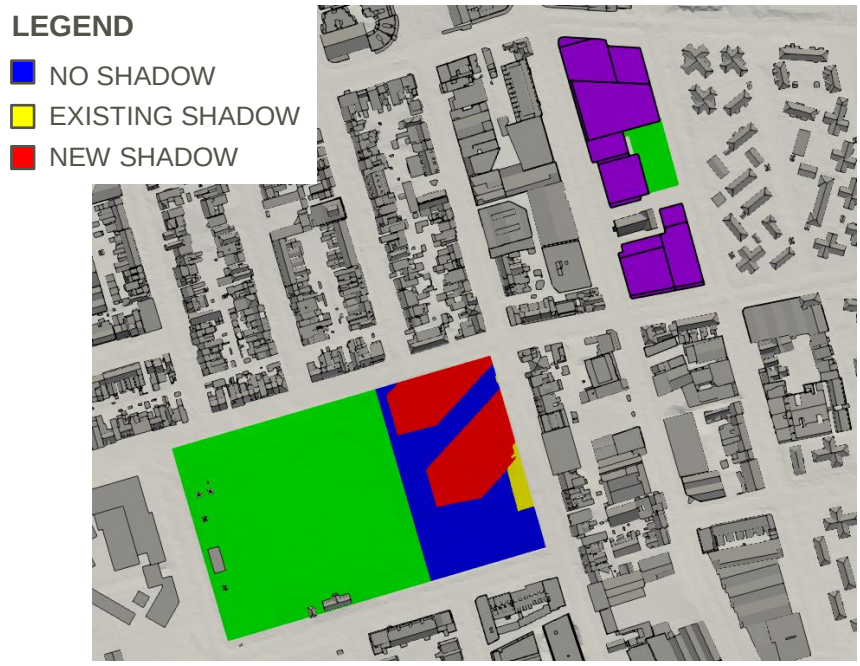
Overshadowing impacts have been considered cumulatively for the entire development, as summarised in the following sections.

8.2.1 Alexandria Park

The criteria that needs to be met for Alexandria Park are:

- **Design Criteria 1** - The development does not result in any additional overshadowing of Alexandria Park after 10am on 21 June
- **Design Criteria 2** - No more than 30% of Alexandria Park excluding the oval is overshadowed by the development as measured at any time after 9am on 21 June

Table 2 summarizes the results of the point-in-time shadow analysis (plots of which can be found in Appendix 2). The table presents the percentage of new shadow resulting from the proposed development landing on Alexandria Park (excluding the oval) for the Approved Envelope, the Reference Design Scheme for the Approved Envelope, and the Proposed Detailed Design Scheme contained wholly within the Amended Envelope. A comparison of the overshadowing onto Alexandria Park at 9:00 AM on 21 June is shown in Figure 8. These figures do not include the impact of any existing overshadowing.



Approved DA Envelope Design Scheme

41.50% Overshadowing of Alexandria Park at 9:00 AM on 21 June

Reference Design Scheme for the Approved Envelope

32.30% Overshadowing of Alexandria Park at 9:00 AM on 21 June

Proposed Detailed Design Scheme (Contained Within Amended Envelope)
29.94% Overshadowing of Alexandria Park at 9:00 AM on 21 June

Figure 8 - Comparison of 21 June 9:00 AM Overshadowing on Alexandria Park

Time (AEST)	Approved Envelope 21 June	Reference Scheme for the Approved Envelope 21 June	Detailed Design Contained Within Amended Envelope 21 June
9:00	41.50%	32.30%	29.94%
9:15	27.41%	22.62%	18.39%
9:30	14.86%	12.85%	7.67%
9:45	4.99%	4.36%	0.62%
10:00	0.00%	0.11%	0.00%
10:15 – 15:00	0.00%	0.00%	0.00%

Table 2 - Shadowed Percentage of Alexandria Park (excluding the oval)

The simulations show that for the Proposed Detailed Design Scheme (contained wholly within the Amended Envelope), there is no additional overshadowing of Alexandria Park after 10:00 am on 21 June, and that no more than 30% of Alexandria Park (excluding the oval) is overshadowed by the development after 9:00 am. For comparison, the Approved DA Envelope Design Scheme and the Reference Design for the Approved Envelope both exhibit greater amounts of overshadowing at 9:00 am, and in fact the

Reference Scheme for the Approved Envelope which was supposed to sit within the Approved Envelope, actually breached the envelope as demonstrated by the slight overshadowing of Alexandria Park at 10:00 am.

Therefore, the proposed Amended Envelope allows for a design which will be compliant with the criteria stipulated for Alexandria Park and improves the amount of sunlight available to Alexandria Park as compared to the proposed Amended Envelope.

8.2.2 Cope Street Plaza

The criterion that needs to be met for Cope Street Plaza is:

- **Design Criteria 4** - At least 50 percent of the area of the Cope Street plaza receives at least two hours sunlight between 9am and 3pm on 21 June.

As was undertaken for Alexandria Park, solar simulations at 1-minute increments were conducted for 21 June to understand the total potential minutes of direct solar exposure in the plaza.

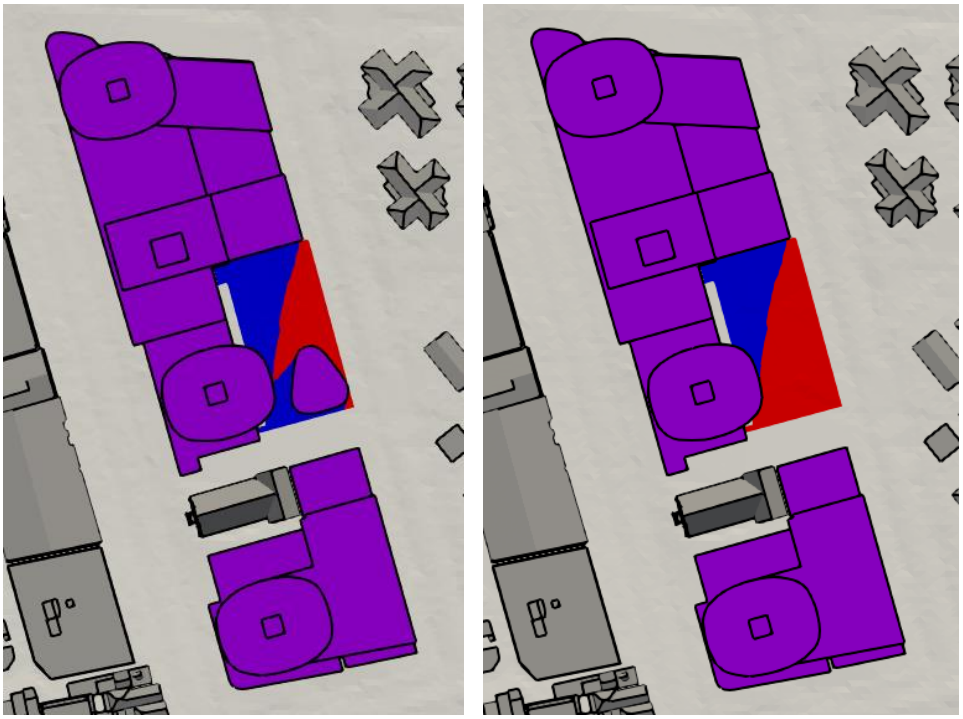
The simulations confirm that the criterion is met for Cope Street Plaza. Figure 9 shows the area in Cope Street Plaza which was predicted to receive at least two hours of sunlight between 9:00 am and 3:00 pm. This amounts to 52.9% of the total area achieved for the for the Approved DA Envelope Design Scheme, 60.1% for the Reference Design Scheme for the Approved Envelope (excluding the pavilion), and 57.3% for the Proposed Detailed Design Scheme which is contained wholly within the Amended Envelope. This demonstrates that the proposed amended envelope allows for notable increase in solar access to Cope Street Plaza above the criterion as compared to the Approved DA Envelope Design Scheme.

Figure 10 shows point-in-time shadow plots with the percentage of area receiving sunlight at 15-minute increments to demonstrate the overall availability of sunlight at the winter solstice for the Proposed Detailed Design Scheme, which sits within the proposed amended envelope. These images show that sunlight is generally available in the morning hours between 9:15 and 11:15 AM when the 50% criterion is achieved, with afternoon hours mostly in shadow.

Point-in-time shadow plots were also generated for the winter solstice and can be found in Appendix 3.

Approved DA Envelope Design Scheme

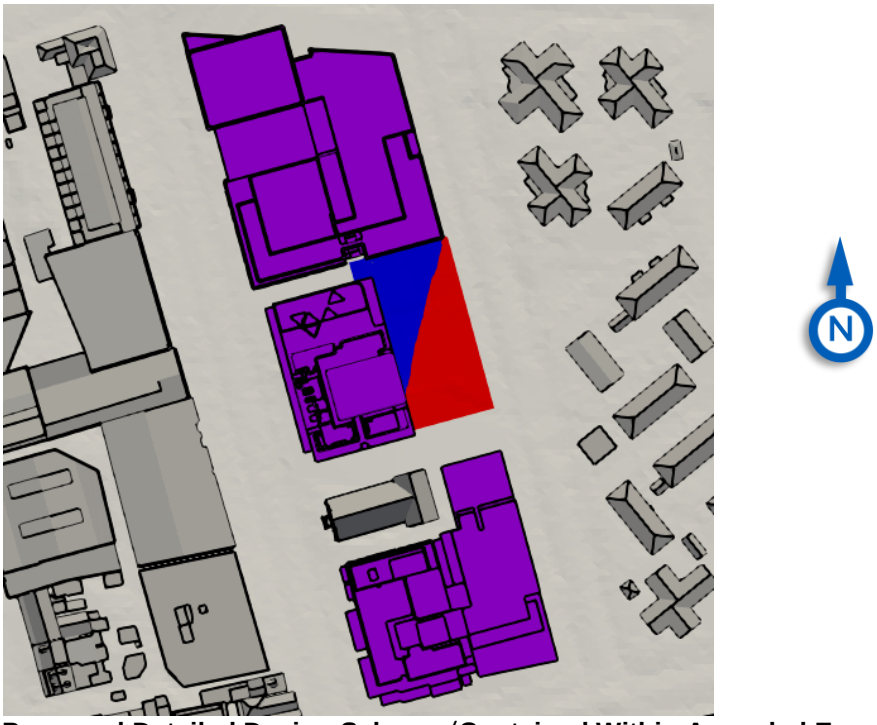
52.9% of Cope Street Plaza achieves at least 2 hours of sunlight



Reference Scheme for the Approved Envelope

30.5% of Cope Street Plaza achieves at least 2 hours of sunlight (including pavilion)

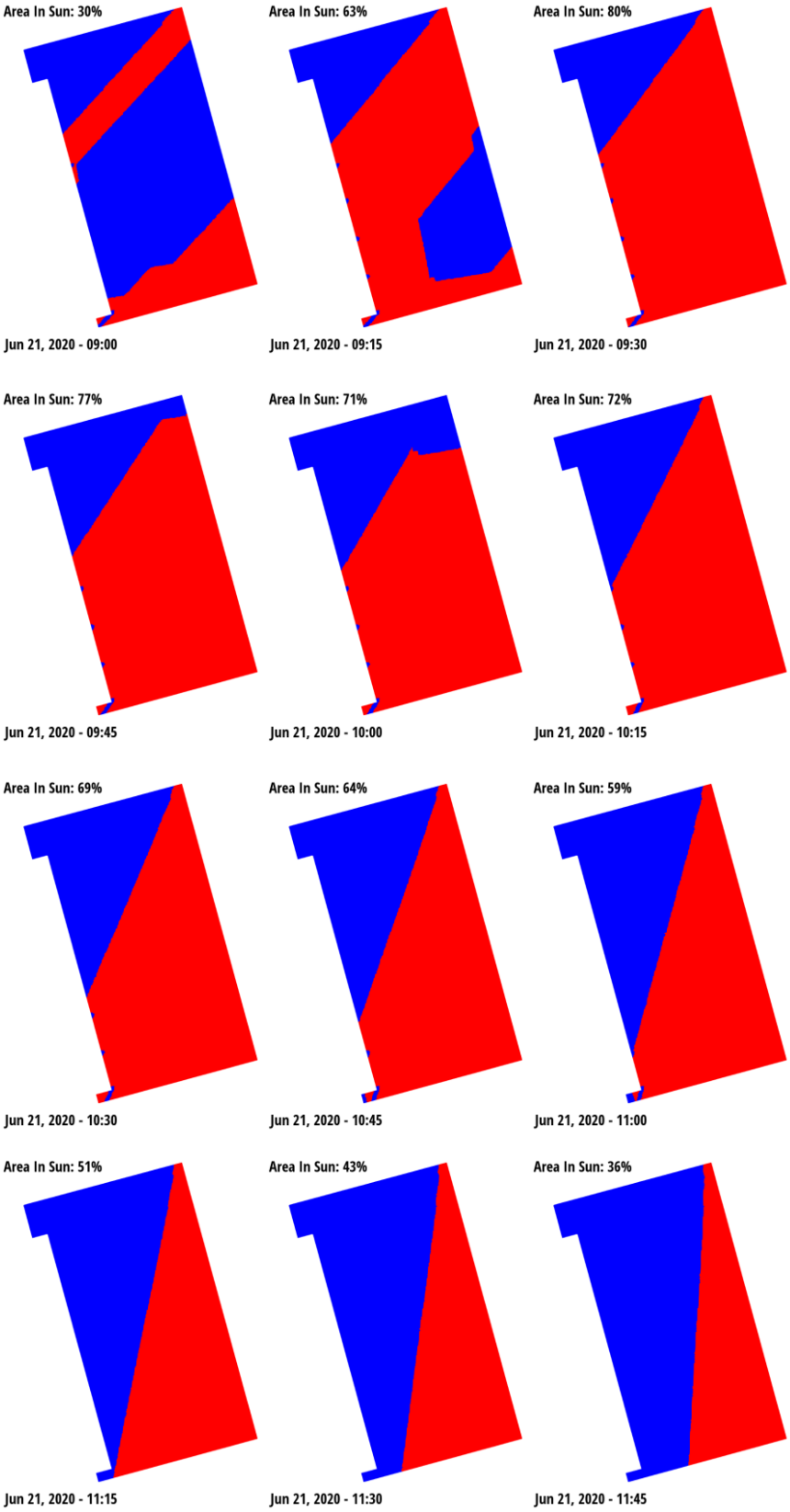
60.1% of Cope Street Plaza achieves at least 2 hours of sunlight (excluding pavilion)



Proposed Detailed Design Scheme (Contained Within Amended Envelope)

57.3% of Cope Street Plaza achieves at least 2 hours of sunlight

Figure 9 - Area in Cope Street Plaza where Direct Solar Access is Available Above 2 Hours (red).



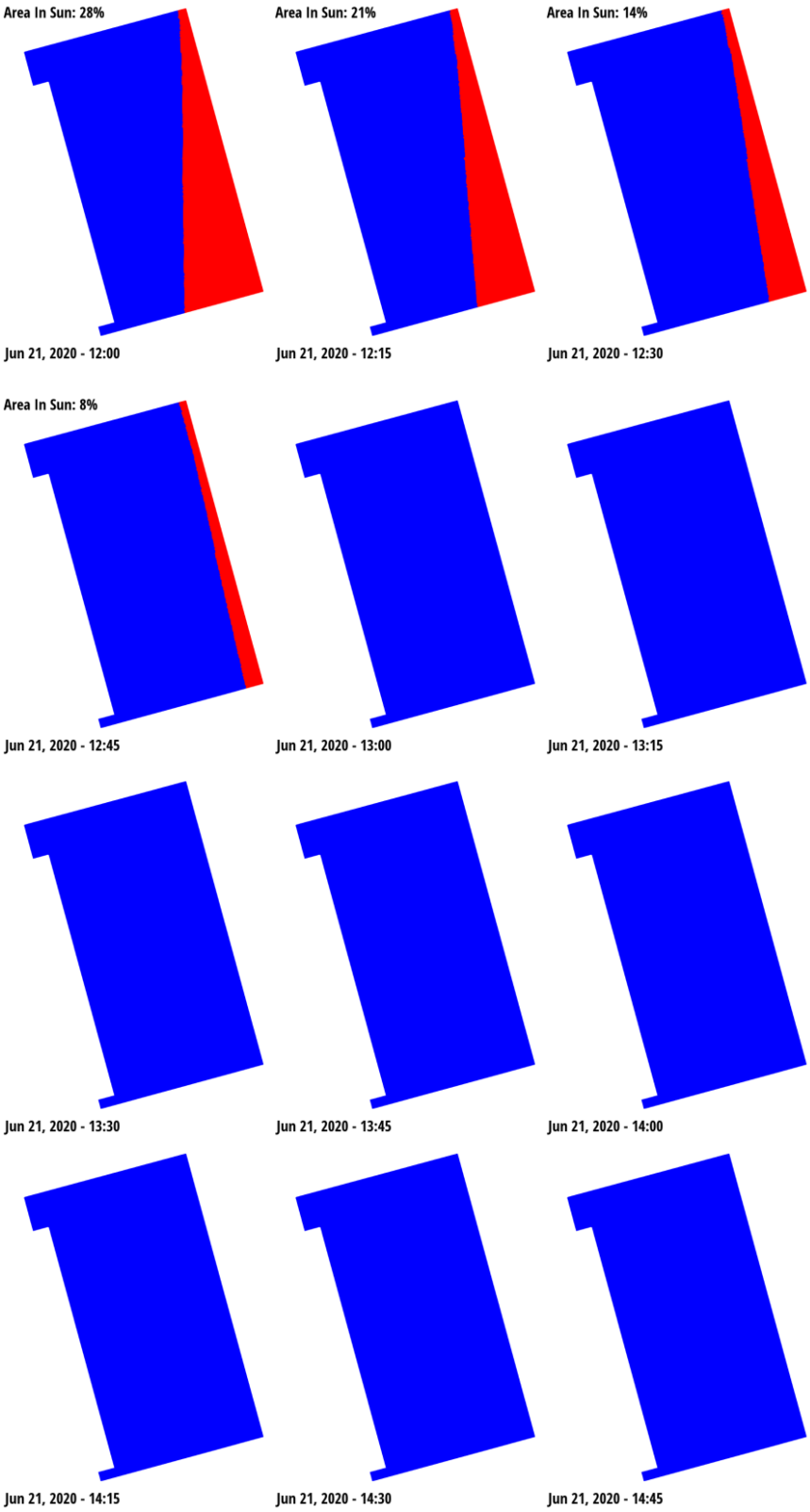


Figure 10 - Area in Cope Street Plaza where Direct Solar Access is Available (red).

8.2.3 Neighbouring Developments and Waterloo Heritage Precinct

The criteria that needs to be met for neighbouring developments and the Waterloo Heritage Precinct are:

- **Design Criteria 3** - Proposed apartments in a development and neighbouring developments including the Waterloo Heritage Precinct must achieve a minimum of 2 hours direct sunlight between 9am and 3pm on 21 June onto at least 1m² of living room windows and a minimum 50% of the required minimum area of private open space area. Note: This applies to at least 70% of the apartments in a development in accordance with the NSW Apartment Design Guide.
- **Design Criteria 4** - The new development does not create any additional overshadowing onto a neighbouring dwelling where that dwelling currently receives less than 2 hours direct sunlight to habitable rooms and 50% of the private open space between 9am and 3pm on 21 June.

Solar simulations at 1-minute increments were conducted for 21 June to understand the total potential minutes of direct solar exposure at grade with and without the proposed development in place. Figure 11 illustrates (in red) areas at grade which received 2 hours of sun under the existing condition, which do not under the proposed condition. This analysis was conducted for the Approved DA Envelope Design Scheme, the Reference Scheme for the Approved Envelope, and the Proposed Detailed Design Scheme contained wholly within the Amended Envelope.

The simulations indicate that under the Proposed Detailed Design Scheme it is primarily the areas immediately south of the proposed development where the impact can occur, and that no areas within the Heritage Precinct which currently receive 2 hours of direct sunlight experience a reduction to below 2 hours. Conversely, the Approved DA Envelope Design Scheme and Reference Design Scheme for the Approved Envelope were predicted to create areas within the Heritage Precinct that see reductions below 2 hours.

The size of the grade level areas impacted by the Approved DA Envelope Design Scheme along Wellington St. and Botany Rd. in particular are also larger compared to the Proposed Detailed Design Scheme. The Proposed Detailed Design Scheme reduced the total impacted area compared to the Approved DA Envelope Design Scheme by approximately 1,330 m², or approximately 12%. This demonstrates that the Amended Envelope allows for notable improvement of sunlight to the neighbouring developments and Waterloo Heritage Precinct as compared to the Approved DA Envelope Design Scheme

Approved DA Envelope Design Scheme

Reference Design Scheme for the Proposed Envelope

Figure 11 - Grade Level Areas Where Direct Solar Access is Reduced from At or Above 2 Hours to Less Than 2 Hours on 21 June

An annual assessment of potential sunlight hours on the ground was also conducted to provide an understanding of sunlight impacts during other times of year. Figure 12 illustrates the total hours of potential sunlight gained under the Proposed Detailed Design Scheme (contained wholly within the amended envelope) compared to the Approved DA Envelope Design Scheme. Note that areas with gains below 50 hours per year equate to approximately 1% of daytime hours or less, and are not shown in the interest of clarity.

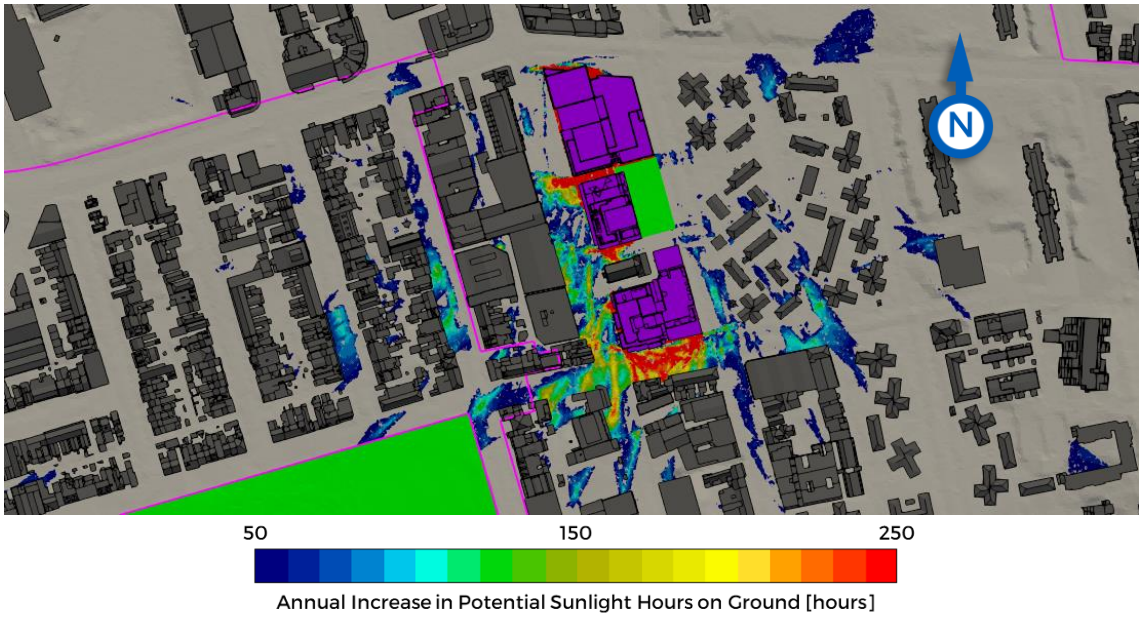


Figure 12 - Annual Increase in Potential Sunlight Hours on Ground Due to Proposed Detailed Design Scheme Compared to Approved DA Envelope Design Scheme

This diagram better illustrates the benefits of Amended Envelope (through the Detailed Design Scheme contained within it) by including a wider range of possible solar positions compared to the uniformly low elevation sun angles found in the 21 June analysis. Improvements in solar access were predicted up to 450 m away, though the majority of the improvement is confined to a radius of approximately 250 m.

Along Botany Rd. the Proposed Detailed Design Scheme increases potential solar access at grade by between 50 and 200 hours per year. Along Wellington St. increases up to 300 hours per year were predicted.

Overall, RWDI would expect the Amended Envelope to have a minimal impact on solar access to the residences in the Heritage Precinct and an impact on other neighbouring buildings that is lower than that of the Approved DA Envelope Design Scheme.

Appendix 4 contains point-in-time shadow diagrams for 21 June over a wide area surrounding the project to clarify when and where shadows can fall in the surrounding vicinity. Sun view diagrams are shown in Appendix 7.

9. Conclusion

The proposed Amended Envelope has significantly reduced over-shadowing on the neighbouring properties and public open space, in particular the Waterloo Heritage Precinct. The overshadowing caused by the proposed development was found to comply with the Waterloo Metro Quarter Design and Amenity Guidelines FINAL (March 2020). The conclusions in respect of the individual areas assessed are summarised below.

Alexandria Park

- The Amended Envelope has significantly reduced overshadowing of Alexandria Park as demonstrated by the Detailed Design Scheme contained wholly within the Amended Envelope.
- The Amended Envelope allows for a Detailed Design Scheme which will not create new shadowing on Alexandria Park between 10:00 am and 3:00 pm on 21 June; and not exceed the 30% overshadowing of Alexandria Park at 9:00 am.

Cope Street Plaza

- The Amended Envelope significantly improves the amount of sunlight onto Cope Street Plaza as compared to the Approved DA Envelope as demonstrated by the Detailed Design Scheme contained wholly within the Amended Envelope.
- The Amended Envelope allows for a Detailed Design Scheme which achieves 2 hours of direct sunlight between 9 am and 3 pm on June 21 on over 50% of Cope Street Plaza.

Neighbouring Developments and Waterloo Heritage Precinct

- The Amended Envelope has significantly reduced overshadowing of the Waterloo Heritage Precinct and other neighbouring developments as demonstrated by the Detailed Design Scheme contained wholly within the Amended Envelope.

Point-in-time shadow diagrams for the autumn equinox (21 March) and the summer solstice (21 December) have been included in Appendices 4 and 5 for further reference.

10. Applicability of Results

The drawings and information listed below were received from Woods Bagot, Hassell, and Bates Smart. The findings presented in this report pertain to the proposed design as detailed in the architectural design drawings listed in the table below. Should there be any design changes that deviate from this list of drawings, the predictions presented may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted.

File Name	File Type	Date Received (dd/mm/yyyy)
Building 1 (Woods Bagot)		
WMQ-SITE-HAS-UD-MDL-0005	DWG	12/06/2020
WMQ-BLD1-WBG-AR-DRG-DA001-dwg[B]	DWG	28/07/2020
WMQ-BLD1-WBG-AR-DRG-DA002-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA003-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA091-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA092-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA100-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA100M-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA101-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA102-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA103-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA104-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA105-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA108-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA109-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA110-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA113-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA114-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA115-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA116-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA117-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA121-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA122-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA123-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA124-dwg[B]		
WMQ-BLD1-WBG-AR-DRG-DA131-dwg[B]		

File Name	File Type	Date Received (dd/mm/yyyy)
WMQ-BLD1-WBG-AR-DRG-DA132-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA133-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA134-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA141-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA142-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA143-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA144-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA145-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA146-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA147-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA148-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA149-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA190-dwg[B] WMQ-BLD1-WBG-AR-DRG-DA191-dwg[B]		
Building 2 (Hassell)		
WMQ-SITE-HAS-UD-MDL-0005	DWG	12/06/2020
WMQ-BLD2-HAS-AR-DRG-DA001 WMQ-BLD2-HAS-AR-DRG-DA002 WMQ-BLD2-HAS-AR-DRG-DA010 WMQ-BLD2-HAS-AR-DRG-DA011 WMQ-BLD2-HAS-AR-DRG-DA012 WMQ-BLD2-HAS-AR-DRG-DA013 WMQ-BLD2-HAS-AR-DRG-DA014 WMQ-BLD2-HAS-AR-DRG-DA015 WMQ-BLD2-HAS-AR-DRG-DA016 WMQ-BLD2-HAS-AR-DRG-DA017 WMQ-BLD2-HAS-AR-DRG-DA018 WMQ-BLD2-HAS-AR-DRG-DA019 WMQ-BLD2-HAS-AR-DRG-DA020 WMQ-BLD2-HAS-AR-DRG-DA021 WMQ-BLD2-HAS-AR-DRG-DA022 WMQ-BLD2-HAS-AR-DRG-DA023	DWG	29/07/2020

File Name	File Type	Date Received (dd/mm/yyyy)
WMQ-BLD2-HAS-AR-DRG-DA024		
WMQ-BLD2-HAS-AR-DRG-DA025		
WMQ-BLD2-HAS-AR-DRG-DA026		
WMQ-BLD2-HAS-AR-DRG-DA027		
WMQ-BLD2-HAS-AR-DRG-DA028		
WMQ-BLD2-HAS-AR-DRG-DA029		
WMQ-BLD2-HAS-AR-DRG-DA030		
WMQ-BLD2-HAS-AR-DRG-DA031		
WMQ-BLD2-HAS-AR-DRG-DA032		
WMQ-BLD2-HAS-AR-DRG-DA033		
WMQ-BLD2-HAS-AR-DRG-DA034		
WMQ-BLD2-HAS-AR-DRG-DA035		
WMQ-BLD2-HAS-AR-DRG-DA101		
WMQ-BLD2-HAS-AR-DRG-DA102		
WMQ-BLD2-HAS-AR-DRG-DA103		
WMQ-BLD2-HAS-AR-DRG-DA201		
WMQ-BLD2-HAS-AR-DRG-DA202		
WMQ-BLD2-HAS-AR-DRG-DA301		
WMQ-BLD2-HAS-AR-DRG-DA302		
WMQ-BLD2-HAS-AR-DRG-DA303		
WMQ-BLD2-HAS-AR-DRG-DA304		
WMQ-BLD2-HAS-AR-DRG-DA401		
WMQ-BLD2-HAS-AR-DRG-DA402		
WMQ-BLD2-HAS-AR-DRG-DA501		
WMQ-BLD2-HAS-AR-DRG-DA502		
WMQ-BLD2-HAS-AR-DRG-DA503		
WMQ-BLD2-HAS-AR-DRG-DA601		
WMQ-BLD2-HAS-AR-DRG-DA701		
WMQ-BLD2-HAS-AR-DRG-DA801		
WMQ-BLD2-HAS-AR-DRG-DA901		
WMQ-BLD2-HAS-AR-DRG-DA902		
Building 3 (Bates Smart)		
WMQ-SITE-HAS-UD-MDL-0005	DWG	12/06/2020

File Name	File Type	Date Received (dd/mm/yyyy)
WMQ-BLD3-BSA-AR-DRG-DA100-dwg_G WMQ-BLD3-BSA-AR-DRG-DA100M-dwg_F WMQ-BLD3-BSA-AR-DRG-DA101-dwg_F WMQ-BLD3-BSA-AR-DRG-DA102-dwg_F WMQ-BLD3-BSA-AR-DRG-DA103-dwg_F WMQ-BLD3-BSA-AR-DRG-DA106-dwg_F WMQ-BLD3-BSA-AR-DRG-DA116-dwg_D WMQ-BLD3-BSA-AR-DRG-DA123-dwg_F WMQ-BLD3-BSA-AR-DRG-DA124-dwg_F WMQ-BLD3-BSA-AR-DRG-DA125-dwg_F	DWG	28/07/2020
WMQ-BLD3-BSA-AR-DRG-DA140-dwg_C WMQ-BLD3-BSA-AR-DRG-DA141-dwg_C WMQ-BLD3-BSA-AR-DRG-DA142-dwg_C WMQ-BLD3-BSA-AR-DRG-DA143-dwg_C WMQ-BLD3-BSA-AR-DRG-DA150-dwg_E WMQ-BLD3-BSA-AR-DRG-DA151-dwg_F	DWG	29/07/2020
Building 4 (Bates Smart)		
WMQ-SITE-HAS-UD-MDL-0005	DWG	12/06/2020
WMQ-BLD4-BSA-AR-DRG-DA101-dwg_I WMQ-BLD4-BSA-AR-DRG-DA102-dwg_D WMQ-BLD4-BSA-AR-DRG-DA103-dwg_I WMQ-BLD4-BSA-AR-DRG-DA108-dwg_H WMQ-BLD4-BSA-AR-DRG-DA109-dwg_H WMQ-BLD4-BSA-AR-DRG-DA110-dwg_G	DWG	28/07/2020
WMQ-BLD4-BSA-AR-DRG-DA140-dwg_D WMQ-BLD4-BSA-AR-DRG-DA141-dwg_D WMQ-BLD4-BSA-AR-DRG-DA142-dwg_D WMQ-BLD4-BSA-AR-DRG-DA143-dwg_D WMQ-BLD4-BSA-AR-DRG-DA150-dwg_H WMQ-BLD4-BSA-AR-DRG-DA151-dwg_B WMQ-BLD4-BSA-AR-DRG-DA160-dwg_E	DWG	29/07/2020

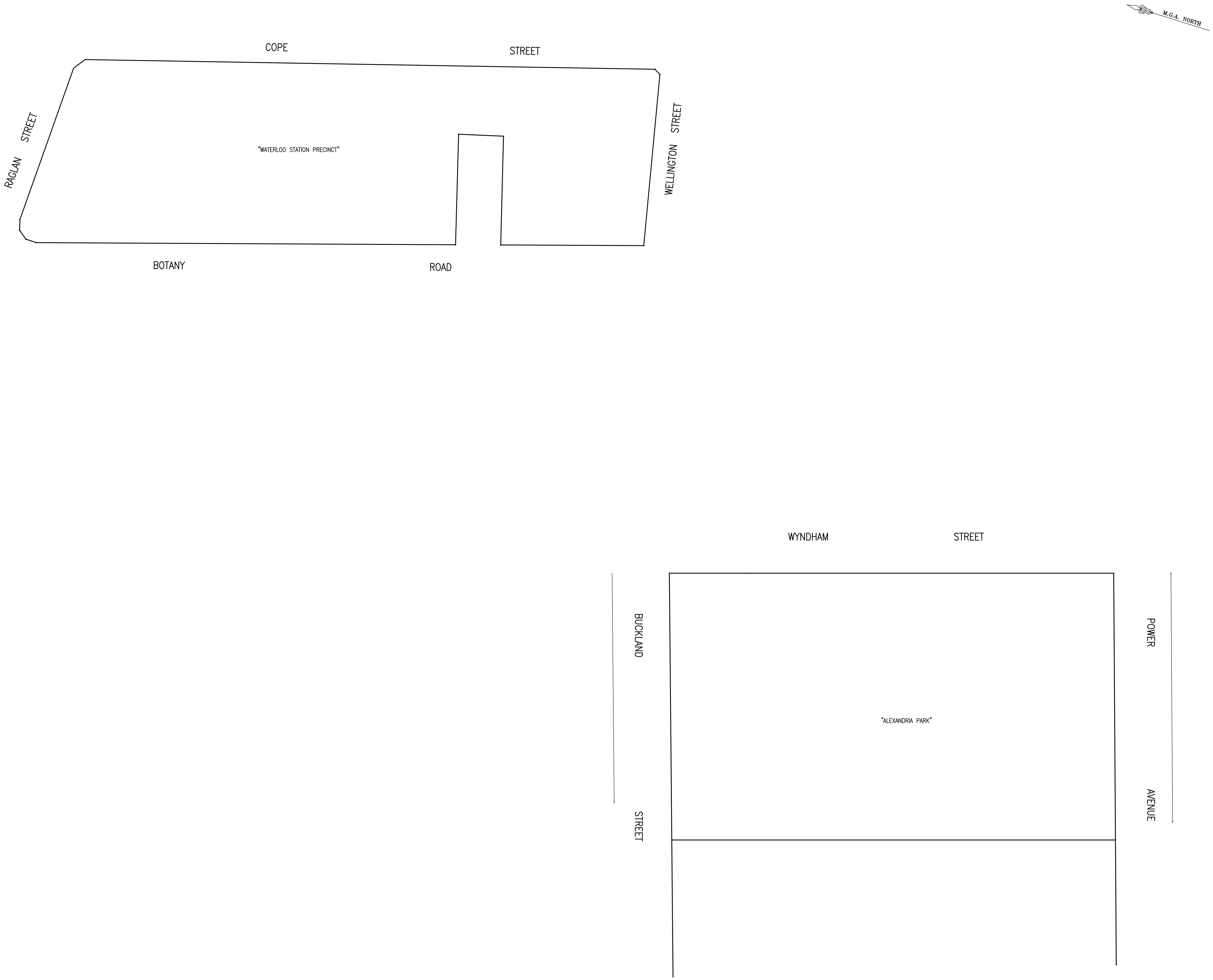
File Name	File Type	Date Received (dd/mm/yyyy)
WMQ-BLD4-BSA-AR-DRG-DA161-dwg_E		
WMQ-BLD4-BSA-AR-DRG-DA162-dwg_E		
WMQ-BLD4-BSA-AR-DRG-DA163-dwg_E		

11. Appendices

11.1 Appendix 1 – Alexandria Park Survey

LOCALITY

SEE SHEET 2 FOR PARK DETAIL



ISSUE	DATE	AMENDMENT	BY

TYPICAL NOTES:

1. ORIGIN OF LEVELS SSM 0000, R.L.00.000 (A.H.D.)
2. BEARINGS ARE ON XXXX NORTH
3. A SUITABLE BOUNDARY SURVEY HAS BEEN UNDERTAKEN.
4. BOUNDARIES SHOULD BE MARKED PRIOR TO ANY WORKS BEING CARRIED OUT ON OR NEAR THE BOUNDARIES.
5. RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
6. SERVICES SHOWN ARE BASED ON VISIBLE SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY AND THE RELEVANT SERVICE DIAGRAMS OF THE VARIOUS AUTHORITIES. ALL SERVICES MUST BE VERIFIED ON SITE PRIOR TO ANY WORK BEING UNDERTAKEN. VERIS AUSTRALIA PTY LTD BEAR NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE SERVICES SHOWN HEREON.
7. RIDGE, EAVE & GUTTER HEIGHTS HAVE BEEN OBTAINED BY AN INDIRECT METHOD AND ARE ACCURATE FOR PLANNING PURPOSES ONLY.
8. ADJOINING BUILDINGS AND DWELLINGS HAVE BEEN PLOTTED FOR DIAGRAMMATIC PURPOSES ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
9. THE DIAMETER (ø), SPREAD (S) & HEIGHT (H) OF EACH TREE IS INDICATIVE ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
10. CONTOURS ARE AN INDICATION OF THE TOPOGRAPHY ONLY. SPOT LEVELS SHOULD BE USED IF DETAILED DESIGN IS TO BE UNDERTAKEN.
11. CONTOUR INTERVAL 0.2 METRE.

LEGEND OF TYPICAL CODES

AE	ARCHITECTURAL EMBELLISHMENT	MLID	METAL LID
AP	ALIGNMENT PIN	NS	NATURAL SURFACE
AWN	AWNING	OCC	STRUCTURE
BALC	BALCONY	OPT	OPTUS PIT
BAWN	BOTTOM OF AWNING	PC	PRAM CROSSING
BB	BOTTOM OF BANK	PED	PEDESTRIAN CROSSING
BCH	BOTTOM OF CHIMNEY	PERG	PERGOLA
BD	BOTTOM OF DOOR	PM	PERMANENT MARK
BDY	BOUNDARY	PP	POWER POLE
BF	BOTTOM OF FENCE	RCK	ROCK
BHR	BOTTOM OF HANDRAIL	RLWY	RAILWAY
BIT	BITUMEN	RM	REFERENCE MARK
BK	BOTTOM OF KERB	RR	ROOF RIDGE
BLD	BUILDING	RSN	CONCRETE NAIL
BM	BENCH MARK	SEW	SEWER
BOL	BOLLARD	SHR	SHRUB
BR	BOTTOM OF ROCK	SIP	SEWER INSPECTION PIT
BRK	BRICK	SLH	SEWER LAMP HOLE
BRW	BOTTOM OF RETAINING WALL	SMH	SEWER MANHOLE
BS	BOTTOM OF STEPS	SP	SIGN POST
BW	BOTTOM OF WALL	SSM	STATE SURVEY MARK
BWIN	BOTTOM OF WINDOW	SV	STOP VALVE
CHIM	CHIMNEY	SW	STORM WATER
CL	CENTRELINE	TARCH	TOP OF ARCH
CLID	CONCRETE LID	TAWN	TOP OF AWNING
COL	COLUMN	TB	TOP OF BANK
COM	COMMUNICATIONS PIT	TBX	TELSTRA BOX
CONC	CONCRETE	TCH	TOP OF CHIMNEY
CPT	CARPORT	TD	TOP OF DOOR
D	DOOR	TEL	TELSTRA PIT
DD	DISH DRAIN	TELP	TELSTRA PILLAR
DH	DRILL HOLE	TF	TOP OF FENCE
DHW	DRILL HOLE & WINGS	TG	TOP OF GUTTER
DWY	DRIVEWAY	THR	TOP OF HANDRAIL
EB	EDGE OF BITUMEN	TI	TRAFFIC ISLAND
EBOX	ELECTRICITY BOX	TK	TOP OF KERB
EC	EDGE OF CONCRETE	TL	TRAFFIC LIGHT
ED	EDGE OF DOOR	TP	TOP OF PARAPET
EG	EDGE OF GARDEN	TR	TREE
ELEC	ELECTRICITY PIT	TRF	TOP OF ROOF
EP	EDGE OF PATH	TRK	TOP OF ROCK
ER	EDGE OF ROAD	TRW	TOP OF RETAINING WALL
FCE	FENCE	TS	TOP OF STEPS
FL	FLOOR LEVEL	TW	TOP OF WALL
FFL	FINISHED FLOOR LEVEL	TWIN	TOP OF WINDOW
FP	FENCE POST	US	UNDERSIDE
GD	GLASS DOOR	UAWN	UNDERSIDE OF AWNING
GL	GROUND LEVEL	UKS	UNKNOWN SERVICE
GM	GAS METER	USB	UNDERSIDE OF BEAM
HPG	HIGH POWERED GAS	USC	UNDERSIDE OF CEILING
HR	HANDRAIL	USE	UNDERSIDE OF EAVE
HYD	HYDRANT	USG	UNDERSIDE OF GUTTER
IL	INVERT LEVEL	V	VENT
K	KERB	VER	VERANDAH
LIN	LINTEL	VC	VEHICLE CROSSING
LP	LAMP POST	W	WINDOW
MH	MANHOLE	WM	WATER METER

LEGEND OF TYPICAL SERVICES

C	COMMUNICATIONS CABLE	RW	RECYCLED WATER
CSWP	CERAMIC STORMWATER PIPE	RM	RISING MAIN
E	UNDERGROUND ELECTRICITY CABLES	RMS	ROADS & MARITIME SERVICES
AE — AO	UNDERGROUND ELECTRICITY & OPTUS CABLES	S	SEWER
FS	FIRE SERVICE	SO	SEWER OUTFALL
G	GAS LINE	ST	SHARED TRENCH
GE	GAS LINE & ELECTRICITY CABLES	SW	STORM WATER
NBN	NATIONAL BROAD BAND CABLES	SW — CK	STORMWATER CREEK
NG	NATURAL GAS LINE	T	TELSTRA CABLES
OH	OVERHEAD CABLES	TG	TELSTRA & GAS CABLES
OPT	OPTUS CABLE	U	UNKNOWN SERVICE
PE	PRIVATE ELECTRICITY	VO	VOCUS CABLES
PS	PRIVATE SEWER	VR	VERIZON CABLES
PW	PRIVATE WATER	W	WATER SUPPLY
		WM	WATER MAIN

1. ALL UNDERGROUND SERVICE INFORMATION INCLUSIVE OF GENERAL POSITION AND SURFACE COVER DEPTHS NOTED ON THE PLAN ARE APPROXIMATELY ONLY.
2. ALL UNDERGROUND SERVICE INFORMATION HAS BEEN COMPILED FROM SERVICE AUTHORITY PLANS PROVIDED BY THE AUTHORITIES.
3. THE LOCATION OF SERVICES BETWEEN SURVEYED POINTS (AS INDICATED) HAVE BEEN SHOWN DIAGRAMMATICALLY ONLY USING THE SERVICE DIAGRAMS AS PROVIDED. THE EXACT LOCATION OF THESE SERVICES BETWEEN THE SURVEYED POINTS MUST BE VERIFIED PRIOR TO ANY EXCAVATION OR PILING. NO WARRANTY IS GIVEN AGAINST THE POSSIBILITY OF THE EXISTENCE OF FURTHER UNCHARTED SERVICES.
4. ALL CONTRACTORS, TRADESMEN, BUILDING & PROJECT CONSULTANTS MUST CONTACT THE VARIOUS AUTHORITIES, IN ACCORDANCE WITH STANDARD "DIAL BEFORE YOU DIG" PROCEDURES PRIOR TO UNDERTAKING ANY WORKS WITHIN THE VICINITY OF THE SERVICE LINES TO VERIFY THE POSITION OF THE SERVICE LINES.

Liability limited by a scheme approved under Professional Standards Legislation

DIAL BEFORE YOU DIG www.1100.com.au The Essential First Step

REDUCTION RATIO 1 : 500

0 5 10 15 20 25 30 35 40 45 50

LENGTHS ARE IN METRES

CLIENT: MIRVAC

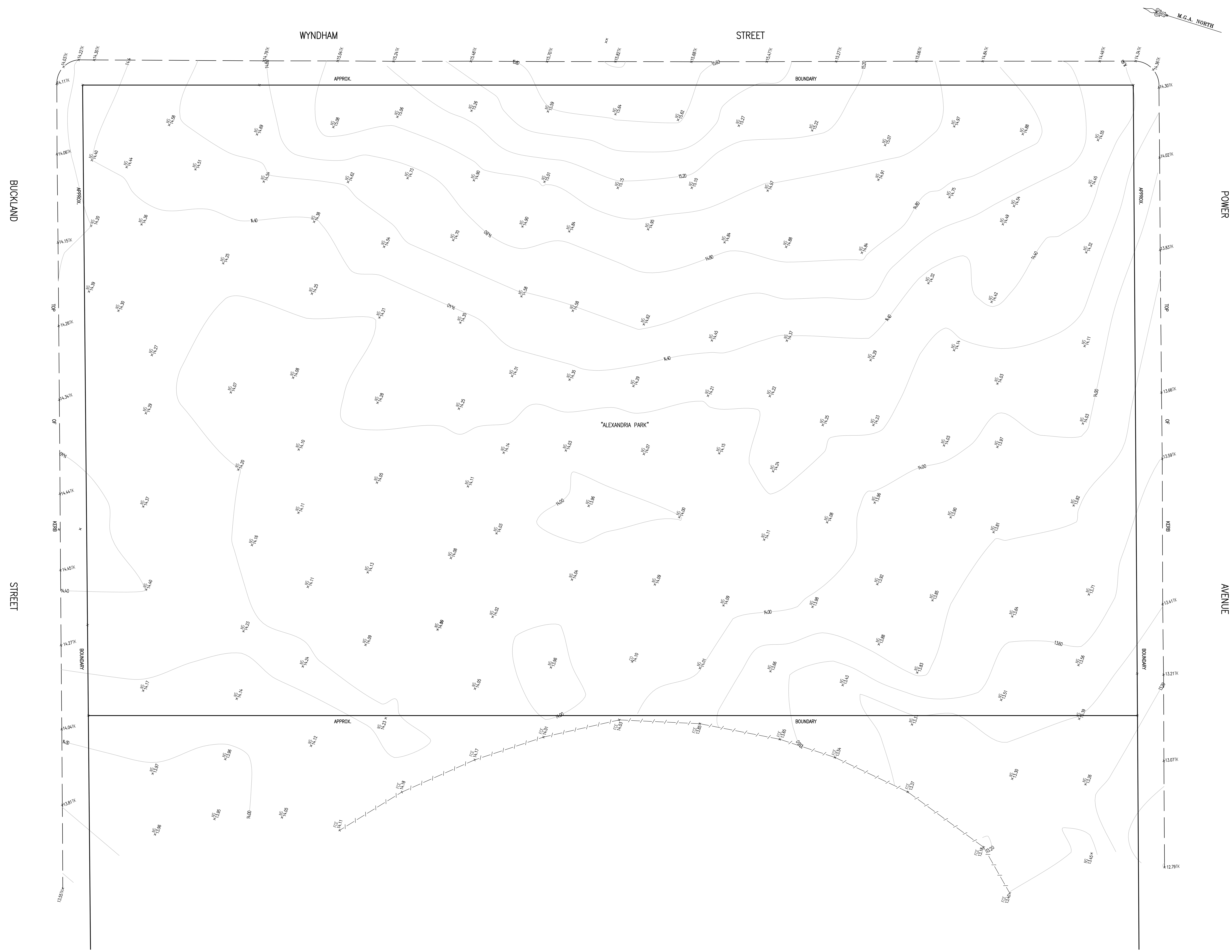
TITLE No:	REF: 201372
DATUM: A.H.D.	ISSUE: 1
DATE OF SURVEY:	ISSUE DATE: 20.04.2020
SURVEYOR: TM	SHEET SIZE: A0
DRAFTER: JJ	SHEET 1 OF 2 SHEETS

PLAN SHOWING SPOT HEIGHTS AND CONTOURS OVER ALEXANDRIA PARK FOR WATERLOO METRO OSD SHADOW INVESTIGATION PURPOSES ALEXANDRIA PARK, WATERLOO

veris

Veris Australia Pty Ltd
Suite 301, Level 3, 55 Holt Street
Surry Hills NSW 2012
PO Box 1807
Strawberry Hills NSW 2012
t: (02) 92124655
email: surryhills@veris.com.au
web site: www.veris.com.au

X:\00ALL VERIS JOBS\201001-201500\201372 WATERLOO STATION PRECINCT\ALEXANDRIA PARK LEVELS\201372 ALEXANDRIA PARK LEVELS WITH SITE.DWG



ISSUE	DATE	AMENDMENT	BY

TYPICAL NOTES:

1. ORIGIN OF LEVELS SSM 0000, R.L.00.000 (A.H.D.)
2. BEARINGS ARE ON XXXX NORTH
3. A SUITABLE BOUNDARY SURVEY HAS BEEN UNDERTAKEN.
4. BOUNDARIES SHOULD BE MARKED PRIOR TO ANY WORKS BEING CARRIED OUT ON OR NEAR THE BOUNDARIES.
5. RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
6. SERVICES SHOWN ARE BASED ON VISIBLE SURFACE INDICATORS EVIDENT AT THE DATE OF SURVEY AND THE RELEVANT SERVICE DIAGRAMS OF THE VARIOUS AUTHORITIES. ALL SERVICES MUST BE VERIFIED ON SITE PRIOR TO ANY WORK BEING UNDERTAKEN. VERIS AUSTRALIA PTY LTD BEAR NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE SERVICES SHOWN HEREON.
7. RIDGE, EAVE & GUTTER HEIGHTS HAVE BEEN OBTAINED BY AN INDIRECT METHOD AND ARE ACCURATE FOR PLANNING PURPOSES ONLY.
8. ADJOINING BUILDINGS AND DWELLINGS HAVE BEEN PLOTTED FOR DIAGRAMMATIC PURPOSES ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
9. THE DIAMETER (ø), SPREAD (S) & HEIGHT (H) OF EACH TREE IS INDICATIVE ONLY AND SPECIFIC DETAILS, IF CRITICAL, WILL REQUIRE FURTHER SURVEY.
10. CONTOURS ARE AN INDICATION OF THE TOPOGRAPHY ONLY. SPOT LEVELS SHOULD BE USED IF DETAILED DESIGN IS TO BE UNDERTAKEN.
11. CONTOUR INTERVAL 0.2 METRE.

LEGEND OF TYPICAL CODES

AE	ARCHITECTURAL EMBELLISHMENT	MLID	METAL LID
AP	ALIGNMENT PIN	NS	NATURAL SURFACE
AWN	AWNING	OCC	STRUCTURE
BALC	BALCONY	OPT	OPTUS PIT
BAWN	BOTTOM OF AWNING	PC	PRAM CROSSING
BB	BOTTOM OF BANK	PED	PEDESTRIAN CROSSING
BCH	BOTTOM OF CHIMNEY	PERG	PERGOLA
BD	BOTTOM OF DOOR	PM	PERMANENT MARK
BDY	BOUNDARY	PP	POWER POLE
BF	BOTTOM OF FENCE	RCK	ROCK
BHR	BOTTOM OF HANDRAIL	RLWY	RAILWAY
BIT	BITUMEN	RM	REFERENCE MARK
BK	BOTTOM OF KERB	RR	ROOF RIDGE
BLD	BUILDING	RSN	CONCRETE NAIL
BM	BENCH MARK	SEW	SEWER
BOL	BOLLARD	SHR	SHRUB
BR	BOTTOM OF ROCK	SIP	SEWER INSPECTION PIT
BRK	BRICK	SLH	SEWER LAMP HOLE
BRW	BOTTOM OF RETAINING WALL	SMH	SEWER MANHOLE
BS	BOTTOM OF STEPS	SP	SIGN POST
BW	BOTTOM OF WALL	SSM	STATE SURVEY MARK
BWIN	BOTTOM OF WINDOW	SV	STOP VALVE
CHIM	CHIMNEY	SW	STORM WATER
CL	CENTRELINE	TARCH	TOP OF ARCH
CLID	CONCRETE LID	TAWN	TOP OF AWNING
COL	COLUMN	TB	TOP OF BANK
COM	COMMUNICATIONS PIT	TBX	TELSTRA BOX
CONC	CONCRETE	TCH	TOP OF CHIMNEY
CPT	CARPORT	TD	TOP OF DOOR
D	DOOR	TEL	TELSTRA PIT
DD	DISH DRAIN	TELP	TELSTRA PILLAR
DH	DRILL HOLE	TF	TOP OF FENCE
DHW	DRILL HOLE & WINGS	TG	TOP OF GUTTER
DWY	DRIVEWAY	THR	TOP OF HANDRAIL
EB	EDGE OF BITUMEN	TI	TRAFFIC ISLAND
EBOX	ELECTRICITY BOX	TK	TOP OF KERB
EC	EDGE OF CONCRETE	TL	TRAFFIC LIGHT
ED	EDGE OF DOOR	TP	TOP OF PARAPET
EG	EDGE OF GARDEN	TR	TREE
ELEC	ELECTRICITY PIT	TRF	TOP OF ROOF
EP	EDGE OF PATH	TRK	TOP OF ROCK
ER	EDGE OF ROAD	TRW	TOP OF RETAINING WALL
FCE	FENCE	TS	TOP OF STEPS
FL	FLOOR LEVEL	TW	TOP OF WALL
FFL	FINISHED FLOOR LEVEL	TWIN	TOP OF WINDOW
FP	FENCE POST	US	UNDERSIDE
GD	GLASS DOOR	UAWN	UNDERSIDE OF AWNING
GL	GROUND LEVEL	UKS	UNKNOWN SERVICE
GM	GAS METER	USB	UNDERSIDE OF BEAM
HPG	HIGH POWERED GAS	USC	UNDERSIDE OF CEILING
HR	HANDRAIL	USE	UNDERSIDE OF EAVE
HYD	HYDRANT	USG	UNDERSIDE OF GUTTER
IL	INVERT LEVEL	V	VENT
K	KERB	VER	VERANDAH
LIN	LINTEL	VC	VEHICLE CROSSING
LP	LAMP POST	W	WINDOW
MH	MANHOLE	WM	WATER METER

LEGEND OF TYPICAL SERVICES

C	COMMUNICATIONS CABLE	RW	RECYCLED WATER
CSWP	CERAMIC STORMWATER PIPE	RM	RISING MAIN
E	UNDERGROUND ELECTRICITY CABLES	RMS	ROADS & MARITIME SERVICES
AE AO	UNDERGROUND ELECTRICITY & OPTUS CABLES	S	SEWER
FS	FIRE SERVICE	SO	SEWER OUTFALL
G	GAS LINE	ST	SHARED TRENCH
GE	GAS LINE & ELECTRICITY CABLES	SW	STORM WATER
NBN	NATIONAL BROAD BAND CABLES	SW CK	STORMWATER CREEK
NG	NATURAL GAS LINE	T	TELSTRA CABLES
OH	OVERHEAD CABLES	TG	TELSTRA & GAS CABLES
OPT	OPTUS CABLE	U	UNKNOWN SERVICE
PE	PRIVATE ELECTRICITY	VO	VOCUS CABLES
PS	PRIVATE SEWER	VR	VERIZON CABLES
PW	PRIVATE WATER	W	WATER SUPPLY
		WM	WATER MAIN

1. ALL UNDERGROUND SERVICE INFORMATION INCLUSIVE OF GENERAL POSITION AND SURFACE COVER DEPTHS NOTED ON THE PLAN ARE APPROXIMATELY ONLY.
2. ALL UNDERGROUND SERVICE INFORMATION HAS BEEN COMPILED FROM SERVICE AUTHORITY PLANS PROVIDED BY THE AUTHORITIES.
3. THE LOCATION OF SERVICES BETWEEN SURVEYED POINTS (AS INDICATED) HAVE BEEN SHOWN DIAGRAMMATICALLY ONLY USING THE SERVICE DIAGRAMS AS PROVIDED. THE EXACT LOCATION OF THESE SERVICES BETWEEN THE SURVEYED POINTS MUST BE VERIFIED PRIOR TO ANY EXCAVATION OR PILING. NO WARRANTY IS GIVEN AGAINST THE POSSIBILITY OF THE EXISTENCE OF FURTHER UNCHARTED SERVICES.
4. ALL CONTRACTORS, TRADESMEN, BUILDING & PROJECT CONSULTANTS MUST CONTACT THE VARIOUS AUTHORITIES, IN ACCORDANCE WITH STANDARD "DIAL BEFORE YOU DIG" PROCEDURES PRIOR TO UNDERTAKING ANY WORKS WITHIN THE VICINITY OF THE SERVICE LINES TO VERIFY THE POSITION OF THE SERVICE LINES.

REDUCTION RATIO 1 : 200

0 2 4 6 8 10 12 14 16 18 20

LENGTHS ARE IN METRES

CLIENT: MIRVAC

TITLE No:	REF: 201372
DATUM: A.H.D.	ISSUE: 1
DATE OF SURVEY:	ISSUE DATE: 20.04.2020
SURVEYOR: TM	SHEET SIZE: A0
DRAFTER: JJ	SHEET 2 OF 2 SHEETS

PLAN SHOWING SPOT HEIGHTS AND CONTOURS OVER ALEXANDRIA PARK FOR WATERLOO METRO OSD SHADOW INVESTIGATION PURPOSES ALEXANDRIA PARK, WATERLOO

Veris Australia Pty Ltd
Suite 301, Level 3, 55 Holt Street
Surry Hills NSW 2012
PO Box 1807
Strawberry Hills NSW 2012
t: (02) 92124655
email: surryhills@veris.com.au
web site: www.veris.com.au

11.2 Appendix 2 – Point-in-time shadow diagrams – Alexandria Park – 21 Jun

POINT-IN-TIME SHADOW PLOTS

21 June - 9:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June - 9:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 9:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June - 9:45 AEST

POINT-IN-TIME SHADOW PLOTS

21 June - 10:00 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 10:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 10:30 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 10:45 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 11:00 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 11:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 11:30 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 11:45 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 12:00 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 12:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 12:30 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 12:45 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 13:00 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 13:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 13:30 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 13:45 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 14:00 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 14:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 14:30 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 14:45 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 15:00 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

11.3 Appendix 3 – Point-in-time shadow diagrams – Cope Street Plaza – 21 Jun

POINT-IN-TIME SHADOW PLOTS

21 June - 9:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June - 9:15 AEST

LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June - 9:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June - 9:45 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 10:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 10:15 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 10:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 10:45 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 11:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 11:15 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 11:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 11:45 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 12:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 12:15 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 12:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 12:45 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 13:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 13:15 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 13:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 13:45 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 14:00 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 14:15 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 14:30 AEST

POINT-IN-TIME SHADOW PLOTS

21 June – 14:45 AEST

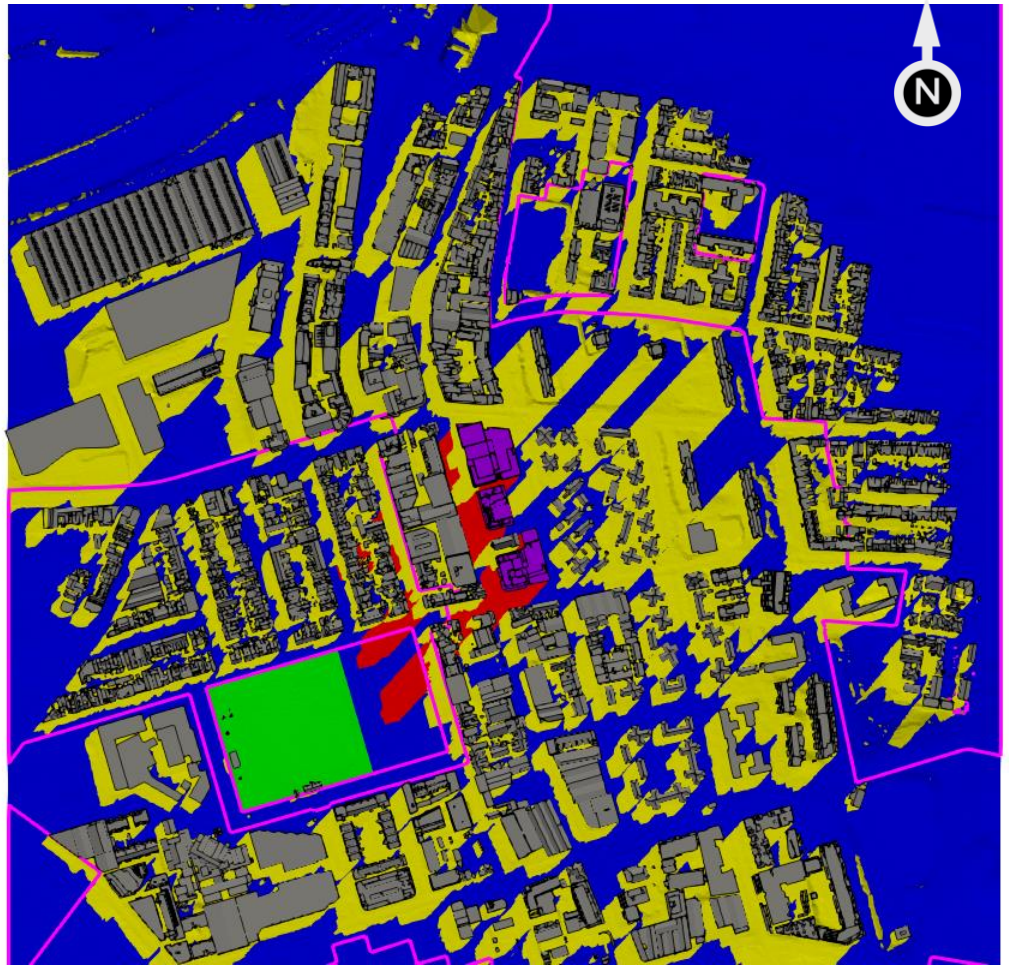
POINT-IN-TIME SHADOW PLOTS

21 June – 15:00 AEST

11.4 Appendix 4 – Point-in-time shadow diagrams – Full domain – 21 Jun

POINT-IN-TIME SHADOW PLOTS

21 June – 9:00 AEST

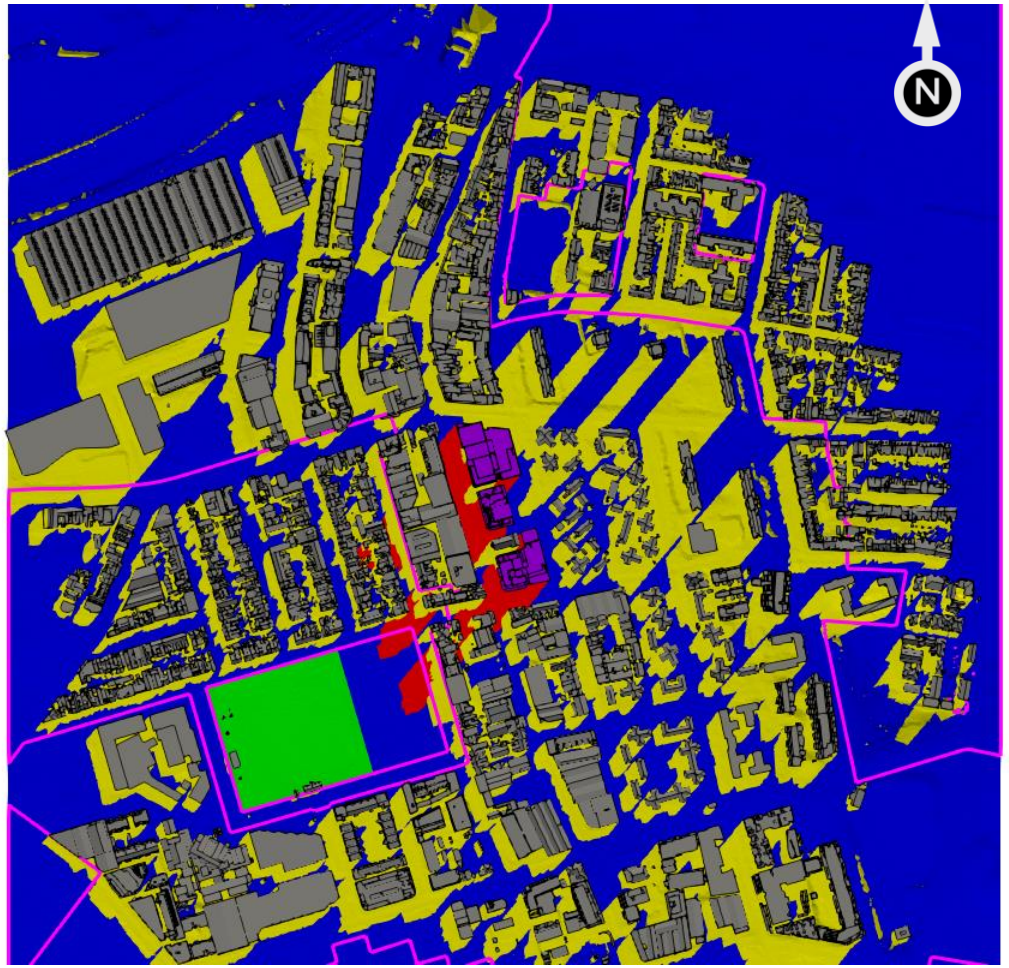


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 9:15 AEST

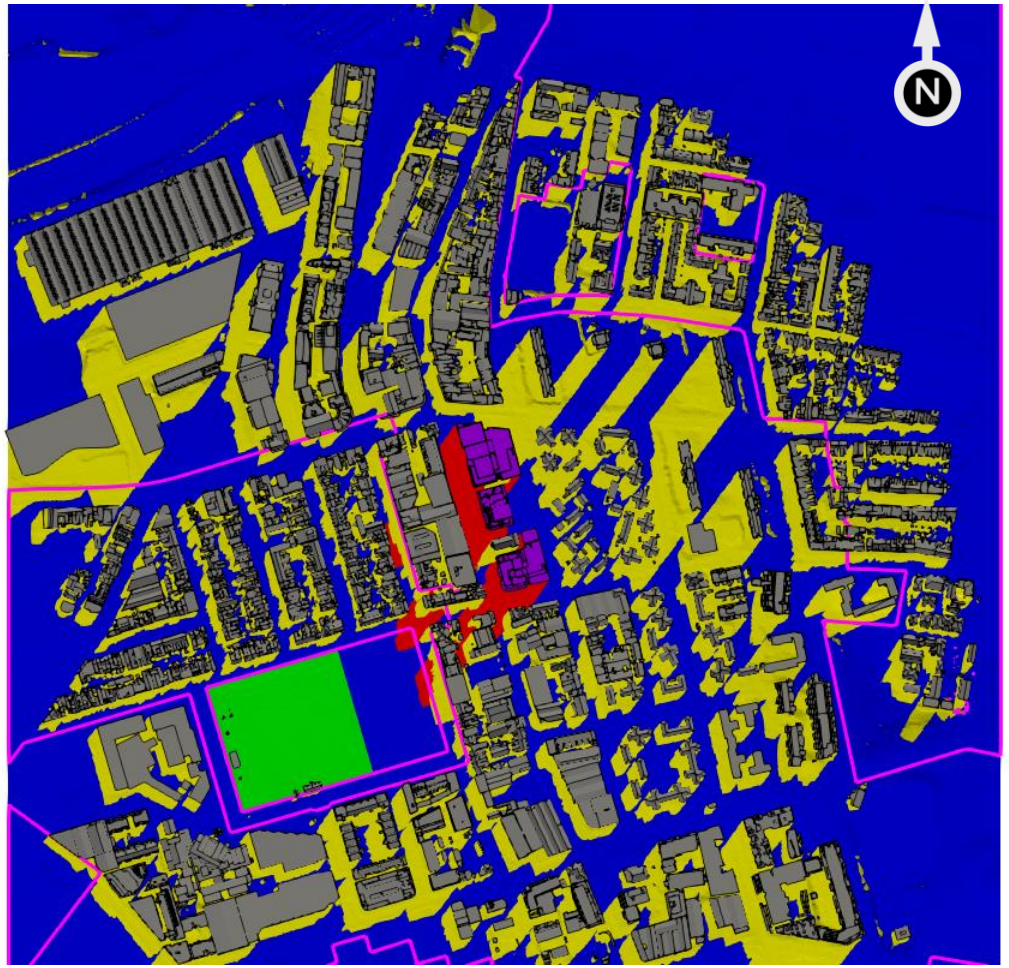


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 9:30 AEST

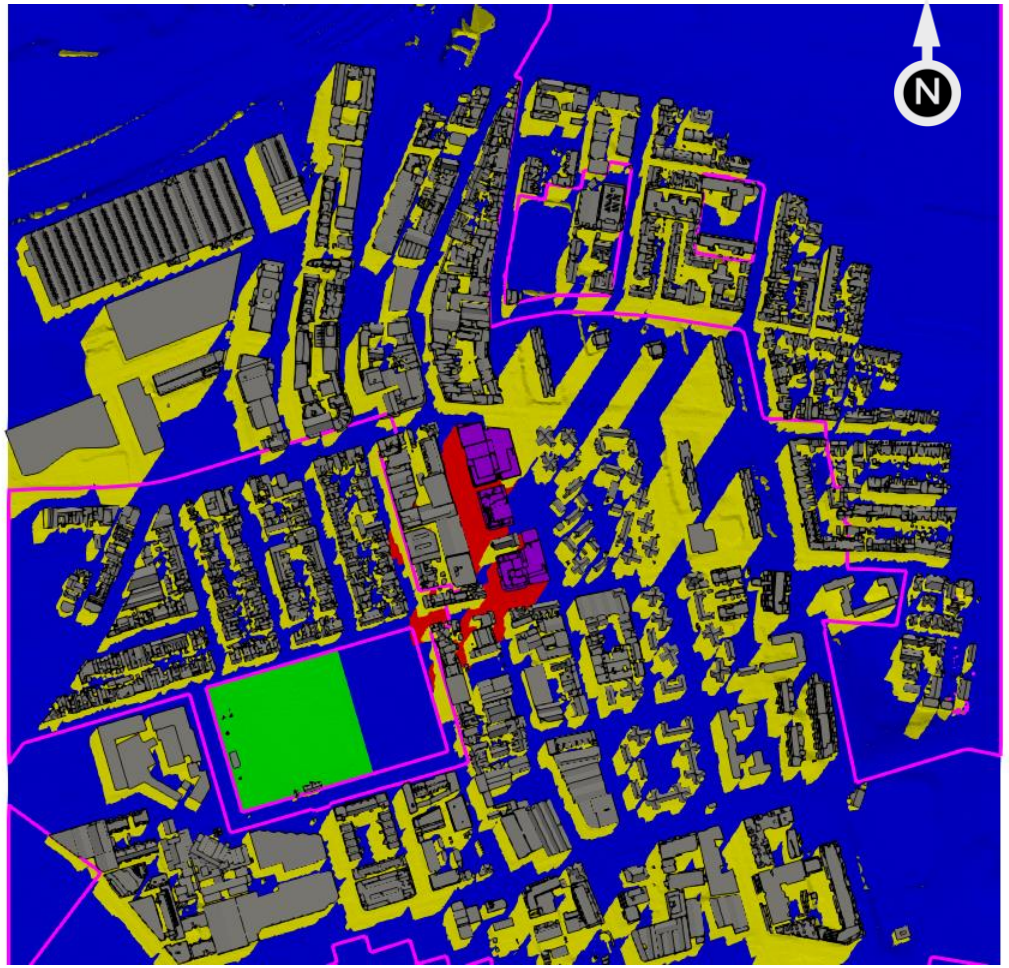


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 9:45 AEST

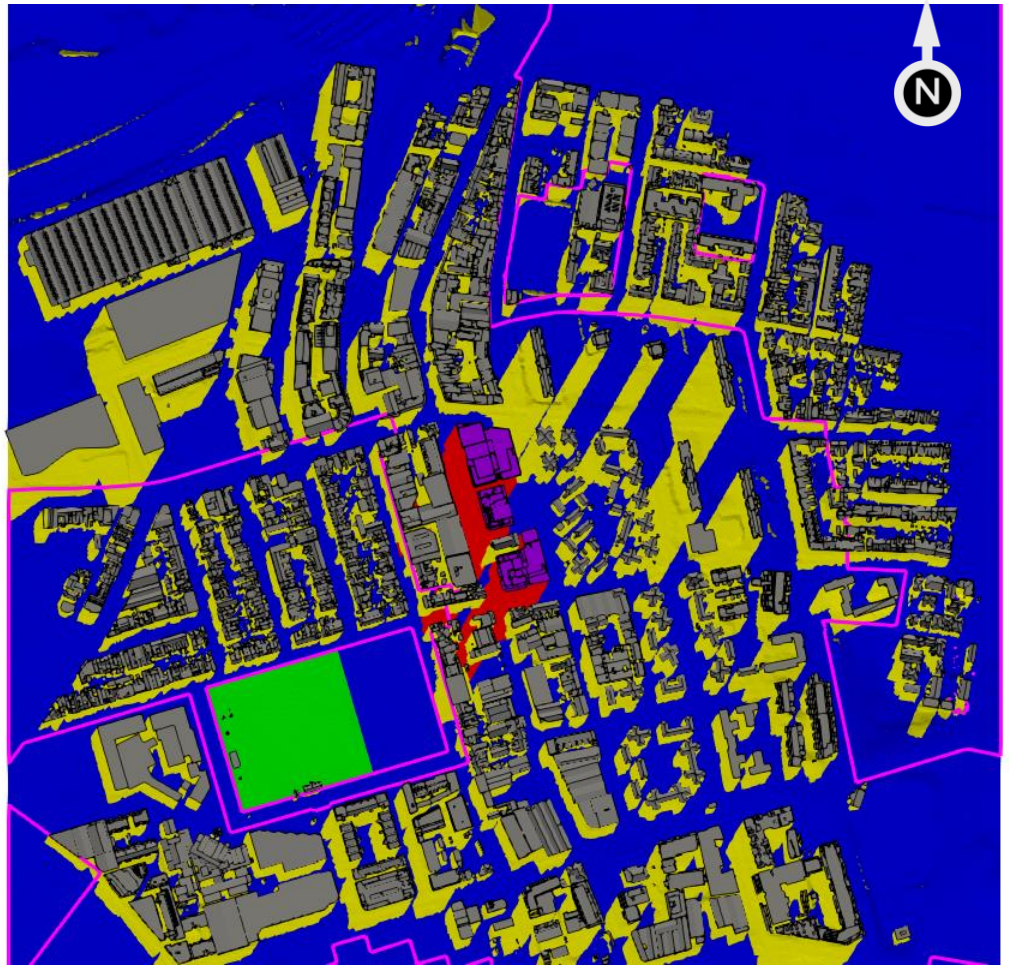


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 10:00 AEST

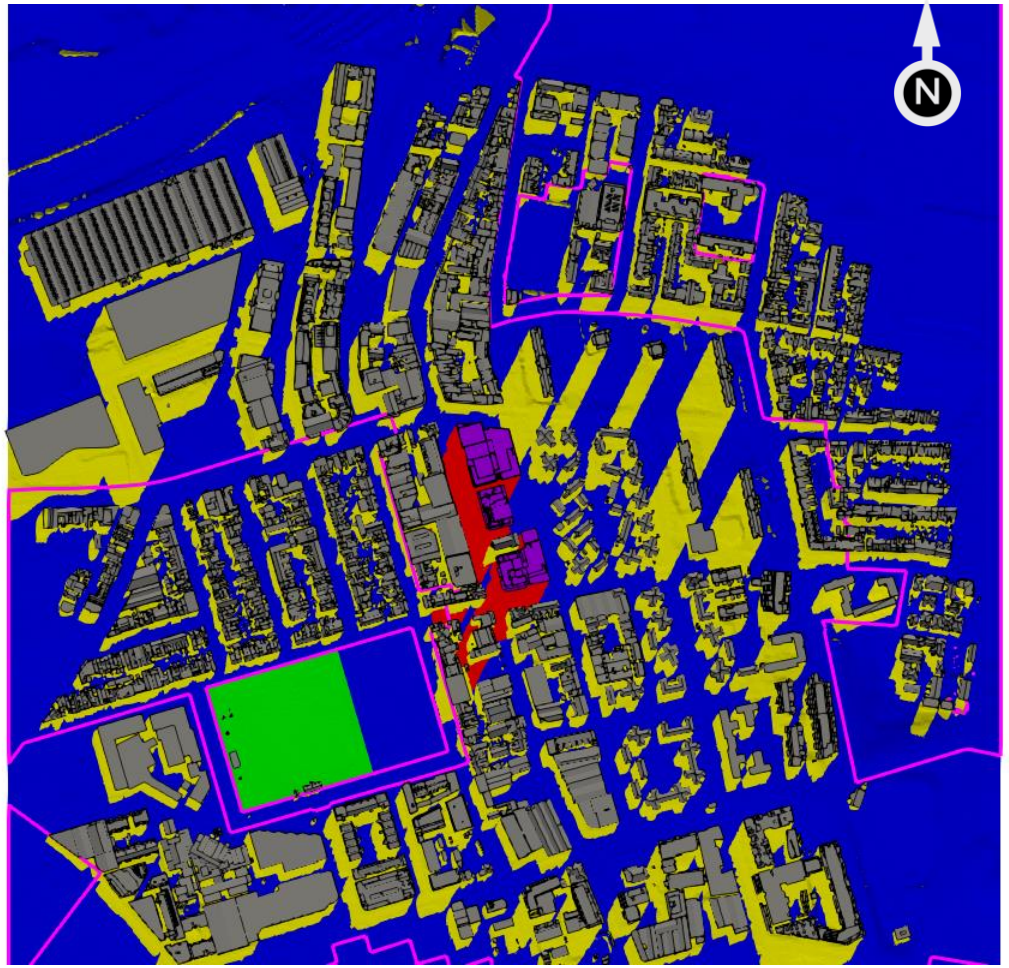


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 10:15 AEST

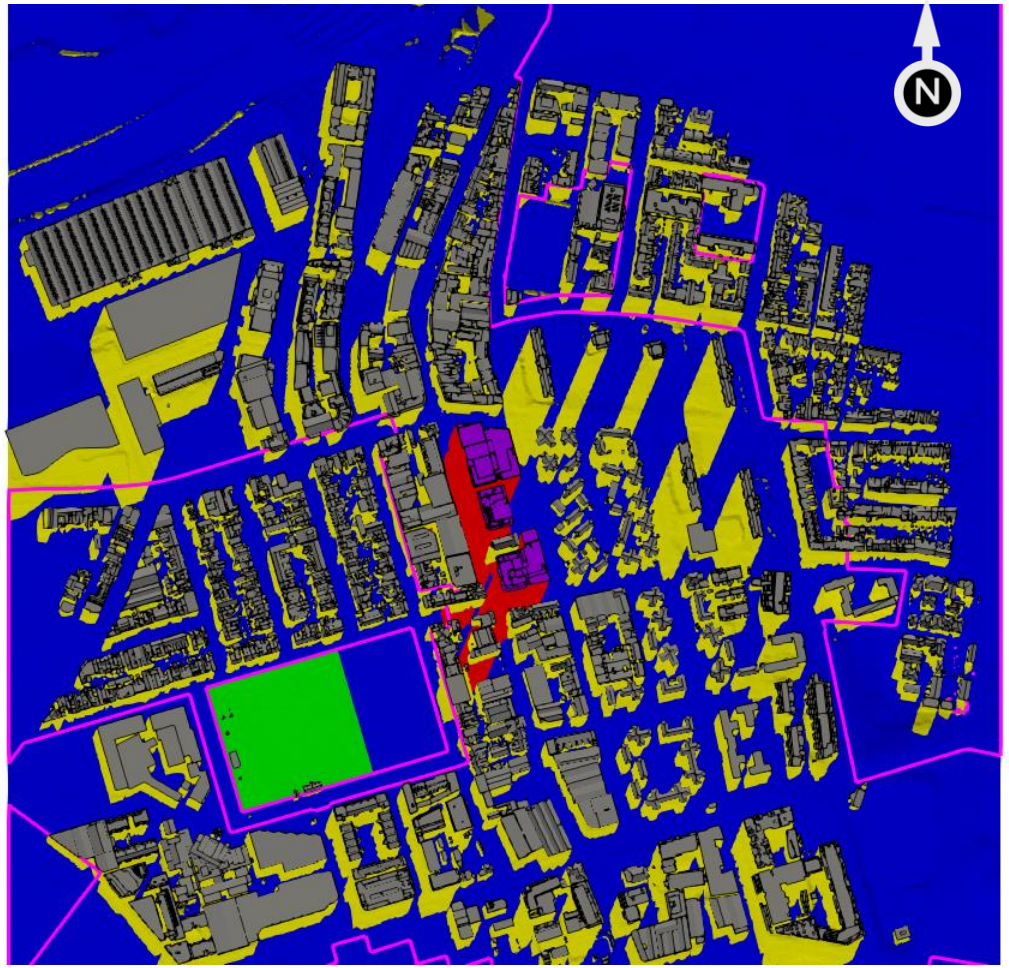


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 10:30 AEST

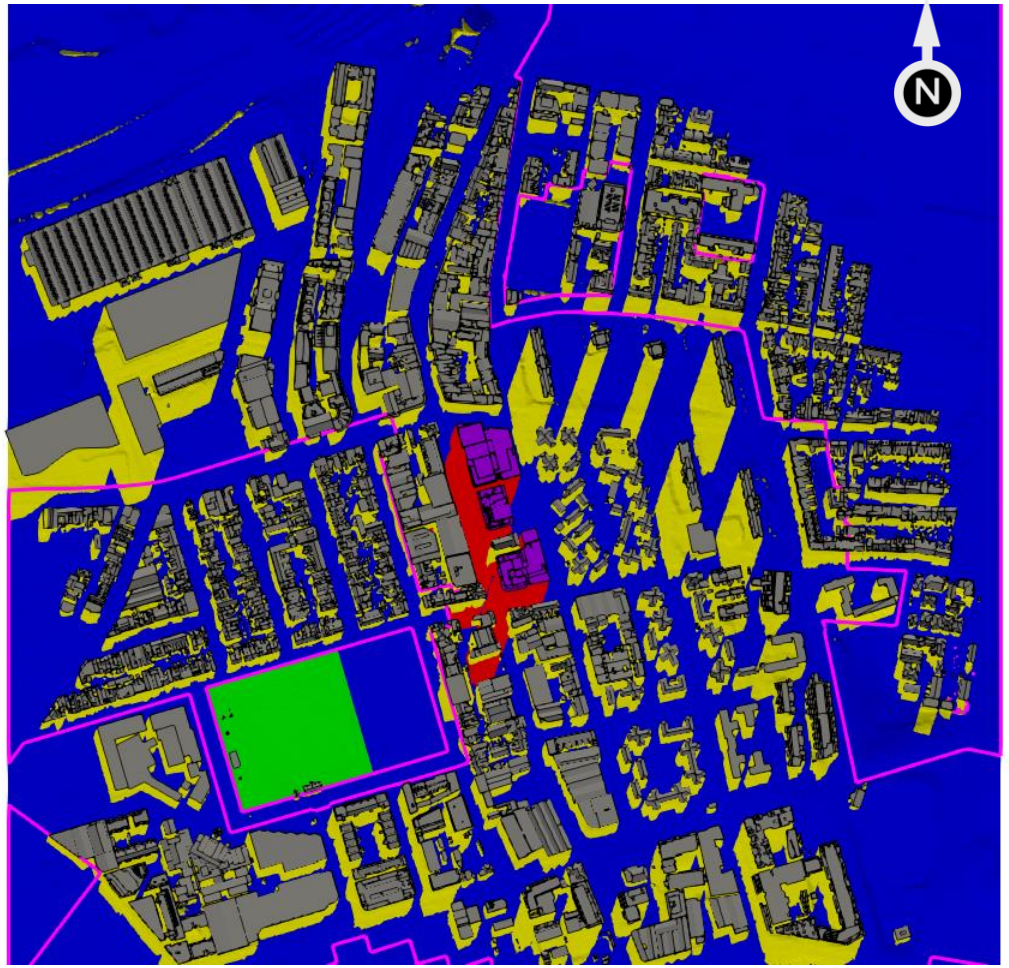


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 10:45 AEST

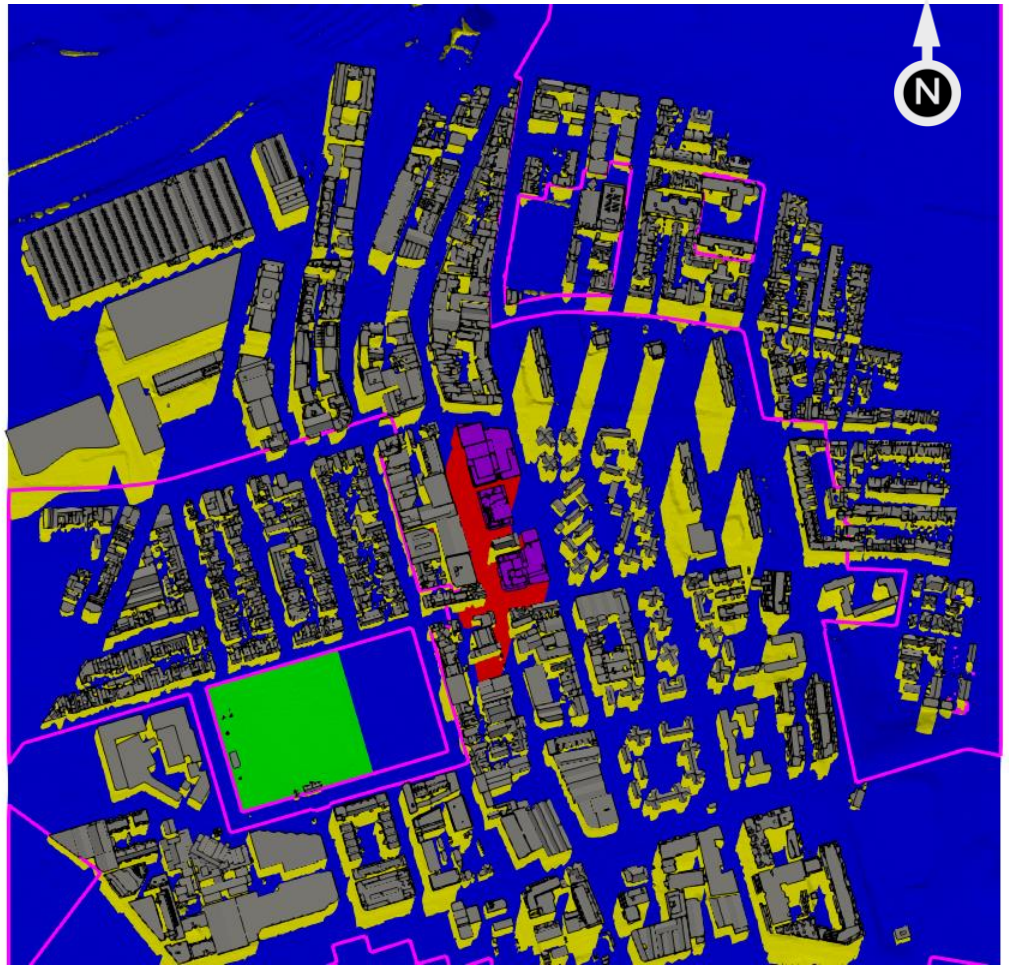


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 11:00 AEST

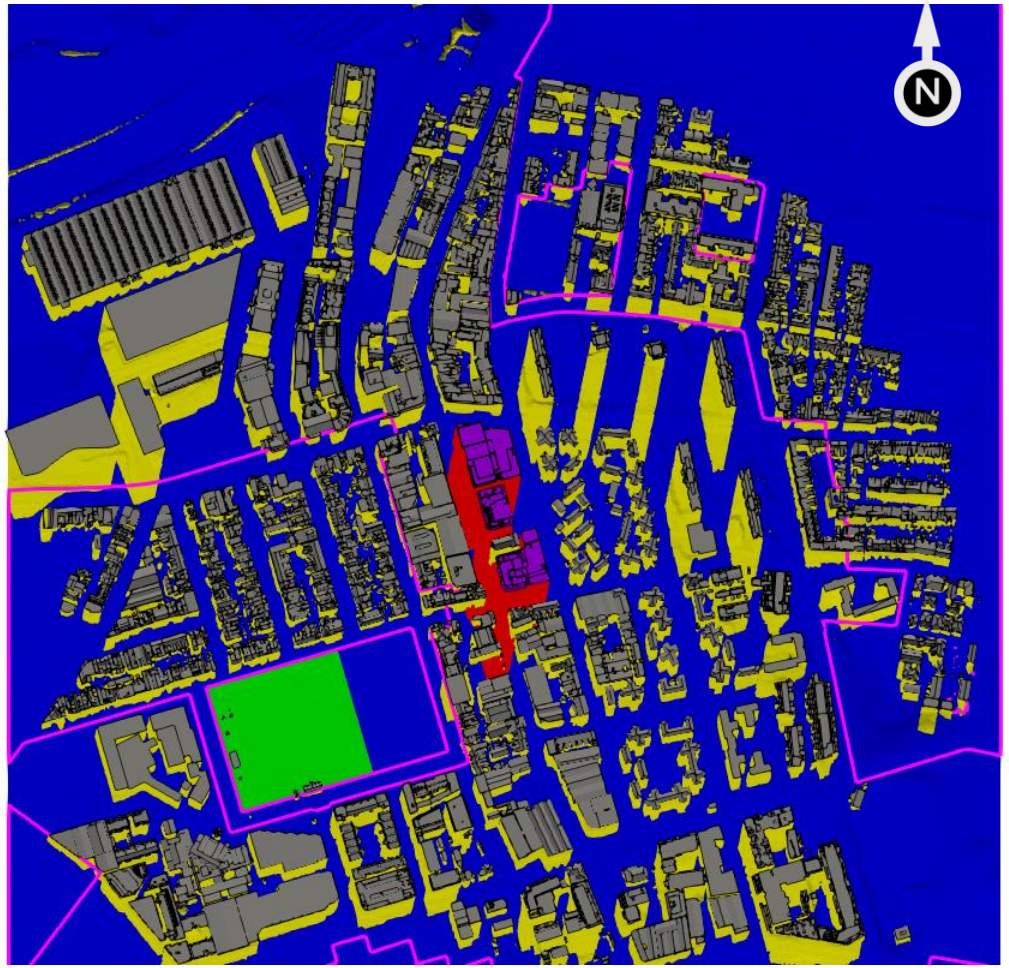


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 11:15 AEST

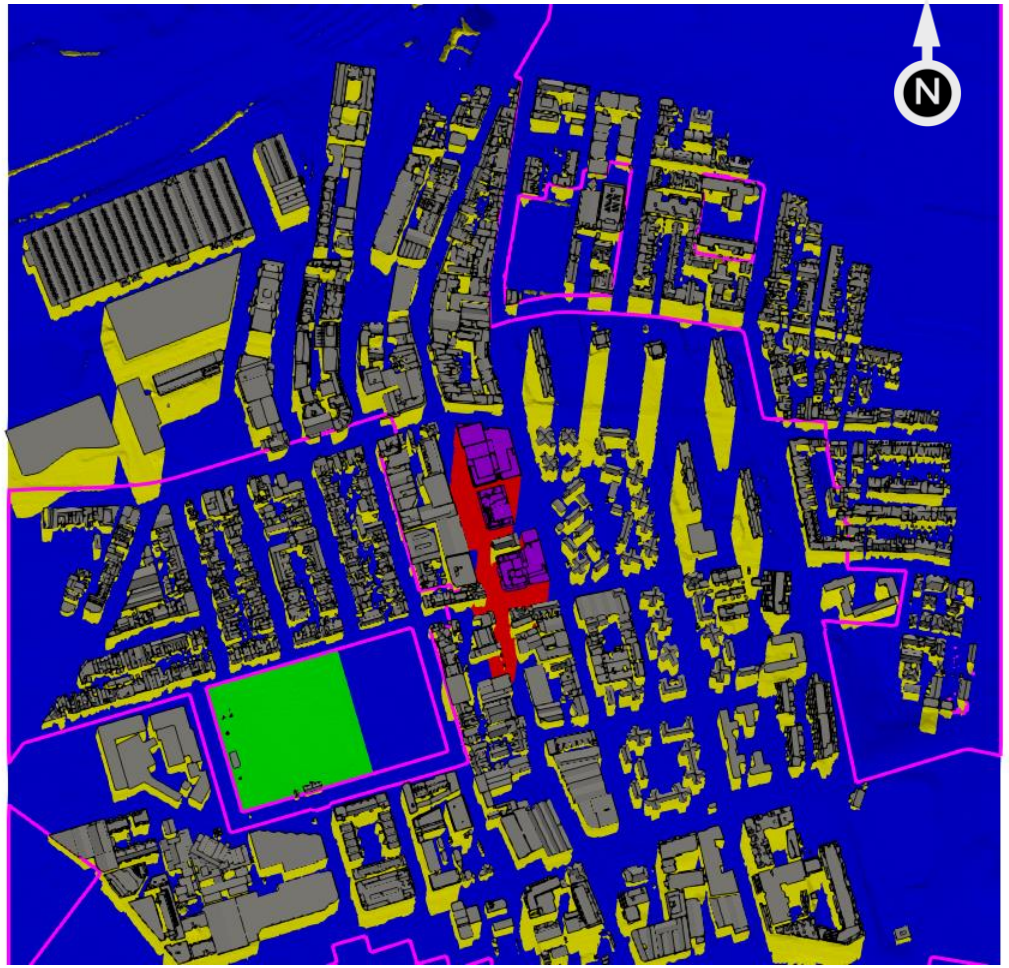


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 11:30 AEST

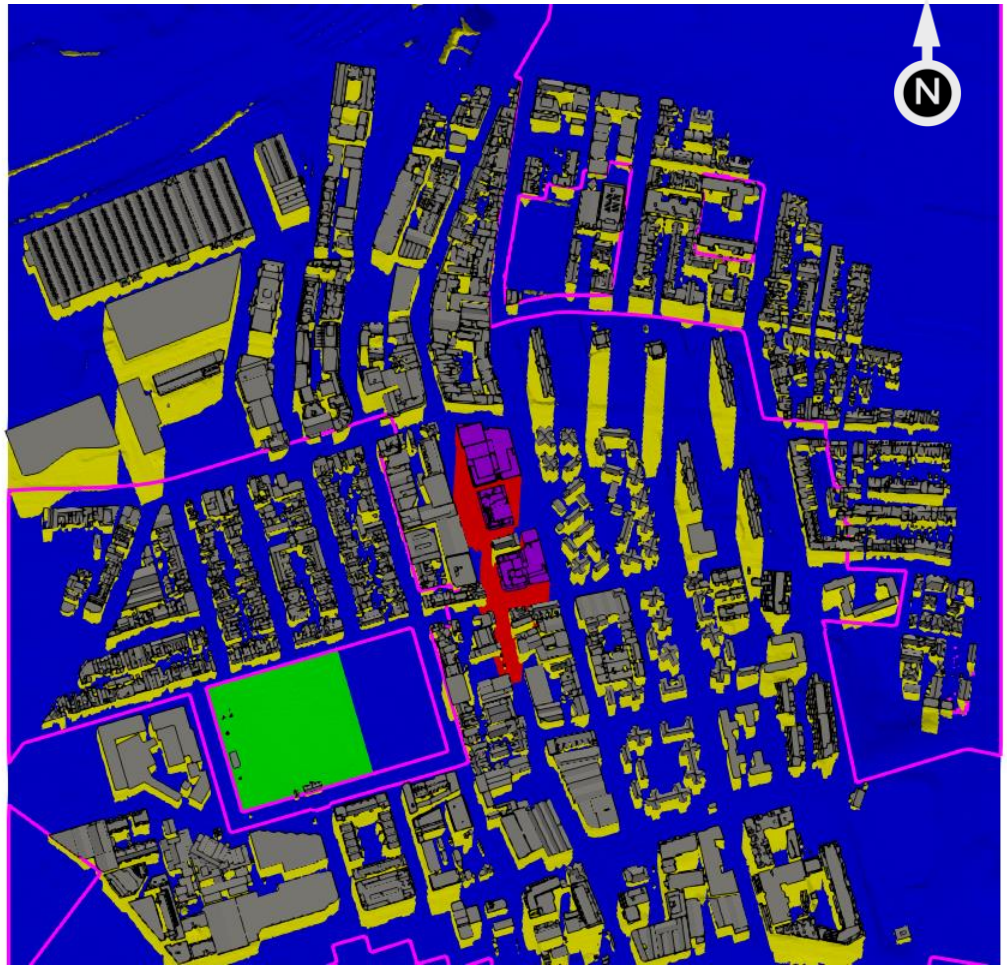


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 11:45 AEST

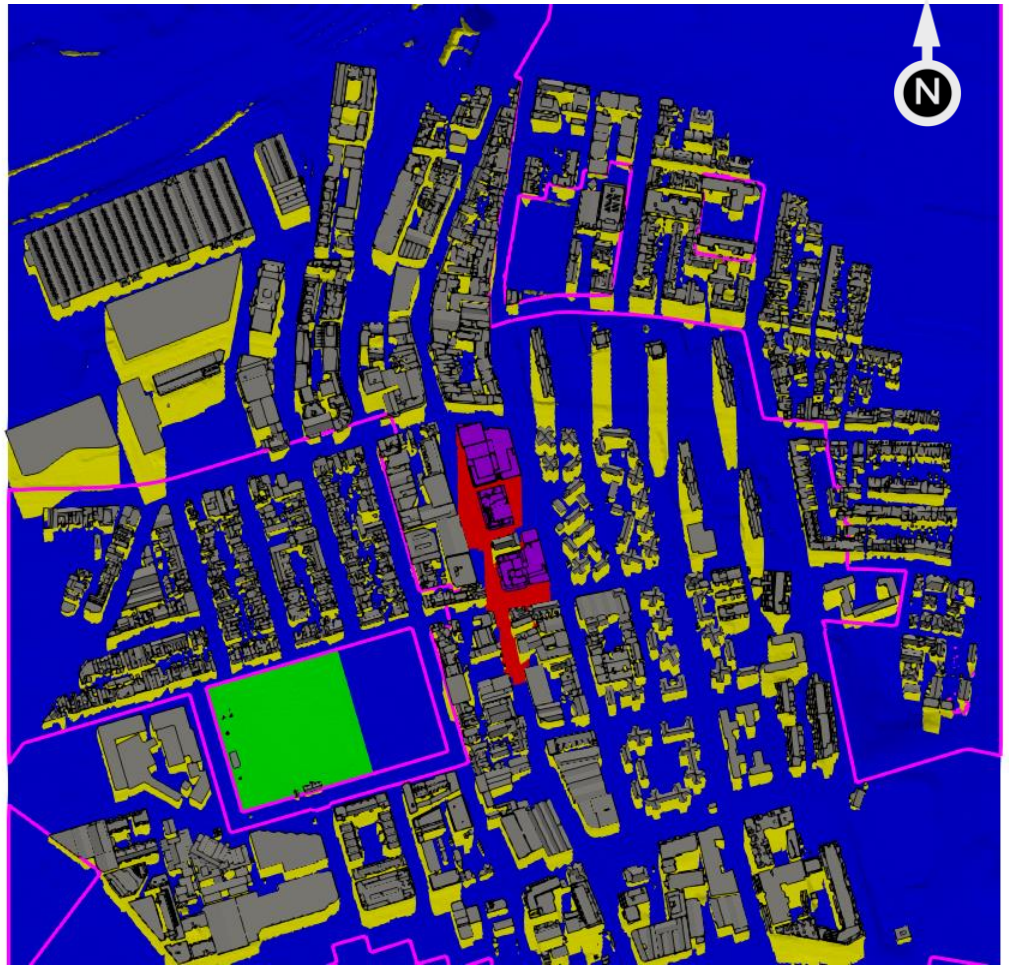


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 12:00 AEST

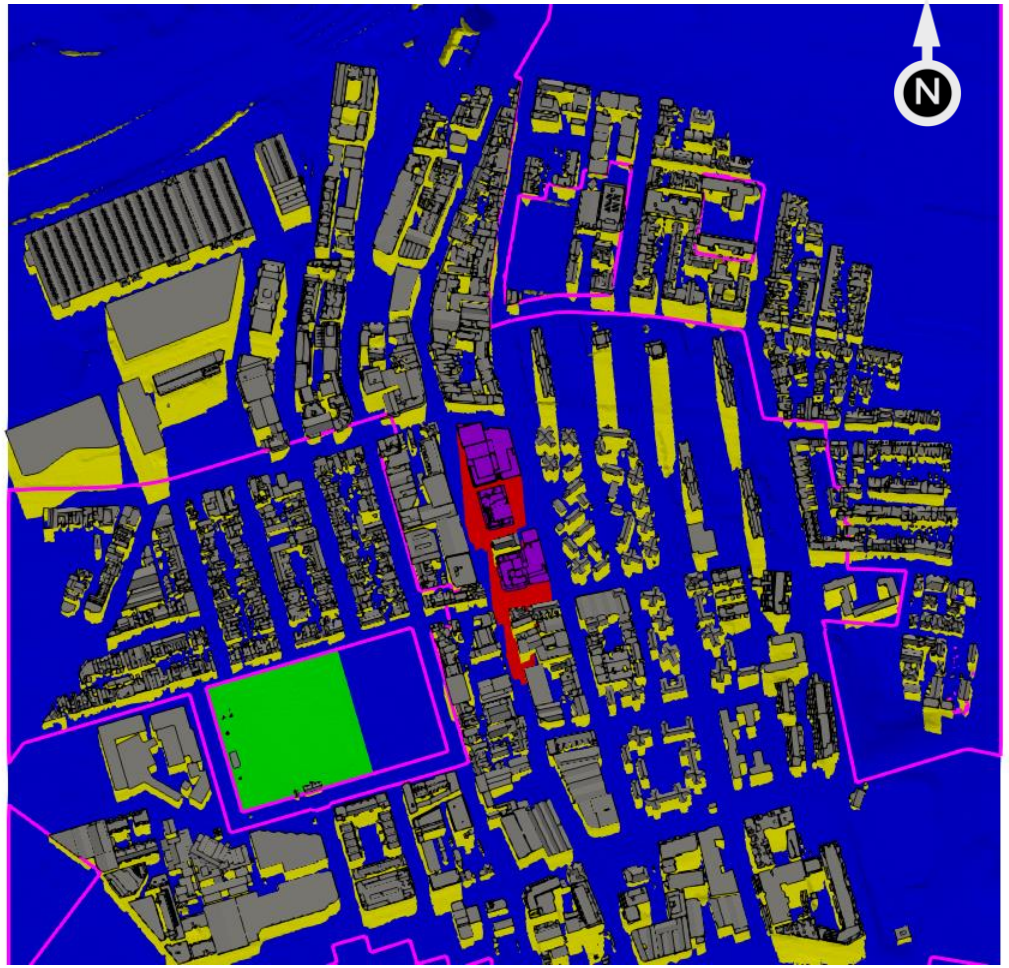


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 12:15 AEST

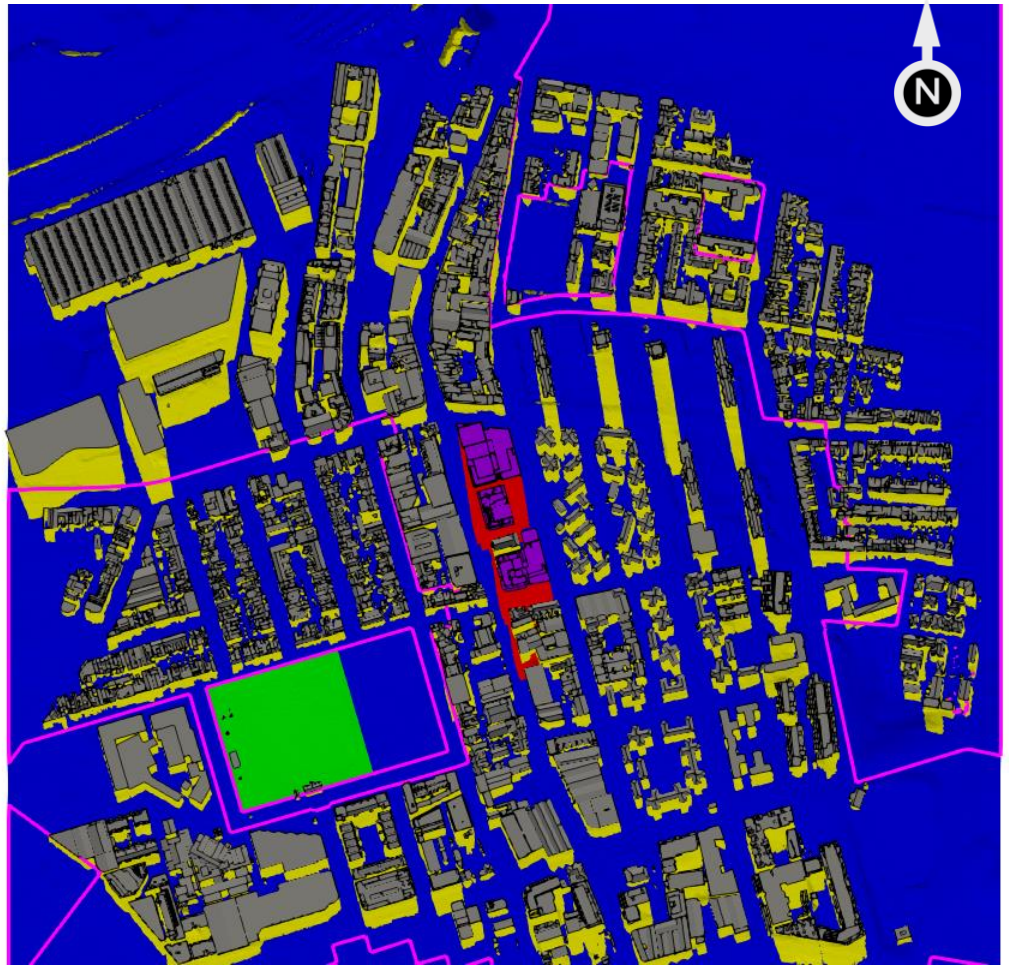


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 12:30 AEST

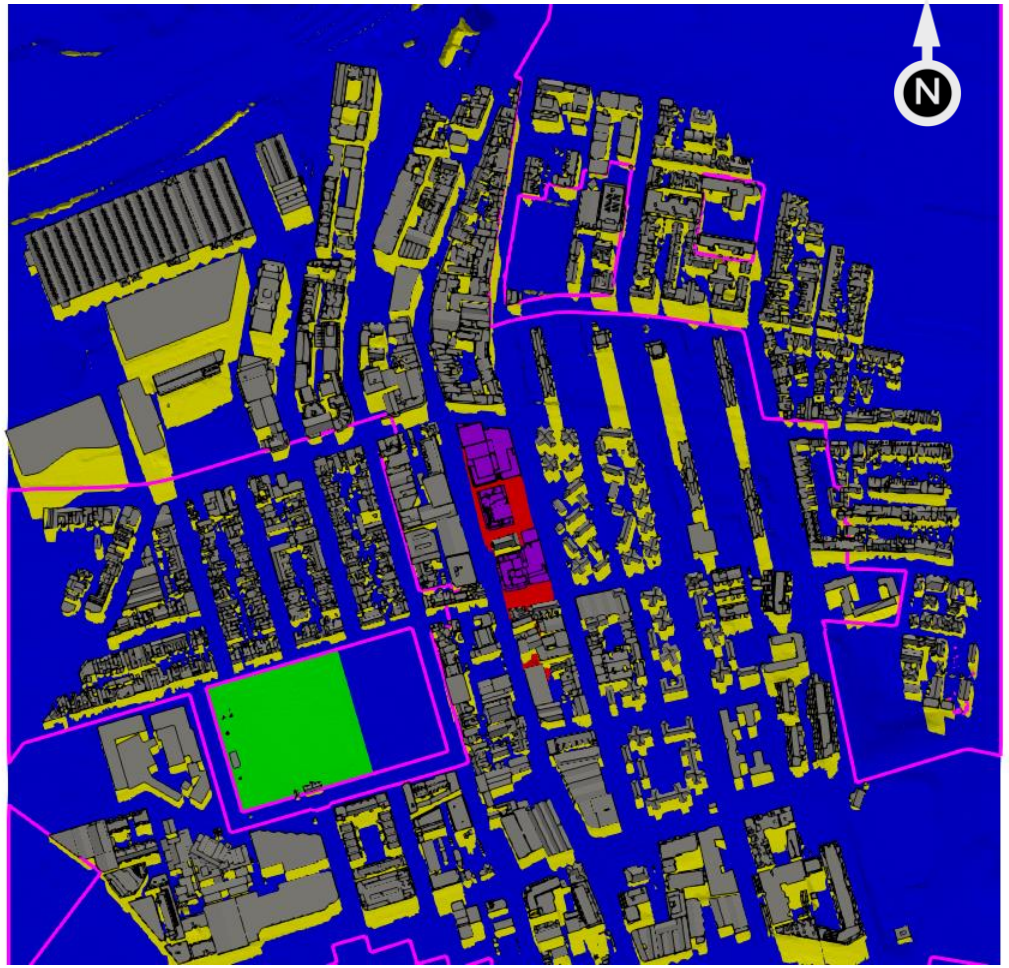


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 12:45 AEST

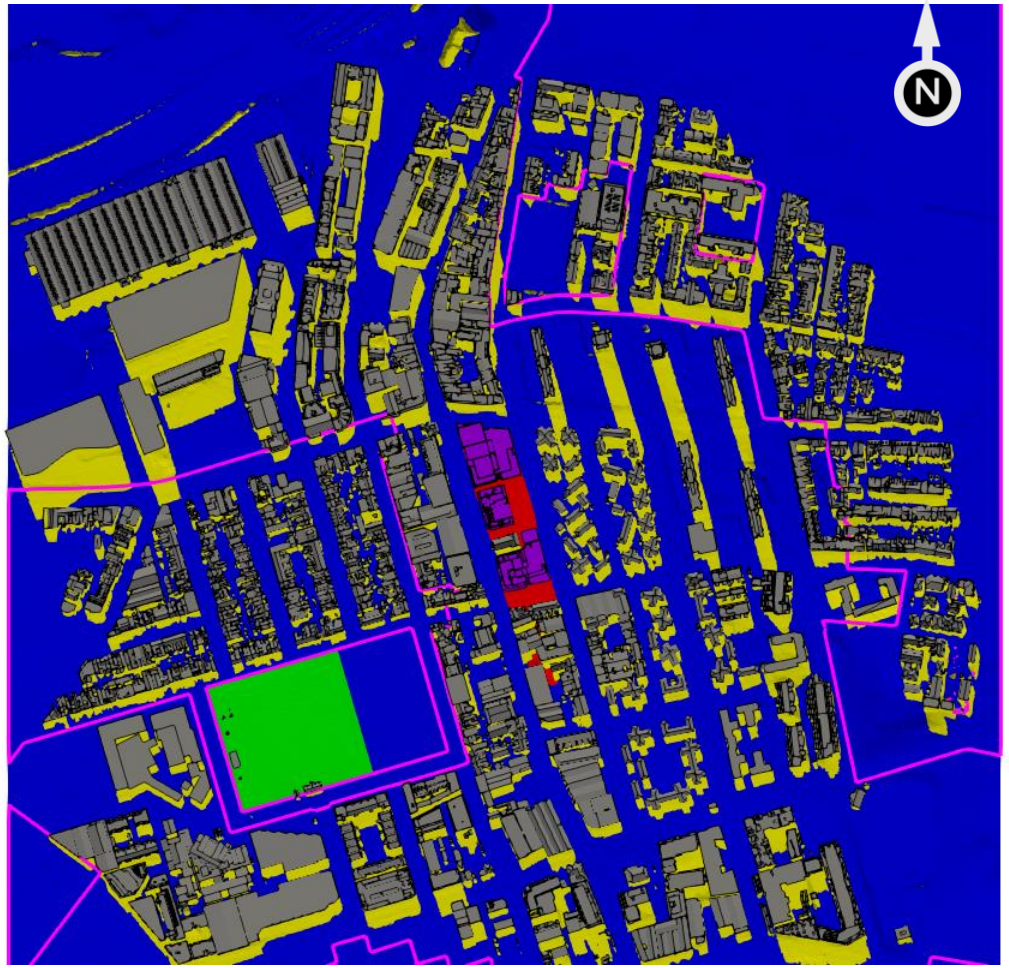


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 1:00 AEST

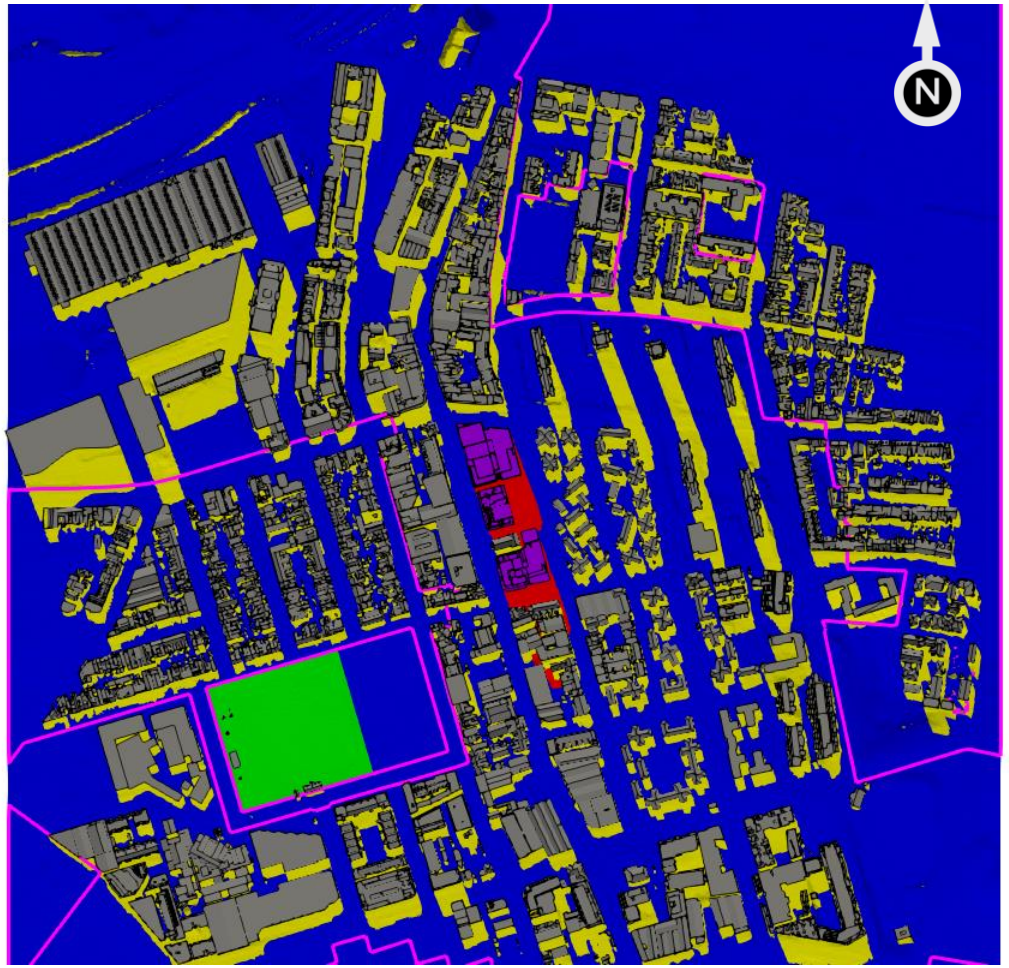


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 1:15 AEST

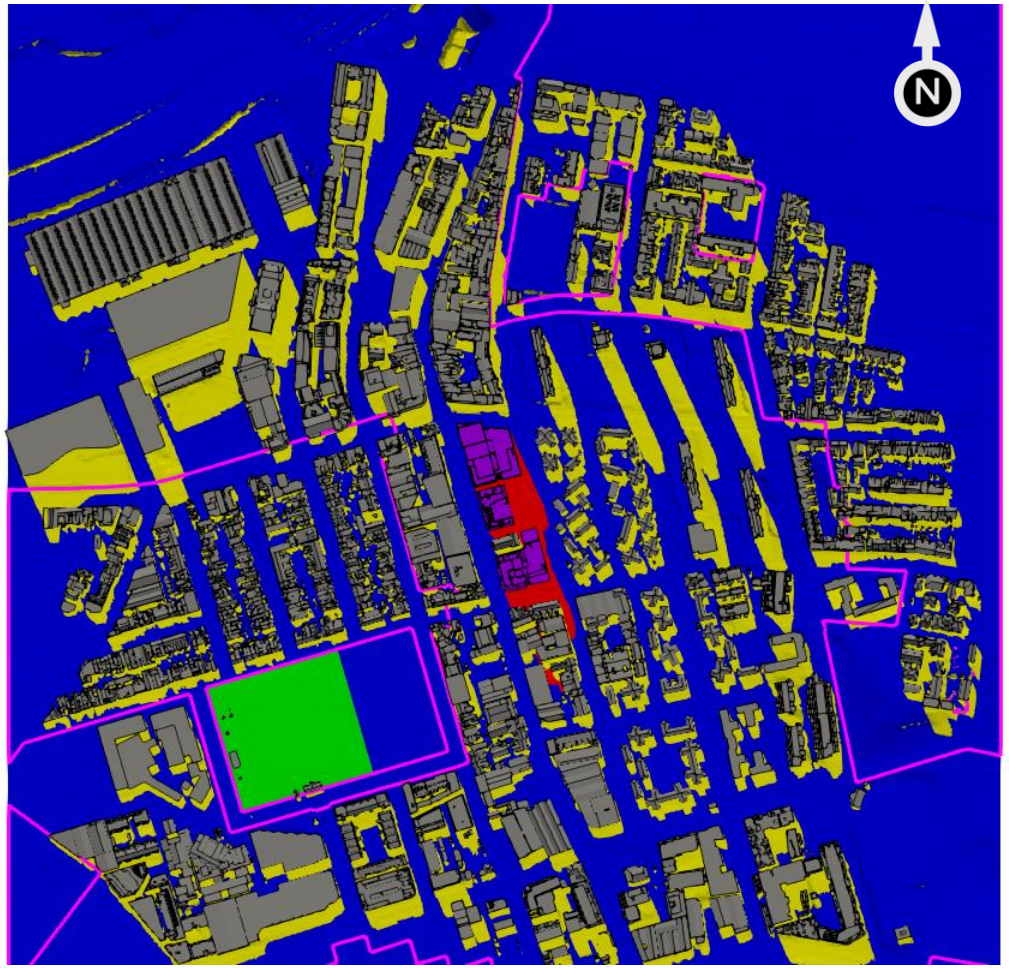


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 1:30 AEST

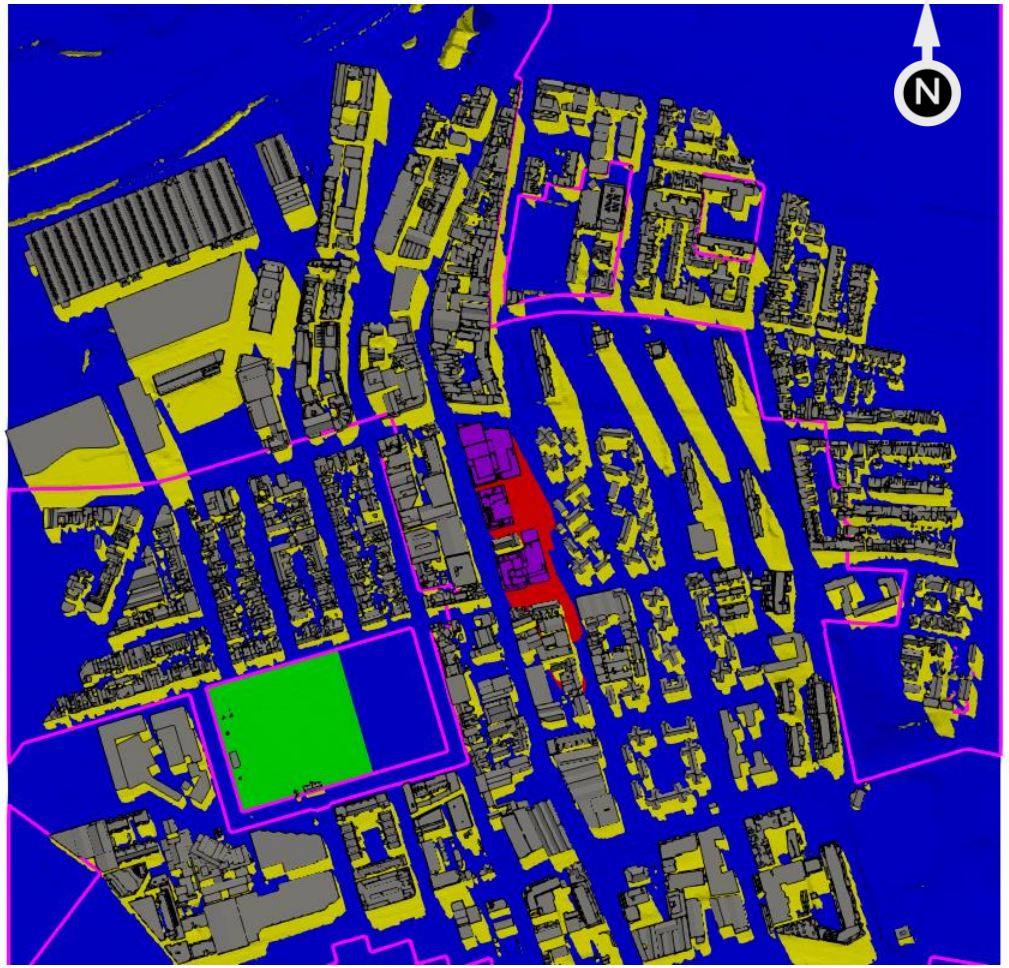


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 1:45 AEST

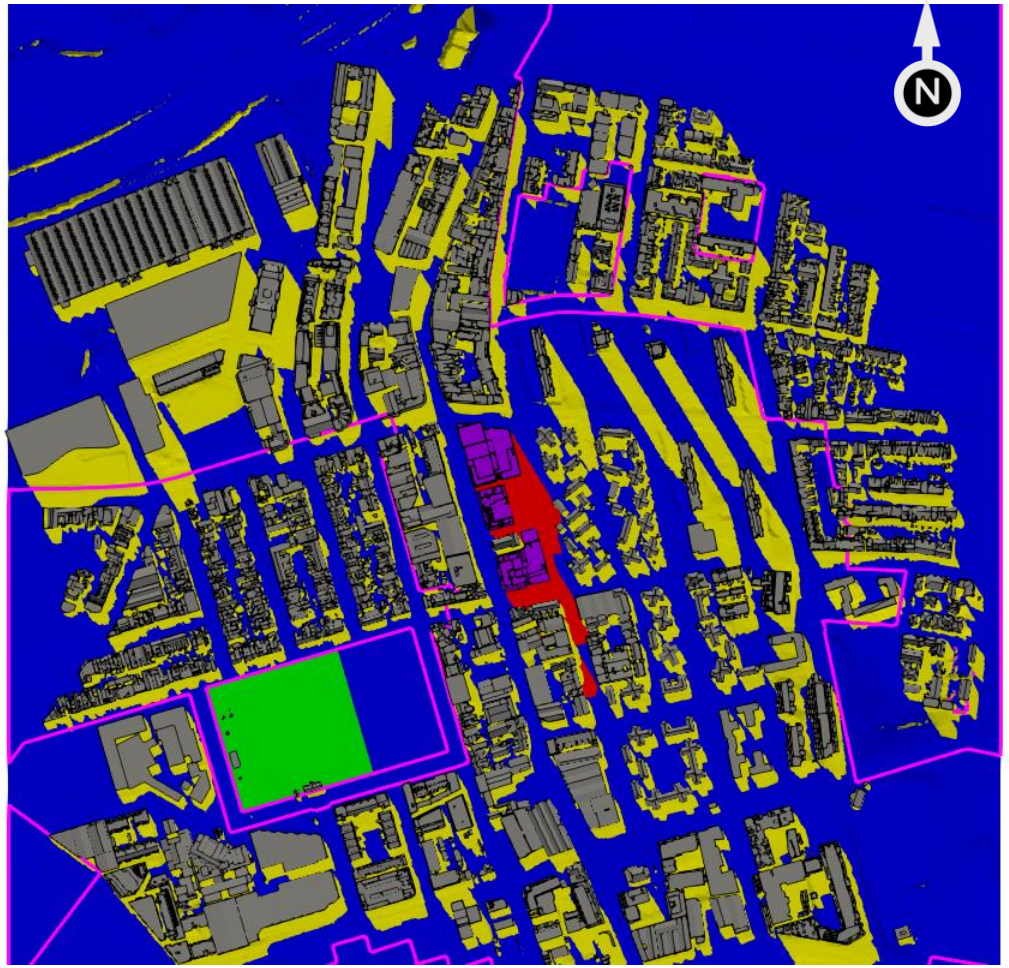


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 2:00 AEST

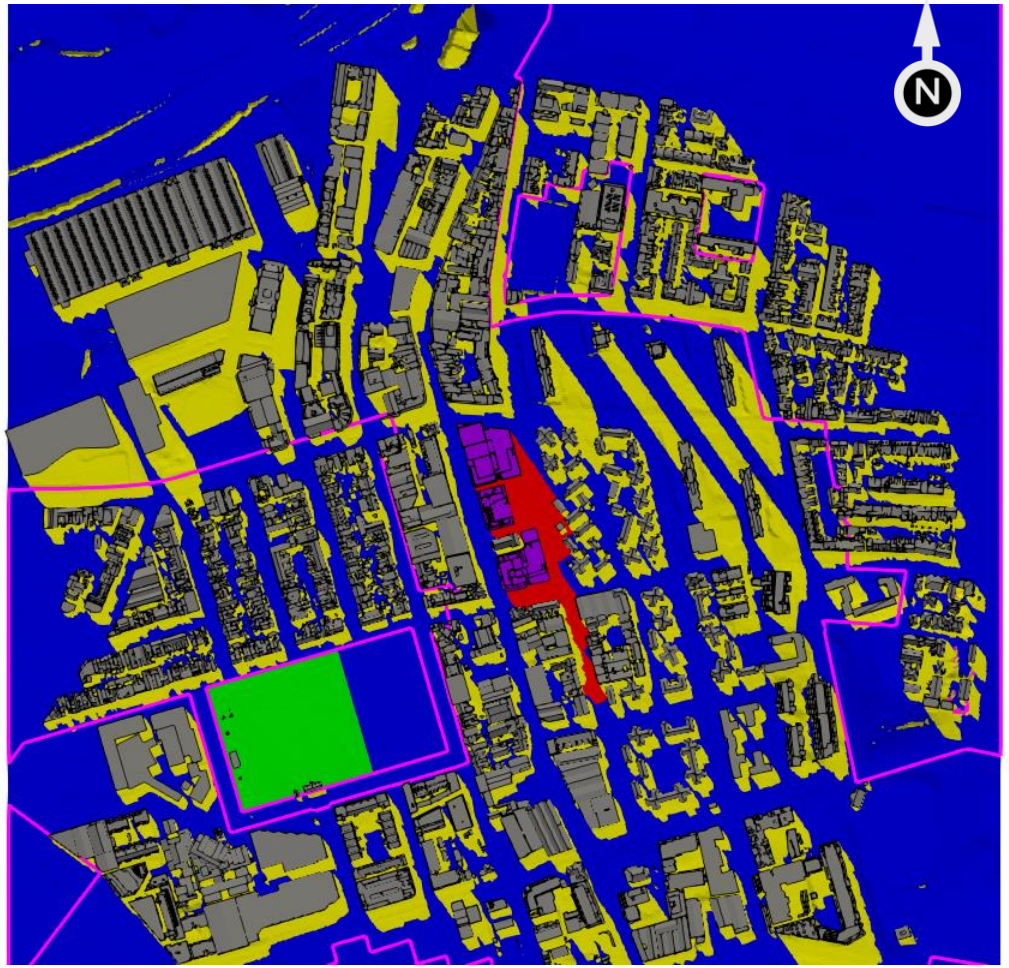


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 2:15 AEST

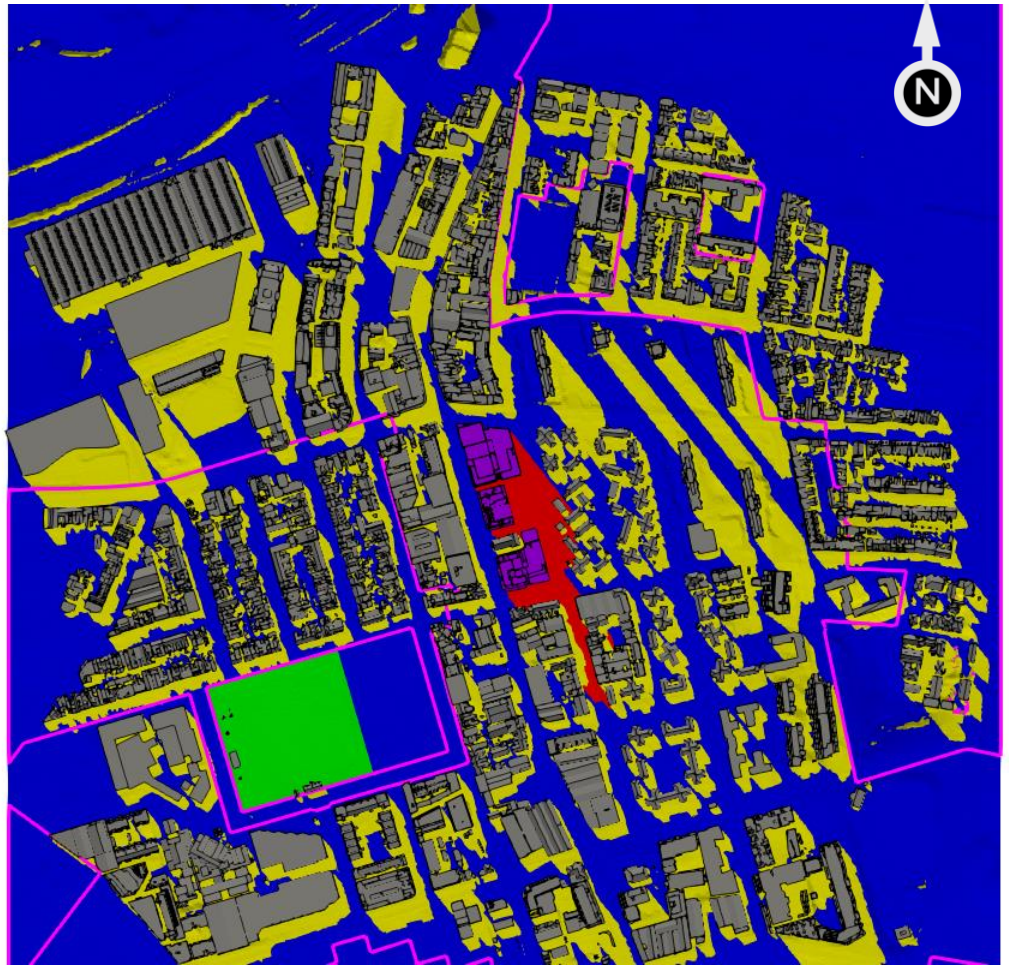


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 2:30 AEST

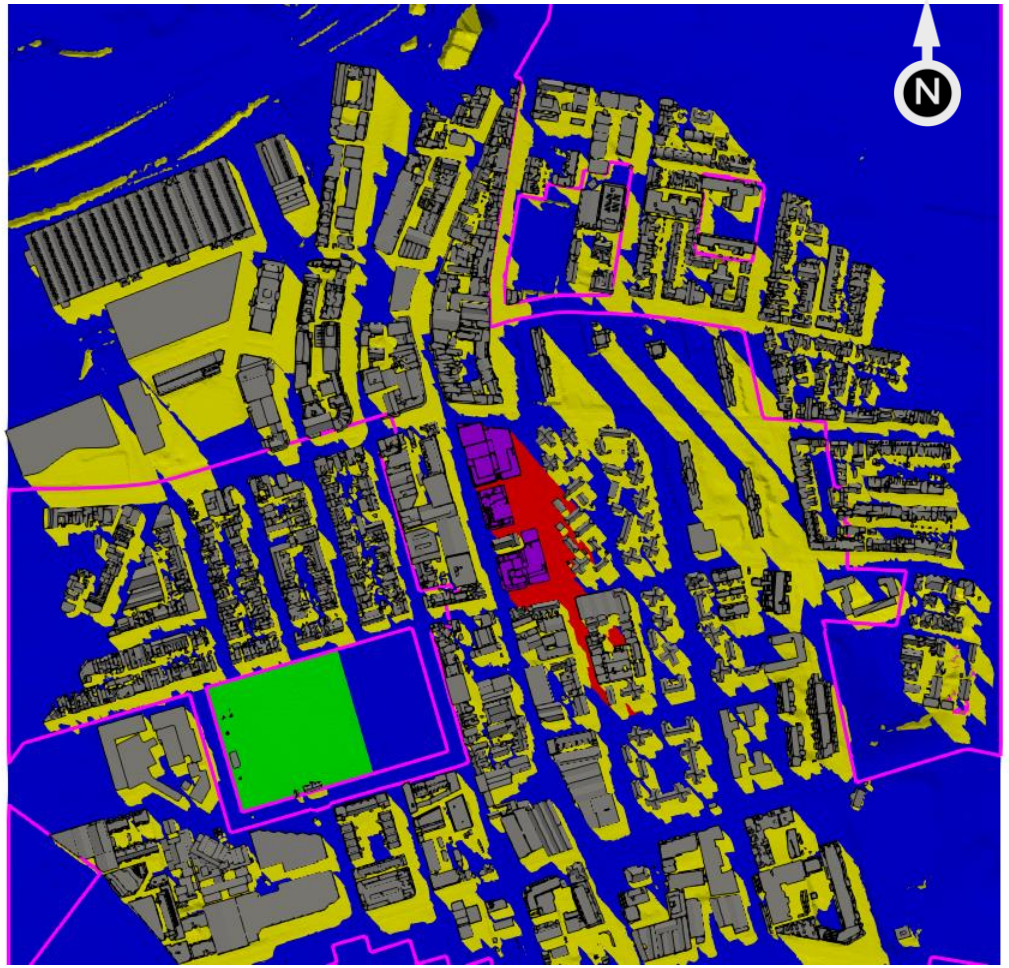


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 2:45 AEST

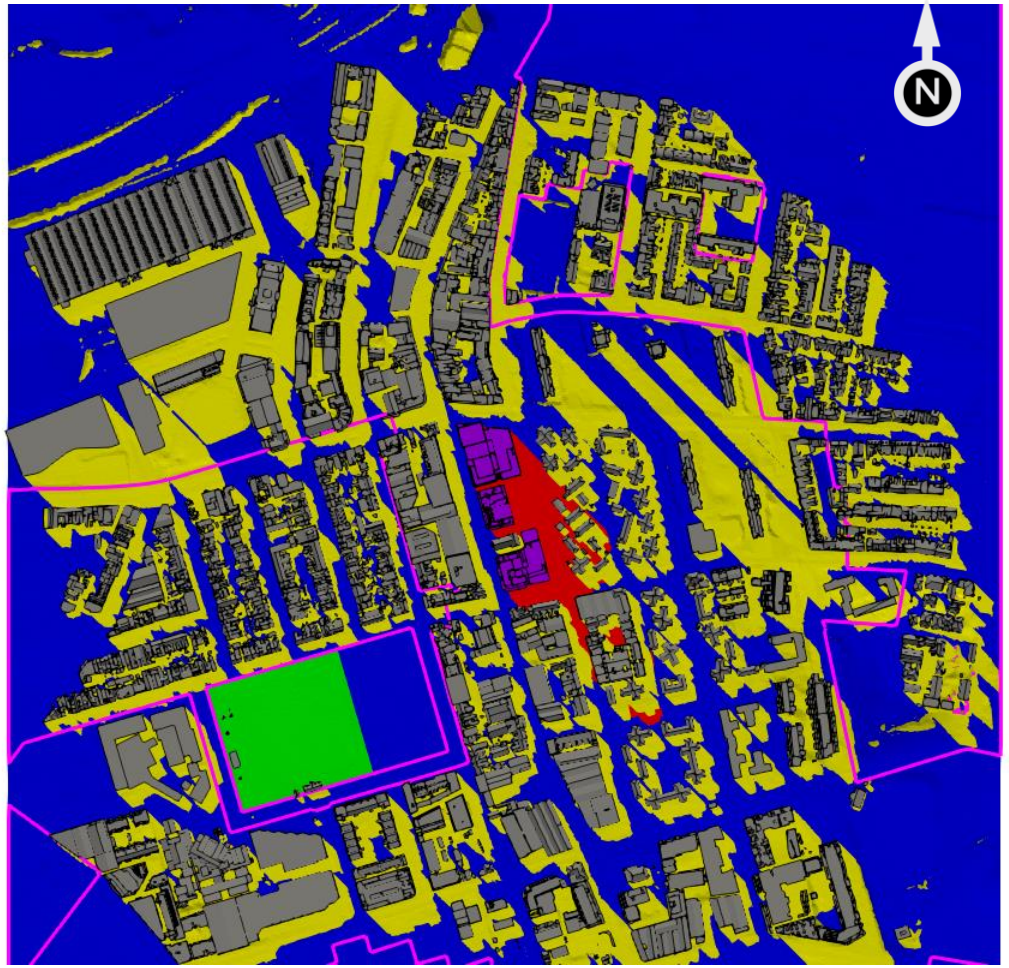


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 June – 3:00 AEST



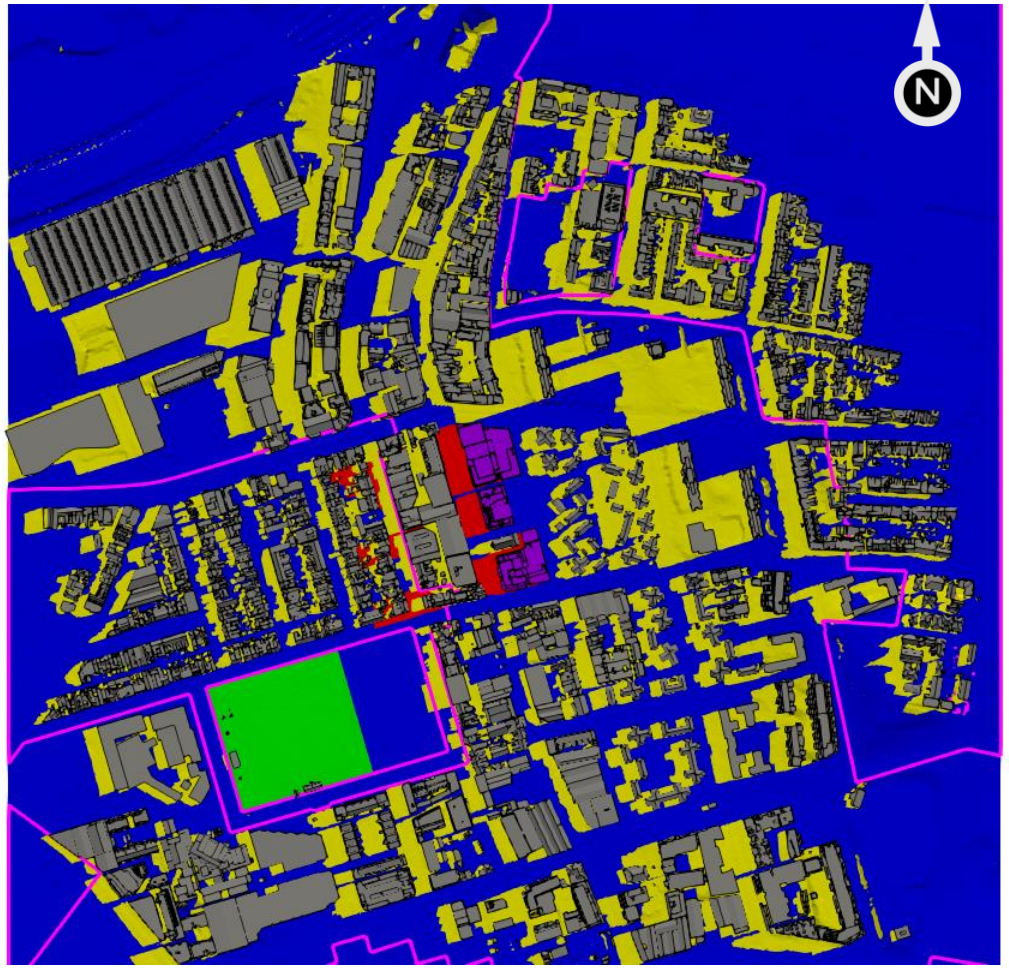
LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

11.5 Appendix 5 – Point-in-time shadow diagrams – Full Domain – 21 Mar

POINT-IN-TIME SHADOW PLOTS

21 March - 9:00 AEDT

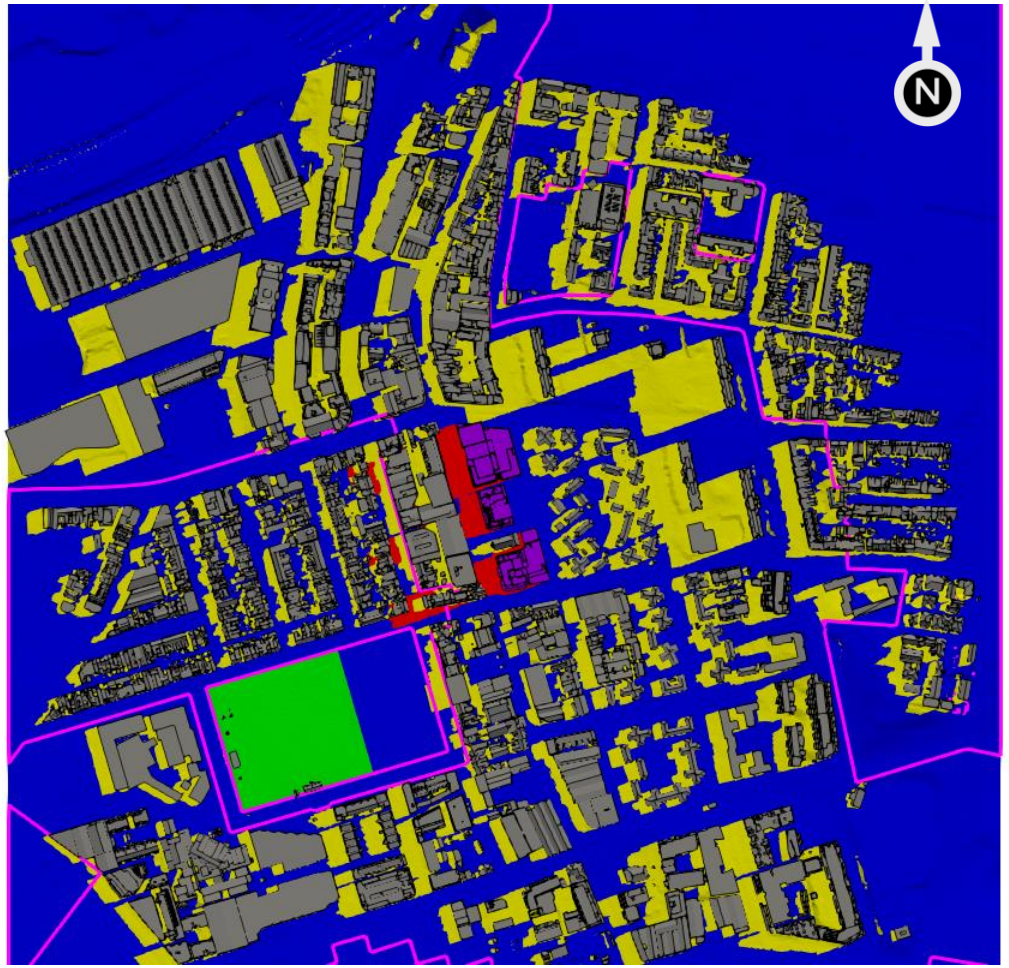


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 9:15 AEDT

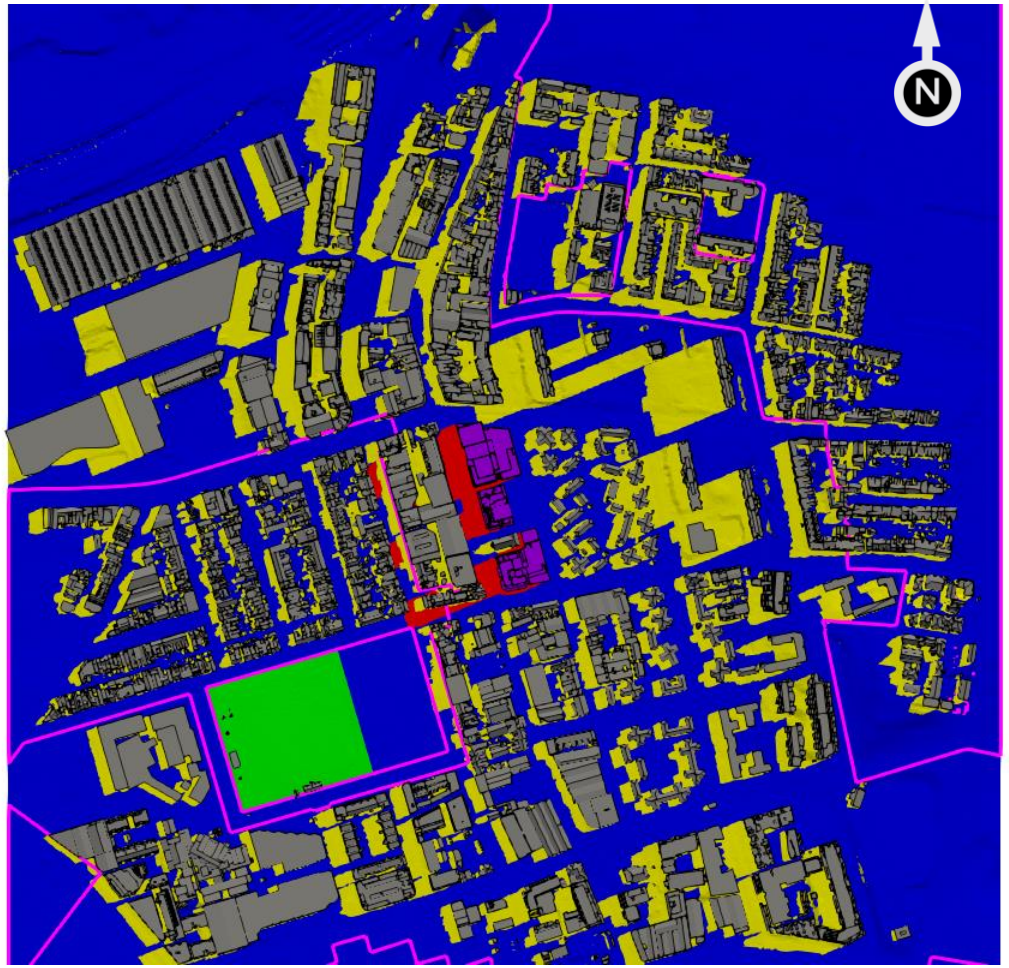


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 9:30 AEDT

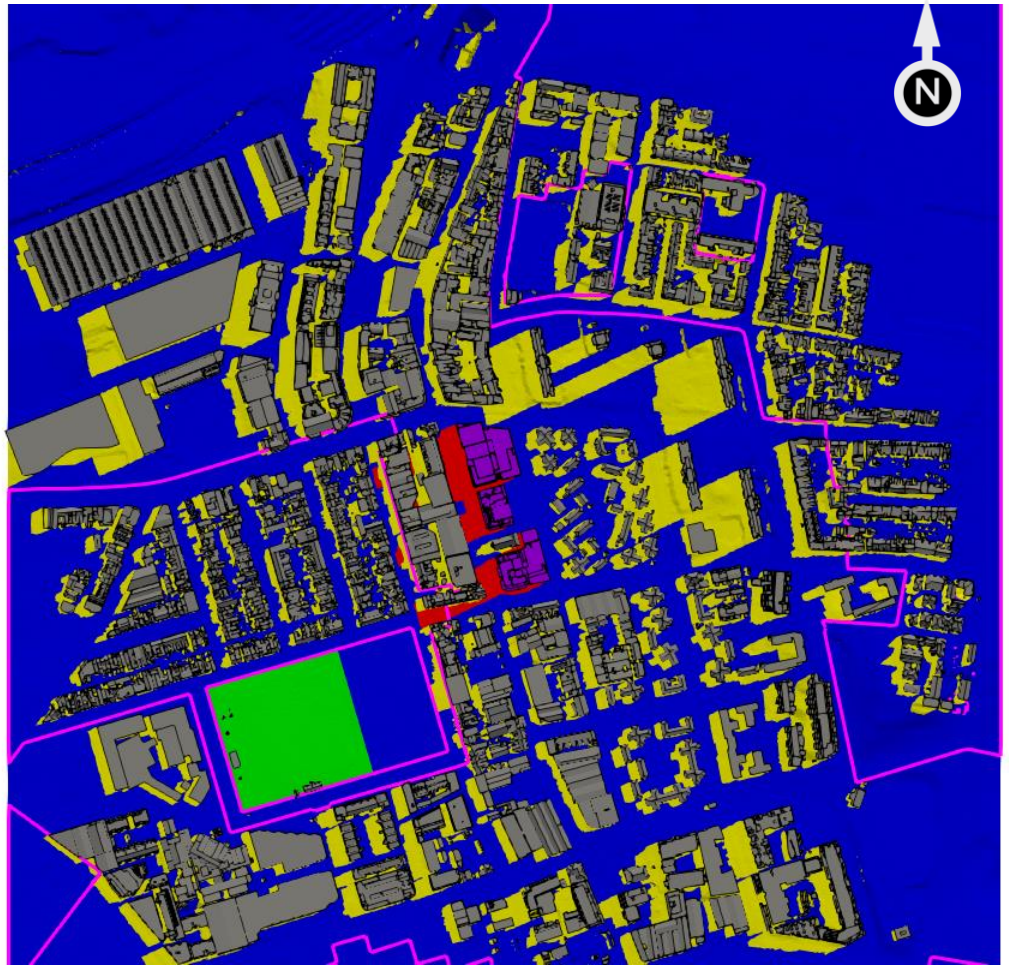


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 9:45 AEDT

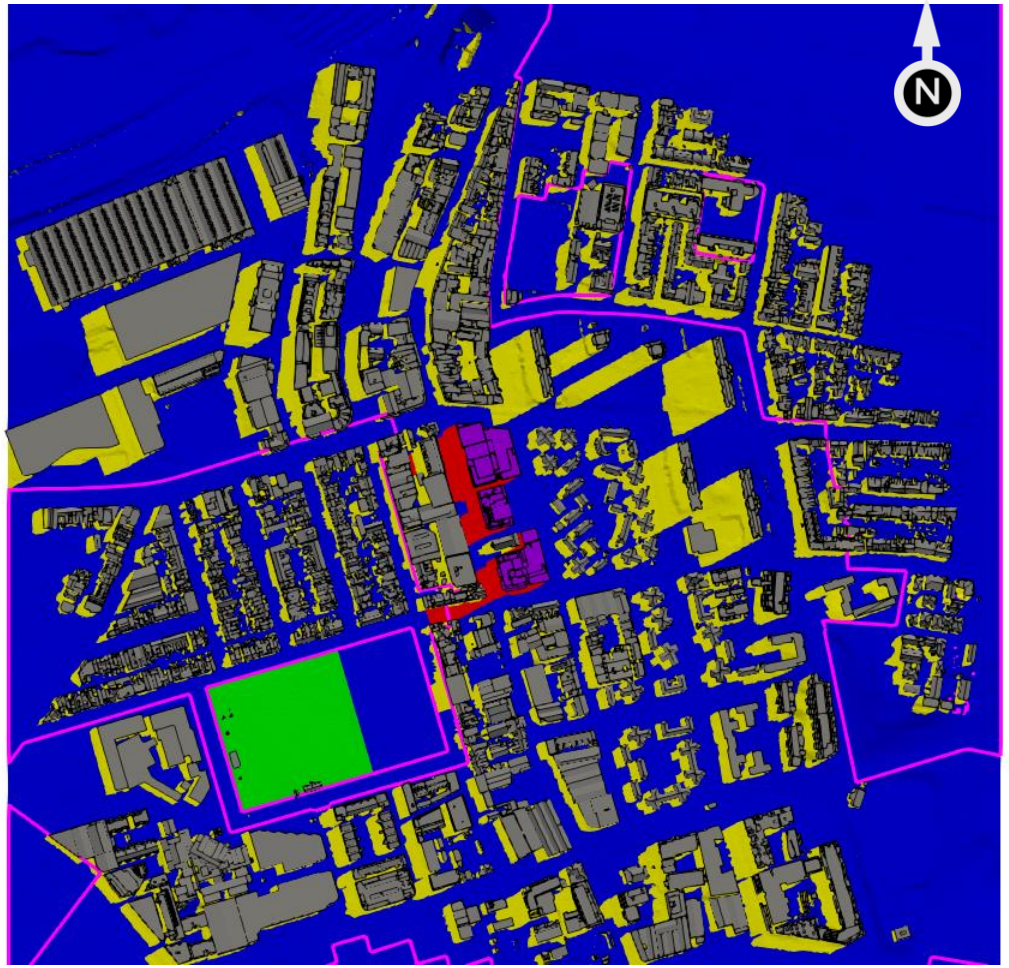


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 10:00 AEDT

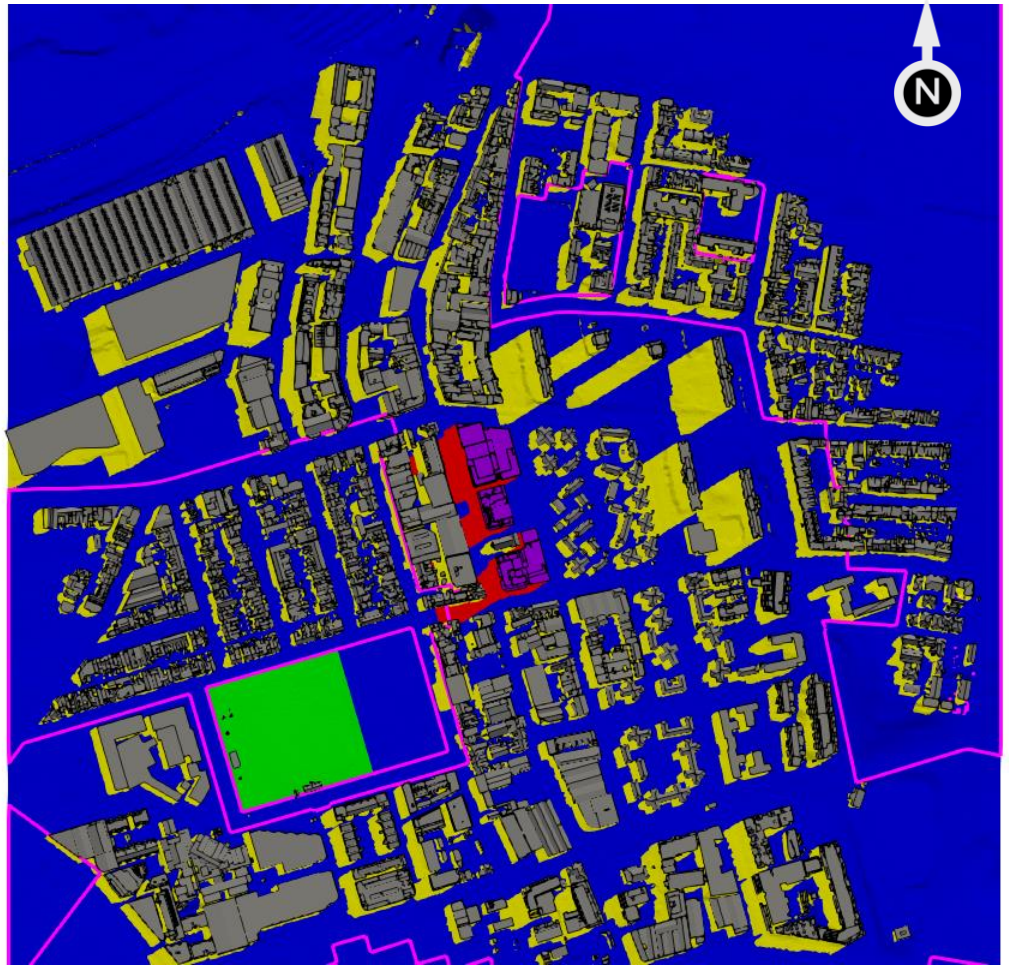


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 10:15 AEDT

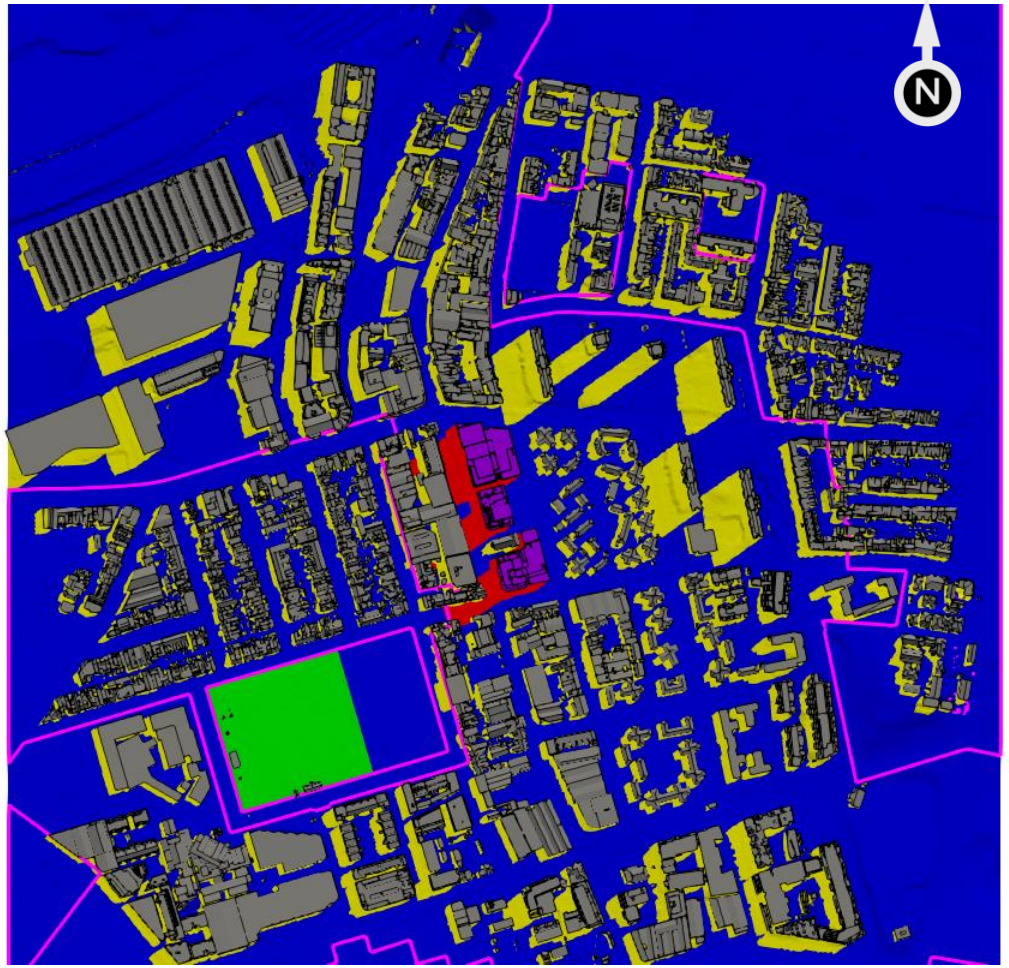


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 10:30 AEDT

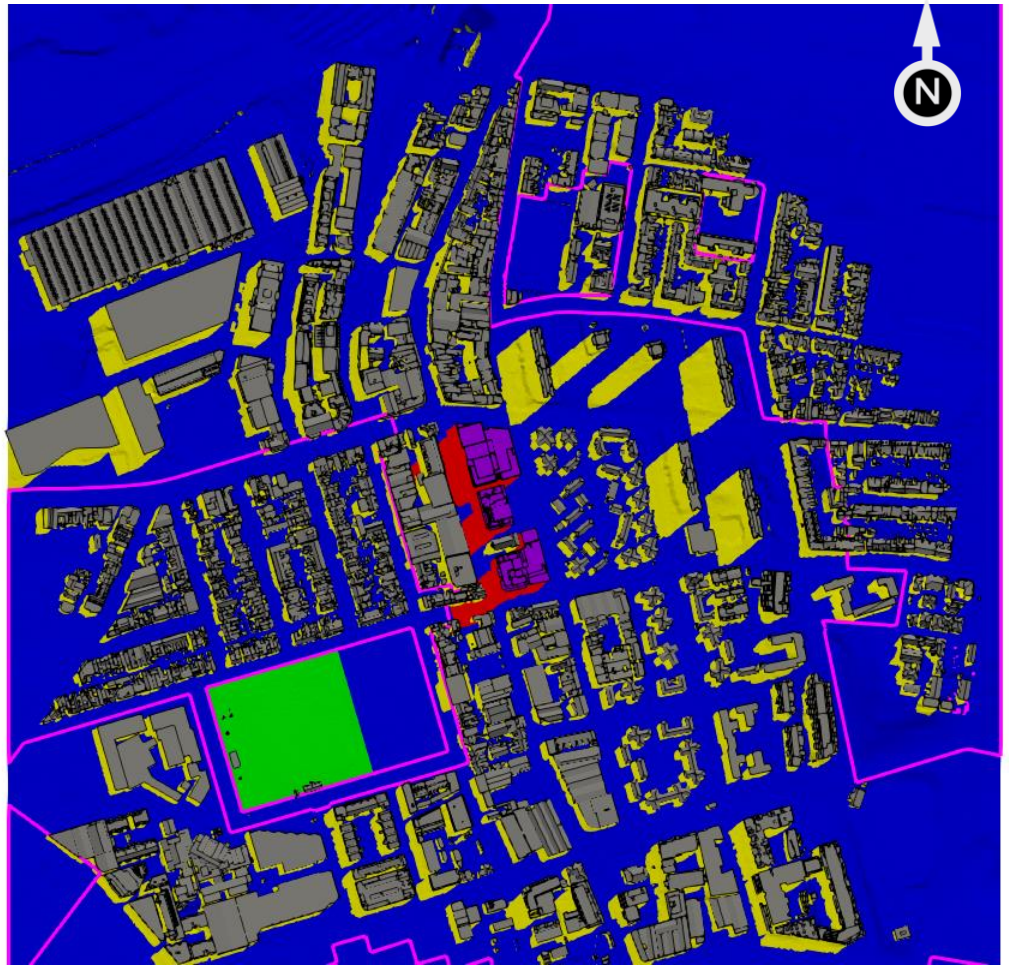


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March - 10:45 AEDT

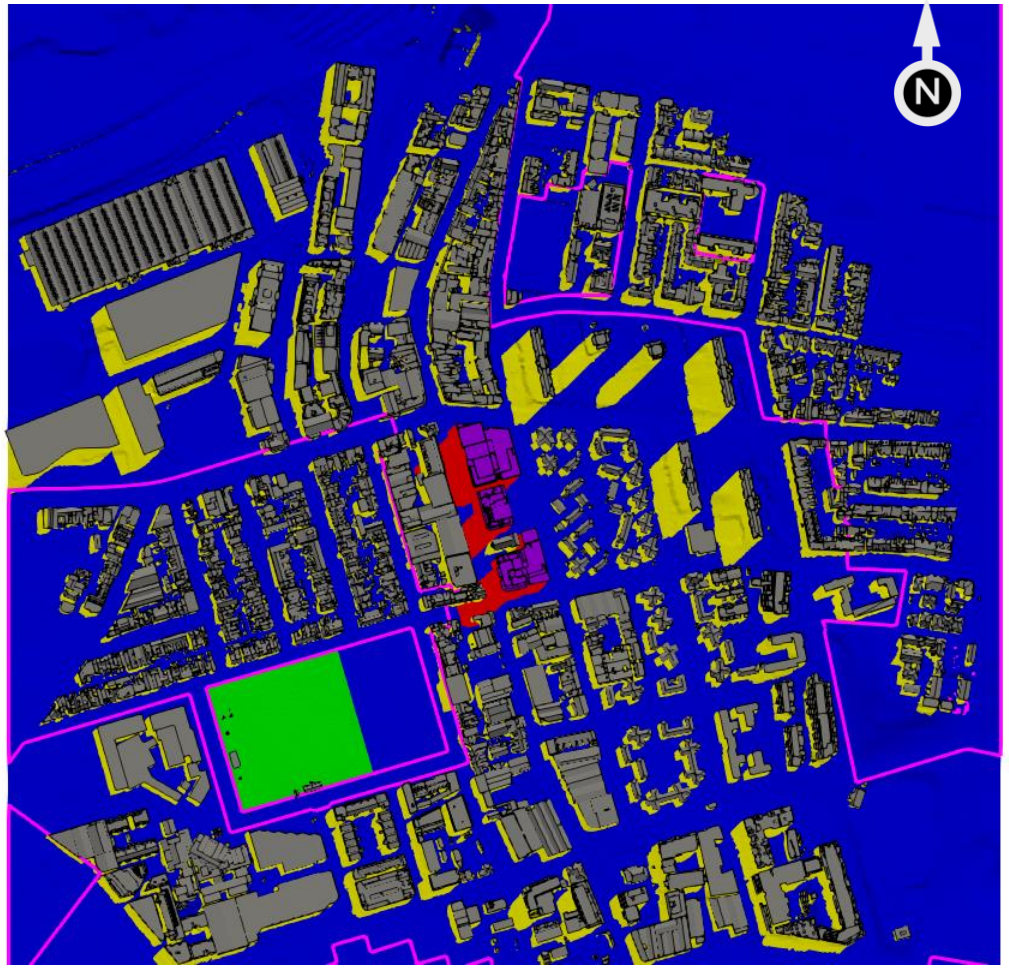


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 11:00 AEDT

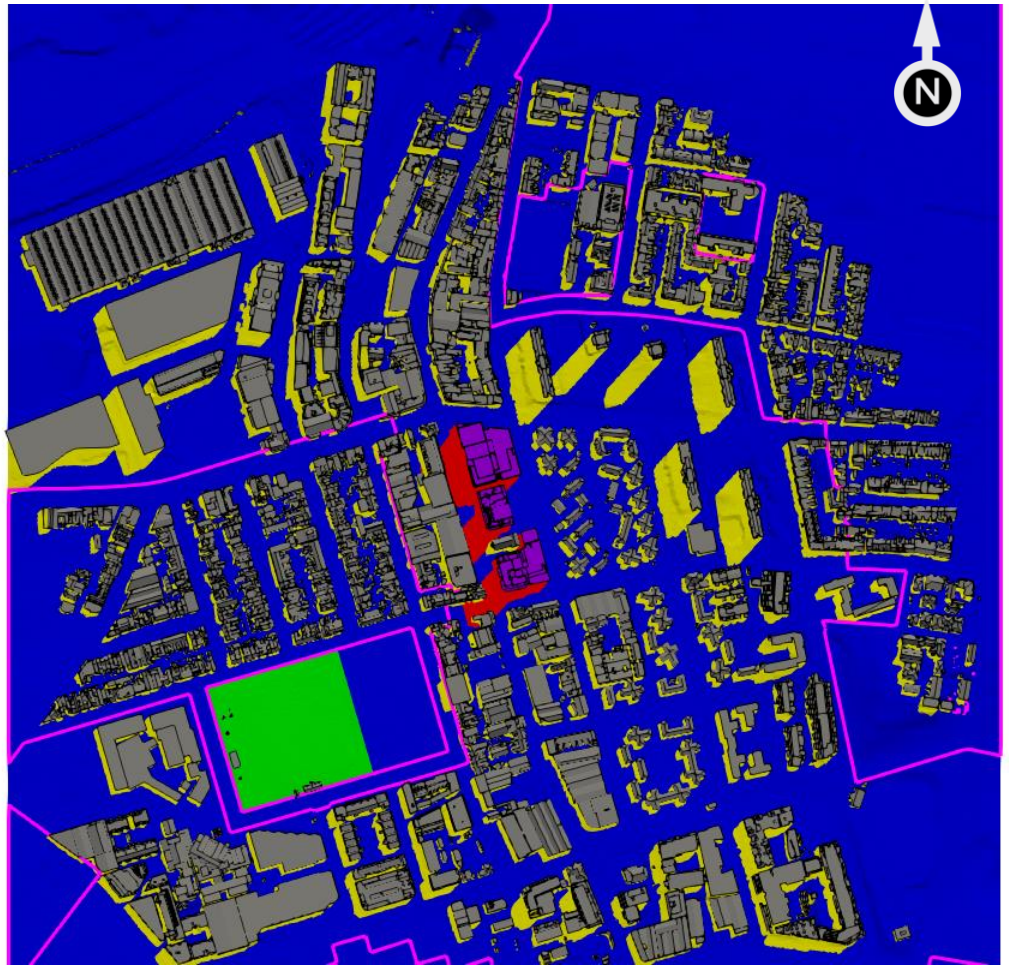


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 11:15 AEDT

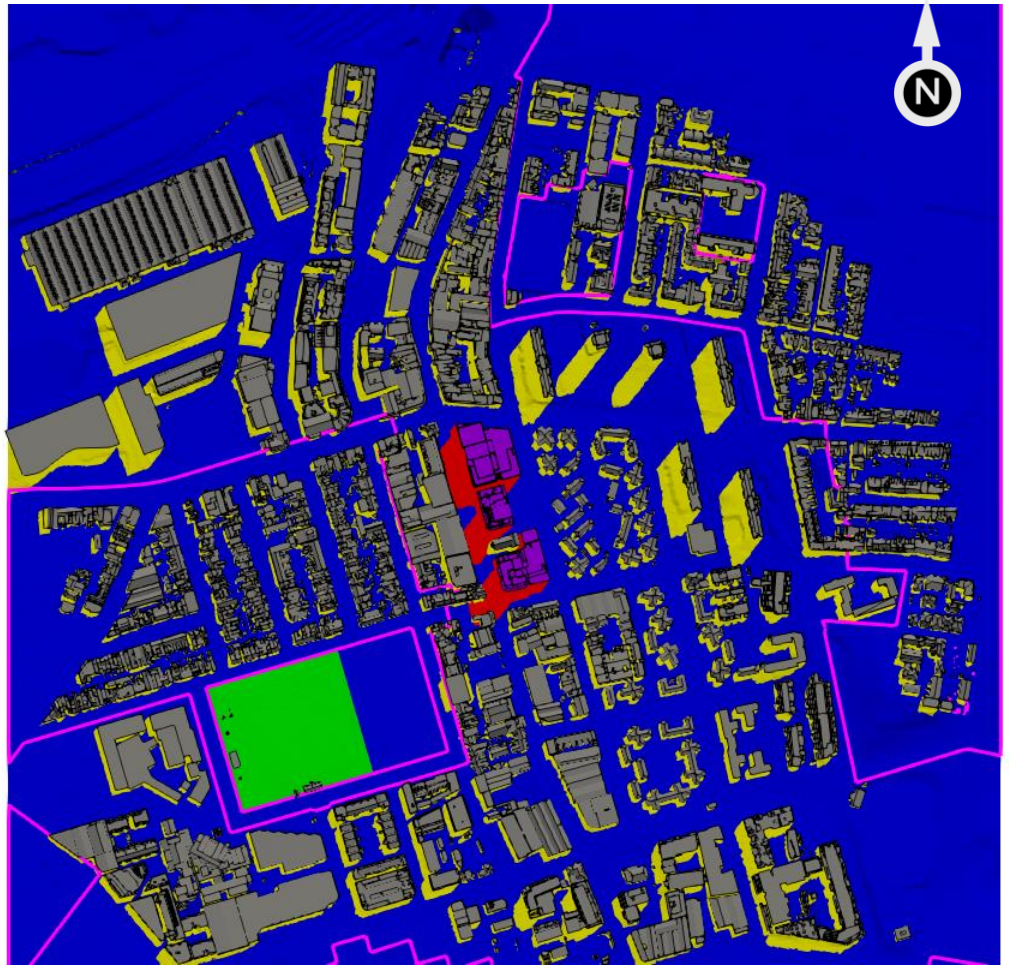


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 11:30 AEDT

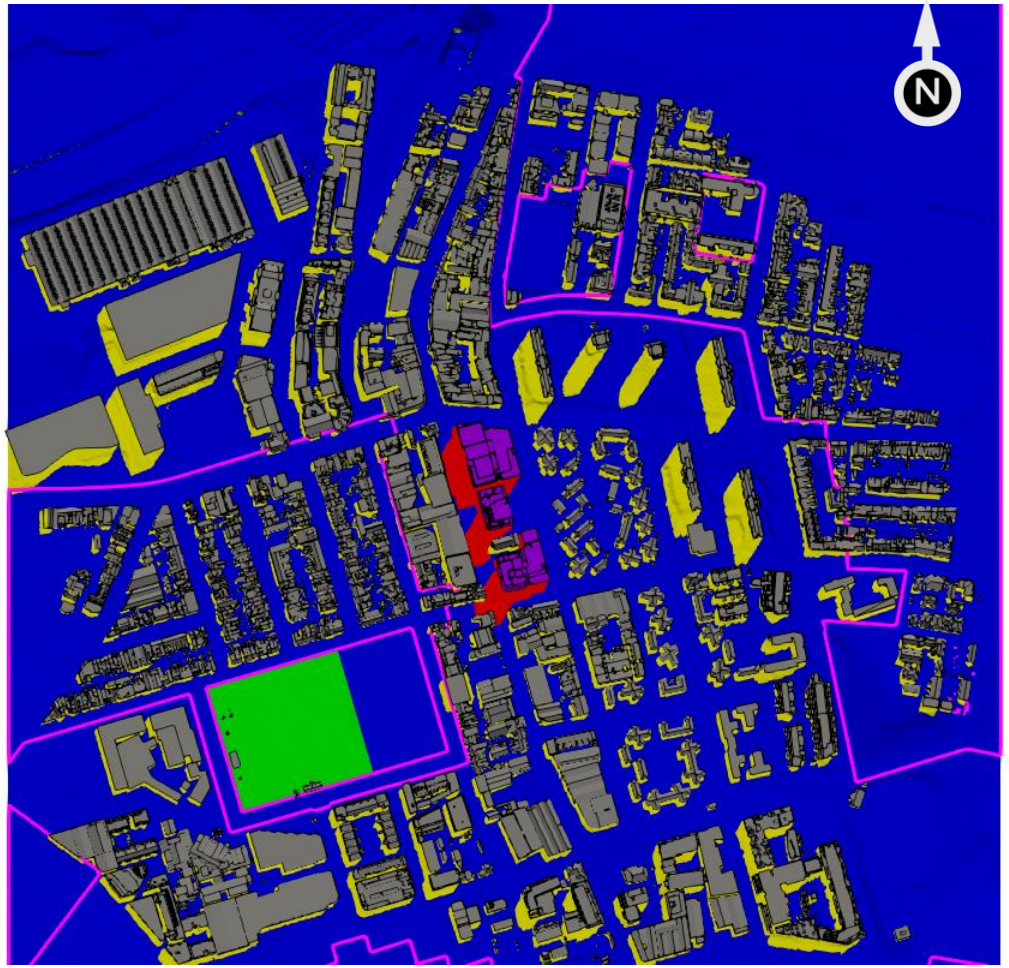


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 11:45 AEDT

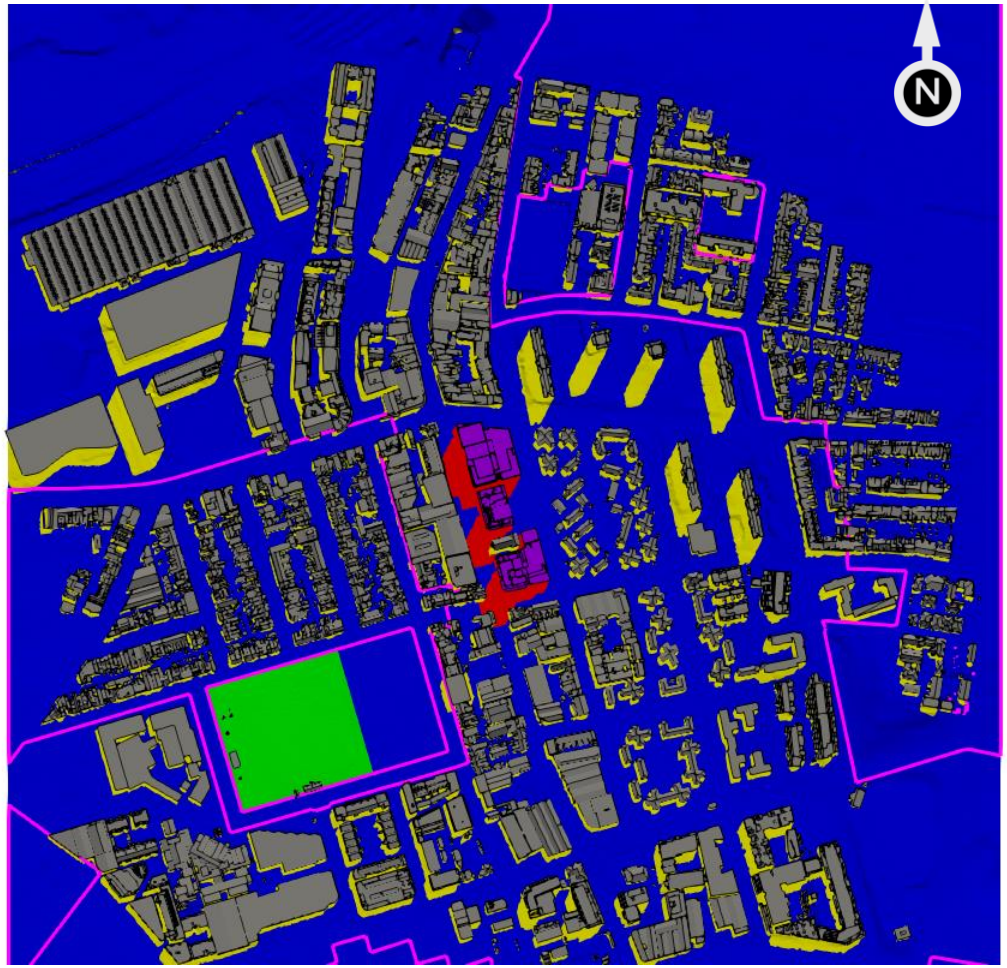


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 12:00 AEDT

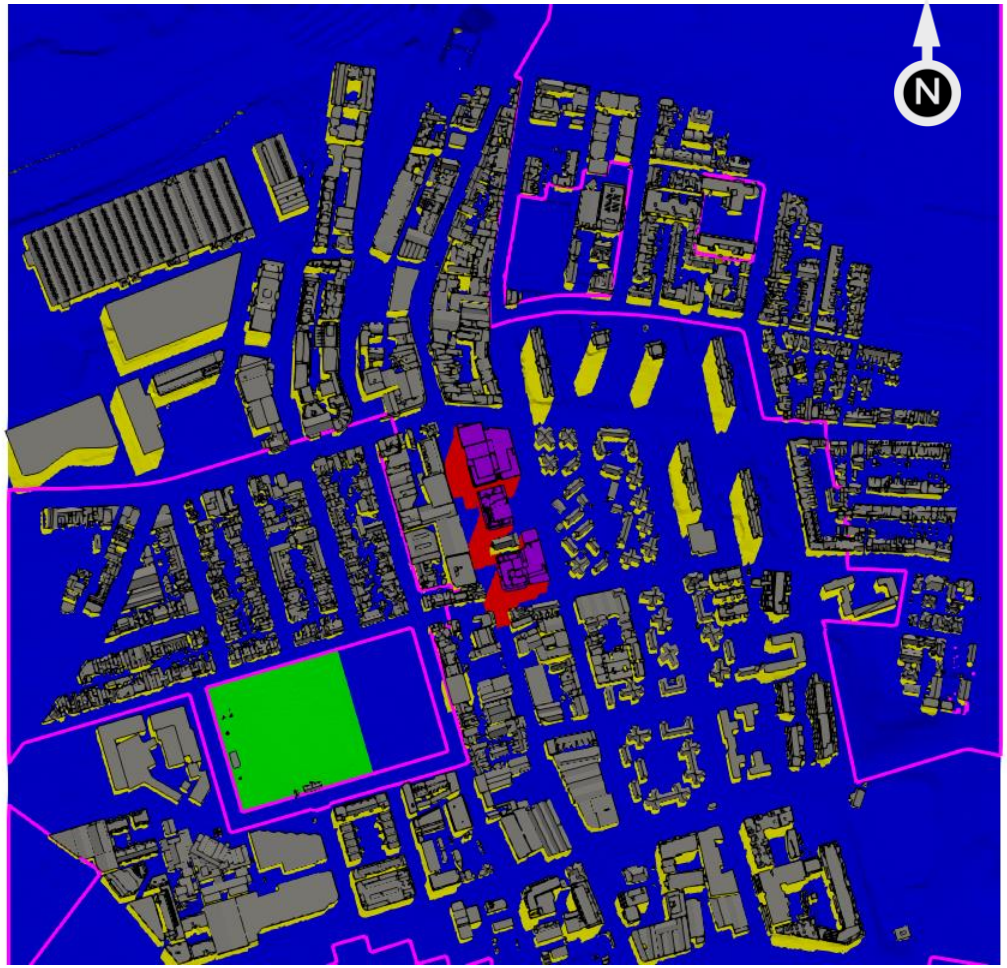


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 12:15 AEDT

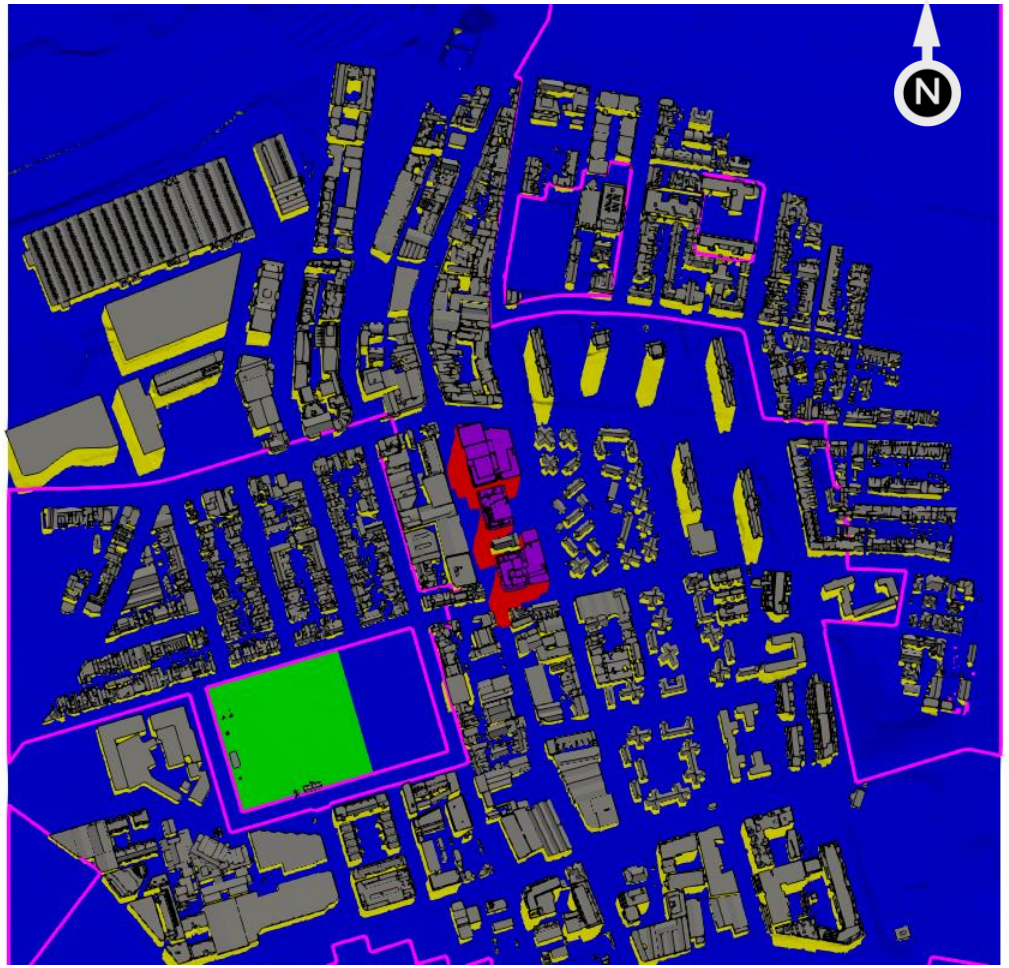


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 12:30 AEDT

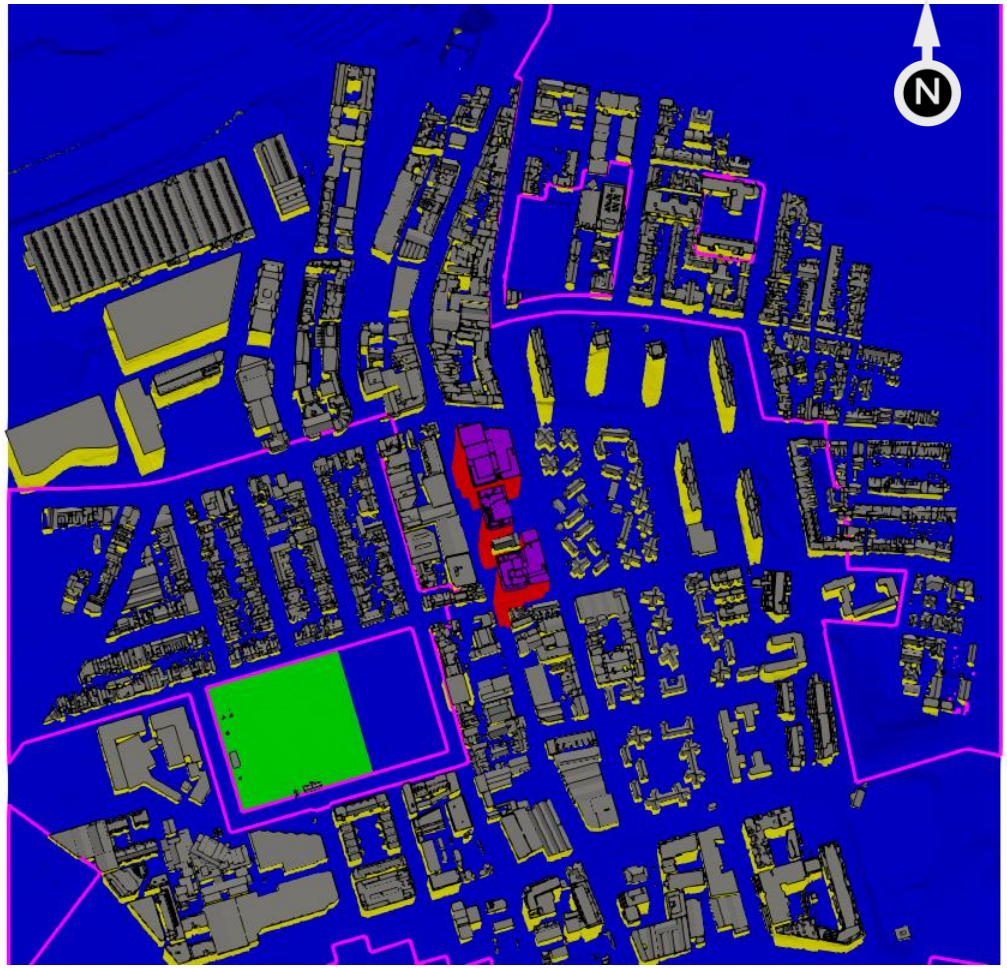


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 12:45 AEDT

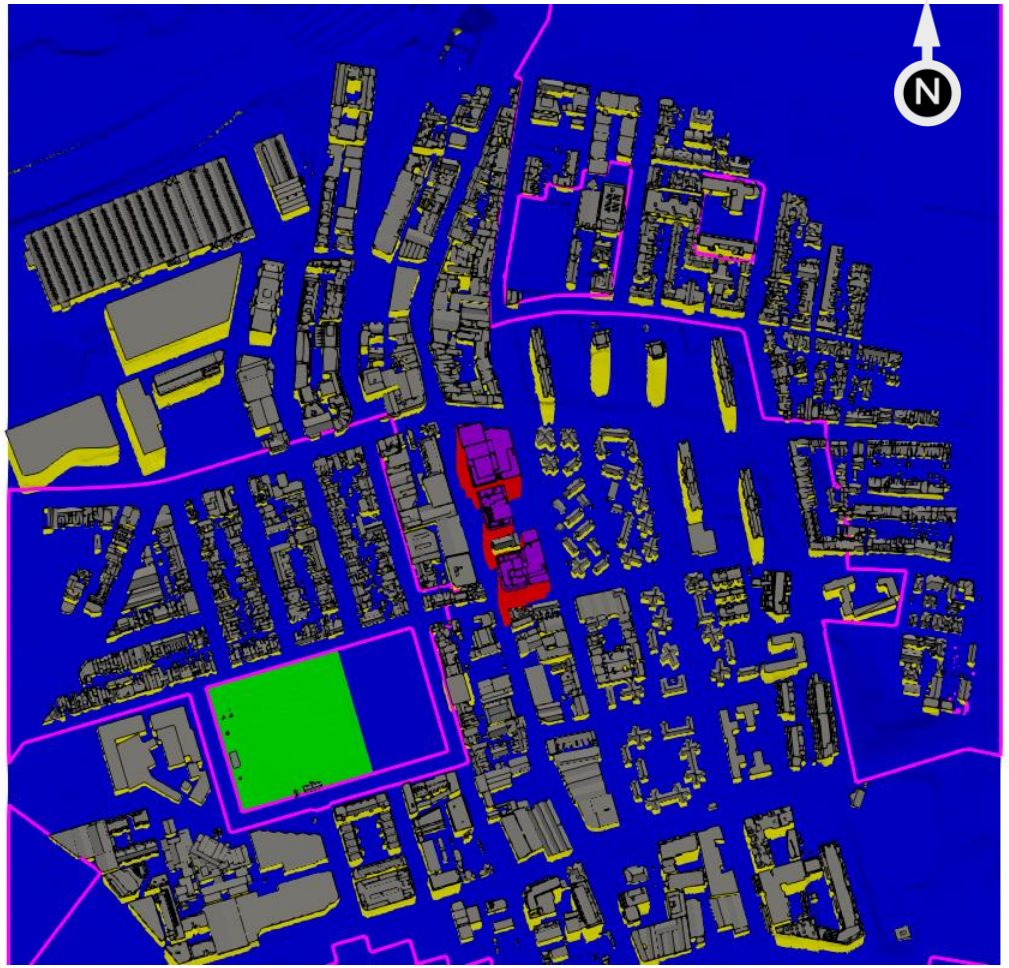


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 1:00 AEDT

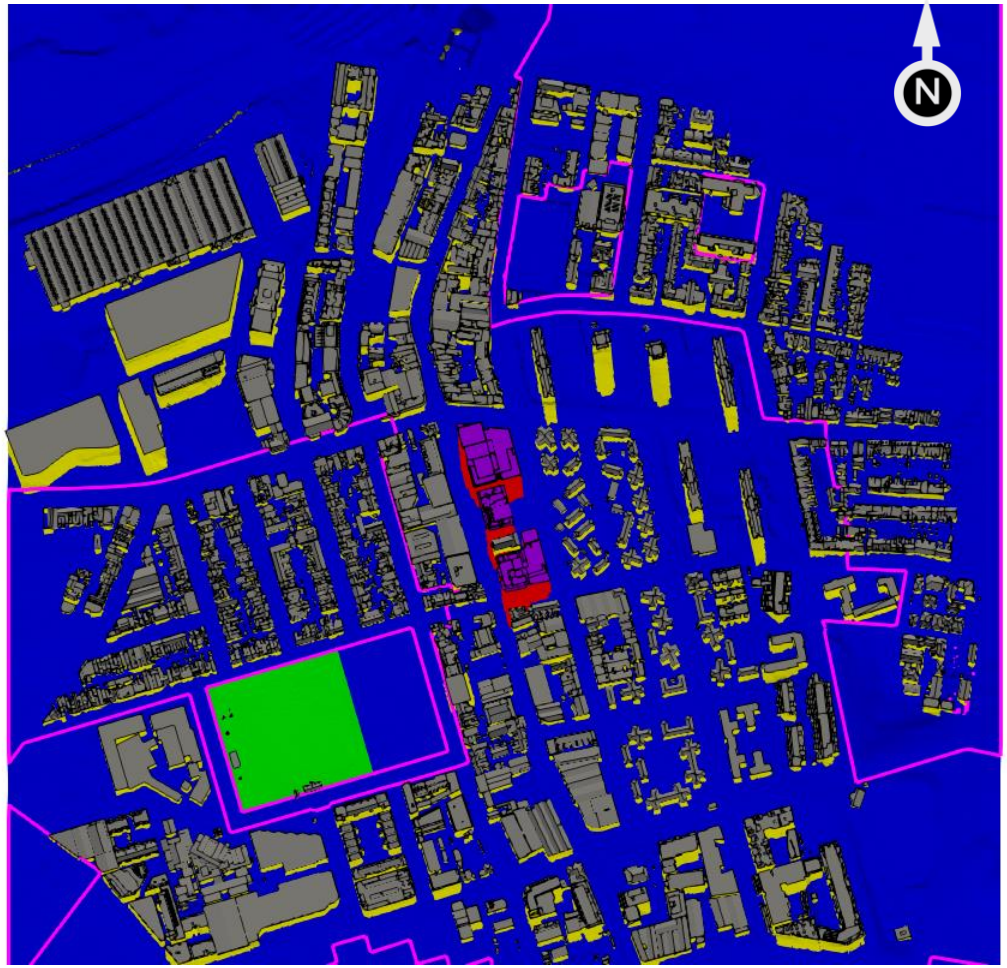


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 1:15 AEDT

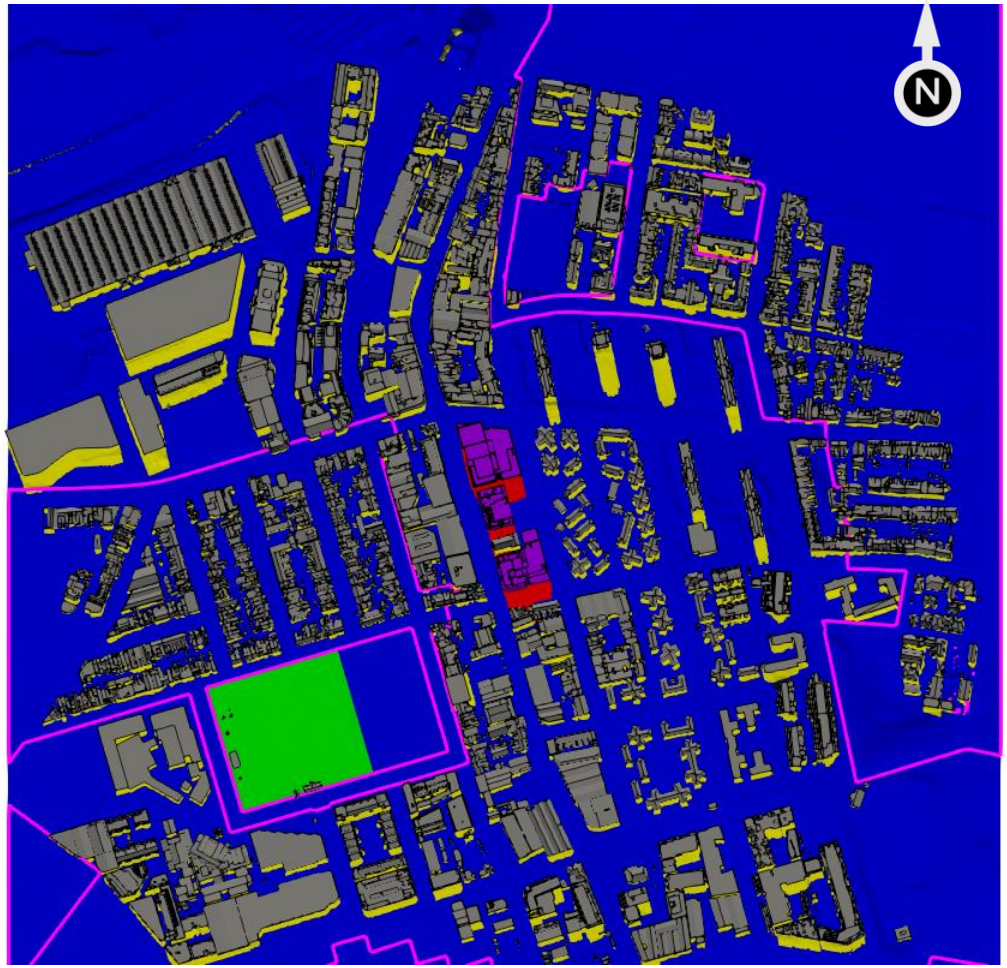


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 1:30 AEDT

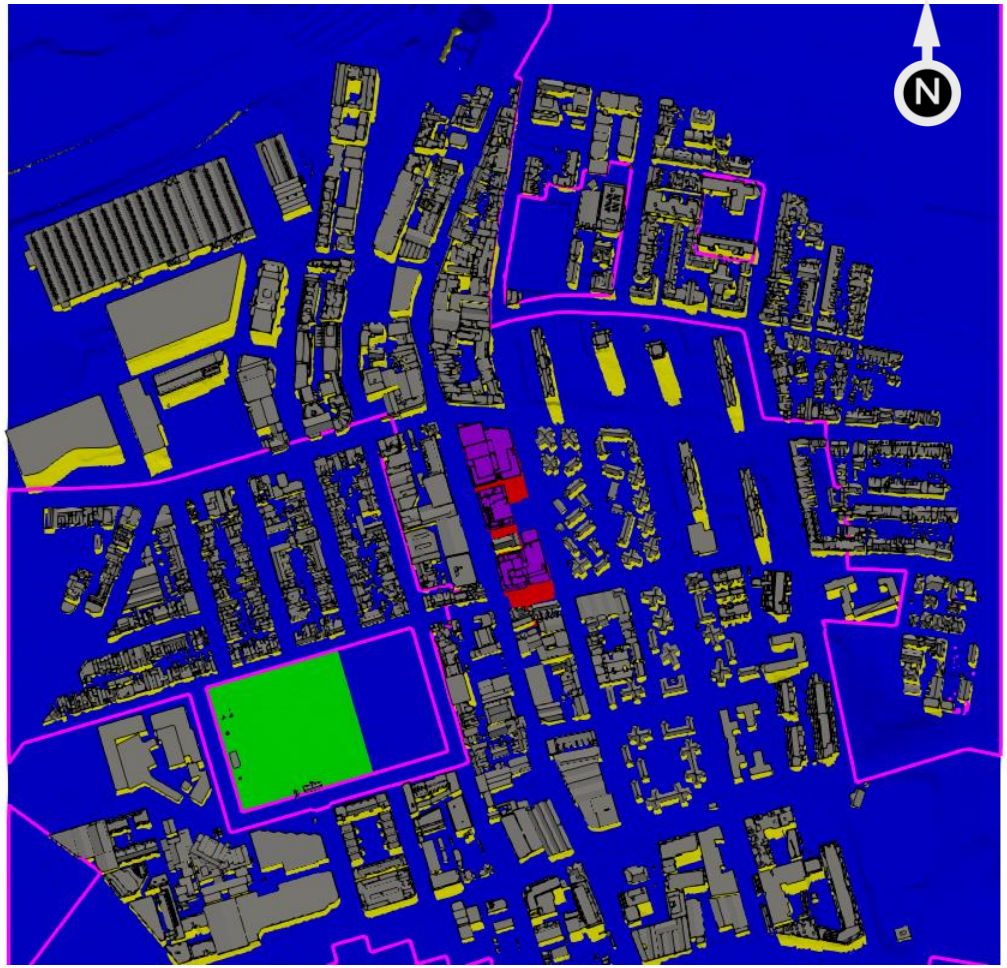


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 1:45 AEDT

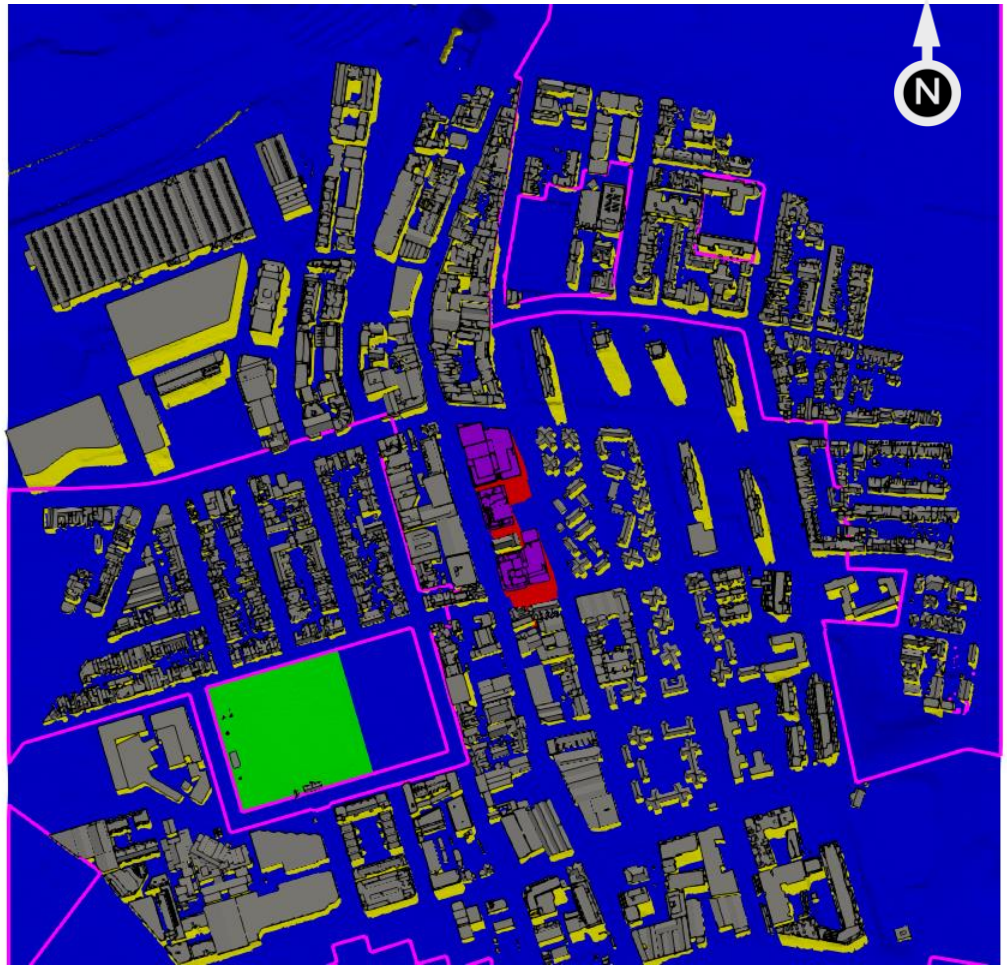


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 2:00 AEDT

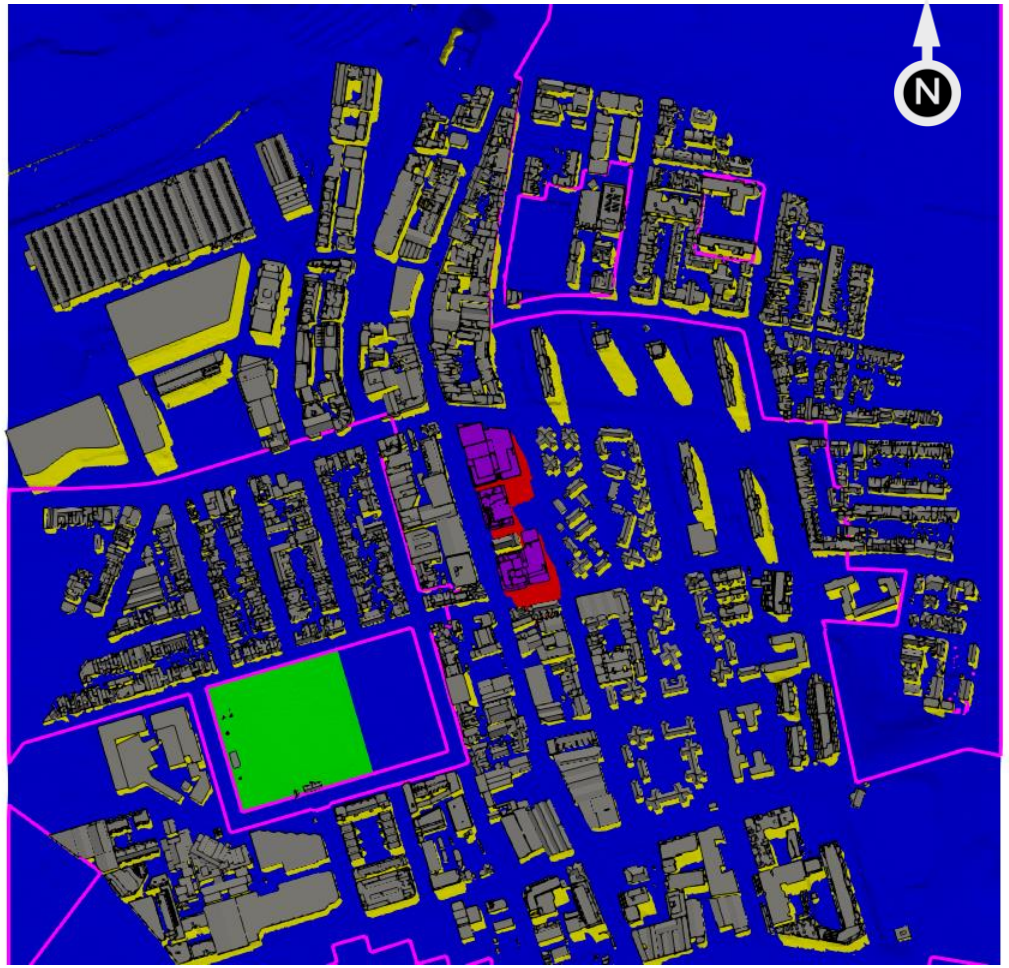


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 2:15 AEDT

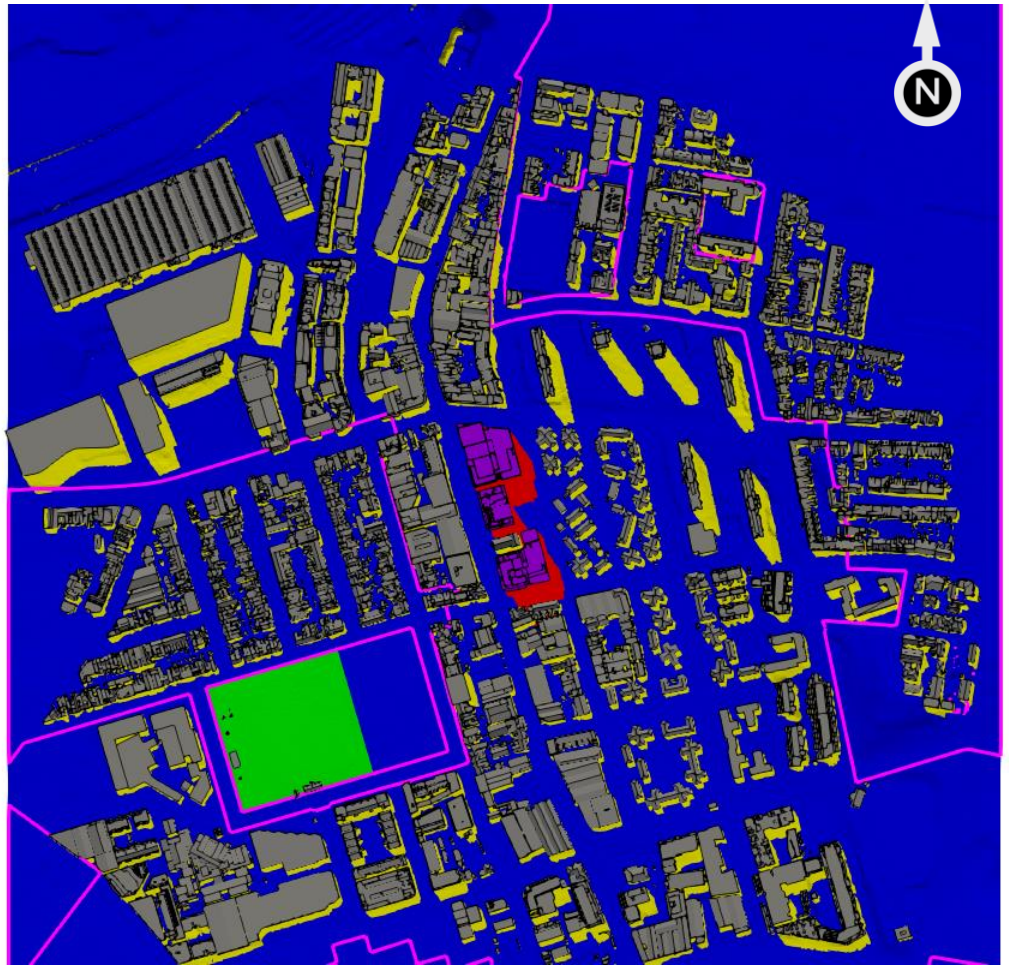


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 2:30 AEDT

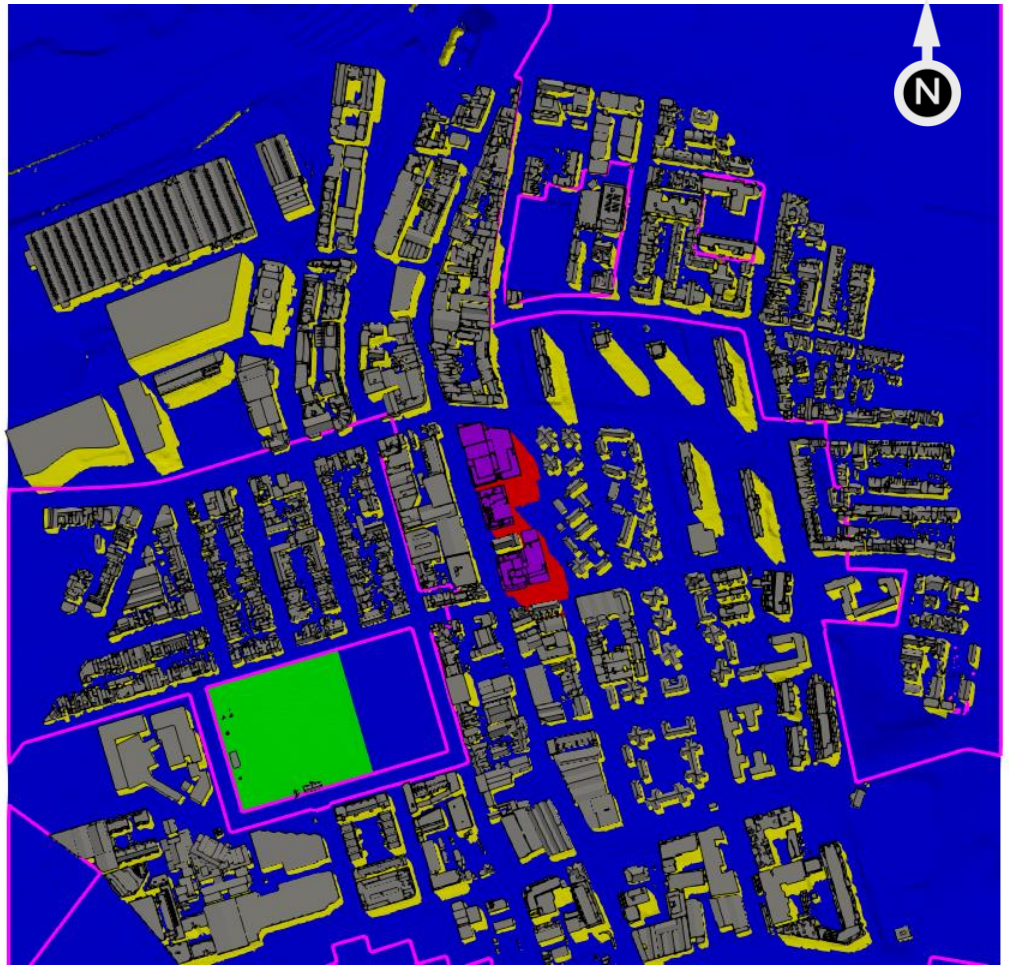


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 2:45 AEDT

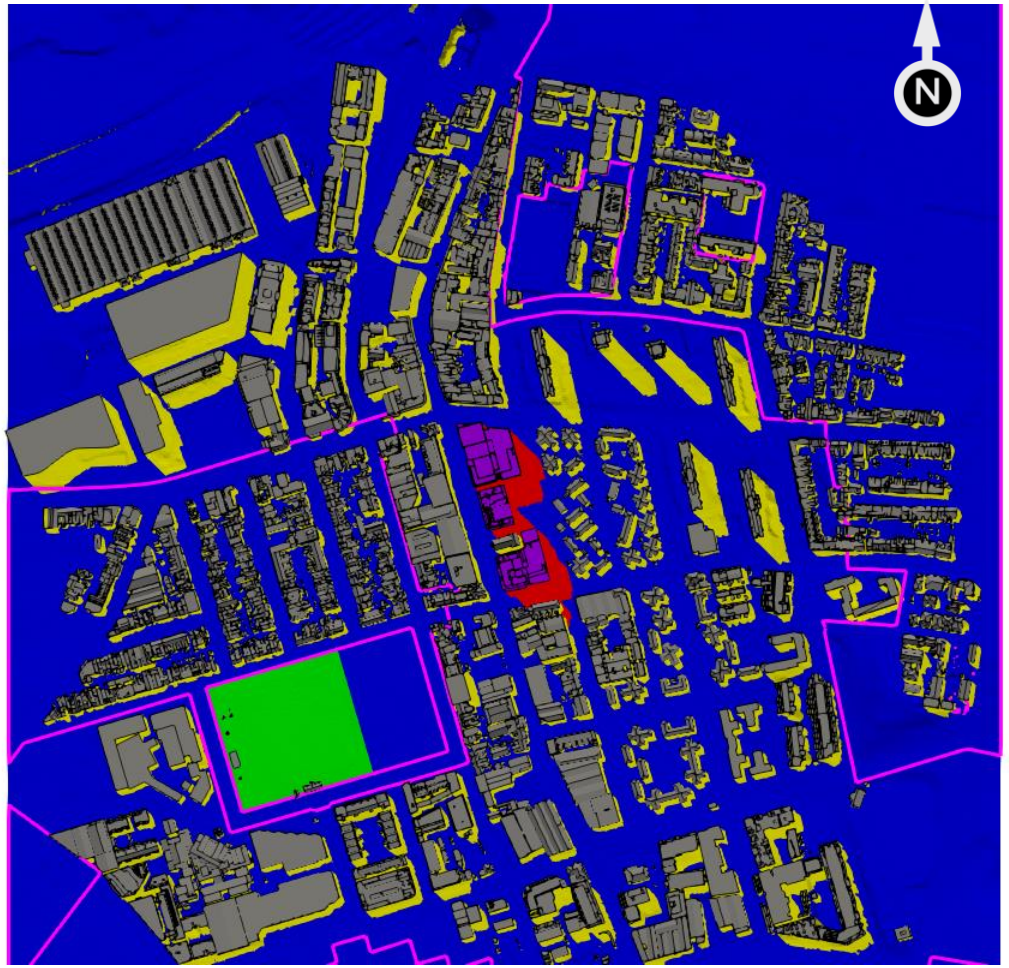


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 March – 3:00 AEDT



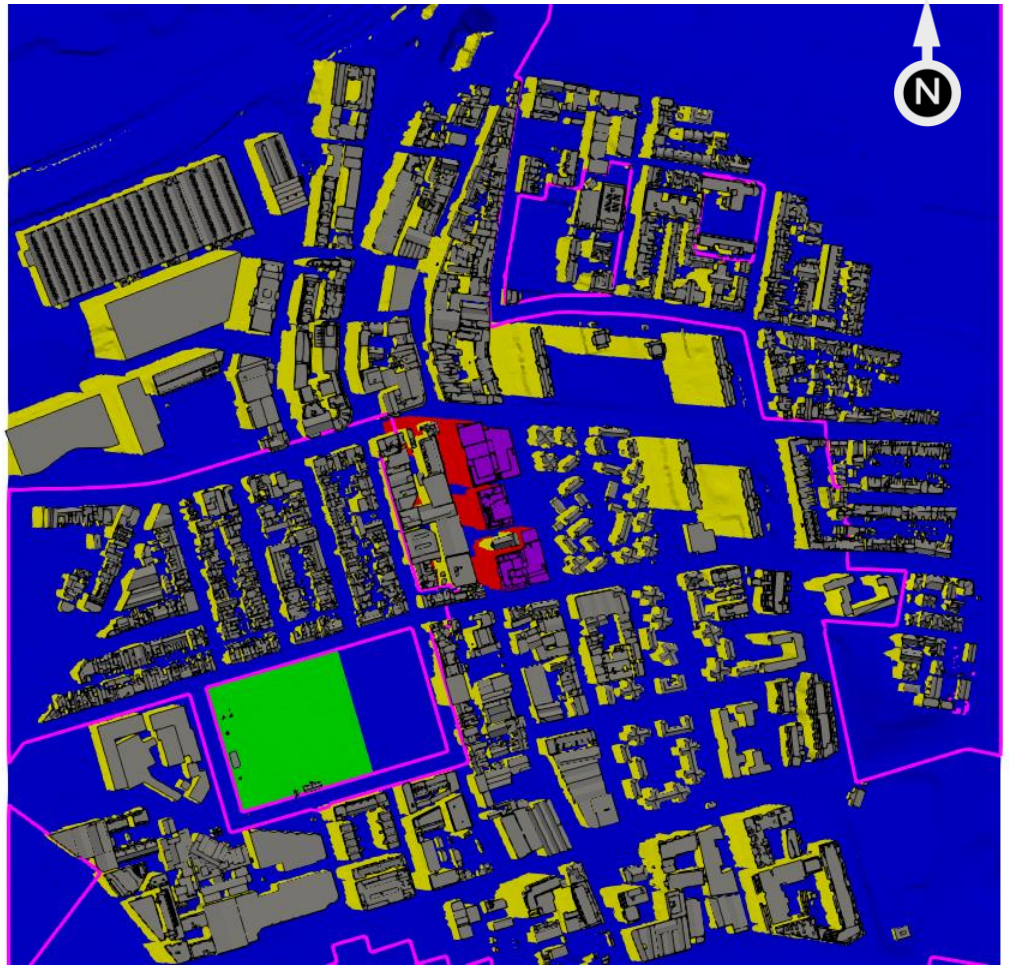
LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

11.6 Appendix 6 – Point-in-time shadow diagrams – Full Domain – 21 Dec

POINT-IN-TIME SHADOW PLOTS

21 December – 9:00 AEDT

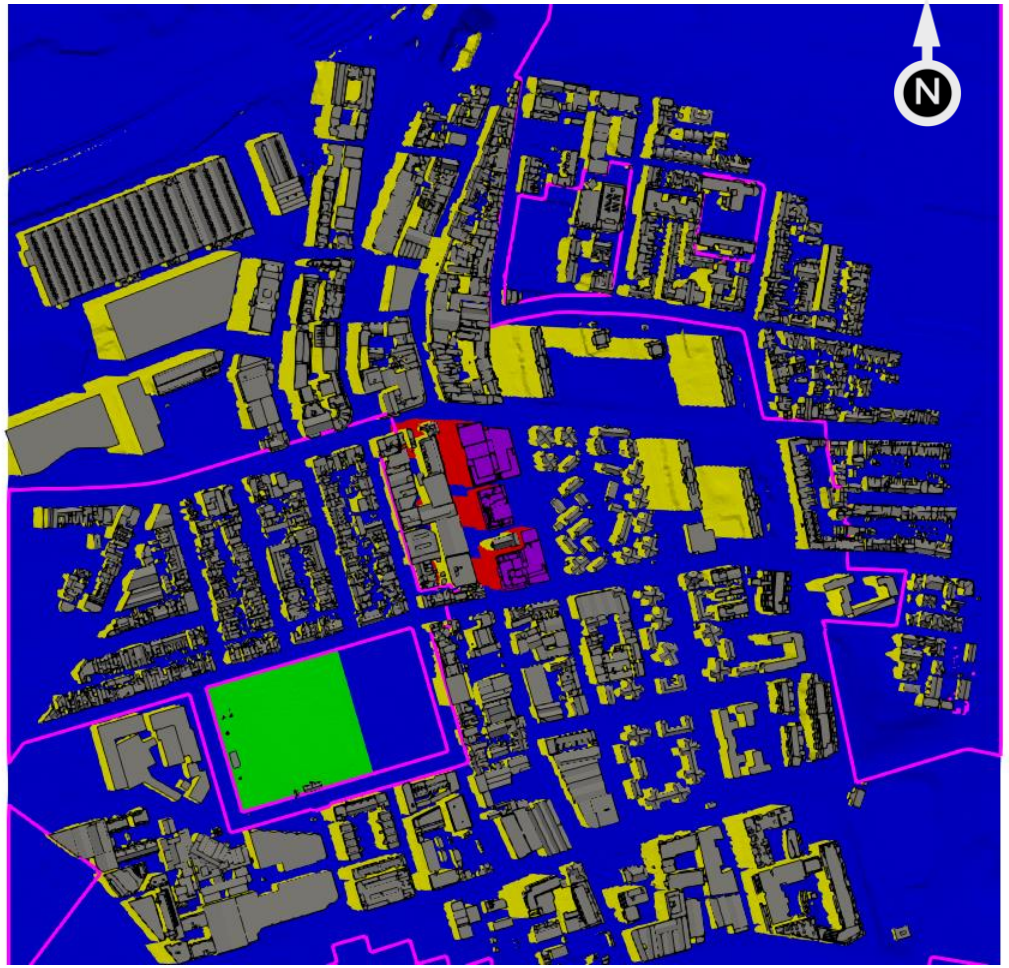


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 9:15 AEDT

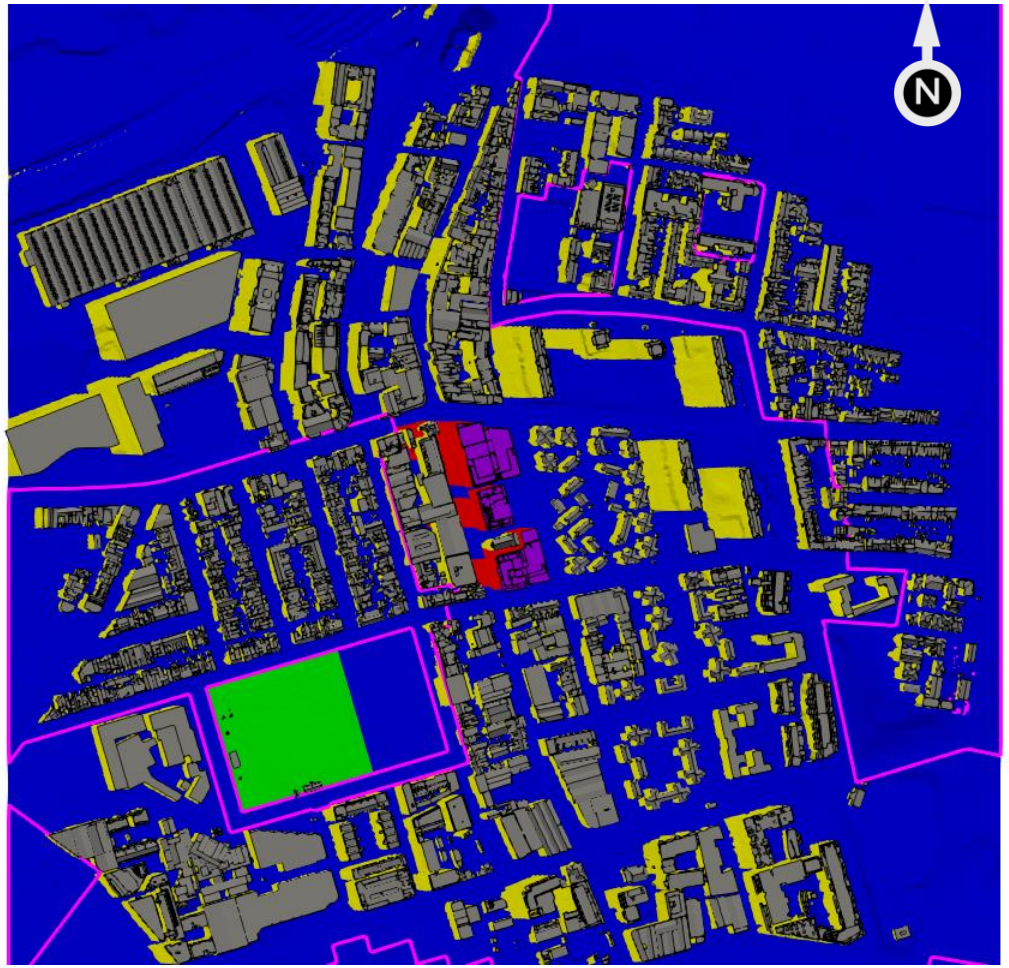


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 9:30 AEDT

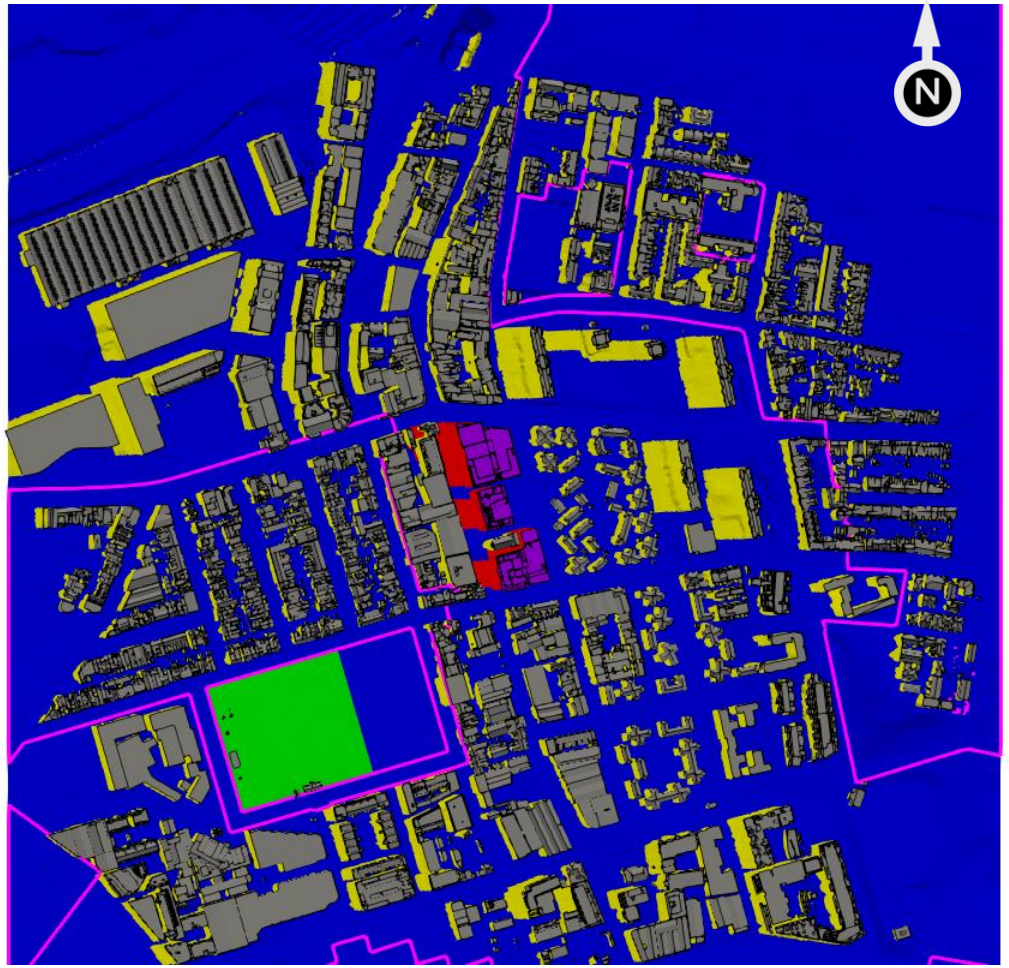


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 9:45 AEDT

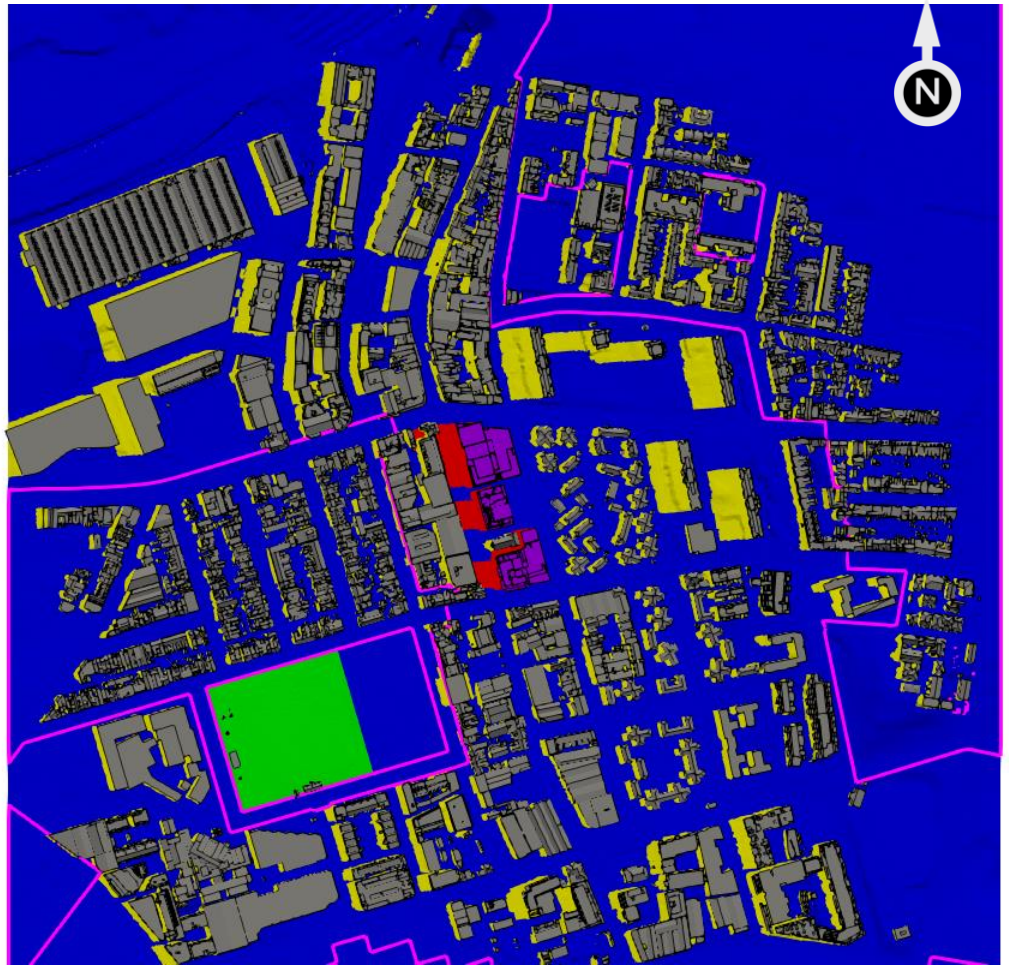


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 10:00 AEDT

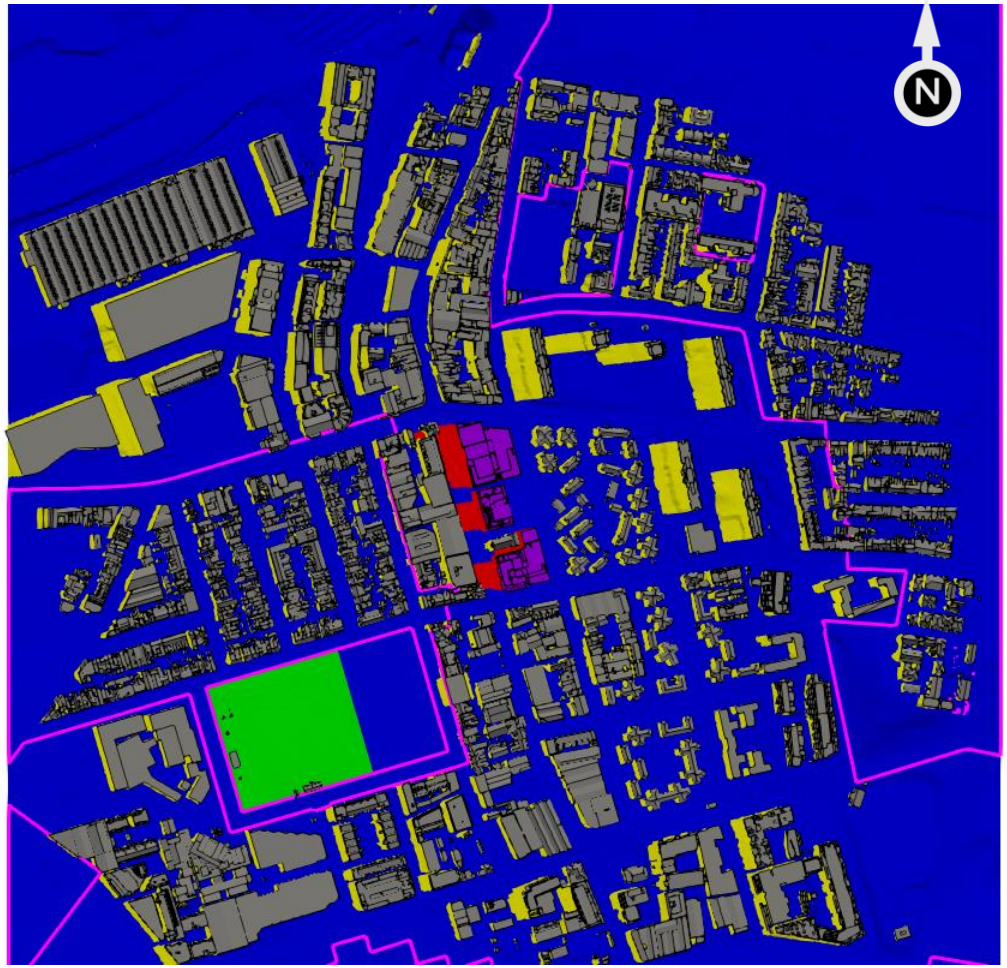


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 10:15 AEDT

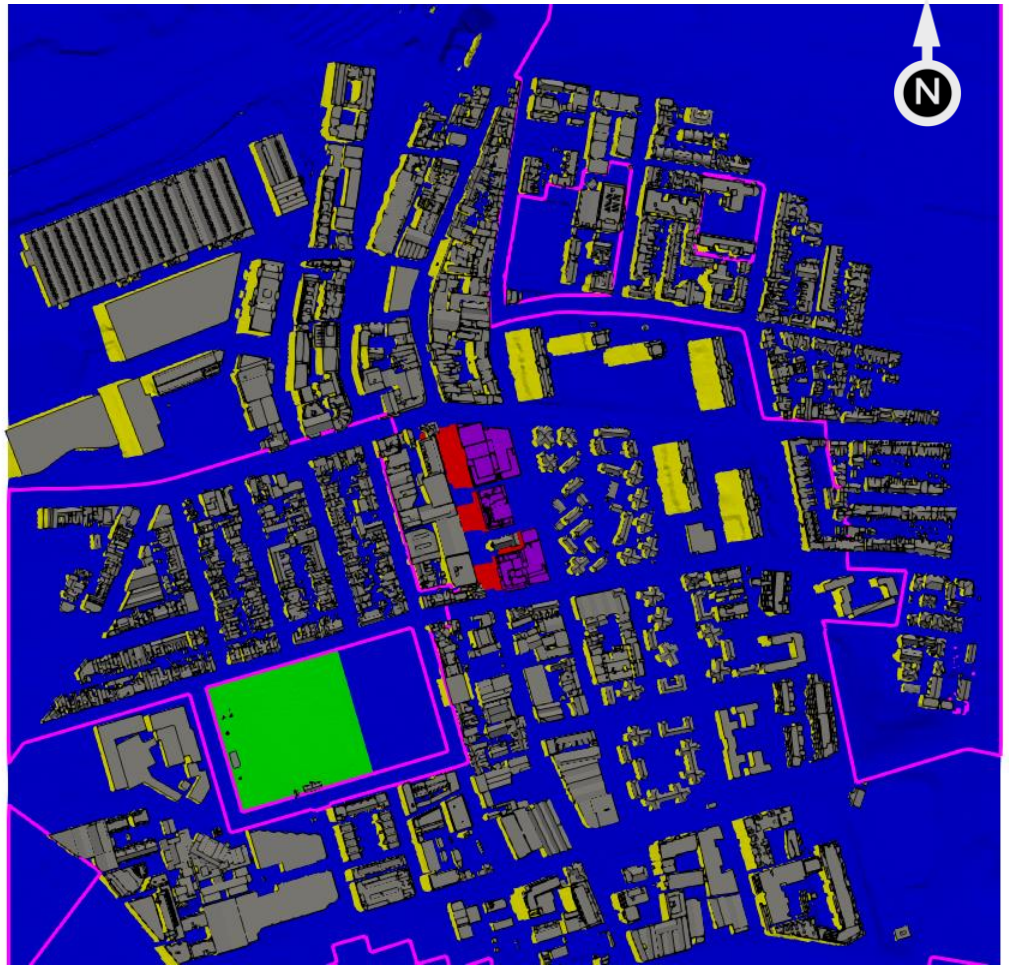


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 10:30 AEDT

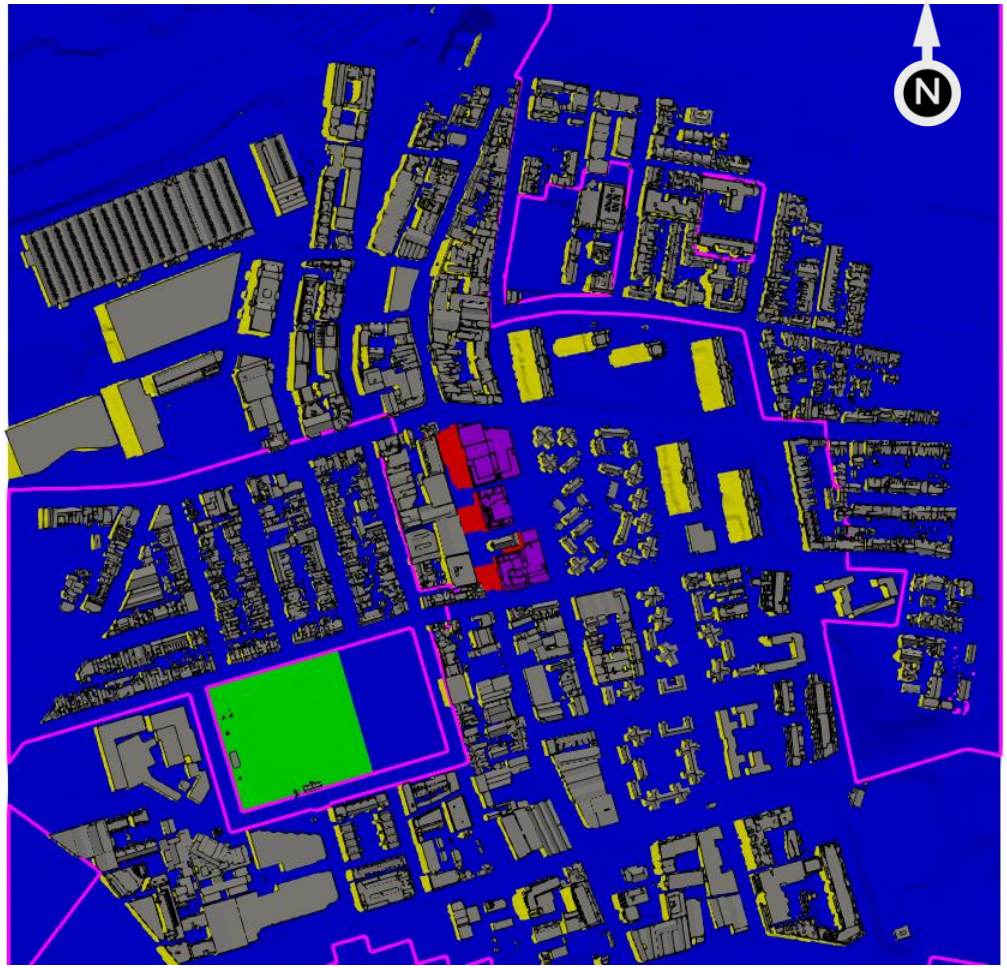


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 10:45 AEDT

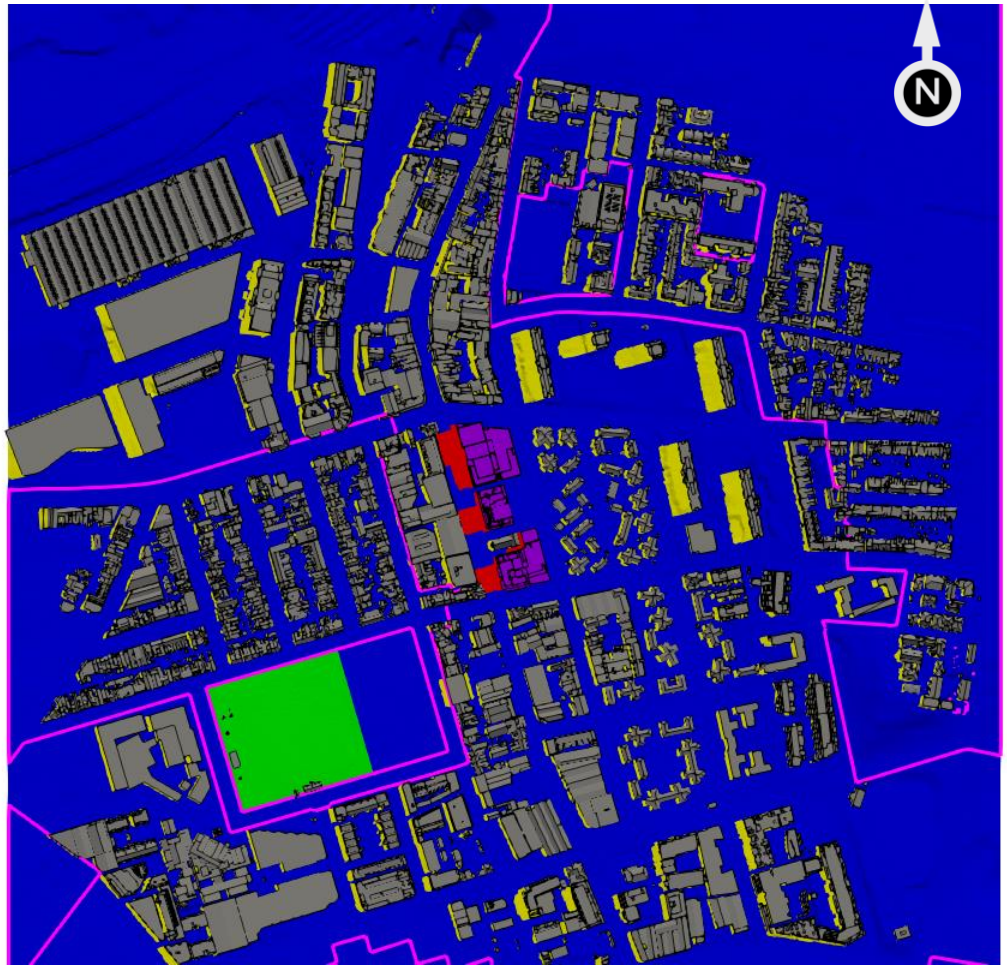


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 11:00 AEDT

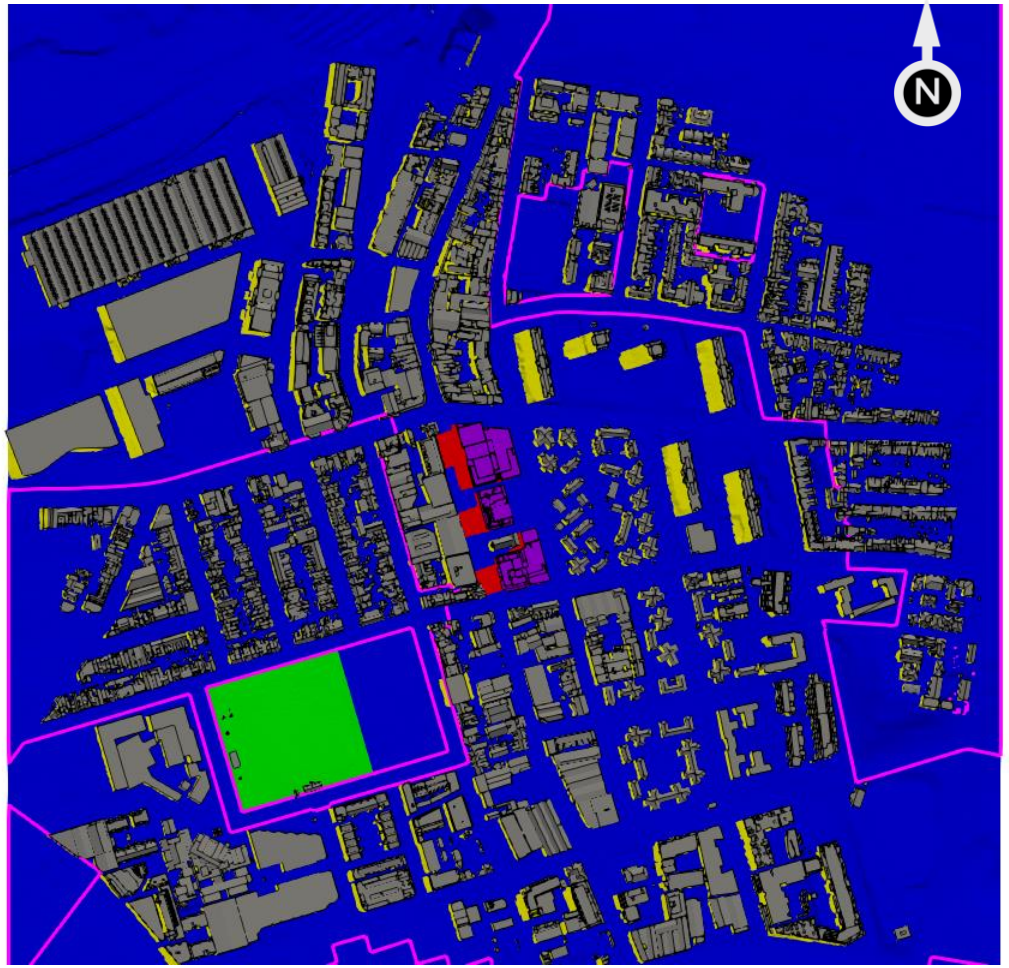


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 11:15 AEDT

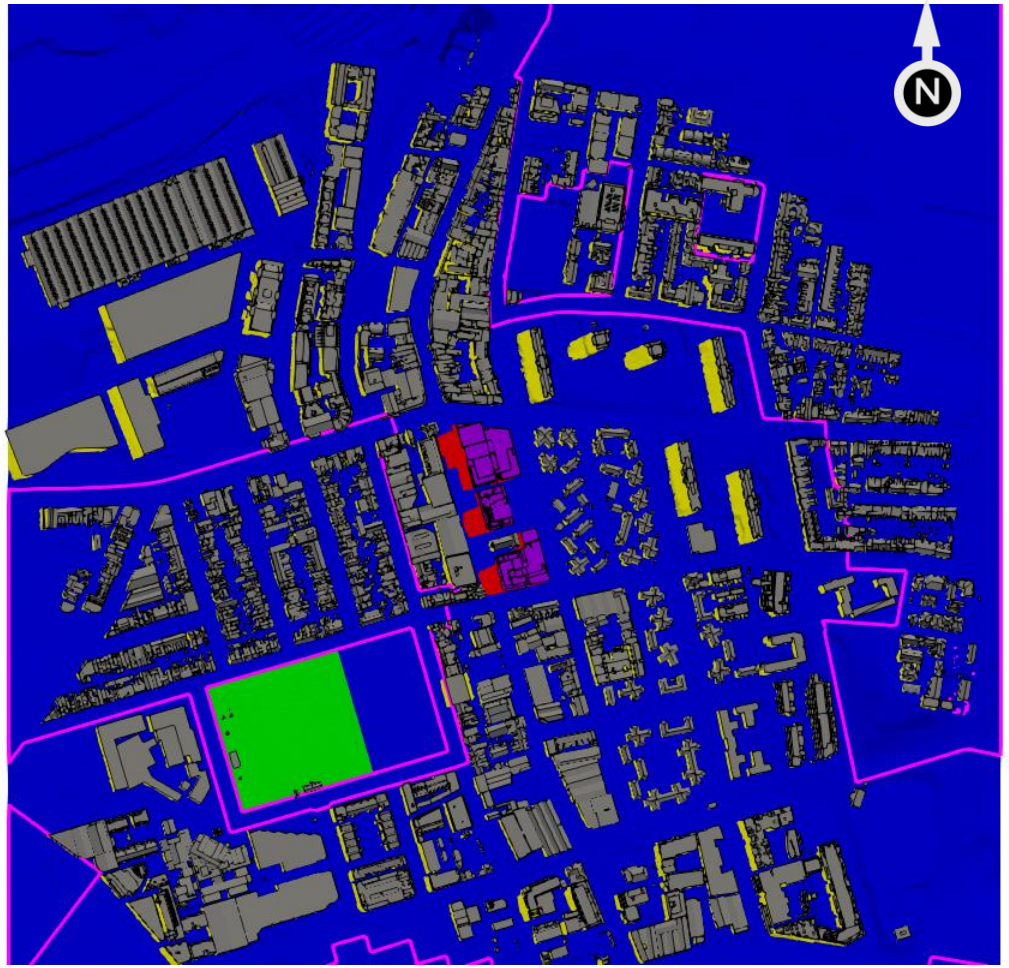


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 11:30 AEDT

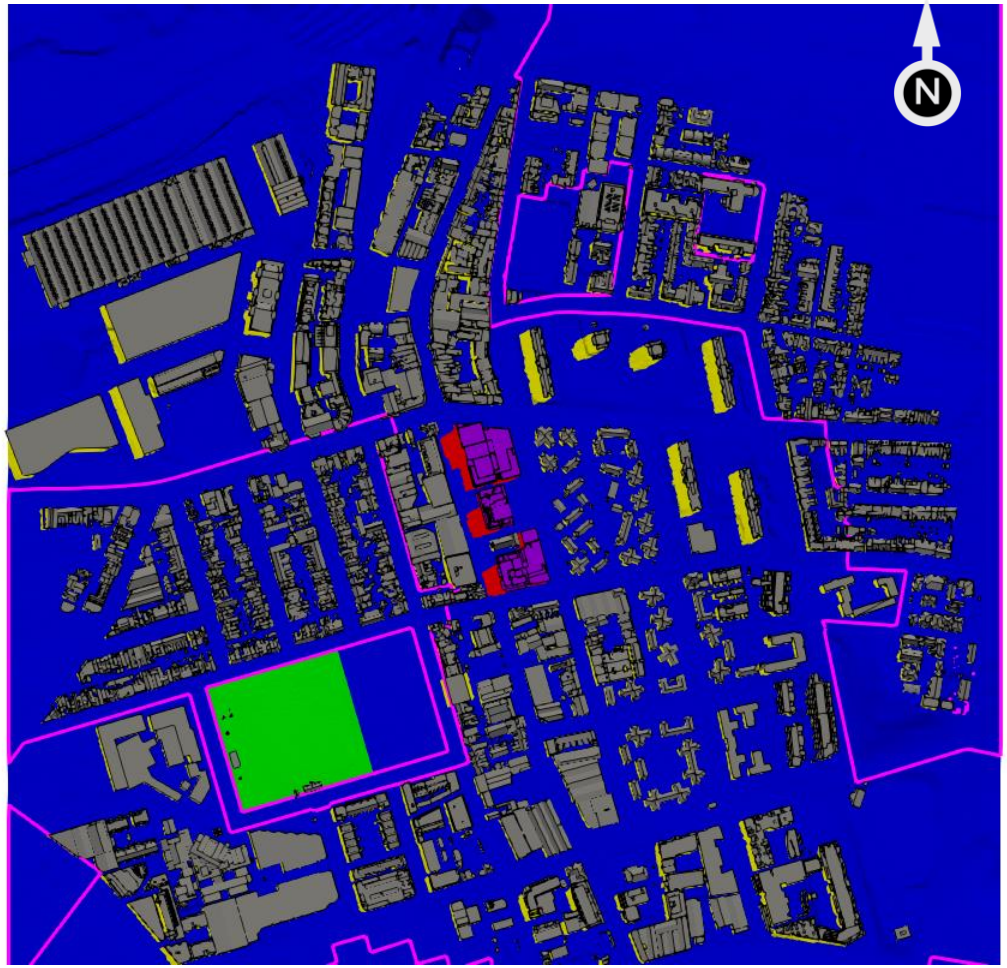


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 11:45 AEDT

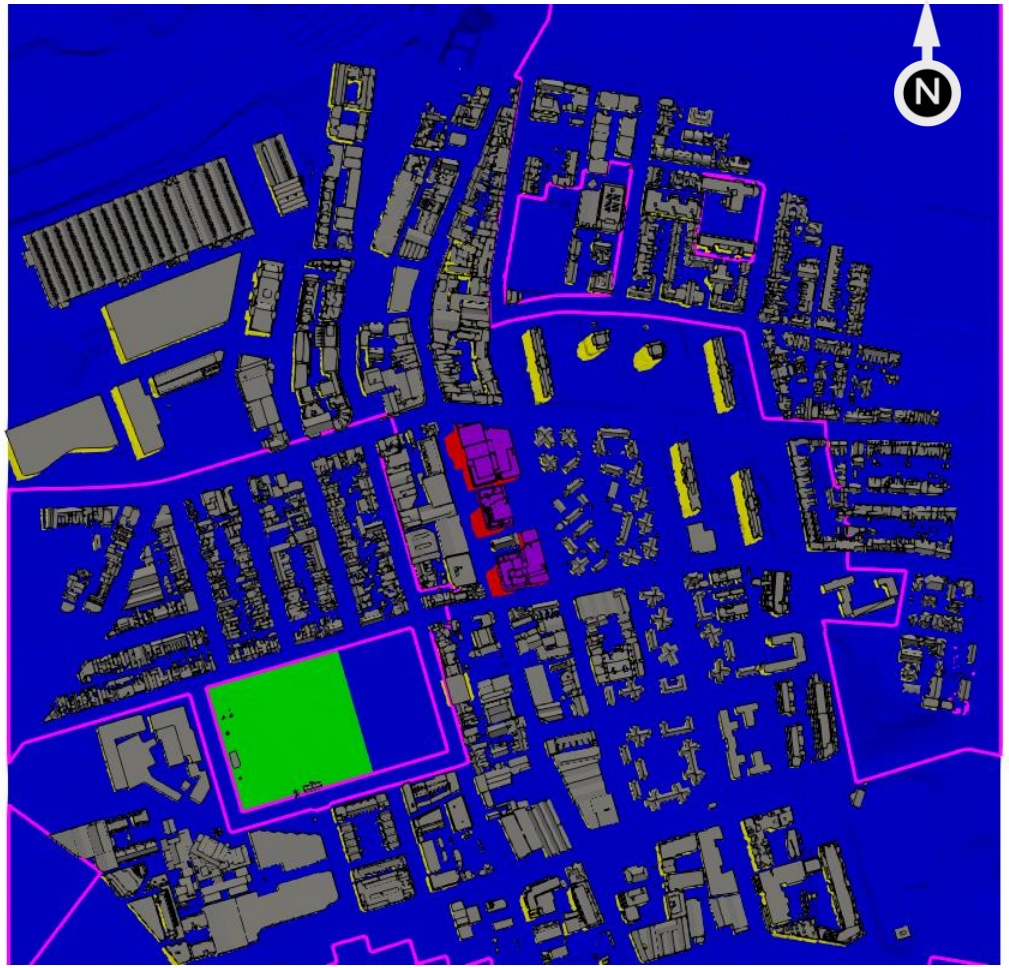


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 12:00 AEDT

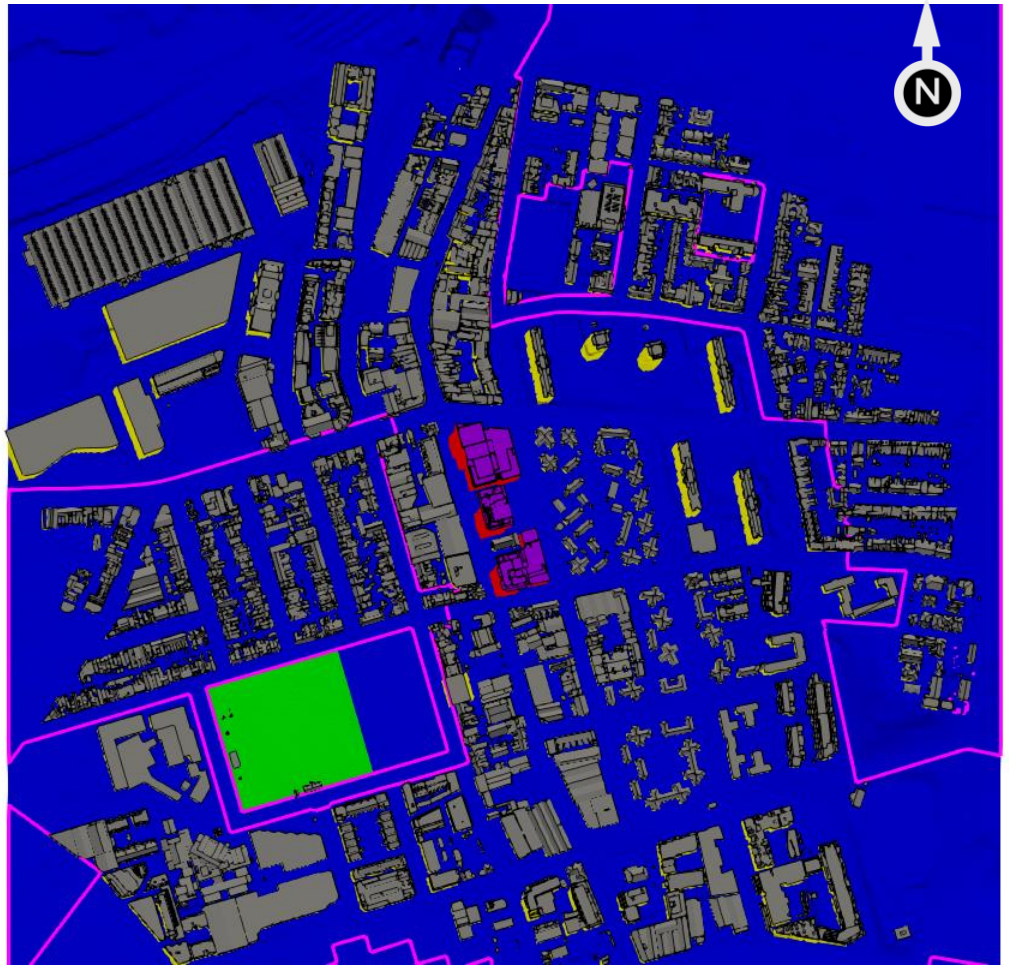


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 12:15 AEDT

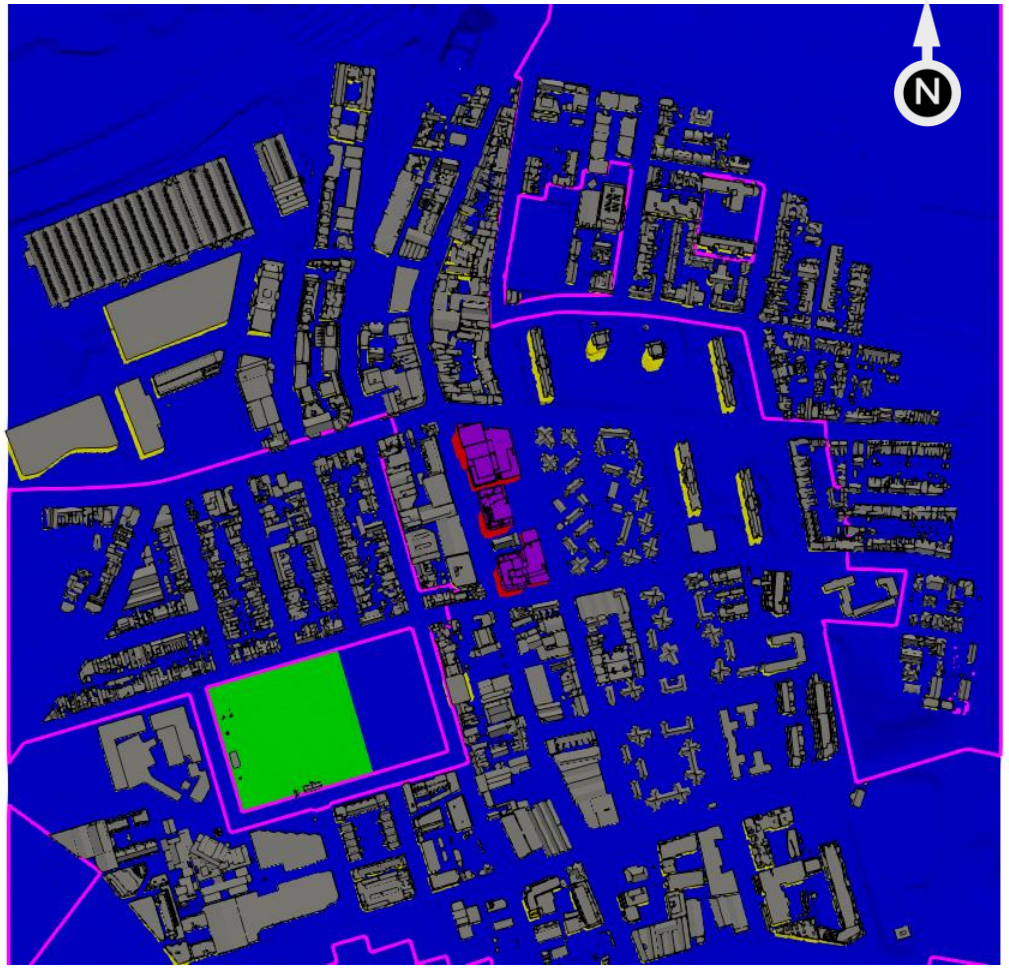


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 12:30 AEDT

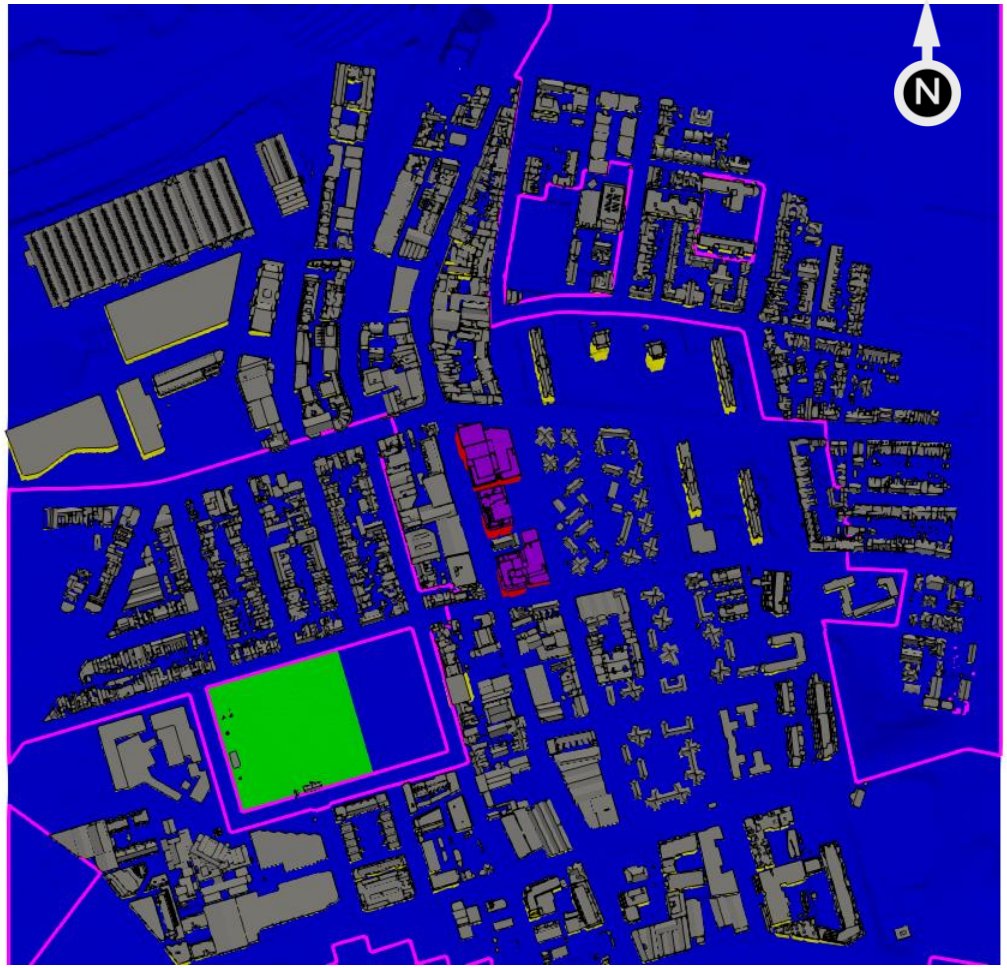


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 12:45 AEDT

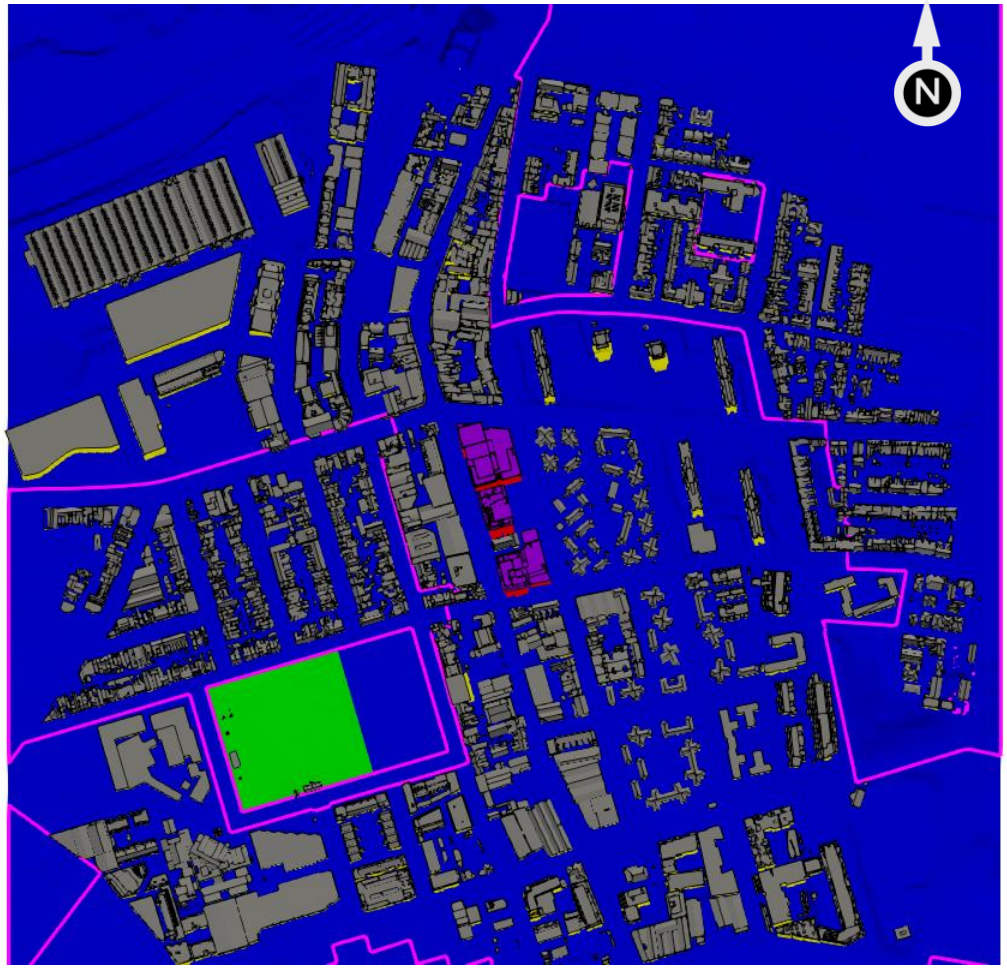


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 1:00 AEDT

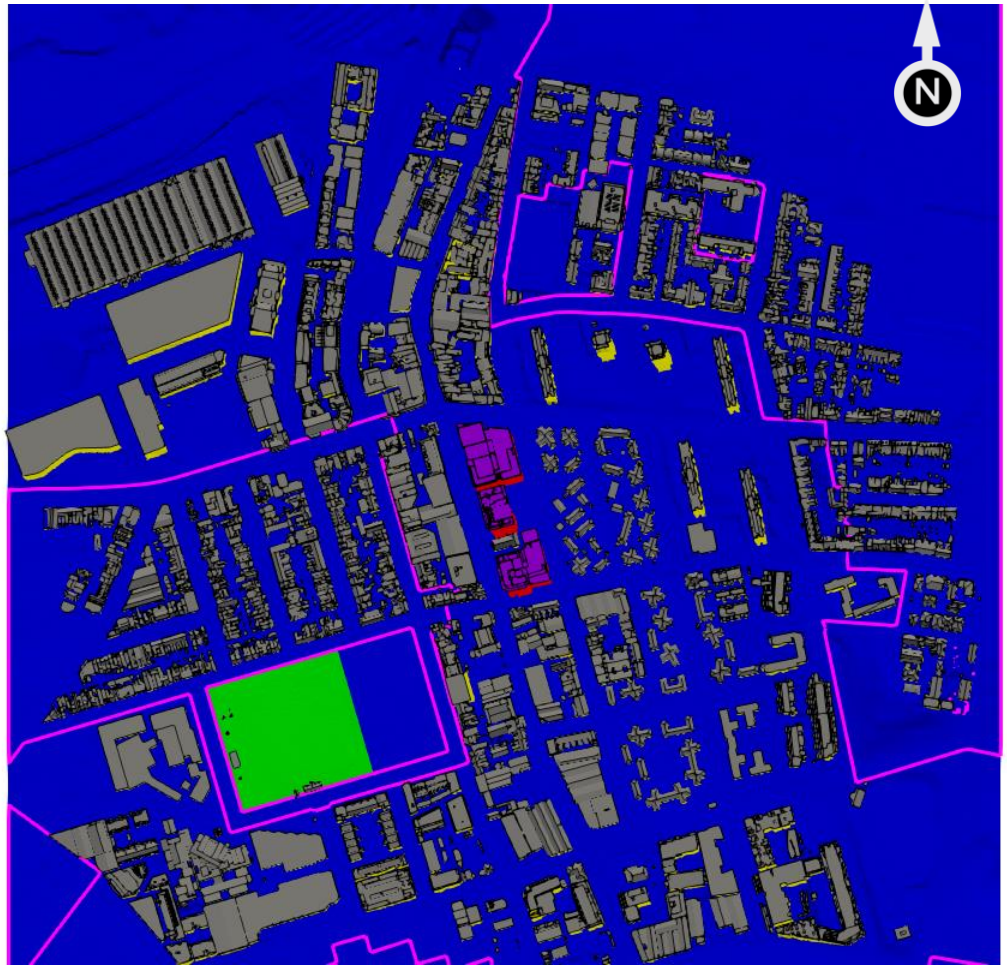


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 1:15 AEDT

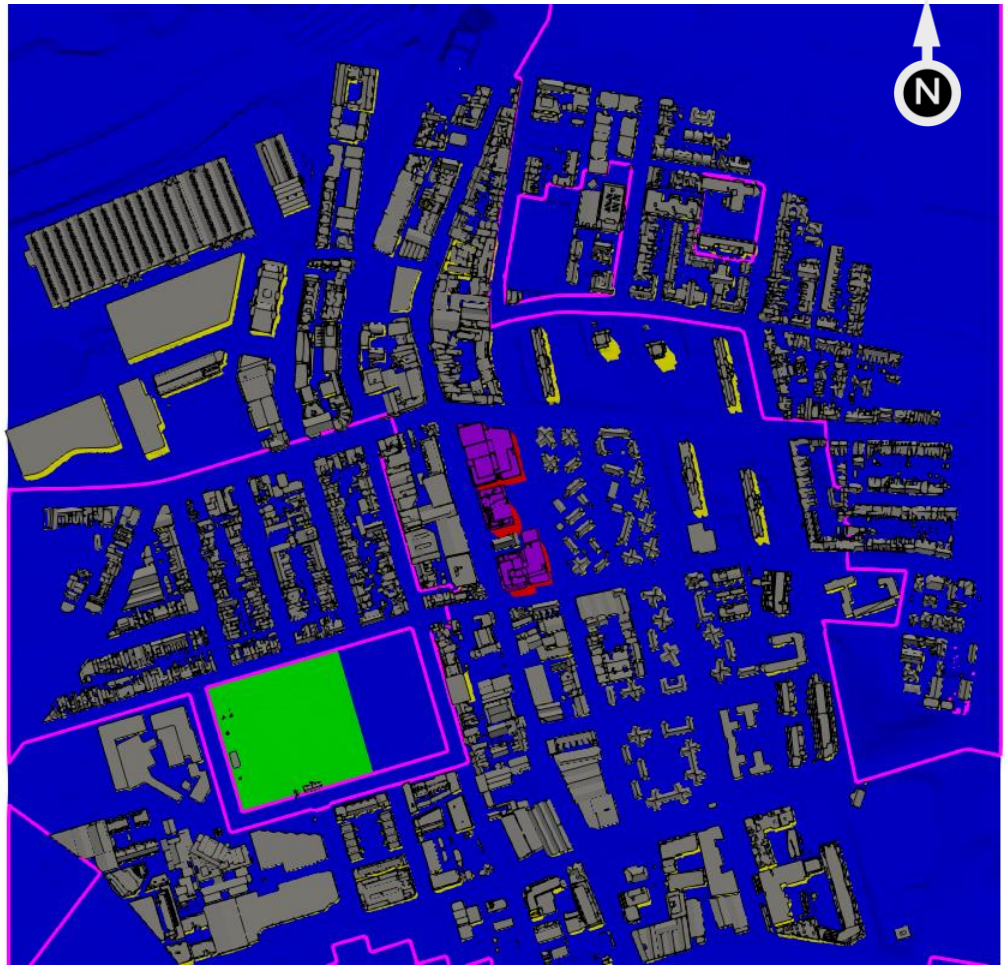


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 1:30 AEDT

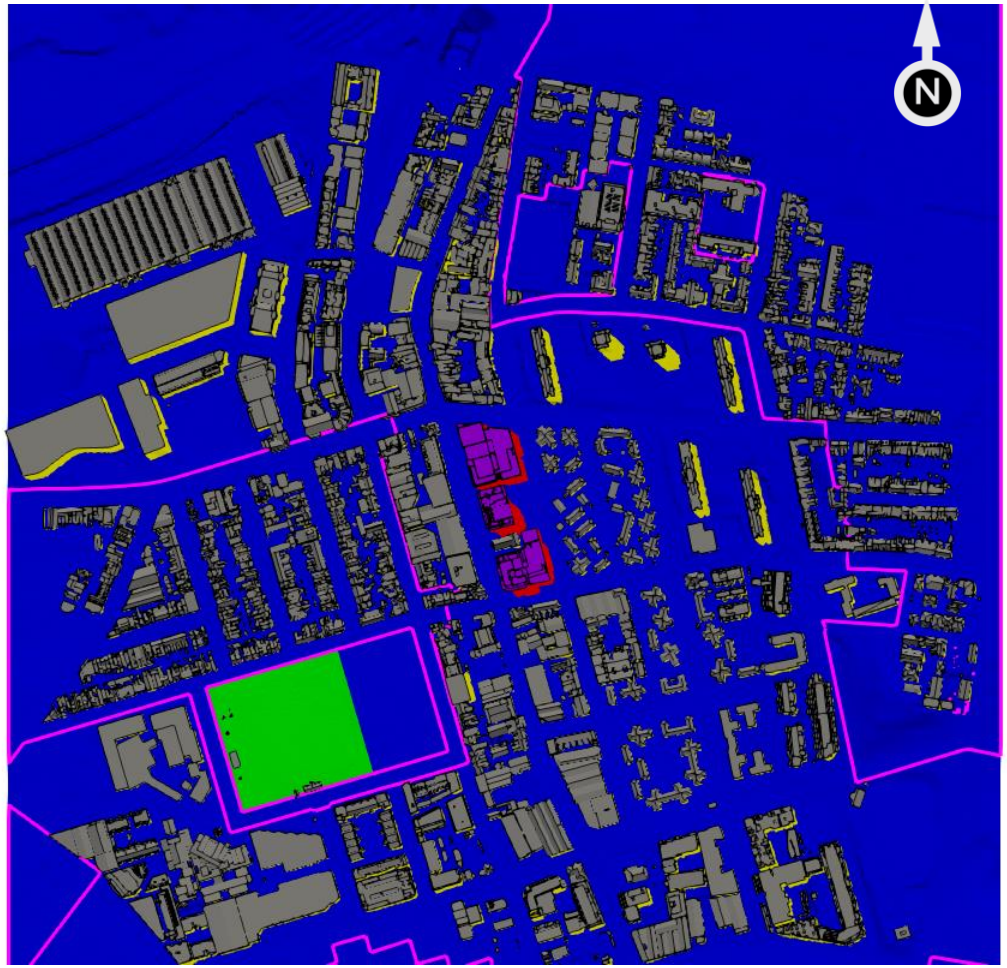


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 1:45 AEDT

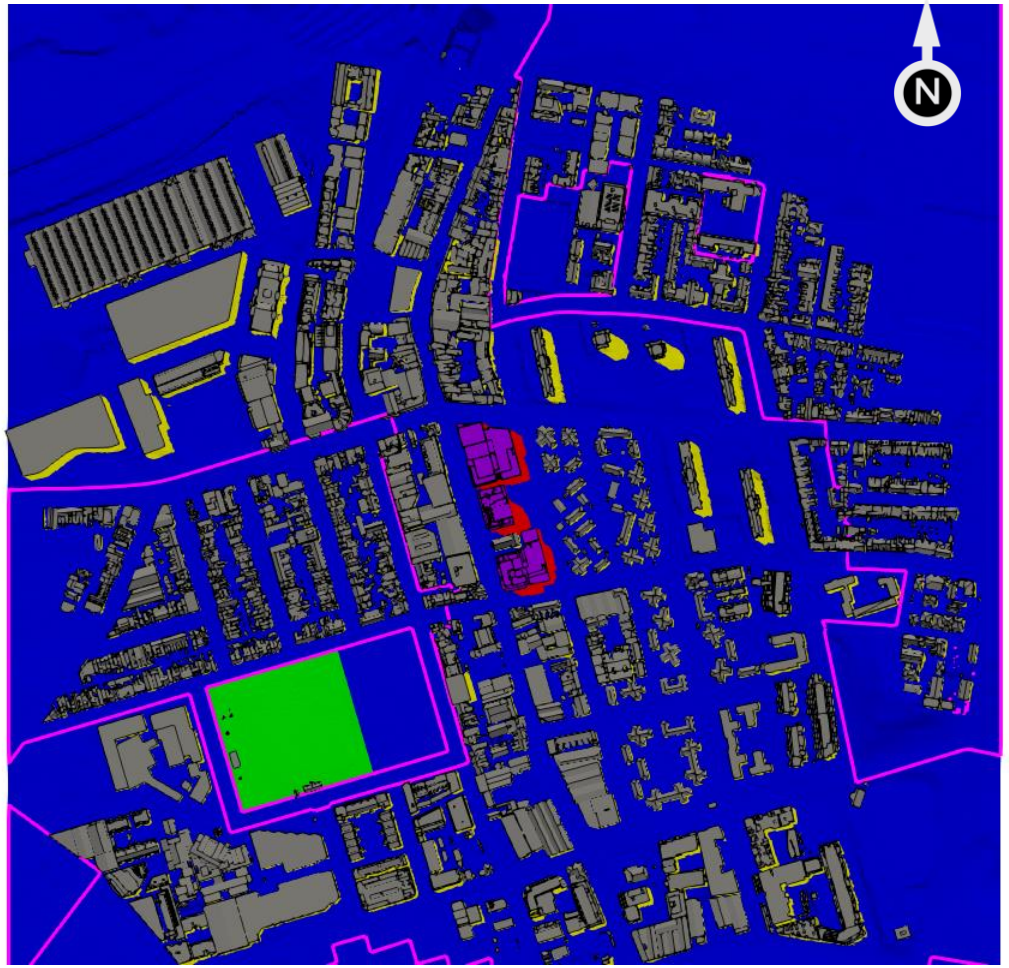


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 2:00 AEDT

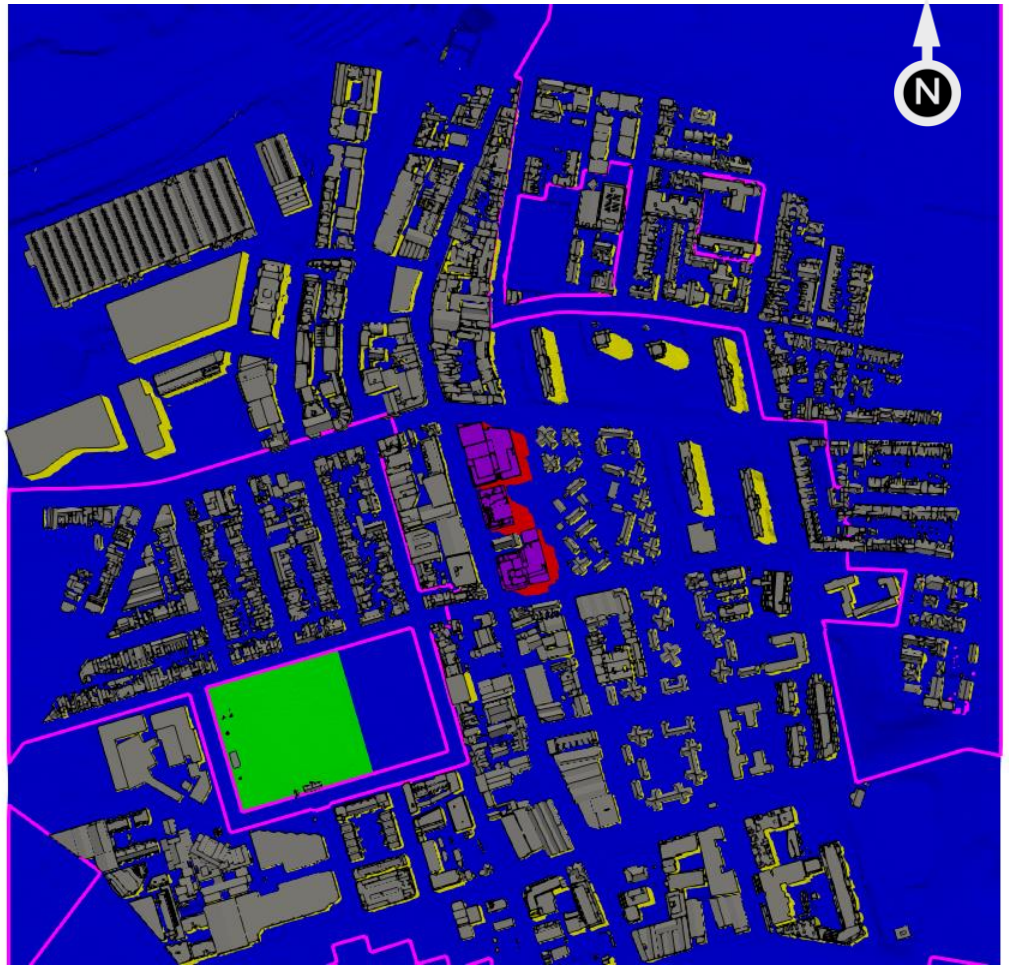


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 2:15 AEDT

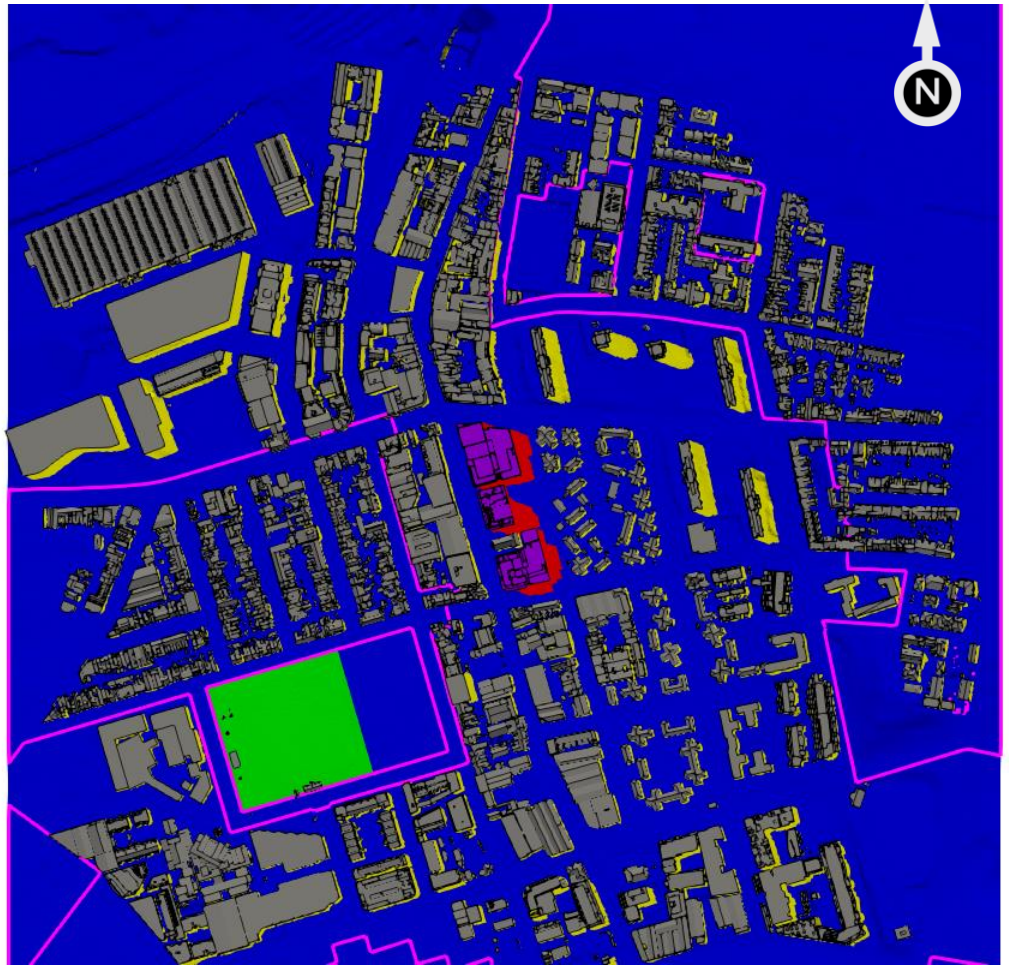


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 2:30 AEDT

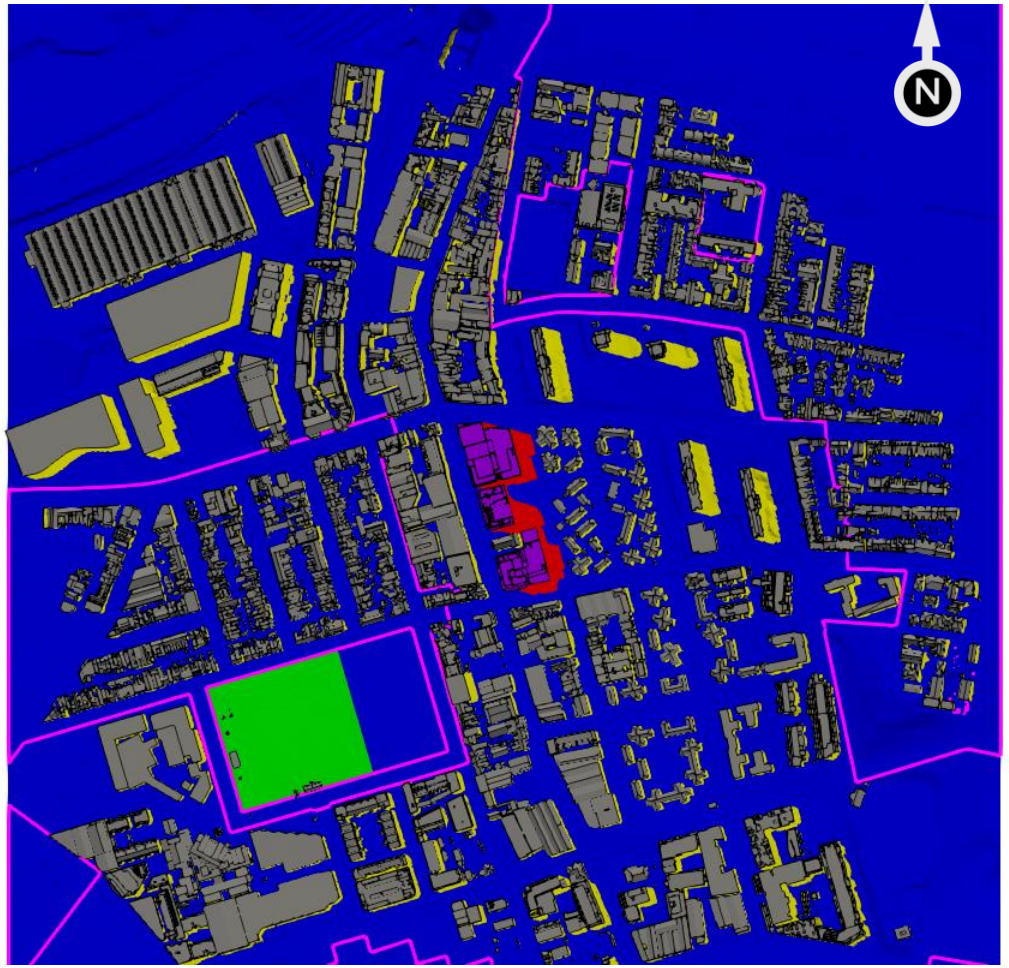


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 2:45 AEDT

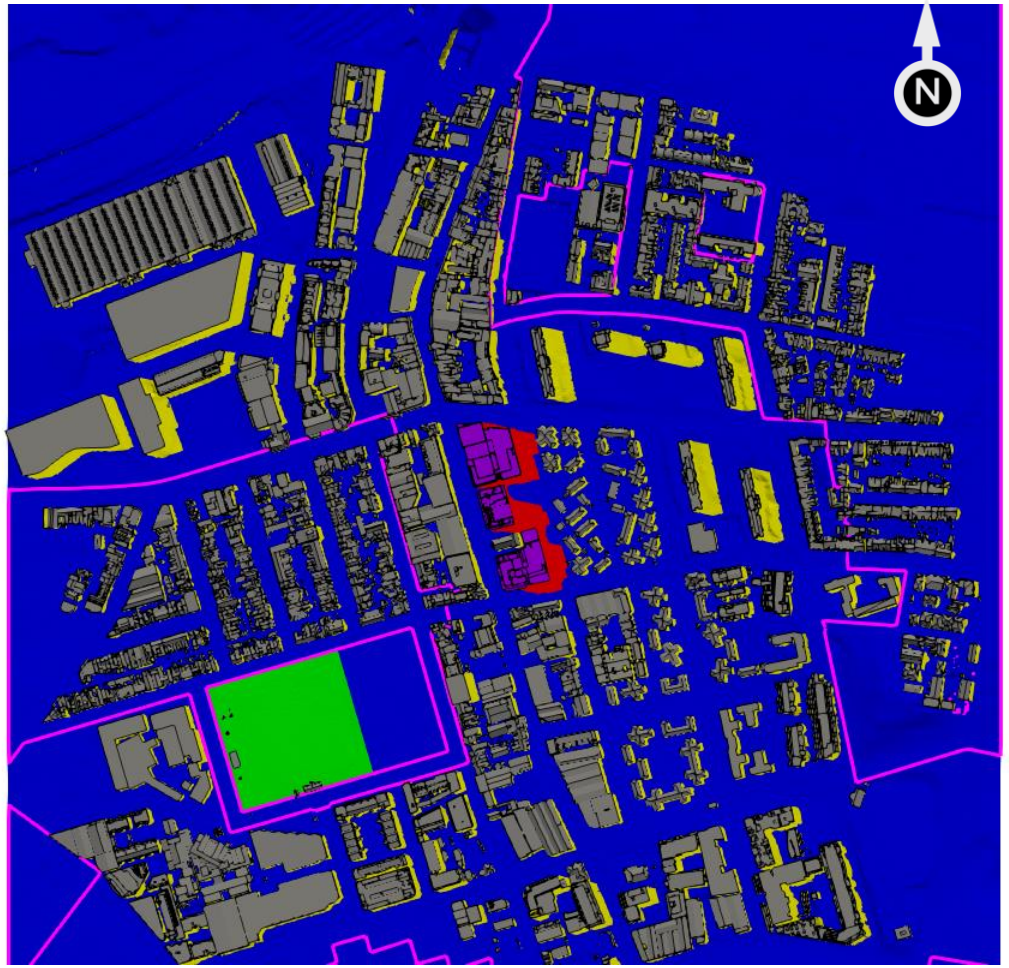


LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

POINT-IN-TIME SHADOW PLOTS

21 December – 3:00 AEDT



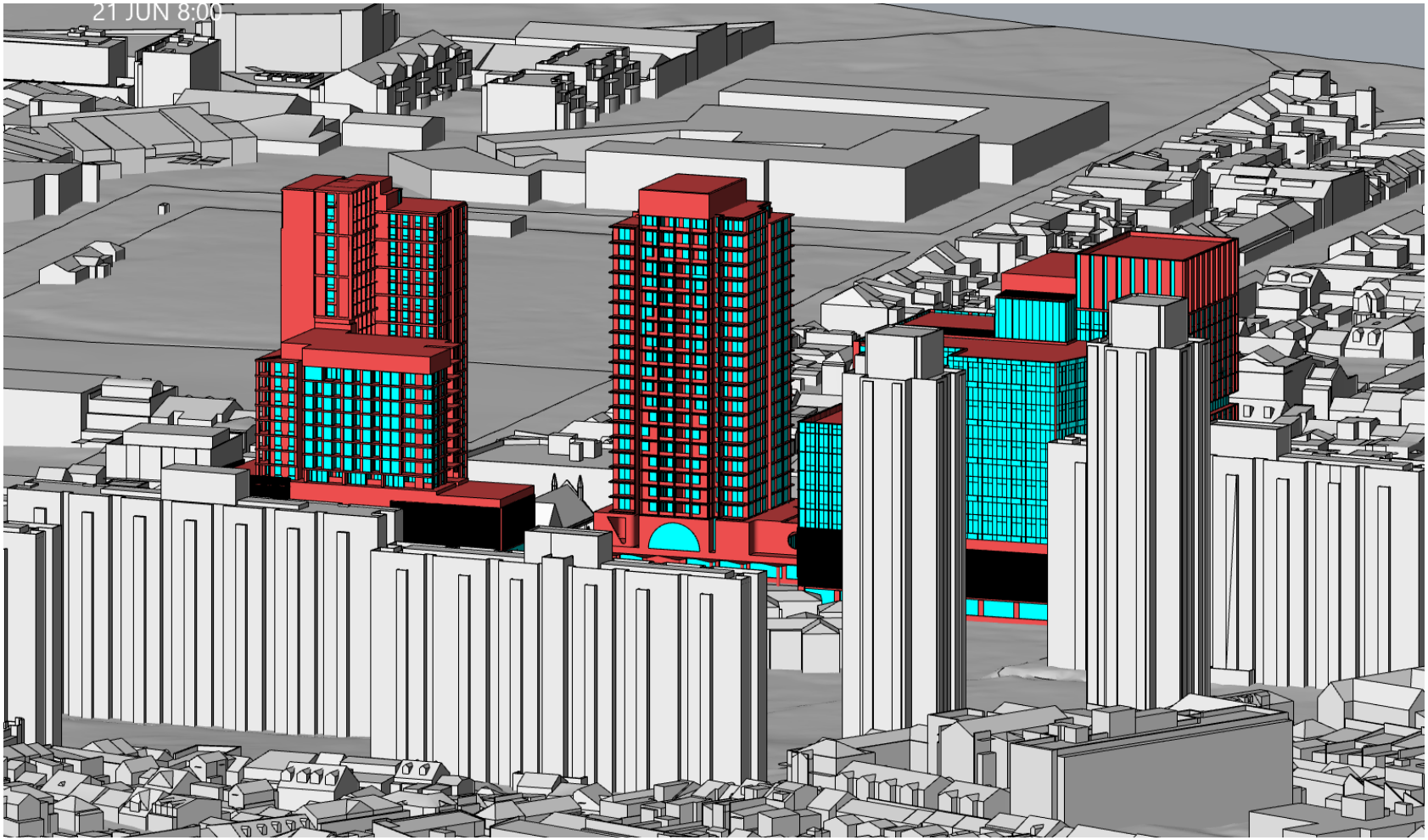
LEGEND

- NO SHADOW
- EXISTING SHADOW
- NEW SHADOW

11.7 Appendix 7 – Sun View Diagrams – 21 Jun

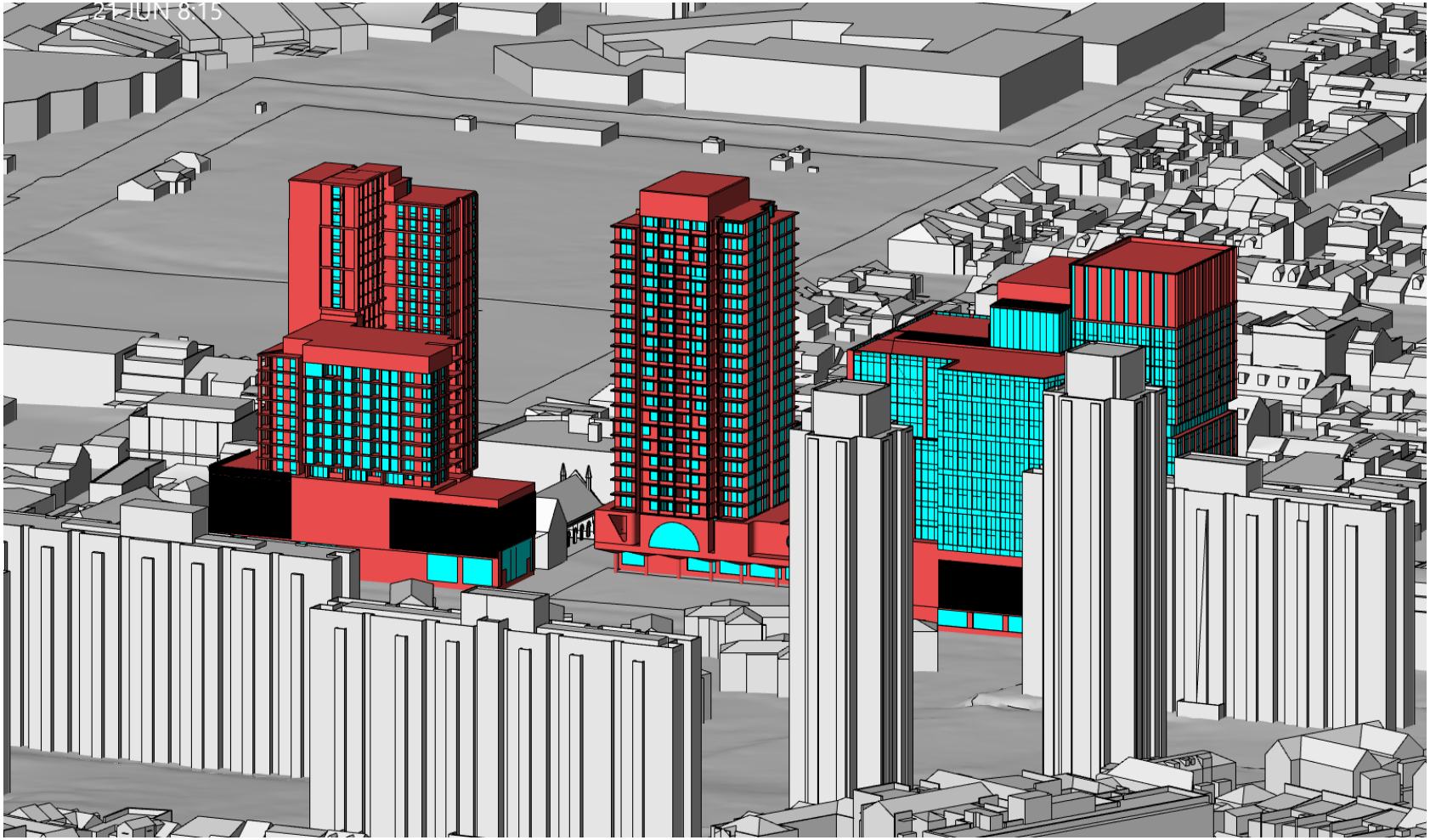
SUN VIEW DIAGRAM

Jun 21 - 08:00 AEST



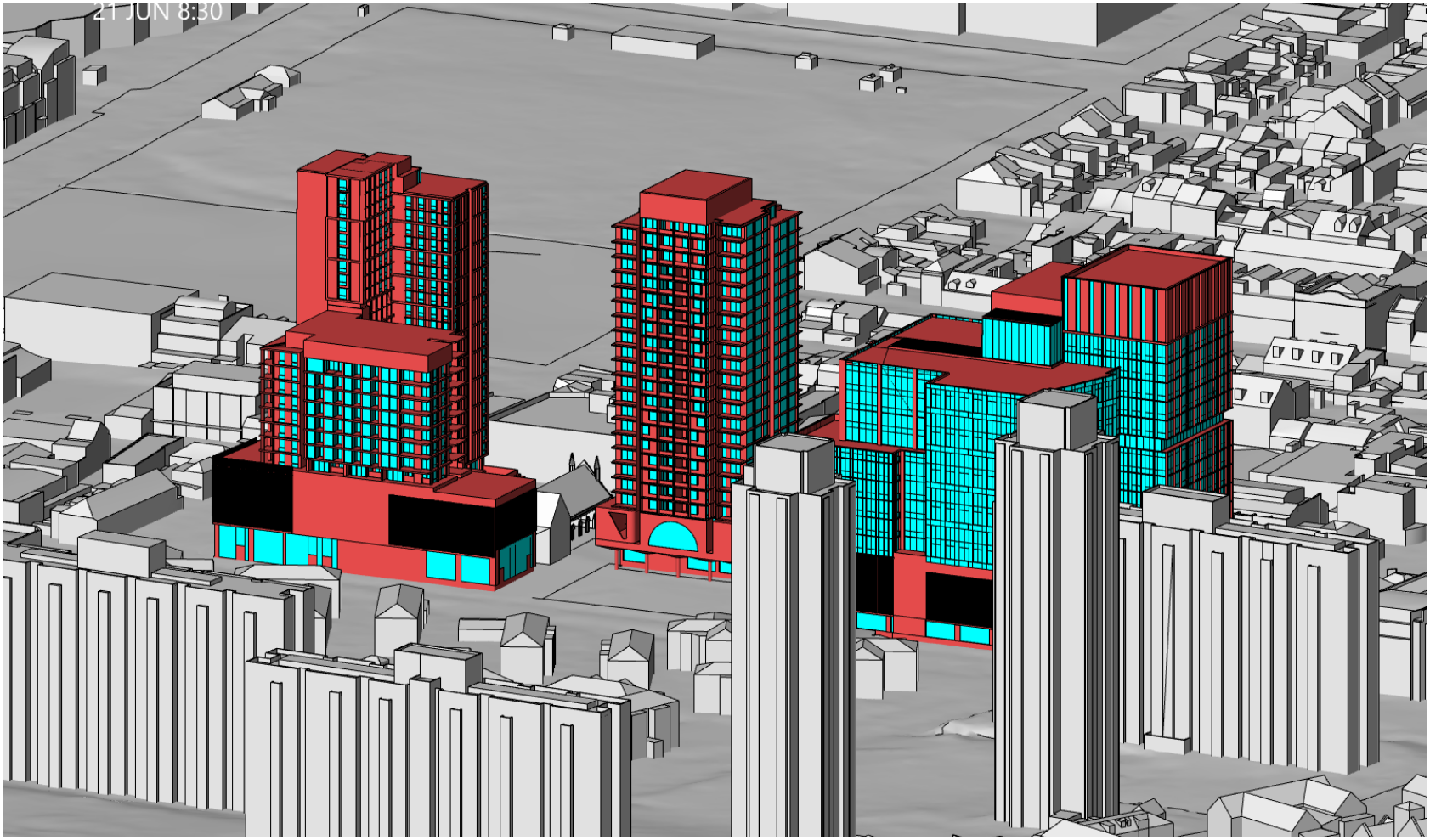
SUN VIEW DIAGRAM

Jun 21 - 08:15 AEST



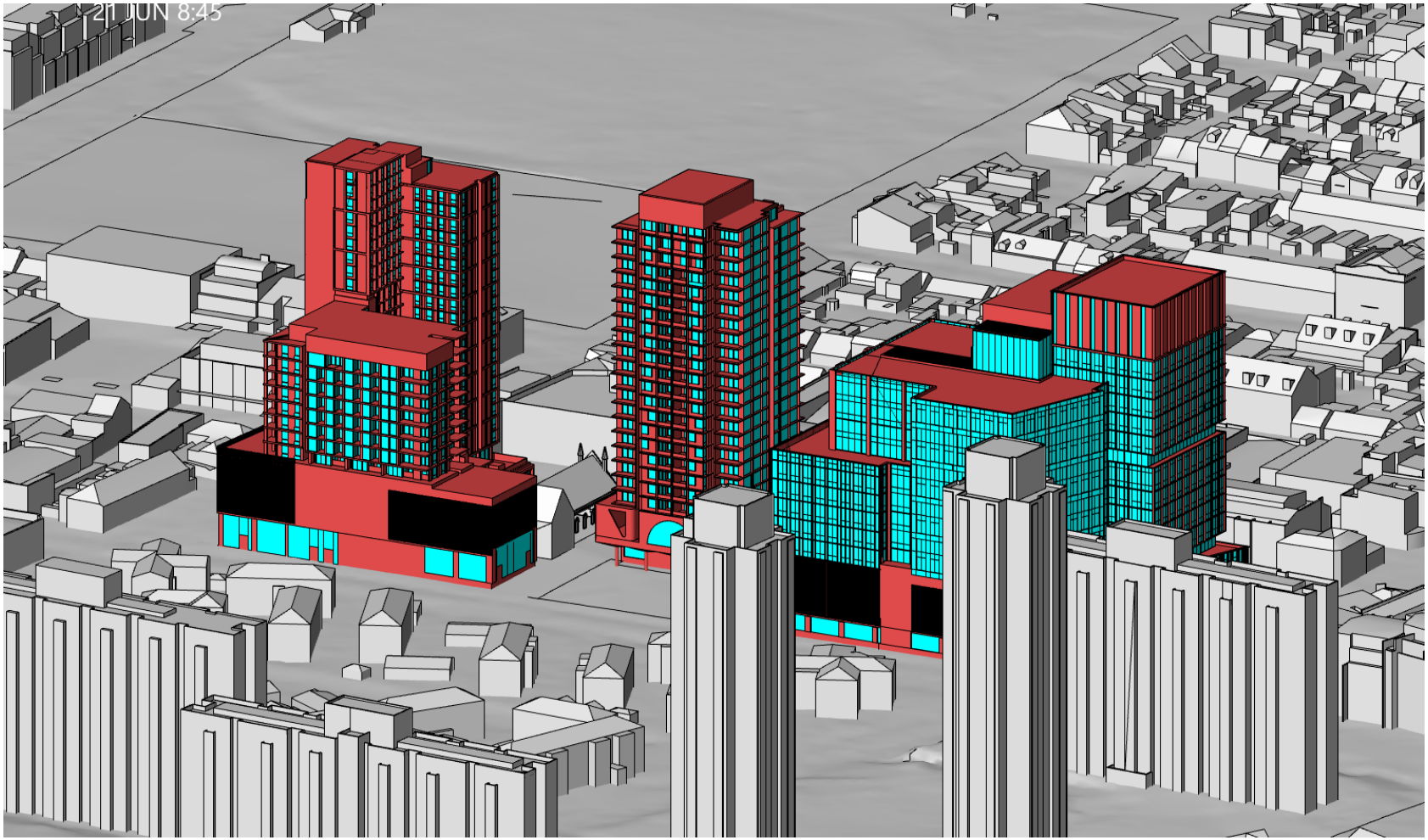
SUN VIEW DIAGRAM

Jun 21 - 08:30 AEST



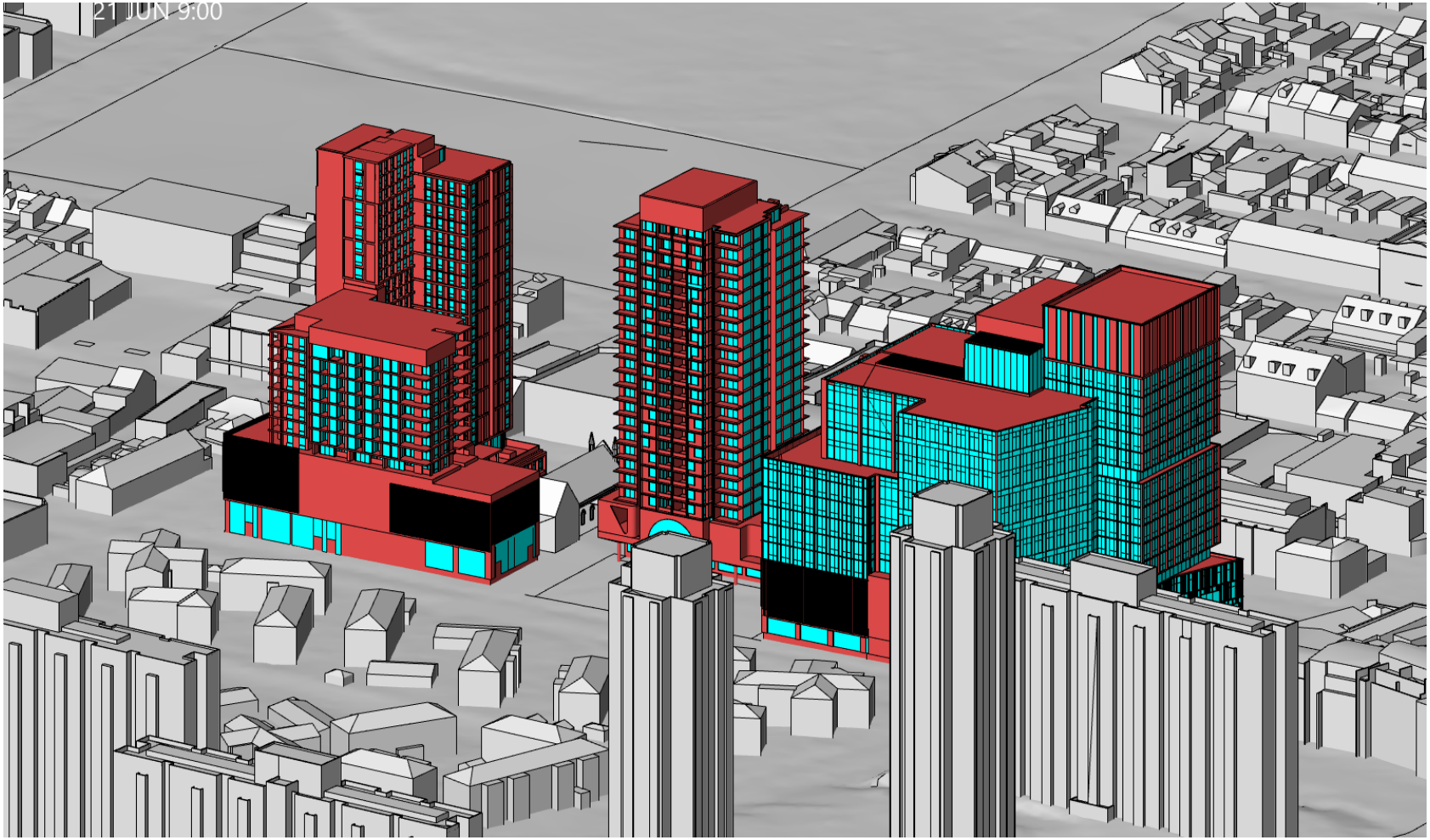
SUN VIEW DIAGRAM

Jun 21 - 08:45 AEST



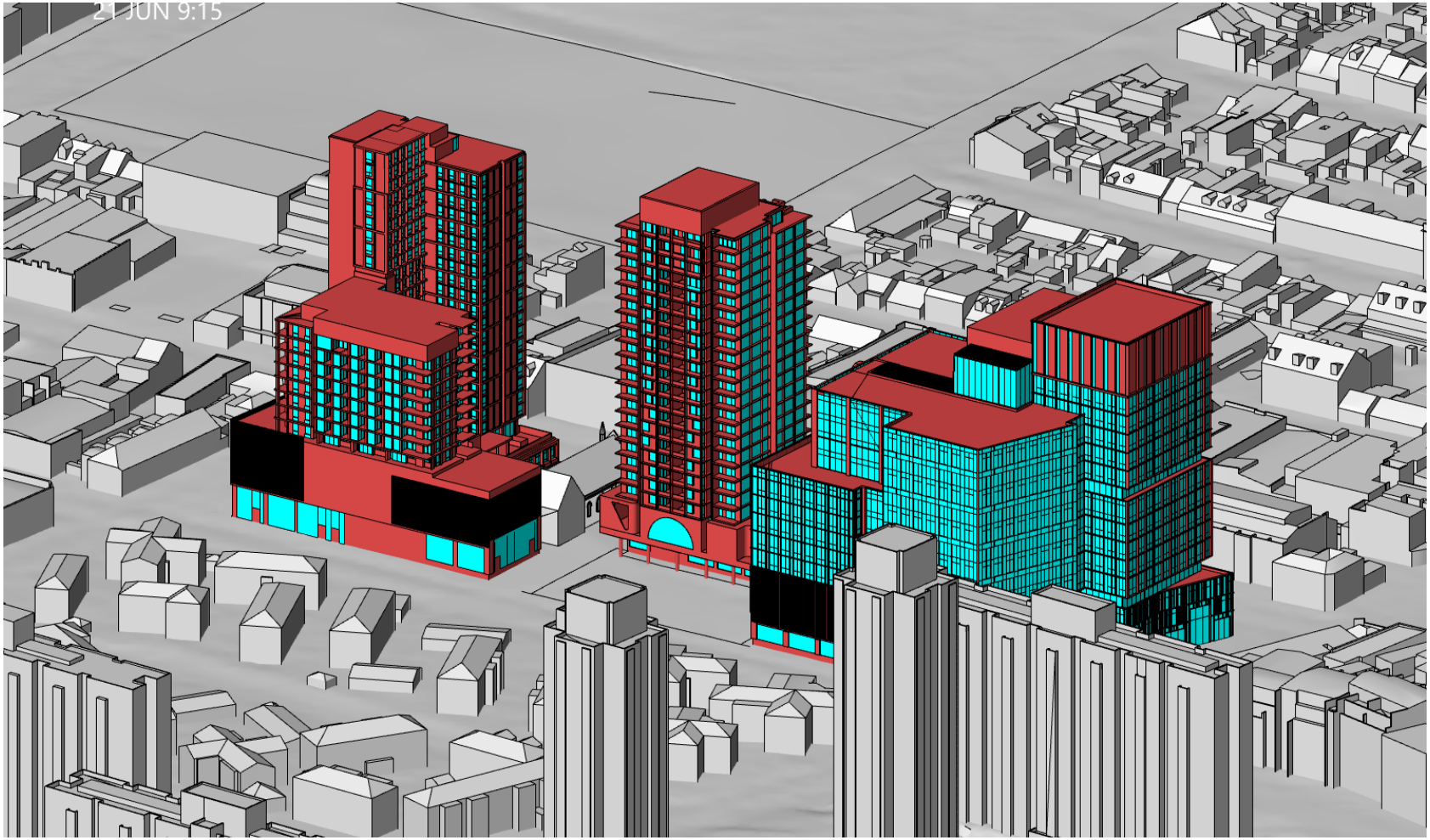
SUN VIEW DIAGRAM

Jun 21 - 09:00 AEST



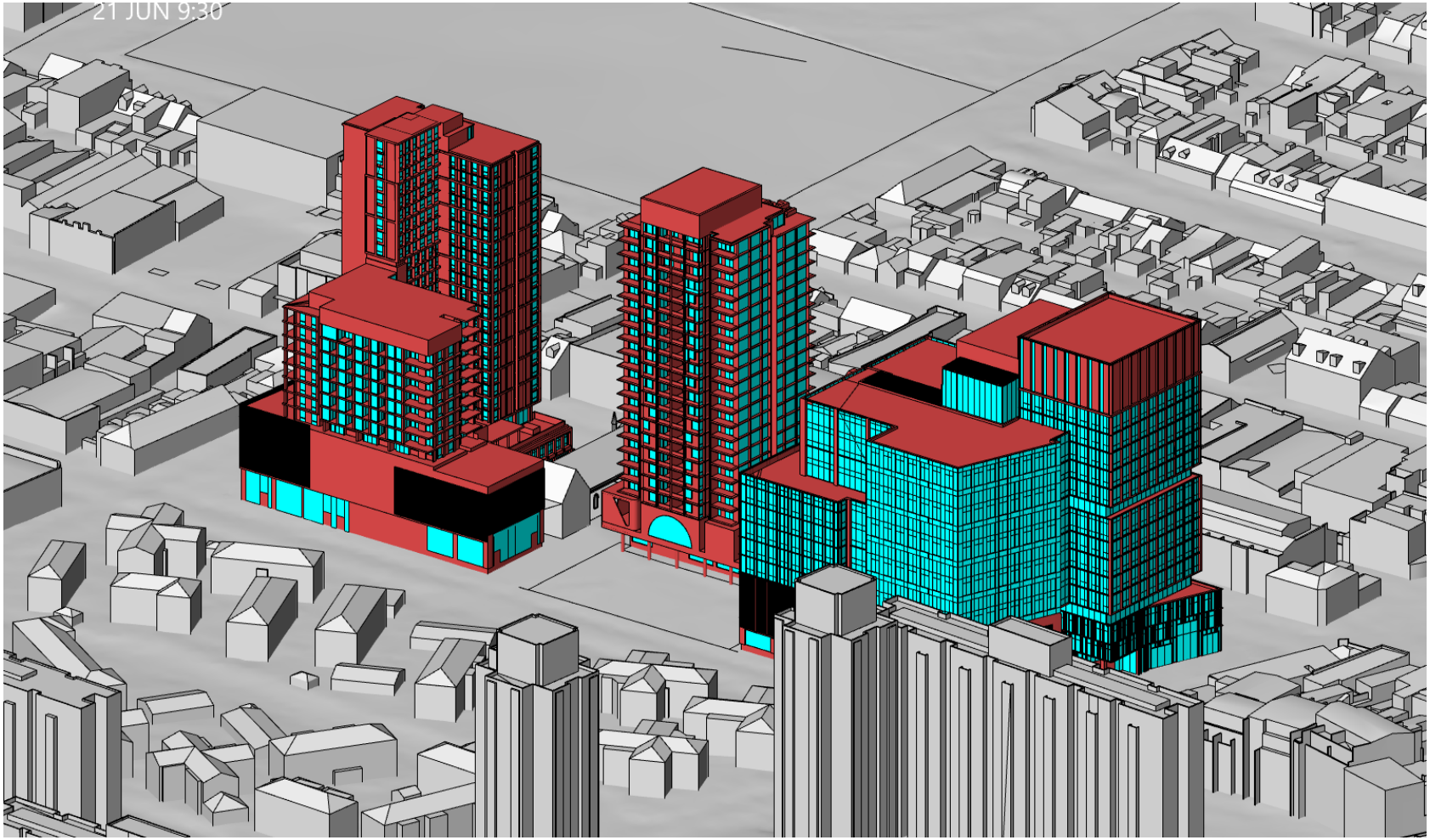
SUN VIEW DIAGRAM

Jun 21 - 09:15 AEST



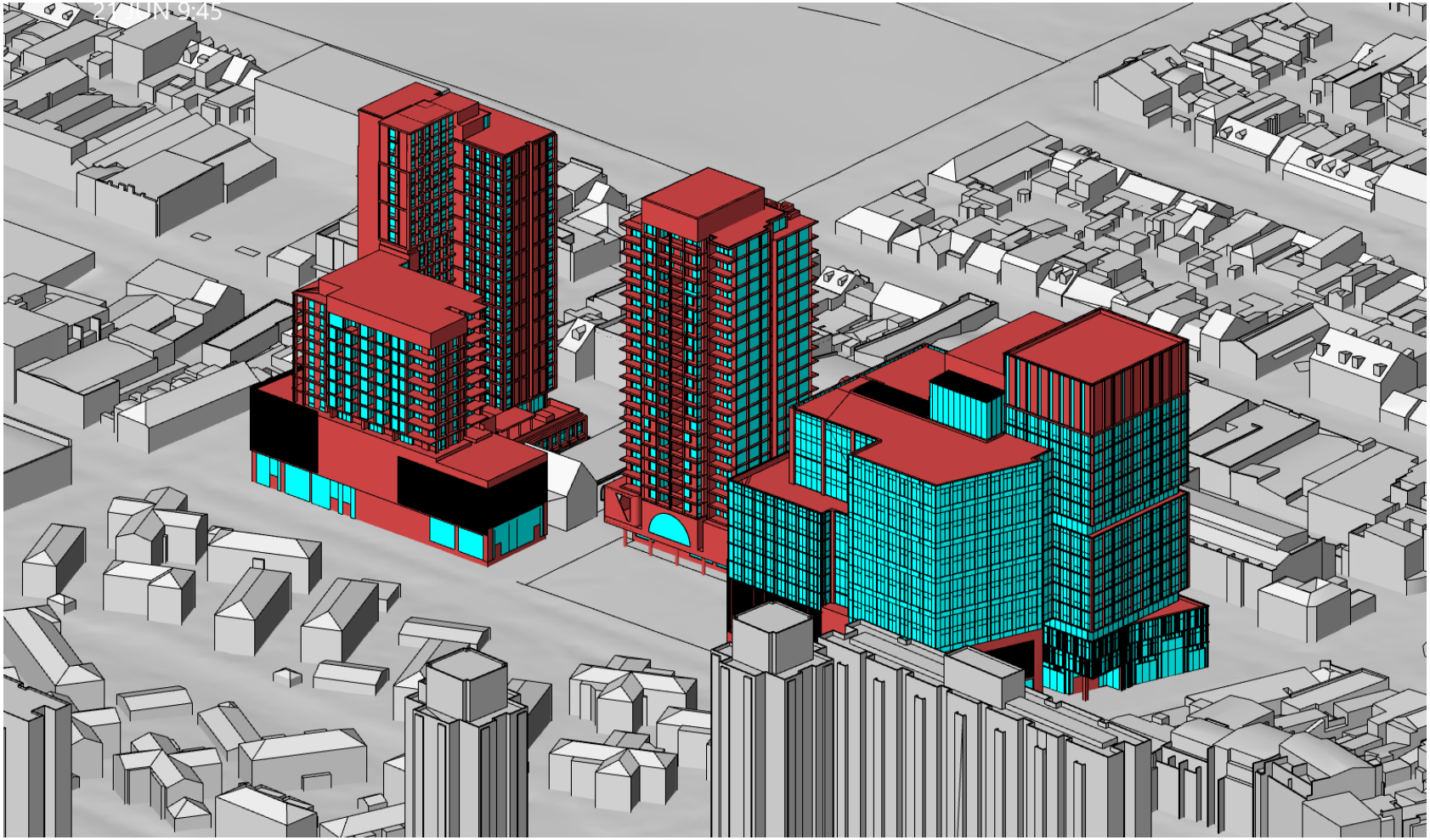
SUN VIEW DIAGRAM

Jun 21 - 09:30 AEST



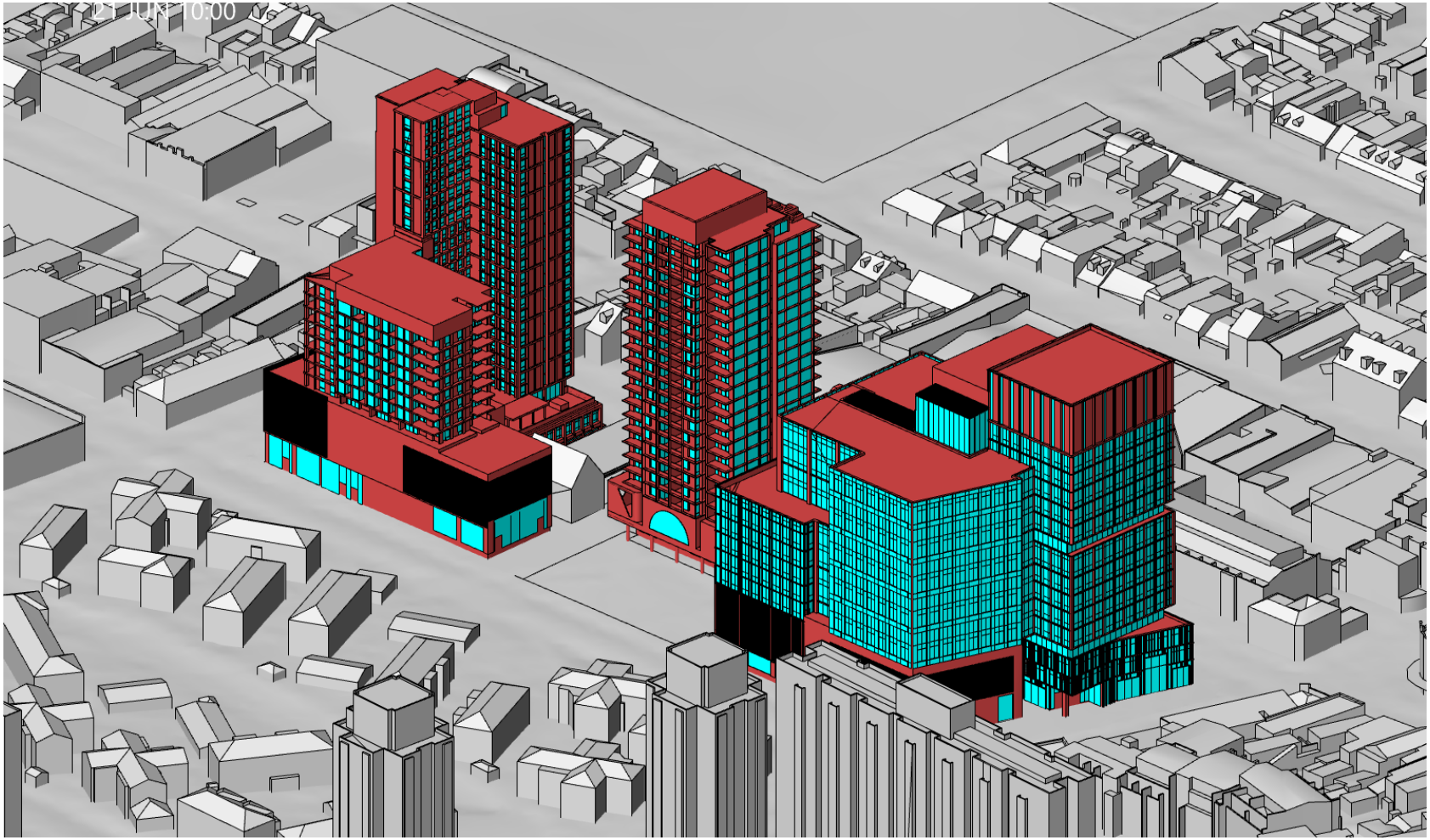
SUN VIEW DIAGRAM

Jun 21 - 09:45 AEST



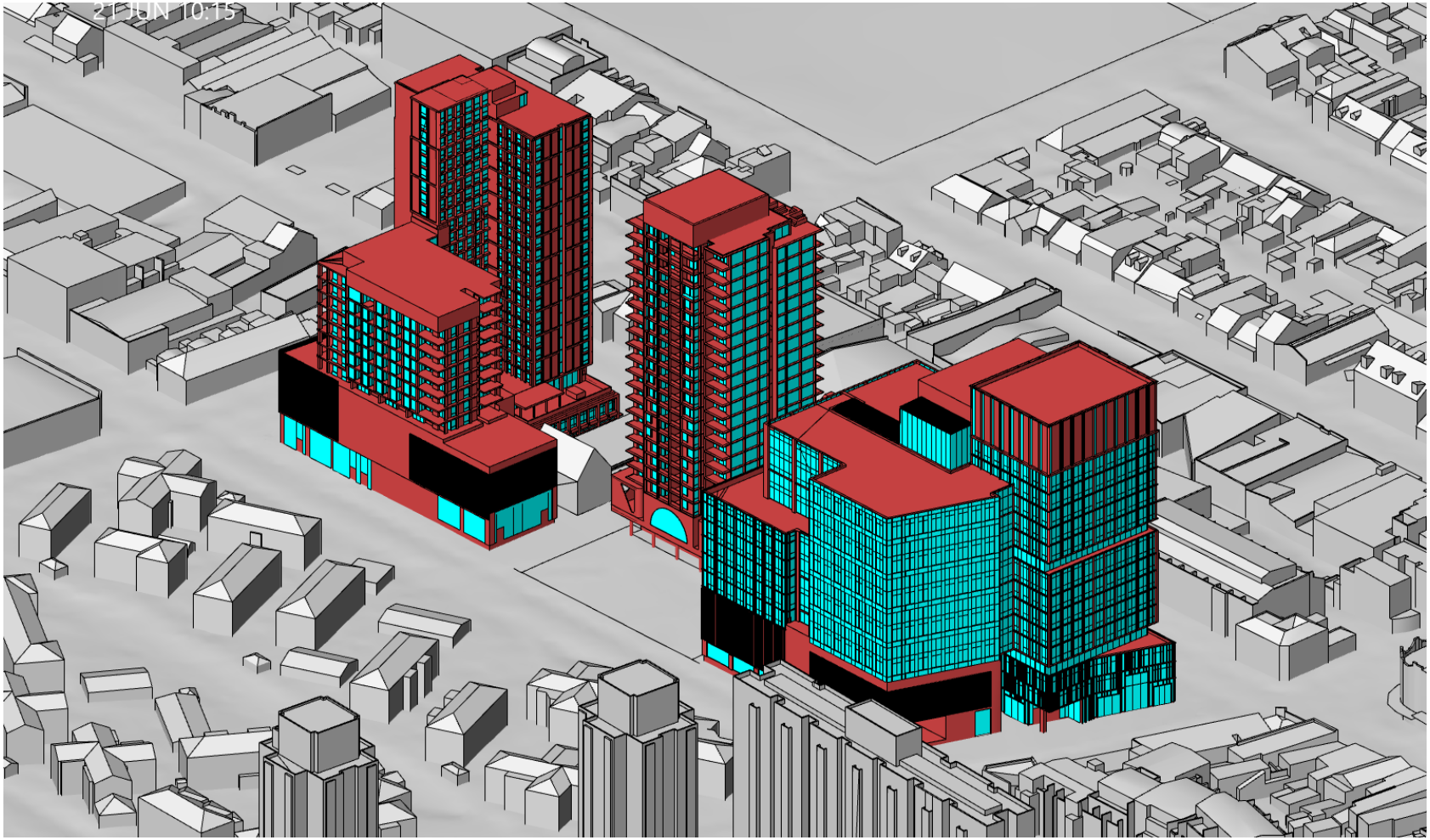
SUN VIEW DIAGRAM

Jun 21 - 10:00 AEST



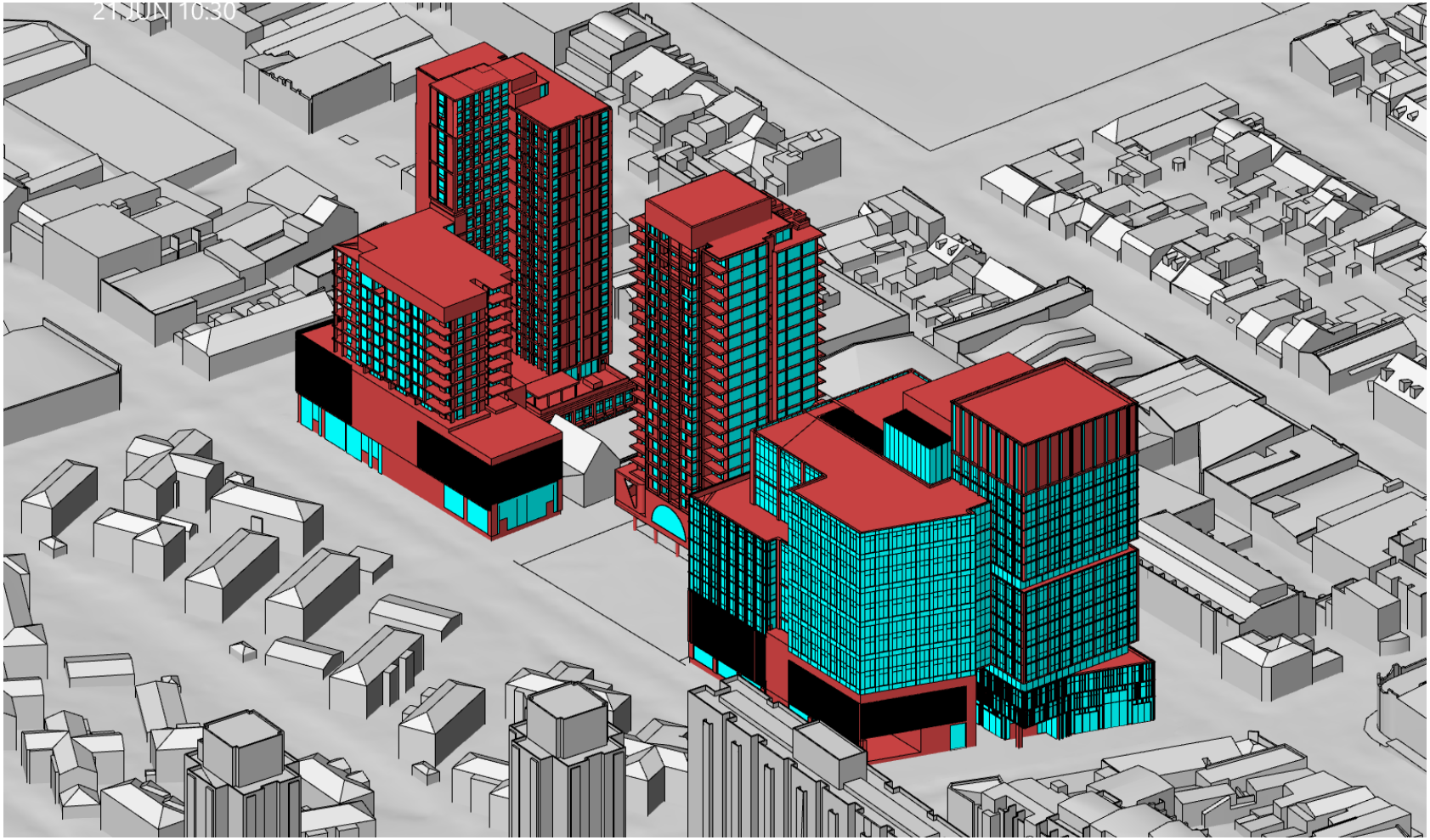
SUN VIEW DIAGRAM

Jun 21 - 10:15 AEST



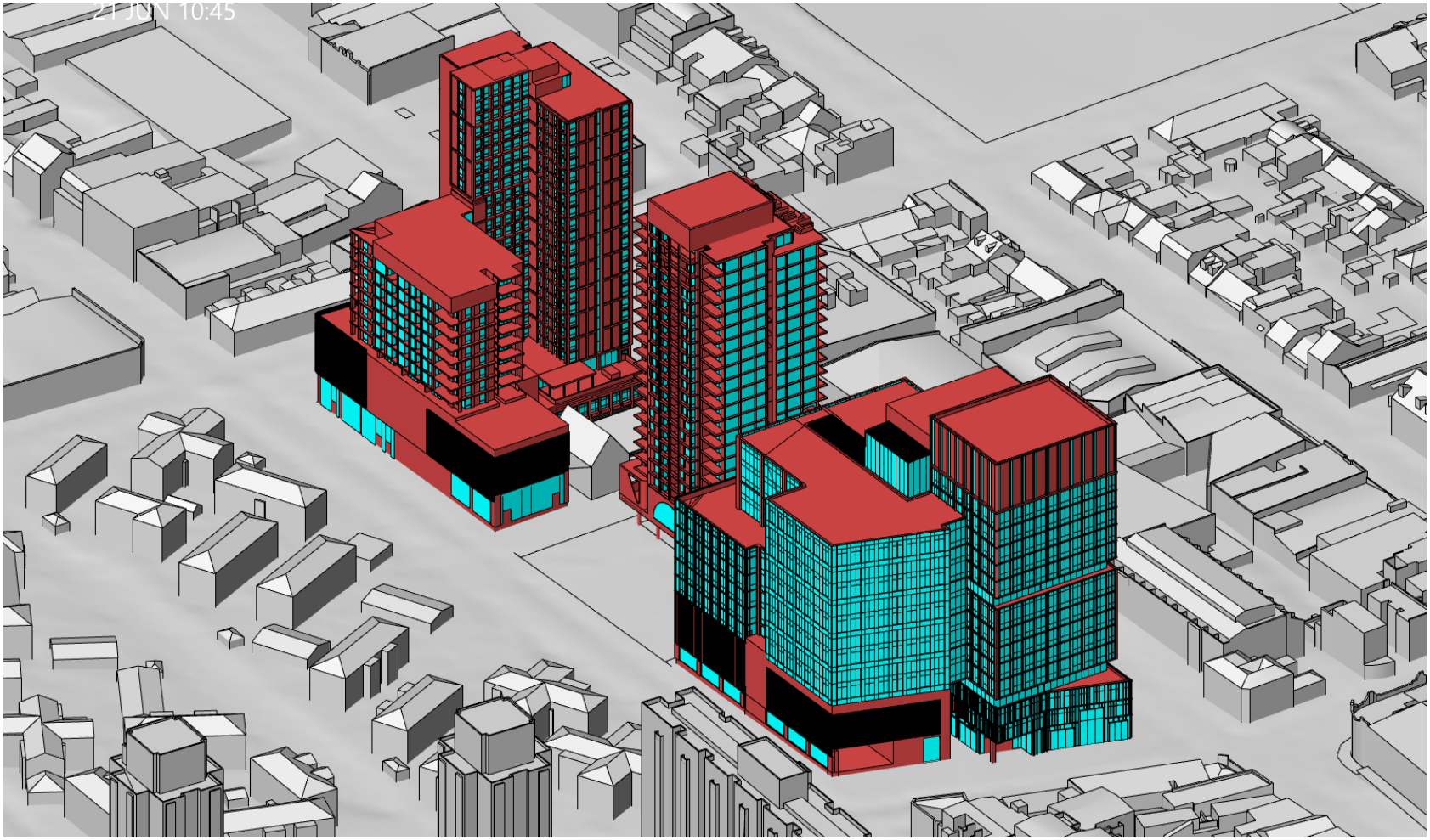
SUN VIEW DIAGRAM

Jun 21 - 10:30 AEST



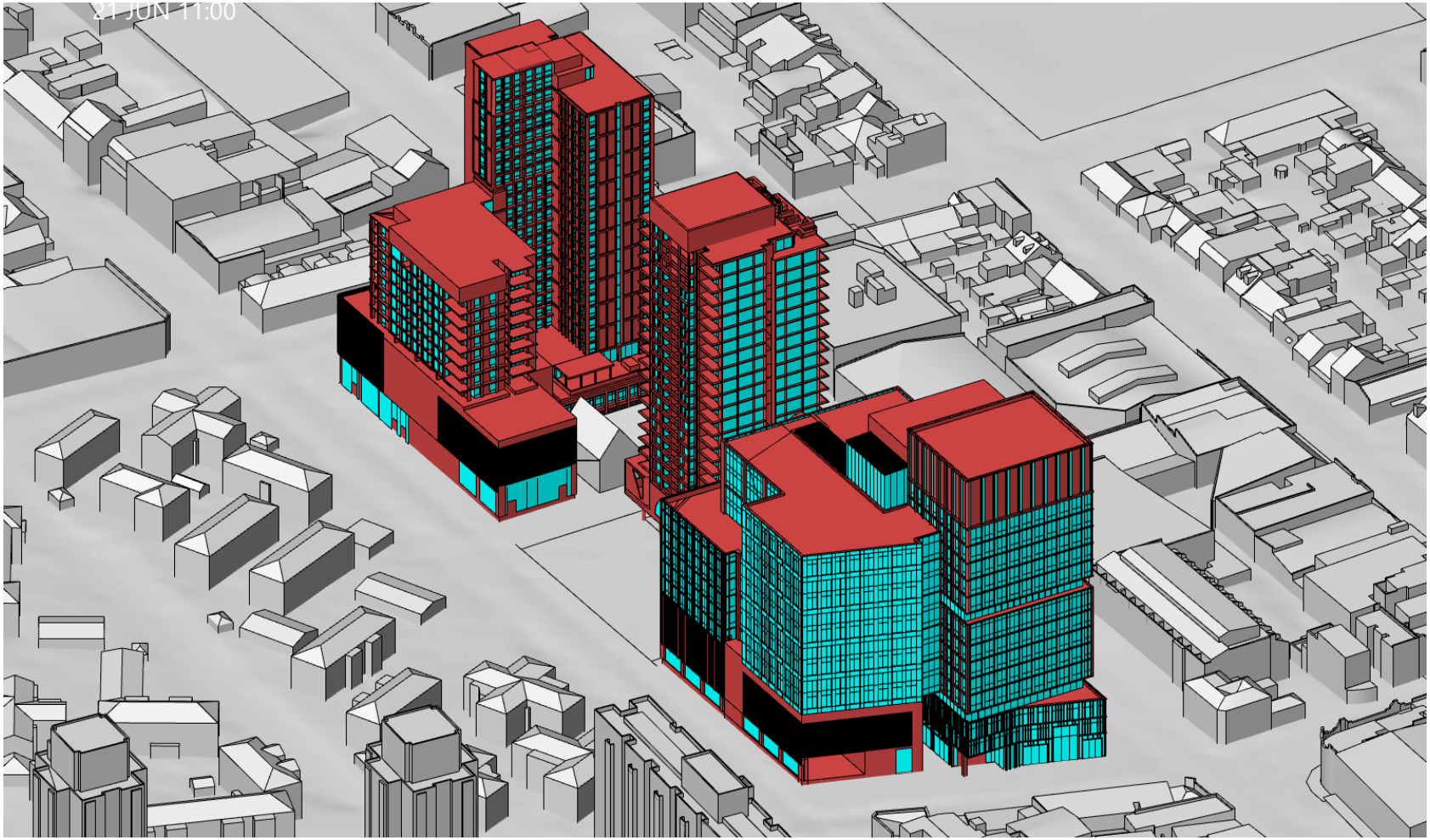
SUN VIEW DIAGRAM

Jun 21 - 10:45 AEST



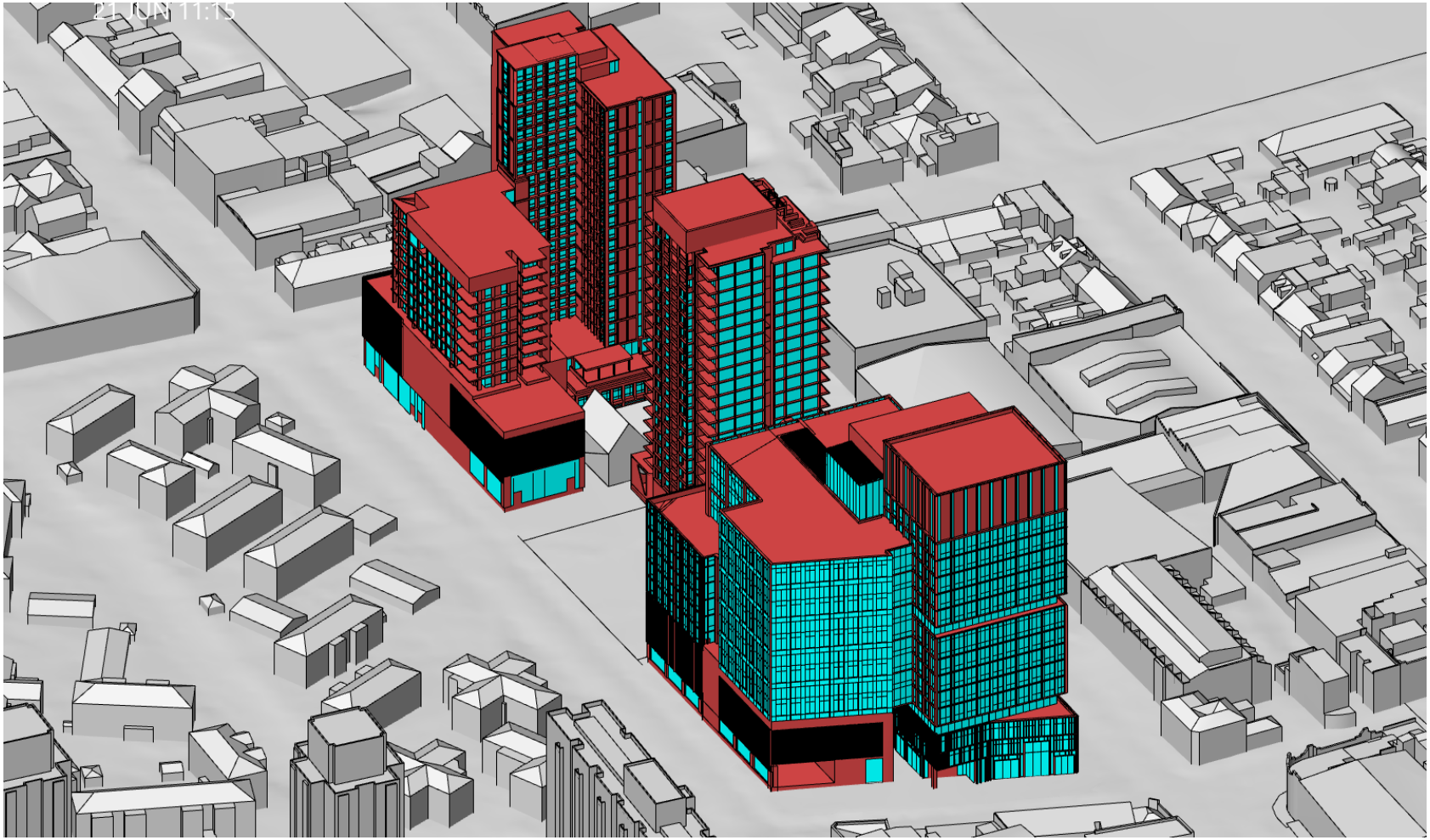
SUN VIEW DIAGRAM

Jun 21 - 11:00 AEST



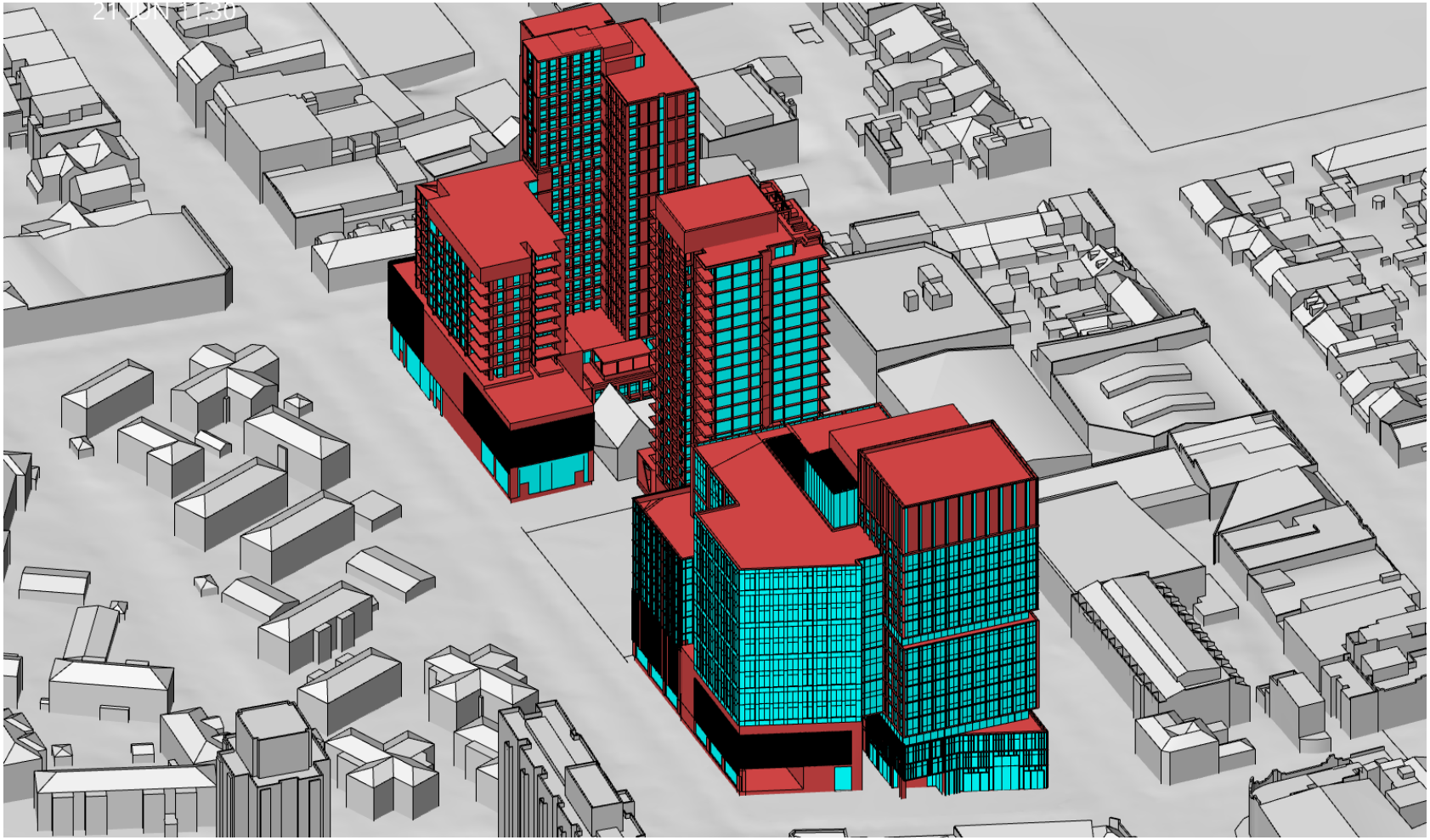
SUN VIEW DIAGRAM

Jun 21 - 11:15 AEST



SUN VIEW DIAGRAM

Jun 21 - 11:30 AEST

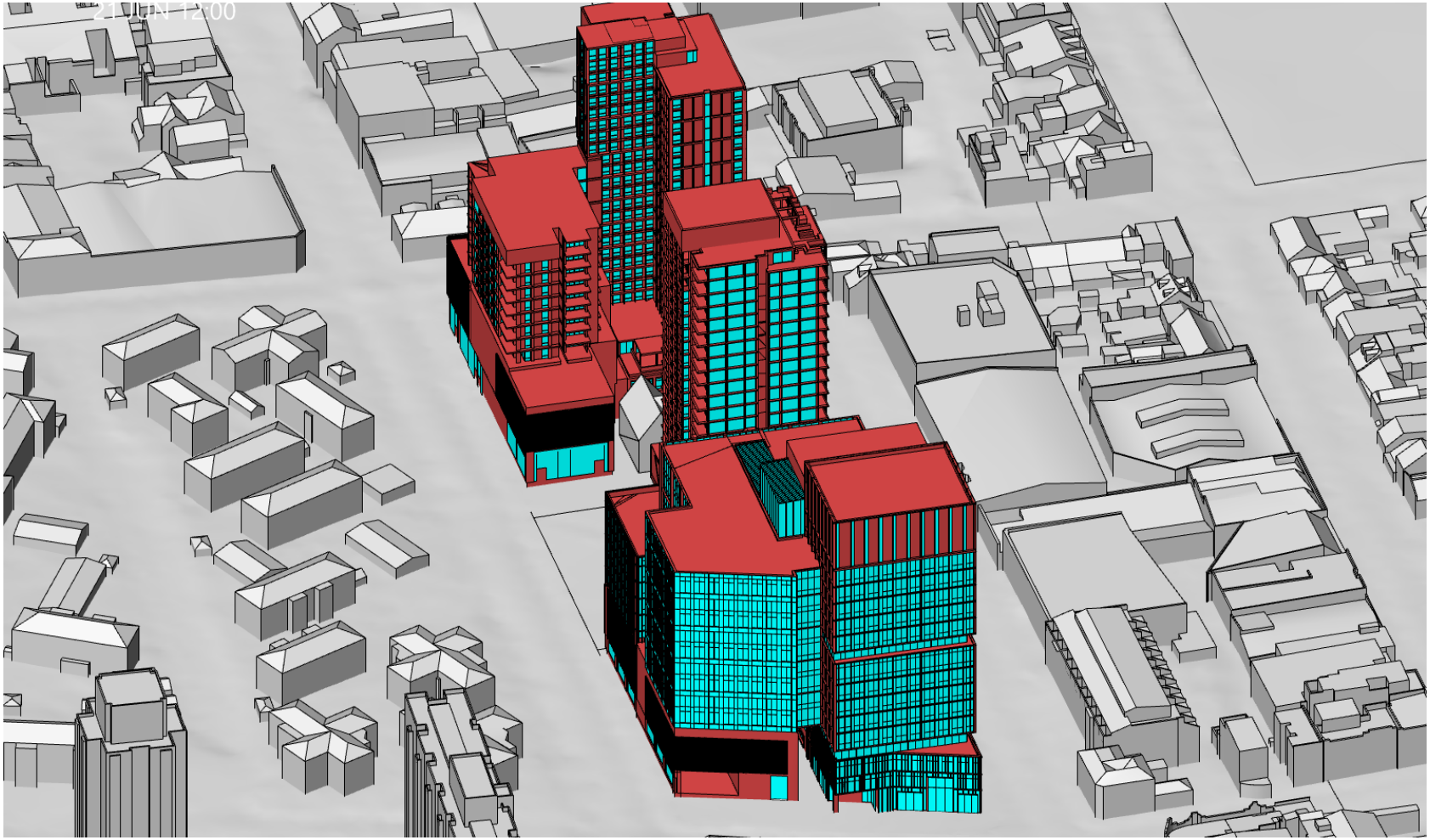


SUN VIEW DIAGRAM

Jun 21 - 11:45 AEST

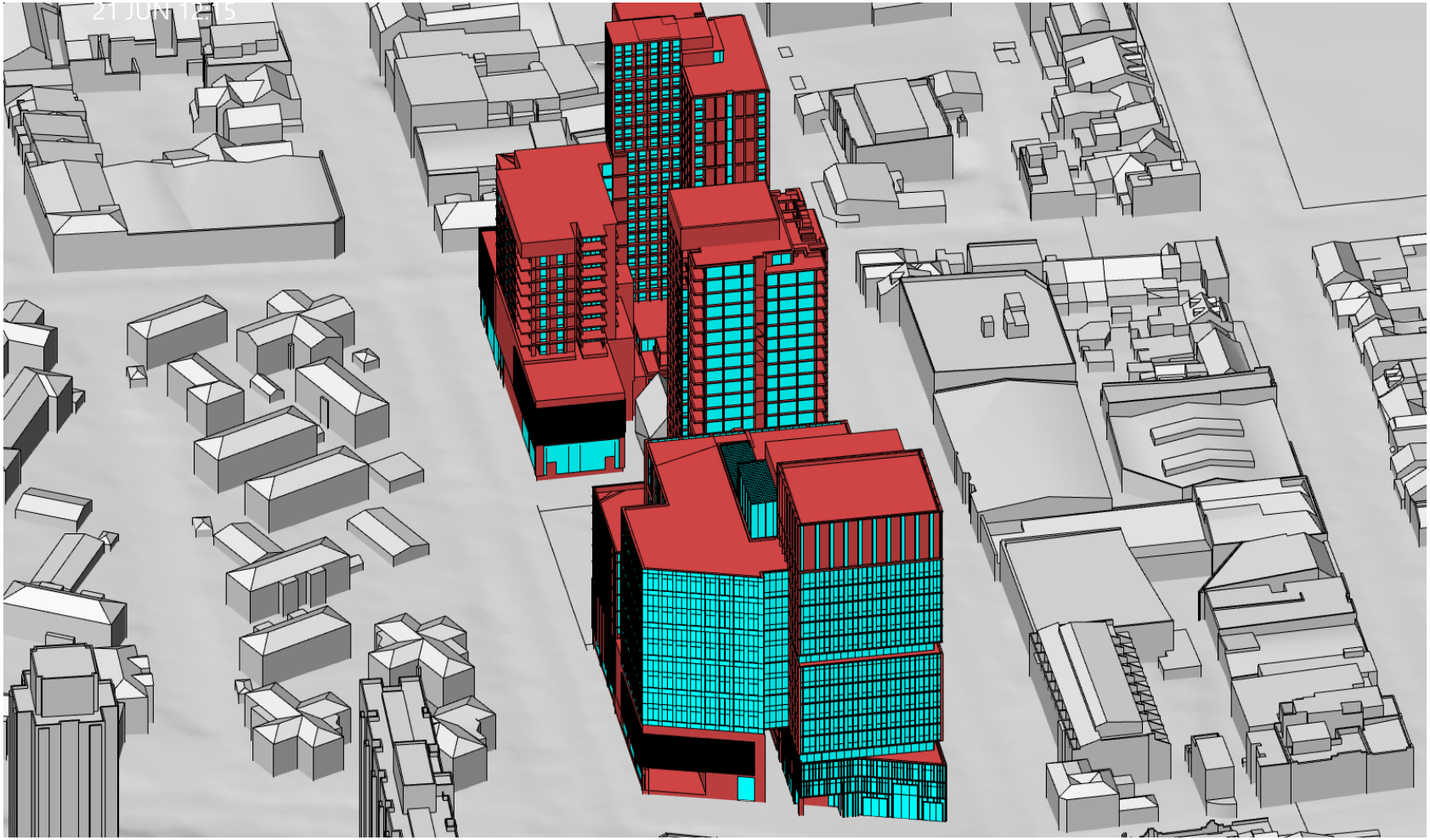
SUN VIEW DIAGRAM

Jun 21 - 12:00 AEST



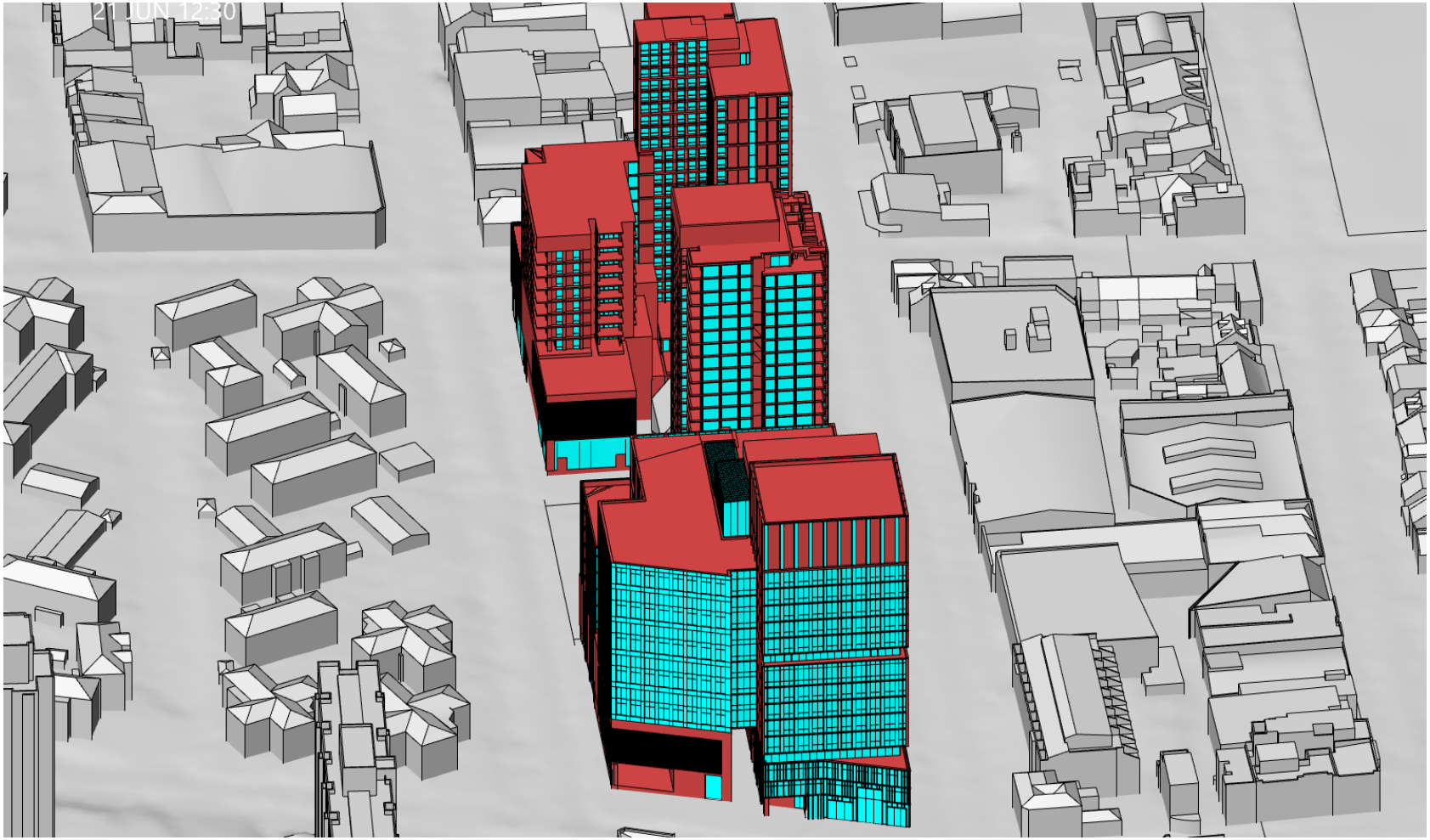
SUN VIEW DIAGRAM

Jun 21 - 12:15 AEST



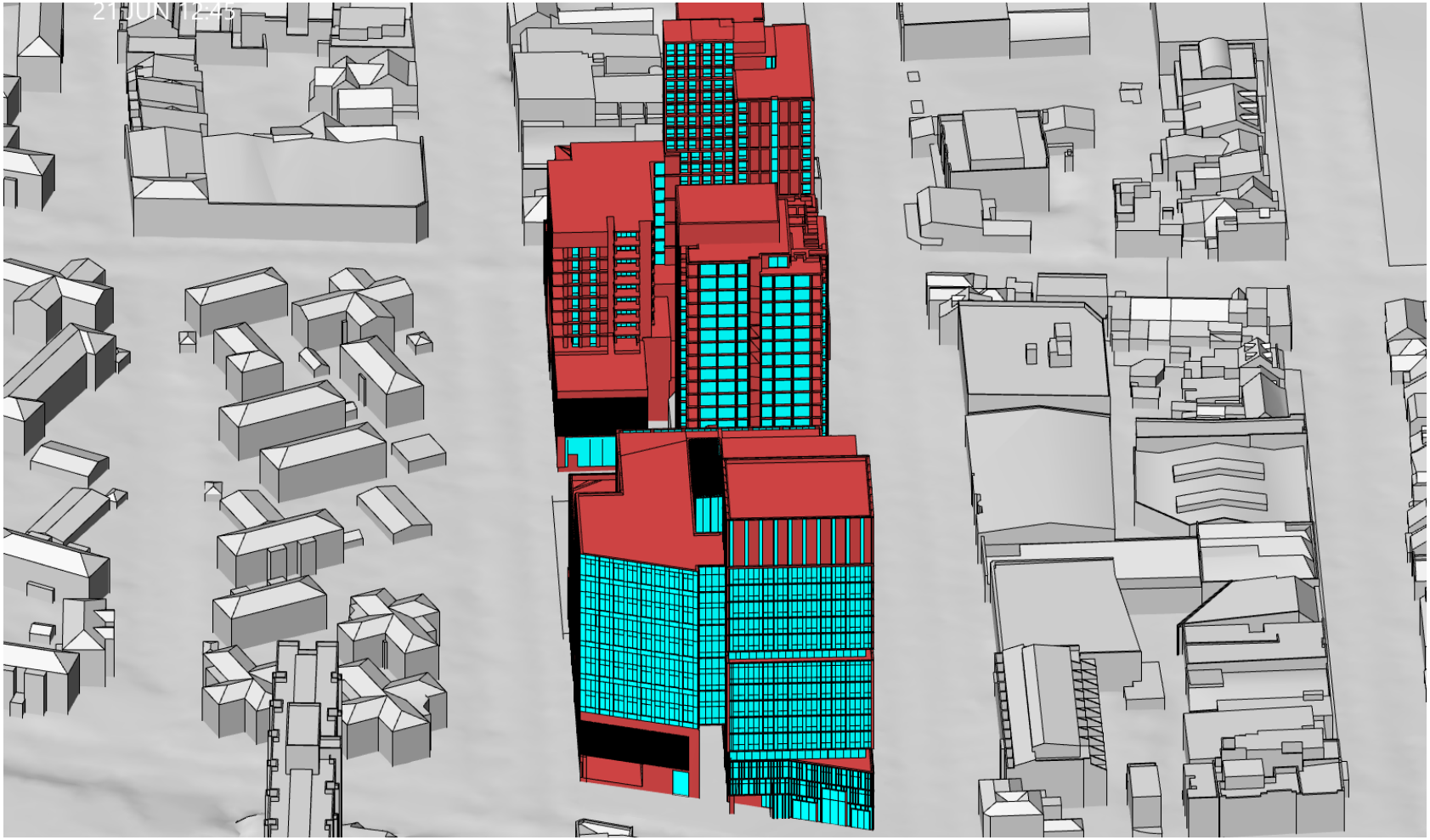
SUN VIEW DIAGRAM

Jun 21 - 12:30 AEST



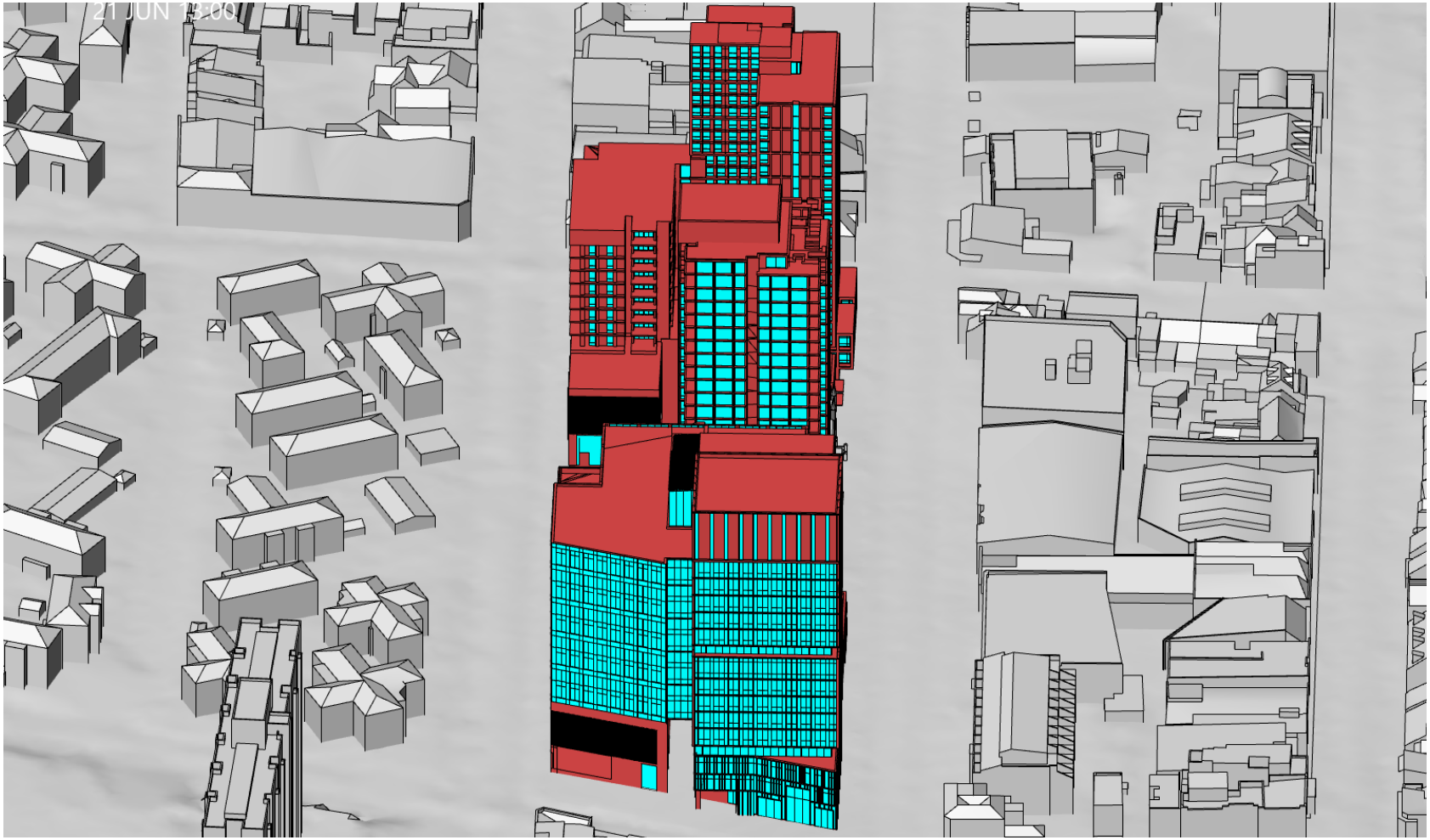
SUN VIEW DIAGRAM

Jun 21 - 12:45 AEST



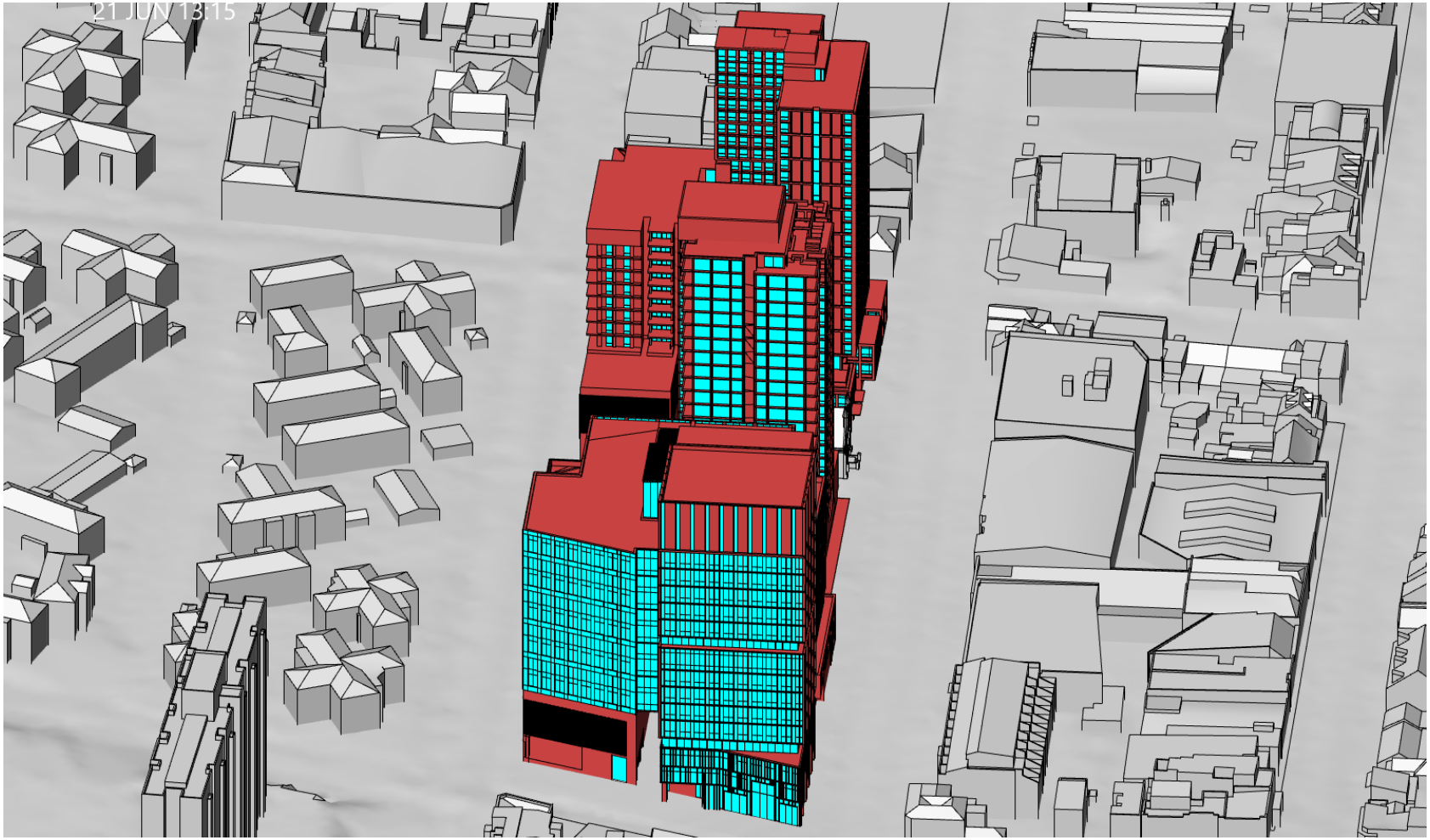
SUN VIEW DIAGRAM

Jun 21 - 13:00 AEST



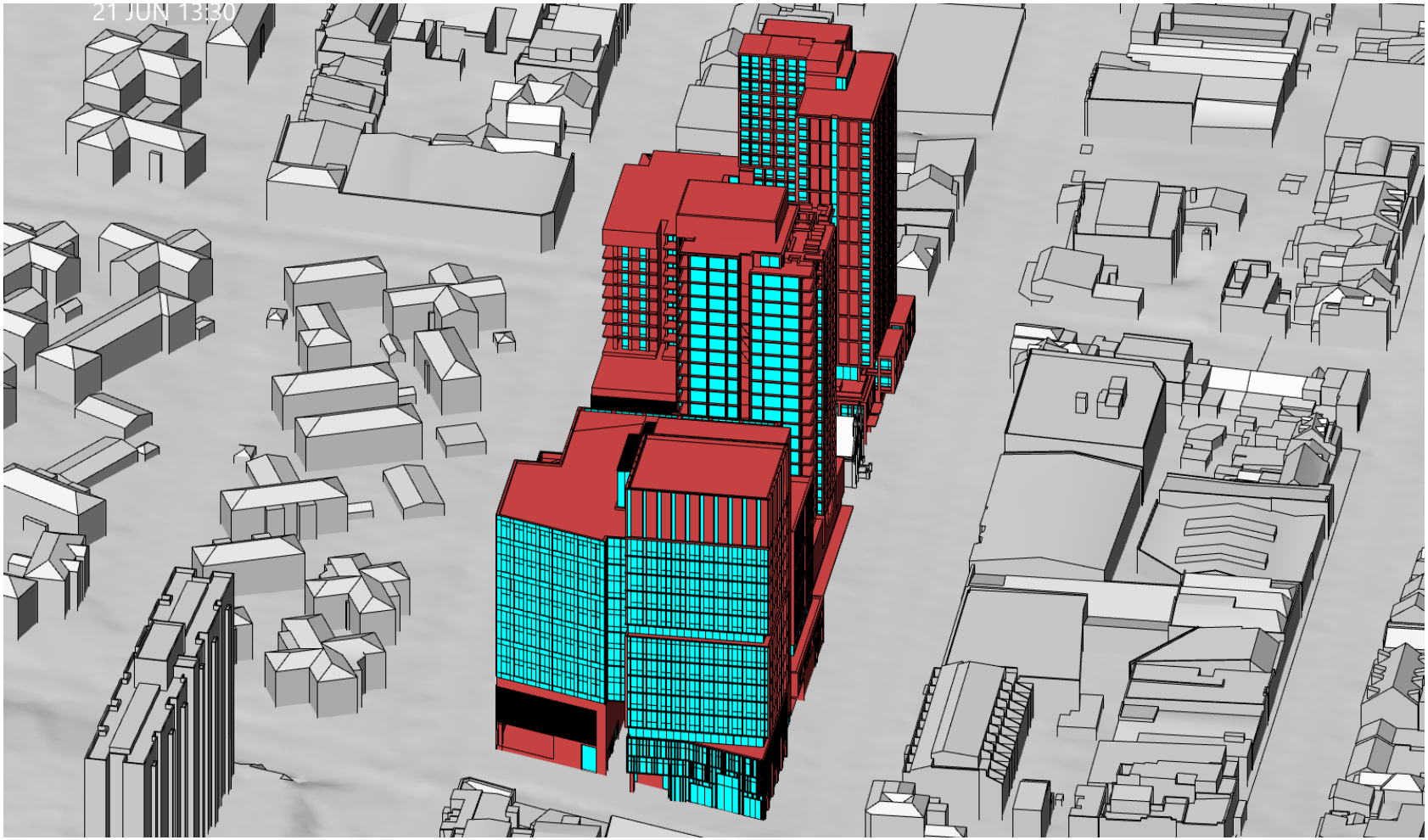
SUN VIEW DIAGRAM

Jun 21 - 13:15 AEST



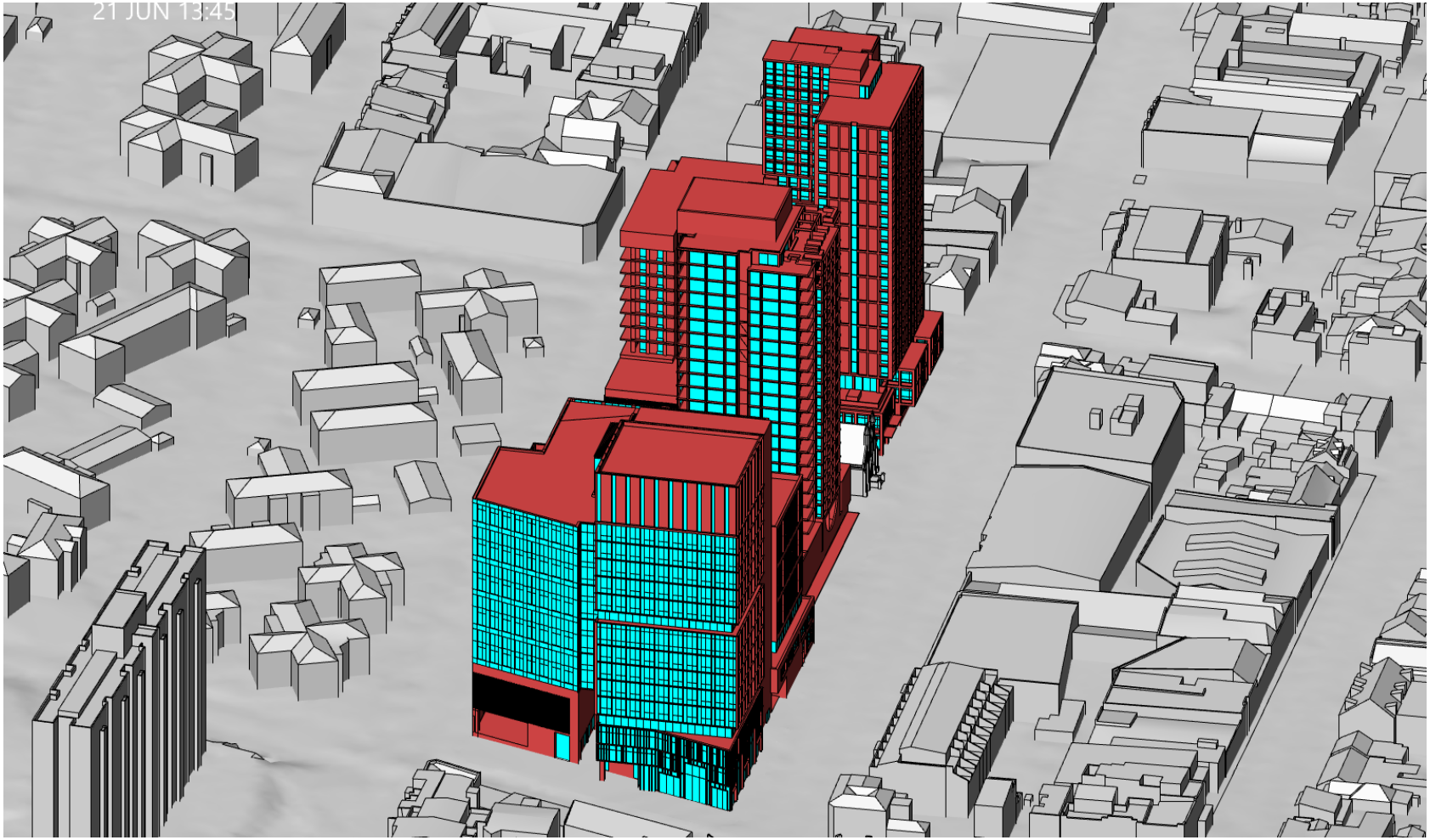
SUN VIEW DIAGRAM

Jun 21 - 13:30 AEST



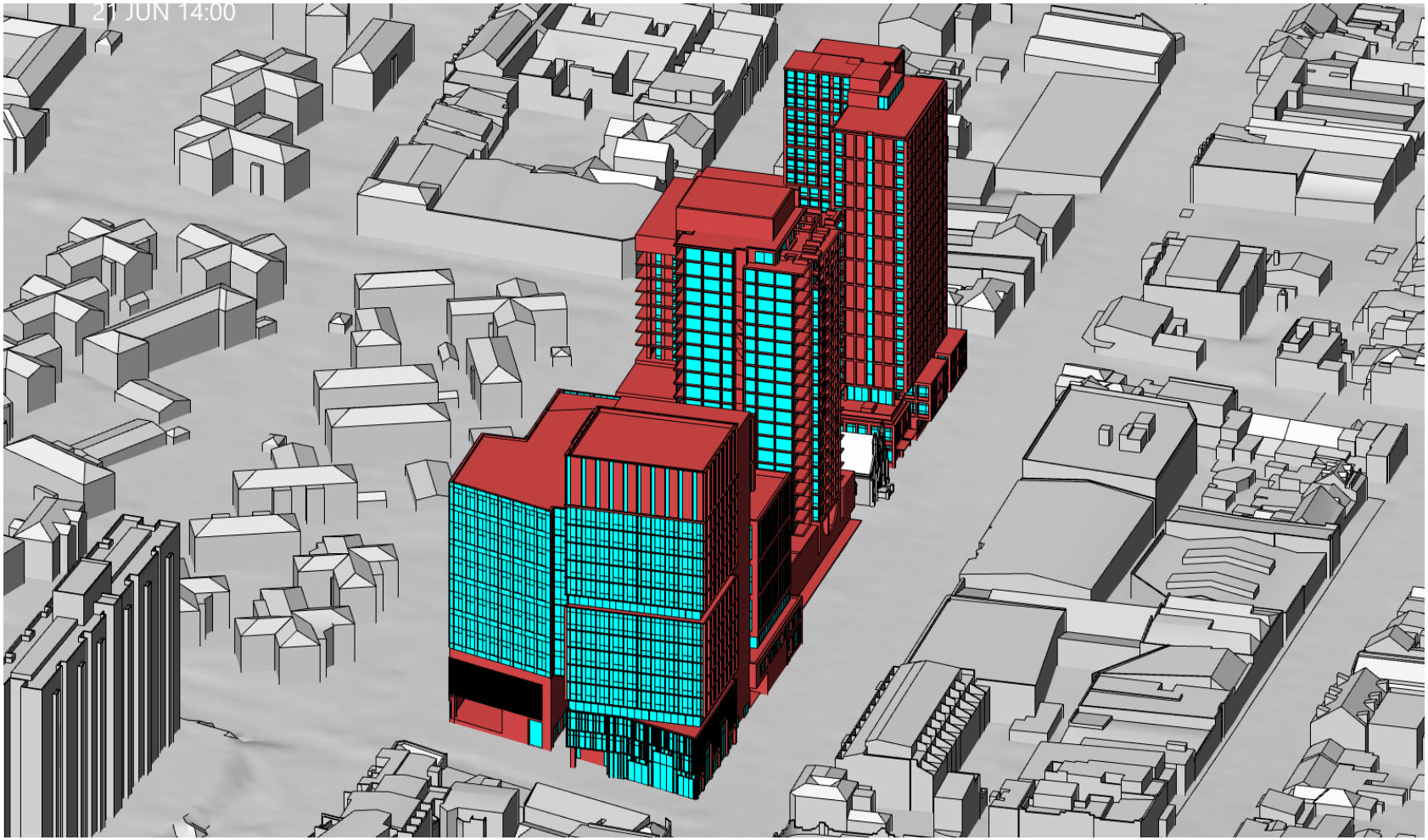
SUN VIEW DIAGRAM

Jun 21 - 13:45 AEST



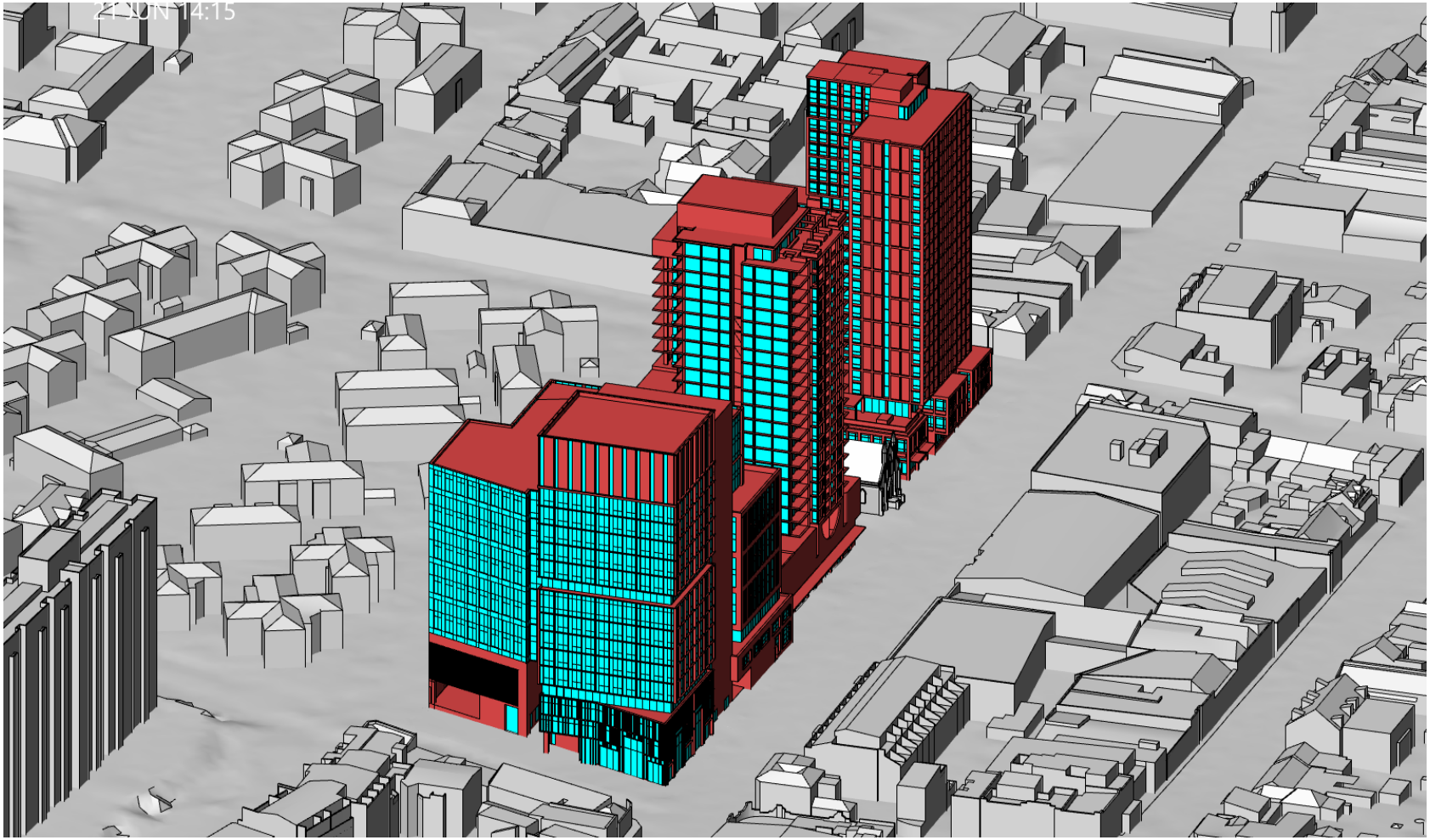
SUN VIEW DIAGRAM

Jun 21 - 14:00 AEST



SUN VIEW DIAGRAM

Jun 21 - 14:15 AEST

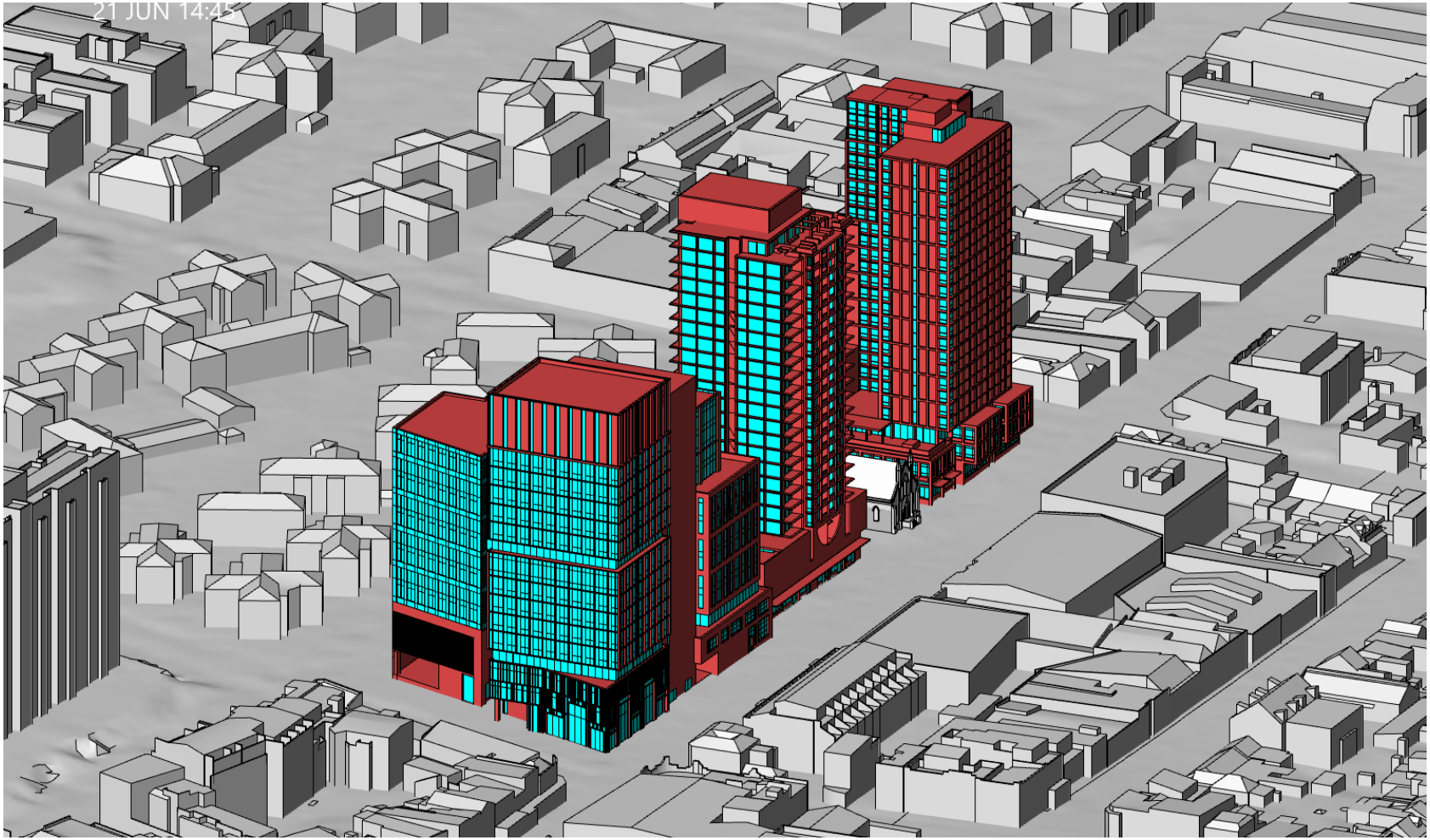


SUN VIEW DIAGRAM

Jun 21 - 14:30 AEST

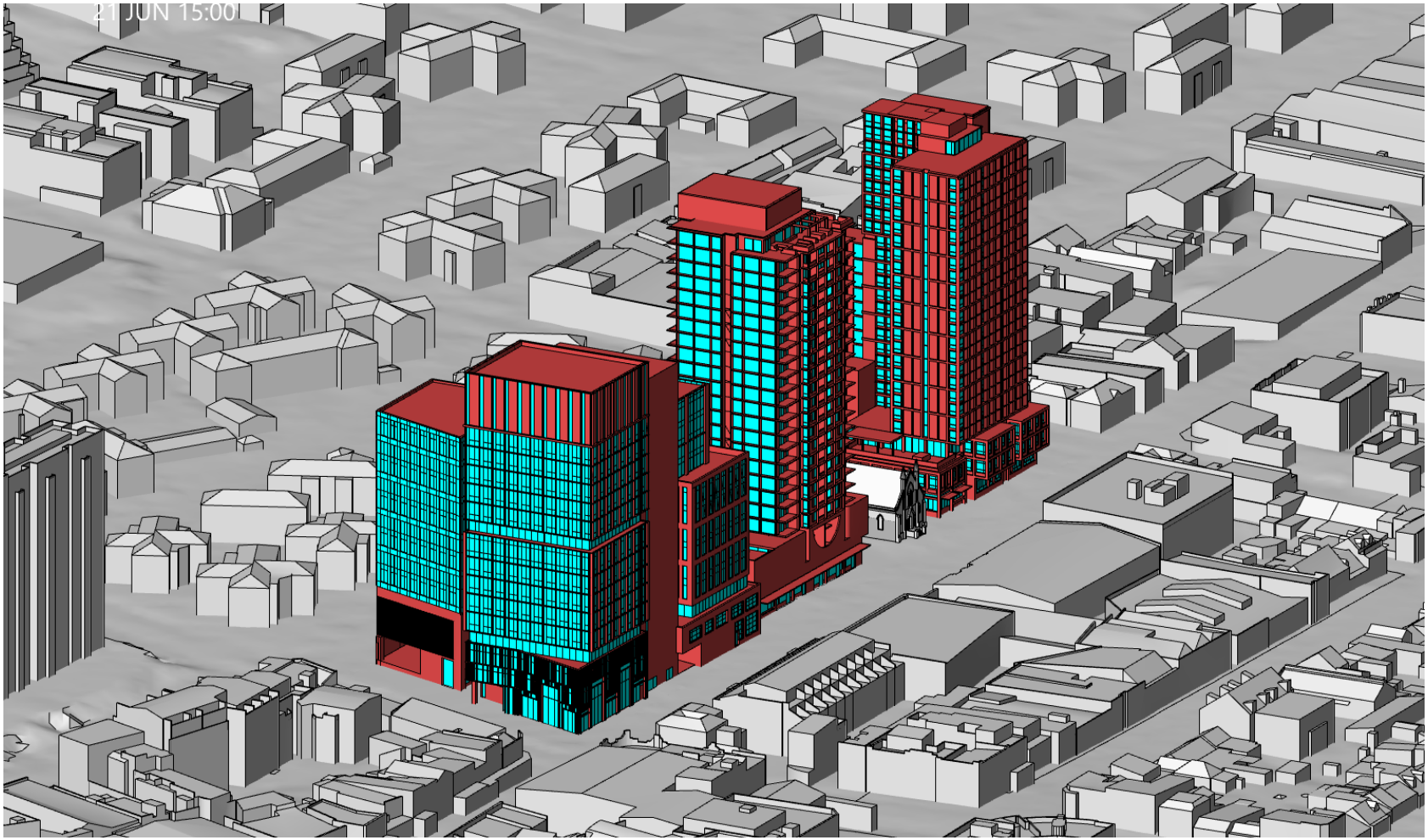
SUN VIEW DIAGRAM

Jun 21 - 14:45 AEST



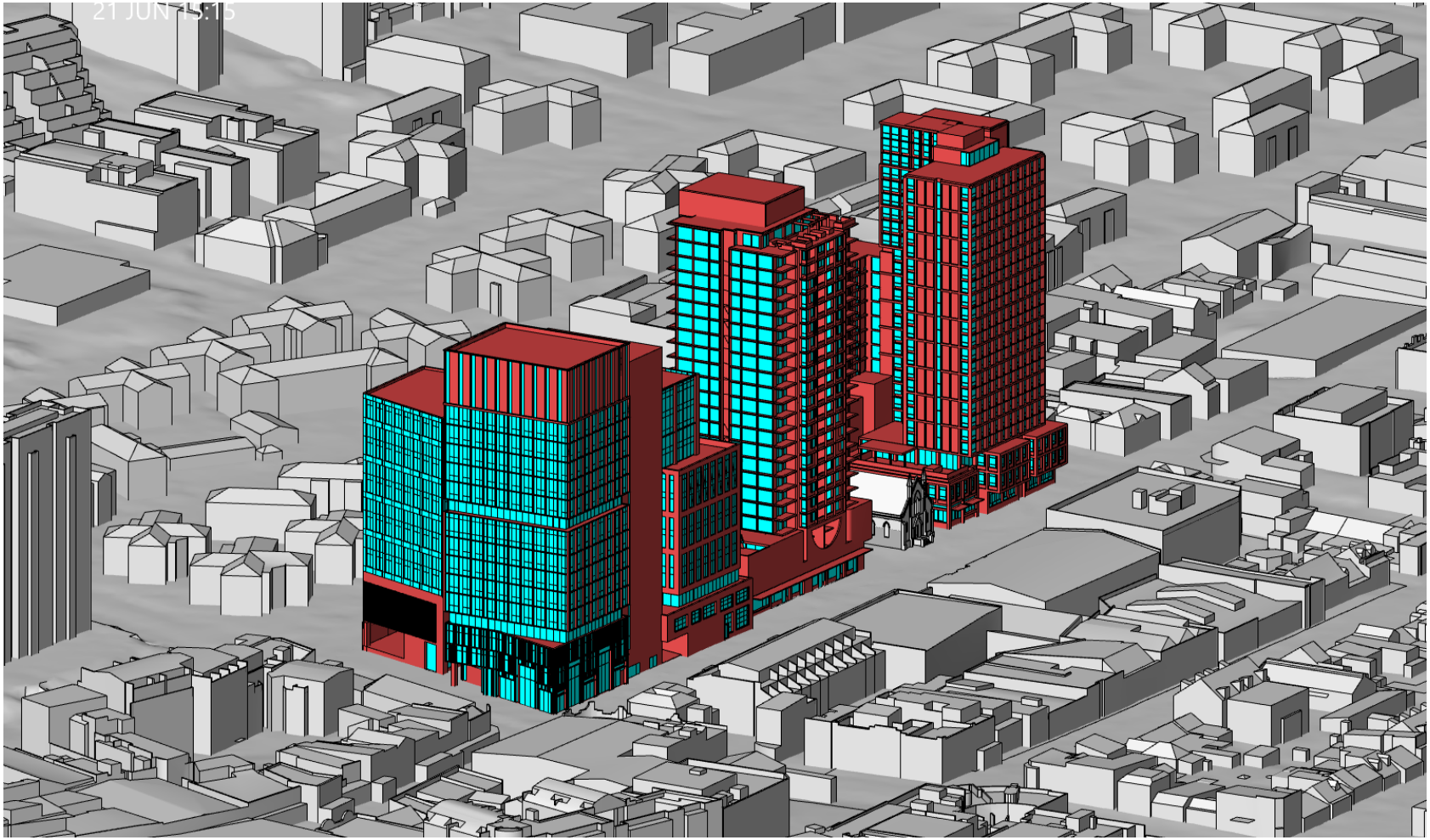
SUN VIEW DIAGRAM

Jun 21 - 15:00 AEST



SUN VIEW DIAGRAM

Jun 21 - 15:15 AEST

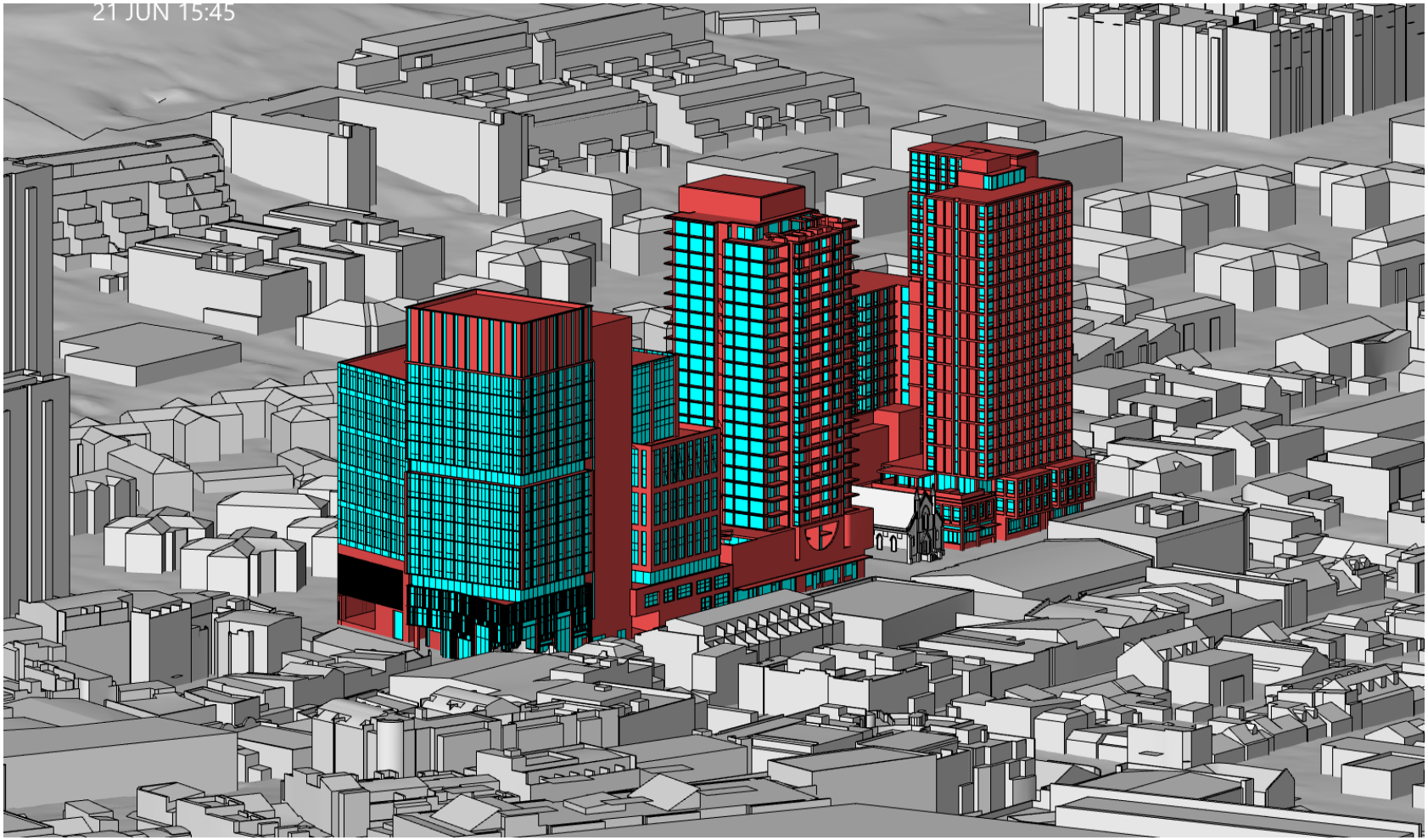


SUN VIEW DIAGRAM

Jun 21 - 15:30 AEST

SUN VIEW DIAGRAM

Jun 21 - 15:45 AEST



SUN VIEW DIAGRAM

Jun 21 - 16:00 AEST