

Sydney Metro West - Central Tunnelling Package
Five Dock Visual Amenity, Solar Access and Overshadowing Report

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Acciona Ferrovia Joint Venture



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1. Introduction

1.1 Project Overview

The Sydney Metro West project will provide a new underground railway that connects Greater Parramatta and the Sydney CBD. It will double rail capacity between the two CBDs, linking new communities to rail services and supporting employment growth and housing supply. The locations of the nine proposed metro stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and the Sydney CBD (Hunter Street).

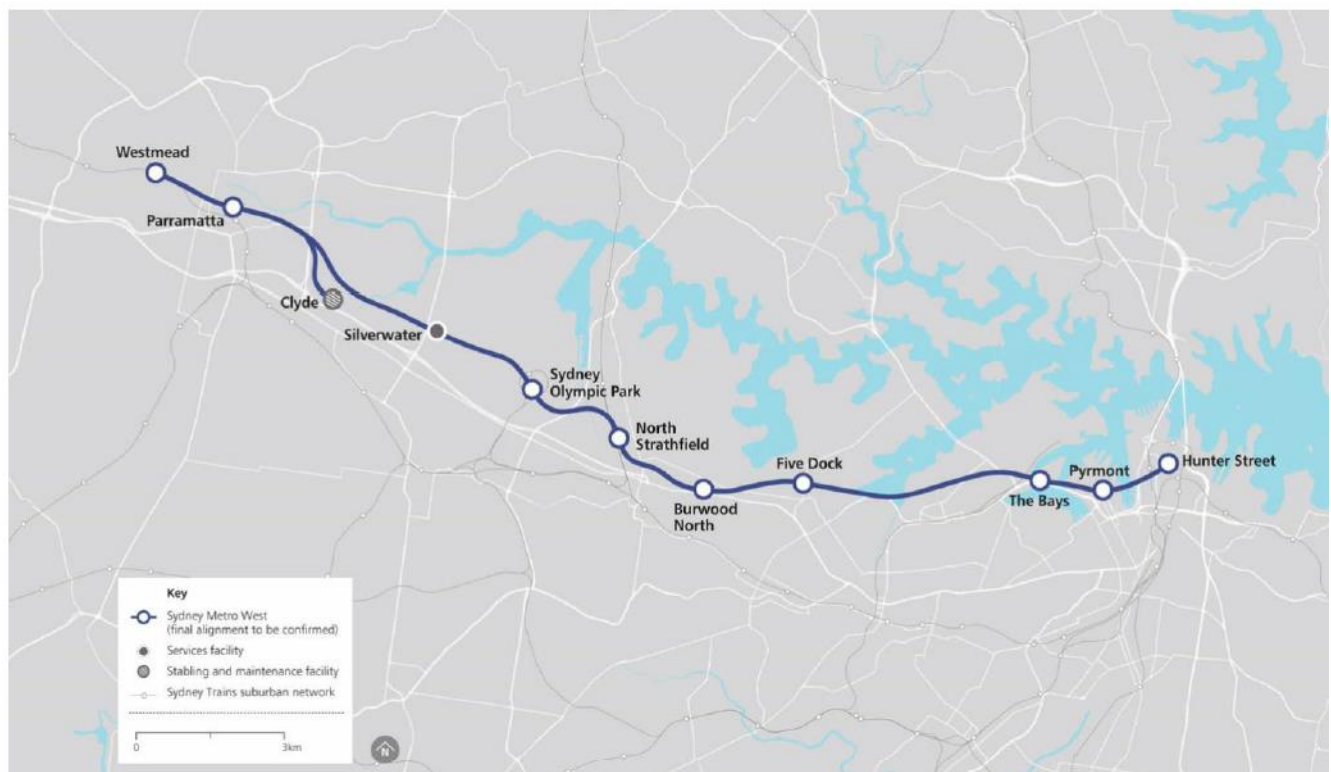


Figure 1-1 Sydney Metro West Overview

Key components of the project will include about 24 kilometres of twin tunnels between Westmead and the Sydney CBD.

The planning approvals and environmental impact assessment for Sydney Metro West has been split into a number of stages recognising the size of the project. This includes:

- Stage 1 – Concept and all major civil construction works including station excavation and tunnelling between Westmead and The Bays. Planning approval for this stage was granted in March 2021.

- Stage 2 – All major civil construction works including station excavation and tunnelling from The Bays to Sydney CBD.
- Stage 3 – Tunnel fit-out, construction of stations, ancillary facilities and station precincts, and operation and maintenance of the Sydney Metro West line.

Acciona Ferrovia Joint Venture (AFJV) has been awarded the contract to design and construct the Sydney Metro West – Central Tunnelling Package (CTP). The contract includes the delivery of twin 11-kilometre tunnels and excavation of five station boxes at Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays.

As the project comprises the excavation and construction of the tunnel, this report will aim to provide a preliminary assessment of the overshadowing impacts of two temporary acoustic sheds to be constructed for the station excavation works at the proposed Five Dock Station.

The Sydney Metro West project is classed as Critical State Significant Infrastructure (CSSI) by virtue of Schedule 5, clause 21 of State Environmental Planning Policy (State and Regional Development) 2011.

An Environmental Impact Statement (EIS) (Jacobs and Arcadis, 2020) for the Concept and Stage 1 (herein referred to as the Project) was developed in response to the Secretary Environmental Assessment Requirements issued by the Department of Planning, Industry and Environment (DPIE).

The Project was approved on 11 March 2021 (SSI 10038) and Conditions of Approval (CoA) issued (current version SS1 10038 Mod 1 Determined 28 July 2021).

1.2 Purpose of This Report

This Visual Amenity, Solar Access and Overshadowing Report has been prepared to address the Minister's Condition of Approvals D106 to D108 with respect to assessing acoustic sheds that may cause overshadowing to the residential apartments at 110 Great North Road, Five Dock.

Jacobs Typsa (JTJV) has been engaged by AFJV to provide an overshadowing assessment for the proposed acoustic sheds at the Five Dock Shaft against mixed use building 110 Great North Road.

This report documents the findings of the visual amenity impact assessment and overshadowing assessment for 110 Great North Road, Five Dock. The report also documents the next steps and describes how the potential impacts and mitigation measures will be discussed with affected property owners.

The outcomes of this report will inform the Project's Visual Amenity Management Plan (VAMP).

1.3 Ministers Conditions of Approval

Table 1 outlines the Conditions of Approval (CoA) relating to Visual Amenity, Solar Access and Overshadowing for the Project.

Table 1. Conditions of Approval relating to Visual Amenity, Solar Access and Overshadowing at the Five Dock Metro Stations

CoA No.	Condition(s)	Where Addressed
D106	<i>The acoustic shed at the Five Dock metro station eastern construction site must be designed and constructed in a manner that minimises visual amenity, solar access and overshadowing impacts to the residential apartments at 110 Great North Road, Five Dock facing the acoustic shed. The potential visual amenity, solar access and overshadowing impacts of the acoustic shed on the affected residential apartments must be assessed in a Visual Amenity, Solar Access and Overshadowing Report prepared by the Proponent.</i>	Section 2 Section 3 Appendix A Appendix B
D107	<p><i>The Visual Amenity, Solar Access and Overshadowing Report must include:</i></p> <p><i>(a) visual amenity impact assessments from the relevant residential apartments to the acoustic shed at the Five Dock metro station eastern construction site;</i></p> <p><i>(b) solar access assessments of the relevant residential apartments, with consideration for the relevant development controls in the City of Canada Bay Development Control Plan (Version 4, 21 October 2020) and the Apartment Design Guide; and</i></p> <p><i>(c) a consultation plan to detail how potential impacts and mitigation measures will be discussed and negotiated with potentially affected property owners.</i></p> <p><i>The Visual Amenity, Solar Access and Overshadowing Report must be provided to the Planning Secretary for approval within (1) month prior to the installation of the acoustic shed at the Five Dock metro station eastern construction site.</i></p>	Section 2 Section 3 Section 4
D108	<i>Where the acoustic shed causes a moderate (or greater) adverse visual amenity impact and / or unreasonable overshadowing and solar access impacts to any of the subject residential apartments, the Proponent must consult with the relevant affected property owners and occupiers to identify appropriate mitigation measures and an agreed implementation program. A copy of agreed implementation programs must be provided to the Planning Secretary for information.</i>	Section 4

2. Visual Amenity Assessment

2.1 Assessment approach

Landscape character and visual amenity were assessed to identify the likely impacts arising from Central Tunnelling Package (CTP). The visual impact assessment considers the impacts of CTP on views from the residential properties on the eastern side of 110 Great North Road, Five Dock as required by CoA D107(a).

The visual impact assessment was undertaken in the same manner as the EIS and with reference to the following guidelines, policies and standards:

- Transport for NSW Guidance note *EIA-N04 Guidelines for Landscape Character and Visual Impact Assessment* (2020)
- *Guidance for Landscape and Visual Impact Assessment* (Landscape Institute and Institute of Environmental Management & Assessment, 2013)
- *Guidance Note for Landscape and Visual Assessment* (Australian Institute of Landscape Architects, 2018)

A range of legislation, policies and planning strategies from international, federal, State and local government agencies were also considered in the assessment of potential landscape character and visual impacts.

2.2 Assessment outcomes

The Five Dock construction site comprises two sites, an eastern and western site, located either side of Great North Road. Five Dock has a vibrant town centre located on Great North Road, including a mix of commercial, retail, community, residential and civic open space uses. The mix of different low-rise buildings in the town centre creates a continuous building form, with similar setbacks and building scales. Great North Road comprises a mix of modern and heritage buildings with distinctive decorative façades that assist in wayfinding along the street. Wide footpaths on both sides of the street, intermittent street trees and continuous awnings provide shade and comfort for pedestrians. The road is highly activated with retail frontages, street cafes and alfresco dining areas.

Due to the proximity of the eastern side 110 Great North Road to the Five Dock East construction site, further consideration of the visual amenity impact of the acoustic shed and general site arrangement on the residents is required.

Construction activities and elements that will be visible from 110 Great North Road will include:

- Demolition of five residential buildings at 23-31 Waterview Street and a car park at Second Avenue

- Removal of about seven trees within 23 and 25 Waterview Street and the trimming of some trees overhanging the site at 106 and 108 Great North Road
- Office and staff amenities double stacked along the western edge of site up to the height of about 13 metres
- Acoustic shed to the height of around 17 and 22 metres due to the difference in the ground level and the slightly pitched roof.
- Hoarding surrounding the construction site, about three to five metres in height.

Section 15.12.2 of the EIS did not specifically assess the impacts of the visual amenity from the residential apartments in 110 Great North Road, however, the EIS does state that the Viewpoint 5 – View south-east from the corner of Great North Road and Second Avenue, which is the viewpoint that would see the western edge of the Five Dock East site, would have a Minor Adverse impact from the construction of the acoustic shed and the general establishment of the construction site.

The principal living spaces in the apartments on the first and second floors of eastern side of the 110 Great North Road building would look directly onto the office building and the acoustic shed and therefore an additional daytime visual impact assessment from the eastern side of 110 Great North Road was carried out.

The CTP would occur for a temporary period and the level of visual magnitude of change assessed would only apply for the duration of the CTP and does not consider the subsequent stages of construction or operation. The sensitivity of a viewpoint is considered in the broadest context of possible views, ranging from national to neighbourhood importance (Table 2). The magnitude of change describes the extent of change expected from The CTP (Table 3). To assess the overall impact on daytime visual amenity, the visual sensitivity and magnitude of change assessments are combined (Table 4).

Table 2. Visual Sensitivity Levels

Visual sensitivity	Description
National	Heavily experienced view to a national icon, for example the view to the Sydney Opera House from Circular Quay. There are no nationally sensitive views within Stage 1.
State	Heavily experienced view to a feature or landscape that is iconic to the State, for example views to Old Government House from within Parramatta Park.
Regional	Heavily experienced view to a feature or landscape that is iconic to a major portion of a city or a non-metropolitan region, or an important view from an area of regional open space, for example view to St John's Anglican Cathedral Church in Centenary Square, view to Abattoir Heritage Precinct in Sydney Olympic Park.
Local	High quality view experienced by concentrations of residents and/or local recreational users, local commercial areas and/or large numbers of road or rail users, for example view along Macquarie or George Street in Parramatta, view to a prominent corner building on Parramatta Road in Burwood North, or the view to the landscaped gardens and palm grove within the Abattoir Heritage Precinct in Sydney Olympic Park.
Neighbourhood	Views where visual amenity is appreciated by a small number of residents, not particularly valued by the wider community.

Table 3. Visual Impact Levels

Visual magnitude of change	Visual sensitivity				
	National	State	Regional	Local	Neighbourhood
Considerable reduction	Very high adverse	Very high adverse	High adverse	Moderate adverse	Minor adverse
Noticeable Reduction	Very high adverse	High adverse	Moderate adverse	Minor adverse	Negligible
No perceived change	Negligible	Negligible	Negligible	Negligible	Negligible
Noticeable improvement	Very high beneficial	High beneficial	Moderate beneficial	Minor beneficial	Negligible
Considerable improvement	Very high beneficial	Very high beneficial	High beneficial	Moderate beneficial	Minor beneficial

Table 4. Visual impact rating from the eastern side of 110 Great North Road, Five Dock.

Location	Sensitivity rating	Magnitude of change	Impact rating
Viewpoint: Eastern side of 110 Great North Road, Five Dock	Neighbourhood	Considerable reduction	Minor adverse

The Revised Environmental Mitigation Measure (REMM) LV4, relates directly to mitigating the potential impact of the structure at the site and states that:

All structures (including acoustic sheds or other acoustic measures, site offices and workshop sheds) will be finished in a colour which aims to minimise their visual impact, if visible from areas external to the construction site.

The colour chosen for the acoustic shed will be similar to the colours shown in the photomontages in Figures 15.20 and 15.22 of the EIS. The colour chosen to match the photomontages is a Colourbond colour called Mangrove.

3. Overshadowing Assessment

3.1 Methodology

3.1.1 Assessment Criteria

Where appropriate, the acoustic shed envelope has been designed with consideration to the guidance documents outlined in Table 5.

Table 5. Relevant development controls

Document	Criteria
<i>City of Canada Bay Development Control Plan Part F1.6 Daylight and sunlight access</i>	Direct solar access (sunshine) to windows of principal living areas and to the principal area of open space of dwellings adjacent to commercial zones should not be reduced to less than 3 hours between 9.00am and 3.00pm on 21 June.
<i>Apartment Design Guide part 2G</i>	In conjunction with height controls, consider secondary upper-level setbacks to reinforce the desired scale of buildings at the street frontage, and minimise overshadowing of the street and other buildings.

3.1.2 Assessment Methodology

To determine the extents of overshadowing, a 3D model and analysis process was undertaken using specialist Building Information Modelling (BIM) software, Revit. A survey was initially established by the JTJV surveying team, with the point cloud data subsequently imported into Revit, which was then used for the preparation of simulation and shadow figures at hourly intervals. Other built form and natural features within the landscape, such as trees and adjacent buildings have not been included in the plan and 3D modelling and simulation process.

An overshadowing analysis has been run for the proposed construction site at hourly intervals on the solstices and equinoxes, that is 21st of March, June, September, and December, between 10am and 3pm. Refer to Appendix A *Shadow Diagrams- Option 1*, and Appendix B *Shadow Diagrams- Option 2* for the diagrams indicating extent of hourly overshadowing extents.

The methodology for the desktop overshadowing assessment involved:

- Desktop review of the study area to identify potentially affected apartment and public open areas. This involved development of a three-dimensional (3D) computer model of the proposed construction sheds to simulate overshadowing and review of aerial images including cadastral boundaries at the proposed construction site.
- Written assessment of shadow diagrams shown in both plan and 3D views, at hourly intervals between 10am and 3pm on 21st of March, June, September, and December.
- The extent of overshadowing on affected properties will be focused and measured on 21 June, which is the shortest day of the year and represents the day on which overshadowing effects from the acoustic sheds will be at their greatest.

3.2 Design Input and Assumptions

3.2.1 Overview of Proposed Acoustic Sheds

Five Dock Station will require two construction sites to the East and West sides of Great North Road. Two acoustic sheds are intended to be provided during the construction phase, to improve security, noise, dust, water, soil and sediment control issues at the site. These structures will be temporary in nature and will be installed, decommissioned, and dismantled in line with site establishment, tunnel boring and shaft excavation works programmed for CTP.

- Five Dock East acoustic shed will be located to the east of Great North Road. The site borders ground level council carparking on Second Avenue; and has a mixed-use building - 110 Great North Road - located six metres to the west of the closest façade. The existing site contains several residential properties located on Waterview Street.

Five Dock Visual Amenity, Solar Access and Overshadowing Report

- Five Dock West acoustic shed located to the west of Great North Road. This site is across the road from 110 Great North Road, approximately 22 metres from the closest façade. This site is currently occupied by commercial and mixed-use premises.

Refer to Figure 3-1 for location of the proposed sheds, referred to as Five Dock East and Five Dock West.

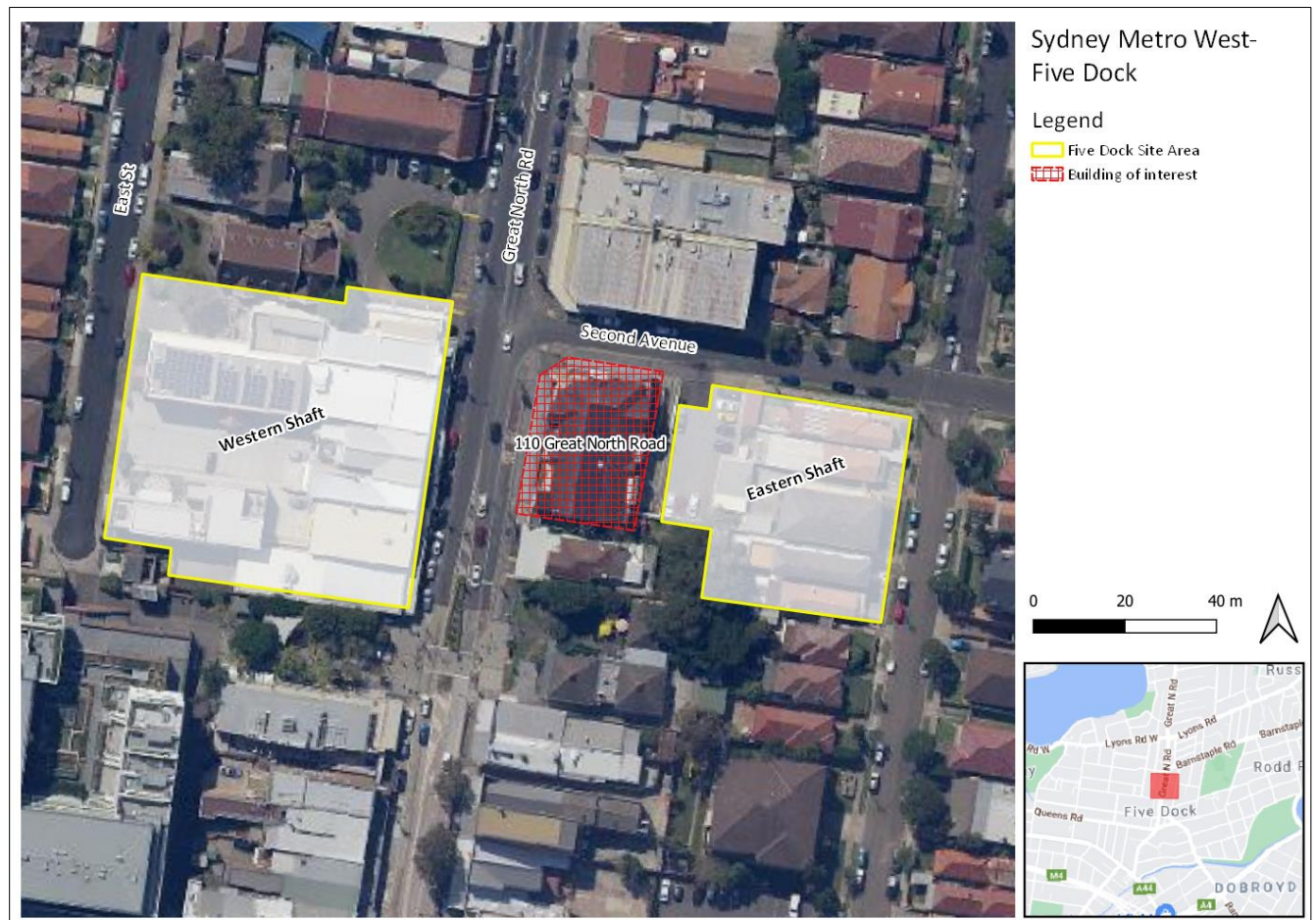


Figure 3-1 Proposed east and west Five Dock Station Construction Site

As part of the consultation process with AFJV, two design options have been proposed to provide comparison for different shed arrangements and heights for Five Dock East. These options (Option 1 and Option 2) are presented in Figure 3-2 and Figure 3-3.

3.2.2 Five Dock East

Due to the site gradient, the Five Dock East acoustic shed will sit approximately 17 to 22 metres above existing ground in both proposed options.

In Option 1, the Five Dock East acoustic shed footprint will be approximately 51 metres long, 40 metres wide and 17-22 metres high (to the top of the roof, which is slightly pitched). A four-level site office will be constructed to the west of the acoustic shed. This site office will be about 25 metres long, 6.4 metres wide and about 13 metres high. It should be noted that the model included a flat roof for the acoustic shed and anticipated the worst case length and height for the offices (16 metres high). Therefore, it is expected the pitch of the acoustic shed roof and the lower site office height will decrease the overshadowing and visual amenity impact. In addition, it is unlikely the offices extend the full length of the area highlighted in light-blue in Figure 3-2, which would further reduce the overshadowing and visual impact on the receivers.



Figure 3-2 Proposed Option 1- Five Dock East. Note that the RL heights shown in this figure are the worst-case scenario, which were included in the model. The pitch of the acoustic shed roof and a decrease in the expected height of the site office should reduce the overshadowing impact experienced.

Five Dock Visual Amenity, Solar Access and Overshadowing Report

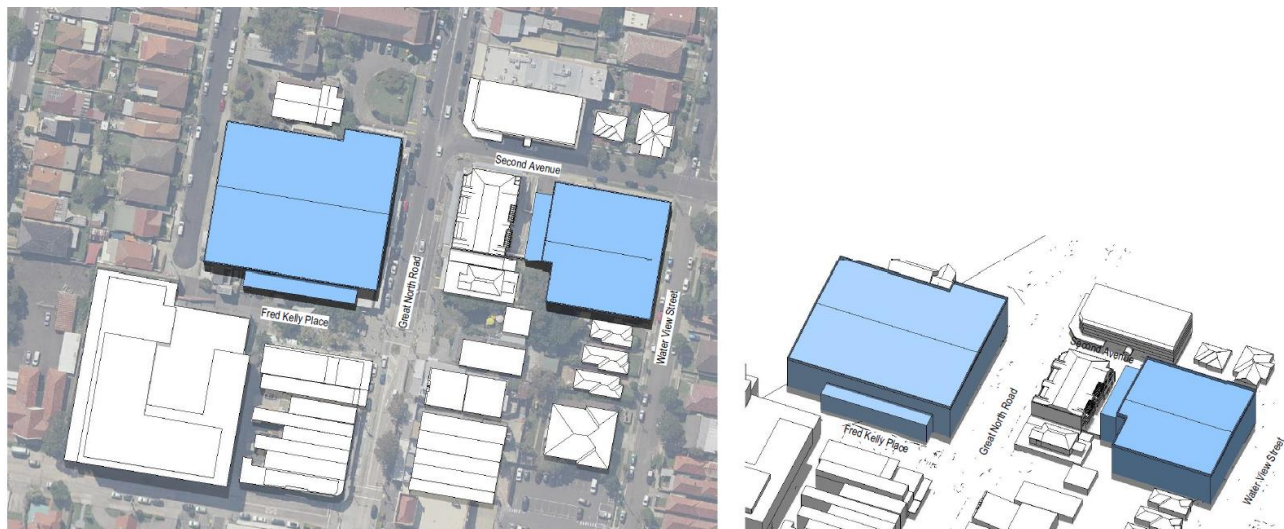
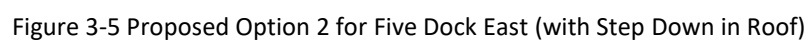
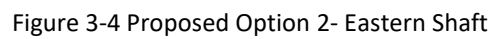


Figure 3-3 Model of Option 1- Five Dock East

In Option 2, the acoustic shed will have a step down in roof on the west side at RL34. The acoustic shed would have a footprint of around 51 metres long, 40 metres wide and 16-20 metres high (varying roof height due to proposed step down in roof). A three-level site office would be constructed to the north of the acoustic shed, with roof at RL32.5. This site office will be about 30 metres long, 3.5 metres wide and 15 to 16 metres high.



3.3 Overshadowing assessment results

While they serve as an important mitigation measure to manage noise impacts and works undertaken outside of standard construction hours, the proposed acoustic sheds will result in temporary overshadowing impacts during the construction phase:

- In both options for the Five Dock East acoustic shed, a portion on the eastern side of building of 110 Great North Road will be overshadowed by the Five Dock East acoustic shed, on the 21 June (winter solstice) between 10 am and 12 pm.
- The eastern side of the ground floor of 110 Great North Road does not have any residential apartments or living spaces; nor does it appear to have any commercial spaces that will be affected by overshadowing.
- Residential apartments occupy the first and second floors of 110 Great North Road. Three apartments on each floor are located on the eastern side of the building; and overshadowing would affect principal living spaces in the apartments on the south-eastern portion of the building for a short period of time in the winter month (between 10am and 12pm on the winter solstice).

For the extent of overshadowing on the winter solstice (21 June) and other days (21 March, September, and December), refer to Appendix A and Appendix B for details of both options demonstrated in the shadow diagrams.

The City of Canada Bay *Development Control Plan - Part F1.6 Daylight and sunlight access*, states that “direct solar access (sunshine) to windows of principal living areas and to the principal area of open space of dwellings adjacent to commercial zones should not be reduced to less than 3 hours between 9.00am and 3.00pm on 21 June”.

The overshadowing analysis included in the Appendix A for Option 1 shows that overshadowing will occur between 10 am and 11 am on the 21 June, which therefore complies with the City of Canada Bay *Development Control Plan - Part F1.6 Daylight and sunlight access*.

The overshadowing analysis included in the Appendix B for Option 2 shows that overshadowing will occur between 10 am and 12 pm on the 21 June, thus also complying with the City of Canada Bay *Development Control Plan - Part F1.6 Daylight and sunlight access*.

When the two options were considered against the *Apartment Design Guide part 2G*, Option 1 was deemed to be consistent with the Guideline as the highest sections of the acoustic shed have been set-back and the offices a lower height, thus reducing the impact on the overshadowing of eastern side of 110 Great North Road in the winter months.

For the above reasons, Option 1 was deemed to be the preferred option and is considered to have reasonable overshadowing and solar access impacts on the residential apartments on the eastern side of building of 110 Great North Road, Five Dock. In addition, as described in Section 3.2.2 the overshadowing assessment was carried out on the worst-case scenario and as a result of design refinements, both the overshadowing and visual amenity impacts are expected to be further decreased.

4. Consultation Plan

Condition of Approval D107(c) requires a consultation plan to detail how potential impacts and mitigation measures will be discussed and negotiated with *potentially affected property owners*. Additionally, Condition of Approval 108 requires:

Where the acoustic shed causes a moderate (or greater) adverse visual amenity impact and / or unreasonable overshadowing and solar access impacts to any of the subject residential apartments, the Proponent must consult with the relevant affected property owners and occupiers to identify appropriate mitigation measures and an agreed implementation program. A copy of agreed implementation programs must be provided to the Planning Secretary for information.

Based upon the outcomes in this report, it is considered that

Condition of Approval D107(c) is not triggered as the overshadowing and solar access impacts are considered to be reasonable and the visual impact assessment resulted in a minor adverse impact and therefore does not exceed the “moderate (or greater)” trigger as described in Condition of Approval D108.

AFJV do, however, acknowledge that the affected receivers who reside at 110 Great North Road, Five Dock may still have concerns with the construction of the temporary Five Dock East construction site. Community consultation and engagement with these affected receivers would still occur in accordance with the commitments outlined in the Overarching Community Communications Strategy and all reasonable and feasible mitigation measures will be applied to minimise the visual impact on these receivers.

5. Conclusion

The Five Dock East acoustic shed and construction site has been designed to minimise impacts on 110 Great North Road, Five Dock to the fullest extent possible. This was achieved by reducing the overall height of the temporary sheds where feasible, and by configuring the site to introduce a setback and stepped configuration by locating the site offices adjacent to the western boundary of the site, pushing the acoustic shed away from the boundary. The pitch of the roof would also assist in further minimising the overshadowing and visual impact.

Due to the nature and scale of the acoustic sheds and offices, the Five Dock East site will result in some temporary overshadowing of the existing mixed use building 110 Great North Road located adjacent to the construction site. These overshadowing impacts will be temporary and short term and are consistent with the area Development Control Plan, and therefore considered to be reasonable.

The visual amenity impact assessment resulted in a “minor adverse” impact even though the affected receivers at 110 Great North Road are likely to have a considerable reduction of the magnitude of impact, it would only have a sensitivity to the neighbourhood.

For these reasons Conditions of Approval D 107(c) and D108 are not triggered and therefore a specific Consultation Plan for the receivers is not required. It is acknowledged that the affected receivers the reside at 110 Great North Road, Five Dock may still have concerns with the construction of the temporary Five Dock East construction site. Community consultation and engagement with these affected receivers would still occur in accordance with the commitments outlined in the Overarching Community Communications Strategy and all reasonable and feasible mitigation measures will be applied to minimise the visual impact on these receivers. The outcomes of this report will inform the Project's Visual Amenity Management Plan (VAMP) and any residual impacts addressed through the VAMP.

Fundamentally, the proposed acoustic sheds will provide a variety of benefits, such as reducing noise impacts on the surrounding community, which will assist in avoiding delays to the overall project construction program, as well as improving security, dust, water, soil and sediment control issues at the site.

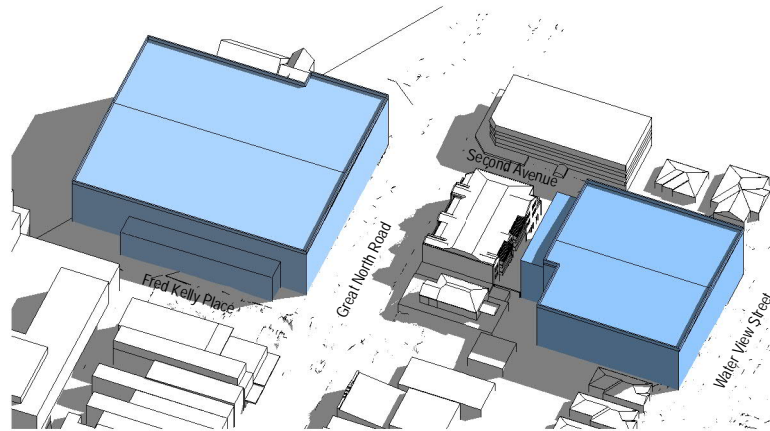
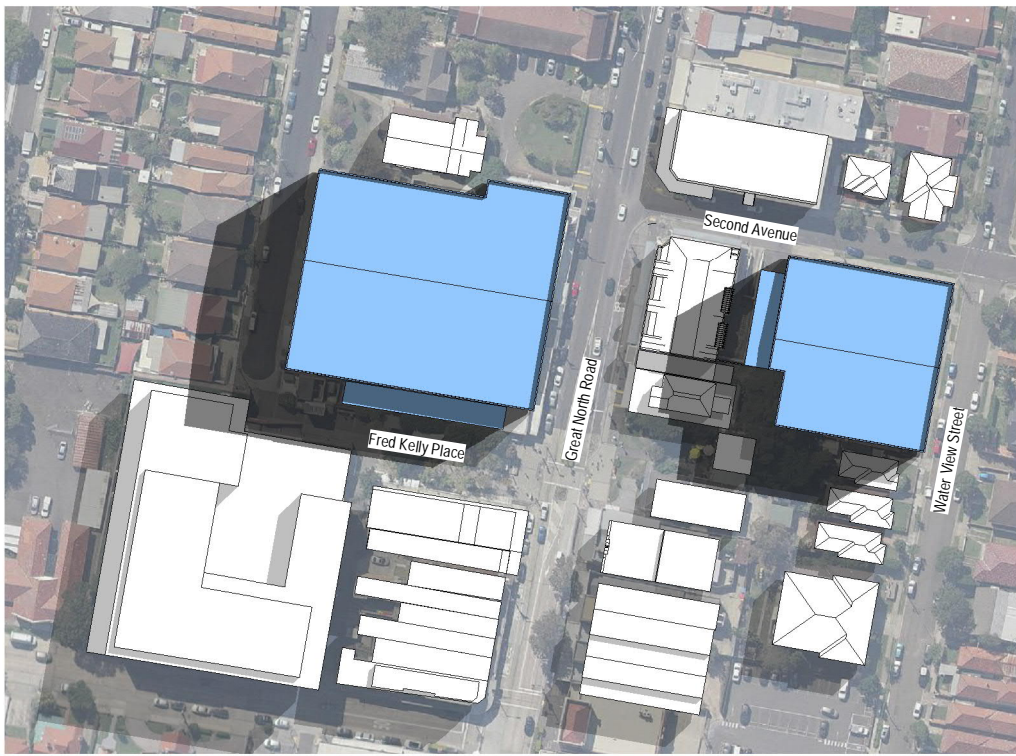
Given the various merits of the temporary construction sheds, it is deduced that the benefits will outweigh the potential overshadowing impacts and visual amenity impact, and that residual impacts can be managed in accordance with the existing AFJV Construction Environmental Management Plan and the Visual Amenity Sub-Plan.

Appendix A. Shadow Diagrams- Option 1

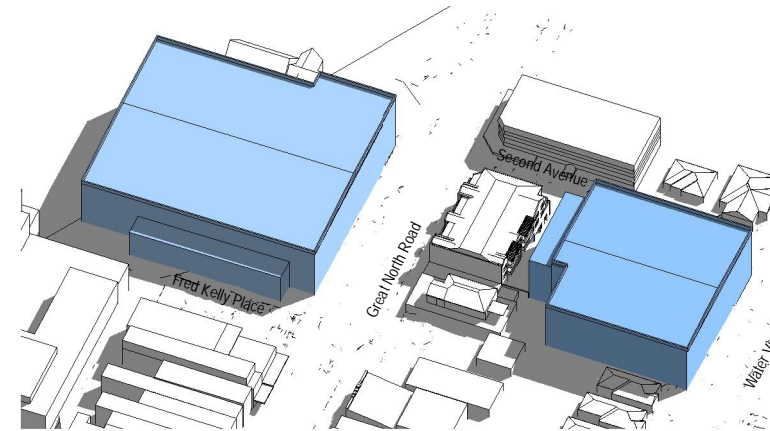
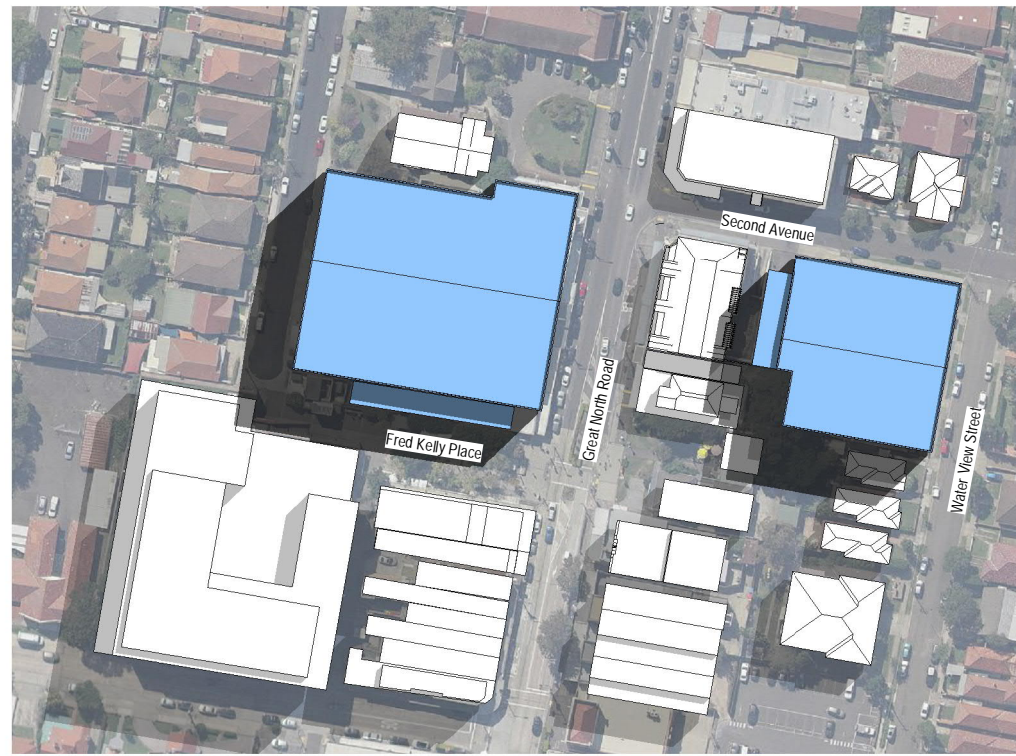
SYDNEY METRO
FIVE DOCK
CTP OVERSHADOWING ANALYSIS
OPTION 1

MAR 21

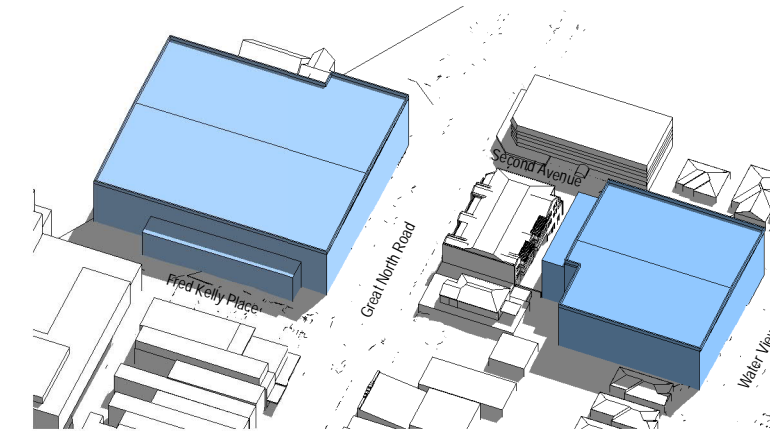
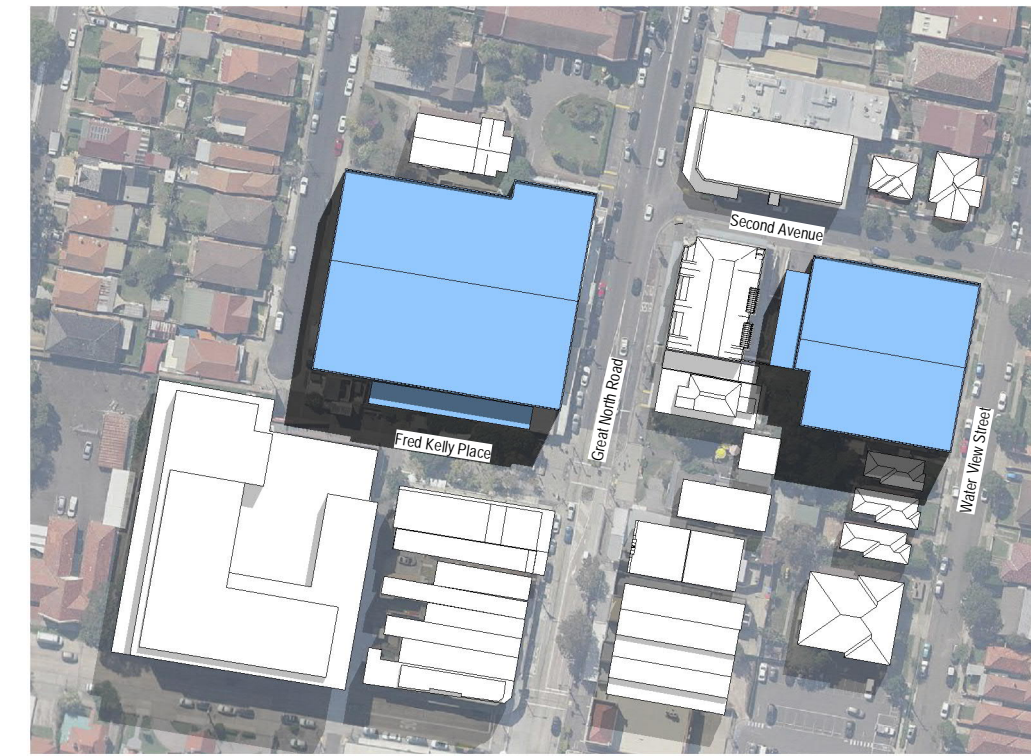
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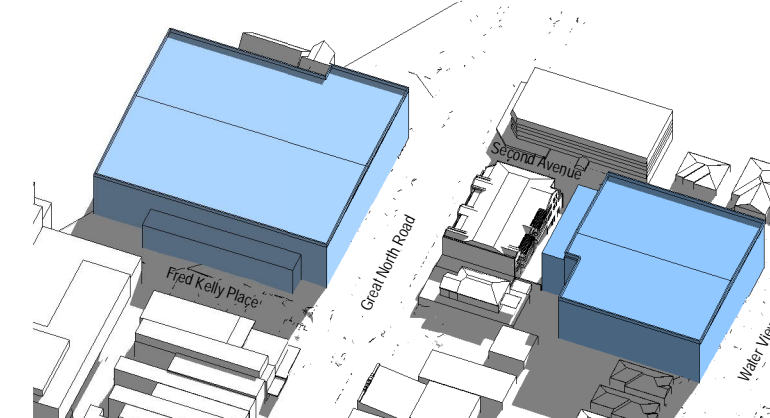
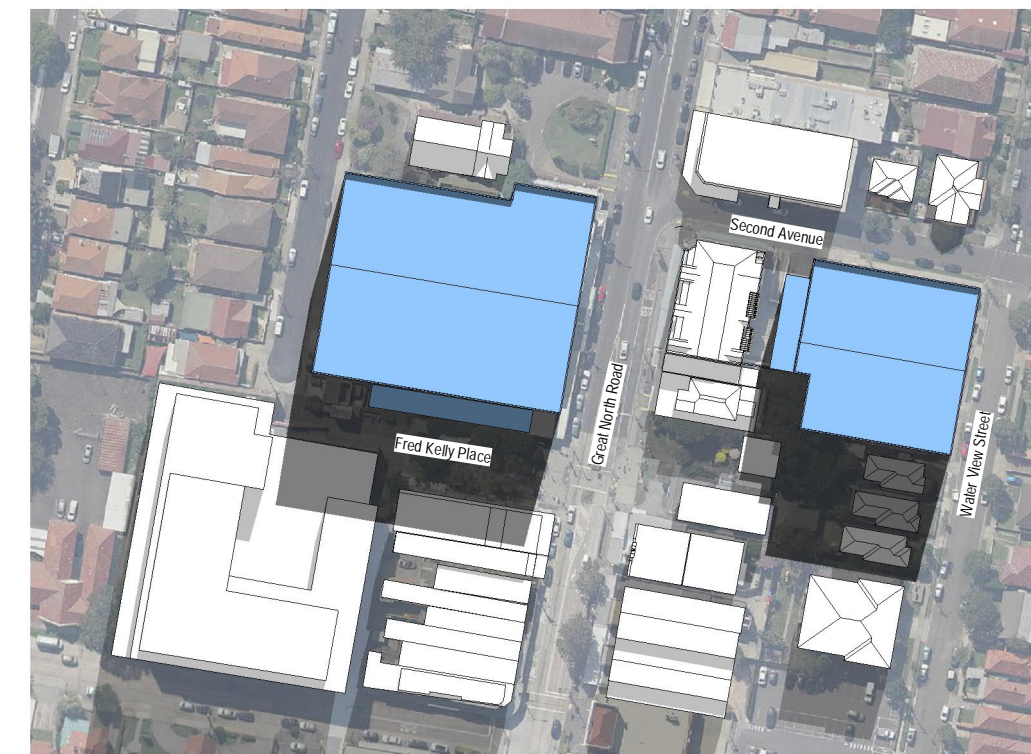
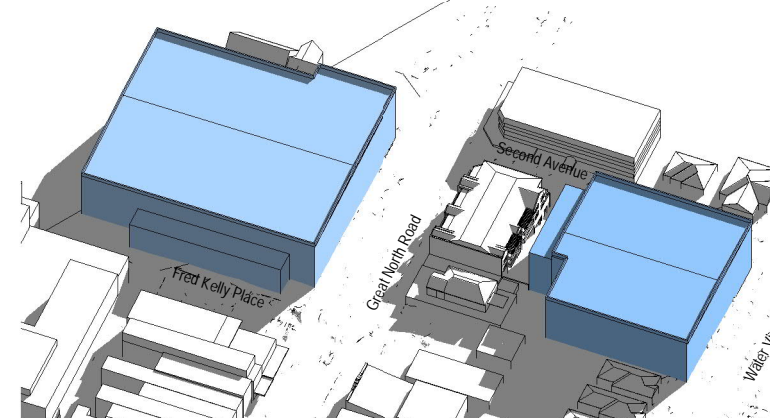
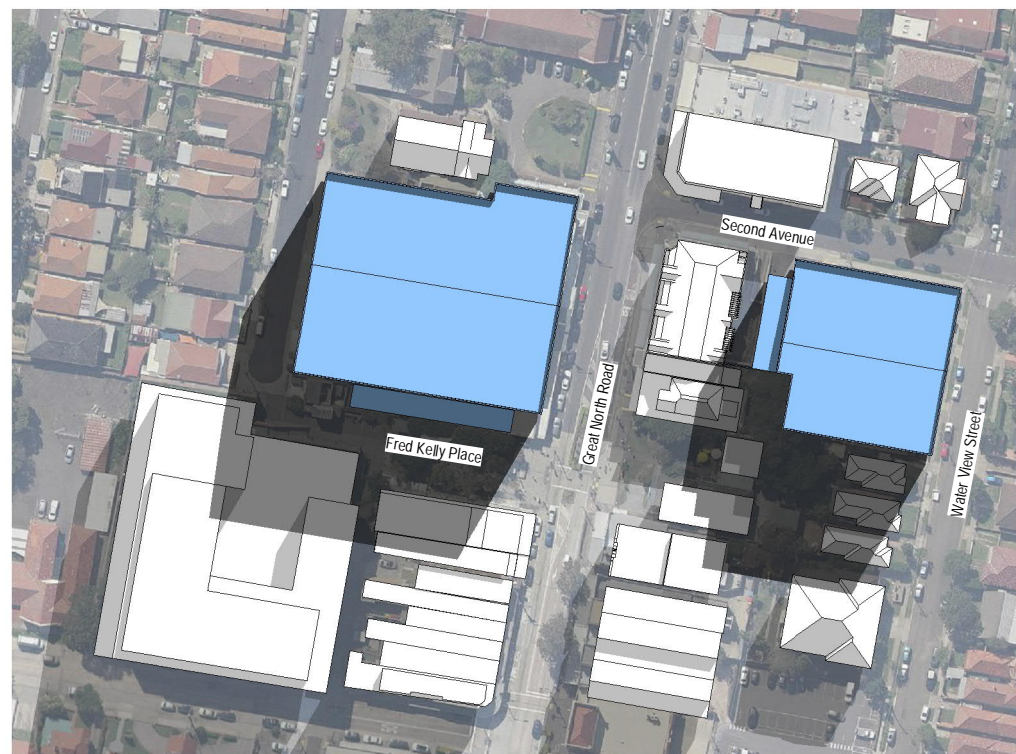
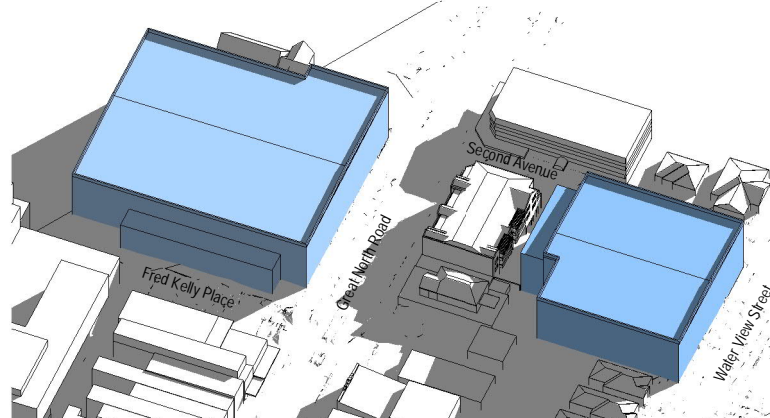
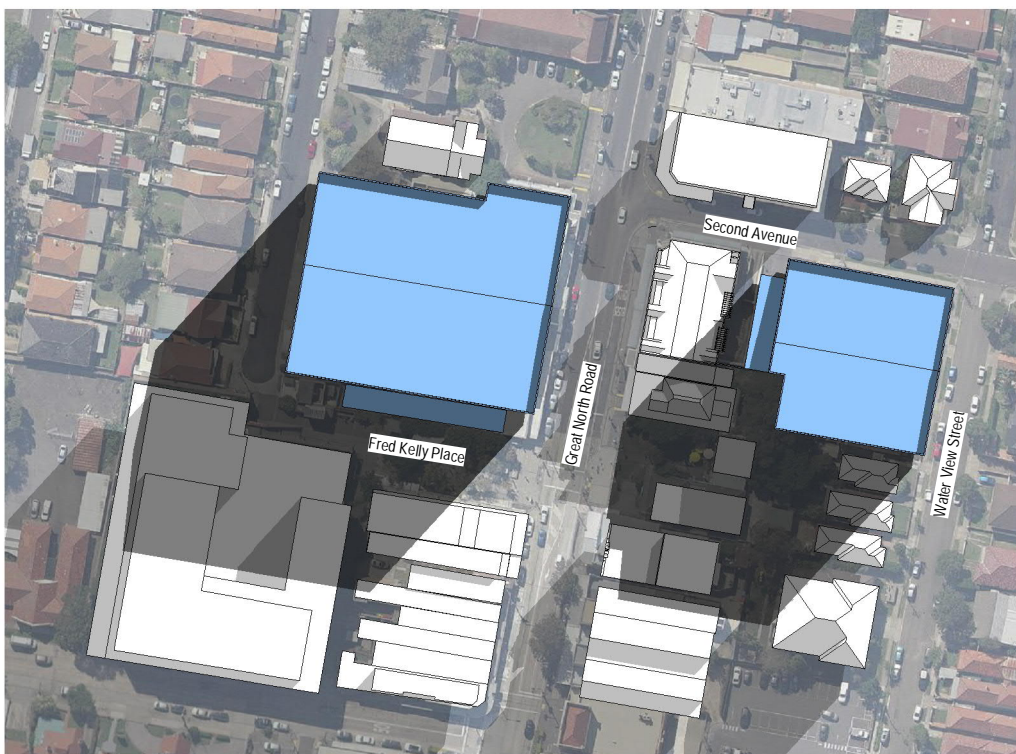
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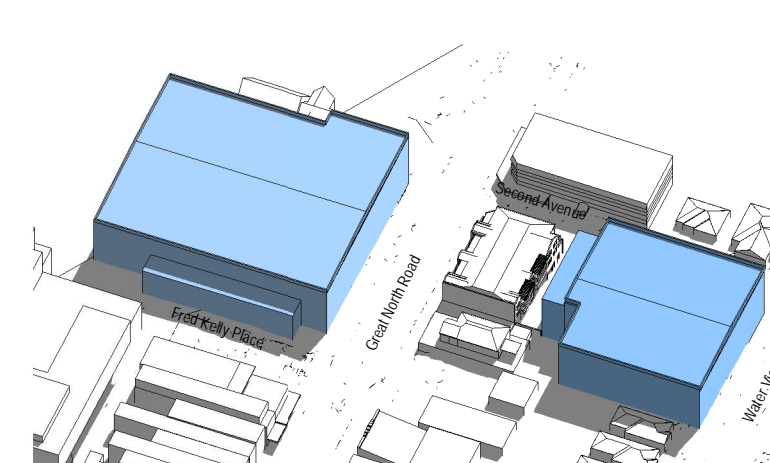
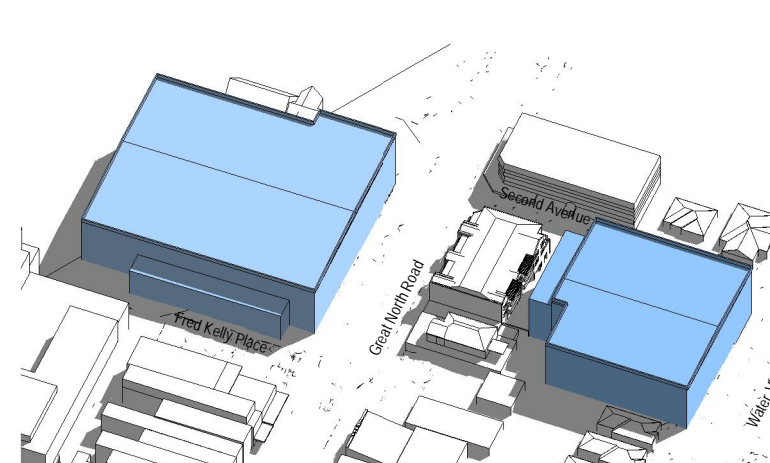
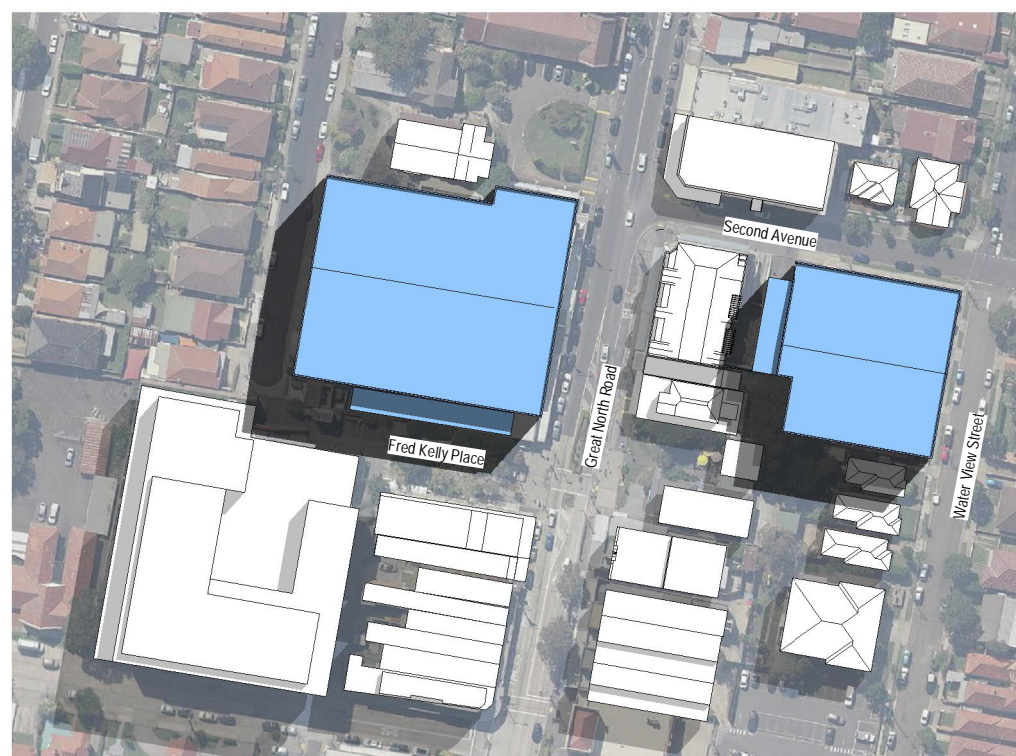
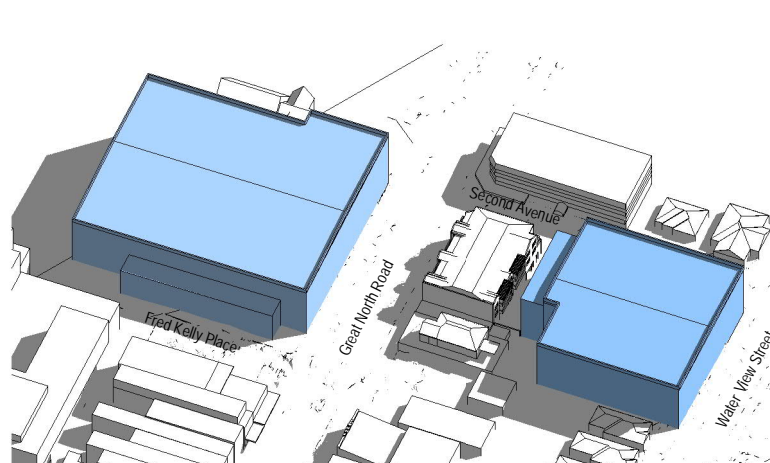
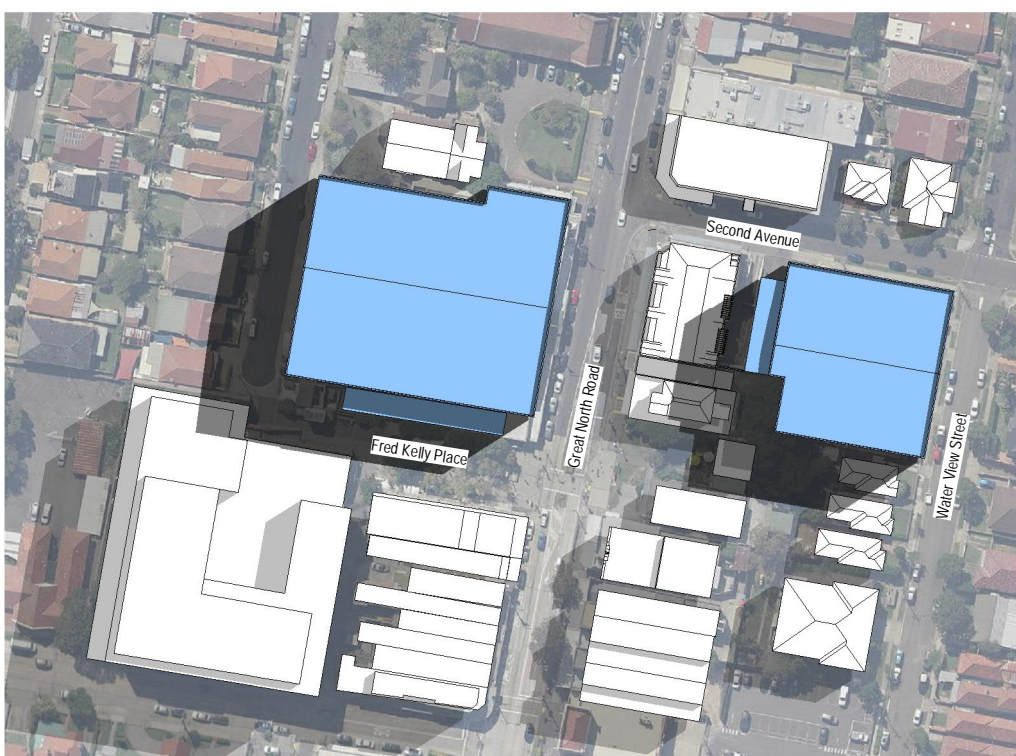
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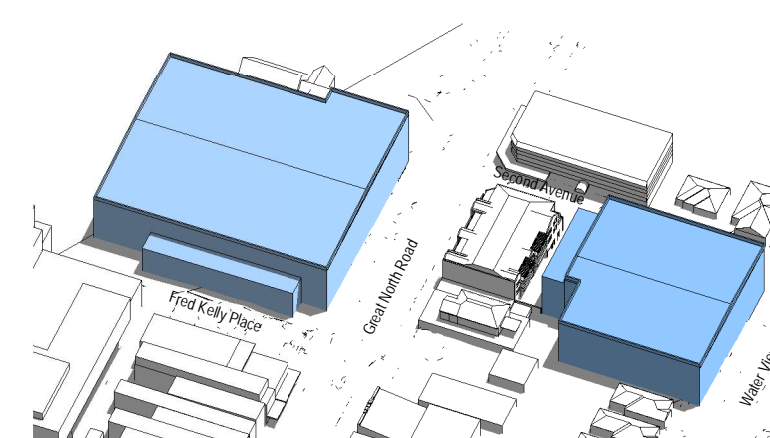
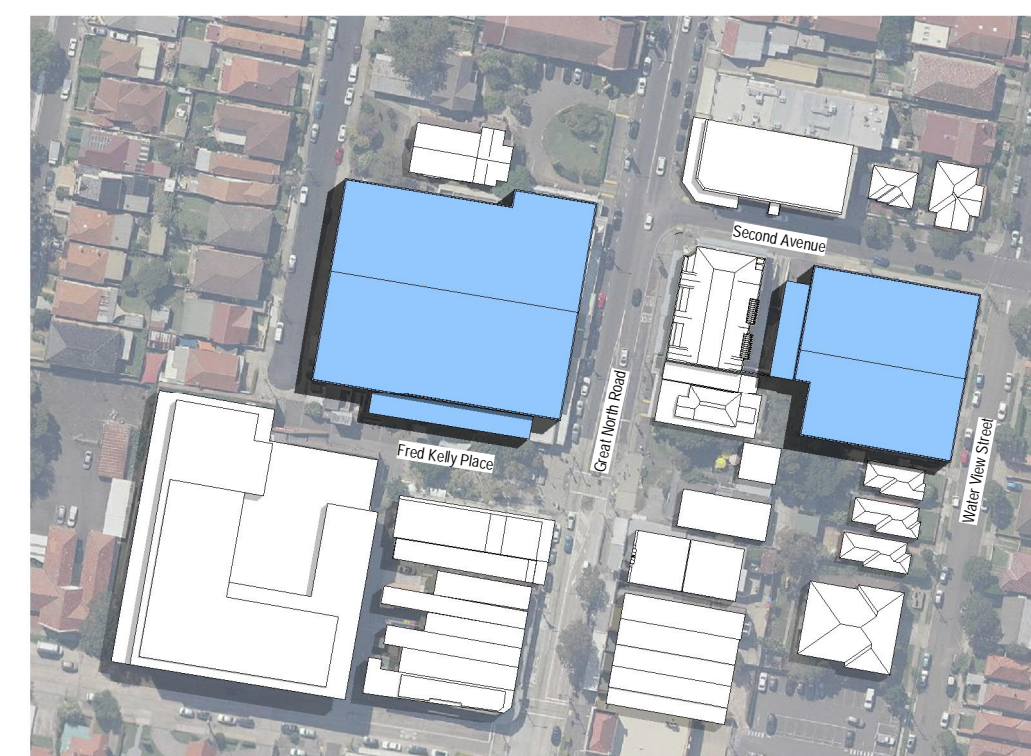
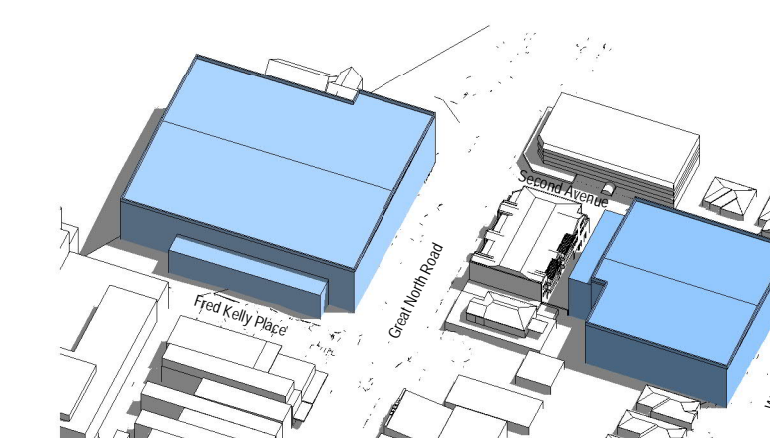
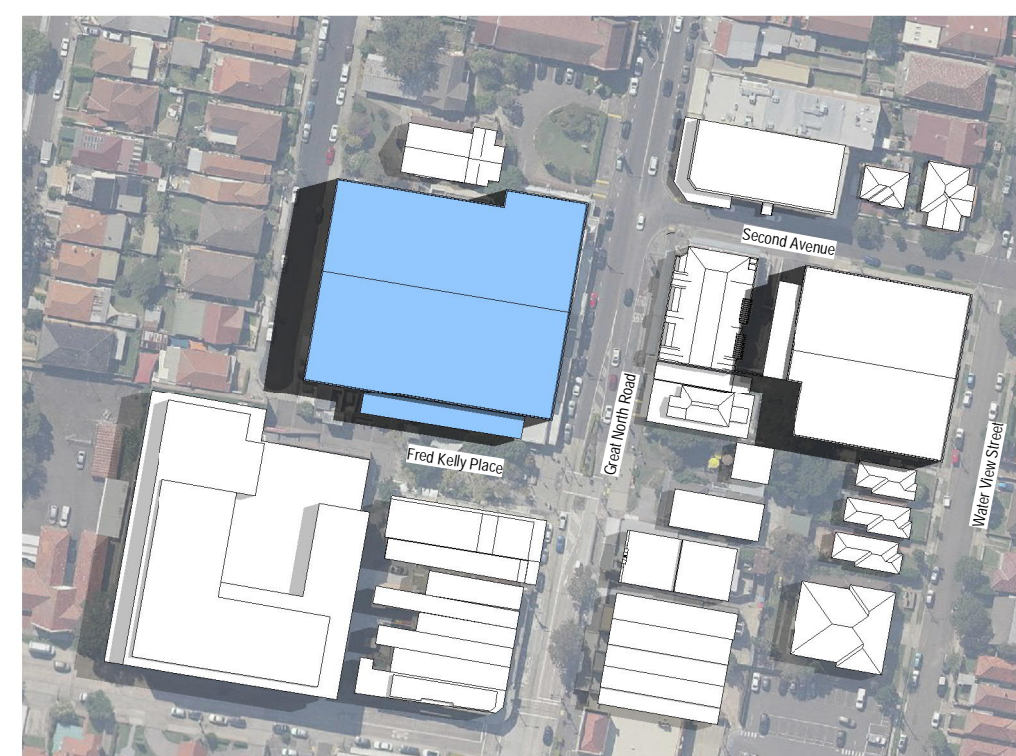
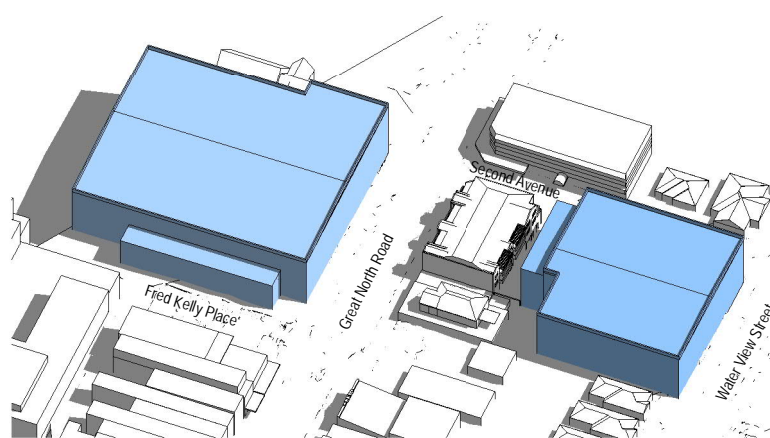
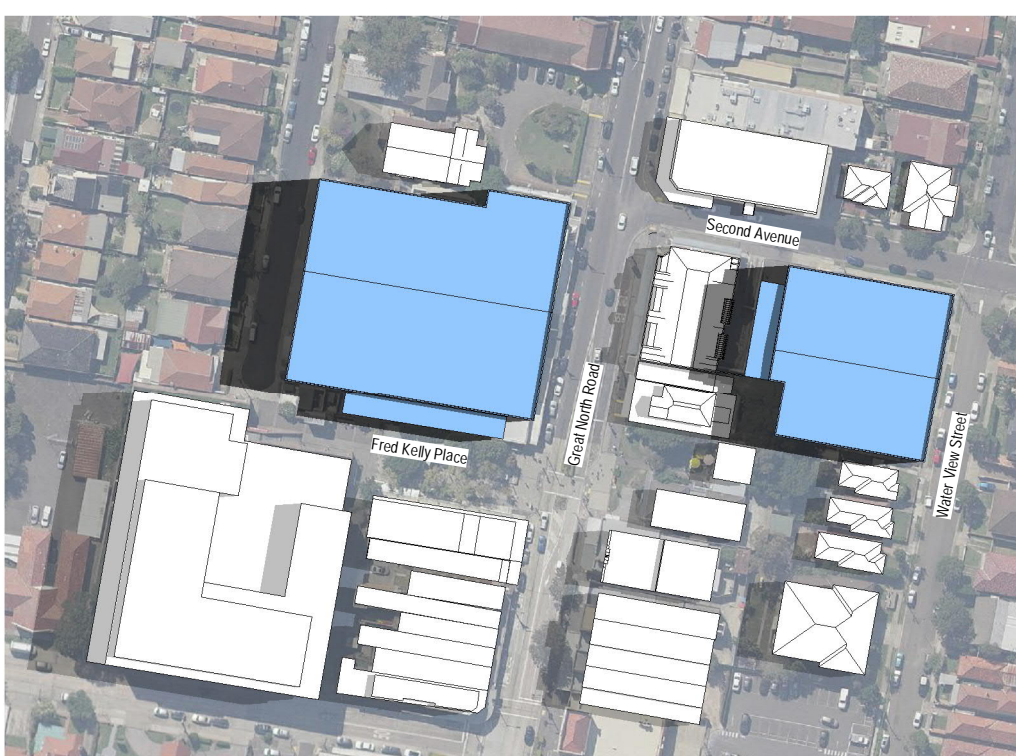
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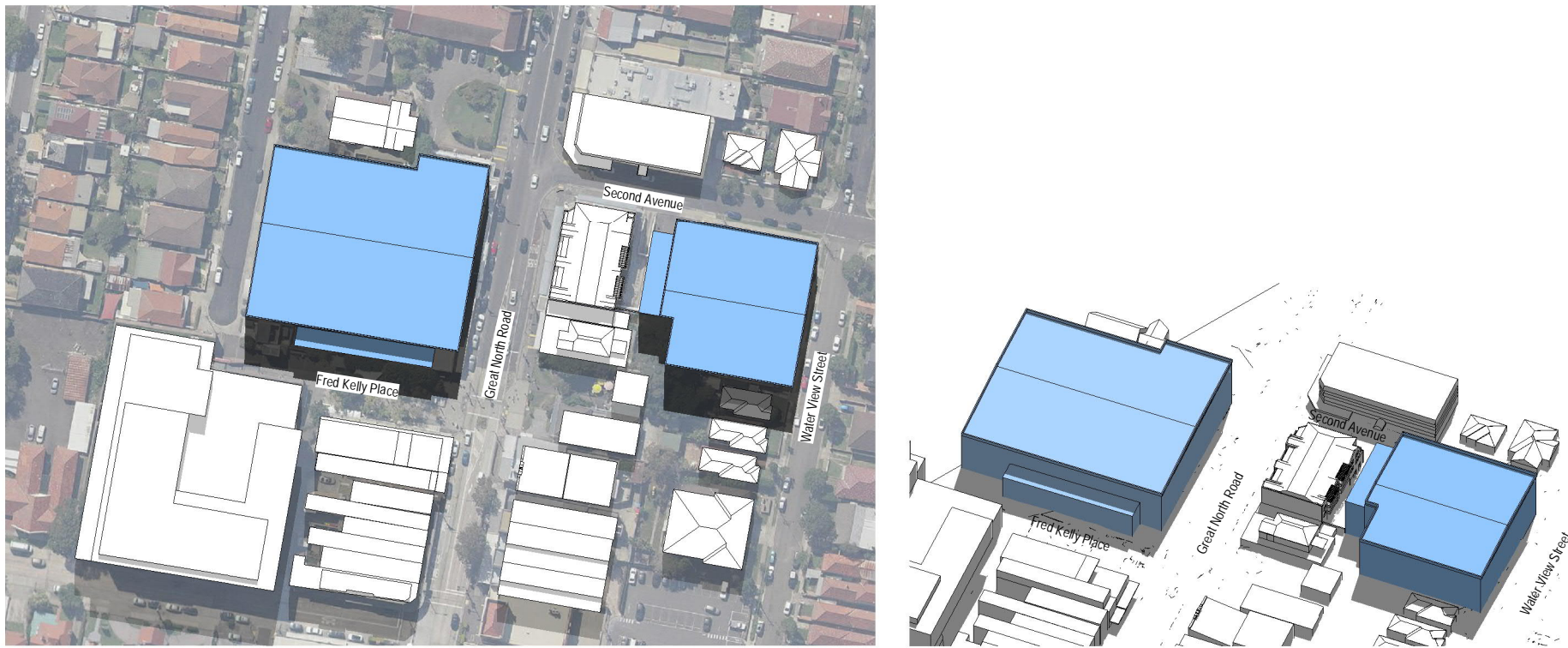


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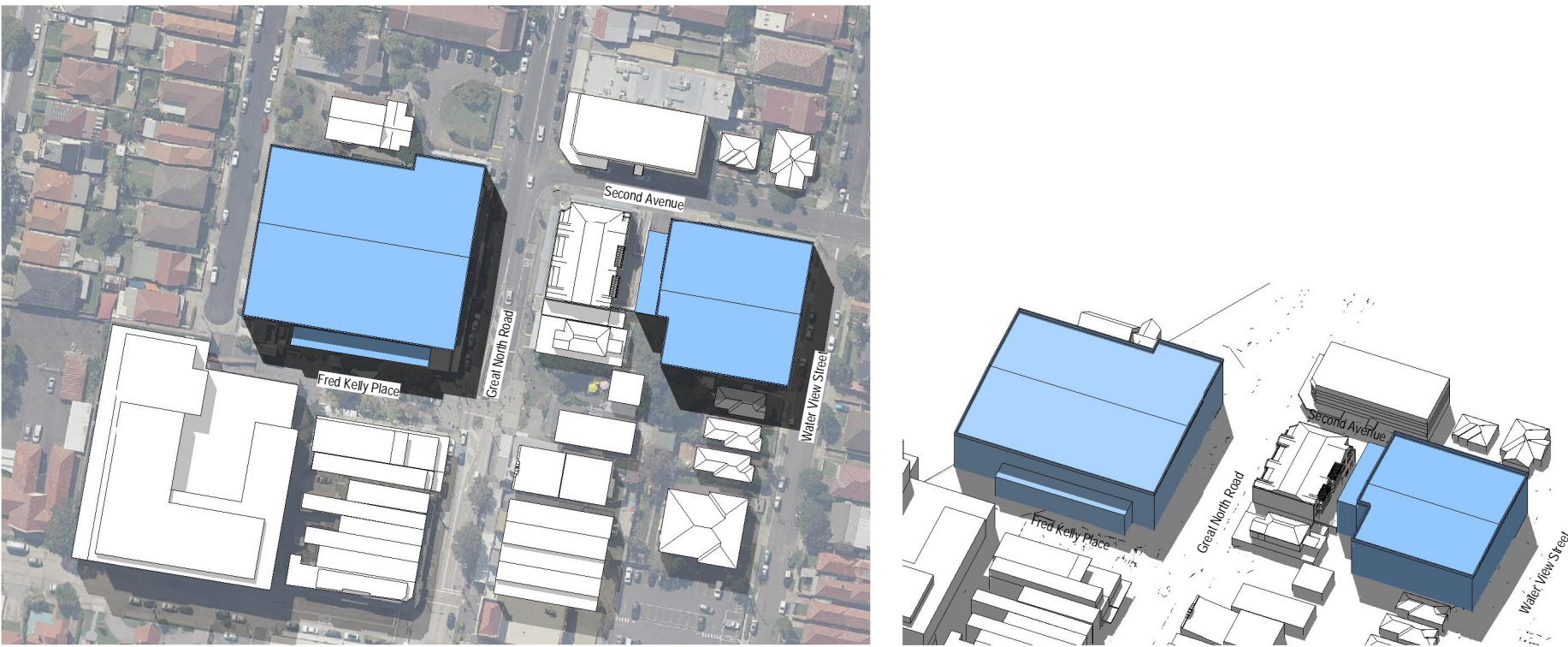


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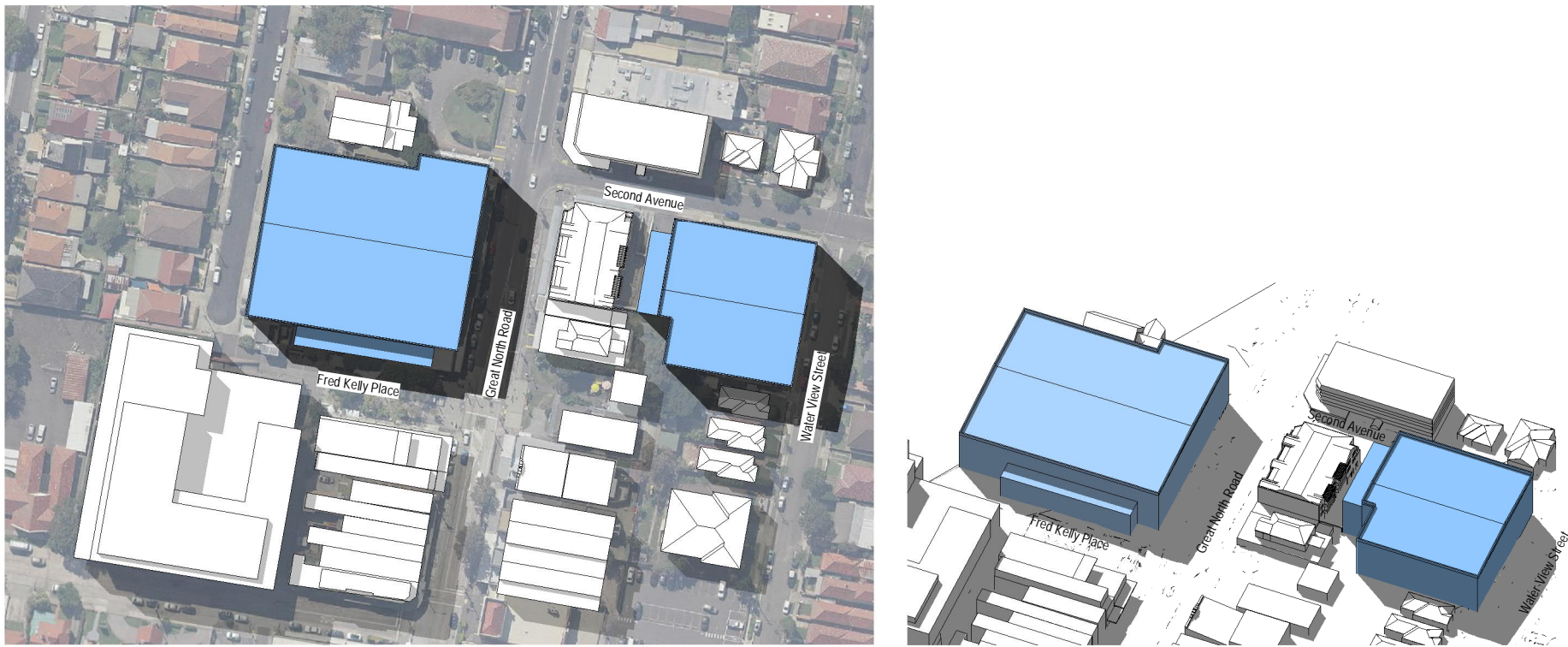
1 PM



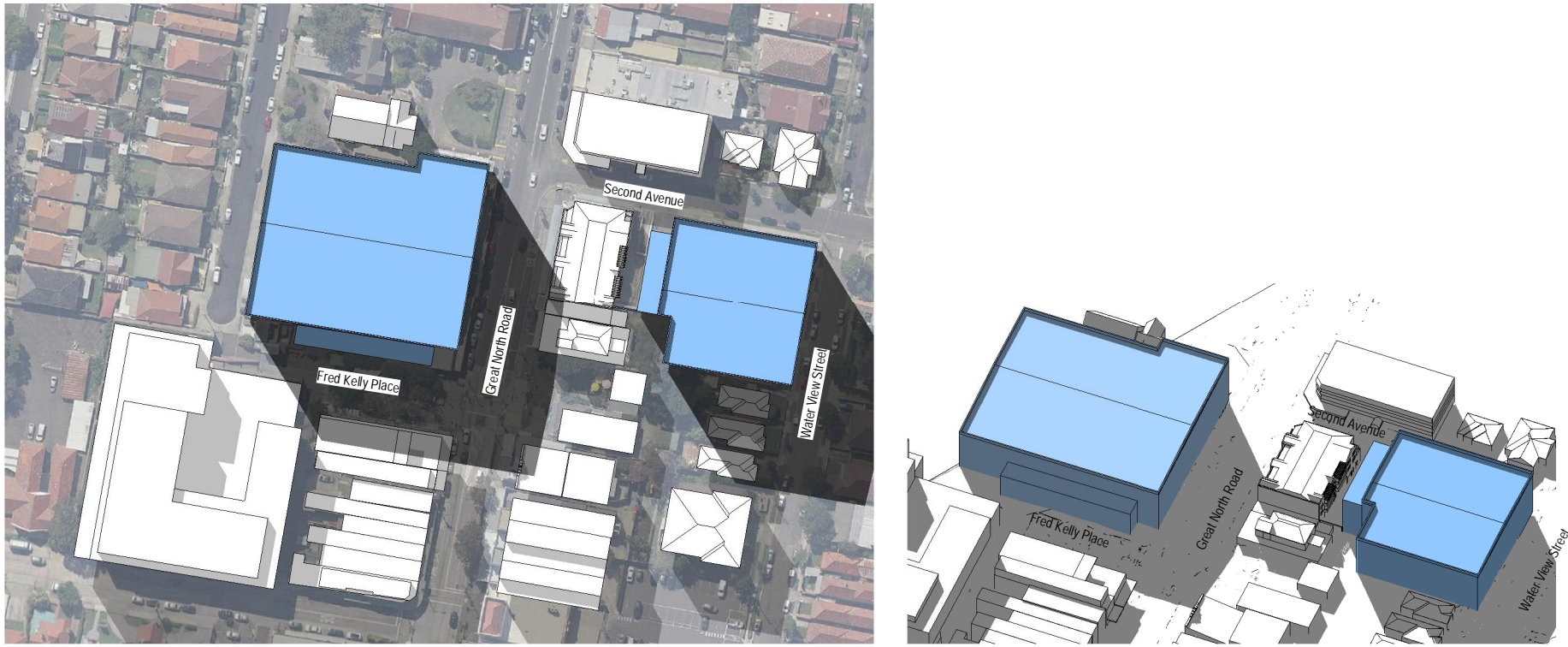
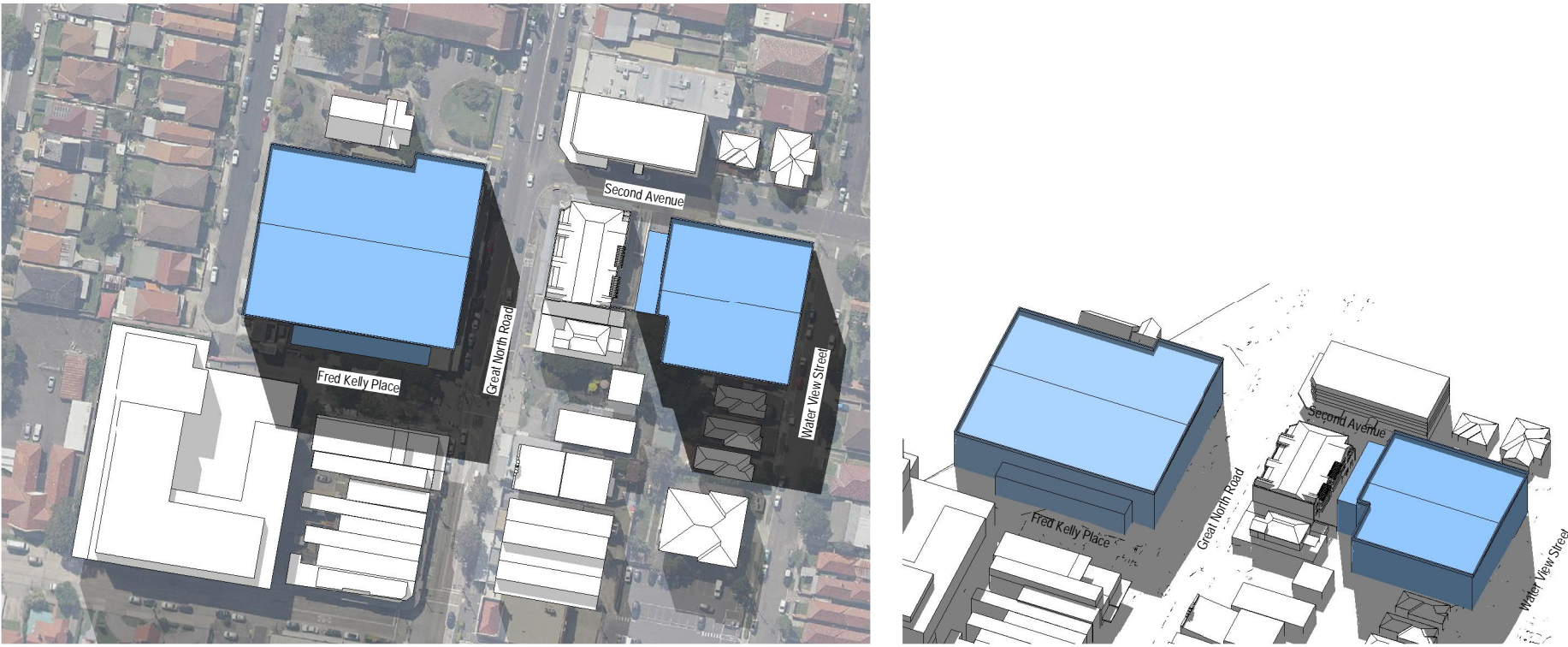
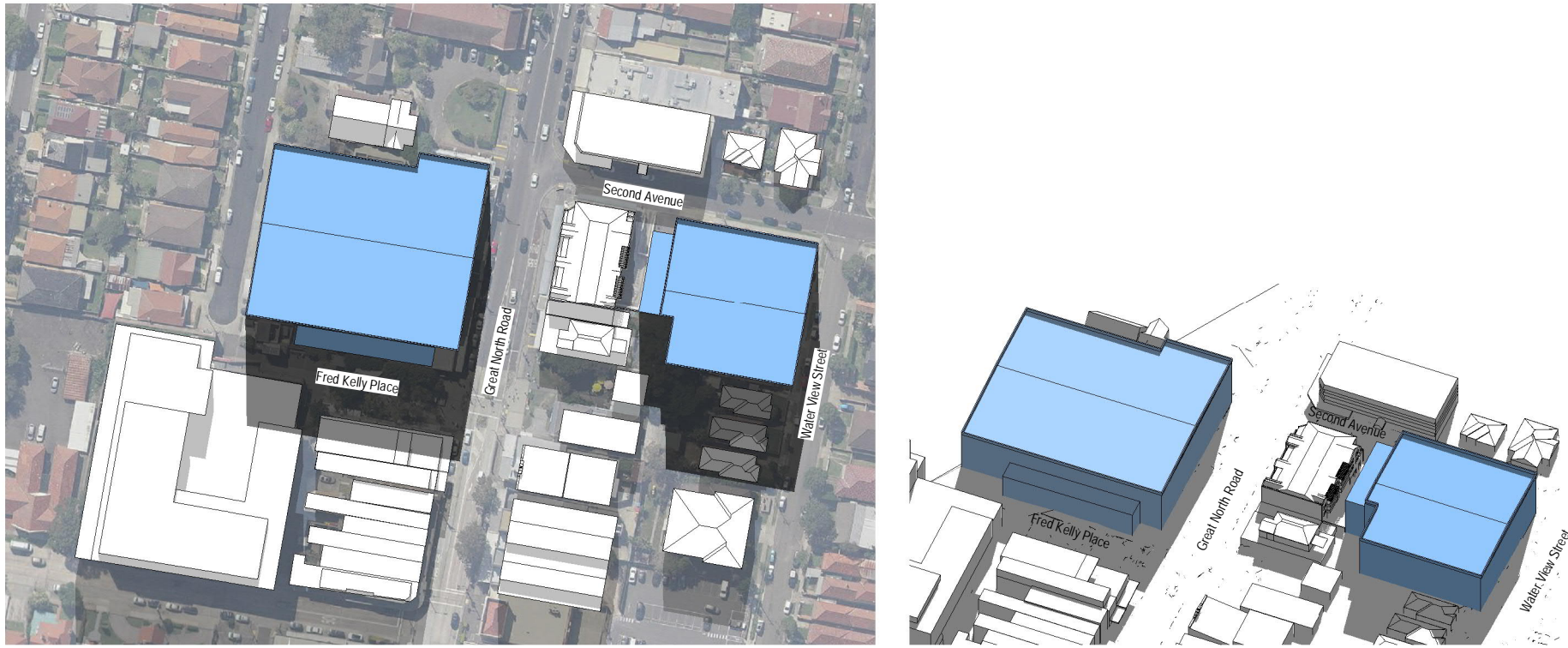
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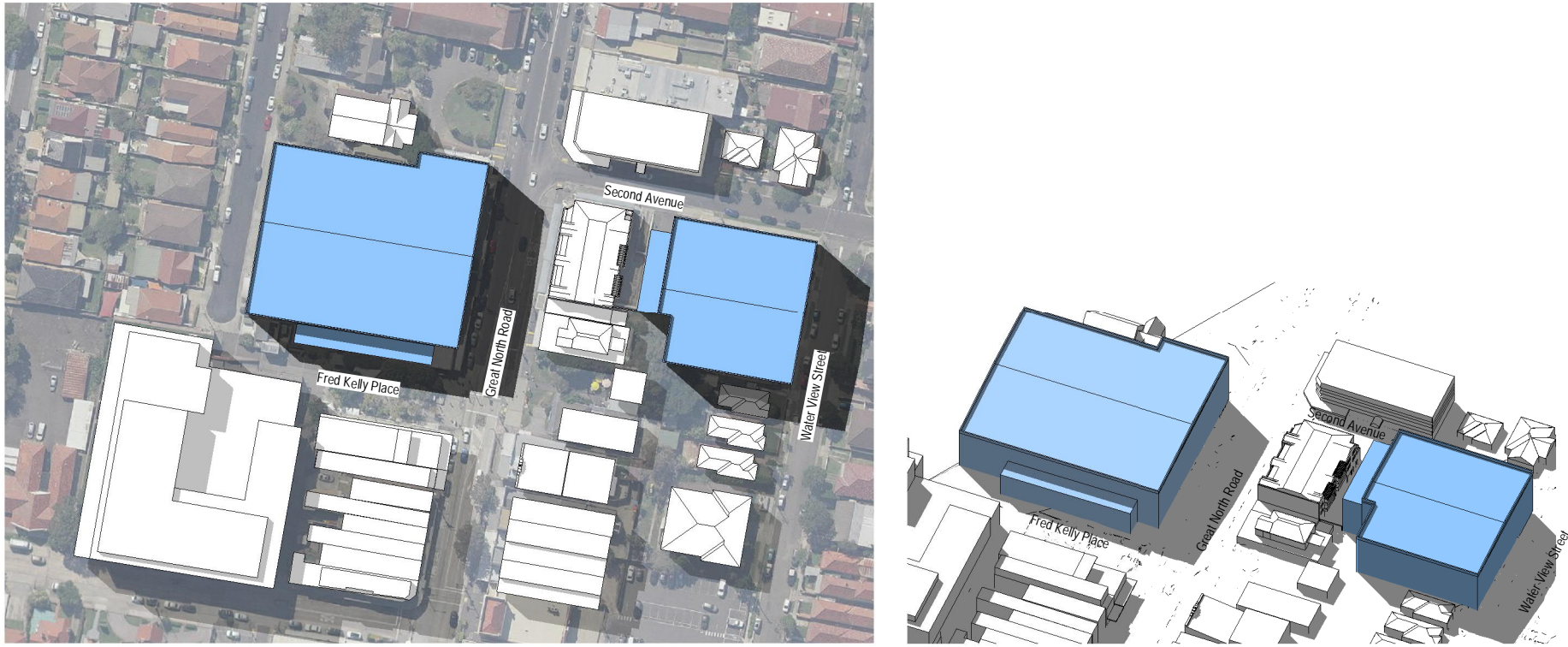
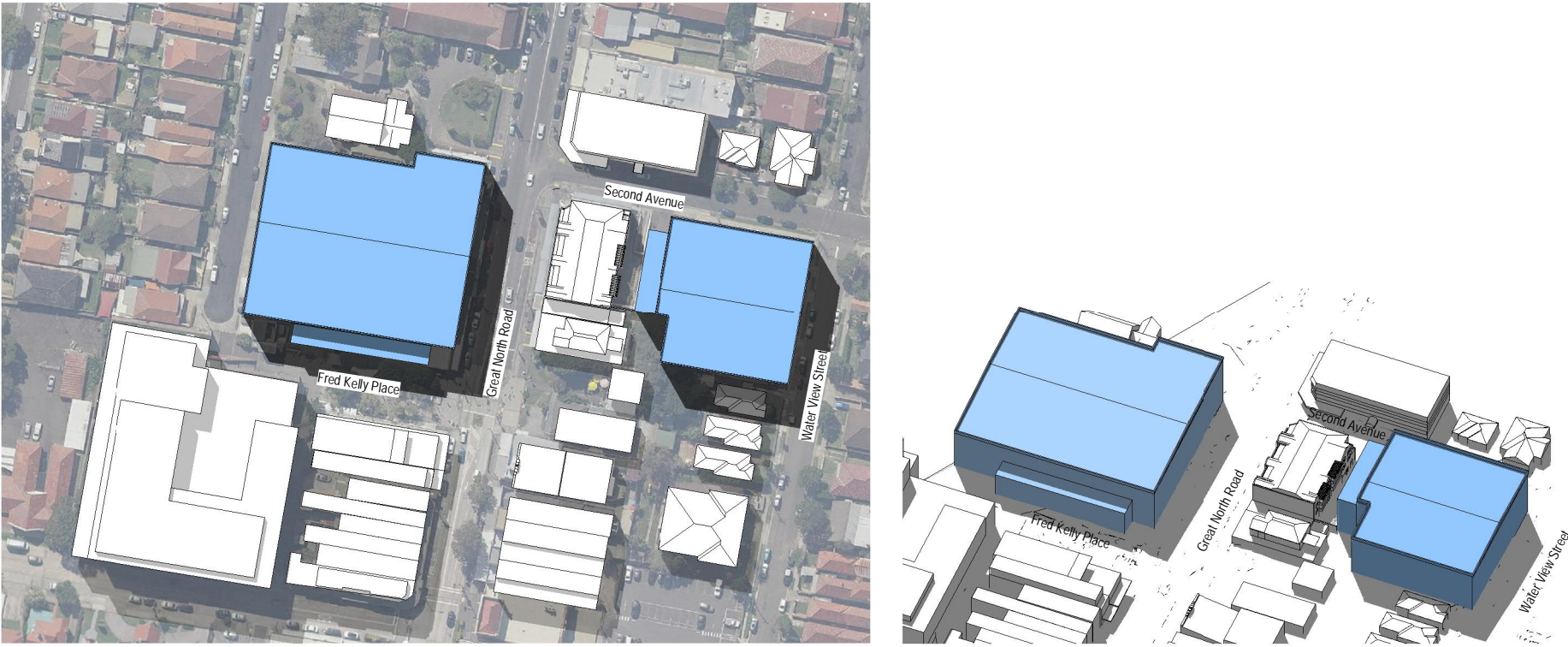
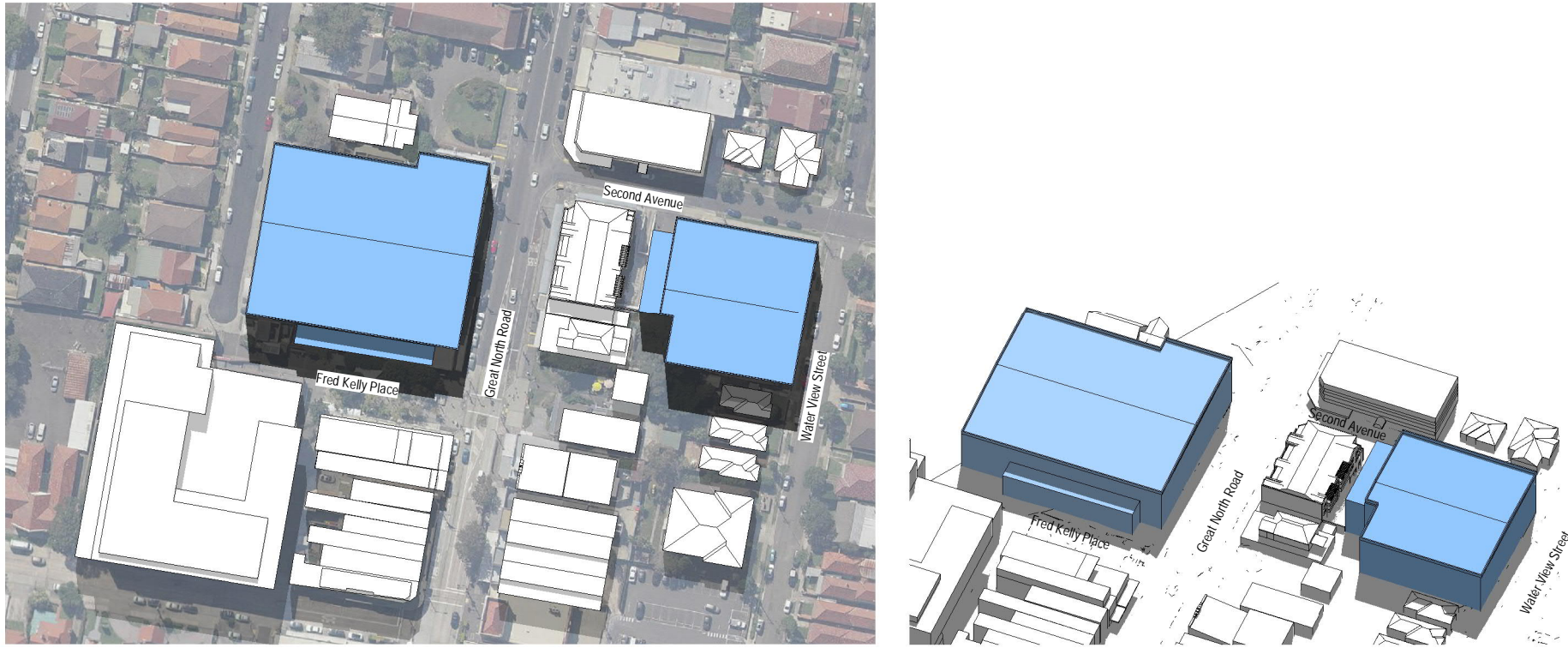
3 PM



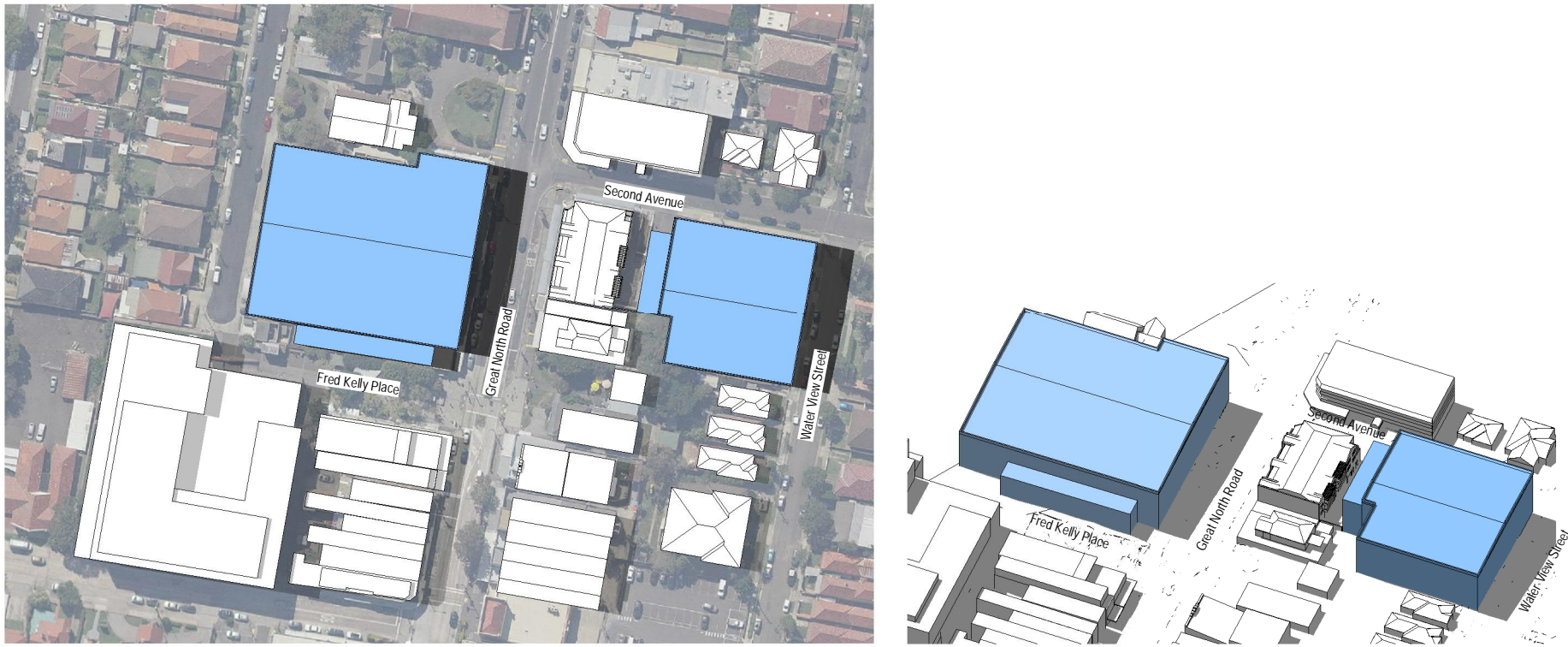
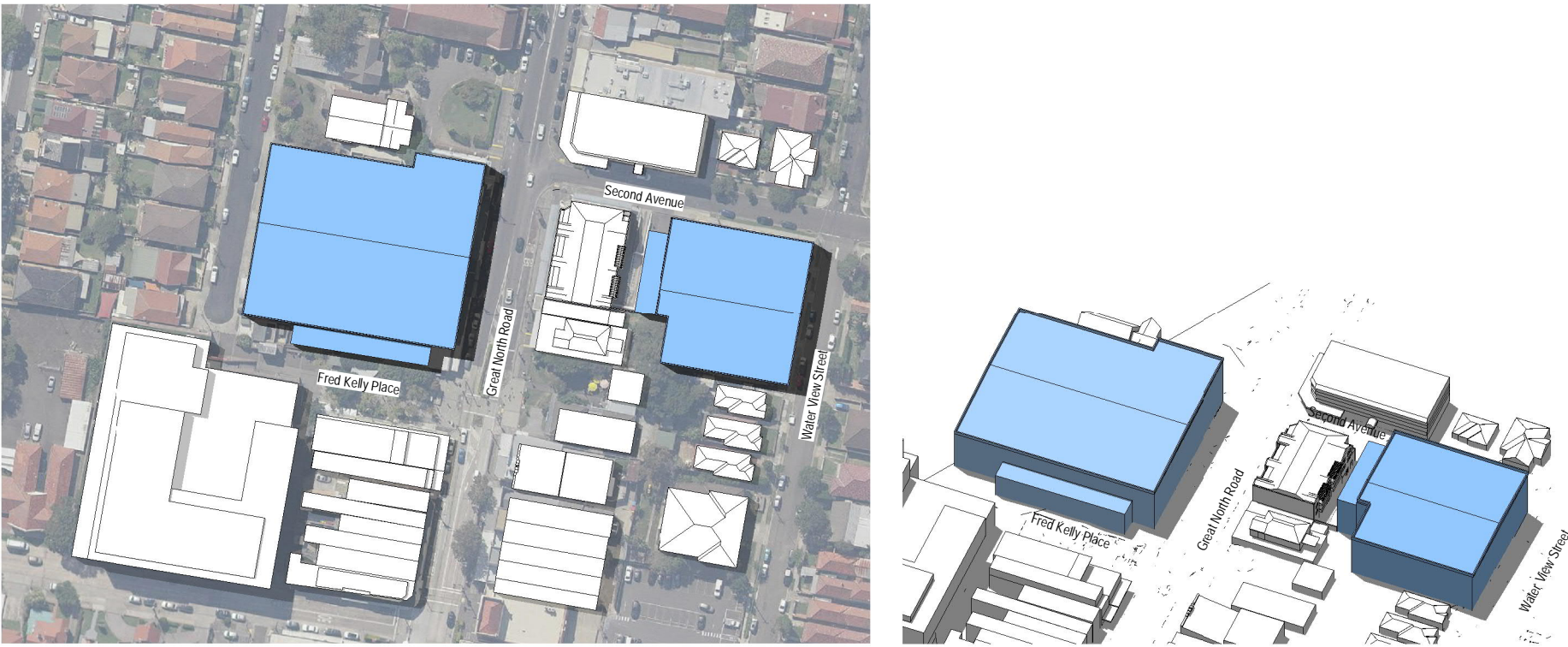
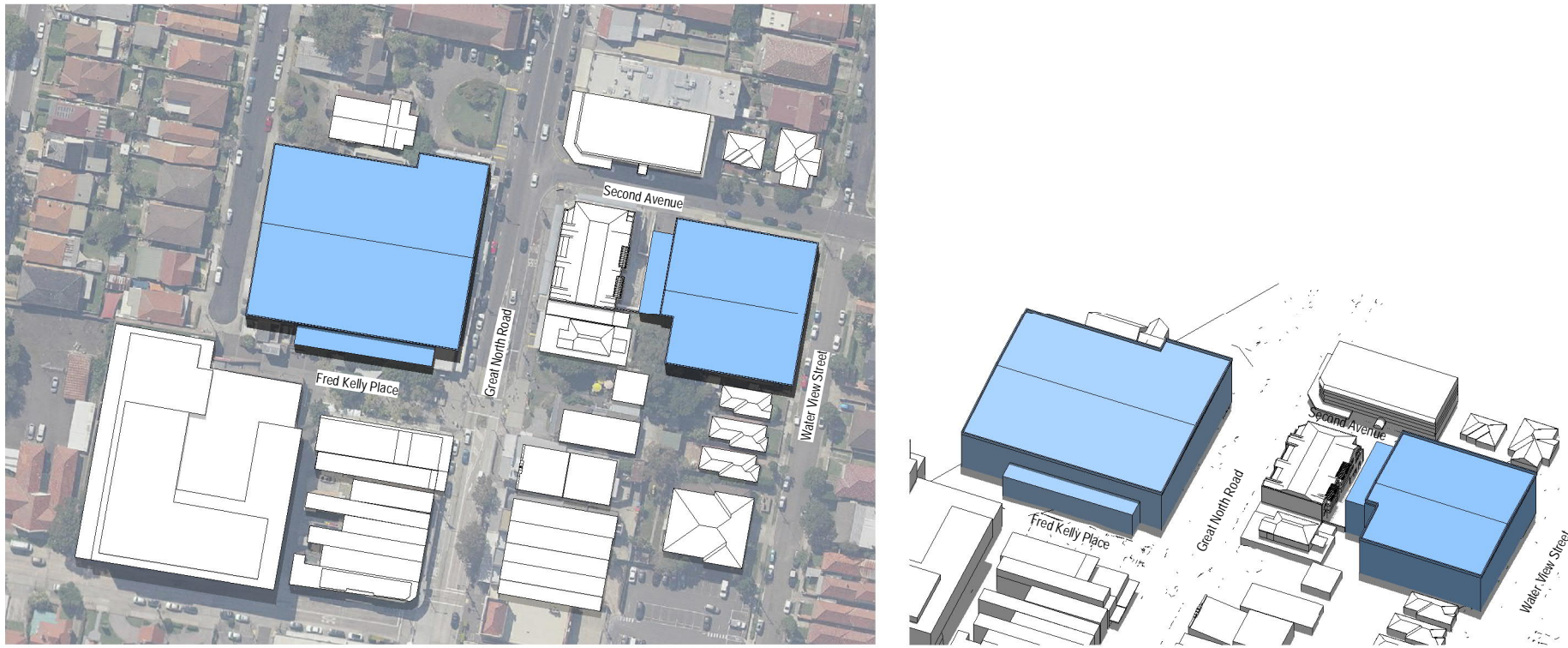
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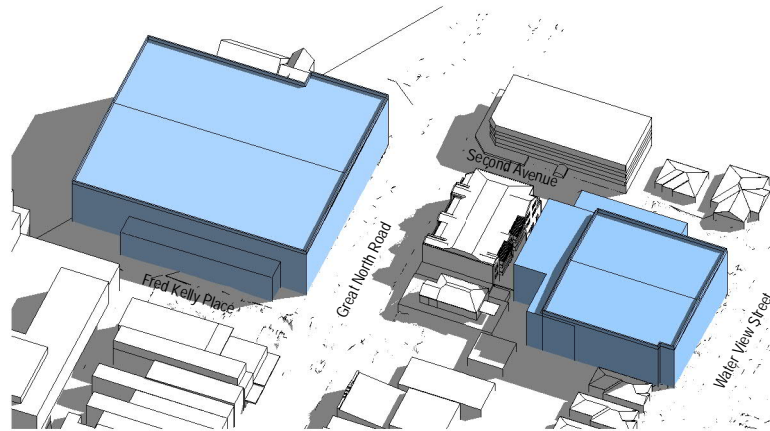
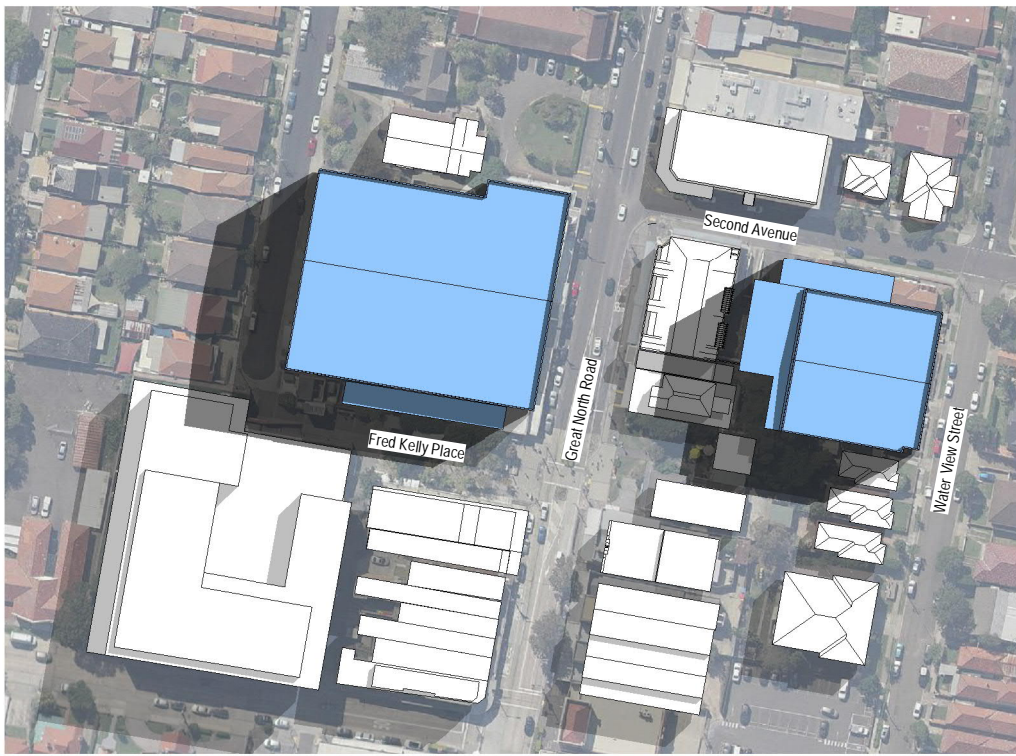


Appendix B. **Shadow Diagrams- Option 2**

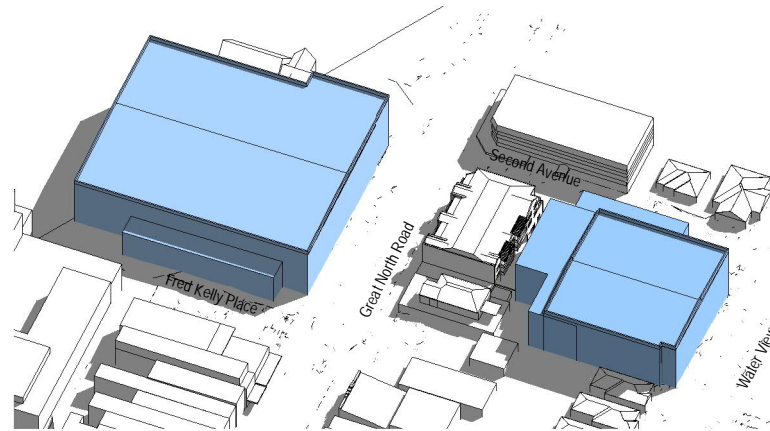
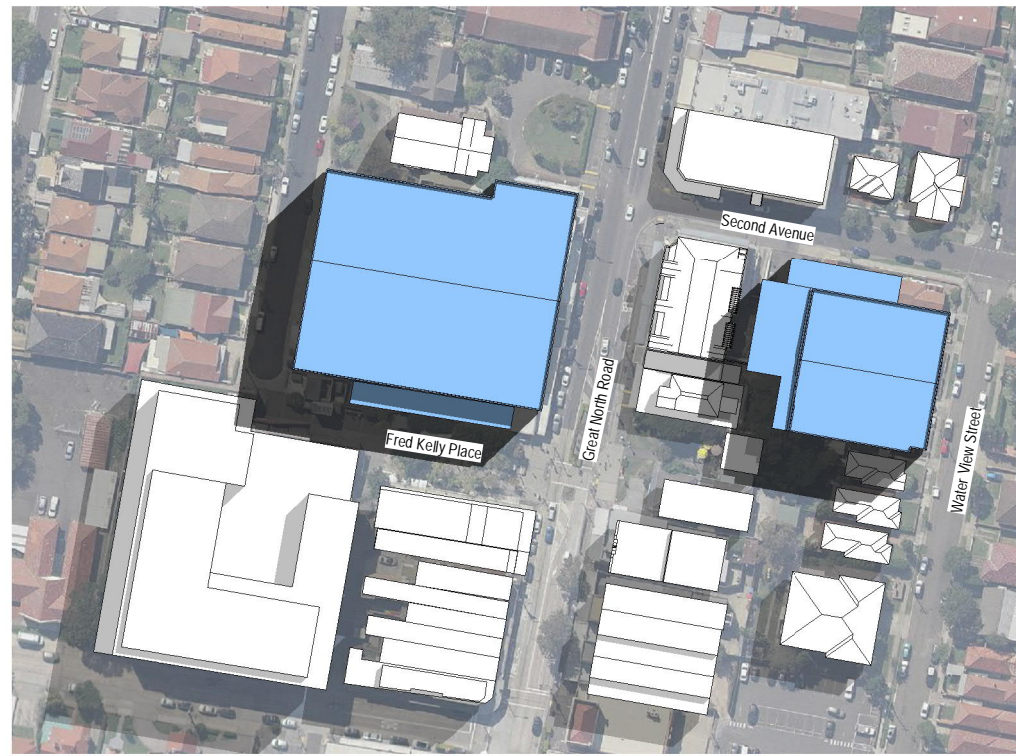
SYDNEY METRO
FIVE DOCK
CTP OVERSHADOWING ANALYSIS
OPTION 2

MAR 21

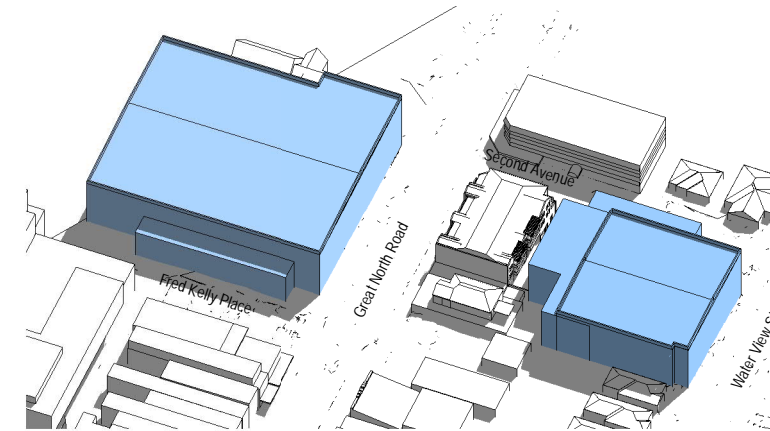
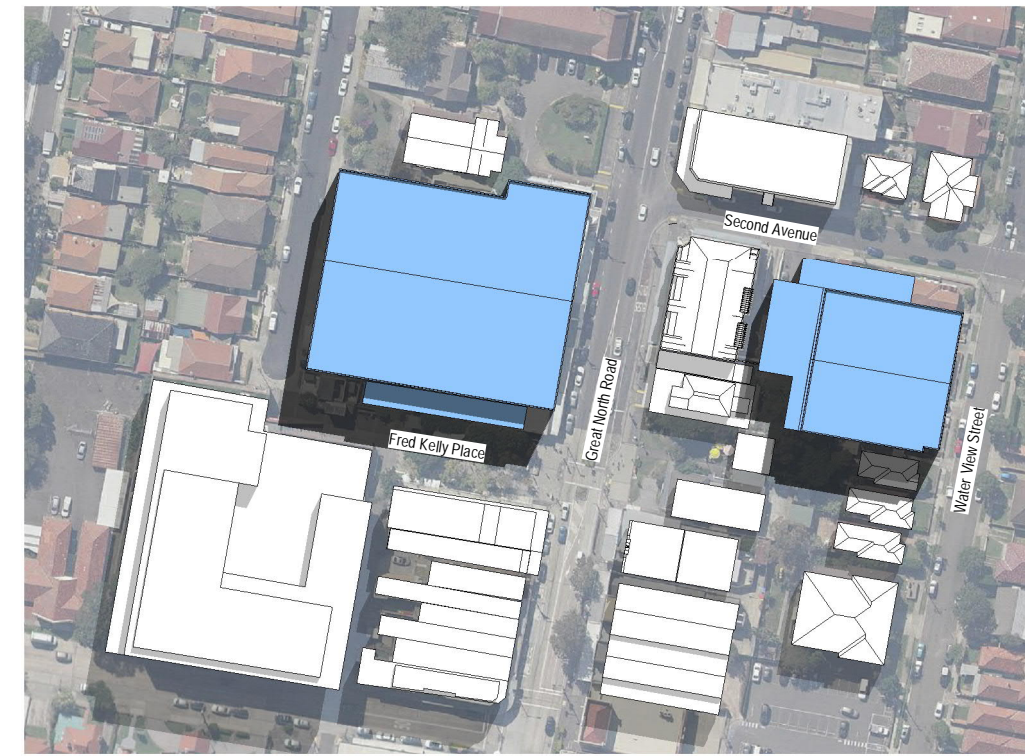
10 AM



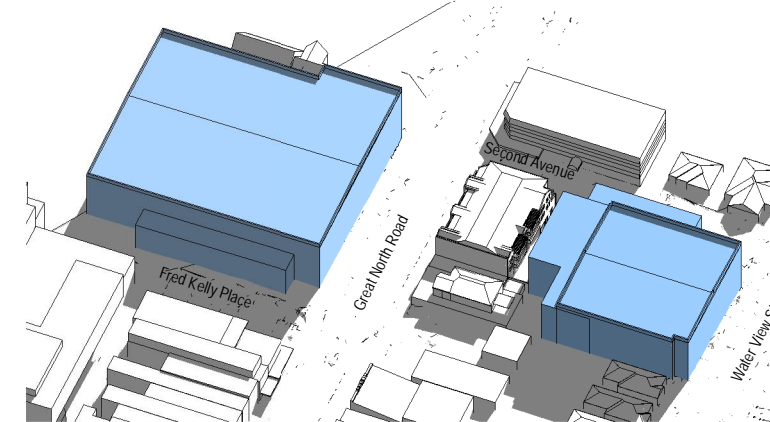
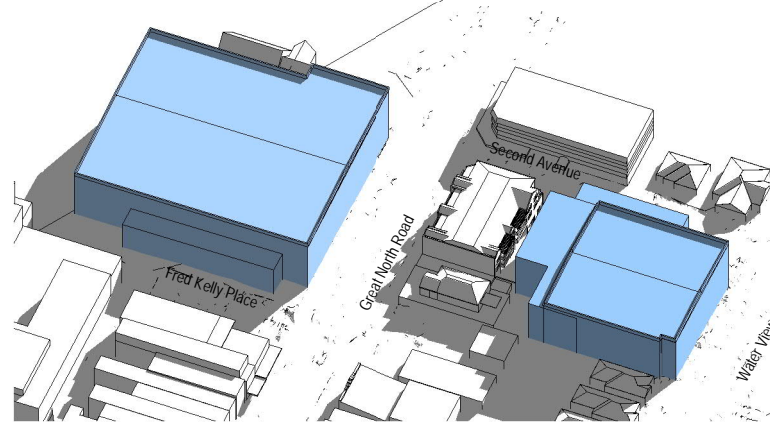
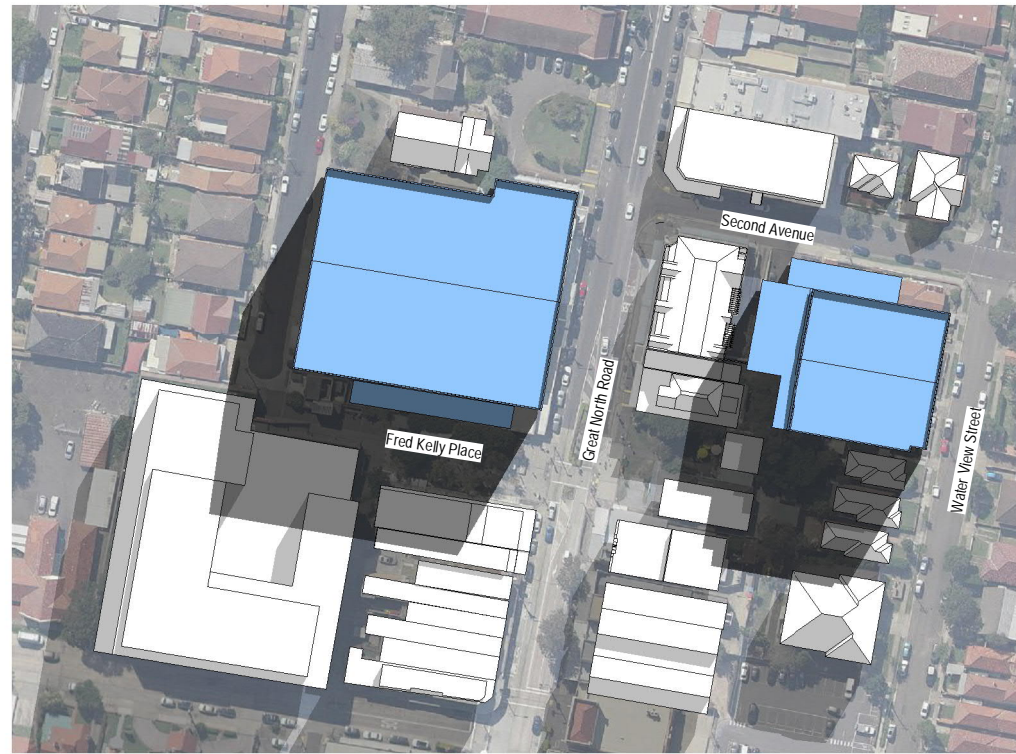
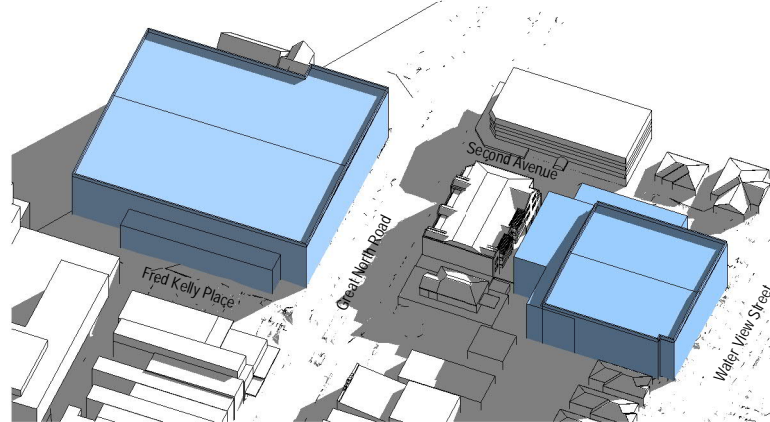
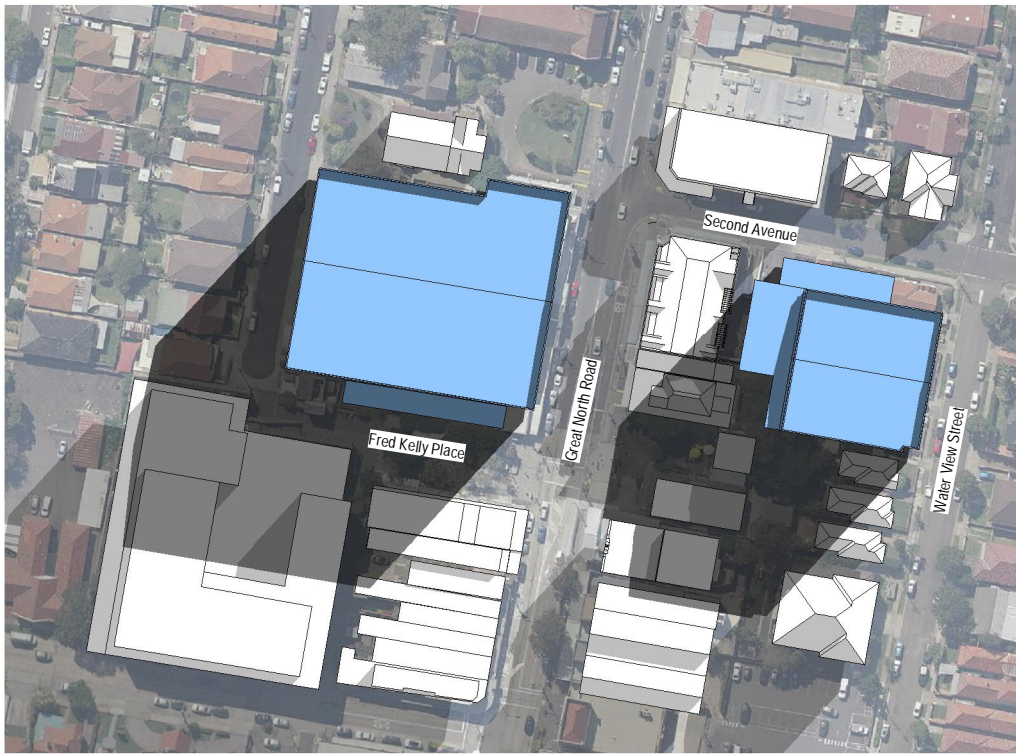
11 AM



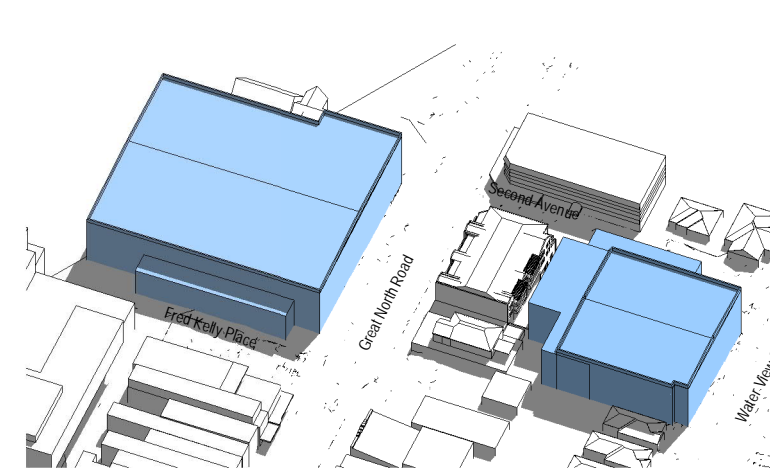
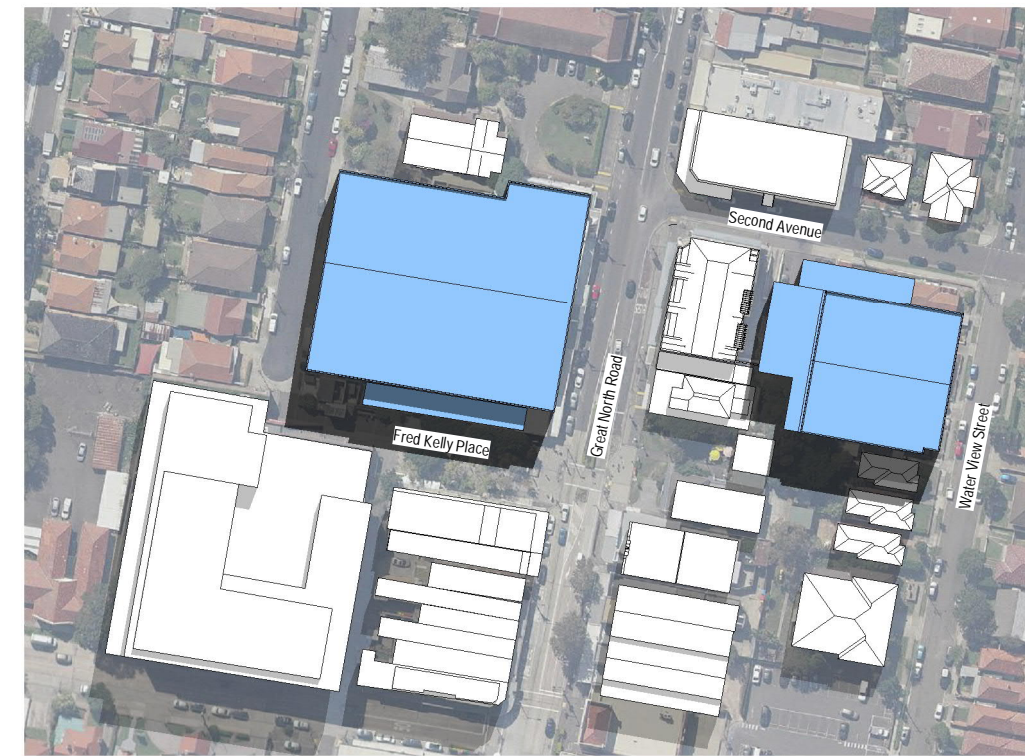
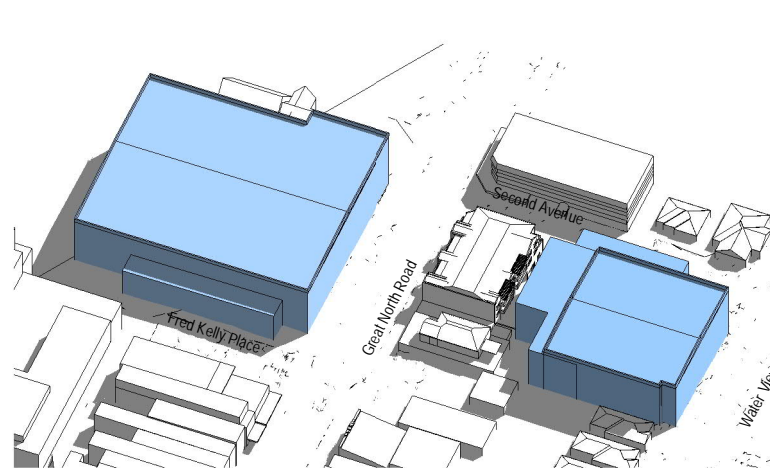
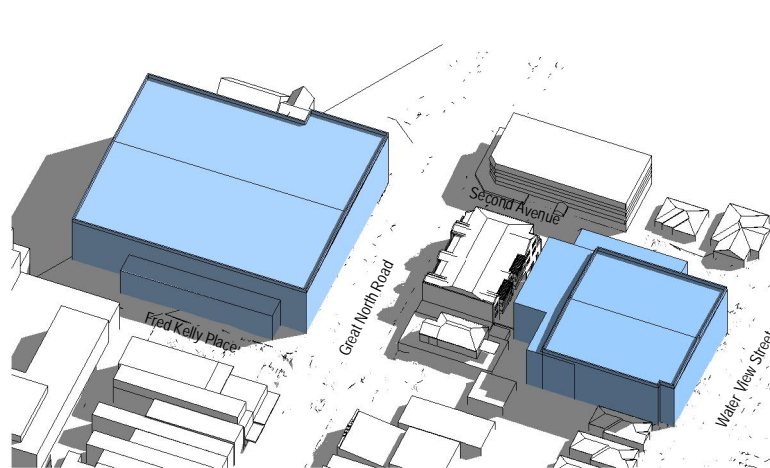
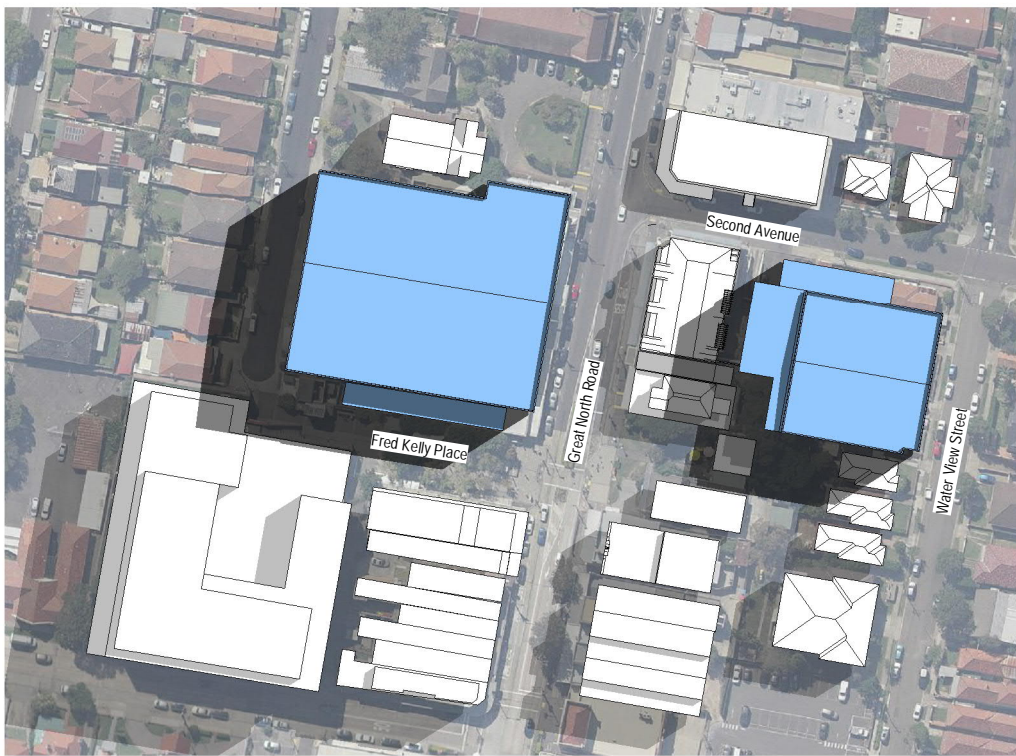
12 PM



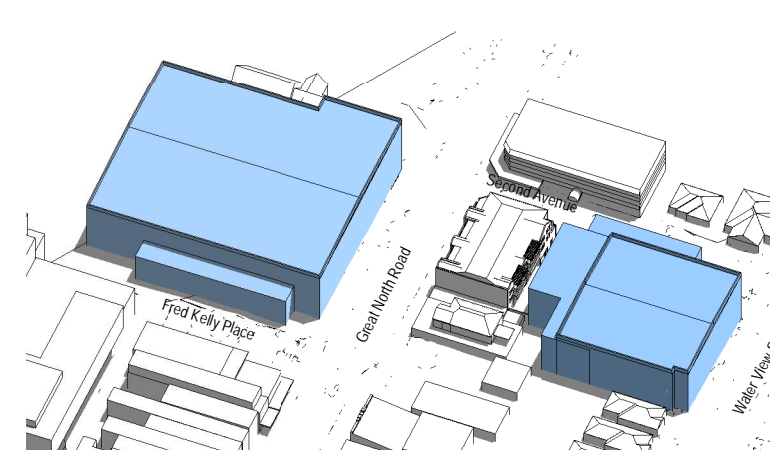
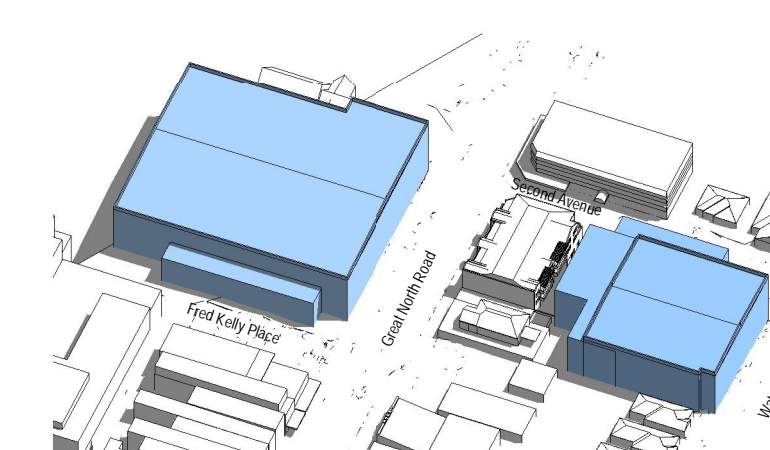
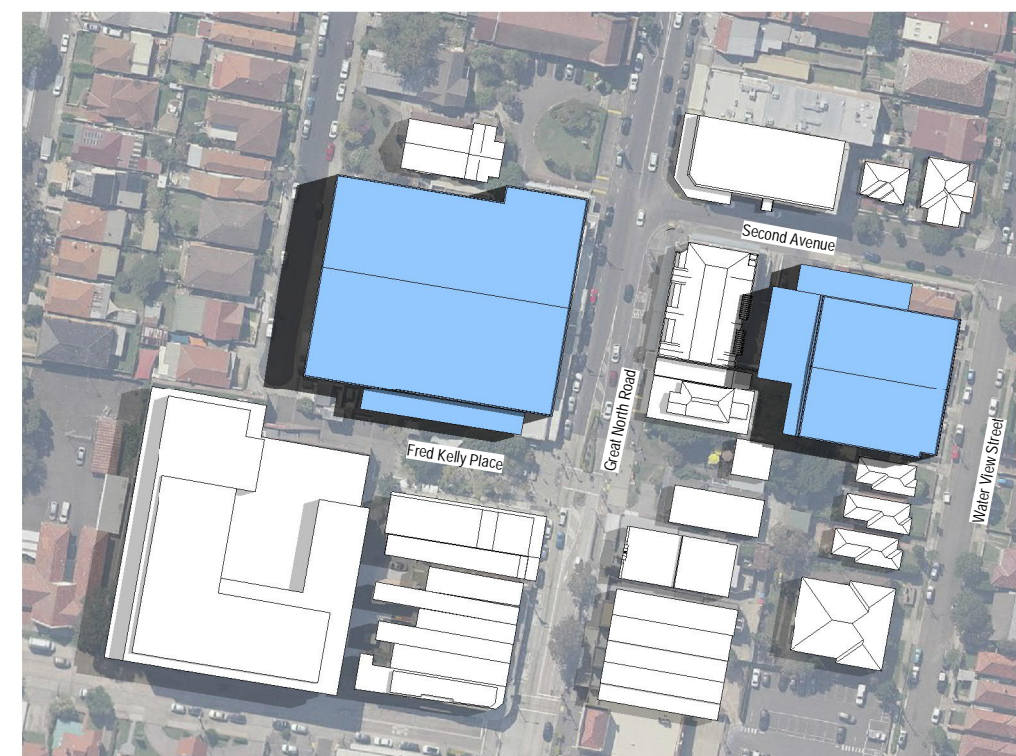
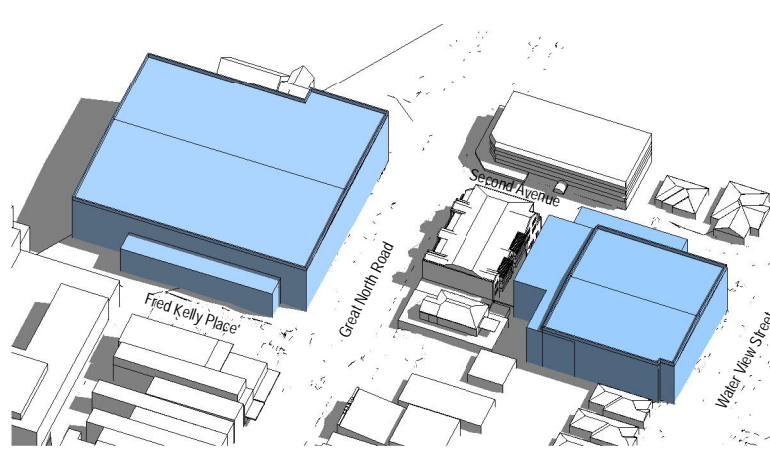
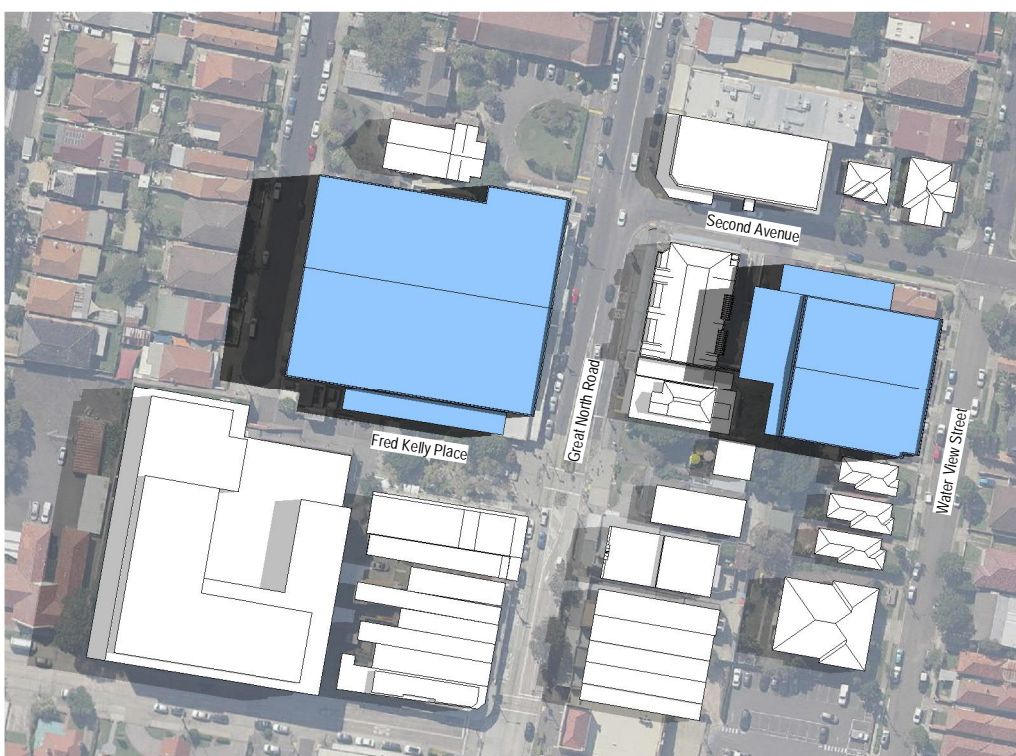
JUNE 21



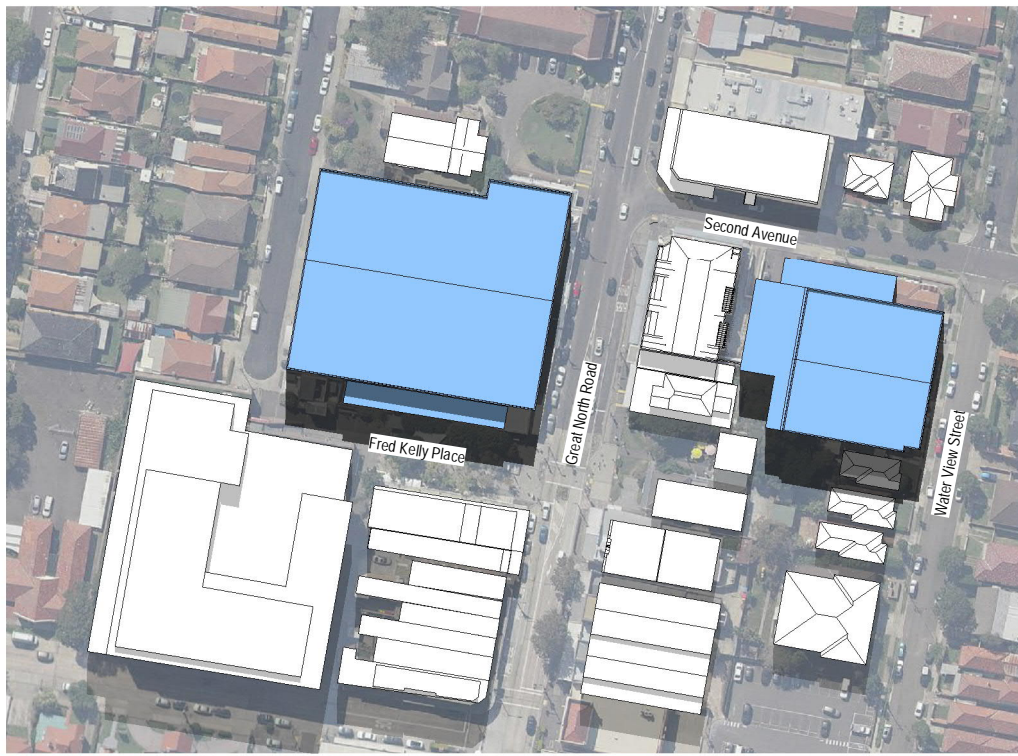
SEP 21



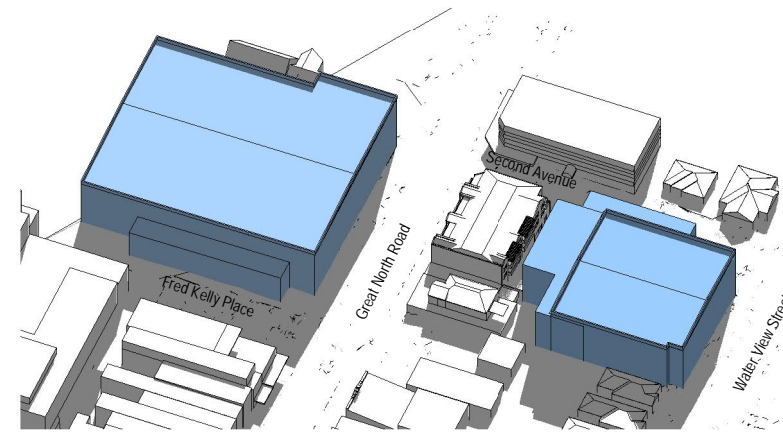
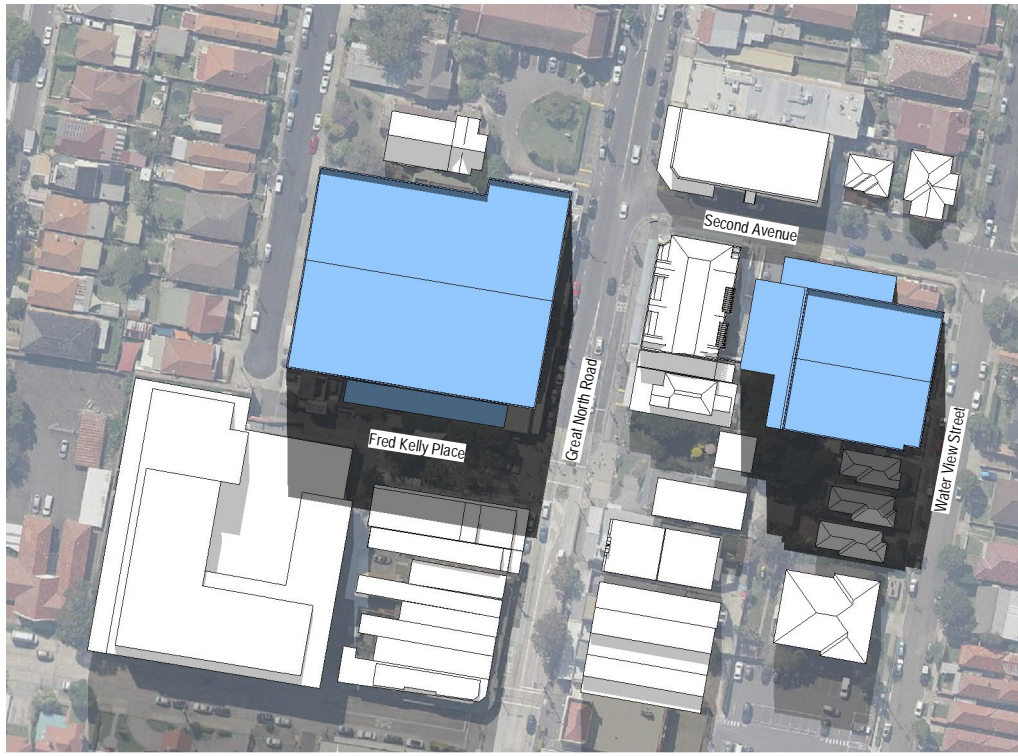
DEC 21



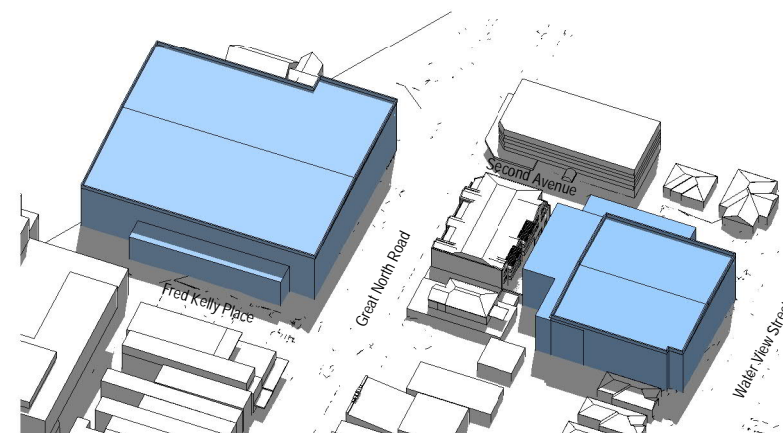
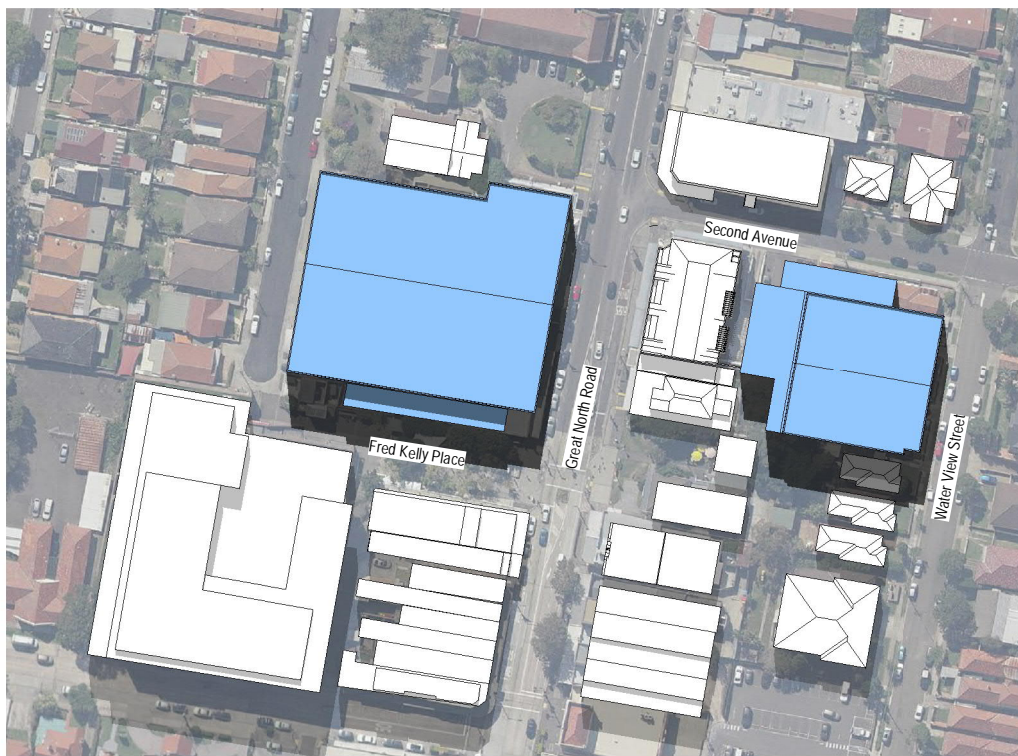
MAR 21



JUNE 21



SEP 21



DEC 21

