City of Ryde
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ATTACHMENTS FOR: AGENDA NO. 16/18 EXTRAORDINARY COUNCIL MEETING

Meeting Date: **Tuesday 4 December 2018**
Location: **Council Chambers, Level 1A, 1 Pope Street, Ryde**
Time: **9.00pm**

ATTACHMENTS FOR EXTRAORDINARY COUNCIL MEETING

Item

2 PLANNING PROPOSAL – 112 TALAVERA ROAD, MACQUARIE PARK

Attachment 4 Amended Planning Proposal – 112 Talavera Road, Macquarie Park

SJB Planning

112 Talavera Road, Macquarie Park

Planning Proposal

October 2018 | Final

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MERITON

Notification Statement
Planning Proposal – 112 Talavera Road, Macquarie Park

Meriton is providing this statement to support our Planning Proposal at 112 Talavera Road, Macquarie Park. Unfortunately, as we head towards a state election, misinformation is being released that makes it difficult for the community to make informed views on this proposal and and we hope this statement assists you in understanding the facts.

Please note that this site is already zoned for high density residential development. The current proposal only seeks to increase the density and height on this site which is located opposite a Metro Station and at the gateway to Australia's 4th largest economic centre with excellent access to jobs, education, hospitals and services, but importantly away from low-density residential suburbs.

This is consistent with Government policies to provide increased development close to transport infrastructure and that is why the proposal has received support to proceed to this stage from the State Government, Council and others such as traffic and aviation authorities. That is also why the Government is planning other similar centres like St Leonards, Crows Nest, Rhodes and Olympic Park with even higher densities as demonstrated in the attached plan.

Meriton has a long and established connection to the broader Ryde area. In fact, one of our first developments was at 20 Meriton Street, Gladesville. That is where the name Meriton was forged in 1963 and we have been continually involved in the area ever since, providing housing and jobs for thousands of families. We hope that will continue with this development which will generate over 5,000 jobs during construction and provide much needed housing in the right location.

In line with Government policy to ensure we share the value created by extra density being permitted, Meriton has also agreed with Council and the Government to provide the following public benefits:

- 27 residential apartments given to Council to house key-workers such as police, teachers, and nurses who may not be able to find approporiate housing in the area they work. The value of these apartments would be in excess of $30M.
- $8.2M payment to fund an upgrade Christie Park into a regional sporting complex
- Provision of a $2M publicly accessible park within the site
- $12M payment to the state government to upgrade state infrastructure like major roads
- $26M in local developer contributions to fund local roads, parks and community facilities

As per the attached plan, the proposal will also result in much better outcomes for this site when compared to the current planing controls as it will:

- Reduce the development from 6 dense buildings to 4 taller separated buildings between 27-60 stories in height which is not the tallest in Sydney and complies with aviation requirements
- Replace the dominant 30-storey wall along Talavera Road with a low-rise edge and taller buildings set back in a staggered form away from the street
- Increase the area of open space by 40% and sunlight to that space from 36% to 91%
- Increase the separation between buildings that will provide better sunlight and ventilation with less overlooking well in excess of the planning requirements
- Improve the overall appearance and design of the building via a design competition to ensure a high-quality outcome of this gateway site.

Overall, there is a much broader benefit across the community if the proposal is approved. If we develop what is currently permitted, it will just be another high-density development where only the developer benefits and the public will lose the opportunity for better quality development, affordable housing and improvements to local and state infrastructure.

Finally, I would like to confirm that we have conducted this process in accordance with established planning policies and practices of Council and the State Government.

We look forward to this proposal proceeding and on behalf of myself and everyone at Meriton, we would like to thank you for your time and we hope to receive your support.

Kind Regards,
MERITON GROUP

MR HARRY TRIGUBOFF AO
Managing Director

112 Talavera Road - Comparative Centre Analysis

Sydney Centres with FSR 6.5:1+

This diagram identifies key centres throughout Sydney with signifcant maximum Floor Space Ratio controls that are comparable to that proposed on the subject site in Macquarie Park.

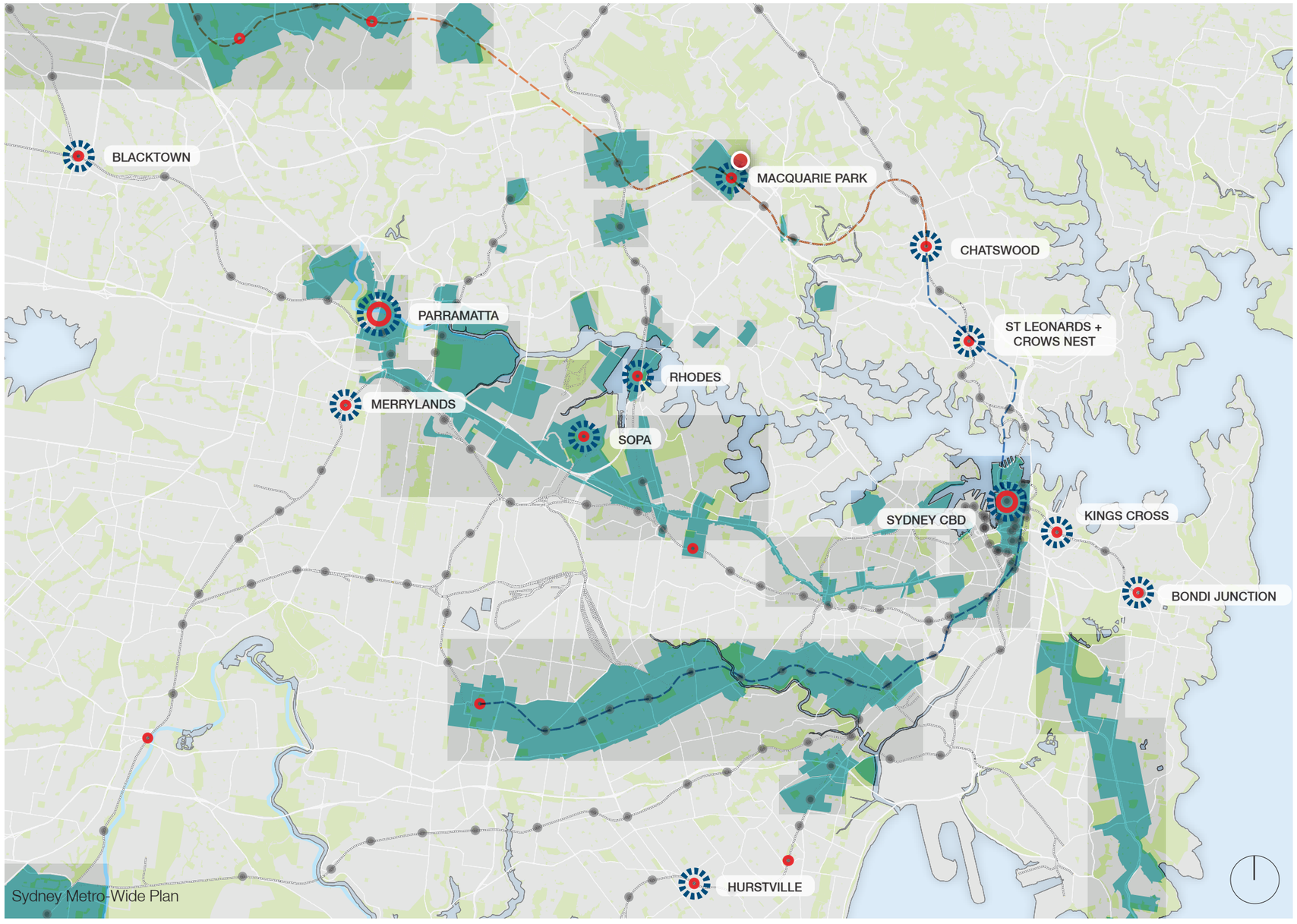
The range of existing and future Maximum FSR controls for key centres would indicate that the proposed uplift for Macquarie Park is appropriate within the greater Strategic context of a growing Sydney.

Maximum FSR Controls for Key Centres across Sydney:

Major Centre	Maximum FSR
112 Talavera Road Proposal	6.5:1
St Leonards	17:1
Parramatta	12:1
Crows Nest	12:1
SOPA	8:1 - 12:1
Sydney CBD	7:1 - 11:1
Rhodes	9.3:1
Hurstville	9:1
Merrylands	9:1
Blacktown	8.5:1
Bondi Junction	8:1
Chatswood	7:1 - 8:1
Kings Cross	5-7:1

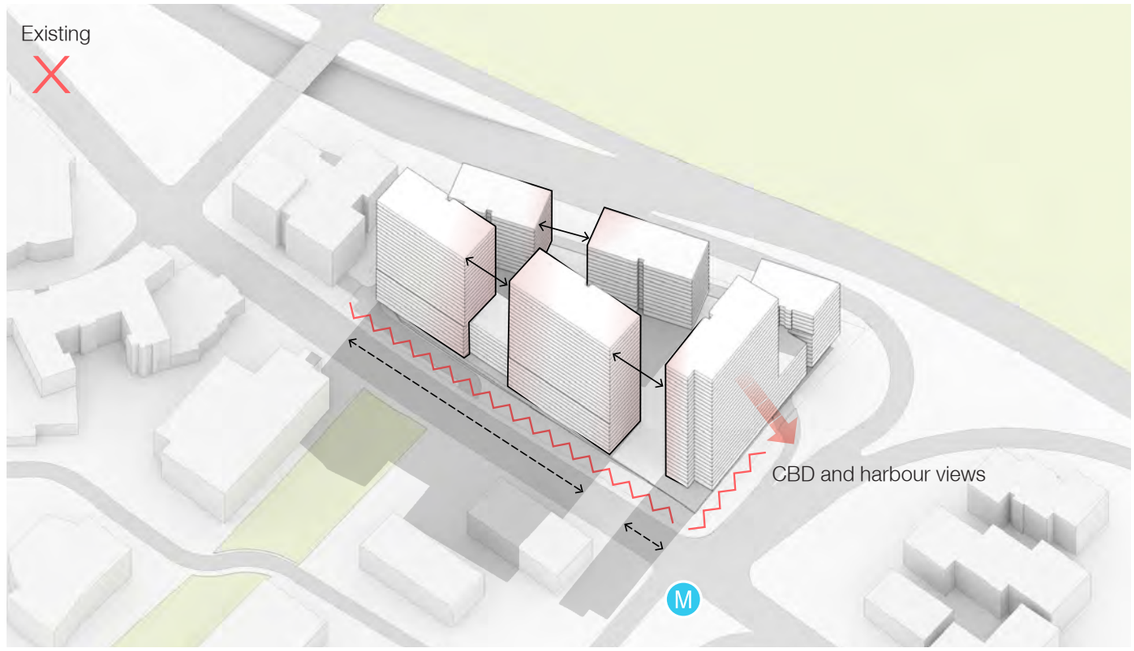
Key

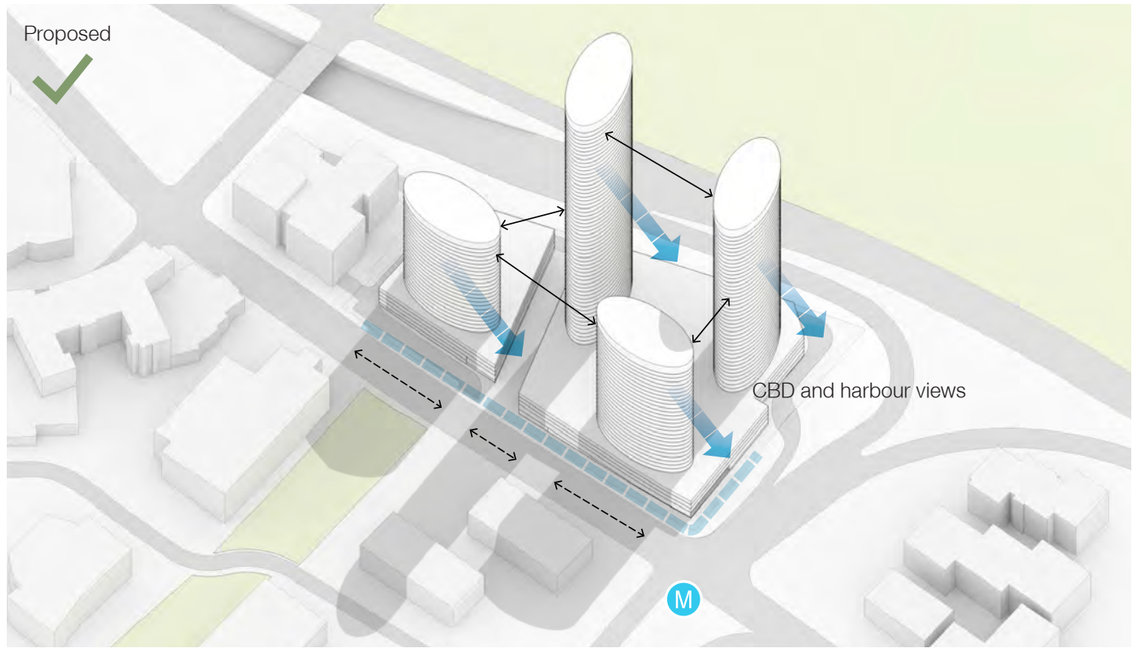
- Site Location
- Renewal Precincts
- Railway Line
- Sydney Metro Northwest
- Sydney Metro City and Southwest
- Major Centres
- Centres with FSR 6.5:1 and over



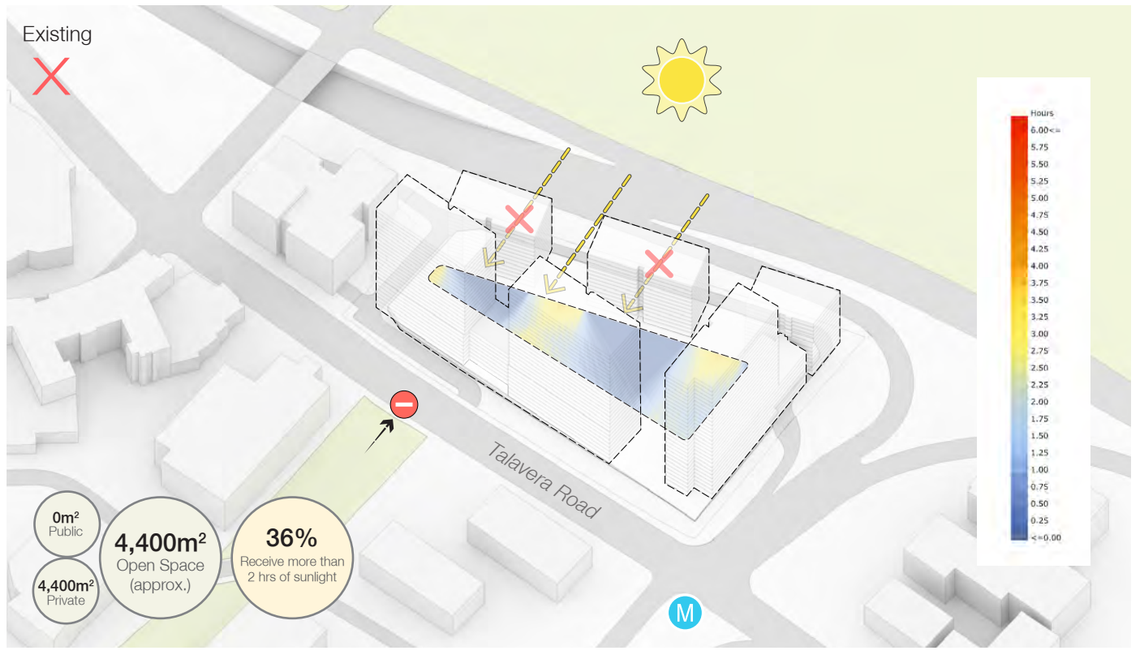
112 Talavera Road - Comparative Design Analysis

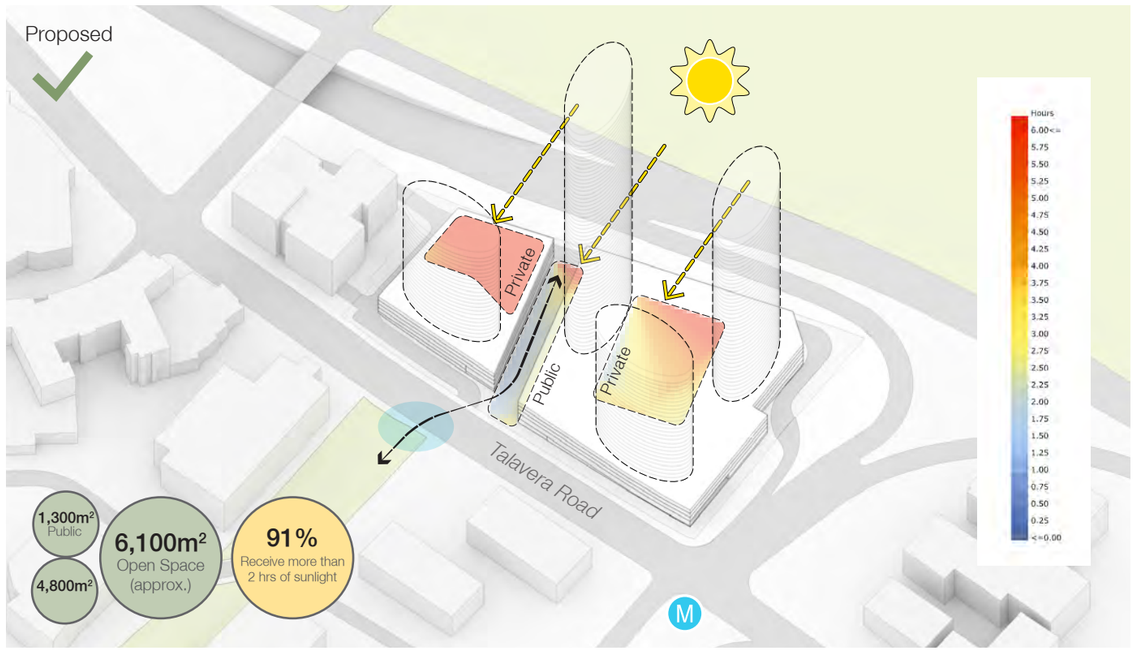
Built Form, Amenity and Overshadowing





Accessibility, Open Space and Solar





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Executive Summary

This Planning Proposal (PP) has been prepared for the Meriton Group, the owners of the land known as 112 Talavera Road, Macquarie Park. The site has a legal description of Lot 422 in DP 1153360. The PP has addressed the publication *Planning Proposals – A Guide to Preparing Planning Proposals* (August 2016). Particularly, Section 4.4 of this report addressed the questions to consider when demonstrating the justification and the strategic merit test raised in Question 3(a). The submission and supporting reports show that the proposal demonstrates strategic merit when considered against the Strategic Merit Test.

The holding has an area of approximately 1.953ha. The site has frontages to M2 Motorway to the north east, Herring Road to the south east, and Talavera Road to the south west. A small water course runs under the site, which converges with Shrimptons Creek and the Lane Cove River on the opposite side of the M2.

This PP seeks to amend the maximum building heights and floor space ratio (FSR) provisions under the Ryde Local Environmental Plan (RLEP) 2014, that currently apply to the site, and add site specific provisions for design excellence for buildings over 150m in height. The existing B4 Mixed Use Development zone will be retained.

The site, within the City of Ryde Local Government Area (LGA) is currently zoned B4 Mixed Use under RLEP 2014. The RLEP 2014 imposes a maximum FSR of 4.5:1 and height of buildings of 45m and 90m.

The site is currently developed with a multistorey office/industrial complex and car parking.

This PP provides an analysis of the physical and strategic planning constraints and the opportunities of the site and considers the relevant environmental, social and economic impacts of the proposal and its strategic merit.

The PP request is supported by urban design analysis and architectural testing and an assessment of the potential impacts upon the transport network. As the analysis has critically reviewed the site planning and proposes an alternate site approach specialist advice has also been provided to address the ability for potential flood impacts to be managed or reduced. The Transport Assessment concludes that the surrounding road network can accommodate the proposed increase in density. Similarly, specialist advice has been sought to confirm that the proposed building heights do not conflict with relevant aviation navigation requirement

The PP is considered to demonstrate strong strategic merit for the following reasons:

- Macquarie Park is one of the most significant urban centres in Sydney and Australia, the proposed increase in residential capacity provides more homes with 30 minutes of these employment opportunities as well as the rest of the Eastern Economic Corridor identified in *A Metropolis of Three Cities* stretching from the Harbour CBD, through St Leonards to Macquarie Park and highly accessible to Greater Parramatta Metropolitan Centre;
- The PP is located in the existing mixed use precinct and does not rely on a land use change to allow residential development, and will not compromise the key employment function of Macquarie Park;
- The site is one of the largest sites in the Macquarie Park Mixed Use area that is designated for significant residential development and which is ready for development;
- The site is located within 350m of Macquarie Park Train Station, which is to be upgraded under the Sydney Metro by mid-2019, with a frequency of trains running every four (4) minutes in the peak;

- The site proposes to dedicate to Council 7% of the FSR uplift as Affordable Rental Housing, equating to 27 dwellings;
- The development makes provision for an average 15.0m wide lineal open space which could be dedicated to Council. This will also create an opportunity for a future pedestrian link over the M2 Motorway (by others) to the open space to the north. Both of these potential outcome elements are identified in the Macquarie Park Finalisation Report (MPFR);
- Splitting the ground plane planning of the site to provides for a continuation of the linear green space to the south west, following the former alignment of Shrimpton Creek;
- Increasing the height of buildings standard to 18.5m, 90m, and RL 243 to facilitate more slender tower form development, allowing lower podium forms of four (4) to five (5) levels reducing the massing to the public domain and shadowing to adjoining properties;
- Increasing the height reduces the number of buildings and overall floorplates across the site, creating more communal open space opportunities with better solar access;
- The Urban Design analysis identifies that the proposed range of building heights are appropriate for the proposed and emerging character of Macquarie Park and appropriately locates height at a focal point within the precinct close to the rail station, which is to be part of the new Sydney Metro Network;
- Consistency with *A Metropolis of Three Cities and* the and the North District Plan, providing additional accommodation in well located and serviced areas;
- Supports the diversification of activity in Macquarie Park in a location already targeted for residential accommodation in the Macquarie Park Corridor Structure Plan as Mixed Use/Residential;
- The PP can be accommodated utilising the existing road network which has been assessed as being capable of accommodating the increased residential development capacity; and
- The PP provides an opportunity to better mitigate flood impacts and reduce flood levels.

The proposal has the potential to provide an additional 360 dwellings, increasing the site capacity from 900 dwellings to 1,260 dwellings.

This additional 360 dwellings is a significant contribution to the five (5) year (to 2021) housing target of 23,950 dwellings for the North District and 7,600 five (5) year (to 2021) target for the Ryde LGA. The potential additional 360 dwellings represent 4.7% of Ryde's five (5) year housing targets.

Recommendations

It is recommended that arising from the consideration of this PP, Ryde City Council resolve to support the changes to RLEP 2014 as detailed in this PP, and forward the PP for a Gateway Determination to undertake the following:

- Amend the Height of Buildings Map (map sheet HOB_004) to show new maximum building heights of 18.5m, 90m and maximum RL 243m AHD;
- Amend the Floor Space Ratio Map (map sheet FSR_004) to show a maximum FSR of 6.5:1 applying to the site; and
- Add site specific provisions for design excellence for applications proposing redevelopment of the site. (excluding development lodged under the existing planning controls)

In support of the amendments to RLEP 2012 a Public Benefit Offer to enter into a VPA is provided to facilitate the delivery of the significant public benefit of affordable rental housing and significant contributions to planned open space upgrades beyond the delivery of an onsite open space.

The applicant is also separately negotiating a Voluntary Planning Agreement (VPA) to provide reasonable contributions towards state infrastructure in the Macquarie Park corridor.

1.0 Introduction

1.1 Overview

This PP has been prepared for the Meriton Group, the owners of the site. The opportunity to increase potential housing supply has significant strategic merits on this well served and located site. The proposal will provide a contribution to the housing demand projections, which now estimate a further 725,000 dwellings for greater Sydney by 2036. In the interests of maximum utilisation of available land for housing provision, the proposal should be pursued. The proposal seeks an amendment to the Height of Buildings and FSR controls applying to the site. The amendments sought would facilitate the provision of residential towers ranging from 30 storeys up to 60 storeys in height. A review of the capacity and potential of the site has been pursued in recognition of a number of attributes that could accommodate taller buildings. Of primary importance is that the site is located in the area of Macquarie Park identified as being primary residential. The strategic location of the area as residential has prompted the exercise to critically review if the current planning controls and maximising the sites potential, contribution to housing supply, public amenities, affordable rental housing and support of existing public investment in transport infrastructure.

In that regard, considering the sites location on the periphery of the Eastern Economic Corridor, housing in this location has extremely good access and proximity to employment and retail services. The access to these services are then further supplemented by the access to tertiary education, research and medical services undertaken by Macquarie University. Having regard to external connectivity, the site is highly accessible to the existing Macquarie University rail station which will be converted to be part of the Sydney Metro network. All of these attributes support a conclusion that maximum strategic utilisation of the site for residential accommodation should be pursued.

With these underlying attributes, the development capacity of the site has been tested for an urban design perspective. This has been underpinned by testing what is the visual impact and the shadow impact of taller built forms. The analysis has identified that the positions of a variety of tower forms across the site can be pursued without adverse shadow impacts upon public open space land or residential areas. The consideration of the visual impact of towers up to 60 storeys has identified that in this marker location, such heights are appropriate.

The approach to provide taller towers with greater separation also relieves the visual impact of the current approach forcing large street walls to the Talavera Road frontage. In the concepts prepared the street walls can be reduced to a four (4) to five (5) storey level down from 28 storeys under a complying scheme with the height shifted to the less sensitive part of the site, opposite the M2 Motorway. This allows a development of only four (4) buildings which is two (2) less than a complying scheme under the current controls, creating larger communal open space with better amenity and solar access. This in turn creates the opportunity for ground level open space that can be dedicated to the public in line with the additional open space suggestions under the MPFR, as shown in the following extract from the Urban Design Report.

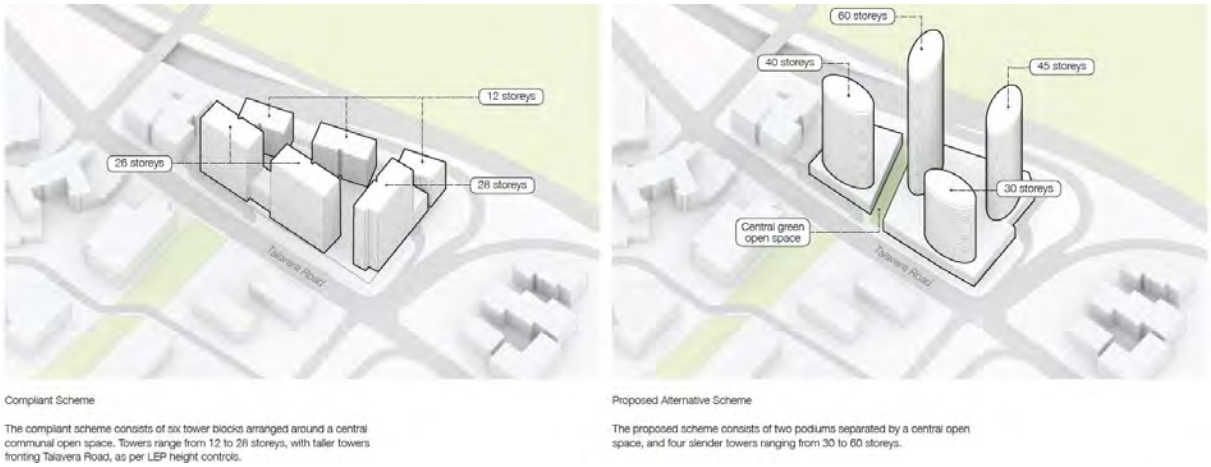

Figure 1: Compliant Scheme and Proposed Alternative Scheme contained in Urban Design Report

The volumes achieved could accommodate approximately 1,260 dwellings. This dwelling capacity has been tested having regard to the performance of the transport network. The analysis undertaken has identified that the network with the additional capacity could operate at or below network capacity.

The final testing for the height relates to aviation navigation impact. The assessment undertaken confirms that the proposed maximum RL of 243m AHD height limit will accommodate buildings that also do not breach navigational guidelines.

The concepts prepared by SJB Architects propose the replanning of the site into three (3) zones. The western and eastern zone will accommodate the four (4) proposed towers, while the central zone will provide an open space break in the site broadly over the drainage line that traverses below the site.

The schemes propose a single tower to 40 storeys in the western zone and 30 to 60 storeys in the eastern zone. The concepts prepared provide a visual extension of the linear open space to the south west of the site, and with the replanning of the site as a development typology providing separation between the residential towers.

The PP applies to the land described as Lot 422 in DP 1153360, shown at Figure 2 below.

Figure 2: Site location (Source: Six Maps)

The holding has an area of approximately 1.953ha. The site comprises the majority of an "island" site bound by the M2 Motorway, Herring Road, Talavera Road and Christie Road. An upper tributary to Shrimptons Creek drains through the site via an established drainage network and easements which can be maintained. This drainage network connects to the creek and ultimately and the Lane Cove River on the opposite side of the M2 Motorway.

The PP demonstrates the strategic merit of the proposed amendments to RLEP 2014 and seeks commencement of the statutory process to:

- Amend the Height of Building Map (map sheet HOB_004) to show new maximum building heights of 18.5m, 90m and RL243m AHD;
- Amend the Floor Space Ratio Map (map sheet (FSR.004) to show a maximum FSR of 6.5:1 applying to the site; and
- Add site specific provision for design excellence for redevelopment of the site (excluding any development applications (DAs) lodged under the existing controls).

The proposed amendments will facilitate the redevelopment to provide a residential development in close proximity to major transport, a regional shopping centre, and the master employment area of Macquarie Park. The proposed amendments are also within the precedent set by the Council endorsed scheme at 66-82 Talavera Road, where height increases of 45m to 120m (166%) and FSR from 1.5:1 to 3.5:1 (133%) or up to 4.75:1 (217%) when taking into account exclusions.

This proposal seeks only a variation to the height and FSR development standards in an appropriate location. The proposal does not seek a land use change to allow residential development. The current planning framework already permits residential development on the site.

The PP is supported by detailed urban design analysis and architectural mass modelling plans that show development configuration outcomes for the site, including shadow impact testing and traffic analysis.

Support for the PP is based on the following circumstances:

- Consistency with the surrounding development;
- Urban design integration and renewal of the locality;
- Consistency with the strategic planning framework;
- Consistency with Council and State Government policy approach to provide increased residential densities in well serviced existing urban locations;
- Inclusion of Affordable Rental Housing in future development;
- Provision of open space required under the Macquarie Park Finalisation Report;
- Creation of the opportunity for better pedestrian connection over the M2 as per the Macquarie Park Finalisation Report; and
- Contribution to the improvement of surrounding regional recreational facilities (i.e. Christie Park Upgrade).

The PP has been prepared in accordance with the Department of Planning and Environment (DP&E) publication *Planning Proposals - A Guide to Preparing Planning Proposals,* dated August 2016.

1.2 Scope and Format of the Planning Proposal

The PP details the merits of the proposed changes to RLEP 2014 and has been structured in the following manner:

- Section 1.0 provides an introduction to the PP;
- Section 2.0 provides a description of the site, its context and existing development, including identification of the land to which the changes are proposed;

- Section 3.0 identifies the planning framework applying to the site, and considers the Planning Proposal against relevant strategic plans and policies;
- Section 4.0 is the Planning Proposal, and is provided consistent with the matters to be considered in the DP&E publication *Planning Proposals – A Guide to Preparing Planning Proposals*; and
- Section 5.0 provides the conclusions and recommendations to proceed with the PP to Gateway Determination to amend RLEP 2014.

1.3 Supporting Plans and Documentation

This Proposal has been prepared with input from a number of technical and design documents which have been prepared to accompany the application. These documents are included as Attachments to this report and are identified in Table 1.

Document Name	Prepared by
Urban Design Report	SJB Urban
Indicative Layout	SJB Architecture
Transport Assessment	ARUP
Preliminary Flood Impact Assessment	Calibre Consulting
Aeronautical Impact Assessment	Landrum & Brown
Social Infrastructure Statement	Elton Consulting
Bushfire Risk Assessment	Bushfire Planning Services

Table 1: Plans and documents prepared to accompany this Planning Proposal

2.0 Site Description and Context

2.1 Overview

This section describes the location of the site, existing development on the land, the current planning framework and State Government and City of Ryde Council strategic plans applying to the location.

2.2 Site Context and Locality

The subject site is located in the suburb of Macquarie Park, located 15km north west of the Sydney CBD. Lane Cove National Park is to the north, Macquarie Shopping Centre to the south east, and Macquarie University to the south and south west.

The suburb is serviced by a series of key roads. Lane Cove Road provides linkages to Pymble in the north and Rhodes in the south, while the M2 Motorway and Epping Road provides direct connectivity to Sydney CBD.

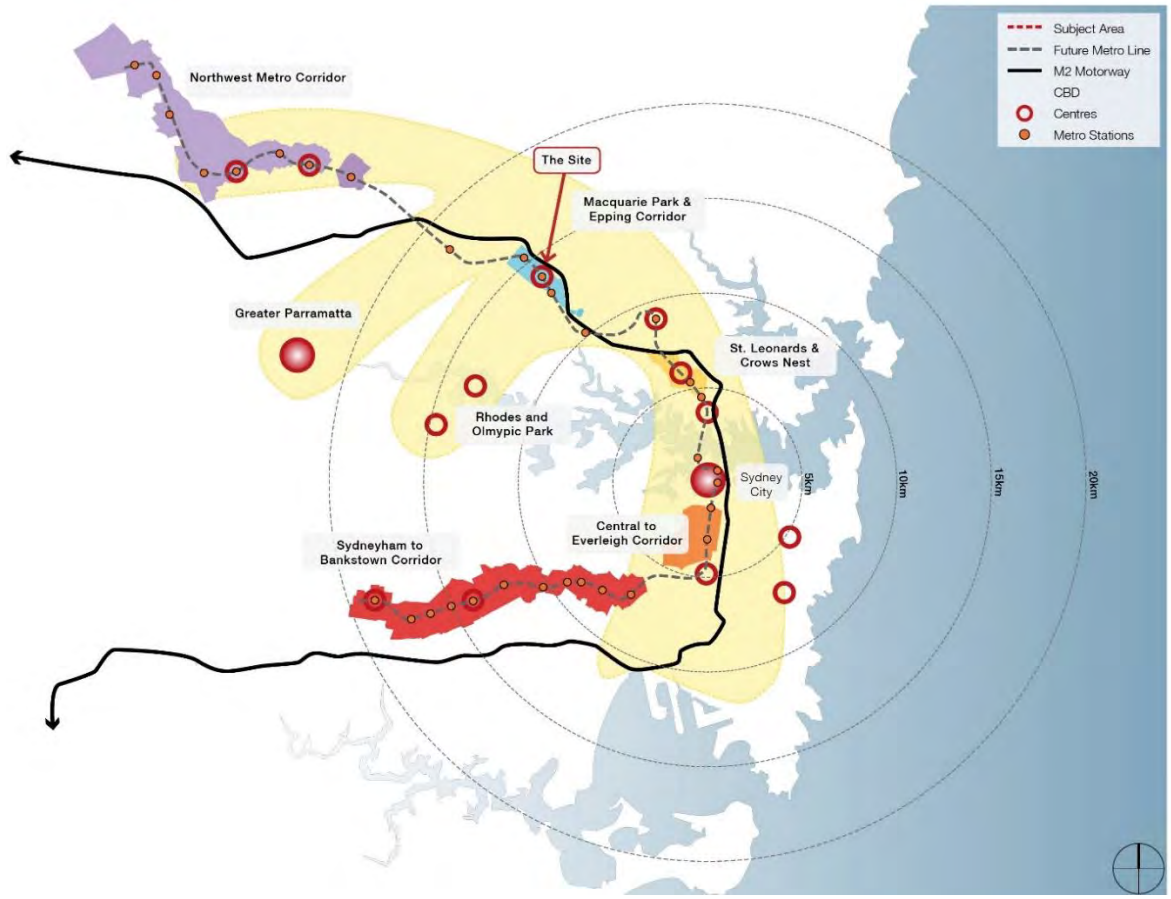

Figure 3: Strategic Context diagram

Land to the north of the M2 Motorway comprises Lane Cove National Park, while land south of the M2 Motorway provides a number of key education, health, and business related uses including Macquarie University, Macquarie Shopping Centre and Macquarie University Hospital.

Macquarie Park is defined by large scale business park and commercial developments south of Herring Road, that make it one of the largest employment centres in Australia, while land north of Herring Road provides university campus facilities and student accommodation. Outside of the core employment functions, substantial mid to high density mixed use areas have been identified to support the established commercial, educational, and medical precincts. The subject site sits within the identified mixed use area. As a consequence, the proposal to maximise the residential capacity of the site in the manner proposed does not compromise the key employment function of Macquarie Park or impact upon the identified employment cores.

The site is in close proximity to Macquarie University Railway Station. The site is within a 400m walking catchment of Macquarie University Railway Station.

The station is supported by a number of bus services connecting Macquarie Park to areas including Epping, Chatswood, North Sydney, Chatswood and Parramatta.

The suburbs broader urban context features a range of public parks and recreation facilities including North Ryde Golf Club, Gordon Golf Club, Lane Cove National Park, Blenheim Park, and Waterloo Park.

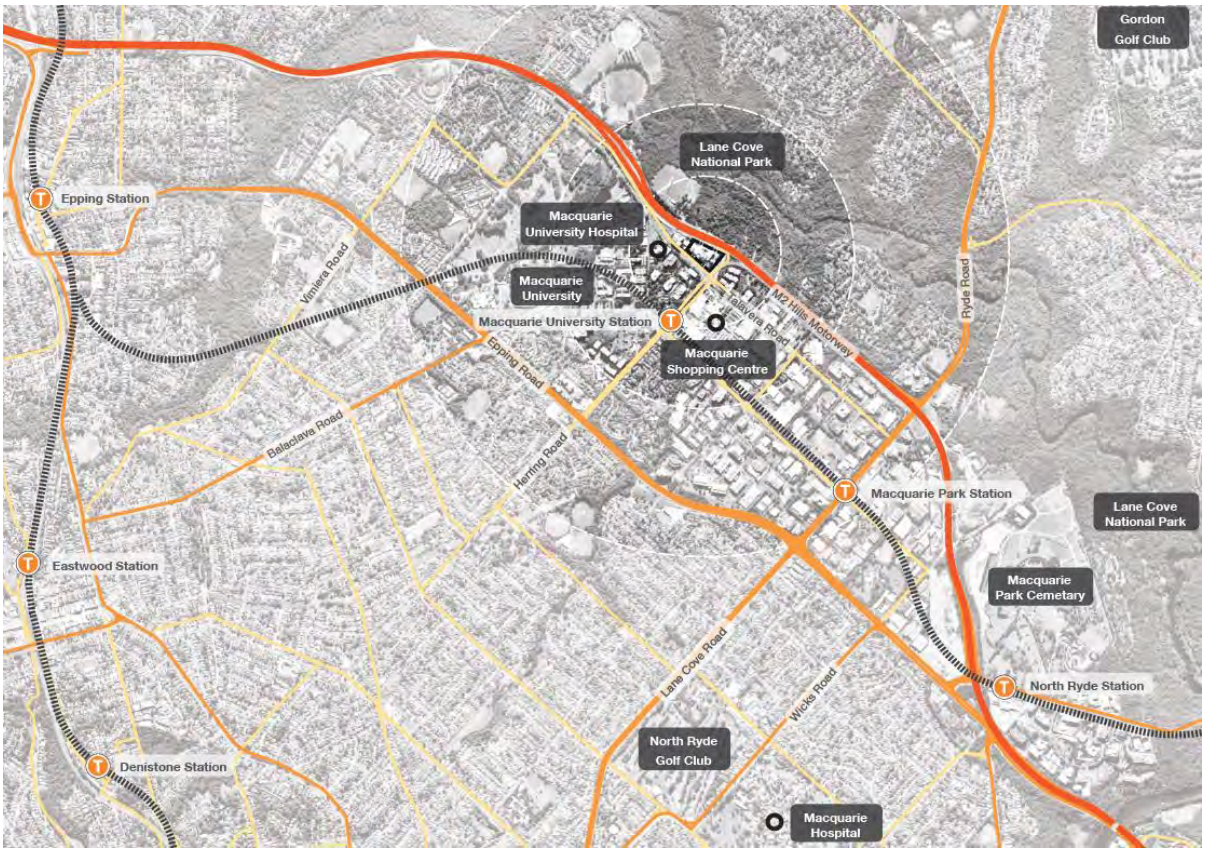

Figure 4: Site context (Source: Near Map)

2.3 Site Description

The subject site is an irregular shaped allotment, located at the corner of Talavera Road and the M2 Motorway. The site legally described as Lot 422 DP 1153360, and comprises a site area of approximately 1.9ha.

The site is the majority of an "island" site bound by the M2 Motorway, Herring Road, Talavera Road and Christie Road.

A small watercourse runs around the existing building within established drainage infrastructure, which converges with Shrimptons Creek and Lane Cove River on the opposite side of the M2.

The site is currently developed with a multistorey office/industrial complex and car parking. Perimeter trees and planting are located along the M2 boundary, acting as a natural noise barrier.

2.4 Surrounding Land Uses and Built Form

Land to the north on the opposite side of the M2 comprises Lane Cove National Park, while land to the south on the opposite side of Talavera Road is developed with Macquarie University Hospital and campus facilities.

Land to the east on the opposite side of Herring Road is developed with Meriton Serviced Apartments, while land to the west is developed as office accommodation.

The site is accessed via Herring Road and Talavera Road. The access is shared with tenants in the existing office complex to the west.

The site is located within excellent proximity to key transport, education, business and retail facilities. The site is within 400m walking distance from Macquarie Shopping Centre, Macquarie University Station and Macquarie University Hospital. Christie Road provides pedestrian and vehicular links to the opposite side of the M2 towards Lane Cove National Park.

As shown in Figure 5, the site is located within the Mixed Use Residential area of the Macquarie Park corridor. The mixed use area is outside of the core employment areas identified as the commercial core, retail core and business park.

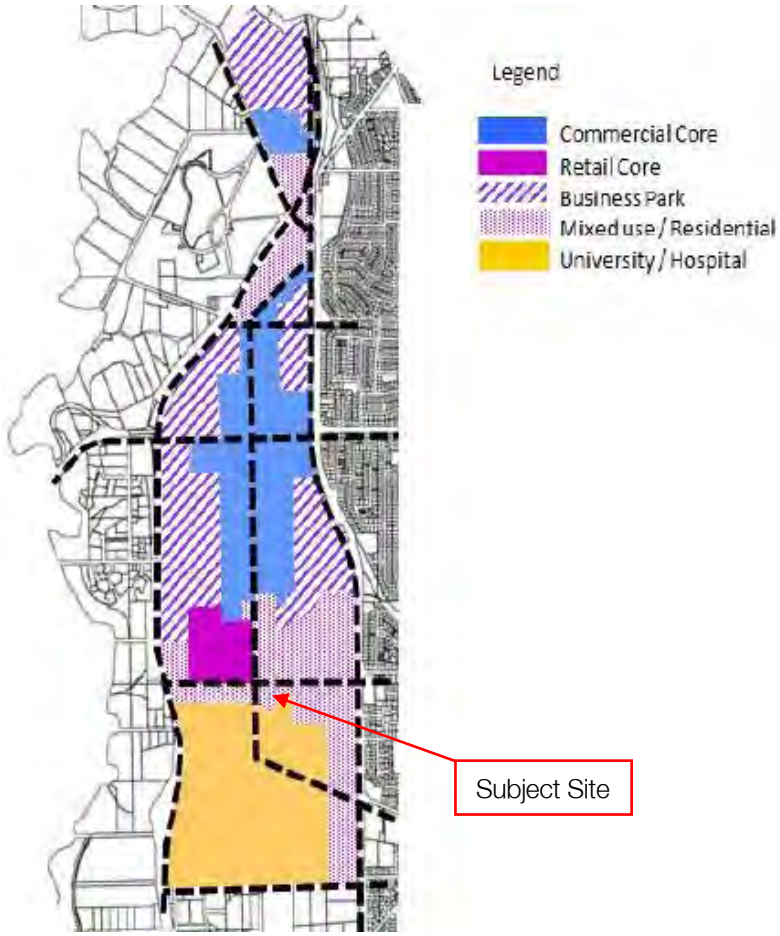

Figure 5: The Macquarie Park Corridor Urban Structure Plan – RDCP 2014

3.0 Planning Framework

3.1 A Metropolis of Three Cities

The subject site is located within the eastern economic Corridor, with Macquarie Park identified in A Metropolis of Three Cities as a Strategic centre and a Planned Precinct.

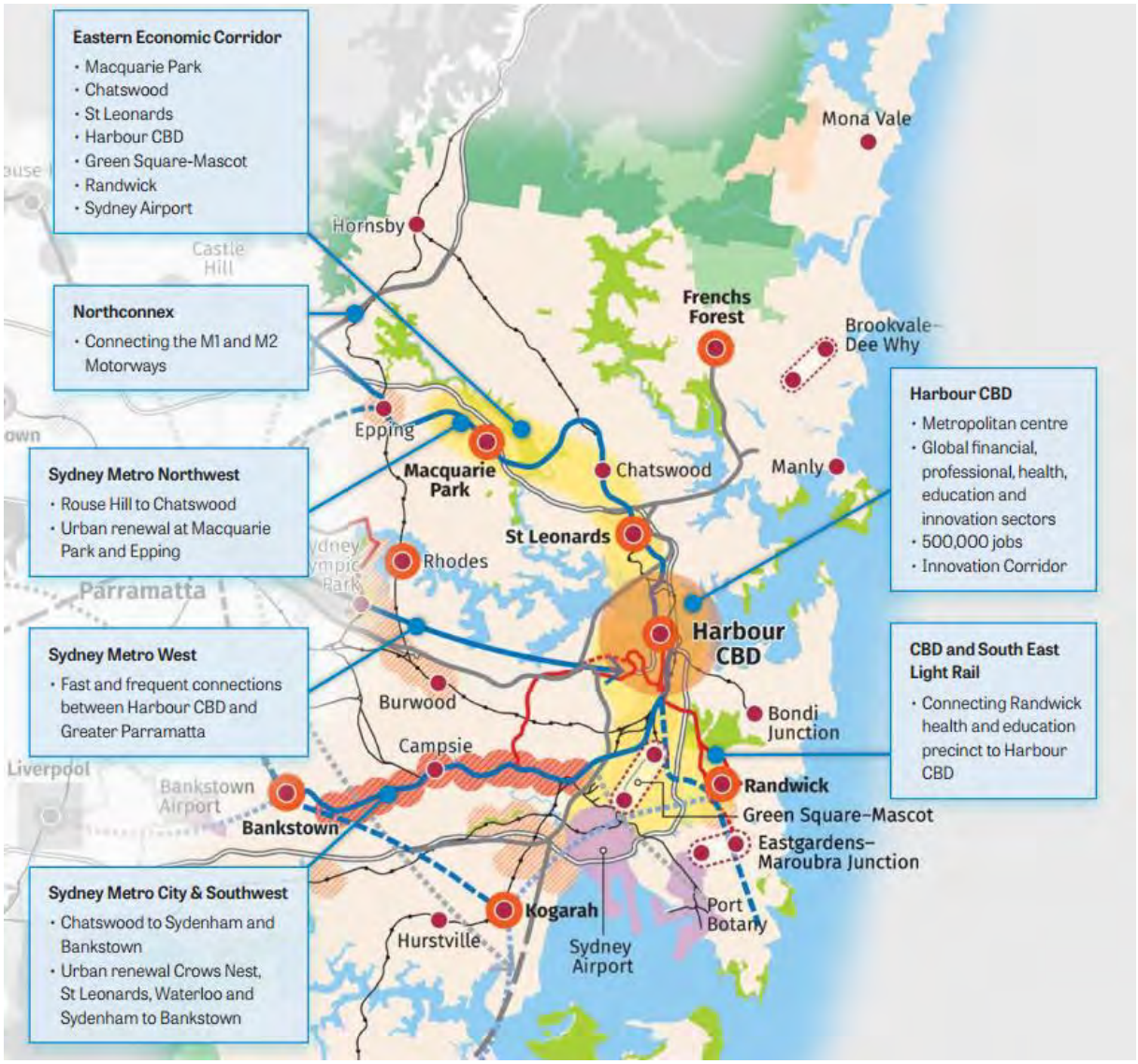

Figure 6: Extract from Eastern Harbour City Vision A Metropolis of Three Cities

The Macquarie Park area is a key element of the Eastern Economic Corridor between the Harbour CBD and Greater Parramatta CBD. The Macquarie Park area is identified as a key knowledge hub and strategic centre. The locality will also be serviced be the North-West Metro Rail Line. The subject site, while zoned B4 Mixed Use, is a part of the Planned Precinct identified for residential use.

The proposal is consistent with the broad directions of A Metropolis of Three Cities through:

- The provision of additional residential floor space within the Macquarie Park area outside of the identified core employment areas;
- Assisting the state government in achieving its target of an additional 725,000 new dwellings for the metropolitan region by 2036, in an area well connected to employment and transport;
- Facilitating development of a site which is highly accessible by public transport;
- Improving resident access to jobs, services and recreation opportunities;
- Accelerating housing supply, choice and affordability and building great places to live; and
- Retaining and reinforcing the role of the Macquarie Park area to continue to provide services and employment opportunities for the greater metropolitan area.

The pursuit of increased height and FSR at the site is consistent with the following Directions and Objectives of the plan:

Direction 1 – A city supported by Infrastructure

Infrastructure supporting new developments

Objective 4: Infrastructure use is optimised

Macquarie Park will be served by the Sydney Metro with the conversion of the existing Macquarie University Railway Station to the Metro Trains Network. The provision of residential accommodation outside the core employment areas of Macquarie Park provides further patron support for ancillary services provided by the Metro rail. The PP is consistent with this action and is entirely consistent with current and proposed FSR controls around other major centres and new Metro Stations which have FSRs ranging from 5:1 through to 17:1 including:

- St Leonards – 17:1;
- Parramatta – 12:1;
- SOPA – 8:1 – 12:1;
- Sydney CBD – 7:1 to 11:1;
- Rhodes – 9.3:1;
- Merrylands – 9:1;
- Hurstville – 9:1;
- Blacktown – 8.5:1;
- Bondi Junction – 8:1;
- Chatswood – 7:1 – 8:1;
- 112 Talavera Road Macquarie Park – 6.5:1; and
- Kings Cross – 5:1 – 7:1.

As can be seen from these comparisons, the proposed FSR is at the lower end of the comparison scale for locations with comparable transport access and proximity to employment.

Direction 2 – A collaborative city

Working together to grow a Greater Sydney

Objective 5: Benefits of growth realised by collaboration with governments, community and business

The PP is supported by an agreement to enter into a VPA with Ryde City Council. The VPA will deliver affordable housing and contribution to significant open space embellishment and upgrades. The proponent will also enter into separate arrangements to make reasonable contributions towards state infrastructure within the Macquarie Park Corridor.

Direction 3 – A city for people

Objective 7 Communities are healthy, resilient and socially connected

The site is located in a highly accessible area with easy walkable access to a wide range of employment, education, health, entertainment and service facilities. The location fosters ready access to these services and facilities by means other than the private vehicle as well as ready access to Greater Parramatta and the Harbour CBD.

The proposal does not conflict with the research and health potential of Macquarie Park. The provision of housing as proposed will potentially support these uses.

Direction 4 – Housing the city

Giving people housing choices

Objective 10 - Greater housing supply

The proposal has the potential to provide 1,250 – 1,300 dwellings, in a well serviced location, close to jobs and support facilities. Meriton is also well regarded for its commitment to project delivery and will commence the project in December 2018, when vacant possession is achieved. The proposal provides the additional housing opportunities outside of the retail core, commercial core and business park areas of Macquarie Park.

The residential opportunities are on the periphery of the Macquarie Park precinct and will assist in creating diverse activity hubs and support of the transport investment occurring in the area. It also provides additional open space and connectivity opportunities within the precinct and to the national park as well as contributions to regional recreational facilities and improved amenity for residents.

The additional housing capacity is within the established mixed use area of the Macquarie Park Planned Precinct, including the provision of affordable housing as part of the overall development. Meriton is uniquely positioned to deliver the housing despite market conditions and will commence the project as soon as possible. A DA is being prepared for demolition so works on the site can commence as soon as possible.

Objective 11 – Housing is more diverse and affordable

The proposal includes the provision of 7% of the total uplift as affordable housing, equating to 27 dwellings in a well serviced location. It will also provide a large number of apartments in close proximity to transport, employment, education, health and retail facilities promoting active travel and reducing cost of living on future residents.

Direction 6 – A well-connected city

Developing a more accessible and walkable city.

> *Objective 14 – A Metropolis of Three Cities – integrated land use and transport creates walkable and 30-minute cities*

The site is highly accessible to a range of public transport options including the future Macquarie University Metro station. This transport accessibility in conjunction with ready walkable access to a diverse range of education, health and employment services supports ready accessibility to many facilities well under 30 minutes. The transport access provides ready connectivity to Greater Parramatta, the Eastern Economic Corridor and the Harbour CDB in an easy 30 minutes.

The site is located in an area suitable to encourage walking and cycling as alternate modes of transport. The site planning also proposes to accommodate a central open space link that is an extension of linear open space to the south of the site. The site is also within 450m of the entry to the Lane Cove Valley Walk in the Lane Cove National Park to the north.

3.2 North District Plan

The City of Ryde Council is located within the North District identified under the District Plans prepared by the Greater Sydney Commission. The draft plans include a number of Planning Priorities that are to be considered by planning authorities in making strategic planning decisions.

Macquarie Park is identified in the District Plan as a Strategic Centre.

The relevant Planning Priorities to the proposal are addressed below.

Planning Priority N1 – Planning for a city supported by infrastructure

The opportunity to increase the housing density is in a location well serviced public transport infrastructure which will be enhanced by the conversion to the Metro rail. In addition to the transport infrastructure, Macquarie Park is extremely well served with tertiary education and health services.

Planning Priority N3 - Fostering healthy, creative, culturally rich and socially connected communities

Macquarie Park is underpinned by Macquarie University and the employment precinct that has evolved around it. The addition of residential housing supply ill assist in diversifying the uses in the area as well as expanding upon the provision and utilisation of services and facilities that support a more diverse population in a well-connected, readily walkable area.

Planning Priority N5 - Providing housing supply, choice and affordability with access to jobs, services and public transport

The proposal has the capacity to deliver high quality, high density living in conjunction with the provision of affordable housing as part of the mix. The dwelling mix will be weighted towards one (1) bedroom and two (2) bedroom apartments to provide more affordable stock in this well located site and in recognition of the attraction to this size of dwelling close to the education and research facilities of Macquarie Park and excellent public transport infrastructure.

The concepts include the provision of through-site open space links and support facilities on the site, such as child care. This will complement the sites proximity to transport, education, health and employment services.

The proposal is supported by an offer to provide 7% of the FSR uplift as affordable rental housing. The submission is supported by an offer to enter a VPA with Council that would deliver 27 dwellings as affordable rental housing. This provision is consistent with the underlying intent of the Priority to increase the level of affordable housing available within the Sydney Metropolitan area. The proposed provision of Affordable Rental Housing is consistent to the targets in the North District Plan, and is in addition to other commitments for the provision of onsite open space, and significant contribution towards funding of an upgrade to Christie Park.

The City of Ryde has a minimum five (5) year housing target of 7,600 dwellings. The concept proposed in support of the proposal identifies a potential dwelling yield of approximately 1,260 dwellings, or approximately 360 additional dwellings beyond the current projected capacity of the site. The 360 potential additional dwellings represent 4.7% of Ryde's five (5) year dwellings target (to 2021) in a well-served location, well capable of accommodating the building height and density. The proponent's timeframe would have the development completed within three (3) years (commencing December 2018) providing a genuine contribution to the targets. Given the transport, employment, education and urban support facilities that are readily accessible from the site it is prudent urban management to ensure that the best use of the available capacity is utilised. Otherwise, this land in this location, once developed, will not be capable of delivering additional housing for a significant period years.

Planning Priority N6 - Creating and renewing great places and local centres, and respecting the District's heritage

Macquarie Park is a strategic centre and part of the Eastern Economic Corridor. The proposal remains consistent with the Macquarie Park structure plan and does not impact upon the identified core employment lands of the centre. The proposal seeks to maximise the residential potential to support the services and facilities in the area as well as accommodating the delivery of adaptable housing as part of the ultimate development. The proposal is consistent with Action P3 to create a sense of place in Macquarie Park that diversifies activity without diminishing the potential of the identified core employment lands.

Planning Priority N11 – Retaining and managing industrial and urban services land

The proposal does not seek to alter the underlying zone or land use permissibility. The amendment to RLEP 2014 seeks to amend the applicable height of building and FSR controls. The site is located outside of the core employment lands of Macquarie Park, that is, the site is not in the Business Park, Retail Core, or Commercial Core areas. The site is in the mixed use/residential area of the applicable structure plan under the RDCP 2014. The PP request is not considered to undermine the role of the Macquarie Park Employment Lands. The provision of additional residential capacity compliments the employment and research functions of the area with managed residential accommodation within walking distance to the core commercial area and upgraded metro station. The mixed use /residential fringe area supports the core employment areas, providing accommodation options to support the area and support a vibrant mix of uses in the Macquarie Park area.

Planning Priority N12 - Delivering integrated land use and transport planning and a 30-minute city

The site is highly accessible to a range of public transport options including the future Macquarie University Metro station. This transport accessibility in conjunction with ready walkable access to a diverse range of education, health and employment services supports ready accessibility to many facilities well under 30 minutes. The transport access provides ready connectivity to Greater Parramatta, the Eastern Economic Corridor and the Harbour CDB in an easy 30 minutes.

Planning Priority N16 - Protecting and enhancing bushland and biodiversity

The site is existing urban developed land. The development of the site remains within the urban footprint and does not impact upon biodiversity or flora communities. The PP does create relief at the ground plane that will allow for the provision of at-grade open space, aligned to an existing riparian corridor.

Planning Priority N19 - Increasing urban tree canopy cover and delivering Green Grid connections

The concepts propose the delivery of a 15m wide deep soil zone that divides the site into two (2) development zones. This landscaped area could readily accommodate canopy tree planting opportunities. The concept design also retains the external road system which results in large setbacks and maximises tree retention on the periphery of the site.

3.3 Ryde Local Environmental Plan (RLEP) 2014

The PP seeks to amend RLEP 2014 relating to the Height of Building Maps and FSR Maps. It is proposed that the Height of Building Map (Sheet 004) is amended to permit building heights of 18.5m, 90m and Maximum RL 243m AHD.

The FSR Map (Sheet 004) would be amended to permit, with consent, a maximum FSR of 6.5:1 on the site.

The 6.5:1 FSR includes an allowance for Affordable Housing. To ensure delivery of the Affordable Housing to be provided. The Affordable Rental Housing provision has been based upon providing 7% of the FSR uplift as Affordable Rental Housing. The uplift in FSR is 2:1 (4.5:1 increase to 6.5:1), 7% of the uplift equates to 0.14:1. On a site area of 19,530m^2, and FSR of 0.1:1 equates to 2,734m^2. If it is assumed that each of the apartments has a gross floor area (GFA) of 100m^2 (which includes a portion of common circulation space and the like), the FSR equates to 27 apartments. The Proponent has offered and the Council has agreed to enter into VPA with Council to provide 27 dwellings within the development as Affordable Rental Housing. The VPA also makes provision for financial contributions to regional open space and an allowance for public access to open space within eth site.

The 6.5:1 FSR has been compared and analysed against other similar centres as well urban design testing. This comparative analysis identifies that FSRs in similar centres range between 5:1 through to 17:1, with the proposal being at the lower end of the range identified.

No changes or amendments are sought to Clause 4.5B Macquarie Park Corridor of Clause 6.9 Development in Macquarie Park Corridor.

The site is zoned B4 Mixed Use under RLEP 2014 as illustrated in the extract of the Land Zoning Map in Figure 7.

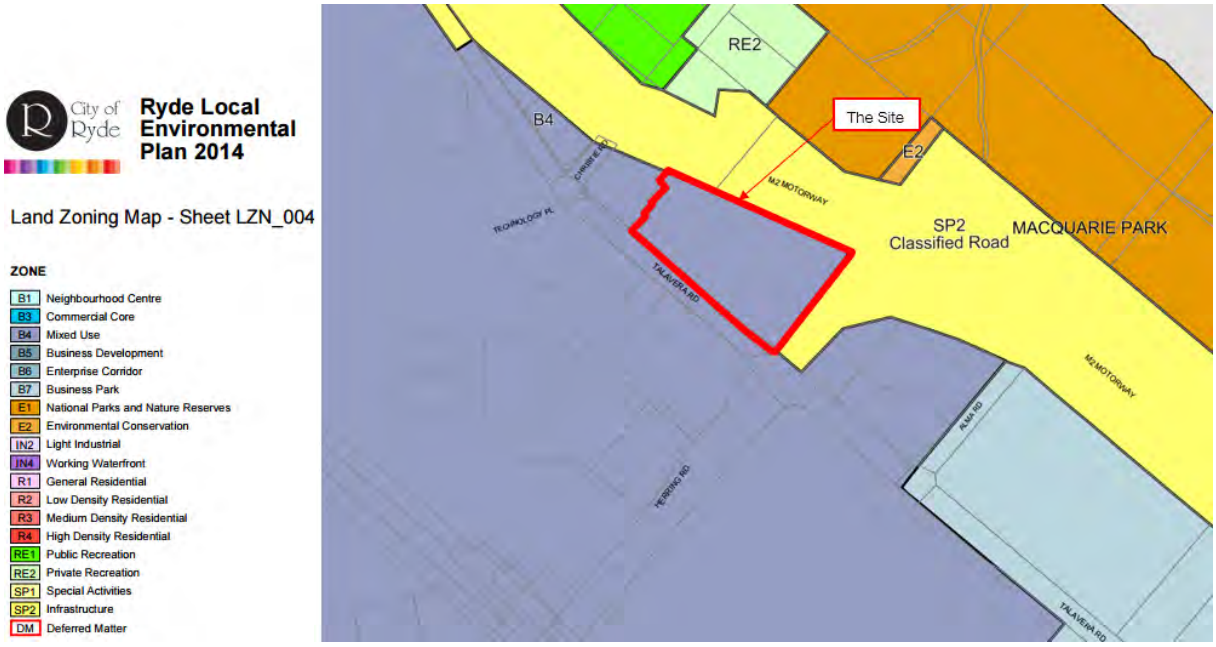

Figure 7: Extract from RLEP 2014 Land Zoning Map

The objectives of the B4 Mixed Use zone are:

- To provide a mixture of compatible land uses;
- To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling;
- To ensure employment and educational activities within the Macquarie University campus are integrated with other businesses and activities; and
- To promote strong links between Macquarie University and research institutions and businesses within the Macquarie Park corridor.

Figure 8: Extract from RLEP 2014 Floor Space Ratio Map

Figure 9: Extract from RLEP 2014 Height of Buildings Map

4.0 The Planning Proposal

4.1 Overview

This section addresses the DP&E publication *Planning Proposals – A Guide to Preparing Planning Proposals* (August 2016). This section provides:

- Objectives and intended outcomes;
- Explanation of provisions;
- Justification;
- Mapping;
- Community consultation; and
- Project timeline.

4.2 Objectives and Intended Outcomes

The objective of this PP is to amend the height and FSR development standards that apply to the site to facilitate a redevelopment of the site that:

- Provides residential accommodation in a well serviced centre with high levels of access to employment, transport, and urban services;
- Locates tall residential buildings in a location with minimal impact to sensitive uses;
- Facilitates an approach to the development of the site including ground level public space;
- Accommodates the provision to support the delivery of Affordable Rental Housing; and
- Optimise the utilisation of existing and current capital expenditure on transport infrastructure.

The amendment to the height and FSR development standards would facilitate the development of the site consistent with the principles and concepts contained in the analysis provided by SJB Urban and SJB Architects.

4.3 Explanations of Provisions

The PP does not seek to amend the underlying land use zone of the B4 Mixed Use.

To facilitate the redevelopment of the site with four (4) towers of 30, 40, 45, and 60 storeys, and over 1,260 dwellings, the amendments proposed comprise the following:

- Amend the Height of Buildings Map (Sheet HOB_004) to impose a maximum height of 18.5m, 90m and maximum RL 243m AHD;

Figure 10: Proposed amended RLEP 2014 Height of Buildings Map

- Amend the FSR Map (Sheet FSR_004) to impose a maximum FSR of 6.5:1 across the site; and

Figure 11: Proposed amended RLEP 2014 FSR Map

- Add site specific provisions for design excellence for redevelopment of the site, generally consistent with the following clause:

"Design excellence

(1) The objective of this clause is to deliver the highest standard of architectural, urban and landscape design.

(2) This clause applies to the development on land known as 112 Talavera Road, Macquarie Park, with a legal description of Lot 422 in DP 1153360.

(3) Development consent must not be granted to development to which this clause applies unless:

(a) an architectural design competition that is consistent with the Secretary's Design Excellence Guidelines has been held in relation to the development, and

(b) the design of the development is the winner of the architectural design competition, and

(c) the consent authority considers that the development exhibits design excellence.

(4) An architectural design competition is not required under subclause (3) if the consent authority is satisfied that:

(a) the development application relies on former planning controls that applied to the site; or

(b) such a process would be unreasonable or unnecessary in the circumstances, or

(c) the development exhibits design excellence.

(5) In deciding whether to grant development consent to development to which this clause applies, the consent authority must take into consideration the results of the architectural design competition.

(6) In this clause:

Architectural design competition means a competitive process conducted in accordance with the Design Excellence Guidelines.

Design Excellence Guidelines means, the Design Excellence Guidelines issued by the Secretary."

- Add site specific provision for satisfactory arrangements for contribution to designated state infrastructure.

Subject to ongoing negations between the Proponent and the DP&E, it is accepted that the site that map sheet SP1_004 may be amended to include the subject site in "Area A" to allow the existing provision of clause 6.10 to apply to 112 Talavera Road.

To support the delivery of the Affordable Housing, and open space contributions, the PP is supported by a public benefit offer. The offer outlines the terms in which the developer would be willing to deliver substantial public benefits for the dedication of onsite affordable housing and open space, as well as substantial financial commitments to the upgrade of Christie Park. This Offer has been presented to and accepted by the Council and is in addition to any state infrastructure contributions. It must also be acknowledged that the PP would result in up to an additional $10 million in Section 7.11 contributions that can provide Council with further funding for public infrastructure in the Macquarie Park area.

The intended outcome for development is provided in the following diagrams.

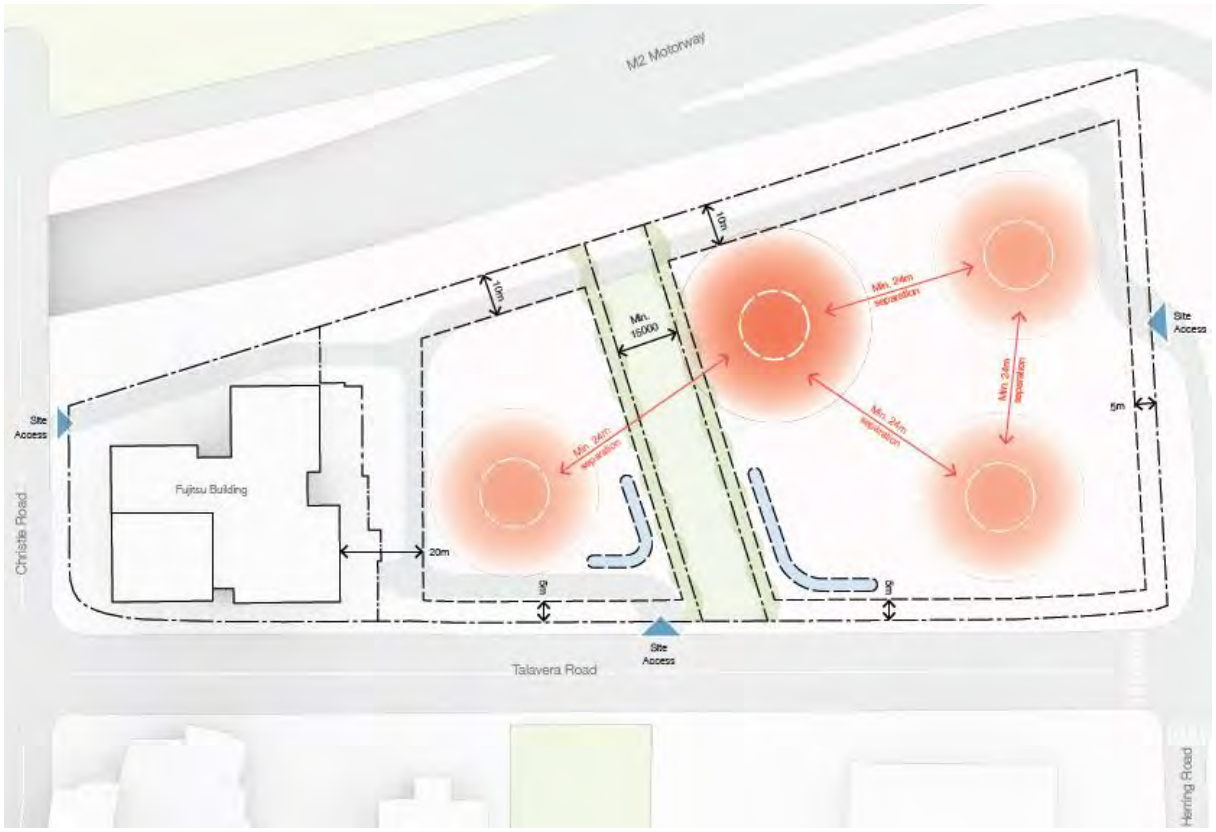

Figure 12: Indicative outcome diagram

Figure 13: Illustrative Master Plan – Indicative only, with built form subject to Design Excellence considerations

4.4 Justification and Strategic Merit

This section addresses the need for the rezoning, identifies the background studies undertaken, why the PP is the best approach and what the community benefits will be.

4.4.1 Section A – Need for the Planning Proposal

Q1. Is the planning proposal a result of any strategic study or report?

The site is located at the northern perimeter of the Herring Road Priority Precinct. In the Finalisation Report of May 2015, amendments to RLEP 2014 were recommended. These amendments delivered the planning controls that currently apply to the site. Since the finalisation of the Herring Road precinct there have been substantial shifts in strategic planning context and Government priorities that recognise the need to pursue greater housing supply and affordability, particularly in locations with access to jobs and public transport such as the subject site. These factors support the request to better utilise the available urban land already zoned for residential purposes.

While these controls delivered a precinct wide planning framework, the opportunity has been taken to critically review the potential for the subject site in the broader context of Macquarie Park and population projections since 2015.

The subject site is in close proximity to Macquarie University rail station. This location advantage has then been considered in the context of the development capacity of the site and, in particular, building height. An urban design and impact exercise has been pursued to test impacts to surrounding land that would arise from heights of over 60 storeys. This testing was undertaken in the context of ensuring ADG consistency could be achieved and to explore the opportunities that tall, slender towers afforded with regard to opportunities to extend open space through the site.

This exercise of testing heights, massing, and tower placement has identified that the provision of four (4) towers can deliver apartments readily capable of achieving ADG amenity requirements. The tower configuration has also been demonstrated to avoid adverse solar access impacts upon sensitive land uses. This is further aided by the sites location, being bound on three (3) side by roads, including the M2 Motorway.

The proposal is supported by detailed urban design and traffic and transport assessment prepared to analyse the sites capacity and ability for the additional development to be accommodated. These studies demonstrate that the proposed density can be supported and will respond to of the shift in strategic planning context and Government priorities for increasing housing supply and affordability. The standalone proposal is supported by appropriate studies that confirm the potential of the site and the ability for potential impacts to be managed and public benefits delivered.

Q2. Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

The PP is considered the best option as it will allow the redevelopment of the site in a manner that is compatible with the concepts prepared. The variation to the height of building and FSR controls could not reasonably be pursued via a variation under Clause 4.6 of RLEP 2014.

Further, the PP approach provides a mechanism for the proponent to deliver substantial public benefits not otherwise required under the existing controls. This will provide contributions to Council's affordable housing portfolio in an appropriate location and fund improvements to district open space at Christie Park that would otherwise require amendments to Council's Section 94 Development Contribution Plan 2007 (S94 Plan), and a long term horizon within which to accumulate the required funds.

A site specific LEP rezoning is preferred as it allows a detailed response to the site as opposed to a more broad brush approach of a comprehensive LEP. A site specific rezoning will enable a more detailed analysis of the site considerations and the delivery of appropriate controls and mechanisms to deliver the future development of this central location. The proponent has agreed to the preparation of a site specific DCP.

4.4.2 Section B – Relationship to Strategic Planning Framework – The Strategic Merit Test

In considering if a PP should proceed to gateway determination, strategic merit is to be demonstrated. Section B – Relationship to Strategic Planning Framework from *Planning Proposals – A Guide to Preparing Planning Proposals* (August 2016) provides the matters to be considered when determining strategic merit. The particular matters to be considered are addressed below.

Q3. Is the planning proposal consistent with the objectives and actions of the applicable regional, sub-regional strategy, or district plan or strategy (including any exhibited draft plans or strategies)?

The consideration of the strategic framework at Section 3.0 confirms the consistency of the proposal relating to:

- Growing jobs and housing across Sydney to create vibrant hubs of activity;
- Acceleration of housing supply;
- Acceleration of housing supply in designated infill areas;
- Provision of housing supply in a transport corridor being transformed by investment and in a strategic centre;
- Delivery of additional and affordable rental housing;
- Provision of housing in a locality that does not diminish employment or urban services land;
- Contributing increased on the periphery of the Macquarie Park Strategic Centre; and
- Delivery of an additional 500 dwellings representing 6.58% of the Ryde target of 7,600 dwellings in the Draft North District Plan.

Does the proposal have strategic merit? Is it:

- *Consistent with the relevant regional plan outside of the Greater Sydney Region, the relevant district plan within the Greater Sydney Region, or corridor/precinct plans applying to the site, including any draft regional, district or corridor/precinct plans released for public comment; or*
- *Consistent with a relevant local council strategy that has been endorsed by the Department; or*
- *Responding to a change in circumstances, such as the investment in new infrastructure or changing demographic trends that have not been recognised by existing planning controls?*

The consistency of the proposal with *A Plan for Growing Sydney* and the Draft North District Plan has been addressed in detail in Section 3.0 of this PP.

In considering the strategic merit of the site, the Herring Road Priority Precinct was finalised in May 2015. Since this time, the District Plans have been released, and the housing delivery targets from *A Plan for Growing Sydney* have been revised in A Metropolis of Three Cities.

The estimates have identified an unmet demand of a further 725,000 dwellings for Greater Sydney by 2036 in a Metropolis of Three Cities (compared to the target in *A Plan for Growing Sydney* of 664,000 by 2036).

These increased housing demand projections represent a 9.2% increase in dwellings to be provided. This recognition of the increasing housing demand reinforces the planning sense to maximise the available opportunities in well serviced locations to minimise future demand pressures for housing delivery.

The recognition that the demand for additional housing is greater than anticipated at the time of the finalisation of the Herring Road Priority Precinct justifies a review of the site, particularly given the identified ability for development of taller towers to be pursued without unacceptable amenity impacts to sensitive land uses.

The review of the planning provision is supported by the investment in infrastructure, particularly public transport in the form of the Sydney Metro. The conversion of Macquarie University Station to be part of the Sydney Metro will further add to the connectivity and accessibility of the locality. Sound urban management and maximising public investment returns support the approach to ensure the limited land resource Is utilised to maximum efficiency. In addition, the approach to the site reflected in the concepts accommodates the provision of a central north south open space spine that reflect the Macquarie Park finalisation report and provides the ability for future pedestrian connectivity to the open space to the north, over the M2 Motorway to be explored.

The proposal does not conflict with the underlying intent of the Macquarie Park corridor with the additional housing opportunities proposed within an area of the corridor that is outside the identified core retail and employment areas. The site is within the mixed use area and the subject site is subject to a Development Consent for a substantial residential development. The increase in the potential FSR does not undermine the employment and economic generation forecasts for the core employment areas, rather seeks to more efficiently utilise the site for increased residential purposes consistent with the strategic decisions already made that this area is suitable for mixed use development. The proposed towers have been extensively tested to demonstrate that the proposed residential dwellings will achieve high levels of amenity without adversely impacting upon the amenity or development potential of surrounding lands.

From an underlying land use perspective the proposal does not conflict with the strategic intent for the Macquarie Station Precinct, rather achieves a greater utilisation of the available land resource for additional housing opportunities in a location that has been recognised as being highly suitable for mixed use development.

The proposal responds to the North District Plan by including an offer to enter into a VPA to provide 27 dwellings as Affordable Rental Housing. The provision of 27 dwellings is equivalent to 7% of the FSR uplift proposed via the PP.

These factors, in conjunction with the Affordable Rental Housing offer, supports the review of controls requested being pursued.

In considering the three (3) points raised in the strategic merit test, the request is considered to have strategic merit as:

- The request has been demonstrated to be consistent with the North District Plan;
- Does not conflict with the Ryde Local Planning Study 2010 which was prepared to inform RLEP 2014;
- Is responding in particular to the investment in infrastructure in the vicinity through the delivery of the Sydney Metro Network;
- Is responding to the housing demand forecast identifying an increase in unmet demand for housing to 2036 which has increased from 664,000 dwellings to 725,000 dwellings;
- The proposal is reflecting the expectation that further updates of the District Plan will reflect the increased demand forecast; and
- The proposal includes a provision for Affordable Rental Housing, responding to the District Plan.

Q3(b). Does the proposal have site specific merit, having regard to the following:

- *The natural environment (including known significant environmental values, resources or hazards);*
- *The existing uses, approved uses, and likely future uses of land in the vicinity of the proposal; and*
- *The services and infrastructure that are or will be available to meet the demands arising from the proposal and any proposed financial arrangements for infrastructure provision?*

The site is existing developed urban land and therefore does not have impacts to significant environmental values or natural resources. The site is not subject to natural hazards of land slip or geotechnical instability. The site is identified as being subject to minor impacts from a 100 year ARI flood event and the PMF event.

The ability to manage the flood impacts upon the site are addressed in the Preliminary Flood Impact Assessment (Attachment 4) which concludes that the flood issues affecting the site are manageable to support the development. The potential impacts are to the periphery of the site, and the potential impacts are readily able to be managed to avoid any adverse impacts to the site and surrounding lands. The assessment has identified that the duplication of the current piped drainage through the site, flood risk could be reduced and the design floor levels able to be reduced.

The site is also mapped as partly impacted by the buffer to the bushfire prone land which is the bushland that includes the Lane Cove River to the north. The M2 Motorway is an extensive vegetation free buffer between the site and the bushfire prone land. Bushfire is considered unlikely to be a constraint to development on the site.

The sites key merits relate to its proximity and access to significant employment and service lands in the Macquarie Park Corridor and existing passenger rail services at Macquarie Park University Station.

The location of the site supports the provision of increased housing capacity on the site in this well served location. The proximity to employment, research and educational facilities also supports the proposal to include the provision of Affordable Rental Housing in future development.

The PP will generate up to an additional $10 million in S7.11 payment, affordable housing and open space commitments. It is considered that the PP provides sufficient financial contributions to meet the demands of the requested amendment and delivers benefits to the broader community.
Q4. Is the planning proposal consistent a local council's Local Strategy, or other local strategic plan?

Ryde Council prepared a Local Planning Study (December 2010) ("the study") to inform the comprehensive LEP. The comprehensive LEP became RLEP 2014.

The strategy predates *A Metropolis of Three Cities* North District Plan.

The study identifies Macquarie Park as a specialised centre to be a premium business location with traffic congestion identified as a major constraint. At that time, Macquarie Park was estimated to have capacity for a further 3,780 dwellings to 2021 and has been superseded by subsequent overarching policy decisions and population growth projections for the Sydney metropolitan region. *A Metropolis of Three Cities* projects a dwelling growth of 725,000 by 2036. This represents an increase of 61,000 or 9.2% from the previous A Plan for Growing Sydney.

Despite this, the proposal is consistent with many of the Strategic Directions of the Study as:

- The City's ecological footprint is constrained by reusing existing urban land and supporting public transport usage, walking, and cycling;
- Contributes to additional open space opportunities;
- Supports growth in the centre providing housing and supporting jobs and services in the locality;
- Improves the public domain through improved through-site access and open space provision;

- Maximises residential potential outside of the identified core employment lands; and
- Encourages walking, cycling, and public transport uses.

It is noted that Council has also recently resolved to proceed with a PP to introduce significant height increases for development of a similar sized site to the east known as 66-82 Talavera Road. This site is within the business park area of Macquarie Park, with the Draft PP including the proposal to accommodate up to 1,260 dwellings in addition to 20,000m^2 of office accommodation. The Council has endorsed a proposal to increase the height from 45m to 120m (166% increase) and increase the FSR from 1.5:1 to 3.5:1 (133% increase), or up to 4.75:1 (217%) when taking into account agreed GFA exclusions.

Q5. Is the planning proposal consistent with applicable state environmental planning policies?

The consideration of these State Environmental Planning Policies and deems SEPPs has identified that the PP does not conflict with any of these policies:

SEPP Title	Consistency	Comment
SEPP 19 Bushland in Urban Areas	Yes	The proposal is unlikely to have adverse impacts upon urban bushland.
SEPP 44 Koala Habitat Protection	Yes	The site does not include potential koala habitat.
SEPP 55 Remediation of Land	Yes	The PP does not alter land use permissibility or introduce permissibility for sensitive land uses. Past land use would continue be considered at DA stage as required by Clause 7 of the SEPP.
SEPP 64 Advertising and Signage	N/A	Should the PP proceed future development would be subject to the provisions of this SEPP.
SEPP 65 Design Quality of Residential Flat Development	Yes	The Masterplan has had regards to the principles of SEPP 65.
SEPP 70 Affordable Housing (Revised Schemes)		The provisions of the SEPP apply to the City of Ryde and will be addressed by future DAs.
SEPP (Building Sustainability Index: BASIX) 2004	Yes	This SEPP is relevant to specific development that would be permitted on the land. Future development would need to comply with these provisions.
SEPP (Housing for Seniors or People with a Disability) 2004	Yes	This SEPP is relevant to specific development that would be permitted on the site and would need to comply with these provisions should this development be pursued.
SEPP (Infrastructure) 2007	Yes	This SEPP is relevant to particular development categories. This PP does not derogate or alter the application of the SEPP to future development.
SEPP (Exempt and Complying Development Codes) 2008	Yes	This SEPP is relevant to particular development categories. This PP does not derogate or alter the application of the SEPP to future development.

SEPP Title	Consistency	Comment
SEPP (Affordable Rental Housing) 2009	Yes	This SEPP is relevant to particular development categories. This PP does not derogate or alter the application of the SEPP to future development.
SREP (Sydney Harbour Catchment) 2005	Yes	Consideration of this deemed SEPP will continue to apply relating to management of water quality entering the Sydney Harbour Catchment.

Table 2: Consistency of the Planning Proposal with SEPP titles

Q.6 Is the planning proposal consistent with applicable Ministerial Directions (S9.1 Directions)?

The PP would be consistent with all relevant Directions as detailed below:

S117 Direction Title	Consistency	Comment
1.0 Employment and Resources		
1.1 Business and Industrial Zones	Yes	The PP does not seek to alter the applicable B4 Mixed Use zone applying to the land.
1.2 Rural Zones	N/A	
1.3 Mining, Petroleum Production and Extractive Industries	N/A	
1.4 Oyster Aquaculture	N/A	
1.5 Rural Lands	N/A	
2.0 Environment and Heritage		
2.1 Environment Protection Zones	Yes	The PP does not propose the introduction of an Environmental Protection zone.
2.2 Coastal Protection	N/A	
2.3 Heritage Conservation	Yes	There are no known matters of heritage significance required to be considered for the site and there are no heritage items located on the site.
2.4 Recreation Vehicle Areas	N/A	
3.0 Housing, Infrastructure and Urban Development		
3.1 Residential Zones	Yes	The proposal is considered to be consistent with the direction, including the potential to broaden housing choice and provision in a location able to make efficient use of existing infrastructure and services. The range of housing includes 7% of the uplift as Affordable Rental Housing that would be dedicated free of charge to the Council.
3.2 Caravan Parks and Manufactured Home Estates	NA	
3.3 Home Occupations	Yes	Home occupations will continue to be permitted, to be carried out in dwelling houses without the need for development consent.

S117 Direction Title	Consistency	Comment
3.4 Integrating Land Use and Transport this Ministerial Direction	Yes	The PP is considered to be consistent with this Direction through: • The Proposal will provide housing in a location that will be well serviced by public transport and in a location able to support cycling and walking in close proximity to employment lands, adjacent to an existing retail centre in in an area designated a Local Centre in the Draft District Plan; • The provision of a small proportion of housing in a location that is 300m from an existing centre that contains retail, commercial, education, and community facilities; • The site enjoys pedestrian and cycleway connections through the site; • The proposal will facilitate further pedestrian and cycleway connections through the site; • Providing an opportunity for residential development that improves opportunities for travel by means other than by car; and • Supports the efficient and viable operation of public transport services.
3.5 Development Near Licensed Aerodromes	N/A	
4.0 Hazard and Risk		
4.1 Acid Sulphate Soils	Yes	The area is not subject to potential acid sulfate soils.
4.2 Mine Subsidence and Unstable Land	NA	
4.3 Flood Prone Land	Yes	The PP will be consistent with this Ministerial Direction. Small areas of the site are subject to flooding. The PP is supported by a flood report confirming these impacts can be readily managed on the site, and it is possible to reduce flood levels as a result of this development.
4.4 Planning for Bushfire Protection	Yes	The site is partly mapped as being within the buffer area to bushfire prone land. The mapped buffer includes the M2 Motorway, which forms a substantial vegetation free barrier to the site. Bushfire is considered unlikely to impact upon development on the subject site and can be dealt with at the DA stage.
5.0 Regional Planning		
5.2 Sydney Drinking Water Catchments	N/A	

S117 Direction Title	Consistency	Comment
5.3 Farmland of State and Regional Significance on the NSW Far North Coast	N/A	
5.4 Commercial and Retail Development along the Pacific Highway, North Coast	N/A	
5.8 Second Sydney Airport: Badgerys Creek	N/A	
5.9North West Rail Link Corridor Strategy	N/A	
5.10 Implementation of Regional Plans	Yes	The PP is consistent with the Regional Plan *A Metropolis of Three Cities* and has been specifically addressed in the PP request.
6.0 Local Plan Making		
6.1 Approval and Referral Requirements	Yes	The PP is consistent with this Ministerial Direction.
6.2 Reserving Land for Public Purposes	Yes	The PP is consistent with this Ministerial Direction.
6.3 Site Specific Provisions	Yes	The PP includes a site specific provision to facilitate the delivery of high quality architectural development with the requirement for a design competition in certain circumstances.
7.0 Metropolitan Plan Making		
7.1 Implementation of the Metropolitan Strategy	Yes	The PP is consistent with the relevant actions from A Metropolis of Three Cities and the North District Plan as detailed within this submission.

Table 3: Consistency of the Planning Proposal with Ministerial Directions

4.4.3 Section C – Environmental, Social and Economic Impact

Q7. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The request for a PP is for existing developed urban land and is not considered to have any adverse impacts upon threatened species, population or ecological communities.

Q8. Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

The PP is supported by a Flood Impact Assessment confirming the ability for the minor impacts to be managed, and flood levels could actually be reduced as a result of the public link and associated drainage amplification.

The proposal is also supported by a Transport Assessment which concludes that the transport network can accommodate the projected increase in housing provision that would be facilitated. The assessment has addressed the testing of the additional traffic generation. The assessment identifies that the testing of the small additional trip generation is not suitable to be tested under the AIMSUN Model. That is the scope of the AIMSUN model is large that the sensitivities of the model would not deduce reliable results for the additional

52 additional peak hour trips that would be generated by the additional development capacity. The traffic assessment identifies that the SIDRA modelling that was undertaken remains the most appropriate tool and assessment modelling for the analysis of the traffic impacts. This assessment has concluded that the additional development capacity would not have a detrimental impact upon the performance of the local road network.

The proposed built form has been tested for its impacts on surrounding land in relation to solar access. The sites location is such that the proposal does not result in unacceptable solar access impacts to residential properties or public open space areas. The design review section of the urban design report has undertaken a comparison assessment between a compliant building envelope under the exiting controls and the proposed envelopes. The current controls establish a perimeter enclosure of the site with six (6) buildings. The alternate envelopes established under the proposed controls would accommodate four (4) towers.

The morning shadow is cast to office buildings within the mixed use, residential area to the immediate south of the site. The shadows cast are larger, but narrower than those cast by a complying envelope. The majority of shadow cast by 1:00pm in midwinter is being cast towards the Macquarie Shopping Centre rooftop car park and loading dock areas. Beyond 2:00pm, the shadows cast will be towards the serviced apartments to the east of the site. These serviced apartments are unaffected by shadows between 9:00am and 1:00pm in midwinter.

The proposal seeks to amend the height of building development standard to facilitate towers of 30 to 60 storeys in height. This will result in taller, more slender tower forms that will have fast moving shadows. The shadow comparison between the current complying envelopes and the proposed envelopes in the Urban Design Report identify gaps in the taller slender shadow cast rather than the more solid shadow of the current envelopes, particularly between 9:00am and 1:00pm.

The urban design and architectural analysis have identified that the tower placement on the site can achieve ADG spatial separation requirements. From a visual impact assessment, the proposal contemplates the tallest tower centrally on the site. The varied tower heights provide a visually interesting skyline and can act as a marker to the Christie Road and Herring Road entry points to Macquarie park off the M2 Motorway. Figure 14 demonstrates the potential towers in the context of existing height development standards in the vicinity.

Figure 14: Potential view of the corner of the Herring Road and M2 Motorway

The proposal is also supported by an Aeronautical impact assessment to ensure aviation navigation requirements would not be conflicted with by the proposal. The assessment identifies that the site has a PANS OPS height of RL 246.3m AHD. The proposed building envelope has an effective height to RL 243m AHD. To ensure the Height of Buildings provisions would not conflict with aviation limitations it is proposed that for the portion of the site proposing development up to 60 storeys, the height control is expressed as a

maximum RL. Accordingly, the height of building maps impose a maximum RL of 243m on the eastern portion of the site. The balance of the site with maximum height of 90m is well below the obstacle limitations.

The site will be subject to a site specific DCP which will draw upon the masterplan principles developed in the Urban Design Report. The site specific DCP would retain reliance upon the broad requirements of Part 4.5 Macquarie Park of RDCP 2014.

The site specific provisions are anticipated to guide:

- A four (4) tower solution;
- Tower placement and height graduation;
- Perimeter setbacks;
- Preferred active frontage locations;
- Public open space location alignment; and
- Site access locations.

Q9. How has the planning proposal adequately addressed any social and economic effects?

Social Effects

The site does not contain any items of known heritage significance and is highly disturbed from previous development.

The site proposes the provision housing on land outside the core employment lands of Macquarie Park, which is one of the most significant employment centres in Australia. The site has location attributes that make it highly desirable to pursue high density residential housing. It is a large site within 400m of a soon to be Metro Station, and walking distance to internationally renowned educational and medical facilities. The Metro will provide easy access to Sydney CBD, making it an appropriate location for maximising residential density without compromising employment capacity and access to Macquarie Park.

The proposal includes the provision of 27 dwellings as Affordable Rental Housing. The massing studies identify a potential dwelling yield of 1,260 dwellings. The provision of this potential quantum of Affordable Rental Housing dwellings in conjunction with the private dwellings in a location that is highly accessible to employment, services, education and transport is a highly desirable outcome, and consistent with all key strategic planning policies.

The site planning that is facilitated by the tower form approach to the site has afforded the opportunity to provide an open space break through the site on a north-south alignment. This deep soil landscape opportunity provides a potential publicly accessible landscaped open space through the site. The landscape treatment would be a visible extension of the lineal open space approach for sites to the south which have followed the alignment of the natural drainage line.

This approach provides further ground level landscaping to augment the landscaped amenity of the site for the public and future residents of the development. This significantly enhances the amenity compared to a complying scheme. The PP is not considered to present any adverse social impacts.

Economic Effects

The proposal has the potential to deliver a range of positive economic impacts with the potential provision of a significant level of Affordable Rental Housing that is well located to suit a range of potential key worker groups. The potential to provide affordable rental accommodation closer to employment opportunities and transport improves the prospect of reducing commute times with the consequent social benefits that can

provide. Locating housing within excellent access to jobs, transport, services etc. to reduce demand on cars and increase patronage and utilisation of the Government's investment in the Metro transport project.

Positive economic effects:

- Affordable Rental Housing dedicated without cost;
- Open space (over 1,300m^2) dedicated without cost;

- Financial contribution to Stage 2 of Christie Park Upgrade; and
- Additional $10 million in S7.11 contributions.

Q10. Is there adequate public infrastructure for the planning proposal?

The locality is a highly urbanised area that I accessed by the full range of urban services and utilities. The maximisation of the residential capacity, the planning amendment and potential future redevelopment supports sound principles for utilising existing community investment in infrastructure and services in the locality. Any augmentation of utility services will be undertaken as required.

Q11. What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway Determination?

This section will be completed following consultation with any State and Commonwealth Public Authorities identified in the Gateway Determination. However, the PP is consistent with the latest strategic planning policies and Government approach to increase housing supply in appropriate locations.

4.5 Part 4 – Mapping

The current maps as they apply to the subject site are proposed to be amended in accordance with figures 15 and 16.

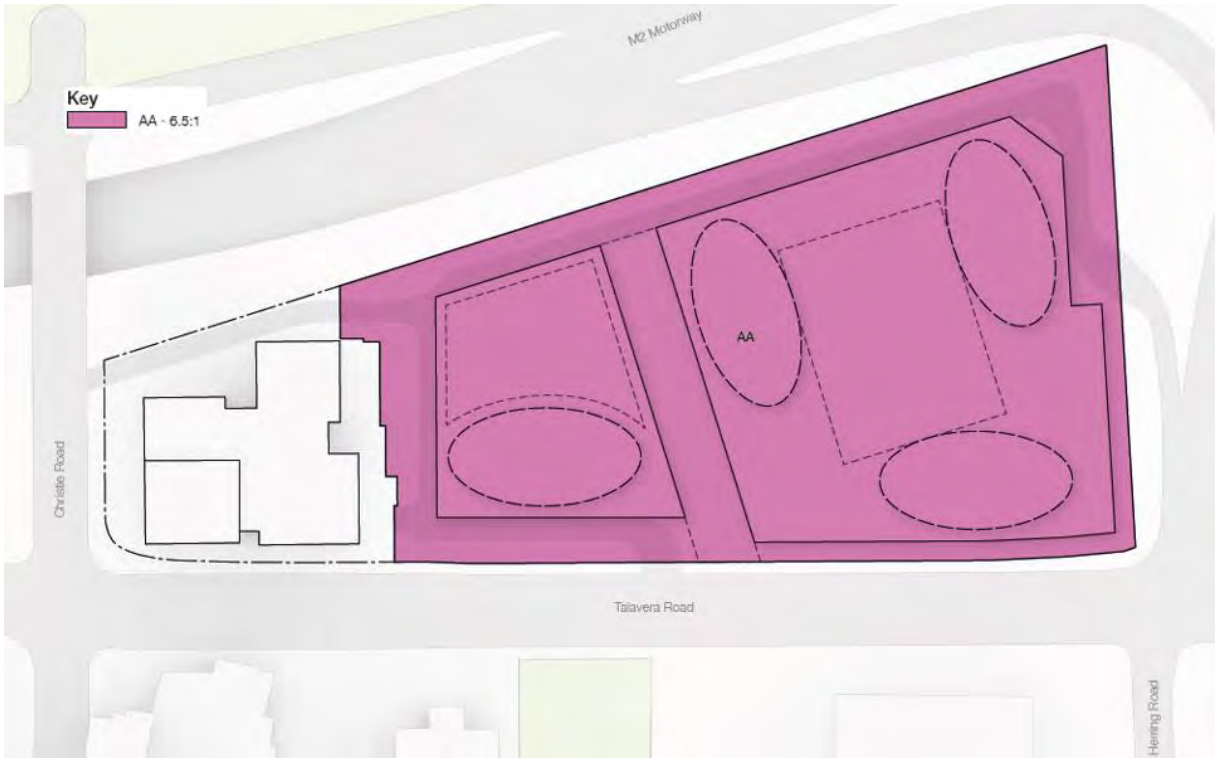

Figure 15: Proposed FSR Map

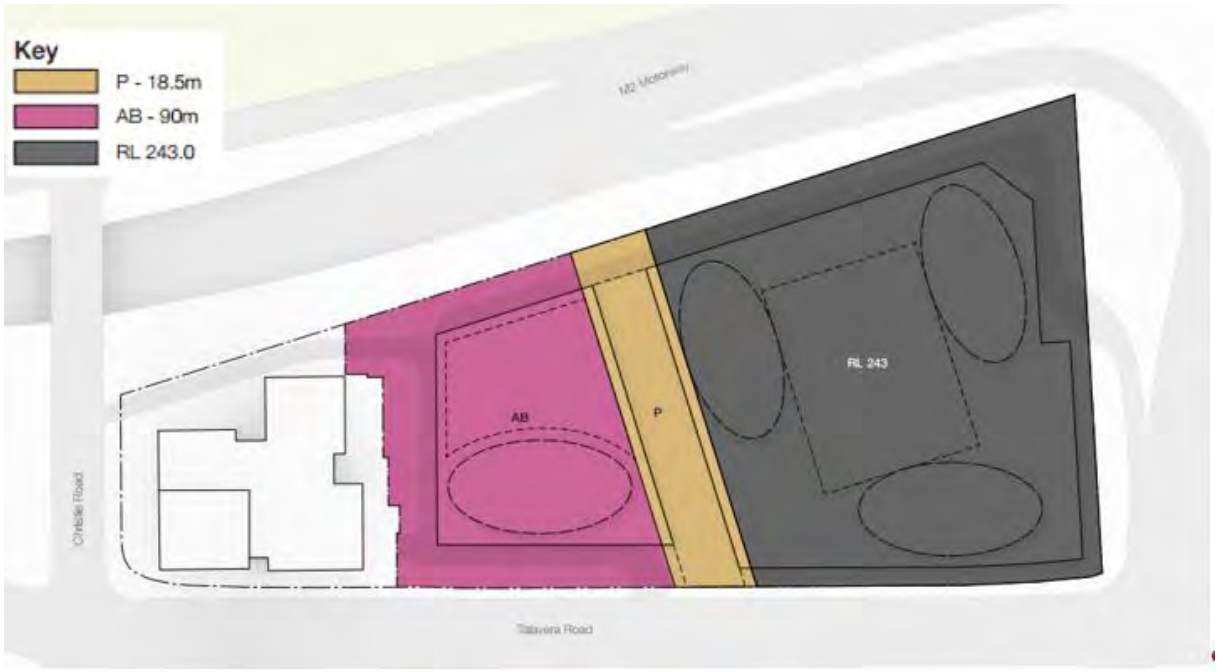

Figure 16: Proposed Height of Buildings Map

The amended mapping proposes a new FSR of 6.5:1 across the site and a varied height providing 190m to the south, a maximum of 18.5m through the central area of the site stepping up to a maximum of RL243m AHD for the eastern portion of the site.

4.6 Part 5 – Community Consultation

It is expected that community consultation will be pursued consistent with standard practice of:

- Notification of surrounding land owners;
- Public notification in local newspapers; and
- Notification on Council's website.

Should further consultation be required, this can be managed through the Gateway Process.

4.7 Part 6 – Project Timeline

- Planning Proposal exhibition – October/November 2018;
- Review of submissions – November/December 2018;
- Consideration by Council of exhibition outcomes – December 2018; and
- Planning Proposal finalisation February/March 2019.

5.0 Conclusion and Recommendations

This PP for 112 Talavera Road, Macquarie Park, seeks to retain the B4 Mixed Use zone, but amend the height of buildings and FSR development standards, and add site specific provisions for design excellence for development of the site as well as a provision of contribution towards designated state infrastructure in the Macquarie Park locality.

The amendments to the development standards requested would facilitate the redevelopment of the site to accommodate tall towers forms. The proposed tower forms, ranging between 30 and 60 storeys, have been demonstrated as being capable of being developed without adverse impact to sensitive lands. Critically, the location is outside of the core employment areas of Macquarie Park and is already identified as suitable for significant residential development.

The PP request ensures that the potential of the site is best realised to maximise the benefit of the sites proximity to public transport, employment, education, and urban services.

The provision of taller towers in addition to providing dwellings in a well serviced location provides marker to the entry to Macquarie Park with the varied tower heights achieving a visually interesting skyline.

The supporting studies identify that potential flood impacts on the site can be readily managed. The urban design analysis supports the approach for taller towers with a break in the podium to deliver a north south oriented landscaped open space providing a landscaped asset for future residents and surrounding residents and workers. The proposed tower forms have been demonstrated to have no adverse impacts on sensitive land uses and existing open space areas. The proposed height of buildings standard has been considered against navigation considerations and have been confirmed as being able to avoid potential navigation restrictions. The additional development capacity has been tested to ensure that the existing transport network can accommodate the additional demand. This analysis has confirmed that the proposed network can accommodate the level of additional development identified.

In addition to realising the residential development potential and capacity of the site the proposal is supported by an offer to provide 27 dwellings as affordable rental housing by way of a VPA with Council, as well as upgrades to existing open space in the area.

The outcome for a redevelopment of the site in accordance with the requested development standards will be a contribution of approximately 1,260 dwellings to the 725,000 dwellings now projected as required in Greater Sydney by 2036.

The approach to the site is to provide taller towers to reduce the street wall impacts of the current controls and break site to accommodate a north south oriented lineal open space. This open space provides additional landscape open space for the areas as well as providing a future option for pedestrian connectivity over the M2 Motorway to the open space to the north accommodating the Lane Cove River.

The proposal supports the public investment in infrastructure in the locality and ensures that a diverse and vibrant community is achieved in Macquarie Park. This can be achieved in this instance without adverse impact upon the employment land capacity of the area and this important contribution to the economy of Sydney and NSW.

It is therefore requested that arising from the consideration of this PP request that the RLEP 2014 be amended in the following manner:

- Amend the Height of Building Map (map sheet HOB_004) to show new maximum building heights of 18.5m, 90m and RL 243m AHD and 200m;
- Amend the Floor Space Ratio Map (map sheet (FSR.004) to show a maximum FSR of 6.5:1 applying to the site; and
- Add site specific provisions for design excellence for development of the site.

Attachment 1: Urban Design Report prepared by SJB Urban

SJB Architects
SJB Urban

Urban Design Report
Talavera Road, Macquarie Park

112 Talavera Road,
Macquarie Park, 2113

We create spaces people love.
SJB is passionate about the possibilities of architecture, interiors, urban design and planning.
Let's collaborate.

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Prepared for
Meriton Group

Issued
12 October 2018

We create amazing places

At SJB we believe that the future of the city is in generating a rich urban experience through the delivery of density and activity, facilitated by land uses, at various scales, designed for everyone.

Ref: 5633
Version: 09
Prepared by: JS, JF, AG
Checked by: JK, NH

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Contents

Introduction

1

Overview of the regional, urban and local context to provide an initial undestanding of the site.

Introduction

1.1 Purpose of this Report

SJB have been appointed by Meriton Group to prepare an Urban Design Report for 112 Talavera Road, Macquarie Park. The purpose of this report is to test the development capacity of the site against the strategic context, existing planning controls, opportunities and constraints in a detailed and comprehensive manner, taking into account the future vision for Macquarie Park.

The report also considers the ability of future development on the site to achieve design requirements of SEPP 65 and the Apartment Design Guide (ADG), and the consolidated impact of development on surrounding land uses.

The outcome of the report provides a concept master plan for the site, which will form the basis of a Planning Proposal.

The analysis and options have been assessed against the context of current planning controls for the site and a suite of strategic planning documents, which include:

- A Plan for Growing Sydney 2014
- Draft North District Plan 2016
- Herring Road Priority Precinct Plan 2012
- Ryde Local Environmental Plan 2014
- Ryde Development Control Plan 2014

The concept master plan supports the planning proposal to amend the sites current FSR of 4.5:1 to a proposed FSR of 6.5:1 and maximum building height up to 200 metres.

The urban design report reinforces the planning proposal on the following grounds:

- The site is situated at the gateway of Macquarie Park, requiring a prominent/landmark built form
- The site is located within excellent proximity to public transport including bus, rail and the future metro
- The proposal will supply additional dwellings addressing the pressure on land zoned for housing purposes, offsetting the pressure to rezone vital commercial and employment lands
- The proposal will contriubte to increased public benefit including site linkages, open space and pedestrian scale frontages
- The proposed controls facilitate unique built form outcomes, enhancing design excellence for the precinct

Figure 01: Aerial View of Site from the North-west - Distant City Views Visible in to the South-east

1.2 Strategic Context

A Plan for Growing Sydney

A Plan for Growing Sydney is the NSW Government's plan for the future of the Sydney Metropolitan Area over the next 20 years.

The site is located within Sydney's Global Economic Corridor. The corridor extends from Port Botany and Sydney Airport, Mascot through Sydney CBD, Macquarie Park, Parramatta and Sydney Olympic Park. These centres are playing a key role in providing increased density and development to keep pace with Sydney's growing population.

The site is located within the Herring Road Macquarie Park Priority Precinct. The Plan identifies the need to accelerate new housing in designated infill areas, investigate potential for urban renewal in and around corridors between Macquarie Park and Parramatta and match population growth with investment in infrastructure.

Draft North District Plan

The Draft North District Plan was released in late 2016. It defines a 20-year vision, priorities and actions for the North District.

The Plan outlines the need to create a sense of place, grow jobs and diversify activity in Macquarie Park. This includes improving urban amenity as the centre transitions from business park functions to a vibrant commercial centre providing an effective mix of commercial, residential, retail, health and education activities with a fine urban grain.

The Plan also identifies Macquarie Park as a Collaboration Area, which will provide a strong mix of liveability, productivity and sustainability drivers across different levels of government and private landowners.

Sydney Metro

The NSW Government has commited to delivering 31 metro stations and new rail extending from Cudgegong Road in Sydney's north west to Bankstown in Sydney's south west. The metro is being supported by the announcement of priority precincts and renewal corridors, which will facilitate additional housing, jobs and infrastructure.

The subject site is situated within the Macquarie Park and Epping Corridor, where opportunities to revitalise local areas are being planned for Herring Road and Macquarie Park.

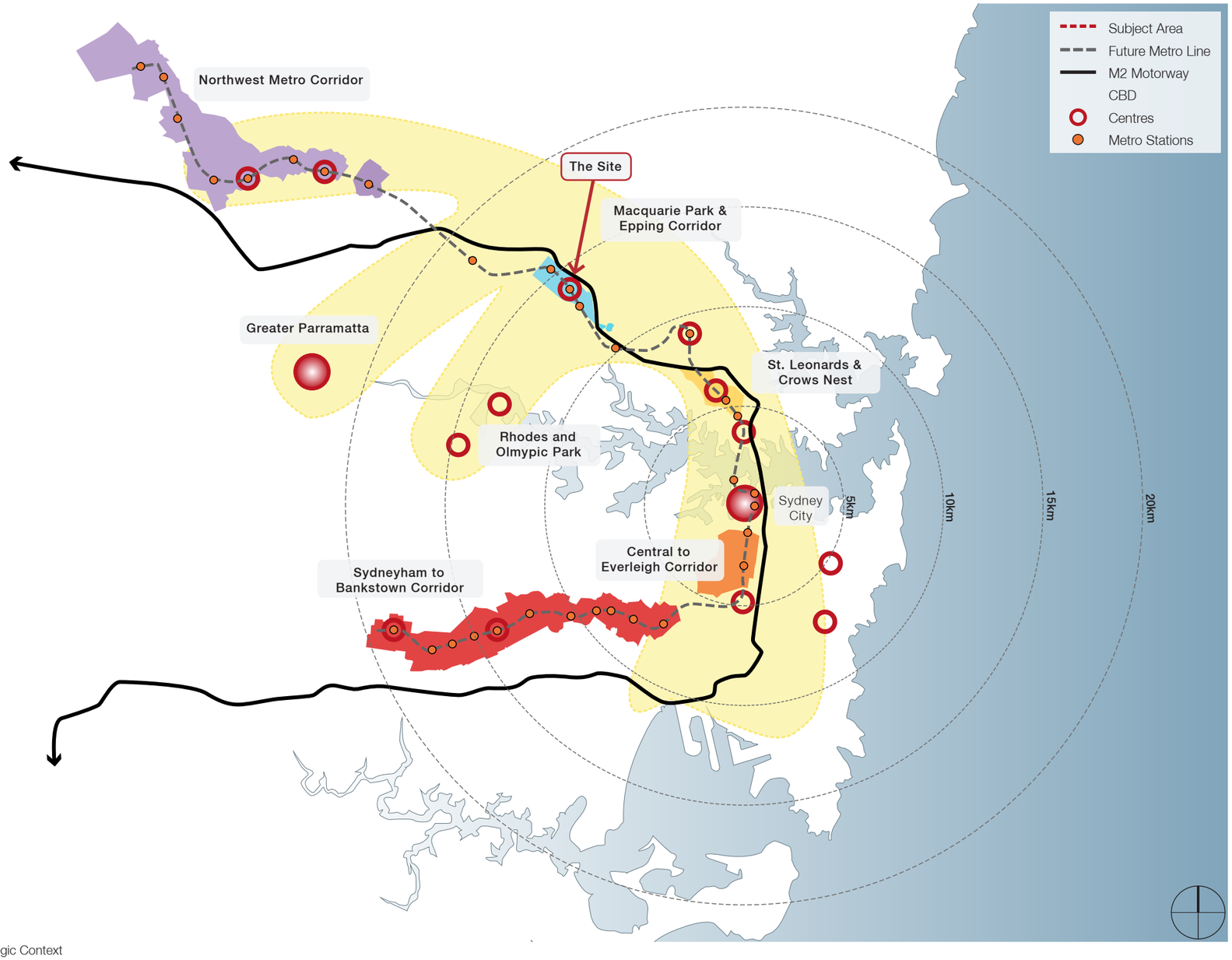


Figure 02: Strategic Context

1.3 Urban Context

The subject site is located in the suburb of Macquarie Park, located 15 kilometres north-west of Sydney CBD. The suburb is bound by Lane Cove National Park in the north and Epping Road in the south.

The suburb is transected by a series of key roads. Lane Cove Road provides linkages to Pymble in the north and Rhodes in the south, while the M2 provides connectivity to Sydney CBD.

Land north of the M2 comprises Lane Cove National Park, while land south of the M2 provides a number of key education, health and business related uses including Macquarie University, Macquarie Shopping Centre and Macquarie University Hospital.

Macquarie Park is defined by large scale business park and commercial developments south of Herring Road, while land north of Herring Road provides university campus facilities and student accommodation. The suburb transitions into traditional low density suburban dwellings south of Epping Road.

The suburb provides two train stations including Macquarie University and Macquarie Park located south of the site along Waterloo Road. The site is within a 400 metre walking catchment of Macquarie University Station and a 1.6km walking catchment of Macquarie Park Station, which will be served by train services 4 minutes in peak hour under its upgrade as part of the Metro.

Both stations are supported by a number of bus services connecting Macquarie Park to areas including Epping, Chatswood, North Sydney, Chatswood and Parramatta.

The suburbs broader urban context features a range a number of public parks and recreation facilities including North Ryde Golf Club, Gordon Golf Club, Lane Cove National Park, Blenheim Park and Waterloo Park.

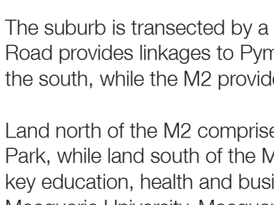


Figure 03: Urban Context

1.4 Local Context

The Site

The subject site is an irregular shaped allotment, located at the corner of Talavera Road and the M2 Motorway. The site legally described as Lot 42 DP 1153360 and comprises a site area of approximately 1.953ha.

The site benefits from three frontages. It adjoins the M2 to the north, Herring Road to the east and Talavera Road to the south.

The site is currently developed with a multi-storey office complex and car parking. Perimeter trees and planting are located along the Herring Road and M2 boundaries, acting as a natural noise barrier.

A small water course runs under the site, which converges with Shrimptons Creek and Lane Cove River on the opposite side of the M2.

Site Interfaces

Land to the north on the opposite side of the M2 comprises Lane Cove National Park, while land to the south on the opposite side of Talavera Road is developed with Macquarie University Hospital and campus facilities.

Land to the east on the opposite side of Herring Road is developed with Meriton Serviced Apartments, while land to the west is developed with Fujitsu Australia Building.

The site is accessed via Herring Road and Talavera Road, which is shared with tenants in the existing office complex.

Surrounding Context

The site is located within excellent proximity to a number of key transport, education, business and retail facilities. The site is within a 400 metre walking catchment of Macquarie Shopping Centre, Macquarie University Station and Macquarie University Hospital.

Christie Road provides pedestrian and vehicular links to the opposite side of the M2 towards Lane Cove National Park.

Site Boundary
Train Station
Key View Locations

Figure 04: Local Context and View Locations

1.5 Site Photos

1 View to M2 access road and down south-east Talavera Road with existing Meriton Serviced Apartments on the corner.

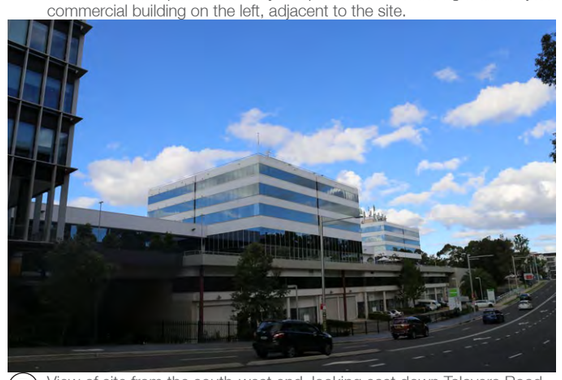
2 View from Herring Road looking north towards Talavera Road and west access road to Macquarie Centre carpark.

3 View from Talavera Road at intersection with Christie Road, looking south-east. Macquarie University Hospital is seen on the right and Fujitsu commercial building on the left, adjacent to the site.

4 View from Innovation Road to nature reserve and adjacent commercial building, located south of the site.

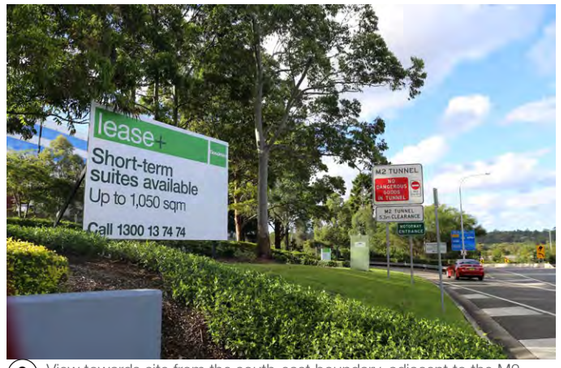
5 View towards the south-east corner of the site, running along Talavera Road and the M2 access road.

6 View at signalised intersection towards existing commercial buildings at the south-east end of the site along Talavera Road.

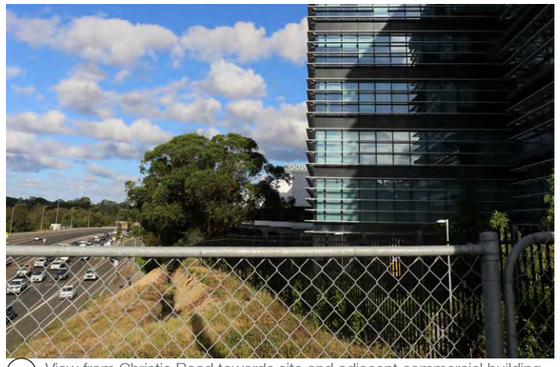


7 View of site from the south-west end, looking east down Talavera Road.

8 View of site across Talavera Road through the nature reserve, located to the south.



9 View towards site from the south-east boundary, adjacent to the M2 access roads and Motorway.



10 View from Christie Road towards site and adjacent commercial building at the north-west boundary along the M2 Motorway.

11 View to existing carpark and commercial buildings on site at the south-west boundary, adjacent to the Fujitsi commercial building.

12 View through site from Talavera Road.

1.6 Precinct Context, Recent and Future Development

Macquarie University Station (Herring Road)

The Herring Road Priority Precinct was nominated by City of Ryde in 2012 as part of the NSW Government's Priority Precinct Program. The precinct was identified on the following basis:

- Well serviced by public transport
- Strategically located close to the geographic centre of Sydney metropolitan region
- Key part of Sydney's Global Economic Corridor
- Contains large number of landholdings for redevelopment
- An area with strong market demand for additional housing

The precinct was designed to deliver up to 5,800 dwellings by 2031, transforming the precinct into a mix of jobs, retail and educational opportunities supported by the future North West Rail Link and key road upgrades.

The subject site is located at the gateway of the precinct towards the M2. The Finalisation Report, prepared by Planning and Environment identifies this area should predominantly comprise taller buildings, concentrated at the corner of Talavera Road and Herring Road.

Macquarie Park Investigation Area

In March 2017, the Department of Planning and Environment announced new investigations for Macquarie Park. The investigations will seek to dentify opportunities for more homes, shops, restaurants and high quality public spaces within walking distance of the train stations.

The investigation was underpinned by a Strategic Employment Review of Macquarie Park, which identified that residential development could occur around key strategic locations to complement logical high rise commercial development. The proposal is consistent with this investigation, which relieves pressure to rezone key commercial lands to provide additional dwellings.

Recent and Future Development

A number of key sites are located within the Precinct, which have either recently been constructed, are DA approved, been recently approved at Gateway or being considered for future development. These sites are facilitating the transformation of Macquarie Park into a vibrant employment hub with strategically placed residential development.

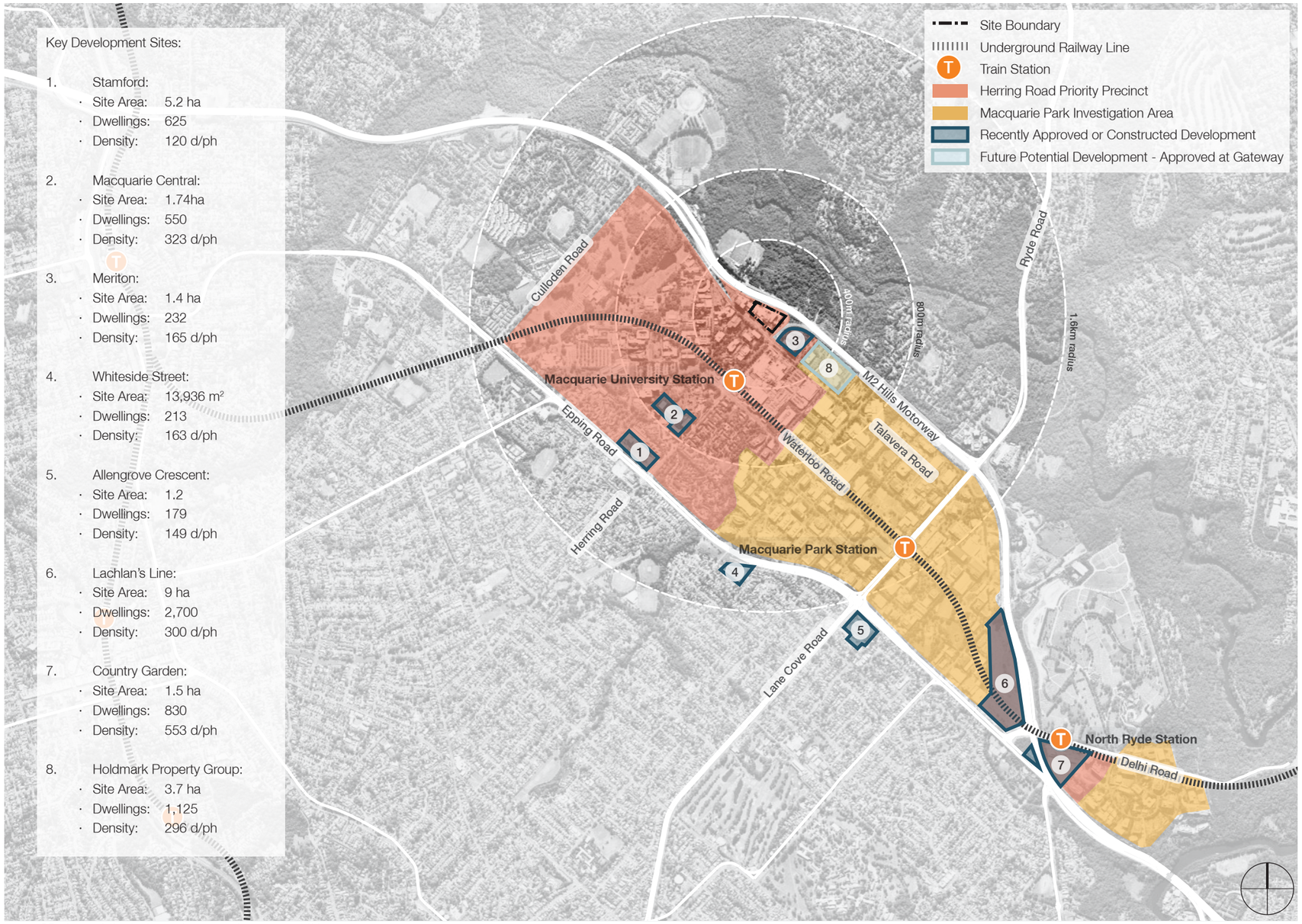


Figure 05: Precinct Context and Key Local Development Sites

1.7 Demographics and Forecasts

Population and Housing Projections

By 2036 it is anticipated that NSW will experience a population growth of 2.71 million, placing pressure to provide housing in key locations that provide employment, education, recreation and leisure.

City of Ryde is expected to play a significant role in accomodating Sydney's growth. By 2036 Ryde is anticipated to cater for an additional 62,950 persons, which will require approximately 29,650 dwellings.

By 2036 Ryde LGA is anticipated to comprise largely persons aged 0-34, which will account for 34% of the total population, followed by persons aged 55-85+, comprising 28% of the population.

Between 2011 and 2036, Macquarie Park is forecast for the greatest increase in development of new dwellings in the City of Ryde, with an estimated 9,458 dwellings.

Macquarie Park Summary

A snapshot of Macquarie Park's 2016 demographic profile is provided below:

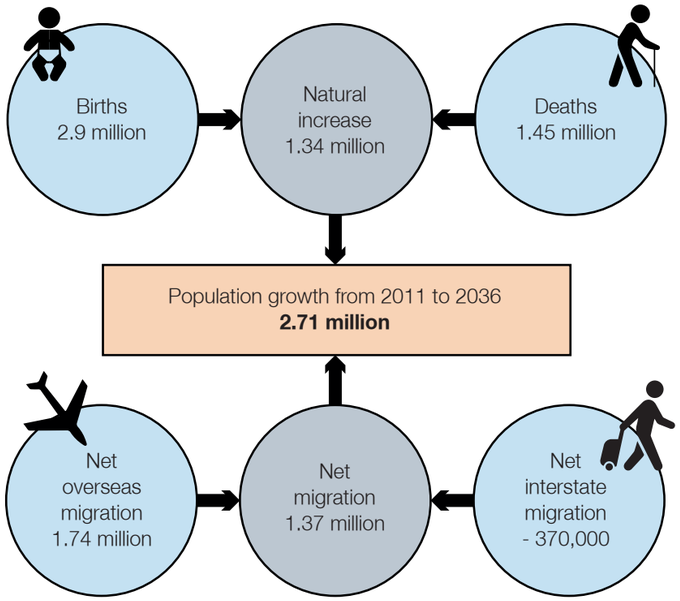
- Population 8,172
- Change in population (5 years) 1,629
- Annual average change 4.55%
- Households 3,265
- Average household size 2.05
- Dwellings 3,450
- Dwelling occupancy rate 94.64

Travel

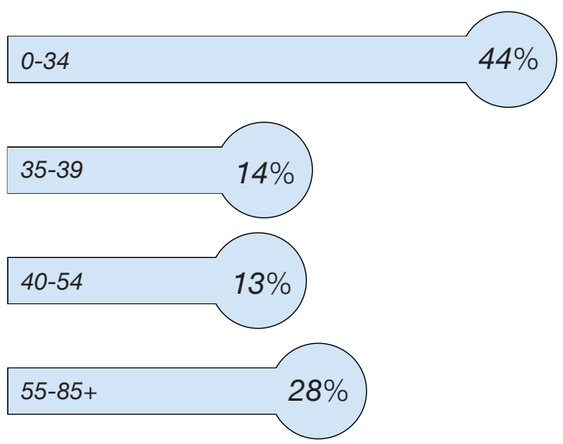
Based on the 2011 ABS Census, only 12.6% of residents living in Ryde used the train to travel to work, compared with 13.8% of Greater Sydney.

Train patronage is anticipated to increase alongside the rapid transformation of Macquarie Park. The new metro will provide services every 4 minutes in peak hour, which will likely see Macquarie Park transform into a more pedestrian friendly and transit oriented precinct.

NSW Population Forecast to 2036

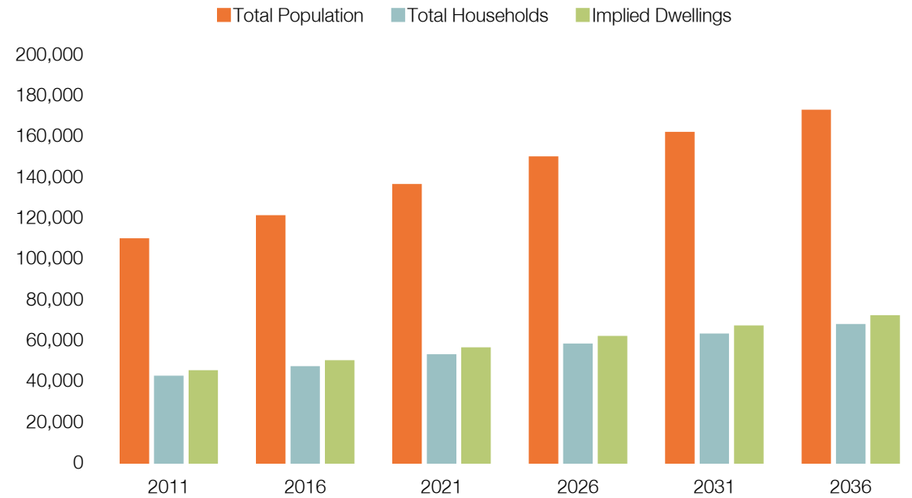


City of Ryde Age Group Breakdown by 2036



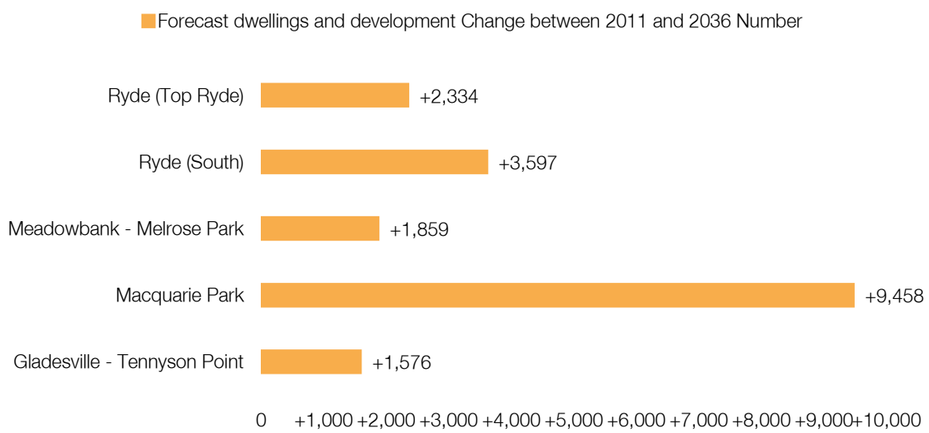
Source: Planning & Environment 2016 NSW and Local Government Area Population and Household Projects, and Implied Dwelling requirements

City of Ryde Forecasts



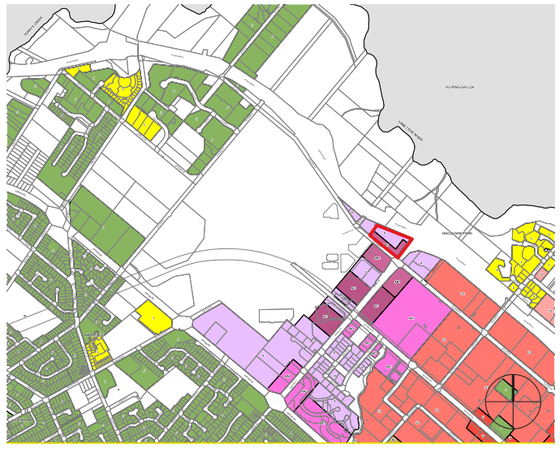
Source: Planning & Environment 2016 NSW and Local Government Area Population and Household Projects, and Implied Dwelling requirements

Forecast Dwelling and Development Change Between 2011 and 2036 (Top 5 Ryde Suburbs)



Source: Profile ID 2017 Population and Household Forecasts, 2011 to 2036

1.8 Existing Controls - Ryde Local Environmental Plan 2014



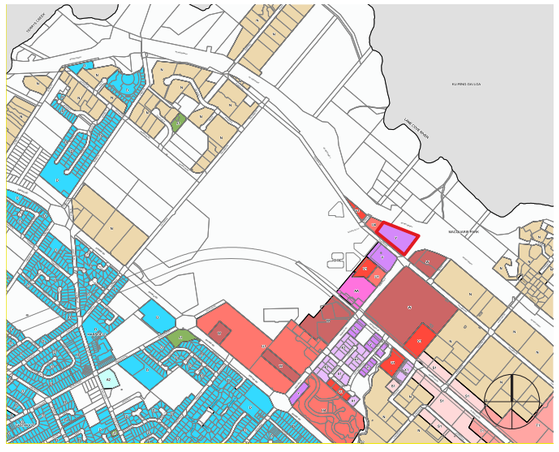
01 Height of Buildings Map

The subject site has height controls of 45m,and 90m, as outlined in the Ryde LEP 2014.

Key

J	9.5	T1	26
K	10	T2	27.5
L	11.5	U1	30
M1	12	U2	30.5
M2	12.5	U3	33
N1	13	U4	33.5
N2	14	V	37
O1	15	W	44.5
O2	15.5	X	45
O3	16	Z	57
P	18.5	AA1	65
Q	19	AA2	75
R1	21.5	AB1	90
R2	22	AB2	92
S1	23	AB3	99
S2	24	AC	120

Source: Ryde Local Environmental Plan 2014 (Amendment No. 12, March 2017) - Height of Buildings Map - Sheet HOB - 004



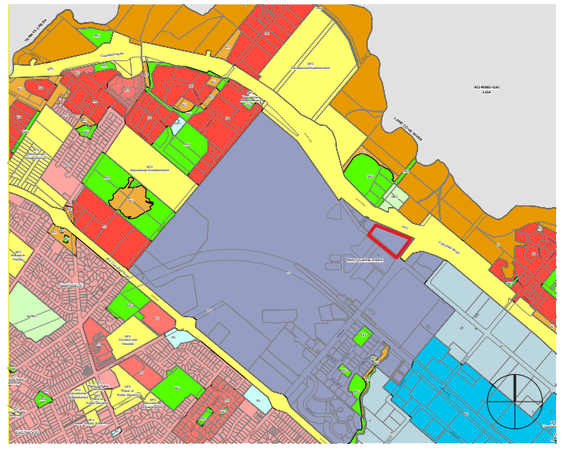
02 Floor Space Ratio Map

There is an FSR control of 4.5:1 placed on the subject site.

Key

A1	0.30	T1	2.00
A2	0.33	T2	2.30
D	0.50	U1	2.50
G	0.65	U2	2.60
J1	0.80	U3	2.70
J2	0.83	U4	2.90
K	0.88	V1	3.00
N	1.00	V2	3.20
O1	1.10	V3	3.30
O2	1.15	W	3.50
P1	1.20	X1	4.00
P2	1.25	X2	4.30
Q1	1.30	Y	4.50
Q2	1.39	Z	5.00
S1	1.50	AA	6.00
S2	1.70		
S3	1.80		

Source: Ryde Local Environmental Plan 2014 (Amendment No. 12, March 2017)- Floor Space Ratio Map - Sheet FSR - 004



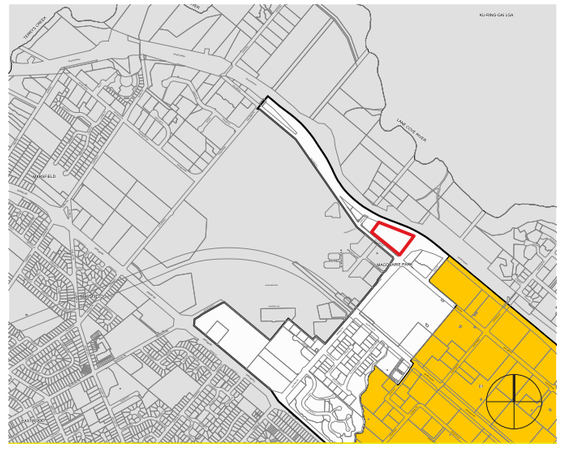
03 Land Zoning Map

The subject site is zoned as B4 Mixed Use.

Key

B1	Neighbourhood Centre	RE2	Private Recreation
B3	Commercial Core	SP1	Special Activities
B4	Mixed Use	SP2	Infrastructure
B5	Business Development	DM	Deferred matters
B6	Enterprise Corridor		
B7	Business Park		
E1	National Parks and Nature Reserves		
E2	Environmental Conservation		
IN2	Light Industrial		
IN4	Working Waterfront		
R1	General Residential		
R2	Low Density Residential		
R3	Medium Density Residential		
R4	High Density Residential		
RE1	Public Recreation		

Source: Ryde Local Environmental Plan 2014 (Amendment No. 12, March 2017) - Land Zoning Map - Sheet LZN - 004



04 Macquarie Park Corridor Precinct Map

The subject site is identified as being part of the Macquarie Park Corridor Precinct.

Key

Macquarie Park Corridor

Precinct

01 Macquarie Park

Source: Ryde Local Environmental Plan 2014 (Amendment No. 1, September 2015) - Macquarie Park Corridor Precinct Map - Sheet MPC - 004

Site Analysis

2

Exploring the existing urban conditions and context, to assist in developing an appropriate urban response

2.1 Open Space Network

Greater Context

The site is located within an extensive network of open space, consisting of sports and recreational facilities, bushland and reserves, as well as dedicated areas for public and private use.

Lane Cove National Park is located to the north of the site, wrapping around the motorway and major roads network to the east. The national park can be accessed via several walking and cycling trails that mostly run alongside the existing watercourse, primarily the Lane Cove River.

Other open spaces within the vicinity include a nature reserve that lies within the Macquarie University Precinct directly south of the site, and Christie Park across the motorway to the north-west.

Key Open Spaces:

1. Lucknow Park
2. Granny Smith Memorial Park
3. Kotara Park
4. Marsfield Park
5. Pioneer Park
6. Dunbar Park
7. Waterloo Park
8. ELS Hall Park
9. Macquarie University Community Garden
10. Jim Campbell Sportsfield
11. Gwilliam Field
12. Vince Barclay Tennis Courts
13. Christie Park
14. Nature Reserve off Talavera Road
15. Elouera Reserve
16. Cottonwood Park
17. Lane Cove National Park
18. Lofberg Oval
19. Bicentennial Park
20. Tuckwell Park
21. Tunks Hill Piicnic Area
22. Macquarie Park Cemetery
23. Saint Crispens Green

- Site Boundary
- Underground Railway Line
- Train Station
- Public Open Space
- Sports and Recreational Space
- Bushland and National Parks
- Private Open Space

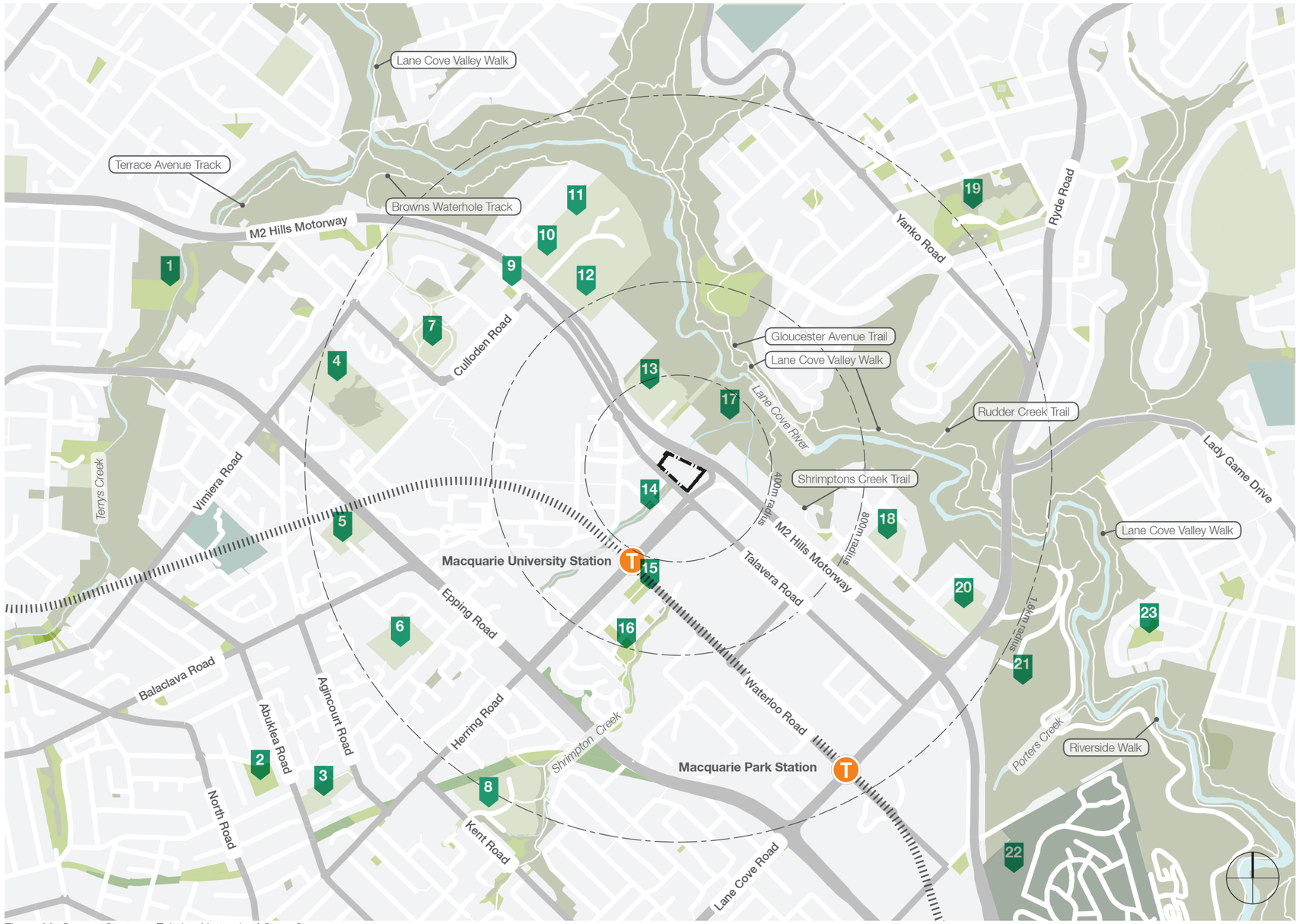


Figure 06: Greater Context : Existing Network of Open Space

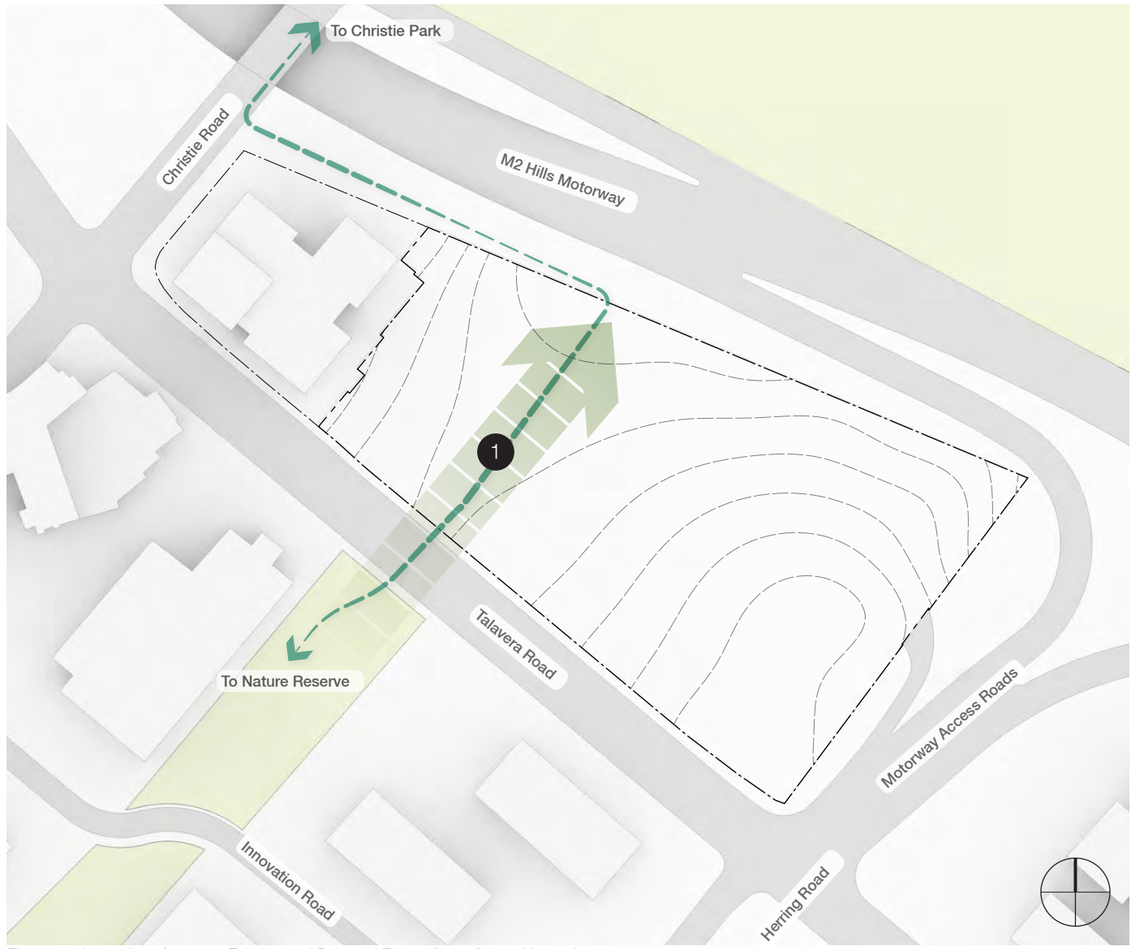


Figure 07: Immediate Context : Existing and Potential Future Open Space Network

Figure 08: Nature Reserve south of Talavera Road

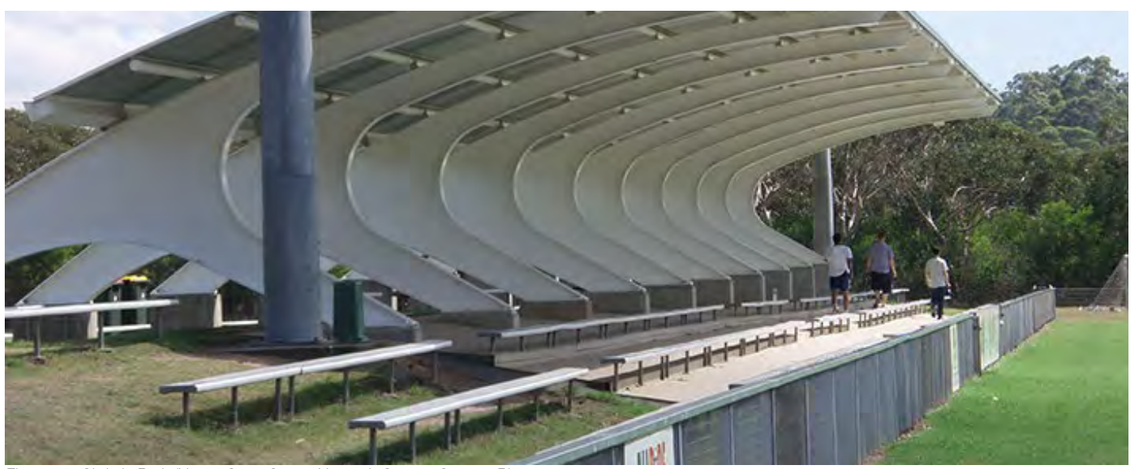


Figure 09: Christie Park (No.14 Open Space Network Greater Context Plan

Source: City of Ryde Council Website - Parks and Sportsgrounds - Christie Park
Accessed from: *http://www.ryde.nsw.gov.au/Recreation/Parks-and-Sportsgrounds/Find-a-Park-or-Sportsground/Christie-Park*

Immediate Context

1. Potential extending of open space across onto site with the inclusion of a through-site link.
2. The Macquarie Park Finalisation Report (May 2015) nominates Transurban to deliver a pedestrian link over the M2. However, there is opportunity within the site to link existing pedestrian paths south of Talavera Road with Christie Road, creating a cohesive and safe link across the M2.

Key Local Open Spaces

The images above are two key open spaces located within the immediate vicinity of the site. Future development on the site has the potential to respond to it's significant location within the local network of open spaces.

Redevelopment of the site offers the possibility for a better integrated open space network and improved amenity within the local context, particularly in regard to pedestrian and cycle connections, recreational opportunities, views and streetscape quality.

2.2 Environment

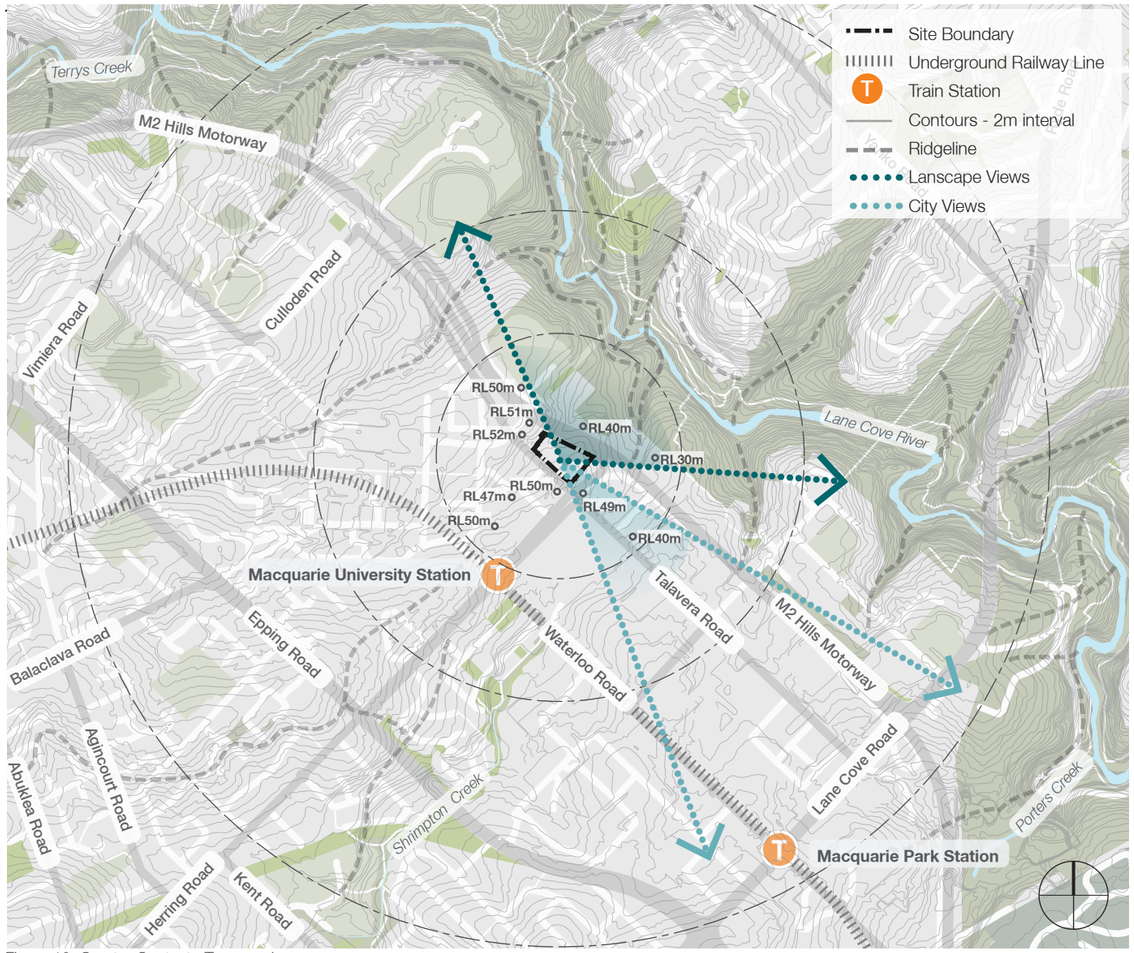


Figure 10: Greater Context : Topography

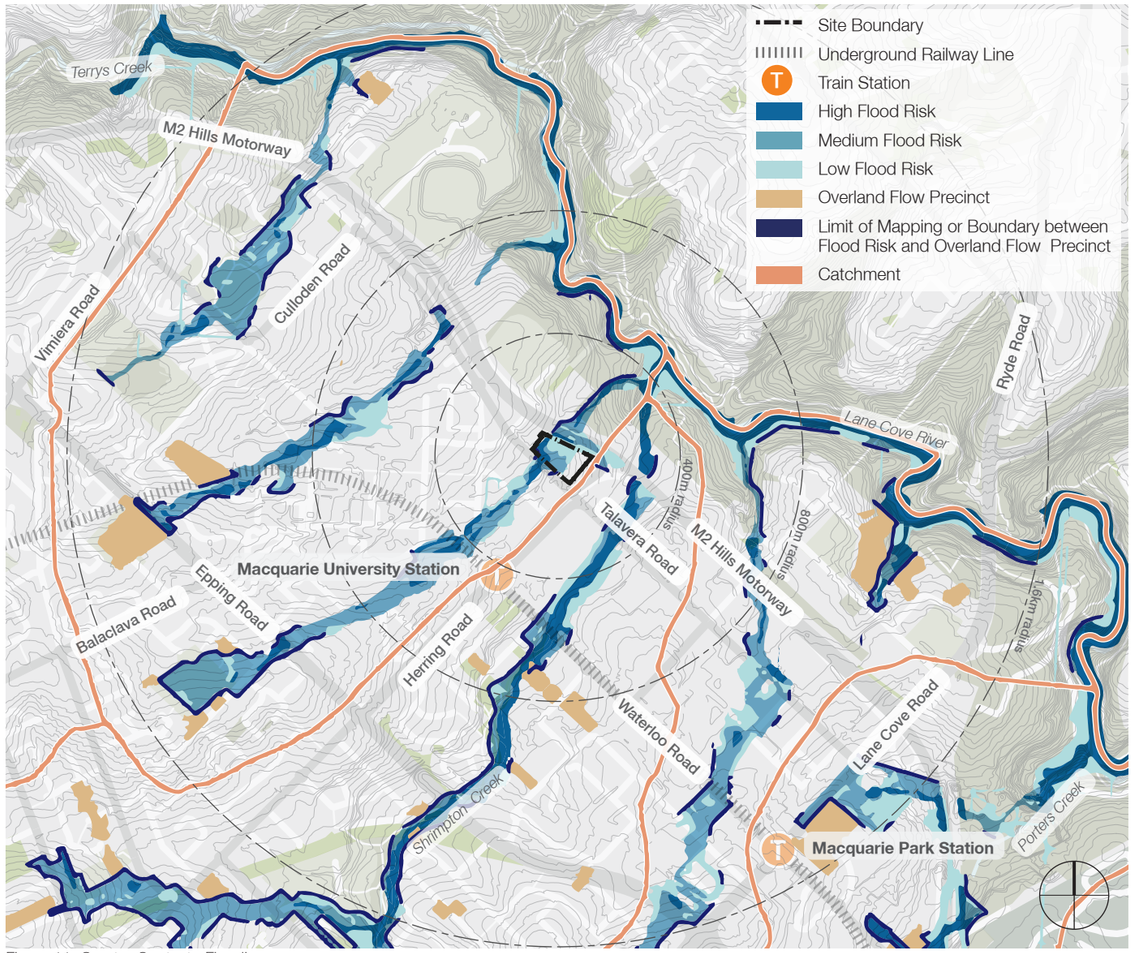


Figure 11: Greater Context : Flooding

Source: *Macquarie Park Floodplain Risk Management Study & Plan* - Prepared by Bewsher for City of Ryde Council (Final Report published February 2011) - Figure 4.1- *Flood Risk Precincts and Overland Flow Precinct*, page 4

Topography

The topography within the site's context is quite undulating, especially across the Lane Cove National Park located to the north and east of the site. The site is located on an incline along Talavera Road, which rises to the north-west and slopes down towards the south-east.

The terrain drops off to the north of the site at the edge of the M2 Hills Motorway and offers extensive landscape views to the National Park beyond. The site's relatively elevated location also offers an opportunity for distant city views to the south-east to be captured at high levels.

Flooding

The *Macquarie Park Floodplain Risk Management Plan,* prepared by Bewsher for the City of Ryde Council (2011) indicates a significant flood impact risk to the site and surrounding Macquarie Park-North Ryde area. The varied terrain and natural watercourses running through the area result in sections of considerably flood prone land.

The potential flood risks can be minimised by employing effective design and engineering mechanisms that align with the findings and recommendations presented in the Bewsher Risk Managment Plan and other relevant documents. Please refer to the Flood Impact Assessment prepared by Calibre Consulting for further details and recommendations.

Site Analysis

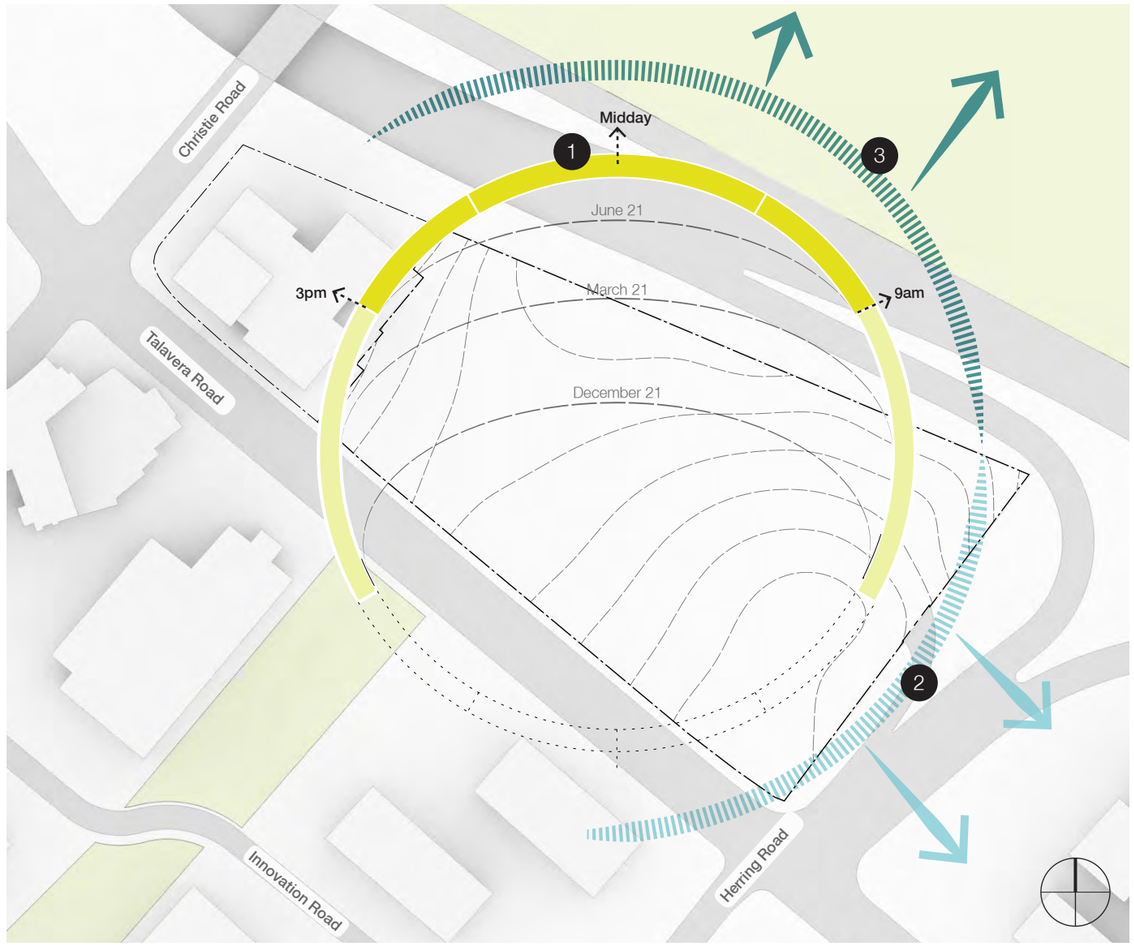


Figure 12: Immediate Context : Views and Solar Access

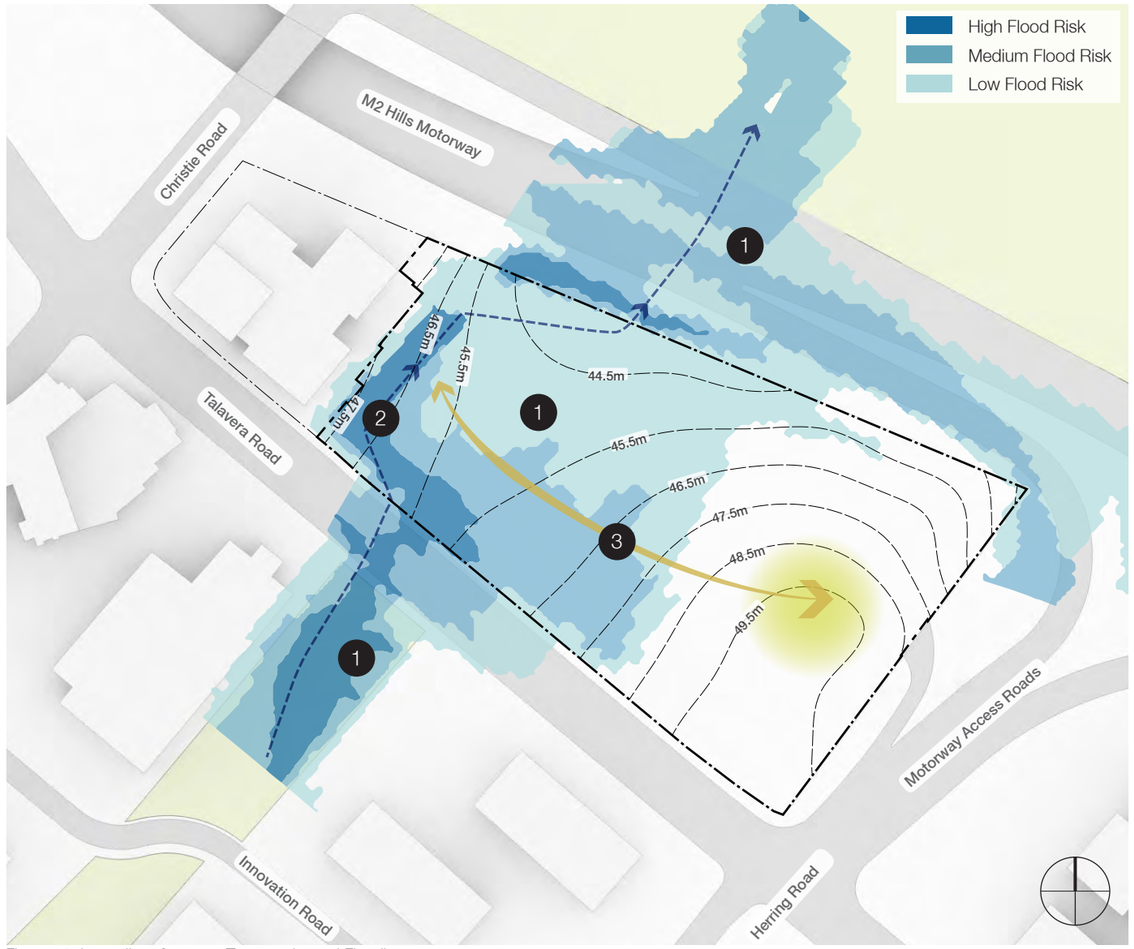


Figure 13: Immediate Context : Topography and Flooding

Source: *Macquarie Park Floodplain Risk Management Study & Plan* - Prepared by Bewsher for City of Ryde Council (Final Report published February 2011) - Figure 4.1- *Flood Risk Precincts and Overland Flow Precinct*, page 4

Views and Solar

1. Good solar access, north facing
2. Views of city and harbour to south east
3. Landscape views to the north east

Flooding and Topography on Site

1. Flood Risk Areas
2. Existing Watercourse beneath Site - Culvert under M2 Motorway
3. Inclining Topography across Site

Please refer to the Flood Impact Assessment prepared by Calibre Consulting for further details and recommendations.

2.3 Movement and Access

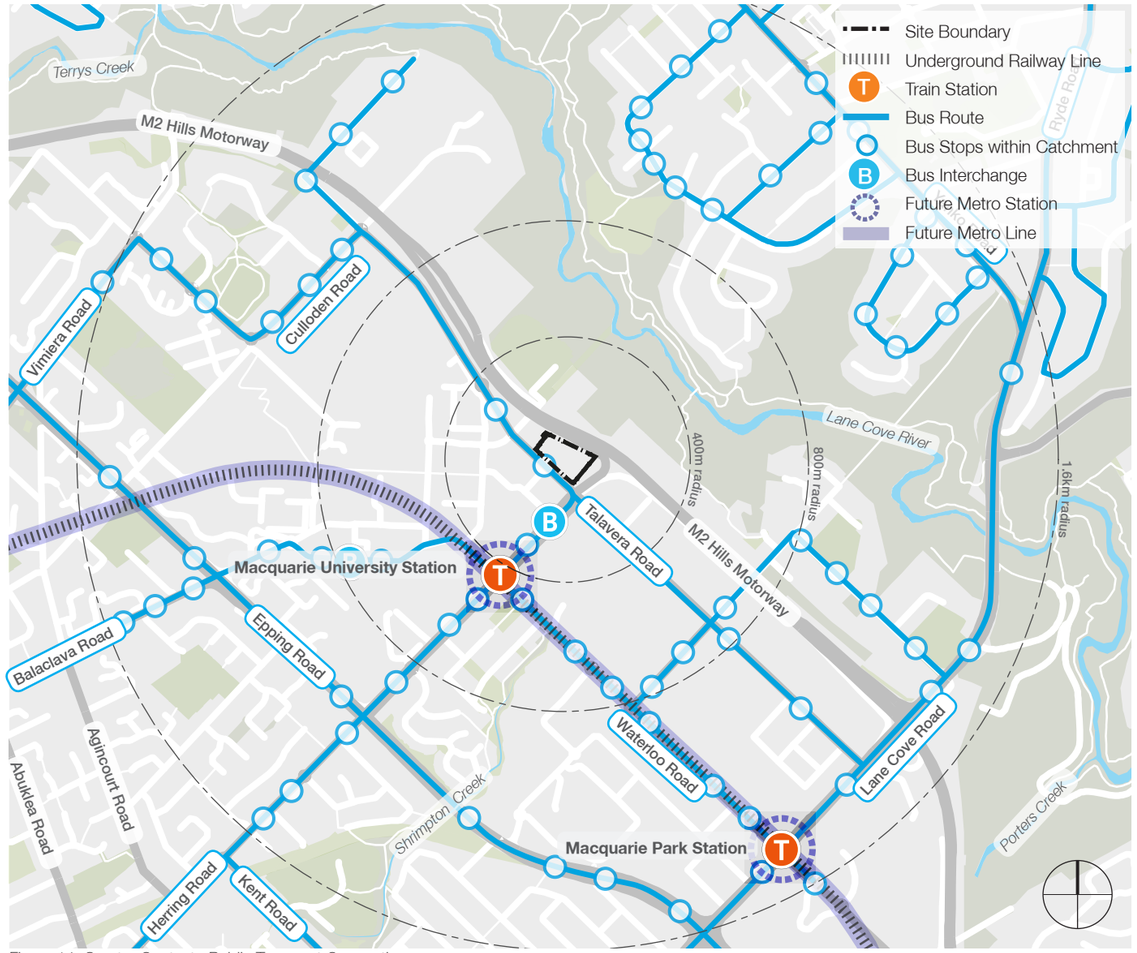


Figure 14: Greater Context : Public Transport Connections

Public Transport Connections

The site is well-connected to public transport services, both existing and planned. The existing bus network runs along multiple routes that offer connections to key destinations within Macquarie Park and beyond to other areas of Sydney. The site is within the vicinity of several bus stops including one adjacent to the south-western boundary along Talavera Road, which provides services towards the city, Chatswood and other areas of Macquarie Park.

The site is situated within walking distance to Macquarie University Train Station and is near Macquarie Park Station, which are both included in the planned upgrade to the future Sydney Metro Sydneham to Bankstown line, anticipated for completion by 2024. The new metro will provide increased train services that will run every 4 minutes in peak hour. Direct services to the Sydney CBD and North Sydney will also be available once the later stages of the project are completed.

Figure 15: Greater Context : Vehicular Connections

Vehicular Connections

Within the greater context, the subject site is accessible by vehicles via a network of major and secondary roads.

The major perimeter roads surrounding the site include Talavera Road along the southern boundary and the M2 Motorway to the directly north. These routes are linked by the M2 access roads to the east and Christie Road to the west.

Other significant roads within the area include Herring Road, which runs perpendicular to Talavera Road, as well as Waterloo Road above the train line and the major route along Epping Road and Lane Cove Road, which continues north onto Ryde Road.
Please refer to the Transport Assessment completed by Arup for further details and recommendations.

Site Analysis

Figure 16: Local Context : Movement and Access

Figure 17: Immediate Context : Movement & Access

Local Movement and Access

Traffic flow within the local area is managed with traffic lights or roundabouts located at key intersections. At the south-east corner of the site, Talavera Road forms a major signalised intersection with Herring Road. The traffic lights located at the junction of Talavera and Christie Road provide a second local crossing for pedestrians.

The existing vehicular access points to and from the site are currently located from all perimeter roads excluding the motorway, at the south-west, north-west and north-east corners. There are several dedicated pedestrian and cycle links across the Macquarie Park Centre, including a path leading from Talavera Road through the existing nature reserve within the Macquarie University Precinct, to the south of the site.

Access and Movement on Site

1. Access for Service Vehicles
2. Vehicular Access to/from Site
3. On-site Access
4. Dedicated Cycle Path
5. Major Signalised Intersections

2.4 Land Use & Amenity

The subject site is located within a B4 Mixed Use Zone that primarily comprises institutional, commercial, and retail uses, as well as some medium-high density residential buildings. The area also contains the Macquarie University Precinct, located to the south-west of the site across Talavera Road.

The site also falls within the Herring Road Activation Precinct, which is designated as an area for growth and redevelopment. The nearby commercial area identified to the south-east is also under investigation for additional growth and activation.

The site's location has access to considerable amenity and services within the local context. The Macquarie Shopping Centre is conveniently located within walking distance, providing a range of retail, dining and entertainment services. Several health, educational and other community facilities are found within the local area, including three childcare centres and the Macquarie University Hospital. The subject site lies within a well-integrated network of open spaces that provide a range of sport and recreational facilities.

Amenity and Services:

- Open Space
- Sports and Recreation
- Community Service
- Medical Service
- Educational Institution
- Childcare Centre
- Gallery/Museum
- Accomoation
- Carparking
- Retail
- Cafe
- Restaurant
- Bar
- Entertainment

- Site Boundary
- Underground Railway Line
- Train Station
- Primary Mixed Use Precinct
- Primary Commercial & Business Precinct
- Macquarie University Campus
- Macquarie University Hospital
- Macquarie Shopping Centre
- Herring Road Activation Precinct
- Macquarie Park Investigation Area

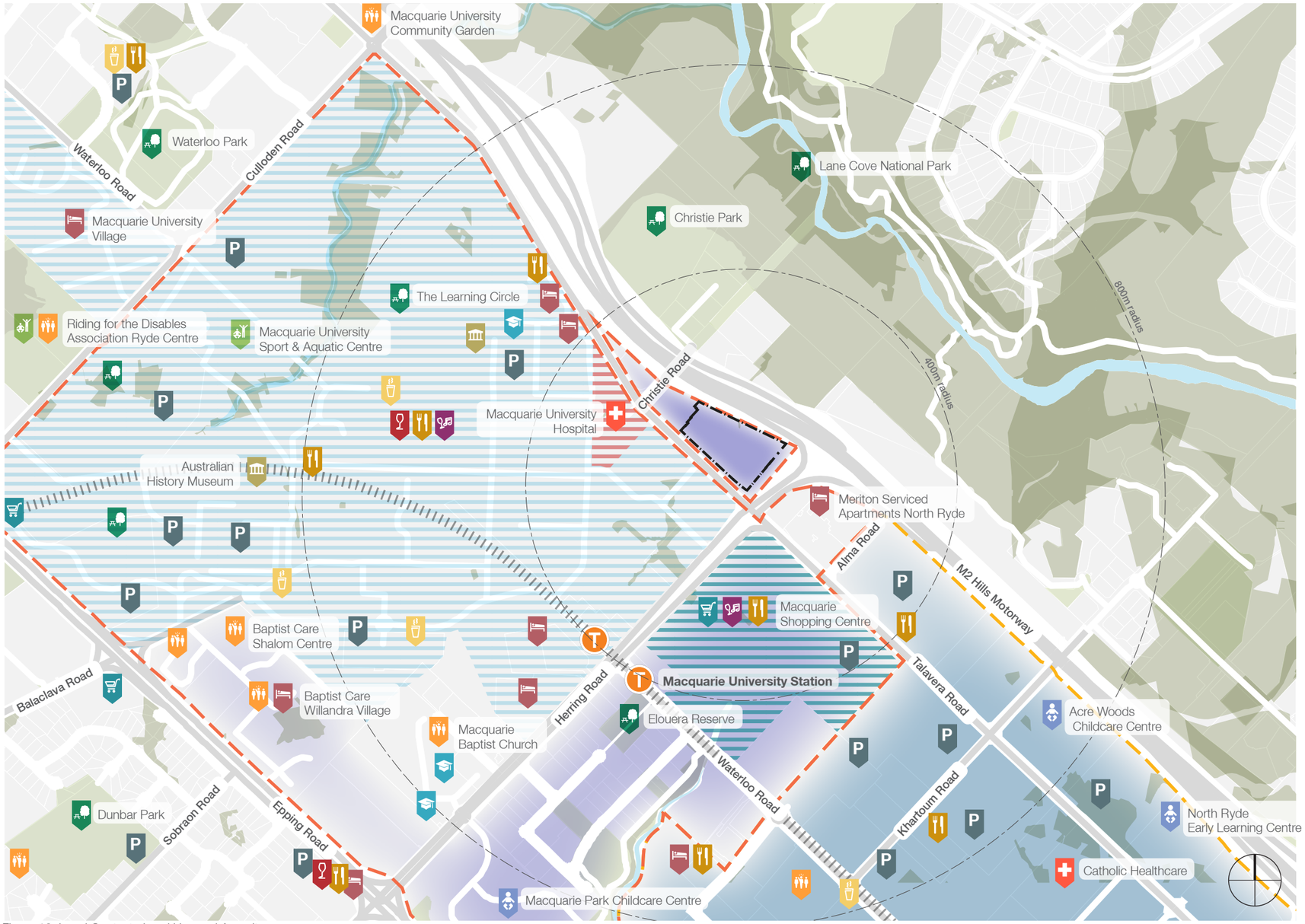


Figure 18: Local Context : Land Use and Amenity

2.5 Built Form

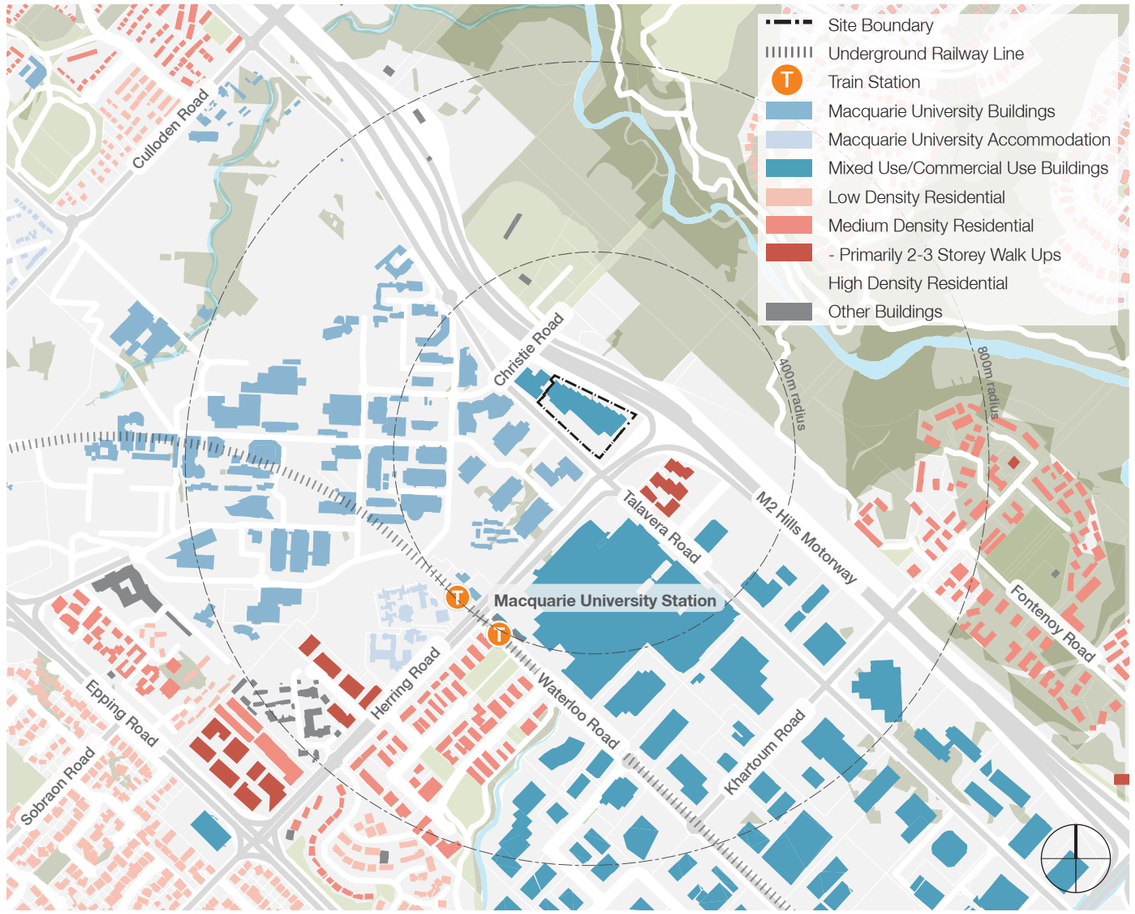


Figure 19: Local Context : Built Form Typology

Built Form Typology

The existing local built form consists primarily of educational and mixed use buildings within the Macquarie University Precinct and large retail and commercial footprints within the south-east quarter.

The clusters of residential buildings extend out from the centre and range from low to medium density housing, in addition to a few high density developments that have been recently built or are currently under construction.

A large commercial building is currently located on the subject site beside the Fujitsu commercial building, recently constructed on the adjacent north-eastern lot.

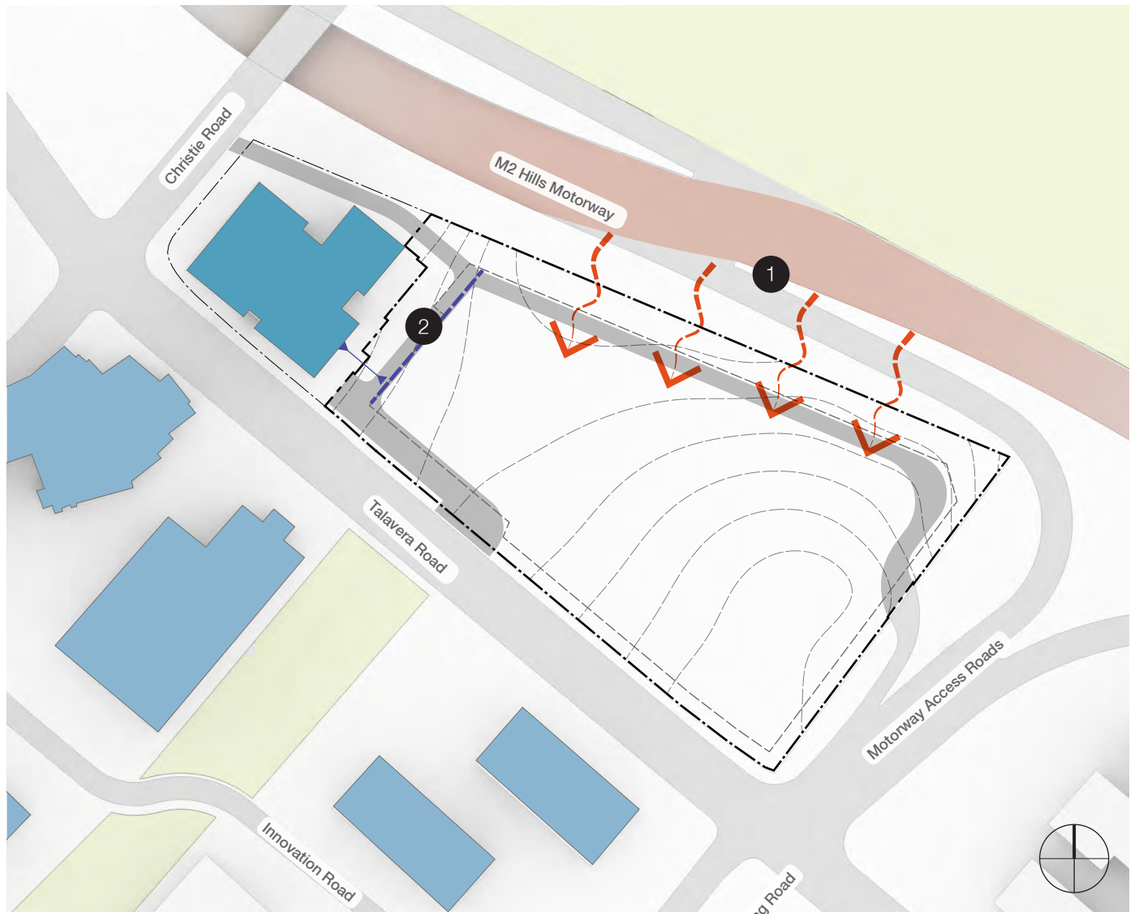


Figure 20: Immediate Context : Site Conditions

Site Conditions

1. M2 motorway noise
2. Interface with neighbouring Fujitsu building + 20m offset

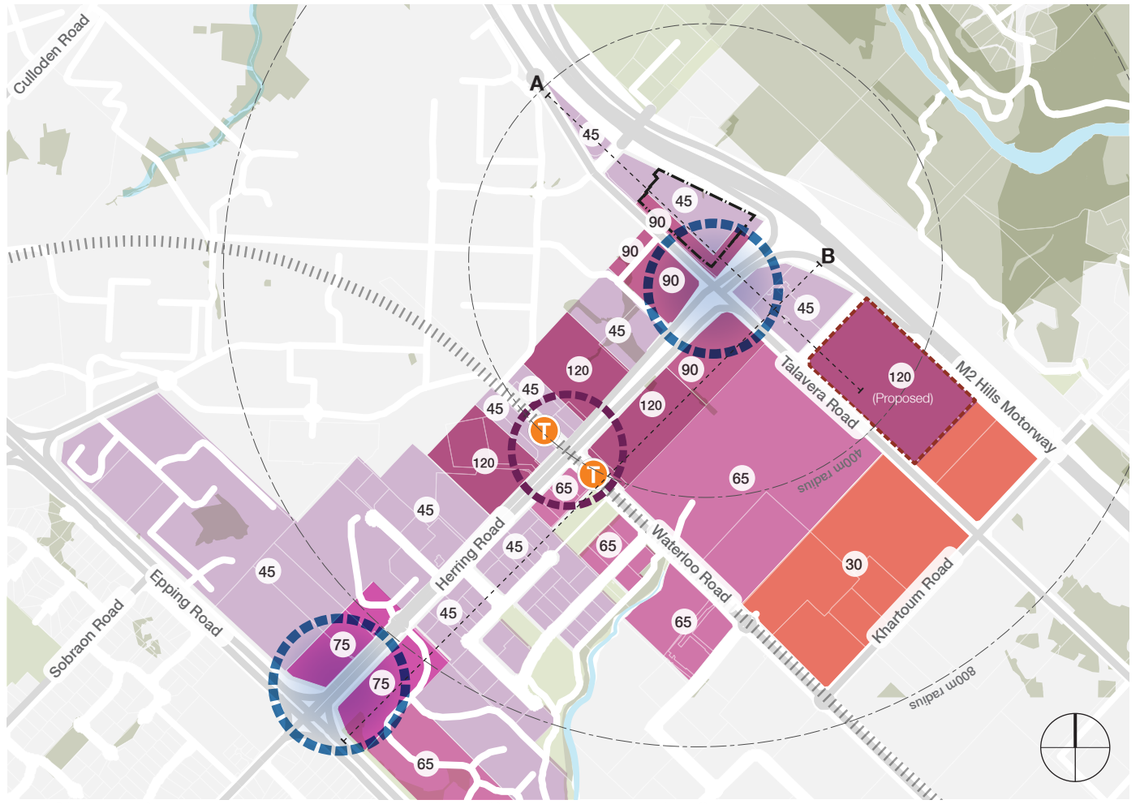


Figure 21: Existing Building Heights along Talavera Road and Herring Road within the vicinity of the Site

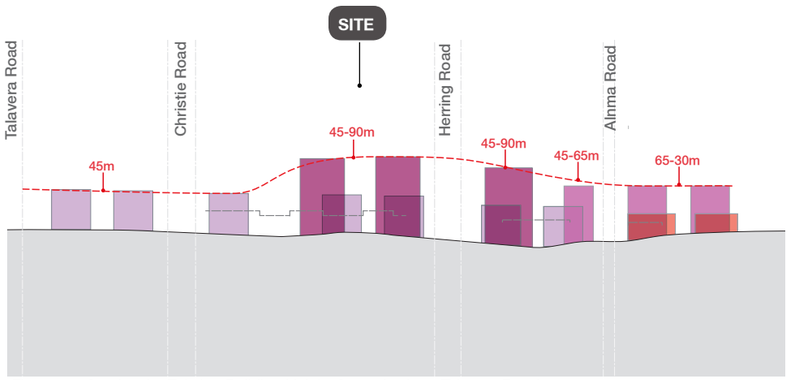


Figure 22: Section A : Existing Building Height Controls along Talavera Road

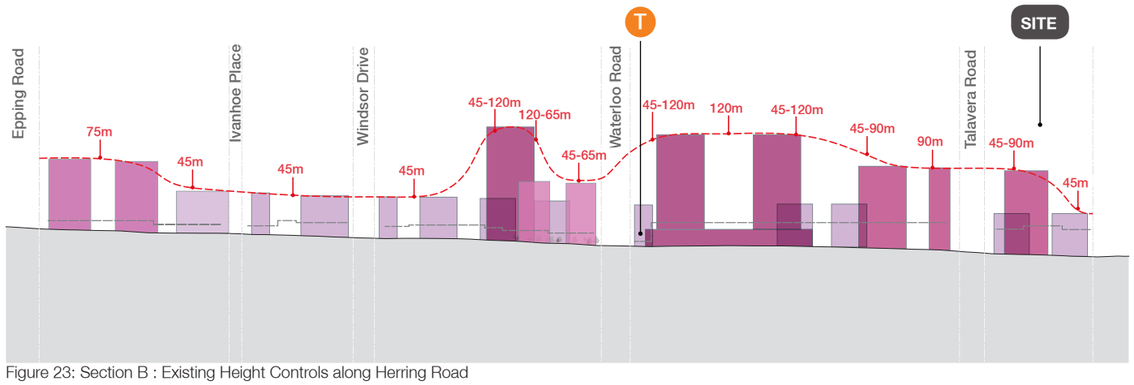


Figure 23: Section B : Existing Height Controls along Herring Road

Existing Building Heights (m) - Ryde Local Environmental Plan 2014

The current LEP Height controls suggest the intention for a concentration of height along Herring Road, as a major street through the city centre.

There is a concentration of height at the Herring Road intersections with Epping Road and Talavera Road, adjacent to the subject site. The built form situated at these junctions have the potential for further uplift, acting as gateways for the Macquarie Centre Precinct.

There is also cluster of greater heights focused around the station and Macquarie Shopping Centre, marking the location of these key destinations.

The heights of existing buidlings along Talavera and Herring Road are considerably lower than the maximum LEP height controls, highlighting the centre's potential for future redevelopment focused around key gateway and urban marker sites.

Existing Maximum LEP Heights:

- 30m
- 45m
- 65m
- 75m
- 90m
- 120m

- Train Station
- Existing Indicative Skyline
- Existing Built Form
- Planning Proposal for Rezoning + Increased Height and Density
- Key Gateway
- Urban Marker between Transition Areas

2.6 Combined Constraints

There are some restrictions to the site that should be considered and managed in the process of design and development. These include the following:

1. Proximity to Motorway
The potential visual and noise impact of the nearby M2 Motorway should be taken into account when considering future development.

2. Flooding and Topography
The topography and existing watercourse running across the site result in an area that is flood prone. A flood risk management strategy will need to be employed to address these issues. Please refer to the Flood Impact Assessment prepared by Calibre Consulting for further details and recommendations.

3. Movement and Access
Access to the site is somewhat restricted by existing traffic and road conditions. A traffic report has been prepared to address these issues and outlines appropriate recommendations to manage traffic. Please refer to the Transport Assessment completed by Arup for further details and recommendations.

4. Impact on Local Built Form
Potential impact on amenity to and by existing local built form, primarily in relation to views and solar access. This can be managed with a carefully considered design and testing as part of future stages.

5. Easement and Setbacks
The setback requirements, as outlined in the DCP and ADG, and existing easement across the site limit the development footprint.

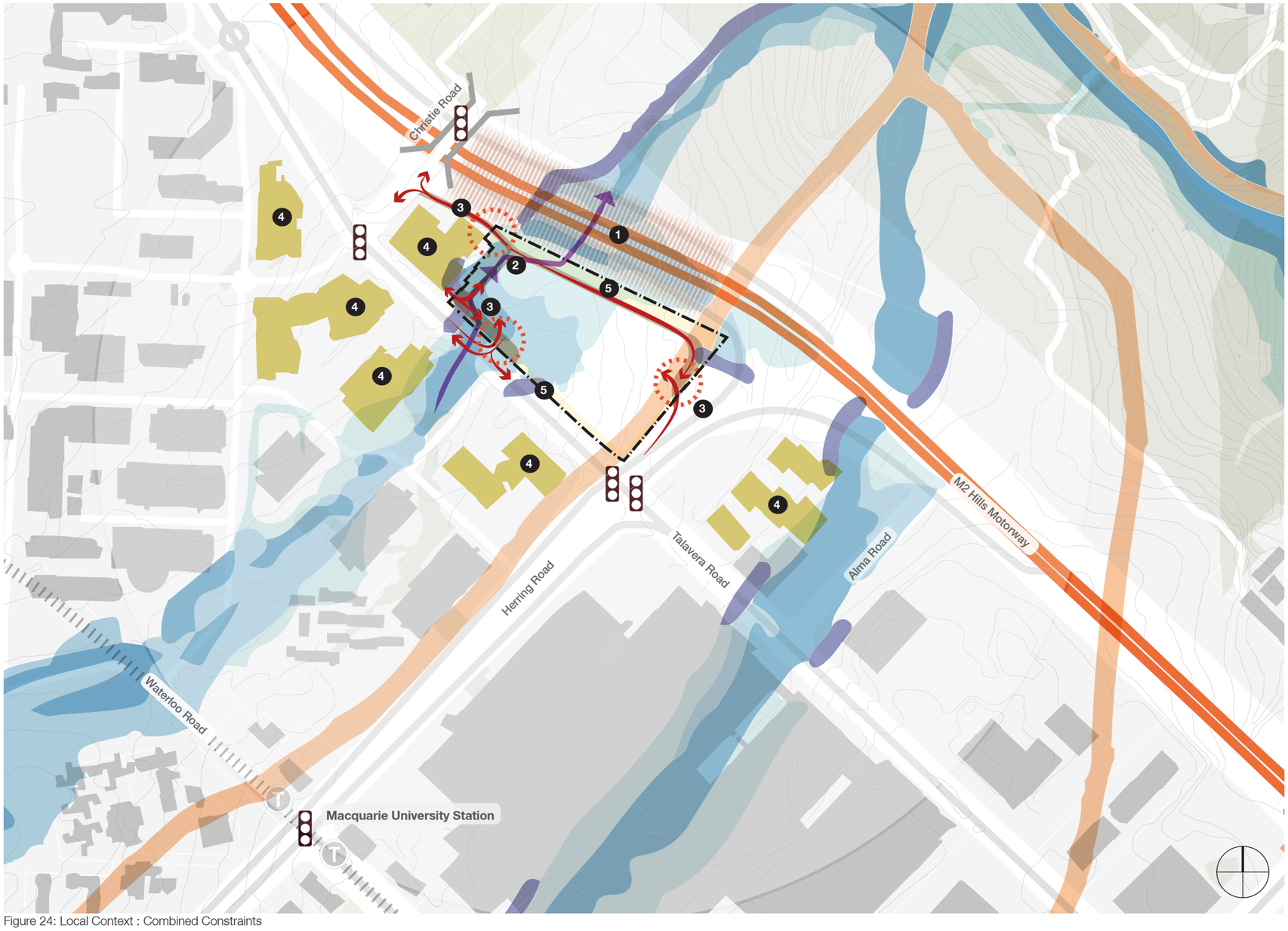


Figure 24: Local Context : Combined Constraints

2.7 Combined Opportunities

The unique conditions of the site present a number of opportunities that support a move towards uplift and redevelopment at this location. These include the following:

1. Views
The topography enables views to be captured from high levels across the site, including the rolling green landscape to the north and distant city views to the south-east.

2. Open Space Connection
The site's location between existing open spaces may be enhanced with the addition of a through site-link. This would provide additional connectivity to high amenity areas for both the site and the surrounding context.

3. Activation Precincts
The site's significance is evident in its location within the Herring Road Priority Precinct and in close proximity to the Macquarie Park Investigation Area.

4. Public Transport
There is good accessibility, with bus routes and stops positioned alongside the site and Macquarie University existing train/future Metro Station located within walking distance.

5. Local Built Form
The local built form primarily features large footprint commercial and mixed use buildings. The Meriton Serviced Apartments are located across from the site along Talavera Road, followed by the site of a potential future high density development, currently undergoing assessment as a planning proposal.

6. Local Amenity and Services
There is excellent access to amenity and services, including the Macquarie Shopping Centre and Macquarie University Hospital as well as an extensive network of open spaces.

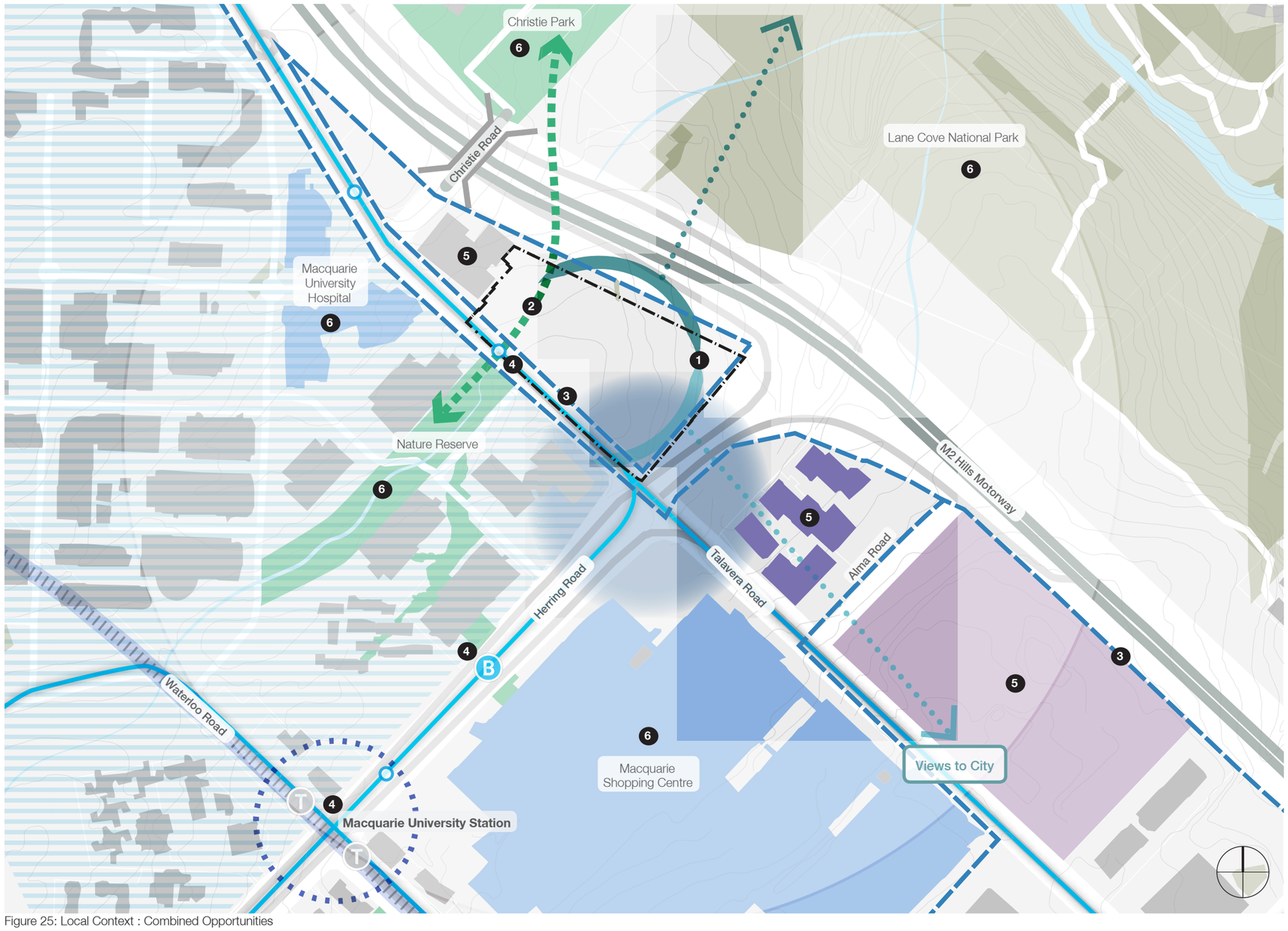


Figure 25: Local Context : Combined Opportunities

Design Strategy

3

Analysis of the opportunities and constraints on the site, and the design principles that respond to the site's unique characteristics.

3.1 Strategy in Context

Macquarie Park has significant strategic importance to Sydney's growth.

Located within Sydney's Global Economic Corridor, the centre is Sydney's second largest office market, surpassing North Sydney in 2013. Under a Plan for Growing Sydney, it recognises the need to promote efficient land use outcomes and urban renewal around the centre.

Given its prominence and contribution to Sydney's economy, the centre will also become increasingly competitive. This requires Macquarie Park to provide a balance of housing and public amenity without compromising on its employment and land use assets.

Like many priority precincts and strategic centres, the prominence of gateway buildings is critical to a legible and cognitive environment. Macquarie Park shares common urban characteristics with other centres, including Chatswood, St. Leonards and Parramatta, where the skyline is being defined by taller buildings punctuating previous height controls, and marking the location of transport nodes and key facilities.

The diagram opposite identifies the heights of key buildings, both future and existing, from major strategic centres across Sydney. The height proposed for the site will sit appropriately within the context of these major centres and establish Macquarie Park as one of Sydney's key precincts for both employment, recreation and living.

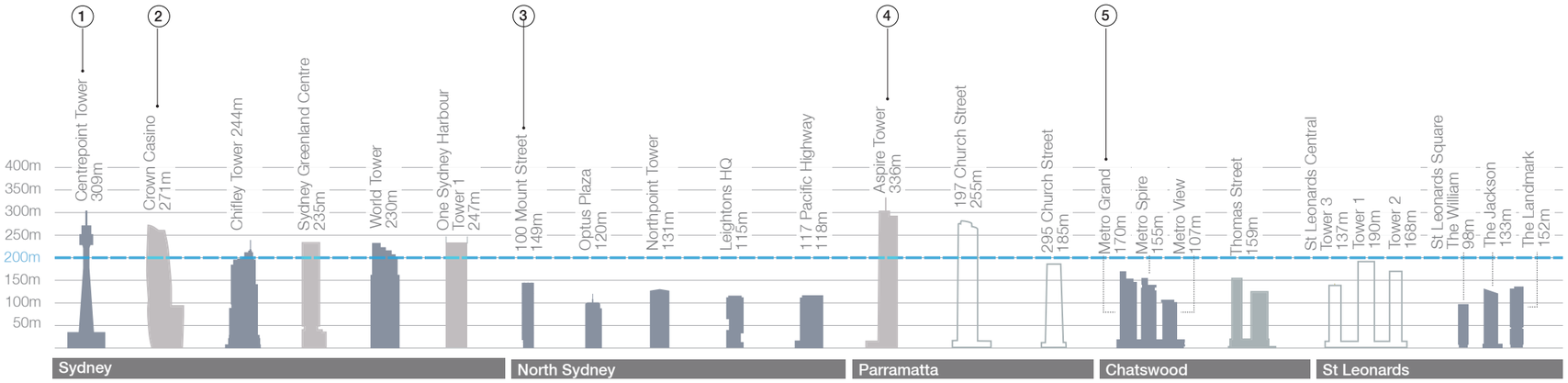


Figure 03: Key Building Heights in Major Sydney Centres

3.2 Proposed Future Macquarie Park Skyline

The planning proposal seeks to increase the FSR and building height on the subject site. There is design merit to this proposal for a number of reasons, these include:

- Provide additional housing in a strategically located area, without infringing on any existing commercial/business development land
- Absorb future housing demand into a concentrated part of the precinct that is already zoned for housing purposes
- Facilitate more efficient building footprint and separation across the site
- Redistribution of building mass away from Talavera Road and towards the M2 Motorway
- Tall and oval shaped towers enhance public and resident amenity, including solar access, building separation and views to key landmarks
- Podium elements can reduce perceived bulk of any increased height through sensitive street frontages
- Facilitate design excellence through diverse building typologies, forms and architecture
- Create a built form that functions as a gateway to the precinct, assisting with precinct legibility
- Taller towers enable less intensive use of the ground plane, creating better opportunities for open space and accessibility
- Increased public benefit, including affordable housing (consistent with Draft District Plan), open space amenity and connectivity over the M2.

The sections opposite indicate the proposed future skyline for the Macquarie Park Centre, along both Talavera Road and Herring Road. The existing maximum LEP height controls are shown in conjunction with key areas that are strategically located for potential future uplift, including the subject site at the junction of Herring Road and Talavera Road.

The heights of key buildings in other major centres are also referenced to relate back to the signifcant role of Macquarie Park, as a key strategic centre within the greater Sydney Context.

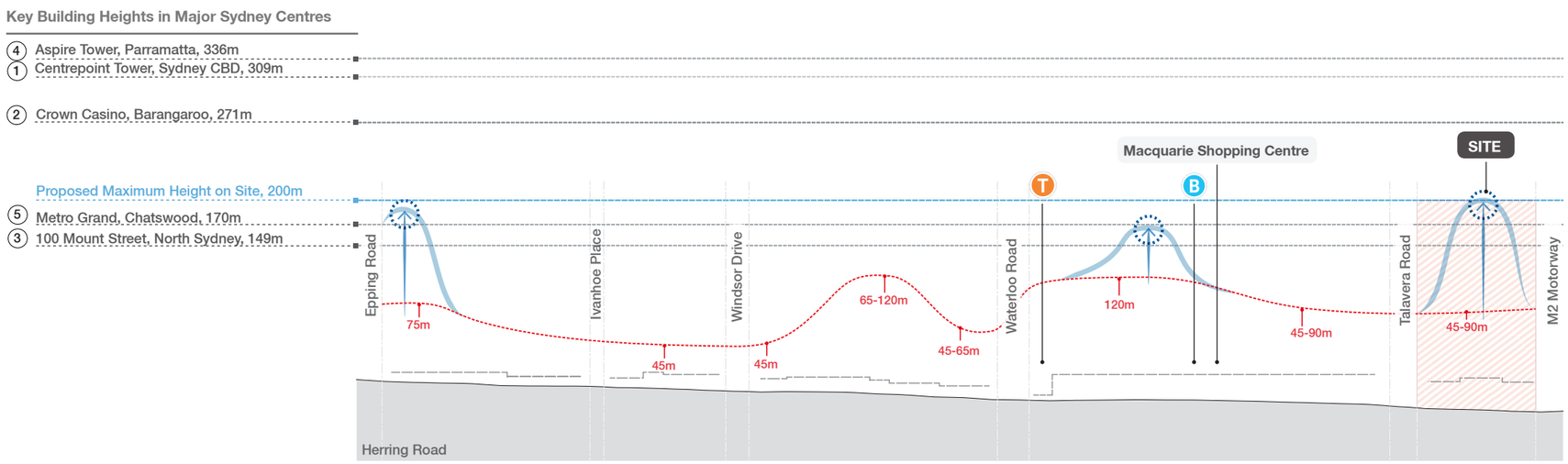


Figure 02: Section A - Herring Road, Macquarie Park : Existing Permissable Heights and Proposed Future Uplift

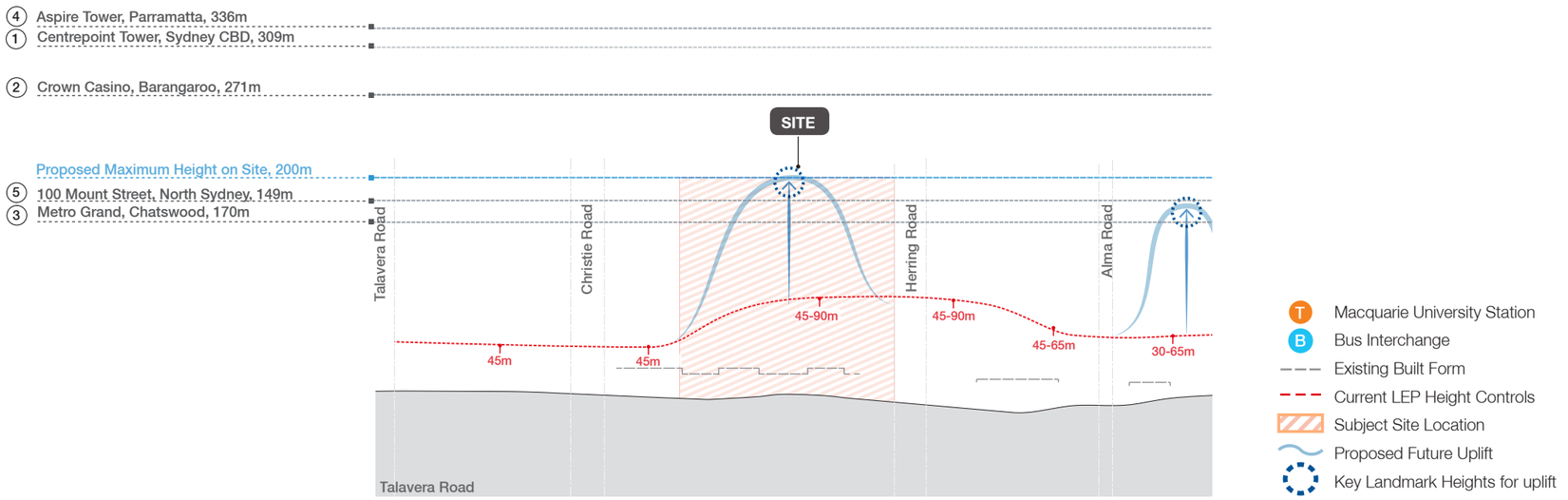


Figure 01: Section B - Talavera Road, Macquarie Park : Existing Permissable Heights and Proposed Future Uplift

3.3 Sydney Centres with FSR 7:1+

The diagram opposite identifies key centres throughout Sydney with signifcant maximum Floor Space Ratio controls that are comparable to that proposed on the subject site in Macquarie Park.

The range of existing and future Maximum FSR controls for key centres would indicate that the proposed uplift for Macquarie Park is appropriate within the greater Strategic context of a growing Sydney.

Maximum FSR Controls for Key Centres across Sydney:

Major Centre	Maximum FSR
Macquarie Park	6.5:1
Blacktown	8.5:1
Merrylands	9:1
Parramatta	12:1
SOPA	8:1 - 12:1
Rhodes	9.3:1
Chatswood	7:1 - 8:1
St Leonard's	17:1
Sydney CBD	7:1 - 11:1
Kings Cross	5-7:1
Bondi Junction	8:1
Hurstville	9:1

Key

- Site Location
- Renewal Precincts
- Railway Line
- Major Centres
- Centres with FSR 6:1 and over

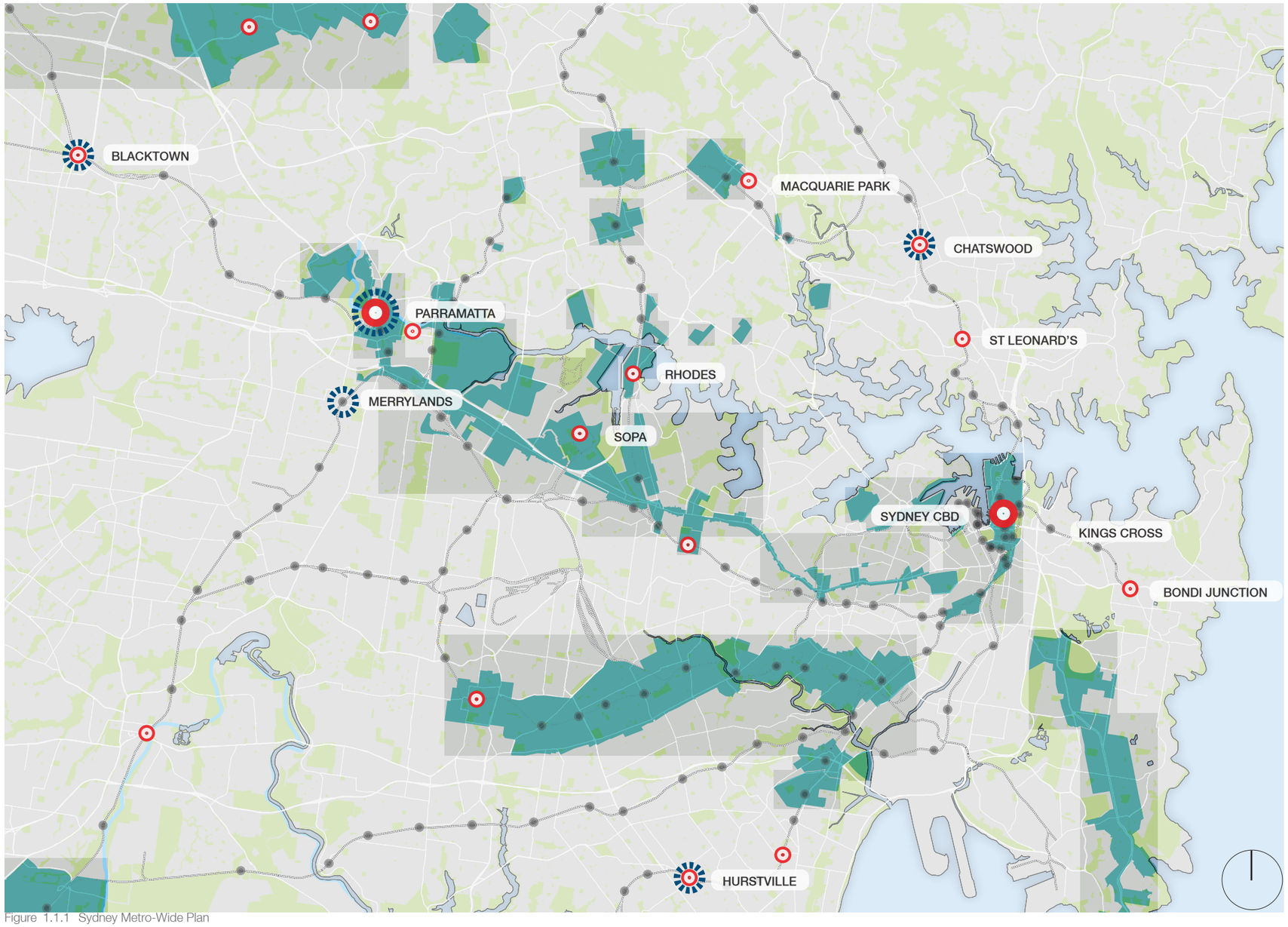
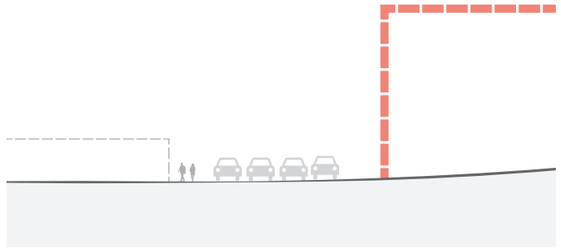


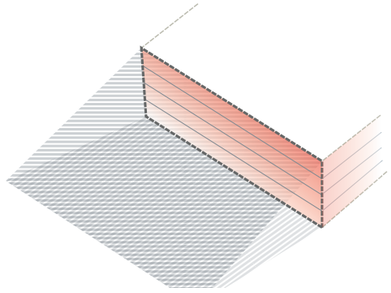
Figure 1.1.1 Sydney Metro-Wide Plan

3.4 Strategy for Uplift



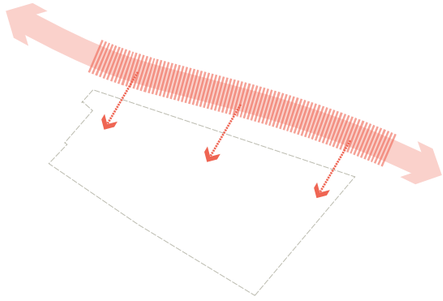
1. Height Transition along Talavera Road

Under the current planning controls, the massing on the site is distributed towards Talavera Road, which would establish a solid wall of development. As a consequence, development at this location would result in an insensitive transition to university and campus facilities on the opposite side of Talavera Road, which are pedestrian scaled.



2. Overshadowing Impact

The massing along Talavera Road would result in an imposing and undesirable ‘wall of shadow’, which would impact the public domain and university areas located to the south.

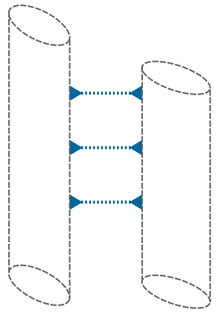


3. Response to M2 Motorway

The proposed height would be placed towards the M2 Motorway. Under current planning controls, the site permits a maximum building height of 45 metres on the northern boundary, which does not adequately respond the proportion of the M2 Motorway. Taller buildings at this location would be able to minimise dwellings impacted by noise, light reflection and establish definable building forms.

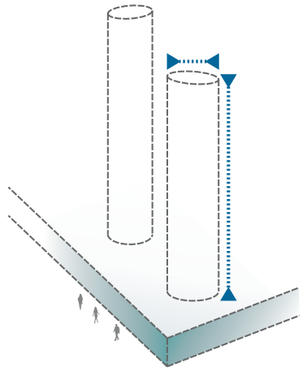
Constraints/Undesired Outcome

Opportunities/Desired Outcomes



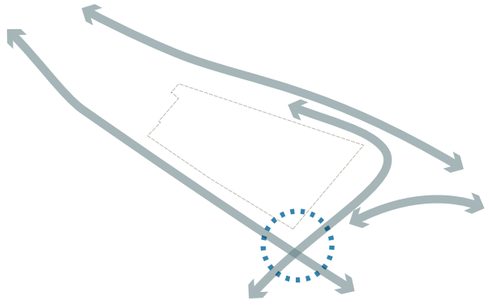
4. Building Separation and Variation

The proposed height would permit a range of building typologies, forms and features. Tall and oval shaped towards can be appropriately oriented and sited to ensure generous building separation, solar access and views to prominent features. Under the current controls, height would unlikely result in adequate separation of dwellings, resulting in reduced amenity.



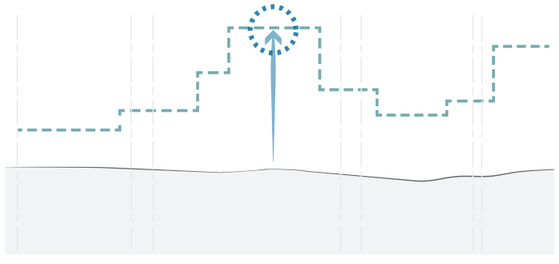
5. Proportions and Scale

The proposed height would be offset by tall towers, supported by a podium element. This would reduce the perceived scale of development and provide human-scale frontages along Talavera Road and Herring Road.



6. Strategic Gateway Site

The site benefits from three frontages – M2 Motorway, Talavera Road and Herring Road. This lends itself towards having a more prominent presence within the streetscape, specifically at the gateway of Macquarie Park. The site is strategically placed to accommodate higher built form.



7. Macquarie Park Skyline

Permitting additional height would allow the site to contribute towards the Macquarie Park skyline. The site is generally located on a higher plane within the Macquarie Park precinct. High points should be utilised with unique building forms allowed to enhance the skyline.

3.5 Urban Design Principles

Based on our understanding of the site and its broader urban context, we have distilled several key urban design principles that should be applied to any future development on the site.

Movement + Access

Movement within and around the subject site should be easy to navigate with pleasant and attractive streetscapes.

Pedestrian access is a key priority, particularly to open space areas that are readily accessible from residential buildings. It is essential that buildings are sited to ensure efficient connections through and around the site, reducing travel distance to transport and services.

Vehicle and pedestrian access points should be clearly separated to improve pedestrian experience. Vehicular access points should be minimised near major intersections at Talavera and Herring Road to ensure pedestrian comfort and safety.

Sustainability

The redevelopment of the site will embody sustainability, not only in financial terms, but also through connections to public transport, open spaces, services, and provision of varying building forms.

It is important that the site is integrated into the transformation of Macquarie Park as a vibrant mixed use precinct, where attractive public open spaces and streetscapes along Talavera and Herring Road encourage pedestrian movement and complement workplace amenity.

In addition, the use of public and active transport should be facilitated through the provision of bicycle parking, cycle lanes, and safe and comfortable routes to the station.

Density

The density of development within the site is an important contributor to activating the public domain and spaces, maximising access to the station and services, and buffering undesirable noise and activity along the M2 Motorway.

The housing choice offered by this scale of development, within such close proximity to transport and employment, should complement the location of the site as a gateway into the precinct. The location of the site lends itself to pursue taller built form as a definable element in the precinct skyline.

While a higher density brings positive outcomes, it is also important that the proposal responds to its context in terms of traffic, access and overshadowing. Density should be consistent with the role of centres for example Chatswood, St Leonards and Sydney Olympic Park.

Amenity

A key component of any successful mixed use development is active, quality and accessible public open spaces, where residents can build relationships with neighbours and facilitate interaction within the public domain. This is even more important in higher-density communities, where private spaces are limited.

Key locations on Talavera and Herring Road frontage should establish a sense of place and arrival through creation of a plaza or square. This should be complemented by public domain elements including lighting, seating and shade.

The orientation of buildings should carefully consider passive surveillance, views, over-shadowing of spaces, solar access and natural ventilation to individual dwellings.

Podium

It is important to consider the scale and bulk of the built form in relation to pedestrians. Podium elements are an effective way of ensuring high density areas respond to fine grain and human scale interactions with the street.

Podiums should consider the relationship to primary frontages to create a permeable street wall at human scale (approximately 3-5 storeys). Podium levels offset the perceived bulk of taller buildings and provide comfortable scale for pedestrians. Additionally, any above ground parking should be sleeved with uses; this avoids presenting blank facades.

Separation of buildings can be used to break up the bulk of the built form and create opportunities for gathering spaces. Tall and slim buildings have the ability to provide greater separation and enhance urban amenity by creating efficient footprints.

Diversity

Varying urban conditions throughout the locality should be embraced, as they will ensure a variation in built form, scale and housing typologies. Common urban design principles should not manifest into common architecture. A range of materials, design approaches and styles should be encouraged to create interest in the streetscape and character.

Design responses to particular urban conditions, including the M2 Motorway, adjoining commercial uses, the existing watercourse running through the site and proximity to transport should be encouraged, and allowed to manifest in unique design outcomes.

Diversity through podium elements can provide elevated communal open space with increased solar access, security and separation from noise pollution.

Character

Development should make a positive contribution to the future character of Macquarie Park, building on and enhancing local sense of identity. It is essential that new development improve amenity within the existing precinct to satisfy future residents and employment satisfaction. All proposed buildings will assist with defining a new character for a modern Macquarie Park, responding to the need for density and making it a competitive place to both live and work.

Existing ecosystem and river systems around the site and towards Lane Cove River should be celebrated and complemented by passive and active recreation opportunities where appropriate.

Safety

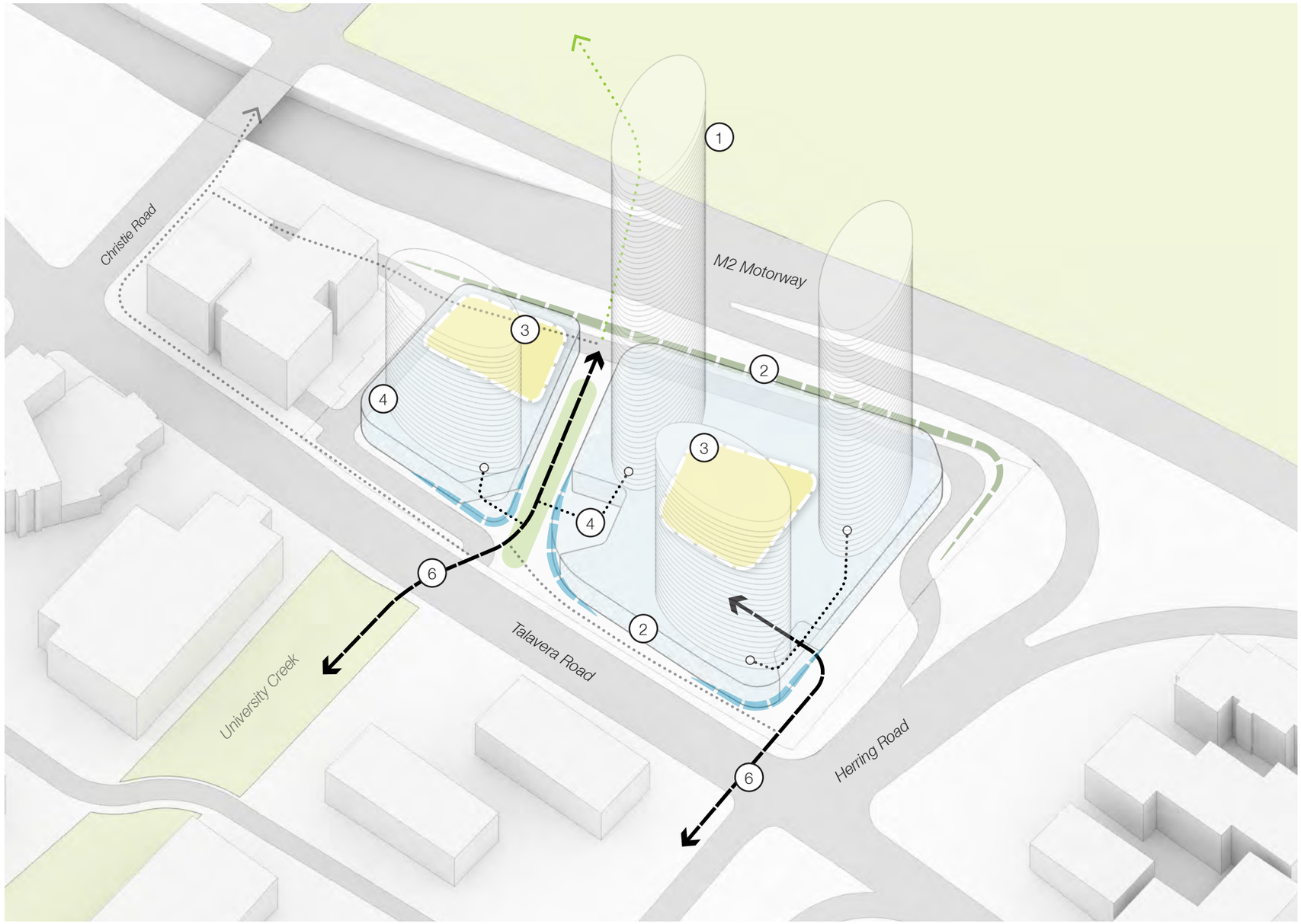
‘Safer-by-Design’ principles will be implemented into the design of the built form, and within both the public and private realms of the development.

Setback of built form, adequate lighting, elimination of blind spots, ground level entries and passive surveillance are strategies that will be taken into consideration throughout the design process.

3.6 Concept

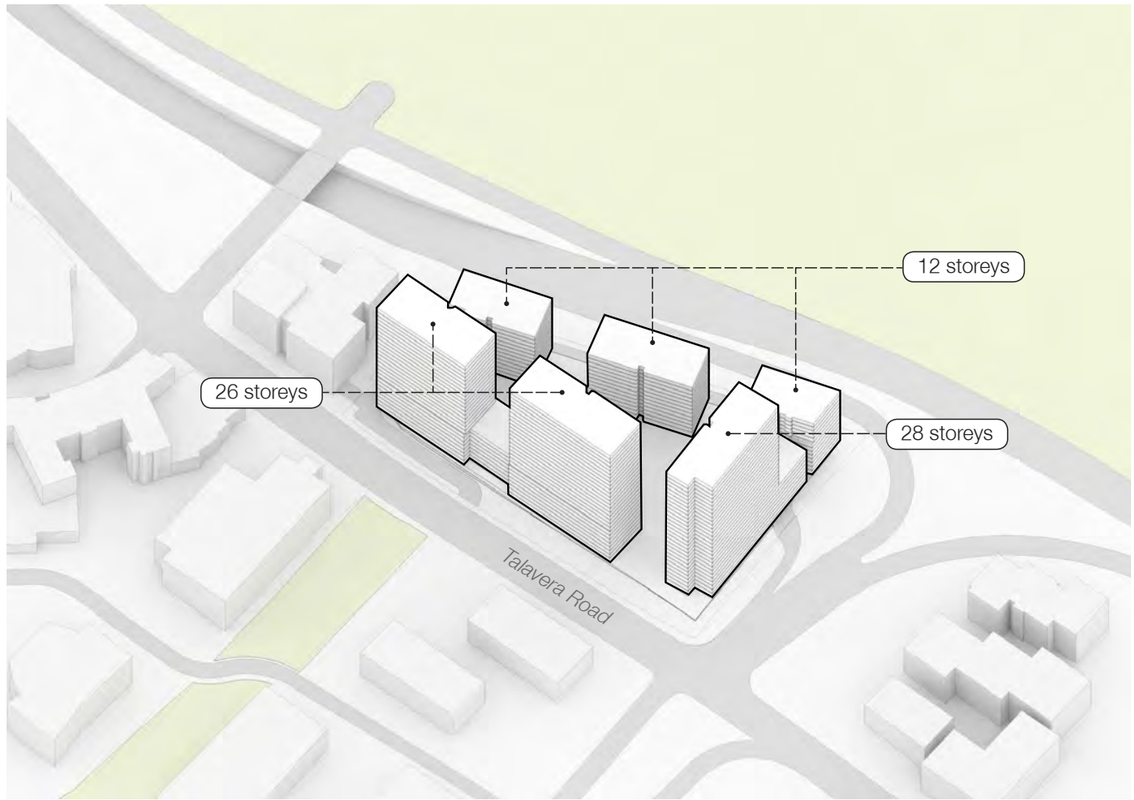
From the principles, the key ideas of the scheme are described in the concept diagram as follows:

1. **Height**
   A diverse range of building heights can be accomodated throughout the site, in consideration of it's position as a gatway to the precinct.
2. **Edges and Interface**
   The Talavera Road frontage should enhance pedestrian scale interactions, while the M2 Motorway frontage should be used as a buffer to shield the site from noise and traffic conditions.
3. **Open Space**
   A variety of open space typologies should be provided with optimised exposure to sunlight. Access to these spaces by local residents should be maximised, allowing for passive surveillance and activation.
4. **Built Form**
   Built form should contextually respond to surrounding buildings as well as the precint as a whole.
5. **Amenity**
   Views and solar access within the site should be enhanced and not negatively impacted around the site
6. **Connectivity**
   Linkages should be established with exisiting networks, particularly with University Creek, and towards Macquarie University station and bus stops.



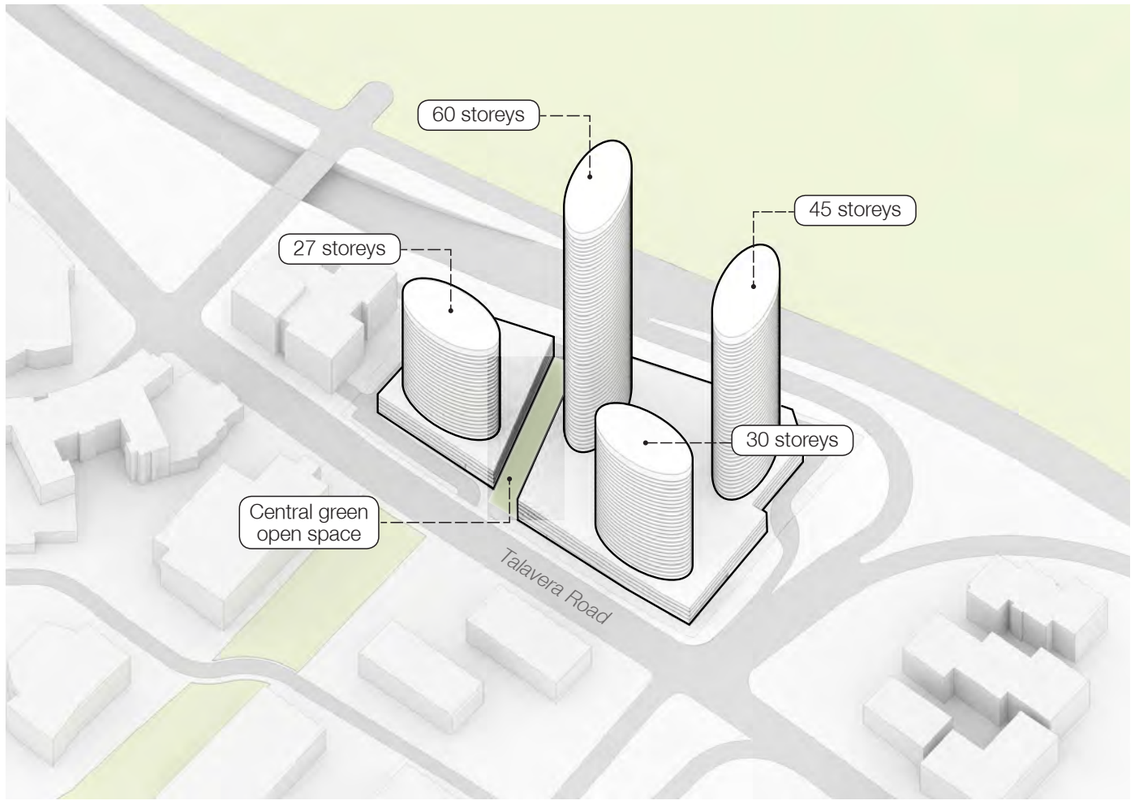
3.7 Design Response

This review has tested the site's capacity to be developed, as a compliant scheme and a proposed alternative (non-compliant) scheme. The merits of each outcome, based on site specific design concepts, are analysed in the following pages.



Compliant Scheme

The compliant scheme consists of six tower blocks arranged around a central communal open space. Towers range from 12 to 28 storeys, with taller towers fronting Talavera Road, as per LEP height controls.



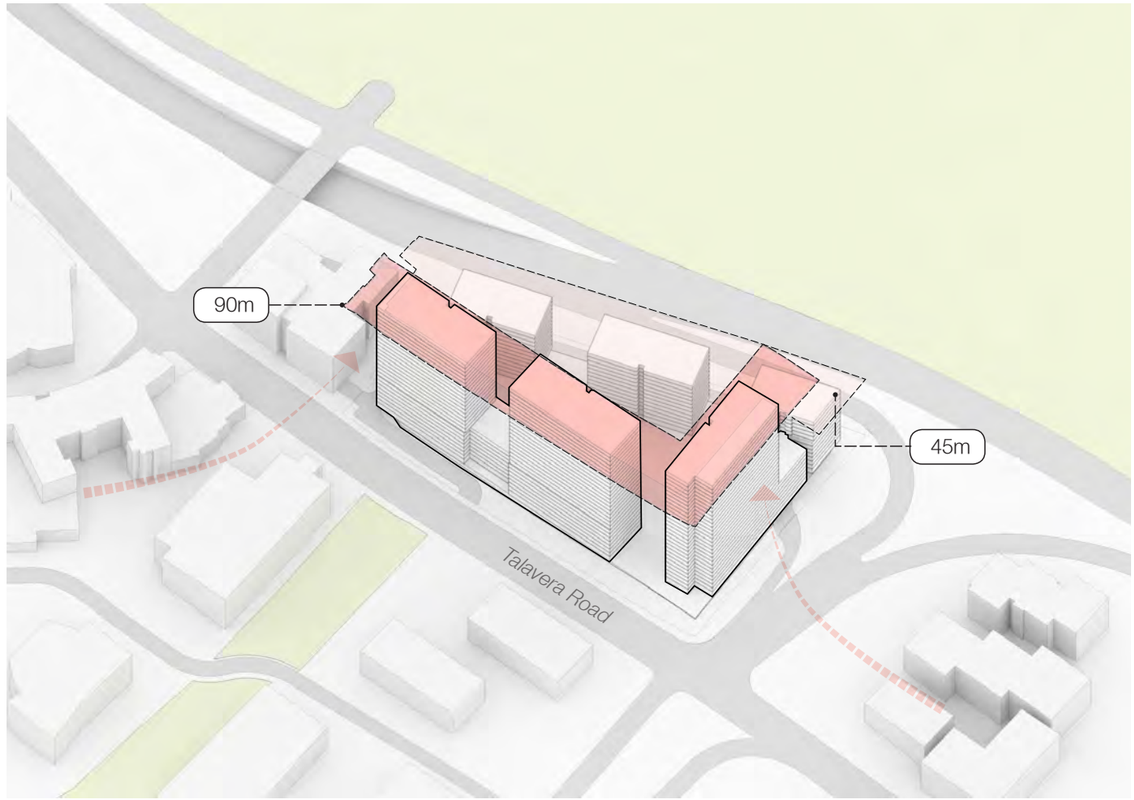
Proposed Alternative Scheme

The proposed scheme consists of two podiums separated by a central open space, and four slender towers ranging from 27 to 60 storeys.

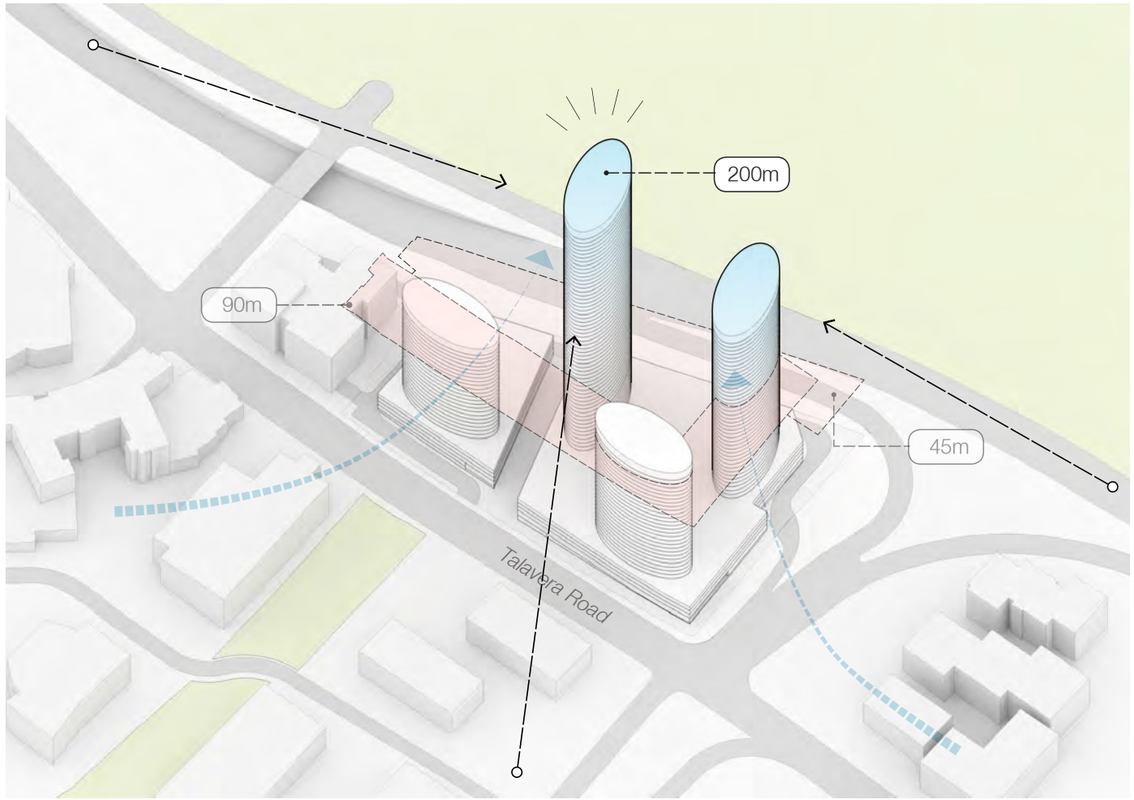
Design Strategy

Height

Site as a gateway into the precinct



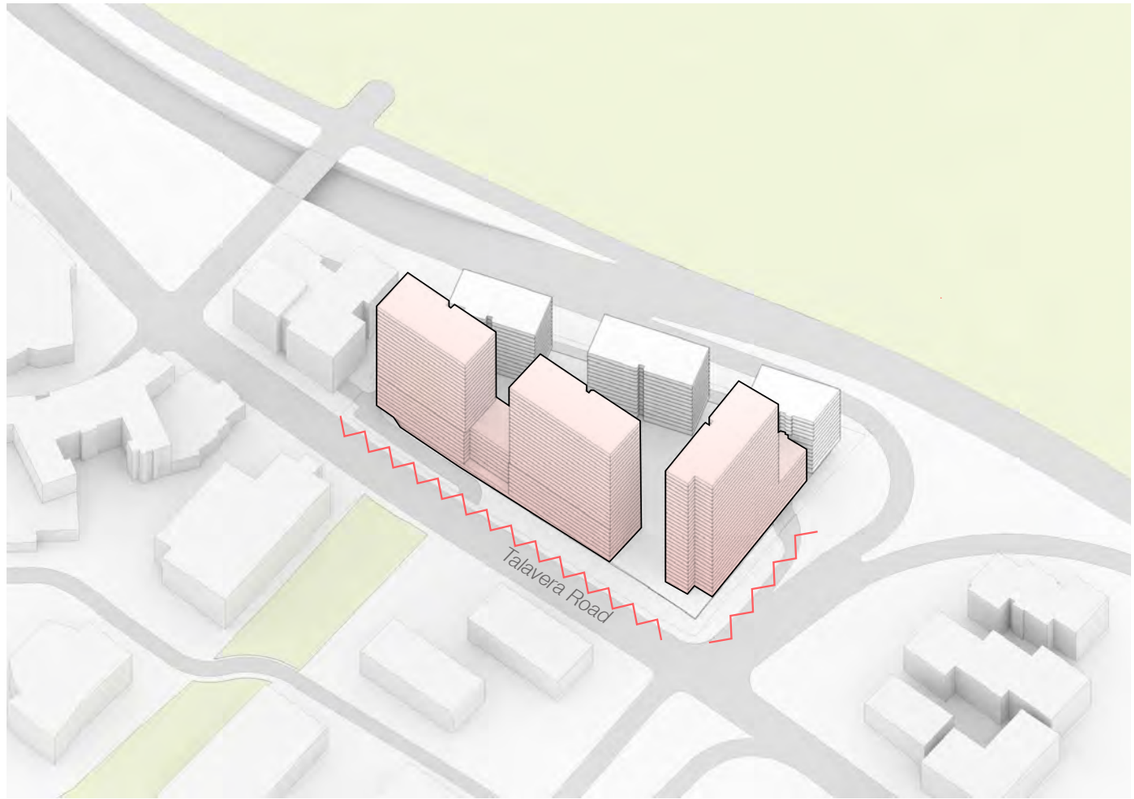
Compliant:
Existing height controls (90m along the southern boundary, 45m along the north) limits the site's potential to become a definable gateway for the precinct.



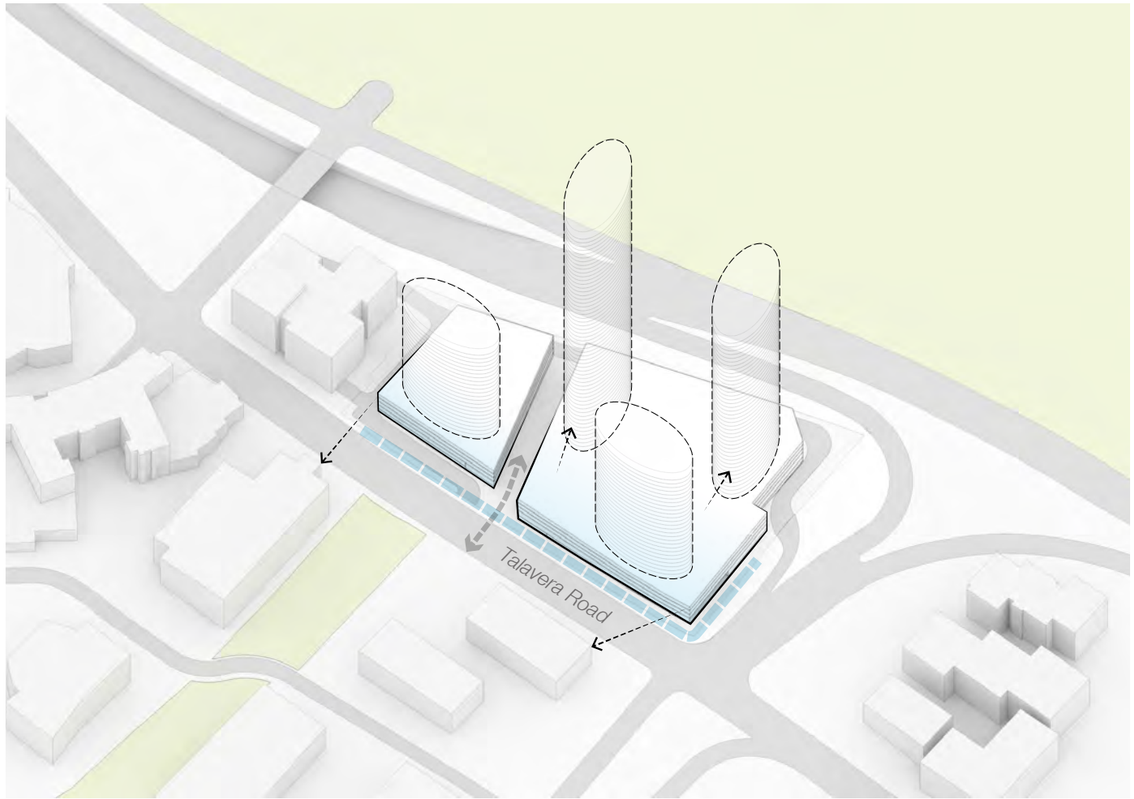
Proposed:
An increased height limit will create a definable gateway with diverse and visually prominent building forms.

Edges + Interface

Frontages should relate to their specific conditions.



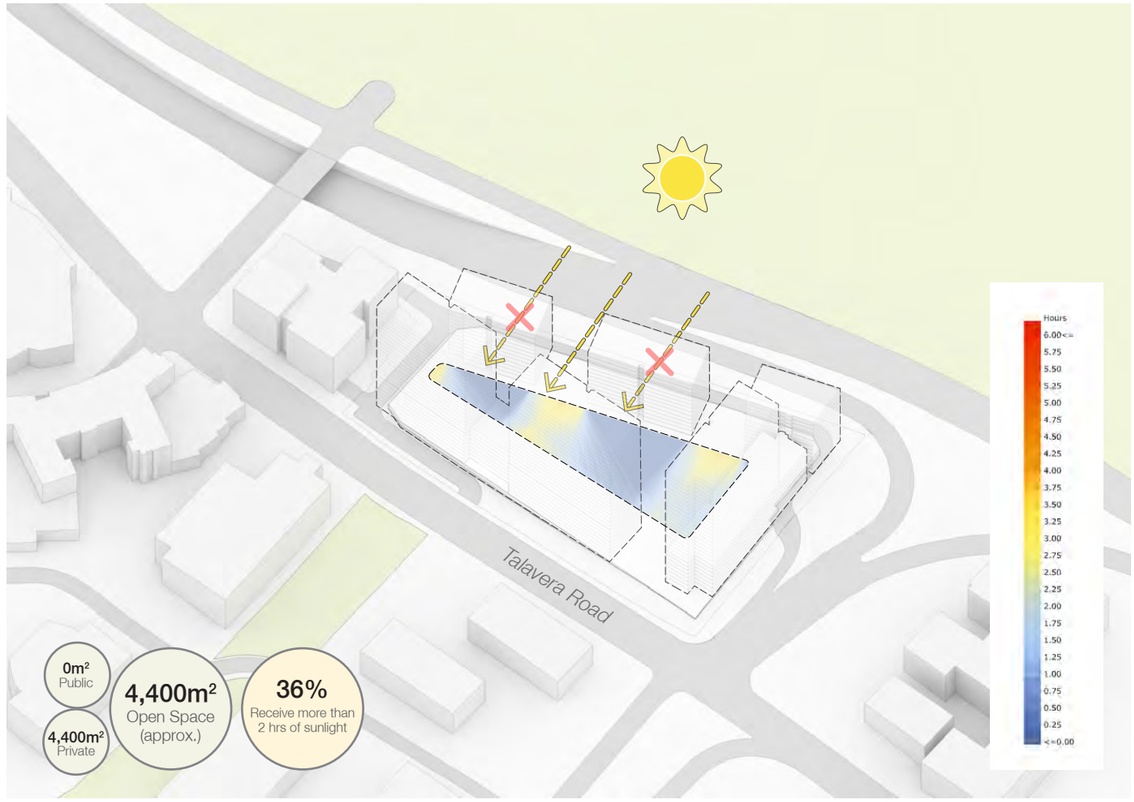
Compliant:
The current controls will result in long massive built forms oriented towards Talavera Road, creating an undesirable streetscape dominated by 25-30 storey blocks.



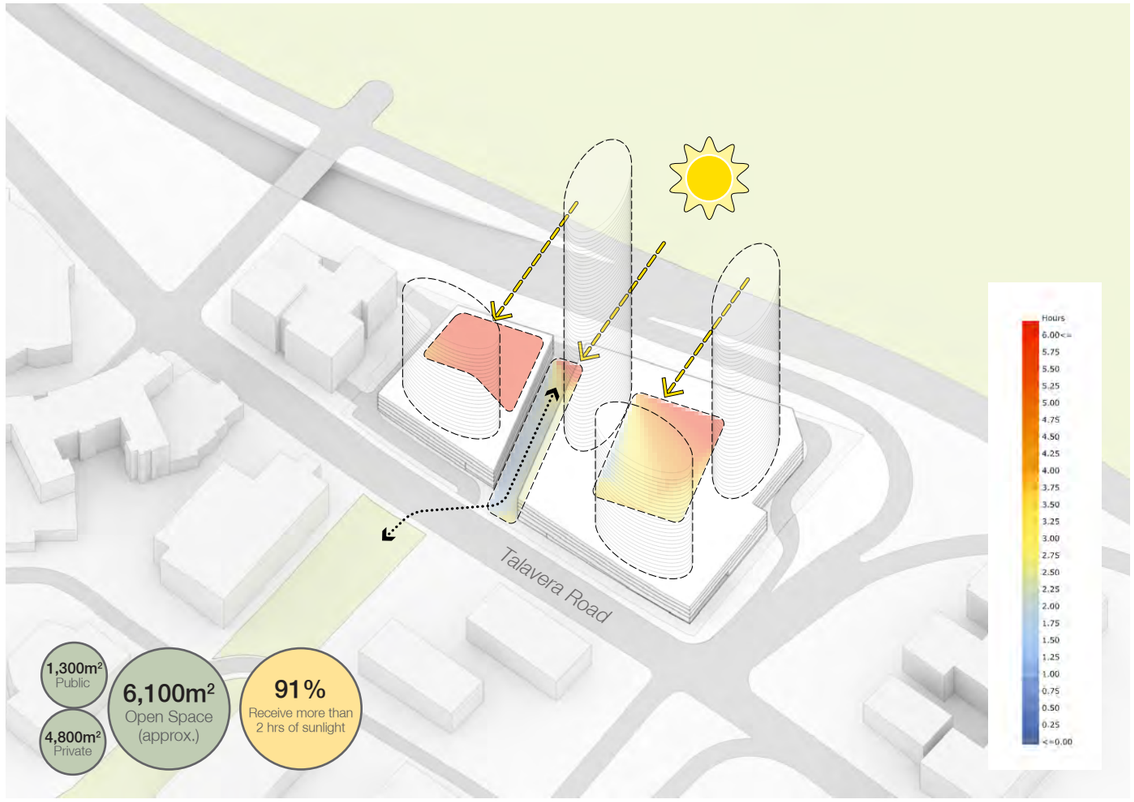
Proposed:
Redistribution of massing towards the M2 will reduce bulk along Talavera Road and allows for human scale street edge interaction at ground level, while forming a buffer against M2 Motorway conditions.

Open Space

Establish variety of open space typologies to optimise exposure to sunlight and maximise access by local residents.



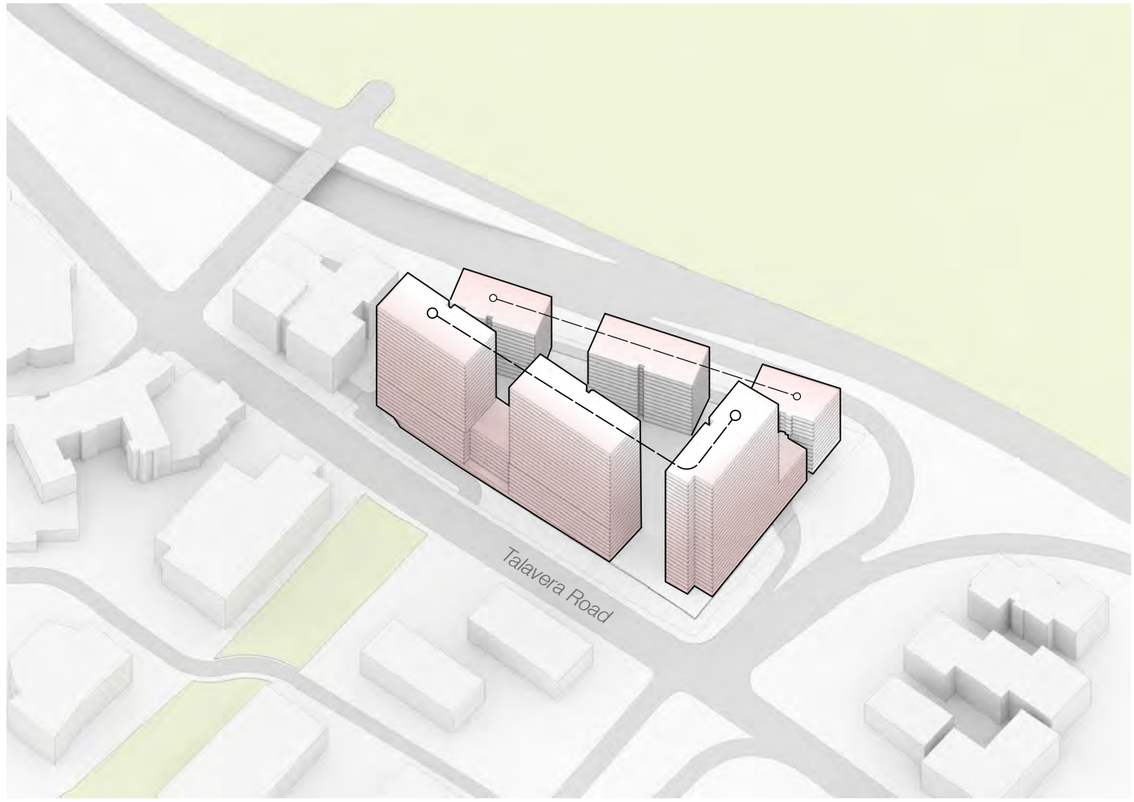
Compliant:
A compliant scheme will result in a lack of dynamic and varied open space arrangements, due to generic building forms. Solar access is restricted due to massing surrounding the central communal open space.
(Winter solstice solar access shown in diagram)



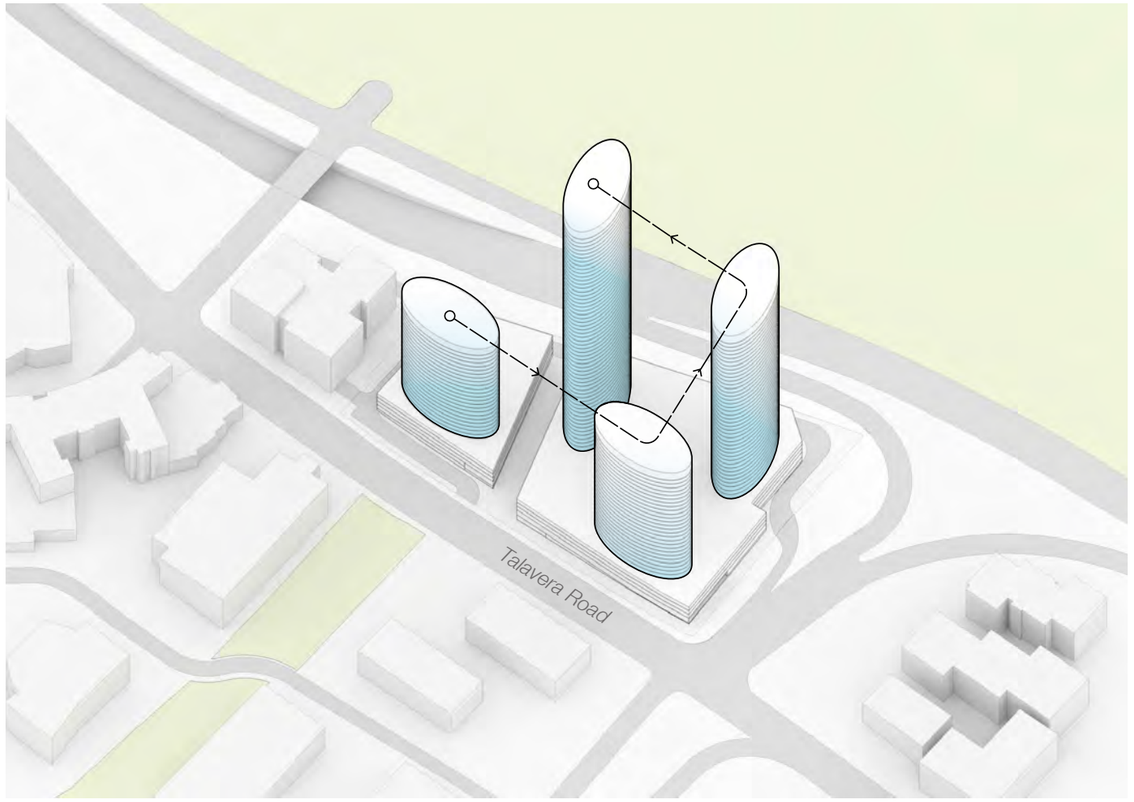
Proposed:
The proposed scheme has the ability to provide functional and dynamic open spaces across different building elements, including a public open space as recommended by the Macquarie Park Finalisation Report (May 2015). Amenity is also enhanced by raising communal open spaces, improving solar access. (Winter solstice solar access shown in diagram)

Built Form

Built form should respond to its boundaries and positively contribute to the precinct skyline



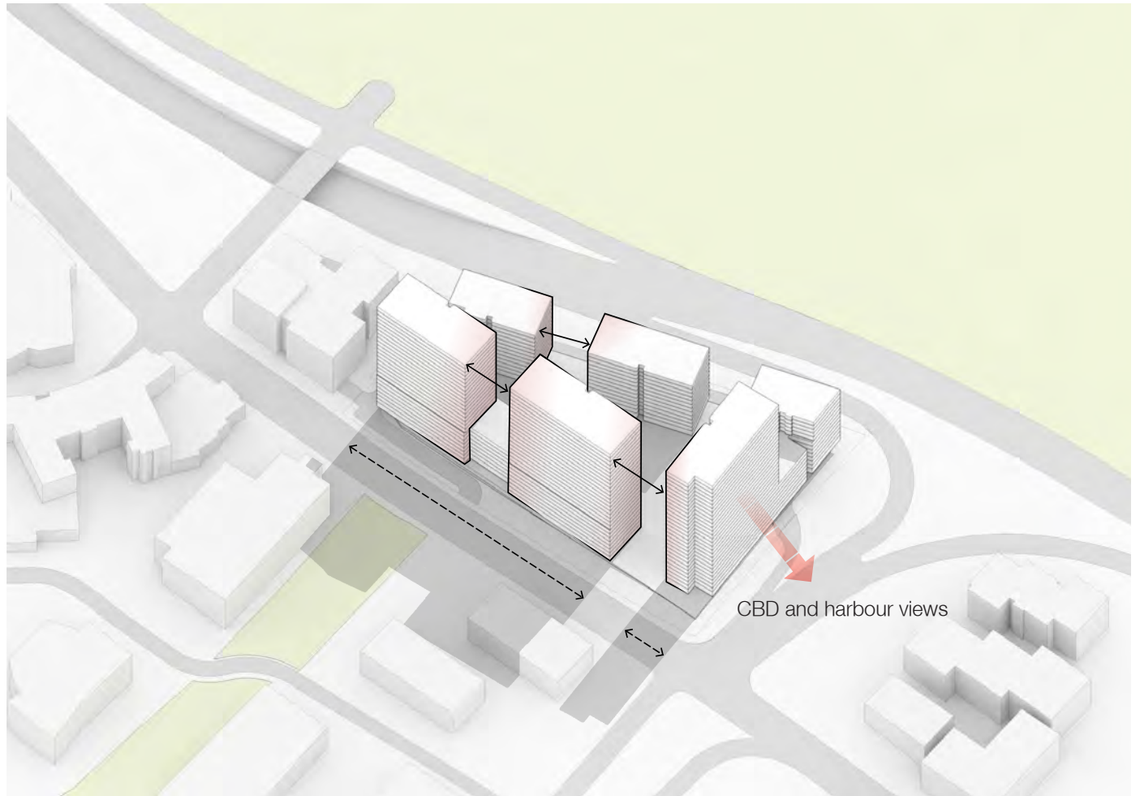
Compliant:
Existing controls will result in a scheme that lacks building diversity and height variation. This results in an inability to adequately address the M2 Motorway with appropriate height.



Proposed:
Diverse building typologies, including podium and tall slim oval towers, will reduce the ‘wall of shadow’ and perceived bulk. Efficient use of building footprint and building height creates a distinctive skyline for Macquarie Park.

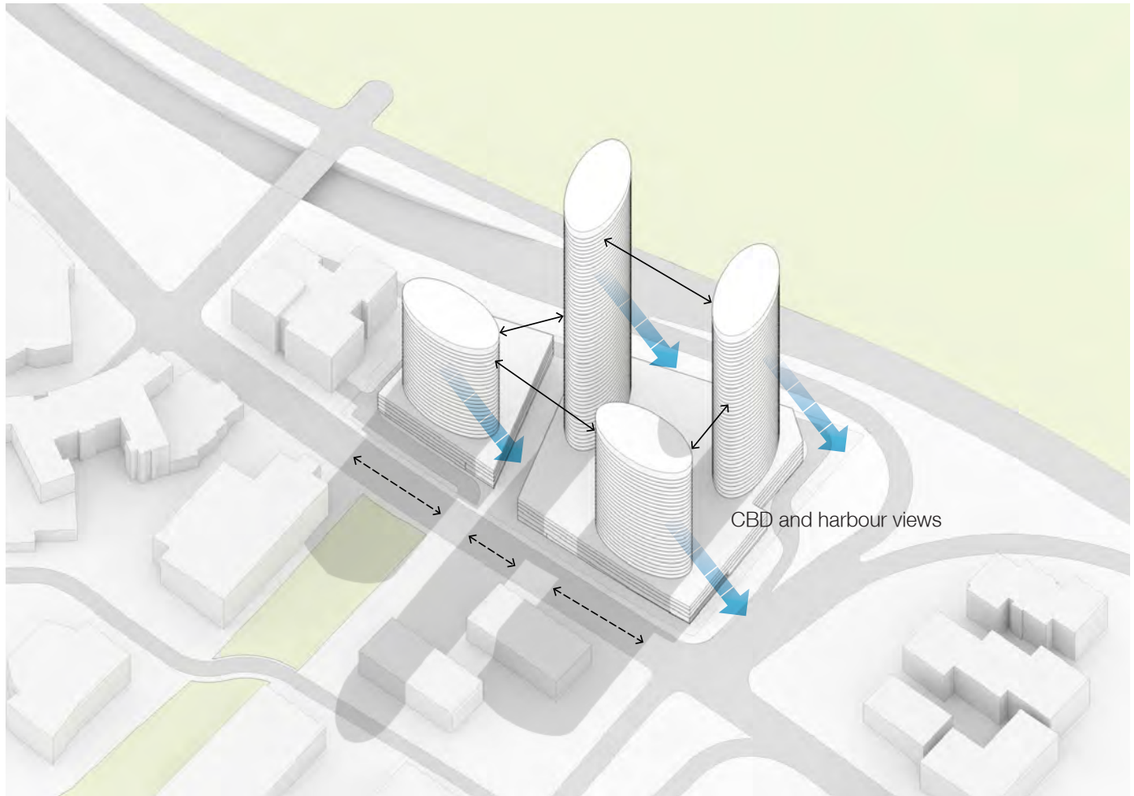
Amenity

Enhance views and solar access within and around the site



Compliant:
The compact built form reduces building separation, creating a ‘wall of shadow’ and negatively impacting public amenity. Outlook into and out from the site is also limited.

Refer to Section 5.2 and 5.3 (pages 47-48) for Compliant Scheme shadow study, which details the extent of shadows cast during Winter and Summer Solstices.



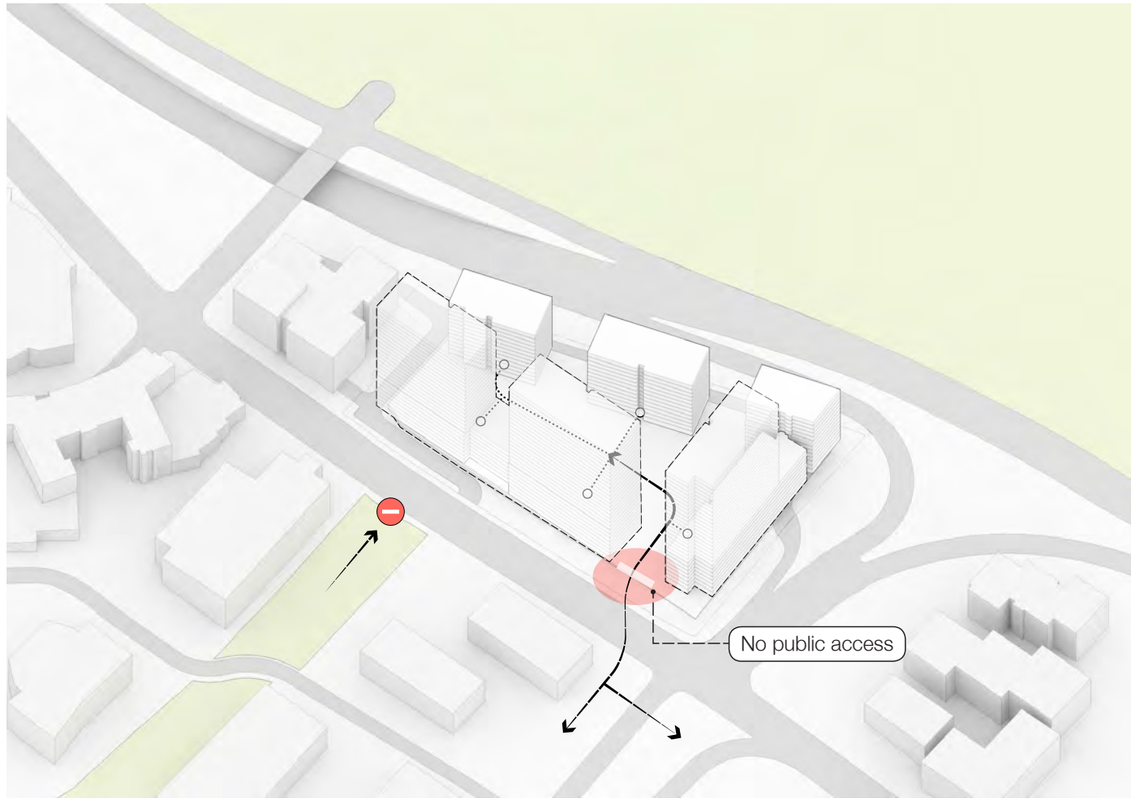
Proposed:
Height in combination with a podium facilitates the development of slender building forms, which provides optimum tower separation and better residential amenity. Shadows are thinner and move quicker throughout the day.

Refer to Section 5.4 and 5.5 (pages 49-50) for Proposed Scheme shadow study, which details the extent of shadows cast during Winter and Summer Solstices. .

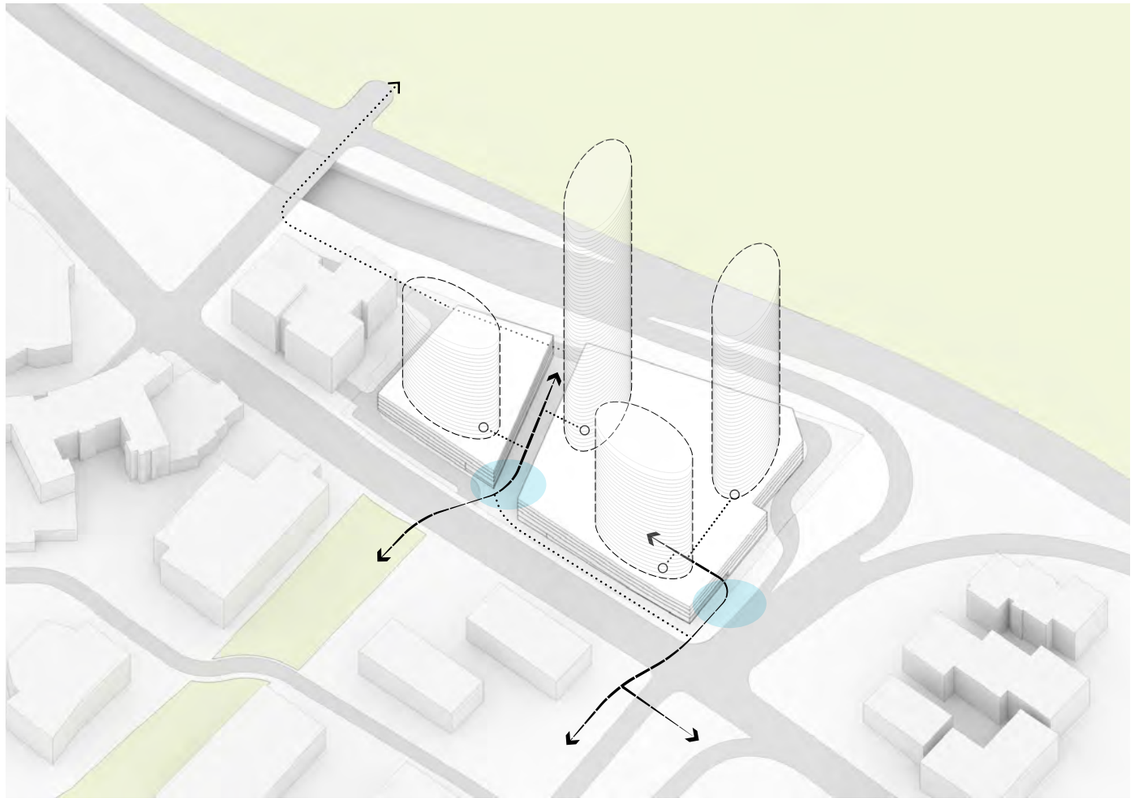
Design Strategy

Connectivity

Provide logical links to open space, transport and amenity



Compliant:
Massing along Talavera Road limits opportunities for pleasant site linkages, addresses and entries.

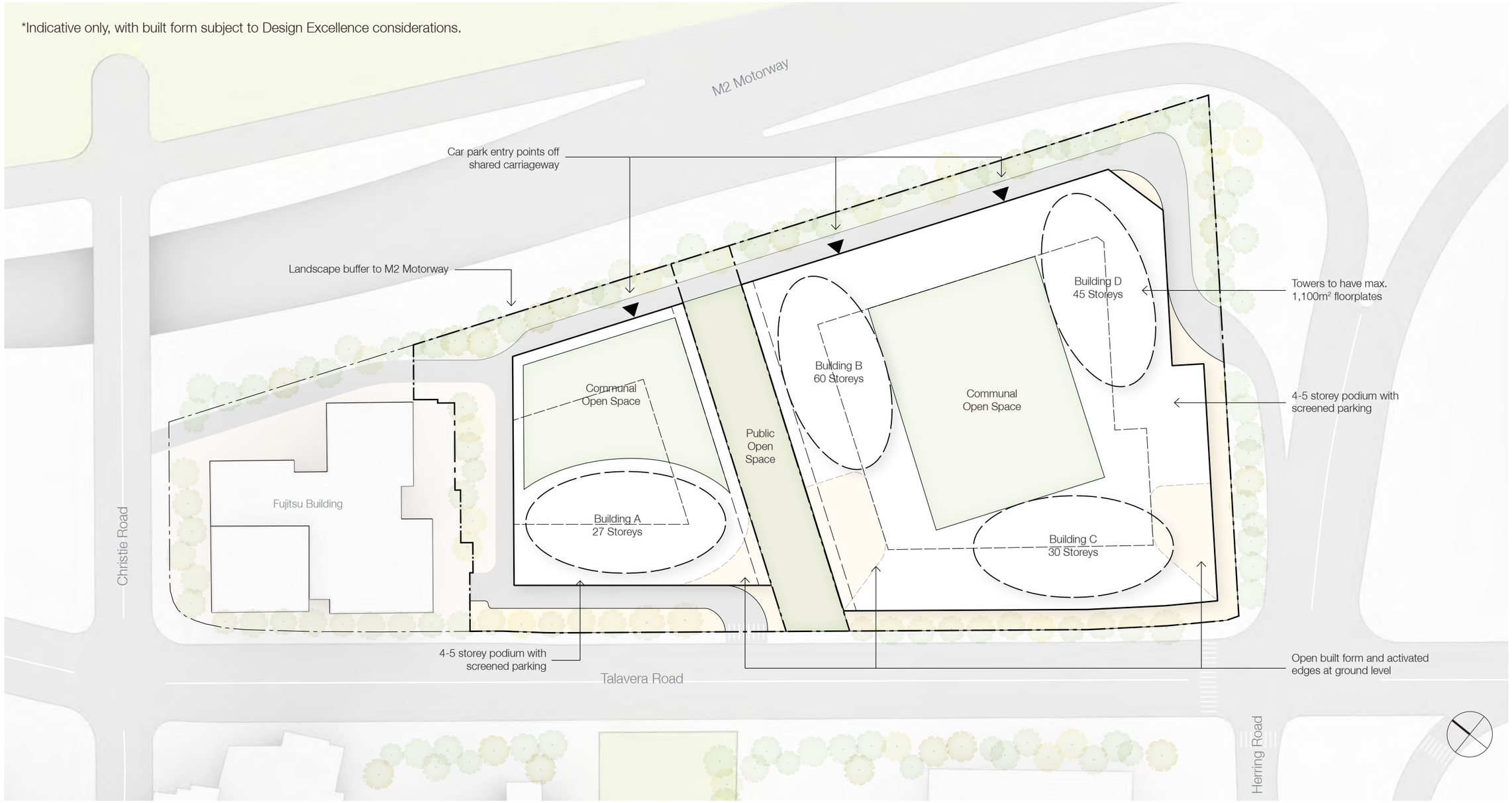


Proposed:
The proposed scheme will enhance opportunities to establish through site linkages and preserve areas for future connections across the M2 Motorway. Opportunities are also maximised for street addresses.

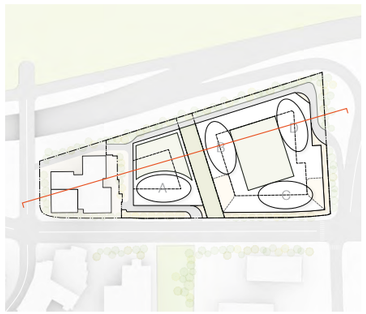
Design Scheme

4

4.1 Illustrative Master Plan

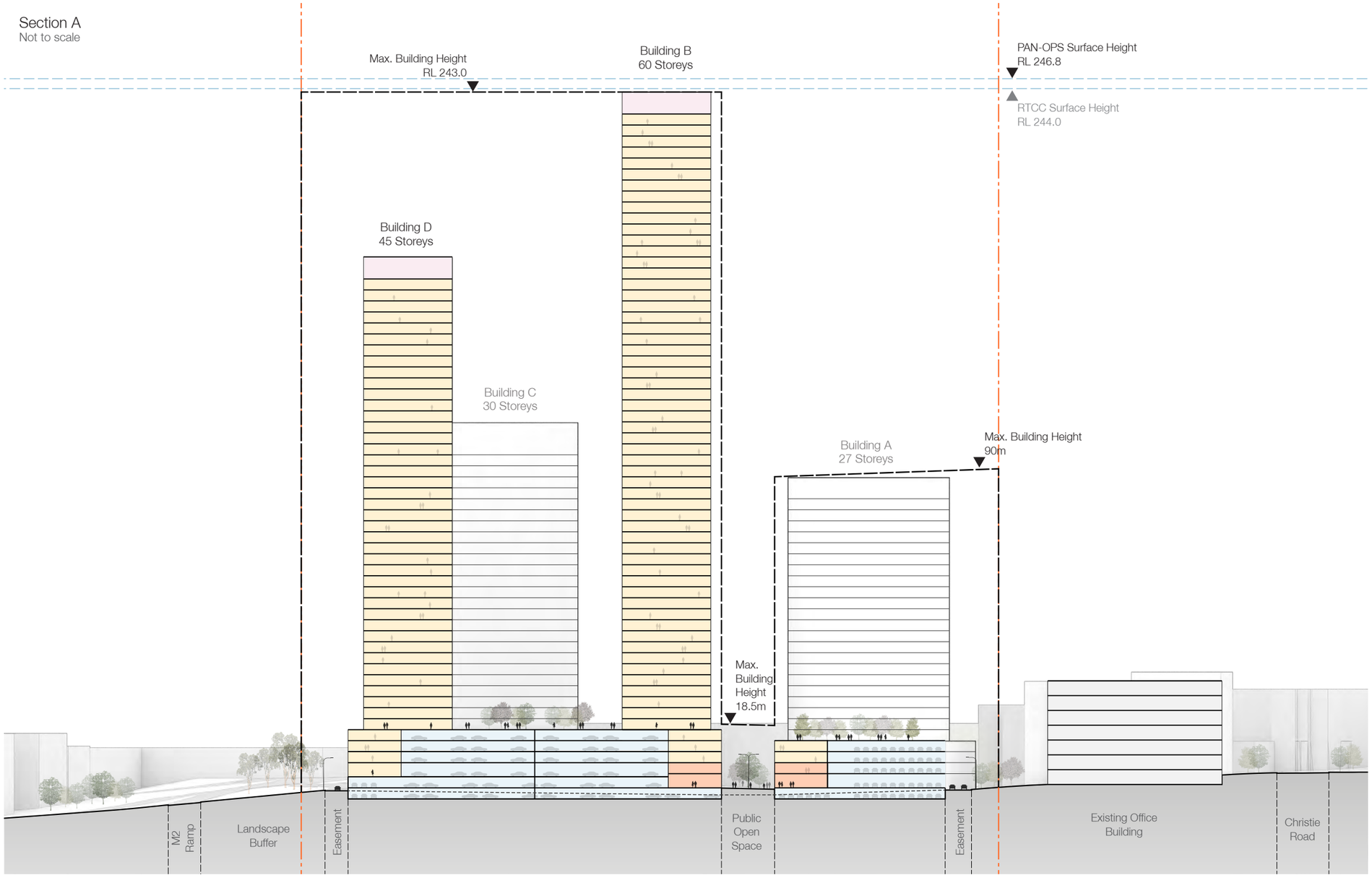


4.2 Section A



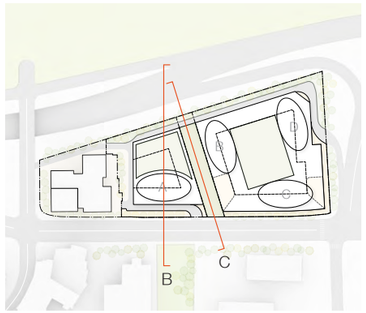
Key Plan
Not to scale

Section A
Not to scale



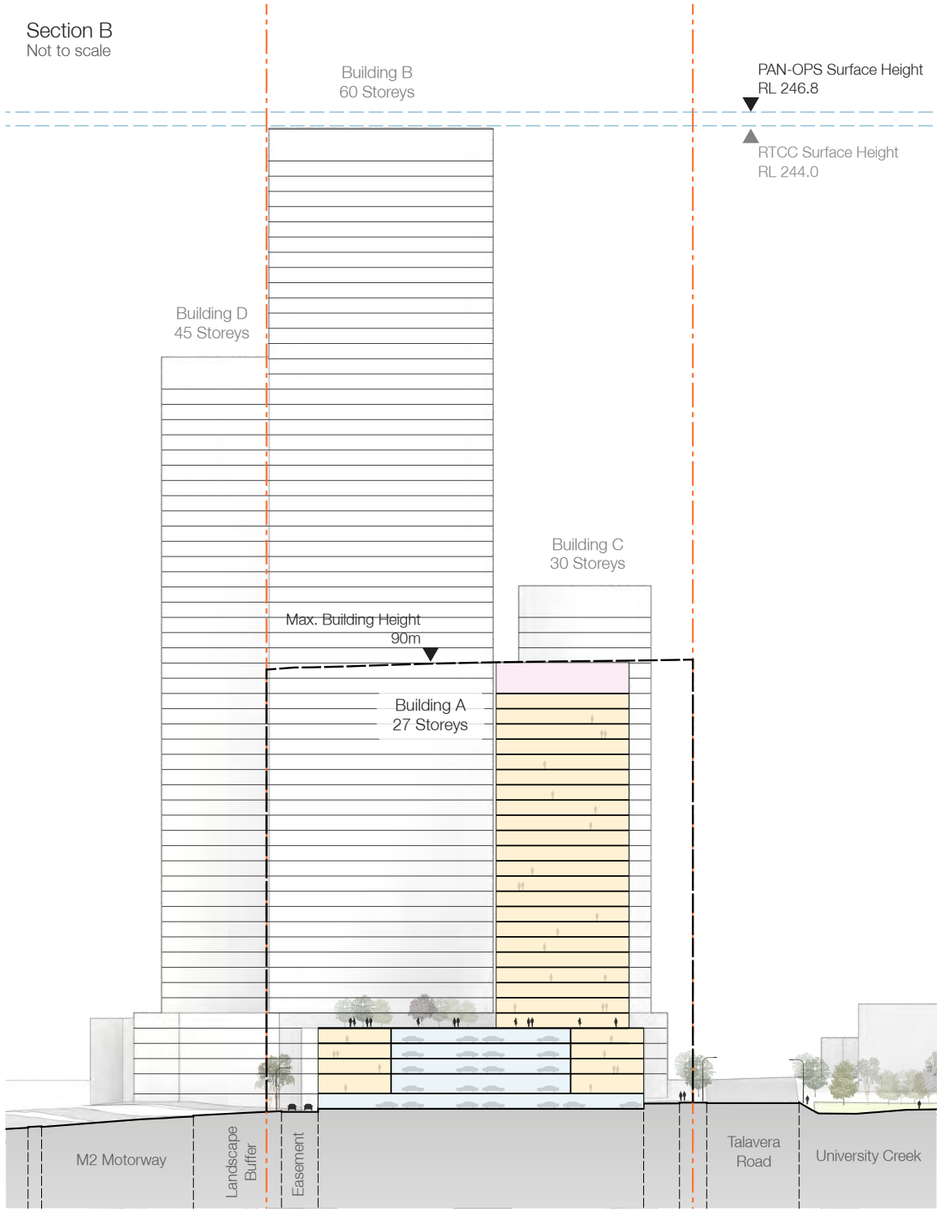
Plant
Residential
Retail/Commercial
Parking

4.3 Section B and C



Key Plan
Not to scale

Section B
Not to scale



Section C
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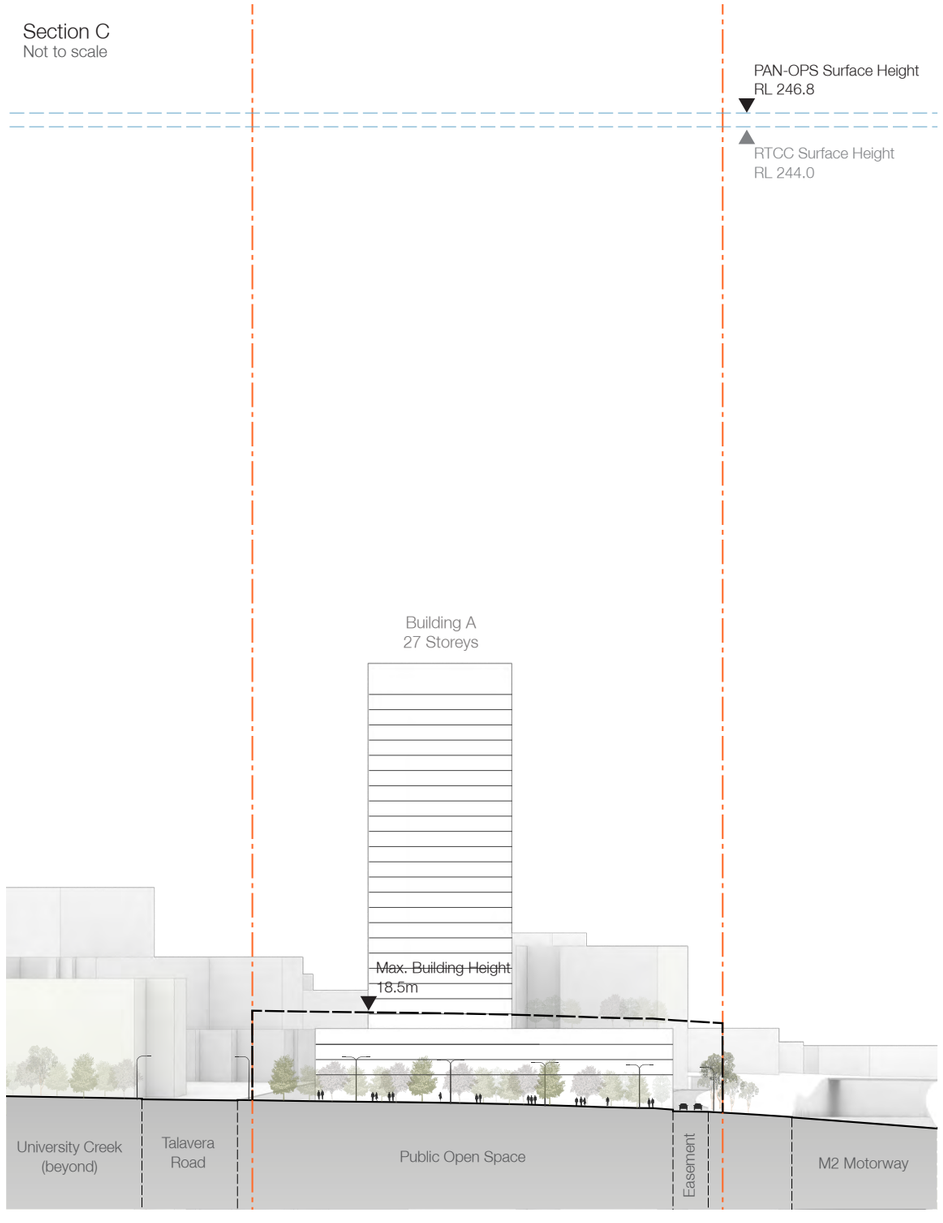
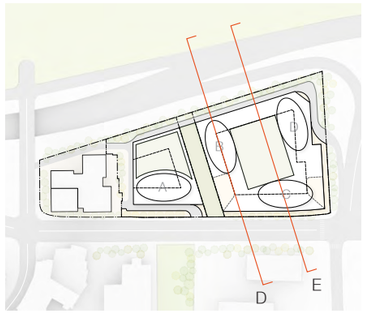


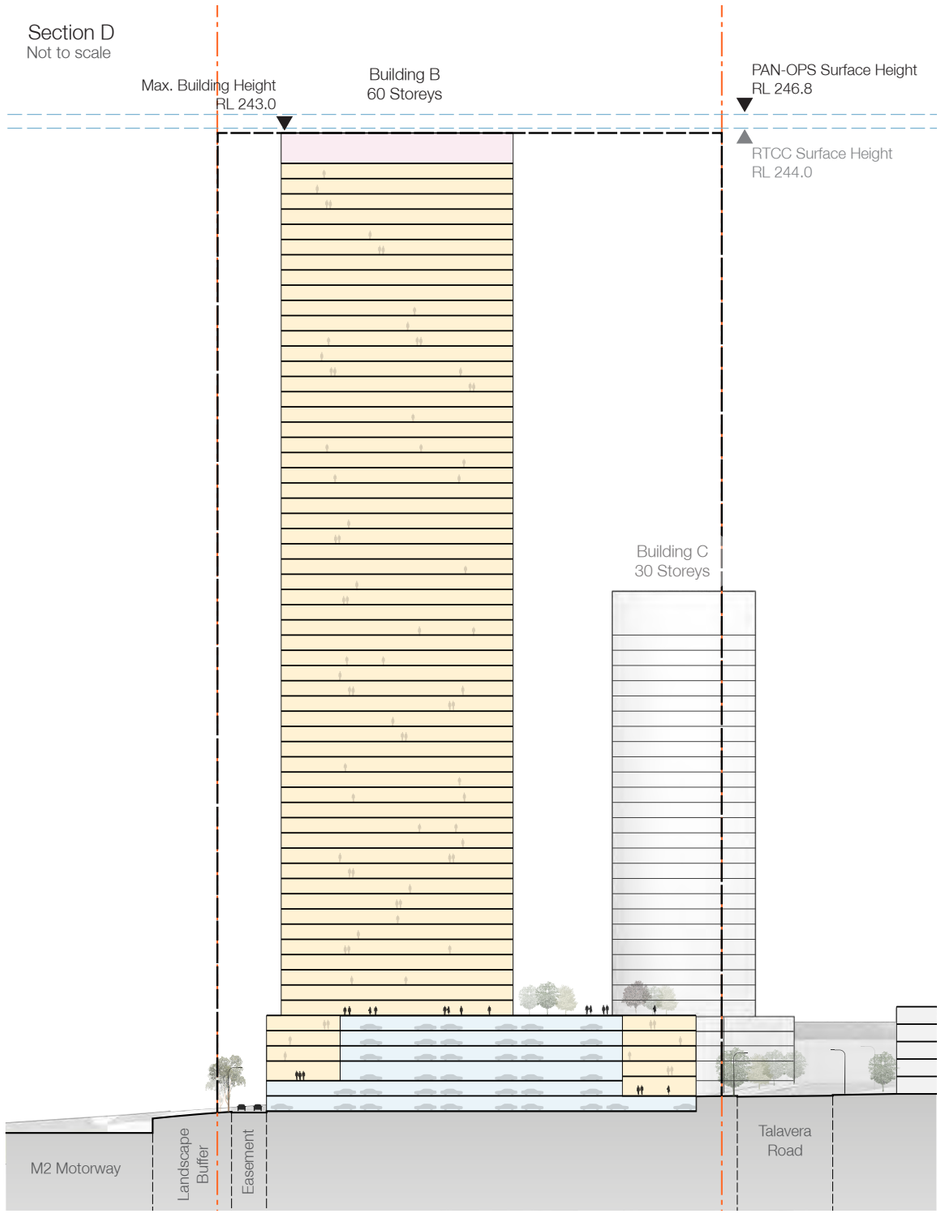
Plant
Residential
Parking

4.4 Section D and E



Key Plan
Not to scale

Section D
Not to scale



Section E
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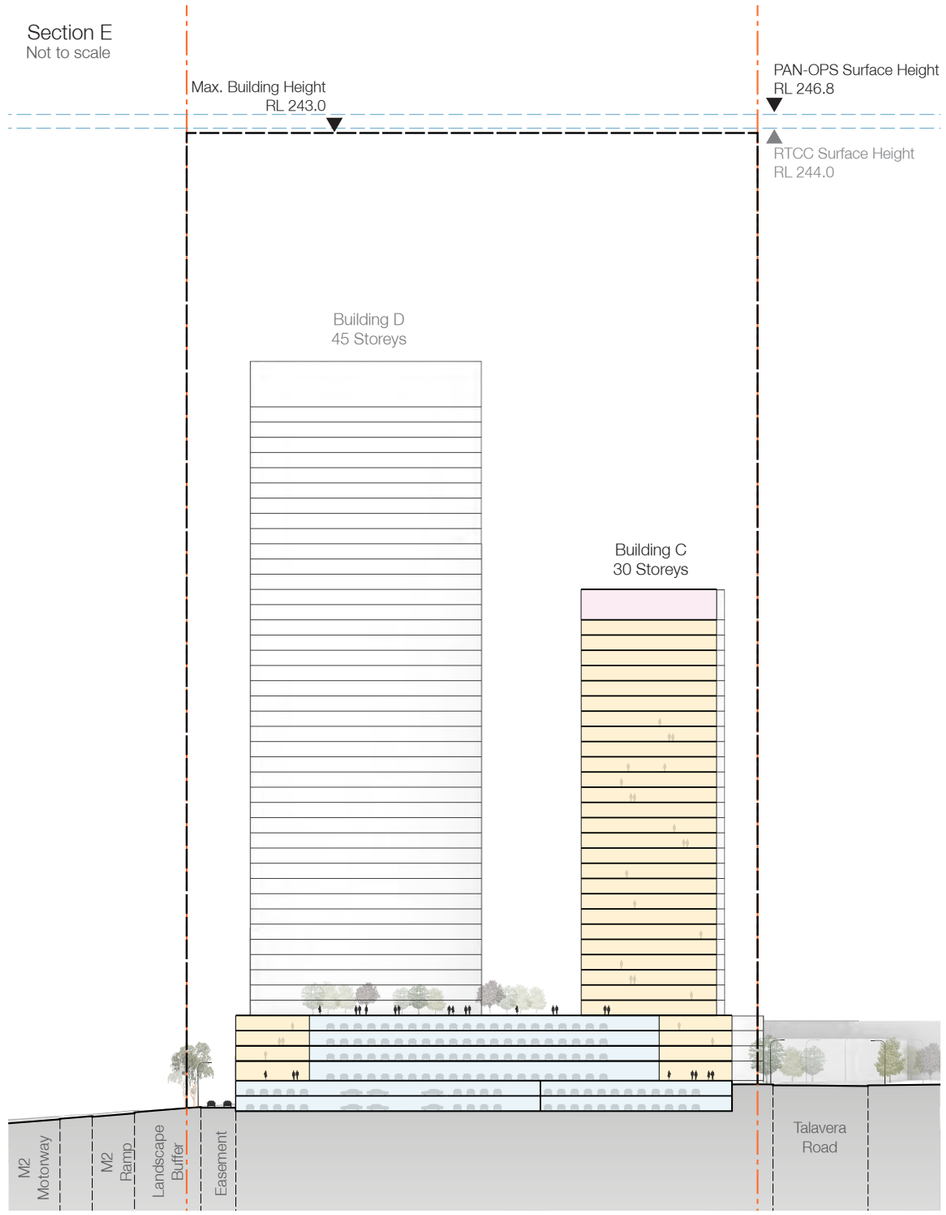
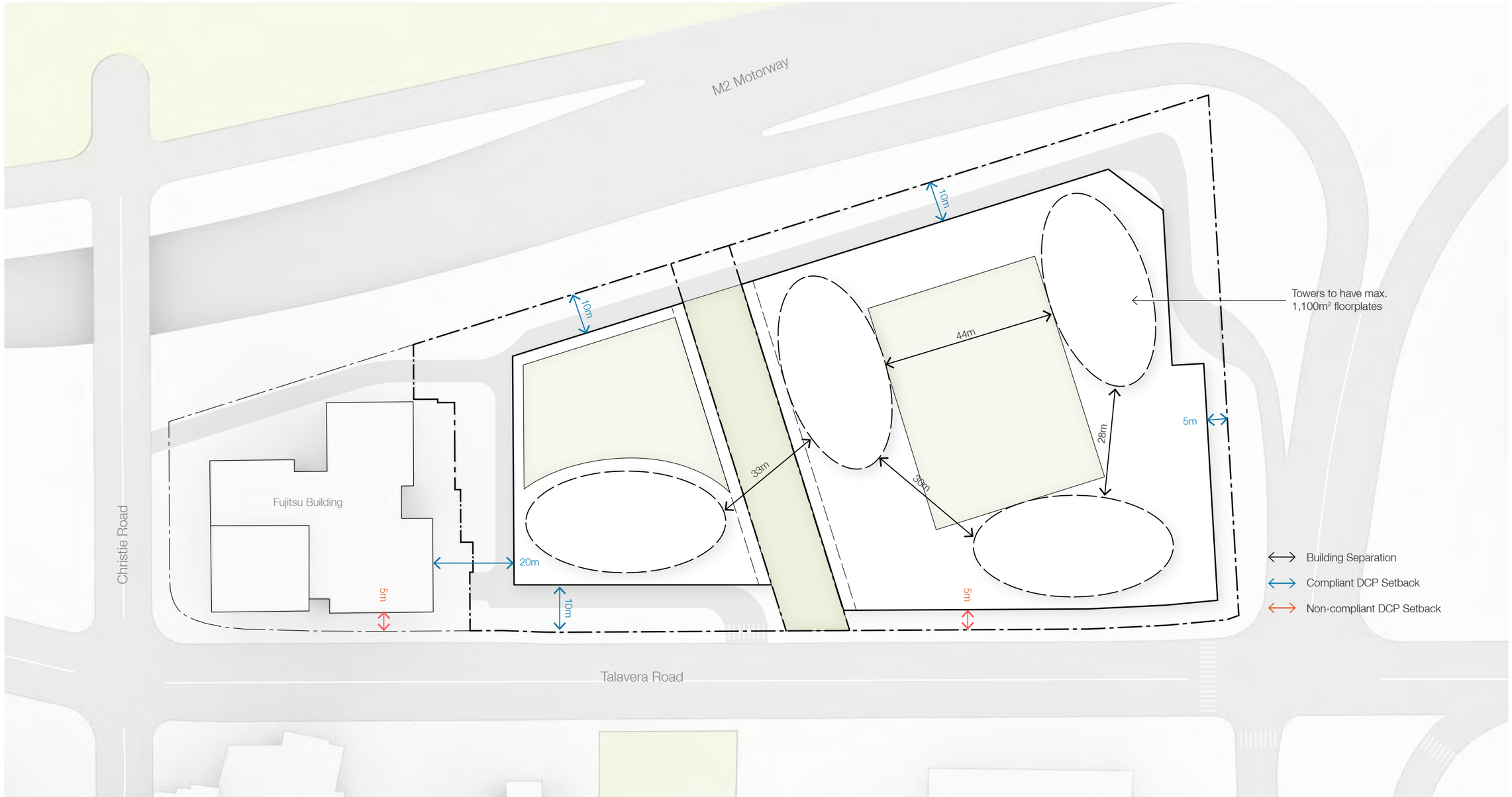


Plant
Residential
Parking

Design Review

5

5.1 DCP Compliance



5.2 Shadow Analysis: Winter Solstice (21 June) - Compliant

9:00 am

10:00 am

11:00 am

12:00 pm

1:00 pm

2:00 pm

3:00 pm

Shadow cast

5.3 Shadow Analysis: Summer Solstice (21 December) - Compliant

9:00 am

10:00 am

11:00 am

12:00 pm

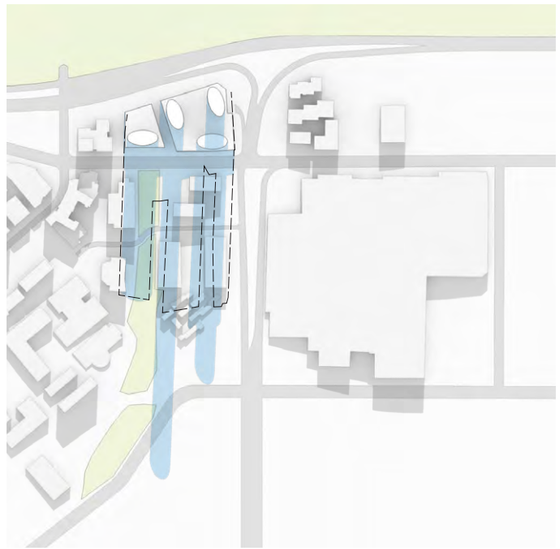
1:00 pm

2:00 pm

3:00 pm

Shadow cast

5.4 Shadow Analysis: Winter Solstice (21 June) - Proposed



9:00 am

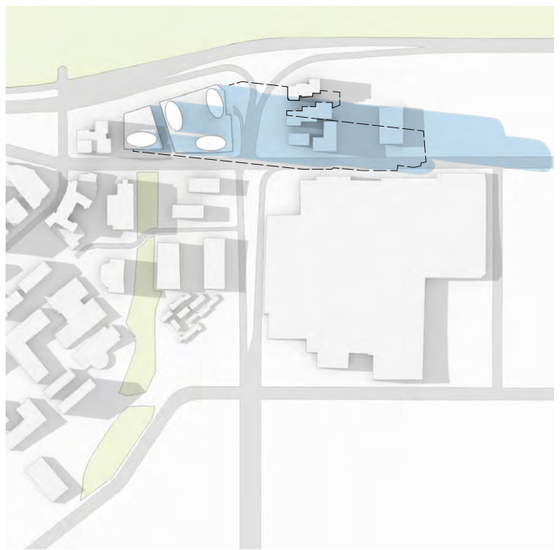
10:00 am

11:00 am

12:00 pm

1:00 pm

2:00 pm



3:00 pm

Shadow cast

Extent of shadow cast by compliant scheme

5.5 Shadow Analysis: Summer Solstice (21 December) - Proposed

9:00 am

10:00 am

11:00 am

12:00 pm

1:00 pm

2:00 pm

3:00 pm

Shadow cast

Extent of shadow cast by compliant scheme

Appendix: Drawings

6

Site Topography

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
Site Boundary

SJB Urban
Level 2, 490 Crown Street, Surry Hills NSW 2010
T. 61 2 9380 9911 sjb.com.au
SJB Architecture (NSW) Pty Ltd
ABN 20 310 373 425 ACN 081 094 724
Adam Haddow 7188 John Pradel 7004

Site Boundary and Setbacks

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
Site Boundary
Setbacks

SJB Urban
Level 2, 490 Crown Street, Surry Hills NSW 2010
T. 61 2 9380 9911 sjb.com.au
SJB Architecture (NSW) Pty Ltd
ABN 20 310 373 425 ACN 081 094 724
Adam Haddow 7188 John Pradel 7004

Site Access

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
- Site Boundary
- Setbacks
- Relinquished portion of carriageway
- Adjusted right of carriageway

SJB Urban
Level 2, 490 Crown Street, Surry Hills NSW 2010
T. 61 2 9380 9911 sjb.com.au
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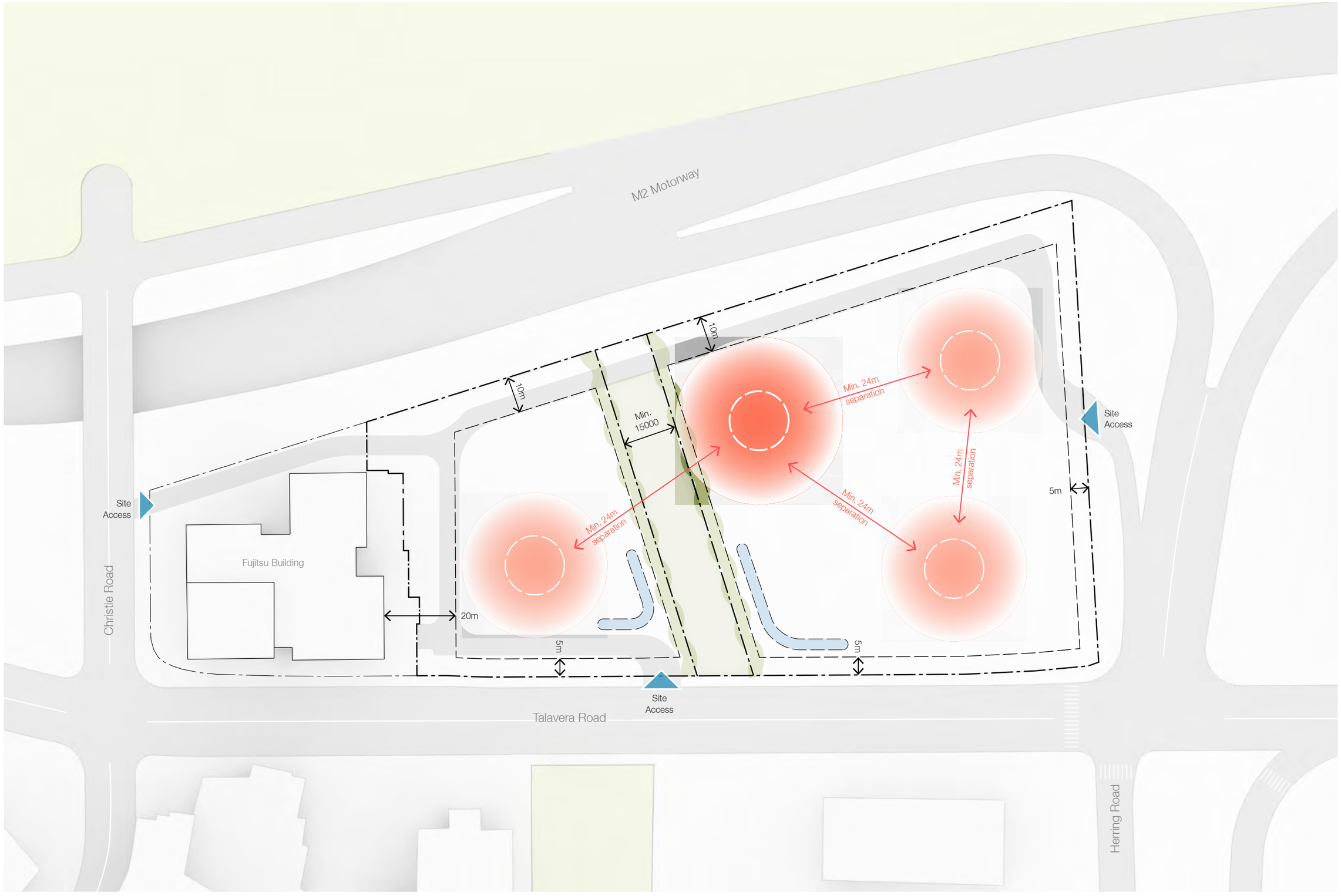
Adam Haddow 7188 John Pradel 7004



Indicative Outcome Diagram

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key

- Site Boundary
- Setbacks
- Preferred tower location
- Landscaped area
- Retail/commercial activation

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Illustrative Master Plan

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
Building Envelope
Indicative Tower Locations
Site Boundary

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Maximum Building Heights

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
- P - 18.5m
- AB - 90m
- RL 243.0

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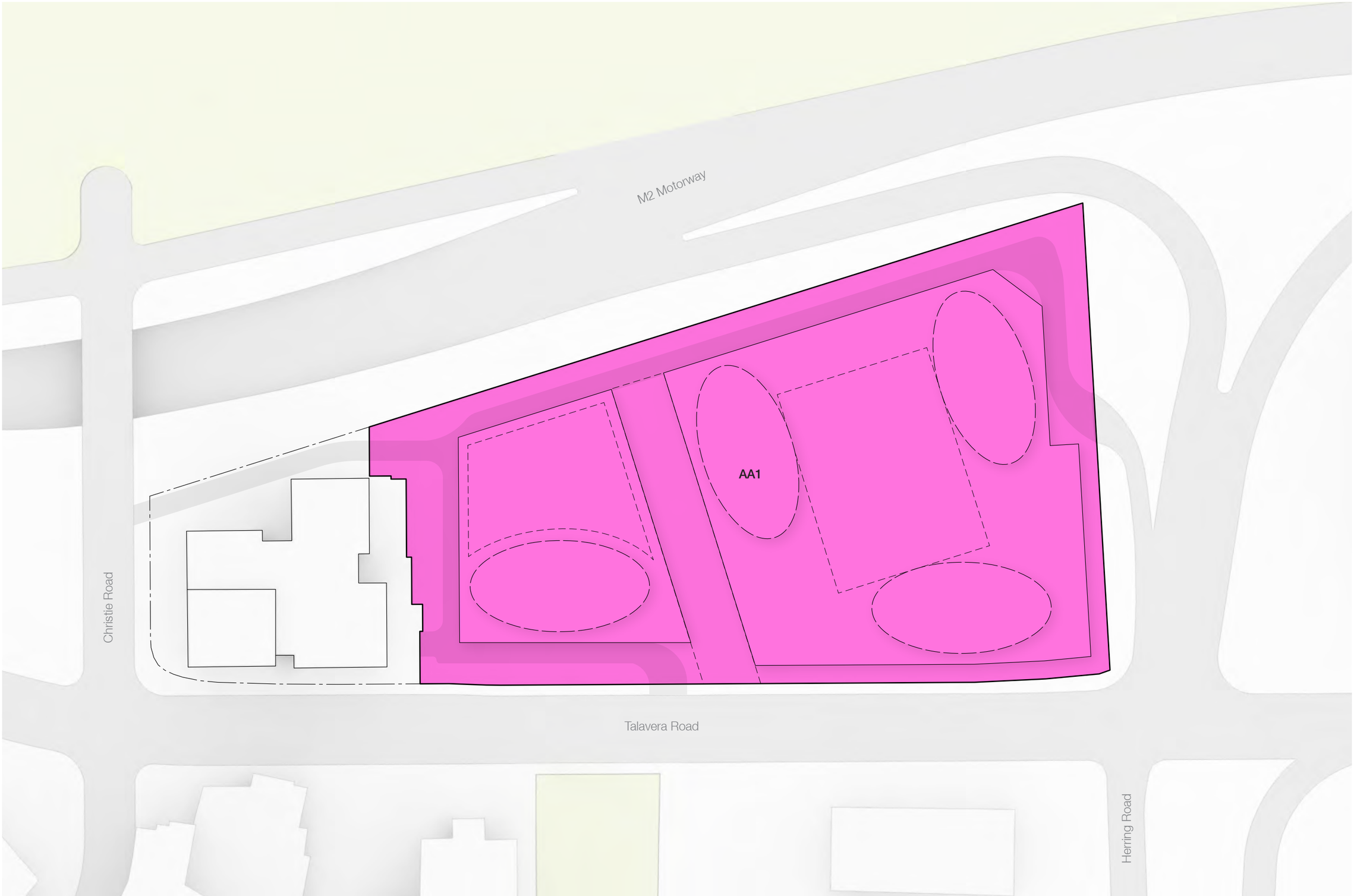

Floor Space Ratio

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
AA1 - 6.5:1

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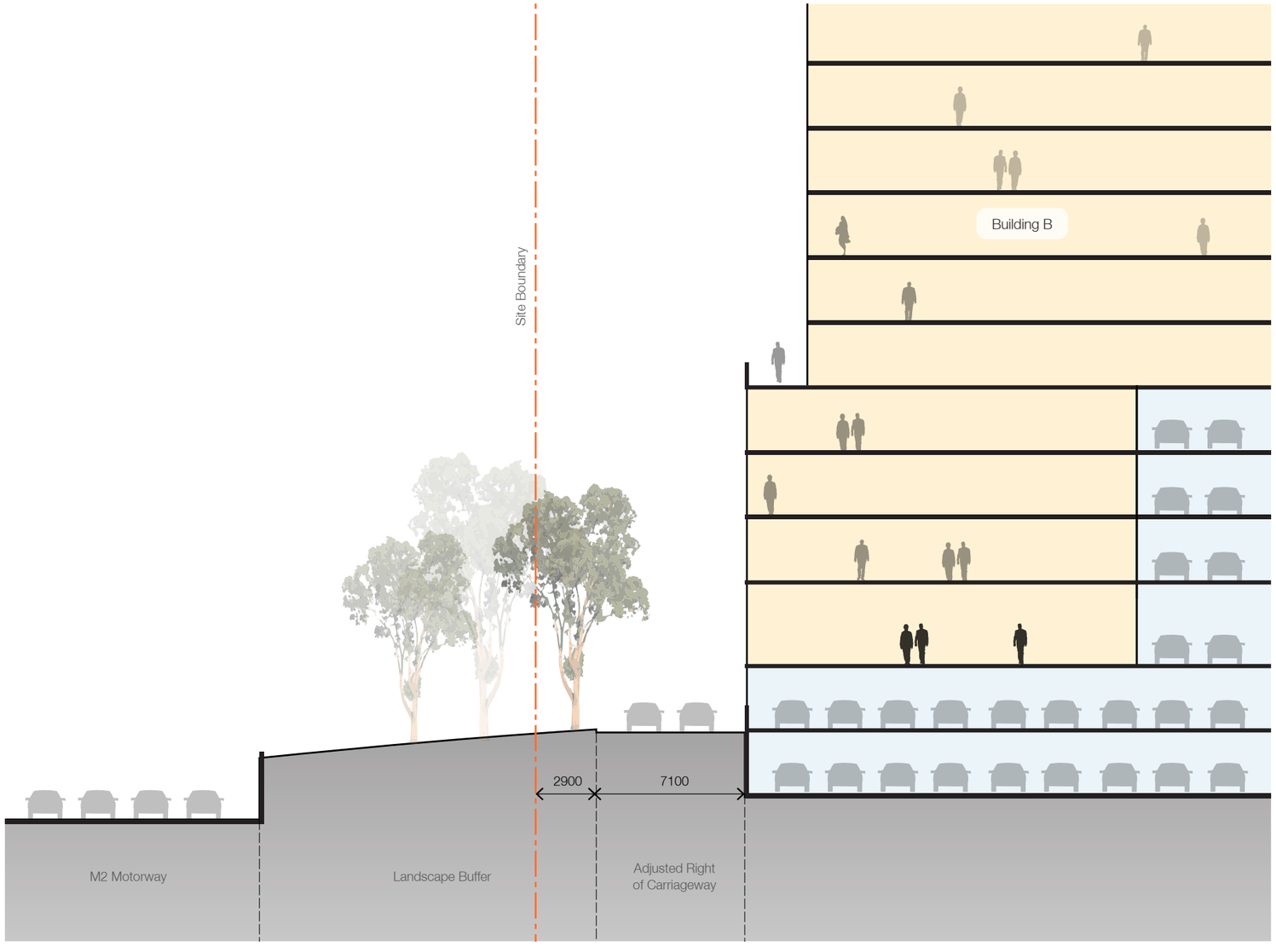

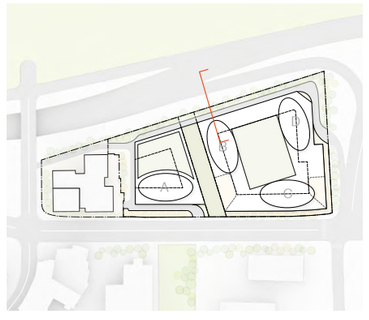

Residential

Parking

Study Section - M2 Frontage

Scale
1:250@A3

0 2 4 6 8 10

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

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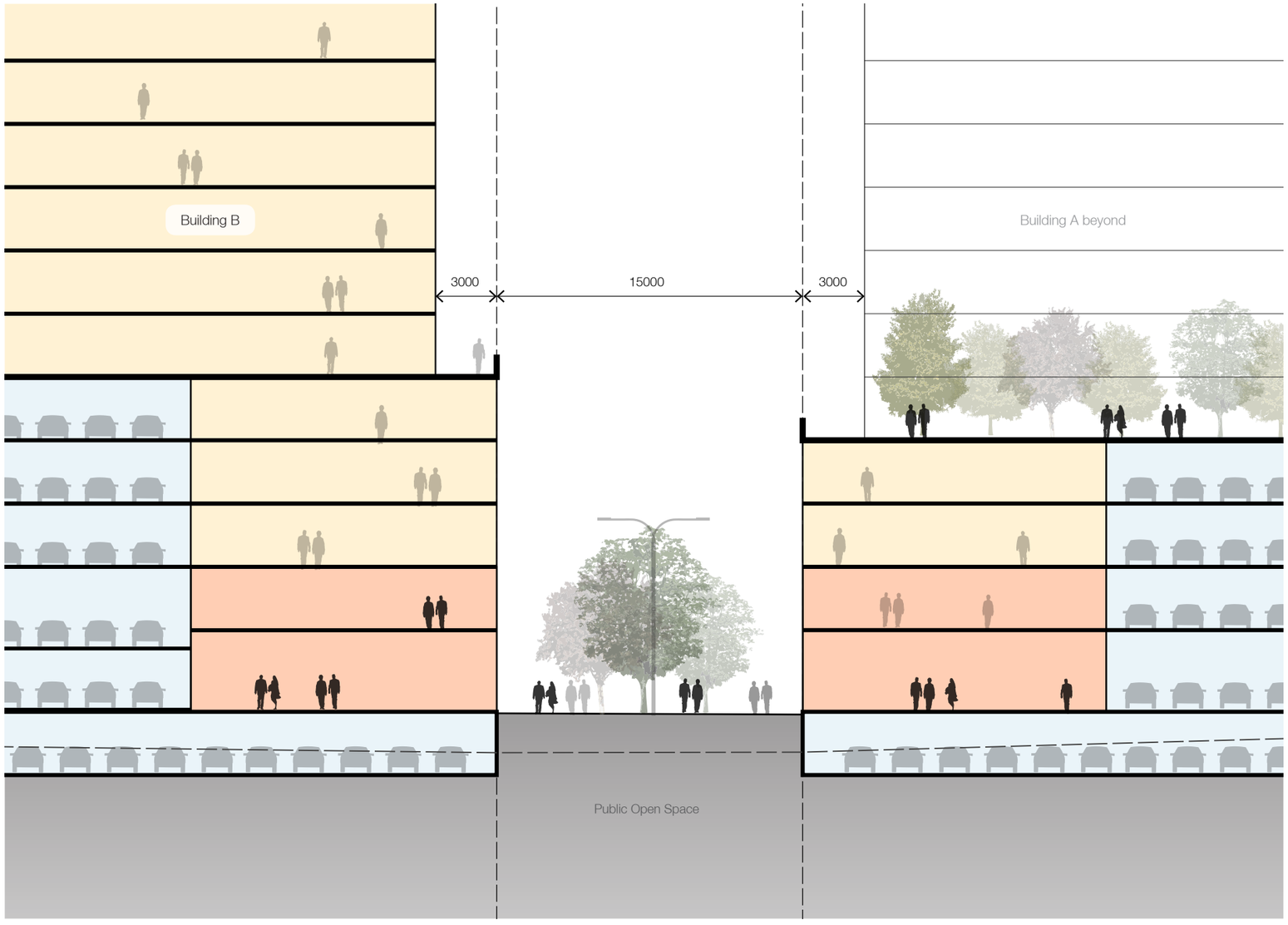

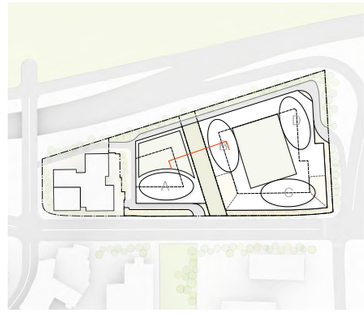

Residential

Retail/Commercial

Parking

Study Section - New Park

Scale
1:250 @ A3

0 2 4 6 8 10

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
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Photomontage - View Southeast along the M2

Scale
Not to scale

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key

- Proposed massing
- Max. LEP Building Heights

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Photomontage - View Southwest along Herring Road

Scale
Not to scale

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
Proposed massing
Max. LEP Building Heights

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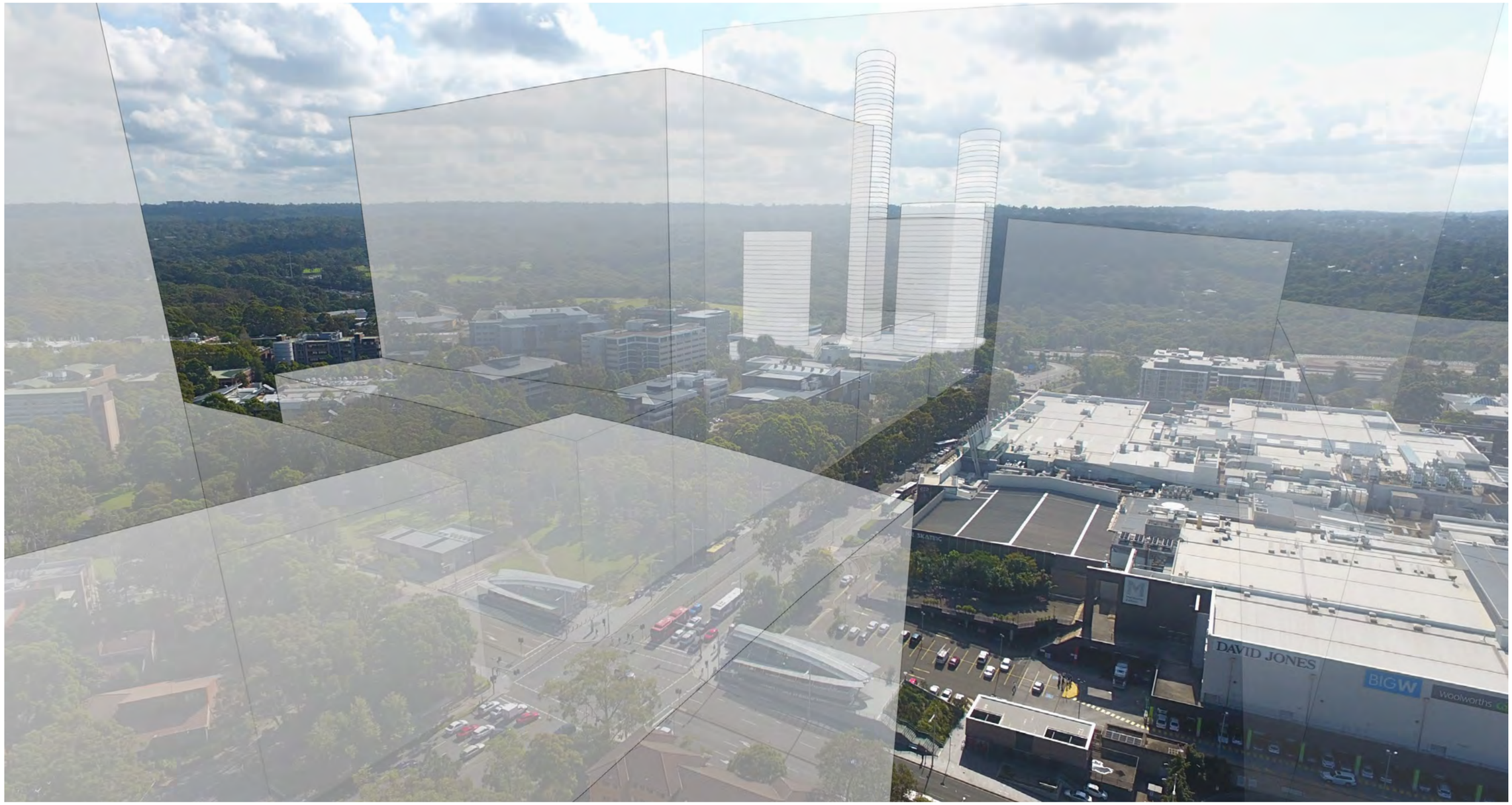

Photomontage - View North along Herring Road

Scale
Not to scale

Project number
5633

Project name
Talavera Road PP

Project address
112Talavera Road

Client
Meriton Group

Key
- Proposed massing
- Max. LEP Building Heights

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SJB Architects
SJB Urban

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We create spaces people love.
SJB is passionate about the
possibilities of architecture,
interiors, urban design
and planning.
Let's collaborate.

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Surry Hills NSW 2010
Australia
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architects@sjb.com.au
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Attachment 2: Indicative Layout prepared by SJB Architecture

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Indicative Layout
Talavera Road, Macquarie Park

112 Talavera Road,
Macquarie Park, 2113

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Prepared for
Meriton Group

Issued
8 May 2018

We create amazing places

At SJB we believe that the future of the city is in generating a rich urban experience through the delivery of density and activity, facilitated by land uses, at various scales, designed for everyone.

Ref: 5633
Version: 08
Prepared by: JS
Checked by: NH

Contact Details:

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ACN 081 094 724
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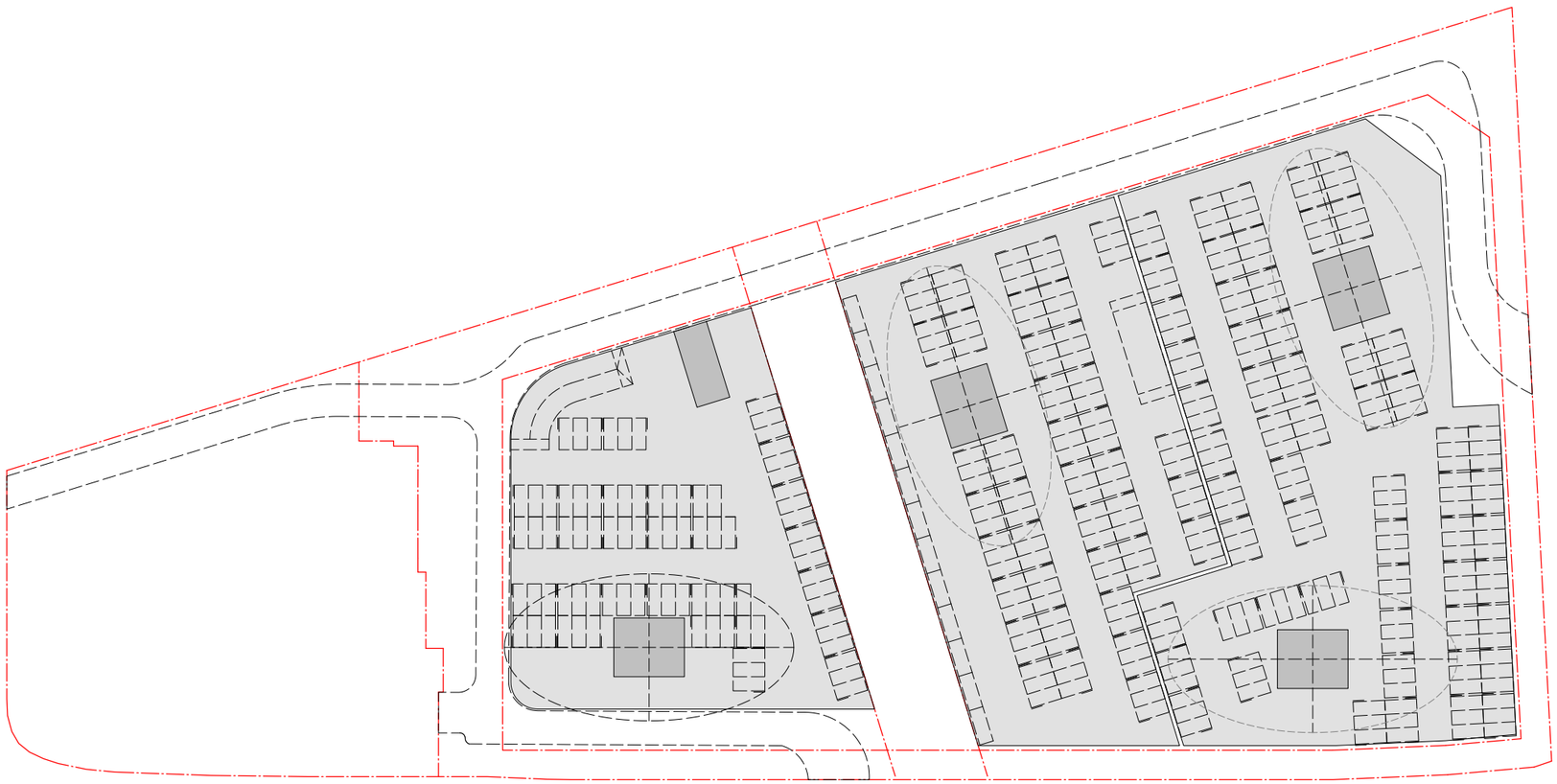

Parking

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
Parking

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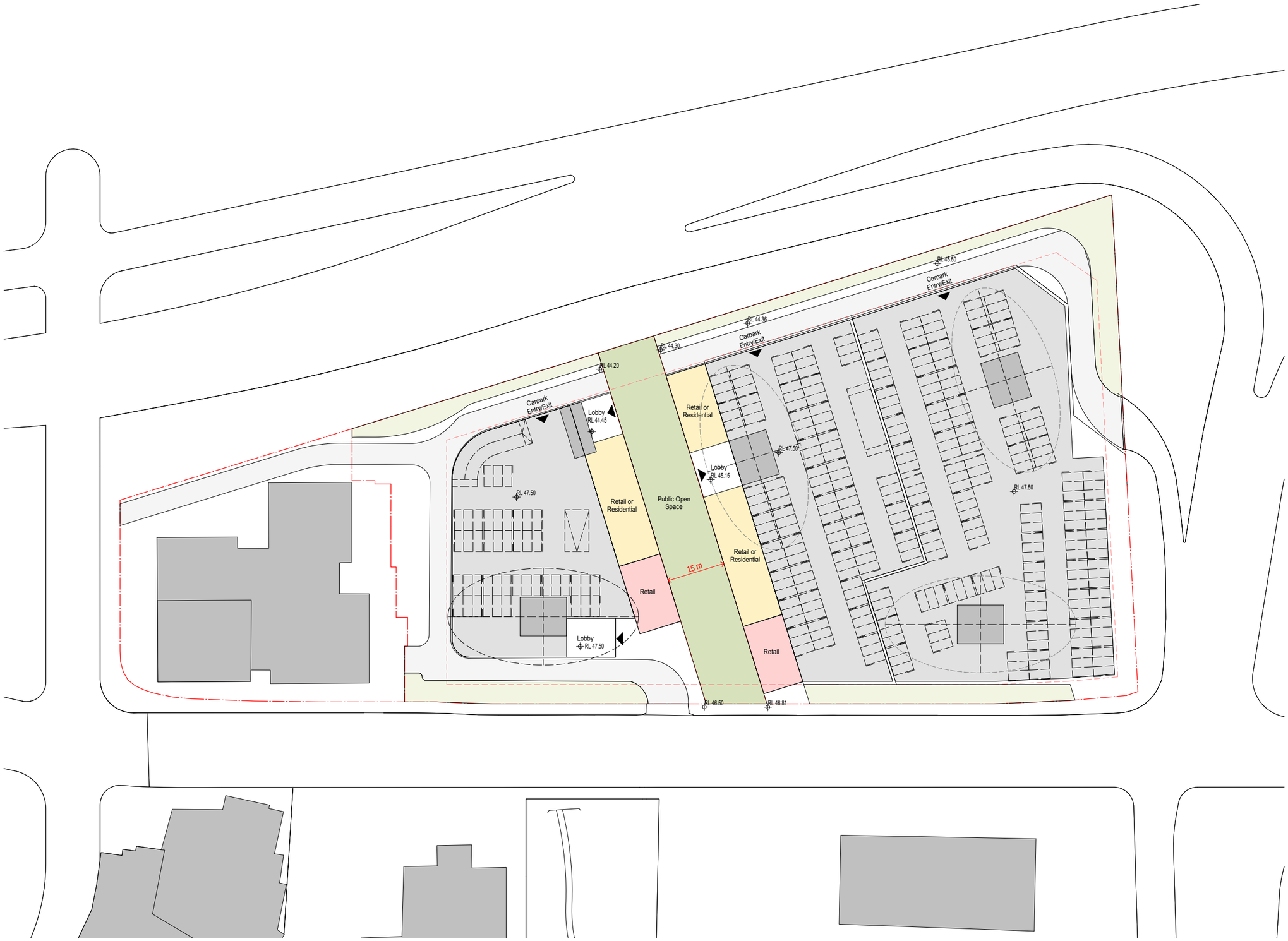

Lower Ground

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
- Retail / Commercial
- Retail or Residential
- Parking
- Public Open Space
- Landscaping

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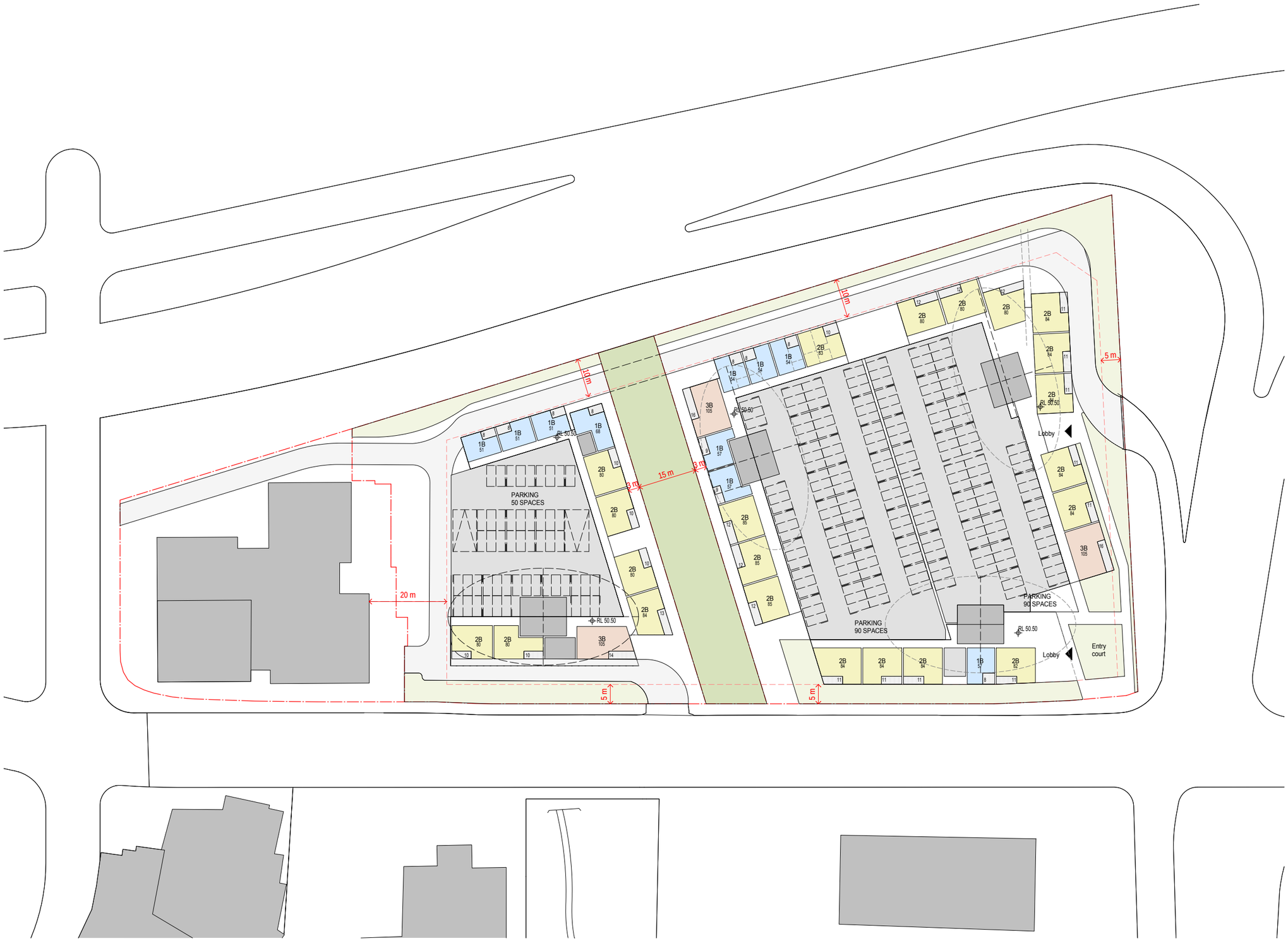

Upper Ground

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
- One Bedroom Apt.
- Two Bedroom Apt.
- Three Bedroom Apt.
- Parking
- Public Open Space
- Landscaping

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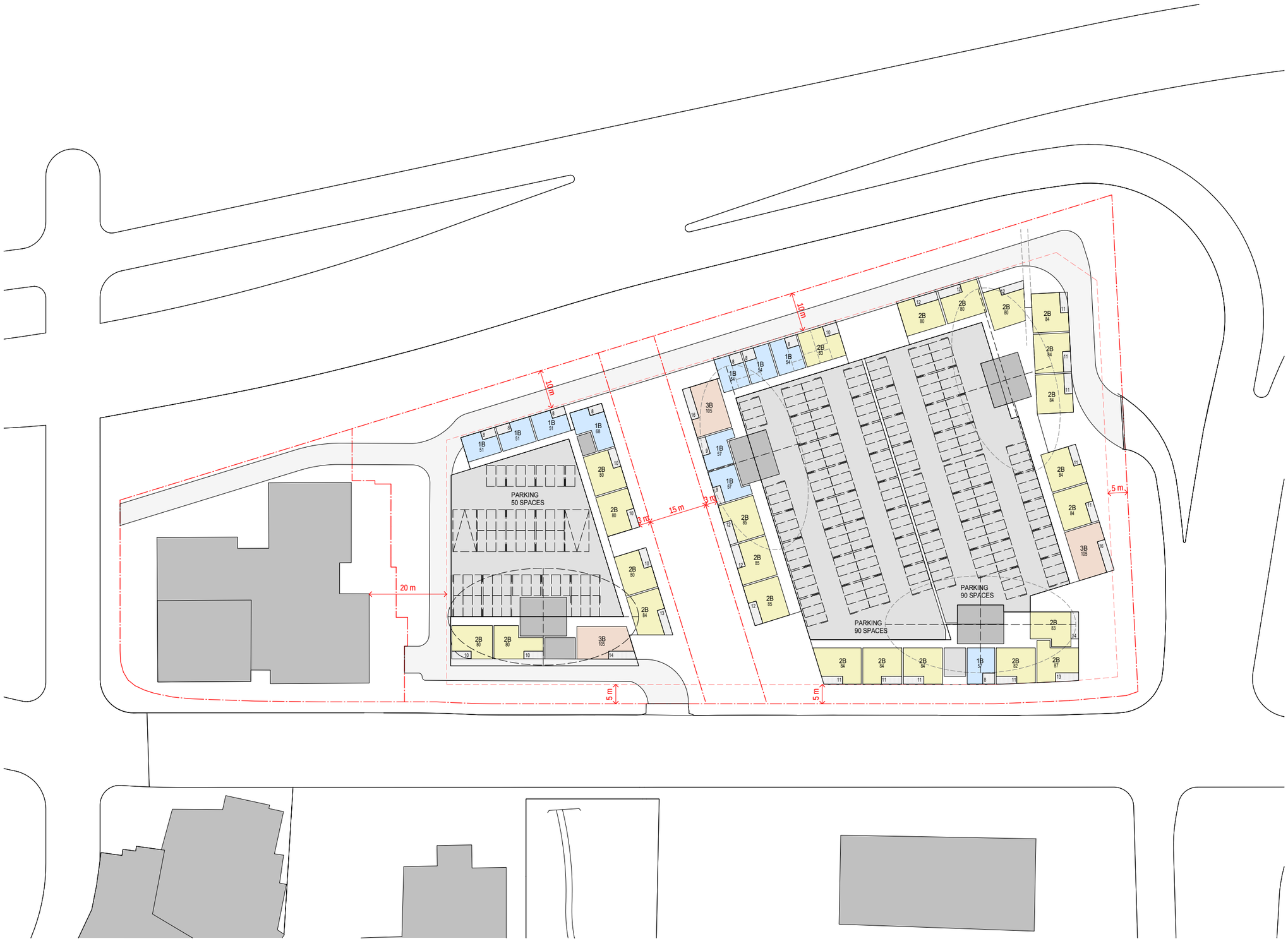

Typical Podium (Levels 1-3)

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
- One Bedroom Apt.
- Two Bedroom Apt.
- Three Bedroom Apt.
- Parking

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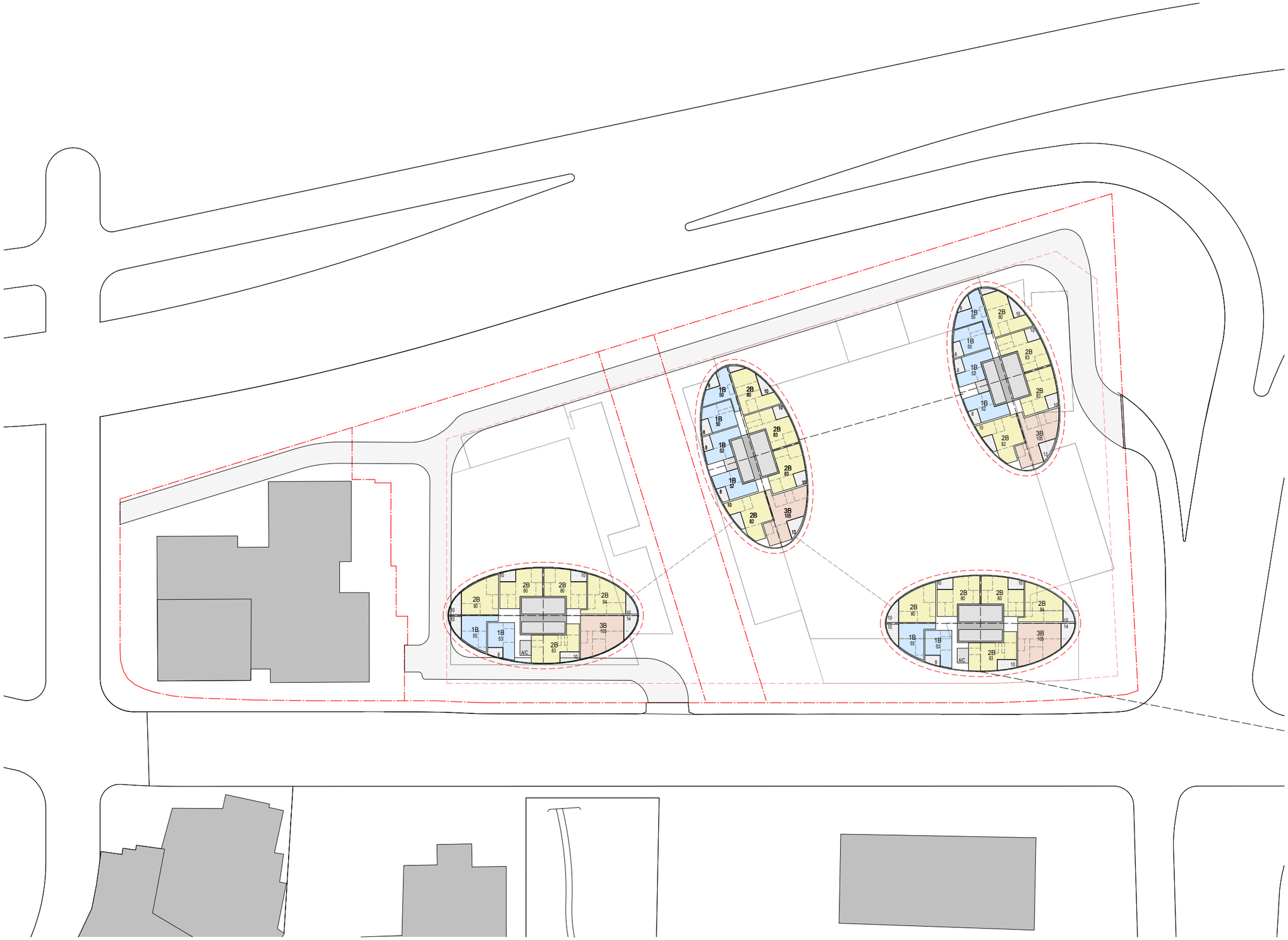

Typical Tower

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
- One Bedroom Apt.
- Two Bedroom Apt.
- Three Bedroom Apt.

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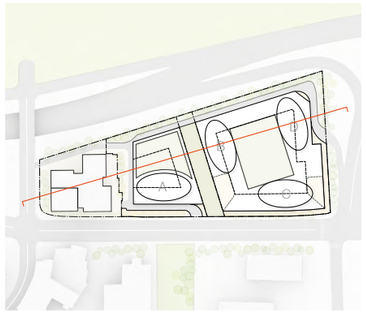

Key Plan
Not to scale

Section A

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
Plant
Residential
Retail/Commercial
Parking

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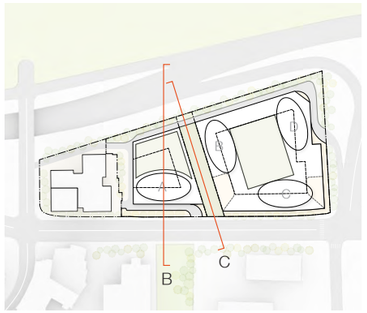
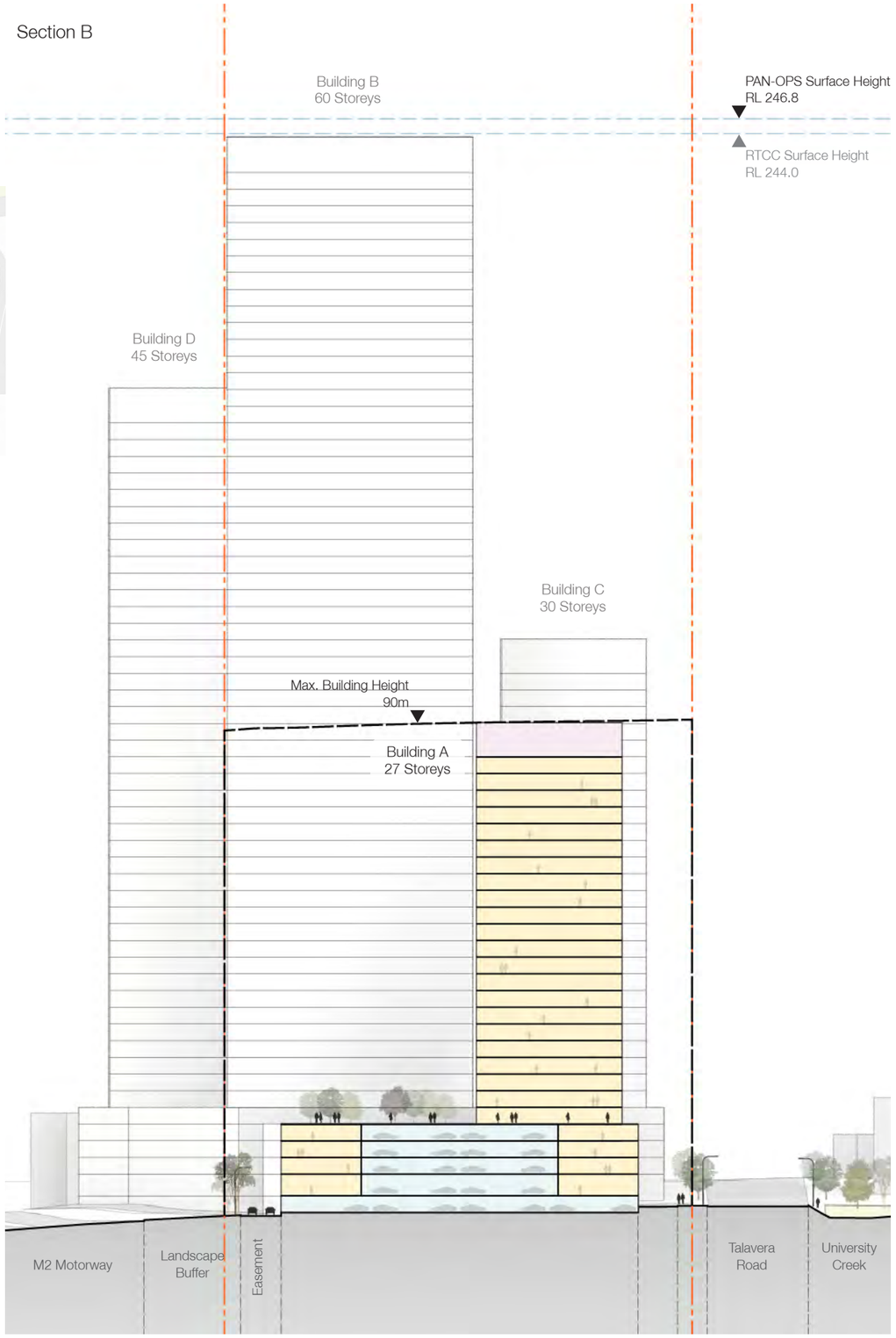
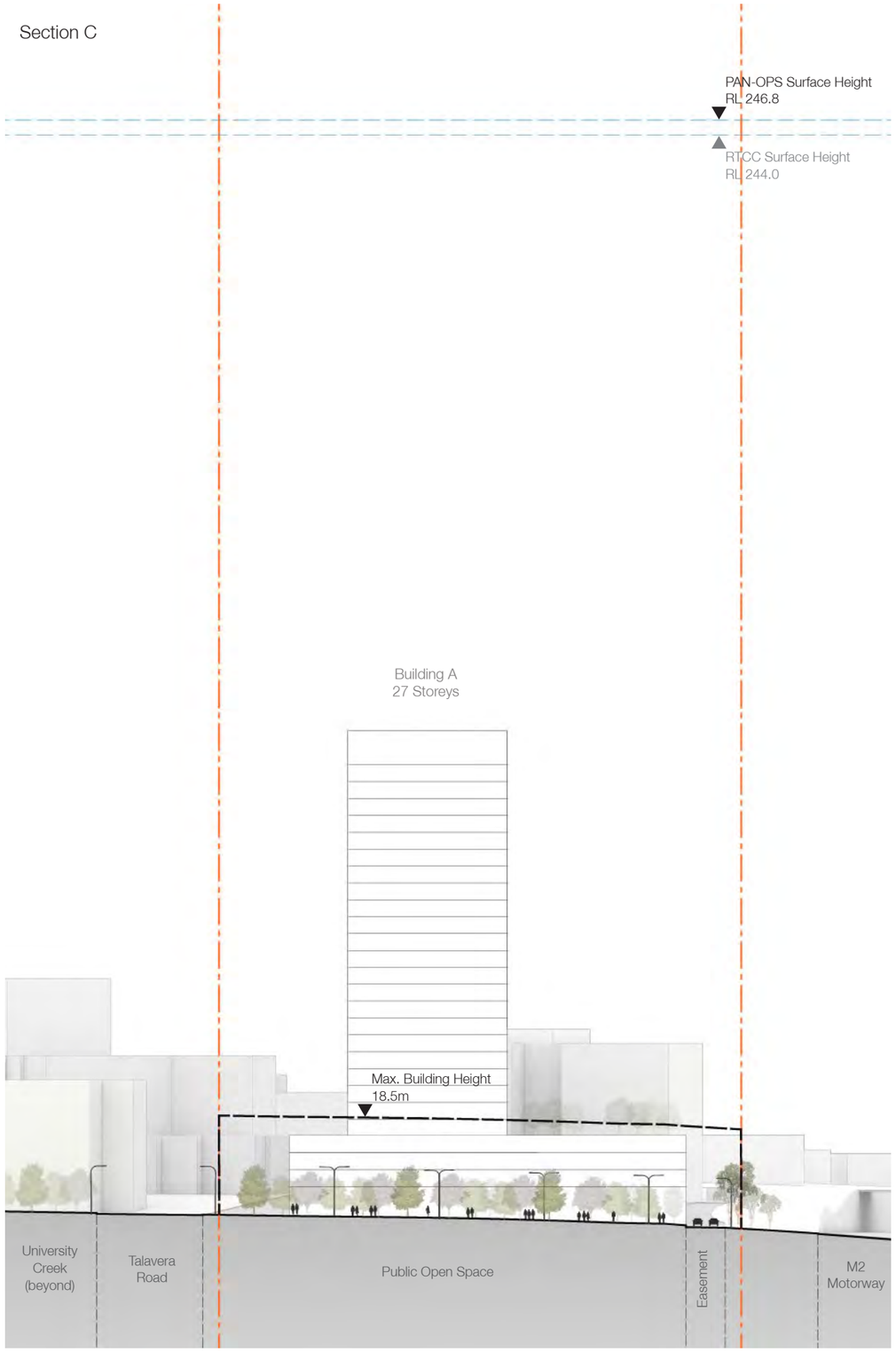


Key Plan
Not to scale

Section B



Section C



Section B and C

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
- Plant
- Residential
- Retail/Commercial
- Parking

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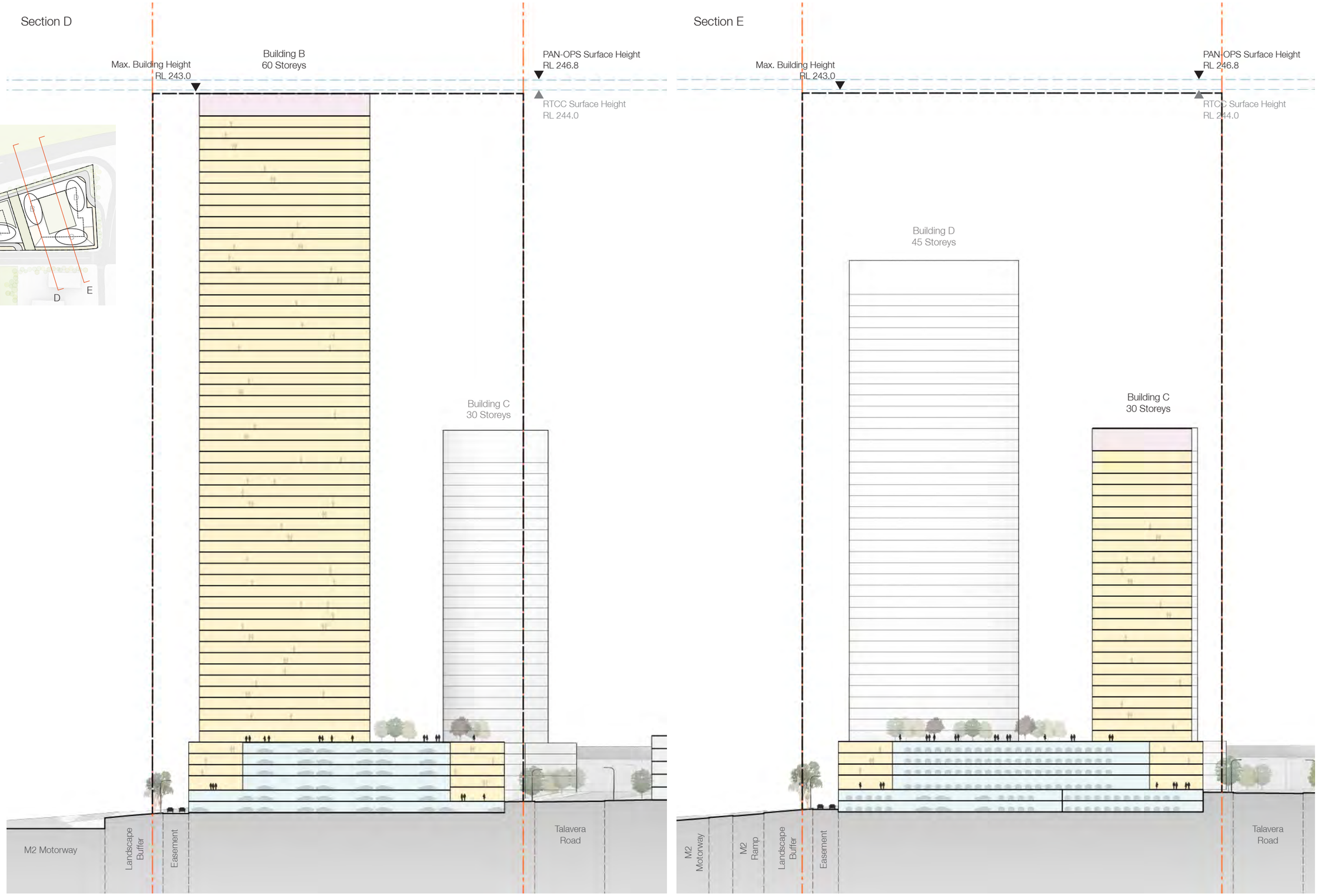
Section D



Section E

Key Plan
Not to scale

Section D and E

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key

- Plant
- Residential
- Retail/Commercial
- Parking

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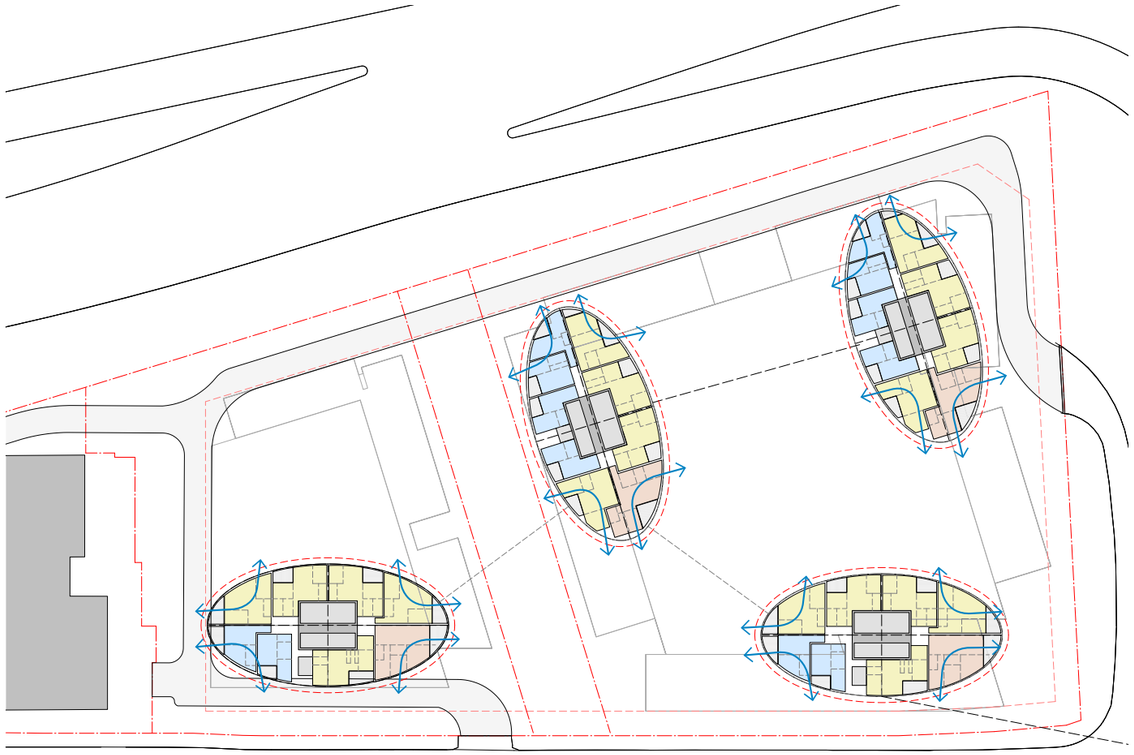
Typical Podium Level



Typical Tower Level

Cross ventilation **62%**

Cross Ventilation

Scale
1:2500@A3

0 20 40 60 80 100

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
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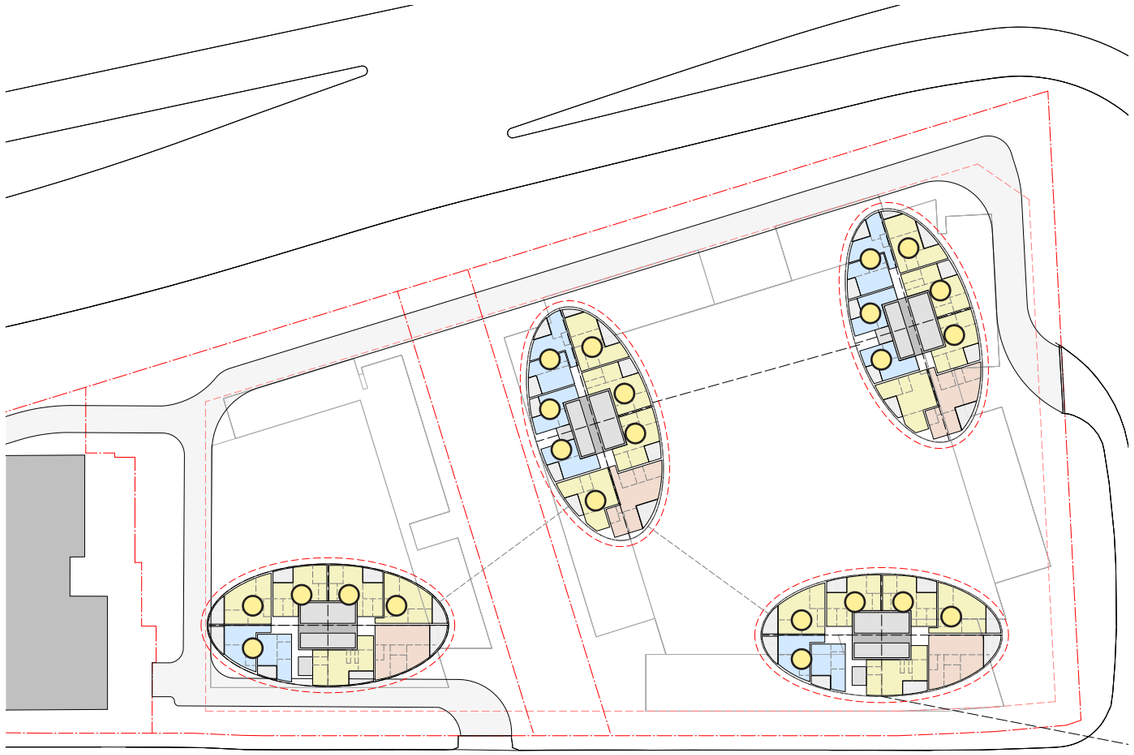
Typical Podium Level



Typical Tower Level

Solar **73%**

Solar

Scale
1:2500@A3

0 20 40 60 80 100

Project number
5633

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Project address
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Yield Schedule

Building A 27 storeys

RESIDENTIAL	Building Height	Gross Floor Areas	Studio	1B	2B	3B	Totals	Cross Ventilation	Solar	South Facing	Parking
	3.1										
Parking Level 1		100.0									80
Ground Level	3.6	950.0									48
Level 01	6.7	950.0		5	6	2	13	8	7	1	50
Level 02	9.8	950.0		5	6	2	13	8	7	1	50
Level 03	12.9	950.0		5	6	2	13	8	7	1	50
Level 04	16	750.0		2	4	1	7	4	5	2	
Level 05	19.1	750.0		2	4	1	7	4	5	2	
Level 06	22.2	750.0		2	4	1	7	4	5	2	
Level 07	25.3	750.0		2	4	1	7	4	5	2	
Level 08	28.4	750.0		2	4	1	7	4	5	2	
Level 09	31.5	750.0		2	4	1	7		5	2	
Level 10	34.6	750.0		2	4	1	7		5	2	
Level 11	37.7	750.0		2	4	1	7		5	2	
Level 12	40.8	750.0		2	4	1	7		5	2	
Level 13	43.9	750.0		2	4	1	7		5	2	
Level 14	47	750.0		2	4	1	7		5	2	
Level 15	50.1	750.0		2	4	1	7		5	2	
Level 16	53.2	750.0		2	4	1	7		5	2	
Level 17	56.3	750.0		2	4	1	7		5	2	
Level 18	59.4	750.0		2	4	1	7		5	2	
Level 19	62.5	750.0		2	4	1	7		5	2	
Level 20	65.6	750.0		2	4	1	7		5	2	
Level 21	68.7	750.0		2	4	1	7		5	2	
Level 22	71.8	750.0		2	4	1	7		5	2	
Level 23	74.9	750.0		2	4	1	7		5	2	
Level 24	78	325.0			2	2	4		5	2	
Level 25	81.1	325.0			2	2	4		5	2	
Level 26	84.2										
Level 27	87.3	Plant and lift overun									
Level 28	90.4	Maximum Building Height									
Level 29	93.5										
Level 30	96.6										
Level 31	99.7										
Level 32	102.8										
Level 33	105.9										
Level 34	109										
Level 35	112.1										
Level 36	115.2										
Level 37	118.3										
Level 38	121.4										
Level 39	124.5										
Level 40	127.6										
Level 41	130.7										
Level 42	133.8										
Level 43	136.9										
Level 44	140										
Level 45	143.1										
Level 46	146.2										
Level 47	149.3										
Level 48	152.4										
Level 49	155.5										
Level 50	158.6										
Level 51	161.7										
Level 52	164.8										
Level 53	167.9										
Level 54	171										
Level 55	174.1										
Level 56	177.2										
Level 57	180.3										
Level 58	183.4										
Level 59	186.5										
Plant & L/O	196.5										
Subtotals		19550.0	0	55	102	30	187	44	131	47	
				29%	55%	16%	100%	66%	70%	25%	

Building B 60 Storeys

Level		Gross Floor Areas	Studio	1B	2B	3B	Totals	Cross Ventilation	Solar	South Facing	Parking
Parking Level 1		100.0									120
Ground Level		1100.0		5	4	1	10	8	9	1	120
Level 01		1100.0		5	4	1	10	8	9	1	90
Level 02		1100.0		5	4	1	10	8	9	1	90
Level 03		1100.0		5	4	1	10	8	9	1	90
Level 04		1100.0		5	4	1	10	8	9	1	90
Level 05		750.0		4	4	1	9	4	7	1	
Level 06		750.0		4	4	1	9	4	7	1	
Level 07		750.0		4	4	1	9	4	7	1	
Level 08		750.0		4	4	1	9	4	7	1	
Level 09		750.0		3	4	1	8		7	1	
Level 10		750.0		3	4	1	8		7	1	
Level 11		750.0		3	4	1	8		7	1	
Level 12		750.0		3	4	1	8		7	1	
Level 13		750.0		3	4	1	8		7	1	
Level 14		750.0		3	4	1	8		7	1	
Level 15		750.0		3	4	1	8		7	1	
Level 16		750.0		3	4	1	8		7	1	
Level 17		750.0		3	4	1	8		7	1	
Level 18		750.0		3	4	1	8		7	1	
Level 19		750.0		3	4	1	8		7	1	
Level 20		750.0		3	4	1	8		7	1	
Level 21		750.0		3	4	1	8		7	1	
Level 22		750.0		3	4	1	8		7	1	
Level 23		750.0		3	4	1	8		7	1	
Level 24		750.0		3	4	1	8		7	1	
Level 25		750.0		3	4	1	8		7	1	
Level 26		750.0		3	4	1	8		7	1	
Level 27		750.0		3	4	1	8		7	1	
Level 28		750.0		3	4	1	8		7	1	
Level 29	PLANT	350.0		3	4		7		4		
Level 30		750.0		3	4	1	8		7	1	
Level 31		750.0		3	4	1	8		7	1	
Level 32		750.0		3	4	1	8		7	1	
Level 33		750.0		3	4	1	8		7	1	
Level 34		750.0		3	4	1	8		7	1	
Level 35		750.0		3	4	1	8		7	1	
Level 36		750.0		3	4	1	8		7	1	
Level 37		750.0		3	4	1	8		7	1	
Level 38		750.0		3	4	1	8		7	1	
Level 39		750.0		3	4	1	8		7	1	
Level 40		750.0		3	4	1	8		7	1	
Level 41		750.0		3	4	1	8		7	1	
Level 42		750.0		3	4	1	8		7	1	
Level 43		750.0		3	4	1	8		7	1	
Level 44		750.0		3	4	1	8		7	1	
Level 45		750.0		3	4	1	8		7	1	
Level 46		750.0		3	4	1	8		7	1	
Level 47		750.0		3	4	1	8		7	1	
Level 48		750.0		3	4	1	8		7	1	
Level 49		750.0		3	4	1	8		7	1	
Level 50		750.0		3	4	1	8		7	1	
Level 51		750.0		3	4	1	8		7	1	
Level 52		750.0		3	4	1	8		7	1	
Level 53		750.0		3	4	1	8		7	1	
Level 54		750.0		3	4	1	8		7	1	
Level 55		750.0		3	4	1	8		7	1	
Level 56		750.0		3	4	1	8		7	1	
Level 57		750.0		3	4	1	8		7	1	
Level 58		750.0		3	4	1	8		7	1	
Level 59		750.0		3	4	1	8		7	1	
Plant & L/O		Plant and lift overun									
Subtotals		46,450	0	194	240	59	493	56	427	59	
				39%	49%	12%	100%	65%	87%	12%	

Building C 30 storeys

Level	Gross Floor Areas	Studio	1B	2B	3B	Totals	Cross Ventilation	Solar	South Facing
Parking Level 1	100.0								
Ground Level	900.0		1	4	0	5	3	0	1
Level 01	900.0		1	6	0	7	4	0	1
Level 02	900.0		1	6	0	7	4	0	1
Level 03	900.0		1	6	0	7	4	0	1
Level 04	900.0		2	4	1	7	4	5	1
Level 05	750.0		2	4	1	7	4	5	2
Level 06	750.0		2	4	1	7	4	5	2
Level 07	750.0		2	4	1	7	4	5	2
Level 08	750.0		2	4	1	7	4	5	2
Level 09	750.0		2	4	1	7		5	2
Level 10	750.0		2	4	1	7		5	2
Level 11	750.0		2	4	1	7		5	2
Level 12	750.0		2	4	1	7		5	2
Level 13	750.0		2	4	1	7		5	2
Level 14	750.0		2	4	1	7		5	2
Level 15	750.0		2	4	1	7		5	2
Level 16	750.0		2	4	1	7		5	2
Level 17	750.0		2	4	1	7		5	2
Level 18	750.0		2	4	1	7		5	2
Level 19	750.0		2	4	1	7		5	2
Level 20	750.0		2	4	1	7		5	2
Level 21	750.0		2	4	1	7		5	2
Level 22	750.0		2	4	1	7		5	2
Level 23	750.0		2	4	1	7		5	2
Level 24	750.0		2	4	1	7		5	2
Level 25	750.0		2	4	1	7		5	2
Level 26	750.0		2	4	1	7		5	2
Level 27	750.0		2	4	1	7		5	2
Level 28	750.0		2	4	1	7		5	2
Level 29	750.0		2	4	1	7		5	2
Level 30	Plant and lift overun								
Subtotals	23350.0	0	56	126	26	208	35	130	55
			27%	61%	13%	100%	65%	63%	26%

Building D 45 storeys

Level	Gross Floor Areas	Studio	1B	2B	3B	Totals	Cross Ventilation	Solar	South Facing	Parking
Parking Level 1	100.0									175
Ground Level	1200.0			7	1	8	6	5	1	175
Level 01	1200.0			8	1	9	7	6	1	90
Level 02	1200.0			8	1	9	7	6	1	90
Level 03	1200.0			8	1	9	7	6	1	90
Level 04	1200.0		4	4	1	9	7	10	1	90
Level 05	750.0		4	4	1	9	4	10	1	
Level 06	750.0		4	4	1	9	4	10	1	
Level 07	750.0		4	4	1	9	4	10	1	
Level 08	750.0		4	4	1	9	4	5	1	
Level 09	750.0		3	4	1	8		7	1	
Level 10	750.0		3	4	1	8		7	1	
Level 11	750.0		3	4	1	8		7	1	
Level 12	750.0		3	4	1	8		7	1	
Level 13	750.0		3	4	1	8		7	1	
Level 14	750.0		3	4	1	8		7	1	
Level 15	750.0		3	4	1	8		7	1	
Level 16	750.0		3	4	1	8		7	1	
Level 17	750.0		3	4	1	8		7	1	
Level 18	750.0		3	4	1	8		7	1	
Level 19	750.0		3	4	1	8		7	1	
Level 20	750.0		3	4	1	8		7	1	
Level 21	750.0		3	4	1	8		7	1	
Level 22	750.0		3	4	1	8		7	1	
Level 23	750.0		3	4	1	8		7	1	
Level 24	750.0		3	4	1	8		7	1	
Level 25	750.0		3	4	1	8		7	1	
Level 26	750.0		3	4	1	8		7	1	
Level 27	750.0		3	4	1	8		7	1	
Level 28	750.0		3	4	1	8		7	1	
Level 29	750.0		3	4	1	8		7	1	
Level 30	750.0		3	4	1	8		7	1	
Level 31	750.0		3	4	1	8		7	1	
Level 32	750.0		3	4	1	8		7	1	
Level 33	750.0		3	4	1	8		7	1	
Level 34	750.0		3	4	1	8		7	1	
Level 35	750.0		3	4	1	8		7	1	
Level 36	750.0		3	4	1	8		7	1	
Level 37	750.0		3	4	1	8		7	1	
Level 38	750.0		3	4	1	8		7	1	
Level 39	750.0		3	4	1	8		7	1	
Level 40	750.0		3	4	1	8		7	1	
Level 41	750.0		3	4	1	8		7	1	
Level 42	750.0		3	4	1	8		7	1	
Level 43	750.0		3	4	1	8		7	1	
Level 44	750.0		3	4	1	8		7	1	
Level 45	Plant and lift overun									
Subtotals	36,100	0	128	195	45	368	50	320	45	
			35%	53%	12%	100%	63%	87%	12%	

Totals

Level	Gross Floor Areas	Totals
Parking Level 1	400.0	0
Ground Level	4150.0	23
Level 01	4150.0	39
Level 02	4150.0	39
Level 03	4150.0	39
Level 04	3950.0	33
Level 05	3000.0	32
Level 06	3000.0	32
Level 07	3000.0	32
Level 08	3000.0	32
Level 09	3000.0	30
Level 10	3000.0	30
Level 11	3000.0	30
Level 12	3000.0	30
Level 13	3000.0	30
Level 14	3000.0	30
Level 15	3000.0	30
Level 16	3000.0	30
Level 17	3000.0	30
Level 18	3000.0	30
Level 19	3000.0	30
Level 20	3000.0	30
Level 21	3000.0	30
Level 22	3000.0	30
Level 23	3000.0	30
Level 24	2575.0	27
Level 25	2575.0	27
Level 26	2250.0	23
Level 27	2250.0	23
Level 28	2250.0	23
Level 29	1850.0	22
Level 30	1500.0	16
Level 31	1500.0	16
Level 32	1500.0	16
Level 33	1500.0	16
Level 34	1500.0	16
Level 35	1500.0	16
Level 36	1500.0	16
Level 37	1500.0	16
Level 38	1500.0	16
Level 39	1500.0	16
Level 40	1500.0	16
Level 41	1500.0	16
Level 42	1500.0	16
Level 43	1500.0	16
Level 44	1500.0	16
Level 45	750.0	8
Level 46	750.0	8
Level 47	750.0	8
Level 48	750.0	8
Level 49	750.0	8
Level 50	750.0	8
Level 51	750.0	8
Level 52	750.0	8
Level 53	750.0	8
Level 54	750.0	8
Level 55	750.0	8
Level 56	750.0	8
Level 57	750.0	8
Level 58	750.0	8
Level 59	750.0	8
Resi GFA	125,450	1,256
	1500.0	Retail

126950.0	Total GFA
Site area	19530
FSR	6.50

Building A parking

Unit types	ST	1B	2B	3B	Total
Rates	0.0	0.6	0.9	1.4	
Residential	0	33	92	42	167
Allowance for Adaptable					14.03
Visitors 1 per			10		19
Total					200
Provided					278

Building B parking

Unit types	ST	1B	2B	3B	Total
Rates	0.0	0.6	0.9	1.4	
Residential	0	116	216	83	415
Allowance for Adaptable					36.98
Visitors			10		49
Total					501
Provided					600

Building C parking

Unit types	ST	1B	2B	3B	Total
Rates	0.0	0.6	0.9	1.4	
Residential	0	34	113	36	183
Allowance for Adaptable					15.6
Visitors			10		21
Total					220

Building D parking

Unit types	ST	1B	2B	3B	Total
Rates	0.0	0.6	0.9	1.4	
Residential	0	77	176	63	315
Allowance for Adaptable					27.6
Visitors			10		37
Total					380
Total Provided for C and D					710

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Adam Haddow 7188 John Pradel 7004

Summary	GFA	Apartment No.					Performance		
		ST	1B	2B	3B		CF	SR	SF
Proposed Total GFA	**126,950.0**	**0**	**433**	**663**	**160**		**185**	**1,008**	**206**
Site area	19,530.0	0%	34%	53%	13%	Mix	69%	80%	16%
Proposed FSR	**6.5 :1**	**1,256**	**APARTMENTS**						

	Rates		ST	1B	2B	3B	Total
			0.0	0.6	0.9	1.4	
Parking							
Residential			0	260	597	224	**1081**
Allowance for Adaptable	15%		1 clearance for every two spaces				**94**
Visitors	1 per		10 Dwellings				125.6
							126
Car Share		1 per	50 spaces				21.6
							22
Motor bike		1 per	50 spaces				21.6
Service							2.0
Childcare General		1 per	8 Children				0
Childcare Staff		1 per	2 Staff				0
Total Required							**1325**
Cars Provided							1,588 TBC

Yield Summary

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

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BUILDING A

Max. Height	90m
Max. Storeys	27
GFA	19,550m²
Total units	187

	1B	2B	3B
Percentage	29%	55%	16%
Units	55	102	30
Parking Rates	0.6	0.9	1.4
Parking Spaces	33	92	42

Total Residential Parking	167
Allowance for adaptable	14
Visitor Spaces (1 per 10)	19
Total Parking Spaces	200

BUILDING B

Max. Height	200m
Max. Storeys	60
GFA	46,450m²
Total units	493

	1B	2B	3B
Percentage	39%	49%	12%
Units	194	240	59
Parking Rates	0.6	0.9	1.4
Parking Spaces	116	216	83

Total Residential Parking	415
Allowance for adaptable	37
Visitor Spaces (1 per 10)	49
Total Parking Spaces	501

BUILDING C

Max. Height	200m
Max. Storeys	30
GFA	23,350m²
Total units	208

	1B	2B	3B
Percentage	27%	61%	13%
Units	56	126	26
Parking Rates	0.6	0.9	1.4
Parking Spaces	34	113	36

Total Residential Parking	183
Allowance for adaptable	16
Visitor Spaces (1 per 10)	21
Total Parking Spaces	220

BUILDING D

Max. Height	200m
Max. Storeys	45
GFA	36,100m²
Total units	368

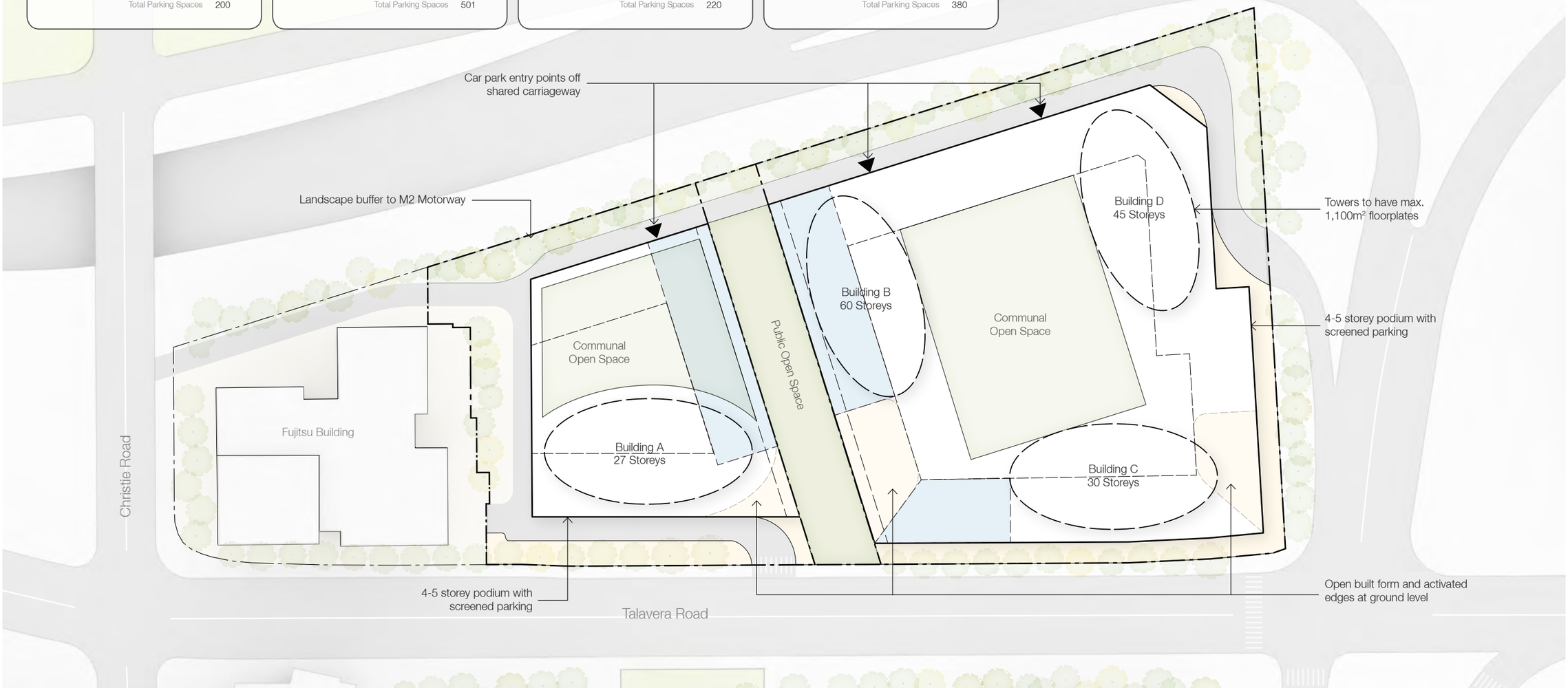
	1B	2B	3B
Percentage	35%	53%	12%
Units	128	195	45
Parking Rates	0.6	0.9	1.4
Parking Spaces	77	176	63

Total Residential Parking	315
Allowance for adaptable	28
Visitor Spaces (1 per 10)	37
Total Parking Spaces	380

SUMMARY

	GFA	1B	2B	3B	Total
Building A	19,550m²	55	102	30	187
Building B	46,450m²	194	240	59	493
Building C	23,350m²	56	126	26	208
Building D	36,100m²	128	195	45	368
Retail/Childcare	*1,500m²				
Proposed Total GFA	126,950m²	433	663	160	^1,256
		34%	53%	13%	100%
Site Area	19,530m²				
Proposed FSR	6.5:1				

* Up to 2x childcare at 600m² each
^ Excludes affordable housing



Development Summary

Scale
1:1000@A3

0 5 10 15 20 25 50

Project number
5633

Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
- Building Envelope
- Retail/childcare at Ground
- Site Boundary
- Indicative Tower Locations

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Attachment 3: Transport Assessment prepared by ARUP

Meriton Group

112 Talavera Road, Macquarie Park

Transport Assessment

Rev D | 30 August 2018

Job number 252454-00

Arup
Arup Pty Ltd ABN 18 000 966 165

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ARUP

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Appendices

Appendix A

SIDRA Assessment

1 Introduction

1.1 Overview

Meriton Group has engaged Arup to provide a transport assessment to support the Planning Proposal of 112 Talavera Road, Macquarie Park. The site is currently known as the Macquarie View Corporate Park, and is located within the northern section of the Macquarie University Station Priority Precinct. The site is approximately 1.95 hectares and currently supports a predominately commercial/ industrial land use.

The development proposal looks to transform the site in phases, into a mixed use development supporting approximately 1,256 apartments and 1,500 sqm of childcare/retail uses.

This report also provides additional information following discussion with Roads and Maritime Services, Ryde Council, Department of Planning and Environment on 8 August 2018. Specific reference is made to Alteration of Gateway Determination dated 27 July 2018 which refers to the Roads and Maritime letter dated October 2017. The key comments to be addressed by the

Conditions	Report reference
"The planning proposal is to be updated to: … (g) include a revised traffic impact assessment that	
i. incorporates Roads and Maritime Services' (RMS) SIDRA modelling advice dated October 2017;	Section 6.4 and Appendix A1
ii. considers the traffic generation implications of reduced parking rates	Sections 5.2.1 and 6.2.2
iii. incorporates future traffic growth. The applicable future growth rates to be modelled for the assessment of future traffic impacts are available from RMS by request; and	Section 2.4 and 0
iv. provides an assessment of entry/exit options of the site, including a demonstration of the impacts of the closure of the left-in access via the M2"	Sections 5.3 and 6.4.3

1.2 Reference documentation

Specific documentations referred to in this report includes:

- Development Control Plan (DCP), City of Ryde, 2014
- Ryde Local Environmental Plan, 2014
- State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development (SEPP 65)
- Apartment Design Guide, NSW Department of Planning and Environment, 2015
- Guide to Traffic Generating Developments, Road and Maritime Services, 2002
- Herring Road, Macquarie Park Finalisation Report, Department of Planning, 2015

1.3 Report Structure

The scope of this report will outline the following:

- Planning context
- Existing transport conditions
- Proposed development yields
- Vehicle access and parking
- Traffic impact assessment
- Public transport access
- Pedestrian and cycle access

2 Planning Context

2.1 Sydney Metro Northwest

Sydney Metro Northwest represents Stage 1 of the NSW Government's Sydney Metro project. Sydney Metro is a new proposed railway line that will deliver 31 metro stations and more than 65 kilometre of new metro rail (Figure 1).

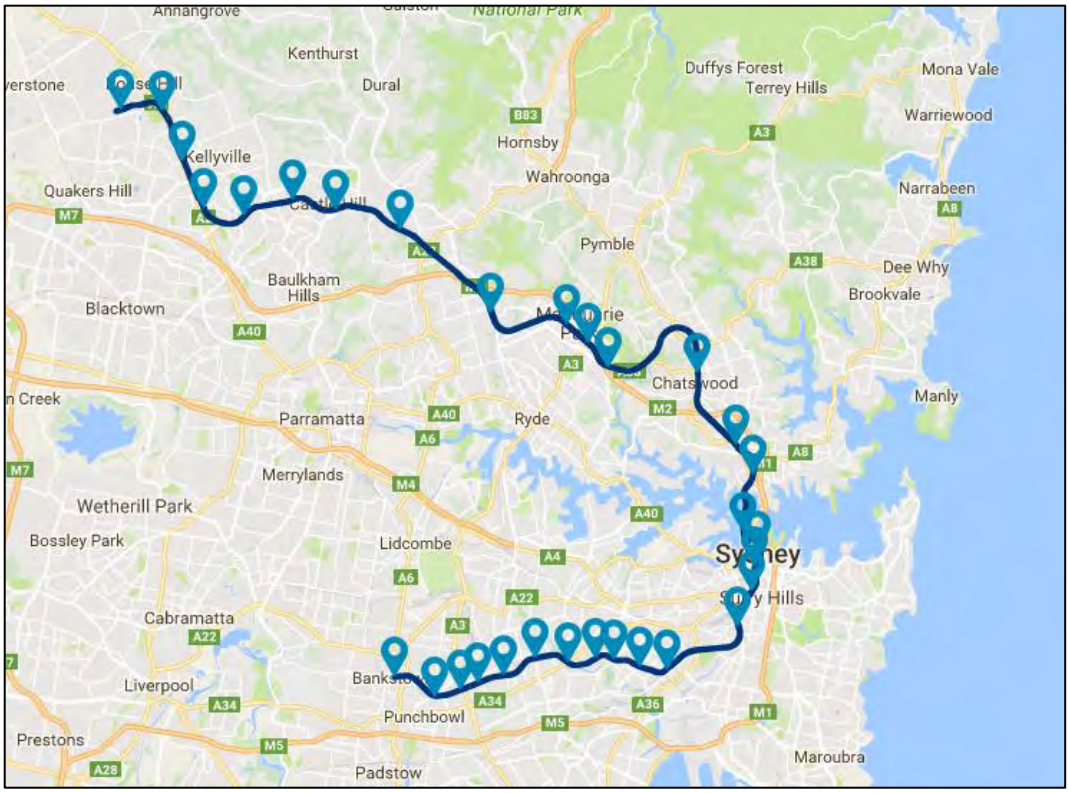


Figure 1: Proposed Sydney Metro alignment

Source: TfNSW (accessed 04/2017) https://www.sydneymetro.info/map/interactive-map

Sydney Metro Northwest will connect Rouse Hill to Chatswood, via Epping. This project proposes to convert the existing Epping to Chatswood railway line to rapid transit standard and extend this line to Cudgegong Road and Rouse Hill. This latter section of railway line was originally referred to as the North West Rail Link. A review of Transport for NSW's Sydney Metro website indicates project completion of Stage 1 is forecast for the first half of 2019, with rail replacement buses between Epping and Chatswood in late 2018.

The Macquarie University Station, which is within 400m of the development site, currently sits along the Epping to Chatswood railway line. It is one of five current railway stations which will be upgraded to metro standards as part of the Sydney Metro project. The number of train services between Epping and Chatswood is anticipated to increase by almost four times during the peak hour to 15 trains an hour in both direction. Direct services to Crows Nest, Barangaroo and Martin Place will also be introduce once Sydney Metro City and Southwest (Stage 2) is finished in 2024.

2.2 Epping and Macquarie Park Urban Renewal Area

The Epping and Macquarie Park Urban Renewal Area is a priority growth area outlined by the NSW government's Department of Planning and Environment (Department). As part of this initiative, the Department has worked with the Ryde Council and other stakeholders to identify opportunities to revitalise the Macquarie University Station (Herring Road) precinct.

The Finalisation Report for this precinct, completed by the department in 2015, focused on the walking catchment around Macquarie University Station and along Herring Road, which are currently zoned mixed use in the City of Ryde's Local Environmental Plan (LEP), 2014.

The report proposes amendments to Ryde's LEP to increase the height and density controls, especially around the station. The precinct will look to deliver up to 5,800 dwellings by 2031.

2.3 Macquarie Park Bus Priority and Capacity Improvements

Transport for NSW (TfNSW) and Roads and Maritime Services (Roads and Maritime) are proposing a range of road and intersection upgrades in Macquarie Park. Given the precinct's growth, these upgrades aim to improve the reliability and efficiency of bus services, while easing congestion and improving traffic flow for all road users in the area.

The proposal is currently out for public comment, with the feedback window closing in May 2017. This proposal would be delivered as part of the Bus Priority Infrastructure Program and will be separated into two stages.

Stage 1

As highlighted in section 2.1, Sydney Metro Northwest will temporarily close in late 2018, with rail replacement buses operating for approximately seven months. During this period the Temporary Transport Plan (TfNSW, 2014) will be implemented. Works on the proposed road and intersection upgrades will commence mid-2017 and once complete will support the running of current and additional rail replacement bus services and improved traffic flow in the area.

Stage 2

Following the completion of the Sydney Metro Northwest, the remainder of the proposed road and intersection upgrades will be carried out. These works will focus on long term improvements and ongoing support for the Parramatta to Macquarie Park and Hurstville to Burwood bus corridors as well as other bus services operating the in the area.

Some of the key proposed upgrades within proximity of 112 Talavera Road are outline in Figure 2.

Figure 2: Key features of the Macquarie Park bus priority and capacity improvements

2.4 Macquarie Park AIMSUN Model Review

It is understood that Transport for NSW and Roads and Maritime have been in discussions with The Department of Planning and Environment in regards to updating the Macquarie Park AIMSUN Model. The DPE letter dated 7 March 2018 noted that the planning proposal be updated to:

"1 (f) demonstrate consistency with the updated Aimsun traffic model for the Macquarie Park Precinct, available at request from RMS"

Arup is aware that the Macquarie Park Aimsun Model (MPAM) was built to understand the traffic and transport implications of the future development uplift in the Macquarie Park corridor. It covers the road network within the North Ryde Station precinct through to Culloden Road north of Macquarie University, and includes major arterial roads such as Lane Cove Road and Epping Road. The base year model considers the movement of approximately 25,000 individual traffic movements during both the AM and PM peak hour.

Arup have previously utilised the MPAM to under the future year traffic conditions in Macquarie Park – up to the year 2031. With the extent of development growth and uplift envisaged by the Transport for NSW owned Strategic Travel Model, the modelling indicated significant capacity constraints throughout the modelled area. Further, there was significant variation in each model run (using random seeds) due to these capacity constraints.

As part of this updated Transport Assessment, Roads and Maritime have provided output flows at the Talavera Road and Herring Road intersection for years 2021 and 2031. These flows have been used as the basis of future year modelling. It is assumed that traffic generation rates utilised in this model are consistent with the typical rates outlined in the Roads and Maritime guides.

3 Existing Context

3.1 Site description

The site subject to the planning proposal is located at 112 Talavera Road, Macquarie Park, approximately 17 km from Sydney CBD. The site is approximately 1.95 hectares in size and is situated within the City of Ryde local government area. The location plan is shown in Figure 3.

The site is bound by the M2 Motorway to the north, Herring Road to the east, Talavera Road to the south and Christie Road to the west. The site currently comprises of the Macquarie View Corporate Park with the Fujitsu Head Office commercial building abutting the site to the west.

Figure 3: Location plan

Background image source: Google Maps, accessed 2017

The site currently consists of an office tower and associated business park/ industrial uses. Existing vehicular access is provided along Talavera Road, Herring Road and Christie Road. The access from Christie Road is shared with a right of way easement with Fujitsu. As per the Ryde's LEP (2014) the development site is zoned B4, mixed use. This is shown in Figure 4.

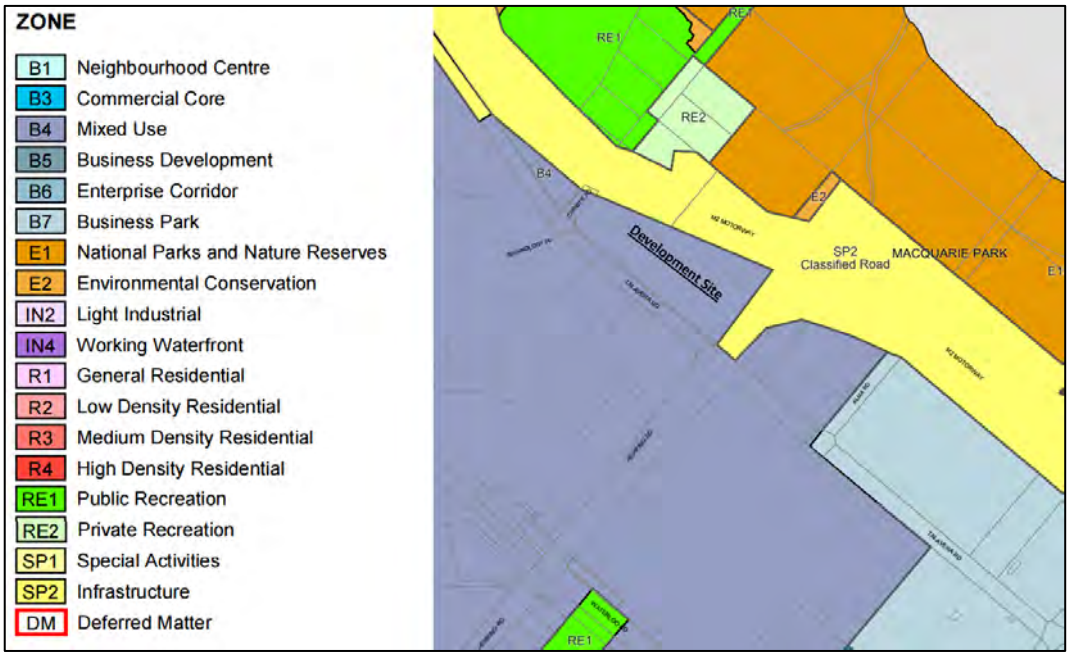


Figure 4: Land use zoning

Source: City of Ryde LEP (2014)

3.2 Road network

The site is bound by the M2 Motorway to the north, the Herring Road M2 on-ramp to the east, Talavera Road to the south and the Fujitsu commercial building to the west.

The M2 Motorway is a toll road that is operated by Transurban. It has a sign posted speed limit of 100km/h. In this vicinity, it operates as a six lane dual carriage way.

Talavera Road is an east-west regional road and generally consists of two lanes in each direction.

Herring Road is a north-south regional road. The section north of Talavera Road forms the on/off ramp to the M2 Motorway.

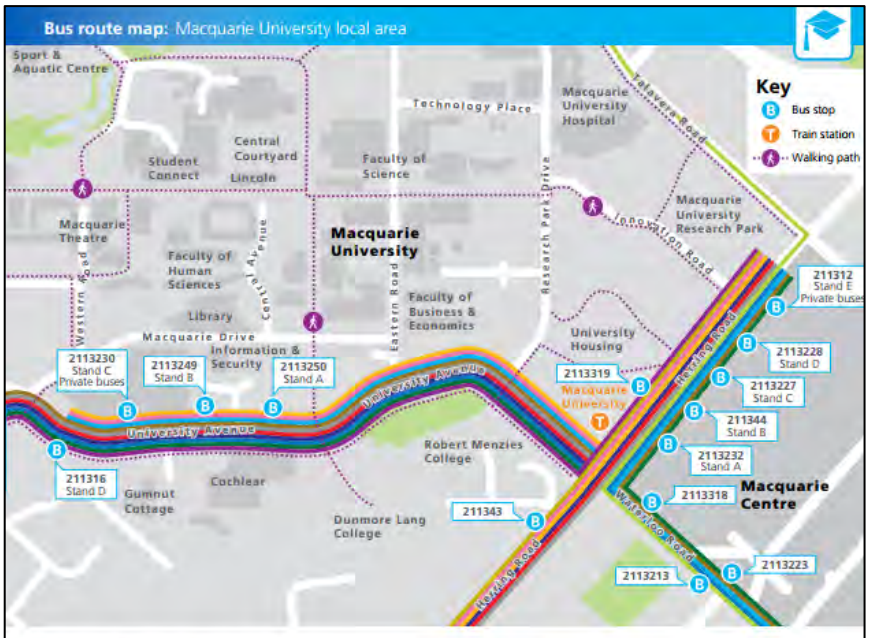
The key intersections surrounding the development site consists of:

- **Herring Road/ Talavera Road/ M2 Ramps:** Pedestrian crossing facilities are provided to all approaches to the intersection expect the eastern leg. A bus priority lane is provided on the western approach along Talavera Road, with the right turn movement from Talavera Road to Herring Road restricted for buses only.
- **Talavera Road/ Christie Road:** This signalised intersection caters for pedestrian crossing facilities on the north and west approaches. The Christie Road approach provides vehicular access to and from the M2 Motorway for traffic travelling eastbound.

3.3 Public transport

The site has good access to public transport and is within walking distance to both rail and bus services. Macquarie University Station is located 400m to the south of the development site and forms part of the Epping to Chatswood line. This station provides services between 5am to 11pm on a topical weekday and 13 train services arrive at the station during peak hours.

Several bus services operate along Talavera Road, fronting the development site. Macquarie University and Macquarie Centre are within close proximity, both of which provide high frequency buses connecting to Parramatta CBD, Sydney City and other major centres. Public transport options for the local area are summarised via Macquarie University's local area map (Figure 5).



Stop	Stand	Routes	Towards
University Avenue			
2113250	Stand A	288 290 291 292 294 506 507 518	City, McMahons Point
2113249	Stand B	M54 140 459 545	Macquarie Park, Manly, Strathfield, Chatswood
211316	Stand D	M54 140 288 290 291 292 544 545 550	Marsfield, Epping, Parramatta, Auburn
Herring Road			
2113232	Stand A	M54 506 507 518 544 545 550	Parramatta, City, Auburn
211344	Stand B	458 459 545	Strathfield, Burwood, Chatswood
2113227	Stand C	M54 140 288 290 291 292 294	Macquarie Park, Manly, McMahons Point, City
2113228	Stand D	140 288 290 291 292 295	Marsfield, Epping, North Epping
211343		288 290 291	Epping
2113319		M41	Marsfield
Waterloo Road			
2113213		292 545 550	Marsfield, Parramatta
2113223		M41 M54 292 294 458 459 506 545	Macquarie Park, Ryde, Rhodes, Burwood, Strathfield, Hurstville, City, Chatswood
2113318		M41	Ryde, Rhodes, Burwood, Hurstville

Figure 5: Local area public transport map

Source: Transport for NSW, September 2016

3.4 Active transport

The pedestrian network in the vicinity of the proposed development is of a reasonable quality with footpaths on both sides of Talavera Road. Good connectivity to nearby attractors such as Macquarie Centre, Macquarie University and Macquarie University Station is provided.

Walking isochrones from the proposed development site are shown in Figure 6, using the Arup developed T3A tool. This tool utilises pedestrian data from Open Street Map, with a walking speed of 5km/h. The isochrones indicate the area which can be reached within a certain walking time.

The assessment indicates that Macquarie Centre and Macquarie University Station are both approximately five minutes walk of the development site, while Macquarie University can be accessed within 15 minutes.

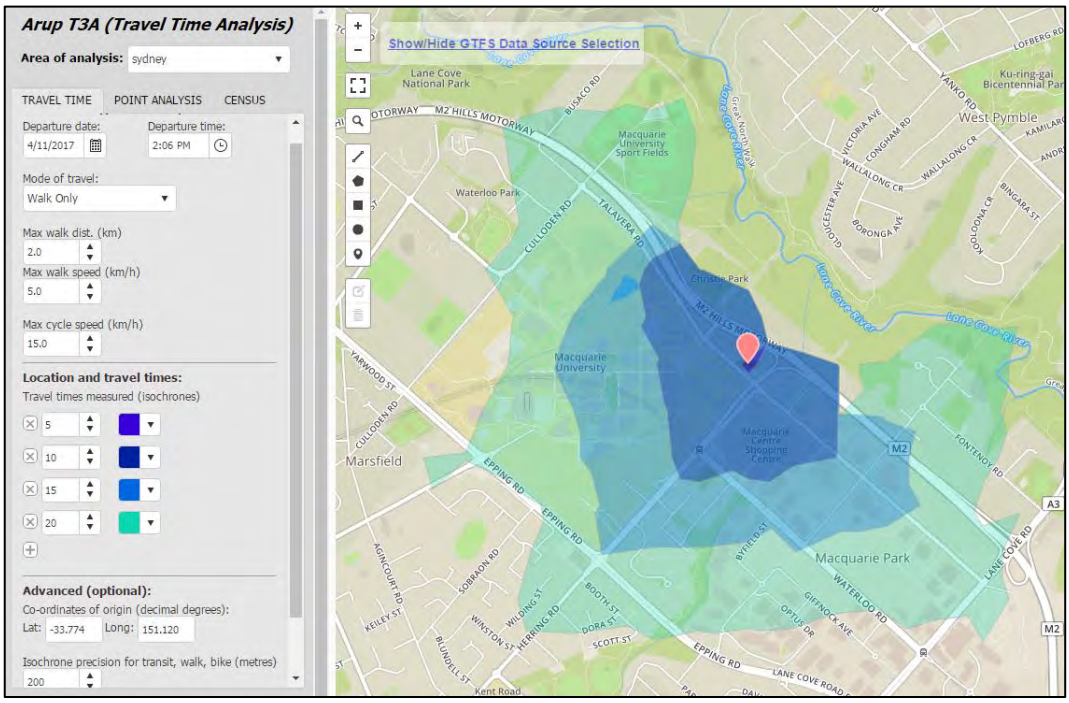


Figure 6: Walking isochrones, Arup T3A

The existing dedicated and low difficulty cycle routes, recommended by the Roads and Maritime Cycleway Finder is shown in Figure 7. Existing cycle routes are relatively well connected with off-road paths located along Talavera Road and Waterloo Road.

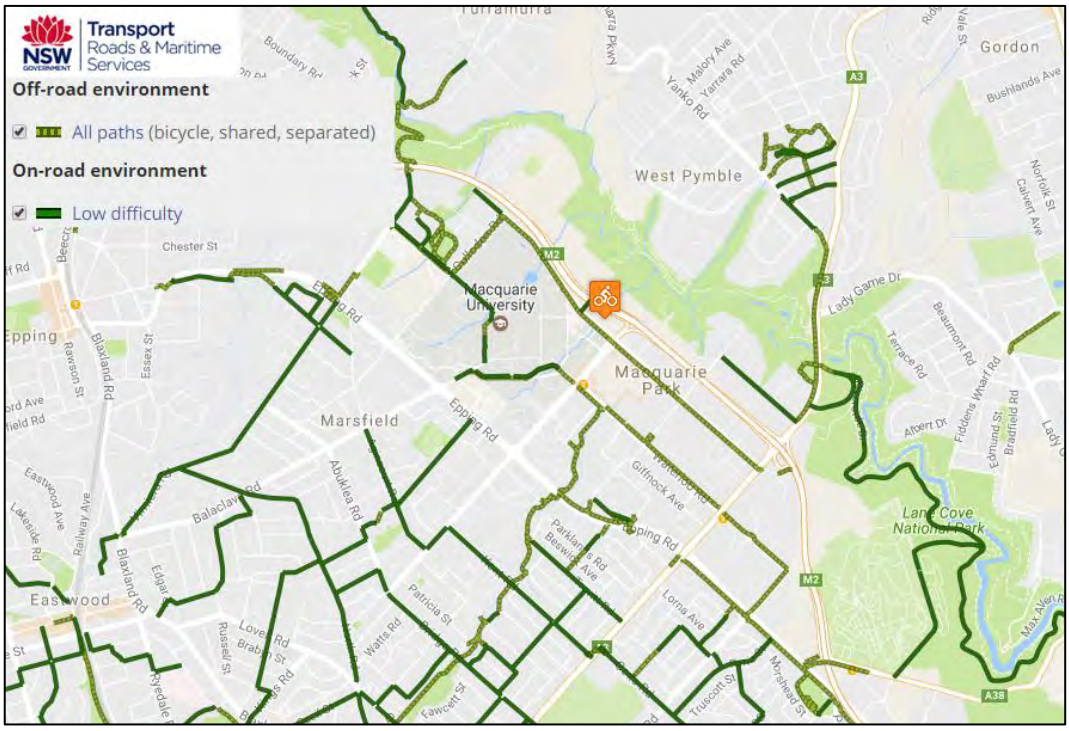


Figure 7: Cycle network map

Source: Roads and Maritime Cycleway Finder

3.5 Travel patterns

Analysis of travel modes of people who live and work in the immediate area has been undertaken. A review of the 2016 Census Travel to Work data was conducted to assess people's method of commute to and from the suburb. This information is collected as part of the Census and it captures commuter travel behaviours for one particular day.

3.5.1 Workers of Macquarie Park

An approximate total of 48,400 people was recorded working in the Macquarie Park area in 2011. The Travel to Work data indicates that the majority of workers in the area use private vehicle as the primary form of commute. Public and active transport make up less than 30% of all respondents in the area. A summary of worker mode share is shown in Table 1.

Table 1: Workers travelling to Macquarie Park

Mode	Trips	Proportion
Public Transport	11,744	24%
Private Vehicle	30,299	63%
Active Transport	1,576	3%
Other Mode	184	0%
Worked at home or Did not go to work	4,251	9%
Mode not stated	340	1%
Not applicable	0	0%
Total	48,394	100%

3.5.2 Residents of Macquarie Park

The Census data indicates there are approximately 18,700 working residents that live in the Macquarie Park area in 2016. Unlike the workers within the area, the data shows that the commuting patterns of residents in Macquarie Park are more balanced. With an approximate 50/50 split of survey respondents indicating private vehicle compared to public and active transport as a method of travel to work as indicated in Table 2. It is important to note this covers areas that do not necessarily have immediate access to the public transport nodes.

Table 2: Residents commuting from Macquarie Park

Mode of travel	Trips	Proportion
Public Transport	3,126	17%
Private Vehicle	4,527	24%
Active Transport	994	5%
Other Mode	36	0%
Worked at home or Did not go to work	1,228	7%
Mode not stated	89	0%
Not applicable	8,736	47%
Total	18,742	100%

3.6 Road safety

Crashes were analysed on the surrounding streets of the site over the most recent five-year period (from July 2011 – June 2016 inclusive). Overall, there were 82 crashes recorded, of which there were no fatalities, 47 injury crashes involving 59 casualties and 35 non-casualty (tow away) crashes. The data also indicates a fairly even distribution of crashes per year as shown in Figure 8 (accounting for the half years for 2011 and 2016).

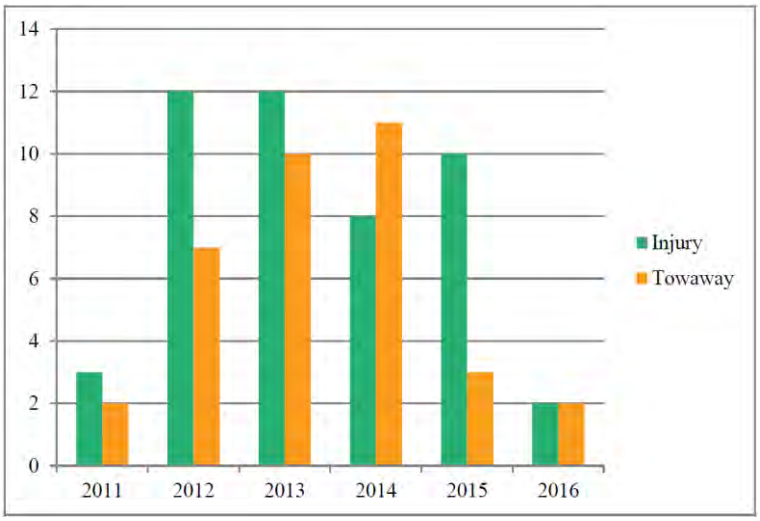


Figure 8: Degree of crashes per year (2011-2016) on surrounding streets

The crash data was classified into the various road user movement (RUM) codes to analyse crash clustering. The majority of crash types were recorded as vehicles from opposing directions, followed by vehicles in the same direction which are common along arterial roads and at intersections (Figure 9).

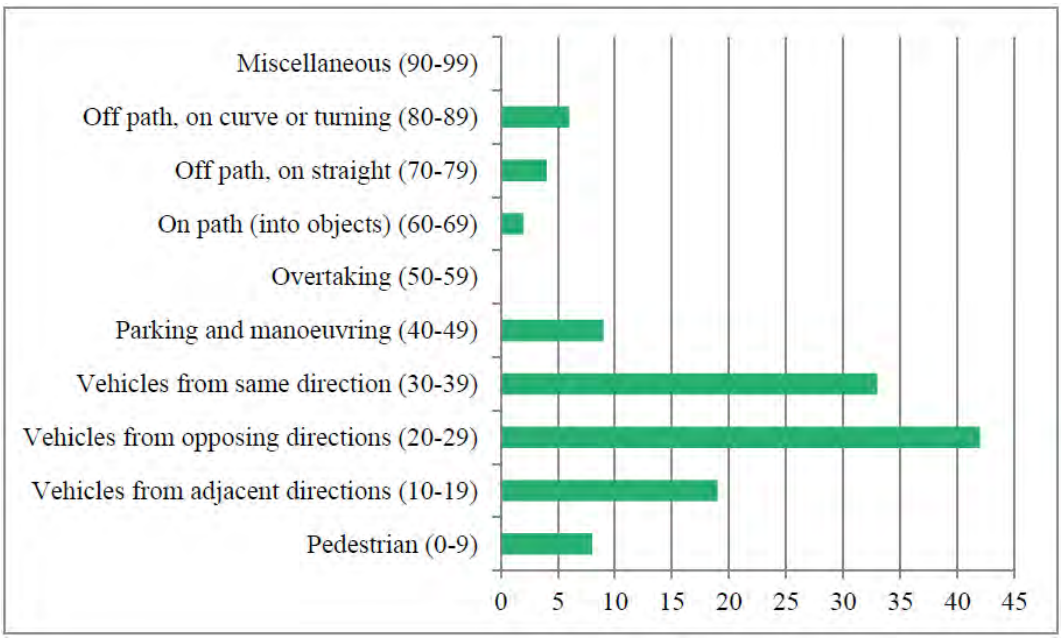


Figure 9: Crash types by road user movement categories

The majority of crashes occurred at intersections and included the lower rum codes. However, there were some crashes recorded midblock on Talavera Road, which included a rear-left, opposing right-thru crash and a rear end due to another crash. The opposing right-thru crash was recorded in 2013 and involved a vehicle turning right into the site access. The other rear-left crash was attributed to the University access opposite the site.

4 Proposed Development

The development proposes approximately 1,256 residential apartments over four buildings. Arup understands that this is approximately 350 apartments in addition to the current planning controls for this site. The proposed development is planned to be constructed in phases. A summary of the residential development yields per building is shown in Table 3

Table 3: Residential yield summary of the proposed development per building

Yield Summary	Building A	Building B	Building C	Building D	Total
One Bedroom	55	194	56	128	433
Two Bedroom	102	240	126	195	663
Three Bedroom	30	59	26	45	160
TOTAL	**187**	**493**	**208**	**368**	**1,256**

Arup understands that up to 25 apartments may be dedicated to Council affordable housing. It should be noted that no affordable housing has been allowed for in this transport assessment.

In addition to the residential component, up to two 600sqm child care centres are proposed to be included (as part of each development phase). Each child care centre is anticipated to cater for 100 children and 20 staff per phase. There is also a small retail component of 300sqm proposed.

A concept site plan is shown in Figure 10 below.

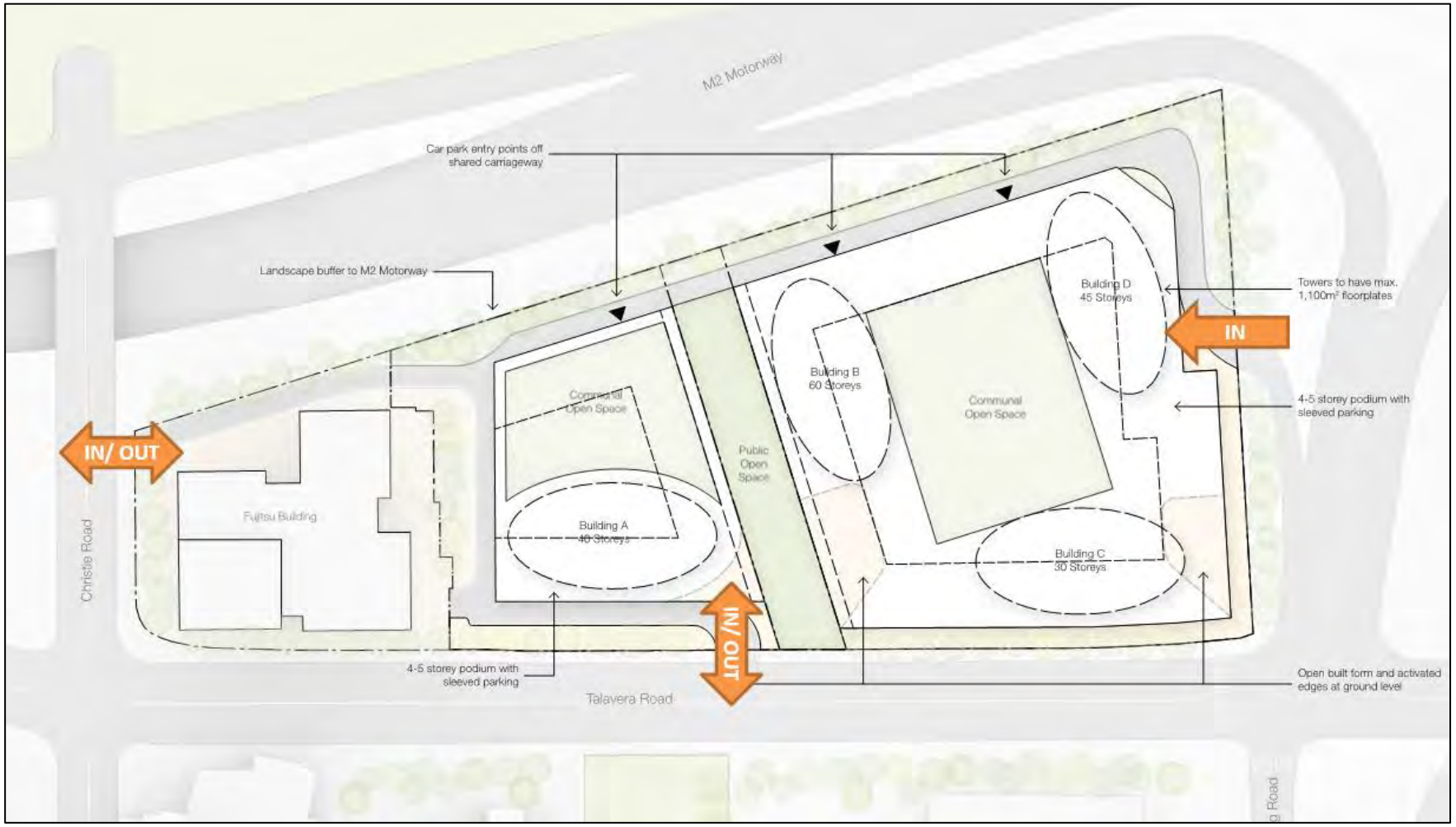


Figure 10 Site concept plan (Source: SJB Architects, May 2017)

5 Parking and Vehicle Access

5.1 Existing parking

A review of the existing parking supply was conducted. The capacity and occupancy during the morning peak of a typical weekday is summarised in Table 4.

Table 4: Existing parking supply and occupancy

Site	Level	Spaces	Occupancy*
Fujitsu Site	Lower level	85	25%
	Middle level	86	50%
	Upper level	72	25%
Development Site	At Grade	187	100%
	Service Bays	8	-
	Upper Basement	60	50%
	Lower Basement	60	50%

* Occupancy was recorded during the morning peak hour of a typical weekday

5.2 Parking requirements

5.2.1 Car parking

A review of the City of Ryde Development Control Plan (DCP) 2014 indicates the following **maximum** residential parking rates for the Macquarie Park Corridor:

- 1 bedroom – 0.6 bays per dwelling
- 2 bedroom – 0.9 bays per dwelling
- 3 bedroom or more – 1.4 bays per dwelling
- Visitor parking – 1 bay per 10 dwellings
- Car Share – 1 bay per 50 required parking spaces

The Apartment Design Guide provides design criteria and general guidance regarding how development proposals can achieve the quality principles identified in the State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development (SEPP 65). Applying transit oriented development principles, the guide indicates that on-site car parking on a site that is within 800m of a railway station in the Sydney metropolitan area should take the minimum of either the council DCP or Roads and Maritime's Guide to Traffic Generating Developments. In this case, the parking rates outlined the DCP are maximum and the development has considered reducing rates further.

A review of the DCP was also conducted to identify the baseline parking requirements for the proposed child care centres. The rates were as follows:

- 1 space per 8 children – this is to facilitate the drop off and pick up of children
- 1 space per 2 staff – to facilitate parking for employees

The assumptions applied to the calculation of parking requirements are as follows:

- As the child care centres are anticipated to predominately serve the residents on site, it is proposed to share the residential visitor parking with the child care component

The estimated parking potential per building for this development are summarised in Table 5.

Table 5: Summary of potential maximum parking permitted on site

Use types	**Building**				**Total**
	A	**B**	**C**	**D**	
1 bed	33	116	34	77	260
2 bed	92	216	113	176	597
3 bed	42	83	36	63	224
Visitor Parking	19	49	21	37	126
Car Share Parking	4	9	4	7	24*
TOTAL	**190**	**473**	**208**	**360**	**1,232**

* From experience on other residential projects, it is recommended that consultation with car share companies such as Go Get be conducted during subsequent stages of design to achieve a more realistic provision of allocated car share bays.

Traffic generation will be discussed in more detail in the Section 6, however it is important to note that the actual supply of parking will have an influencing factor on traffic generation. Though this statement may seem obvious, current guidance does not correlate these two factors. Arup recently undertook research which considered the influencing factors that contribute to the level of traffic generated by high density residential developments. The research specifically considered how the provision of on-site parking and site location may influence traffic generation rates.

Key findings of the research was that the rate at which parking is provided within residential developments was found to influence the overall level of traffic generated by that development. Further, the consideration of public transport accessibility was found to influence the level of traffic generation. Figure 11 shows the relatively positive correlation between peak hour traffic generation and parking provision.

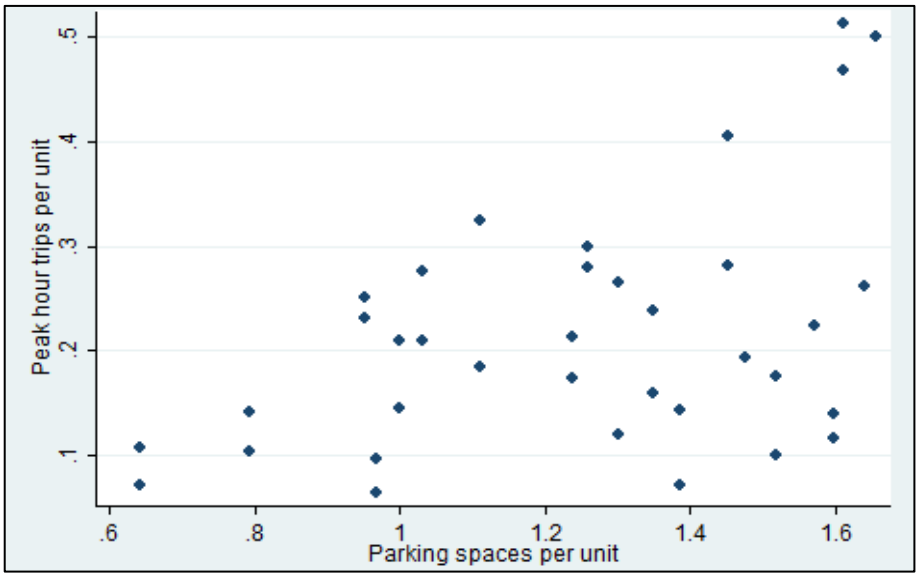


Figure 11: Correlation between peak traffic generation and parking spaces per unit

Given the Macquarie Park Corridor's evolution from business park uses to a specialised employment centre, this development should be cognisant that reduced parking provision will likely lead to lower traffic generation.

In regards to the parking provision, using the RTA parking rates could theoretically reduce car mode share (see Table 5). It is anticipated that a mode shift from 52% to 28% based on the parking provision and trip rates per parking space.

However, to adopt Roads and Maritime objectives of no additional parking/traffic compared to the no uplift (i.e. 879 units) scenario, an alternative parking rate has been developed with lower parking rates that can be supported with the enhanced public transport provisions.

Table 6: Proposed parking rates for the development

Bedrooms	**Assumed Mix**	**RMS parking rates**	**Permitted base scenario**		**Uplift development scenario (PP)**		**Revised parking rates**
			Units	**Parking (RMS rates)**	**Units**	**Parking (RMS rates)**	
1	34%	0.6	303	182	433	259.8	**0.42**
2	53%	0.9	464	418	663	596.7	**0.63**
3	13%	1.4	112	157	160	224	**0.98**
Total		0.860	**879**	756	**1256**	1080.5	**0.602**

5.2.2 Bicycle parking

The City of Ryde's DCP highlights that cycling accounts for approximately 10% of the journey to work in the Ryde local government area and as a result requires bicycle parking to be provided at 10% of the required maximum car spaces. This control looks to provide for the minimum quantum of bicycle parking and to cater for anticipated increases in demand.

Secure bicycle parking should designed in accordance with the requirements of AS2890.3. The required bicycle parking result in a total of 124 bicycle spaces summarised by building below:

- Building A: 19 bicycle spaces
- Building B: 48 bicycle spaces
- Building C: 21 bicycle spaces
- Building D: 36 bicycle spaces

The development proposes to adopt the bicycle parking provision above.

5.3 Vehicle accesses

It is generally recommended that there should be least one access point per 500 car parking spaces on a site as per AS2890. Given that the development will supply a reduced parking provision outlined in Section 5.2.1 (882 spaces), the parking for Fujitsu (243 spaces) should also be taken into account resulting in a total of approximately 1,125 spaces will be provided across the site by the completion of the planning proposal development.

This would imply that conceptually three external access points should be allowed for to serve the anticipated traffic accessing the site. It is recommended to maximise the amount of vehicle storage space between the frontage road and the access gates for all driveways to minimise any impacts on the network traffic. This will still remove up to two existing access points along Talavera Road.

In order to better facilitate access onto the east bound on ramp of the M2 Motorway, it is recommended that a right turn out of the site is maintained at Talavera Road. Keep clear line marking can contribute to improving exiting movement from right turn vehicles at this location. This should be considered given the impacts associated with removing these right turns as previously suggested by the authorities.

5.3.1 M2 On-ramp access

During consultation with Roads and Maritime Services, the proponent has been advised to review access arrangements against the State Environmental Planning Policy (SEPP) Infrastructure 2007 on practicality. The following outlines the wording of the SEPP (in blue) and the proponent's response following:

(2) The consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that:
(a) where practicable, vehicular access to the land is provided by a road other than the classified road, and –

It is noted that it is not practicable to redirect traffic to make erroneous and unsafe movements that will create additional congestion on the regional road network and reduce safety by encouraging vehicles to make unsafe manoeuvres. Otherwise, the M2 Motorway on-ramp access closure will limit vehicle access to the site by directing vehicles approaching from the east and south, requiring

vehicles to travel up to Research Park Drive roundabout (to perform a U-turn) and then travel back to Talavera Road.

The subject access point currently exists and there is no recorded crash history at the subject access point.

Design/signage adjustments can be made as required by Roads and Maritime. Access control can be granted to Roads and Maritime, the access point has existed for many years without any issues and the proposed development can improve the situation with reduced traffic, this site is very unique and will not set an undesirable precedent.

The impacts of the resulting redistribution of traffic along with potential right turn bans is shown in Figure 12 and further assessed in Section 6.4.3.

Figure 12: Impacts associated with closure of M2 On-ramp access driveway

(b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of:
(i) the design of the vehicular access to the land, or

The site access has not had known issues in the past and the proponent accepts adjustments of the design to address any concerns as per Roads and Maritime requirements, retaining the access.

(ii) the emission of smoke or dust from the development, or

Zoning is not changing and future uses will not emit smoke or dust.

(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and

The volume of traffic using the access will be reduced from the existing situation and the proponent is happy to accommodate any design changes necessary to retain the access.

The proposed increase in density has not resulted in any additional traffic generation by limiting the parking. This will ensure practical and safe access as well as encouraging more use for the Metro which is due to being operation in 2019.

(c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.

The planning proposal allows for a taller, more slender built form which will pull the building away from the M2 Motorway, as well as retaining the perimeter road as a buffer. Appropriate design and acoustic measures will be adopted at the development application (DA) stage. This has already been addressed in the current DA.

5.4 Service vehicles

It is recommended that one service bay is provided for each of the phases of the development given that the Roads and Maritime Guide to Traffic Generating Development (Section 5.4.3) for high density housing states that:

The provision of at least one loading dock for residential use is desirable, although a dock intended for commercial uses may be sufficient.

Where service bays are to be located on the site circulation (private) road, they should be located such that sufficient sightlines to the one-way oncoming traffic is provided. A minimum recommend width of 7m should be provided to allow cars to pass stationary service vehicles.

Swept path analysis using a 12.5m long heavy rigid vehicle (as per AS2890.2) has been conducted to check access around the development site. It is not anticipated that service vehicles will be required to access the car park. This has been used to inform the development of the concept design.

6 Transport Impact Assessment

6.1 Person trip generation

Traffic generation forecasts for high-density residential uses are generally derived from the RMS Guide to Traffic Generating Developments – Updated Traffic Surveys (Roads and Maritime, August 2013), which stipulate that the quantum of traffic generated is based on the number of dwellings contained in the future development. Traffic generation rates are however typically influenced by a number of factors such as bulk and scale of the development, public transport availability, availability and cost of parking, mixed-use and complementary nature of various land use components and peak traffic generation hours.

Taking the proposed yields for the development site, an assessment of the person trip generation for the various modes was conducted. Reviewing data collected by Roads and Maritime (2014) for high density residential flat buildings; a peak hour person trip rate of 0.67 per unit was utilised for this assessment. Applying the residential yields outlined in Section 4, the peak hour people trips for each phase was calculated (Table 7).

Table 7: Forecast peak hour pedestrian trips

Building	Units	Peak Hour People Trips
A	187	125
B	493	329
C	208	139
D	368	245
Total	**1,256**	**838**

The residential land uses, in particular, market housing, are by far the most significant component of the proposed development. Therefore, adopting an appropriate traffic generation rate for this use is critical in determining the traffic impacts and required mitigation measures arising from the proposal. Typically this is done in one of two ways, as outlined below:

6.1.1 Determining vehicle mode share and trip generation

Previously, mode share assumptions which are broadly based on existing travel behaviour from residents of Macquarie Park and Marsfield area were used. This indicates a driver mode share of 52% during the AM peak hour (of those who travelled in Section 3.5.2).

Roads and Maritime surveys of high-density residential developments (as outlined in TDT 2013/04a) have indicated a trip (i.e. all modes) generation rate of 0.67 trips/dwelling as noted above. Applying the 52% vehicle driver mode share to this trip rate gives a traffic generation rate of 0.35 vehicles trips/dwelling.

6.1.2 Surveying a similar site

Given the complexities in forecasting traffic generation rates, it is good practice to survey a site with similar characteristics and features to that of the proposed development. The recently completed development at 120-128 Herring Road, which is opposite the Ivanhoe Estate site, is considered suitable to inform the development of a traffic generation rate.

Arup undertook a survey at this development during the AM and PM peak hours to determine the volume of traffic generated by the site in 2018. This survey recorded all vehicle entries and exits from the basement driveways at the buildings within the development, as shown in Figure 13. The survey results are shown in Table 8.

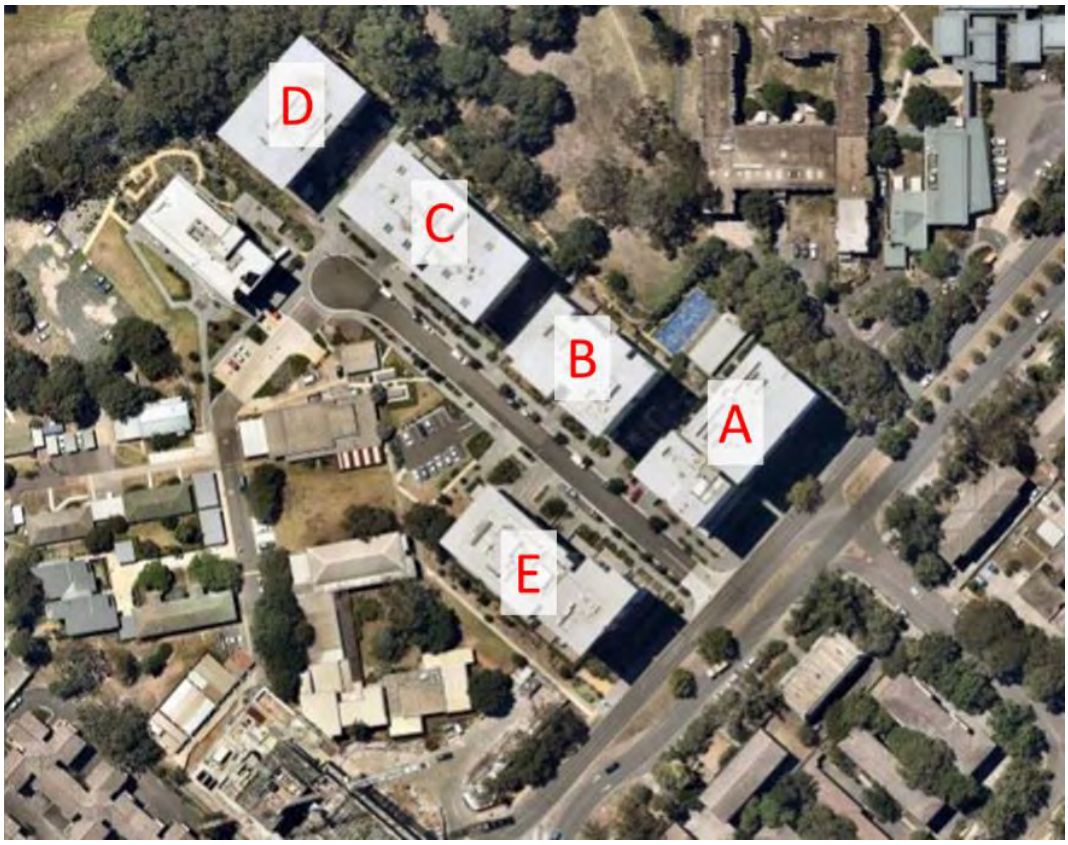


Figure 13: 120-128 Herring Road development

Table 8: Traffic generation for 120-128 Herring Road site

Building	# Units	No. of vehicles		Trip rate	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
A	129	26	19	0.11	0.08
B	117				
C	153	27	27	0.12	0.12
D	71				
E	148	23	18`	0.16	0.12
Average rate				**0.13**	**0.11**

6.1.3 Summary

- By comparing the survey results undertaken by Arup and the mode shares, it is concluded that the standard traffic generation rates for the high-density residential component of the development are appropriate
- The mode share assumptions (including those by public transport) should be adjusted to reflect the adopted traffic generation rate

6.2 Traffic generation

6.2.1 Existing

Traffic surveys were conducted for traffic accessing the development site and the surrounding the road network during the AM and PM peak hours on a typical week day. This is displayed in Figure 14 and Figure 15 below. A summary of the peak hour trips accessing the current site are as shown in Table 9.

Table 9: Summary of baseline traffic generation

Peak Hour	Fujitsu		Development Site (Existing)		Total	
	In	Out	In	Out	In	Out
AM (8am – 9am)	69	1	137	50	206	51
PM (5pm – 6pm)	3	54	58	162	61	216

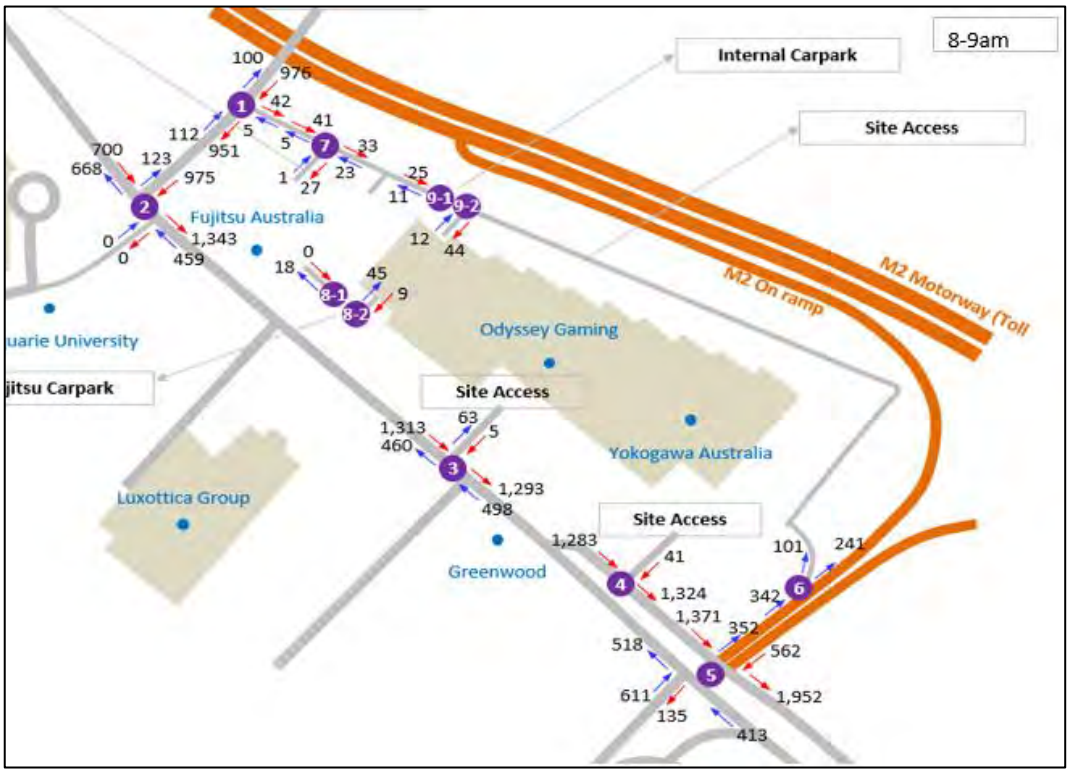


Figure 14: Baseline traffic generation - AM Peak

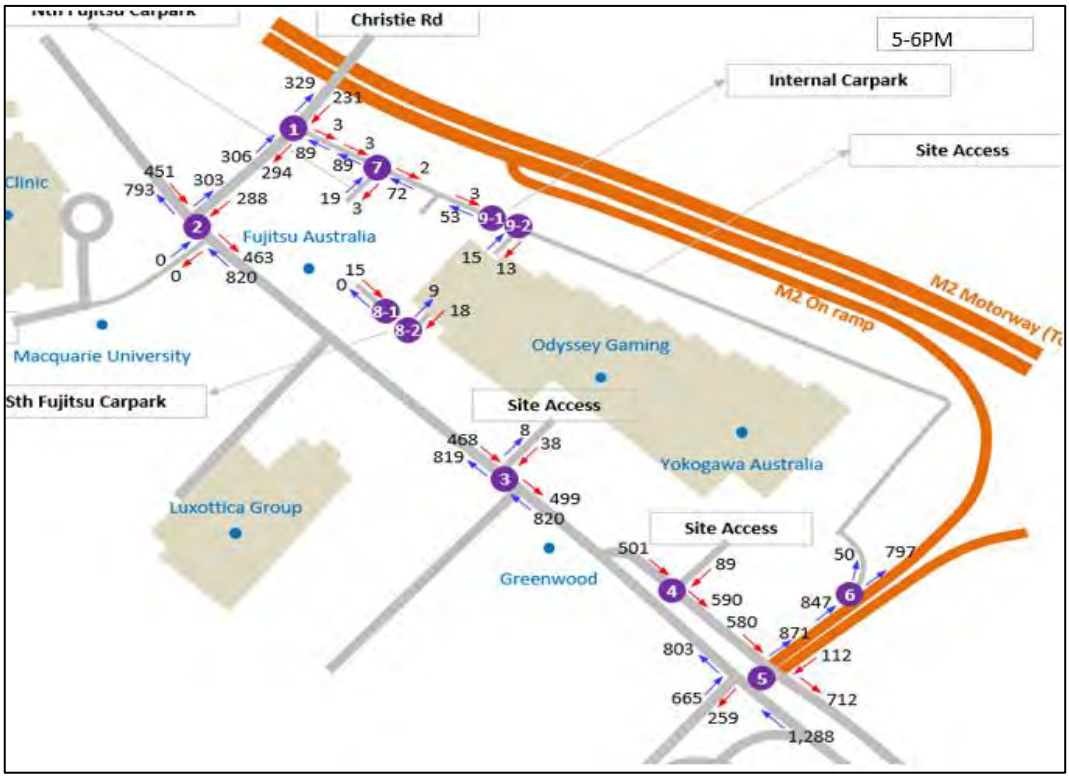


Figure 15: Baseline trip generation - PM Peak

6.2.2 Development

Under the proposed development yields, trip generation was estimated with the following assumptions (Table 11):

- The childcare centres serve mostly residents living on site and a reduced rate of trip generation has been applied.
- Residential trip rates have been based on the standard Roads and Maritime parking rates (based on reduced parking and surrounding development trip rates)

Table 10: Expected development trip generation rates per use

Land Use	AM	PM	Weekend
High density residential	0.15	0.12	0.21
Child Care*	0.6	0.54	-

*Child care trip generation rates reduced by 25% due to containment

The following in/ out proportions for the respective peak hours:

- AM (8:00 – 9:00) – 80% (out), 20% (in)
- PM (17:00 – 18:00) – 20% (out), 80% (in)
- Weekend (and childcare) – 50% (out), 50% (in)

- The Fujitsu site will continue to generate the same amount of traffic as observed in 2016, with negligible traffic on the weekend.

Table 11: Expected development trip generation per building

Building	AM		PM		Weekend	
	In	Out	In	Out	In	Out
A	4	16	13	3	14	14
B	10	39	31	8	34	34
C	4	17	14	3	15	15
D	7	30	24	6	26	26
Childcare	45	45	40	41	0	0
Total	**70**	**147**	**122**	**61**	**89**	**89**

6.2.3 Additional trips relative to existing

Traditionally, traffic generation at high density residential developments is dictated by the number of dwellings proposed. However, considering the reduced parking provision utilised by the development in comparison to the Macquarie Park corridor rates as well as the restrictive nature of on-street parking surrounding the development, traffic generation rates relating to the number of parking bays provided was investigated.

Comparison of the baseline with the development trip generation is shown in Table 12. Overall, the proposed development will generate an increase in traffic to the network relative to the existing land use. However, it should be noted that with the change in land use from commercial to residential, the proportion of trips entering and exiting the site will switch for the respective peak hours. With the adjacent commercial development (Fujitsu) this will have a balancing effect to in/out movements during the respective peak hours.

Table 12: Comparison of trip generation relative to existing (no Fujitsu traffic)

Peak hour	Baseline Traffic	Trip Rate per Car Space*	
		Development Traffic	Relative Difference
AM	187	217	+30
PM	220	183	-37

*Roads and Maritime trip generation rate of 0.15 and 0.12 trips per car space for the AM and PM peaks, respectively.

6.3 Traffic distribution

6.3.1 Existing distribution

Approximately 50% of the current 206 trips into the site are made via the M2 on-ramp entrance to the east of the site. The access point on Talavera Road is used by a further 30% of people entering the site, with the remaining 20% using the Christie Road entrance.

In the afternoon when majority of trips are leaving the site, the most common direction is left turn out of Christie Road (30%) and left out onto Talavera Road (16%). The right-turn movement out of Christie Road, while signed as left-only (facing inside the site), receives over 10% of trips. The right turn onto Talavera Road is difficult due to higher traffic volumes and is used by only 2% of people exiting the site.

(Note there is an additional exit access on Talavera Road which is being removed which accounts for the remaining 89 vehicles or 41% of the total site traffic.)

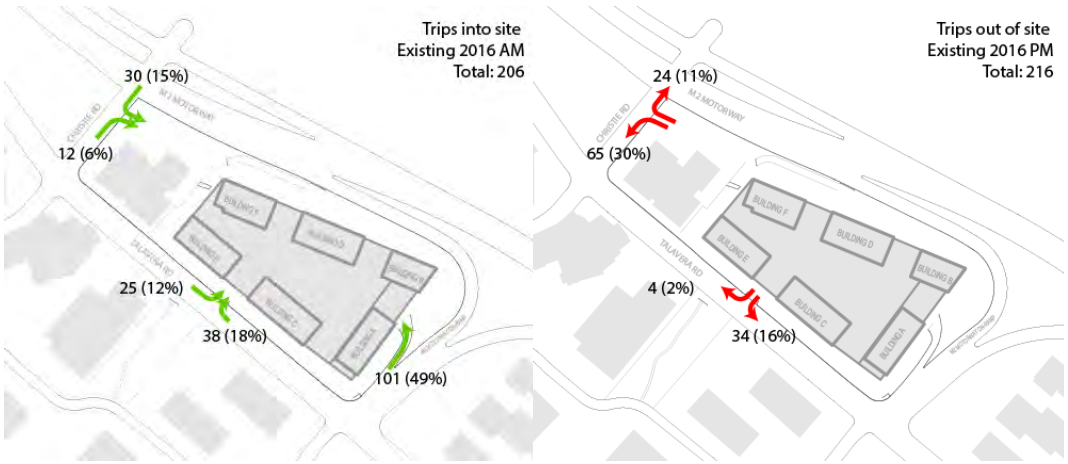


Figure 16: Trips into site in morning peak and out of site in evening, 2016

6.3.2 Potential future distribution

Changing the major land use of the site from commercial space to residential shifts the dominant traffic directions. Residential traffic generates mostly outbound trips in the morning peak and inbound trips in the evening, while commercial space has the opposite pattern. Combining the new residential development with the existing Fujitsu site evens out the traffic distribution so that entries and exits are more balanced than they currently are.

Given the traffic generation estimated in Table 11, future traffic patterns can be estimated by assuming that:

1. Fujitsu access is maintained as-is (entrance off Christie Road and Talavera Road maintained)
2. Access to the site via M2 on-ramp is entry only
3. Entry and exit to/from the site is made via Christie Road and Talavera Road
4. Left turn out of Christie Road only for site traffic.

Note that since the access point on Talavera Road is an entrance for Fujitsu, there are vehicles entering only in the AM peak since in the evening all traffic is leaving Fujitsu.

The future access points have been assumed to ban all right turns, so that traffic movements (including Fujitsu) were required to account for the banned right turns, including:

- Vehicles turning right onto Talavera Road were reallocated to the left turn movement onto Christie Street, to either continue north along Talavera Road or perform a U-Turn at Talavera Road / Research Park Drive;
- Right turning vehicles into the site from Talavera Road were reallocated to the access to the Herring Road on-ramps, with appropriate changes to the turning volumes at Talavera Road / Herring Road.

It has been assumed that the current authority Aimsun traffic modelling has taken these assumptions into account, inclusive of all the background development in the Macquarie Park area and retention of all of the existing access points. It should be noted that Fujitsu is a recently completed office development that is likely to stay in the foreseeable future.

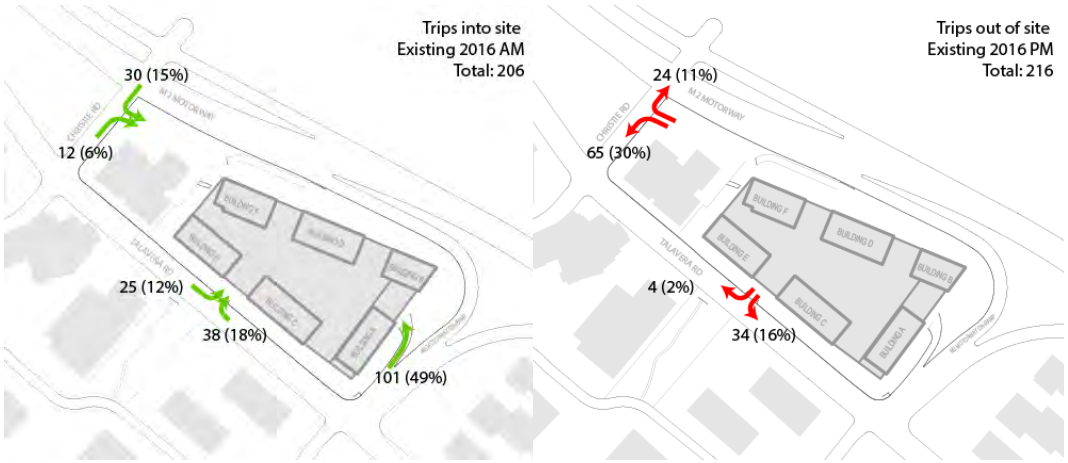


Figure 17: Trips into site in morning peak and out of site in evening, 2016

6.4 Local network performance

The intersections have been assessed using Roads and Maritime approved software SIDRA software (version 8) incorporating the commentary from the October 2017 letter. The intersections have been considered as a network to account for the effect of queuing on the network as a whole.

In urban areas, the traffic capacity of the major road network is generally a function of the performance of key intersections. This performance is quantified in terms of Level of Service (LOS), is based on the average delay per vehicle. LOS ranges from A = very good to F = unsatisfactory. In urban environments, no worse than a LOS of D is often aimed for.

The existing case (2016 volumes) is compared against the 2021 and 2031 future base cases, which is considered to be 2016 volumes with background growth and the development traffic. The 2021 and 2031 models are assumed to allow for the base development traffic (with 879 units on the site) with proposed right turn bans as a result of the previous rezoning submission for the Priority Precinct.

6.4.1 Modelling calibration

Previous models generated had calibrated a coordinated network, which operated much better than the revised isolated network that has been advised by Roads and Maritime. The 2016 models were previously calibrated by observed queue lengths at the intersections during the peak hours both from site visit and video footage, but have subsequently been adjusted as a result of this commentary.

The right turn onto Christie Street from the site was also banned to reflect current signposting at the egress, although it is still possible in the base case, as there were a number of vehicles observed illegally turning right.

A list of the assumptions and associated responses to the Roads and Maritime commentary is provided in Appendix A1.

6.4.2 Road network impacts

The critical intersection in the local network is Talavera Road and Herring Road. This intersection is unable to meet current demand with the revised phasing and non-coordinated nature of the network. This in turn impacts the operation of the Christie Road and Talavera Road intersection.

Changing the travel patterns of the area have been modelled by the 2021 and 2031 Aimsun network outputs provided by Roads and Maritime. This provides a slight improvement initially in 2021, but still results in significant delays.

In the morning, queues build up along Talavera Road, west of Herring Road due to the large volumes of eastbound traffic, as well as Herring Road south of the intersection. These queues therefore impact the Christie Road and Talavera Road intersection operation.

The intersection of Talavera Road and Herring Road is currently operating poorly and able to service the new traffic associated with the development of the study site. The west approach (Talavera Road) has higher delays than the other approaches in all cases since traffic must either give way or is held to allow the respective east-west and north-south pedestrian crossing.

Any slight variations on the sensitive nature of the unstable road network are expected to have significant flow on effects. Therefore, it is considered that the development will maintain the current trip generation associated with the reduced parking rates which have already been tested at a network level.

Results for each the AM peak period and PM peak period are displayed below in Table 13 and Table 14 respectively. Further detailed outputs and commentary are provided in the appendix.

Table 13: Intersection performance for AM peak period

Intersection	Year / Scenario	Degree of saturation	Average delay	Level of service
101 Christie Road / M2 ramps	2016	0.6	18	B
	2021	0.4	19	B
	2031	0.3	21	B
102 Christie Road / Site Access	2016	0.2	19	B
	2021	0.2	16	B
	2031	0.1	14	A
103 Christie Road / Talavera Road	2016	1.0	73	F
	2021	0.9	33	C
	2031	1.0	50	D
104 Site Access / Talavera Road	2016	0.4	52	D
	2021	0.3	67	E
	2031	0.3	62	E
105 Herring Road / Talavera Road	2016	1.0	69	E
	2021	1.0	75	F
	2031	1.1	137	F

Table 14: Intersection performance for PM peak period

Intersection	Year / Scenario	Degree of saturation	Average delay	Level of service
101 Christie Road / M2 ramps	2016	0.3	23	B
	2021	0.4	24	B
	2031	0.4	24	B
102 Christie Road / Site Access	2016	0.1	9	A
	2021	0.1	12	A
	2031	0.2	15	B
103 Christie Road / Talavera Road	2016	0.4	15	B
	2021	0.4	15	B
	2031	0.4	15	A
104 Site Access / Talavera Road	2016	0.2	25	B
	2021	0.2	36	C
	2031	0.4	49	D
105 Herring Road / Talavera Road	2016	0.8	55	D
	2021	0.9	50	D
	2031	1.0	71	F

6.4.3 Impacts of a potential M2 on-ramp access closure

As described in Section 5.3.1, there may be considerable impacts along Talavera Road with a proposed closure of the M2 On-ramp access. Given the proposed right turn bans outlined in Section 6.3.2, access to the site will be severely limited.

The closure of the additional access point will require any traffic from the south of the site (or within the Macquarie Park area) to also utilise the roundabout at Research Park Drive and Talavera Road to perform a U-turn, before re-joining southbound traffic on Talavera Road. The impact will be two-fold as it will also impact existing Fujitsu trips to the site, which is expected to remain in operation into the foreseeable future.

With the right turn bans, some 36% of the site's traffic will be added to the Christie Road and Talavera Road intersection (to account for the two trips through the intersection), with up to 18% performing a U-turn at Research Park Drive to enter the site via Talavera Road. There are similar results in the exit scenario, with some 22% of site traffic requiring to perform this U-turn.

With the removal of the on-ramp access point, the entering site traffic adds an additional 98% of site traffic through the Christie Road and Talavera Road intersection. Some 89% of development traffic will be required therefore to perform a U-turn manoeuvre at the roundabout.

This redistribution was modelled in the 2021 and 2031 scenarios and resulted in further impacts to the Christie Road and Talavera Road intersection, which is at capacity as a result of the network queuing impacts at the Talavera Road and Herring Road intersection. In the year 2031, the intersection fails and results in a level of service of F given the further delays from network queuing effects (see Table 15).

Table 15: Christie Road / Talavera Road impacts with on-ramp closure

Peak scenario	Year / Scenario	Degree of saturation	Average delay	Level of service
AM peak	2021	0.9	42	C
	2031	1.1	71	F
PM peak	2021	0.4	21	B
	2031	0.4	21	B

7 Recommendations and Conclusion

7.1 Public transport

As discussed in preceding sections, the site is currently serviced by a good array of public transport options. Macquarie University Station is located approximately 400m away and multiple bus routes service the area, with bus stops along Talavera Road as well Macquarie Centre and Macquarie University.

The construction of Sydney Metro Northwest, which is scheduled to be completed in late 2018, will boost the capacity of the public transport network with the inclusion of 15 peak hour trains in both directions along the Epping to Chatswood line. This is almost an increase of four times the current train frequencies.

Furthermore, Transport for NSW has plans to inject $60 million worth of bus priority and road infrastructure works in order to improve travel times, upgrade pedestrian safety and increase public transport reliability. This will commence prior to the construction of Sydney Metro Northwest and Stage 1 of the 2 stage programme will be focused on supporting the existing bus services during the construction shut down period of Macquarie University Station.

With current mode share for public transport of residents in Macquarie Park of approximately 30%, it is reasonable to expect this to increase to 40% with the boost in public transport infrastructure. As a result, this development site will likely generate approximately 350 peak hour pedestrian trips onto the public transport network.

7.2 Pedestrian and cycling

Walking and cycling are forecast to account for one in five trips generated by the site, a similar proportion to the current rate of 18%. In the peak hour the site is expected to generate around 200 trips on bike or on foot.

Pedestrian facilities in the area surrounding the site are generally of a reasonable quality, with footpaths of both sides of Talavera Road. Nearby Macquarie Centre, Macquarie University and Macquarie University Station are all well connected to the site and are all within a 15 minute walk of the site.

Cycling connections in the area are reasonable, with the southern footpath along Talavera Road marked as a shared pedestrian/cycle path and a number of smaller roads in the area considered low-difficulty.

7.3 Road network

Given the traffic generated from the proposed development is commensurate with the affects outlined in the previous rezoning work conducted by Department of Planning, it does not significantly impact the performance of the surrounding the road network.

The following improvements may be considered:

- The intersection of Talavera Road and Christie Road currently accommodates a pedestrian crossing on the western approach along Talavera Road. Given the geometry of the intersection and the current signal phasing there is potential to increase the capacity of the intersection if the pedestrian crossing was shifted to the eastern leg. This measure is not required to support this development.
- Coordination of signalised intersections surrounding the site could improve network results which currently indicate poor performance.

7.4 Summary

A transport assessment was conducted to examine the impacts of the proposed development at 112 Talavera Road on the surrounding transport network. The development is anticipated to accommodate approximately 1,256 new dwellings (approximately 350 apartments above the current planning controls) and two child care centres.

The site is serviced by reasonable pedestrian and cyclist connections as well as excellent access to public transport. The introduction of Sydney Metro Northwest will only add to the accessibility of this development to public transport.

Proposed parking for the site is limited by the maximum parking requirements imposed by the City of Ryde's Development Control Plan and the site is proposing to further reduce parking rates to generate no additional traffic than the permitted development scenario of 879 units.

A SIDRA modelling exercise was conducted for the local road network surrounding this development. The analysis showed that the local road network will be operating either at or above capacity for all scenarios. There are considered to be no further implications of this development which has not already been tested using the Macquarie Park AIMSUN Model (MPAM).

In conclusion this assessment, which conservatively assumed the provision of reduced parking rates, indicates that the proposed development will not have a detrimental impact on the local road network. The proposed increase in density on the site can be accommodated with application of the maximum parking rates in the City of Ryde DCP. Through the detail design process, given the site's high level of public transport accessibility due to the proximity to the future Metro station, opportunities for further mode shift may be considered.

Appendix A

SIDRA Assessment

A1 Responses to commentary received by Roads and Maritime (October 2017)

The following commentary is provided in response to issues raised by Roads and Maritime Services in a letter dated October 2017. Arup have reviewed and provided the suggested changes with the exception to the issues outlined below.

A1.1 Christie Rd / Talavera Rd (2_Base) - AM & PM Peak

Lane Geometry

East Approach: Christie Road / Talavera Road intersection east approach distance is around 250m and the short right turn length is 180m as presented in Figure 18. However, the subject site access (intersection no.104) is located between two intersections of Christie Road / Talavera Road and Talavera Road / Herring Road. Therefore, the distances are measured from this point as shown in the below in Figure 18.

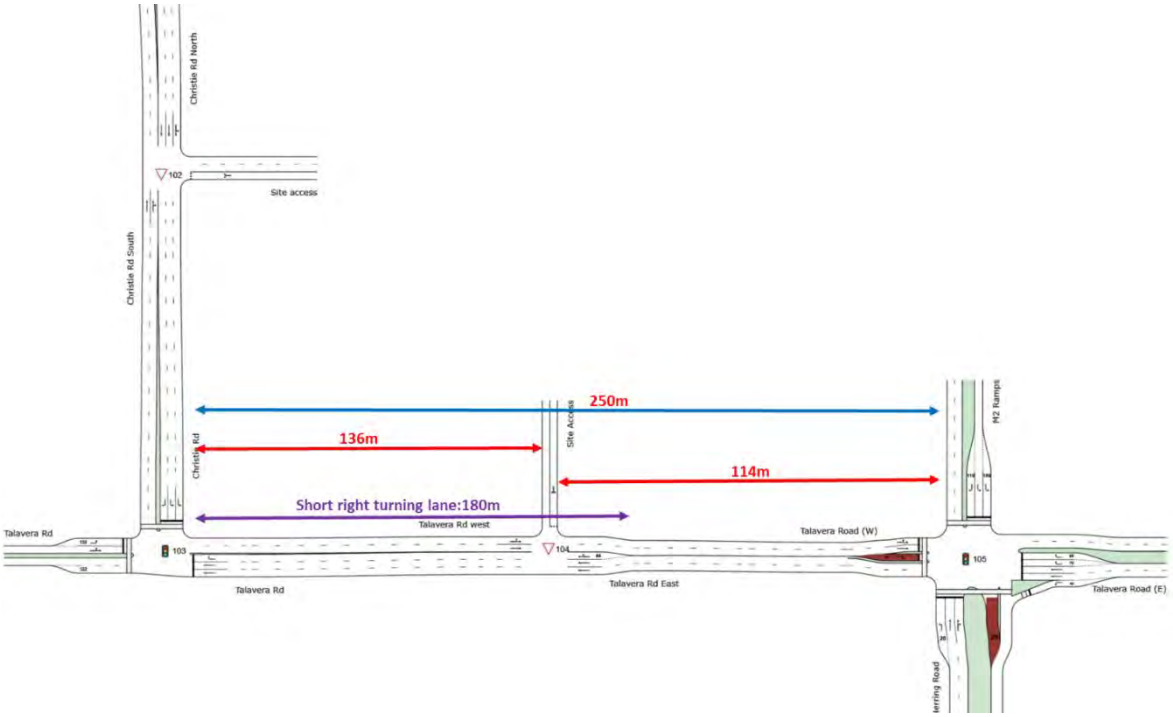


Figure 18: Network Layout and Approaches distances

West Approach: They have been corrected in the updated Sidra models.

North Approach: The two left turning lanes and one right turning lane have been corrected in the updated Sidra models.

Christie Road / Talavera Road intersection north approach distance is around 90m as presented in Figure 19. However, the subject site access (intersection no.102) is located between two intersections of Christie Road / Talavera Road and Christie Rd / M2 on-off ramps. Therefore, the distances are measured from this point as shown in the below Figure.

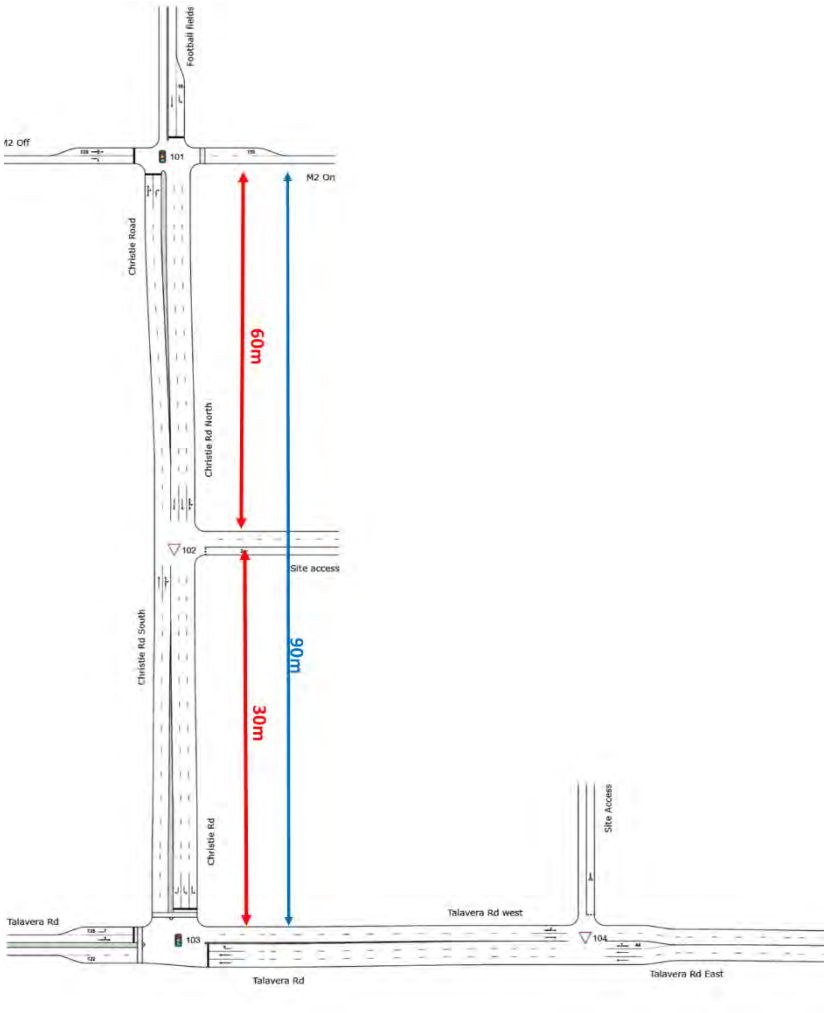


Figure 19: Network Layout and Approaches distances

Pedestrians:

Peak flow factors have been changed to 30minutes (default) in the updated Sidra models.

Volumes:

Peak flow periods have been changed to 30minutes (default) in the updated Sidra models.

Priorities:

Opposed and opposing movements for right running vehicles have been corrected in the updated models.

Phasing and Timing:

- Network shows filter right turns as observed in videos/site visits.
- The reference phase has been changed to phase A in the updated models.
- The videos have been checked and seen that the cycle time of 115sec occurred during the AM peak period.
- All red time of 3 seconds have been applied for A and B phases.

A1.2 Talavera Road / Herring Road / M2 Ramp (5_Base) - AM & PM Peak

Lane Geometry

South Approach: The approach distance has been corrected in the updated Sidra models. One short exit lane (Bus only) has also been added to the south approach.
West Approach: Please see Figure 18.
North Approach: They have been corrected in the updated Sidra models.
East Approach: They have been corrected in the updated Sidra models.

Pedestrians:

Peak flow factors have been changed to 30minutes (default) in the updated Sidra models.

Volumes:

Peak flow periods have been changed to 30minutes (default) in the updated Sidra models.

Priorities:

Opposed and opposing movements for right running vehicles have been corrected in the updated models.

Vehicle Movement Data Signals:

The arrival type has been changed to type 3 (default) which represents random arrivals.

Phasing and Timing:

- The 4 phases (A, D, E and F) and SCATS cycle times have been applied to this intersection in the updated models.
- All red time of 3 seconds have been applied to A, D and E phases. The all red time for phase F has been changed to 4sec in the updated models.

A1.3 Christie Road / Football Fields / M2 Ramps (6_base) - AM & PM Peak

Lane Geometry

South Approach: Please see Figure 19.

West Approach: They have been corrected in the updated Sidra models.

North Approach: They have been corrected in the updated Sidra models.

Pedestrians:

Peak flow factors have been changed to 30minutes (default) in the updated Sidra models.

Volumes:

Peak flow periods have been changed to 30minutes (default) in the updated Sidra models.

Priorities:

Opposed and opposing movements for right running vehicles have been corrected in the updated models.

Phasing and Timing:

- The 3 phases (A, B and C) and SCATS cycle times have been applied to this intersection in the updated models.
- The reference phase has been changed to phase B in the updated models.
- The cycle time option has been changed to user given cycle time in the updated models.

A1.4 Christie Road / Site Access - AM & PM Peak

Lane Geometry

East Approach: It has been corrected in the updated Sidra models.

The videos have been checked for this intersection. The Observed traffic volumes indicates that all movements are allowed from/to this access.

Pedestrians:

Peak flow factors have been changed to 30minutes (default) in the updated Sidra models.

Volumes:

Peak flow periods have been changed to 30minutes (default) in the updated Sidra models.

A1.5 Talavera Road / Site Access (3_Base): AM & PM Peak

Lane Geometry

The videos have been checked for this intersection. The Observed traffic volumes indicates that all movements are allowed from/to this access.

Sidra Network Model Comments

The coordination system has been removed in the updated models.

MOVEMENT SUMMARY

Site: 103 [103_Base_AM_ Talavera Rd/ Christie Rd]

Network: N101 [AM_Base]

Talavera Rd/ Christie Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 115 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd														
5	T1	433	2.4	433	2.4	0.197	7.1	LOS A	5.2	37.4	0.39	0.33	0.39	43.5
6	R2	51	0.0	51	0.0	0.305	57.2	LOS E	2.7	19.1	0.97	0.72	0.97	8.4
Approach		483	2.2	483	2.2	0.305	12.3	LOS A	5.2	37.4	0.45	0.37	0.45	35.4
North: Christie Rd														
7	L2	756	5.3	756	5.3	1.005	106.7	LOS F	6.7	49.0	1.00	1.17	1.71	1.5
9	R2	271	0.8	271	0.8	0.802	56.6	LOS E	6.9	49.0	1.00	0.90	1.15	10.2
Approach		1026	4.1	1026	4.1	1.005	93.5	LOS F	6.9	49.0	1.00	1.10	1.56	3.1
West: Talavera Rd														
10	L2	79	2.7	79	2.7	0.052	7.5	LOS A	0.8	5.6	0.19	0.62	0.19	34.8
11	T1	658	1.1	658	1.1	1.006	93.8	LOS F	61.8	436.9	1.00	1.40	1.60	6.0
Approach		737	1.3	737	1.3	1.006	84.6	LOS F	61.8	436.9	0.91	1.32	1.45	6.6
All Vehicles		2246	2.8	2246	2.8	1.006	73.1	LOS F	61.8	436.9	0.85	1.02	1.29	6.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	68	18.4	LOS B	0.1	0.1	0.57	0.57
P4	West Full Crossing	55	46.2	LOS E	0.2	0.2	0.90	0.90
All Pedestrians		123	30.8	LOS D			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [101_Base_AM_M2 On Off /Christie Road]

Network: N101 [AM_Base]

M2 On Off /Christie Road
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 95 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Road														
2	T1	1	0.0	1	0.0	0.386	48.6	LOS D	2.1	15.3	0.99	0.74	0.99	6.4
3	R2	105	2.0	105	2.0	0.530	53.9	LOS D	3.0	21.2	1.00	0.75	1.01	22.9
Approach		106	2.0	106	2.0	0.530	53.8	LOS D	3.0	21.2	1.00	0.75	1.01	22.8
North: Football fields														
7	L2	1	0.0	1	0.0	0.013	52.5	LOS D	0.0	0.3	0.97	0.58	0.97	22.6
8	T1	1	0.0	1	0.0	0.015	46.8	LOS D	0.0	0.3	0.94	0.57	0.94	2.9
Approach		2	0.0	2	0.0	0.015	49.6	LOS D	0.0	0.3	0.96	0.58	0.96	15.5
West: M2 Off														
10	L2	1	0.0	1	0.0	0.571	14.5	LOS B	8.7	62.8	0.57	0.77	0.57	24.7
11	T1	1	0.0	1	0.0	0.571	9.0	LOS A	8.7	62.8	0.57	0.77	0.57	48.5
12	R2	1017	3.1	1017	3.1	0.571	14.3	LOS A	16.3	116.9	0.57	0.77	0.57	40.9
Approach		1019	3.1	1019	3.1	0.571	14.3	LOS A	16.3	116.9	0.57	0.77	0.57	40.9
All Vehicles		1127	3.0	1127	3.0	0.571	18.1	LOS B	16.3	116.9	0.61	0.77	0.61	37.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	41.8	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		53	41.8	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 105 [105_Base_AM_Talavera Rd/ Herring Road/ M2 Ramps]

Network: N101 [AM_Base]

Talavera Rd/ Herring Road/ M2 Ramps
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Herring Road														
1	L2	110	2.7	110	2.7	0.333	31.3	LOS C	3.6	25.6	0.92	0.77	0.92	24.4
2	T1	221	14.5	221	14.5	1.010	108.5	LOS F	24.8	175.7	1.00	1.26	1.80	18.7
3	R2	280	0.7	280	0.7	1.010	110.3	LOS F	24.8	175.7	1.00	1.19	1.72	13.4
Approach		611	6.1	611	6.1	1.010	95.4	LOS F	24.8	175.7	0.99	1.14	1.60	16.5
East: Talavera Road (E)														
4	L2	98	2.0	98	2.0	0.147	32.0	LOS C	3.7	26.7	0.70	0.73	0.70	29.6
5	T1	250	0.8	250	0.8	0.175	26.6	LOS B	4.8	34.0	0.71	0.57	0.71	18.3
6	R2	65	4.6	65	4.6	0.367	69.4	LOS E	2.0	14.4	1.00	0.72	1.00	21.2
Approach		413	1.7	413	1.7	0.367	34.6	LOS C	4.8	34.0	0.75	0.63	0.75	22.3
North: M2 Ramps														
7	L2	404	4.5	404	4.5	0.360	40.3	LOS C	9.2	66.8	0.83	0.79	0.83	28.7
9	R2	158	1.9	158	1.9	0.427	51.3	LOS D	8.2	58.2	0.92	0.80	0.92	21.5
Approach		562	3.7	562	3.7	0.427	43.4	LOS D	9.2	66.8	0.85	0.79	0.85	26.7
West: Talavera Road (W)														
10	L2	66	6.1	66	6.1	0.971	84.4	LOS F	26.3	186.0	1.00	1.22	1.67	18.4
11	T1	1268	0.7	1268	0.7	0.971	76.7	LOS F	26.4	186.0	1.00	1.22	1.53	11.6
12	R2	35	100.0	35	100.0	0.657	75.0	LOS F	2.3	29.7	1.00	0.82	1.21	16.3
Approach		1369	3.5	1369	3.5	0.971	77.0	LOS F	26.4	186.0	1.00	1.21	1.53	12.2
All Vehicles		2955	3.8	2955	3.8	1.010	68.5	LOS E	26.4	186.0	0.93	1.04	1.31	16.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	43.4	LOS E	0.2	0.2	0.85	0.85
P2S	East Slip/Bypass Lane Crossing	53	21.1	LOS C	0.1	0.1	0.82	0.82
P3	North Full Crossing	53	33.8	LOS D	0.1	0.1	0.75	0.75
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	38.2	LOS D			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 102 [102_Base_AM_Christie Rd / Site Access]

Network: N101 [AM_Base]

Christie Rd / Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Rd South														
2	T1	105	2.0	105	2.0	0.045	1.3	LOS A	0.2	1.7	0.11	0.06	0.11	37.0
3	R2	13	0.0	13	0.0	0.045	11.6	LOS A	0.2	1.7	0.62	0.34	0.62	22.4
Approach		118	1.8	118	1.8	0.045	2.4	NA	0.2	1.7	0.17	0.09	0.17	32.0
East: Site access														
4	L2	5	0.0	5	0.0	0.018	5.9	LOS A	0.0	0.2	0.43	0.60	0.43	23.4
6	R2	1	0.0	1	0.0	0.018	18.9	LOS B	0.0	0.2	0.43	0.60	0.43	23.4
Approach		6	0.0	6	0.0	0.018	8.1	LOS A	0.0	0.2	0.43	0.60	0.43	23.4
North: Christie Rd North														
7	L2	32	0.0	32	0.0	0.178	4.3	LOS A	13.6	97.9	0.00	0.05	0.00	38.5
8	T1	985	3.2	985	3.2	0.178	0.0	LOS A	13.6	97.9	0.00	0.02	0.00	58.2
Approach		1017	3.1	1017	3.1	0.178	0.1	NA	13.6	97.9	0.00	0.02	0.00	56.5
All Vehicles		1141	3.0	1141	3.0	0.178	0.4	NA	13.6	97.9	0.02	0.03	0.02	53.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [104_Base_AM_ Talavera Rd/ Site Access]

Network: N101 [AM_Base]

Talavera Rd/ Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd East														
5	T1	484	1.7	484	1.7	0.115	1.8	LOS A	0.6	4.5	0.06	0.22	0.06	47.2
6	R2	40	0.0	40	0.0	0.115	15.4	LOS B	0.6	4.5	0.75	0.48	0.75	28.4
Approach		524	1.6	524	1.6	0.115	2.8	NA	0.6	4.5	0.11	0.24	0.11	43.5
North: Site Access														
7	L2	5	0.0	5	0.0	0.040	9.1	LOS A	0.1	0.5	0.68	0.74	0.68	17.9
9	R2	1	0.0	1	0.0	0.040	52.0	LOS D	0.1	0.5	0.68	0.74	0.68	17.9
Approach		6	0.0	6	0.0	0.040	16.2	LOS B	0.1	0.5	0.68	0.74	0.68	17.9
West: Talavera Rd west														
10	L2	26	0.0	26	0.0	0.362	5.5	LOS A	27.7	199.1	0.00	0.21	0.00	39.2
11	T1	1356	3.3	1356	3.3	0.362	1.1	LOS A	27.7	199.1	0.00	0.21	0.00	53.0
Approach		1382	3.3	1382	3.3	0.362	1.2	NA	27.7	199.1	0.00	0.21	0.00	52.4
All Vehicles		1913	2.8	1913	2.8	0.362	1.7	NA	27.7	199.1	0.03	0.22	0.03	49.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [103_Base_PM_ Talavera Rd/ Christie Rd]

Network: N101 [PM_Base]

Talavera Rd/ Christie Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd														
5	T1	679	0.8	679	0.8	0.378	8.0	LOS A	6.7	47.5	0.59	0.50	0.59	41.9
6	R2	184	5.7	184	5.7	0.384	17.9	LOS B	3.7	27.0	0.81	0.78	0.81	20.5
Approach		863	1.8	863	1.8	0.384	10.1	LOS A	6.7	47.5	0.63	0.56	0.63	37.3
North: Christie Rd														
7	L2	153	15.2	153	15.2	0.098	12.8	LOS A	1.3	9.9	0.59	0.68	0.59	10.6
9	R2	151	0.0	151	0.0	0.405	26.6	LOS B	4.0	28.1	0.91	0.78	0.91	17.9
Approach		303	7.6	303	7.6	0.405	19.6	LOS B	4.0	28.1	0.75	0.73	0.75	15.9
West: Talavera Rd														
10	L2	140	0.0	140	0.0	0.393	23.1	LOS B	5.5	38.4	0.82	0.75	0.82	19.9
11	T1	335	1.6	335	1.6	0.393	17.6	LOS B	5.6	39.8	0.82	0.70	0.82	21.6
Approach		475	1.1	475	1.1	0.393	19.2	LOS B	5.6	39.8	0.82	0.72	0.82	21.1
All Vehicles		1641	2.7	1641	2.7	0.405	14.5	LOS B	6.7	47.5	0.71	0.64	0.71	28.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	68	24.4	LOS C	0.1	0.1	0.90	0.90
P4	West Full Crossing	55	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		123	24.4	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [101_Base_PM_M2 On Off /Christie Road]

Network: N101 [PM_Base]

M2 On Off /Christie Road
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Road														
2	T1	1	0.0	1	0.0	0.199	14.2	LOS A	3.2	22.8	0.67	0.73	0.67	15.3
3	R2	346	1.5	346	1.5	0.274	19.2	LOS B	4.7	33.1	0.70	0.74	0.70	37.3
Approach		347	1.5	347	1.5	0.274	19.2	LOS B	4.7	33.1	0.70	0.74	0.70	37.3
North: Football fields														
7	L2	1	0.0	1	0.0	0.010	38.3	LOS C	0.0	0.2	0.96	0.58	0.96	27.0
8	T1	1	0.0	1	0.0	0.006	32.3	LOS C	0.0	0.2	0.93	0.55	0.93	4.1
Approach		2	0.0	2	0.0	0.010	35.3	LOS C	0.0	0.2	0.95	0.56	0.95	19.6
West: M2 Off														
10	L2	1	0.0	1	0.0	0.272	28.5	LOS B	3.4	25.8	0.84	0.77	0.84	21.0
11	T1	1	0.0	1	0.0	0.272	22.9	LOS B	3.4	25.8	0.84	0.77	0.84	40.9
12	R2	243	8.7	243	8.7	0.272	28.5	LOS B	3.4	25.8	0.84	0.77	0.84	31.2
Approach		245	8.6	245	8.6	0.272	28.5	LOS B	3.4	25.8	0.84	0.77	0.84	31.2
All Vehicles		595	4.4	595	4.4	0.274	23.1	LOS B	4.7	33.1	0.76	0.75	0.76	34.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		53	29.3	LOS C			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 105 [105_Base_PM_Talavera Rd/ Herring Road/ M2 Ramps]

Network: N101 [PM_Base]

Talavera Rd/ Herring Road/ M2 Ramps
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 130 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Herring Road														
1	L2	161	6.8	161	6.8	0.253	22.4	LOS B	3.8	27.8	0.76	0.76	0.76	29.4
2	T1	286	7.3	286	7.3	0.788	55.7	LOS D	19.3	137.3	0.96	0.88	1.10	27.9
3	R2	218	0.0	218	0.0	0.788	62.4	LOS E	19.3	137.3	1.00	0.90	1.09	20.6
Approach		665	4.8	665	4.8	0.788	49.8	LOS D	19.3	137.3	0.92	0.86	1.01	25.5
East: Talavera Road (E)														
4	L2	234	0.9	234	0.9	0.688	57.2	LOS E	13.8	97.2	0.97	0.84	0.98	21.3
5	T1	582	0.2	582	0.2	0.798	56.2	LOS D	20.3	142.0	0.99	0.91	1.10	10.3
6	R2	472	0.2	472	0.2	0.780	65.3	LOS E	15.2	106.4	1.00	0.88	1.11	22.1
Approach		1288	0.3	1288	0.3	0.798	59.7	LOS E	20.3	142.0	0.99	0.89	1.08	17.7
North: M2 Ramps														
7	L2	52	1.9	52	1.9	0.032	27.4	LOS B	0.9	6.5	0.59	0.68	0.59	34.2
9	R2	60	3.3	60	3.3	0.152	50.1	LOS D	3.1	22.2	0.85	0.74	0.85	21.8
Approach		112	2.7	112	2.7	0.152	39.5	LOS C	3.1	22.2	0.73	0.71	0.73	27.1
West: Talavera Road (W)														
10	L2	113	0.0	113	0.0	0.710	55.4	LOS D	15.3	106.8	0.98	0.90	1.26	23.9
11	T1	441	0.0	441	0.0	0.710	51.6	LOS D	16.8	117.8	0.99	0.87	1.10	15.6
12	R2	1	100.0	1	100.0	0.006	54.3	LOS D	0.1	0.7	0.85	0.61	0.85	20.3
Approach		555	0.2	555	0.2	0.710	52.4	LOS D	16.8	117.8	0.99	0.87	1.13	17.7
All Vehicles		2620	1.5	2620	1.5	0.798	54.8	LOS D	20.3	142.0	0.96	0.87	1.06	20.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	59.3	LOS E	0.2	0.2	0.96	0.96
P2S	East Slip/Bypass Lane Crossing	53	14.3	LOS B	0.1	0.1	0.66	0.66
P3	North Full Crossing	53	53.7	LOS E	0.2	0.2	0.91	0.91
P4	West Full Crossing	53	52.8	LOS E	0.2	0.2	0.90	0.90
All Pedestrians		211	45.0	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 102 [102_Base_PM_Christie Rd / Site Access]

Network: N101 [PM_Base]

Christie Rd / Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Rd South														
2	T1	321	1.6	321	1.6	0.084	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	59.5
3	R2	1	0.0	1	0.0	0.084	4.3	LOS A	0.0	0.1	0.00	0.00	0.00	43.4
Approach		322	1.6	322	1.6	0.084	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.3
East: Site access														
4	L2	68	0.0	68	0.0	0.103	5.1	LOS A	0.4	3.0	0.18	0.55	0.18	27.3
6	R2	25	0.0	25	0.0	0.103	9.4	LOS A	0.4	3.0	0.18	0.55	0.18	27.3
Approach		94	0.0	94	0.0	0.103	6.2	LOS A	0.4	3.0	0.18	0.55	0.18	27.3
North: Christie Rd North														
7	L2	2	0.0	2	0.0	0.044	4.3	LOS A	0.0	0.0	0.00	0.02	0.00	39.4
8	T1	241	8.7	241	8.7	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.4
Approach		243	8.7	243	8.7	0.044	0.0	NA	0.0	0.0	0.00	0.01	0.00	58.9
All Vehicles		659	4.0	659	4.0	0.103	0.9	NA	0.4	3.0	0.03	0.08	0.03	47.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [104_Base_PM_ Talavera Rd/ Site Access]

Network: N101 [PM_Base]

Talavera Rd/ Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd East														
5	T1	858	1.7	858	1.7	0.150	1.1	LOS A	0.1	0.4	0.01	0.20	0.01	52.0
6	R2	5	0.0	5	0.0	0.150	7.8	LOS A	0.1	0.4	0.02	0.20	0.02	47.5
Approach		863	1.7	863	1.7	0.150	1.1	NA	0.1	0.4	0.01	0.20	0.01	52.0
North: Site Access														
7	L2	36	0.0	36	0.0	0.056	6.6	LOS A	0.2	1.5	0.39	0.60	0.39	27.0
9	R2	4	0.0	4	0.0	0.056	24.5	LOS B	0.2	1.5	0.39	0.60	0.39	27.0
Approach		40	0.0	40	0.0	0.056	8.5	LOS A	0.2	1.5	0.39	0.60	0.39	27.0
West: Talavera Rd west														
10	L2	3	0.0	3	0.0	0.136	5.5	LOS A	0.0	0.0	0.00	0.21	0.00	39.4
11	T1	489	5.2	489	5.2	0.136	1.1	LOS A	0.0	0.0	0.00	0.20	0.00	53.3
Approach		493	5.1	493	5.1	0.136	1.1	NA	0.0	0.0	0.00	0.20	0.00	53.1
All Vehicles		1396	2.9	1396	2.9	0.150	1.3	NA	0.2	1.5	0.02	0.21	0.02	51.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [103_2021_AM_ Talavera Rd/ Christie Rd]

Network: N101 [AM_2021]

Talavera Rd/ Christie Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 115 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd														
5	T1	669	1.6	669	1.6	0.300	7.2	LOS A	8.6	61.0	0.41	0.36	0.41	43.2
6	R2	78	0.0	78	0.0	0.339	46.1	LOS D	3.8	26.6	0.92	0.78	0.92	10.0
Approach		747	1.4	747	1.4	0.339	11.3	LOS A	8.6	61.0	0.46	0.40	0.46	36.6
North: Christie Rd														
7	L2	620	6.5	620	6.5	0.776	46.4	LOS D	6.6	49.0	0.97	0.90	1.07	3.4
9	R2	271	0.8	271	0.8	0.842	60.2	LOS E	6.9	49.0	1.00	0.93	1.22	9.7
Approach		891	4.7	891	4.7	0.842	50.6	LOS D	6.9	49.0	0.98	0.91	1.11	5.9
West: Talavera Rd														
10	L2	79	2.7	79	2.7	0.052	7.5	LOS A	0.8	5.6	0.19	0.62	0.19	34.8
11	T1	658	1.1	658	1.1	0.883	36.8	LOS C	39.1	276.1	0.94	0.99	1.09	13.3
Approach		737	1.3	737	1.3	0.883	33.6	LOS C	39.1	276.1	0.86	0.95	1.00	14.2
All Vehicles		2375	2.6	2375	2.6	0.883	33.0	LOS C	39.1	276.1	0.78	0.76	0.87	14.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	68	17.9	LOS B	0.1	0.1	0.56	0.56
P4	West Full Crossing	55	47.1	LOS E	0.2	0.2	0.91	0.91
All Pedestrians		123	30.9	LOS D			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [101_2021_AM_M2 On Off /Christie Road]

Network: N101 [AM_2021]

M2 On Off /Christie Road
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 95 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Road														
2	T1	1	0.0	1	0.0	0.264	42.0	LOS C	2.5	17.5	0.94	0.75	0.94	7.2
3	R2	133	1.6	133	1.6	0.363	47.2	LOS D	3.4	24.5	0.95	0.76	0.95	24.8
Approach		134	1.6	134	1.6	0.363	47.2	LOS D	3.4	24.5	0.95	0.76	0.95	24.7
North: Football fields														
7	L2	1	0.0	1	0.0	0.013	52.5	LOS D	0.0	0.3	0.97	0.58	0.97	22.6
8	T1	1	0.0	1	0.0	0.007	44.7	LOS D	0.0	0.3	0.94	0.56	0.94	3.1
Approach		2	0.0	2	0.0	0.013	48.6	LOS D	0.0	0.3	0.96	0.57	0.96	15.7
West: M2 Off														
10	L2	1	0.0	1	0.0	0.393	15.1	LOS B	10.1	73.1	0.54	0.75	0.54	24.5
11	T1	1	0.0	1	0.0	0.393	9.6	LOS A	10.1	73.1	0.54	0.75	0.54	48.1
12	R2	881	3.6	881	3.6	0.393	15.1	LOS B	10.1	73.1	0.54	0.75	0.54	40.2
Approach		883	3.6	883	3.6	0.393	15.1	LOS B	10.1	73.1	0.54	0.75	0.54	40.2
All Vehicles		1019	3.3	1019	3.3	0.393	19.4	LOS B	10.1	73.1	0.59	0.75	0.59	36.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	41.8	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		53	41.8	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 105 [105_2021_AM_Talavera Rd/ Herring Road/ M2 Ramps]

Network: N101 [AM_2021]

Talavera Rd/ Herring Road/ M2 Ramps
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Herring Road														
1	L2	99	3.0	99	3.0	0.263	29.0	LOS C	2.9	20.9	0.88	0.76	0.88	25.5
2	T1	242	13.2	242	13.2	0.948	77.9	LOS F	17.6	136.8	1.00	1.14	1.53	23.3
3	R2	325	0.6	325	0.6	0.969	90.1	LOS F	25.2	177.0	1.00	1.10	1.53	15.7
Approach		666	5.6	666	5.6	0.969	76.6	LOS F	25.2	177.0	0.98	1.07	1.43	19.4
East: Talavera Road (E)														
4	L2	201	1.0	201	1.0	0.336	37.8	LOS C	8.8	62.1	0.80	0.78	0.80	27.2
5	T1	272	0.7	272	0.7	0.214	30.6	LOS C	5.7	39.9	0.76	0.62	0.76	16.6
6	R2	131	2.3	131	2.3	0.728	72.7	LOS F	4.2	29.8	1.00	0.83	1.22	20.6
Approach		604	1.2	604	1.2	0.728	42.1	LOS C	8.8	62.1	0.82	0.72	0.87	21.8
North: M2 Ramps														
7	L2	142	12.7	142	12.7	0.127	36.1	LOS C	2.9	22.5	0.74	0.73	0.74	29.9
9	R2	398	0.8	398	0.8	0.984	95.5	LOS F	32.5	228.6	1.00	1.10	1.56	13.8
Approach		540	3.9	540	3.9	0.984	79.9	LOS F	32.5	228.6	0.93	1.00	1.34	16.8
West: Talavera Road (W)														
10	L2	34	11.8	34	11.8	0.990	97.3	LOS F	26.3	186.0	1.00	1.29	1.79	16.6
11	T1	1179	0.8	1179	0.8	0.990	89.1	LOS F	26.4	186.0	1.00	1.29	1.64	10.3
12	R2	31	100.0	31	100.0	0.578	74.0	LOS F	2.0	25.8	1.00	0.78	1.12	16.5
Approach		1244	3.5	1244	3.5	0.990	88.9	LOS F	26.4	186.0	1.00	1.28	1.63	10.7
All Vehicles		3054	3.6	3054	3.6	0.990	75.4	LOS F	32.5	228.6	0.95	1.07	1.39	15.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	47.8	LOS E	0.2	0.2	0.89	0.89
P2S	East Slip/Bypass Lane Crossing	53	19.3	LOS B	0.1	0.1	0.79	0.79
P3	North Full Crossing	53	37.7	LOS D	0.1	0.1	0.79	0.79
P4	West Full Crossing	53	52.4	LOS E	0.2	0.2	0.94	0.94
All Pedestrians		211	39.3	LOS D			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 102 [102_2021_AM_Christie Rd / Site Access]

Network: N101 [AM_2021]

Christie Rd / Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Rd South														
2	T1	133	1.6	133	1.6	0.049	1.2	LOS A	0.3	1.8	0.13	0.05	0.13	37.0
3	R2	13	0.0	13	0.0	0.049	10.0	LOS A	0.3	1.8	0.45	0.19	0.45	27.2
Approach		145	1.4	145	1.4	0.049	2.0	NA	0.3	1.8	0.16	0.07	0.16	34.5
East: Site access														
4	L2	5	0.0	5	0.0	0.017	5.7	LOS A	0.0	0.2	0.39	0.58	0.39	24.5
6	R2	1	0.0	1	0.0	0.017	16.4	LOS B	0.0	0.2	0.39	0.58	0.39	24.5
Approach		6	0.0	6	0.0	0.017	7.5	LOS A	0.0	0.2	0.39	0.58	0.39	24.5
North: Christie Rd North														
7	L2	32	0.0	32	0.0	0.154	4.3	LOS A	7.4	53.0	0.00	0.06	0.00	38.3
8	T1	849	3.7	849	3.7	0.154	0.0	LOS A	8.3	59.6	0.00	0.02	0.00	58.0
Approach		881	3.6	881	3.6	0.154	0.2	NA	8.3	59.6	0.00	0.02	0.00	56.1
All Vehicles		1033	3.3	1033	3.3	0.154	0.5	NA	8.3	59.6	0.02	0.03	0.02	52.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [104_2021_AM_ Talavera Rd/ Site Access]

Network: N101 [AM_2021]

Talavera Rd/ Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd East														
5	T1	748	1.1	748	1.1	0.158	2.1	LOS A	1.0	6.9	0.10	0.21	0.10	45.3
6	R2	40	0.0	40	0.0	0.158	14.7	LOS B	1.0	6.9	0.55	0.26	0.55	33.4
Approach		788	1.1	788	1.1	0.158	2.7	NA	1.0	6.9	0.12	0.21	0.12	43.9
North: Site Access														
7	L2	5	0.0	5	0.0	0.048	8.5	LOS A	0.1	0.6	0.70	0.75	0.70	16.4
9	R2	1	0.0	1	0.0	0.048	67.3	LOS E	0.1	0.6	0.70	0.75	0.70	16.4
Approach		6	0.0	6	0.0	0.048	18.3	LOS B	0.1	0.6	0.70	0.75	0.70	16.4
West: Talavera Rd west														
10	L2	26	0.0	26	0.0	0.327	5.5	LOS A	25.6	184.7	0.00	0.22	0.00	39.1
11	T1	1220	3.7	1220	3.7	0.327	1.1	LOS A	25.6	184.7	0.00	0.21	0.00	52.9
Approach		1246	3.6	1246	3.6	0.327	1.2	NA	25.6	184.7	0.00	0.21	0.00	52.3
All Vehicles		2041	2.6	2041	2.6	0.327	1.8	NA	25.6	184.7	0.05	0.21	0.05	48.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [103_2021_PM_ Talavera Rd/ Christie Rd]

Network: N101 [PM_2021]

Talavera Rd/ Christie Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd														
5	T1	695	0.8	695	0.8	0.399	8.7	LOS A	7.2	50.7	0.61	0.53	0.61	40.9
6	R2	181	5.8	181	5.8	0.403	18.6	LOS B	3.7	27.3	0.82	0.78	0.82	20.0
Approach		876	1.8	876	1.8	0.403	10.7	LOS A	7.2	50.7	0.66	0.58	0.66	36.5
North: Christie Rd														
7	L2	354	6.5	354	6.5	0.214	13.4	LOS A	3.1	22.9	0.63	0.71	0.63	10.2
9	R2	151	0.0	151	0.0	0.374	25.5	LOS B	3.9	27.4	0.90	0.78	0.90	18.4
Approach		504	4.6	504	4.6	0.374	17.0	LOS B	3.9	27.4	0.71	0.73	0.71	14.4
West: Talavera Rd														
10	L2	140	0.0	140	0.0	0.393	23.1	LOS B	5.5	38.4	0.82	0.75	0.82	19.9
11	T1	335	1.6	335	1.6	0.393	17.6	LOS B	5.6	39.8	0.82	0.70	0.82	21.6
Approach		475	1.1	475	1.1	0.393	19.2	LOS B	5.6	39.8	0.82	0.72	0.82	21.1
All Vehicles		1855	2.4	1855	2.4	0.403	14.6	LOS B	7.2	50.7	0.71	0.66	0.71	27.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	68	24.4	LOS C	0.1	0.1	0.90	0.90
P4	West Full Crossing	55	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		123	24.4	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [101_2021_PM_M2 On Off /Christie Road]

Network: N101 [PM_2021]

M2 On Off /Christie Road
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Road														
2	T1	1	0.0	1	0.0	0.255	18.8	LOS B	3.7	26.5	0.77	0.76	0.77	12.9
3	R2	348	1.5	348	1.5	0.350	24.0	LOS B	5.4	38.4	0.80	0.77	0.80	34.3
Approach		349	1.5	349	1.5	0.350	24.0	LOS B	5.4	38.4	0.80	0.77	0.80	34.3
North: Football fields														
7	L2	1	0.0	1	0.0	0.010	38.3	LOS C	0.0	0.2	0.96	0.58	0.96	27.0
8	T1	1	0.0	1	0.0	0.006	32.3	LOS C	0.0	0.2	0.93	0.55	0.93	4.1
Approach		2	0.0	2	0.0	0.010	35.3	LOS C	0.0	0.2	0.95	0.56	0.95	19.6
West: M2 Off														
10	L2	1	0.0	1	0.0	0.362	24.4	LOS B	5.8	42.3	0.79	0.79	0.79	22.0
11	T1	1	0.0	1	0.0	0.362	18.9	LOS B	5.8	42.3	0.79	0.79	0.79	42.8
12	R2	444	4.7	444	4.7	0.362	24.4	LOS B	5.8	42.3	0.79	0.79	0.79	33.5
Approach		446	4.7	446	4.7	0.362	24.4	LOS B	5.8	42.3	0.79	0.79	0.79	33.5
All Vehicles		798	3.3	798	3.3	0.362	24.2	LOS B	5.8	42.3	0.80	0.78	0.80	33.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		53	29.3	LOS C			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 105 [105_2021_PM_Talavera Rd/ Herring Road/ M2 Ramps]

Network: N101 [PM_2021]

Talavera Rd/ Herring Road/ M2 Ramps
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 130 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Herring Road														
1	L2	134	8.2	134	8.2	0.200	24.6	LOS B	4.4	32.7	0.72	0.74	0.72	28.0
2	T1	409	5.1	409	5.1	0.846	61.2	LOS E	21.2	152.0	0.98	0.95	1.19	26.6
3	R2	131	0.0	131	0.0	0.846	67.3	LOS E	21.2	152.0	1.00	0.96	1.17	19.9
Approach		674	4.7	674	4.7	0.846	55.1	LOS D	21.2	152.0	0.93	0.91	1.09	25.4
East: Talavera Road (E)														
4	L2	416	0.5	416	0.5	0.874	57.1	LOS E	26.4	185.4	0.91	0.93	1.10	21.3
5	T1	603	0.2	603	0.2	0.487	35.3	LOS C	16.0	112.1	0.83	0.71	0.83	15.0
6	R2	538	0.2	538	0.2	0.844	66.4	LOS E	17.8	124.7	1.00	0.93	1.20	21.9
Approach		1557	0.3	1557	0.3	0.874	51.9	LOS D	26.4	185.4	0.91	0.84	1.03	20.1
North: M2 Ramps														
7	L2	31	3.2	31	3.2	0.027	38.7	LOS C	0.7	4.8	0.72	0.68	0.72	29.3
9	R2	78	2.6	78	2.6	0.786	78.4	LOS F	5.4	38.6	1.00	0.87	1.27	16.1
Approach		109	2.8	109	2.8	0.786	67.1	LOS E	5.4	38.6	0.92	0.82	1.11	19.1
West: Talavera Road (W)														
10	L2	61	0.0	61	0.0	0.584	46.7	LOS D	19.2	134.7	0.87	0.81	1.17	27.0
11	T1	696	0.0	696	0.0	0.584	38.9	LOS C	19.4	136.0	0.87	0.78	1.01	19.2
12	R2	15	100.0	15	100.0	0.070	52.1	LOS D	0.8	10.0	0.84	0.70	0.84	20.9
Approach		772	1.9	772	1.9	0.584	39.8	LOS C	19.4	136.0	0.87	0.78	1.02	20.1
All Vehicles		3112	1.7	3112	1.7	0.874	50.1	LOS D	26.4	185.4	0.91	0.84	1.04	21.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	48.4	LOS E	0.2	0.2	0.86	0.86
P2S	East Slip/Bypass Lane Crossing	53	15.9	LOS B	0.1	0.1	0.64	0.64
P3	North Full Crossing	53	38.5	LOS D	0.1	0.1	0.77	0.77
P4	West Full Crossing	53	53.7	LOS E	0.2	0.2	0.91	0.91
All Pedestrians		211	39.1	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 102 [102_2021_PM_Christie Rd / Site Access]

Network: N101 [PM_2021]

Christie Rd / Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Rd South														
2	T1	323	1.6	323	1.6	0.085	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	59.2
3	R2	1	0.0	1	0.0	0.085	5.6	LOS A	0.0	0.1	0.01	0.00	0.01	43.3
Approach		324	1.6	324	1.6	0.085	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.0
East: Site access														
4	L2	68	0.0	68	0.0	0.120	5.3	LOS A	0.5	3.4	0.28	0.58	0.28	25.4
6	R2	25	0.0	25	0.0	0.120	11.8	LOS A	0.5	3.4	0.28	0.58	0.28	25.4
Approach		94	0.0	94	0.0	0.120	7.1	LOS A	0.5	3.4	0.28	0.58	0.28	25.4
North: Christie Rd North														
7	L2	2	0.0	2	0.0	0.078	4.3	LOS A	0.0	0.0	0.00	0.01	0.00	39.5
8	T1	442	4.8	442	4.8	0.078	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		444	4.7	444	4.7	0.078	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.4
All Vehicles		862	3.1	862	3.1	0.120	0.8	NA	0.5	3.4	0.03	0.07	0.03	49.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [104_2021_PM_ Talavera Rd/ Site Access]

Network: N101 [PM_2021]

Talavera Rd/ Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd East														
5	T1	871	1.7	871	1.7	0.153	1.1	LOS A	0.1	0.6	0.01	0.20	0.01	51.9
6	R2	5	0.0	5	0.0	0.153	9.3	LOS A	0.1	0.6	0.03	0.20	0.03	47.3
Approach		876	1.7	876	1.7	0.153	1.2	NA	0.1	0.6	0.01	0.20	0.01	51.8
North: Site Access														
7	L2	36	0.0	36	0.0	0.088	7.0	LOS A	0.3	1.8	0.49	0.65	0.49	24.5
9	R2	4	0.0	4	0.0	0.088	35.5	LOS C	0.3	1.8	0.49	0.65	0.49	24.5
Approach		40	0.0	40	0.0	0.088	10.0	LOS A	0.3	1.8	0.49	0.65	0.49	24.5
West: Talavera Rd west														
10	L2	3	0.0	3	0.0	0.229	5.5	LOS A	0.0	0.0	0.00	0.20	0.00	39.4
11	T1	691	3.7	691	3.7	0.229	1.1	LOS A	0.0	0.0	0.00	0.20	0.00	53.3
Approach		694	3.6	694	3.6	0.229	1.1	NA	0.0	0.0	0.00	0.20	0.00	53.2
All Vehicles		1609	2.5	1609	2.5	0.229	1.4	NA	0.3	1.8	0.02	0.21	0.02	51.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 103 [103_2031_AM_ Talavera Rd/ Christie Rd] — Network: N101 [AM_2031]

Talavera Rd/ Christie Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 115 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd														
5	T1	842	1.3	788	1.3	0.340	6.3	LOS A	9.7	68.8	0.39	0.35	0.39	44.8
6	R2	98	0.0	92	0.0	0.546	59.1	LOS E	5.1	35.4	1.00	0.80	1.11	8.1
Approach		940	1.1	880 N1	1.2	0.546	11.8	LOS A	9.7	68.8	0.45	0.39	0.47	36.0
North: Christie Rd														
7	L2	466	8.6	466	8.6	0.861	61.0	LOS E	6.5	49.0	1.00	0.99	1.31	2.6
9	R2	271	0.8	271	0.8	0.991	96.2	LOS F	6.9	49.0	1.00	1.11	1.68	6.6
Approach		737	5.7	737	5.7	0.991	73.9	LOS F	6.9	49.0	1.00	1.04	1.45	4.6
West: Talavera Rd														
10	L2	79	2.7	79	2.7	0.052	7.5	LOS A	0.8	5.6	0.19	0.62	0.19	34.8
11	T1	658	1.1	658	1.1	0.986	80.3	LOS F	57.9	408.9	1.00	1.33	1.51	6.9
Approach		737	1.3	737	1.3	0.986	72.5	LOS F	57.9	408.9	0.91	1.25	1.37	7.6
All Vehicles		2414	2.6	2354 N1	2.6	0.991	50.2	LOS D	57.9	408.9	0.77	0.86	1.06	11.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	68	16.2	LOS B	0.1	0.1	0.53	0.53
P4	West Full Crossing	55	49.9	LOS E	0.2	0.2	0.93	0.93
All Pedestrians		123	31.2	LOS D			0.71	0.71

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [101_2031_AM_M2 On Off /Christie Road]

Network: N101 [AM_2031]

M2 On Off /Christie Road
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 95 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Road														
2	T1	1	0.0	1	0.0	0.248	39.8	LOS C	2.6	18.8	0.92	0.75	0.92	7.5
3	R2	153	1.4	147	1.4	0.341	45.0	LOS D	3.7	26.4	0.94	0.76	0.94	25.4
Approach		154	1.4	148 N1	1.4	0.341	45.0	LOS D	3.7	26.4	0.94	0.76	0.94	25.4
North: Football fields														
7	L2	1	0.0	1	0.0	0.013	52.5	LOS D	0.0	0.3	0.97	0.58	0.97	22.6
8	T1	1	0.0	1	0.0	0.007	44.7	LOS D	0.0	0.3	0.94	0.56	0.94	3.1
Approach		2	0.0	2	0.0	0.013	48.6	LOS D	0.0	0.3	0.96	0.57	0.96	15.7
West: M2 Off														
10	L2	1	0.0	1	0.0	0.339	15.7	LOS B	8.4	61.2	0.54	0.75	0.54	24.4
11	T1	1	0.0	1	0.0	0.339	10.1	LOS A	8.4	61.2	0.54	0.75	0.54	47.7
12	R2	727	4.3	727	4.3	0.339	15.7	LOS B	8.4	61.2	0.54	0.75	0.54	39.8
Approach		729	4.3	729	4.3	0.339	15.7	LOS B	8.4	61.2	0.54	0.75	0.54	39.7
All Vehicles		885	3.8	880 N1	3.8	0.341	20.7	LOS B	8.4	61.2	0.61	0.75	0.61	35.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	41.8	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		53	41.8	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 105 [105_2031_AM_Talavera Rd/ Herring Road/ M2 Ramps]

Network: N101 [AM_2031]

Talavera Rd/ Herring Road/ M2 Ramps
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Herring Road														
1	L2	125	2.4	125	2.4	0.283	26.8	LOS B	3.2	22.6	0.86	0.76	0.86	26.6
2	T1	270	11.9	270	11.9	0.954	78.9	LOS F	19.8	153.0	0.99	1.16	1.52	23.1
3	R2	431	0.5	431	0.5	1.123	187.3	LOS F	50.7	356.3	1.00	1.44	2.19	8.5
Approach		826	4.5	826	4.5	1.123	127.6	LOS F	50.7	356.3	0.98	1.24	1.77	13.0
East: Talavera Road (E)														
4	L2	253	0.8	253	0.8	0.552	47.2	LOS D	12.9	90.7	0.92	0.82	0.92	24.0
5	T1	283	0.7	283	0.7	0.287	38.4	LOS C	6.6	46.7	0.85	0.69	0.85	14.0
6	R2	230	1.3	230	1.3	1.088	161.8	LOS F	12.0	84.9	1.00	1.27	2.23	11.2
Approach		766	0.9	766	0.9	1.088	78.4	LOS F	12.9	90.7	0.92	0.91	1.28	14.9
North: M2 Ramps														
7	L2	156	11.5	156	11.5	0.120	31.8	LOS C	3.0	22.7	0.69	0.73	0.69	31.8
9	R2	544	0.6	544	0.6	1.131	192.3	LOS F	65.9	463.5	1.00	1.39	2.20	7.6
Approach		700	3.0	700	3.0	1.131	156.5	LOS F	65.9	463.5	0.93	1.24	1.86	9.6
West: Talavera Road (W)														
10	L2	41	9.8	41	9.8	1.125	169.9	LOS F	26.2	186.0	1.00	1.51	2.17	9.2
11	T1	1039	0.9	1039	0.9	1.125	173.7	LOS F	26.4	186.0	1.00	1.63	2.17	5.3
12	R2	17	100.0	17	100.0	0.273	69.9	LOS E	1.0	13.5	0.99	0.71	0.99	17.2
Approach		1097	2.7	1097	2.7	1.125	171.9	LOS F	26.4	186.0	1.00	1.61	2.15	5.5
All Vehicles		3389	2.8	3389	2.8	1.131	136.8	LOS F	65.9	463.5	0.96	1.29	1.80	9.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2S	East Slip/Bypass Lane Crossing	53	17.7	LOS B	0.1	0.1	0.77	0.77
P3	North Full Crossing	53	45.2	LOS E	0.2	0.2	0.87	0.87
P4	West Full Crossing	53	49.6	LOS E	0.2	0.2	0.91	0.91
All Pedestrians		211	41.7	LOS E			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 102 [102_2031_AM_Christie Rd / Site Access]

Network: N101 [AM_2031]

Christie Rd / Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Rd South														
2	T1	153	1.4	147	1.4	0.050	0.8	LOS A	0.2	1.5	0.11	0.05	0.11	40.9
3	R2	13	0.0	12	0.0	0.050	8.2	LOS A	0.2	1.5	0.32	0.13	0.32	31.7
Approach		165	1.3	159[N1]	1.3	0.050	1.4	NA	0.2	1.5	0.12	0.05	0.12	38.9
East: Site access														
4	L2	5	0.0	5	0.0	0.015	5.5	LOS A	0.0	0.2	0.33	0.56	0.33	25.8
6	R2	1	0.0	1	0.0	0.015	13.6	LOS A	0.0	0.2	0.33	0.56	0.33	25.8
Approach		6	0.0	6	0.0	0.015	6.9	LOS A	0.0	0.2	0.33	0.56	0.33	25.8
North: Christie Rd North														
7	L2	32	0.0	32	0.0	0.128	4.3	LOS A	4.3	31.3	0.00	0.08	0.00	38.0
8	T1	696	4.5	696	4.5	0.128	0.0	LOS A	8.3	60.3	0.00	0.02	0.00	57.6
Approach		727	4.3	727	4.3	0.128	0.2	NA	8.3	60.3	0.00	0.03	0.00	55.3
All Vehicles		899	3.7	893[N1]	3.8	0.128	0.5	NA	8.3	60.3	0.02	0.03	0.02	52.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 104 [104_2031_AM_ Talavera Rd/ Site Access] — Network: N101 [AM_2031]

Talavera Rd/ Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd East														
5	T1	941	0.9	881	0.9	0.174	1.8	LOS A	0.9	6.0	0.09	0.21	0.09	46.8
6	R2	40	0.0	37	0.0	0.174	13.0	LOS A	0.9	6.0	0.38	0.22	0.38	38.1
Approach		981	0.9	918[N1]	0.9	0.174	2.2	NA	0.9	6.0	0.10	0.21	0.10	46.0
North: Site Access														
7	L2	5	0.0	5	0.0	0.044	8.0	LOS A	0.1	0.5	0.68	0.72	0.68	17.4
9	R2	1	0.0	1	0.0	0.044	61.5	LOS E	0.1	0.5	0.68	0.72	0.68	17.4
Approach		6	0.0	6	0.0	0.044	16.9	LOS B	0.1	0.5	0.68	0.72	0.68	17.4
West: Talavera Rd west														
10	L2	26	0.0	26	0.0	0.288	5.5	LOS A	28.2	204.2	0.00	0.22	0.00	39.1
11	T1	1066	4.2	1066	4.2	0.288	1.1	LOS A	30.6	221.9	0.00	0.21	0.00	52.9
Approach		1093	4.1	1093	4.1	0.288	1.2	NA	30.6	221.9	0.00	0.21	0.00	52.1
All Vehicles		2080	2.6	2017[N1]	2.7	0.288	1.7	NA	30.6	221.9	0.05	0.21	0.05	49.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 103 [103_2031_PM_ Talavera Rd/ Christie Rd]

Network: N101 [PM_2031]

Talavera Rd/ Christie Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd														
5	T1	718	0.7	718	0.7	0.399	8.1	LOS A	7.2	50.9	0.59	0.51	0.59	41.8
6	R2	187	5.6	187	5.6	0.390	17.9	LOS B	3.7	27.5	0.81	0.78	0.81	20.4
Approach		905	1.7	905	1.7	0.399	10.2	LOS A	7.2	50.9	0.64	0.57	0.64	37.3
North: Christie Rd														
7	L2	526	4.4	526	4.4	0.313	14.0	LOS A	4.9	35.3	0.66	0.74	0.66	9.8
9	R2	151	0.0	151	0.0	0.405	26.6	LOS B	4.0	28.1	0.91	0.78	0.91	17.9
Approach		677	3.4	677	3.4	0.405	16.8	LOS B	4.9	35.3	0.72	0.75	0.72	13.1
West: Talavera Rd														
10	L2	140	0.0	140	0.0	0.393	23.1	LOS B	5.5	38.4	0.82	0.75	0.82	19.9
11	T1	335	1.6	335	1.6	0.393	17.6	LOS B	5.6	39.8	0.82	0.70	0.82	21.6
Approach		475	1.1	475	1.1	0.393	19.2	LOS B	5.6	39.8	0.82	0.72	0.82	21.1
All Vehicles		2057	2.1	2057	2.1	0.405	14.4	LOS A	7.2	50.9	0.71	0.66	0.71	26.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	68	24.4	LOS C	0.1	0.1	0.90	0.90
P4	West Full Crossing	55	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		123	24.4	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [101_2031_PM_M2 On Off /Christie Road]

Network: N101 [PM_2031]

M2 On Off /Christie Road
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Road														
2	T1	1	0.0	1	0.0	0.317	22.4	LOS B	4.2	29.7	0.84	0.77	0.84	11.5
3	R2	355	1.5	355	1.5	0.436	27.7	LOS B	6.0	42.9	0.87	0.78	0.87	32.3
Approach		356	1.5	356	1.5	0.436	27.7	LOS B	6.0	42.9	0.87	0.78	0.87	32.3
North: Football fields														
7	L2	1	0.0	1	0.0	0.010	38.3	LOS C	0.0	0.2	0.96	0.58	0.96	27.0
8	T1	1	0.0	1	0.0	0.006	32.3	LOS C	0.0	0.2	0.93	0.55	0.93	4.1
Approach		2	0.0	2	0.0	0.010	35.3	LOS C	0.0	0.2	0.95	0.56	0.95	19.6
West: M2 Off														
10	L2	1	0.0	1	0.0	0.427	22.1	LOS B	7.7	55.8	0.77	0.79	0.77	22.6
11	T1	1	0.0	1	0.0	0.427	16.5	LOS B	7.7	55.8	0.77	0.79	0.77	44.0
12	R2	617	3.4	617	3.4	0.427	22.1	LOS B	7.7	55.8	0.77	0.79	0.77	34.9
Approach		619	3.4	619	3.4	0.427	22.0	LOS B	7.7	55.8	0.77	0.79	0.77	34.9
All Vehicles		977	2.7	977	2.7	0.436	24.1	LOS B	7.7	55.8	0.80	0.79	0.80	33.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
All Pedestrians		53	29.3	LOS C			0.92	0.92

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 105 [105_2031_PM_Talavera Rd/ Herring Road/ M2 Ramps]

Network: N101 [PM_2031]

Talavera Rd/ Herring Road/ M2 Ramps
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 130 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Herring Road														
1	L2	166	6.6	166	6.6	0.260	23.6	LOS B	5.2	38.6	0.72	0.75	0.72	28.6
2	T1	469	4.5	469	4.5	0.977	90.8	LOS F	35.8	254.8	0.98	1.17	1.51	21.0
3	R2	250	0.0	250	0.0	0.977	95.6	LOS F	35.8	254.8	1.00	1.16	1.47	15.3
Approach		885	3.6	885	3.6	0.977	79.6	LOS F	35.8	254.8	0.94	1.09	1.35	19.8
East: Talavera Road (E)														
4	L2	447	0.4	447	0.4	1.005	111.8	LOS F	42.9	301.4	1.00	1.15	1.60	13.3
5	T1	560	0.2	560	0.2	0.478	37.3	LOS C	14.9	104.8	0.84	0.72	0.84	14.3
6	R2	537	0.2	537	0.2	0.974	98.0	LOS F	22.3	156.2	1.00	1.08	1.56	16.9
Approach		1544	0.3	1544	0.3	1.005	80.0	LOS F	42.9	301.4	0.94	0.97	1.31	15.0
North: M2 Ramps														
7	L2	37	2.7	37	2.7	0.033	39.6	LOS C	0.8	5.8	0.73	0.69	0.73	29.0
9	R2	117	1.7	117	1.7	0.912	85.4	LOS F	8.6	61.2	1.00	0.99	1.49	15.1
Approach		154	1.9	154	1.9	0.912	74.4	LOS F	8.6	61.2	0.94	0.92	1.31	17.6
West: Talavera Road (W)														
10	L2	75	0.0	75	0.0	0.766	54.0	LOS D	26.5	185.2	0.96	0.90	1.31	24.8
11	T1	846	0.0	846	0.0	0.766	45.5	LOS D	26.5	185.2	0.96	0.88	1.13	17.2
12	R2	15	100.0	15	100.0	0.079	55.0	LOS D	0.8	10.4	0.86	0.70	0.86	20.2
Approach		936	1.6	936	1.6	0.766	46.4	LOS D	26.5	185.2	0.96	0.87	1.14	18.1
All Vehicles		3519	1.5	3519	1.5	1.005	70.7	LOS F	42.9	301.4	0.95	0.97	1.28	17.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	51.0	LOS E	0.2	0.2	0.89	0.89
P2S	East Slip/Bypass Lane Crossing	53	14.9	LOS B	0.1	0.1	0.63	0.63
P3	North Full Crossing	53	40.9	LOS E	0.2	0.2	0.79	0.79
P4	West Full Crossing	53	50.1	LOS E	0.2	0.2	0.88	0.88
All Pedestrians		211	39.2	LOS D			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 102 [102_2031_PM_Christie Rd / Site Access]

Network: N101 [PM_2031]

Christie Rd / Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Christie Rd South														
2	T1	329	1.6	329	1.6	0.086	0.0	LOS A	0.0	0.1	0.01	0.00	0.01	58.8
3	R2	1	0.0	1	0.0	0.086	7.0	LOS A	0.0	0.1	0.01	0.00	0.01	43.2
Approach		331	1.6	331	1.6	0.086	0.1	NA	0.0	0.1	0.01	0.00	0.01	58.6
East: Site access														
4	L2	68	0.0	68	0.0	0.164	5.5	LOS A	0.5	3.8	0.35	0.60	0.35	23.5
6	R2	25	0.0	25	0.0	0.164	15.0	LOS B	0.5	3.8	0.35	0.60	0.35	23.5
Approach		94	0.0	94	0.0	0.164	8.1	LOS A	0.5	3.8	0.35	0.60	0.35	23.5
North: Christie Rd North														
7	L2	2	0.0	2	0.0	0.124	4.3	LOS A	0.0	0.0	0.00	0.01	0.00	39.6
8	T1	615	3.4	615	3.4	0.124	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		617	3.4	617	3.4	0.124	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.6
All Vehicles		1041	2.5	1041	2.5	0.164	0.8	NA	0.5	3.8	0.03	0.06	0.03	50.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 104 [104_2031_PM_ Talavera Rd/ Site Access]

Network: N101 [PM_2031]

Talavera Rd/ Site Access
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Talavera Rd East														
5	T1	900	1.6	900	1.6	0.158	1.1	LOS A	0.1	0.7	0.01	0.20	0.01	51.7
6	R2	5	0.0	5	0.0	0.158	10.8	LOS A	0.1	0.7	0.04	0.20	0.04	47.0
Approach		905	1.6	905	1.6	0.158	1.2	NA	0.1	0.7	0.01	0.20	0.01	51.6
North: Site Access														
7	L2	36	0.0	36	0.0	0.170	7.5	LOS A	0.3	2.2	0.57	0.72	0.57	22.1
9	R2	4	0.0	4	0.0	0.170	49.3	LOS D	0.3	2.2	0.57	0.72	0.57	22.1
Approach		40	0.0	40	0.0	0.170	11.9	LOS A	0.3	2.2	0.57	0.72	0.57	22.1
West: Talavera Rd west														
10	L2	3	0.0	3	0.0	0.444	5.6	LOS A	0.0	0.0	0.00	0.20	0.00	39.3
11	T1	863	2.9	863	2.9	0.444	1.1	LOS A	0.0	0.0	0.00	0.20	0.00	53.3
Approach		866	2.9	866	2.9	0.444	1.1	NA	0.0	0.0	0.00	0.20	0.00	53.2
All Vehicles		1812	2.2	1812	2.2	0.444	1.4	NA	0.3	2.2	0.02	0.21	0.02	51.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Attachment 4: Preliminary Flood Impact Assessment prepared by Calibre Consulting

Calibre Consulting (NSW) Pty Ltd
Level 2, 2 Burbank Place
Norwest Business Park NSW 2153
PO Box 8300
Baulkham Hills BC NSW 2153
T +61 2 8808 5000
ABN 30 109 434 513

Our Ref: 17-000226
Your Ref: Preliminary Flood Impact Assessment – 118 Talavera Road, Macquarie Park
Contact: Troy Eyles

28 April 2017

Meriton Group
Level 11, Meriton Tower
528 Kent Street
Sydney NSW 2000

Attention: Tom Hutchison

Dear Tom

Preliminary Flood Impact Assessment – 118 Talavera Road, Macquarie Park

1 INTRODUCTION

This Preliminary Flood Impact Assessment has been prepared to support the planning proposal for a proposed multi-building residential development at 118 Talavera Road, Macquarie Park. This report is to accompany the application for the development on the site being prepared by SJB Architects on behalf of Meriton Group Pty Ltd (Meriton). This letter is a supplementary report outlining flooding issues on the site and includes descriptions of:

- The proposed development.
- Existing flooding issues and information.
- The hydrologic and hydraulic modelling undertaken to determine existing and post-development runoff on the site.
- Impacts of flooding issues on the proposed development.

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

The site is bounded by the M2 motorway and Talavera Road as shown in Figure 1. It does not include the current Fujitsu building.

The current site includes commercial buildings and car spaces. An overland flow path follows the drive way and discharges into culverts which cross the M2 motorway.

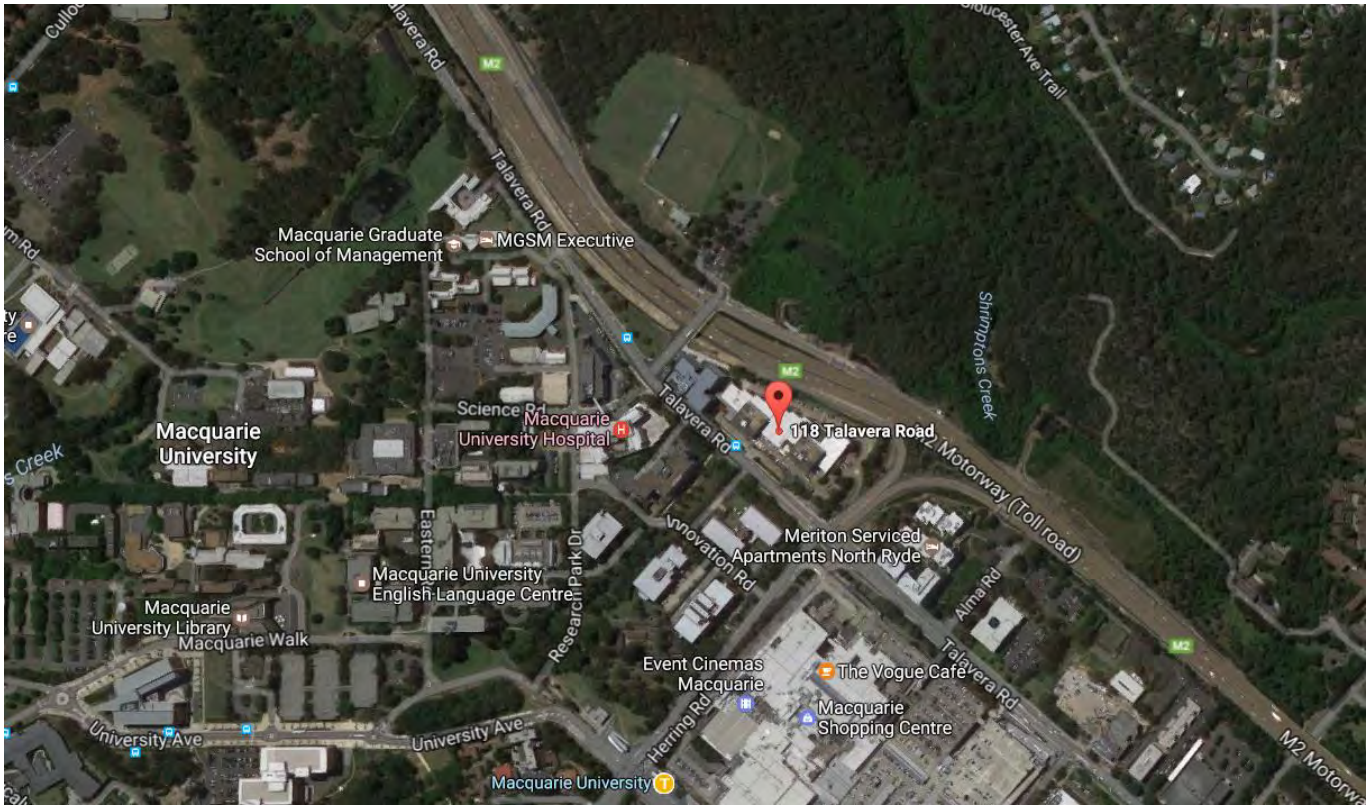


Figure 1: Site locality

The proposed development is shown in Figure 2.

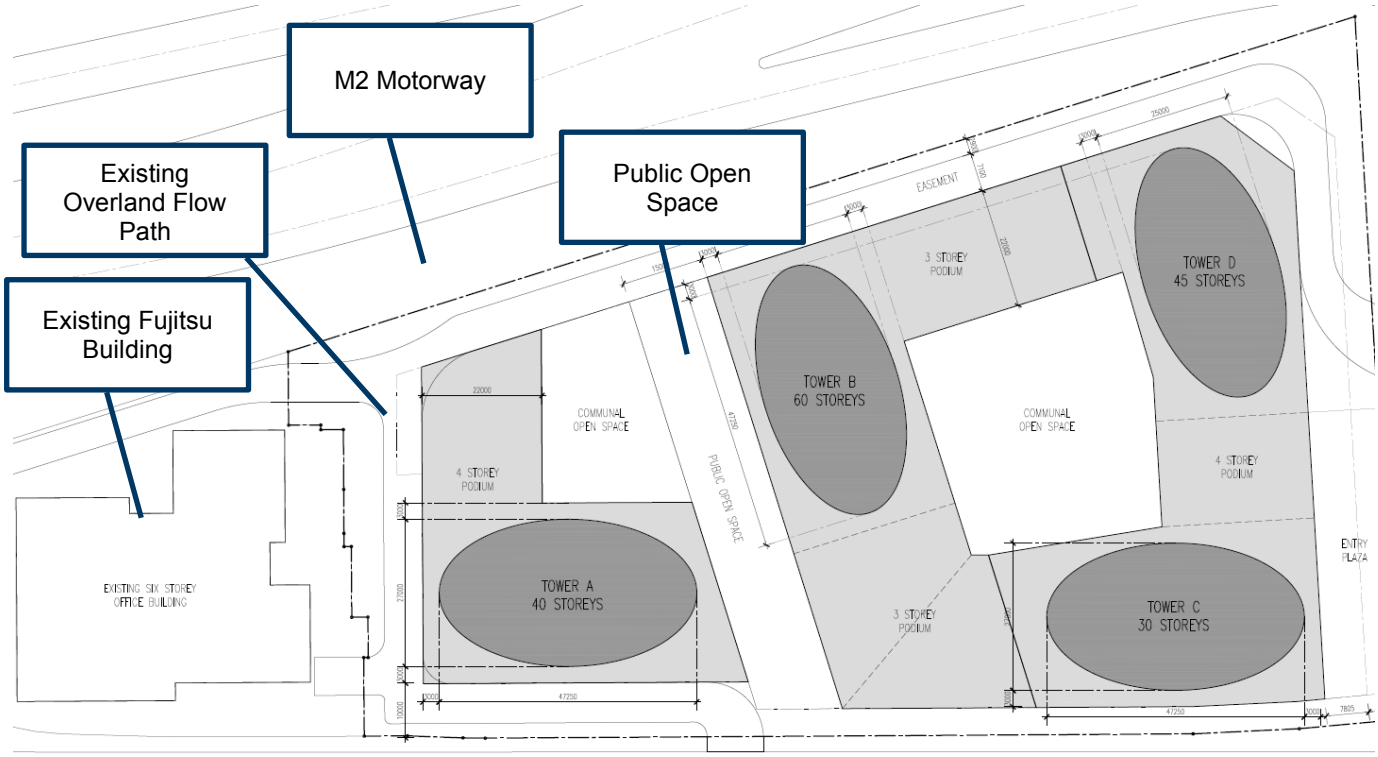


Figure 2: Proposed development (SJB Architects, 2017)

3 EXISTING FLOODING ISSUES

The *Macquarie Park Floodplain Risk Management Study & Plan* (Bewsher, 2010) identifies flood issues in the Macquarie Park catchment. Council has provided preliminary flood information derived from the Study (2010) which indicate that the site is flood affected. Flood studies have shown that a peak 1% annual exceedance probability (AEP) flow of approximately 32.5 m^3/s passes the site. Approximately 8.5 m^3/s of this is pipe flow and 24 m^3/s is overland flow. The overland flow is picked up in culverts which allow flow to pass under the M2 motorway.

A flood risk map identifying areas of low, medium and high flood risks are shown in Figure 3.

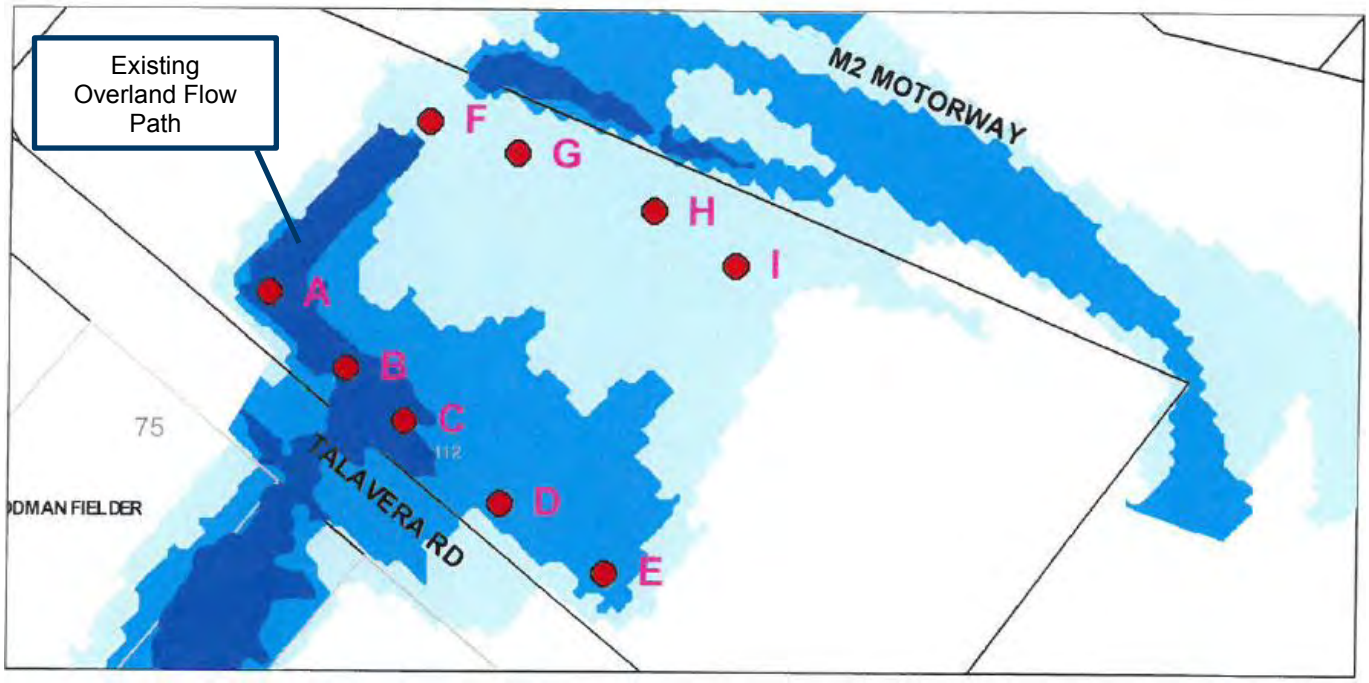


Figure 3: Flood risks Map (City of Ryde, 2017)

The existing overland flow path is expected to be preserved in the proposed development as shown in Figure 2. The public open space is be flood free for the 1% storm event.

4 IMPACTS OF FLOODING ISSUES ON PROPOSED DEVELOPMENT

The *City of Ryde Development Control Plan 2014* (City of Ryde, 2015) outlines floor levels with freeboard requirements to flood levels. The requirements are based on flood risk level and if the floors are habitable. Table 1 nominates the floor levels for locations shown in Figure 3.

Table 1: Minimum floor levels

Location	Flood risk level	Minimum habitable floor level (mAHD)	Minimum non-habitable floor level (mAHD)
A	High	45.62	45.42
B	High	45.64	45.44
C	High	45.81	45.61
D	Medium	45.90	45.70
E	Medium	45.90	45.70
F	Low	300mm above kerb	150mm above kerb
G	Low	300mm above kerb	150mm above kerb
H	Low	300mm above kerb	150mm above kerb
I	Low	300mm above kerb	150mm above kerb

5 POTENTIAL FLOOD IMPROVEMENT WORKS

The existing 15m wide overland flowpath would convey the 1% AEP overland flow of 24 m^3/s with 360mm depth.

Existing drainage infrastructure conveys approximately 8.5 m^3/s within a concrete pipe. Duplication of this infrastructure underneath the public open space may reduce the 1% AEP overland flow of 24 m^3/s to 15.5 m^3/s which could reduce the flood risk and required finished floor levels. The 360mm flow depth would reduce to 270mm.

6 CONCLUSION

This Flood Impact Statement has been prepared to support the planning proposal for a proposed multi-building residential development at 118 Talavera Road, Macquarie Park. This report outlines flooding issues on the site and includes descriptions of:

- The site and the existing flooding issues review of the existing available flood study information
- The proposed development for the site
- The hydrologic and hydraulic modelling undertaken to determine flood levels on the site
- Preliminary flood planning levels for the initial building design and site layout
- Potential flood alleviation works.

The flood issues affecting the site are manageable to support the development

Yours faithfully
Calibre Consulting

Troy Eyles
Senior Engineer – Water & Environment

Attachment 5: Aeronautical Impact Assessment prepared by Landrum & Brown

Aeronautical Impact Assessment

Building Development
112 Talavera Road,
Macquarie Park, NSW

Meriton Group

LB00206

Final Version No.003
5 April 2018

Version No.	Basis of issue	Author	Date	Reviewers
001	Draft report for submission to Client	PWW	3 April 2018	SK
002	Draft report with client revisions	PWW	5 April 2018	SK
003	Final report	PWW	5 April 2018	SK

Contents

1 Introduction

1.1 The Development

Meriton Group Pty Ltd has tasked Landrum & Brown Worldwide (Australia) Pty Ltd to prepare an Aeronautical Impact Assessment (AIA) for a proposed building development at 112 Talavera Road, Macquarie Park, NSW.

The development comprises a mixed-use building with a maximum height of 243 m AHD and will be constructed using a Tower Crane (TC).

Table 1 shows the distances of the various airports and heliports in the vicinity of the development.

Airport	Direction and distance from 112 Talavera Rd
Sydney Airport	19.7 km south
Bankstown Airport	20.68 km south west
RAAF Richmond	35.5 km north west
Western Sydney Airport (Proposed)	37.6 km south west

Table 1: Airports in the vicinity

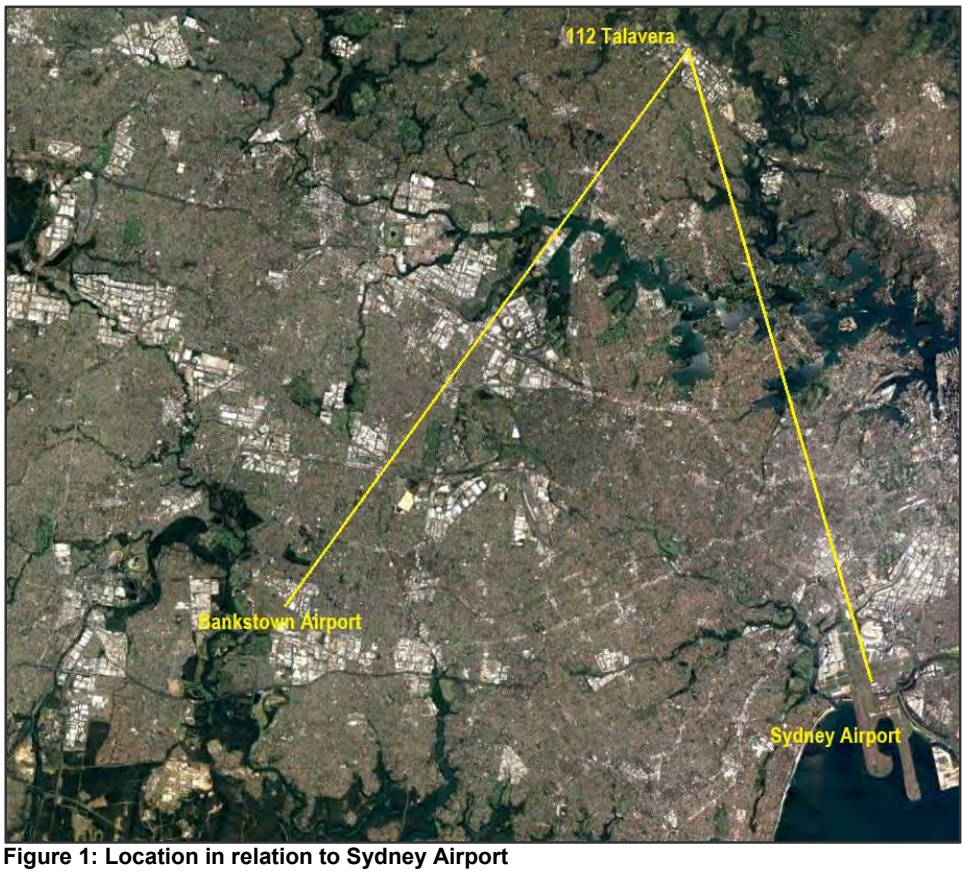


Figure 1: Location in relation to Sydney Airport

2 Prescribed Airspace

2.1 Overview

Prescribed Airspace for an airport is the airspace above any part of either an Obstacle Limitation Surface (OLS), a PANS OPS (Procedures for Air Navigation Services – Aircraft Operations) surface for the airport and the Radar Terrain Clearance Chart (RTCC) protection surfaces.

The OLS are conceptual surfaces associated with runways that are designed to protect aircraft operations from unrestricted obstacle growth. The OLS comprises the following:

- outer horizontal surface (OHS);
- conical surface;
- inner horizontal surface (IHS);
- approach surface;
- inner approach surface;
- transitional surface;
- inner transitional surface;
- baulked landing surface; and
- take-off climb surface.

The PANS OPS surfaces are designed to guarantee an obstacle free path to and from a runway, with a prescribed minimum obstacle clearance above the obstacles or terrain, for the safety of aircraft operations in Instrument Meteorological Conditions (IMC).

The RTCC provides ATC with minimum heights that they can provide surveillance services to aircraft in the area around major airports.

Infringement by a building or crane through the OLS requires the approval of the Civil Aviation Safety Authority (CASA), and the Department of Infrastructure, Regional Development and Cities (DIRDC) where the airport is on federally leased land.

Infringement of PANS OPS or RTCC protection surfaces are not supported by the aviation authorities.

2.2 OLS

The Outer Horizontal Surface of the OLS extends to 15 km from the applicable airport. There are no other OLS extending beyond 15 km from the applicable airport.

The development site is located more than 15 km from any of the airports in the Sydney area and is therefore located laterally outside of all applicable OLS.

Table 2 identifies the various Airports' OLS and Infringement.

Airport	Prescribed Airspace Surface	Height of surface (m AHD)	Infringement (m)
Sydney	All OLS	Laterally Outside	Nil
Bankstown	All OLS	Laterally Outside	Nil
RAAF Richmond	All OLS	Laterally Outside	Nil
Western Sydney	All OLS	Laterally Outside	Nil

Table 2: Development site relationship to various Airports' OLS

2.3 PANS OPS

Sydney Airport's PANS OPS surfaces are the most relevant for this proposed development.
PANS OPS surfaces related to other airports are well above the maximum proposed height of this development.

The development site is situated at the edge of an area where the PANS OPS surface height is 246.8 m AHD, but the majority of the development is situated beneath a PANS OPS surface height of 335.2 m AHD.

Figure 2 depicts Sydney Airport's Master Plan 2015 diagram of the PANS OPS surfaces with the location of the development marked upon it.

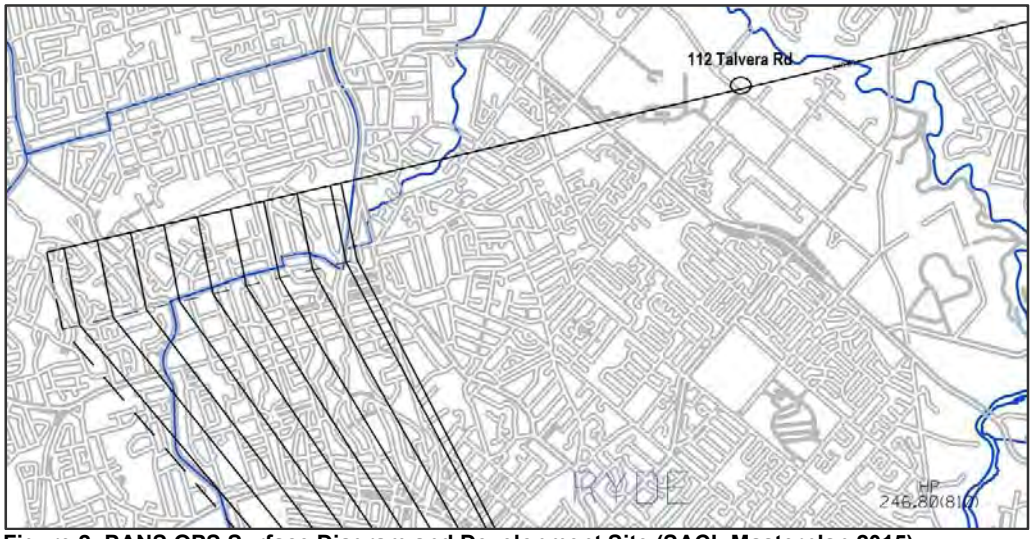


Figure 2: PANS OPS Surface Diagram and Development Site (SACL Masterplan 2015)

Table 3 shows the lowest PANS OPS surface height above the development site for each airport and the clearance (in green) or infringement (in red) of the building on each surface.

Airport/Approach or Departure Procedure	Surface Height (m AHD)	Building 243 m AHD
Sydney (Extracted from Sydney Airport Master plan 2015)	246.8	3.8
Bankstown (Extracted from Bankstown Airport Masterplan 2014)	820	577
Camden (25nm MSA)	1341	1098
RAAF Richmond	396	153
Radar Terrain Clearance Chart (RTCC)	244	1

Table 3: PANS OPS Surface Heights and result

A Radar Terrain Clearance Chart (RTCC) protection surface exists above the site. This surface relates to the lowest level that aircraft are able to descend to whilst under the direction of ATC.

Figure 3 depicts the development site and the RTCC protection surface chart (SACL Masterplan 2015).

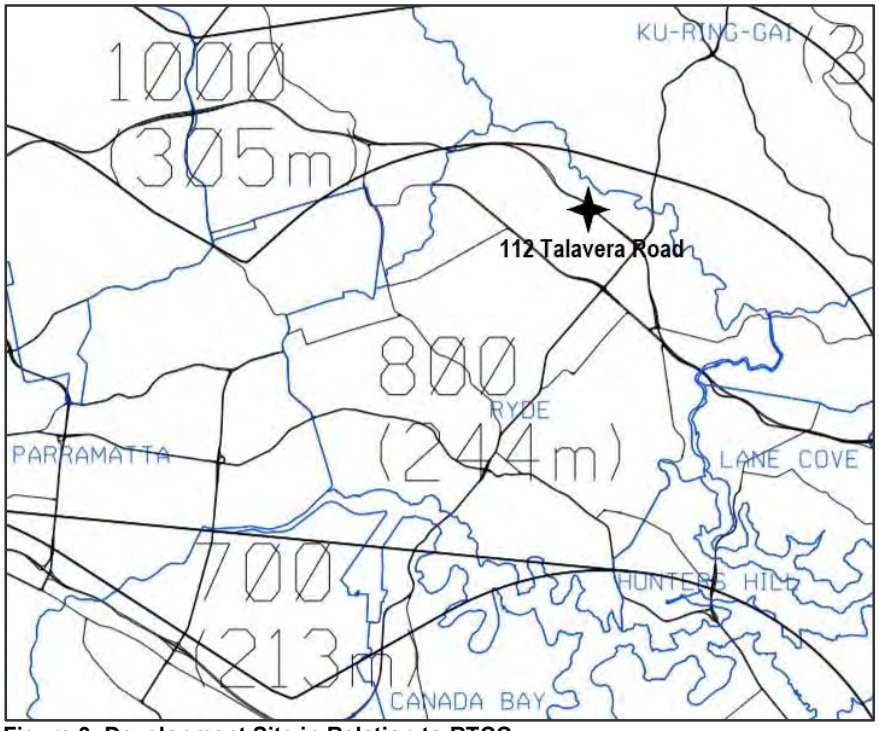


Figure 3: Development Site in Relation to RTCC

2.3.1 Result of Assessment

The proposed development at a maximum height of 243 m AHD:

- will not infringe the PANS OPS surface of Sydney Airport;
- will not infringe any PANS OPS surfaces at any other airport;
- will not infringe the RTCC protection surface.

3 ATC Surveillance System Performance

This assessment identified two radars in relative proximity to the development at 112 Talavera Road, Macquarie Park: the Sydney Airport Terminal Area Radar (TAR), and the Cecil Park TAR.

Cranes are considered not to impact the performance of ATC surveillance equipment.

Table 4 depicts the impact of the development on the performance of the ATC Surveillance System Performance.

Surveillance System	Distance from development	Distance in metres	Antenna Elevation (m AHD)	Plane Elevation at Church St (m AHD) Distance x Tan 0.5° + TAR elevation	Infringement result for building height of 243 m AHD
Sydney Airport TAR	19.7 km south	19700	38.2	210.1	32.9 m Infringement
Cecil Park TAR	28.6 km SW	28600	200.51	450.1	No infringement
RTCC				244	No infringement

Table 4 Impact of development on ATC Surveillance System Performance

3.1 Result of Assessment

The proposed development:

- will infringe the clearance plane for the Sydney Airport TAR;
- will not infringe the clearance plane for the Cecil Park TAR.

It is common that building developments infringe terminal area radar clearance planes. The infringement of the Sydney Airport TAR clearance plane should be mitigated by the additional coverage from the Cecil Park TAR and the multitude of ADS-B receiver sites in the area.

Airservices Australia will conduct an assessment of the effect that the proposed development will have on the Sydney TAR, and the mitigating effect of the other installations.

4 Navigation Aid Performance

There are a number of navigation aids installed at Sydney Airport, including ILS, GBAS and DME. An NDB is installed at Bankstown Airport and an ILS with a DME is planned for future installation.

The Building Restricted Areas (BRA) describes a sensitive zone that exists to a radius of 3000 m from the navigation aid antenna sites. The development limitations within the BRA is specified in the Airservices Australia document Navigation Aid Building Restricted Areas and Siting Guidance AEI-7.1613 Issue 2.

4.1 Result of Assessment

The development site is located outside of all BRA for all navigation aids in the Sydney area.

5 Roof Top Exhaust Plumes

Exhaust plumes in excess of 4.3 m/s can create sufficient turbulence to upset the stability of aircraft during take-off and landing operations. Roof top exhaust plume rises in excess of 4.3 m/s must be referred to CASA for their assessment of risk to aircraft operations.

There are no airfields within the immediate vicinity of the development site. Aircraft operating overhead or nearby to the building will not be in the take-off or landing phase of flight and therefore should not be affected by any exhaust plume above the building.

6 Obstacle Lighting

CASA will classify the building a 'Tall Structure' as per the CASA AC139-08v2.0 *Reporting of tall structures and hazardous plume sources*, and may require the installation of permanent obstruction lighting.

Shielding of the lights to avoid distraction to residents may be installed, however the lights must remain visible above a horizontal plane.

Obstacle lighting for the building, if required by CASA, will be in accordance with the Manual of Standards Part 139 – Aerodromes, Chapter 9.4 *Obstacle Lighting*.

Police and Ambulance helicopter operations occur in and around the Sydney metropolitan area, but the dominant structure by day, and obstacle lighting at night will provide sufficient visibility of the building for pilots to be able to identify it and adjust their flight path if required.

7 Cranes

Meriton understands that the RTCC and PANS OPS surfaces above the site restrict the use of construction cranes, and will develop a construction methodology plan that allows for the majority of the construction to be completed by tower cranes operating beneath the aeronautical surfaces.

An application will be made at a later date for cranes to infringe the surfaces for the minimum duration.

8 Conclusion

Recognition of the significance of the aeronautical protection surfaces has enabled Meriton to design a building development that will not adversely impact the aviation sector.

The proposed building at 112 Talavera Road, Macquarie Park, to a maximum height of 243 m AHD:

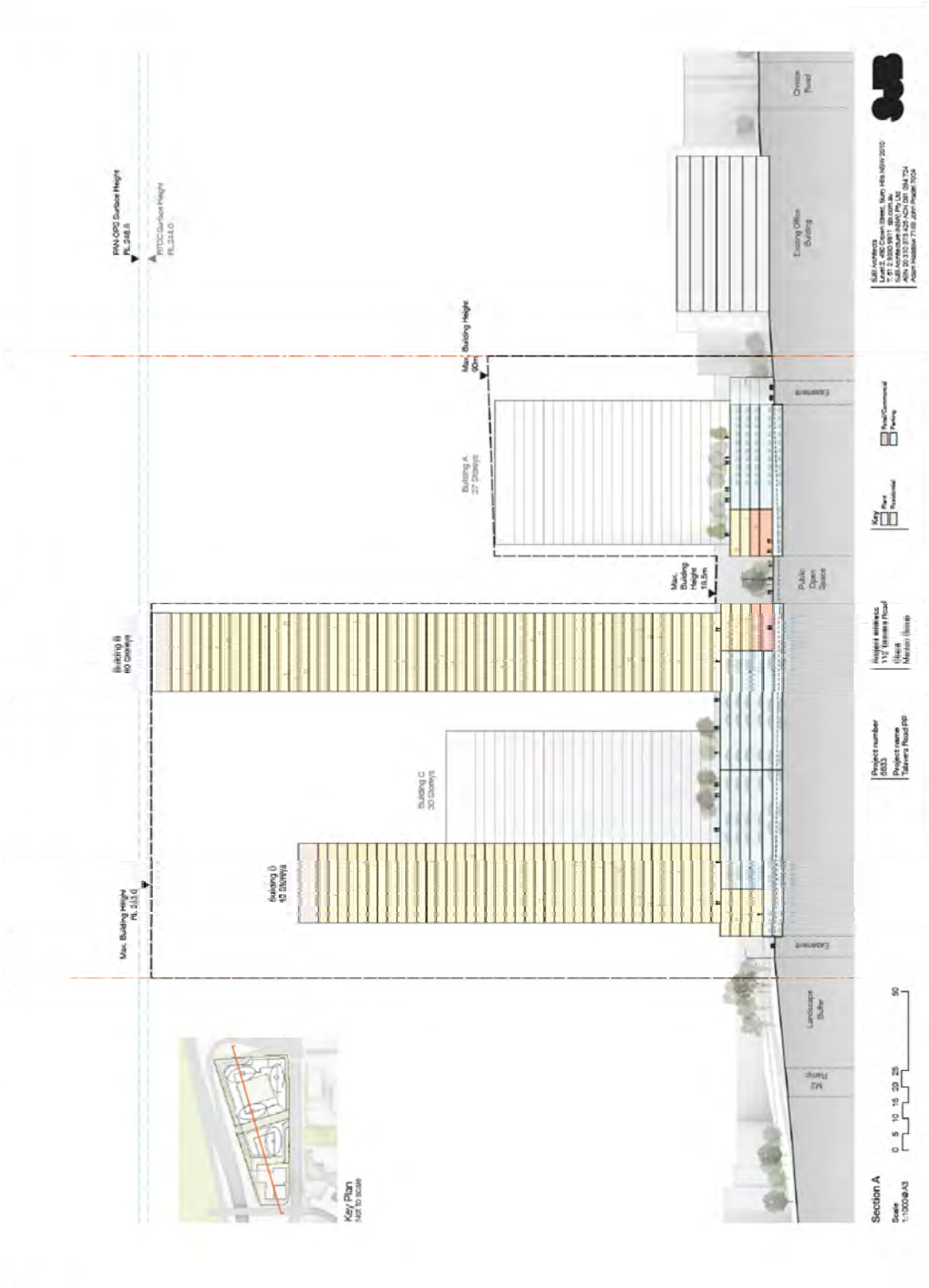
- will not infringe the OLS for Sydney Airport or any other airport in the vicinity;
- will not infringe the Sydney Airport PANS OPS surfaces, or the PANS OPS surfaces for any other airport in the vicinity; and
- will not infringe the RTCC protection surface above the site.

It will be necessary to gain approval from Airservices Australia for the infringement of the Sydney TAR. This approval process will be managed by SACL during the assessment of the application for aviation approval.

Subsequent to the grant of any approval for this development, a detailed application to CASA, Airservices Australia, Bankstown and Sydney airports will need to be made for the cranes (temporary obstacles) required during the building process.

Appendix A

Building Height Diagram



Maximum building heights
Source: SJB Architects

Maximum building heights in plan view
Source: SJB Architects

Appendix B

Assessment Methodology

In preparing aeronautical impact assessments associated with airport safeguarding and protection, it is necessary to observe the requirements of the relevant aviation authorities including:

- The Department of Infrastructure and Regional Development (DIRD);
- The Civil Aviation Safety Authority of Australia (CASA);
- Airservices Australia (ASA);
- Airport Operators; and
- Department of Defence where appropriate.

The *Airports Act 1996* and *Airports (Protection of Airspace) Regulations 1996* prescribes the volumes of airspace surrounding Federally Leased Airports that protect aircraft operations into those airports, in order to ensure the safety and regularity of airline and other flight operations.

Sydney Airport's Prescribed Airspace comprises:

- Obstacle Limitation Surfaces (OLS) that restrict obstacle growth in the vicinity of takeoff and landing paths; and
- PANS OPS surfaces that provide a buffer between flight paths and terrain or obstacles.

Relevant Acts and Regulations applicable to developments near airports and air traffic routes were referenced during this assessment.

The major relevant documents include:

- The Airports Act 1996, Airports (Protection of Airspace) Regulations 1996;
- Civil Aviation Safety Regulation (CASR) Part 139 Manual of Standards – Aerodromes;
- Aeronautical Information Publication (AIP);
- Airservices Australia's Airways Engineering Instruction – Navigation Aid Building Restricted Areas and Siting Guidance (BRA);
- International Civil Aviation Organisation (ICAO) DOC 8168 Procedures for Air Navigation – Aircraft Operations (PANS OPS).

A Glossary of Aeronautical Terms and Abbreviations is shown at Appendix C.

Appendix C

Glossary of Aeronautical Terms and Abbreviations

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies.

AC (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

Aeronautical study is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

AIPs (Aeronautical Information Publications) are publications promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. They contain details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, AIP is issued by Airservices Australia on behalf of CASA.

Air routes exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under IFR.

Airservices Australia is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

Altitude is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

ATC (Air Traffic Control) service is a service provided for the purpose of:

a. preventing collisions:
    1. between aircraft; and
    2. on the manoeuvring area between aircraft and obstructions; and
b. expediting and maintaining an orderly flow of air traffic.

CASA (Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago Convention,* CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

CASR (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework *(Regulations)* within which all service providers must operate.

Civil Aviation Act 1988 (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

ICAO (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention.*

IFR (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, “a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying,” such as an IFR or VFR flight plan. Pilots must hold IFR qualifications and aircraft must be suitably equipped with appropriate instruments and navigation aids to enable flight in IMC.

IMC (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

LSALT (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

MOS (Manual of Standards) comprises specifications (Standards) prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

NOTAMs (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

Obstacles. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

OLS (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

PANS OPS (Procedures for Air Navigation Services - Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS OPS may vary from country to country.

PANS OPS Surfaces. Similar to an Obstacle Limitation Surface, the PANS OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to infringe the OLS, they cannot be permitted to infringe any PANS OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

Prescribed airspace is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

Radar Terrain Clearance Chart (RTCC) is a chart that provides air traffic controllers with the lowest usable altitude that they can vector an aircraft using prescribed surveillance procedures within controlled airspace. There is a protection surface below this usable altitude which is shown in airport master plans.

Regulations (Civil Aviation Safety Regulations)

VFR (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules. Pilots must be specifically qualified and aircraft specifically equipped to enable flight in IMC,

VMC (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima.

Abbreviations

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table.

Abbreviation	Meaning
AC	Advisory Circular (document support CAR 1998)
ACFT	Aircraft
AD	Aerodrome
ADS-B	Automatic Dependent Surveillance - Broadcast
AHD	Australian Height Datum
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALT	Altitude
AMSL	Above Mean Sea Level
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BRA	Building Restricted Area
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DIT	Department of Infrastructure and Transport. (Formerly Dept. of Infrastructure, Transport, Regional Development and Local Government and Department of Transport and Regional Services (DoTARS))
DOTARS	See DIT above
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point

Abbreviation	Meaning
ft	feet
GBAS	Ground Based Augmentation System (satellite precision landing system)
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NDB	Non Directional Beacon
NE	North East
NM	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North North East
NOTAM	NOtice to AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS OPS	Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168
PBN	Performance Based Navigation

Abbreviation	Meaning
PRM	Precision Runway Monitor
QNH	An altimeter setting relative to height above mean sea level
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RTCC	Radar Terrain Clearance Chart
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
STAR	STandard ARrival
SGHAT	Solar Glare Hazard Analysis Tool
TAR	Terminal Approach Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
V_n	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range
WAC	World Aeronautical Chart

Attachment 6: Social Infrastructure Statement prepared by Elton Consulting

112 Talavera Road, Macquarie Park

Social infrastructure statement

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Date	13 September 2017
Document name	112 Talavera Road Macquarie Park Social Infrastructure Statement
Version	Final

Contents

TABLES

1 Introduction

This Social Infrastructure Statement (SIS) has been prepared for the Meriton Group to inform a Planning Proposal to amend building heights and floor space ratio controls. The Planning Proposal would enable the Meriton Group to increase housing supply at 112 Talavera Road, Macquarie Park (the site). The increased residential component of the proposed development would result in future added population. The purpose of the SIS is to identify any social infrastructure needs that would be required to support the added population generated.

1.1 Project description

The Planning Proposal site is located at the edge of the M2 Motorway and Herring Road within the Macquarie Park Corridor. The Macquarie Park Corridor plays an important employment centre role and provides commercial, technology and research opportunities. The area is currently subject to many renewal projects due to its proximity to key public transport, health and education infrastructure. Meeting the needs of future residents is understood within this ever more urbanised setting.

No change is sought to the zoning of the site which is currently zoned B4 Mixed use. This B4 zone enables residential development to be mixed with other suitable business, office, retail and other uses.

The Planning Proposal seeks to increase the current site height limit and floor space ratios to allow for taller buildings. This amendment is predicted to increase the number of dwellings allowed from 879 to 1269. A key anticipated community benefit of this approach is better urban design allowing more ground level open space. This is likely to improve pedestrian connectivity and access to communal spaces.

The Planning Proposal is supported by a public benefit offer that proposes contributions to social infrastructure including:

» Providing affordable housing dwellings

» Providing new onsite publicly accessible open space

» Contributions to improve regional open space in the surrounding area

» The future development will include a new large childcare centre (90+ places).

1.2 Scope of the report

This SIS will consider the likely added demand for community facilities, human services and open space (together known as social infrastructure) by the people who would occupy the added 390 dwellings. The SIS has been prepared at a high level suited to this initial Planning Proposal application stage. Other cumulative or social impact issues generated by the added dwellings, such as longer construction periods, should be considered in more detail at later stages of planning for the site.

The SIS did not involve any new community consultation but has considered the community consultation findings of the *Herring Road Macquarie Park Finalisation Report* (2015). These noted an existing expectation that added social infrastructure and open space will be needed to support population growth in Macquarie Park. The SIS will help in quantifying these added social infrastructure needs. The SIS does not make any specific recommendations about the ways in which the demand should be met.

2 Social Infrastructure Statement

2.1 Site context

The site is located within the Macquarie University (Herring Road) Priority Precinct. The status of Priority Precinct recognises the broader strategic context of Macquarie Park being in a transport corridor and centre of economic importance. Planning for Priority Precincts recognises a need for co-operation between state and local governments to deliver infrastructure, including social infrastructure.

2.2 Existing social infrastructure

Table 1 outlines examples of relevant social infrastructure near the site.

Table 1 Nearby existing social infrastructure

Existing facilities	Brief description	Approximate distance from site
Community centres, libraries and cultural facilities		
Macquarie University Art Gallery	Holds regular exhibitions that are open to the public	600m
Macquarie University Library	Restrictions apply to members of the public for borrowing	850m
North Ryde Library	Facilities include toy library, free Wi-Fi, public computers	3.3km
Lifelong education		
Macquarie University	126ha campus including sports facilities	900m
Greenwood Macquarie Park Childcare	162 approved places for long day care for 0 to 6-year olds Vacancies currently showing for all ages	On current site
Goodstart early learning North Ryde	53 approved places for long day care for 0 years to over pre-school ages Some current vacancies except for 0 to 2 year olds	400m
Health and Wellbeing		
Macquarie University Hospital	A private not-for-profit teaching hospital	210m

Existing facilities	Brief description	Approximate distance from site
Ryde Hospital (public)	Within the Northern Sydney Local Health District, providing inpatient, outpatient and community services	4.1km
Entertainment		
Macquarie Centre (Retail, cinemas, fresh food, medical centre and pharmacy, postal services)	Major shopping centre owned by AMP Capital Retail Trust General trading hours 9:30 am to 9pm	450m
Public transport		
Macquarie Centre Bus stand	Major interchange with access to over 20 routes	450m
Macquarie University Train Station	On the North Shore Line Wheelchair accessible	450m
Recreation		
Christie Park	Sports fields used for soccer, has access to BBQ's, picnic area and toilets	300m
Lane Cove National Park (Shrimptons Creek Trail) (Tunks Hill picnic area)	670ha regional open space containing walking tracks, cycling trails, canoeing and boating facilities, campgrounds, picnic and BBQ facilities	 (1.3km) (2.1km)

Source: Mychild.gov.au and acecqa.gov.au/national-registers accessed 8/9/2017.

Table 1 shows that the site presently has good access to a range of social infrastructure types.

Gaps in current access include:

» local community centre

» public library

» local open space (parks and playgrounds).

There are several planning policy documents that discuss this existing need for social infrastructure within Macquarie Park, including:

» *City of Ryde draft Social and Cultural Infrastructure* (2014) identifies the need for a district level facility within Macquarie Park.

» *City of Ryde Community Hubs Plan* (2012) adopts an approach of delivering community hubs in high growth centres.

» *City of Ryde Integrated Open Space Plan* (2012) identifies a local open space deficit.

» *Draft Macquarie Park Recommendations Paper* (2013) makes recommendations including to provide fitness trails and urban plazas.

» *Macquarie University (Herring Road) Finalisation Report* (2015) suggests the need for local parks dispersed throughout the precinct.

2.3 Planned social infrastructure

Recognising the growth planned for the Macquarie University (Herring Road) Priority Precinct, it is understood that several major new community and open space facilities are currently planned. This includes several facilities nearby the site including:

» A new regional library and creative hub as part of the renewal of Macquarie Centre[1]

» A new regional civic precinct (1 Devlin Road)[2]

» Shrimptons Creek Precinct Activation[3]

» An indoor recreation facility and public open space (62-82 Talavera Road)[4]

It is anticipated that the district and regional scale of these planned facilities will enable them to meet the needs of a significant proportion of expected population growth in the area.

2.4 Likely future population

To help understand the impact of the added population of the Planning Proposal, Table 2 shows some key characteristics of the current population. The profile of the City of Ryde LGA is shown for comparison purposes.

Table 2 Key Macquarie Park population characteristics 2016

	Macquarie Park	Ryde LGA
Population number (2016)	8,509	121,807
Age groups	%	%
Babies and pre-schoolers (0-4 years)	5.9	6.1
Primary school aged (5-11 years)	3.5	7.5
Secondary schoolers (12-17 years)	1.9	5.5
Tertiary education and independence (18 to 24 years)	23.3	10.7
Young workforce (25-34 years)	30.9	18.2
Parents and homebuilders (35-49 years)	17.9	21
Older workers and pre-retirees (50-59 years)	5.6	11.7
Empty nesters and retirees (60-69 years)	5.3	9.1
Seniors and the elderly (70+ years)	5.7	10.1
Households	%	%
Couple with children	18.2	34.5
Couples without children	28.2	23.6

[1] Subject to Voluntary Planning Agreement between AMP Capital and City of Ryde Council
[2] More information at http://www.ryde.nsw.gov.au/Business-and-Development/Major-Development/Ryde-Civic-Precinct-Redevelopment
[3] More information at http://www.ryde.nsw.gov.au/Recreation/Parks-and-Sportsgrounds/Works-and-Improvements/SCPA
[4] Subject to Voluntary Planning Agreement between Holdmark and City of Ryde Council

	Macquarie Park	Ryde LGA
Single parent families	5.7	8.5
Group household	9.3	5.4
Lone person	29.3	22.3
Dwellings	%	%
Owned outright	12.5	28.3
Owned with mortgage	16.5	28.3
Rented (total)	63.5	37.1
Proportion of households with no registered motor vehicles	22.4	11.4
Cultural background	%	%
Percentage overseas born	60.4	46.9

Source: http://profile.id.com.au/ryde accessed 8/9/2017

Assuming the future population of residents will be similar to the current Macquarie Park suburb profile, Table 2 shows that they will be characterised by:

» High proportions of lone person households

» High proportions of young adults 18-34 years

» Relatively low proportions of children

» Relatively low proportions of older people

» Higher proportions of people renting their accommodation

» Higher proportions of cultural diversity.

To forecast the population numbers, Table 3 shows current occupancy rates by dwelling type.

Table 3 Average occupancy rates 2016

Area	High density	Medium density	Low density	All dwellings average
Macquarie Pak	2.13	2.08	2.1	1.94
Ryde LGA	2.15	2.48	3.14	2.48

Source: ABS Community Profile (2016) Code SSC12437 (SSC)

Applying the average high-density occupancy rate of 2.1 persons suggests the Planning Proposal will result in a total added population of around 800 people (shown in Table 4).

Table 4 Projected population change

Site	Dwelling yield	Average household size (persons)	Estimated Population
Current	879	2.1	1,846
Proposed	1,269	2.1	2,665

Source: Meriton Group, 2017

2.5 Likely future demand for social infrastructure

This section identifies the likely social infrastructure needs for a future added population of around 800 people at the site. The assessment relies on standards and thresholds available using a desktop review of City of Ryde policy documents and Elton Consulting knowledge of best practice community facility and open space provision standards.

Community centres

The existing demographics of the Macquarie Park population suggests community centres in the area will need to especially accommodate:

» The needs of households with young children (such as playgroups)

» Opportunities for cultural expression and celebrations of diversity (including language classes for new migrants)

» Catering for single person households who may feel socially isolated and renters who may experience increased insecurity of tenure by providing programs and events that facilitate social connections

» Social programs and activities for young people.

City of Ryde S94 Development Contributions Plan interim update (2014) standards for provision are one community centre of 600-800sqm for every 7,000 – 10,000 persons. On this basis, the added population would not trigger a need for provision of a local community centre.

There are no existing community centre near the site. This means the added population is likely to increase pressure on existing nearby community centres in North Ryde and Epping.

The planning for a Library and Creative hub at Macquarie Centre and Ryde Civic Precinct Redevelopment is likely to have substantial capacity. As well as addressing the existing current shortfall it is likely to meet the needs of the added site population.

Residents living in high density will have limited adequate space at home for some activities such as meeting friends, entertaining guests and holding celebrations. Leading practice in high density locations suggests residents need good access to facilities outside their home such as an onsite communal lounge room or function room that offers a gathering place to meet.

Library facilities

New libraries are typically planned according to benchmarks contained in the NSW State Library publication *People Places: A Guide for Public Library Buildings in NSW* (2012). This suggests 39sqm of library floor space be provided for every 1,000 people for populations between 20,000 and 35,000 people. The demand generated by the added population at the site would likely result in some increased pressure experienced at North Ryde and Epping local libraries.

The planned provision of a regional library as part of the Library and Creative hub at Macquarie Centre would be likely to have substantial capacity to cater for the library needs of the added site population.

Cultural facilities

Cultural facilities such as galleries, performance and entertainment venues are typically provided at a district and regional level. The planning for the Ryde Civic Precinct Redevelopment includes a 400 seat performance venue to replace the current ageing Civic Hall and is likely to have substantial capacity. A proportion of the added population could be expected to want to access more locally focused spaces designed for smaller scale creative and cultural activities. This demand may place some increased pressure on local studio, workshop, rehearsal and exhibition space.

Lifelong education

The higher education needs of the added population would largely be met through existing university and TAFE facilities, including Macquarie University.

Planning for the secondary and primary school education needs of added populations is the responsibility of the Department of Education. In urban renewal areas such as Macquarie Park, government policy suggests optimising use of existing school assets. Nearby public schools include Kent Road Public School and North Ryde Public School. Enrolment data suggests that these local schools are undergoing moderate levels of enrolment growth. It is understood that a new primary school on Smalls Road (about 4km from the site) is planned to open in 2020[5]. When built, it could be expected that this school would have capacity to cater for the primary school needs of the added site population.

Based on 3.5% of the future population being primary school aged and 2% high school aged, 28 places in local primary schools and 16 places in local high schools would be needed. Some of this demand is likely to be met by independent private school providers.

Many residents are likely to be households with children. A proportion of these are likely to want to access different forms of childcare such as long day care, family day care, occasional care and playgroups. *City of Ryde S94 Development Contributions Plan interim update* (2014) standards for long day care provision are one place per 11 children aged 0 to 4 years. A more current standard for centre based care is one place per 3 children aged 0 to 4 years.

Based on 6% of the future population being babies and pre-school aged, the need for around 16 extra places in centre based childcare would be needed.

There is currently a large centre based childcare facility on the site. The proponent has provided information that this centre would be relocated within Macquarie Park before commencing any new development. This would result in no net loss of childcare places in the nearby area.

It is understood that the Planning Proposal also includes a commitment to provide a large childcare centre onsite supplying at least 90 places. This scale could be increased subject to demand and market conditions. It is highly likely that this childcare centre would have capacity absorb all demand generated by the added population.

Health and wellbeing

Residents are likely to access community health services and specialist health services such as outpatient clinics, maternal and child health services, oral health, counselling and welfare services.

The added population is likely to create some extra pressure on the capacity of local health services. This would need to be factored in to the strategic planning of the Northern Sydney Local Health District.

Based upon a benchmark of 1 GP per 1,000 people, the added population will reasonably contribute to the need for more health staff. This need is likely to be met through commercial feasibility of nearby medical practices and allied health services.

Recreation

Access to open space is regarded as critical to physical and mental wellbeing. Leading practice in high density locations suggests residents need good access to passive open space. Open space offers chances for physical activity and places for community interaction that encourage social cohesion. In high density urban areas, the quality of open space is more crucial than its quantity. High quality

[5] More information at http://www.dec.nsw.gov.au/about-the-department/our-reforms/innovative-education-successful-students/newschools/smalls-road-public-school

pedestrian and cycle linkages connections are also important to link and enable better usage of spaces.

As noted in section 2.2, there is an existing shortfall of local open space in Macquarie Park. Best practice suggests that residents should ideally be within a 400m walk from open space. The site is currently within walking distance of a range of recreational facilities at Christie Park.

Open space in higher density apartment locations is usually met through a combination of public, semi-public and private open space. There are no recognised standards for open space provision in higher density locations. It is generally accepted that traditional measures using a square metre per person ratio are impractical these settings.

The Planning Proposal indicates that the site can supply close to 7% of the site area (0.13ha) as public open space in the form of a landscaped linear connection through the site. 24.5% of the site area (0.48ha) is also proposed as private open space. This totals 31% of the site area.

To suitably meet the social needs of residents, the open space should consider design that encourages social interaction, promotes safety and includes high quality embellishments such as seating and age appropriate amenities and equipment.

Public benefit offer

The Planning Proposal is accompanied by a public benefit offer. These commitments would supply social infrastructure amenities and services to the broader community as well as benefiting the future residents living onsite. The offer has the potential to offset the childcare and recreation needs of the added population. The offer may also be considered to provide relative benefits through the provision of new affordable housing and upgrades to nearby district open space.

3 Conclusion

An added population of around 800 people is likely to be generated by the Planning Proposal. This study concludes that there would be no need to construct new social infrastructure facilities to meet this demand, however some further increase in demand on existing facilities and services is likely. It is also expected that the public benefit offer that accompanies the Planning Proposal will generate some wider social benefit.

Table 5 provides a summary of the expected added social infrastructure demand for the Planning Proposal.

Table 5 Summary of likely social infrastructure demand from added population

Social infrastructure type	Brief description of likely impact
Community centres, libraries and cultural facilities	
Community facilities	Likely to require onsite provision of a meeting and gathering space, such as a function room or community lounge area (approximately 60sqm). Some added pressure on local community centres and social programs. Will contribute to demand for district level facilities such as the planned Library and Creative hub at Macquarie Centre and Ryde Civic Precinct Redevelopment.
Cultural facilities	Some added pressure on local cultural facilities. Will contribute to demand for district level creative activities such as the planned Library and Creative hub at Macquarie Centre and Ryde Civic Precinct Redevelopment.
Libraries	Some added pressure on local library facilities. Will contribute to demand for district and regional library facilities such as the planned Library and Creative hub at Macquarie Centre.
Lifelong education	
Tertiary (University)	No identified impact. A proportion of the student population may be attracted to residing at the proposed development.
Secondary (High Schools)	Some added pressure on existing local high schools. Around 16 extra places may need to be met in the public and private systems.
Primary (Primary Schools, and out of school hours care)	Some added pressure on local primary schools and on local out of hours school care and vacation care services. Around 28 extra places may be needed to be met in the public and private systems. Will contribute to demand for planned Smalls Road Primary School.
Early childhood (centre based child care)	Assuming existing facility onsite is relocated within Macquarie Park, the additional demand of around 16 places is likely to be offset through commitment to new onsite provision of at least 1 large 90+ place childcare centre.

Social infrastructure type	Brief description of likely impact
Health and Wellbeing	
Health services	Some additional need which is likely to be met by nearby medical practices. May contribute to demand for 1 new local general practitioner and additional general practice nurses.
Recreation	Local passive open space needs are likely to be met onsite. Some added pressure on existing district active open space that is likely to be offset through commitment to upgrades of Christie Park which is within walking distance of the site. Access to regional open space at Lane Cove National Park may be limited for residents without a car.
Public transport	Minimal increase in pressure on existing bus and train services.

Beyond demand for social infrastructure, it is expected that social benefits can also be achieved through further consideration of public space and building design in future stages of the proposed development.

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Attachment 7: Bushfire Risk Assessment prepared by Bushfire Planning Services

Member of the Fire Protection Association of Australia

112 Talavera Road, Macquarie Park NSW 2113.

Sunday, 12 August 2018

Prepared and certified by:	**Matthew Willis** BPAD – Level 3 Certified Practitioner Certification No: BPD-PA 09337		12/08/2018 **28/08/2018**
Can this proposal comply with AS3959-2009 (inc PBP addendum 3)?		Yes	
Is referral to the RFS required?		Yes. Integrated development and SFPD	
Can this development comply with the requirements of PBP?		Yes	
Plans by Meriton.		(Attached)	

Bushfire Planning Services
15 Parkcrest Place
Kenthurst NSW 2156
0428408577 96543228
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Bushfire Risk Assessment

Sunday, 12 August 2018

Contact
Tom Hutchison
Meriton
Level 11 Meriton Tower
528 Kent Street
Sydney NSW 2000
9287 2888

Subject Property
Lot 422, DP 1221081
112 Talavera Road
Macquarie Park NSW 2113

1. Contents

2. Executive summary.

Bushfire Planning Services has been requested by Mr Tom Hutchison of Meriton to supply a bushfire compliance report on Lot 422, DP 1221081, number 112 Talavera Road, Macquarie Park, NSW 2113.

The proposal is for the construction of a multi-use residential unit development containing residential units (class 2) a day-care centre (class 9b) and retail units (class 6).

The development can meet all the bushfire requirements for residential subdivision and the Special Fire Protection Development (SFPD) component as outlined in the RFS document Planning for Bushfire Protection.

The retail spaces are not covered by bushfire requirements as the general fire safety provisions of the NCC are considered as appropriate as per Planning for Bushfire Protection.

The hazard to the proposal is an area of forest vegetation to the north-east of the subject lot.

The subject lot is separated from the hazard by the M2 Motorway, a distance of at least 68m to the lot boundary.

The separation distance within the lot to the closest part of the residential development is 6.5m and the setback to the closest part of the day-care is 6.5m to the outdoor area and 22m to the closest part of the rooms.

The slope beneath the hazard is 0-5 deg downslope.

Given the above the residential section of the development complies with the setback needed to achieve BAL-12.5 in accordance with table 2.2.4 of AS3959-2009.

The SFPD area can achieve compliance with table A2.6 of Planning for Bushfire Protection.

All other aspects of this proposal can or can be made to comply with the acceptable solutions for subdivision and SFPD as outlined in Planning for Bushfire Protection.

Based on the assumptions and measurements contained within this assessment the development is considered to be able to meet the requirements of clause 44 of the Rural Fires Regulation 2008 and the RFS requirements as outlined in Planning for Bushfire Protection.

3. General.

As this proposal includes the construction of a multi dwelling building and that the building also includes a Special Fire Protection Development (day-care) the proposal is considered to be "integrated development" and is required under section 91 of the Environmental Planning and Assessment Act to obtain a section 100B Bushfire Safety Authority from the Rural Fire Service.

For the Rural Fire Service to issue the 100B Bushfire Safety Authority it must be satisfied that the proposal can meet the requirements of clause 44 of the Rural Fires Regulation.

This assessment is based around the requirements of clause 44 and indicates if and how the proposal meets these requirements.

The following text in italics is a copy of clause 44 of the Rural Fires Regulation 2008;

44 Application for bush fire safety authority

For the purposes of section 100B (4) of the Act, an application for a bush fire safety authority must be made in writing and must include the following:

(a) a description (including the address) of the property on which the development the subject of the application is proposed to be carried out,

(b) a classification of the vegetation on and surrounding the property (out to a distance of 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in Planning for Bush Fire Protection,

(c) an assessment of the slope of the land on and surrounding the property (out to a distance of 100 metres from the boundaries of the property),

(d) identification of any significant environmental features on the property,

(e) the details of any threatened species, population or ecological community identified under the Threatened Species Conservation Act 1995 that is known to the applicant to exist on the property,

(f) the details and location of any Aboriginal object (within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property,

(g) a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters:

(i) the extent to which the development is to provide for setbacks, including asset protection zones,

(ii) the siting and adequacy of water supplies for firefighting,

(iii) the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency,

(iv) whether or not public roads in the vicinity that link with the fire trail network have two-way access,

(v) the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response,

(vi) the adequacy of bush fire maintenance plans and fire emergency procedures for the development site,

(vii) the construction standards to be used for building elements in the development,

(viii) the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development,

(h) an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of Planning for Bush Fire Protection.

Any wording that appears in blue italics are quotes from Planning for Bushfire Protection 2006 (PBP).

Some of the distance measurements used in this report have been taken from aerial photographs and as such are approximate only. If doubt exists, the distances should be verified by survey.

4. Block description

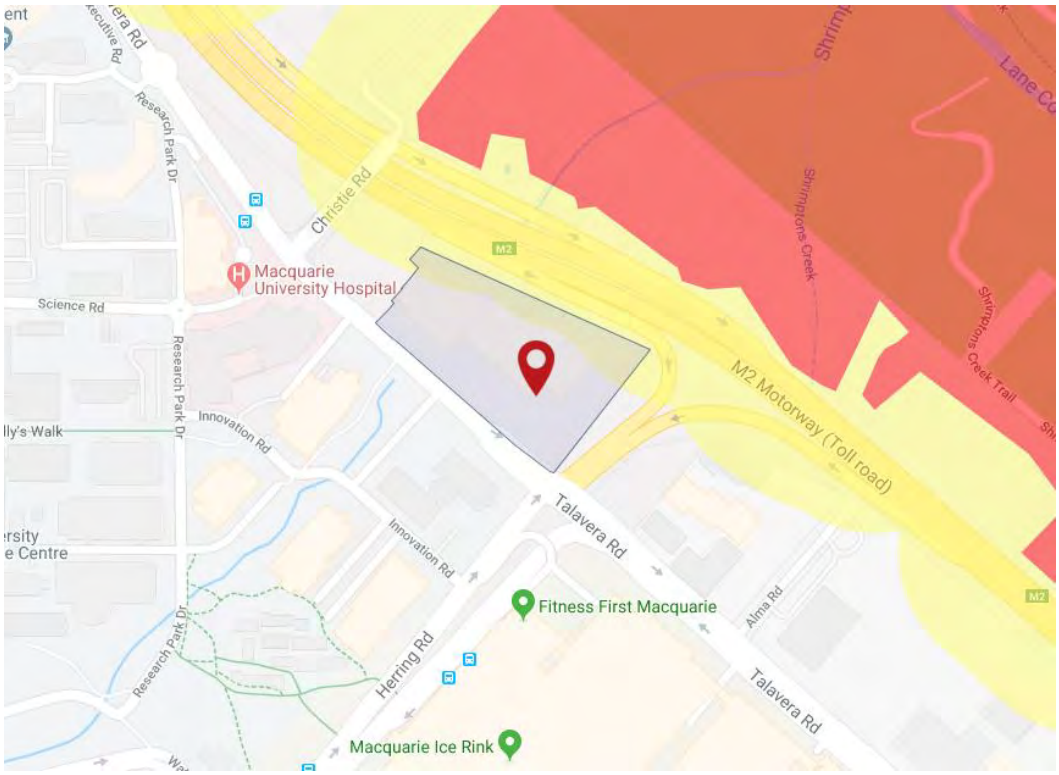
Clause 44 requirement. "a description (including the address) of the property on which the development the subject of the application is proposed to be carried out"

The subject lot is a large allotment with road frontage on 3 sides, the north-east, south-east and south-west.

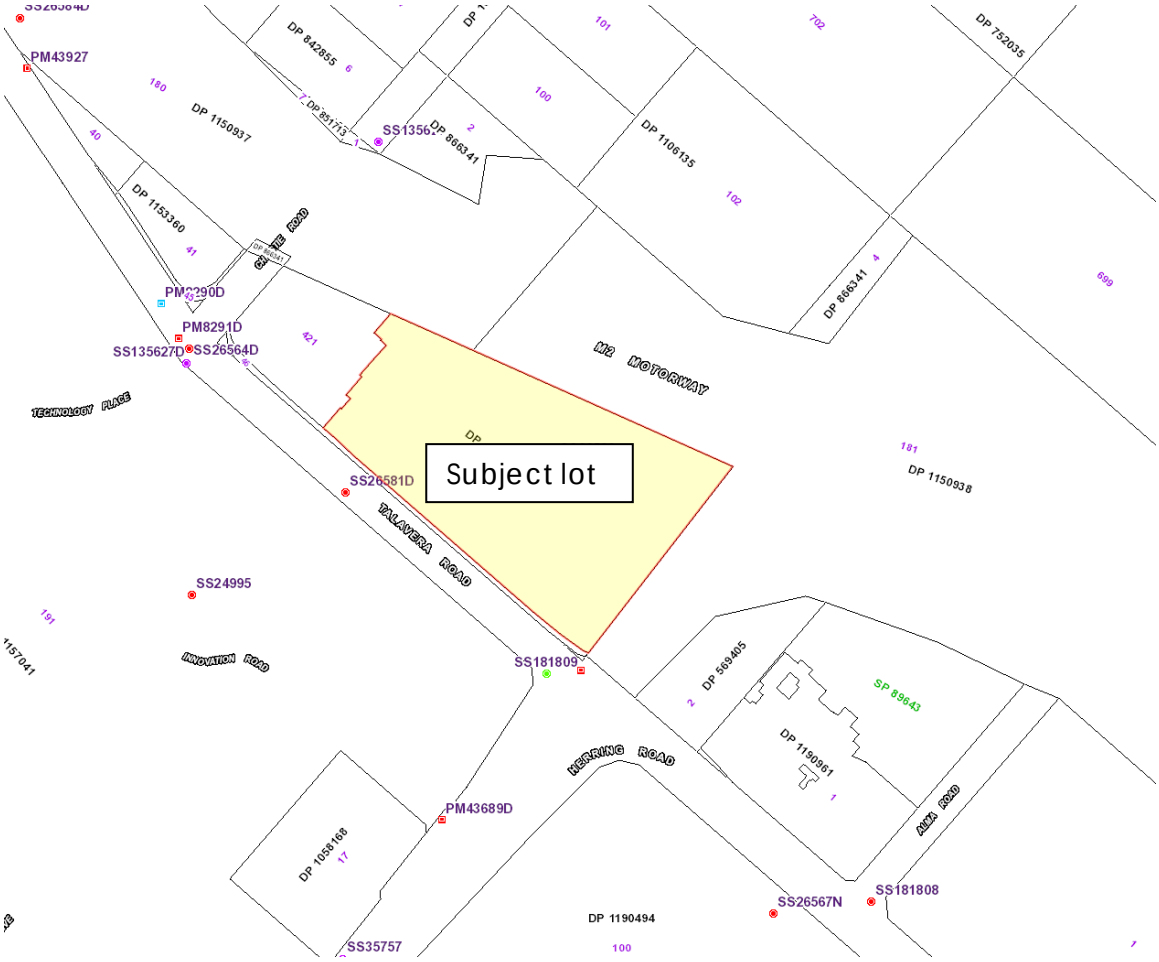
There is existing commercial development to the north-west.

- *Lot 422,*
- *DP 1221081,*
- *112, Talavera Road Macquarie Park,*
- *LGA, Ryde,*
- *Area, 19398m2,*

PHOTO 1 (ABOVE) SHOWS A GENERAL OVERVIEW OF THE SURROUNDING AREA.



MAP 1 IS AN EXTRACT FROM THE COUNCILS BUSHFIRE PRONE LAND MAP.



MAP 2 ABOVE SHOWS THE CURRENT CADASTRAL DATA FOR THE DEVELOPMENT AND SURROUNDING BLOCKS.

5. Vegetation

Clause 44 requirement *"a classification of the vegetation on and surrounding the property (out to a distance of 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in Planning for Bush Fire Protection"*

The study area for the vegetation is 140m surrounding the development site. The vegetation assessment has been undertaken using the methodology of "Ocean Shores to Desert Dunes, Native Vegetation of New South Wales and the ACT" by David Keith.

The lands within the study area for this proposal comprises of mostly commercial development, urban landscaping and transport infrastructure.

The vegetation that is mapped as the hazard to this proposal is to the north-east of the subject lot.

The vegetation has several classifications, these include:

- *Weeds and Exotics*
- *Western Vine Thickets*
- *Southern Tablelands Dry Sclerophyll Forest*
- *Hornsby Enriched Sandstone Exposed Woodland.*

In general, the vegetation is highly disturbed and doesn't fit any one recognised category.

For the purpose of this assessment a worst-case scenario of Southern Tablelands Dry Sclerophyll Forest has been used,

This is considered as an overestimation of the current vegetation structure.

PHOTO 2 . THE YELLOW DASHED LINE DEFINES THE EXTENT OF THE 140M VEGETATION STUDY AREA FOR THIS PROPOSAL.

6. Slope

Clause 44 requirement "*an assessment of the slope of the land on and surrounding the property (out to a distance of 100 metres from the boundaries of the property)*",

For the purpose of the slope analysis for this proposal 1 slope run beneath the mapped hazard to the north-east has been evaluated.

The run is shown on the following topographical map and the run details are shown in table 1.

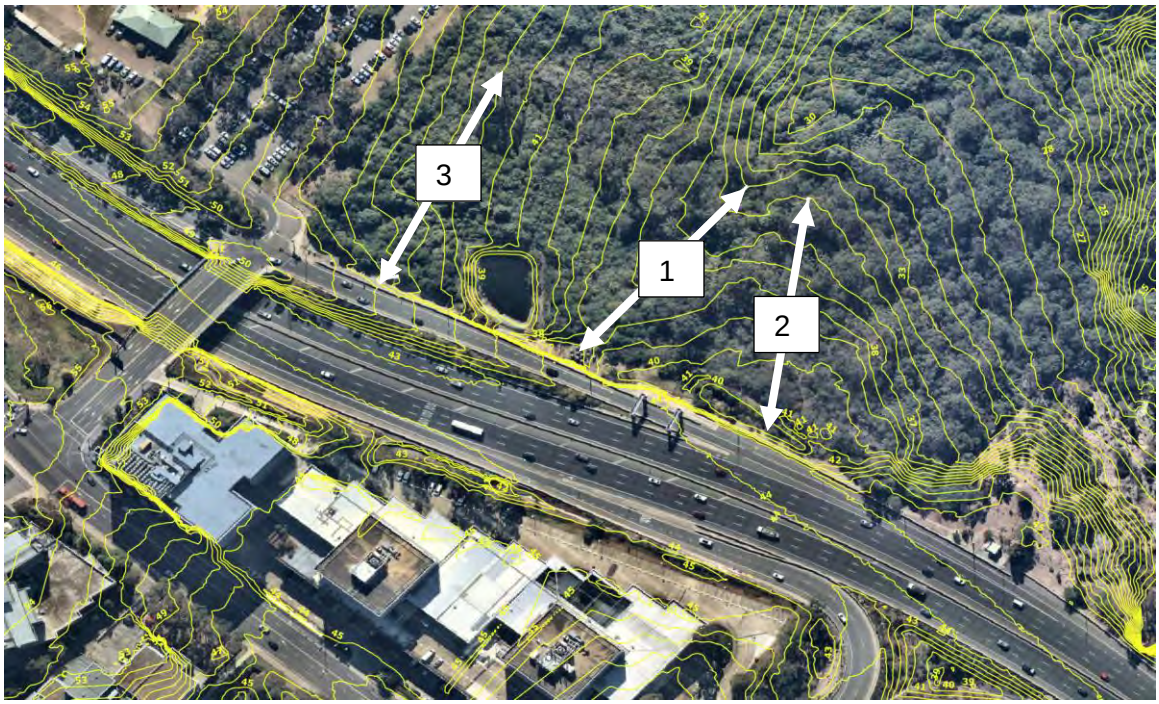


TABLE 1. THE ABOVE TABLE SHOWS THE PARTICULARS OF THE SLOPE RUNS USED IN THIS ASSESSMENT.

Slope run	*Starting height (m)*	*Finish height (m)*	*Length of run (m)*	*Height difference (m)*	*Slope (deg)*
1	*38*	*34*	*100*	*4*	*2.3*
2	*40*	*35*	*100*	*5*	*2.8*
3	*47*	*43*	*100*	*4*	*2.3*

7. Significant features

Clause 44 requirement "*identification of any significant environmental features on the property*"

I have not been informed of any significant environmental features that would be affected by this proposal.

8. Threatened Species

Clause 44 requirement "*the details of any threatened species, population or ecological community identified under the Threatened Species Conservation Act 1995 that is known to the applicant to exist on the property,*"

I have not been informed of any threatened species that would be affected by this proposal.

9. Aboriginal Heritage

Clause 44 requirement "*the details and location of any Aboriginal object (within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property,*"

I have not been informed of any places of cultural significance that would be affected by this proposal.

10. Bushfire Assessment Methodology

Clause 44 requirement"a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters:

The methodology used in the assessment of bushfire threat to the subject property is outlined in;

- *Planning for Bushfire Protection 2006 as published by the New South Wales Rural Fire Service, and*
- *Australian Standard 3959-2009, Construction of buildings in Bushfire Prone Areas.*

11. Setbacks

(i)	Clause 44 requirement "the extent to which the development is to provide for setbacks, including Asset Protection Zones,"

The available setbacks between the proposal and the hazard have been taken from the north-eastern boundary of the subject lot then the setbacks available within the lot have been added where required.

These setbacks have been specifically targeted as this area contains the Special Fire Protection aspect of the proposal.

See following plan for details of setback within the lot.

Setback	*Available distance*
Outside lot	*74m*
To external face of building	*6.5m*
To SFPD (excluding outdoor area)	*22m*
Total setbacks available	*80.5m and 96m*

The following overlaid aerial photo shows the setback available over the larger area of the lot. It should be noted that the setbacks shown do not include the setback of the building within the lot which is nominally 6.5m.

12. Water

(ii)	Clause 44 requirement "the sighting and adequacy of water supplies for firefighting,"

The following map is an extract from the Sydney Water hydrant map for the area. Hydrants are shown as blue dots on a blue line.

As can be seen there are multiple hydrants indicated around the subject lot.

13. Access

(iii)	Clause 44 requirement "the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency,"

The subject lot has road frontage onto Talavera Road with access proposed from Christie Road to the north-west and a M2 entry/exit to the south-east.

Talavera Road is a two-way road that are considered to be capable of handling emergency service vehicles.

14. Fire trails

(iv)	Clause 44 requirement "whether or not public roads in the vicinity that link with the fire trail network have two-way access,"

Fire trails are not planned or recommended as part of this development proposal. All roads in the vicinity have two-way access.

15. Property Access

(v)	Clause 44 requirement "the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response,"

In accordance with the requirements of Planning for Bushfire Protection there are no access requirements for this proposal.

16. Maintenance plans

(vi)	Clause 44 requirement "the adequacy of bush fire maintenance plans and fire emergency procedures for the development site"

No additional advice or information regarding bushfire maintenance plans & fire emergency procedures has been provided by the proponent.

Under the Rural Fires Act 1997 sect 52, the local council's bushfire management committees are required to prepare and submit management plans for the rural fire district or part of the state which it is constituted.

The plan covers the following,

- a plan of operations and
- a bushfire risk management plan.

The plan of operations must be reviewed within every 2 years and the bushfire risk plan must be reviewed within each 5 years.

Should a bushfire emergency impact upon this area, the implementation of the existing councils Sect. 52 Operations & Risk Plan should be adequate for bushfire suppression, hazard management and maintenance.

I have not been informed of any site-specific bushfire plans.

17. Building construction standards

(vii)	Clause 44 requirement "the construction standards to be used for building elements in the development,"

Table 2.4.2 of AS 3959-2009 'Construction of Buildings in a Bushfire Prone Area' outlines the appropriate level of construction to be used once analysis has been undertaken in accordance with the methodology of that standard.

Given the variables of slope, vegetation classification and achievable setback distances from the classified vegetation have been considered the resultant BAL (Bushfire Attack Level) for this proposal has been determined as being less than or equal to BAL 29.

The appropriate construction standards for construction in bushfire prone areas are;

- AS 3959-2009 (amendment 3) Construction of Buildings in Bushfire Prone Areas.
- Building Code of Australia and the applicable referenced standards.
- The addendum to appendix 3 of Planning for Bushfire Protection.

18. Sprinkler systems

(viii) Clause 44 requirement "the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development,"

It is assumed that the building will be fitted with an internal sprinkler system that will be installed in line with the appropriate Australian Standards.

19. Compliance with chapter 4 of PBP (Residential subdivision)

Clause 44 requirement "assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of Planning for Bush Fire Protection."

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
Radiant heat levels at any point on a proposed building will not exceed 29 kW/m²	an APZ is provided in accordance with the relevant tables and figures in PBP	**Yes**	In accordance with table A2.4 of Planning for Bushfire Protection.
	the APZ is wholly within the boundaries of the development site	**No**	The APZ for this development is contained within the subject lot and on the neighbouring developed or otherwise historically managed lands.
Applicants demonstrate that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	the APZ is not located on lands with a slope exceeding 18 degrees	**Yes**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
APZs are managed and maintained to prevent the spread of a fire towards the building	in accordance with the requirements of 'Standards for Asset Protection Zones (RFS 2005)	**Achievable**	APZ's used in this assessment are all developed land or otherwise historically managed.
Fire fighters are provided with safe all-weather access to structures (thus allowing more efficient use of firefighting resources)	public roads are two-wheel drive, all weather roads	**Yes**	Existing roads provide this.
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area	urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions	**N/A**	The subject development does not incorporate any new or redesigned public roadway.
	Non-perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle)	**N/A**	
	the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas	**N/A**	
	roads are through roads. Dead end roads are not more than 200 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end	**N/A**	
	traffic management devices are constructed to facilitate access by emergency services vehicles	**N/A**	
	there is a minimum vertical clearance to a height of four metres above the road at all times	**N/A**	
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress	**N/A**	
	the minimum distance between inner and outer curves is six metres	**N/A**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient.	**N/A**	
	Public roads have a cross fall not exceeding 3 degrees	**N/A**	
	the internal road surfaces and bridges have a capacity to carry fully-loaded fire fighting vehicles (15 tonnes)	**N/A**	
The capacity of public road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles	the capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicate load rating	**N/A**	
Roads that are clearly sign-posted (with easily distinguishable names) and buildings/properties that are clearly numbered	public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression	**N/A**	
	public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression	**N/A**	
There is clear access to reticulated water supply	public roads up to 6.5 metres wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression	**Yes**	There are several hydrants located in the surrounding area.
	one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression	**No**	
Parking does not obstruct the minimum paved width	parking bays are a minimum of 2.6 metres wide from kerb edge to road pavement. No services or	**N/A**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	hydrants are located within the parking bays		
	public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road	**N/A**	
Access to properties is provided in recognition of the risk to fire fighters and/ or evacuating occupants	at least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 metres from a public through road	**N/A**	
The capacity of property access road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles **All weather access is provided**	bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes	**N/A**	
	roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge)	**N/A**	
Property road widths and design enable safe access for vehicles	Note: No specific access requirements apply in a urban area where a 70 metres unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency fire fighting vehicles (i.e. a hydrant or water supply)	**Yes**	Access will be available from Talavera Road which has a speed limit of less than 70khph.
	in forest, woodland and heath situations, rural property access roads have passing bays every 200 metres that are 20 metres long by two metres wide, making a minimum trafficable width of six metres at the passing bay	**N/A**	
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches	**N/A**	
	internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12 metre outer radius	**N/A**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress	**N/A**	
	the minimum distance between inner and outer curves is six metres	**N/A**	
	the cross-fall is not more than 10 degrees	**N/A**	
	maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above	**N/A**	
	access to a development comprising more than three dwellings have formalised access by dedication of a road and not by right of way	**N/A**	
The width and design of the fire trails enables safe and ready access for firefighting vehicles	a minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass) is provided	**N/A**	The subject development does not incorporate nor require any new or redesigned fire trail access.
	the trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed	**N/A**	
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided	**N/A**	
	the cross-fall of the trail is not more than 10 degrees	**N/A**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	the trail has the capacity for passing by: - reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and/or - a passing bay every 200 metres, 20 metres long by three metres wide, making a minimum trafficable width of seven metres at the passing bay	**N/A**	
Fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non authorised persons	the fire trail is accessible to fire fighters and maintained in a serviceable condition by the owner of the land	**N/A**	The subject development does not incorporate nor require any new or redesigned fire trail access.
	appropriate drainage and erosion controls are provided	**N/A**	
	the fire trail system is connected to the property access road and/or to the through road system at frequent intervals of 200 metres or less	**N/A**	
	fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge)	**N/A**	
	gates for fire trails are provided and locked with a key/lock system authorised by the local RFS	**N/A**	
Fire trails designed to prevent weed infestation, soil erosion and other land degradation	fire trail design does not adversely impact on natural hydrological flows	**N/A**	
	fire trail design acts as an effective barrier to the spread of weeds and nutrients	**N/A**	
	fire trail construction does not expose acid-sulphate soils	**N/A**	
(Reticulated water supplies) **Water supplies are easily accessible and located at regular intervals**	reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads	**N/A**	This proposal will utilize existing water infrastructure.
	fire hydrant spacing, sizing and pressures comply with AS 2419.1	**Achievable**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	– 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles		
	hydrants are not located within any road carriageway	**Achievable**	
	all above ground water and gas service pipes external to the building are metal, including and up to any taps	**Achievable**	
	the provisions of parking on public roads are met	**N/A**	
(Non-reticulated water supply areas) **For rural-residential and rural developments (or settlements) in bush fire prone areas, a water supply reserve dedicated to firefighting purposes is installed and maintained.** **The supply of water can be an amalgam of minimum quantities for each lot in the subdivision (community titled subdivisions), or held individually on each lot**	the minimum dedicated water supply required for firefighting purposes for each occupied building excluding drenching systems, is provided in accordance with [PBP] Table 4.2	**N/A**	.
	a suitable connection for firefighting purposes is made available and located within the IPA and away from the structure. A 65mm Storz outlet with a Gate or Ball valve is provided	**N/A**	
	Gate or Ball valve and pipes are adequate for water flow and are metal rather than plastic	**N/A**	
	underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank. A hardened ground surface for truck access is supplied within 4 metres of the access hole	**N/A**	
	above ground tanks are manufactured of concrete or metal and raised tanks have their stands protected. Plastic tanks are not used. Tanks on the hazard side of a building are	**N/A**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	provided with adequate shielding for the protection of fire fighters		
	all above ground water pipes external to the building are metal including and up to any taps. Pumps are shielded	**N/A**	
(Electricity Services) **Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings** **Regular inspection of lines is undertaken to ensure they are not fouled by branches.**	where practicable, electrical transmission lines are underground	**Achievable**	
	where overhead electrical transmission lines are proposed: - lines are installed with short pole spacing (30 metres), unless crossing gullies, gorges or riparian areas; and - no part of a tree is closer to a power line than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002)	**Achievable**	
(Gas Services) **Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings**	reticulated or bottled gas is installed and maintained in accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used	**Achievable**	
	all fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation	**Achievable**	
	if gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal	**Achievable**	
	polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used	**Achievable**	

20. Compliance with chapter 4 of PBP (Special Fire Protection Development)

Clause 44 requirement "assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of Planning for Bush Fire Protection."

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
Radiant heat levels of greater than 10kW/m^2 will not be experienced by occupants or emergency services workers entering or exiting a building	an APZ is provided in accordance with the relevant tables and figures in PBP	**Yes**	Compliance with table A2.6 is achievable. The Asset Protection Zone for this proposal is contained within the subject lot itself and already established and maintained allotments.
	exits are located away from the hazard side of the building	**Achievable**	
	the APZ is wholly within the boundaries of the development site	**No**	
Applicants demonstrate that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	mechanisms are in place to provide for the maintenance of the APZ over the life of the development	**Achievable**	As the Asset Protection Zone is contained within already developed allotments it is considered reasonable to expect that this situation will continue into the future.
	the APZ is not located on lands with a slope exceeding 18 degrees	**Not applicable**	
APZs are managed and maintained to prevent the spread of a fire towards the building	in accordance with the requirements of 'Standards for Asset Protection Zones (RFS 2005) (Note - a Monitoring and Fuel Management Program should be required as a condition of development consent)	**Reasonably Assumed**	All land within the required APZ is managed land.

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
Vegetation is managed to prevent flame contact and reduce radiant heat to buildings, minimise the potential for wind driven embers to cause ignition and reduce the effect of smoke on residents and fire-fighters	compliance with Appendix 5 (PBP)	**Achievable**	
Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle.	internal roads are two-wheel drive, sealed, all-weather roads	**Not applicable**	No new internal roads are planned as part of this proposal.
	internal perimeter roads are provided with at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions	**Not applicable**	
	roads are through roads. Dead end roads are not more than 100 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end	**Not applicable**	
	traffic management devices are constructed to facilitate access by emergency services vehicles.	**Not applicable**	
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided.	**Not applicable**	
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress	**Not applicable**	
	the minimum distance between inner and outer curves is six metres	**Not applicable**	
	maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees	**Not applicable**	
	cross-fall of the pavement is not more than 10 degrees	**Not applicable**	
	roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge)	**Not applicable**	
	roads are clearly sign-posted and bridges clearly indicate load ratings	**Not applicable**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes)	**Not applicable**	
Water supplies are easily accessible and located at regular intervals.	Access points for reticulated water supplies to SFPP developments incorporate a ring main system for all internal roads. Fire hydrant spacing, sizing and pressures comply with AS 2419.1/2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. The provisions of public roads in section 4.1.3 in relation to parking are met.	**Achievable**	
Non-reticulated water supply areas. **A water supply reserve dedicated to firefighting purposes is installed and maintained. The supply of water can be an amalgam of minimum quantities for each lot in the development and be reticulated within dedicated firefighting lines.**	10,000 L is the minimum dedicated water supply required for firefighting purposes for each occupied building, excluding drenching systems. The provision for suitable connection for RFS and or New South Wales fire brigades purposes in section 4.1.3 in relation to water supplies is made available.	**Not applicable**	
Electricity **location of electricity services will not lead to ignition of surrounding bushland or the fabric of buildings or risk to life from damaged electrical infrastructure.**	Electrical transmission lines are underground.	**Achievable**	
Gas **location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.**	Reticulated or bottled gas is installed and maintained in accordance with AS 1596/2002 and the requirements of relevant authorities. Metal piping is to be used. All fixed LPG tanks are kept clear of all flammable materials and located on the non-hazard side of the development. If gas cylinders need to be kept close to the building the release valves must be directed away from the building and away from any combustible material, so that they do not act as catalysts to combustion.	**Achievable**	

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
	Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.		
An emergency and evacuation management plan is approved by the relevant fire authority for the area.	An emergency/evacuation plan is prepared consistent with the RFS guidelines for the preparation of emergency evacuation plan. Compliance with AS 3745/2002 emergency control organisation and procedures for buildings, structures and workplaces for residential accommodation". Compliance with AS 4083/1997 "planning for emergencies - for health care facilities".	**Achievable**	
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	An emergency planning committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an emergency procedures manual. Detailed plans of all emergency assembly areas including "on-site" and "offsite" arrangements as stated in a S3745/2002 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.	**Achievable**	
In relation to eco-tourism accommodation: **suitable refuge areas and evacuation/management arrangements are in place commensurate with the bushfire risk.**	At least one building should be used as a local refuge area and comply with the APZ and construction requirements for residential buildings Cavan's are within 50 m of a refuge building and are clearly signposted. The pass from cabins to the refuge areas are safe with management of surface fuels to less than or equal to 4 t per hectare. The overall accommodation for tourist does not exceed 12 persons. A mechanism for the relocation of occupants on days of a total fire ban or adverse fire activity is provided in the local area in which the development operates.	**Not applicable**	

Explanation of terms;

- *'Achievable'. With appropriate design this aspect can achieve the acceptable solution.*
- *'Reasonably assumed'. It is considered reasonable to assume this requirement has been met.*
- *'N/A'. This item is not considered as relevant to this proposal.*
- *'Yes'. This item can/does comply with the acceptable solution.*

21. Compliance with the Aims and Objectives of Planning for Bushfire Protection.

Aims of Planning for Bushfire Protection	*Opinion*	*Compliant*
The aim of PBP is to use the NSW development assessment system to provide for the protection of human life (including fire fighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment".	*The development assessment procedure has identified that the subject lot is considered to be bushfire prone land. It is considered that this proposal can comply with the aim of PBP of minimising the impacts of a bushfire on the property.*	*Yes*
PBP specific objectives	*Opinion*	*Compliant*
Afford occupants of any building adequate protection from exposure to a bush fire;	*In accordance with table A2.6 of Planning for Bushfire Protection and table 2.4.2 of AS3959-2009.*	*Yes*
Provide for a defendable space to	*It is considered there is adequate defendable*	*Yes*

be located around buildings;	*space around the development.*	
Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition	*Flame contact between the building and identified hazard is considered highly unlikely.*	*Yes*
Ensure that safe operational access and egress for emergency service personnel and residents is available	*It is considered that the access and egress for the site is adequate for firefighting purposes.*	*Yes*
Provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ);	*Normal maintenance can provide for this.*	*Yes*
Ensure that utility services are adequate to meet the needs of fire fighters (and others assisting in bush firefighting).	*Assumed*	

22. Conclusions

It is shown through this assessment that this proposal has all the necessary requirements to meet the conditions of clause 44 of the Rural Fires Regulations and the requirements of Planning for Bushfire Protection and that it is reasonable to expect that the Rural Fire Service will issue a section 100B Bushfire Safety Authority for this development.

The proposal has sufficient setback from the hazardous vegetation to achieve a BAL of less than or equal to BAL-29 for the residential component and less than 10kwm2 of radiant heat energy for the SFPD area.

Bushfires are affected by many external influences such as climactic conditions, vegetation type, moisture content of the fuel, slope of the land and human intervention to name a few and are difficult to predict.

This report does not intend to provide a guarantee that the subject property will survive if a bushfire should impact the surrounding area. The purpose of this report is to show the developments level of compliance or in some cases non-compliance with the New South Wales legislation regarding building in bushfire prone areas.

Where non-compliance is found measures will be suggested that should make the building less susceptible to the various attack mechanisms of a bushfire and comply with the performance requirements of the Building Code of Australia.

The opinions expressed in this report are based on the writers experience and interpretation of the relevant guidelines and standards. Notwithstanding the above, these guidelines and standards are open to interpretation. All care has been taken to ensure that the opinions expressed in this report are consistent with past successful outcomes.

If any further clarification is required for this report please do not hesitate to contact me using the details above.

Yours Sincerely

Matthew Willis

Grad Dip Planning for Bushfire Prone Areas

Bushfire Planning Services Pty Limited.

23. References

Australian Building Codes Board

Building Code of Australia

Volumes 1&2

Canprint

New South Wales Rural Fires Act 1997

Section 100b

Planning NSW [2006]

Planning for Bushfire Protection

A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners

Standards Australia [2009]

Australian Standards 3959

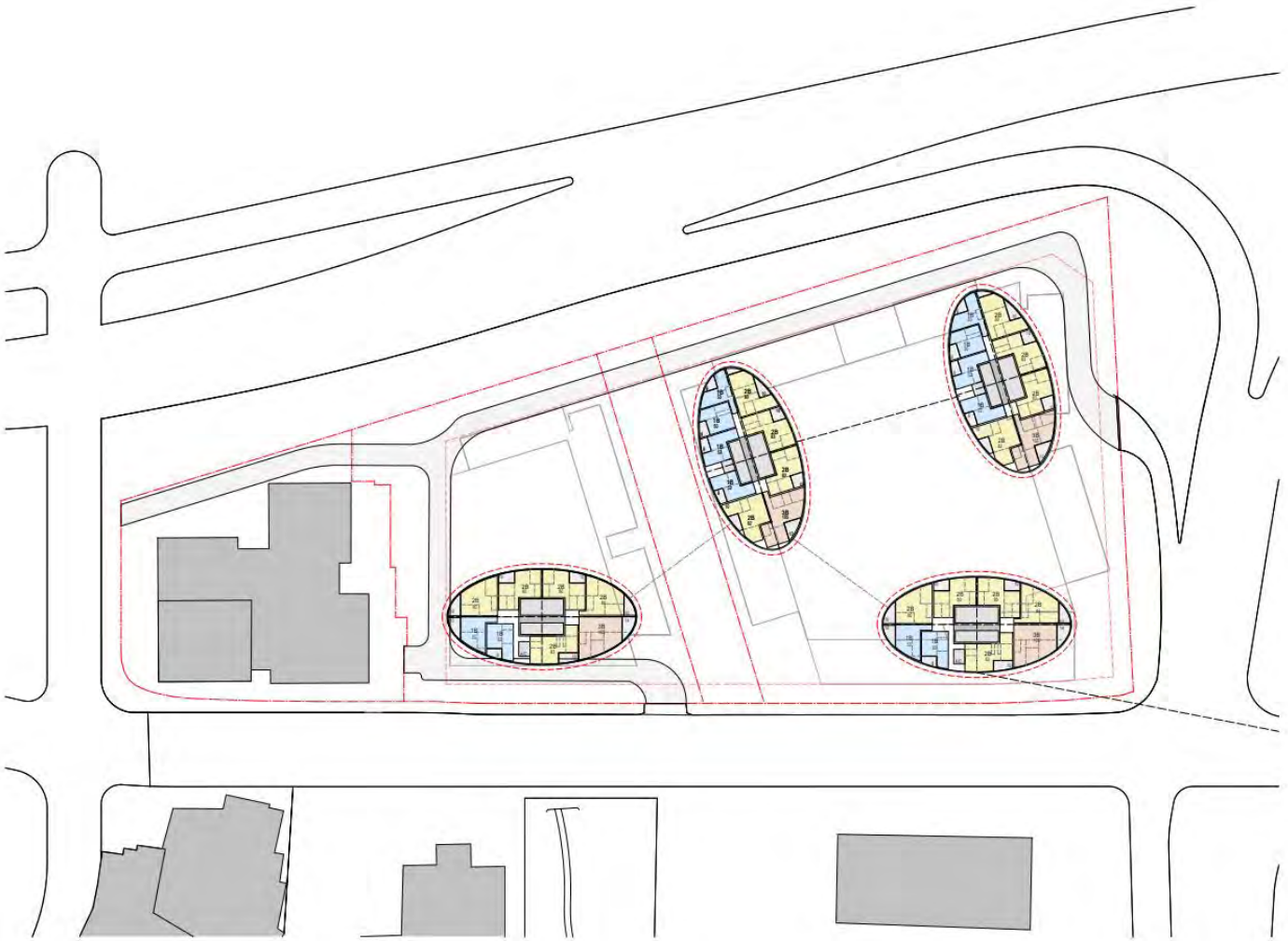
Australian Building Code Board

Edition 2009

Rural Fires Regulation 2008

Clause 44

24. Appendix 1 Plans



Typical Tower

Scale
1:1000 @ A3

0 5 10 15 20 25 50

Project number
5633

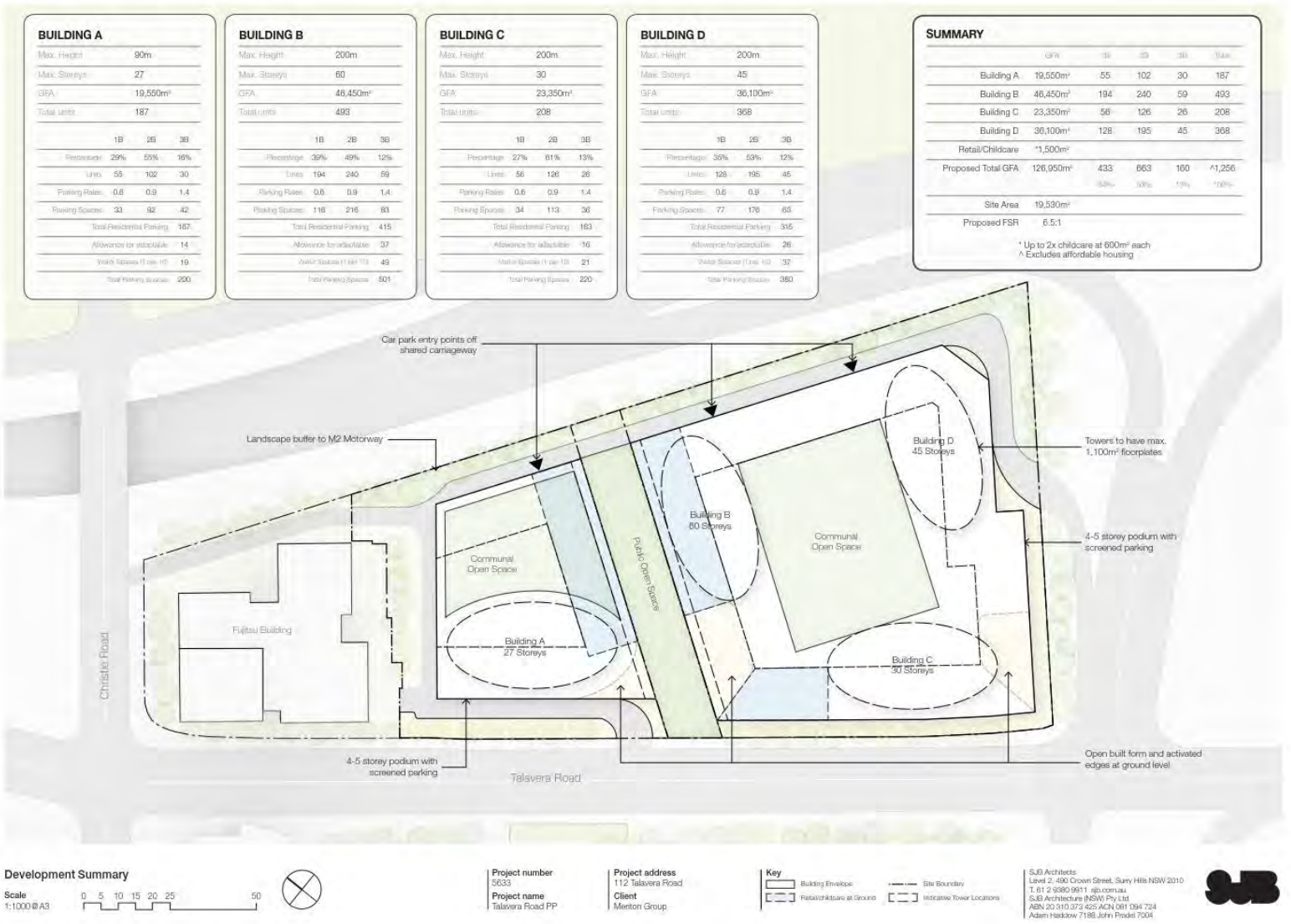
Project name
Talavera Road PP

Project address
112 Talavera Road

Client
Meriton Group

Key
One Bedroom Apt
Two Bedroom Apt
Three Bedroom Apt

SJB Architects
Level 2, 490 Crown Street, Surry Hills NSW 2010
T: 61 2 9380 9911 sjb.com.au
SJB Architecture (NSW) Pty Ltd
ABN 20 310 373 425 ACN 091 094 724
Adam Haddow 7198 John Pradel 7004


BUILDING A
Max. Height 90m
Max. Storeys 27
GFA 19,550m²
Total Units 187
1B 2B 3B
Percentage 29% 55% 16%
Units 55 102 30
Parking Rates 0.6 0.9 1.4
Parking Spaces 33 92 42
Total Residential Parking 167
Allowance for adaptable 14
Visitor Spaces (1 per 10) 19
Total Parking Spaces 200
BUILDING B
Max. Height 200m
Max. Storeys 60
GFA 46,450m²
Total Units 493
1B 2B 3B
Percentage 39% 49% 12%
Units 194 240 59
Parking Rates 0.6 0.9 1.4
Parking Spaces 116 216 83
Total Residential Parking 415
Allowance for adaptable 37
Visitor Spaces (1 per 10) 49
Total Parking Spaces 501
BUILDING C
Max. Height 200m
Max. Storeys 30
GFA 23,350m²
Total Units 208
1B 2B 3B
Percentage 27% 61% 13%
Units 56 126 26
Parking Rates 0.6 0.9 1.4
Parking Spaces 34 113 36
Total Residential Parking 183
Allowance for adaptable 16
Visitor Spaces (1 per 10) 21
Total Parking Spaces 220
BUILDING D
Max. Height 200m
Max. Storeys 45
GFA 36,100m²
Total Units 368
1B 2B 3B
Percentage 35% 53% 12%
Units 128 195 45
Parking Rates 0.6 0.9 1.4
Parking Spaces 77 176 63
Total Residential Parking 316
Allowance for adaptable 26
Visitor Spaces (1 per 10) 37
Total Parking Spaces 380
SUMMARY
GFA 1B 2B 3B Total
Building A 19,550m² 55 102 30 187
Building B 46,450m² 194 240 59 493
Building C 23,350m² 56 126 26 208
Building D 36,100m² 128 195 45 368
Retail/Childcare *1,500m²
Proposed Total GFA 126,950m² 433 663 160 ^1,256
34% 53% 13% 100%
Site Area 19,530m²
Proposed FSR 6.5:1
* Up to 2x childcare at 600m² each
^ Excludes affordable housing
Car park entry points off shared carriageway
Landscape buffer to M2 Motorway
Towers to have max. 1,100m² floorplates
4-5 storey podium with screened parking
Open built form and activated edges at ground level
Building A 27 Storeys
Building B 60 Storeys
Building C 30 Storeys
Building D 45 Storeys
Communal Open Space
Public Open Space
Fujitsu Building
Christie Road
Talavera Road
Development Summary
Scale 1:1000 @ A3
0 5 10 15 20 25 50
Project number 5633
Project name Talavera Road PP
Project address 112 Talavera Road
Client Meriton Group
Key
Building Envelope
Retail/childcare at Ground
Site Boundary
Indicative Tower Locations
SJB Architects
Level 2, 490 Crown Street, Surry Hills NSW 2010
T. 61 2 9380 9911 sjb.com.au
SJB Architecture (NSW) Pty Ltd
ABN 20 310 373 425 ACN 081 094 724
Adam Haddow 7188 John Pradel 7004

MERITON

DKO

Project Name: Talavera Road
Project Address: Talavera Road, Macquarie Park, Sydney, NSW 2113
Client: Meriton
Drawing Number: TP206
Revision: A

End of document.