Integrated Transport Plan

Lilydale Quarry Urban Renewal

V161623

Prepared for
Intrapac

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Cardno

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Executive Summary

Cardno Victoria Pty Ltd has been engaged by Intrapac to provide this Integrated Transport Plan to inform and support the preparation of the Comprehensive Development Plan (CDP) for the Lilydale Quarry urban renewal (Kinley development).

This Integrated Transport Plan identifies opportunities to integrate a proposed transport network, which considers all users, with the existing surrounding network. This will inform a framework for future investment in transport network provisions as development progresses and demand increases.

This report is not designed to be a detailed traffic impact analysis, although it is based on technical detail that has been accepted through wider stakeholder reviews. Future traffic & transport assessments will be required to be provided as the planning process for the urban renewal of the site progresses. This will involve Integrated Traffic & Transport Management Plans (ITTMPs) and Traffic Impact Assessments (TIAs) to accompany Planning Permit applications. In support of this Integrated Transport Plan, a Supporting Traffic Impact Assessment has been prepared and is enclosed at the end of this document.

Kinley is located such that 20-minute neighbourhood principles and objectives can be met through the provision of a higher density urban core consisting of Transit Oriented Development (TOD) integrated with a potential future train station and public transport interchange along the Lilydale railway line.

A permeable and connected wider masterplan is proposed, with a road hierarchy which accommodates and promotes all users, including walkers, cyclists and bus routes. Rail crossings for vehicles and pedestrians have been strategically located to promote a connected community, which is able to efficiently access and integrate with the external transport network. Connections to the external active transport network includes key existing off-road shared paths such as the Lilydale-Warburton rail trail, Bayswater-Lilydale trail and Olinda Creek trail.

Transport objectives, requirements and guidelines have been identified to provide clear direction for establishing an integrated transport network at Kinley. These are generally defined as follows:

Objectives	High level vision statements that apply to each development theme. Objectives are mandatory, so any development proposal must comply with these statements.
Requirements	Matters that must be complied with in the design of a development. Requirements cannot be varied by the issue of a planning permit.
Guidelines	Matters that should be considered in precinct planning or the design of a development. If the Responsible Authority is satisfied that an application for an alternative to a guideline satisfies the objectives or requirements of the CDP, then that alternative may be considered.

The overarching objectives identified in this Integrated Transport Plan are:

Objective 1: To develop an integrated multimodal transport network that supports the redevelopment of the former Lilydale Quarry as a dense, highly-walkable urban environment affording high levels of transport choice while promoting a shift towards sustainable transport modes.

Objective 2: To prioritise sustainable transport within the development and maximise intermodal connectivity within the Urban Core and in proximity to the potential future train station.

Objective 3: To provide safe and convenient active transport links between where people live and where they work, shop and recreate, integrated with connections outside the site.

Objective 4: To develop a legible and inter-connected vehicle transport network within the site, with public transport that is fully integrated with surrounding areas, including key local and regional employment nodes and activity centres.

Objective 5: To ensure the transport and car parking network is capable of advancing and responding to future trends and technologies.

Mode specific requirements and associated guidelines have been identified to provide a fully integrated approach to ensuring that Kinley capitalises on its location to increase sustainable transport mode share, whilst providing efficient vehicle access with minimal impact on the surrounding road network.

A concept masterplan has been developed in consideration of these transport objectives, requirements and guidelines and is supported through the Comprehensive Development Plan.

Once developed, the site generated traffic will be distributed onto the surrounding road network through the provision of a main North-South Boulevard Connector Street, connector streets and higher order access streets.

The proposed site access intersections to the surrounding road network will cater for the access needs of the urban renewal of the Quarry site, via the following:

- a new four-leg signalised intersection at Churchill Drive;
- a new four-leg signalised intersection at Landscape Drive;
- a three-leg signalised intersection at Hull Road; and
- a new roundabout at the Hutchinson Street / Melba Avenue intersection.

Mitigating works are required to remediate the impact of traffic associated with the urban renewal development of the Lilydale Quarry site at the following existing external intersections:

- Victoria Road / Maroondah Highway / Mooroolbark Road (additional lanes and lane extensions);
- Mooroolbark Road / Hull Road (bridge widening to facilitate additional lanes and lane extensions, which is to be an intermediary treatment ahead of the delivery of the proposed Healesville Arterial – to be delivered by others in the future);
- Swansea Road / Hull Road intersection (linemarking change only); and
- Hutchinson Street / John Street intersection (additional lanes and lane extensions utilising existing road pavement).

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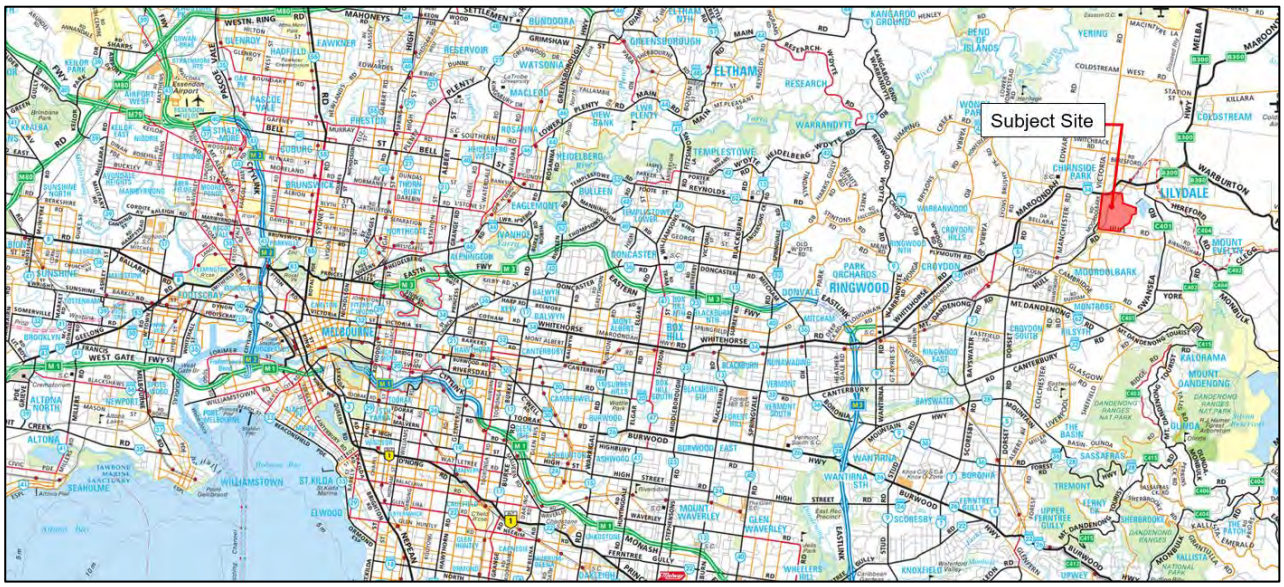
1 Introduction & Background

1.1 Introduction

Cardno Victoria Pty Ltd (Cardno) has been engaged by Intrapac to provide this Integrated Transport Plan (ITP) to inform and support the preparation of the Comprehensive Development Plan (CDP) for the Lilydale Quarry Stage 2 land (the subject site).

The subject site is located approximately 32 kilometres east of the Melbourne CBD within the Shire of Yarra Ranges and covers an area of approximately 144 hectares. The location of the subject site in the context of the Melbourne metropolitan area is shown in Figure 1-1.

Figure 1-1 Subject Site Location



Source: Melway

The purpose of the Lilydale Quarry CDP is to provide a long-term plan to facilitate the redevelopment of the subject site. It is a higher-order planning document that sets out the broad vision, objectives and requirements for the future development of the site.

The subject site presents a unique opportunity to provide a fully integrated mixed use development, benefitting from its strategic location along the Lilydale train line and its potential for Transit Oriented Development (TOD).

1.1.2 Purpose of the Integrated Transport Plan

The purpose of this Lilydale Quarry Urban Renewal ITP is to inform and support the preparation of the CDP and Infrastructure Contributions Agreement. This ITP identifies areas of opportunity within the subject site to integrate the movement and access network with the surrounding transport network. This will inform a framework for the future investment in transport network provision as the development progresses and demand increases.

The development of this ITP considers all appropriate State, regional and local transport and planning policy, with a particular emphasis on the Outcomes and Directions identified in *Plan Melbourne* supporting the creation of a “20-minute neighbourhood”.

1.1.3 Consultation

In order to inform the preparation of the CDP, stakeholder consultation has been undertaken with agencies across key themes including Sustainability, Land Use, Open Space, Integrated Water Management, Heritage, and Integrated Transport. A series of workshops and meetings were held with key government agencies based on each theme to gain feedback to inform the development of the CDP.

In addition to the Consultant team, the following organisations participated in the Integrated Transport consultation process:

- Yarra Ranges Council (Council);
- Victorian Planning Authority (VPA);
- Transport for Victoria (TfV), now part of Department of Transport (DoT);
- VicRoads, now part of DoT;
- Public Transport Victoria (PTV), now part of DoT;
- Department of Environment, Land, Water and Planning (DELWP); and
- Department of Economic Development, Jobs, Transport and Resources (DEDJTR).

1.2 Background

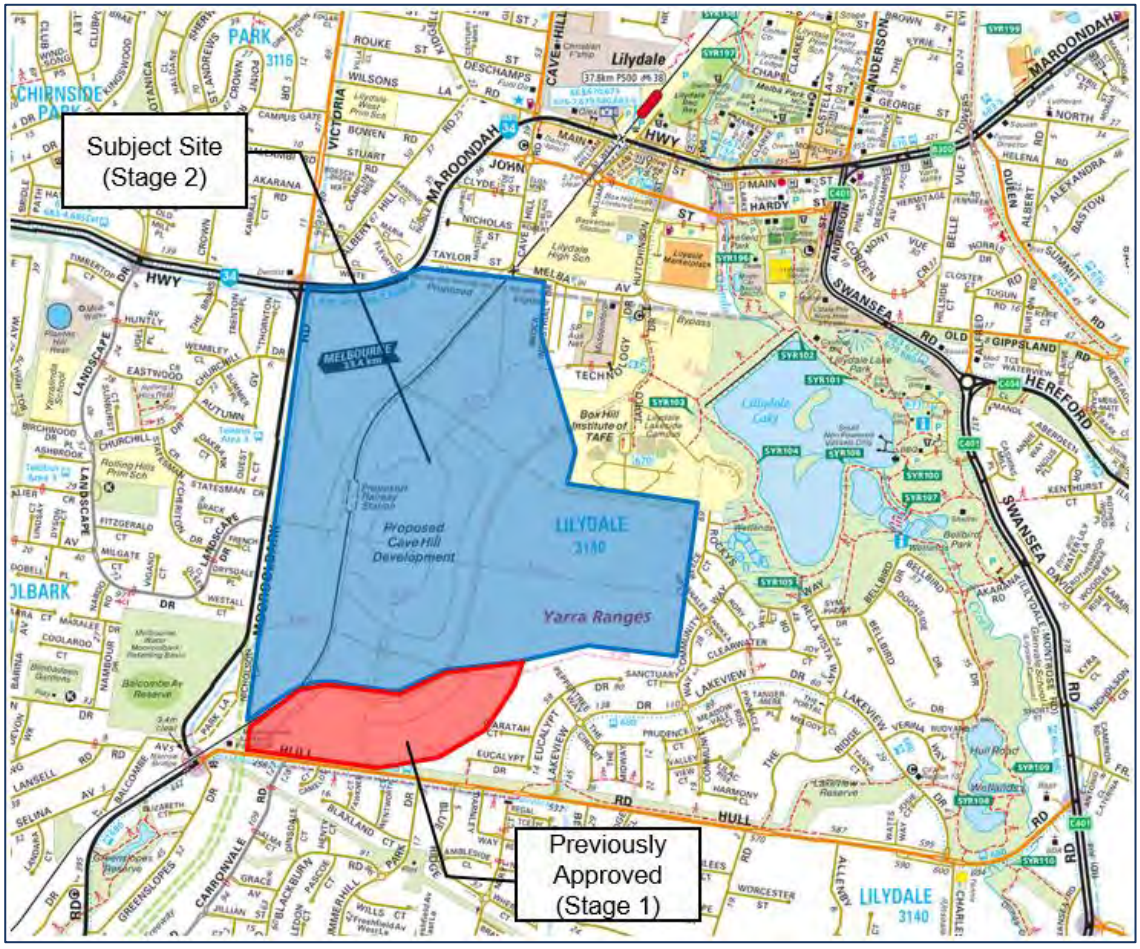
1.2.1 Site Location

The subject site is approximately 144 hectares of land known as the Lilydale Quarry (Stage 2), within the Shire of Yarra Ranges. It is located at 4 Melba Avenue, Lilydale, with key frontages to Mooroolbark Road (approx. 1.2km frontage) and Maroondah Highway (approx. 450m frontage). Land to the immediate south that interfaces Hull Road, known as Stage 1, underwent a separate planning approval process for which a planning permit has been issued to facilitate development.

The Lilydale metropolitan railway line runs through the subject site, generally in a northeast – southwest direction, between Mooroolbark Road and the quarry. Lilydale Railway Station is located approximately 750 metres northeast of the subject site, north of the Maroondah Highway.

The locality of the subject site in the context of the overall surrounding area is illustrated in Figure 1-2.

Figure 1-2 Locality Plan (Map)



Source: Melway

1.2.2 Existing Land Use

The subject site is predominantly occupied by the Lilydale Quarry, located immediately to the east of the railway line. The land between Mooroolbark Road / Maroondah Highway and the railway line is undeveloped grassland with scattered trees. Surrounding land is typically residential in nature, including the previously approved Stage 1 development area to the south, with a mix of land uses to the northeast including the Box Hill Institute's Lilydale Lakeside Campus, industrial land, recreational facilities and the Lilydale marketplace.

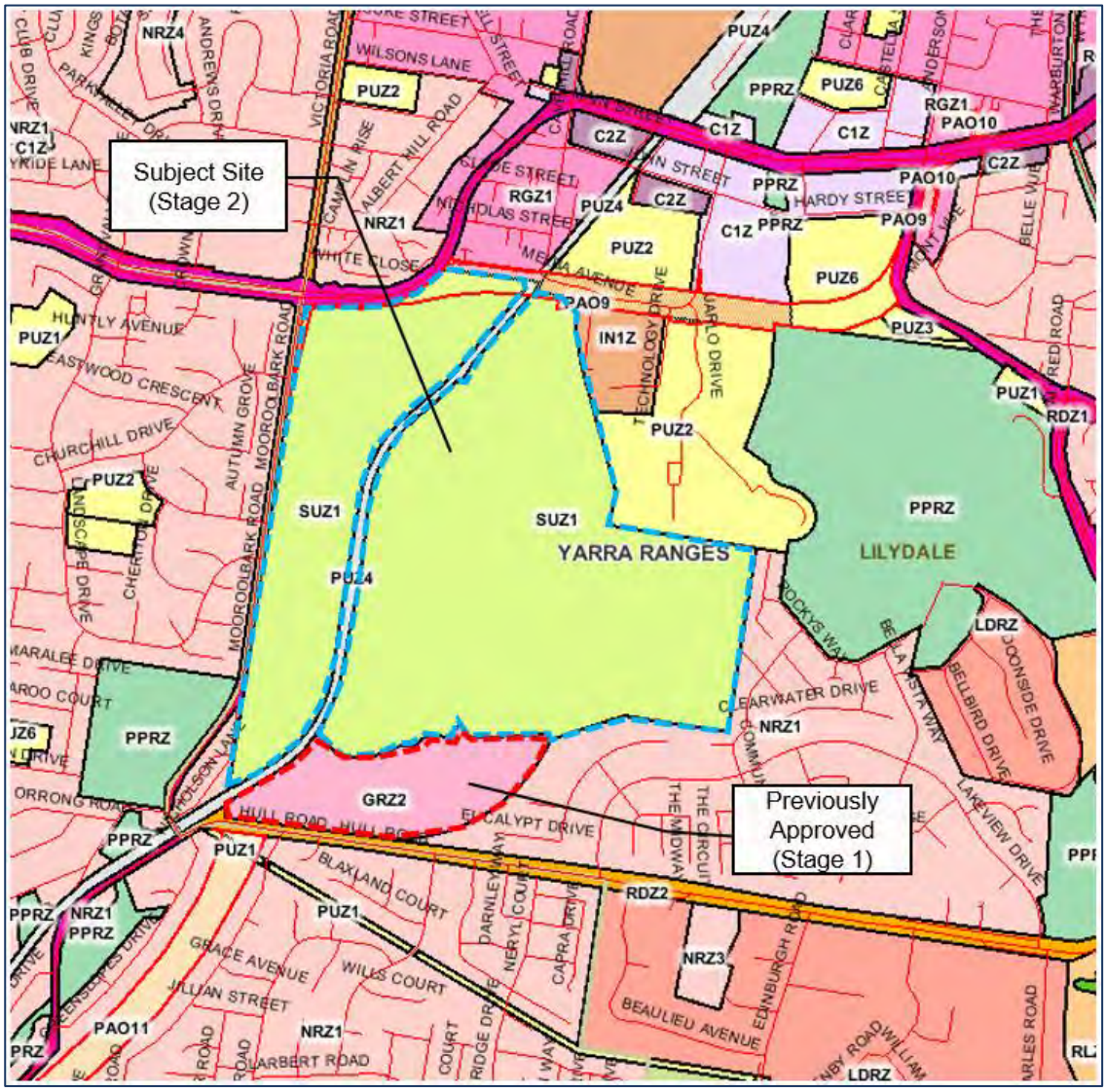
1.2.3 Planning Scheme Zones

The subject site is located within the Special Use Zone 1 (SUZ1) of the Yarra Ranges Planning Scheme as shown in Figure 1-3.

Amendment C139 to the Yarra Ranges Planning Scheme rezoned the southern portion of the Lilydale Quarry site (Stage 1) from Special Use Zone (SUZ1) to General Residential Zone (GRZ2) and enabled a planning permit to be issued for the subdivision of the land into approximately 191 residential lots.

A strip along the northern portion of the subject site is located within a Public Acquisition Overlay (PAO9), which makes allowance for the construction of the Lilydale Bypass from the Maroondah Highway to Anderson Street (via Melba Avenue). Part of this PAO affects the northern and north-western portions of the subject site. PAO11 is also located within close proximity to the subject site, south of Hull Road, relating to the Healesville Freeway Reserve.

Figure 1-3 Planning Scheme Zones & Public Acquisition Overlays



Source: DELWP Planning Maps Online

2 The 20-Minute Neighbourhood

2.1 Plan Melbourne Strategic Policy

The intent of *Plan Melbourne* is to inform local and State policy that will become the framework including to provide the required infrastructure and services and improve accessibility to these services to create 20-minute neighbourhoods throughout the metropolitan area.

The 20-minute neighbourhood concept is about ensuring that people are able to access their daily needs within a 20-minute walk or alternatively make use of convenient active and public transport infrastructure. The intent is to create sustainable communities by providing the mix of land uses required to achieve this concept.

The 20-minute neighbourhood concept outlined in *Plan Melbourne* is illustrated in Figure 2-1 below.

Figure 2-1 The 20 Minute Neighbourhood Concept

Source: Plan Melbourne

A key element in realising this concept is the provision of access opportunities throughout the neighbourhood connecting people to the various services and facilities.

2.2 Lilydale Quarry Urban Renewal – A 20-Minute Neighbourhood Opportunity

The success of a 20-minute neighbourhood relies on both the existence or provision of local services and amenities, and the integration and ease of access between the residential areas and these services. With an urban renewal site such as the Lilydale Quarry, the integration of new services and facilities within the site with those existing in the surrounding neighbourhood will be important.

2.2.1 Local Services & Facilities

The primary local attractors that will contribute to a successful 20-minute neighbourhood and encourage a mode shift to sustainable transport for shorter trips are outlined below.

Proximity to **Activity Centres**: Activity Centres provide a range of services, retail, employment, social, and leisure opportunities throughout cities and towns. The urban renewal of the subject site will include the delivery of a mix of land uses including retail, commercial, office, residential and community, with a focus on TOD, reflective of an Activity Centre. Further to this, the subject site is also within close proximity to the existing Major Activity Centre (MAC) in Lilydale. The Lilydale MAC provides a considerable supplementary Activity Centre to the development of the subject site, which will be accessible via sustainable forms of transport.

Access to **Public Transport** nodes: Whilst access to public transport within Activity Centres plays a key role in usage, additional public transport services within the residential areas with a balance of maximum catchment but reasonably direct routes to key destinations will widen the 20-minute neighbourhood for both employment and other journey purposes. The site is well positioned to make use of the existing public transport network, including a potential future train station along the Lilydale railway line, with opportunity to integrate bus routes with the existing wider network.

Location of **Proposed Government Specialist School**: Primary, secondary and tertiary education centres are a significant traffic generator. Primary schools have a higher car mode share but with a relatively small catchment radius, whereas a greater number of secondary students walk, cycle or take public transport. A proposed Government Specialist School has been identified on the subject site, which could assist in minimising the distances required for school travel, and hence the ability to walk and cycle for these shorter journeys. A number of existing schools are also located at the interface or within close proximity to the subject site, including Lilydale High School, Lilydale West Primary School, Yarralinda Primary and Early Learning School, Rolling Hills Primary School and Bimbadeen Heights Pre-School and Primary Schools. In addition, the Box Hill Institute is located at the north-eastern interface of the site, with direct connectivity providing active transport opportunities for local students.

Provision of **Health Services, Open Space and Recreation Facilities**: The subject site has excellent direct access to open space in terms of parks, sporting facilities and walking and cycling trails. This includes the Bayswater-Lilydale trail to the southwest and the Olinda Creek trail to the east, which provides connectivity to the 38km Lilydale-Warburton rail trail that begins at Lilydale Railway Station. The rail trail proposed within the subject site will provide a missing link between the Bayswater-Lilydale trail to the southwest and the Lilydale-Warburton rail trail to the north. Such facilities provide a number of benefits including health, social, community and mobility. The development of urban renewal sites should provide adequate open space that is accessible to residents within and around the development whilst considering the location of surrounding open space and recreational facilities. The subject site proposes to provide substantial areas of public open space, with opportunity to provide connectivity with surrounding active transport linkages to open space.

Access to **Employment**: *Plan Melbourne* recognises that generally, people will travel a greater distance to access employment. The neighbouring Lilydale MAC provides considerable employment opportunities for future residents of the subject site from its early development. Further to this, the commercial, retail and office land uses proposed for the urban renewal of the subject site will provide significant employment opportunities for residents of the neighbourhood.

3 A Sustainable Transport Opportunity

3.1 Site Opportunity

The location of the Lilydale Quarry provides an ideal opportunity to integrate sustainable transport modes, incorporating TOD principles that will provide permeability within the site and encourage connectivity to the surrounding network. Given the close proximity of existing Activity Centres, including the Lilydale MAC to the northeast and Ringwood Metropolitan Activity Centre to the southwest along the same railway line, there is opportunity to actively promote sustainable transport for these local journeys.

This ITP considers the significant forward-looking planning opportunities that are provided due to the unique location of the site in terms of:

- Direct access via the Lilydale railway line to Metropolitan Activity Centres including Ringwood and Box Hill, in addition to the nearby Lilydale MAC which can be accessed using active transport;
- The potential future train station within the subject site presents the opportunity to integrate TOD principles within the development, providing direct access to regular metropolitan rail services on the Lilydale line;
- Accessibility to the surrounding existing bus networks with numerous bus stops within walking distance of the subject site, in addition to the potential for additional bus services to provide direct access within the subject site; and
- The existing surrounding walking and cycling network and the opportunities to provide links to the strategic shared trail network, including Bayswater-Lilydale trail to the southwest, the Lilydale-Warburton rail trail to the north and Olinda Creek trail to the northeast.

Consideration of these opportunities in the context of the current planning objectives has allowed for an innovative approach in determining the mix of land uses and densities proposed.

The following sections demonstrate the unique ability of the subject site to connect with both the existing local transport network, in addition to the broader strategic transport network.

3.2 Public Transport Connectivity

The subject site is well serviced by existing transport infrastructure, having good access to the Lilydale railway line and surrounding bus network. It is proposed that this is further augmented in the context of the growing population. The existing public transport service provision is highlighted in the following sections.

3.2.1 Rail Network

The subject site is located along the Lilydale railway line, situated between the Lilydale Railway Station to the northeast and the Mooroolbark Railway Station to the southwest. This provides direct access between the subject site and Ringwood and Box Hill Metropolitan Activity Centres and Melbourne's CBD, in addition to the nearby Lilydale MAC. Lilydale Station currently provides regular service frequency, with trains departing approximately every 30 minutes outside of peak times.

Figure 3-1 illustrates the location of the subject site in the context of the eastern Metropolitan rail network and the connectivity along the Lilydale railway line into the CBD. The potential future train station within the subject site will provide highly accessible train services to the future residents of the subject site and surrounding catchment.

Figure 3-1 Metro Rail Network Map (East)

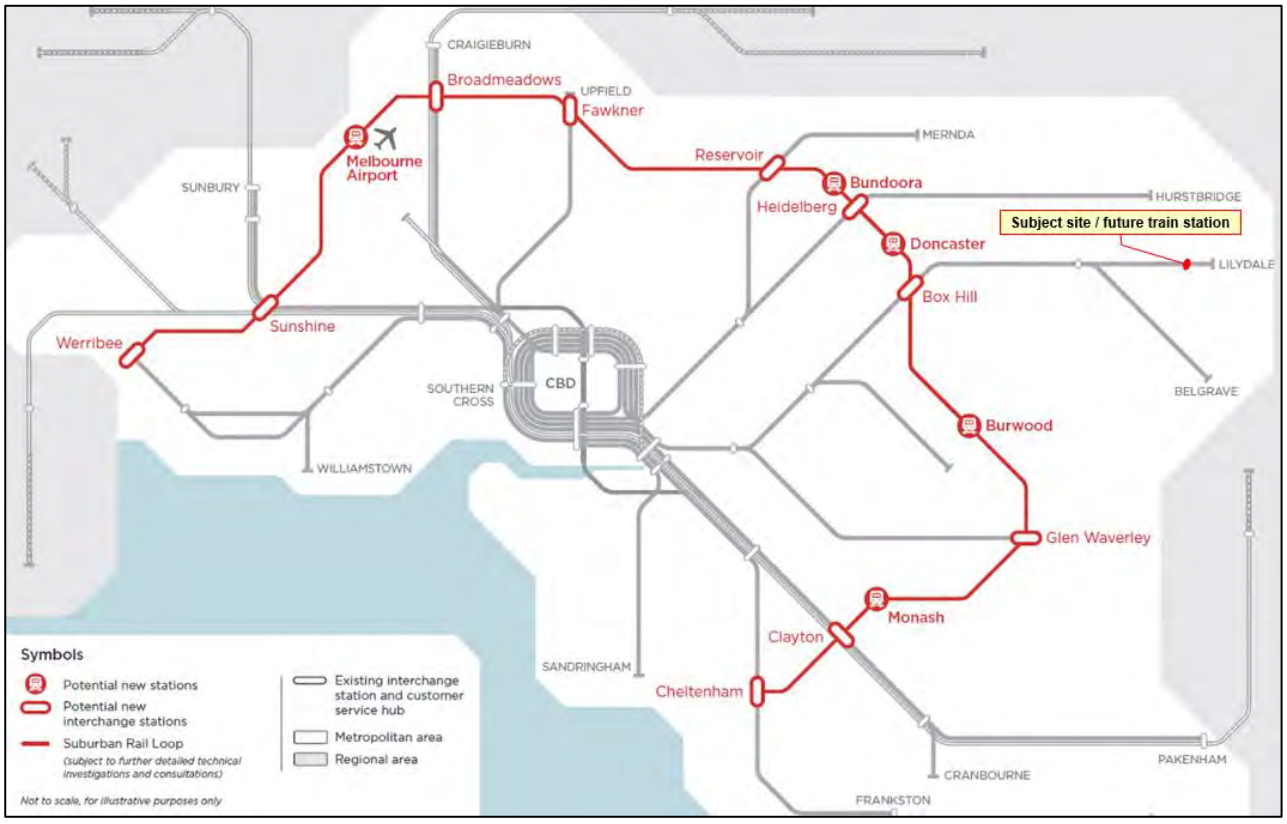
Source: DoT

The level crossing at the Maroondah Highway in Lilydale, just north of the subject site, is scheduled for removal by 2022, with detailed design work having begun in early 2020. The urban renewal of the subject site will benefit from the outcomes of this level crossing removal, including improved safety and pedestrian permeability, in addition to increased road capacity.

3.2.2 Proposed Suburban Rail Loop

The subject site would also benefit greatly from the proposed Suburban Rail Loop, which if delivered, will link all existing major commuter rail lines in Melbourne. This loop will allow commuters to travel by train to Major Activity Centres around Melbourne or Melbourne Airport without the need to travel into the CBD, significantly increasing capacity on the existing lines and reducing journey times for rail commuters across the city. The proposed Suburban Rail Loop route is shown in Figure 3-2.

Figure 3-2 Proposed Suburban Rail Loop Route



Source: https://bigbuild.vic.gov.au/projects/suburban-rail-loop

3.2.3 Bus Network

Strategic and local bus services provide access along routes in close proximity to the subject site, with bus stops within walking distance located to the north, east and south.

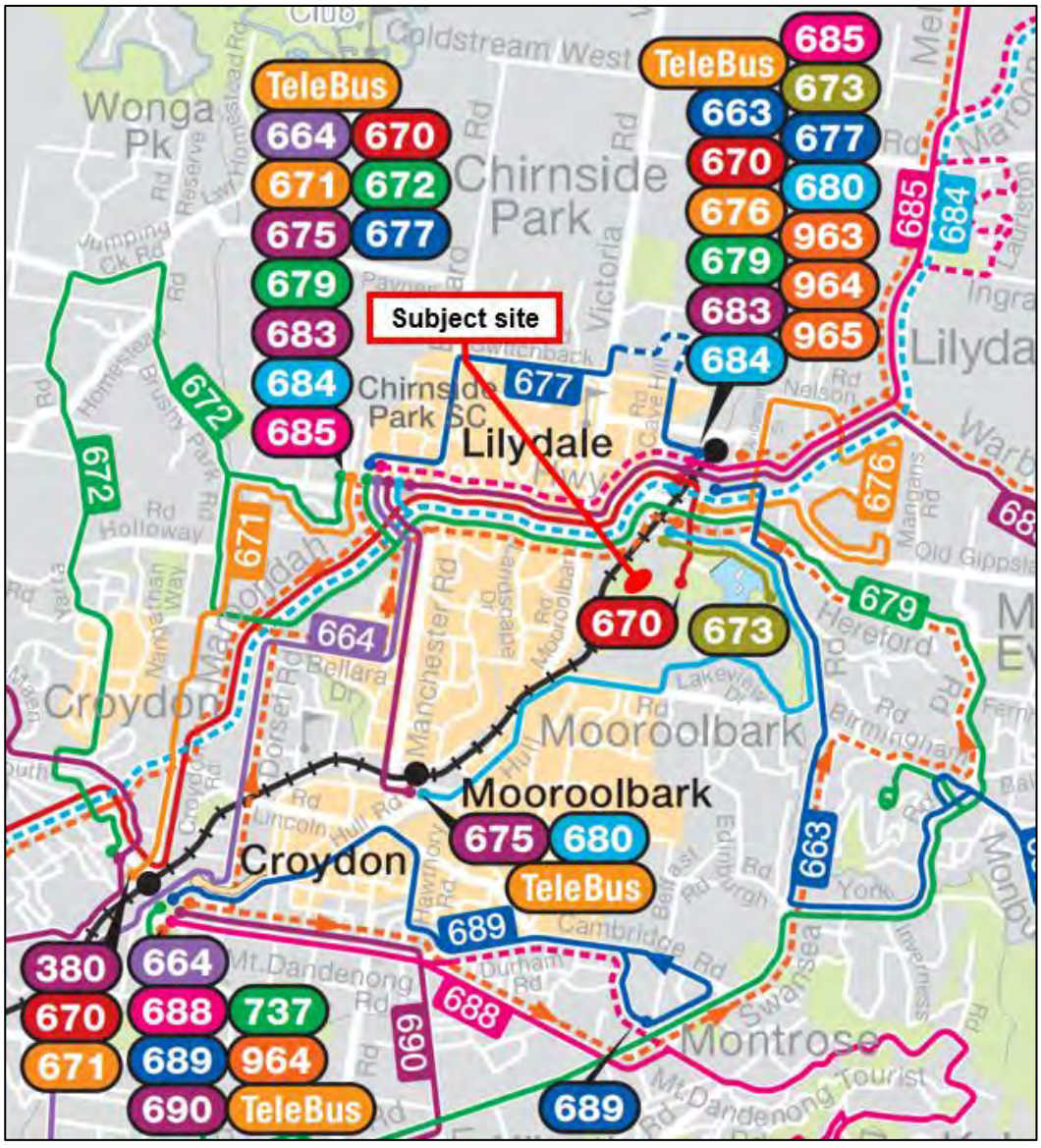
Bus Route 670 provides convenient access for future residents, with surrounding bus stops located at Box Hill Institute's Lilydale Lakeside Campus and at Maroondah Highway / Victoria Road, providing a service primarily along Maroondah Highway via the Lilydale Railway Station.

Servicing the southern and eastern portions of the subject site is Bus Route 680, with bus stops located along Hull Road and Lakeview Drive providing a service between the Lilydale Railway Station and the Mooroolbark Railway Station.

Various other bus services are provided within proximity to the subject site, particularly along the Maroondah Highway, as illustrated in Figure 3-3. It is noted that demand-responsive TeleBus services operate in the area surrounding the subject site, supplementing the fixed route network.

Within the proposed development, all connector streets will be designed as bus capable roads. This will ensure public transport permeability throughout the subject site and provision of linkages to the existing external network. Additionally, in Stage 1, the north-south boulevard connector street (Honour Avenue) has been designed to accommodate bus stops, indicating that DoT and Council view a bus route through the subject site as strategically significant.

Figure 3-3 Local Bus Network Map



Source: DoT

3.3 Active Transport

The subject site is well connected to the surrounding local and strategic active transport networks, with the redevelopment of the Lilydale Quarry presenting a significant opportunity to provide missing connections to the surrounding active transport network.

3.3.1 Footpaths

The nature of the current land use is such that there are poor footpath connections into and immediately surrounding the subject site.

The Maroondah Highway has an existing footpath abutting the subject site, which has safety barriers installed providing separation between pedestrians and vehicles. This footpath, located on the south side of Maroondah Highway, extends for approximately 40 metres along Mooroolbark Road, with no further provision along the east side of Mooroolbark Road. However, a footpath is provided along the entire length of Mooroolbark Road on its west side. It is noted that pedestrian access is provided through to Taylor Street.

Footpath provision along Hull Road in the vicinity of the subject site includes a shared user path on the south side of this road.

Footpaths to the north and east of the subject site are limited due to the non-residential surrounding land uses.

Notwithstanding the above, significant provision of footpaths within the proposed development will provide for internal mobility and connections through to the available surrounding network, including the future development of the Stage 1 land to the south.

There is an opportunity to provide shared user permeability between the subject site and the external network to the east via connectivity to Sharnalee Court.

3.3.2 Shared Paths

The main off-road shared trails within close proximity to the subject site include the Bayswater-Lilydale trail to the south and both the Lilydale-Warburton rail trail and Olinda Creek trail to the east, as illustrated in Figure 3-4.

The Bayswater-Lilydale trail is a strategic link which connects to the wider shared path network throughout the eastern suburbs and through to the Melbourne CBD. In proximity to the subject site, this shared user trail generally follows the alignment of Hull Road, including the recently upgraded east – west section immediately to the south of the subject site, providing connectivity with the Olinda Creek shared path and Lilydale-Warburton rail trail.

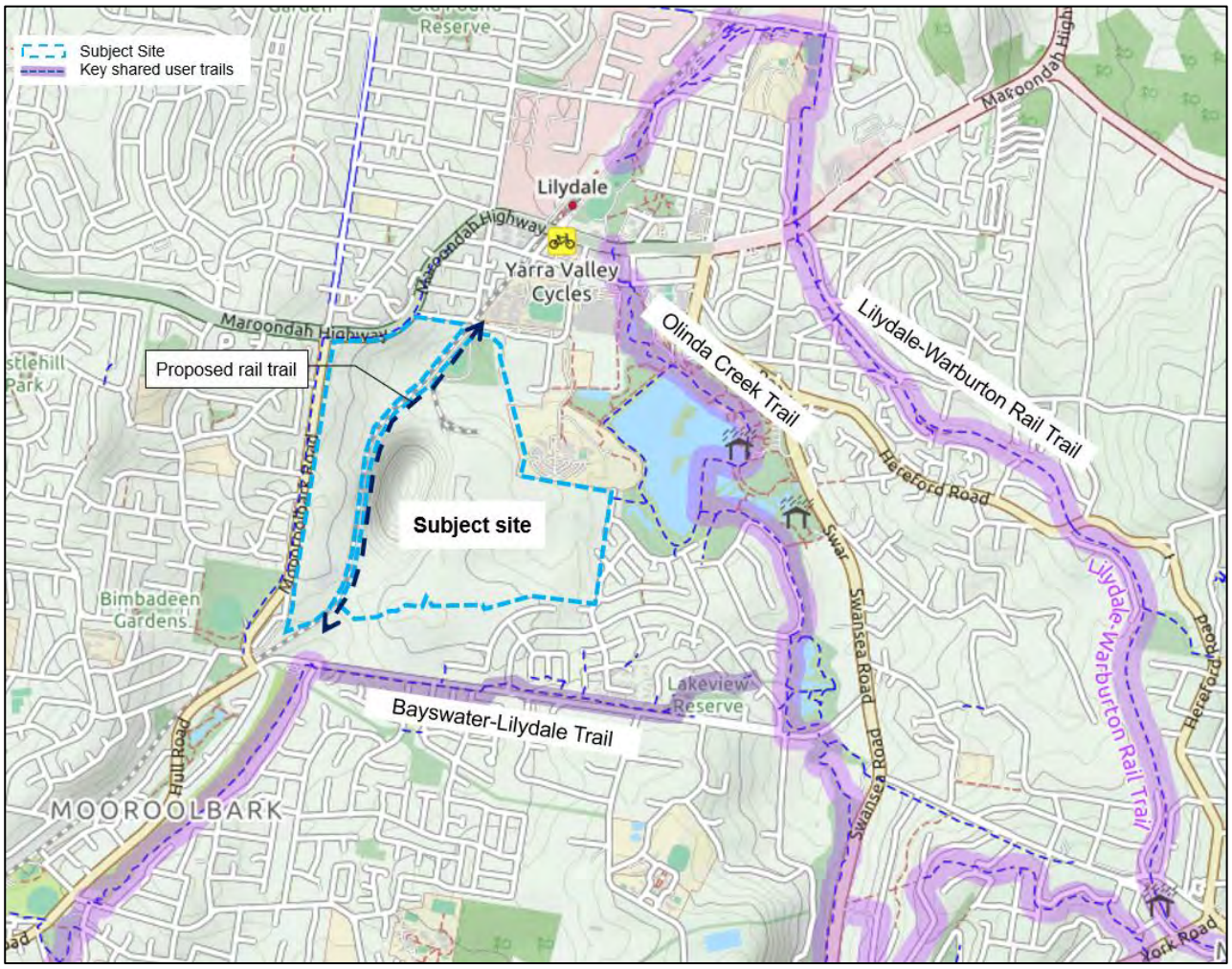
The Olinda Creek shared path is located to the east of the subject site and extends from the Lilydale Railway Station to the south and east of Lilydale. There is an opportunity for the subject site to provide additional access to this shared path via land generally adjacent to the Box Hill Institute's Lilydale Lakeside Campus and Lilydale lake park to the east, where existing connecting trails are located.

The Lilydale-Warburton rail trail is accessible to the north and east of the subject site, with direct connectivity to the Olinda Creek shared path. This trail begins near Lilydale station and extends 38 kilometres to Warburton and is primarily a recreational route for walkers, cyclists and horse riders.

There is currently a gap in north – south shared use trails due to the previous use of the subject site. The urban redevelopment however proposes a rail trail along the Lilydale Railway Line, providing the opportunity to extend the shared path network through the subject site to the Lilydale Railway Station. This then presents further connectivity opportunities with the shared path network to the Lilydale-Warburton rail trail and Bayswater-Lilydale trail.

The redevelopment of the subject site will generally improve east - west connectivity in the locality, which has previously been constrained due to the orientation of the Lilydale railway line and presence of the quarry. The CDP proposes both pedestrian and vehicle crossings over the railway line, providing improved permeability both within and through the subject site.

Figure 3-4 Shared Path Network



Source: Open Street Map

3.3.3 Principal Bicycle Network

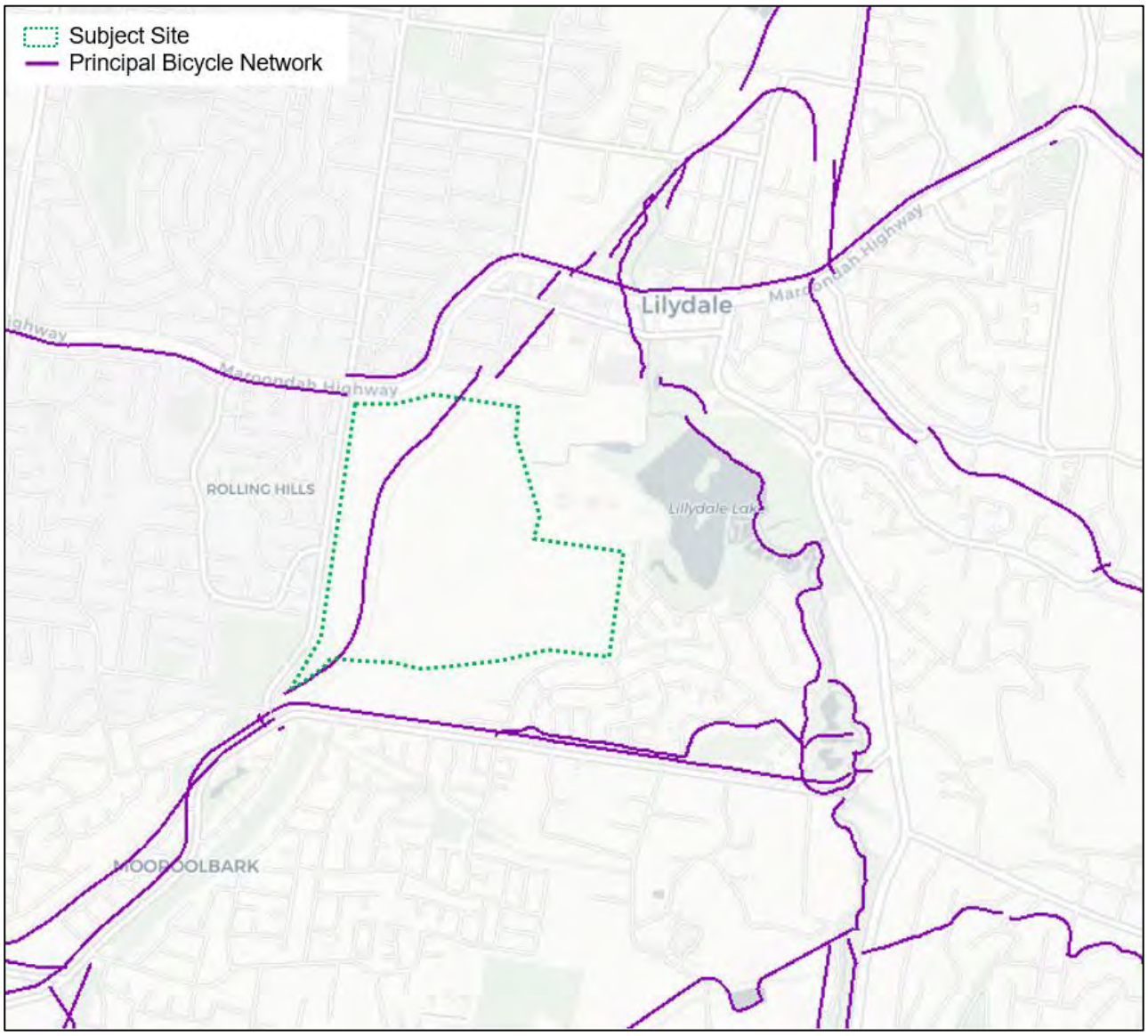
DoT's Principal Bicycle Network (PBN) provides a strategic bicycle network throughout Melbourne. The PBN in the region surrounding the subject site is comprised of both existing and future identified cycle routes providing access throughout the area.

Whilst the Maroondah Highway is currently identified on the PBN network, there is no existing provision of off-road or on-road bicycle lanes. Similarly, the rail trail through the subject site is identified on the PBN, however is not yet constructed.

The PBN identified to the east and south of the subject site includes the constructed Olinda Creek trail, Lilydale-Warburton rail trail and Bayswater-Lilydale trail.

It is noted that whilst the PBN around the subject site is currently somewhat fragmented, the development of the subject site presents an opportunity to implement the rail trail through the subject site, being a significant northeast – southwest PBN link, as shown in Figure 3-5.

Figure 3-5 Principal Bicycle Network



Source: SmartRoads (DoT)

3.4 Road Network

The subject site is located such that it has convenient access to the strategic northeast – southwest arterial road network, which also provides direct access to the nearby Lilydale MAC.

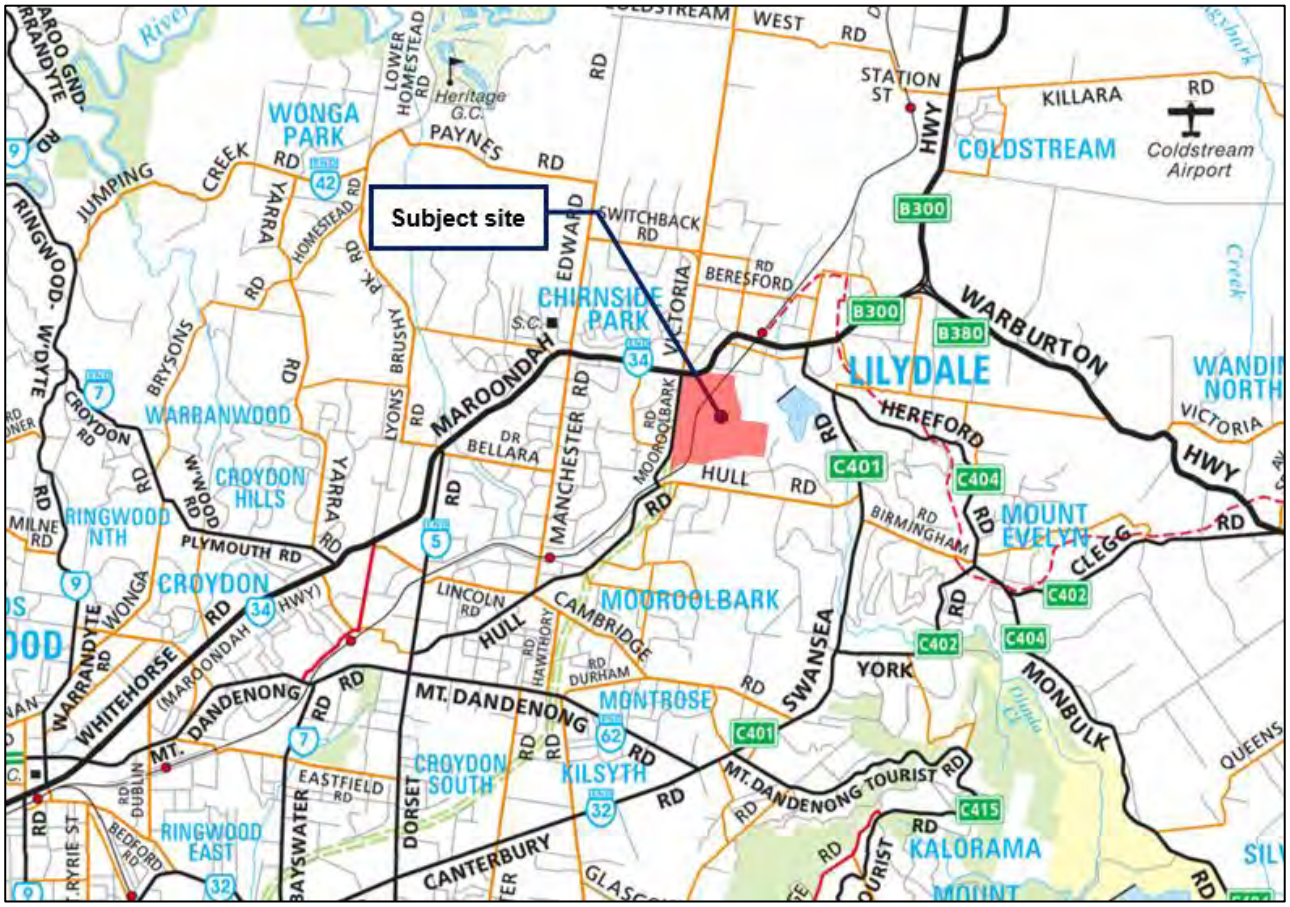
3.4.1 Strategic Road Network

The strategic road network comprises DoT declared roads i.e. freeways and arterial roads, along with certain Council owned secondary arterial and collector roads (or major roads).

With direct access to the strategic road network including Mooroolbark Road and the nearby Maroondah Highway, the subject site has excellent strategic road access to Metropolitan and Major Activity Centres.

The location of the subject site with respect to the strategic road network is shown in Figure 3-6.

Figure 3-6 Strategic Road Network Links



Source: Melway

3.4.2 Mooroolbark Road

Mooroolbark Road is a primary arterial road that extends along the western boundary of the subject site. The road is orientated north-south, and provides a connection between Maroondah Highway to the north and Hull Road to the south. Mooroolbark Road has an undivided carriageway and provides a single traffic lane in each direction with a posted speed limit of 70 km/h. According to traffic volume information prepared by DoT, the AADT on the road is 4,000 vehicles (in 2016).

At its northern end, Mooroolbark Road connects to Maroondah Highway via a signalised intersection, and at its southern end, Mooroolbark Road connects to Hull Road via a signalised intersection under a railway bridge. The layouts of these intersections are shown in Figure 3-7 and Figure 3-8, respectively.

Figure 3-7 Victoria Road / Maroondah Highway / Mooroolbark Road Intersection

Figure 3-8 Mooroolbark Road / Hull Road Intersection

Source: Nearmap

3.4.3 Hull Road

Hull Road east of Mooroolbark Road is classified as a major road (acting as a secondary arterial road) under the control and management of Council, providing an east-west connection between Mooroolbark Road to the west and Swansea Road to the east. In the vicinity of the subject site, Hull Road operates as a single carriageway and provides one traffic lane in each direction with gravel shoulders on each side and a speed limit of 70 km/h. At intersections with side roads (such as Carronvale Road, Camelot Court and Summerhill Park Drive) the road widens to provide auxiliary right-turn lanes.

West of Mooroolbark Road, Hull Road is a primary arterial road under the control and management of DoT forming, in conjunction with Mooroolbark Road, an arterial connection between Dorset Road in Croydon and the Maroondah Highway in Lilydale.

3.4.4 Maroondah Highway

The Maroondah Highway is a primary arterial road that abuts the north-western boundary of the subject site. The road is generally orientated east-west and provides a connection to Mooroolbark Road to the west and the Lilydale town centre to the east. Proximate to the subject site, Maroondah Highway has a divided carriageway up to approximately 200 metres east of the Mooroolbark Road intersection, with the remaining carriageway to the east undivided. Two westbound lanes and a single eastbound traffic lane are provided, with a speed limit of 80 km/h. According to traffic volume information prepared by DoT, the AADT on the road is 13,000 to 15,000 vehicles (in 2016).

Footpaths are provided on both sides of Maroondah Highway, including pedestrian-only access through to Taylor Street to the east.

3.4.5 Taylor Street

Taylor Street is an unsealed local street that extends along the northern boundary of the subject site, with connections to Cave Hill Road and Melba Avenue to the east and a cul-de-sac at the western extent of the road. Taylor Street provides for two-way traffic movements with a default speed limit of 50 km/h.

A footpath is provided on the northern side of the road, providing pedestrian access to the Maroondah Highway footpath.

It is noted that a 30 metre wide road reserve is provided, with an additional 30 metre wide road reserve to the immediate south as a provision for the future Lilydale Bypass.

3.4.6 Melba Avenue

Melba Avenue is a local street located to the north of the subject site which provides an east-west connection between Taylor Street / Cave Hill Road to the west and Hutchinson Street / Jarlo Drive to the east. Melba Avenue provides a single traffic lane in each direction with a speed limit of 40 km/h.

A footpath is provided on the northern side of Melba Avenue, offset from the road by up to 45 metres.

A 60 to 80 metre wide road reserve is provided as a provision for the future Lilydale Bypass.

3.4.7 SmartRoads

SmartRoads is a road network management approach developed by DoT, which recognises the increasing importance of public transport, walking and cycling as transport modes. It uses a set of guiding principles to establish the priority use of roads by transport mode, time of day, and place of activity. This approach also ensures that decisions about the operation of the road network support integrated land use and transport planning.

A key objective of SmartRoads is to reduce the level of ‘through’ traffic including heavy vehicles, and to promote access to the centres via alternative transport modes. This is achieved by designating and promoting certain arterial roads as preferred routes for traffic. Traffic is then encouraged to use the alternative routes and allow key road space within the Activity Centre to be prioritised for public transport, cyclists and pedestrians.

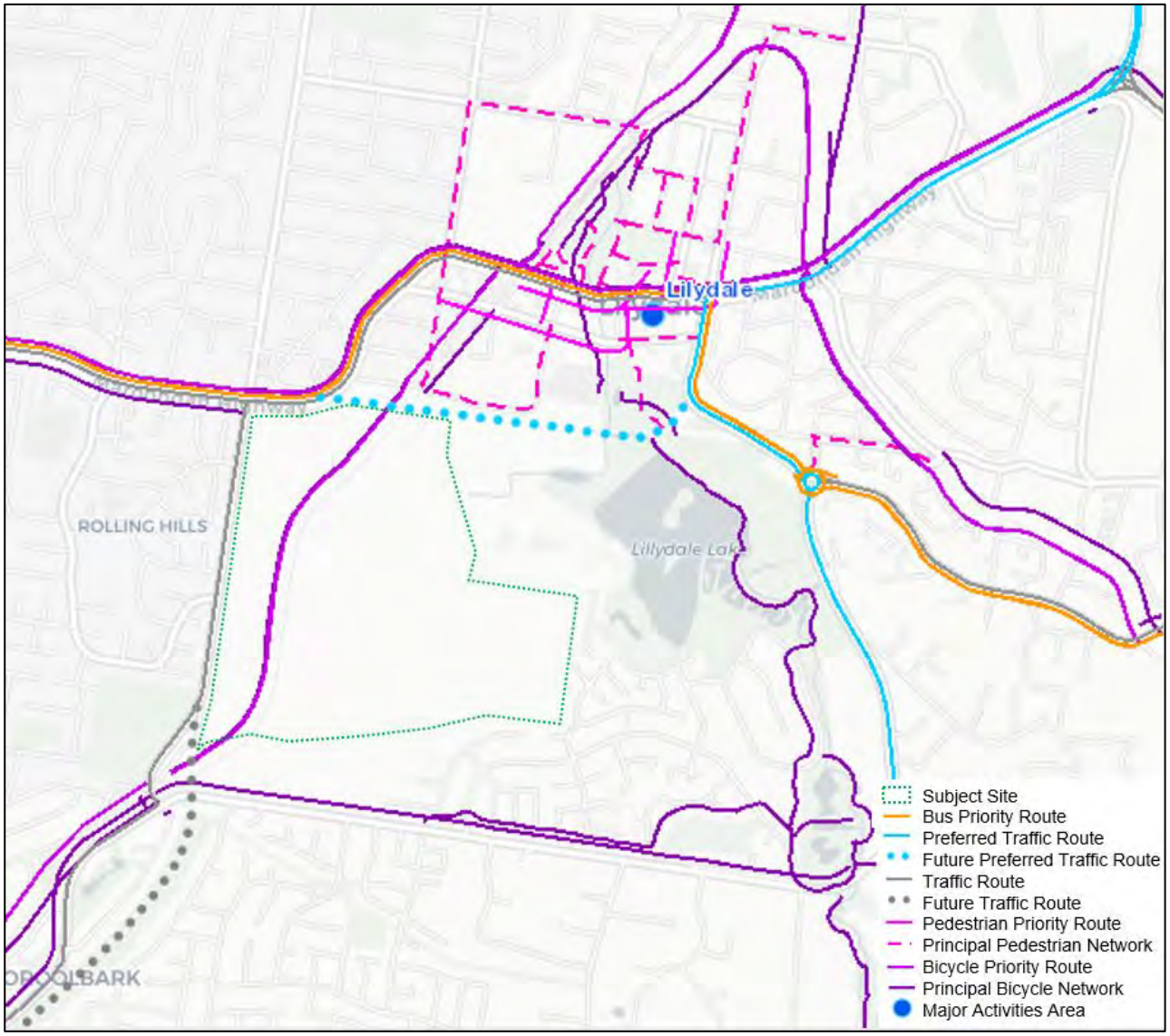
Figure 3-9 identifies the Network Operating Plan in the vicinity of the subject site and indicates the following:

- The Healesville Freeway to the southwest and Lilydale Bypass to the north of the subject site are identified as a future traffic route and a future preferred traffic route, respectively;
- Whilst the Healesville Arterial is not shown indicatively in the figure, based on our discussions with DoT, we understand that this is also a future preferred traffic route;

- The proposed rail trail through the subject site will provide a key link in the identified PBN, with this trail nominated as a bicycle priority route;
- The subject site is in close proximity to the principal pedestrian network to the north, which provides opportunity for connectivity to the Lilydale Major Activity Centre; and
- The northwest corner of the subject site is adjacent to the bus priority route, which runs along the Maroondah Highway.

The subject site is well located to integrate with and support the SmartRoads concept, assisting to realise key linkages such as the PBN and promoting active transport in the vicinity of Activity Centres.

Figure 3-9 SmartRoads Network Operating Plan



Source: SmartRoads (DoT)

3.4.8 Traffic Accident Review

DoT's 'CrashStats' provides access to a database containing Victorian Road Crash Statistics from 1987 onwards, for crashes where at least one person was injured. The CrashStats data was examined for all recorded vehicular collisions in the vicinity of the subject site, within the previous five years up to December 2017 to assess the recent crash history.

The results indicate four serious injury crashes occurring at the Maroondah Highway and Mooroolbark Road intersection during this period of time.

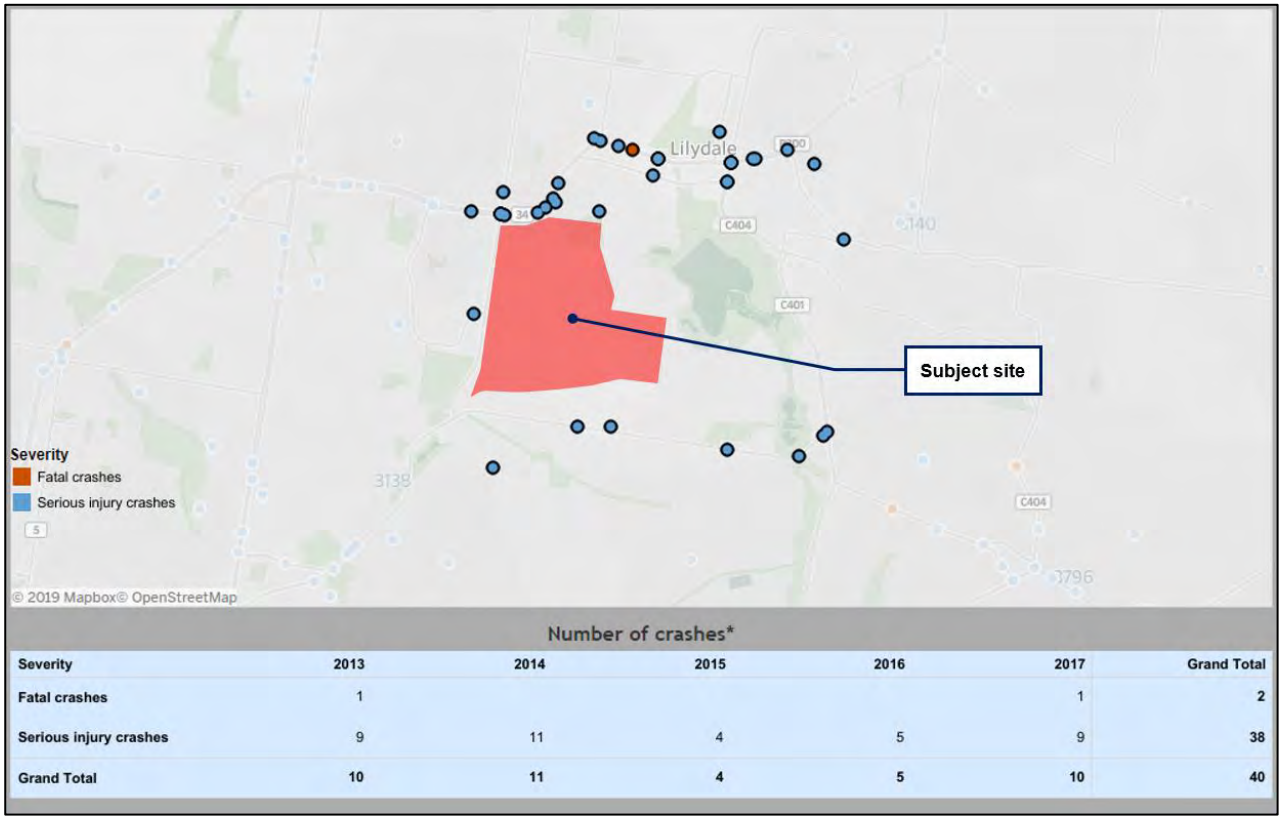
Six serious injury crashes occurred to the immediate north of the subject site including four along Maroondah Highway, one in Taylor Street and one in Melba Avenue. In this area, an access point is proposed to Melba Avenue in the form of a roundabout, which is expected to assist with vehicle safety in this location.

No serious injuries were recorded along Mooroolbark Road, west of the subject site. One serious injury accident occurred on Landscape Drive, however this was not intersection related.

Mitigation measures along Mooroolbark Road proposed as part of the urban renewal of the subject site will improve safety at these intersection locations along the road network.

Figure 3-10 illustrates the location of serious vehicle accidents in the area.

Figure 3-10 Road Traffic Accident Locations



Number of crashes*

Severity	2013	2014	2015	2016	2017	Grand Total
Fatal crashes	1				1	2
Serious injury crashes	9	11	4	5	9	38
Grand Total	10	11	4	5	10	40

Source: CrashStats

3.5 Potential Road Network Infrastructure Projects

3.5.1 Lilydale Bypass

Public Acquisition Overlay 9 (PAO9) relates to the Lilydale Bypass (Melba Avenue - Maroondah Highway to Anderson Street, Lilydale), for which the Roads Corporation (DoT) is the acquiring authority. It is located to the north of the subject site and includes a portion of the land to the north, in addition to a strip of land abutting Mooroolbark Road to the northwest.

The Lilydale Bypass project is in the very early stages of planning. It is noted that DoT have proposed an ultimate intersection concept which would tie-in the northern subject site access with the future Lilydale bypass.

The intersection upgrade proposed as part of the development of the subject site includes a roundabout to connect with the existing alignment of Melba Avenue / Hutchinson Street at Jarlo Drive, appropriate to accommodate anticipated future traffic. This design will sit within DoT's ultimate design and therefore will not preclude the achievement of the ultimate DoT concept design, which could be subject to a separate PAO process in the future when the Lilydale Bypass proposal is finalised.

3.5.2 Healesville Freeway

Public Acquisition Overlay 11 (PAO11) relates to the Healesville Freeway (between Colchester Road and Mt Dandenong Road, Kilsyth, and between Taylor Road and Hull Road, Mooroolbark), for which the Roads

Corporation (DoT) is the acquiring authority. It is located to the southwest of the subject site, however does not occupy any portion of the subject site.

3.5.3 Healesville Arterial

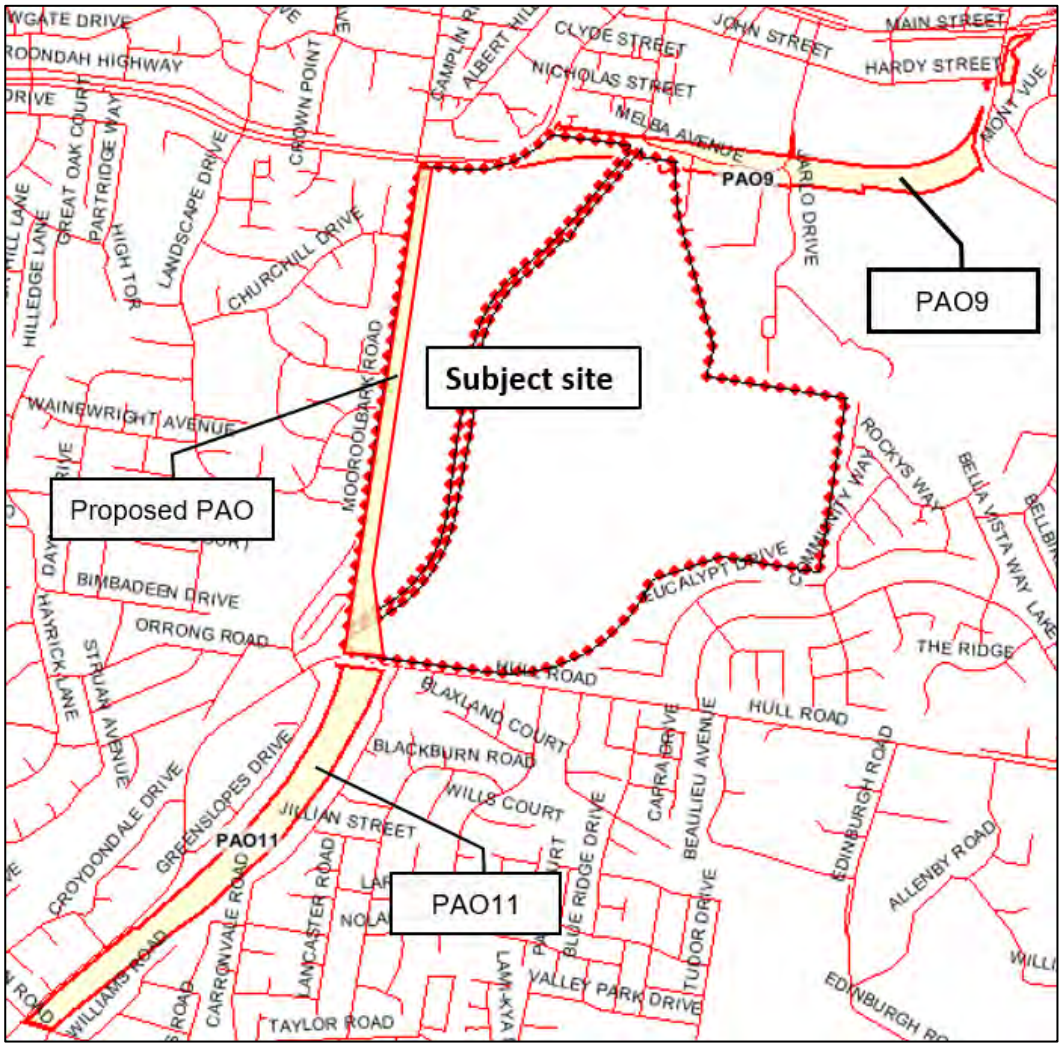
A proposed PAO is nominated along the eastern side of Mooroolbark Road, which includes the western-most strip of land within the subject site, to reserve land for the proposed Healesville Arterial.

The proposed PAO is based on the Healesville Arterial Road Concept Design prepared by AECOM for DoT. 'Road under rail' and a 'road over rail' options were considered; however, the road over rail option was dismissed during initial investigations.

The proposed PAO has been considered during concept master planning.

PAO9, PAO11 and the proposed PAO are depicted in relation to the subject site in Figure 3-11.

Figure 3-11 Public Acquisition Overlay Locations



Source: Planning Maps Online, DELWP

3.6 Planning for the Future

Given the 20-plus year timeframe for development of the site, it would be appropriate to consider emerging employment trends, vehicle and bicycle technology and car parking trends. Advances in technology are expected to have a considerable impact on future traffic generation and trip patterns, car parking demand, mode choice and infrastructure requirements.

3.6.1 Changing Work Patterns

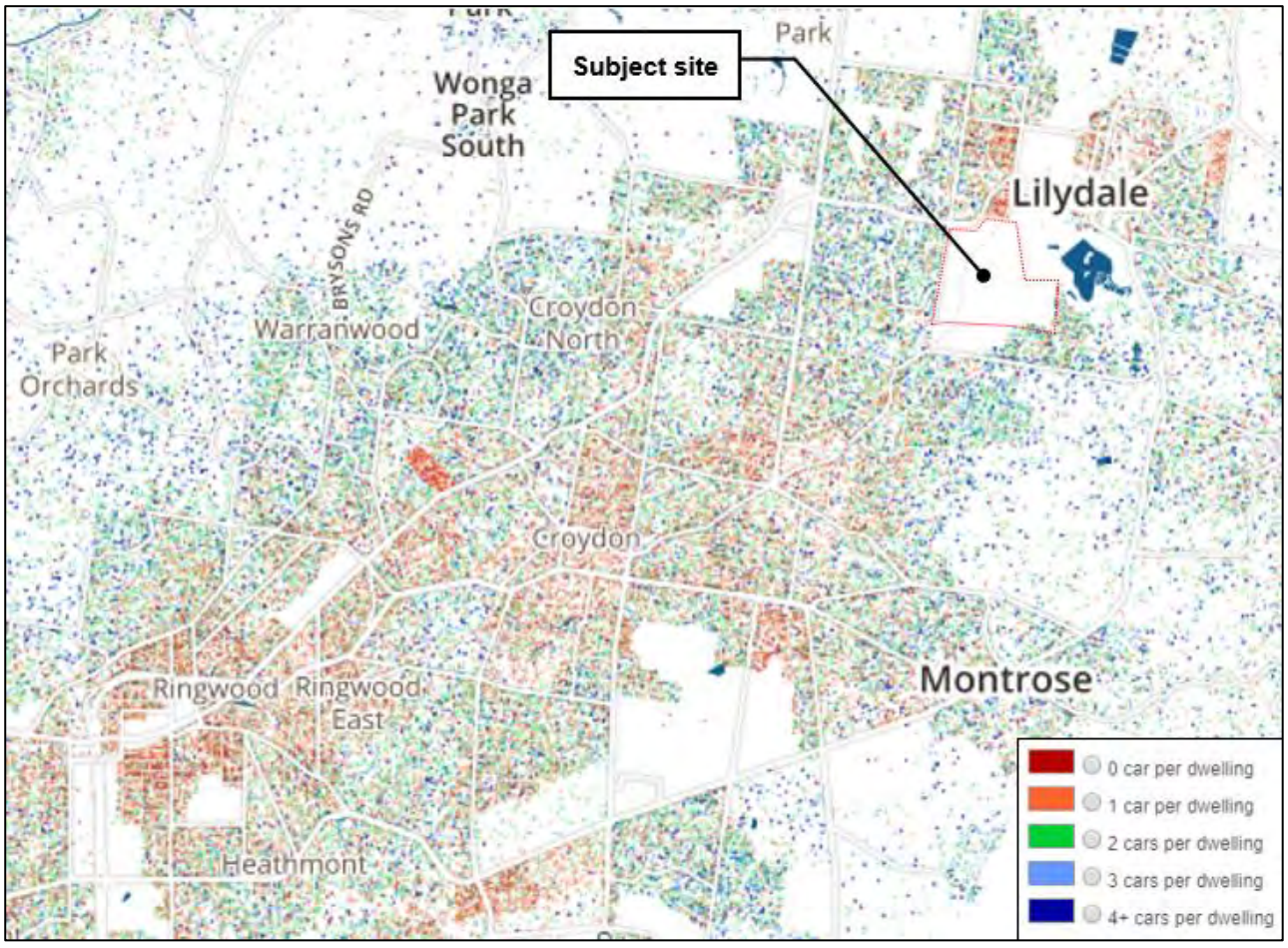
Advances in technology and trends in work patterns have seen an increase in the adoption of flexible working hours and the ability for employees to work from home. The benefits of such trends include a

spreading of the typical peak hours on the road and public transport networks, in addition to a general reduction in the demand for access to the transport network. Whilst the impacts may not yet be having a discernible impact on the transport network, this shift towards employee flexibility and technological advancements has the potential to alter the status quo with respect to demands on transport infrastructure.

3.6.2 Trends in Car Ownership

Historically, car ownership has steadily grown in Victoria, however the rate of growth has slowed in the last 10 years to 2016 at approximately 61 passenger cars per 100 population. A closer look at available car ownership data for Melbourne from the 2006 and 2011 census shows that ownership rates are lowest in areas that are close to the CBD, have high access to public transport, or have significant tertiary education facilities. It is notable in Figure 3-12 that car ownership is typically lower in close proximity to the train line and activity centres such as Ringwood and Lilydale. Given that the subject site is in close proximity to the railway line and proposes a potential future train station and a mix of land uses, supplemented by the nearby MAC, there is significant potential for low car ownership rates associated with the future development. It is also expected that as the development progresses, there will be a higher demand for newer initiatives such as car sharing, which will further reduce car ownership.

Figure 3-12 Car Ownership East of Melbourne



Source: http://monash.edu/research/city-science/MelbourneCarOwnership/#map

3.6.3 Emerging Technologies

There has been significant recent growth in the use of electric vehicles as technology and performance has improved and the cost of vehicles is reducing. It is expected that the ownership and use of electric vehicles will continue to grow as the technology continues to develop. The future development of autonomous vehicles is expected to incorporate electric vehicle technology, and hence a greater demand for charging points and associated parking. The urban redevelopment of the subject site provides an opportunity to cater for this demand by incorporating charge points associated with future car parking.

Electric bicycles have also emerged in recent years, providing a wider catchment area for commuter cyclists, with faster speeds. In particular, electric bike-sharing services have become prominent throughout Australia,

such as Jump, which is currently available in the Melbourne City Council area (as of March 2020) and soon to be available in the City of Port Phillip and City of Yarra. It is also notable in locations such as Lilydale which have an undulating topography that electric bicycles provide a significant benefit for uphill cycling, particularly for less experienced riders. This provides a significant opportunity to boost mode shift to sustainable and active forms of transport for residents of the future development, particularly as electric bikes become cheaper and more accessible.

Looking forward, air-based transport is anticipated to grow in popularity, such as delivery drones and electric-powered passenger vertical take-off and landing aircraft ('v-tols'). These technologies are being trialled in Australia and internationally, with the convenience they provide likely to gain wide appeal.

3.6.4 Emerging Car Parking Management Opportunities

There is an increasing number of car parking management initiatives emerging, capitalising on the policy shift and advances in technology. The 20+ year incremental development of Lilydale Quarry provides an opportunity for this to be incorporated as appropriate for the various land uses and development locations throughout the site.

3.6.4.1 Unbundled Parking

Unbundled parking is a mechanism whereby developers can sell a dwelling separately from car parking provision, rather than the automatic inclusion of the statutory requirement. Buyers then have the choice of purchasing their requirement separately, which may be no parking, a portion of the usual provision, or all of what would normally be provided.

This provides a more equitable and efficient use of the available parking provision in a development. There are a number of ways that unbundled parking can be managed, with a combination of spaces that are sold or rented and common spaces that are unassigned. This provides flexibility for parking supply and assists in minimising an oversupply.

Depending on the proximity to public transport modes, unbundled parking may result in providing a lower parking rate than the statutory requirement. The area around the potential future train station within the subject site which is proposed to incorporate TOD and higher density areas would be a suitable location to incorporate unbundled parking.

3.6.4.2 Electric Vehicle Parking

It is expected that there will be a continued significant increase in the use of hybrid and battery electric vehicles. The increase in both plug-in hybrid electric vehicles and battery electric vehicles will see the need to provide adequate parking / charge points in private developments and in public locations.

4 Lilydale Quarry Comprehensive Development Plan

4.1 Vision

The Lilydale Quarry site will become a major new urban renewal precinct with a masterplan which prioritises liveability and sustainability. A true 20-minute neighbourhood, it will provide housing diversity, recreation opportunities, services and transport modes that support the future community, and integrate with surrounding neighbourhoods. Designed to achieve high levels of walkability, the development will promote social interaction and encourage healthy, active lifestyles.

Key elements of the vision from an integrated transport perspective include the implementation of TOD principles and designing for a walkable neighbourhood. The provision of a potential future train station with higher density development in close proximity increases the opportunity and likelihood for sustainable transport trips. In addition to this, active and healthy lifestyles will be promoted through a mixed-use neighbourhood which provides residents daily needs within a 10-minute walkable catchment. An integrated walking and cycling network, supplemented by a new rail trail link, will encourage active transport as a convenient means of transport. The proposed urban renewal will culminate in sustainable outcomes in all aspects by creating connected, diverse and enduring communities.

4.2 Lilydale Quarry Framework Plan

Given the size of the Lilydale Quarry site and the extended time period over which the site will be developed, it has been identified that a flexible planning framework will be appropriate to realise the full development potential for the site. The Lilydale Quarry CDP will provide this framework to facilitate a development appropriate for the subject site over a potential 20-plus year delivery period.

A Framework Plan for the site has been identified to provide a high-level urban structure for the Lilydale Quarry urban renewal, informed by the opportunities relating to the physical nature and heritage of the site, the adjacent transport network and the various interfaces around the boundary of the site. The Framework Plan provides indicative locations for the mix of land uses, open space areas, and a transport framework including a potential future train station, active transport links and a road hierarchy with connections to the wider transport network.

It is noted that PAO9 is reflected along the northern portion of the site to account for the future Lilydale Bypass, whilst the proposed PAO along the east side of Mooroolbark Road makes allowance for the potential future Healesville Freeway extension (i.e. the Healesville Arterial).

The Lilydale Quarry Framework Plan is shown in Figure 4-1.

Figure 4-1 Lilydale Quarry Framework Plan

Source: Lilydale Quarry CDP

4.3 Proposed Road Hierarchy

The proposed road hierarchy is illustrated in Figure 4-2, with the typical cross sections provided in Appendix B.

A north - south boulevard connector street with a 30.1 m road reserve is proposed to the east of the railway line which will provide a continuous link from Hull Road to Melba Avenue. The road reserve is proposed to comprise of 1.5 m wide pedestrian footpaths on each side of the road reserve, adjacent to 3.0 m wide landscaped nature strips, in addition to a 3.0 m wide two-way cycle path separated from the road by a 1.8 m wide nature strip. 3.5 m wide travel lanes are to be provided in each direction with 2.1 m wide indented parking, separated by a 5.1 m wide central landscaped median. This cross section was agreed following a workshop with the VPA, Council, Intrapac, Reeds and Cardno and has subsequently been approved as part of Stage 1.

An east – west connector street with a 25 m road reserve is proposed to provide access between Mooroolbark Road and the north – south boulevard connector street in the southern portion of the site. It is noted that this connector street includes a vehicle crossing providing connectivity between precincts either side of the railway line. This crossing is ideally located, considerate of constraints with respect to land form, railway operations and the potential future train station location. Connector streets will also be provided to connect to Mooroolbark Road via extensions of Churchill Drive and Landscape Drive. The reserve is proposed to comprise of 1.5 m wide pedestrian footpaths on each side, 3.0 m wide landscaped nature strips and a 3.0 m wide two-way cycle path separated from the road by a 1.8 m wide landscaped separator. 3.5 m wide traffic lanes are to be provided, with 2.1 m wide indented parking on both sides.

Higher order local access streets (level 2) are proposed to provide key residential linkages generally within a 29 m wide road reserve for ‘boulevard streets’ and a 21 m wide road reserve for ‘avenue streets’. The road reserve of avenue streets is proposed to comprise of 1.5 m wide pedestrian footpaths on each side, 2.9-3.0 m wide landscaped nature strips and a 3.0 m wide two-way cycle path separated from the road by a 1.8 m wide landscaped separator. A 7.3 m wide carriageway is to be provided with on-street parking available on both sides of the road carriageway. The road reserve of boulevard streets is proposed to comprise of a cross section similar to boulevard connector streets, with a dedicated cycle path possibly provided in the central landscaped median.

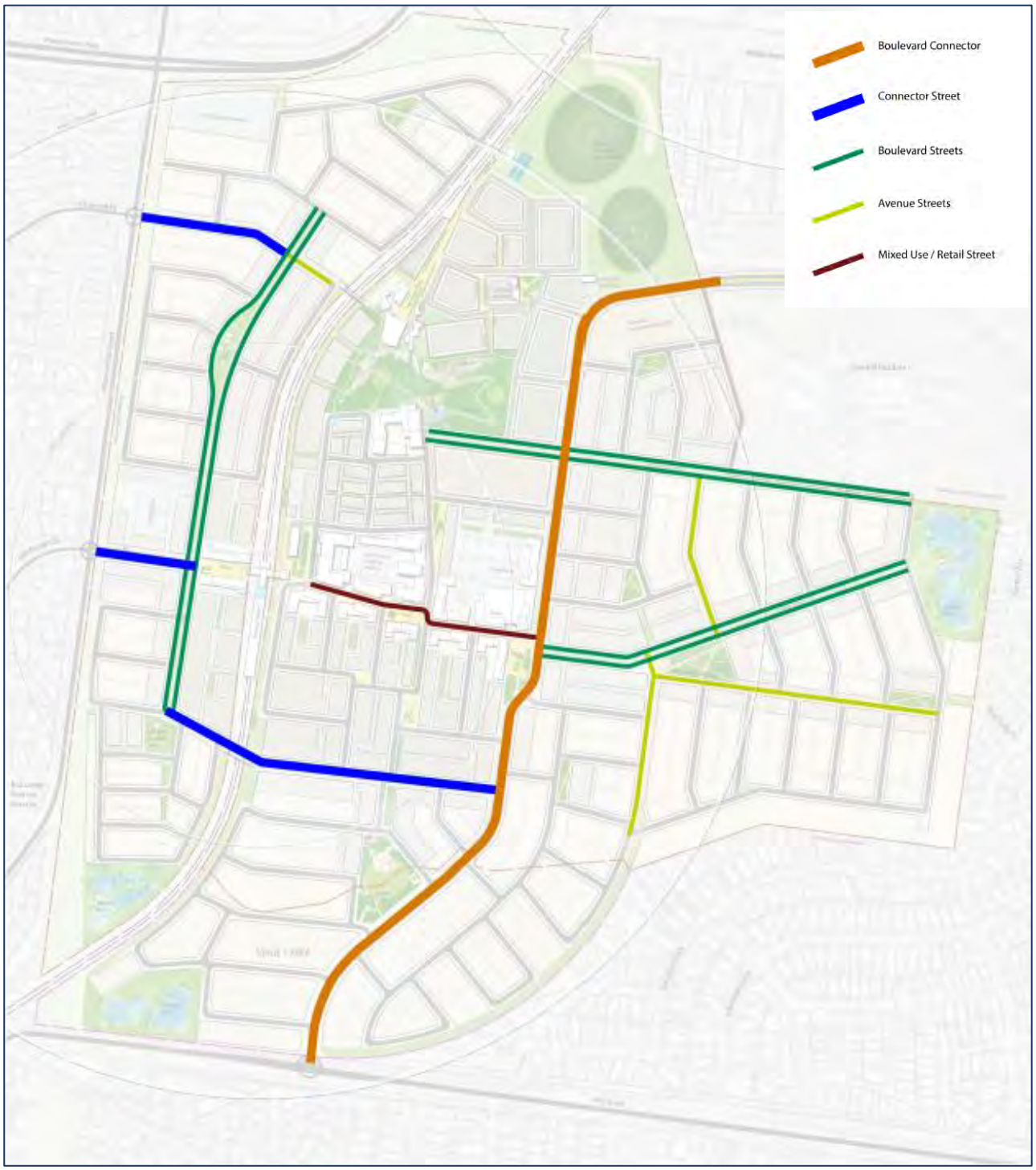
Other residential streets will be in the form of local access streets (level 1) within a 16 m wide road reserve. This road reserve is proposed to comprise of 1.5 m wide pedestrian footpaths on each side, 2.7-3.0 m wide landscaped nature strips and a 7.3 m wide carriageway, with on-street parking available on both sides of the carriageway.

A key ‘mixed use / retail street’ will also be provided in the urban core area, of which the street cross section is subject to future detailed design.

Access lanes (typically 5.5 m wide) will provide access to off-street parking for medium density lots.

In relation to active transport, two-way bicycle path treatments along connector streets will be provided in accordance with Victorian Planning Authority standards, noting examples of their typical treatments at critical locations, such as side road crossings, intersections and bus stops. Treatments include flat top road humps and raised roundabout treatments.

Figure 4-2 Proposed Road Hierarchy



4.4 Future Precinct Access

An indicative precinct plan as shown in Figure 4-3 identifies four primary precincts within the subject site. Each precinct will have a unique character, whilst ensuring that the land use and connectivity remains integrated to achieve the overall objectives for development. The precincts, with the proposed access arrangements, are summarised below.

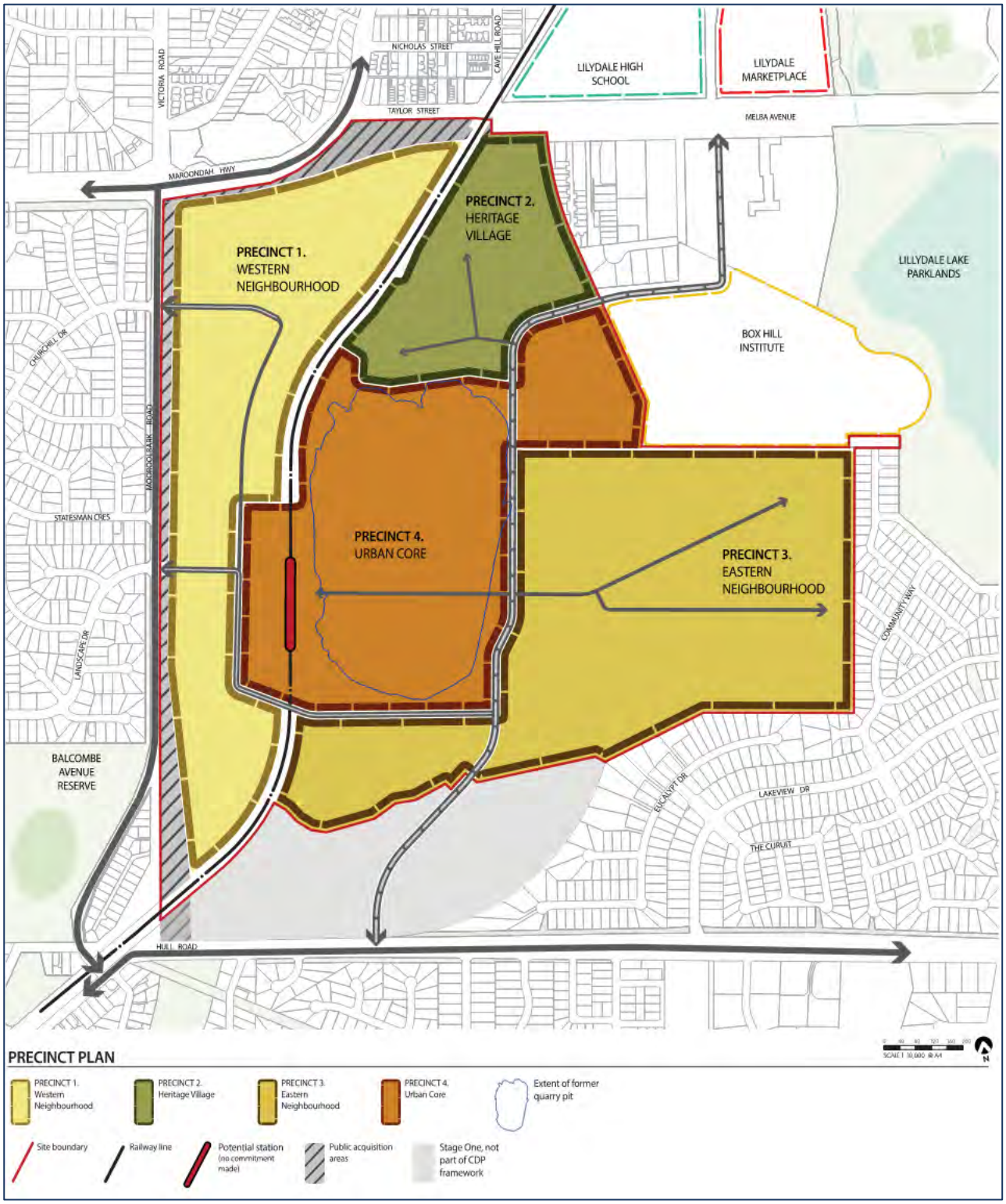
Precinct 1 – Western Neighbourhood: This precinct is bound by the railway line to the east, Maroondah Highway to the north and Mooroolbark Road to the west. The intent is to provide a mix of traditional and medium density housing and delivering a linear green corridor and a signature local access street that forms a legible spine through the precinct, weaving together the northern, central and southern areas. There is also potential for a commercial mixed-use development that responds to the Maroondah Highway frontage at the northern edge of the precinct. The western neighbourhood will also integrate strategic pedestrian connections into the site from Mooroolbark Road.

Precinct 2 – Heritage Village: Located within the northeast portion of the subject site, the heritage village will provide a focus for mixed use activity, including residential development and open space integrated with the site's significant heritage assets. This precinct will celebrate the history of the site and provide a sense of arrival with the historic gateway at the Melba Avenue entrance to the precinct. Vehicular access to the heritage village will be primarily via the north - south connector street boulevard, complemented by a surrounding active transport network.

Precinct 3 – Eastern Neighbourhood: The eastern neighbourhood seeks to deliver a model walkable urban neighbourhood with a mix of traditional and medium density housing, focused around a defining central park and local access streets. Its location is able to maximise the residential population within a walkable catchment of the potential future train station and commercial and retail amenities. The precinct seeks to integrate new development with surrounding residential areas via pedestrian and cycle links that connect to Sharnalee Court and north - south rail trail connections.

Precinct 4 – Mixed Use Urban Core: Located central to the subject site and containing the potential future train station, this precinct will deliver higher density transit-oriented development, establishing opportunities for living and working within a walkable catchment of the station. Local access streets will each have a distinctive character defined by changes in alignment and the precinct will support sustainable transport by providing cycle infrastructure at the station. Pedestrian and cyclist movement will be prioritised, inclusive of a pedestrian priority area around the potential future train station and retail development will be achieved through traffic calming techniques. Consistent with the focus on sustainable transport, shared, pooled or unbundled parking initiatives could be implemented at the time of development, consistent with Green Star objectives.

Figure 4-3 Indicative Precinct Plan



Source: Lilydale Quarry CDP

5 Integrated Transport Objectives, Requirements & Guidelines

In developing this ITP and through extensive stakeholder engagement, a set of Objectives, Requirements and Guidelines (ORGs) have been identified and incorporated within the CDP in order to inform land use and built form decision making. These are generally identified as:

Objectives	High level vision statements that apply to each development theme. Objectives are mandatory, so any development proposal must comply with these statements.
Requirements	Matters that must be complied with in the design of a development. Requirements cannot be varied by the issue of a planning permit.
Guidelines	Matters that should be considered in precinct planning or the design of a development. If the Responsible Authority is satisfied that an application for an alternative to a guideline satisfies the objectives or requirements of the CDP, then that alternative may be considered.

The following sections provide the Integrated Transport ORGs that have been identified. It is recognised that a number of requirements are beneficial to multiple transport modes.

5.1 Integrated Transport

The urban renewal of the Lilydale Quarry is an opportunity to implement the principles of Plan Melbourne's 20-minute neighbourhood, including provision of TOD with an appropriate mix of densities and land uses.

The proposed urban form is centred-around the provision of a potential future train station, which will promote the use of active and public transport. The internal transport network will be fully integrated and will promote sustainable transport modes throughout the subject site.

The overarching Integrated Transport Objectives identified in the CDP to guide the urban renewal of the Lilydale Quarry are:

Objective 1: To develop an integrated multimodal transport network that supports the redevelopment of the former Lilydale Quarry as a dense, highly-walkable urban environment affording high levels of transport choice while promoting a shift towards sustainable transport modes.

Objective 2: To prioritise sustainable transport within the development and maximise intermodal connectivity within the Urban Core and in proximity to the potential future train station.

Objective 3: To provide safe and convenient active transport links between where people live and where they work, shop and recreate, integrated with connections outside the site.

Objective 4: To develop a legible and inter-connected vehicle transport network within the site, with public transport that is fully integrated with surrounding areas, including key local and regional employment nodes and activity centres.

Objective 5: To ensure the transport and car parking network is capable of advancing and responding to future trends and technologies.

5.2 Active Transport

The active transport network has been designed to facilitate east – west and north – south movements throughout the subject site. A rail trail cycle path is proposed along the existing railway line, which promotes active transport use within the subject site and will also connect to the external network, including the Bayswater – Lilydale trail to the south and Lilydale-Warburton rail trail to the north. Pedestrian and cyclist priority areas will be established in the urban core, which will also function to connect areas of open space. Pedestrian pathways are also proposed to be provided over the railway line in key locations to provide active transport links between east and west. These features are illustrated in Figure 5-1.

The following active transport requirements have been identified to support the urban renewal of the subject site:

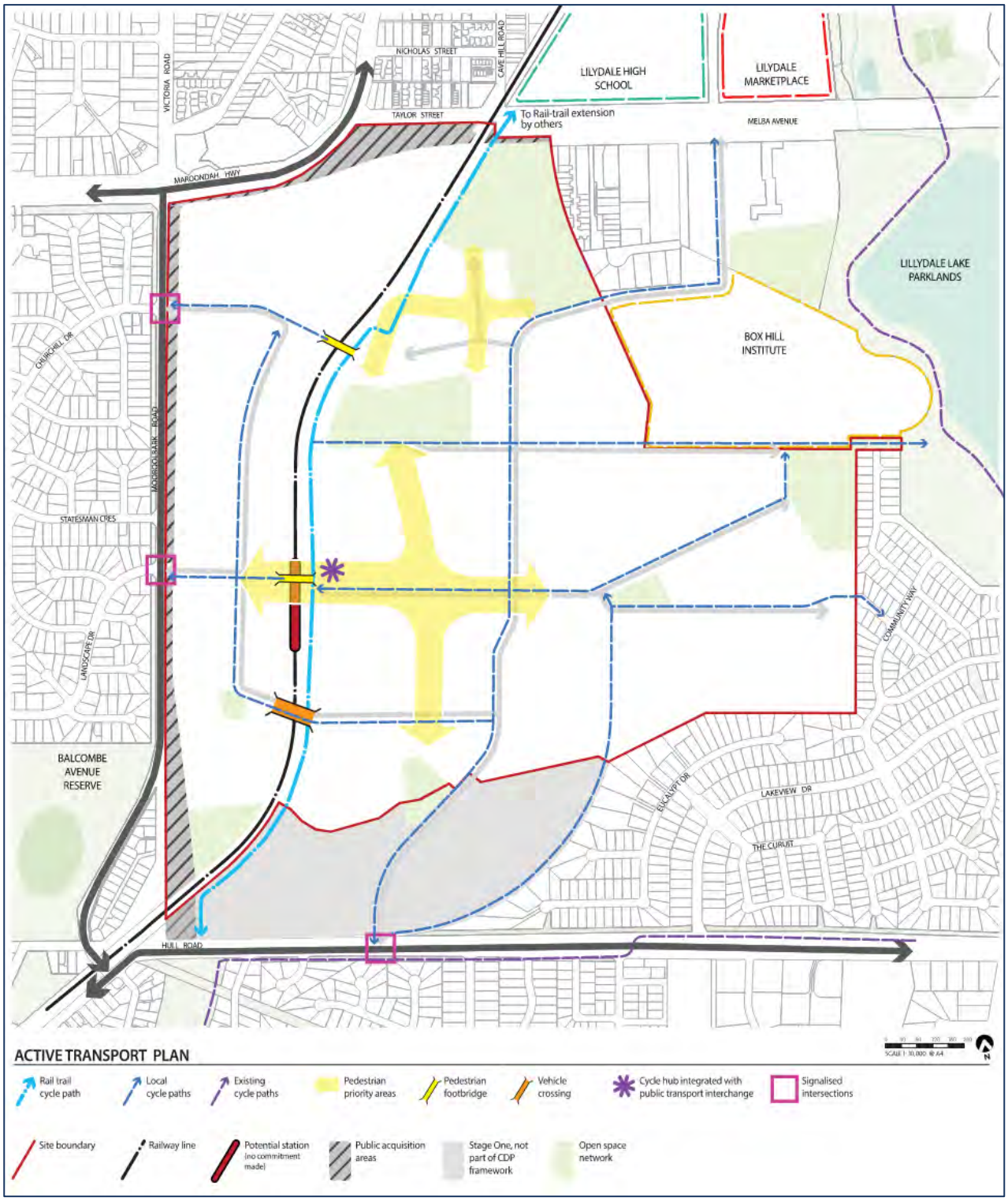
Requirement 1: Dedicated cycle paths (separated from pedestrian and vehicular traffic) or shared paths (separated from vehicular traffic) must be provided internally providing access to the potential future train

station and Town Centre, and be designed to allow for connection to the external shared/cycle paths as shown in Figure 5-1.

Requirement 2: Activated mixed-use streets in the Urban Core shall be provided as shared zones (pedestrian and cyclist priority zones) with streetscape design initiatives to ensure maximum convenience and safety of pedestrians.

Requirement 3: A 'Rail Trail' will be provided within the site adjacent to the existing train line, with a design that allows for connections into the broader shared/cycle-path network external to the site.

Figure 5-1 Active Transport Plan

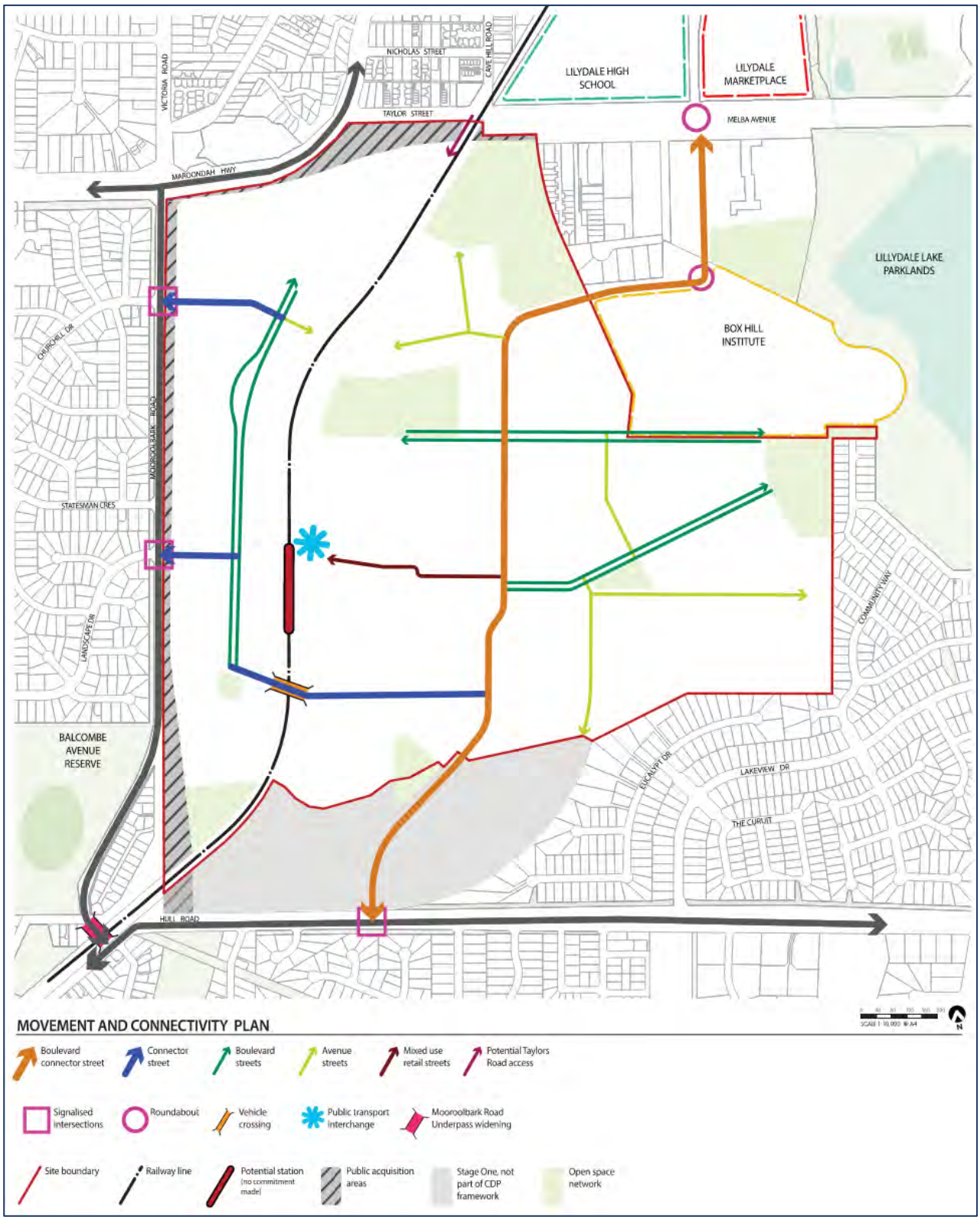


Source: Lilydale Quarry CDP

5.3 Public Transport

A key strength of the urban renewal of the Lilydale Quarry is that the Lilydale metropolitan railway line runs through the subject site. The future urban form is able to capitalise on this opportunity by integrating a connected bus network via an intermodal interchange. All connector streets will be designed as bus capable roads, with the indicative network illustrated in Figure 5-2.

Figure 5-2 Movement and Connectivity Plan



Source: Lilydale Quarry CDP

The following public transport specific requirements have been identified to ensure the integration of a sustainable transport network.

Requirement 4: The potential future train station must be located in Precinct 4, central to the site (generally consistent with Figure 5-2).

Requirement 5: Connector streets and boulevard streets must be designed as bus capable roads, with a minimum of 90% all dwellings generally located within 400 metres of a bus capable road. It is expected that all areas of the subject site will be within a 400 metre bus catchment, satisfying the requirement.

Requirement 6: A transport interchange must be provided to service the potential future train station and the TOD, including adequate bus parking bays with shelters, commuter car parking, real-time service information, direct pedestrian access to the station entrance, and appropriate quality bicycle facilities. The design of the transport interchange must be to the satisfaction of the relevant transport authority.

Requirement 7: Cycle infrastructure should be provided at the potential future train station to encourage active transport, including secure / undercover cycle storage.

5.4 Road Network, Intersections & Car Parking

Vehicular access between the subject site and the external road network is proposed to be provided via four key intersections, as follows:

- A proposed roundabout at the Melba Avenue / Hutchinson Street intersection to the north of the subject site (a roundabout connection will also be provided to the south of this intersection to connect the Box Hill Institute's Lilydale Lakeside Campus to the north-south boulevard connector street);
- Two signalised intersections with Mooroolbark Road to the west (i.e. upgrading the existing priority-controlled intersections at Churchill Drive and Landscape Drive to four-leg signals); and
- A signalised intersection with Hull Road to the south, in the form of a T-intersection.

Internally, traffic will be efficiently distributed throughout the site via connector streets that link the supporting local street networks to all key internal destinations and external connections. Cross sections of these streets are identified in Appendix B.

The existing railway line presents a physical barrier to east – west movements, however a vehicle crossing is provided to the south of the potential future train station to provide for key internal east – west traffic movements to Mooroolbark Road. This location was selected in order to provide separation from the mixed use 'urban core' which has a focus on TOD and active transport. Providing a vehicle crossing north of the potential future train station was considered undesirable as to prevent through movements between the Maroondah Highway and the Lilydale marketplace. An active transport rail crossing is provided to the north instead, which is consistent with the land uses in this location. Further to the above, the site topography to the south of the potential future train station lends more easily to a crossing in that location.

The provision of car parking is intended to be such that sustainable transport modes are encouraged and that flexibility is maintained for future adaptation. Car parking should be complimentary to TOD and as such be located to encourage pedestrian mobility around activity nodes and intermodal transport hubs.

The following requirements and guidelines have been identified to address efficiency in vehicle movements and appropriate provision of car parking:

Requirement 8: The connections to the external road network must be provided in accordance with the intent of the Infrastructure Agreement between the land owner and the Council.

Requirement 9: An efficient internal local road network must be provided on the site, generally consistent with Figure 5-2, which supports safe movement and connectivity to all intersections with the external road network. Local streets should be consistent with relevant standard cross sections. Alternative cross sections may be considered if:

- Minimum required carriageway dimensions are maintained for the operation of emergency service vehicles and buses (on connector streets and above);
- Pedestrian and bicycle performance characteristics are maintained;
- Minimum road reserve widths for the type of street are maintained.

Requirement 10: The road network throughout the site must be appropriately designed to allow emergency services easy access to all parts of the development.

Requirement 11: Where practical, off-street car parking and loading facilities provided at grade in Precincts 2 and 4 must be located to the rear of all buildings, or otherwise appropriately screened, as agreed by the Responsible Authority.

Requirement 12: At-grade or above-ground car parking must have a minimum floor to floor height of 3.5 metres to enable future adaptation for alternate uses.

Guideline 1: The number of vehicle crossovers to the off- road shared user path alongside the North-South Connector Road should be minimised to reduce the likelihood of potential conflicts between vehicles, cyclists and pedestrians.

Guideline 2: Rail crossings should be designed and located to maximise connectivity, minimise ramping required and to minimise the extent of retaining walls and engineered structure required to accommodate level changes.

Guideline 3: The provision of at-grade car parking near the potential future train station should be limited to ensure priority is given to maximising the residential population that lives within a walkable catchment of the station. Multi-level decked parking is preferred.

Guideline 4: Car parking provision within Precinct 2 and 4 may be reduced to encourage use of active and public transport.

Guideline 5: The transport network should be capable of adapting to and providing for new infrastructure to cater for emerging vehicle technology.

Guideline 6: Unbundled car parking options should be provided in higher density residential developments in proximity to public transport hubs, consistent with Green Star requirements.

6 Concept Masterplan

In consideration of the ORGs that have been identified and incorporated within the CDP, a Framework Plan has been developed which is also supported by a Precinct Plan, Active Transport Plan and Movement and Connectivity Plan. Development of these ORGs and guiding Framework Plans has led to the preparation of a Concept Masterplan of the future proposed development of the subject site. This Concept Masterplan enables consideration of a detailed land use schedule, supported by an appropriate movement and access network. The Concept Masterplan is shown in Appendix A.

The Concept Masterplan includes the following key features:

- A potential future train station along the existing Lilydale railway line to be complemented by TOD development including a bus interchange with cycling facilities and parking. Land uses will comprise a mix of office, retail, commercial, civic spaces and higher density residential development;
- A pedestrian and cycling bridge is to be provided north of the potential future train station, whilst a vehicle, cycling and pedestrian bridge is provided to the south, allowing east-west accessibility across the railway line, supplemented by a north-south aligned rail trail;
- A legible movement and access network consisting of a considered road hierarchy with bus capable roads and prioritises active transport;
- A Proposed Government Specialist School and substantial areas of open space supported by active transport linkages;
- A range of on-street and indented parking appropriate to the road classification, with rear laneway access to medium density development; and
- PAO areas reserved for potential future road infrastructure projects relating to the external road network.

In addition to the Concept Masterplan, the following will be provided and outlined in the Infrastructure Agreement:

- Upgraded intersections associated with the proposed north-south boulevard connector street at Melba Avenue to the north and Hull Road to the south, in the form of a roundabout and signalised intersection respectively; and
- Upgraded intersections along Mooroolbark Road at Churchill Drive and Landscape Drive (from unsignalised T-intersections to four-way signalised intersections).

The proceeding sections now consider the future development of this Concept Masterplan in further detail, including the proposed traffic generation and associated impacts.

7 Traffic Impact Assessment

7.1 Introduction & Background

7.1.1 Introduction

The following sections assumes traffic conditions at the completion of the Lilydale Quarry urban renewal (Kinley development) to reflect the 'ultimate' access scenario to cater for the full development. Mitigating works on the road network and access arrangements in the interim will occur as the development progresses and future traffic forecasts can be more accurately assessed.

7.1.2 Purpose of Traffic Impact Assessment

The traffic impact assessment has been undertaken in order to identify road network improvements, which would be required should development proceed prior to regional projects being implemented.

A comprehensive Supporting Traffic Impact Assessment has been prepared and provides further information to this high-level summary. The TIA report is attached in Appendix D.

7.1.3 Prior Consultation

The first Integrated Transport Workshop was held on the 9th of November 2018, which discussed land use and yield, key traffic generation and distribution assumptions, the internal road network, external site access connections and mitigation works required to the surrounding road network. A subsequent technical workshop was held on the 22nd of November 2018 to determine the cross-section of the North-South Boulevard Connector Street.

An outcome of the first workshop was that given a potential future train station (Cave Hill Station) is intended to be provided internal to Kinley, the non-residential uses and external traffic attracted to the train station should be considered in greater detail. Given this, the development yield was updated to consider the additional non-residential uses and subsequently traffic analysis of the anticipated traffic volumes was re-undertaken. If in the event that the intended train station is unable to be delivered, the proceeding analysis is considered to be conservative in nature.

A further workshop was held on the 28th of June 2019, which discussed the actions since the previous workshop, the Comprehensive Development Plan framework and the Integrated Transport Plan document (issues and opportunities, internal street cross sections and crossing treatments, and the external site access connections and mitigation works required to the surrounding road network). Numerous workshops were then held in 2019, inclusive of a meeting to discuss the process and amendment documents to finalise the Integrated Transport Plan on the 24th of October 2019.

Further correspondence with the DoT regarding traffic generation rates took place via Cardno's memo dated 17 August 2020 in response to DoT's letter dated 06 August 2020. DoT's final response to Cardno's memo, dated 17 September 2020, confirmed the traffic generation rates agreed between the two parties that have informed the traffic modelling contained within this report.

7.2 Development Yield

7.2.1 Development Yield

The development scenario and yield used as the basis for the traffic assessment is outlined in Table 7-1. Given the development is in the concept master planning stage, some assumptions regarding the nature of the non-residential uses have been made.

Kinley could ultimately comprise a total of 3,250 dwellings (approximately), with uses centred around Transit Orientated Development in the 'urban core' area (proximate to the potential future train station) that would consist of non-residential uses such as an urban primary school, civic institution and office and retail areas. A mixed-use commercial area at the north-west corner of the site is also envisioned.

The development yield assumed is considered a moderate yield scenario anticipating the delivery of a potential future train station at some point in the future – during the development of Precinct 4. If a potential future train station was not to be delivered, the development yield would subsequently reduce and conversely if a train station was delivered early, development yield would likely increase necessitating a reassessment of the traffic impacts.

7.2.2 Development Staging

It is anticipated that the development of the site will occur progressively over a 20-plus year period until the full yield is realised. As such, the transport network will not be required to cater for projected population immediately. The current and future road and movement network will be considered further as part of the precinct planning stages, responding to the immediate development access needs whilst still considering the ultimate transport network structure.

Development staging will be determined largely by the development proposals on land within the precinct and the availability of infrastructure services.

Table 7-1 Development Yield

Development Use	Typology / Location	Number / Area	Assumptions
Residential Dwellings	Conventional lots	865 dwellings	Low density
	Large lots	99 dwellings	Low density
	Large Medium density lots (3+ bedrooms)	748 dwellings	Large medium density
	Medium density lots (1-2 bedrooms)	320 dwellings	Medium density
	Heritage quarter – Large medium density lots	125 dwellings	Large medium density
	Heritage quarter – Medium density lots	124 dwellings	Medium density
	Urban core townhouses – Large medium density lots	148 dwellings	Large medium density
	Urban core townhouses – Medium density lots	221 dwellings	Medium density
	Apartments	600 dwellings	High density
	Total Dwellings	**3,250 dwellings**	**-**
Mixed Use Commercial	Maroondah Hwy / Mooroolbark Rd corner	Site: 0.55 ha	6,250 m^2 GFA
Proposed Government Specialist School	Urban core	Site: 1.40 ha	250 students
Civic Institution	Urban core	Site: 0.55 ha	2,750 m^2 GFA
Office Commercial	Urban core	Site: 4.1 ha	12,300 m^2 GFA
Retail Opportunity	Urban core	5,300 m^2 GFA	5,300 m^2 GFA
Parking Spaces	Retail and multi-deck	1,100+ spaces	500 spaces associated with potential future train station commuters

GFA = Gross Floor Area

7.3 Traffic Generation & Distribution

7.3.1 Traffic Generation

The traffic generation rates for the various development uses are summarised in Table 7-2, with further detail provided as to how these rates were determined in the supporting TIA report attached in Appendix D.

Table 7-2 Trip Generation Rates

Development Use	AM Peak Hour	PM Peak Hour
Residential: Low Density (Conventional)	0.7 trips/dwelling	0.7 trips/dwelling
Residential: Large Medium Density (3 or more bedrooms)	0.65 trips/dwelling	0.65 trips/dwelling
Residential: Medium Density (1-2 bedrooms)	0.5 trips/dwelling	0.5 trips/dwelling
Residential: High Density (Apartments)	0.3 trips/dwelling	0.3 trips/dwelling
Mixed Use Commercial (Super Lot)	2.2 trips/100m^2 GFA	2.2 trips/100m^2 GFA
Proposed Government Specialist School	0.4 trips/student	0.2 trips/student
Town Centre: Civic Institution	N/A	N/A
Town Centre: Office Commercial	1.5 trips/100m^2 NFA	1.5 trips/100m^2 NFA
Town Centre: Retail Opportunity	0.8 trips/100m^2 LFA	8 trips/100m^2 LFA
Potential Future Train Station Car Park	0.5 trips/space	0.5 trips/space

7.3.2 Traffic Distribution

Trip distribution has been undertaken considering the various land use within and surrounding Lilydale, the survey data from the Victorian Integrated Survey of Travel and Activity (VISTA) and traffic surveys undertaken in the area.

The traffic distribution is broadly outlined in Table 7-3. The trip distribution to/from different areas of the subject site differs slightly due the provision of the North-South Boulevard Connector Street provided through the eastern section of the development site.

Table 7-3 Trip Distribution

Distribution Route	West of Railway Line		East of Railway Line	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
North via Victoria Road	6%	4%	5%	4%
West via Maroondah Highway	31%	31%	31%	30%
East via Maroondah Highway	18%	25%	10%	13%
West via Hull Road	26%	23%	30%	30%
East via Hull Road	19%	17%	24%	23%

7.4 Internal Traffic Assessment

7.4.1 Connectivity & Permeability

The internal road network and hierarchy is intended to respond to the physical constraints and the traffic generation expected from the proposed land use types within the site. The network provides a main North-South Connector Boulevard Street as the primary access to the external strategic road network, whilst the Connector Streets collect and disperse traffic from Mooroolbark Road and the main North-South Connector Boulevard Street to the local residential streets within the development.

The nature of the access points and internal road network are such that it will allow local traffic into and through the development area whilst discouraging any unnecessary traffic passing through the development. Connector Streets will have bus-friendly intersection traffic management or priority discontinuities (such as a “staggered T” intersection or a roundabout) at a maximum 400 m spacings to manage vehicle speeds.

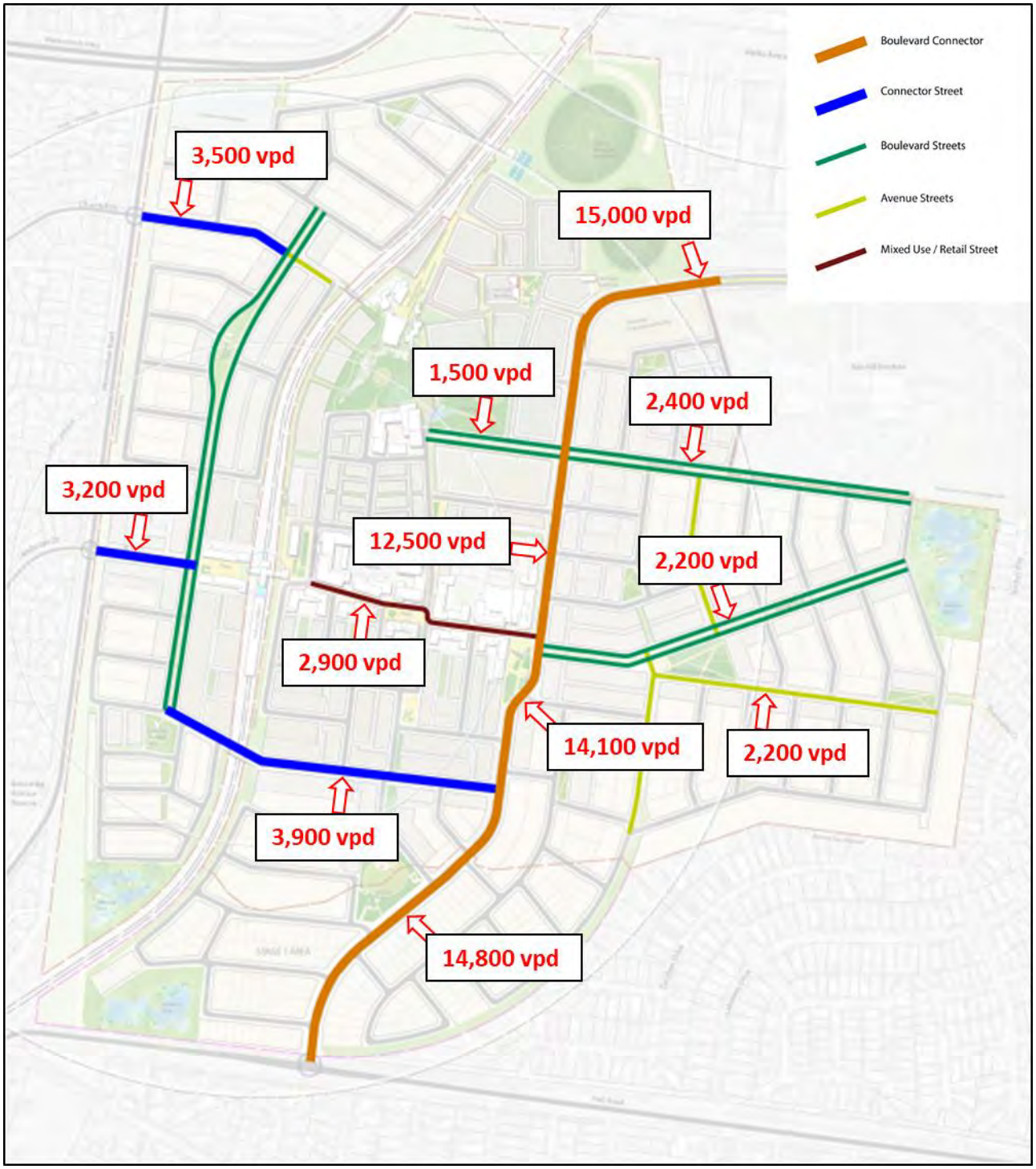
The urban renewal of the Lilydale Quarry will significantly increase permeability for vehicles, cyclists and pedestrians into and through the site.

7.4.2 Traffic Volume Assessment

Based upon the development yield and traffic generation and distribution, spreadsheet modelling has been undertaken to determine the anticipated traffic volumes on the connector streets and higher order access streets within Kinley.

The results of the assessment are illustrated in Figure 7-1. Refer to Appendix B for the relevant cross sections.

Figure 7-1 Anticipated Daily Traffic Volumes on Internal Roads



7.4.3 North-South Boulevard Connector Street

7.4.3.1 Nature & Function

The main North-South Boulevard Connector Street provides a spine through the site providing the primary access to the external road network with internal connections to both connector and local access streets. The road is to be bus capable and provide one lane in each direction, with opposing traffic streams separated by a raised central median.

7.4.3.2 Theoretical Road Capacity

Connector Streets (which provide one lane in each direction) are outlined in Clause 56.06 of the Planning Scheme as carrying traffic volumes typically in the order of 3,000 to 7,000 vehicles per day. In addition, the North-South Connector Street has been designed as a Boulevard Connector Street capable of carrying volumes greater than 7,000 vehicles per day.

Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidance for typical mid-block capacities for urban roads with interrupted flow. The road capacities detailed consider unflared major intersections and interruptions from cross and turning traffic at minor intersections. As set out in Table 5.1 of the Guide, for a kerb lane adjacent to a parking lane, the mid-block capacity is 900 vehicles per lane. This translates to 1,800 vehicles per hour (vph) or 18,000 vehicles per day (vpd) (assuming the peak hour flow is 10% of the daily flow) for a two-lane road.

The North-South Connector Street is estimated to carry up to 15,000 vpd adjacent Hull Road (to the south) and Melba Avenue (to the north), with volumes adjacent the Urban Core in the range of 12,000 vpd to 14,000 vpd. Due to the nature and function of the road (to serve local needs, not regional traffic), as well as intersection upgrades and mitigation works along Mooroolbark Road, this road will not attract significant external traffic.

Based on the above, the current cross-section for the North-South Connector Street is considered sufficient to cater for the increased volumes.

7.4.4 Connector Streets

The East-West Connector Street (across the railway line) is estimated to carry approximately 3,900 vpd. The continuations of Churchill Drive and Landscape Drive are anticipated to carry 3,500 vpd and 3,200 vpd, respectively.

The expected volumes on the connector streets are representative of lower order connector streets, which are representative of their purpose to connect neighbourhoods and to link local streets to the arterial road network.

7.4.5 Access Streets (Level 2)

The higher order access streets are estimated to carry approximately 1,500 vpd to 2,900 vpd. The expected volumes are representative of higher order local access streets (level 2), which primarily function as site access roads rather than through traffic roads.

7.5 External Traffic Assessment

7.5.1 Methodology

7.5.1.1 Traffic Growth Rate

A 1.1% compound traffic growth for background traffic volumes has been applied to obtain current (2020) and future (2030) traffic volumes.

7.5.1.2 Existing External Intersections

It has been agreed with DoT that the traffic assessment of existing external intersections will be based on existing traffic volumes plus the development traffic volumes to determine the impact of the urban renewal of the quarry site, and thus the mitigation measures required. Therefore, the post development traffic volumes have been derived by adding the Kinley development traffic volumes to 2020 volumes.

Notably, the assessment of the post development volumes is based on a first principles assessment and also assumes no major changes to the wider arterial road network (e.g. the Lilydale Bypass or Healesville Arterial implementation), which would lessen the impact of the urban renewal of the Lilydale Quarry on the wider road network.

7.5.1.3 Site Access Intersections

All site access intersections to the urban renewal development area have been assessed at 2030 with a 1.1% compound traffic growth for background traffic volumes. These volumes have been used to inform total intersection requirements, and are outlined in the supporting TIA report provided in Appendix D.

These intersections were assessed in this manner as they will be new intersections and as such require a measure of 'future proofing' given that it is anticipated that the development of the site will occur progressively over a 10-plus year period until the full yield is realised.

7.5.1.4 Intersection Analysis

The operation of the existing external road network intersections has been assessed (using SIDRA Intersection) post the full development of the subject site, with 2020 used as the base year. These results are provided in Appendix D. The existing external intersections modelled include:

- Victoria Road / Maroondah Highway / Mooroolbark Road;
- Mooroolbark Road / Hull Road;
- Swansea Road / Hull Road;
- Anderson Street / Hardy Street;
- Anderson Street / Maroondah Highway;
- Maroondah Highway / Hutchinson Street; and
- Hutchinson Street / John Street.

Similarly, the site access intersections have been assessed post the full development of the subject site, but with 2030 used as the base year. The site access intersections modelled include:

- Mooroolbark Road / Site Access / Churchill Drive;
- Mooroolbark Road / Site Access / Landscape Drive;
- Honour Avenue / Hull Road; and
- Hutchinson Street / Honour Avenue / Melba Avenue.

The following sections detail the proposed external road and access intersection upgrade recommendations, informed by the results from this analysis. These include proposed road network links and intersections provided or upgraded to account for the additional traffic generated by the Kinley development. Further information is provided in the supporting TIA report attached in Appendix D.

7.5.2 Site Access Intersections

The site access intersections will tie into the existing Mooroolbark Road, Hull Road and Melba Avenue / Hutchinson Street road carriageways. Further commentary is provided in the following sections.

7.5.2.1 Western Site Access

The Mooroolbark Road / Churchill Drive and Mooroolbark Road / Landscape Drive intersections will be upgraded from unsignalised T-intersections to four-way signalised intersections. The signalisation of these intersections will provide additional safe crossing points for pedestrians and cyclists across Mooroolbark Road. Specifically, the following is deemed to be required:

- two northbound and two southbound lanes along Mooroolbark Road on approach to the intersections; and
- separate left turn and right turn lanes on all approaches, except for the western approaches where a shared left turn / through lane is provided.

An additional left-in / left-out intersection could also be provided to Mooroolbark Road at the southern end of the quarry site, albeit grading considerations (to enable the road to connect with a future Healesville Arterial) indicate that this is infeasible. This access point would be located south of Landscape Drive and north of Nicholson Lane, near Westall Court.

The concept plans are provided in Appendix D (refer to drawings V161623-TR-SK-0059-2, SK-0061-2 and SK-0062-2).

7.5.2.2 Northern Site Access

The Hutchinson Street / Melba Avenue intersection is proposed to be reconfigured to a three-leg single lane roundabout to provide site access. Jarlo Drive will be realigned to the south of the intersection, connecting to the North-South Boulevard Connector Street via a single lane roundabout.

Should the Lilydale Bypass be constructed, the roundabout design will not preclude the construction of a four-leg signalised intersection, as the proposed roundabout will sit within the ultimate design. Some road realignment of the North-South Boulevard Connector Street may be required, which is also shown in the concept plan provided in Appendix D (refer to drawing number V161623-TR-SK-0050-2).

7.5.2.3 Southern Site Access

A three-leg signalised intersection at the intersection of the North-South Connector Road and Hull Road was developed as part of Stage 1 of the Lilydale Quarry urban renewal, which underwent a separate planning approval process. It was agreed that an unsignalised T-intersection was to be provided in the interim (to cater for the Stage 1 development), with a signalised intersection to be provided to cater for the full (Stage 2) development of the site. Specifically, the following is deemed to be required:

- two eastbound and two westbound lanes along Hull Road on approach to the intersection; and
- separate left and right turn lanes on all approaches, with slip lanes provided for left-turn movements.

The concept plan is provided in Appendix D (refer to drawing number V161623-TR-DG-2501-4, DG-D502-4 and DG-2503-4).

7.5.2.4 SIDRA Intersection Analysis Summary

As detailed in the DoT *Supplement to Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis*, in evaluating intersection performance during capacity analysis and design the target maximum Degree of Saturation (DoS) of the critical (maximum) movement is:

- 0.90 (desirable) and 0.95 (maximum) for signalised intersections; and
- 0.80 (desirable) and 0.85 (maximum) for un-signalised intersections, including roundabouts.

The results of the SIDRA analysis of the site access intersections is summarised in Table 7-4. All of the site access intersections will operate within DoT desirable target Degree of Saturations (DoS).

Table 7-4 Site Access Intersections: Post Development SIDRA Results (2030)

Intersection	Layout	AM Peak Hour		PM Peak Hour	
		Degree of Saturation	Average Delay	Degree of Saturation	Average Delay
Mooroolbark Rd / Churchill Dr	Signal	0.684	27 s	0.78	25 s
Mooroolbark Rd / Landscape Dr	Signal	0.754	26 s	0.645	24 s
Hull Rd / Honour Ave	Signal	0.907	21 s	0.756	18 s
Hutchinson St / Honour Ave / Melba Ave	Roundabout	0.567	8 s	0.453	6 s

7.5.3 Mooroolbark Road

Arterial Roads typically carry volumes of more than 12,000 vehicles per day. Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidance for typical mid-block capacities for urban roads with interrupted flow. The road capacities detailed consider unflared major intersections and interruptions from cross and turning traffic at minor intersections. As set out in Table 5.1 of the *Guide*, for a kerb lane with clearway conditions, the mid-block capacity is 900 vehicles per lane. This translates to 1,800 vph or 18,000 vpd (assuming the peak hour flow is 10% of the daily flow) for a two-lane road.

The *Guide* also notes that peak period mid-block traffic volumes may increase to 24,000 to 28,000 vpd on any approach road when the following conditions exist or can be implemented:

- adequate flaring at major upstream intersections;
- uninterrupted flow from a wider carriageway upstream of an intersection approach and flowing at capacity;
- control or absence of crossing or entering traffic at minor intersections by major road priority controls;
- control or absence of parking;
- control or absence of right turns by banning turning at difficult intersections;
- high volume flows of traffic from upstream intersections during more than one phase of a signal cycle; and

> good co-ordination of traffic signals along the route.

Given that most of the measures detailed above currently exist or will be implemented with the urban renewal of the Lilydale Quarry site, the current mid-block capacity of Mooroolbark Road is anticipated to be greater than 18,000 vpd.

The Kinley development is anticipated to increase the volume on Mooroolbark Road by approximately 4,000 vpd (at its northern end, adjacent Maroondah Highway) to 2,000 vpd (at its southern end adjacent Hull Road). This will result in anticipated two-way volumes on Mooroolbark Road of 18,700 vpd (northern end) to 16,900 vpd (southern end) in 2030.

Based on the above, the post development traffic flows on Mooroolbark Road are expected to remain within the threshold whereby duplication would be considered. Thus, a mid-block two lane undivided carriageway (widening to four lanes at signalised intersections) is considered appropriate for Mooroolbark Road.

7.5.4 Existing External Intersections

7.5.4.1 Maroondah Highway / Mooroolbark Road Intersection

The mitigating works required to this intersection involve additional lanes and lane lengthening. Specifically, the following capacity improvements are deemed to be required:

> an additional right turn lane (and extension of the existing right turn lane) on the Maroondah Highway west approach;

> extended left turn and right turn lanes on the Mooroolbark Road south approach; and

> an additional southbound traffic lane on the Mooroolbark Road south leg.

The concept plan is provided in Appendix D (refer to drawing number V161623-TR-SK-0062-1).

7.5.4.2 Mooroolbark Road / Hull Road Intersection

The following capacity improvements are deemed to be required at the intersection:

> an additional right turn lane on the Mooroolbark Road northwest approach;

> an additional short through lane on the Hull Road northeast approach;

> an extension of the right turn lane on the Hull Road northeast approach; and

> conversion of the Hull Road southeast approach left turn lane into a shared left/through lane.

The provision of two approach lanes on Mooroolbark Road requires the removal of bridge abuttals under the single-track bridge to widen the bridge under the railway line. It is noted that bridge reconstruction may be required in order to facilitate the duplication of the railway line to connect to the potential future train station proposed to be provided within the Kinley development (i.e. notwithstanding road capacity upgrades).

The provision of two approach lanes for Hull Road requires lane lengthening for both approaches. Two approach lanes could be provided for the southwest approach using existing road pavement; however, some road widening will be required for the northeast leg of the intersection. The northwest approach lane lengths (i.e. for southwest bound traffic) should be consistent with the mitigation works required at the intersection for Stage 1 of the development. The other lane lengths are subject to design, land take and community consultation (i.e. some property acquisition may be required).

The concept plan is provided in Appendix D (refer to drawing number V161623-TR-SK-0060-1).

7.5.4.3 Swansea Road / Hull Road Intersection

The mitigating works deemed to be required to this intersection involve a linemarking change to convert the kerbside left-turn lane to a shared left-turn and right-turn lane, which will enable dual right-turn movements to Swansea Road.

The concept plan is provided in Appendix D (refer to drawing number V161623-TR-SK-0016-1).

7.5.4.4 Anderson Street / Hardy Street Intersection

It is considered that no capacity improvements are required at the intersection of Anderson Street and Hardy Street as a result of the proposed development, noting that there may be some existing capacity issues.

7.5.4.5 Anderson Street / Maroondah Highway Intersection

It is considered that no capacity improvements are required at the intersection of Anderson Street and Maroondah Highway as a result of the proposed development, noting that there may be some existing capacity issues.

7.5.4.6 Maroondah Highway / Hutchinson Street Intersection

Given that the Maroondah Highway / Hutchinson Street intersection is to be signalised as part of the Yarra Ranges Council's Lilydale Integrated Transport Plan, it is considered that no capacity improvements are required at the intersection as a result of the proposed development, noting that there may be some existing capacity issues.

7.5.4.7 Hutchinson Street / John Street Intersection

The mitigating works deemed required to this intersection involve linemarking changes to provide additional lanes or lane extensions and parking restriction changes via signage. It is considered that these changes could be incorporated within the existing road pavement. Specifically, this involves:

- time-based parking restrictions (or alternatively removal) of kerbside parking spaces on the Hutchinson Street north approach (to effectively extend the length of shared left / through lane during peak periods);
- dedicated right-turn and through lanes on the John Street east approach;
- time-based parking restrictions (or alternatively removal) of kerbside parking spaces on the John Street east approach (to effectively extend the length of the left turn lane during peak periods);
- an extension of the right turn lane on the Hutchinson Street west approach; and
- an extension of the right turn lane on the Hutchinson Street south approach.

The concept plan is provided in Appendix D (refer to drawing number CG150584-SK02-P3).

7.5.5 Summary of Works

The proposed site access intersections to the surrounding road network will cater for the access needs of the urban renewal of the Quarry site, via the following:

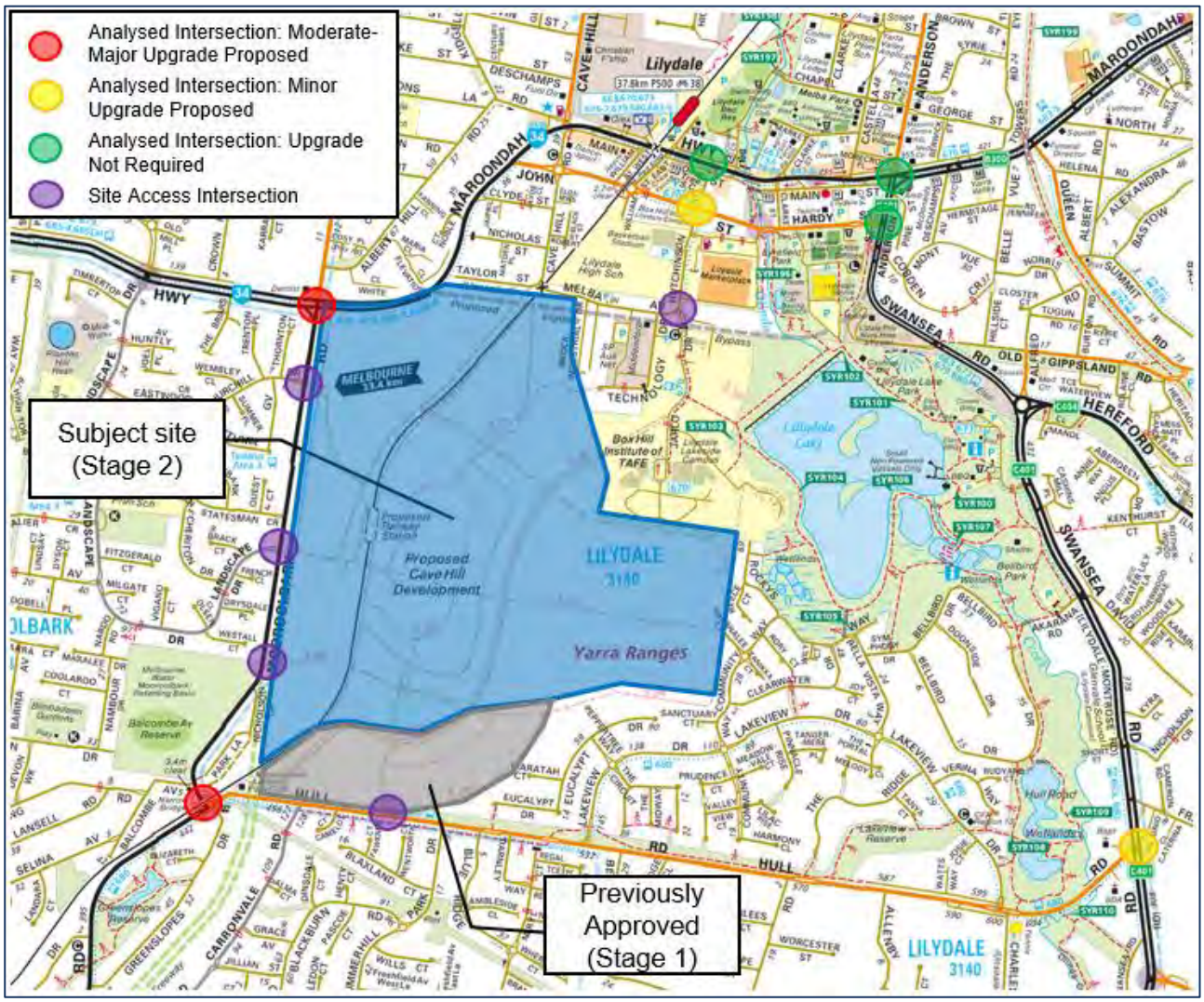
- a new four-leg signalised intersection at Mooroolbark Road / Churchill Drive;
- a new four-leg signalised intersection at Mooroolbark Road / Landscape Drive;
- a three-leg signalised intersection at Hull Road; and
- a new roundabout at the Hutchinson Street / Melba Avenue intersection.

Mitigating works are required to remediate the impact of traffic associated with the urban renewal development of the Lilydale Quarry site at the following existing external intersections:

- Victoria Road / Maroondah Highway / Mooroolbark Road (additional lanes and lane extensions);
- Mooroolbark Road / Hull Road (bridge widening, additional lanes and lane extensions);
- Swansea Road / Hull Road intersection (linemarking change only); and
- Hutchinson Street / John Street intersection (additional lanes and lane extensions utilising existing road pavement).

The site access and externally assessed intersections are detailed in Figure 7-2, with the intersections requiring mitigation measures (and their level of significance) illustrated.

Figure 7-2 External Intersections Analysed



7.6 Future Traffic & Transport Assessments

Future traffic & transport assessments for the Kinley development will be required to be provided as the planning process for the urban renewal of the site progresses. This will involve the preparation of Integrated Traffic & Transport Management Plans (ITTMPs) which need to be in accordance with the CDP and the requirements provided in the CDZ Schedule. Furthermore, Traffic Impact Assessments (TIAs) will be required to accompany Planning Permit applications.

Each ITTMP will need to promote sustainable modes of travel (walking, cycling and public transport) and will:

- Identify proposed roads, pedestrian, cyclist and vehicle connections to the surrounding road network (where relevant);
- Address internal road design requirements, with due reference to Planning Scheme requirements;
- Provide predicted traffic volumes;
- Detail internal and external intersections, performance and treatments;
- Provide an assessment of the impact of traffic generated by the precinct upon the surrounding road network;
- Provide an assessment of potential traffic mitigation works and traffic management measures that may be required within and external to the site, including the staging of the measures and external works;
- Detail the location and linkages to public transport;
- Provide an assessment of car parking demand;

- Provide a transport plan that shows the hierarchy of streets, pedestrian and cycle paths, public transport, any freight routes across the precinct and details of connections to the surrounding road network;
- Provide an assessment of public transport services in the locality, existing stops and any additional stops or infrastructure prepared in consultation with the relevant Victorian public transport authority;
- Detail cycling and pedestrian infrastructure; and
- Identify Precinct Infrastructure works, including detail on roadworks internal or external to the site.

APPENDIX

A

CONCEPT MASTERPLAN

LEGEND

SITE AREA	143.81ha
QUARRY FILL ZONE	

ENCUMBERED LAND

RETENTION BASIN & WETLANDS (2.6% OF SA)	3.68ha
PUBLIC ACQUISITION AREAS	5.73ha
CHMP RESERVATION	0.036ha
TOTAL	9.45ha
% OF SA	7%

GROSS DEVELOPABLE LAND (GDL) 134.37ha

PUBLIC OPEN SPACE

MAJOR PARKLAND	3.17ha
RECREATION RESERVATION	6.77ha
NEIGHBORHOOD PARK	0.98ha
LOCAL PARK	1.80ha
CIVIC PLAZA	1.70ha
RAIL TRAIL	1.38ha
TOTAL	15.80ha
% OF GDA	11.7%

NET DEVELOPABLE LAND (NDL) 118.57ha

ROAD NETWORK

NORTH SOUTH CONNECTOR	3.01ha
ROADS	35.90ha
LANEWAYS	4.38ha
TOTAL	43.29ha
% OF GDA	32%

POTENTIAL COMMUNITY AND CIVIC USES

POTENTIAL EDUCATION FACILITY	1.40ha
POTENTIAL CIVIC INSTITUTION	0.55ha

COMMERCAIL	Gross Areas	Est. Yield
MIXED USE COMMERCIAL	1.25ha	--
RETAIL OPPORTUNITY	0.53ha	--
RETAIL PARKING	1.32ha	
MULTI DECK PARKING	0.46ha	
STATION PARKING	0.80ha	

NET RESIDENTIAL DEVELOPABLE LAND (NRDL) 68.54ha

DEVELOPABLE	Gross Areas	Av. Density	Est. Yield
CONVENTIONAL RESIDENTIAL	28.32ha	420m²	674
MEDIUM DENSITY	19.01ha	178m²	1068
LARGE LOT	5.91ha	600m²	98
URBAN CORE	6.57	178m²	369
HERITAGE QUARTER	6.24ha	40 dw/ha	253
APARTMENTS	2.5ha	60 dw/ha	600
ESTIMATED YEILD			3,059dw
		AVG. DENSITY	25 dw/ha

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WORKING PROGRESS

SIZE A0 1:2000 0 metres 20 40 60 80 100 N

DRAFT CONCEPT PLAN
Lilydale Quarry
Lilydale, VIC

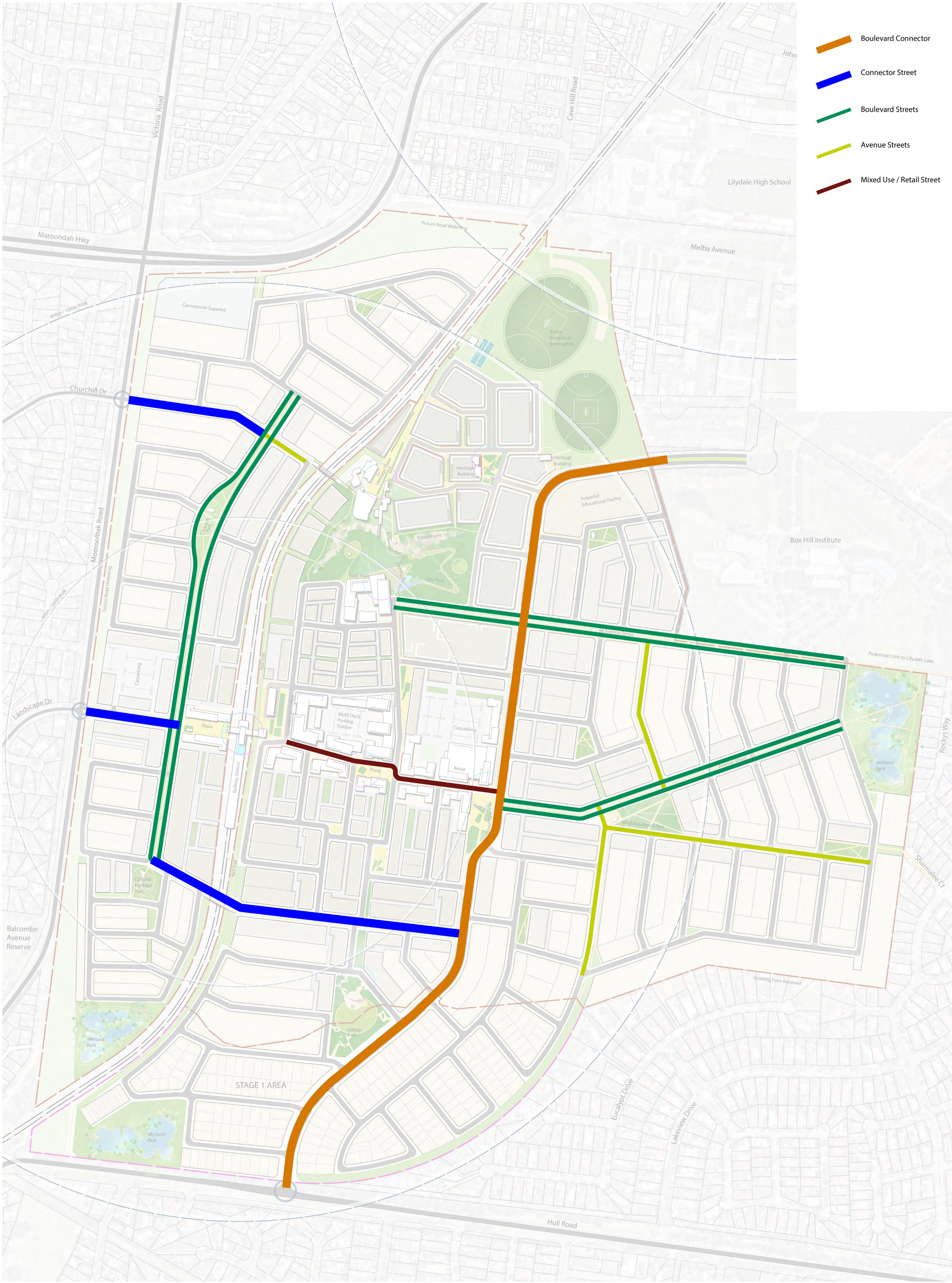
REF NO. INT LIL · DRAW NO. RDT 004 · REV G

REV DESCRIPTION · DD/MM/YY · DRAWN · APP'D
A 28/01/22 AM

APPENDIX

B

STREET CROSS SECTIONS



Lillydale Quarry

Yarra Ranges Council

Concept Masterplan - Road Network

REF NO	DRAW NO	REV
INT LIL	**RD 3019**	**B**

N

0m 50m 100m 200m 400m

SCALE 1: 2,000 SIZE A0

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
-	--	--	--	--
-	--	--	--	--
B	Draft	200314	MJ	MD

INTRAPAC PROPERTY

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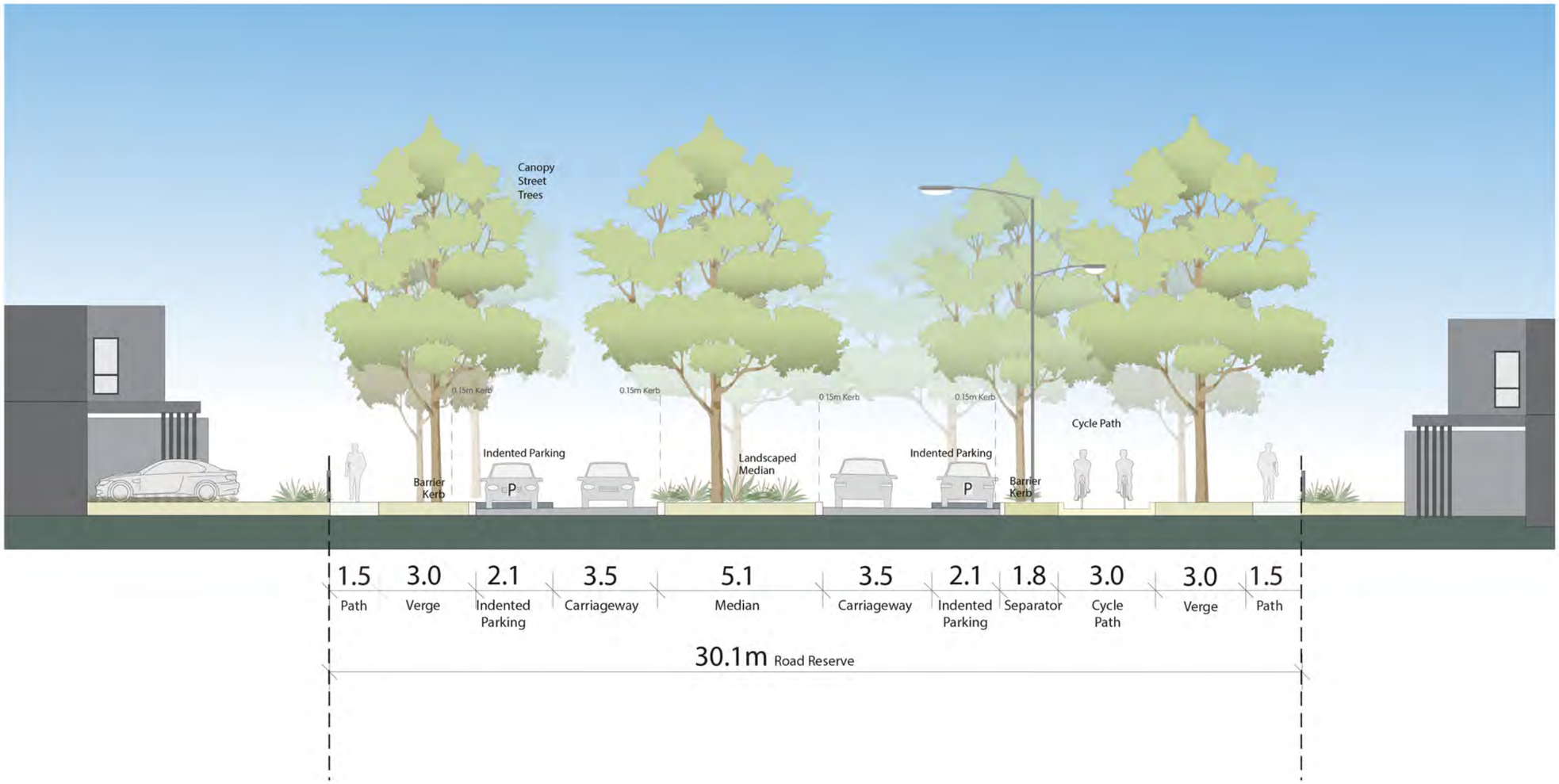

Thoroughfare Cross Section **North/South Connector Avenue**
Lilydale

N

SCALE 1:150 SIZE A3

0 1 2 3 4 6 8 10m

REF NO	DRAW NO	REV
INT LIL	**UD 4201**	**B**

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
B	DRAFT	200303	LP	MJ
A	DRAFT	181108	MJ	--

Bayport: INTRAPAC PROPERTY

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vic australia 3205
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robertsday.com.au
melbourne sydney perth

Thoroughfare Cross Section **Connector St with Cycle Path**
Lilydale

SCALE 1:150 SIZE A3
0 1 2 3 4 6 8 10m
N

REF NO	DRAW NO	REV
INT LIL	**UD 4201**	**B**

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
B	DRAFT	200303	LP	MJ
A	DRAFT	181108	MJ	--

Bayport: INTRAPAC PROPERTY

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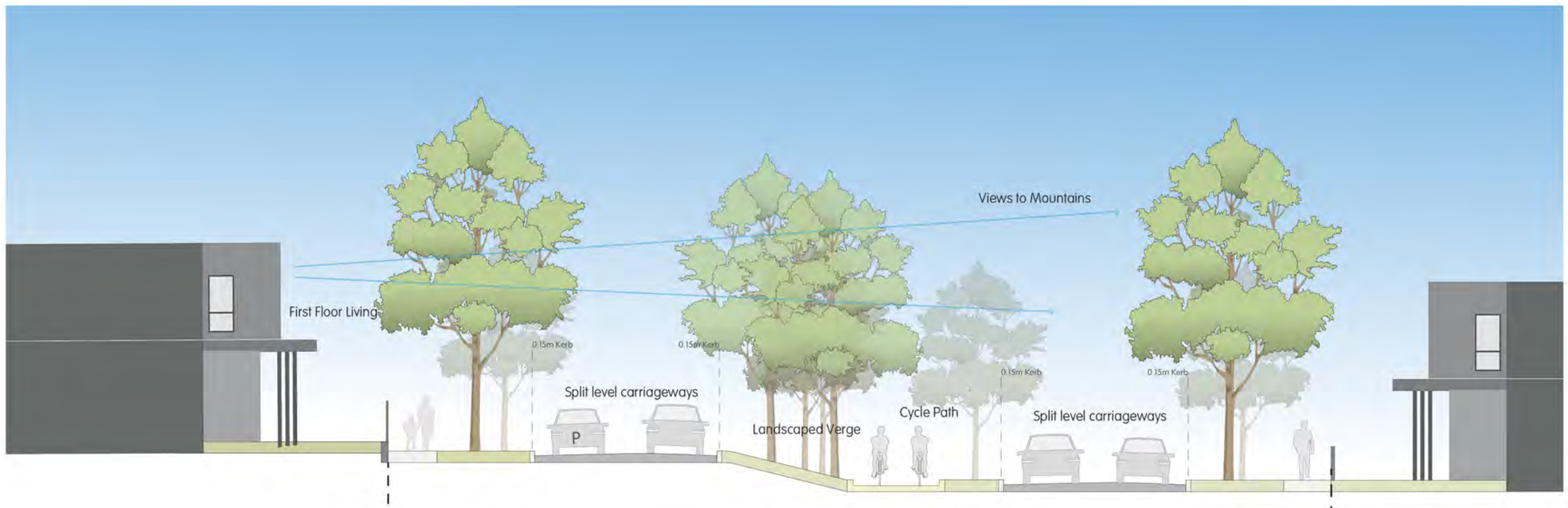

1.5	3.0	2.1	3.5	4.0	3.0	1.8	3.5	2.1	3.0	1.5
Path	Verge	Parking	Travel Lane	Landscaped Median	Shared Cycle Path	Separator	Travel Lane	Parking	Verge	Path
		5.6 Carriageway		8.8 Median			5.6 Carriageway			

29.0
Reserve

Thoroughfare Cross Section **Boulevard Street**
Lilydale

SCALE 1:150 SIZE A3
0 1 2 3 4 6 8 10m
N

REF NO	DRAW NO	REV
INT LIL	**UD 4201**	**B**

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
B	DRAFT	200303	LP	MJ
A	DRAFT	181108	MJ	--

Bayport: INTRAPAC PROPERTY RobertsDay planning·design·place

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Thoroughfare Cross Section **Boulevard Street - Alternative**
Lilydale

N

SCALE 1:150 SIZE A3

0 1 2 3 4 6 8 10m

REF NO	DRAW NO	REV
INT LIL	**UD 4201**	**B**

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
B	DRAFT	200303	LP	MJ
A	DRAFT	181108	MJ	--

Bayport INTRAPAC PROPERTY RobertsDay planning·design·place

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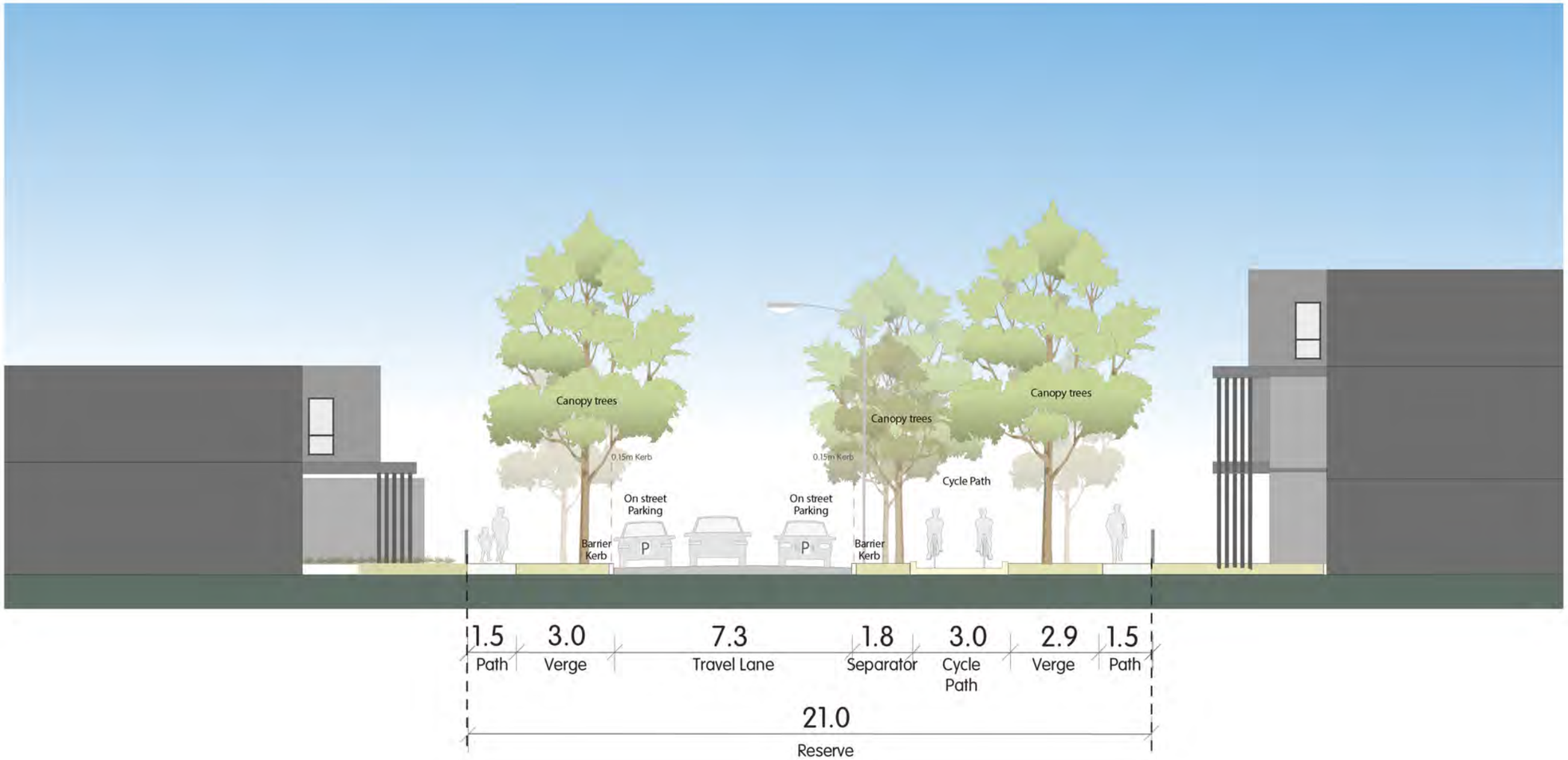

Thoroughfare Cross Section **Avenue St with Cycle Path**
Lilydale

N

SCALE 1:150 SIZE A3

0 1 2 3 4 6 8 10m

REF NO	DRAW NO	REV
INT LIL	**UD 4201**	**B**

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
B	DRAFT	200303	LP	MJ
A	DRAFT	181108	MJ	--

Bayport: INTRAPAC PROPERTY

RobertsDay *planning·design·place*

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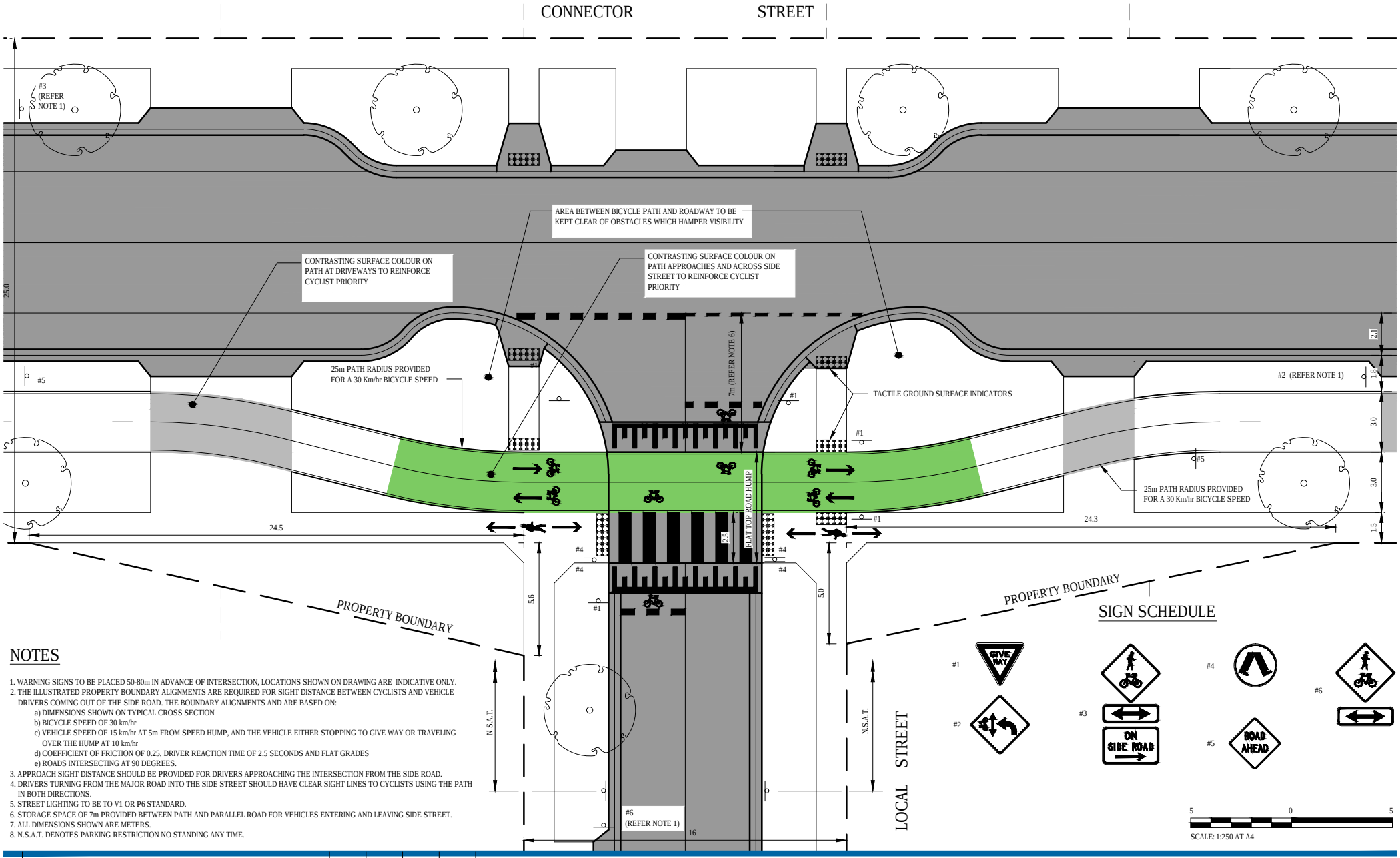
APPENDIX C

VPA BICYCLE PATH TREATMENTS



NOTES

1. WARNING SIGNS TO BE PLACED 50-80m IN ADVANCE OF INTERSECTION, LOCATIONS SHOWN ON DRAWING ARE INDICATIVE ONLY.
2. THE ILLUSTRATED PROPERTY BOUNDARY ALIGNMENTS ARE REQUIRED FOR SIGHT DISTANCE BETWEEN CYCLISTS AND VEHICLE DRIVERS COMING OUT OF THE SIDE ROAD. THE BOUNDARY ALIGNMENTS AND ARE BASED ON:
   a) DIMENSIONS SHOWN ON TYPICAL CROSS SECTION
   b) BICYCLE SPEED OF 30 km/hr
   c) VEHICLE SPEED OF 15 km/hr AT 5m FROM SPEED HUMP, AND THE VEHICLE EITHER STOPPING TO GIVE WAY OR TRAVELING OVER THE HUMP AT 10 km/hr
   d) COEFFICIENT OF FRICTION OF 0.25, DRIVER REACTION TIME OF 2.5 SECONDS AND FLAT GRADES
   e) ROADS INTERSECTING AT 90 DEGREES.
3. APPROACH SIGHT DISTANCE SHOULD BE PROVIDED FOR DRIVERS APPROACHING THE INTERSECTION FROM THE SIDE ROAD.
4. DRIVERS TURNING FROM THE MAJOR ROAD INTO THE SIDE STREET SHOULD HAVE CLEAR SIGHT LINES TO CYCLISTS USING THE PATH IN BOTH DIRECTIONS.
5. STREET LIGHTING TO BE TO V1 OR P6 STANDARD.
6. STORAGE SPACE OF 7m PROVIDED BETWEEN PATH AND PARALLEL ROAD FOR VEHICLES ENTERING AND LEAVING SIDE STREET.
7. ALL DIMENSIONS SHOWN ARE METERS.
8. N.S.A.T. DENOTES PARKING RESTRICTION NO STANDING ANY TIME.

SIGN SCHEDULE

5 0 5

SCALE: 1:250 AT A4

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
A	DRAFT - ISSUED FOR REVIEW					

Victorian Planning Authority

SEPARATED 2-WAY BICYCLE PATH & ROAD INTERSECTION LAYOUT

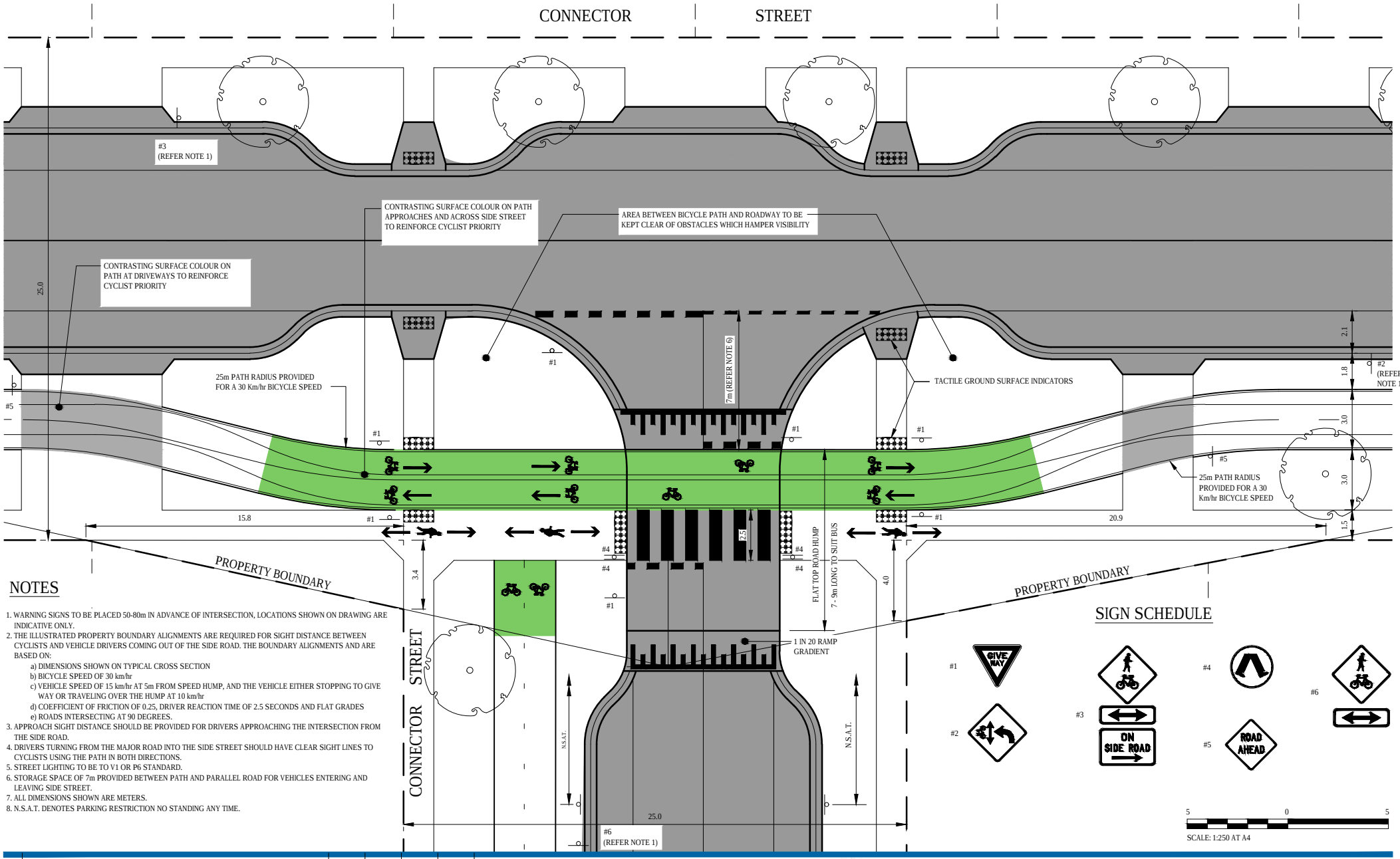
CONNECTOR / LOCAL STREET SIDE ROAD CROSSING

Revision B

Date JAN 2016

Figure 001

Plot Date: 30 June 2017 - 1:14 PM Plotted by: Gary Magno Cad File No: X:\Drawings & Graphics\Resources\Library\DEMONSTRATION ROAD CROSS SECTIONS\CAD\Bicycle Intersection Layout Standard Drawings\FIG 1.dwg



NOTES

1. WARNING SIGNS TO BE PLACED 50-80m IN ADVANCE OF INTERSECTION, LOCATIONS SHOWN ON DRAWING ARE INDICATIVE ONLY.
2. THE ILLUSTRATED PROPERTY BOUNDARY ALIGNMENTS ARE REQUIRED FOR SIGHT DISTANCE BETWEEN CYCLISTS AND VEHICLE DRIVERS COMING OUT OF THE SIDE ROAD. THE BOUNDARY ALIGNMENTS AND ARE BASED ON:
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   d) COEFFICIENT OF FRICTION OF 0.25, DRIVER REACTION TIME OF 2.5 SECONDS AND FLAT GRADES
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3. APPROACH SIGHT DISTANCE SHOULD BE PROVIDED FOR DRIVERS APPROACHING THE INTERSECTION FROM THE SIDE ROAD.
4. DRIVERS TURNING FROM THE MAJOR ROAD INTO THE SIDE STREET SHOULD HAVE CLEAR SIGHT LINES TO CYCLISTS USING THE PATH IN BOTH DIRECTIONS.
5. STREET LIGHTING TO BE TO V1 OR P6 STANDARD.
6. STORAGE SPACE OF 7m PROVIDED BETWEEN PATH AND PARALLEL ROAD FOR VEHICLES ENTERING AND LEAVING SIDE STREET.
7. ALL DIMENSIONS SHOWN ARE METERS.
8. N.S.A.T. DENOTES PARKING RESTRICTION NO STANDING ANY TIME.

SIGN SCHEDULE

5 0 5

SCALE: 1:250 AT A4

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
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Victorian Planning Authority

SEPARATED 2-WAY BICYCLE PATH & ROAD INTERSECTION LAYOUT

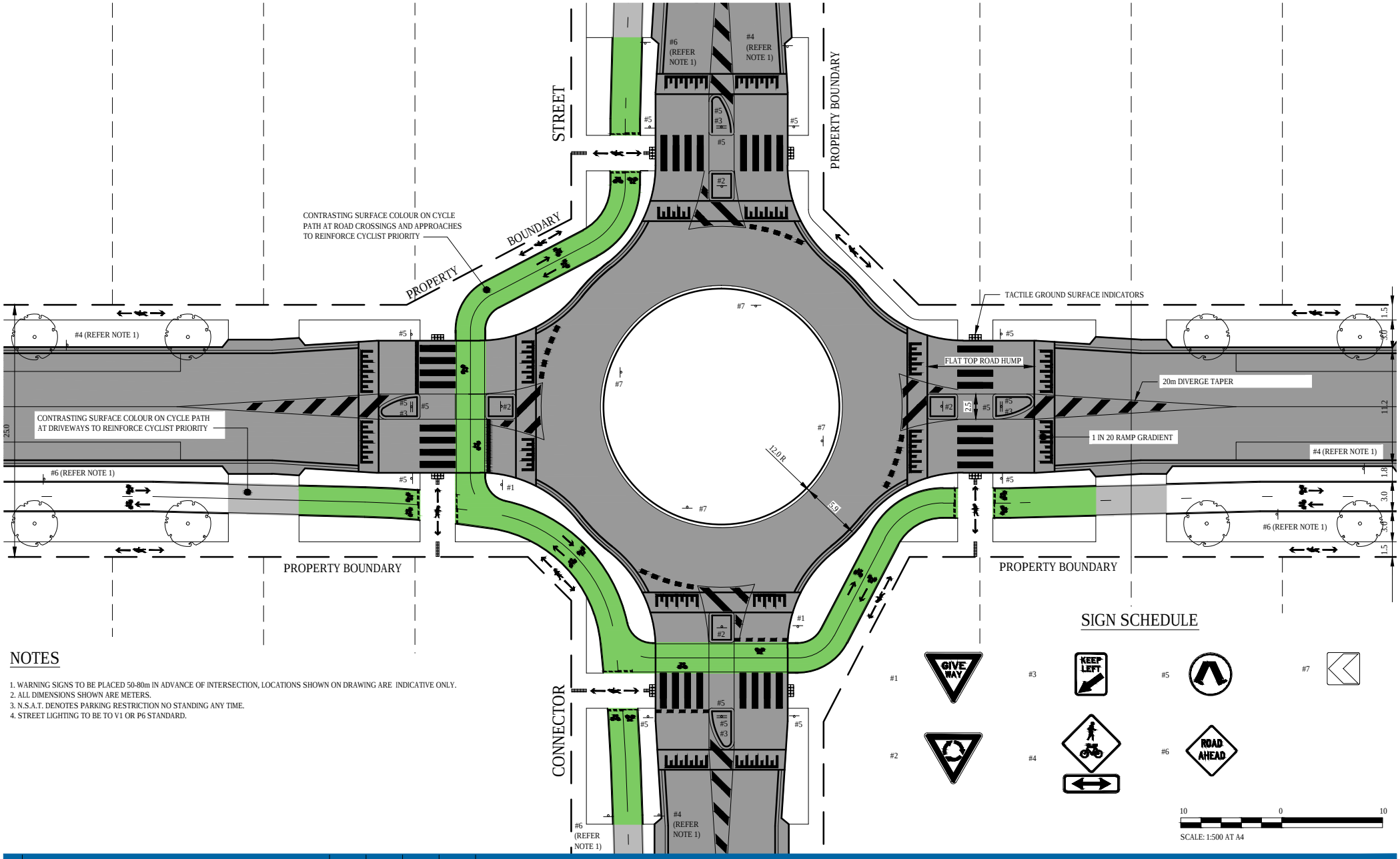
CONNECTOR / CONNECTOR STREET SIDE ROAD CROSSING

Revision B

Date JAN 2016

Figure 002

Plot Date: 30 June 2017 - 1:14 PM Plotted by: Gary Magno Cad File No: X:\Drawings & Graphics\Resources\Library\DEMONSTRATION ROAD CROSS SECTIONS\CAD\Bicycle Intersection Layout Standard Drawings\FIG 2.dwg



NOTES

1. WARNING SIGNS TO BE PLACED 50-80m IN ADVANCE OF INTERSECTION, LOCATIONS SHOWN ON DRAWING ARE INDICATIVE ONLY.
2. ALL DIMENSIONS SHOWN ARE METERS.
3. N.S.A.T. DENOTES PARKING RESTRICTION NO STANDING ANY TIME.
4. STREET LIGHTING TO BE TO V1 OR P6 STANDARD.

SIGN SCHEDULE

10 0 10

SCALE: 1:500 AT A4

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
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Victorian Planning Authority

SEPARATED 2-WAY BICYCLE PATH & ROAD INTERSECTION LAYOUT

CONNECTOR / CONNECTOR STREET ROUNDABOUT

Revision A

Date MARCH 2015

Figure 003

Plot Date: 30 June 2017 - 1:15 PM Plotted by: Gary Magno Cad File No: X:\Drawings & Graphics\Resources\Library\DEMONSTRATION ROAD CROSS SECTIONS\CAD\Bicycle Intersection Layout Standard Drawings\FIG 3.dwg

SIGN SCHEDULE

#1 GIVE WAY

#2

#3

#4

#5 ROAD AHEAD

#6

NOTES

1. WARNING SIGNS TO BE PLACED 50-80m IN ADVANCE OF INTERSECTION, LOCATIONS SHOWN ON DRAWING ARE INDICATIVE ONLY.
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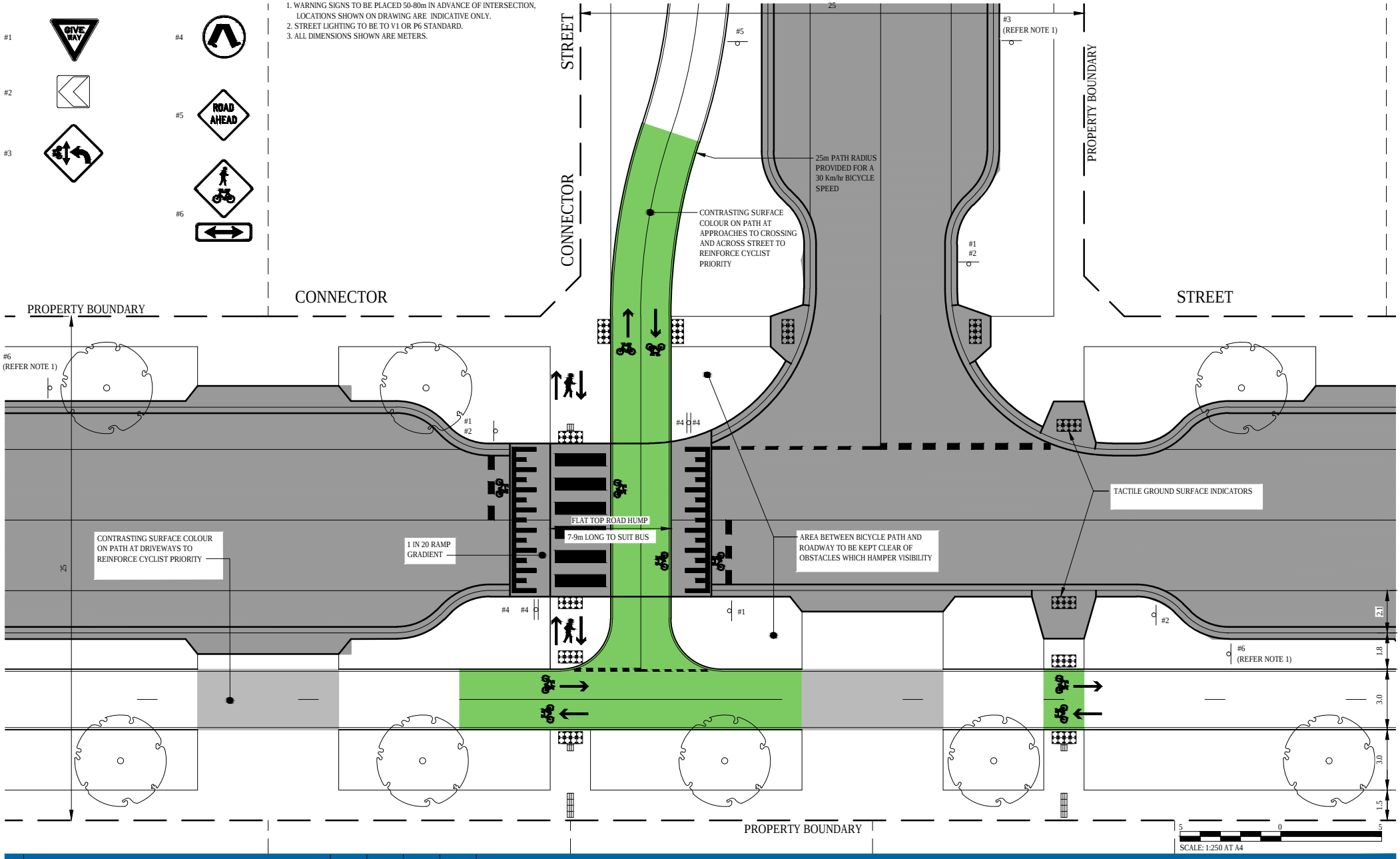
3. ALL DIMENSIONS SHOWN ARE METERS.



No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
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Victorian Planning Authority

SEPARATED 2-WAY BICYCLE PATH & ROAD INTERSECTION LAYOUT

CONNECTOR / CONNECTOR ST THROUGH ROAD CROSSING

Revision B

Date JAN 2016

Figure 004

Plot Date: 30 June 2017 - 1:15 PM Plotted by: Gary Magno Cad File No: X:\Drawings & Graphics\Resources\Library\DEMONSTRATION ROAD CROSS SECTIONS\CAD\Bicycle Intersection Layout Standard Drawings\FIG 4.dwg

NOTES

1. WARNING SIGNS TO BE PLACED 50-80m IN ADVANCE OF INTERSECTION, LOCATIONS SHOWN ON DRAWING ARE INDICATIVE ONLY.
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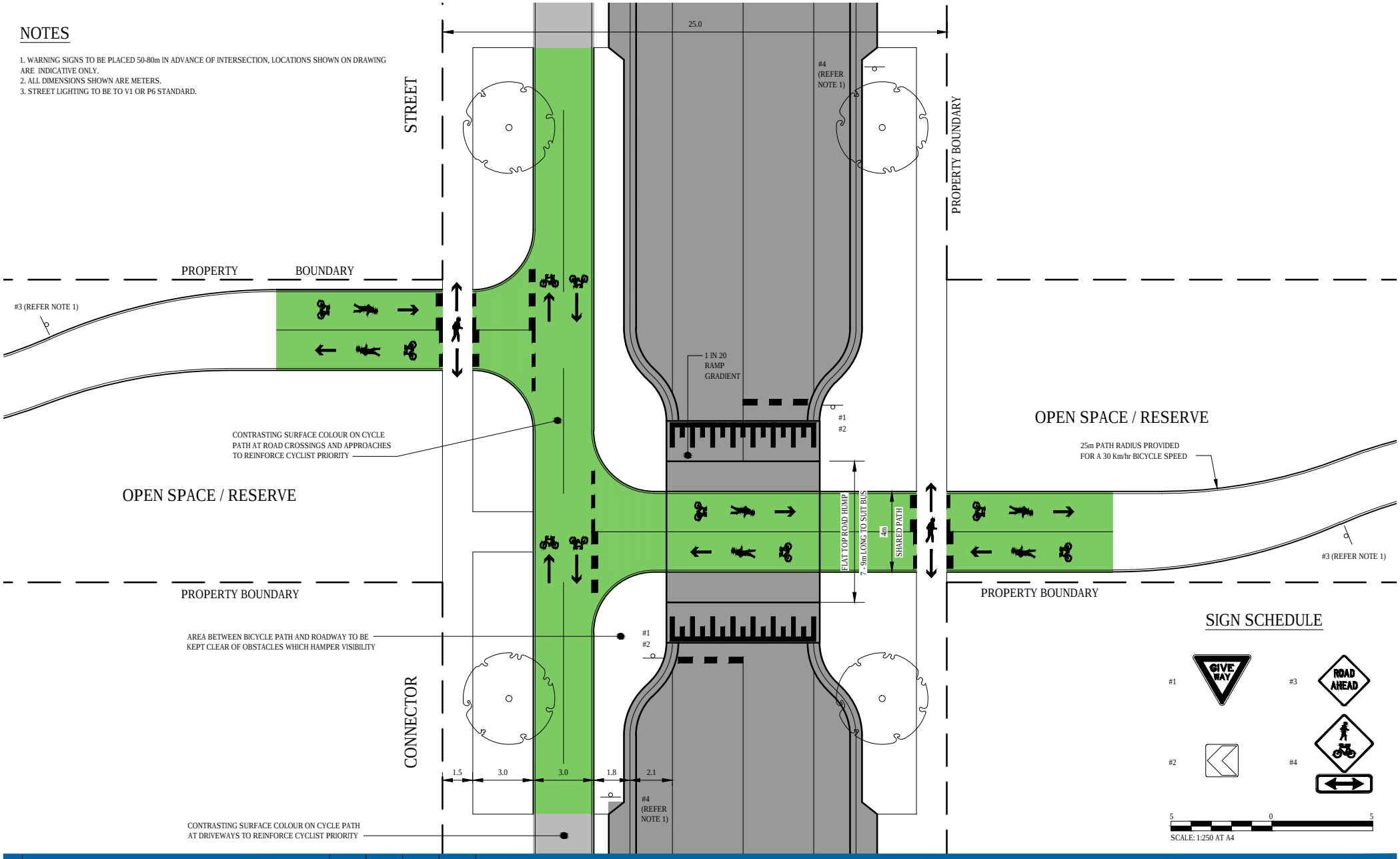
3. STREET LIGHTING TO BE TO V1 OR P6 STANDARD.



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Victorian Planning Authority

SEPARATED 2-WAY BICYCLE PATH & ROAD INTERSECTION LAYOUT

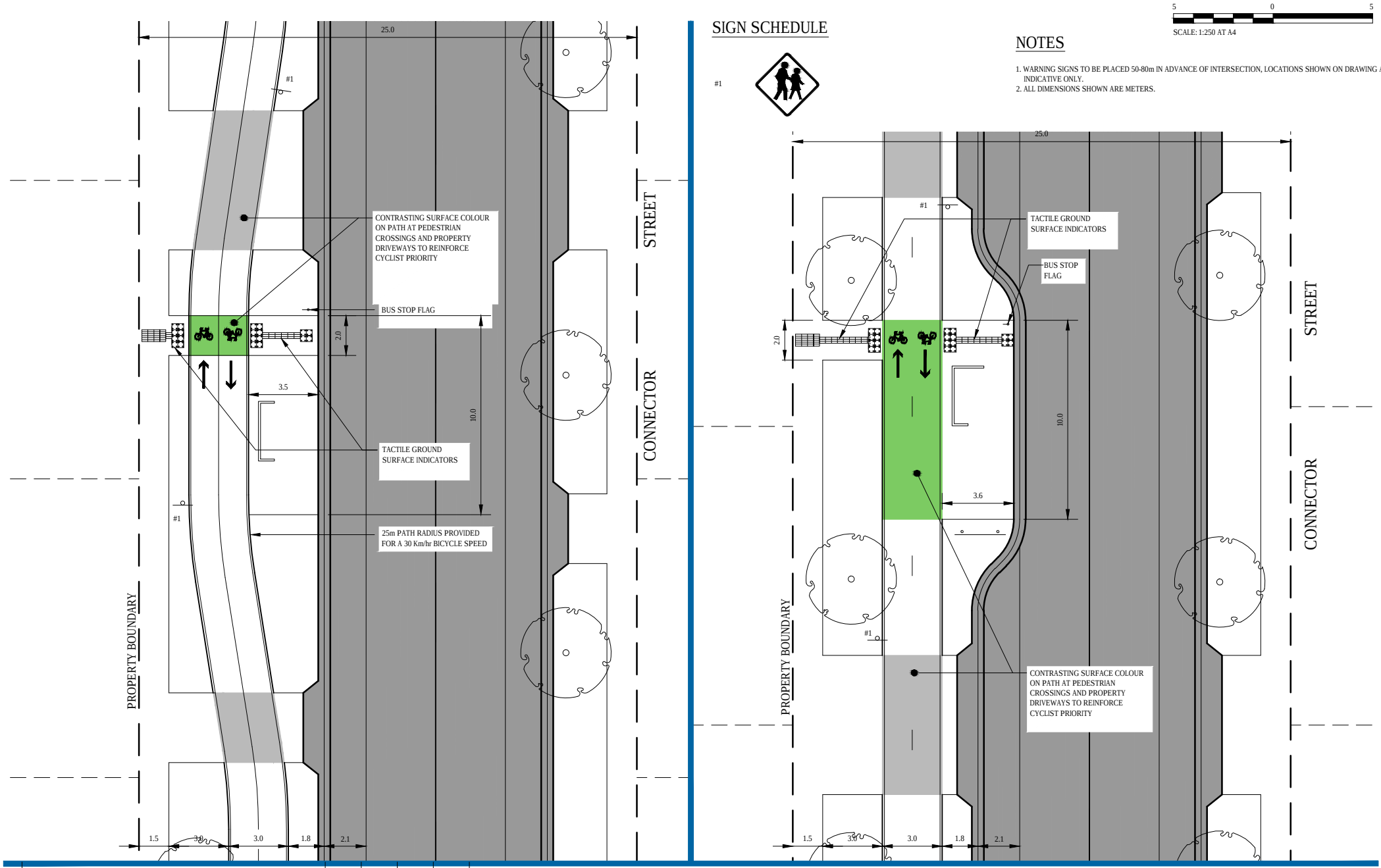
CONNECTOR ST / SHARED PATH MID BLOCK CROSSING

Revision B

Date JAN 2016

Figure 005

Plot Date: 30 June 2017 - 1:15 PM Plotted by: Gary Magno Cad File No: X:\Drawings & Graphics\Resources\Library\DEMONSTRATION ROAD CROSS SECTIONS\CAD\Bicycle Intersection Layout Standard Drawings\FIG 5.dwg



No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
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Victorian Planning Authority

SEPARATED 2-WAY BICYCLE PATH

BUS STOP TREATMENTS

Revision A

Date MARCH 2015

Figure 006

Plot Date: 30 June 2017 - 1:15 PM Plotted by: Gary Magno Cad File No: X:\Drawings & Graphics\Resources\Library\DEMONSTRATION ROAD CROSS SECTIONS\CAD\Bicycle Intersection Layout Standard Drawings\FIG 6.dwg

APPENDIX

D

SUPPORTING TIA REPORT

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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