Cardno
Shaping the Future

Daleston Masterplan

Traffic & Transport Assessment

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Prepared for Phileo Australia

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1 Introduction

Cardno Victoria has been retained by Phileo Australia to undertake a traffic engineering assessment for the land within the Daleston Estate - part of the 'Black Forest Road North PSP' – to inform the preparation of the Precinct Structure Plan.

In the course of preparing this assessment, the site and its environs have been inspected, plans of the development examined, and all relevant traffic data collected and analysed.

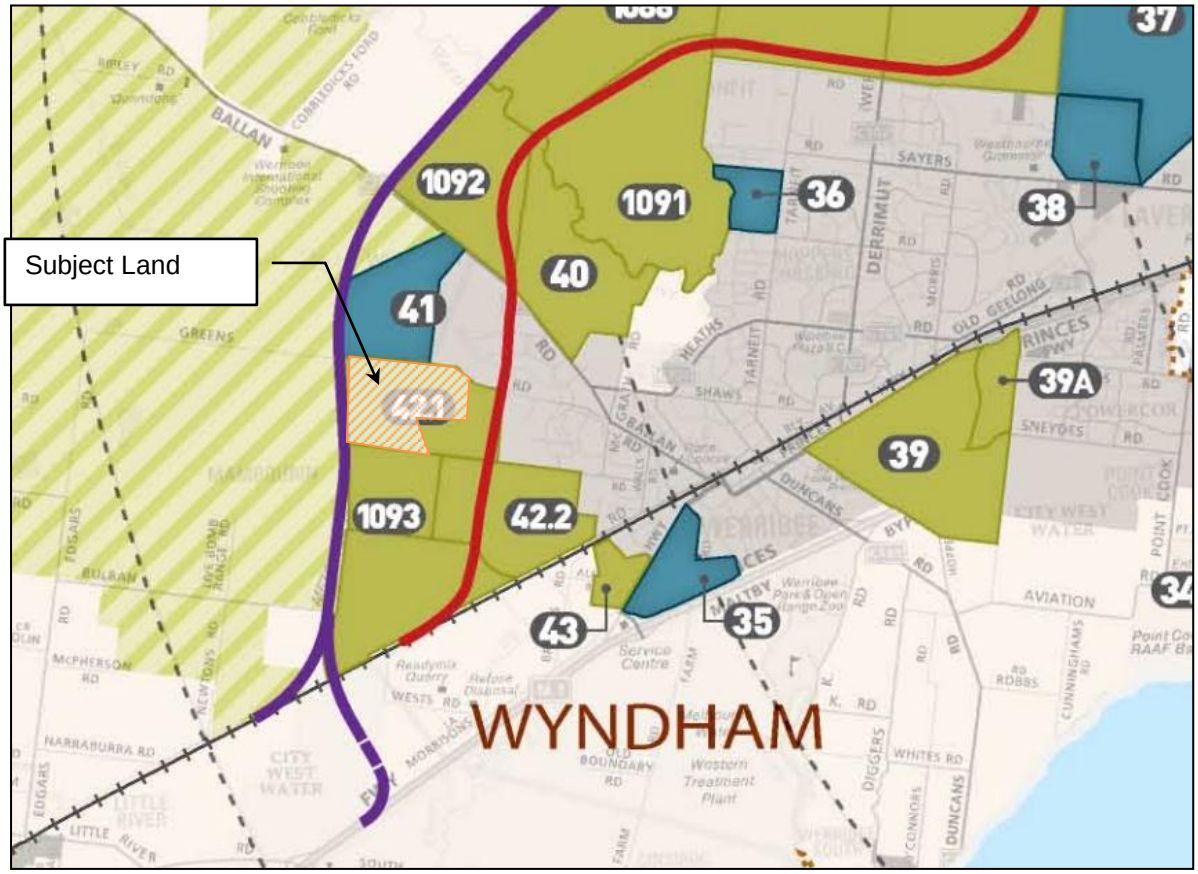
2 Background and Existing Conditions

2.1 Location and Land Use

The subject land is located within the Urban Growth Boundary, adjacent to the future Outer Metropolitan Ring Road. The subject land is known as "Daleston" which is within the Black Forest Road North PSP area (42.1). It is bound by Black Forest Road to the south, the remainder of PSP 42.1 to the east, Greens Road to the north and the future Outer Metropolitan Ring Road to the west. Manor Lakes PSP area (41) is located to the north while the Mambourin East PSP area (1093) and Black Forest Road South PSP area (42.2) are located to the south.

The locality of the subject land is shown in Figure 1.

Figure 1: Locality Plan



Land in the vicinity of the site (to the east and north) is to be predominantly residential in nature comprising of a mixture of recently established and developing residential stages of various estates.

2.2 External Road Network

The general cross sections are based on the Manor Lakes PSP, which is also located within the City of Wyndham and shares its southern boundary with the Daleston Area. The road cross sections are generally based on the GAA standards as detailed within the "PSP Notes – Our Roads: Connecting People" document.

2.2.1 Arterial Roads

2.2.1.1 Westbrook Drive

Westbrook Drive is a future road proposed to be aligned north – south, bisecting the subject land. This road is known as Ison Road as part of the Manor Lakes PSP immediately to the north.

Westbrook Drive is to ultimately operate as a divided carriageway providing for up to 3 traffic lanes in each direction, in addition to a service road in some sections. A designated reservation width of 40-41 metres has been allocated for the main carriageway of Westbrook Drive with a further 24 metres allowed for the two service roads for a total reservation of 64-65 metres.

The initial median width would be 13m, when two a 2 lane carriageway is present in either direction. An additional 3.5m lane width in each direction would reduce the median to 6m ultimately.

The cross section of Westbrook Drive from the Manor Lakes and Black Forest Road South PSPs are shown attached within Annex 1.

It is expected that an interim cross section to provide a single lane in each direction will be constructed utilising the eastern or western carriageway in the first instance, until such time as traffic volumes warrant the duplication of Westbrook Drive.

Westbrook Drive is contemplated to operate with up to three traffic lanes in each direction, giving it a capacity to carry over 45,000 vehicles per day based on traffic volumes only.

Intersections along Westbrook Drive have been appropriately spaced with the intersecting connector roads located at 400 metres spacings.

2.2.1.2 Outer Metropolitan Ring Road

The proposed Outer Metropolitan Ring (OMR) Transport Corridor will start at the Princes Freeway, west of Werribee and run through to Kalkallo, Epping and Thomastown. In the vicinity of Daleston, the OMR would head north from the Princes Freeway aligned along the western boundary of the subject land.

Additionally, the proposal provides for an east-west link between the Western Freeway, Deer Park Bypass and the OMR/E6 Transport Corridor. VicRoads has also defined a study area for a possible high standard connection between the OMR/E6 Transport Corridor and Melbourne Airport, with potential for this connection to pass either to the east or to the west of Bulla. Investigations for this corridor will be undertaken in the future.

The proposal includes changes to a number of existing interchanges on the Princes, Western and Calder Freeways because of their proximity to proposed freeway interchanges on the OMR/E6 Transport Corridor.

A fully directional interchange is currently proposed at Greens Road, but not Black Forest Road. No intersections in the vicinity of Daleston will be permitted along the OMR with the exception of an interchange at Greens Road.

The OMR will be designated as a major arterial road providing a regional function carrying in the order of 50,000 vehicles per day. A road of this status has the capacity to carry well in excess of 50,000 vehicles per day sufficient to accommodate natural growth as further land develops.

It is noted that the PSP contemplates the allocation of land for an interchange at both Greens Road and Black Forest Road.

The cross section of the OMR from the Manor Lakes PSP is shown attached within Annex 1.

2.2.1.3 Greens Road

Greens Road is designated as an arterial road and is proposed to operate with 2 traffic lanes in each direction separated with a central median inclusive of a service road on either side. Currently, a single carriage way and service roads have been constructed to the east of the subject site as an interim cross section. This cross section will be continued along the abuttal of the site in the interim.

The cross section is similar to that of Westbrook Drive (Ison Road), with a road reserve of 41m, supplemented by a local service road frontage of around 11m on either side where required.

The initial median width would be 13m, when two a 2 lane carriageway is present in either direction. An additional 3.5m lane width in each direction would reduce the median to 6m ultimately.

The cross section of Greens Road from the Manor Lakes PSP is shown attached within Annex 1, as well as the Secondary Arterial Road cross section (34m road reserve) from the Black Forest Road South PSP.

The cross section of Greens Road, which will be a divided carriageway with two traffic lanes in each direction has the capacity to carry up to 35,000 vehicles per day, which is well in excess of the projected traffic volumes.

Ultimately, the intersection of Greens Road with Westbrook Drive will be controlled by traffic signals to provide for fully directional access on all legs of the intersection. The intersection with the north – south road will also be treated by traffic signals. In the interim period, the Greens Road/ Westbrook Drive/ Ison Road intersection will be signalised, while the Greens Road/ North-South Road intersection will form a roundabout.

2.2.2 Major Local Roads

2.2.2.1 Black Forest Road

Black Forest Road is designated as a local connector road and is proposed to operate with one traffic lane and one parking lane in each direction. The cross section provides a minimum road reserve of 25m, supplemented by a local service road frontage of around 11m on either side where required.

The cross section of Black Forest Road (adapted from the Black Forest Road South PSP) is shown attached within Annex 1 as well as the Residential Connector Street cross section (26m) from the Manor Lakes PSP.

2.2.2.2 North – South Connector Roads

North – South Road is a future road located centrally to the Daleston, which will travel north from Greens Road and connect to Black Forest Road. It is expected that the north – south road will operate with a single traffic lane in each direction, in addition to a bicycle and parking lane adjacent to both kerbs within a reservation of 26 metres. Connector roads are capable of supporting a bus route.

This road is contemplated to be constructed as a single carriageway providing for one lane in each direction.

Access opportunities are available to properties with direct frontage to the North – South Road. This concept is considered appropriate given the projected traffic volumes and function of the road.

At the intersection with Black Forest Road, it is recommended that any road that continues south or north to the neighbouring PSP is directly aligned to provide the opportunity to have a single intersection treatment.

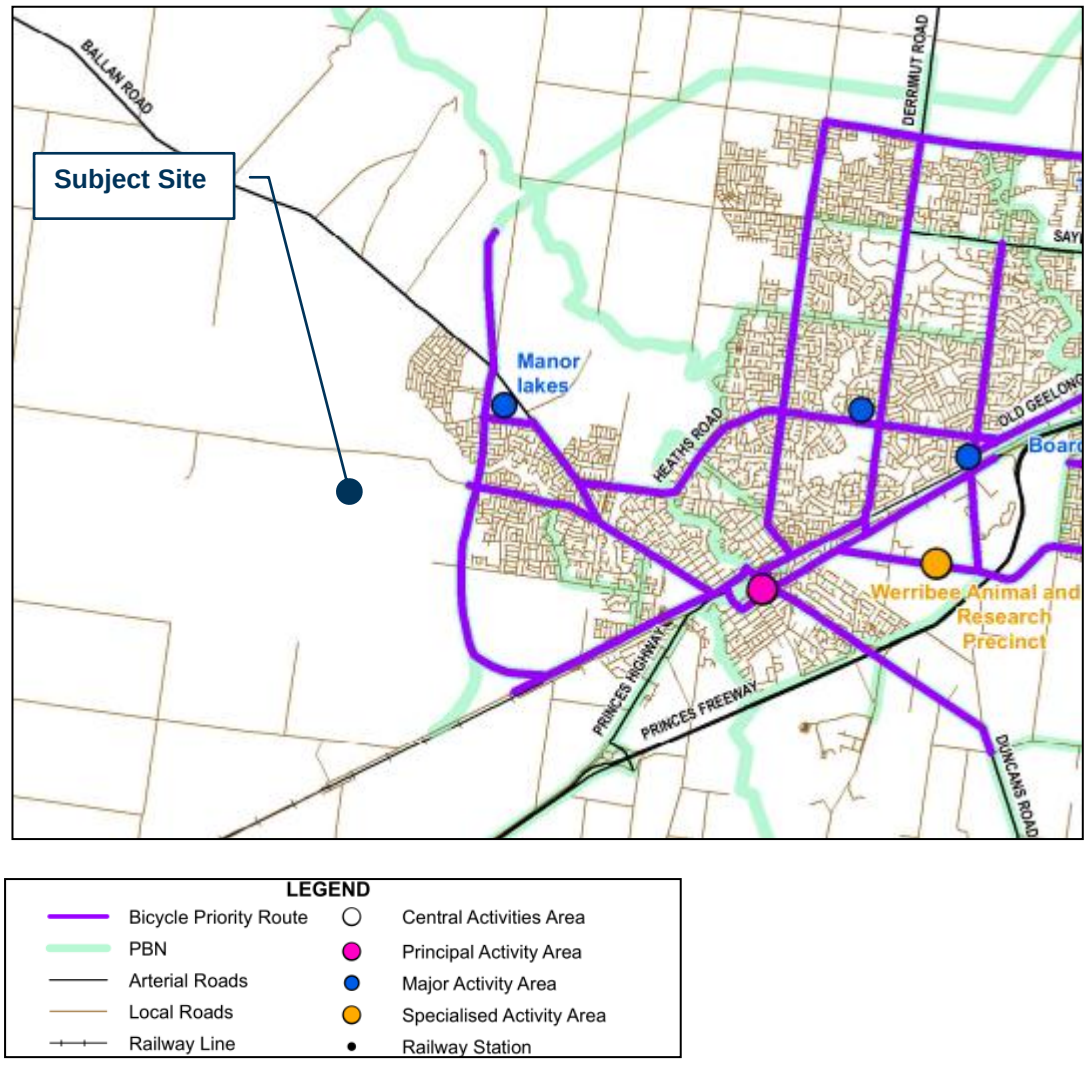
The cross section of Connector Roads (adapted from the Manor Lakes PSP) is shown attached within Annex 1.

2.3 Bicycle Access

The subject site is located on the edge of the existing urban growth boundary and is currently being developed, and as such the site has limited access to the principle bicycle network. However, all major roads within the subdivision have been designed to include bicycle lanes or off road provision for cyclists.

VicRoads has recently updated the Principle Bicycle Network plans. The current plan for the City of Wyndham is shown in Figure 2.

Figure 2: Principle Bicycle Network



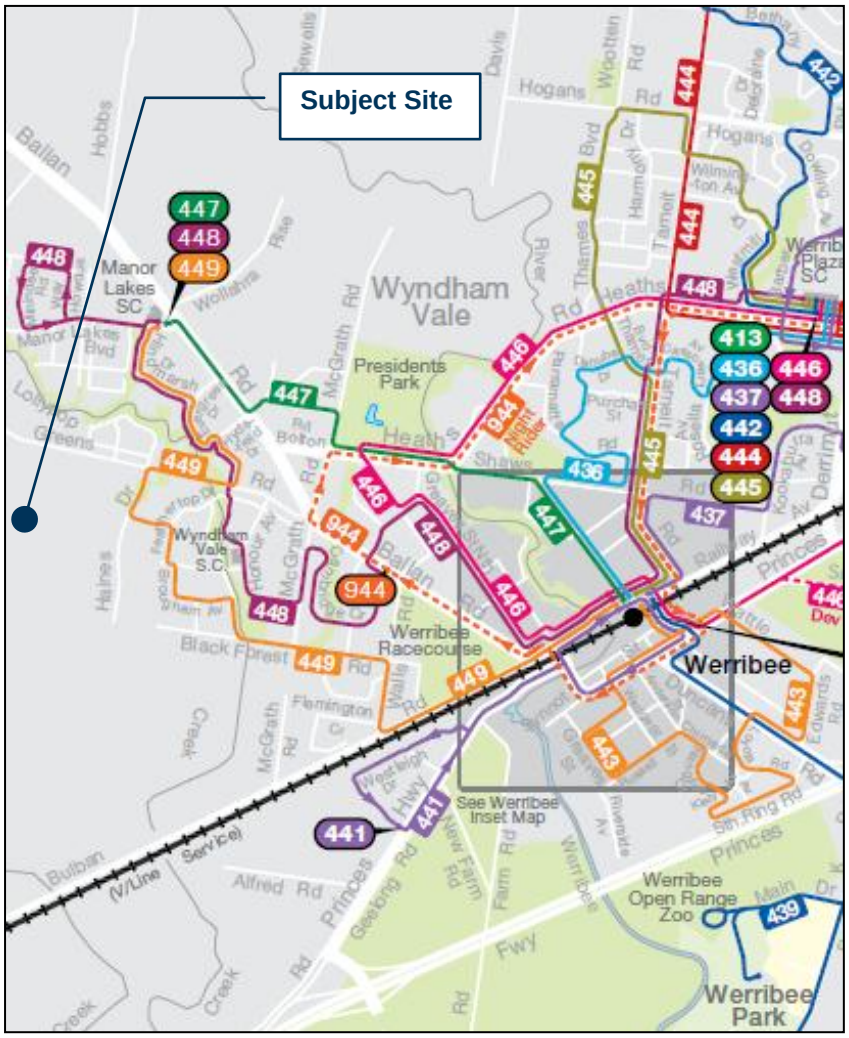
2.4 Existing Public Transport

Public transport within the vicinity of the site is limited to bus services as indicated in Table 1 and Figure 3. These generally run between Werribee train station and Manor Lakes shopping centre. It is generally expected that as development occurs in the area additional bus services will be provided and existing services will be extended.

Table 1: Available Public Transport

Service	Route No's	Route
Bus	447	Werribee - Manor Lakes SC
	448	Werribee Plaza SC - Manor Lakes SC
	449	Werribee - Manor Lakes SC

Figure 3: Public Transport Network



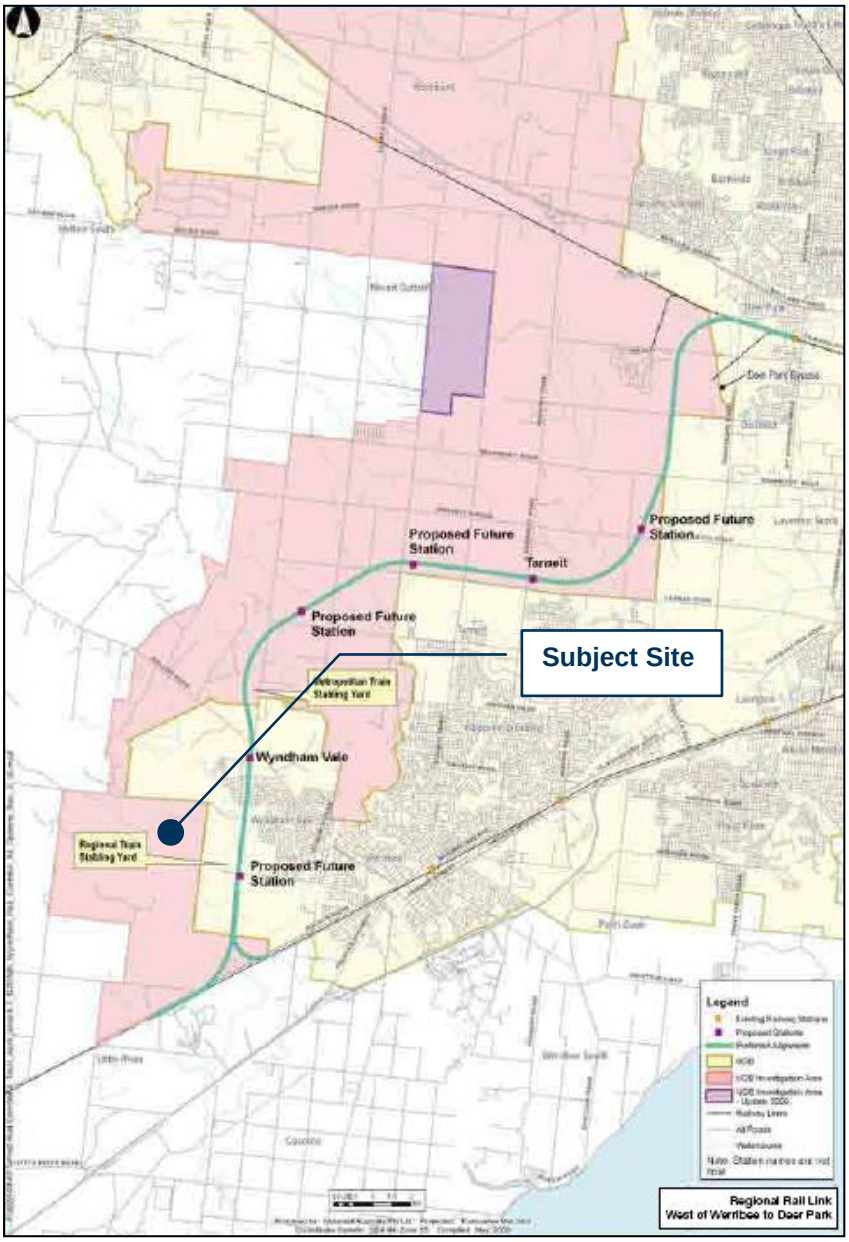
2.5 Regional Rail Link

The proposed Regional Rail Link is a major new rail line running from West Werribee to Deer Park and along the existing rail corridor through suburbs including Sunshine and Footscray to Southern Cross Station. The Regional Rail link is to be located to the west of Armstrong Road, with the station proposed between Black Forest Road and Greens Boulevard.

It is understood that a bus interchange will be included as part of the regional rail project.

The alignment of the Regional Rail Link is shown in Figure 4.

Figure 4: Regional Rail Link



3 Proposed Development

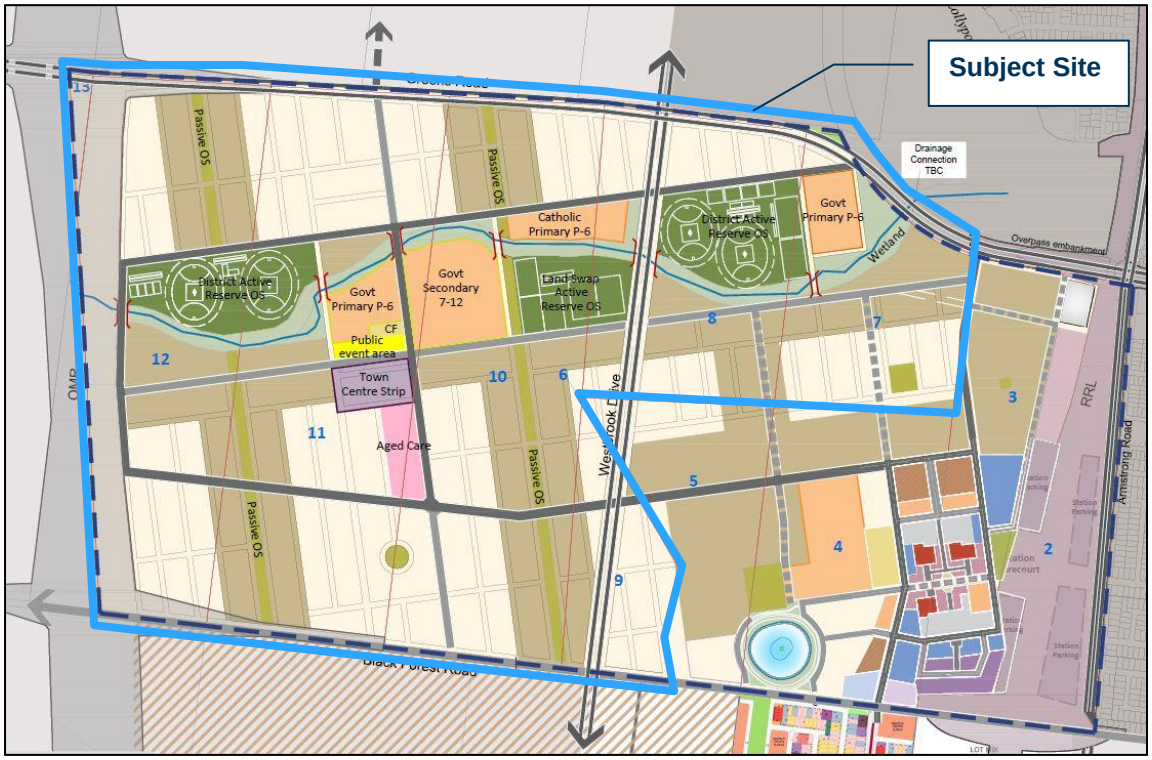
3.1 Daleston Precinct Master Plan

The Daleston area is to be developed as a residential estate generally in accordance with the Precinct Structure Plan road network established for this area in conjunction with GAA, VicRoads and Council.

The Master Plan proposes development of the land for a predominantly residential subdivision, incorporating the following components:

- The Daleston area contemplates the development of 240 hectares of land for approximately 4200 residential lots, comprising a mixture of traditional, terrace, cottage, lodge and manor sized lots.
- Neighbourhood Activity Centre
- State and Catholic Primary Schools
- State Secondary Schools
- Community Hub
- Passive Open Space
- Active Open Space

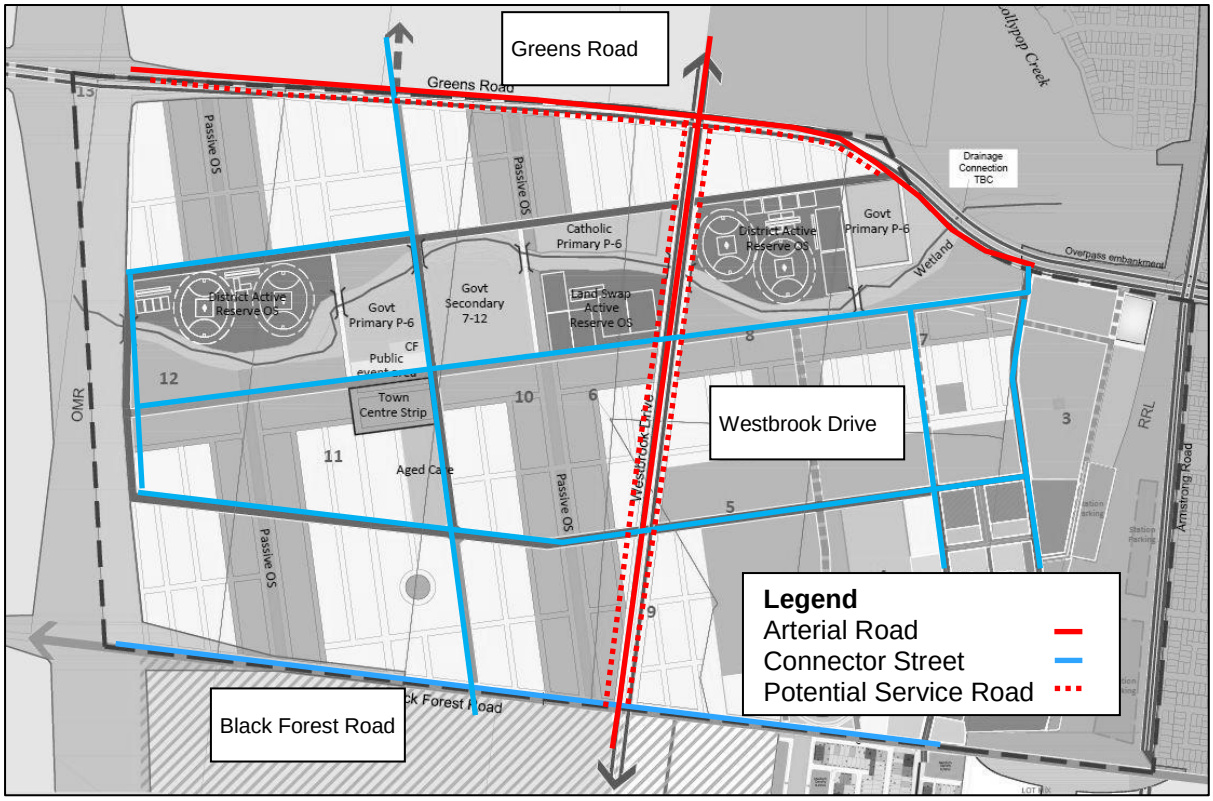
Figure 5: Proposed Master Plan - Daleston



3.2 Transport and Road Hierarchy Plan

The Transport Plan for the subdivision is shown in Figure 6, showing the Arterial Road and Connector Street network throughout the site.

Figure 6: Arterial and Connector Roads



Primary access to the development will be provided from a network of east-west connector streets running from Westbrook Drive and north-south connector streets running between Greens Road and Black Forest Road.

The balance of the internal road network will consist of access streets.

The arterial and residential connector roads will be designed to operate as future bus routes.

It is proposed that all arterial road intersections along Greens Road and Westbrook Drive with residential connector roads will be controlled by traffic signals or roundabouts, constructed as a part of the Development Contributions Plan (interim treatments only). It has been agreed with VicRoads and the GAA that the non-perpendicular intersection angles are within the acceptable range and provide fully functional intersections (see Annex 2 for Concept Plans of Westbrook Drive/ Connector Roads). Major cross intersections within the local street network will predominantly be controlled by roundabouts.

All roads within the development area are proposed to provide for direct access to abutting lots with the exception of the arterial roads, where service roads are required.

The GAA had commissioned GTA to model the major arterial road intersections within wider West Wyndham Structure Plan area (inclusive of Daleston) to determine appropriate treatments for both the interim and ultimate traffic volume scenarios.

A plan of the interim external road connections is shown below in Figure 7, while the likely ultimate road connections are shown below in Figure 8. A summary is shown in Table 2. Ultimate cross sections along Greens Road and Westbrook Drive will contain a central median where Access Streets

connect to Arterial Roads, effectively meaning these intersections are restricted to left in/left out movements. In the interim arrangement, Access Street/ Arterial Road intersections are considered acceptable unless they form a cross intersection.

Table 2: Interim and Ultimate Intersection Layouts

Intersection	Interim	Ultimate	Changes between Interim and Ultimate
IN30 (Greens Road/ Western Connector)	Roundabout	Signals	Signalisation and duplication of east and west approaches.
IN08 (Westbrook Drive/ Greens Road)	Signals	Signals	Slip lanes, duplication of through lanes on east and west approaches, conversion of short lanes to through lanes on north and south approach.
IN07 (Westbrook Drive/ Northern Connector)	Signals	Signals	Slip lanes, conversion of short lanes to through lanes on north and south approach.
IN06 (Westbrook Drive/ Southern Connector)	Signals	Signals	Conversion of short lanes to through lanes on north and south approach.
IN05 (Westbrook Drive/ Black Forest Road)	Signals	Signals	Conversion of short lanes to through lanes on north and south approach.
IN28 (Black Forest Road/ Western Connector)	Roundabout*	Roundabout*	Nil

*Note that the roundabout provision at IN28 is dependent on the alignment of the connector road south of Black Forest Road.

Figure 7: Interim Arterial Intersection Treatments - Daleston

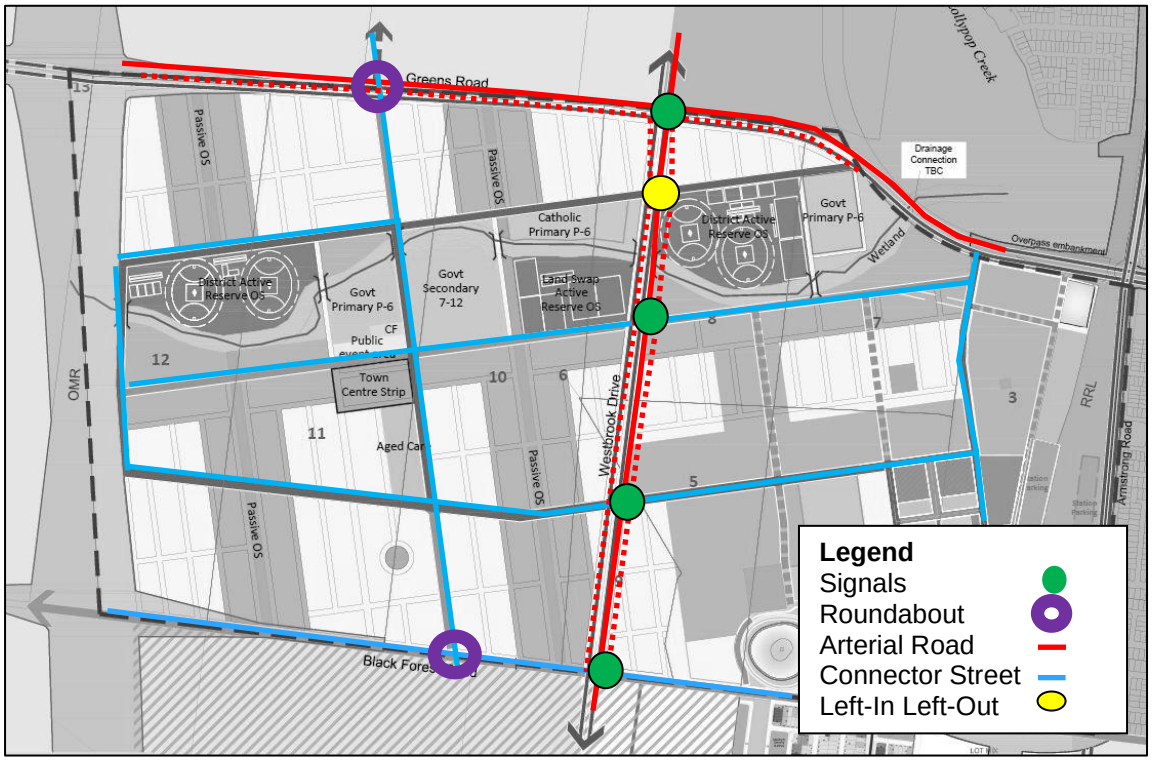
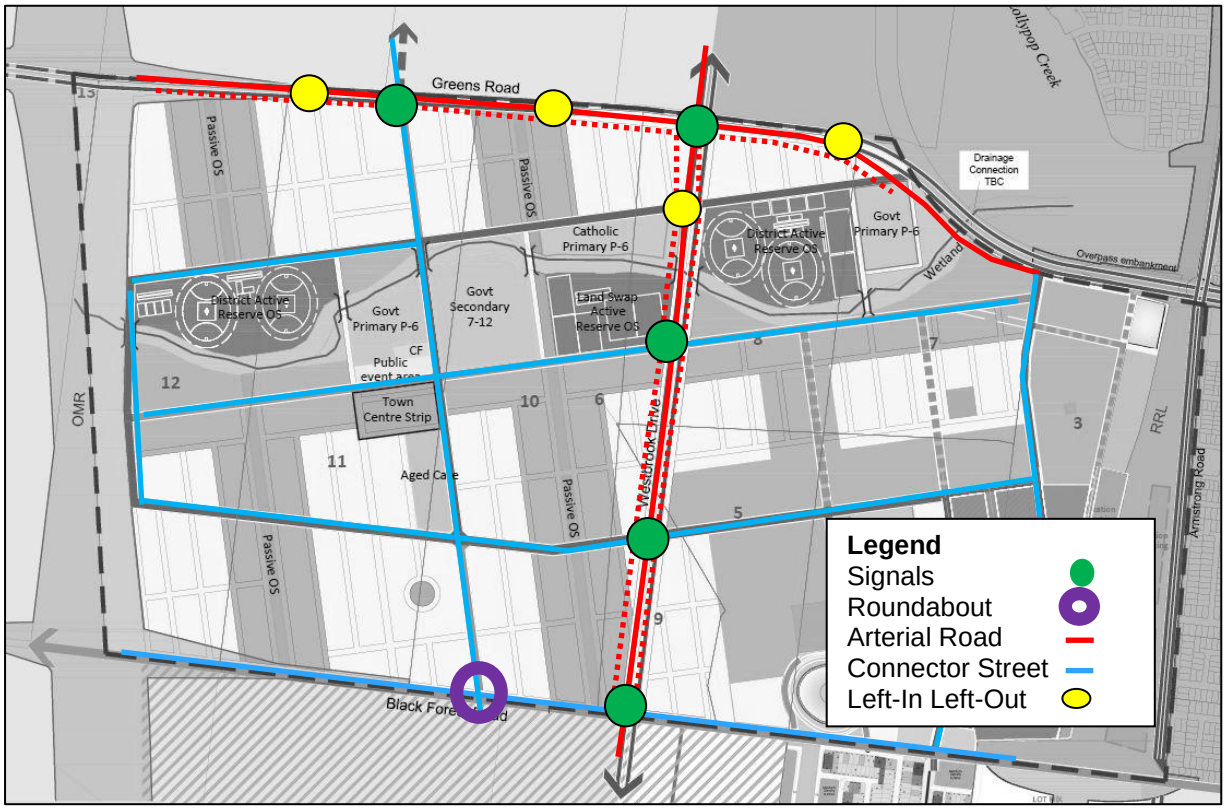


Figure 8: Ultimate Arterial Intersection Treatments - Daleston



It is noted that the costs associated with each of the interim intersection layouts and any land acquisition required for the ultimate intersection and road layouts will be included within the DCP prepared as part of the PSP.

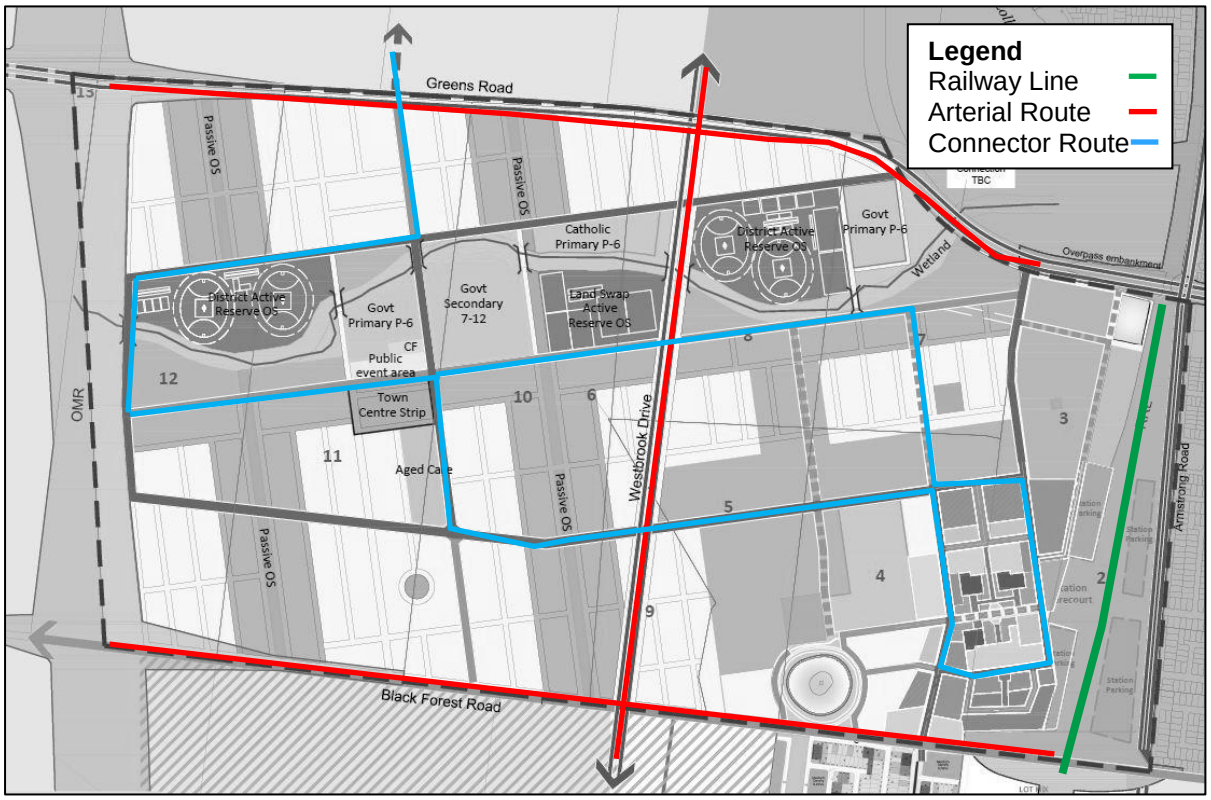
3.3 Future Public Transport

As development of the Daleston land occurs, bus routes will need to be extended within the area to meet the future demands of residents. The road network will be designed to cater for buses with connector streets and associated intersections being designed to allow for buses. Local bus connection to the proposed railway station is recommended.

The road network spacing provides for a good level of walkability and ensures that all individual lots are within 400 metres of public transport services.

The potential public transport plan for the North Black Forest Road PSP is shown in Figure 9.

Figure 9: Potential Public Transport Network



4 Traffic Generation and Volumes

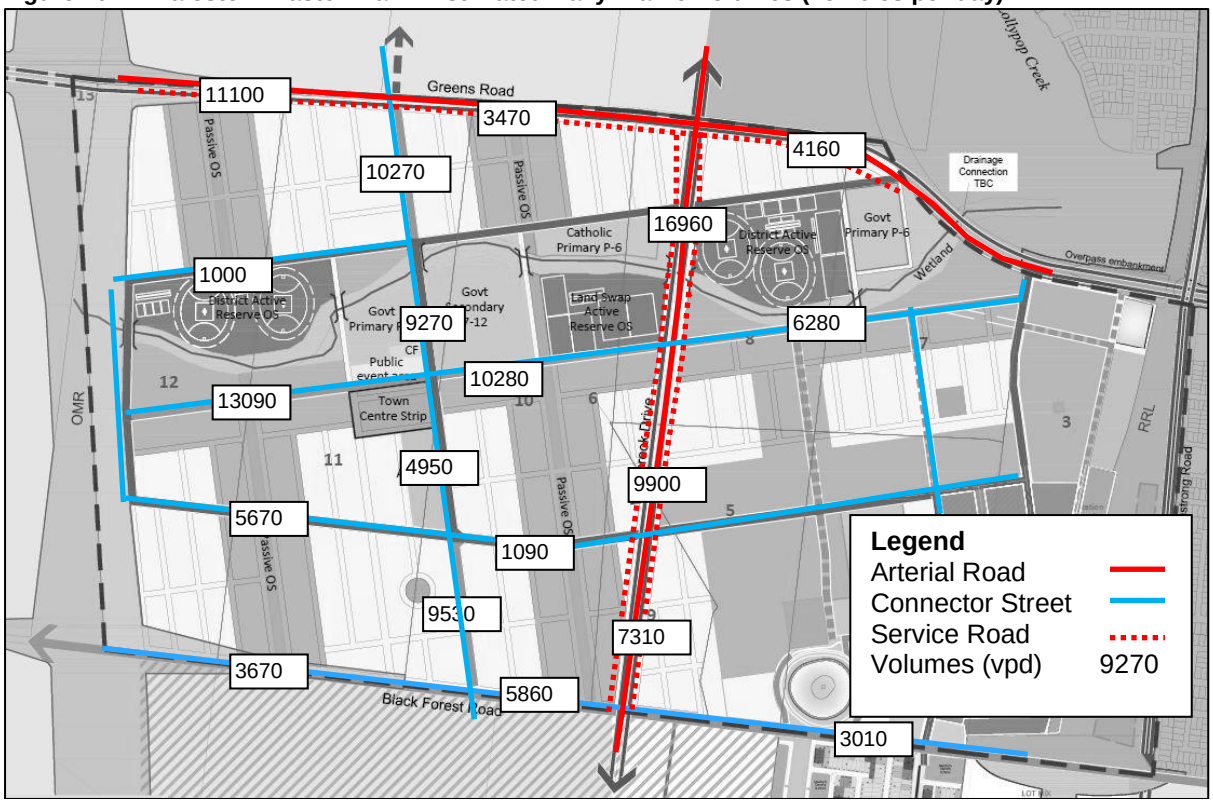
4.1 MITM Modelling For GAA

GTA were commissioned by the GAA to undertake traffic modelling of the Black Forest Road North PSP area and the broader Wyndham West Precinct Structure Plan area to determine future traffic volumes on the arterial and connector road network and to assist in determining road requirements to service the PSP area.

4.2 Estimated Traffic Volumes

Traffic volumes on local roads and connector streets will vary as development of the area progresses. With full development of the Wyndham West area and the construction of the OMR, the GAA modelled estimated ultimate daily volumes on arterial and connector roads within the Master Plan area are shown in Figure 10.

Figure 10: Daleston Master Plan – Estimated Daily Traffic Volumes (vehicles per day)



4.3 Review of Traffic Volumes

Local streets within the Daleston area will at all times carry less than 3,000 vehicles per day and hence act as Access Streets as defined in the Precinct Structure Plan.

It is understood that the traffic modelling does not take the local access streets into consideration and therefore volumes on Connector Streets are shown to be higher than the preferred upper threshold of 7000vpd. When redistributed, the GTA report concluded that the volumes of the Connector Streets would reduce to less than the upper threshold limit and therefore no access restrictions to the roads are appropriate. It is noted that various left-in/ left-out treatments are provided along Greens Road to supplement the major intersections, which will reduce Connector Street traffic, as will any direct connection to Black Forest Road.

The traffic volumes along Black Forest Road are well below the threshold for Connector Streets and therefore a cross section with a single lane in each direction is appropriate for this road. Property access is also considered to be appropriate from Black Forest Road due to the limited traffic and the function of the road.

The traffic volumes along Westbrook Drive are approaching the 18,000vpd threshold that requires duplication of a road, however they only trigger the need for a single lane in each direction. Given the function of the road and the cross sections proposed to the north and the south, two lanes in each direction are considered appropriate. It is understood that VicRoads preference is for a 6-lane cross section (three lanes in each direction) to potentially provide dedicated public transport lanes. It is recommended that the requirement for these additional traffic lanes is further discussed with GAA, VicRoads and Council to ensure an equitable provision of traffic lanes and road reserve is achieved.

The traffic volumes along Greens Road are significantly below the threshold required for road duplication. Given the function of the road and the future interchange with the OMR, two lanes in each direction along Greens Road is considered appropriate, however the requirement to provide for a third lane in each direction is also questionable.

4.4 Road Network and Access - Internal

Daleston is planned to achieve a street character similar to existing older grid parts of inner Werribee. Multiple cross roads are important in optimising the legibility and access efficiency of an interconnected street network, such as that proposed for Riverwalk.

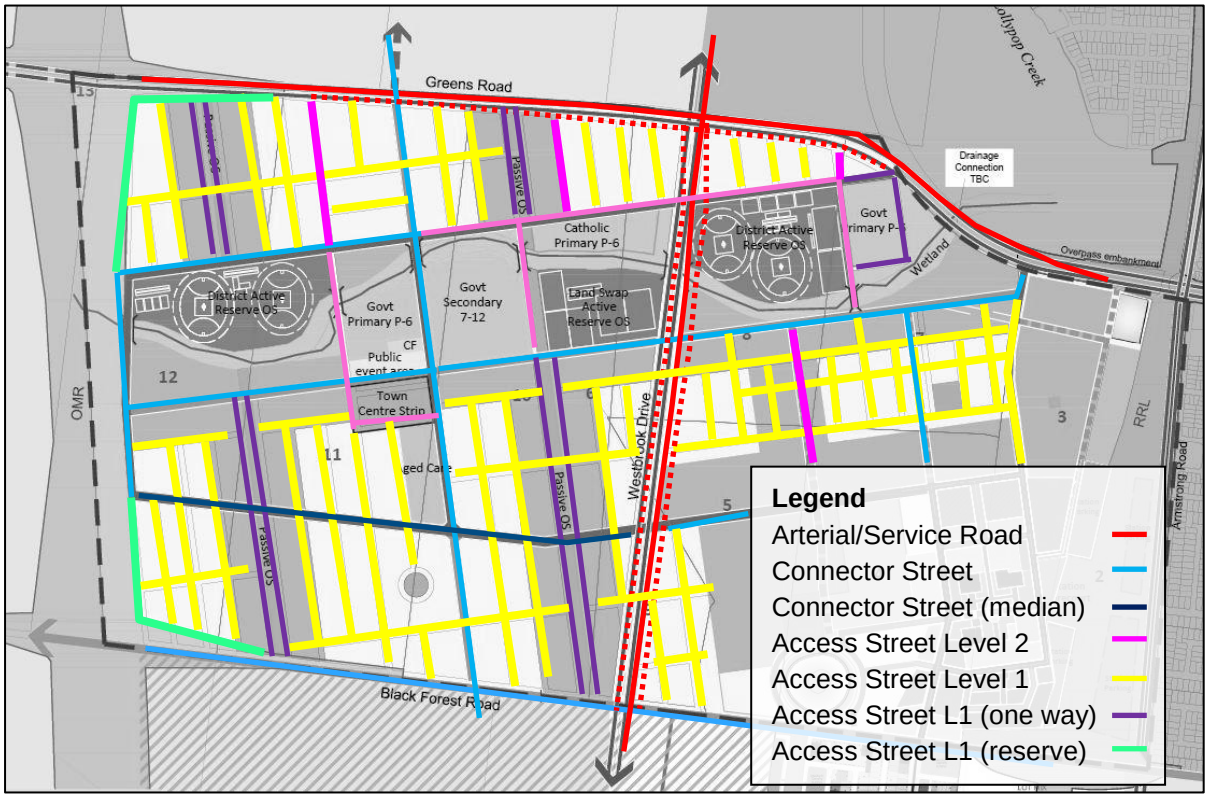
The indicative road network shows a modified grid based road network that has been designed in consideration of the existing surrounding road network, and future connections to Greens Road and Black Forest Road, the Outer Metropolitan Ring Road and Westbrook Drive.

The network has been designed loosely on an 800 metre connector / arterial spacing to conveniently and evenly distribute traffic to the wider road network, and provide accessibility within the estate to schools and local retail facilities.

The proposed arterial, connector and local street network is illustrated in Figure 11. Road descriptions for the overall road hierarchy are nominated as described in Table 3.

The Wyndham Planning Scheme (56.06-7) states that street blocks should be provided "that are generally between 120m and 240m in length and generally between 60m and 120m in width to facilitate pedestrian movement and control traffic speed". Various block lengths exceed 240m, so it is recommended that speed control devices with associated shared pedestrian/ bike links be located midblock in the east-west direction.

Figure 11: Internal Road Hierarchy



Cross sections of each of the roads are provided in Annex 1.

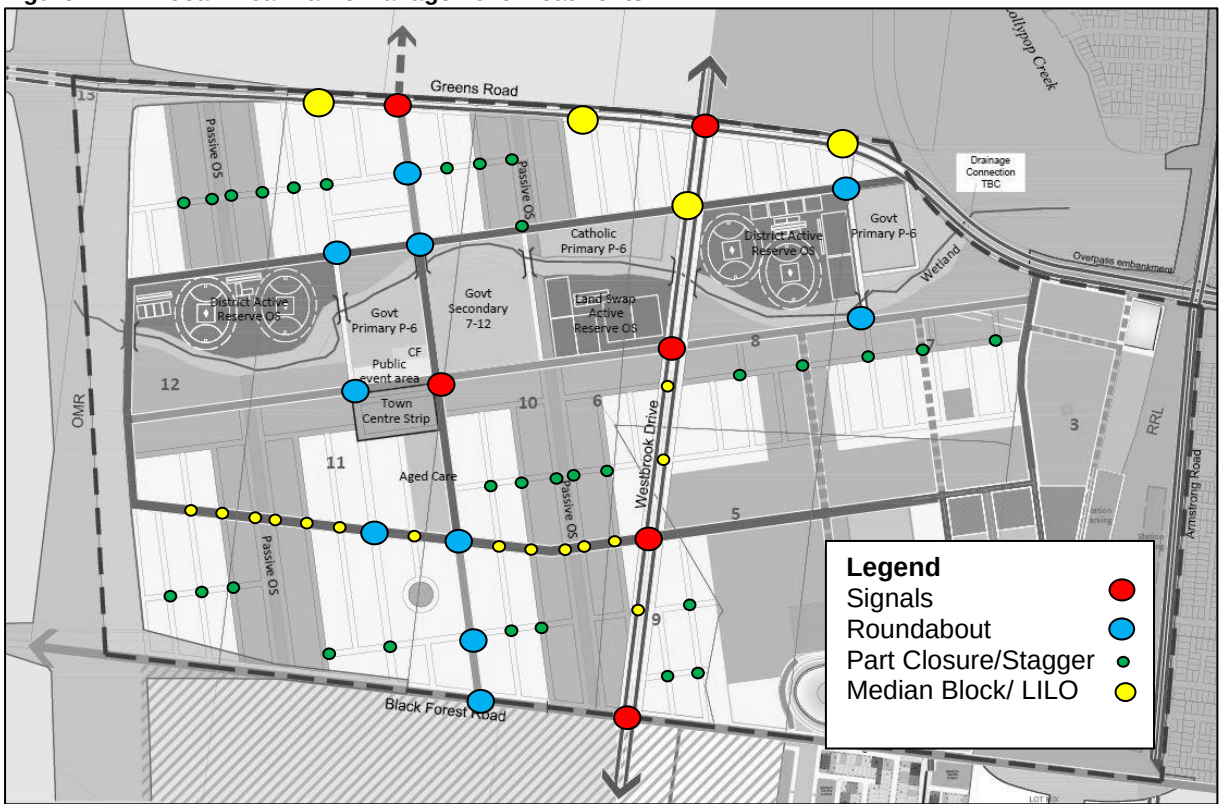
Table 3: Road Hierarchy

Colour Code	Anticipated Daily Traffic Volumes (vpd)	Road Classification & Function	Road Reserve	Recommended Carriageway Widths	Minimum Recommended Footway/Cycleway Provision
Yellow	< 2,000	Access Street 1	16m	7.3 m	Footpath on both sides
Purple	<2,000	Access Street 1 (one-way)	Carriageway plus 4.5m on residential frontage side and allowance on open space side	45 degree – 10.4m 60 degree – 11.8m 90 degree – 12.6m	Footpath on one side only
Light Green	<2,000	Access Street 1 (OMR adjacent)	13m	5.5 m	Footpath on one side only
Pink	<3,000	Access Street 2 (School/Activity Area) Access Street 2 (other)	22.3m 20m	2 x 5.5m lanes (inc parking)	Footpath or shared path on both sides Footpath on both sides
Light Blue	<7,000	Connector Street Black Forest Road (Connector)	26m	2 x 3.5m lanes plus bicycle and parking lane	Footpath on both sides Designated 1.7m bicycle lane
Dark Blue	<7,000	Connector Street with Median	26m +3.6m median	2 x 3.5m lanes plus bicycle and parking lane	Footpath on both sides Designated 1.7m bicycle lane
Red	>30,000	Westbrook (Arterial) Greens Road (Arterial)	41m + service roads (11-12m) 34m+service roads	Service Road (5.5 metres) both sides 2 – 3 traffic lanes (3.5 m) in each direction separated by a central median	Footpath on both sides 2.0 metre bicycle lane in each direction

4.5 Local Area Traffic Management

Intersection treatments and local area traffic management devices are proposed to be used to control vehicle speeds and assign priority at intersections within the development. Cross intersections are a feature of the road network and therefore each individual intersection has been considered in terms of appropriate treatment. An illustration of the local area traffic management treatments is shown in Figure 12. Speed control devices and threshold treatments could also be used on local roads where lengths exceed 200m however the precise location of these devices would be determined at a detailed design stage.

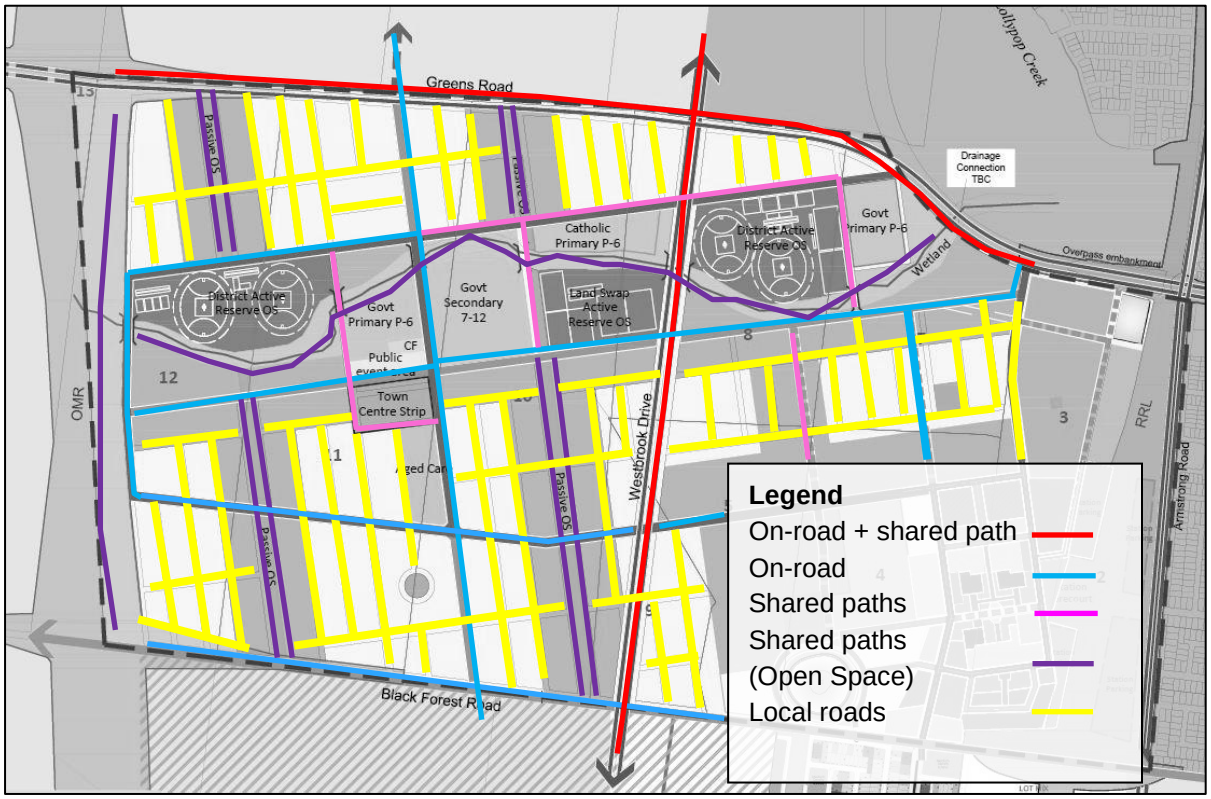
Figure 12: Local Area Traffic Management Treatments



4.6 Bicycle Network

The grid network of the internal roads provides direct bicycle routes to all precincts. All connector and arterial roads are to contain on-road bicycle lanes, while Access Street Level 2 roads will provide shared paths adjacent to activity areas. Open space areas could also provide for shared paths for pedestrians and cyclists. The remaining local streets will carry low traffic volumes and therefore separate bicycle facilities are not considered necessary, however various intersection treatments (described in Section 4.7) are to be provided to enhance cyclist connectivity. The full bicycle network is shown in Figure 13.

Figure 13: Bicycle Network



4.7 Local Cross Road Cross Junction Treatments

To help ensure intersection amenity and safety for pedestrians, cyclists and vehicles, cross roads are recommended to be designed with appropriate controls, with options including traffic signals, roundabouts, raised platforms or pedestrian crossings, offset junctions, partial legs, left in/left out arrangements or priority stop/give way controls under the right conditions. Some of these options preserve the full movement choice for pedestrians and cyclists, but not for cars.

On pedestrian priority routes, use of striped zebra crossings should be incorporated into the cross road design of some key intersections.

A brief summary of the range of possible cross road control options is below.

4.7.1 Traffic Signals

The key intersections with Greens Road, Black Forest Road and Westbrook Drive (i.e. connector roads and above) are to be signalised. Signals would also be a longer term option for the key cross road in the heart of the Village Centre, to facilitate pedestrian safety and movement.

4.7.2 Bus Roundabouts

A limited number of roundabouts will be located along the bus route. These will be designed in accord with the relevant Austroads and VicRoads standards for ultra low floor buses. Pedestrian crossings are proposed on each leg to facilitate safe pedestrian movement.

4.7.3 Local street non-bus Roundabouts

Local roundabouts may be used at cross intersection between local streets with moderate traffic volumes. Such roundabouts may also be used, where appropriate, as traffic calming devices, or where significant U-turns are likely, such as around schools. The roundabouts will be kept as small as practical, with tight entry angles to ensure minimum need for splays on adjoining properties.

The roundabout design will specifically facilitate safe and comfortable use by pedestrians and cyclists, whilst effectively slowing car speeds. The VicRoads Cycle Notes No 15, 2005: *Providing for Cyclists at Roundabouts* and Bicycle Victoria's Technical Note, 2004: *Better Local Traffic Controls for Safer Cycling and Walking* will be used as key references, in addition to Austroads Guides relating to both Roundabouts and Bicycles.

4.7.4 Raised Intersection Platforms / Raised Pedestrian Crossings

At cross intersections of local connector or access streets and where traffic speed and volumes can be constrained on the minor street approach legs, the use of raised platforms or tables across the whole intersection will be explored. Alternatively raised pedestrian crossings across intersection legs may be used along pedestrian priority routes. Zebra crossings may be incorporated as part of these treatments.

Both these treatments effectively slow traffic, but offer a smoother transition that traditional speed humps, whist clearly indicating crossing points for pedestrians.

Figure 14: Typical Roundabout on Bus Route

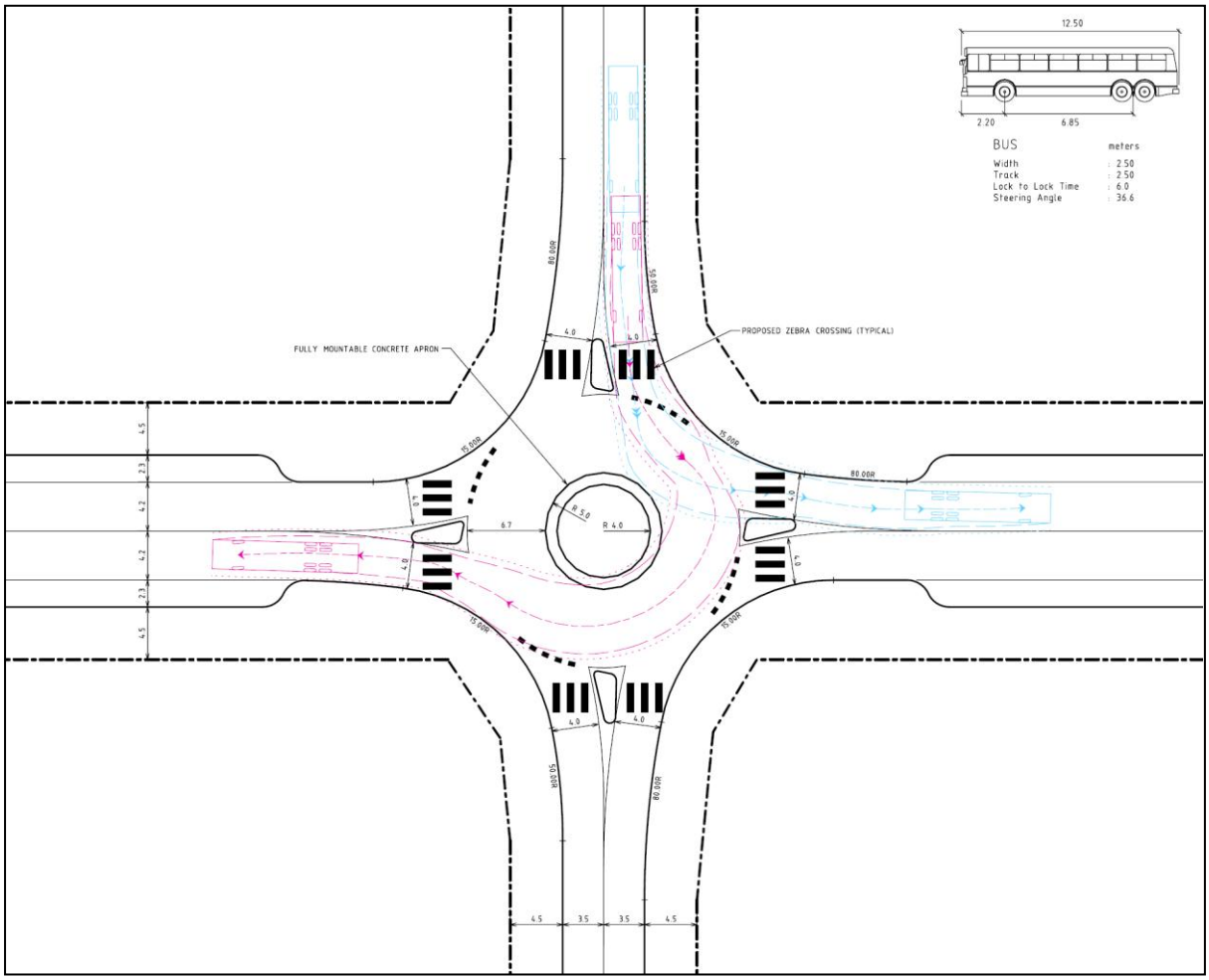


Figure 15: Raised Pavement Control (Henry Street/Lydiard Street Hawthorn)

4.7.5 Offset Intersections with Right-Left Stagger

At cross intersections with low direct crossing volumes on the minor leg, a small offset, or a change in road angle, of the minor street at the intersection may be used to create a visual terminus for drivers. This solution has recently been approved in Williams Landing.

Figure 16: Approved Off-set Cross Intersections, Williams Landing

4.7.6 Left-in / Left-out Intersection Control Using Short Median

Where alternative route options exist, minor legs at cross intersections may be restricted to left-in / left-out only using a central median that would be designed to aid safe pedestrian and cycle crossing of the major leg. A concept of such a treatment is shown in Figure 17.

In some cases triangular islands may be used on the minor leg to assist driver legibility and to provide a pedestrian refuge, as shown in Figure 18. A further option involves retaining all movements for one leg of the minor street, and constraining the other leg to left in-left out.

Figure 17 Central Median, Left-in / Left-out on Both Minor Legs

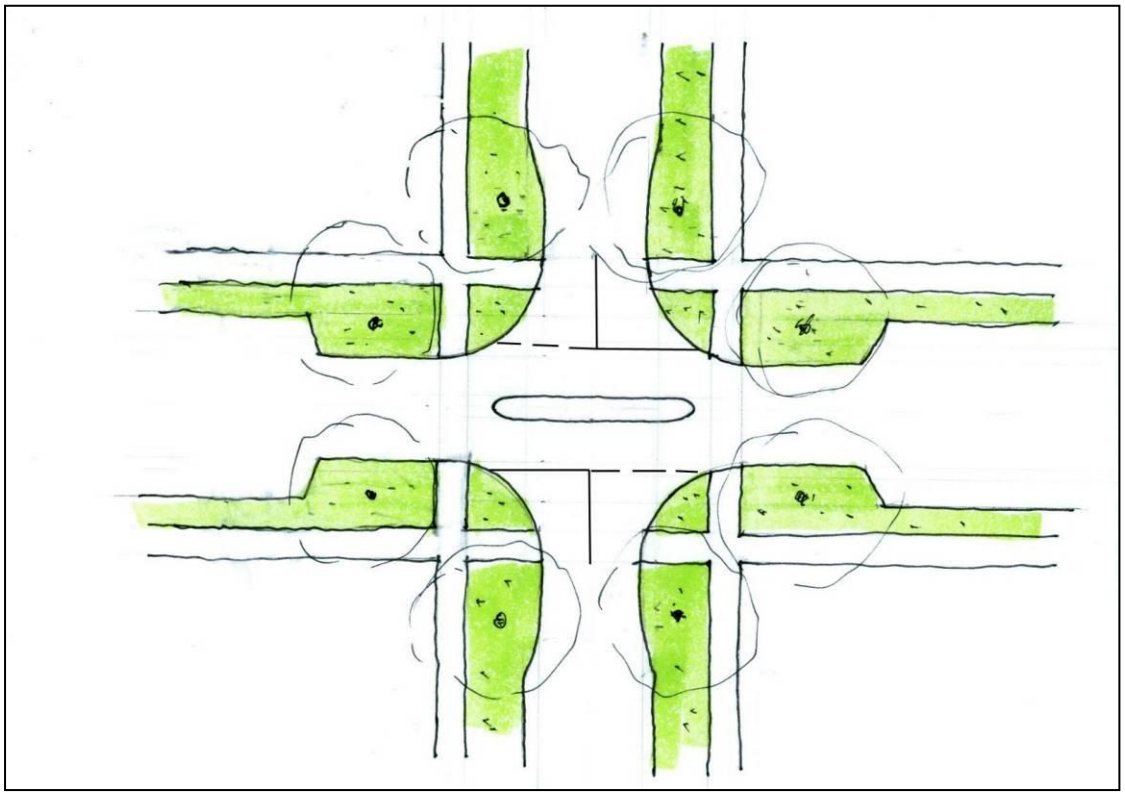
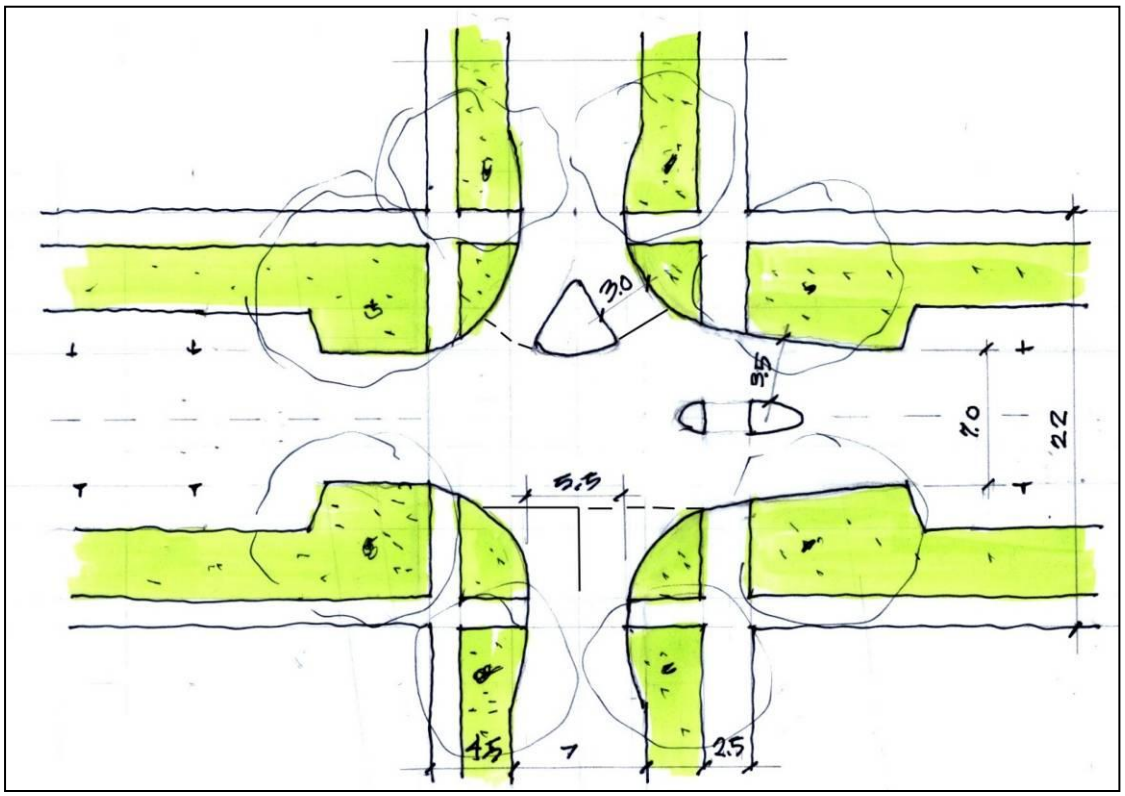


Figure 18 Minor Leg Control to Restrict Movements on One Leg

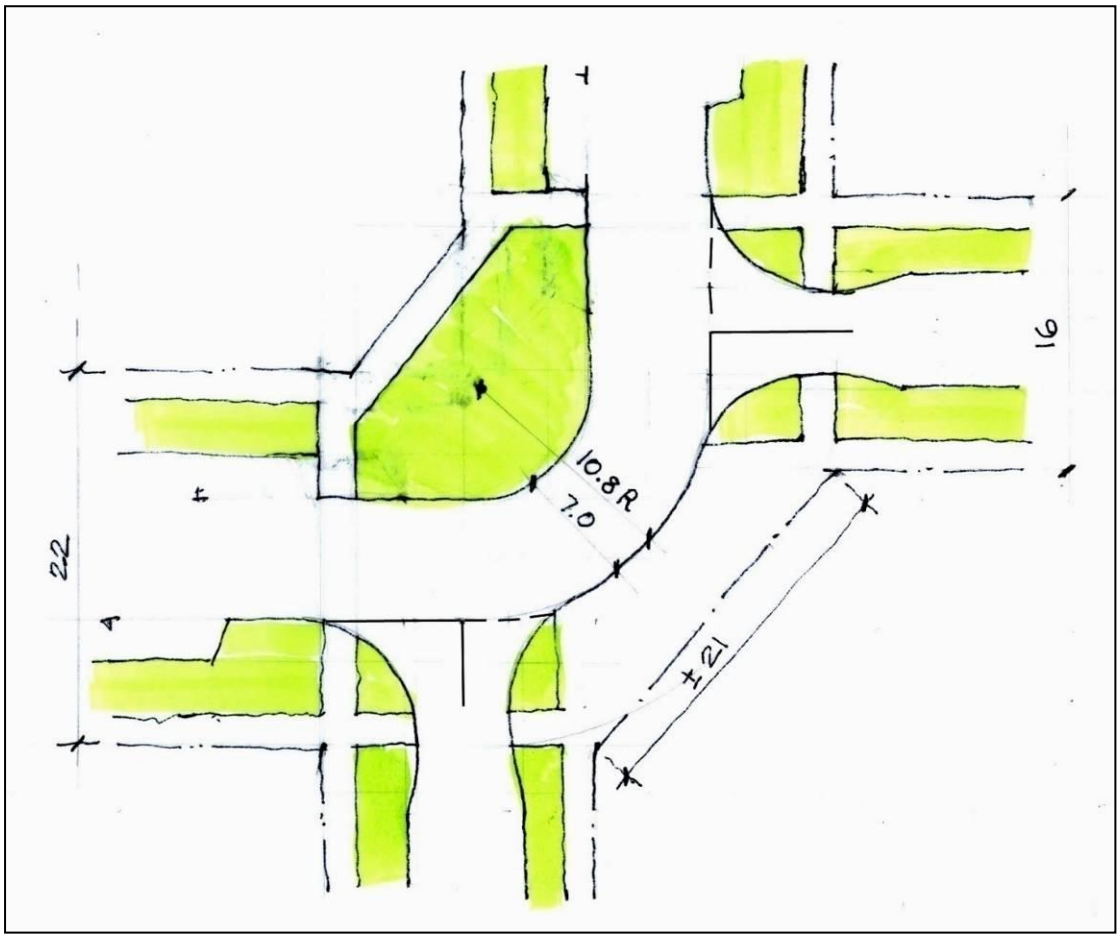


4.7.7 90 Degree Turn Priority

Where the priority movement at a cross intersection is not straight through, the intersection may be configured to provide priority to the major movement (or buses if on a bus route), with minor legs slightly offset.

A concept of such a treatment is shown in Figure 19.

Figure 19 90-degree Priority Intersection Treatment

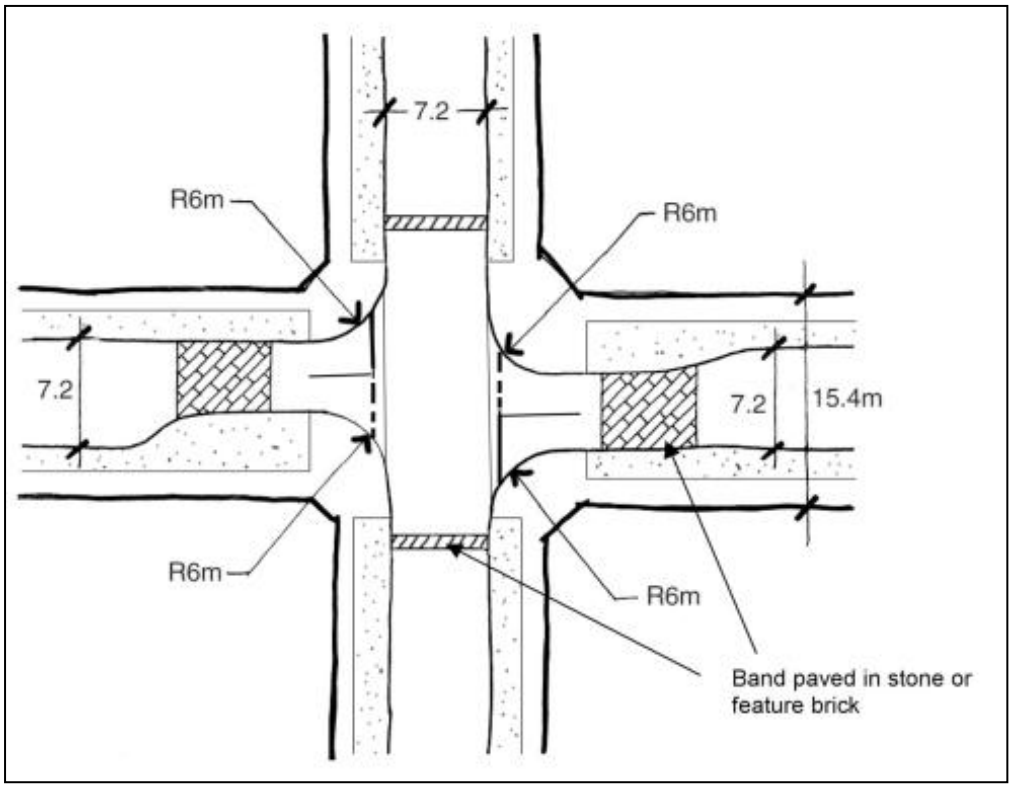


4.7.8 Priority Controlled Cross Roads

Priority controlled cross roads are able to be adopted where traffic volumes along both streets is low, or when traffic along one street of travel is significantly lower than the other street, and run-up lengths are short.

Priority-controlled cross roads, in conjunction with nearby roundabouts or signalised intersections, can also work very well for relatively slow and safe cross movement on connector streets.

Figure 20: Priority Controlled Cross Intersection



4.7.9 Part Road Closure

At cross intersections, various legs can be closed to cars, so that cross traffic is avoided. Openings wide enough for cyclists but not cars to enter can be used effectively. This method is used in Canning Street, Carlton.

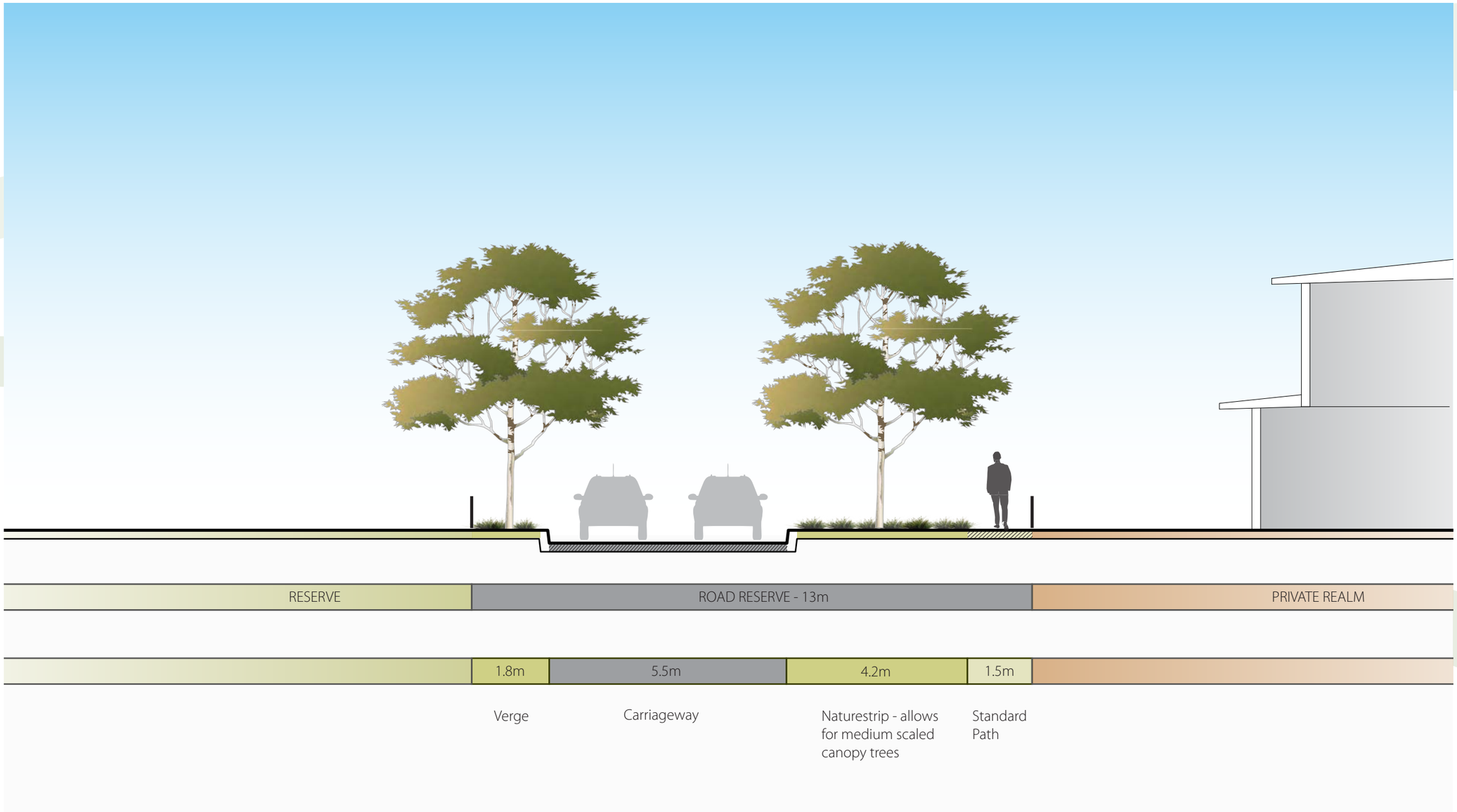
Figure 21: Part Road Closure

5 Conclusions

Based on the foregoing analysis it is concluded that;

- The Daleston masterplan proposes to provide in the order of 4,200 dwellings;
- The proposed road layout has been designed to provide for a connective network and strong internal and external connections that are appropriately spaced;
- The proposed road hierarchy has been designed in accordance with the PSP guidelines with due consideration to future road function and traffic volumes;
- External road connections to Ison Road, Greens Road and Ballan Road have been assessed with due consideration to road function and will provide for safe and efficient access in both interim and ultimate arrangements;
- Intersection controls have been recommended after consideration of the traffic volumes carried by roads in the interim and ultimate arrangements;
- Traffic generated by the Daleston area will be appropriately managed through the proposed road network and beyond.

Annex 1:
Road Cross Sections



** Footpaths to be offset 50mm from property boundary.*

TRACT REF NO. CONSULTATION 309329

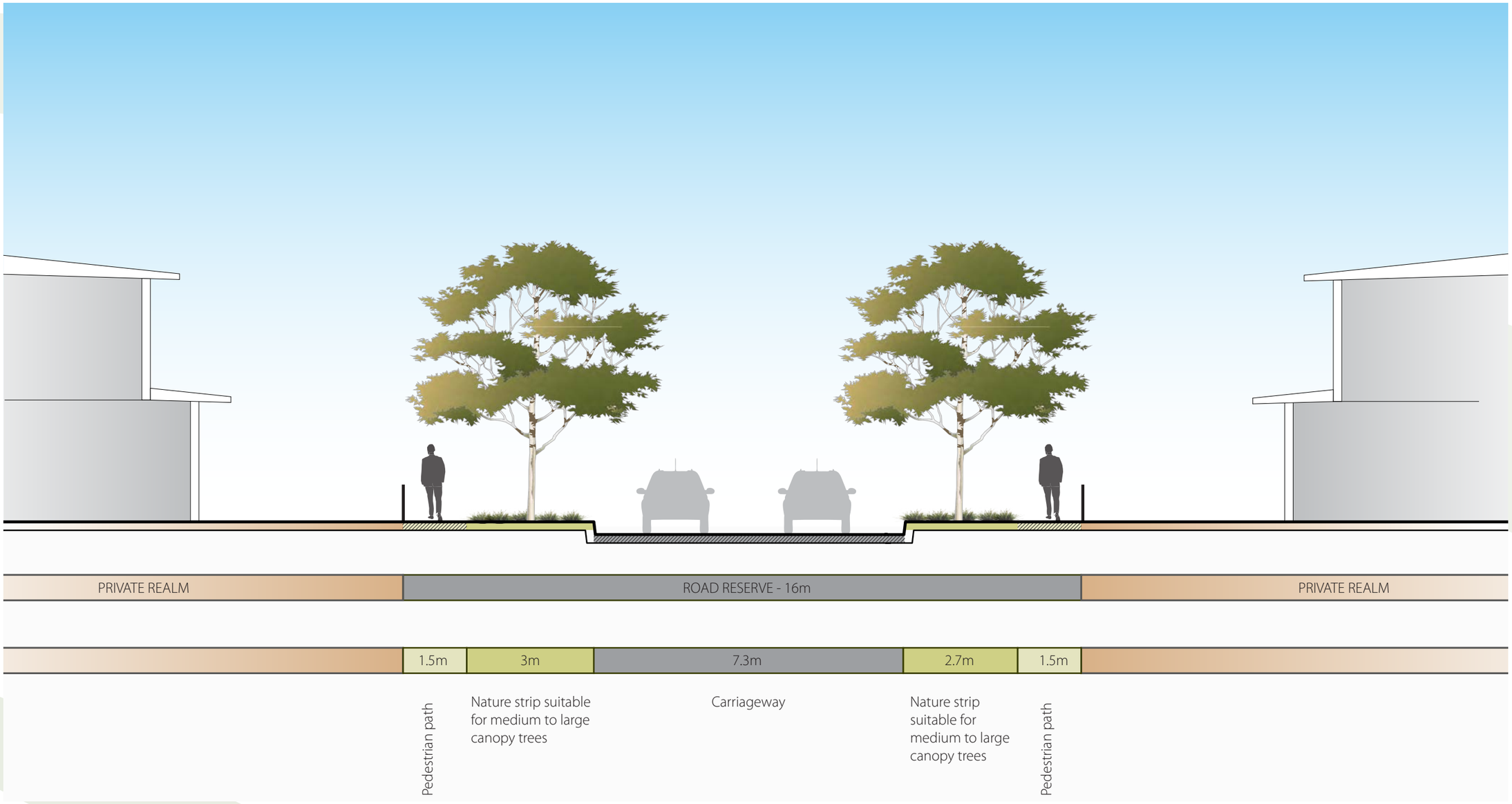
SCALE 1:100

0 1m 2m 5m

Cross Section 1

Access Street Level 1 (13m open space frontage)

manor lakes precinct structure plan



** Footpaths to be offset 50mm from property boundary.*

TRACT REF NO. CONSULTATION 309329

SCALE 1:100

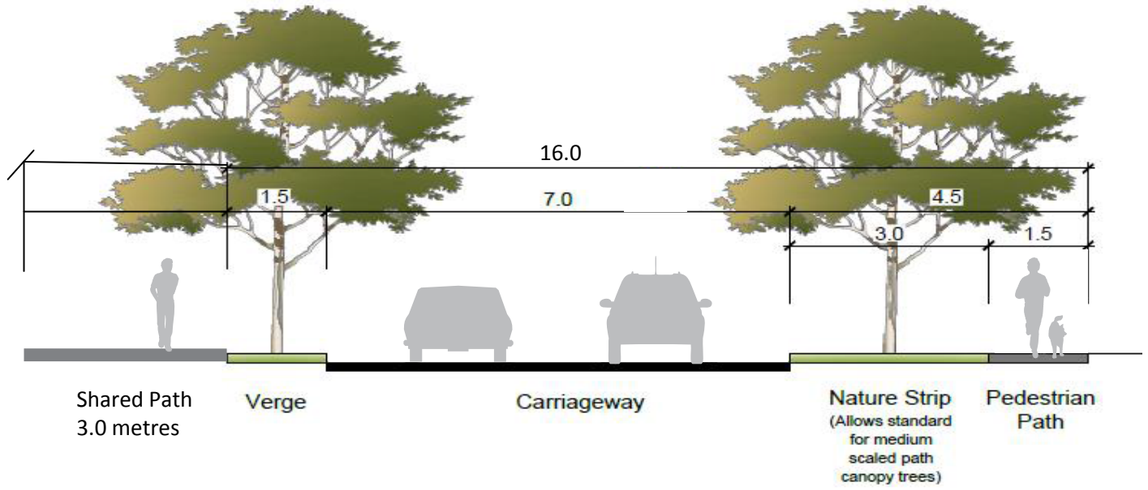
0 1m 2m 5m

Cross Section 2

Access Street Level 1 (16m standard)

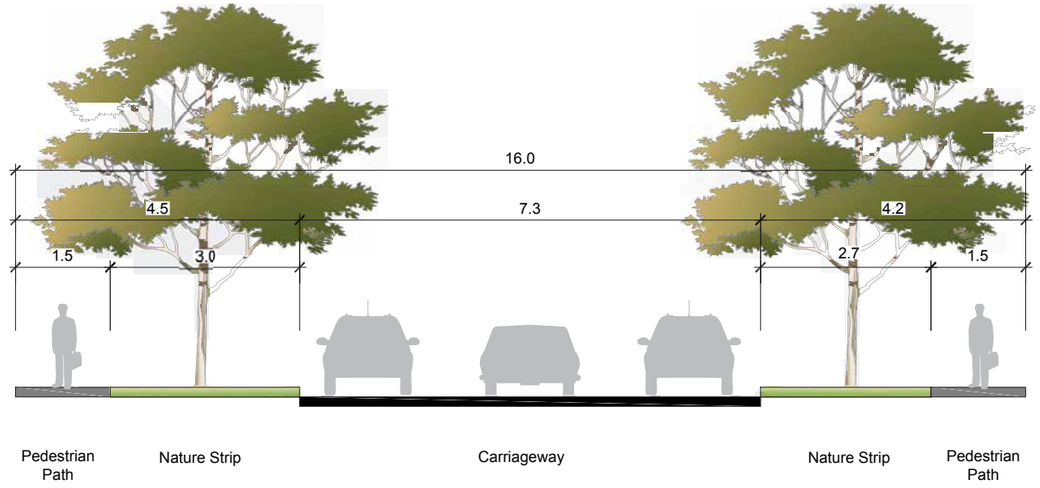
manor lakes precinct structure plan

Cross-Section 15: Access Street Level 1 (16m)
Interface to Regional Rail Link and Metro Spur

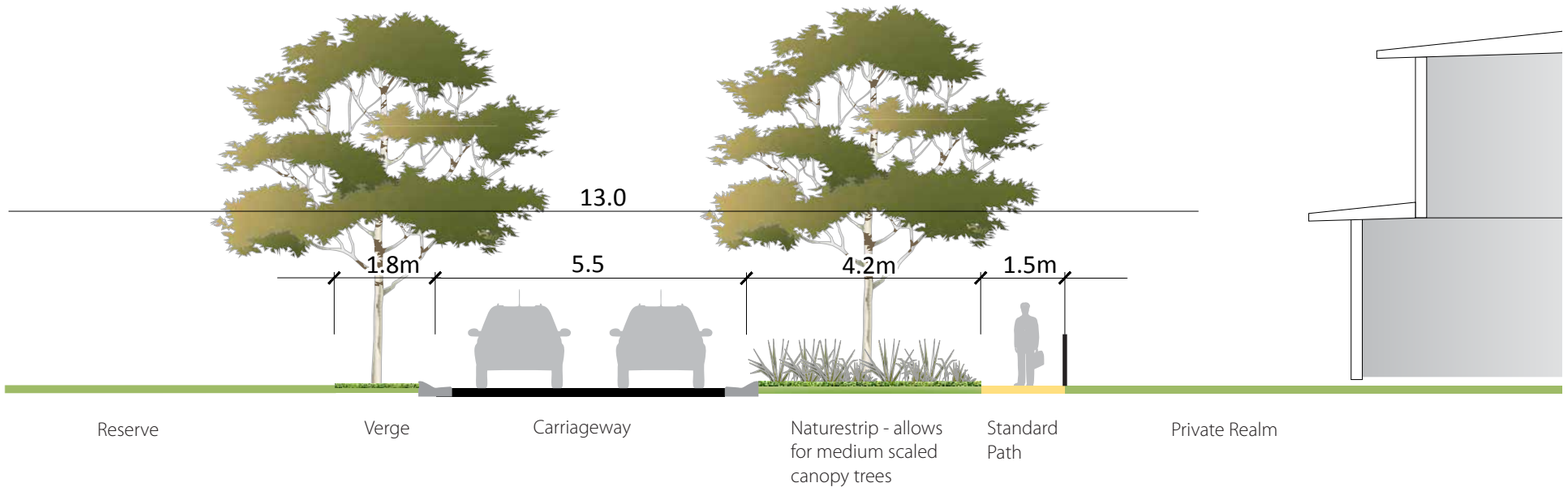


Shared path may be constructed on RRL and Metro Spur reserve if to the satisfaction of DoT and VicTrack
Services may have to be part located under shared path

Cross-Section 16: Access Place/Access Street Level 1 (16m) (<2000 vpd)



Cross-Section 17: Local Street with Reserve Frontage (13m)



** Footpaths to be offset 50mm from property boundary.*

TRACT REF NO. CONSULTATION 309329

SCALE 1:100

0 1m 2m 5m

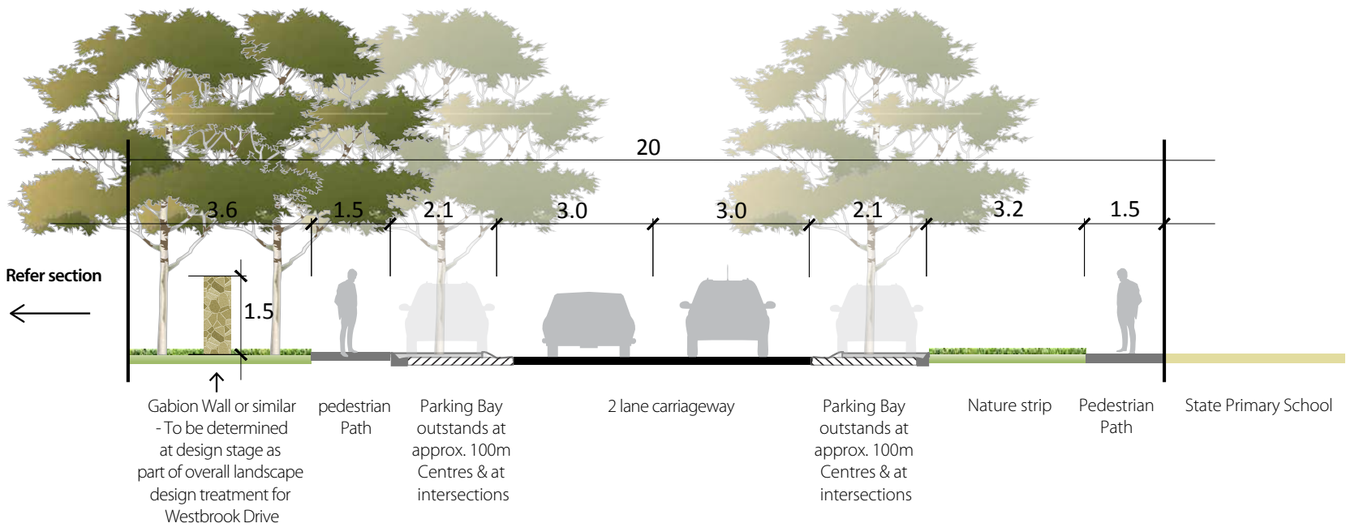
Cross Section 4

School Access Street Level 2 (22.3m)

manor lakes precinct structure plan

Cross-Section 12: Access Street level 2 (20m)

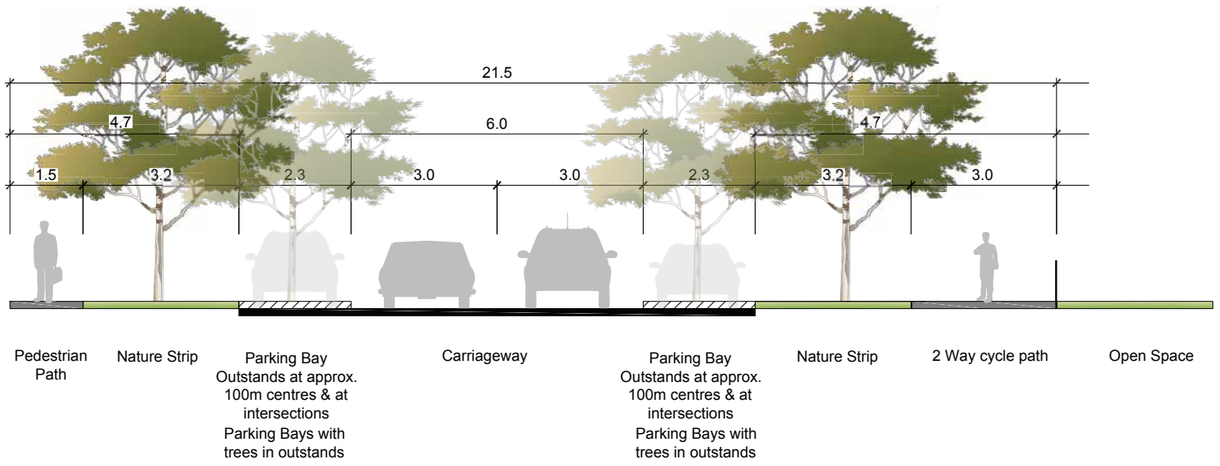
Interface to Ison Road and P6 School



Note: Drop off zones & pedestrian Crossing must be pavement only with trees in grates

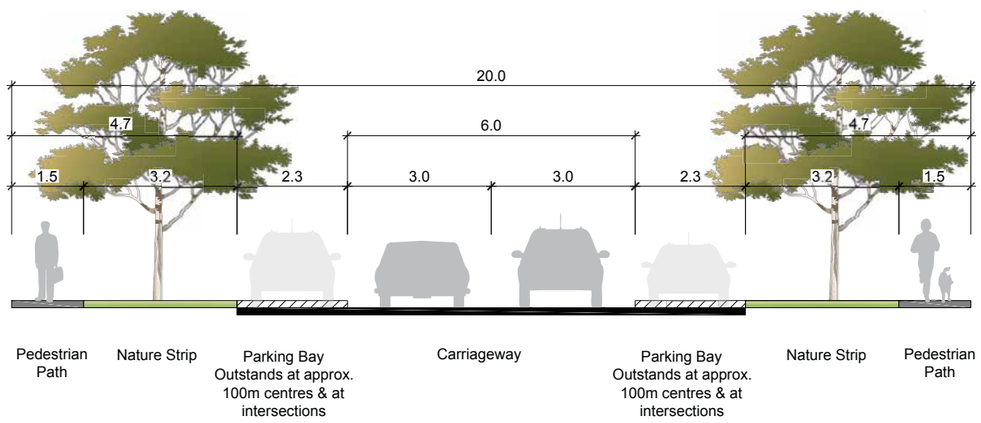
Cross-Section 13: Access Street Level 2 (21.5m)

Interface to Secondary School



Note: Drop off zones & pedestrian Crossing must be pavement only with trees in grates

Cross-Section 14: Access Street Level 2 (20m) (2000-3000 vpd)



SHOP FRONT	ROAD RESERVE 21m					SHOP FRONT
	4m	2.3m	4.2m	4.2m	2.3m	4m	
	Wide pedestrian strip, allowing for cafe furniture etc.	Indended parking with trees in outstands	Wider carriageway to facilitate safe sharing with bicycles		Indended parking with trees in outstands	Wide pedestrian strip, allowing for cafe furniture etc.	

** Key principles:*

- *Key crossing points are to be combined with tree outstands.*
- *Elsewhere, tree outstands are to be provided at approx every 3 car spaces (18m) and should be planted with deciduous canopy trees;*
- *Building awnings are to be free standing and provide shelter to at least 2m of the path width.*
- *Outdoor seating area's must not exceed more than 1.5m of path width.*

TRACT REF NO. CONSULTATION 309329

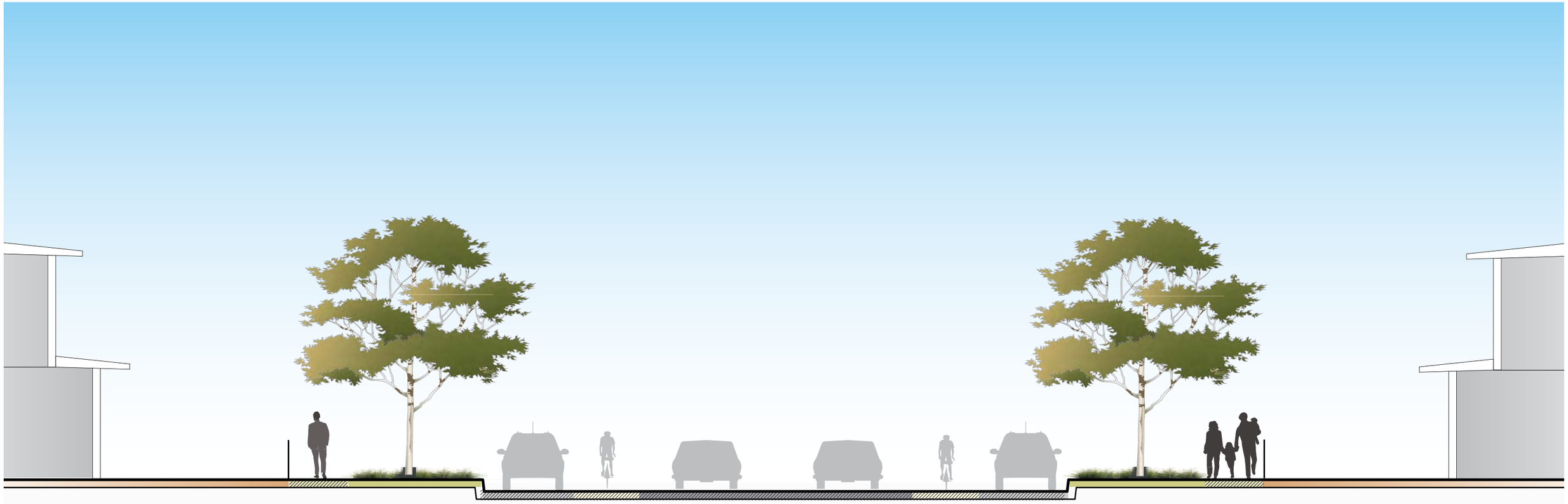
SCALE 1:100

0 1m 2m 5m

Cross Section 5

LTC Internal Road Reserve (21m)

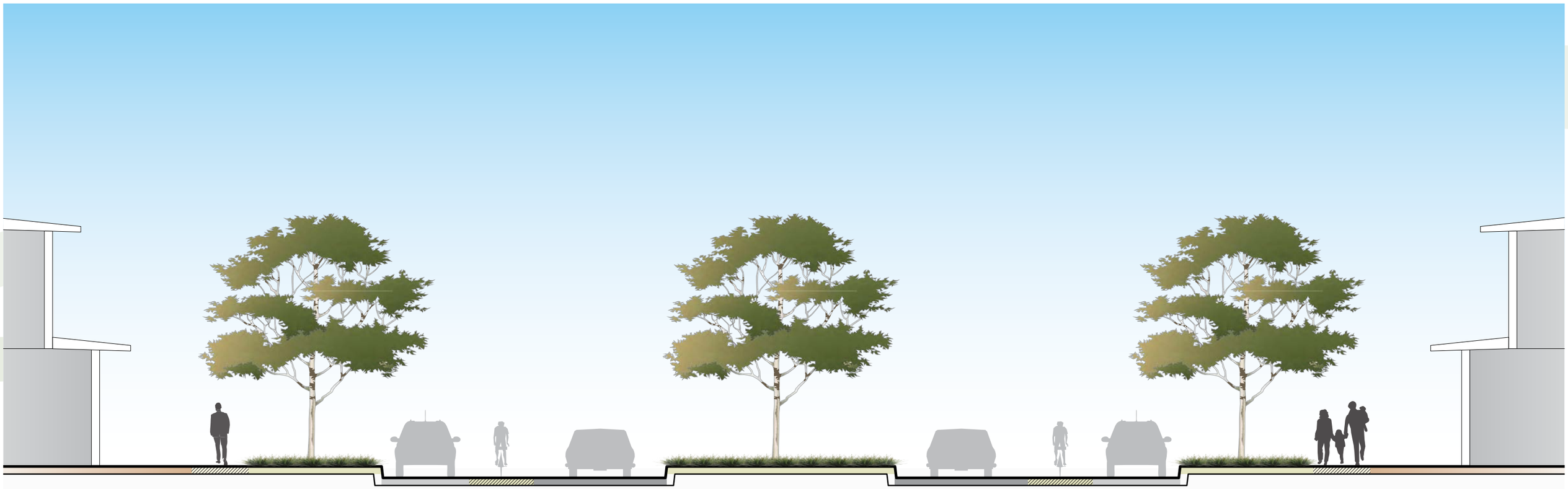
manor lakes precinct structure plan



PRIVATE REALM | ROAD RESERVE - 26m | PRIVATE REALM

1.5-2m	3.5-4m	2.3m	1.7m	3.5m	3.5m	1.7m	2.3m	3.5-4m	1.5-2m
Pedestrian path - up to 2m for key routes	Wider nature strip to enable larger canopy trees	Parking - with outstand at intersections	Bike	Carriageway and bike lanes accord with DOT requirements		Bike	Parking - with outstand at intersections	Wider nature strip to enable larger canopy trees	Pedestrian path - up to 2m for key routes

** Footpaths to be offset 50mm from property boundary.*



PUBLIC REALM	ROAD RESERVE 31m										PUBLIC REALM
	1.5m	3.5m	2.3m	1.7m	3.5m	6m	3.5m	1.7m	2.3m	3.5m	1.5m	
	Pedestrian Path	Nature Strip	Parking Bay	Bike Lane	Carriageway	Median	Carriageway	Bike Lane	Parking Bay	Nature Strip	Pedestrian Path	

TRACT REF NO. CONSULTATION 309329

SCALE 1:100

0 1m 2m 5m

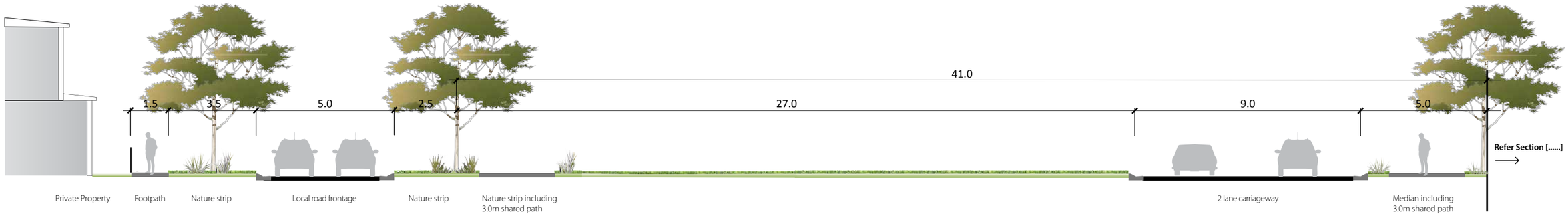
Cross Section 7

Boulevard Connector (31m)

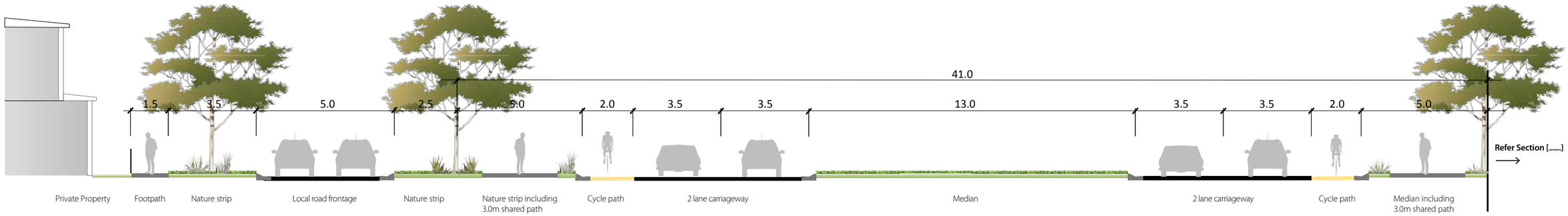
manor lakes precinct structure plan

Cross-Section 1: Primary Arterial Road 6 Lane (41m) (>40000 vpd)
Ison Road

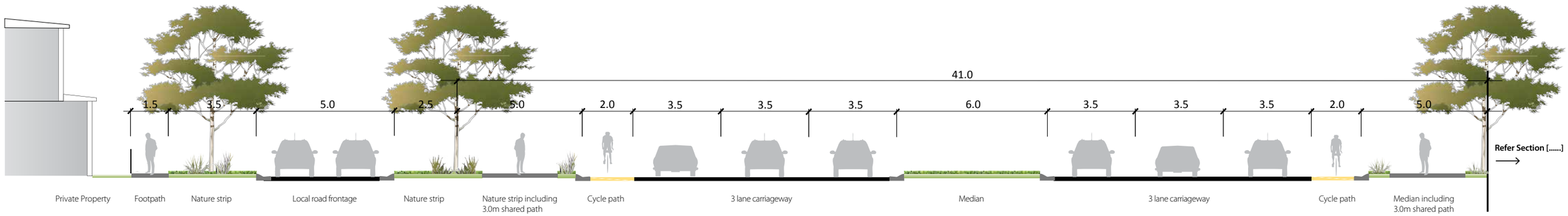
INTERIM DESIGN SOLUTION



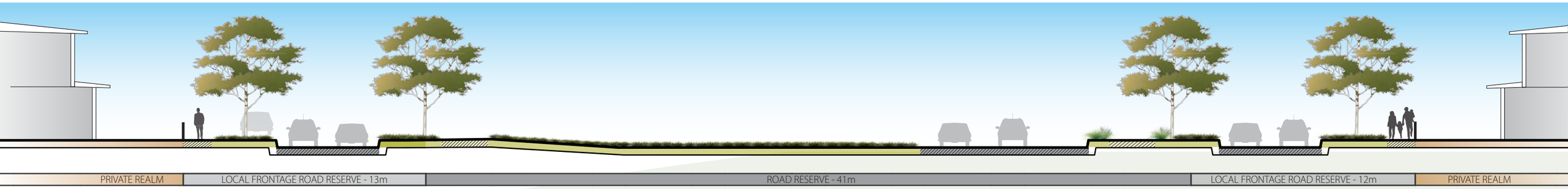
DUPLICATION DESIGN SOLUTION



ULTIMATE DESIGN SOLUTION

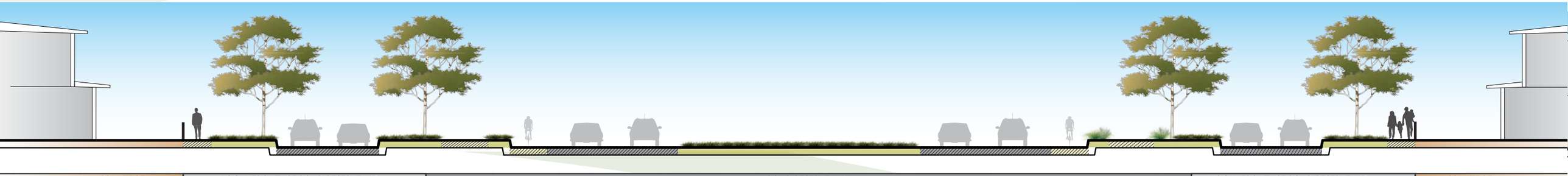


INTERIM DESIGN SOLUTION



PRIVATE REALM	LOCAL FRONTAGE ROAD RESERVE - 13m			ROAD RESERVE - 41m			LOCAL FRONTAGE ROAD RESERVE - 12m			PRIVATE REALM
1.5m	3.5m	5.5m	2.5m	26.5m	9m	5.5m	1.5m	5.5m	3.5m	1.5m
Pedestrian Path	Wider nature strip to enable larger canopy trees with intermittent off street car parking	Local road frontage	Nature Strip	Median Including 2.5m shared path	2 Lane carriageway	Median including 2.5m shared path	Nature Strip	Local road frontage	Wider nature strip to enable larger canopy trees	Pedestrian Path

DUPLICATION DESIGN SOLUTION



PRIVATE REALM	LOCAL FRONTAGE ROAD RESERVE - 13m			ROAD RESERVE - 41m							LOCAL FRONTAGE ROAD RESERVE - 12m			PRIVATE REALM
1.5m	3.5m	5.5m	2.5m	4.5m	2m	3.5m	3.5m	13m	3.5m	3.5m	2m	5.5m	1.5m	5.5m	3.5m	1.5m
Pedestrian Path	Wider nature strip to enable larger canopy trees (car parking removed)	Local road frontage	Nature Strip	Median Including 2.5m shared path	Bike	2 Lane carriageway		Median	2 Lane carriageway		Bike	Median including 2.5m shared path	Nature Strip	Local road frontage	Wider nature strip to enable larger canopy trees	Pedestrian Path

ULTIMATE DESIGN SOLUTION

PRIVATE REALM	LOCAL FRONTAGE ROAD RESERVE - 13m			ROAD RESERVE - 41m							LOCAL FRONTAGE ROAD RESERVE - 12m			PRIVATE REALM
1.5m	3.5m	5.5m	2.5m	4.5m	2m	3.5m	3.5m	3.5m	6m	3.5m	3.5m	3.5m	2m	5.5m	1.5m	5.5m	3.5m	1.5m
Pedestrian Path	Wider nature strip to enable larger canopy trees	Local road frontage	Nature Strip	Median Including 2.5m shared path	Bike	3 Lane carriageway			Median	3 Lane carriageway			Bike	Median including 2.5m shared path	Nature Strip	Local road frontage	Wider nature strip to enable larger canopy trees	Pedestrian Path

** Footpaths to be offset 50mm from property boundary.*
** Trees in the side median to be separated from arterial carriageway in accordance with clear zone requirements.*

TRACT REF NO. CONSULTATION 309329

SCALE 1:100

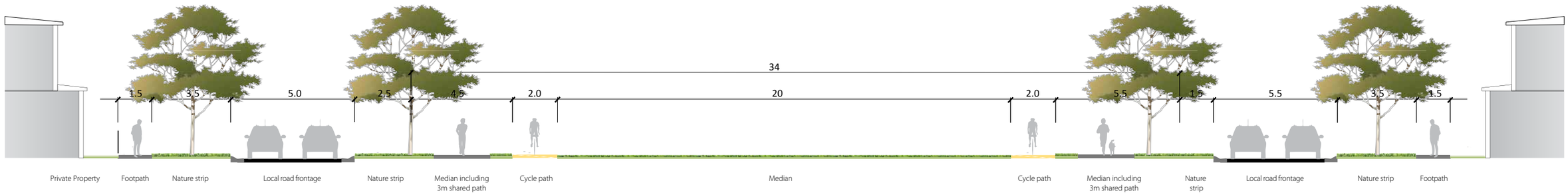
0 1m 2m 5m

Cross Section 10

Ison Road (Section: Lollypop Creek to Greens Road)

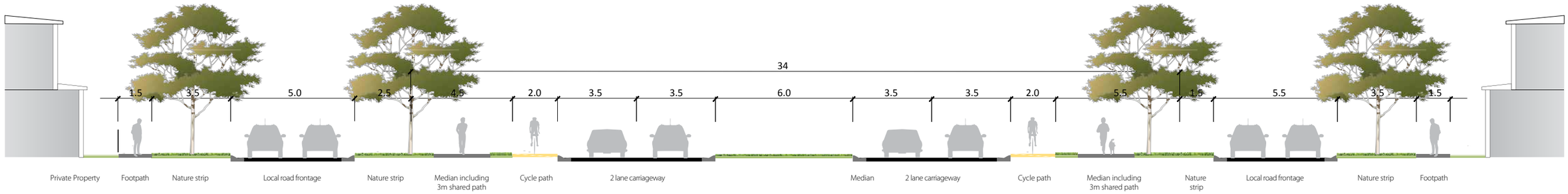
manor lakes precinct structure plan

Cross-Section 2: Secondary Arterial Road 4 Lane (34m)
Interim Design Solution



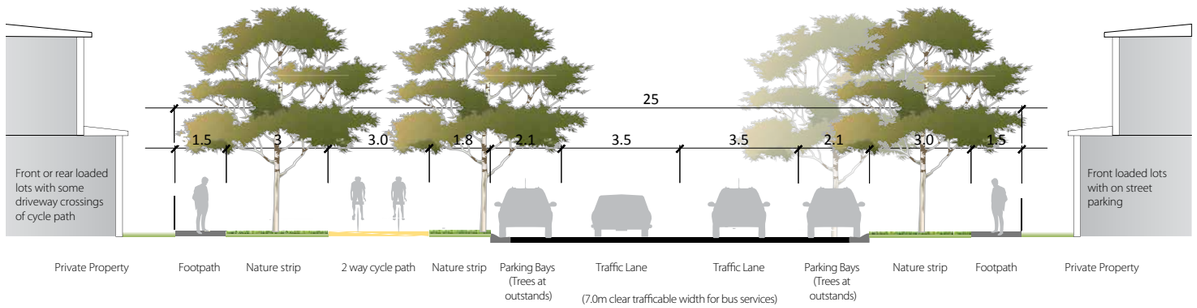
Service lanes to the satisfaction of Council

Cross-Section 3: Secondary Arterial Road 4 Lane (34m)
Ultimate Design Solution

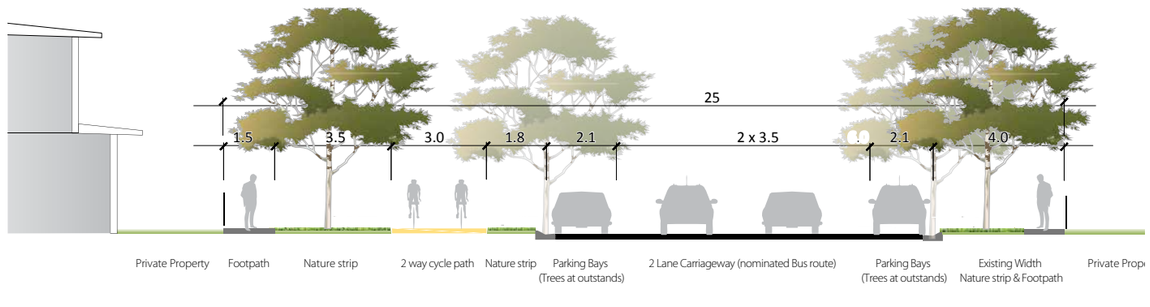


Service lanes to the satisfaction of Council

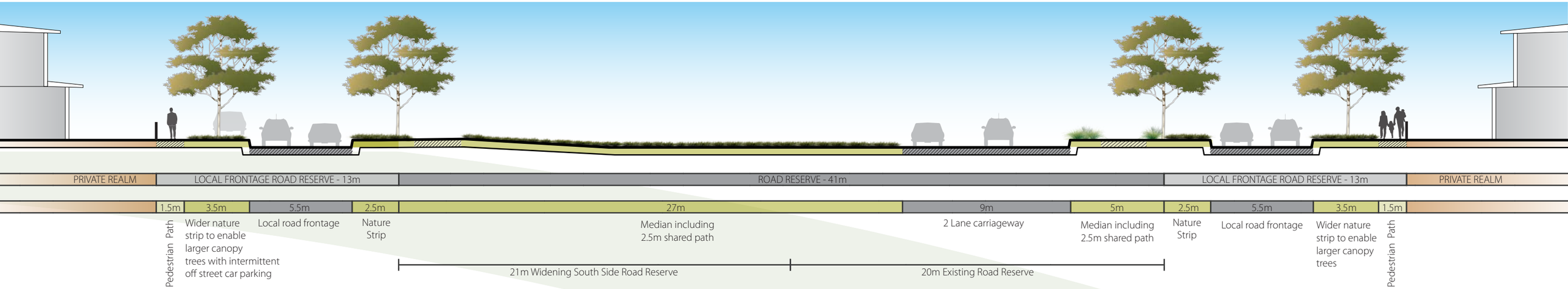
Cross-Section 4: Connector Street (25m)
Black Forest Road



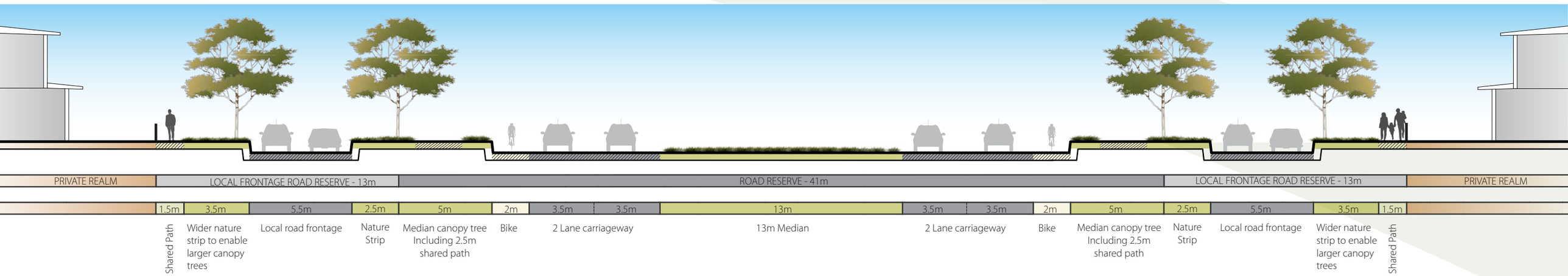
Cross-Section 5: Connector Street (25m)
From existing Black Forest Road to Haines Drive



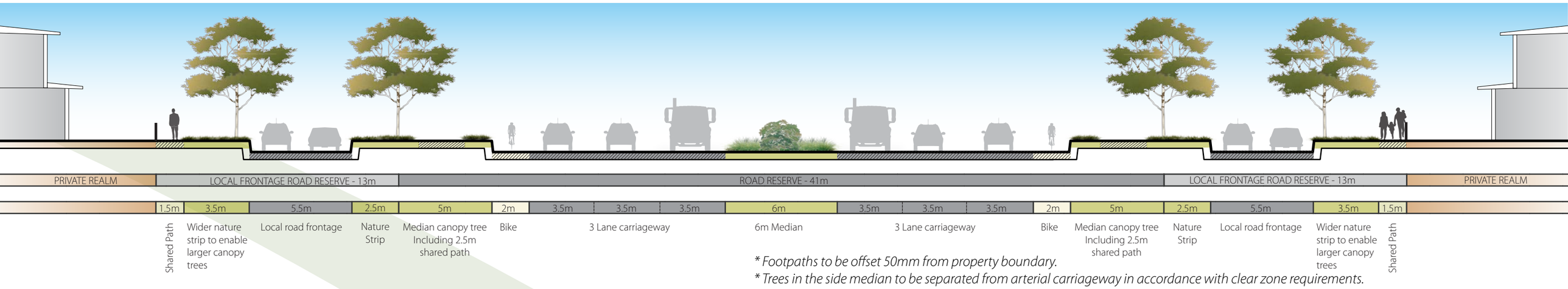
INTERIM DESIGN SOLUTION



DUPLICATION DESIGN SOLUTION



ULTIMATE DESIGN SOLUTION



** Footpaths to be offset 50mm from property boundary.*
** Trees in the side median to be separated from arterial carriageway in accordance with clear zone requirements.*

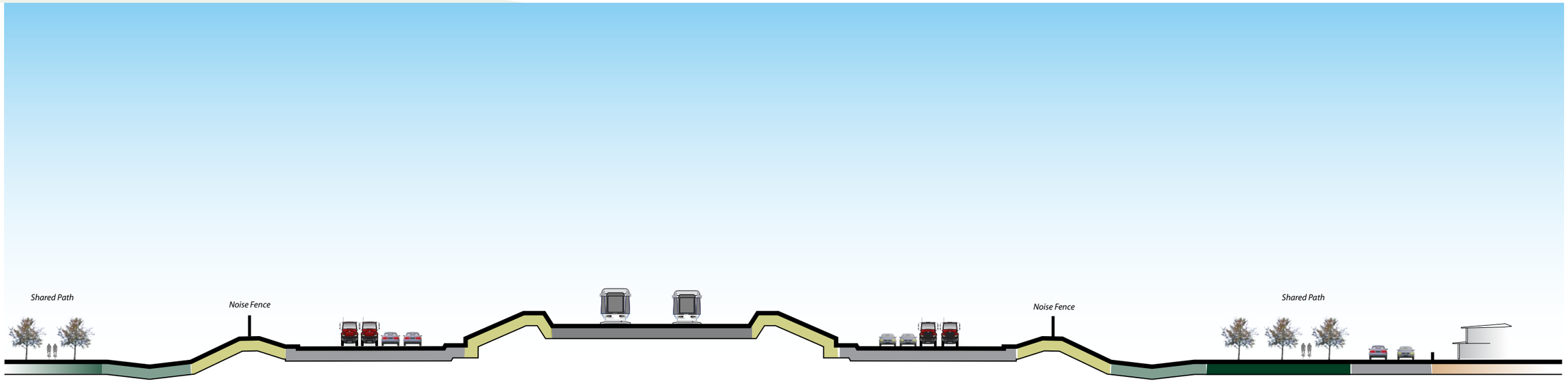
TRACT REF NO. CONSULTATION 309329

SCALE 1:100
0 1m 2m 5m

Cross Section 11

Greens Road Arterial (41m)

manor lakes precinct structure plan



OMR ROAD RESERVE NOMINAL 240M | MANOR LAKES PSP DEVELOPMENT

15m	15m	15m	29.5m						Provision for 32m							29.5				15m	15m	15m+	13m	
OPEN SPACE INCLUDING 3.5M SHARED PATH	SWALE	NOISE MOUND	3m Verge	3m Shoulder	3.5 Access Lane	CARRIAGEWAY *14m Traffic Lanes*	3m Shoulder	3m Verge	BATTER	2m Verge	4m Access Track	4.5m Track	Centre Line Railway Tracks	4.5m Track	4.5m Access Track	2m Verge	BATTER	3m Verge	3m Shoulder	CARRIAGEWAY *14m Traffic Lanes*	3.5 Access Lane	3m Shoulder	3m Verge	NOISE MOUND	SWALE	OPEN SPACE INCLUDING 3.5M SHARED PATH	ACCESS WAY *refer cross section 1 for local street*	PRIVATE REALM

** Footpaths to be offset 50mm from property boundary.*

TRACT REF NO. CONSULTATION 309329

SCALE 1:750

0 5 10 15 20 25 50m

Cross Section 13

Outer Metropolitan Ring Road with rail reserve (240m+)

manor lakes precinct structure plan

Annex 2: Westbrook Drive/ Connector Road Layout Plan

Cardno
Shaping the Future

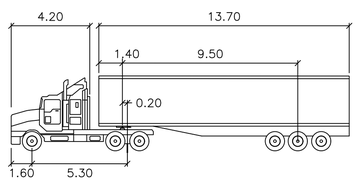
DALESTONE CONNECTOR

WESTBROOK DRIVE

75°20'46"

N

DESIGN VEHICLE



S ARTICULATED 19M meters

Tractor Width	: 2.50	Lock to Lock Time	: 6.0
Trailer Width	: 2.50	Steering Angle	: 27.7
Tractor Track	: 2.50	Articulating Angle	: 70.0
Trailer Track	: 2.50		

SKETCH CG111723SK01 P1 - CONCEPT LAYOUT
WESTBROOK DRIVE / DALESTONE CONNECTOR

SCALE - 1:500 @ A1 DATE - 08-05-12

DATE PLOTTED8/05/2012 3:45:40 PM

CAD FILE:Q:\DRATRAFF\2011\CG111723\Drawings\CG111723SK01.dgn

Cardno
Shaping the Future

DALESTONE CONNECTOR

WESTBROOK DRIVE

70°

70°

70°

70°

75°20'46"

N

SKETCH CG111723SK01 P2 - CONCEPT LAYOUT
WESTBROOK DRIVE / DALESTONE CONNECTOR

SCALE - 1:500 @ A1 DATE - 21-05-12

DATE PLOTTED31/05/2012 11:52:52 AM

CAD FILE:G:\DRATRAFF\2011\CG111723\Drawings\CG111723SK01.dgn