



**AGENDA APPENDIX**  
**Council Meeting**  
**Wednesday 25 May 2016**

AGENDA ITEM FOR SEPARATE DISTRIBUTION TO COUNCILLORS AND EXECUTIVE LEADERSHIP TEAM DUE TO DOCUMENT SIZE.

THE ITEM IS ACCESSIBLE VIA THE COUNCIL WEBSITE OR BY CONTACTING COUNCIL ON 03 5662 9200.

**E.4 KORUMBURRA TOWN CENTRE STREETScape MASTER PLAN - ADOPTION**

Appendix 2 – Korumburra Town Centre Streetscape Master Plan - Traffic Impact Assessment Report February 2016

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**Korumburra Town Centre  
Streetscape Master Plan**

Traffic Impact Assessment Report

Ratio Consultants in association with  
Hansen Partnership

February 2016

**traffic:study**

**ratio:**consultants pty ltd February 2016

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# 1 Glossary:

Term	Definition
Annual Average Daily Traffic (AADT)	The total volume of traffic passing a roadside observation point over the period of a calendar year, divided by the number of days in that year (365 or 366 days).
Approach Sight Distance (ASD)	The distance required for a driver or rider to perceive marking or hazards on the road surface approaching an intersection and to stop.
Auxiliary Lane	A portion of the carriageway adjoining the through traffic lanes, used for speed change or for other purposes supplementary to through traffic movement.
Capacity	The maximum sustainable flow rate at which vehicles or persons reasonably can be expected to traverse a point or uniform segment of a lane or roadway during a specified time period under given roadway, geometric, traffic, environmental, and control conditions; usually expressed as vehicles per hour, passenger cars per hour, or persons per hour.
Car Stopping Distance (CSD)	The distance required for a car driver to perceive a hazard, react and brake to a stop. For design purposes, wet weather conditions and locked wheel braking are assumed.
Carriageway	That portion of a road or bridge devoted particularly to the use of vehicles, inclusive of shoulders and auxiliary lanes.
Clear Zone	A clear zone is the area adjacent to the traffic lane that should be kept free from features that would be potentially hazardous to errant vehicles.
Commercial Vehicle (CV)	A motor vehicle constructed specifically to convey goods or passengers in the course of trade or business. It has at least one axle with dual wheels and/or more than two axles.
FCRT	Fully Controlled Right Turn in a traffic signal sequences.
Kerb	A raised border of rigid material formed at the edge of a carriageway, pavement or bridge.
Median	A strip of road, not normally intended for use by traffic, which separates carriageways for traffic in opposite directions. Usually formed by painted lines, kerbed and paved areas, grassed areas, etc.
Minimum Gap Sight Distance (MGSD)	The minimum sight distance based on the gap necessary to perform a particular movement.
Safe Intersection Sight Distance (SISD)	The distance required for a driver or rider on a major road to observe a vehicle entering from a side road, and to stop before colliding with it.
Saturation	The flow past a point on a carriageway which would be obtained if there was a continuous queue of vehicles waiting upstream of that point.
Shoulder	That portion of formed carriageway that is adjacent to the traffic lane and flush with the surface of the pavement.
SIDRA	Signalised (and Unsignalised) Intersection Design and Research Aid - computer software.
Tube Count	Traffic count with the use of pneumatic road tube counters laid across the roadway.
Turning Movement Count	A traffic count at an intersection during which all turning movements are recorded.

## 2 Introduction:

### 2.1 Purpose of the Study

Ratio Consultants in association with Hansen Partnership has been engaged by the South Gippsland Shire Council (SGSC) to prepare the Korumburra Town Centre Streetscape Master Plan.

This document represents the Traffic Impact Assessment Report (TIAR) for the study, and sets out the traffic engineering impacts of the Master Plan options, and a detailed assessment of the preferred option.

This report should be read in conjunction with:

- the Korumburra Town Centre Streetscape Master Plan, Issues Identification and Initial Concepts Report prepared by Hansen Partnership (August 2015);
- the Korumburra Town Centre Streetscape Master Plan Report (Draft, September 2015).

### 2.2 The Study Area

The study area is focused on Commercial Street through the town centre of Korumburra and comprises the length of Commercial Street, from King Street to the southern-most point of the 'dog-leg' intersection. The study area is shown in Figure 2.1 below:

Figure 2.1: Study Area



## **2.3 Reference Material**

### **Strategic Planning Documents**

- Korumburra Town Centre Framework Plan, Context Report (June 2013), Hansen Partnership for SGSC;
- Korumburra Town Centre Framework Plan, Framework Report (October 2013), Hansen Partnership with GTA Consultants and Tim Nott Economic Analysis and Strategy for SGSC;
- Korumburra Traffic and Drainage Study (Oct 2013), Hyder for SGSC.

### **Traffic/Transport Data**

- A series of MetroCount mid-block traffic and speed counts (in PDF format) for various locations throughout the study area. Data collected variously in 2007, 2013 and 2014;
- A series of turning movement count summaries (in Microsoft Excel format) for various intersections throughout the study area. Data collected in May 2013;
- VicRoads published (July 2014) traffic volumes for freeways and arterial roads in Victoria derived from surveys or estimates based on data collected in SCATs.

### **Industry Standards and Guidelines**

#### **Australian Standards**

- AS/NZS 2890.1:2004: Parking Facilities - Off-street Parking Facilities
- AS 2890.2:2002: Parking Facilities - Off-street Commercial Parking Facilities
- AS 2890.3:1993: Parking Facilities - Bicycle Parking Facilities
- AS 2890.5:1993: Parking Facilities - On-street Parking Facilities
- AS/NZS 2890.6:2009: Parking Facilities - Off-street parking for people with Disabilities

#### **Austroads**

- Austroads Design Vehicles and Turning Path Templates Guide, 2013
- Guide to Traffic Management series, 2009
- Guide to Road Design series, 2009
- Guide to Road Safety series, 2009

#### **Road Rules - Road Safety Road Rules 2009**

#### **VicRoads**

- Traffic Engineering Manual Vol 1: Traffic Management
- Traffic Engineering Manual Vol 2: Signs and Marking
- VicRoads Tree Planting Policy, February 2015
- VicRoads Guidelines for Providing Loading Zones and Other Short Term Drop Off/Pick Up Areas, Oct 2000

- VicRoads Taxi Rank Guidelines, Nov 2005
- VicRoads Crash Statistics Database

Victorian Planning Provisions - South Gippsland Planning Scheme

Disability Discrimination Act (1992)

Disability Standards for Accessible Public Transport (2002)

## 3 Existing Conditions:

### 3.1 Topography

The Korumburra township and surrounds is characterised by its undulating topography. Commercial Street through the township rises from the Melbourne approach to a highpoint at Bridge Street, which lies along one of the main ridgelines in the Township. Grades along Commercial Street reach a maximum of approximately 1:10.

### 3.2 Road Network

**Commercial Street (South Gippsland Highway)** is classified as an 'A' Route as per the VicRoads Country Street Directory of Victoria. It runs in a north-west to south-east alignment between its extension as Elizabeth Street to the north-west and its extension as Mine Road to the south-east. The alignment bends sharply at the intersection with Bridge Street, creating the Commercial Street 'dog-leg'.

Commercial Street has a posted speed limit of 50km/hr through the township.

Commercial Street has an approximate carriageway width of 22.0 metres between face of kerbs consisting of two lanes of traffic in each direction, parallel parking on each side, and a 4.3 metre wide raised central median, which is used for right turn and U-turn lanes into side-streets. Lane widths on Commercial Street vary between 3.1 metres to 3.4 metres.

A set of pedestrian operated signals (POSSs) are located midblock along Commercial Street between Radovick Street and Bridge Street. Additionally a Children's Crossing is located across Mine Road approximately 100 metres south-east of the dog-leg.

Trees line the central median of Commercial Street, with street lighting provided from either side of the street.

**Photo 3.1: Commercial Street looking up the hill to the south-east**



**Photo 3.2: Commercial Street Dog-leg**



**Radovick Street (Korumburra-Wonthaggi Road/Jumbunna Road)** is classified as a 'C' Route as per the VicRoads Country Street Directory of Victoria. It runs in a north-east to south-west direction between Commercial Street and its extension of Jumbunna Road. Radovick Street has a posted speed limit of 60km/hr.

Radovick Street has an approximate carriageway width of 21.7 metres between face of kerbs consisting of one lane of traffic in each direction and angled parking on each side.

**Bridge Street** runs in a north-east to south-west direction between its extension as Amiets Road and Shellcotts Road. Bridge Street has a posted speed limit of 60km/hr.

Bridge Street has an approximate carriageway width of 10.5 metres between face of kerbs and caters for one lane of traffic in each direction.

**Little Commercial Street** runs in a north-west to south-east direction between its extension as Sports Lane and Mine Road. A default speed limit of 50km/hr applies on Little Commercial Street.

Little Commercial Street has a minimum approximate carriageway width of 5.5 metres and gives access to parking facilities at the rear of shops fronting Commercial Street.

### **Intersection of Commercial Street and Radovick Street**

The intersection of Commercial Street and Radovick Street is an unsignalised T-intersection. Right turn movements into Radovick Street are facilitated by a 30 metre long right turning lane cut into the central median.

The Radovick Street approach is controlled by a "Stop" sign and comprises a single stand-up lane, sufficiently wide to accommodate a separate left turning and right turning vehicle.

**Photo 3.3: Commercial Street at Radovick Street, looking up the hill to the south-east**



### **Intersection of Commercial Street and Bridge Street**

Bridge Street intersects each end of the dog-legged section of Commercial Street. Both intersections are unsignalised with right turn movements into Bridge Street facilitated by right turning lanes cut into the central median. The Bridge Street approaches are each controlled by "Give Way" signs and comprise a single stand-up lane, sufficiently wide to accommodate a separate left turning and right turning vehicle.

### **Intersection of Bridge Street and Little Commercial Street**

Little Commercial Street meets Bridge Street at the southern section of the Bridge Street dog-leg. Entry to/from Little Commercial Street is via a 6.5 metre wide crossover. Only left-in/left-out movements are available at the intersection. Vehicles coming out of Little Commercial Street are controlled by a "Stop" sign.

### 3.3 Car Parking Conditions

Car parking provision in the town centre comprises a mix of on-street and off-street car parking. On-street, parallel car parking is provided on both sides of Commercial Street and angled parking (60 degree) is provided on both sides of Radovick Street.

Off-street, there is a large pool of at-grade car parking behind the Commercial Streets shops on the south-western side, with access via Little Commercial Street. On the north-eastern side of Commercial Street, a smaller off-street car park is located between Radovick Street and Bridge Street, which also provides access to off-street car parking around the railway station buildings. According to the 2013 Framework Plan (which covered a larger study area than the Streetscape Master Plan):

- *There are approximately 831 (not all are marked) car parking spaces in Korumburra Town Centre, with a mix of parking restrictions and types for a variety of users. The majority of car parking in the Town Centre is located on Commercial Street, behind the retail centre to the south-east on Little Commercial Street and around the station area.*
- *Access from the car park areas to the main shopping centre present some barriers to safe and convenient access for vulnerable users, such as the elderly, those with young children (walking toddlers or using prams/strollers), in wheelchairs or using mobility scooters. Elements that contribute to these access issues include undulating topography, lack of pedestrian infrastructure such as footpaths, kerb buildouts, steps and rails, lighting and controlled pedestrian crossings and other treatments such as good sightlines, pedestrian priority and wayfinding signage. As a result, connectivity from these areas to Commercial Street presents challenges for equitable and ready access to car parking areas and the Town Centre.*
- *Car parking surveys were undertaken of the study area by GTA Consultants on Friday 14 February 2013... there is ample parking capacity in the overall parking network to cater for peak demands.*
- *Notwithstanding this data, survey and forum feedback reveals that perceptions exist of a lack of parking and minor congestion due to circulating traffic in Commercial Street. It is anticipated that a range of issues contribute to the perceptions of inadequate parking supply within the Town Centre, such as:*
  - *A lack of good directional signage to car parking supply;*
  - *A large proportion of the parking supply (Little Commercial Street) being located 'out of sight' of the main Commercial Street thoroughfare and high levels of parking demand on Commercial Street;*
  - *Low vacancies and lack of parking turnover in high demand areas (i.e. Post Office area)*

### 3.4 Public Transport Services

The following public transport services operate in Korumburra:

- Yarram to Melbourne V/Line Coach Service, with the bus stop for buses towards Melbourne located outside the library to the south-east of King Street, and the closest bus stop towards Yarram located across the road further to the south-east. Buses operate approximately every two hours from 8:21am until 10:49pm Monday to Friday, and approximately every three hours from 8:00am until 7:39pm Saturday and Sunday.
- Korumburra Town Service - Carinya Lodge, with the bus stop located on South Railway Crescent, outside the IGA Supermarket. This bus service runs once a day.

### 3.5 Crash History

A review has been conducted of VicRoads 'CrashStats' database for the most recent five year period of available data from 1 January 2009 and 31 December 2013 for any reported casualty crashes within the study area.

The analysis revealed a total of 7 casualty crashes occurred within this area in the 5 year study period, detailed below:

- Two crashes occurred on Commercial Street (north-westbound), between Radovick Street and Bridge Street, consisting:
  - One 'Far side. Pedestrian hit by vehicle from the left' crash, resulting in an 'other' type injury.
  - One 'Pedestrian near side. Pedestrian hit by vehicle from the right' crash, resulting in an 'other' type injury.
- Two crashes occurred at the intersection of Radovick Street and Victoria Street:
  - One 'Right through' crash, resulting in one 'other' type injury.
  - One 'U turn' crash, resulting in one 'other' type injury.
- One 'Right far' crash occurred at the intersection of Commercial Street and Radovick Street, resulting in one 'serious' type injury.
- One 'Other accidents on curve' crash occurred on Commercial Street (north-westbound) between Bridge Street and Mine Road, resulting in one 'other' type injury.
- One 'Other adjacent' crash occurred at the intersection of Commercial Street and Wrenches Lane, resulting in an 'other' type injury.

From our review of the available crash history for the study area, it is concluded that there is no evident pattern to the recent crashes. Therefore no major safety related issues are identified for the precinct that requires a traffic engineering intervention.

### 3.6 Traffic Volumes

#### VicRoads Arterial Road Data

Arterial road traffic volume data collated by VicRoads is summarised in Table 3.1 for roads within the study area. VicRoads defines its arterial road traffic data as follows: *"the annual average daily traffic volume (AADT) is provided, including the number of commercial vehicles (CV), shown in brackets ( ). AADT is the sum of all traffic using the road for a year, divided by 365. CV includes all vehicles from towing (e.g. car + caravan) and small trucks (4.5 tonnes GVM) to the largest trucks (that*

is, Austroads vehicle class 2 and higher); it does not include single light vehicles such as cars and vans". The VicRoads data is not absolute and is intended as a guide. In any case it is considered suitable for the evaluation of broader traffic patterns in the study area.

**Table 3.1: VicRoads Arterial Road Traffic Volume Data**

Location	Direction	2003	2010	2011	2012	2013
Commercial Street, between Elizabeth Street and Radovick Street	South-Eastbound	4,700* (400*)	5,000 (560)	5,200* (590*)	5,100 (520)	5,200* (550*)
	North-Westbound	4,400* (430*)	5,200 (530)	5,400* (560*)	5,700 (540)	5,800* (570*)
Radovick Street, between South Gippsland Highway and Guys Road	Eastbound	1,400** (100**)	1,500** (120**)	1,600** (130**)	1,900** (130**)	1,200** (80**)
	Westbound	1,400** (110**)	1,500** (110**)	1,600** (120**)	2,000** (120**)	1,300** (120**)

Source: [vicroads.vic.gov.au](http://vicroads.vic.gov.au)

\* indicates that growth factor has been applied to traffic count.  
 \*\*indicates that volumes from surrounding roads have been used to estimate the traffic volume.  
 (xxx) the number of commercial vehicles.

In addition, SGSC has provided traffic data sourced from VicRoads for along the Radovick Street/Jumbunna Road route beyond the immediate township precinct. This data is summarised below, and represents actual counts, without any growth factor estimates as per the above-tabled arterial road collated data.

**Table 3.2: VicRoads Traffic Counts**

Location	Direction	2007		2009	
		7-Day Average (veh/day)	%Commercial Vehicles	7-Day Average (veh/day)	%Commercial Vehicles
Jumbunna Rd NE BD btw Sommers Cres & Commercial St	NE BD	1212	9	1327	9
Jumbunna Rd SW BD btw Commercial St & Sommers Cres	SW BD	1221	10	1335	9

Both of the VicRoads data sets have been reviewed to establish its suitability for providing base line traffic data in the study area. It has been found that:

- traffic has grown along Commercial Street in the 10-year period 2003-2013 at an average rate of 2% per annum, which appears consistent with typical traffic growth along similar regional routes;
- The Radovick Street data within the township precinct for the duration of the count period (2003-2013) relies upon traffic estimates, and therefore needs to be cross-checked against alternative data sources to establish its validity. Specifically, the 2013

counts are significantly lower than the 2012 counts, and will be treated as outliers from this point forward. Between 2003 and 2012, two-way traffic along Radovick is estimated to have grown at an average rate of 4% per annum.

- The Jumbunna Road data beyond the township precinct in 2007 and 2009 indicates that traffic growth along the route is in the order of 5% per annum.

It is concluded that the VicRoads data provides some valuable historic context to traffic volumes in the study area, and will therefore be used to establish average annual average traffic growth levels for design purposes.

### Automatic Tube Count Data

SGSC has provided automatic tube count data collected at key locations in the study area. The relevant traffic data is summarised below.

**Table 3.3: Automatic Tube Count Data**

Location	Direction	Date	7-Day Average (veh/day)	7-Day % HV	Weekday Average (veh/day)	Weekday % HV
Commercial Street, between Radovick Street and King Street	South-Eastbound	Mon 12 - Sun 18 November 2007	4219	13	4432	14
	North-Westbound		4629	17	4734	18
Radovick Street, between Commercial Street and Guys Road	South-Westbound	Mon 8 - Sun 14 April 2013	2489	8	2699	9
	North-Eastbound		2077	8	2206	8

Analysis of the tube count data shows that:

- Average 7-day daily traffic along Commercial Street in 2007 was approximately  $4219+4629=8848$  vehicles per day, including 1319 commercial vehicles (13%).
- Average 7-day daily traffic along Radovick Street in 2013 was approximately  $2489+2077=4566$  vehicles per day, including 364 commercial vehicles (8%).

The tube count data in combination with the historic VicRoads data can be used to provide estimates of annual average traffic growth through Korumburra.

Collating the two data sets, the traffic growth estimates that will be adopted as the primary baseline data for Commercial Street and Radovick Street are:

Baseline Average Annual Traffic Growth Estimates:

- Commercial Street           4% per annum
- Radovick Street             6% per annum

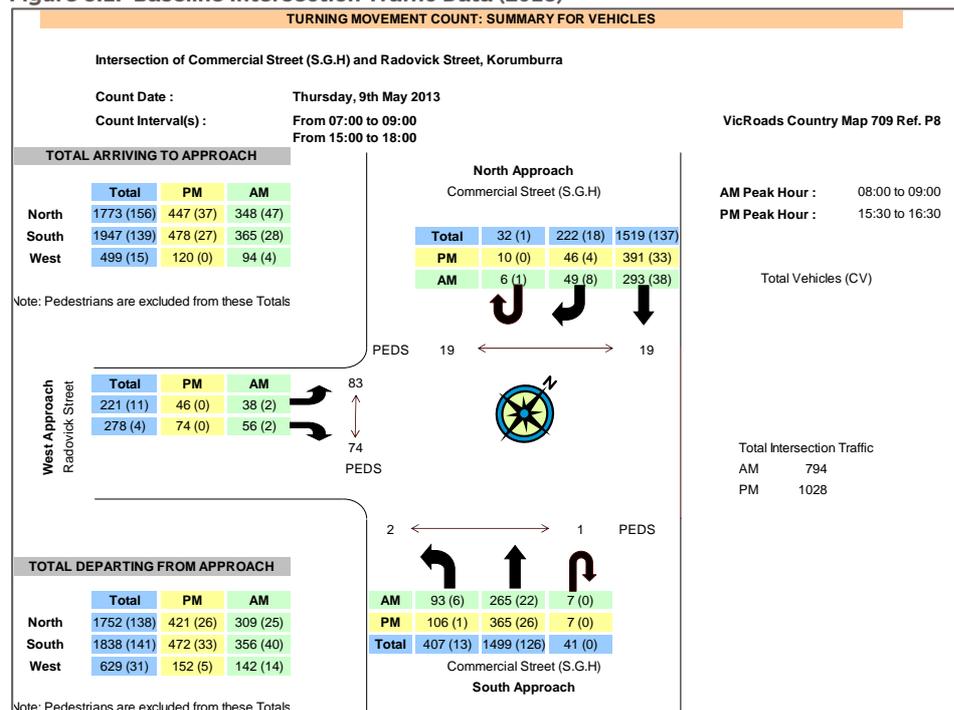
### 3.7 Intersection Counts

The SGSC has provided summaries from its database of turning movement counts and pedestrian counts for the intersection of

Commercial Street and Radovick Street. The data is summarised in the diagram below.

Due to its relative currency (collected 2013), and having cross-checked it against the available data sources, the intersection turning traffic volumes will be adopted as the primary baseline data for the evaluation of the streetscape master plan, and more specifically the performance assessment of the Commercial Street/Radovick Street intersection.

**Figure 3.1: Baseline Intersection Traffic Data (2013)**



South Gippsland Shire Council (SGSC)

### 3.8 Traffic Speeds

SGSC has provided automatic tube count data collected at key locations in the study area. The relevant traffic speed data is summarised below.

**Table 3.4: Vehicle Speed Data**

Location (Direction)	Date	Speed Limit km/h	85th %ile Speed Range km/h
Commercial Street, between Radovick Street and King Street	South-Eastbound	50	50-60
	North-Westbound	50	50-60
Radovick Street, between Commercial Street and Guys Road	South-Westbound	60	40-50
	North-Eastbound	60	50-60

Based on the available speed data as shown above, the adopted design speeds for the project are:

- Commercial Street 60 km/h
- Radovick Street 60 km/h



### **3.9 Capacity of Arterial Roads**

#### **Mid-Block Assessment**

In terms of daily flow, the uninterrupted two-way capacity of a rural highway is in the order of 2,000 vehicles per hour per lane. On this basis, a four-lane rural highway would have a theoretical capacity of 8,000 vehicles per hour. A two-lane highway would be 4,000 vehicles per hour.

The intersection count data collected at Commercial Street / Radovick Street shows that maximum peak hour traffic (PM) is in the order of 600-800 vehicles per hour across the existing four lanes, which is well below the mid-block capacity limit.

#### **Intersection Capacity**

In addition to the capacity considerations represented by mid-block traffic, the capacity and traffic engineering performance of a roadway is best measured at its intersections with other roads.

As a basic measure, an unsignalised intersection has reached saturation when the total volume of traffic (all through and turning traffic) in any peak hour exceeds 1,500 vehicles. The traffic data for Commercial Street at Radovick Street shows that total intersection PM peak hour traffic is approximately 1,028 vehicles per hour, which is within the aforementioned capacity limit.

To more comprehensively test the current performance of the study area's key unsignalised intersections, the SIDRA Intersection modelling program has been utilised. Refer to Section 7.4 for more details.

# 4 Traffic Forecasts:

## 4.1 Traffic Volume Forecasts

The Consultants have explored various sources of information to establish the expected future levels of traffic through the Korumburra township.

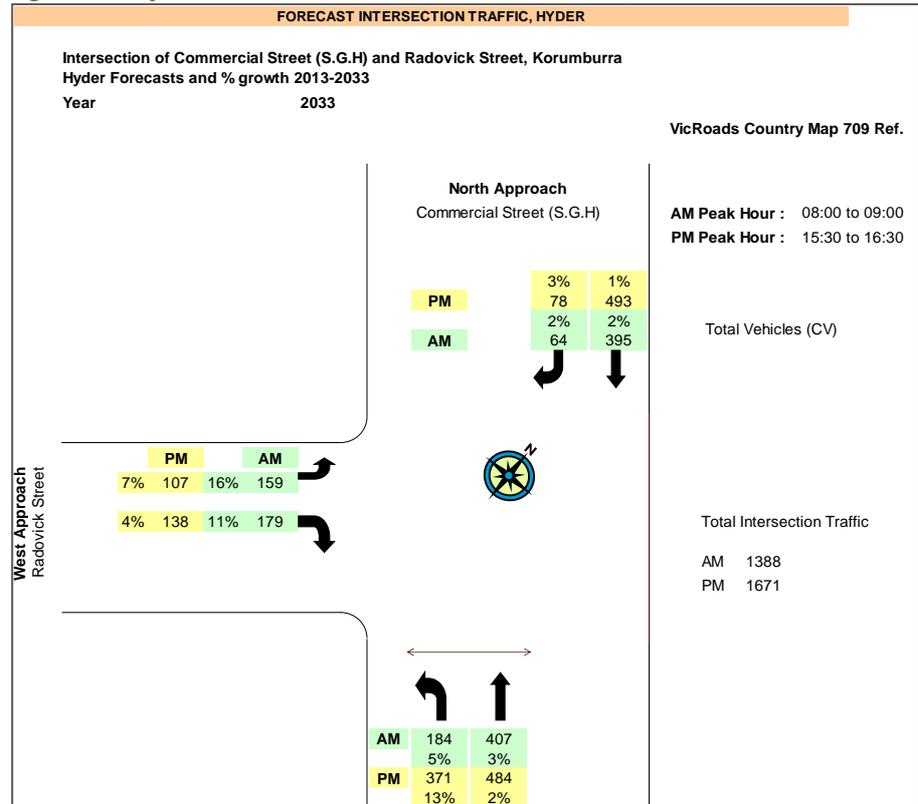
### Structure Plan Forecasts

The Korumburra Structure Plan sets out the land use changes and population forecasts for the precinct to the year 2033. It was the foundation document for the Hyder study, (see reference material, 2.3) which outlines the projected traffic growth in the study area resulting (mainly) from projected residential development in Korumburra.

In summary, the Structure Plan projected that up to 1,122 new residential lots would be developed within 13 sub-precincts in and around Korumburra by the year 2033.

From the Hyder traffic analyses, the location of most interest to this study is the Commercial Street/Radovick Street intersection. The Hyder intersection traffic growth forecasts for the year 2033 are presented in Figure 4.2, along with the resulting percentage change in traffic over the period 2013 to 2033<sup>1</sup>.

**Figure 4.1: Hyder Traffic Forecasts at Commercial Street /Radovick Street**



The Hyder traffic forecasts above show that based on the Structure Plan forecasts:

<sup>1</sup> Compared to the 2013 baseline data as shown in Figure 3.1.

- Maximum total forecast intersection traffic (PM Peak) will be 1,671 vehicles per hour;
- 'through-traffic' growth along Commercial Street ranging from 1-3% per annum;
- Turning traffic growth between Commercial Street and Radovick Street ranging from 2-16% per annum.

These traffic forecasts have been reviewed to ensure that they continue to represent likely traffic growth in Korumburra, based on current information.

At the request of the Consultants, SGSC officers have re-visited the Structure Plan estimates of residential growth, and its implications for traffic growth, and their current appraisal of the situation is:

- Full residential lot development at 2033, as largely assumed by the Hyder forecast, is very much at the upper end of expectations based on past development trends and the current level of land demand.

On this basis, the Structure Plan derived traffic forecasts have been tested using other available traffic data, as set out below.

#### **Traffic Data-Based Forecasts**

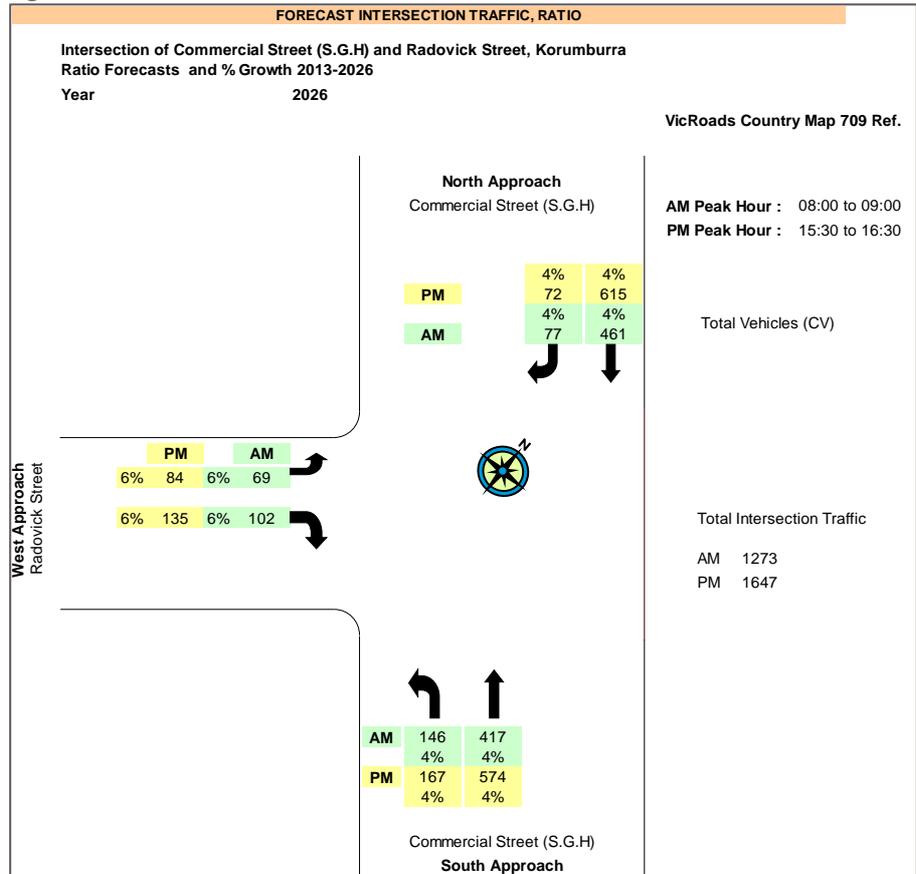
The suitability of the aforementioned Hyder forecasts for adoption as the design traffic volumes for the study has been tested using a first-principles approach using the available traffic data (refer Section 3.6).

Applying the adopted baseline traffic growth estimates for Commercial Street (4%) and Radovick Street (6%), as set out in Section 3.6 to the baseline intersection counts results in forecast intersection traffic as shown in Figure 4.2.

In comparison to the above-mentioned Structure Plan forecasts, the data-based forecasting shows:

- Maximum total forecast intersection traffic (PM Peak) to be 1,647 vehicles per hour, which is comparable to the Hyder intersection forecasts;
- More modest projected growth for turning traffic into/out of Radovick Street, counterbalanced by higher growth forecasts (in-line with historic growth data) for the through-traffic along Commercial Street.

**Figure 4.2: Ratio Traffic Forecasts at Commercial Street / Radovick Street**



**Adopted Design Traffic Forecasts**

We conclude from the our analysis of the two methods set out above that the first-principles traffic forecasts provided a more feasible representation of future traffic in Korumburra, and more specifically at the intersection of Commercial Street / Radovick Street.

The adopted intersection traffic volumes adopted for design purposes are those shown in Figure 4.2.

It is noted that future pedestrian volumes for the intersection have not been forecast. The intersection analysis (refer Section 7.4) of Commercial Street / Radovick Street will be based on fixed time traffic signals, which will allocate pedestrian green times on each leg to match the optimum intersection phase times.

## 5 Consultation:

### **Consultation with Authorities**

The consultations undertaken with authorities relevant to the Korumburra project are summarised below.

#### **South Gippsland Shire Council**

Ratio Consultants and Hansen Partnership attended a meeting with Officers from South Gippsland Shire Council on 15 June, 2015. The outcomes of the meeting formed the basis of the development of the Streetscape Design.

Specifically, the following are the key outcomes that relate to the traffic discipline:

- It was advised at the meeting that drivers are generally compliant with the speed limit through the town.
- At the 'dog-leg' intersection council advised that pedestrian safety is an issue, sight distance is poor and number of near misses.
- Intention for 50km/h speed limit on Commercial Street to be retained.
- Safety issues with merging and diverging on certain parts of Commercial Street.
- VicRoads will be conducting the functional layout plan of the design.
- VicRoads is currently undertaking a sign rationalisation project through the town to reduce the amount of sign clutter.

Further to the SGSC meeting, further instructions were issued to the Consultants, namely:

- Seek to minimise impact on kerb alignments
- Seek to minimise impact on central median
- Investigate into 30 degree angle parking as an alternative to 45 degree angle parking (is it appropriate for Commercial Street and are there other disadvantages besides less number of spaces)

#### **VicRoads**

Ratio Consultants attended a meeting with officers from South Gippsland Shire Council, Hansen Partnership and VicRoads on 8 September, 2015 to seek preliminary input to the project from VicRoads.

Further to the VicRoads meeting, requests for further information and general comments were issued to the Consultants, namely:

- As part of the project's community consultation VicRoads would like to see two options proposed:
  - The preferred Korumburra Streetscape Master Plan with angled parking on the northern side and parallel parking on the southern side of Commercial Street (South Gippsland Highway); and
  - Parallel parking on both sides of Commercial Street (South Gippsland Highway).
- Consultants to review sight distance and roads safety issues with regards to trees and how they are planted with the road reserve (VicRoads Tree Planting policy);

- The design to avoid U-turn movements where possible;
- Consultants to review the length of the left turn lane on the south-eastern approach to the proposed Commercial Street / Radovick Street traffic signals.

# 6 Design Standards:

## 6.1 Road Design Standards

The road design standards adopted for the project are set out in Table 6.1, with more detailed discussions of various key elements following.

**Table 6.1: Road Design Standards Adopted for the Project**

Commercial Street	
carriageway lane widths	3.5m
auxiliary lane widths	3.5m
median	Nominally 4.0m (varies)
Design Speed / Posted Speed	
Commercial Street	50km/h / 50km/h
Radovick Street	60km/h / 60km/h
Design Vehicles	
Commercial Street	Refer Section 6.2 of this document
Radovick Street	Refer Section 6.2 of this document
Bridge Street	Refer Section 6.2 of this document
Intersections	
selection of intersection type	Checked against Austroads Part 6
left turn lanes	To accommodate Back of Queue in accordance with Austroads Part 4A
right turn lanes	To accommodate Back of Queue in accordance with Austroads Part 4A
Prohibited parking offset from intersection	10m
Sight Distance	
SISD	Checked against Austroads Part 4A
ASD	Checked against Austroads Part 4A
MGSD	Checked against Austroads Part 4A
CSD	Checked against Austroads Part 4A
Clear zone	
lateral distance to trees along Commercial Street	Minimum 1m in accordance with VicRoads Tree Planting Policy February 2015 for a 50km/h speed zone
intersections	Minimum 10m beyond intersections on the approach and departure sides in accordance with VicRoads Tree Planting Policy February 2015
Parking	
Parallel Parking	Parallel parking spaces to be at least 2.3 metres wide as per AS/NZS 2890.5.
Angled Parking	Parking spaces to be in accordance with AS/NZS 2890.5

## 6.2 Design and Checking Vehicles

Turning paths of design vehicles form the basis of the turning widths required at intersections. The design vehicles are hypothetical vehicles

whose dimensions and operating characteristics are used to establish lane widths and road geometry intersection layouts.

However, the design vehicle for a particular case is not necessarily the largest of the vehicles that may operate in that location. The design vehicle is intended to represent the majority of the vehicles allowed to operate in that location. A larger vehicle (i.e. the checking vehicle) may not be precluded from using the road or turn at an intersection, but may need to operate with reduced clearances or encroach into adjacent lanes. While this may inconvenience some road users, the low frequency of such occurrences makes this acceptable.

Table 4.2 of Austroads Design Vehicles and Turning Path Templates, 2013 (shown below) is the key reference for selecting the appropriate design and checking vehicles as well as the recommended radii.

**Figure 6.1: Excerpt from AustRoads**

Intersecting road types	Design	Checking
Arterial/Arterial	Prime mover and semi-trailer (19 m) <sup>(1)</sup> Radius 15 m	Appropriate vehicle e.g. B-double (25 m) <sup>(2)</sup> or Prime mover and long semi-trailer (25 m) or Road train <sup>(3)</sup>
Arterial/Collector	Single unit truck/bus (12.5 m) Radius 12.5 m	Prime mover and semi-trailer (19 m) Radius 15 m
Arterial/Local (residential)	Service vehicle (8.8 m) Radius 12.5 m	Single unit truck/bus (12.5 m) Radius 12.5 m
Collector/Collector (industrial)	Prime mover and semi-trailer (19 m) <sup>(1)</sup> Radius 15 m	Prime mover and semi-trailer (19 m) <sup>(1)</sup> Radius 15 m
Collector/Collector (residential)	Single unit truck/bus (12.5 m) Radius 12.5 m	Prime mover and semi-trailer (19 m) <sup>(1)</sup> Radius 15 m
Collector/Local (residential)	Service vehicle (8.8 m) Radius 9 m	Single unit truck/bus (12.5 m) Radius 12.5 m
Local/Local (industrial) <sup>(4)</sup>	Prime mover and semi-trailer (19 m) <sup>(1)</sup> Radius 12.5 m <sup>(5)</sup>	Appropriate vehicle e.g. B-double (25 m) <sup>(2)</sup> or Prime mover and long semi-trailer (25 m) or Road train <sup>(3)</sup>
Local/Local (residential)	Service vehicle (8.8 m) Radius 9 m	Single unit truck/bus (12.5 m) Radius 12.5 m

<sup>1</sup> Select the appropriate vehicle for the design of sites that are frequently used by such vehicles.  
<sup>2</sup> B-double length may vary between jurisdictions.  
<sup>3</sup> Select appropriate road train from the *Guide to Road Design – Part 3: Geometric Design* (Austroads 2010b) or from relevant jurisdiction guide.  
<sup>4</sup> Also for intersections with industrial land use for collector/local intersections.  
<sup>5</sup> Simulations show that for this radius the maximum steering angle occurs at the exit of the turn and not applied at the crawl speed.

Source: Austroads (2009).

Based on the Consultants' evaluation of traffic composition through the study area, the above-listed Austroads guide and referencing the Australian / New Zealand Standard series in the evaluation of car parking spaces, the design and checking vehicles adopted for this study are:

- Intersection of Radovick Street/Commercial Street designed for B-doubles.
- Intersection of Commercial Street / Bridge Street and Commercial Street / King Street designed for 19m semis and checked with B-doubles.
- U-turning and access to Council car parks - tested with the B99 vehicle. The B99 is the 99.8th percentile car that has standard dimensions of 5200 x 1940mm (2890.1:2004).
- Assessment of car parking space manoeuvres - tested with the B85. The B85 is the 85th percentile car that has standard dimensions of 4910 x 1870mm (AS/NZS 2890.1:2004).

In accordance with Australian Standards, the larger B99 vehicle has been used to assess access driveways, ramps and circulation roadways.

As above, in accordance with Australian Standards, the B85 vehicle has been used to assess manoeuvring in and out of individual parking spaces.

## **Cross Section**

### Lane Widths

Lane widths of 3.5 metres have been recommended as the preferred lane width as specified within Table 4.3 of the Austroads Guide to Road Design - Part 3.

### Median Widths

The minimum refuge width is 2.0 metres under Figure 8.1 of Clause 8.2.2 of the Austroads Guide to Road Design - Part 4. However, a 4.0 metre width is recommended to provide additional refuge for pedestrians due to the volume of heavy vehicles passing through the area. It is noted that a refuge of less than 4 metre width is proposed on the Bridge leg dogleg due to the limited available space for pedestrians to safely cross at that location.

### Buffer Lane

Where parallel parking is proposed to be retained, it is recommended that a 2.0 metre wide buffer zone be provided to enable cars to reverse park into the parallel bays without impacting on through traffic.

Additionally, a buffer width of 1.5 metres is recommended for sections with angled parking to ensure that a minimum distance of 5.0 metres is maintained between the kerb in the median and the parked vehicles as per Table 4.3 of the Austroads Guide to Road Design - Part 3.

### Car Parking Dimensions

In the steeper section of Commercial Street south-east of Radovick Street, on the north-westbound carriageway, where parallel parking is proposed to be retained, the parallel parking spaces will need to be at least 2.3 metres wide as per AS/NZS 2890.5.

Where angled car parking is proposed, the dimensions to be provided are set out in AS/NZS2890.5.

## **6.3 On-street Car Parking**

Options for on-street car parking along Commercial Street include:

- Parallel bays
- 45 degree angle bays
- 30 degree angle bays

Angled car parking has the (general) benefit of providing more car parking per unit length than parallel car parking, although the lower the angle, the lower the yield of car parking (so 30 degree car parking has the lowest yield). The parking manoeuvre is considered easier for angled

than for parallel, and therefore becomes more attractive for passing visitors to stop and park.

However, angled parking potentially presents a greater hazard to road users than parallel parking as angled parking requires reversing into the adjoining traffic lane. Additionally, there may be sight/visibility issues and increased conflict with pedestrians crossing midblock.

Parking should be designed so as not to interfere with turning traffic or sight distance at intersections. To ensure that the flow of turning traffic is not impaired, parking within 10 metres of the approach and the departure sides of an intersection has been adopted.

Some locations along Commercial Street where angled parking may be viable include:

- North-east side of Commercial Street between King Street and the 'Dog-Leg', which has an ascending slope, especially south-east of Radovick Street.
- South-west side of Commercial Street, Between Radovick Street and King Street, which is relatively flat.

Angled parking has been successfully implemented in nearby rural townships including:

- 45 degree angled parking has been implemented throughout the township of Yarram along the South Gippsland Highway. A wide buffer zone (around 2.0-2.5 metres wide) has been created to separate the traffic land and the parking bays. Chevron line marking has been used to delineate the buffer lane from the traffic lane.
- 30 degree angled parking has been implemented along the Princess Highway West in Colac. A narrow buffer of approximately 1.0 metre between the parking and traffic lanes has been provided. This arrangement is very similar to that proposed in the Korumburra masterplan.

### **Accessible Car Parking**

In Australia, the Building Code of Australia prescribes the minimum number of car parking spaces that should be reserved for persons with a disability as a proportion of the total number of spaces provided, with the proportion changing for different classes of adjoining building. For a mixed use precinct such as the Korumburra town centre, we would recommend the general provision rate of 1-2% of parking spaces within a commercial precinct. These spaces can be provided in either 90 degree format (within the off-street car parking areas) or in parallel format (on-street).

In the case of parallel car parking for people with a disability, AS2890.6:2009 requires:

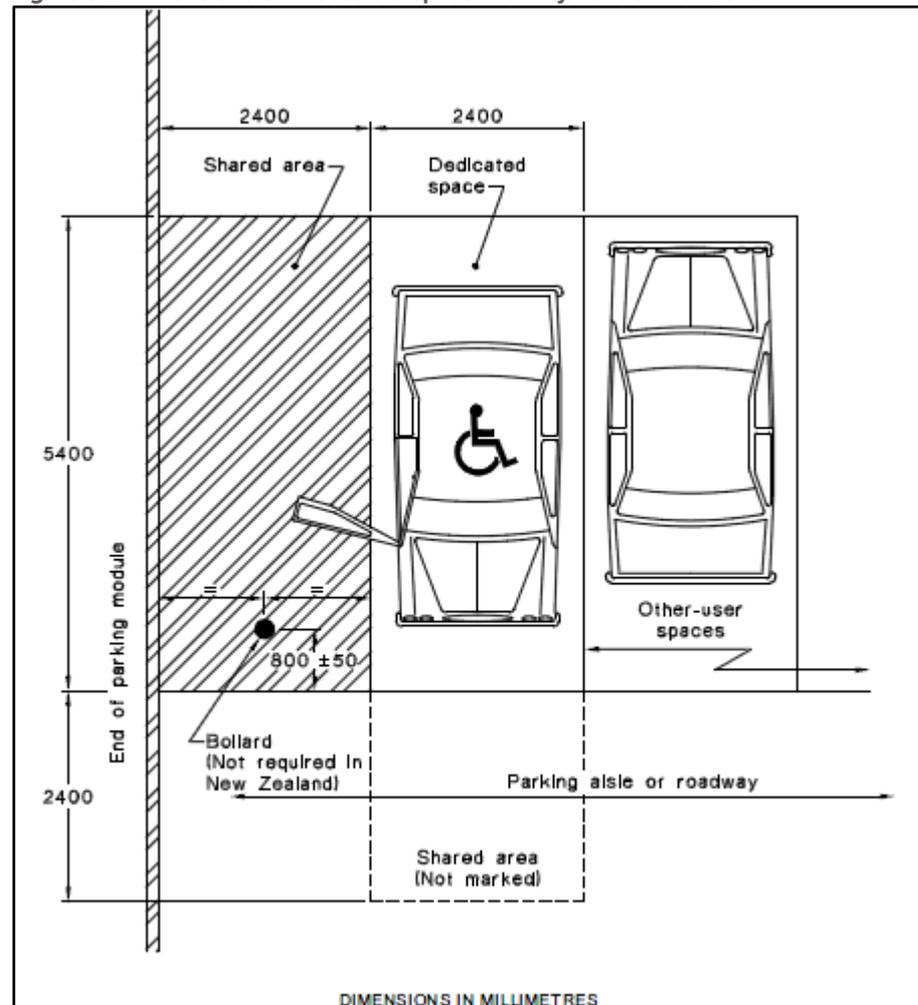
- a dedicated parking space that is at least 3200mm wide by 7800mm long; plus
- a shared area adjacent to the non-trafficked side of the dedicated parking space that is at least 1600mm wide by 7800mm long.

These spatial requirements exceed those that were previously accepted for the provision of parallel accessible parking bays in Victoria. In particular, the provision of a 3200mm wide accessible bay within a row of 2100-2300mm wide regular parallel parking bays requires setting back of the adjoining footpath.

Due to the extended spatial requirements of parallel on-street accessible bays, we recommend that parking for people with disabilities within the town centre be provided mainly within the off-street car parking areas in a 90 degree format, with zero provision on-street.

In accordance with AS2890.6:2009, accessible spaces in a 90-degree format must be 2.4 metres wide by 5.4 metres long, with a shared area on one side of the accessible space of the same dimensions. A bollard must also be installed within the shared zone, set back 800mm from the front of the space to restrict any vehicles from parking in the shared zone. This arrangement is shown in Figure 6.2 below.

**Figure 6.2: Dimensions of Accessible Space with adjacent shared zone**



Source: AS2890.6:2009: Off-street parking for people with disabilities

### Taxi Zones

VicRoads 'Taxi Rank Guidelines' provide information on the design and intended operation of taxi ranks and related facilities.

On-street taxi stands should be sited within the Town Centre at high volume pedestrian areas where it would be intuitive for people to locate them.

All new taxi ranks in Victoria should comply with the requirements of the Disability Discrimination Act and the Disability Standards for Accessible Public Transport.

To manage illegal parking, bus stops, loading zones and no standing areas should not be provided at the rear of a taxi zone.

## 7 Streetscape Options:

### 7.1 The VicRoads Concept Plan

VicRoads prepared a preliminary concept design for the narrowing of the South Gippsland Highway (Commercial Street) in December 2014. Refer Appendix A.

The merits of the VicRoads plan are considered in the accompanying Hansen Issues Identification and Initial Concepts Report, which assesses the plan against the objectives of the Streetscape Master Plan and concludes that:

*"...the VicRoads Plan presents the fundamentals of the road design intervention that is required to reconfigure Commercial Street to one through lane in each direction. However, it does little to consider numerous streetscape interventions to better integrate the roadway with the pedestrian realm..."*

Accordingly, the VicRoads plan has been adopted by this project as a starting point for the development of the streetscape concept options.

### 7.2 Design Options

Through the development of the masterplan, three schematic design options were investigated to demonstrate possible road configurations for Commercial Street. These options mainly differ in terms of parking configuration, median width, extent of kerb outstands, buffer width and through lane location.

The three options are summarised as follows:

- Option 1 - Retaining parallel parking on both sides of Commercial Street;
- Option 2 - Retaining parallel parking on the south-western side of Commercial Street and introducing angled parking on the north-western side;
- Option 3 - Replacing all parallel parking with angled parking on both sides of Commercial Street.

Refer to Appendix B for plans showing the three options that were explored.

The traffic engineering elements of each of the three design options were developed using the design standards presented in Section 6 of this document, and in particular swept path assessments were used to ensure that each of the nominated design and checking vehicles could be accommodated.

The preferred Streetscape Master Plan is presented in Appendix C, and our detailed traffic engineering assessment of the plan follows:

### 7.3 Design Assessment of the Preferred Plan

In accordance with the Design Standards set out in Section 6 of this document, a design assessment for each of the intersections and midblock within the study area for the preferred Plan is outlined below, with the swept path assessments attached in Appendix D.

### South Gippsland Highway / King Street

The proposed changes at the intersection include:

- The extension of the kerb on the south-western and south-eastern corners of the intersection, effectively removing the kerbside lane to demarcate a single lane configuration.
- The extension of the splitter island on King Street to the north
- Trimming back the central median on the eastern side of the median break
- Installing chevron marking on the kerbside lane of the south-east bound carriageway to delineate single lane approach to the town centre.

Swept path assessments conducted on the proposed design of the intersection indicate that:

- A 19 metre long articulated vehicle will be able to turn right into King Street, with a second 19 metre long articulated vehicle queuing behind, without impacting on south-east bound traffic on the South Gippsland Highway. This is no change from the current situation.
- Trucks turning left into King Street will now be required to do so from the through lane. It is noted that the volume of trucks turning left into King Street is minimal, around 2 trucks during the peak hour based on turning movement counts conducted at the intersection. The removal of the kerbside lane will also provide a 2.2 metre buffer zone between the parallel parking and the traffic lane, creating a safer environment for people entering and exiting from parked cars.

### South Gippsland Highway / Radovick Street

The proposed changes (pre-signalisation) at the intersection include:

- Kerb extensions on the south-western and south-eastern corners of the intersection.
- Removal of the splitter island on Radovick Street
- Provision of a dedicated left turn lane from South Gippsland Highway into Radovick Street through the removal of three existing linemarked car parking spaces on the south-east approach of Commercial Street
- Extension of the right turn lane from South Gippsland Highway into Radovick Street to improve storage of right turning vehicles
- Installation of a colour treatment for the pedestrian crossing across the southern leg of Radovick Street.

These works are proposed in the interim, with the intention for signalisation of the intersection in the future. It is noted that the design of the intersection in the proposed interim stage has been designed with the intention that minimal additional civil works is required when signalisation of the intersection occurs.

It is proposed that only the existing three linemarked spaces will be removed on the south-east approach to Radovick Street to create a left turn lane into Radovick Street, i.e. the existing Pedestrian Operated

Signals (POS) and associated kerb outstand will be retained in the interim.

No informal pedestrian crossing will be provided on the western leg of the intersection, as the median refuge is too narrow (due to the right turn lane) to accommodate a safe crossing. Pedestrians may continue to use the existing informal refuge crossing approximately 30 metres west of the intersection.

The existing informal pedestrian refuge crossing on the eastern leg of the intersection will be appropriate in the interim, as the central median is wide enough for pedestrians to safely use as a refuge.

Due to the required removal of the splitter island on Radovick Street, pedestrians will become unable to stage their crossing across Radovick Street, and would be required to give way to vehicles travelling from both directions in a single crossing. To improve the safety of this pedestrian crossing, it is proposed to provide a contrasting colour treatment to better delineate the crossing and provide better warning to drivers of the presence of the pedestrian crossing. This type of treatment have been commonly used in activity centres and shopping strips where pedestrian activity is high.

Several examples of this treatment is listed below:

- Carlisle Street / Barkly Street intersection, St Kilda
- Springvale Road / Windsor Avenue, Springvale
- Clarendon Street, South Melbourne (multiple intersections)
- Donald Street / Nicholson Street, Footscray (unsignalised intersection)

Guidelines for the installation and use of the coloured pavement treatments for pedestrian crossings are outlined in Austroads Guide to Traffic Management Part 10: Traffic Control and Communication Devices, and AS1724.12.

Swept path assessments have been conducted in both the interim condition (unsignalised) and the ultimate condition (signalised), using the design vehicles listed in Section 6.2 of the report. The assessment indicates:

- In a signalised condition, a 26 metre long B-Double will be able to wait within the left or right turn lane without blocking through traffic on the South Gippsland Highway.
- In the interim, based on an unsignalised condition, a second vehicle of a size of up to a 19 metre long Articulated Vehicle will be able to queue in the right turning lane behind a B-Double without impacting through traffic on South Gippsland Highway.
- This is an improvement on the current situation where left turners do not have a dedicated left turn lane, requiring trucks to decelerate within the left through lane, resulting in through vehicles attempting to overtake the turning vehicle. Additionally, the existing right turn lane is only sufficient for one B-double to prop, with insufficient length to accommodate another truck to prop behind within the turn lane.

### South Gippsland Highway / Bridge Street

The proposed changes at the intersection include:

- Adjustments to the central median and relinemarking of the turn lanes to provide additional queuing length for the turn lanes.
- Slight adjustments to the geometry and the removal of parking on both the western and eastern sides of the dog leg to improve truck manoeuvrability through the dog-leg while vehicles are waiting within the turn lanes. The existing taxi space on the eastern side of the dog-leg is proposed to be relocated further south-east on Mines Road. The parking spaces are proposed to be removed for safety reasons, as:
  - There are currently a large volume of large trucks using the route and negotiating the bend. The nature of the dog-leg will restrict sightlines to any vehicles parked on the side of the road
  - Swept path assessments (detailed further below) indicate that B-doubles will require the full width of the carriageway to negotiate the bend with adequate clearances

Swept path assessments tested using the design vehicles outlined in Section 6.2 indicate:

- A 19 metre long articulated vehicle and a second vehicle of a size up to an 8.8 metre long Medium Rigid Vehicle will be able to wait within the right turn lanes on South Gippsland Highway without blocking 19 metre semi-trailers travelling through on South Gippsland Highway.
- Up to four B99 vehicles (99.8th percentile car) will be able to queue within the right turn lane without impacting on B-doubles travelling through on South Gippsland Highway.
- This is an improvement of the current arrangement where more than one car waiting within the right turn lane turning into Bridge Road South would impact on B-doubles travelling through on South Gippsland Highway. The proposal to shift the central median to the west at this location will effectively shift any queued right turners further to the west, increasing the space for B-doubles travelling through.

### South Gippsland Highway Midblock Assessment

The lane width along Commercial Street is proposed to be increased from 3.3 metres to 3.5 metres, which is the standard lane width specified in Austroads Guide to Road Design Part 3. It was reported that most freight-efficient vehicles are able to travel more comfortably along roads that have a usable lane width of 3.5 metres.

Swept path assessments have also been conducted at midblock locations, which indicate:

- The ability for U-turn movements are maintained at the South Gippsland Highway / King Street and Radovick Street intersections, and at the median break at the front of the Council car park, south-east of Radovick Street. This has been tested with a large 5.2 metre long B99 car (99.8th percentile vehicle).

The proposed 30 degree parking have been tested with a large B99 vehicle (representative of a van or a four wheel drive).

The assessment demonstrate that the preferred streetscape design can accommodate the relevant design and checking vehicles in accordance with Section 6.2, and is an improvement to the current layout and geometry of the road.

## **7.4 Traffic Analysis and Modelling of the Preferred Plan**

### **Existing Conditions**

To benchmark the performance on the existing system, a SIDRA analysis has been undertaken of the existing Commercial Street/Radovick Street intersection. The intersection has been modelled with its current geometry and the available peak hour volumes.

One of the major performance measures calculated by SIDRA is the Degree of Saturation (DoS), which is defined as the ratio of the arrival traffic flow rate to the intersection capacity for that particular movement. The degree of saturation has a theoretical maximum value of one. In effect, the degree of saturation is a measure of the level of congestion at an intersection. In practice, a degree of saturation greater than 0.95 would indicate that the intersection is operating under congested conditions, with lengthening queues and delays.

As a guide, the operating conditions at UNSIGNALISED INTERSECTIONS<sup>2</sup> can be defined as:

- |                   |                                 |
|-------------------|---------------------------------|
| — DoS < 0.6       | Excellent operating conditions  |
| — 0.6 < DoS < 0.7 | Very good operating conditions  |
| — 0.7 < DoS < 0.8 | Good operating conditions       |
| — 0.8 < DoS < 0.9 | Acceptable operating conditions |
| — 0.9 < DoS ≤ 1.0 | Poor operating conditions       |
| — DoS > 1.0       | Very poor operating conditions  |

The SIDRA outputs of the existing conditions are presented in Appendix E and the key findings are summarised below.

- The AM Peak hour is the critical period in terms of DoS, queues and delays.
- In the critical AM Peak, the total intersection's DoS as represented by the 'All Vehicles' measure is 0.679, which suggests that the existing intersection is at 'very good operating conditions'.
- The maximum estimated queues (95% back of queue) in the critical AM Peak are in the through lane on the Commercial Street north-west approach, up to 47.1 metres (6.1 vehicles).
- The corresponding maximum average delay is on the Radovick Street approach, up to 23.4 seconds.

### **Post Signalisation**

To measure the expected future performance of the intersection, SIDRA analysis for the Radovick Street/Commercial Street intersection based on intersection signalisation (with a dedicated right turn arrangement)

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<sup>2</sup> Refer SIDRA Intersection 6.1 User Guide, Table 5.14.5 - Degree of Saturation methods for Level of Service definitions, Sign Control (for vehicles)

has been undertaken. Refer to Figure 4.2 for the adopted forecast traffic volumes at the intersection.

As a guide, the operating conditions at SIGNALISED INTERSECTIONS<sup>3</sup> can be defined as:

- |                     |                                 |
|---------------------|---------------------------------|
| — DoS < 0.6         | Excellent operating conditions  |
| — 0.6 < DoS < 0.7   | Very good operating conditions  |
| — 0.7 < DoS < 0.9   | Good operating conditions       |
| — 0.9 < DoS ≤ 0.95  | Acceptable operating conditions |
| — 0.95 < DoS ≤ 1.00 | Poor operating conditions       |
| — DoS > 1.0         | Very poor operating conditions  |

The results of the SIDRA analysis for the post-signalisation conditions are attached as Appendix F, and show:

- The PM Peak hour is the critical period in terms of DoS, queues and delays.
- In the critical PM Peak, the total intersection's DoS as represented by the 'All Vehicles' measure is 0.839, which suggests that the existing intersection is within 'good operating conditions'.
- The maximum estimated queues (95% back of queue) in the critical PM Peak are in the through lane on the Commercial Street south-east approach, up to 125.8 metres (16.8 vehicles). The queue in the adjoining left turn lane is 21.2 metres (2.9 vehicles).
- The corresponding maximum queue length on the north-west approach is 65 metres (8.8 vehicles) in the through lane and 15.5 metres (2.0 vehicles) in the right turn lane.
- The maximum average delay for the intersection is on the Radovick Street approach, up to 32.9 seconds.

Based on the Austroads design guidelines in combination with the SIDRA outputs, the design parameters to be adopted at the intersection to address capacity, queue and delay considerations are:

- The right turn lane on the north-west approach to be 26 metres long (i.e. in excess of the 15.5 metre estimated back of queue length from SIDRA) to accommodate the length of a B-double.
- Similarly, the left turn lane on the south-east approach to be 26 metres long (i.e. in excess of the 21.2 metre estimated back of queue length from SIDRA) to accommodate the length of a B-double.

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<sup>3</sup> Refer SIDRA Intersection 6.1 User Guide, Table 5.14.5 - Degree of Saturation methods for Level of Service definitions, Signals (for vehicles)

## Appendix A: **VicRoads Preliminary Plan:**

Sourced from: VicRoads- plans dated December 2014



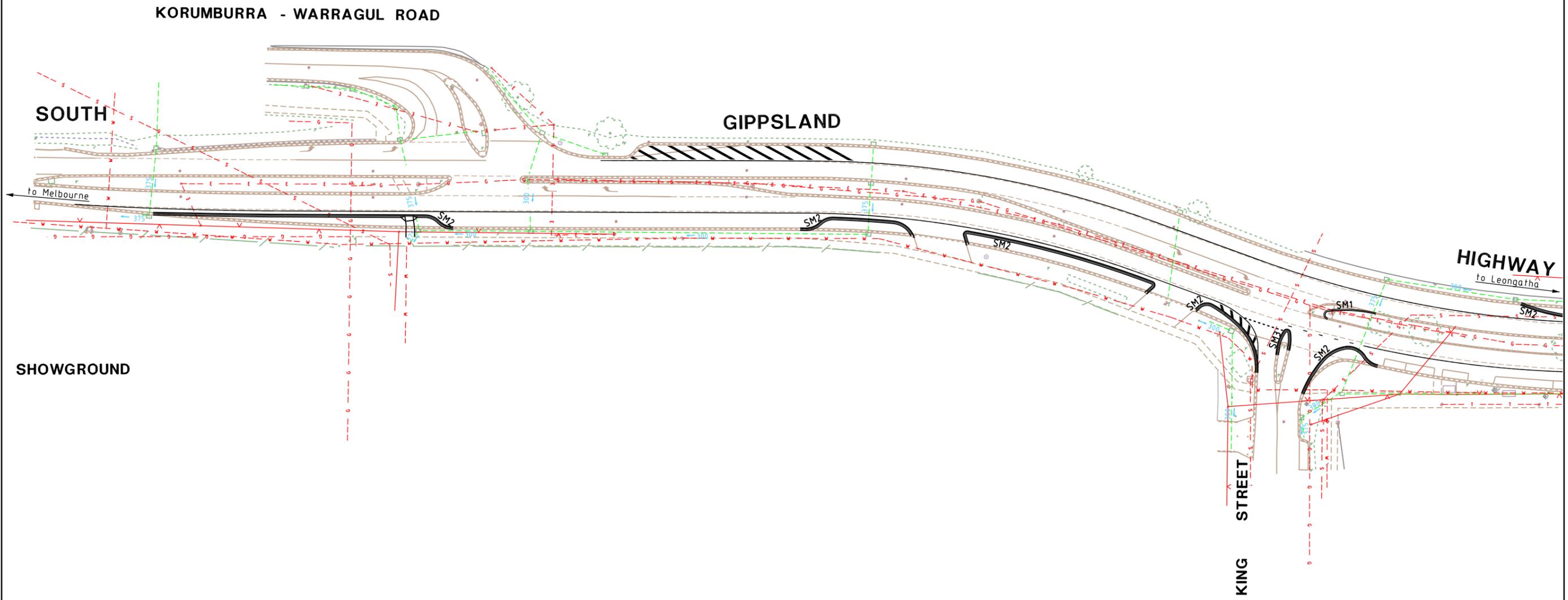
**SOUTH GIPPSLAND HIGHWAY  
KORUMBURRA TOWNSHIP**

**SINGLE LANE CONFIGURATION BETWEEN  
KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET**

**81.45km - 82.15km**

**ALIGNMENT PLANS - option 3TS on feature survey  
(trenched in SM2 kerb outstands)**

# SHIRE OF SOUTH GIPPSLAND TOWNSHIP OF KORUMBURRA



**NOTE:-**  
 -total of 3 parking bays lost  
 -through lane width 4.00m  
 -26m B-Double movements to/from Korumburra-Wonthaggi Road  
 -19m semi trailer movements to/from King Street

DATE: 4/12/2014  
 MODEL: BD943-P3TS-CI-0301  
 FILE: G:\Projects\2014\South\_Gippsland\_Highway\BD943-SGH\_single\_lane\_Korumburra\Design-P3T-Kor-Rd-to-Bridge-St-03.dgn

ISSUE	APP'D	DATE	AMENDMENT

**WARNING**  
 BEWARE OF UNDERGROUND SERVICES  
 THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

STATUS: **PRELIMINARY CONCEPT**  
 STATUS NOTES:  
 1. NOT FOR CONSTRUCTION  
 2. SUBJECT TO FURTHER AMENDMENT  
 3. FUNDING NOT APPROVED

DESIGNED  
 December 2014  
 APPROVED  
 EASTERN REGION DRAWING FILE  
 BD943-P3TS-CI-0301

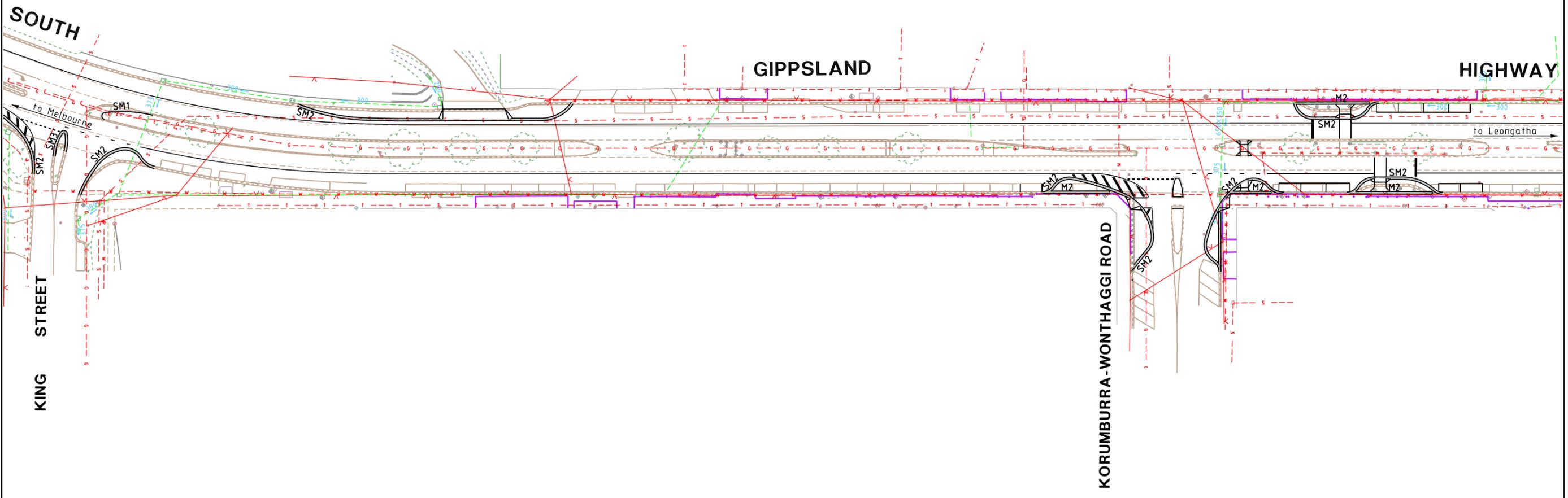


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**SOUTH GIPPSLAND HIGHWAY**  
 SINGLE LANE CONFIGURATION BETWEEN KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET  
 81.45km - 82.15km  
 ALIGNMENT PLAN 1 - option 3TS (trenched in SM2 kerb outstands)

CATALOG: TRARALGON	CONTRACT NO.	SHEET NO.	DRAWING NO.	ISSUE
PROJECT: 2583_korumburra		1		

# SHIRE OF SOUTH GIPPSLAND TOWNSHIP OF KORUMBURRA



**LEGEND**  
 — denotes existing Verandah overhangs  
 . . . denotes existing Verandah posts



DATE: 4/12/2014  
 MODEL: BD943-P3TS-CI-0302  
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ISSUE	APP'D	DATE	AMENDMENT

**WARNING**  
 BEWARE OF UNDERGROUND SERVICES  
 THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

**STATUS: PRELIMINARY CONCEPT**  
 STATUS NOTES:  
 1. NOT FOR CONSTRUCTION  
 2. SUBJECT TO FURTHER AMENDMENT  
 3. FUNDING NOT APPROVED

DESIGNED  
 December 2014  
 APPROVED  
 EASTERN REGION DRAWING FILE  
 BD943-P3TS-CI-0302

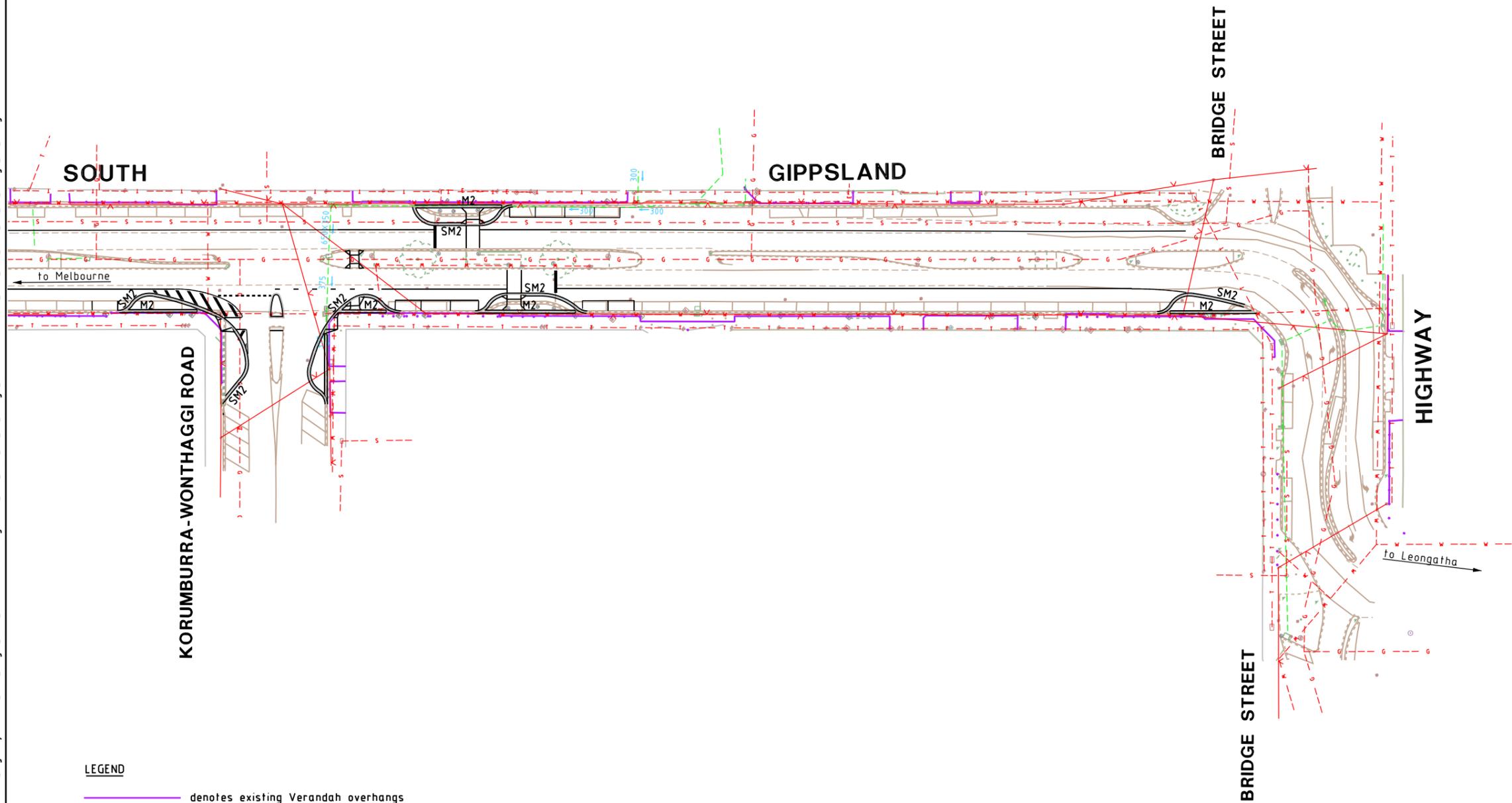
**EASTERN REGION**

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**SOUTH GIPPSLAND HIGHWAY**  
 SINGLE LANE CONFIGURATION BETWEEN KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET  
 81.45km - 82.15km  
 ALIGNMENT PLAN 1 - option 3TS (trenched in SM2 kerb outstands)

CATALOG: TRARALGON	CONTRACT NO.	SHEET NO.	DRAWING NO.	ISSUE
PROJECT: 2583_korumburra		2		

SHIRE OF SOUTH GIPPSLAND  
TOWNSHIP OF KORUMBURRA



LEGEND

-  denotes existing Verandah overhangs
-  denotes existing Verandah posts

**WARNING**  
BEWARE OF UNDERGROUND SERVICES  
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

STATUS: **PRELIMINARY CONCEPT**

STATUS NOTES:  
1. NOT FOR CONSTRUCTION  
2. SUBJECT TO FURTHER AMENDMENT  
3. FUNDING NOT APPROVED

DESIGNED  
December 2014

APPROVED

EASTERN REGION DRAWING FILE  
BD943-P3TS-CI-0303



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OF METRES VER

**SOUTH GIPPSLAND HIGHWAY**  
SINGLE LANE CONFIGURATION BETWEEN KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET  
81.45km - 82.15km  
ALIGNMENT PLAN 3 - option 3TS (trenched in SM2 kerb outstands)

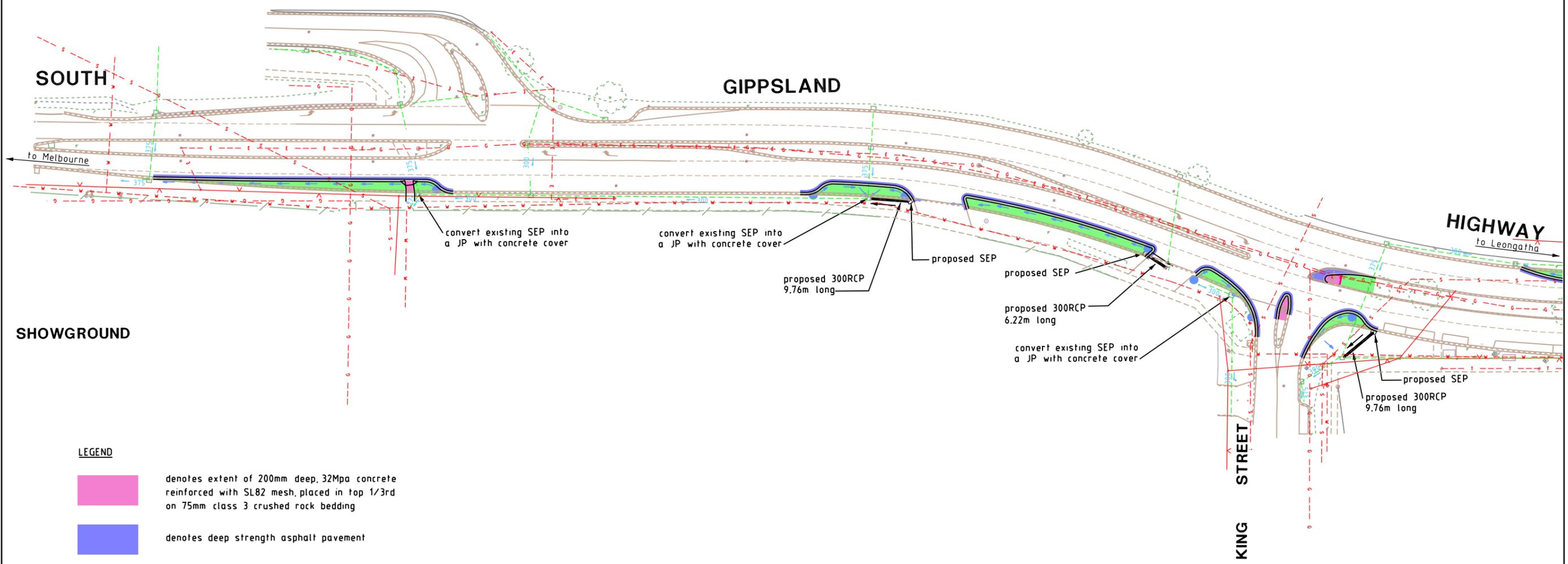
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ISSUE	APP'D	DATE	AMENDMENT

# SHIRE OF SOUTH GIPPSLAND TOWNSHIP OF KORUMBURRA

## KORUMBURRA - WARRAGUL ROAD



### SHOWGROUND

#### LEGEND

- denotes extent of 200mm deep, 32Mpa concrete reinforced with SL82 mesh, placed in top 1/3rd on 75mm class 3 crushed rock bedding
- denotes deep strength asphalt pavement
- denotes area of landscaping
- denotes area of bedding for SM kerbs

#### LEGEND FOR SUBSURFACE DRAINAGE

- ALL DRAINS ARE 100 DIA CLASS 1000 CORRUGATED PIPE UNLESS OTHERWISE SPECIFIED
- PAVT DRAIN (class 200) 100mm dia
- FLUSHOUT RISER

**WARNING**  
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3. FUNDING NOT APPROVED

DESIGNED  
December 2014

APPROVED

EASTERN REGION DRAWING FILE  
BD943-P3TS-CI-0401

**EASTERN REGION**

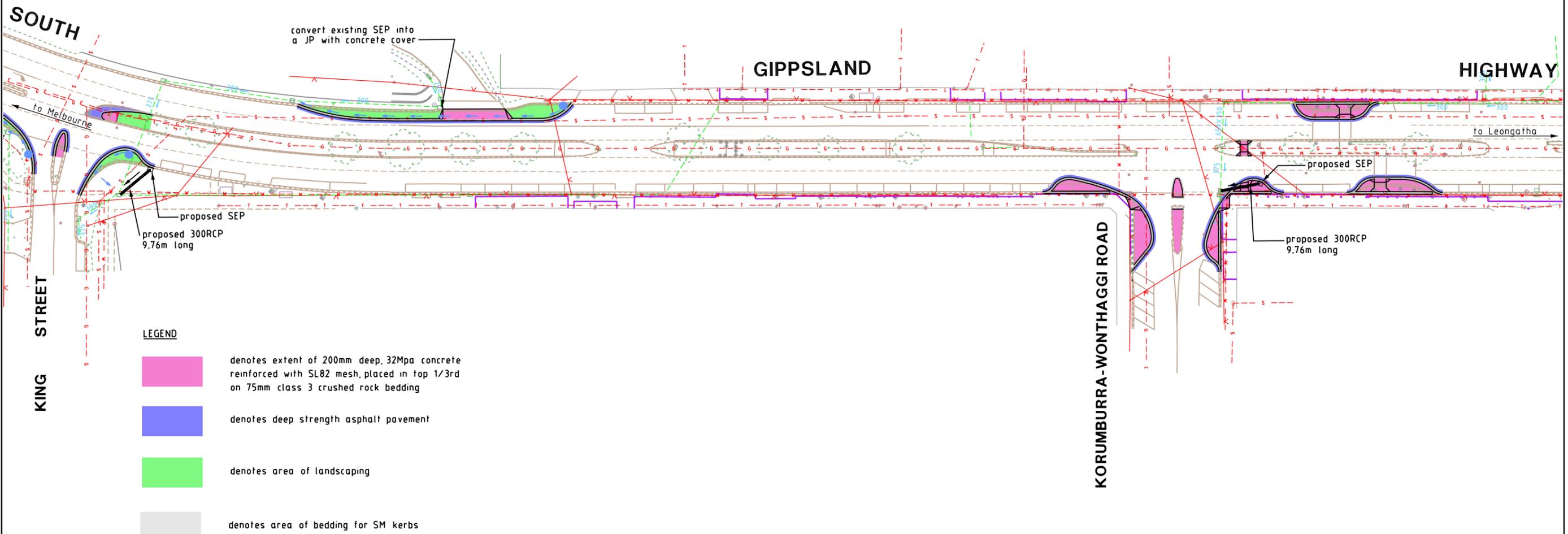
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<b>SOUTH GIPPSLAND HIGHWAY</b>				
SINGLE LANE CONFIGURATION BETWEEN KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET				
81.45km - 82.15km				
ALIGNMENT PLAN 1 - option 3TS (trenched in SM2 kerb outstands)				
CATALOG: TRARALGON	CONTRACT NO.	SHEET NO.	DRAWING NO.	ISSUE
PROJECT: 2583_korumburra		4		

DATE: 4/12/2014  
MODEL: BD943-P3TS-CI-0401  
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ISSUE	APP'D	DATE	AMENDMENT

# SHIRE OF SOUTH GIPPSLAND TOWNSHIP OF KORUMBURRA



- LEGEND**
- denotes extent of 200mm deep, 32Mpa concrete reinforced with SL82 mesh, placed in top 1/3rd on 75mm class 3 crushed rock bedding
  - denotes deep strength asphalt pavement
  - denotes area of landscaping
  - denotes area of bedding for SM kerbs

**LEGEND FOR SUBSURFACE DRAINAGE**  
 ALL DRAINS ARE 100 DIA CLASS 1000 CORRUGATED PIPE UNLESS OTHERWISE SPECIFIED  
 → PAVT DRAIN (class 200) 100mm dia  
 ● FLUSHOUT RISER      ↪ OUTLET

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**STATUS: PRELIMINARY CONCEPT**

**STATUS NOTES:**  
 1. NOT FOR CONSTRUCTION  
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 3. FUNDING NOT APPROVED

DESIGNED  
 December 2014

APPROVED

EASTERN REGION DRAWING FILE  
 BD943-P3TS-CI-0402

**EASTERN REGION**

SCALE  
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 OF METRES  
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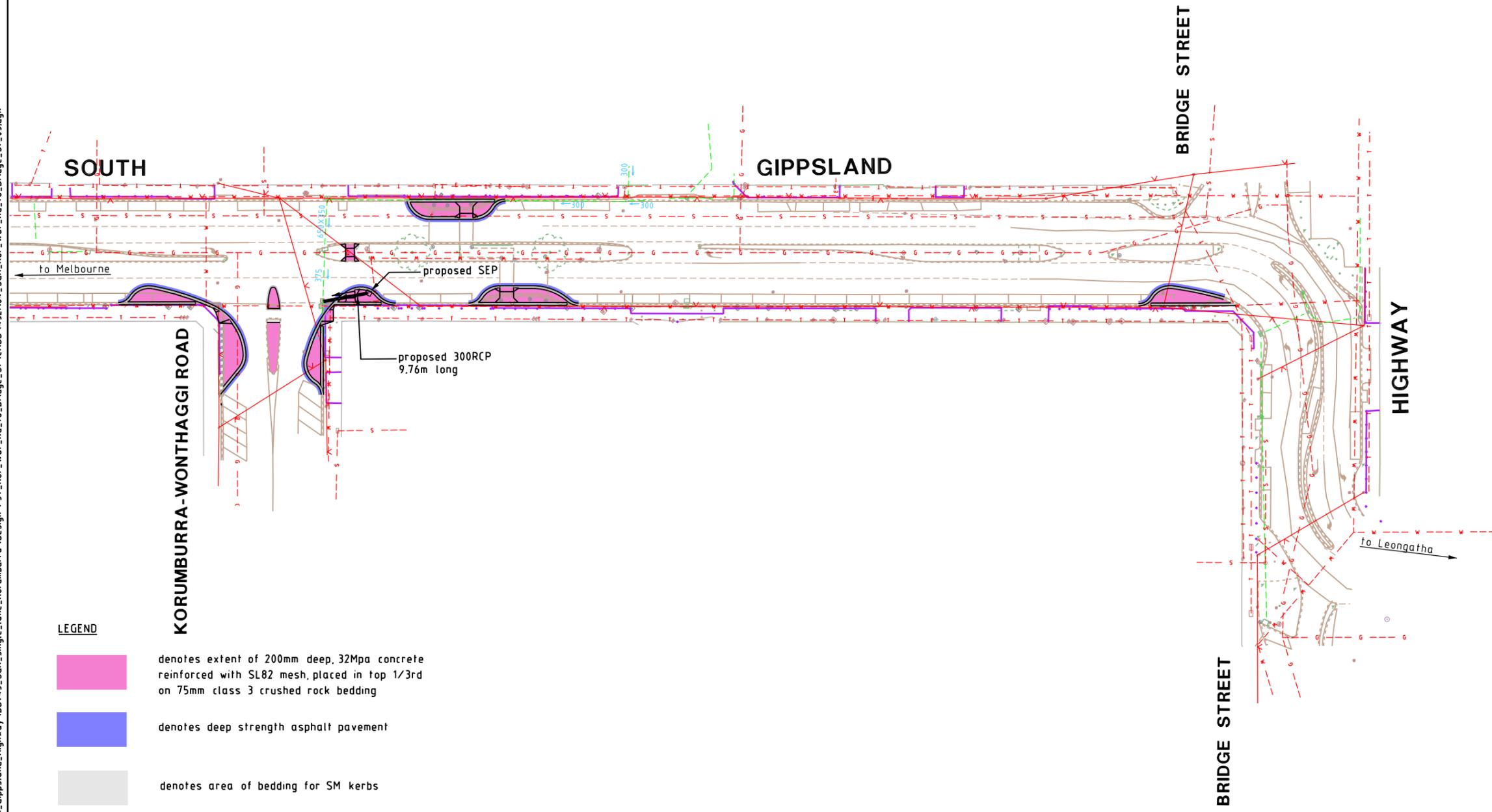
**SOUTH GIPPSLAND HIGHWAY**  
 SINGLE LANE CONFIGURATION BETWEEN KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET  
 81.45km - 82.15km  
 ALIGNMENT PLAN 1 - option 3TS (trenched in SM2 kerb outstands)

CATALOG: TRARALGON	CONTRACT NO.	SHEET NO. 5	DRAWING NO.	ISSUE
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ISSUE	APP'D	DATE	AMENDMENT

SHIRE OF SOUTH GIPPSLAND  
TOWNSHIP OF KORUMBURRA



**LEGEND**

- denotes extent of 200mm deep, 32Mpa concrete reinforced with SL82 mesh, placed in top 1/3rd on 75mm class 3 crushed rock bedding
- denotes deep strength asphalt pavement
- denotes area of bedding for SM kerbs



DATE: 4/12/2014  
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ISSUE	APP'D	DATE	AMENDMENT

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 APPROVED  
 EASTERN REGION DRAWING FILE  
 BD943-P3TS-CI-0403

**EASTERN REGION**

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 OF METRES  
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**SOUTH GIPPSLAND HIGHWAY**  
 SINGLE LANE CONFIGURATION BETWEEN KORUMBURRA-WARRAGUL ROAD AND BRIDGE STREET  
 81.45km - 82.15km  
 ALIGNMENT PLAN 3 - option 3TS (trenched in SM2 kerb outstands)

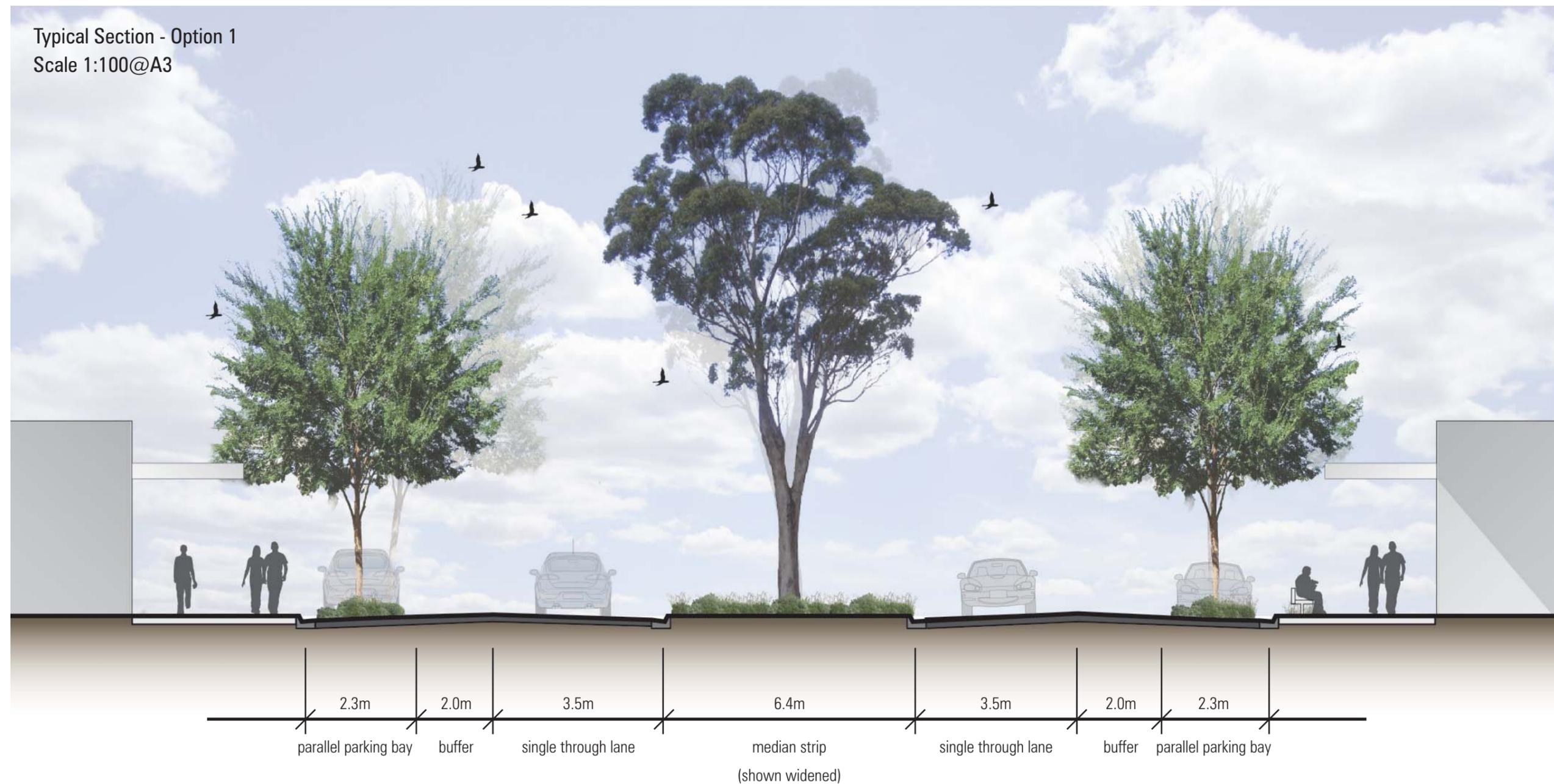
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## Appendix B: Streetscape Options:

Sourced from: Korumburra Streetscape Masterplan prepared by Hansen Partnership

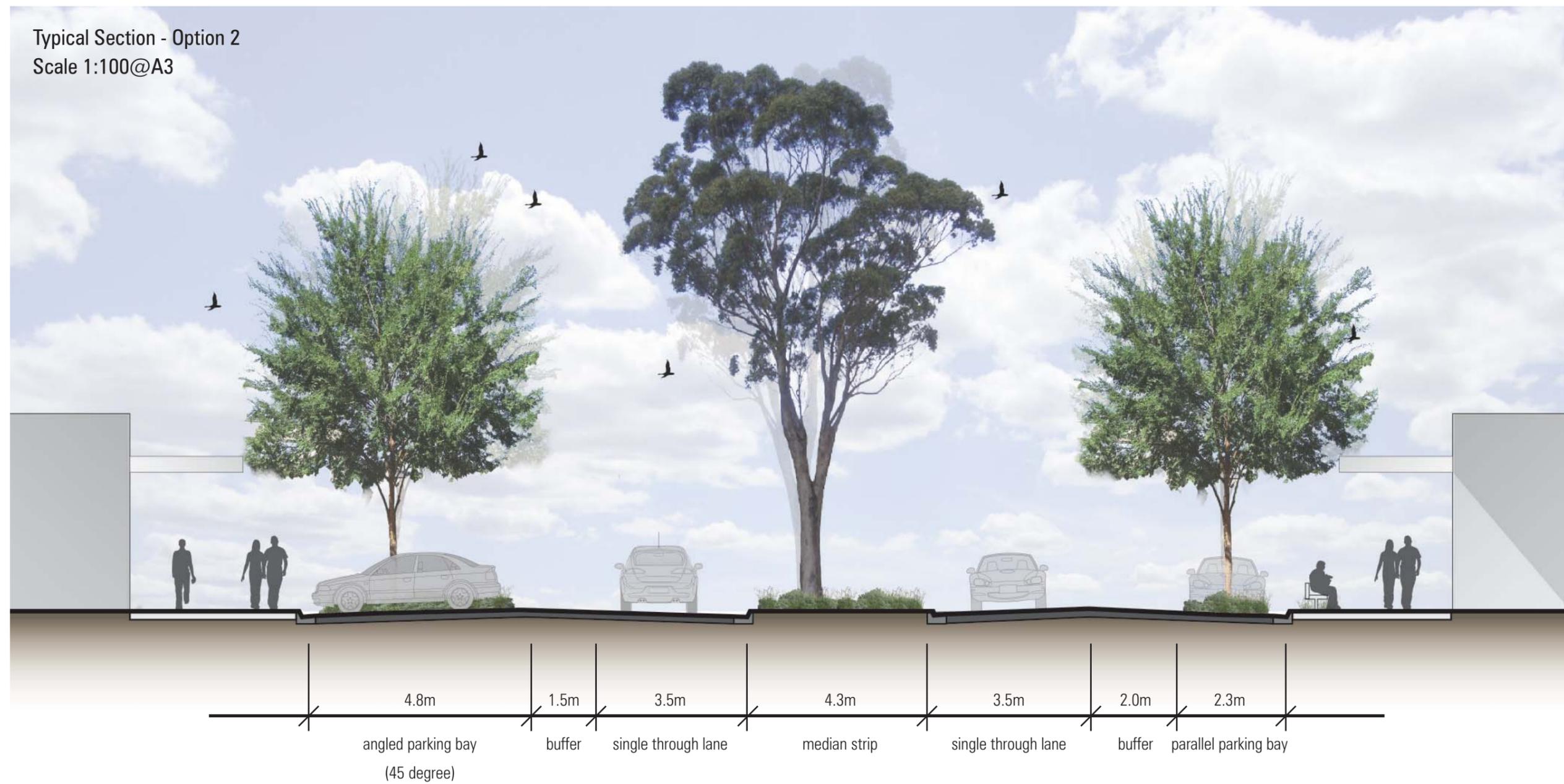
## 6.2 Option 1 - Parallel Parking

Option 1 looks at retaining the parallel parking on either side of Commercial Street, while reconfiguring the roadway to one through lane in each direction. While similar to the VicRoads plan and the existing parking configuration, consideration has been given to adding areas for tree planting between the parallel parking bays, as this has been identified as a fundamental streetscape design principle. This could be considered a base level intervention, which looks to work with the existing streetscape infrastructure as much as possible.



### 6.3 Option 2 - Angled Parking (One Side)

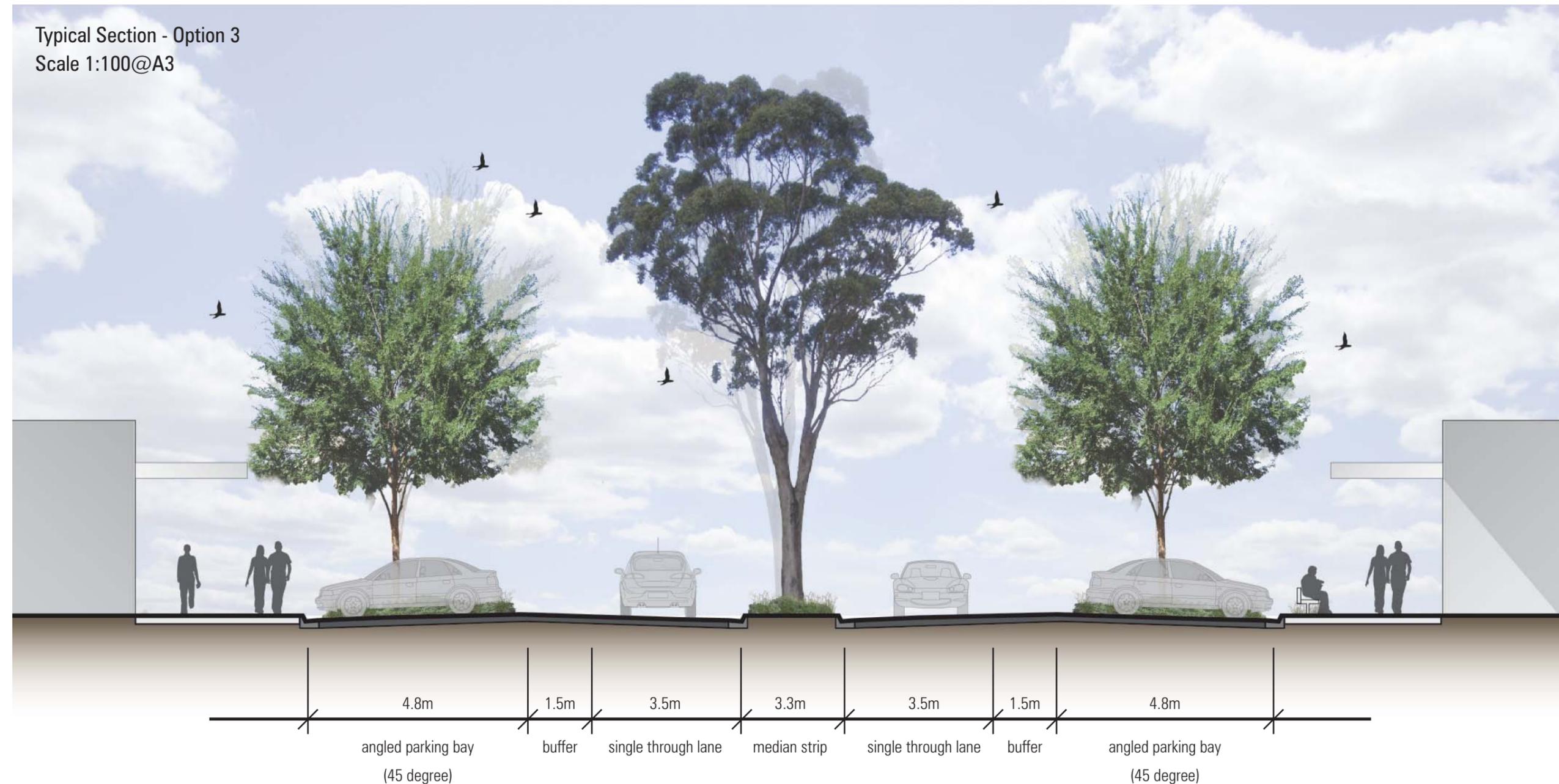
Option 2 retains the parallel parking and buffers on the southern side of Commercial Street, while introducing angled parking on the northern side. The main impact of this option is on the central median, which has to be thinned to accommodate the depth for 45 degree angled parking. This will create a situation where central median trees may have to be removed. Alternatively, 30 degree angled parking has also been considered as this will not impact the central median but allows for less parking spaces.



### 6.4 Option 3 - Angled Parking (Both Sides)

Option 3 demonstrates angled parking on both sides of the roadway. This is the most extensive departure from the existing road configuration

The main impact of this option is on the central median, which has to be thinned significantly to accommodate both 30 and 45 degree angled parking. The thinning in this instance is more severe than Option 2. This will create a situation where central median trees may have to be removed.



## Appendix C: Preferred Streetscape Option:

Sourced from: Korumburra Streetscape Masterplan prepared by Hansen Partnership

## 3 Proposed Road Configuration

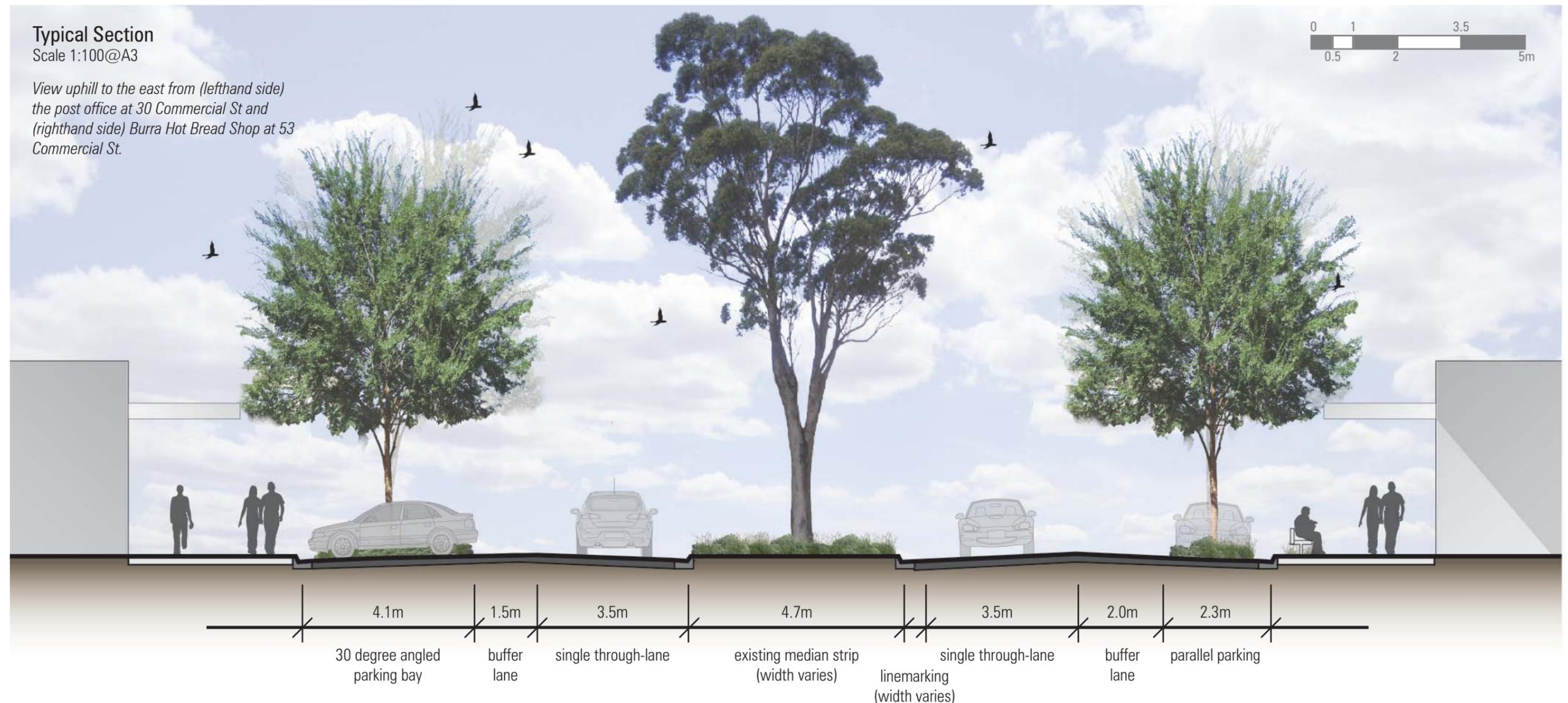
Three road configuration options were developed for Commercial Street and are demonstrated in the Exhibition Report. Retaining parallel parking on the southern side of Commercial street and implementing 30 degree parking on the northern side has been selected as the preferred, most feasible road configuration option for Commercial Street following the stakeholder and community engagement process. Through-lane safety for heavy vehicles is improved by widening the through-lane from 3.2 metres to 3.5 metres and removing the opportunity for smaller vehicles to overtake on the inside lane in both directions. This option presents a balanced intervention in line with project goals.

### Main reasons this particular option has been preferred include:

- This option creates additional space for public open spaces, though extended footpath areas next to angled parking and kerb outstands.
- Angled parking increases accessibility, as it is easier to manoeuvre in and out of parking spaces on the northern side of Commercial Street.
- The 30 degree parking configuration fits the existing street widths well and negates the need to dramatically and expensively extend or reduce the central median, while retaining existing median trees.
- This option does not propose angled parking in dangerous areas where sight lines to traffic are limited or where through vehicles may potentially build up speed - i.e. on the steep slope along the south side of Commercial Street.
- Angled parking creates the opportunity for more spaces to be provided, as it is acknowledged that some spaces will be lost or relocated through installation of street trees and intersection improvements. This was deemed justifiable on the basis of the improved safety and overall surplus of parking in the town centre identified in the previous Framework Plan. *Note: refer to the Appendix 2 for a detailed description of existing and proposed car parking space numbers.*

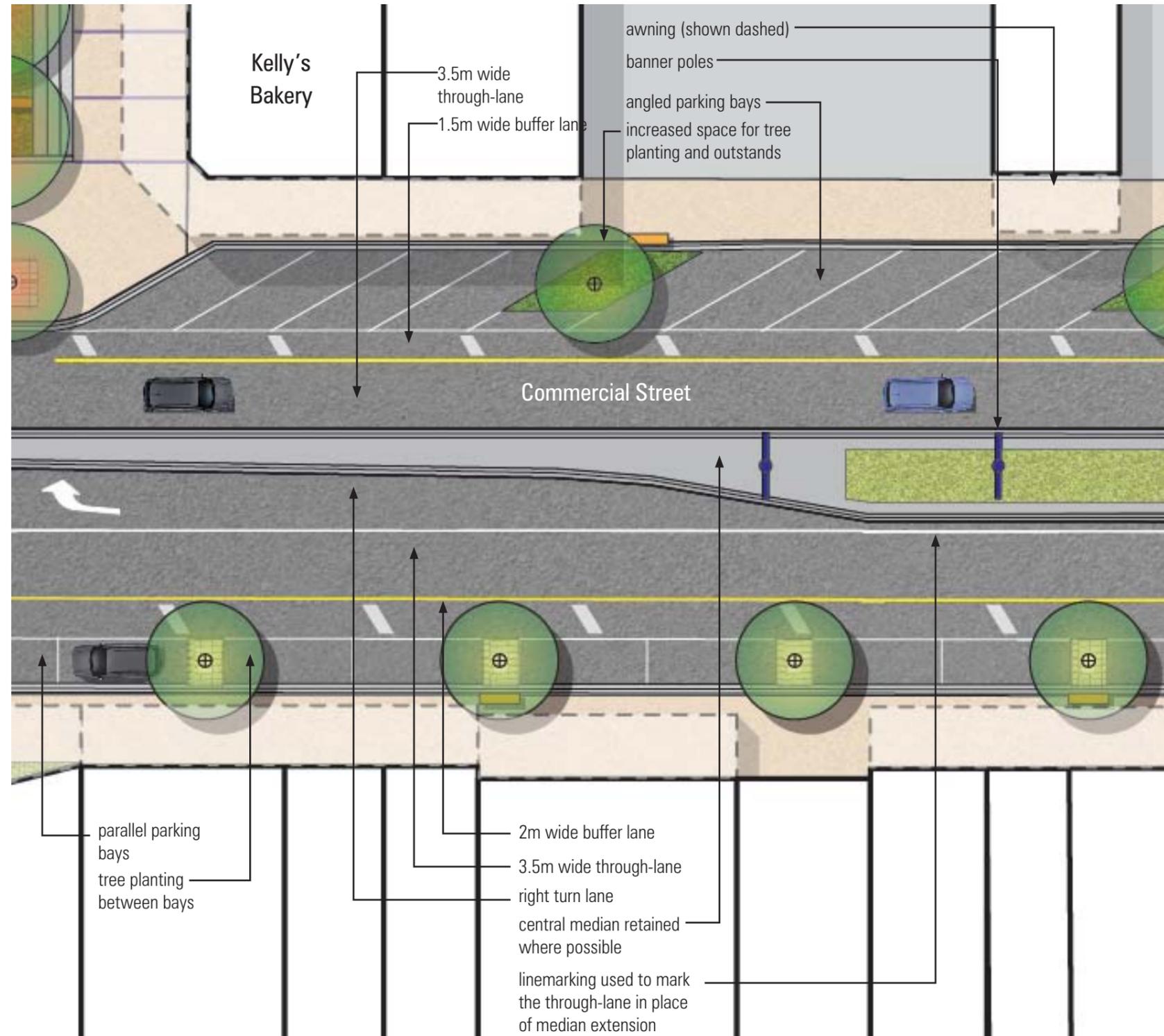
### 3.1 Proposed Road Configuration Section

The typical section drawing below outlines the proposed parking reconfiguration along Commercial Street, with 30 degree angled parking implemented to the northern side of the road (left of picture) and parallel parking maintained to the south (right of picture). The central median has also been retained in this preferred option, with linemarking implemented where needed to maintain a 3.5m through-lane width.



### 3.2 Proposed Road Configuration Plan

The plan demonstrated to the right again shows the proposed parking reconfiguration along Commercial Street, with 30 degree angled parking on the northern side of the road and parallel parking maintained on the south. This is essentially a 'zoom in' of the following Streetscape Master Plan, where this configuration has been extended for the full length of Commercial Street. This schematic plan has been included to further demonstrate a typical picture of the proposed road re-configuration.



### 3.3 Angled Parking Examples

It should be noted that angled parking is a legitimate parking option in Victoria and is present in many urban and rural main streets including:

- South Gippsland Highway, Yarram
- Princes Highway, Colac (30 degree parking)
- Douglas Street, Noble Park
- High Street, Heathcote
- Doncaster Road, Balwyn

Schematic Plan  
Scale 1:250@A3



# 4 Streetscape Master Plan

Scale 1:1000@A3

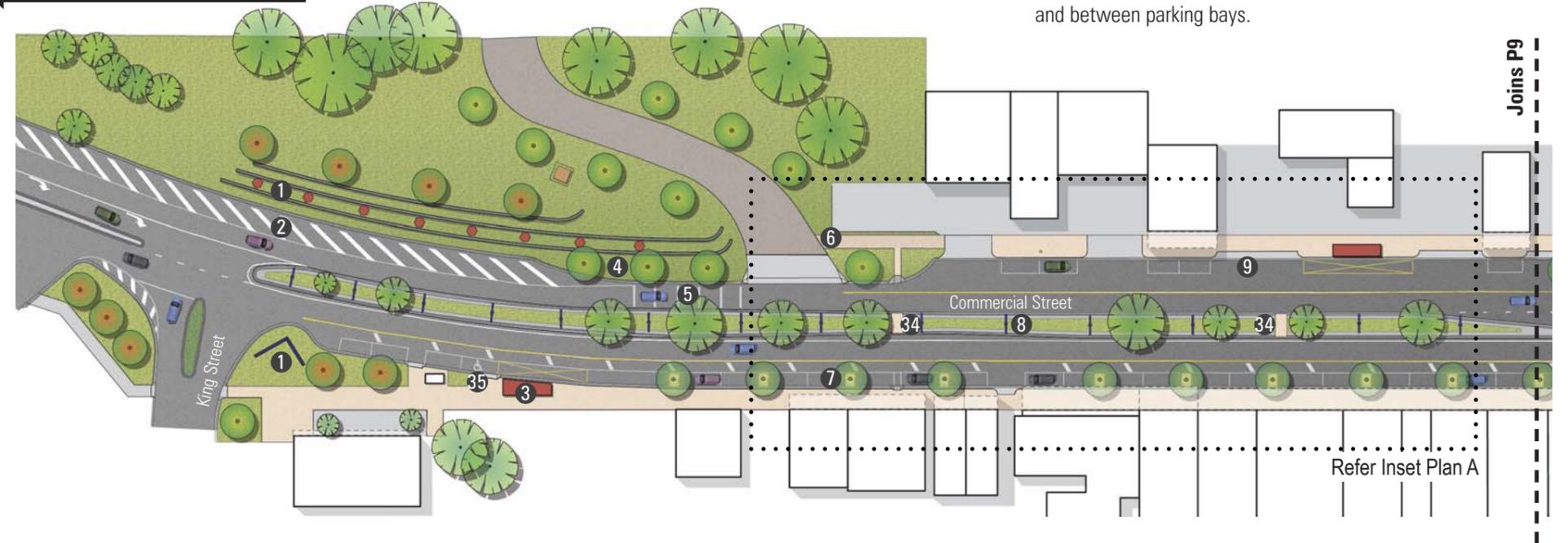


The Streetscape Master Plan demonstrates the vision for the reconfiguration of Commercial Street with a focus on the integration of safe, practical traffic design considerations with attractive, pedestrian-friendly, functional and site specific streetscape interventions. These integrated elements aim to provide the physical structure necessary to achieve overarching project goal of re-vitalising Korumburra's town centre. Supporting plans and imagery included in this report further explain design reasoning, possible materials and potential detailed physical structure.

## Legend

- Proposed trees
- Proposed accent trees
- Existing trees to be retained
- Garden bed planting
- Lawn
- Tree pit
- Exposed aggregate concrete paving
- Feature paving bands
- Plain concrete
- Granite cobbles (pedestrian crossings)
- Asphalt
- Linemarking
- Banner poles
- Seating
- Outdoor picnic settings
- Potential outdoor dining areas
- Potential artwork on existing retaining wall
- Potential gateway sculpture (north gateway)
- Potential pedestrian lighting
- Existing buildings
- Existing awnings
- Coach shelters
- Bus bays
- Disabled parking space (including buffer)
- Disabled parking space - retained
- Taxi spaces - relocated

Note: the proposed single through traffic lane continues to/from the Warragul Road intersection, 150m outside the study area for this project.

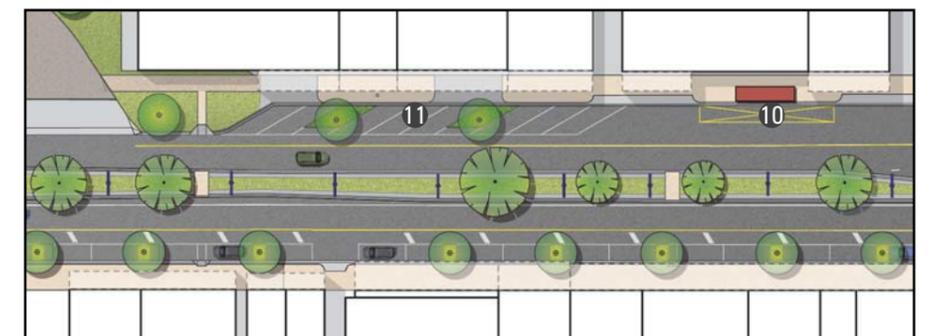


### Northern Gateway

- 1 Town Centre Gateway - improved entry presence and appearance through potential gateway signage or artworks at visually exposed new kerb outstands (King Street intersection) or on the existing retaining wall. The latter could be designed to complement the linear nature of the existing wall. Accent trees are also shown to further delineate the northern town centre gateway.
- 2 Line-marking to delineate single lane on approach to the town centre.
- 3 V-line coach stop to be retained. Consider improvements to shelter structure and the adjoining area, such as lighting, paving and wayfinding signage.
- 4 Kerb outstands provide physical demarcation of single through-lane configuration.
- 5 Linemarking rumble strips used as additional traffic calming measure on approach to the main street.
- 6 New pedestrian footpath to existing reserve. Vehicle access is also maintained.
- 7 Avenue tree planting in tree pits along Commercial Street and between parking bays.

- 8 Central median kerb extents to be retained where possible. Existing trees in the median area also to be retained and understorey planting replaced with lawn for maintenance reasons.
- 9 The parking layout and V-Line coach stop configuration is shown as existing due to current adjoining land use requiring vehicle cross-overs. Should this area be re-developed, potential parking configurations reflective of the rest of the northern side of Commercial Street have been demonstrated in Inset Plan A.
- 10 V-line coach stop retained with new shelter to match the structure opposite.
- 11 Angled parking with tree planting added out the front of potential future businesses.

### Inset Plan A Angled Parking Configuration With Future Redevelopment



**Inset Plan B**  
**Radovick Street Signalised Intersection (Future Option)**



**Radovick Street Intersection**

- 12 Vehicle movements at the Radovick Street intersection are to remain as existing until installation of traffic signals, refer Inset Plan B.
- 13 The interim option aims to minimise redundant work (should the intersection be signalised) by retaining existing kerbs and using garden bed planting instead of temporary asphalt or footpaths.
- 14 30 degree angled parking introduced with the aim of encouraging through traffic to stop in the town centre.
- 15 New public open space (refer page 11), opportunity for a meeting place or outdoor activities for nearby businesses. Streetscape treatments such as continuous feature footpath treatments encourages connectivity with the existing heritage railway station and tunnel. This can be completed independent the signalised intersection construction.
- 16 Kerb outstands at Radovick Street could serve existing or potential businesses, open space or planting. Accent trees are also used to mark the central intersection.

- 17 Inset Plan B demonstrates the signalised intersection future option at Radovick Street, with pedestrian crossings either side (moved from previous location further east). This is considered a long term intervention (after 2033), dependent on the level of the amount of future growth. The pedestrian crossing will remain as is until this date. Open space areas have been improved and parking adjusted to accommodate the signalised intersection (refer page 11).
- 18 Radovick Street pedestrian crossing to be painted to increase visibility to motorists and for safety reasons. The area between the crossing and the give way line (dashed, to the north) is 5.2m wide, large enough for a large vehicle to wait.
- 19 Existing pedestrian crossing to be retained.

**Central Plaza**

- 20 Existing car park reconfigured to create a plaza (refer page 13) with shared area that still allows vehicles to access the car park and public toilet precinct. Accent trees and high quality paving improve the appearance of this key area and encourage visitors to use the space.



- 21 Parallel parking introduced and linked to existing car parking areas with a concrete footpath.
- 22 Improve connectivity and appearance of linkages between public amenity and Commercial Street. This is achieved with a continuous footpath material and a designated informal pedestrian crossing.
- 23 Additional park furniture near public toilets and minimal additional planting to maintain views across the rail yard.
- 24 Increased provision of long vehicle parking while other parking areas are asphalted and linemarking installed.
- 25 Improvements to paving, planting and seating near Karmai Arcade.

**Southern Gateway**

- 26 Parallel parking retained on the south side of Commercial Street.
- 27 The end parking space closest to the 'dog-leg' is removed for safety reasons on the steep slope area.
- 28 Clearer definition of through and turning lanes at the 'dog-leg' intersection is provided. Parking removed for safety reasons (the change from two to one lane occurs outside the study area) and the splitter is modified / relocated.
- 29 The right turn / U-turn lane into the existing service station is removed for safety reasons.
- 30 Possible location for entry artwork (to match northern entry). Entry to town centre also shown as marked with accent trees.
- 31 Removing some car spaces in this location creates the opportunity for additional public open space which encourages people to use this area of the street. A large feature tree is also proposed in this location to mark the southern end of Commercial Street in the town centre (refer page 13).

- 32 Existing clock to be retained (shown red).
- 33 Relocated taxi parking spaces.
- 34 Informal crossing points located strategically to permit pedestrians to cross Commercial Street at key points.
- 35 Retained disabled car parking spaces.
- 36 Proposed or relocated disabled car parking spaces.
- 37 Concrete on the central median to be retained where possible, and a 0.5-1.0m wide concrete edge strip installed for maintenance reasons.

Note: Little Commercial Street to be developed in accordance with the Town Centre Framework Plan.

Note: the proposed single through traffic lane continues to/ from the Mine Road intersection, 350m outside the study area for this project.

# 5.1 Radovick Street Intersection Concept Plan

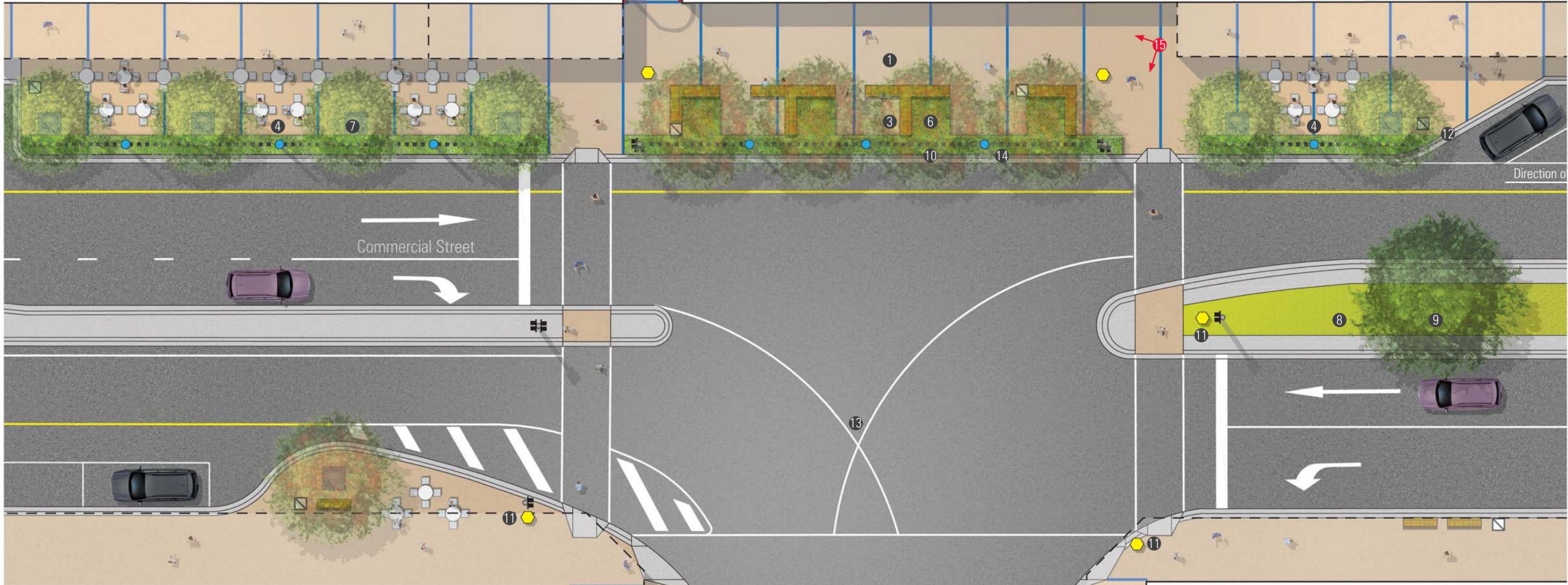
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**Note: This Concept Plan demonstrates the signalised future option for the Radovick Street intersection, refer page 9 for interim, unsignalised plan.**

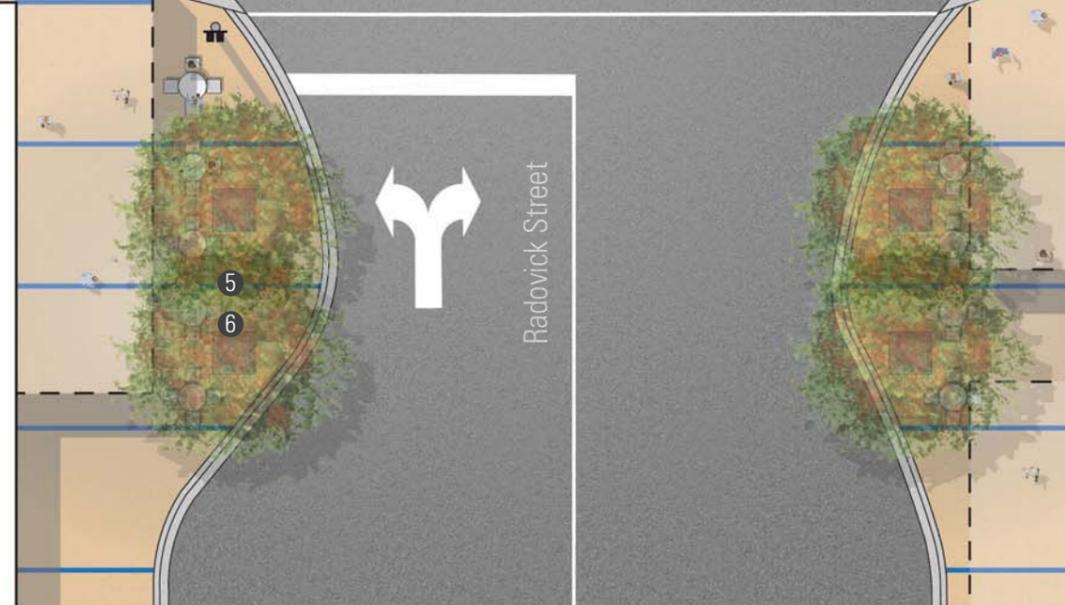
1 Establish a public plaza in this key central location that uses a combination of attractive planting and high quality materials to create a striking setting for activity in the town centre, with the aim of attracting visitors while providing amenity for locals. Space for this plaza is created through the increased kerb width provided by angled parking (note: this space can be constructed independent of the signalisation of the Radovick Street Intersection).

2 Laneway to Railway Station: provide a entry feature such as a heritage themed arch with integrated lighting and possible vandal proof vertical artworks on either side of the laneway (shown red). Continue paving through the laneway so that it visually links with any new public open space and encourages greater use. Link with way finding or directional signage at the end of the laneway and along Commercial Street.

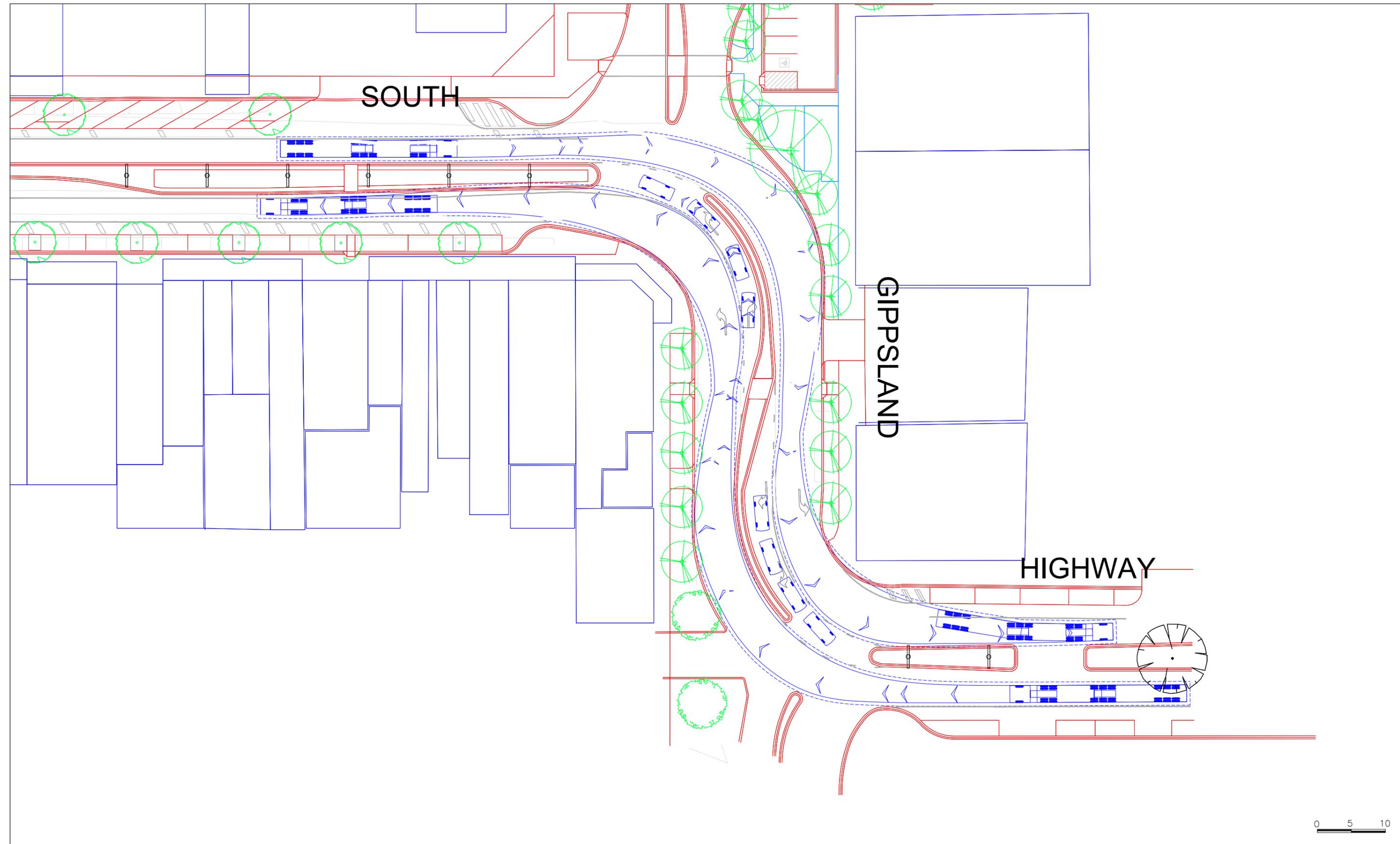


- 3 Public plaza space with seating pods / garden beds located under canopy trees. The wide footpath (approximately 4m) with feature paving bands (refer Section 7) provides a flexible space for special events or markets. This can be completed independent of construction of the signalised intersection.
- 4 Flexible outdoor dining a public spaces provided for in increased kerb space, these areas will reinforce the active and vibrant nature of the area.
- 5 Increased space for planting, furniture, footpaths and trader activity is created on the Southern side of the Radovick Street intersection. This can be completed independent of construction of the signalised intersection.
- 6 Accent trees highlight the public space and intersection (refer page 24).
- 7 Avenue trees provide shade in the new public space while linking with planting along the length of the main street (refer page 24)
- 8 Central median to grassed to enable safe maintenance and provide a continuous green strip through the town centre.
- 9 Existing median tree to be retained.

- 10 Buffer planting and a low level pedestrian barrier separates users from vehicles on Commercial Street
- 11 Directional or way finding signage located at street corners can assist in connecting the two road sides. Signage in the central median assists visiting motorists (refer page 19).
- 12 Angled parking on northern side of the road encourages through traffic to stop in the town centre due to ease of access.
- 13 Signalised intersection creates a central feature on Commercial Street, while allowing for safer and easier pedestrian movement either side of the street (note: traffic light locations indicative and installation is subject to growth / increased traffic volume). Also refer page 31 for staging information.
- 14 Feature pedestrian scale lighting can enhance the space at night while providing a distinct vertical marker for the space (refer page 21).
- 15 Location of Artist's Impression view (refer page 12).



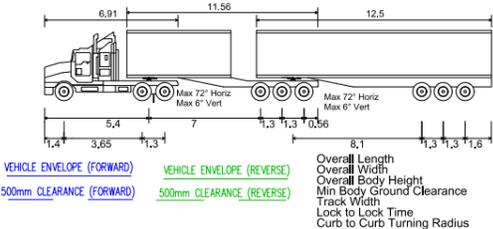
## Appendix D: Swept Path Assessment:



**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

26M B-DOUBLE (Austrroads 2006)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

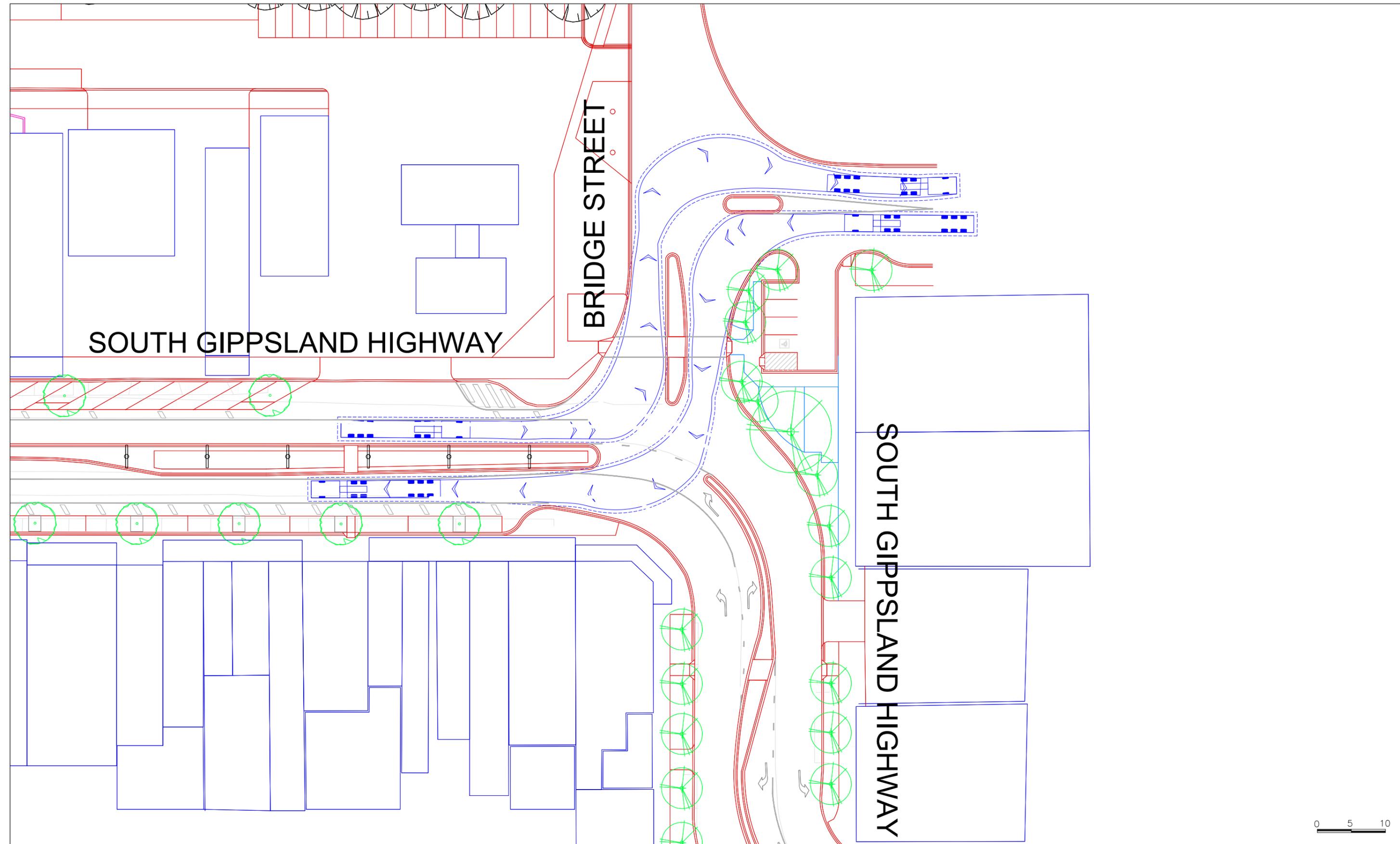
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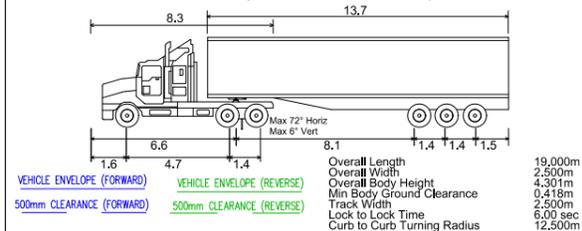




**ratio:**

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AV - Articulated Vehicle (AS/NZS2890.2:2002)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

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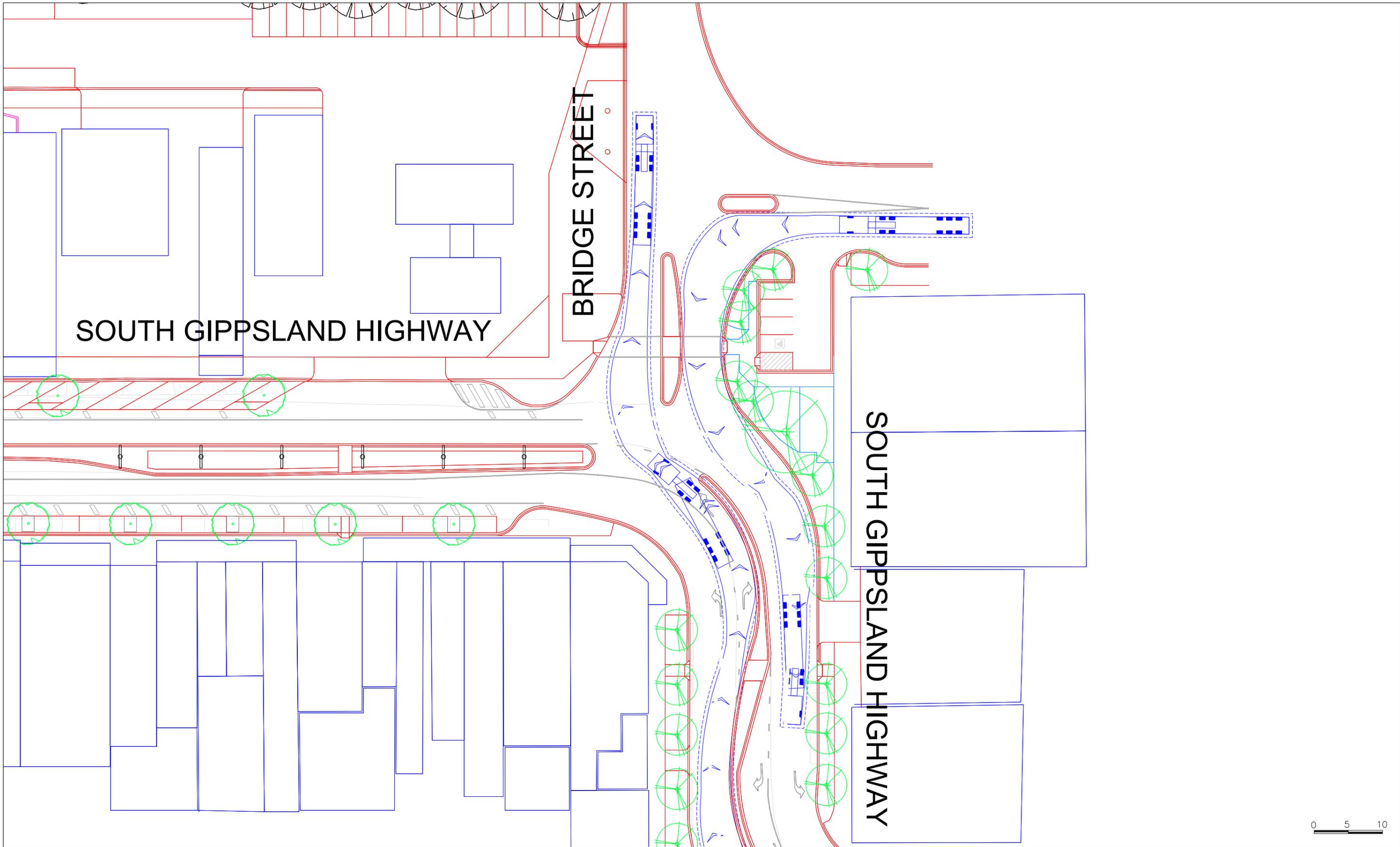
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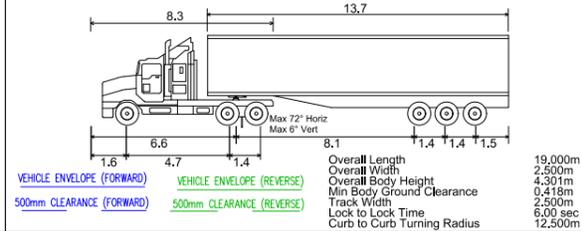




**ratio:**

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 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

AV - Articulated Vehicle (AS/NZS2890.2:2002)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
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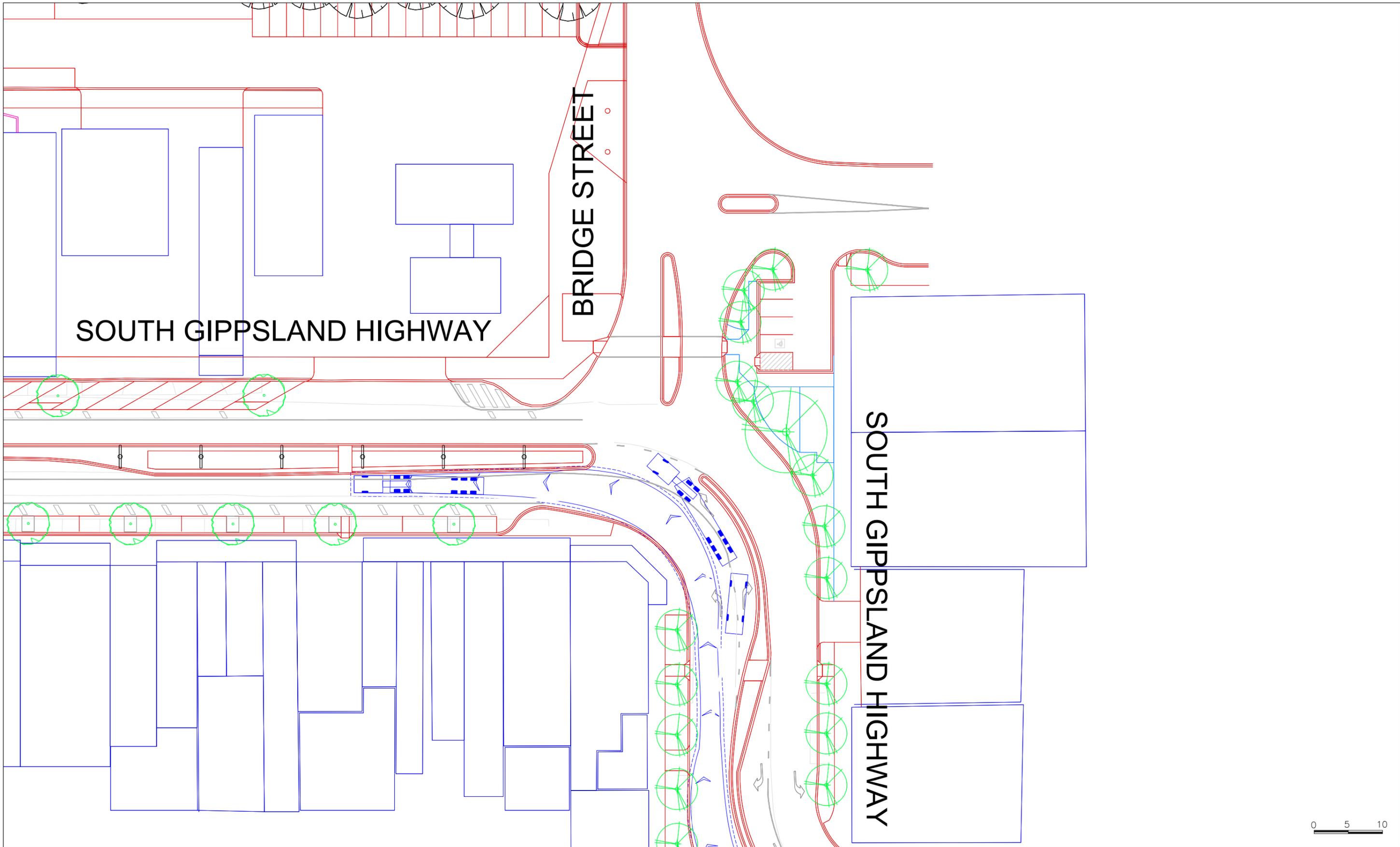
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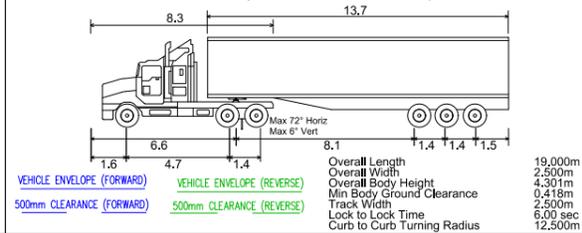




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Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
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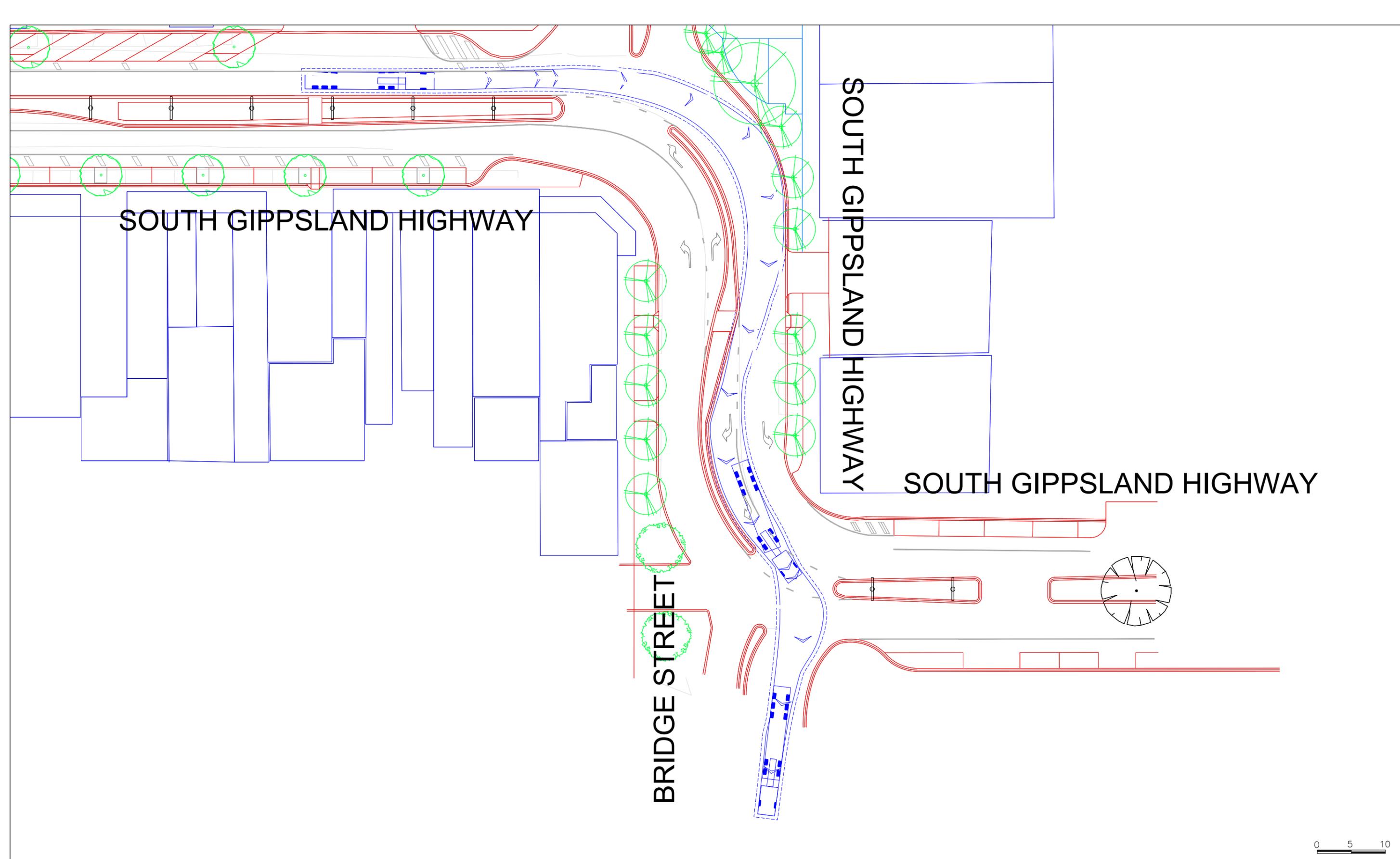
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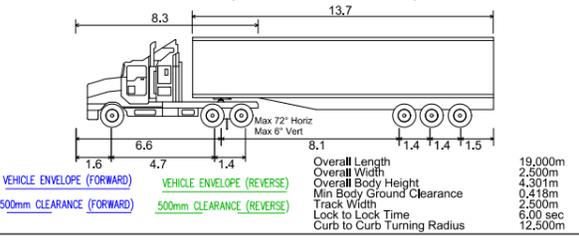




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 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

AV - Articulated Vehicle (AS/NZS2890.2:2002)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

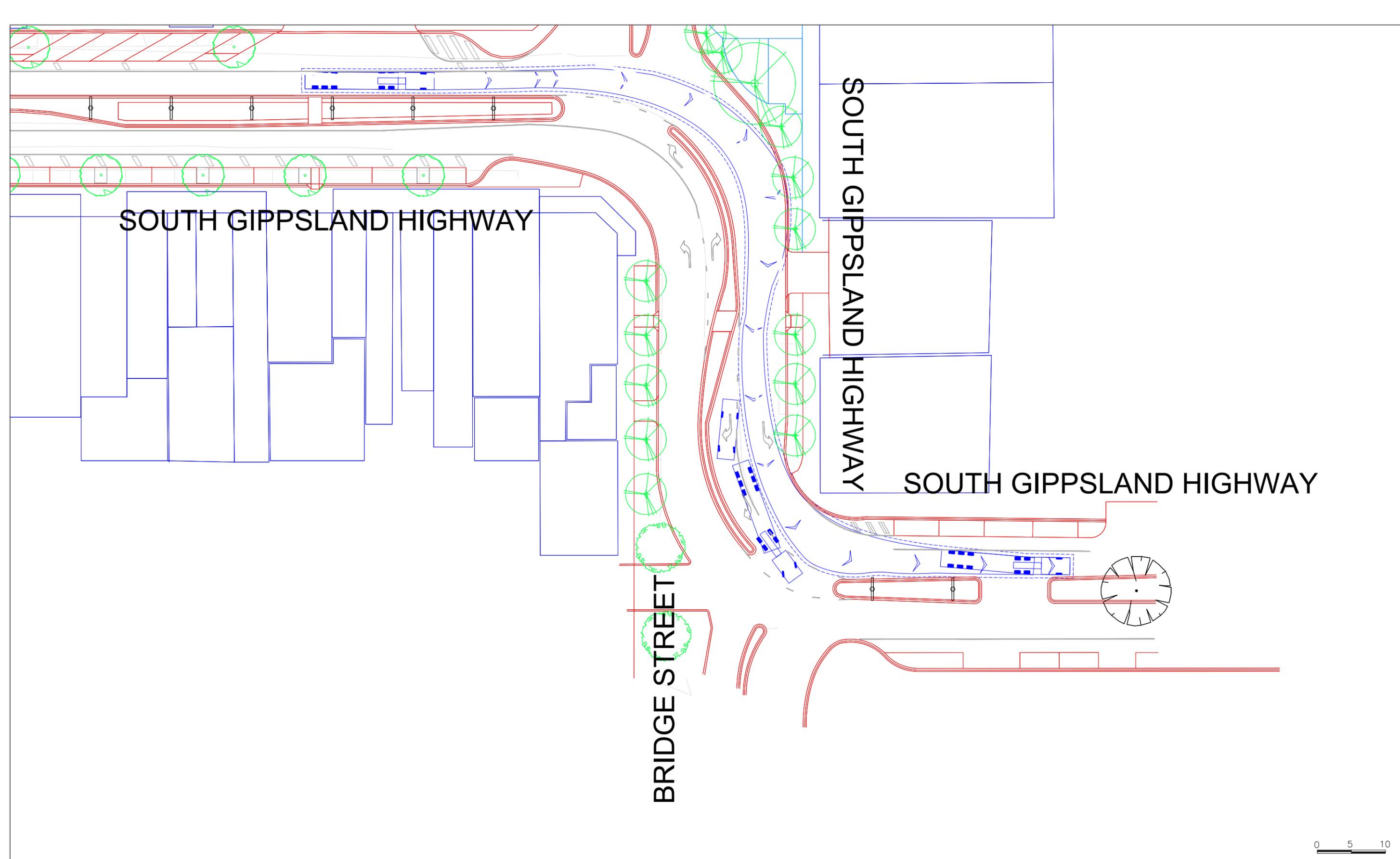
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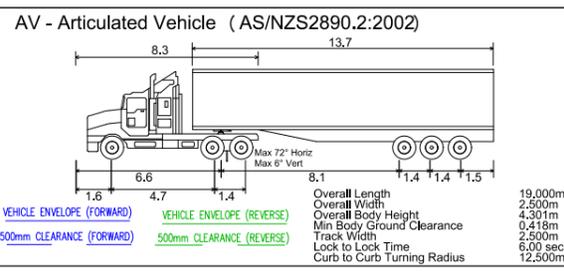
DATE  
 25/02/2016





**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

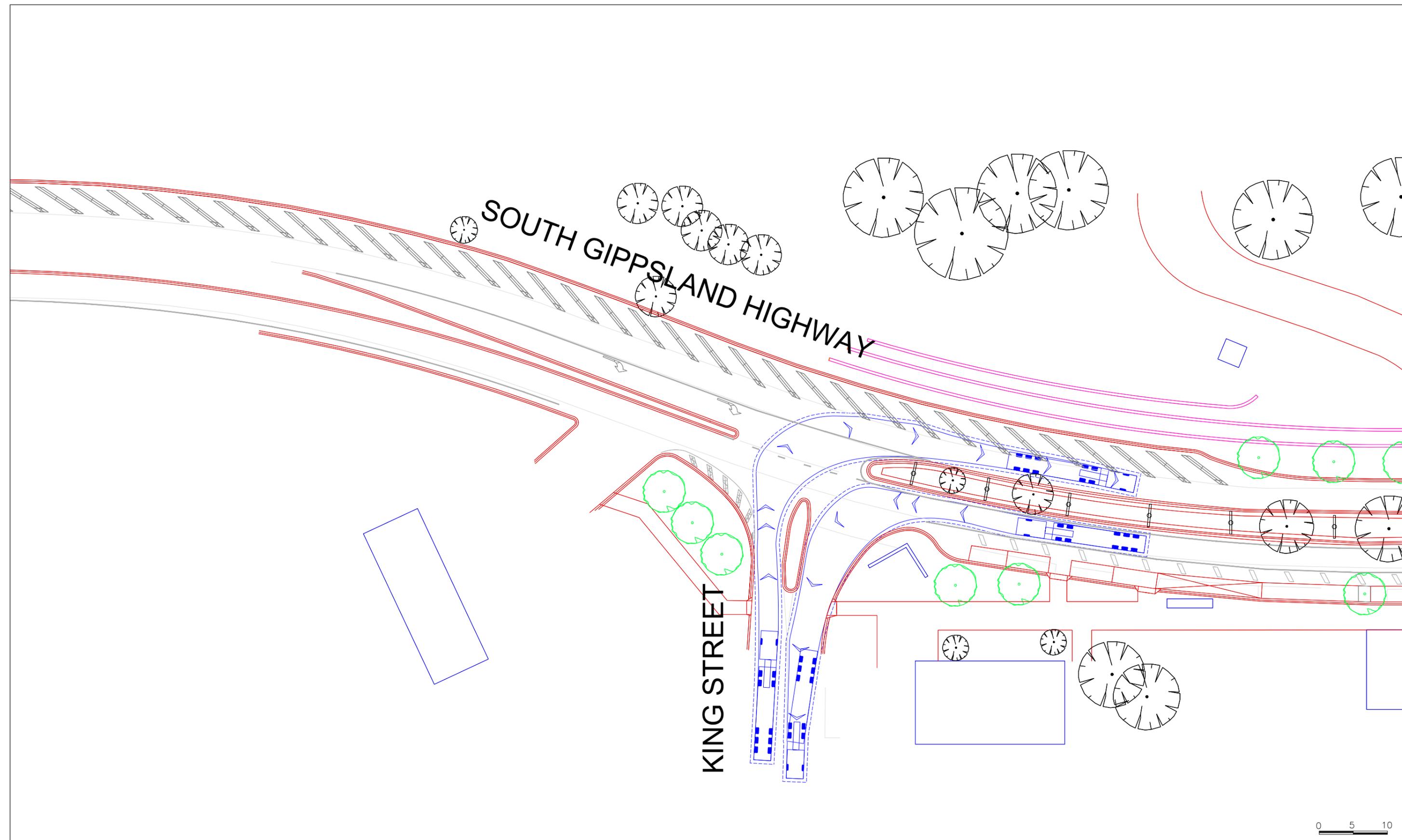
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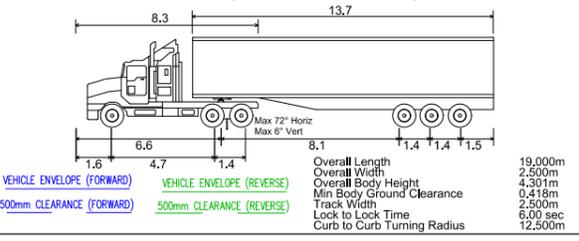




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

AV - Articulated Vehicle (AS/NZS2890.2:2002)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

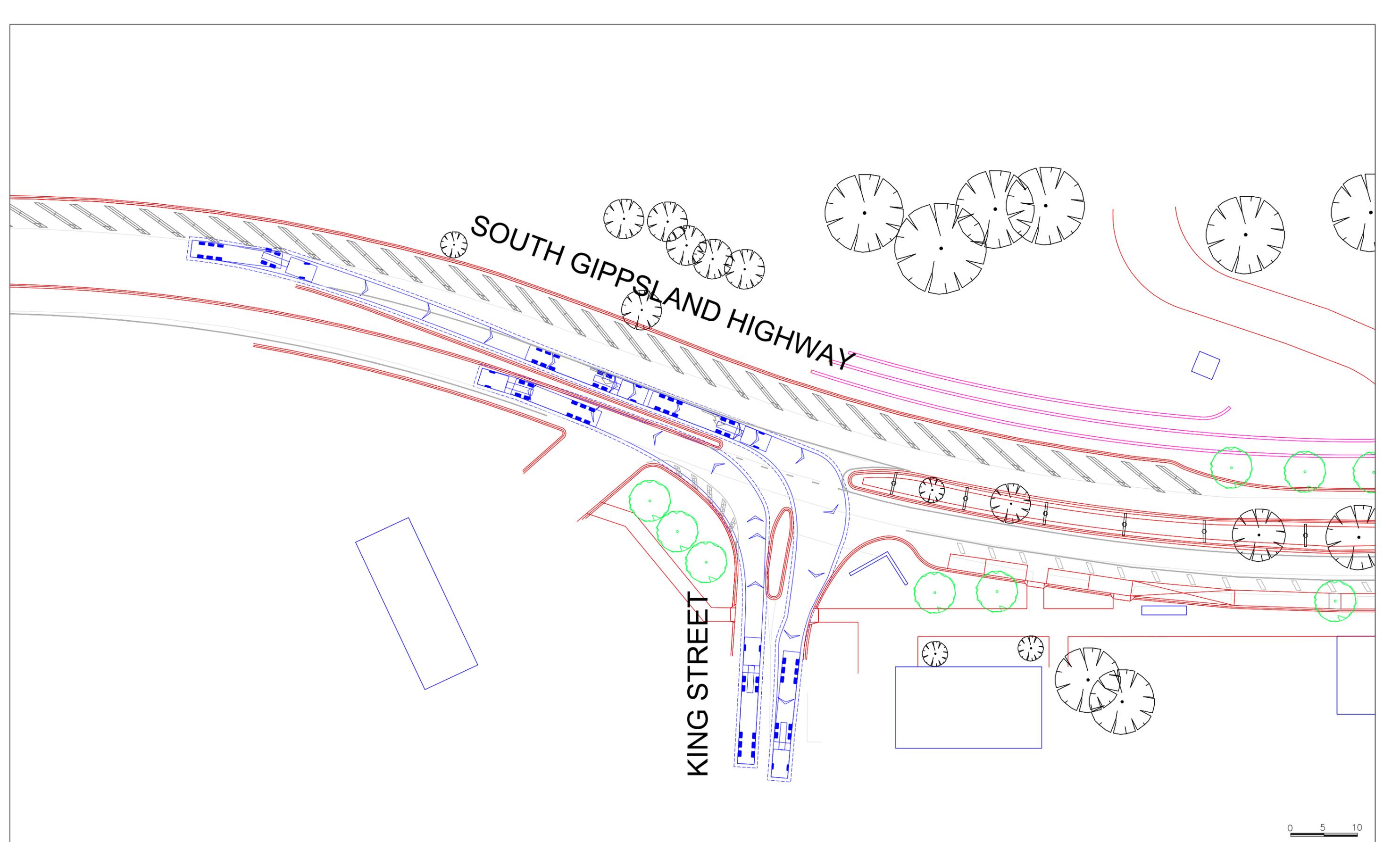
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DATE  
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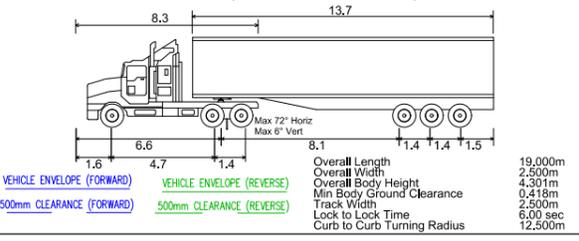




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

AV - Articulated Vehicle (AS/NZS2890.2:2002)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

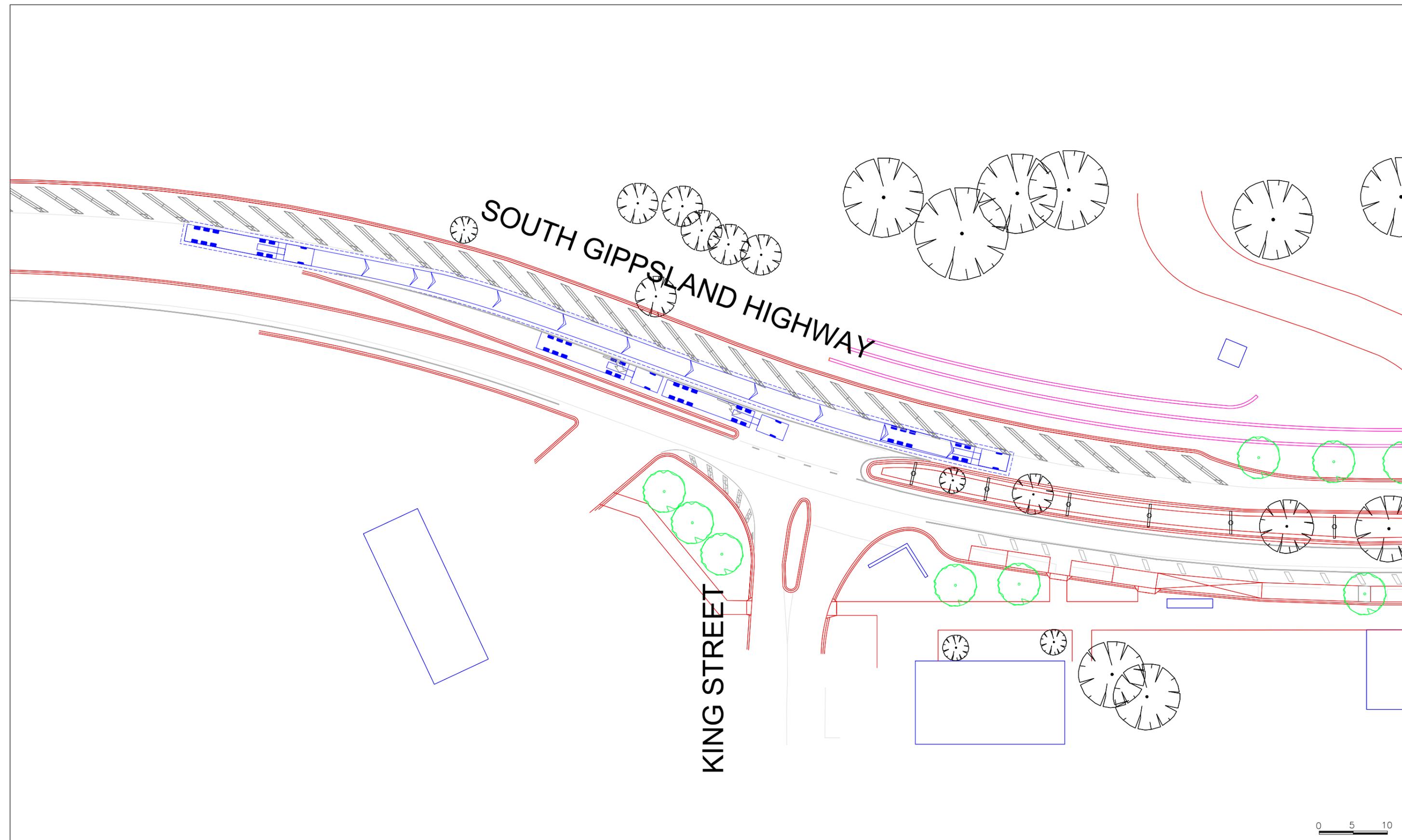
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DATE  
 25/02/2016

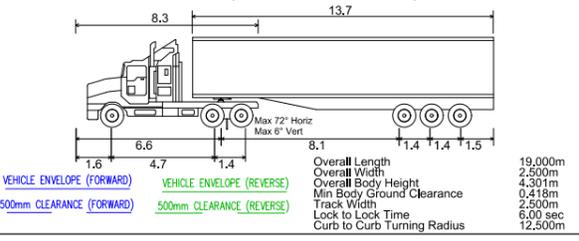




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

AV - Articulated Vehicle (AS/NZS2890.2:2002)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

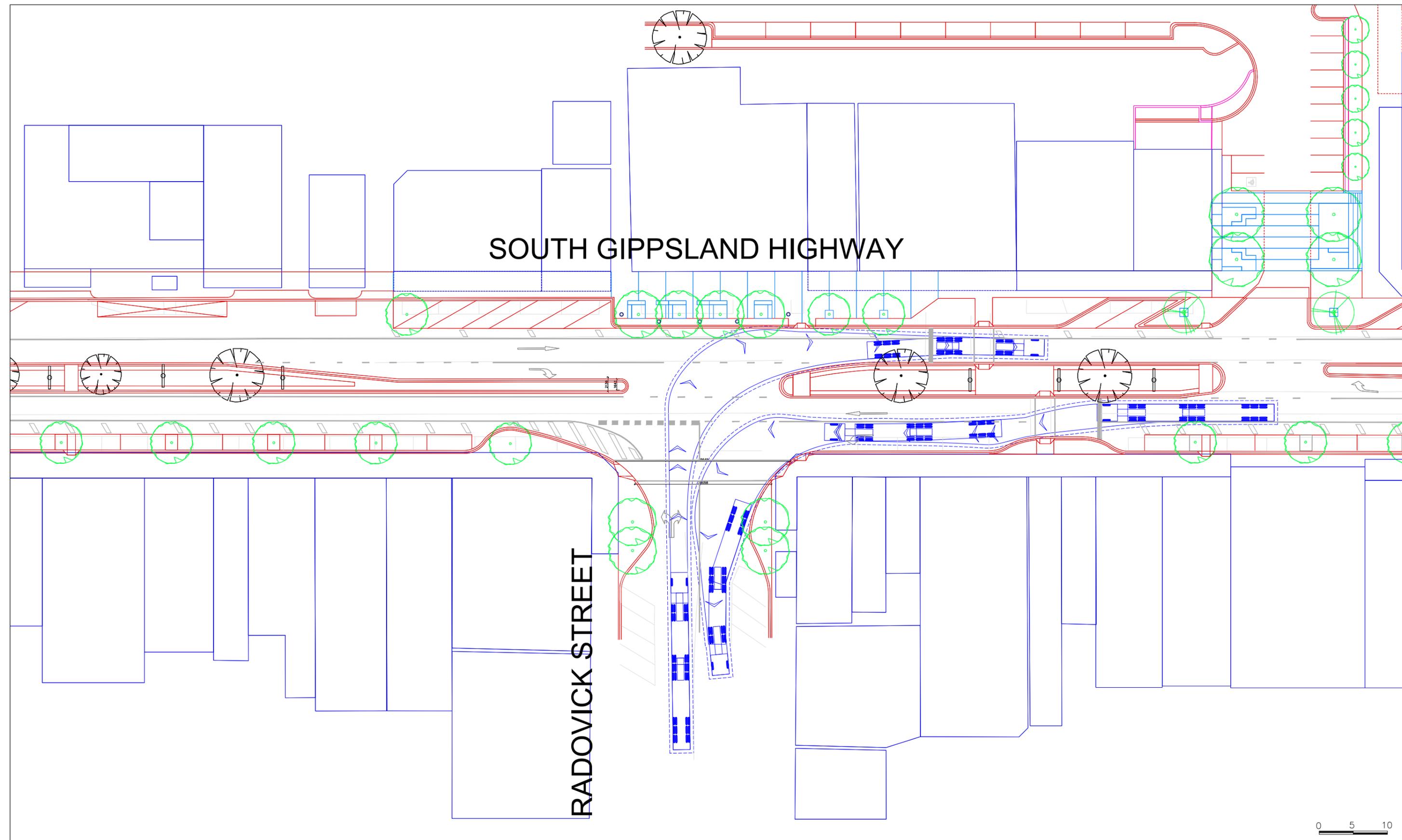
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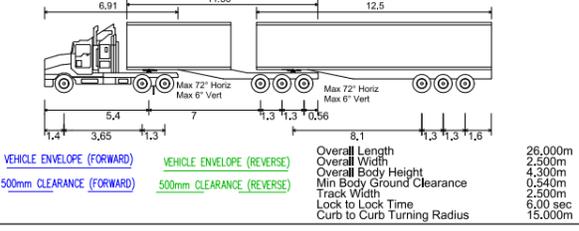




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

26M B-DOUBLE (Austroads 2006)



Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

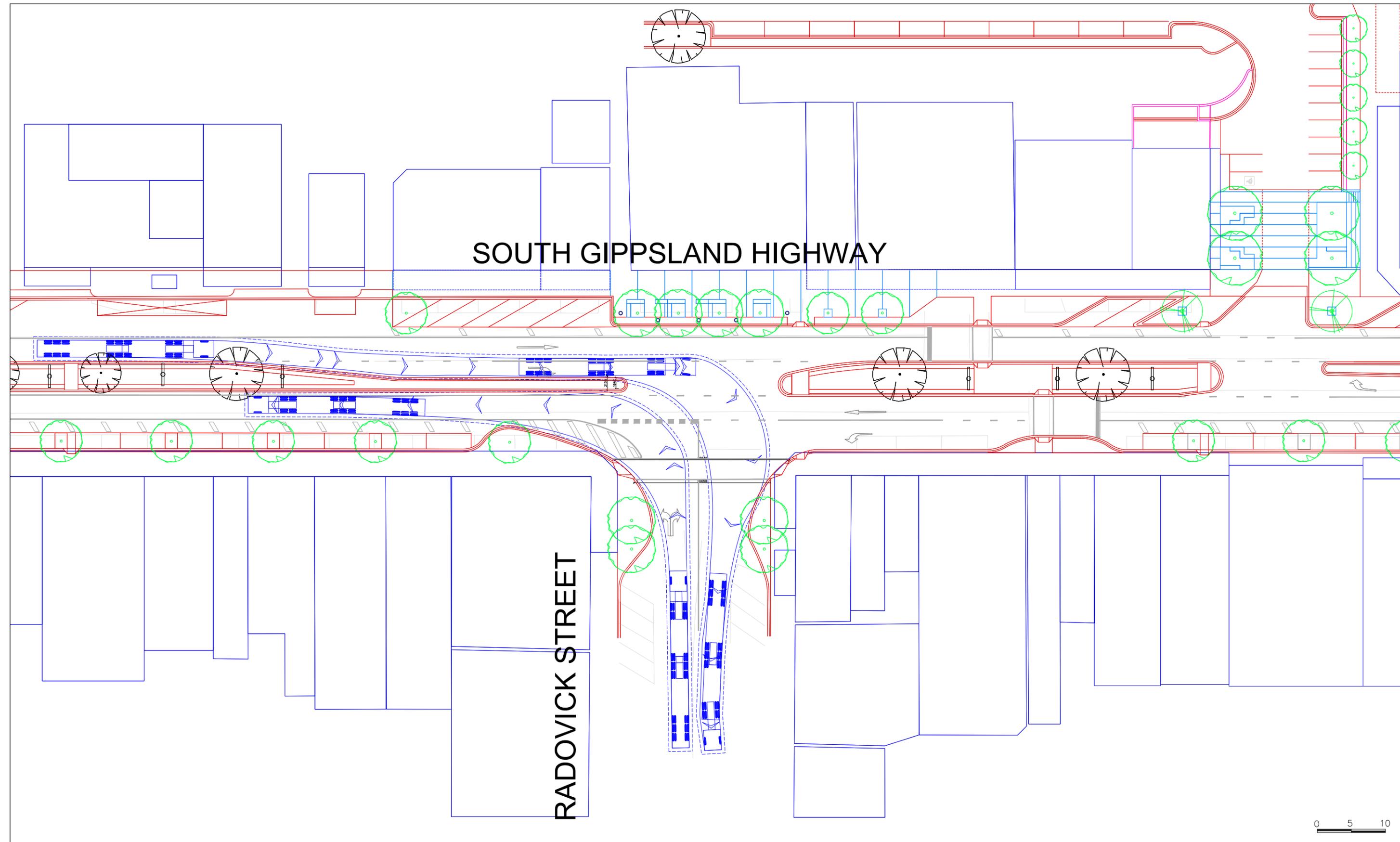
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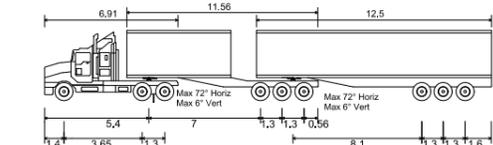




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

26M B-DOUBLE (Austroads 2006)



Overall Length 26.000m  
 Overall Width 2.500m  
 Overall Body Height 4.300m  
 Min Body Ground Clearance 0.540m  
 Track Width 2.500m  
 Lock to Lock Time 6.00 sec  
 Curb to Curb Turning Radius 15.000m

26.000m  
 2.500m  
 4.300m  
 0.540m  
 2.500m  
 6.00 sec  
 15.000m

Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

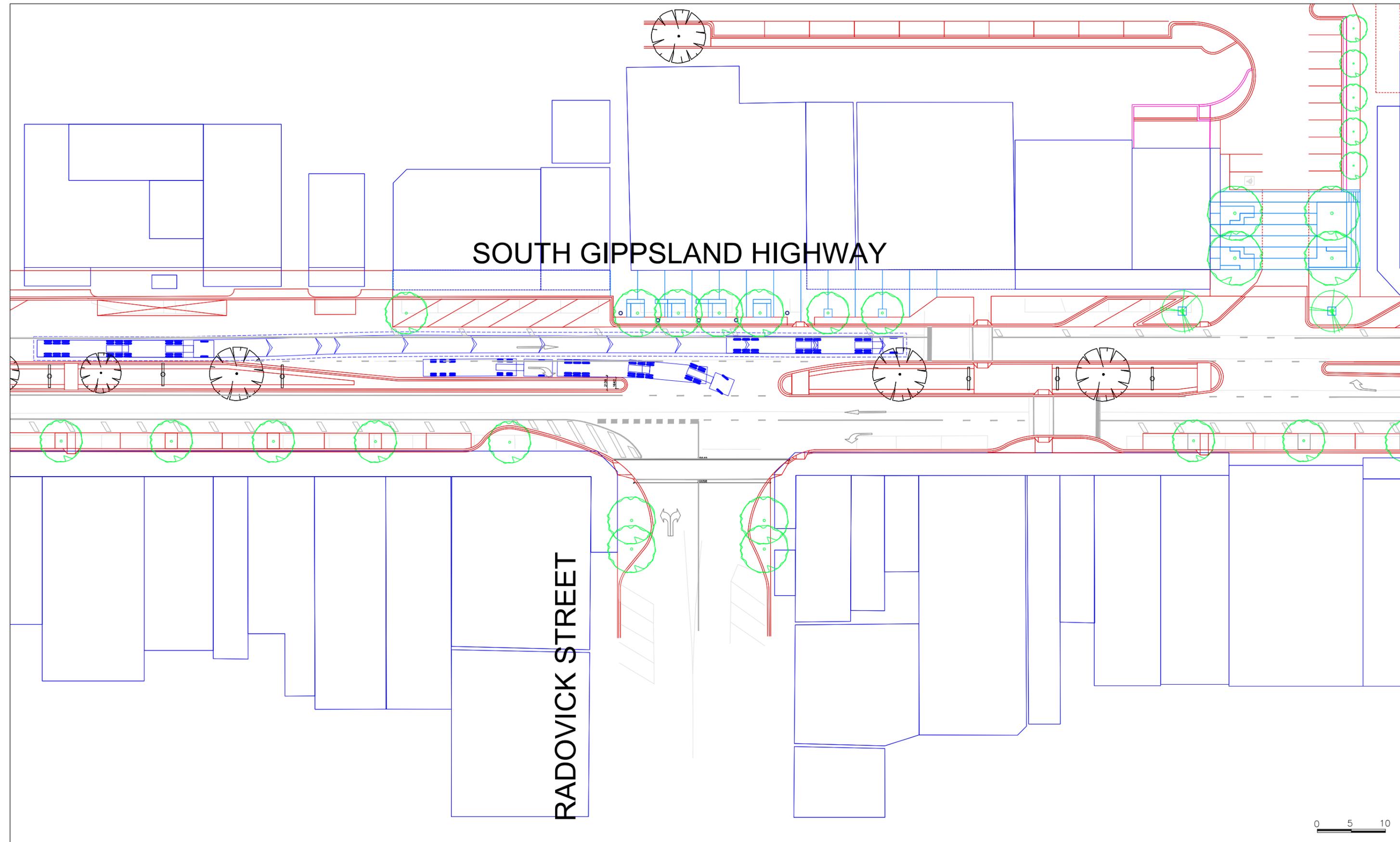
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DATE  
 25/02/2016

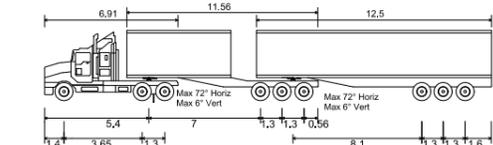




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

26M B-DOUBLE (Austroads 2006)



Overall Length 26.000m  
 Overall Width 2.500m  
 Overall Body Height 4.300m  
 Min Body Ground Clearance 0.540m  
 Track Width 2.500m  
 Lock to Lock Time 6.00 sec  
 Curb to Curb Turning Radius 15.000m

26.000m  
 2.500m  
 4.300m  
 0.540m  
 2.500m  
 6.00 sec  
 15.000m

Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

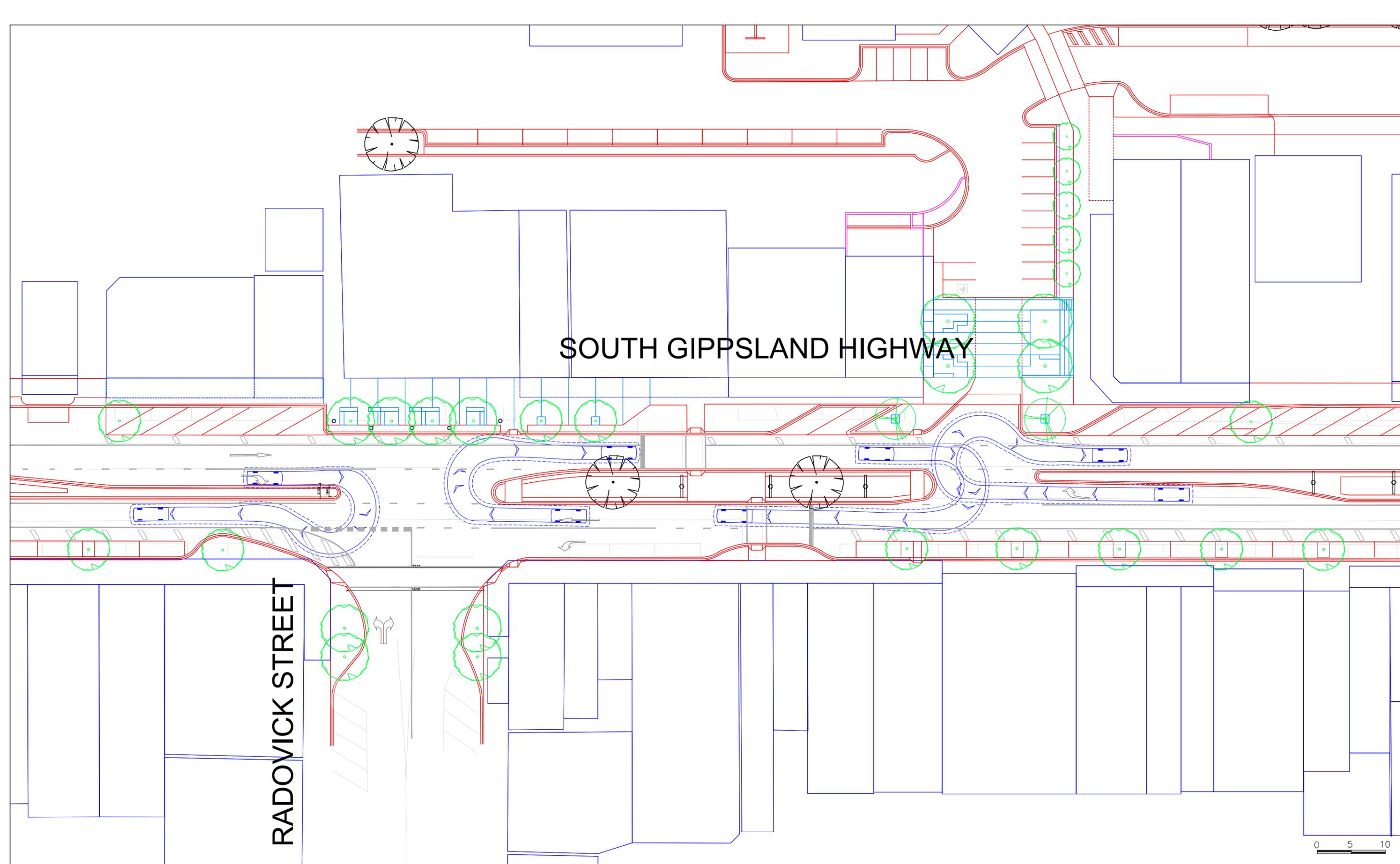
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DATE  
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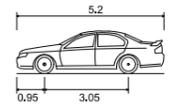




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

B99 Vehicle (AS/NZS2890.1:2004)



Overall Length 5.200m  
 Overall Width 1.940m  
 Overall Body Height 2.200m  
 Min Body Ground Clearance 0.312m  
 Track Width 1.840m  
 Lock to Lock Time 4.00 sec  
 Curb to Curb Turning Radius 6.250m

VEHICLE ENVELOPE (FORWARD)  
 300mm CLEARANCE (FORWARD)  
 VEHICLE ENVELOPE (REVERSE)  
 300mm CLEARANCE (REVERSE)

Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

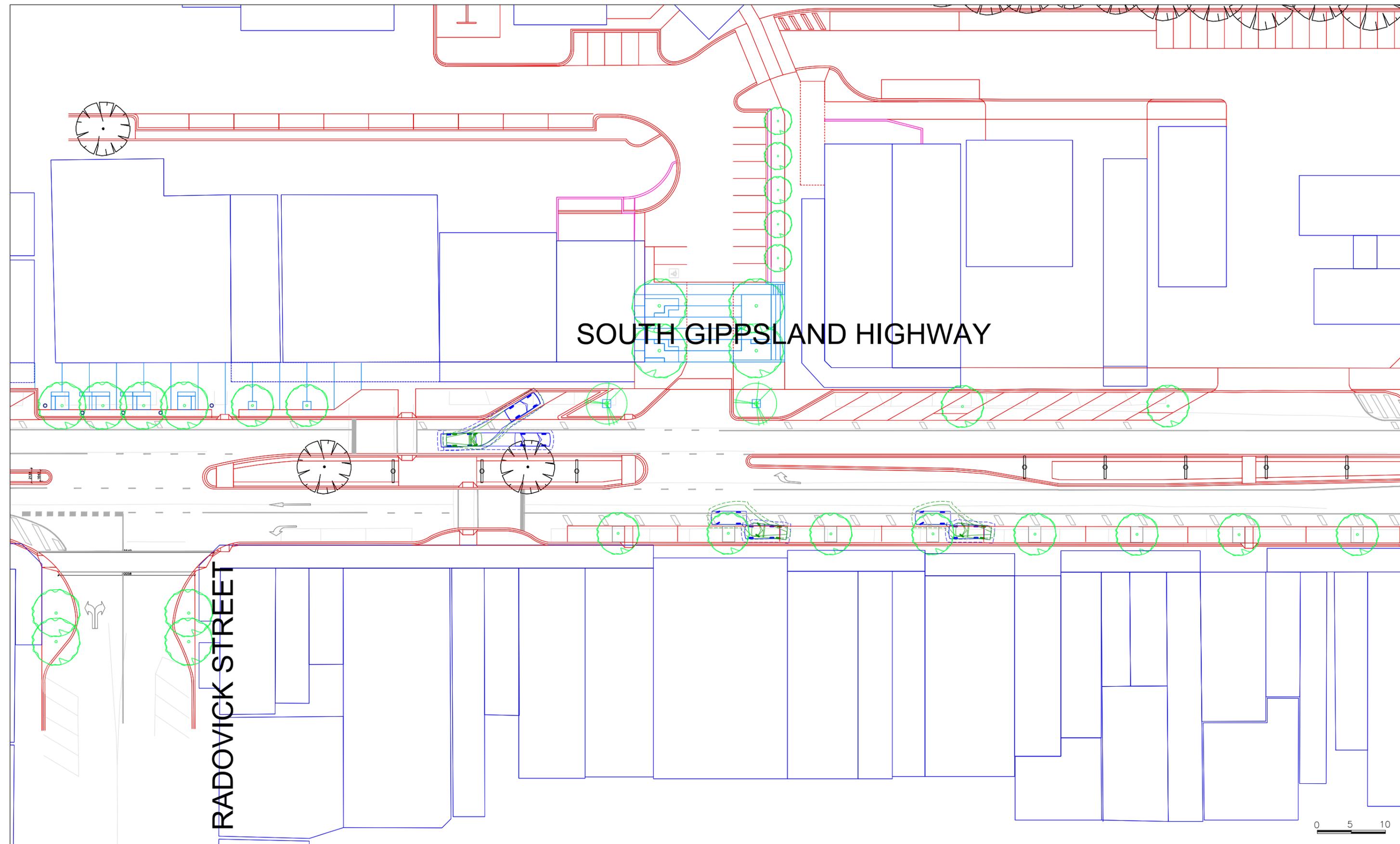
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DATE  
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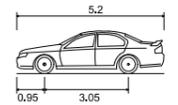




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

B99 Vehicle (AS/NZS2890.1:2004)



Overall Length 5.200m  
 Overall Width 1.940m  
 Overall Body Height 2.200m  
 Min Body Ground Clearance 0.312m  
 Track Width 1.840m  
 Lock to Lock Time 4.00 sec  
 Curb to Curb Turning Radius 6.250m

VEHICLE ENVELOPE (FORWARD)  
 300mm CLEARANCE (FORWARD)  
 VEHICLE ENVELOPE (REVERSE)  
 300mm CLEARANCE (REVERSE)

Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

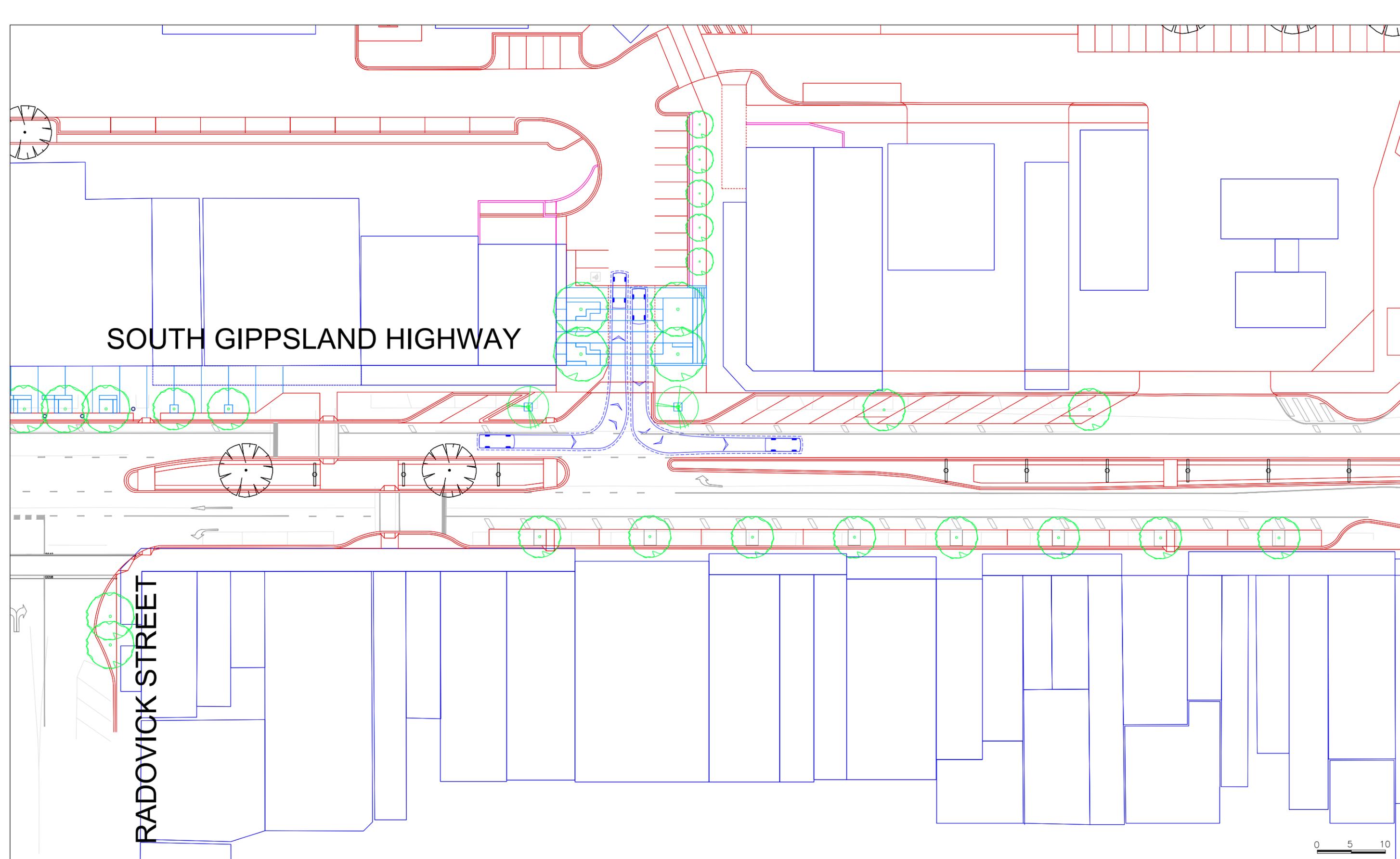
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SCALE  
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DATE  
 25/02/2016





SOUTH GIPPSLAND HIGHWAY

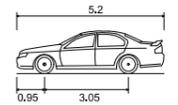
RADOVICK STREET



**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

B99 Vehicle (AS/NZS2890.1:2004)



Overall Length 5.200m  
 Overall Width 1.940m  
 Overall Body Height 2.200m  
 Min Body Ground Clearance 0.312m  
 Track Width 1.840m  
 Lock to Lock Time 4.00 sec  
 Curb to Curb Turning Radius 6.250m

VEHICLE ENVELOPE (FORWARD)  
 300mm CLEARANCE (FORWARD)  
 VEHICLE ENVELOPE (REVERSE)  
 300mm CLEARANCE (REVERSE)

Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

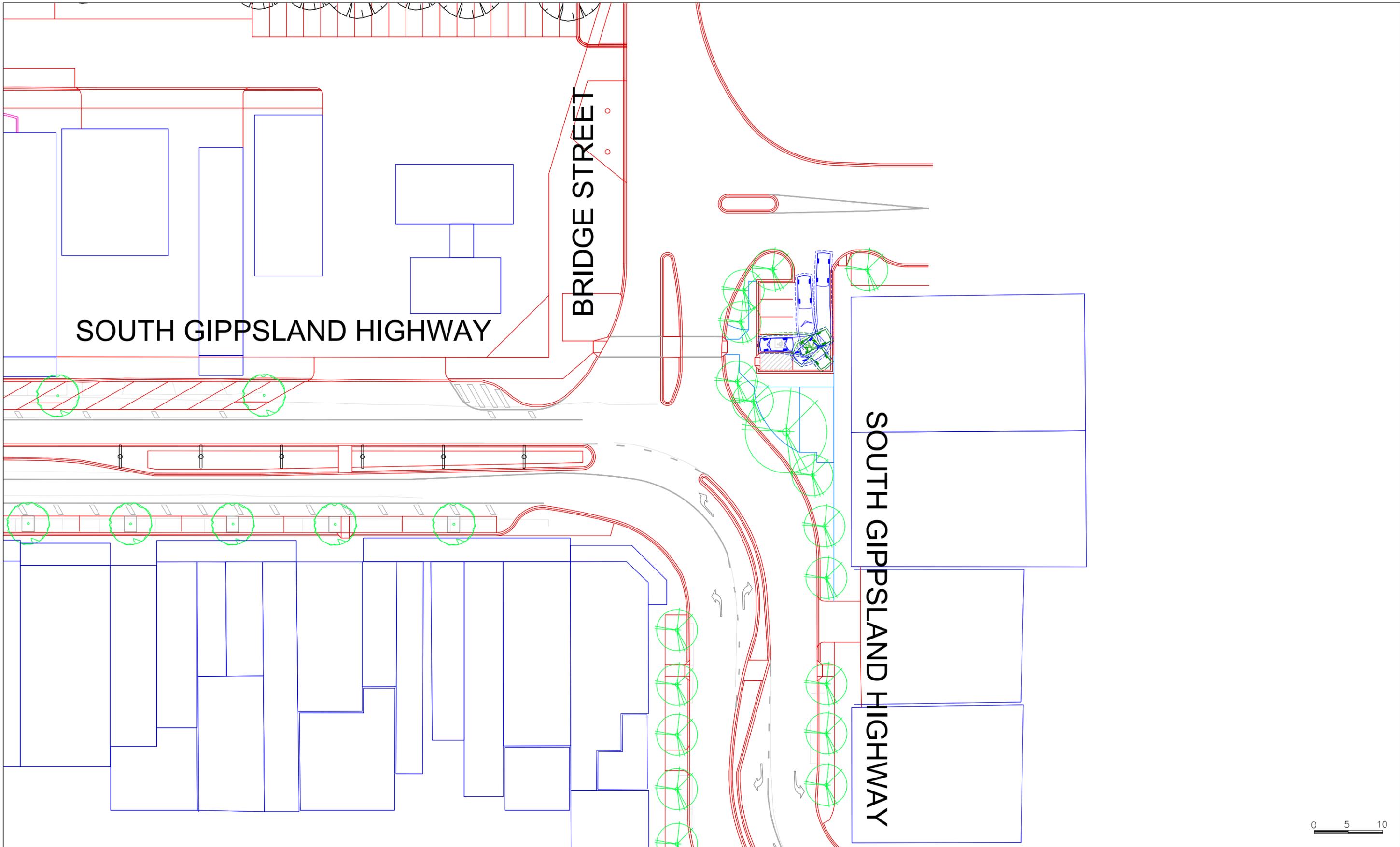
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DATE  
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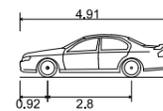




**ratio:**

RATIO CONSULTANTS PTY LTD  
 ABN 005 422 104  
 9 CLIFTON STREET  
 RICHMOND, VICTORIA 3121  
 TELEPHONE (03) 9429 3111  
 FACSIMILE (03) 9429 3011

B85 Vehicle (AS/NZS2890.1:2004)



Overall Length 4.910m  
 Overall Width 1.870m  
 Overall Body Height 1.421m  
 Min Body Ground Clearance 0.159m  
 Track Width 1.770m  
 Lock to Lock Time 4.00 sec  
 Curb to Curb Turning Radius 5.750m

VEHICLE ENVELOPE (FORWARD)  
 300mm CLEARANCE (FORWARD)  
 VEHICLE ENVELOPE (REVERSE)  
 300mm CLEARANCE (REVERSE)

Korumburra Township  
 Streetscape Masterplan  
 Swept Path Assessment

NOTE:  
 1) Base Plan Supplied by Hansen Partnership on 25/02/2016

RATIO REFERENCE  
 12745 AT06/FK

SHEET No.  
 A3 AT(16)

SCALE  
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DATE  
 25/02/2016



# Appendix E: Existing Conditions SIDRA:

# MOVEMENT SUMMARY

## Site: Commercial St / Radovick St - AM Peak 2026 volumes FCRT

Commercial St / Radovick St

Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m		per veh	km/h
SouthEast: Commercial Street South-east approach											
21	L2	154	4.6	0.225	17.2	LOS B	2.6	18.9	0.71	0.74	45.7
22	T1	439	8.3	0.644	14.3	LOS B	9.3	69.7	0.88	0.77	48.5
23u	U	7	0.0	0.644	21.0	LOS C	9.3	69.7	0.88	0.77	47.1
Approach		600	7.3	0.644	15.1	LOS B	9.3	69.7	0.83	0.76	47.7
NorthWest: Commercial Street North-west approach											
28	T1	485	7.1	0.416	5.3	LOS A	6.1	45.4	0.55	0.48	55.2
29	R2	81	10.3	0.432	29.7	LOS C	2.2	16.5	0.97	0.76	39.2
29u	U	6	16.7	0.432	31.0	LOS C	2.2	16.5	0.97	0.76	38.9
Approach		573	7.7	0.432	9.0	LOS A	6.1	45.4	0.61	0.52	51.9
SouthWest: Radovick Street South-West Approach											
30	L2	73	1.9	0.664	30.0	LOS C	4.6	32.9	1.00	0.86	39.4
32	R2	107	1.4	0.664	30.0	LOS C	4.6	32.9	1.00	0.86	39.4
32u	U	1	0.0	0.664	31.2	LOS C	4.6	32.9	1.00	0.86	39.2
Approach		181	1.6	0.664	30.0	LOS C	4.6	32.9	1.00	0.86	39.4
All Vehicles		1354	6.7	0.664	14.5	LOS B	9.3	69.7	0.76	0.67	48.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
		ped/h	sec		Pedestrian ped	Distance m		per ped
P5	SouthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P7	NorthWest Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P8	SouthWest Full Crossing	53	15.2	LOS B	0.1	0.1	0.78	0.78
All Pedestrians		158	18.0	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: Y:\12501 - 13000\12745 - Korumburra Township Streetscape (Korumburra Streetscape Master Plan)\SIDRA\12745 SID\_02.sip6

# MOVEMENT SUMMARY

## Site: Commercial St / Radovick St - PM Peak 2026 volumes FCRT

Commercial St / Radovick St - AM Peak

Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
SouthEast: Commercial Street South-east approach											
21	L2	176	4.6	0.244	16.6	LOS B	2.9	21.2	0.70	0.75	46.0
22	T1	604	8.3	0.839	21.3	LOS C	16.8	125.8	0.97	1.02	44.4
23u	U	7	0.0	0.839	28.0	LOS C	16.8	125.8	0.97	1.02	43.2
Approach		787	7.4	0.839	20.3	LOS C	16.8	125.8	0.91	0.96	44.7
NorthWest: Commercial Street North-west approach											
28	T1	647	7.1	0.537	5.4	LOS A	8.8	65.0	0.59	0.53	55.1
29	R2	76	10.3	0.407	29.6	LOS C	2.0	15.5	0.96	0.76	39.2
29u	U	6	16.7	0.407	30.9	LOS C	2.0	15.5	0.96	0.76	39.0
Approach		729	7.5	0.537	8.1	LOS A	8.8	65.0	0.63	0.55	52.7
SouthWest: Radovick Street South-West Approach											
30	L2	73	1.9	0.775	32.9	LOS C	5.0	35.2	1.00	0.93	38.2
32	R2	107	1.4	0.775	32.9	LOS C	5.0	35.2	1.00	0.93	38.2
32u	U	1	0.0	0.775	34.0	LOS C	5.0	35.2	1.00	0.93	38.0
Approach		181	1.6	0.775	32.9	LOS C	5.0	35.2	1.00	0.93	38.2
All Vehicles		1698	6.8	0.839	16.4	LOS B	16.8	125.8	0.80	0.78	46.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue	Prop. Queued	Effective Stop Rate		
		ped/h	sec		Pedestrian ped	Distance m	per ped		
P5	SouthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88		
P7	NorthWest Full Crossing	53	19.4	LOS B	0.1	0.1	0.88		
P8	SouthWest Full Crossing	53	14.5	LOS B	0.1	0.1	0.76		
All Pedestrians		158	17.8	LOS B			0.84		

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: Y:\12501 - 13000\12745 - Korumburra Township Streetscape (Korumburra Streetscape Master Plan)\SIDRA\12745 SID\_02.sip6

# Appendix F: Forecast Conditions SIDRA:



# MOVEMENT SUMMARY

## Site: Commercial St / Radovick St - AM Peak 2026 volumes FCRT

Commercial St / Radovick St

Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m		per veh	km/h
SouthEast: Commercial Street South-east approach											
21	L2	154	4.6	0.225	17.2	LOS B	2.6	18.9	0.71	0.74	45.7
22	T1	439	8.3	0.644	14.3	LOS B	9.3	69.7	0.88	0.77	48.5
23u	U	7	0.0	0.644	21.0	LOS C	9.3	69.7	0.88	0.77	47.1
Approach		600	7.3	0.644	15.1	LOS B	9.3	69.7	0.83	0.76	47.7
NorthWest: Commercial Street North-west approach											
28	T1	485	7.1	0.416	5.3	LOS A	6.1	45.4	0.55	0.48	55.2
29	R2	81	10.3	0.432	29.7	LOS C	2.2	16.5	0.97	0.76	39.2
29u	U	6	16.7	0.432	31.0	LOS C	2.2	16.5	0.97	0.76	38.9
Approach		573	7.7	0.432	9.0	LOS A	6.1	45.4	0.61	0.52	51.9
SouthWest: Radovick Street South-West Approach											
30	L2	73	1.9	0.664	30.0	LOS C	4.6	32.9	1.00	0.86	39.4
32	R2	107	1.4	0.664	30.0	LOS C	4.6	32.9	1.00	0.86	39.4
32u	U	1	0.0	0.664	31.2	LOS C	4.6	32.9	1.00	0.86	39.2
Approach		181	1.6	0.664	30.0	LOS C	4.6	32.9	1.00	0.86	39.4
All Vehicles		1354	6.7	0.664	14.5	LOS B	9.3	69.7	0.76	0.67	48.0

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue		Prop. Queued	Effective Stop Rate
		ped/h	sec		Pedestrian ped	Distance m		per ped
P5	SouthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P7	NorthWest Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P8	SouthWest Full Crossing	53	15.2	LOS B	0.1	0.1	0.78	0.78
All Pedestrians		158	18.0	LOS B			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Organisation: RATIO CONSULTANTS PTY LTD | Processed: Thursday, 8 October 2015 10:53:33 AM

Project: Y:\12501 - 13000\12745 - Korumburra Township Streetscape (Korumburra Streetscape Master Plan)\SIDRA\12745 SID\_02.sip6

# MOVEMENT SUMMARY

## Site: Commercial St / Radovick St - PM Peak 2026 volumes FCRT

Commercial St / Radovick St - AM Peak

Signals - Fixed Time Isolated Cycle Time = 50 seconds (Practical Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	m		per veh	km/h
SouthEast: Commercial Street South-east approach											
21	L2	176	4.6	0.244	16.6	LOS B	2.9	21.2	0.70	0.75	46.0
22	T1	604	8.3	0.839	21.3	LOS C	16.8	125.8	0.97	1.02	44.4
23u	U	7	0.0	0.839	28.0	LOS C	16.8	125.8	0.97	1.02	43.2
Approach		787	7.4	0.839	20.3	LOS C	16.8	125.8	0.91	0.96	44.7
NorthWest: Commercial Street North-west approach											
28	T1	647	7.1	0.537	5.4	LOS A	8.8	65.0	0.59	0.53	55.1
29	R2	76	10.3	0.407	29.6	LOS C	2.0	15.5	0.96	0.76	39.2
29u	U	6	16.7	0.407	30.9	LOS C	2.0	15.5	0.96	0.76	39.0
Approach		729	7.5	0.537	8.1	LOS A	8.8	65.0	0.63	0.55	52.7
SouthWest: Radovick Street South-West Approach											
30	L2	73	1.9	0.775	32.9	LOS C	5.0	35.2	1.00	0.93	38.2
32	R2	107	1.4	0.775	32.9	LOS C	5.0	35.2	1.00	0.93	38.2
32u	U	1	0.0	0.775	34.0	LOS C	5.0	35.2	1.00	0.93	38.0
Approach		181	1.6	0.775	32.9	LOS C	5.0	35.2	1.00	0.93	38.2
All Vehicles		1698	6.8	0.839	16.4	LOS B	16.8	125.8	0.80	0.78	46.9

Level of Service (LOS) Method: Delay (HCM 2000).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue	Queue Distance	Prop. Queued	Effective Stop Rate	
		ped/h	sec		Pedestrian ped	m		per ped	
P5	SouthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88	
P7	NorthWest Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88	
P8	SouthWest Full Crossing	53	14.5	LOS B	0.1	0.1	0.76	0.76	
All Pedestrians		158	17.8	LOS B			0.84	0.84	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

**r:**

**ratio:**