Report Prepared for
Pace Development Group Pty Ltd

ratio:

traffic:impact

Proposed Mixed Use Development

160 Whitehorse Road, Blackburn

23 May 2019

r:

ratio:consultants

8 Gwynne Street
Cremorne VIC 3121
ABN 93 983 380 225

Prepared for:

Pace Development Group Pty Ltd
Our reference 15814T-REP03-F01

Date	Reason for Issue	Prepared By	Checked By
23/05/19	Draft	Soumil Naik & James McKenzie	Russell Fairlie
23/05/19	Final	Soumil Naik & James McKenzie	Russell Fairlie

Directory Path	Y:\15501-16000\15814T - 160 Whitehorse Road, Blackburn\Work\Reports\15814T-REP03-F01.docx

Table of contents:

1 Introduction:

Ratio Consultants was commissioned by Pace Development Group Pty Ltd to assess the traffic and parking implications of the proposed amendment to the existing Planning Permit (WH/2017/277) for the mixed-use development at 160 Whitehorse Road, Blackburn. More specifically, the amended development comprises the following:

— 187 apartments, comprising:
  - 53 x one-bedroom apartments;
  - 122 x two-bedroom apartments; and
  - 12 x three-bedroom apartments.
— A combined total of 11,798 sqm of office space spread across six levels.
— A total of 13 retail tenancies, with a combined floor area of approximately 2,323 sqm spread across two levels.
— A 1,686 sqm supermarket located on Basement Level 1.
— A total of 725 car parking spaces (including six DDA spaces) within five levels of basement car parking, accessed via Railway Road.
— A total of 215 bicycle parking spaces spread across three basement levels and the ground floor level.
— A total of 12 motorbike parking spaces are provided within the basement car park.
— Vehicle access to the site will be provided via a new double-width crossover connecting to/from Railway Road. All other existing crossovers to Railway Road and Whitehorse Road will be reinstated with kerb, channel and nature strip to the satisfaction of the Responsible Authority.
— Vehicle access to the ground floor loading bay will be provided via a new double-width crossover connecting to/from Railway Road.

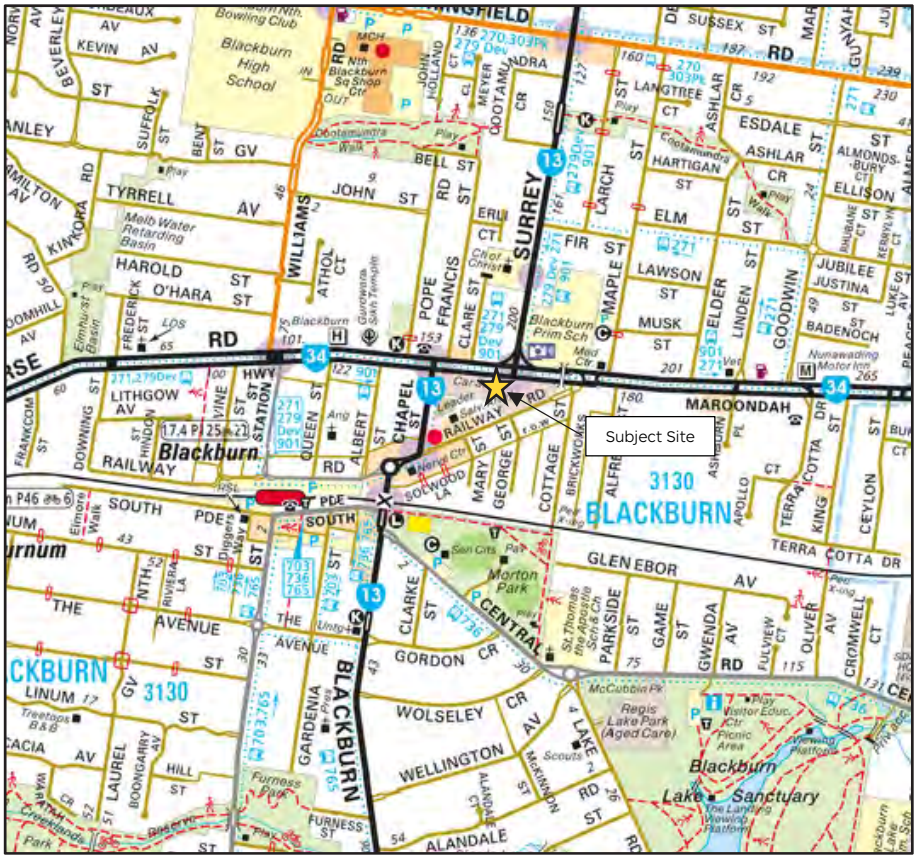
This report has been prepared to address the traffic and parking needs of the proposal and is based on surveys and observations in the vicinity of the site and on previous studies of similar developments elsewhere in Melbourne.

2.1 Location and Environment

The site of the proposed mixed-use development is located on the southern side of Whitehorse Road, between Railway Road and Chapel Street, in Blackburn.

The location of the site relative to the surrounding road network is shown in Figure 2.1 below:

Figure 2.1: Site Location & Surrounds



The subject site is irregular in shape and comprises a frontage to both Whitehorse Road and Railway Road. The overall site at 160 Whitehorse Road has a total area of approximately 8,767 sqm.

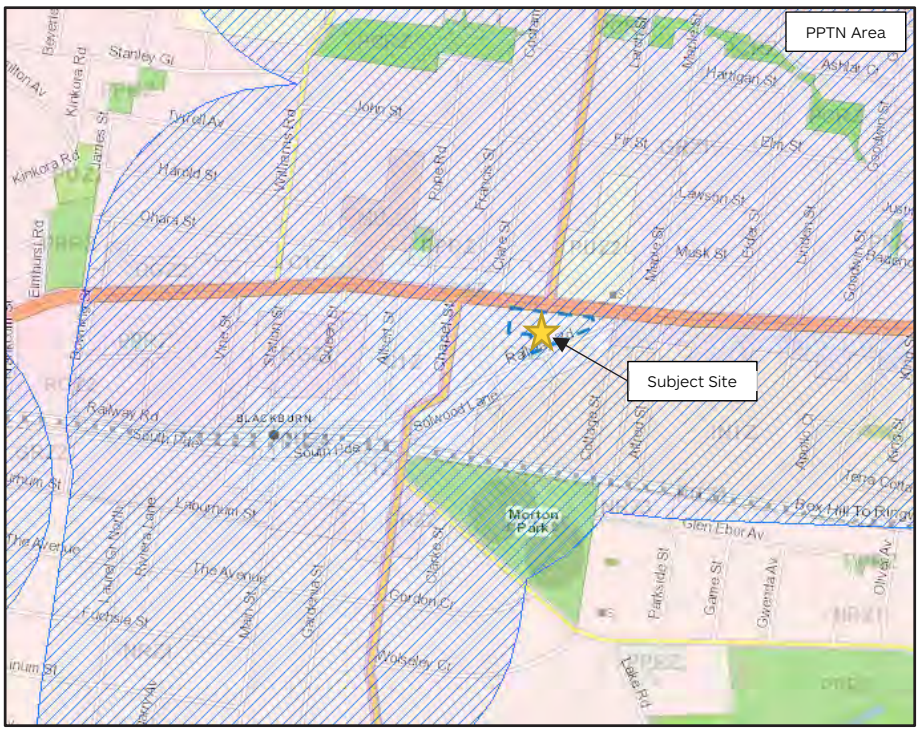
Figure 2.2 shows an aerial view of the overall site.

Figure 2.2: Aerial view of the surrounding road netowrk

The subject site is currently occupied by a car storage yard, a private car park and a vacant lot. The site is located in a Commercial 1 Zone (C1Z), with land in the immediate vicinity of the site being utilised for commercial, residential and light industrial purposes.

The site is also located within the Principle Public Transport Network (PPTN) Area as shown on the PPTN Maps of the State Government of Victoria (July 2018) illustrated in Figure 2.3 below:

Figure 2.3: Principle Public Transport Network Area Map



2.2 Road Network

Whitehorse Road (also known as **Maroondah Highway**) is a VicRoads managed Primary State Arterial Road classified as a Road Zone Category 1 within the Whitehorse Planning Scheme. Whitehorse Road runs in an east-west alignment.

In the vicinity of the subject site, Whitehorse Road has a divided carriageway width of approximately 22.70 metres that accommodates three traffic lanes in each direction separated by a central median. The posted speed limit on Whitehorse Road in the vicinity of the site is 60km/hr, with a 40km/hr speed limit applying during peak school times (8:00am to 9:30am and 2:30pm to 4:00pm).

Railway Road is a Council managed Collector Road that runs in a northeast to southwest alignment. In the vicinity of the subject site, Railway Road has an approximate carriageway width of 12 metres that caters for one traffic lane in each direction along with kerbside parallel parking on both sides of the road.

Railway Road operates with a default speed limit applicable to a built-up area of 50km/hr.

2.3 Traffic Conditions

Traffic Movement Counts

Turning movement count surveys were previously conducted within the area surrounding the subject site as part of the Traffic Evidence Statement prepared by Charmain Dunstan of Traffix Group for a proposed mixed-use development on the subject site (Report Reference No: 23355A#1).

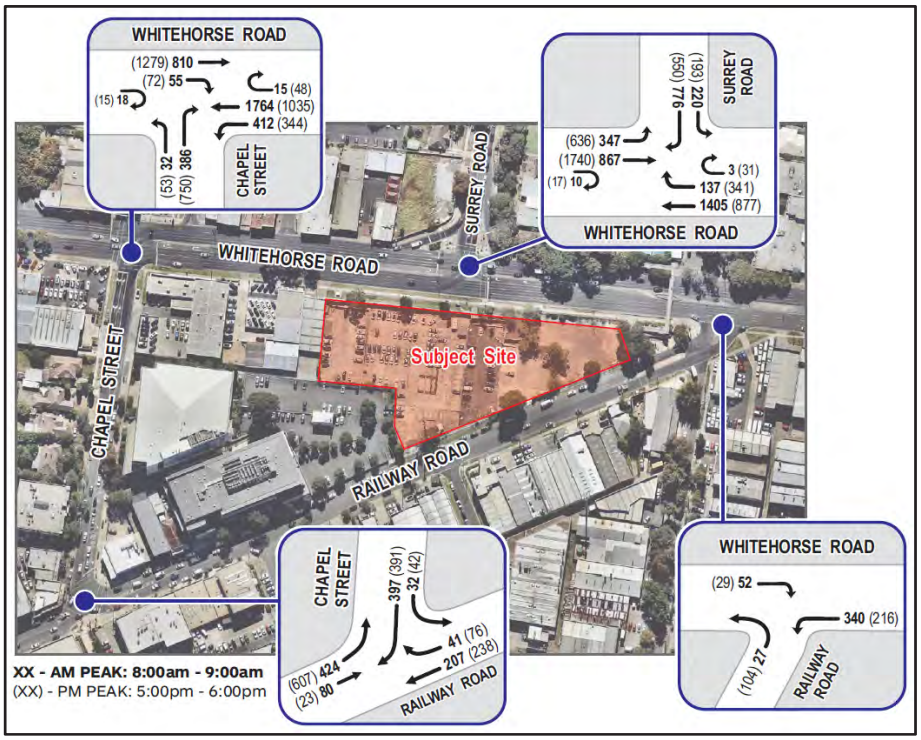
The results of these traffic surveys have been extracted from the Statement to determine the traffic conditions within the vicinity of the subject site.

The surveys were undertaken at the following intersections on Tuesday 9 May 2017 between 7:00am & 9:00am and 5:00pm & 7:00pm:

— Whitehorse Road / Surrey Road;
— Whitehorse Road / Chapel Street;
— Whitehorse Road / Railway Road; and,
— Chapel Street / Railway Road.

The results for the network peak hour for the four intersections are presented in Figure 2.4:

Figure 2.4: Turning Movement Counts – 9 May 2017



Gap Surveys

A gap acceptance analysis was also previously conducted at the nearby priority controlled intersection of Whitehorse Road and Railway Road as part of the Traffic Evidence Statement (23355A#1). The results of the gap acceptance analysis are shown in Table 2.1 below.

Table 2.1: Gap Survey Analysis Results

Movement	Critical Gap / Follow-up Gap	Total Movement Capacity	Existing Volumes
AM Peak Hour			
Left-turn from Railway Road to Whitehorse Road	5 / 3 seconds	326 movements	27 movements
Right-turn from Whitehorse Road to Railway Road	6 / 4 seconds	163 movements	52 movements
PM Peak Hour			
Left-turn from Railway Road to Whitehorse Road	5 / 3 seconds	386 movements	104 movements
Right-turn from Whitehorse Road to Railway Road	6 / 4 seconds	208 movements	29 movements

2.4 Parking Conditions

As part of the Traffic Evidence Statement (23355A#1), parking occupancy surveys were conducted of the on-street parking within the vicinity of the site, at the following times:

— Thursday, 7 September 2017
  - 8:00am, 12:00pm (Noon), 1:00pm, 3:30pm, 5:00pm, 6:00pm 7:00pm and 8:00pm.

— Saturday 9 September 2017
  - 12:00pm (Noon), 1:00pm, 7:00pm and 8:00pm.

The results of these parking surveys have been extracted from the Statement in order to determine the parking supply and demand within the vicinity of the subject site.

Two surveys areas have been analysed, an 'Overall Survey Area' and a 'Reduced Survey Area', with the latter limited to the on-street parking spaces in the immediate vicinity of the subject site along parts of Railway Road, George Street and Cottage Street. The survey area is shown in Figure 2.5.

It is noted that parking spaces with 'P10min' and '1/4P' parking restrictions were considered unsuitable for users of the proposed site and hence were excluded from the results within the analysis.

Figure 2.5: Parking Occupancy Survey Area

In summary, the survey results showed:

Thursday 7 September 2017

— The overall demand for parking throughout the survey area ranged between 30% to 82%.

— The demand for parking peaked at 1:00pm when a total of 87 spaces were recorded to be occupied, representing a parking occupancy level of 82%. During this time, 19 spaces were recorded to be vacant.

— There was observed to be a minimum of 50 and a maximum of 55 spaces available for parking within the 'Reduced Survey Area'. The demand for parking within these spaces ranged between 25% and 84%.

— The parking demand within the 'Reduced Survey Area' peaked at 1:00pm when a total of 42 spaces were recorded to be occupied, representing a parking occupancy of 84%. During this time, 8 spaces were recorded to be vacant.

Saturday 9 September 2017

— The overall demand for parking throughout the survey area ranged between 20% to 56%.

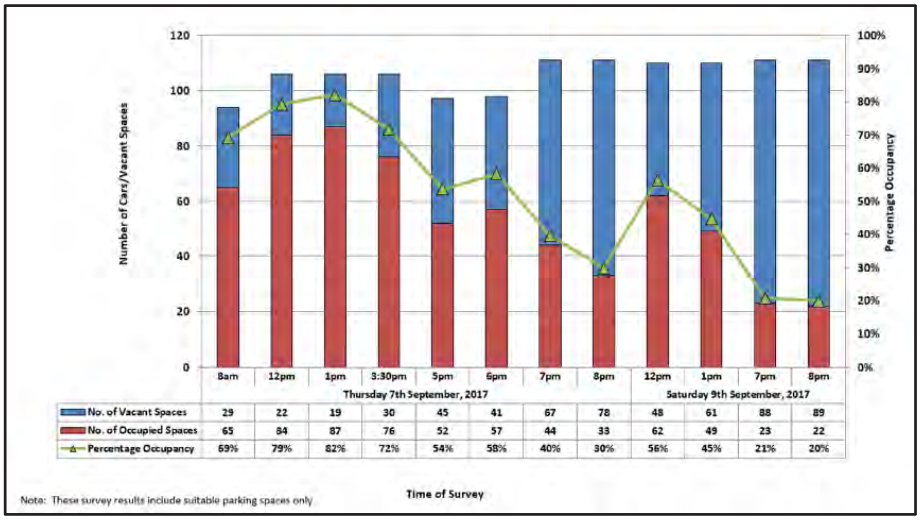
— The demand for parking peaked at 12:00noon when a total of 62 spaces were recorded to be occupied, representing a parking occupancy level of 56%. During this time, 48 spaces were recorded to be vacant.

— There was observed to be between 53-55 spaces available for parking within the 'Reduced Survey Area'. The demand for parking within these spaces ranged between 23% and 56%.

— The parking demand within the 'Reduced Survey Area' peaked at 12:00noon when a total of 31 spaces were recorded to be occupied, representing a parking occupancy of 56%. During this time, 24 spaces were recorded to be vacant.

Graph 2.1 provides a graphical representation of the Thursday and Saturday parking demands for the overall survey area.

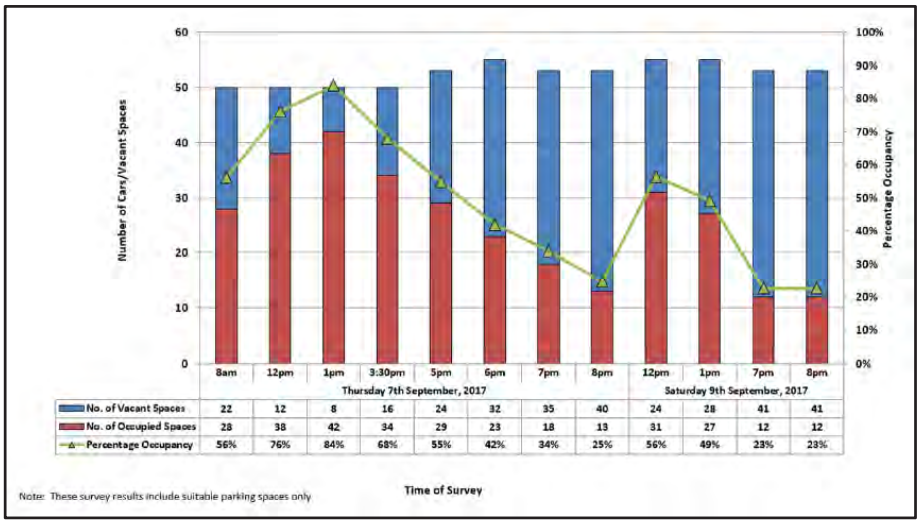
Graph 2.1: Parking Demand for Overall Survey Area



Source: Traffic Evidence Statement prepared by Charmain Dunstan of Traffix Group, 23355A#1

Graph 2.2 provides a graphical representation of the Thursday and Saturday parking demands for the reduced survey area.

Graph 2.2: Parking Demand for Reduced Survey Area



	8am	12pm	1pm	3:30pm	5pm	6pm	7pm	8pm	12pm	1pm	7pm	8pm
No. of Vacant Spaces	22	12	8	16	24	32	35	40	24	28	41	41
No. of Occupied Spaces	28	38	42	34	29	23	18	13	31	27	12	12
Percentage Occupancy	56%	76%	84%	68%	55%	42%	34%	25%	56%	49%	23%	23%

Source: Traffic Evidence Statement prepared by Charmain Dunstan of Traffix Group, 23355A#1

Overall, the Traffix Group parking survey results indicate that the parking demand is moderate to high during the weekday business hours, gradually decreasing in the evenings. The Saturday survey indicated relatively moderate parking demands during the middle of the day, decreasing in the evenings. Similar trends were observed in the 'Reduced Survey Area'.

Overall, it is considered that there is some spare on-street parking available within the vicinity of the site.

Detailed parking survey results are shown in Appendix A.

2.5 Sustainable Transport

Public Transport

The site has very good access to public transport, with bus and train services running in close proximity of the site.

A summary of the public transport services within close proximity to the site is given below in Table 2.2:

Table 2.2: Public Transport Services

Mode	Route Number	Route	Nearest Stop	Distance
Bus	271	Box Hill – Ringwood via Park Orchards	Blackburn Primary School along Surrey Road	100 metres
	279	Box Hill – Doncaster SC via Middleborough Road		
	901 (SMARTBUS)	Frankston – Melbourne Airport		
	736	Mitcham – Blackburn via Vermont South, Glen Waverley, Forest Hill	Blackburn Road along Central Road	500 metres

Train	Belgrave and Lilydale Line	Blackburn Railway Station	550 metres

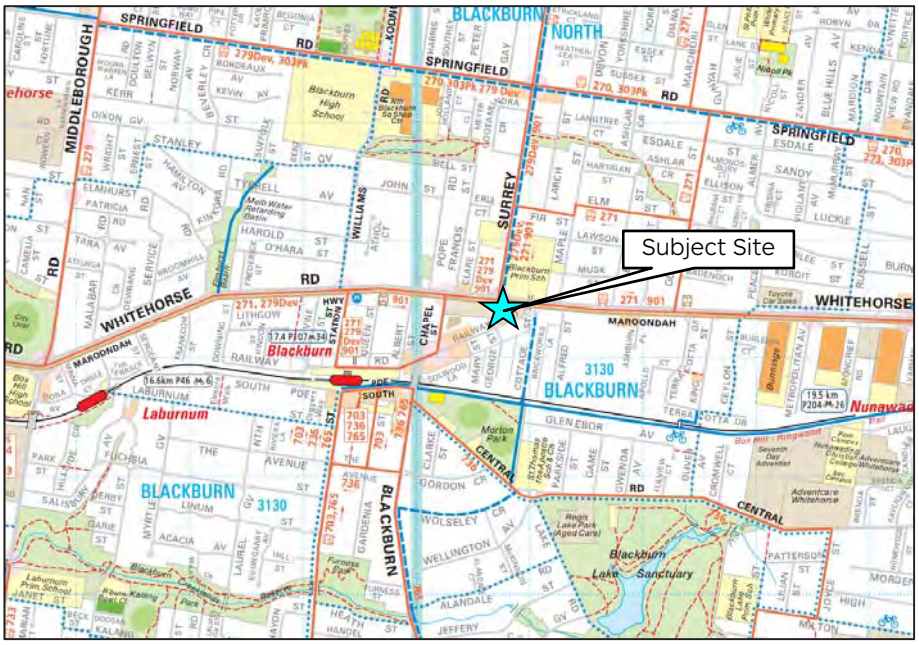
Bicycle Network

The site also has very good access to bicycle facilities, including:

— Off-road shared path that runs along the Belgrave & Lilydale Railway Line and through Morton Park;
— On-road Bicycle Lanes along Cottage Street, Wolseley Crescent, Surrey Road, Blackburn Road and Springfield Road; and
— Informal bicycle route along Central Road, Laburnum Street, Main Street, Williams Road, Lake Road and many more.

The sustainable transport facilities within close proximity to the site, including the bicycle network, are outlined in Figure 2.6 overleaf.

Figure 2.6: Sustainable Transport Facilities within the Vicinity of the Site



3 The Proposal:

It is proposed to amend the existing Planning Permit (WH/2017/277) for the mixed-use development at 160 Whitehorse Road, Blackburn. More specifically, the amended development comprises the following:

— 187 apartments, comprising:
  - 53 x one-bedroom apartments;
  - 122 x two-bedroom apartments; and
  - 12 x three-bedroom apartments.
— A combined total of 11,798 sqm of office space spread across six levels.
— A total of 13 retail tenancies, with a combined floor area of approximately 2,323 sqm spread across two levels.
— A 1,686 sqm supermarket tenancy located on Basement Level 1. It is understood that ALDI is the intended operator of the supermarket tenancy.
— A total of 725 car parking spaces (including six DDA spaces) within five levels of basement car parking, accessed via Railway Road.
— A total of 215 bicycle parking spaces within Basement Level 1 and the ground floor level.
— A total of 12 motorbike parking spaces are provided within the basement car park.
— Vehicle access to the site will be provided via a new double-width crossover connecting to/from Railway Road. All other existing crossovers to Railway Road and Whitehorse Road will be reinstated with kerb, channel and nature strip to the satisfaction of the Responsible Authority.
— Vehicle access to the ground floor loading bay will be provided via a new double-width crossover connecting to/from Railway Road.
— Pedestrian access to the proposed residential apartments will be via a lobby located on the ground floor connecting to/from Whitehorse Road and Railway Road. Separate entrances will be provided to/from the retail premises. Pedestrian access to the office will be provided via an entrance and lobby most directly accessed from Whitehorse Road.
— Residential, retail and commercial refuse and storage areas are provided within the basement car park. Refuse and recycling for the supermarket will be stored and collected adjacent to the loading bay on ground floor.

4.1 Planning Scheme Assessment

Clause 52.06 - Parking Assessment

Parking requirements for new developments are set out under in Clause 52.06 of the Whitehorse Planning Scheme. The purpose of Clause 52.06 is defined in the Scheme as follows:

- To ensure that car parking is provided in accordance with the State Planning Policy Framework and Local Planning Policy Framework.
- To ensure the provision of an appropriate number of car parking spaces having regard to the demand likely to be generated, the activities on the land and the nature of the locality.
- To support sustainable transport alternatives to the motor car.
- To promote the efficient use of car parking spaces through the consolidation of car parking facilities.
- To ensure that car parking does not adversely affect the amenity of the locality.
- To ensure that the design and location of car parking is of a high standard, creates a safe environment for users and enables easy and efficient use.

As per Amendment VC148, Column B rates of Table 1 from Clause 52.06 of the Whitehorse Planning Scheme apply if:

- Any part of the land is identified as being within the Principal Public Transport Network Area as shown in the Principal Public Transport Network Area Maps (State Government of Victoria, 2018); or
- A Schedule to the Parking Overlay or another provision of the planning scheme specifies that Column B applies.

Given that the subject site falls within the Principle Public Transport Network Area (as outlined in Section 2.1), the Column B rates of Table 1 to Clause 52.06 are applicable to the proposed development. The application of these rates is shown Table 4.1 below:

Table 4.1: Statutory Car Parking Requirement

User	Number / Size	Column B Rates	Requirement
Residents	175 x 1 & 2-bedroom dwellings	1 space per dwelling	175 spaces
	12 x 3-bedroom dwellings	2 spaces per dwelling	24 spaces
Residential Visitors	187 dwellings	No Requirement	0 spaces
Office	11,798 sqm	3 spaces per 100sqm net floor area	353 spaces
Retail	2,323 sqm	3.5 spaces per 100sqm leasable floor area	81 spaces
Supermarket	1,686 sqm	5 spaces per 100sqm leasable floor area	84 spaces
Total Statutory Car Parking Requirement			**717 spaces**

Accordingly, the proposed development has a statutory car parking requirement of 717 car parking spaces. It is proposed to provide 725 on-site spaces and allocate car parking as shown in Table 4.2:

Table 4.2: Proposed Car Parking Allocation

User	Parking Requirement	Parking Provision	Location	Statutory Reduction
Residents	199 spaces	204 spaces	Within Basement Level 2 and Basement Level 3	-
Residential Visitors	0 spaces	13 spaces	Within a shared pool of parking on Basement Level 2	-
Office	353 spaces	353 spaces	Within Basement Levels 1, 2, 3, 4 and 5	-
Retail	81 spaces	24 spaces for staff	Within Basement Level 2	-
		66 spaces for customers		
Supermarket	84 spaces	65 spaces	Within Basement Level 1	19 space reduction
Total	**717 spaces**	**725 spaces**	**-**	**19 space reduction**

The proposal therefore seeks a reduction of 19 spaces (associated with supermarket use) against the statutory requirements of Clause 52.06-5 of the Whitehorse Planning Scheme.

An application to reduce the number of car parking spaces required under Clause 52.06-5 must be accompanied by a Car Parking Demand Assessment. A Car Parking Demand Assessment and the appropriateness of allowing a reduction of on-site parking for the proposed development are discussed below:

4.2 Car Parking Demand Assessment

Clause 52.06-7 sets out the factors to be considered when preparing a Car Parking Demand Assessment. These factors are listed below:

— The variation of car parking demand likely to be generated by the proposed use.
— The short-stay and long-stay car parking demand likely to be generated by the proposed use over time.
— The availability of public transport in the locality of the land.
— The convenience of pedestrian and cyclist access to the land.
— An empirical assessment or case study.

Those factors relevant to this assessment are discussed in more detail below:

Public Transport in the Locality

The site has very good access to a range of public transport services with train and bus services operating in the vicinity of the subject site.

Blackburn Railway Station is located approximately 550 metres from the subject site (7 minute walk). The site also has excellent access to a number of bus routes with the closest stop located 100 metres from the

site along Surrey Road. These services are outlined in more detail in Section 2.5.

Given the very good access to sustainable transport options, employees and customers of the site are able to travel to and from the site without relying on the use of a private motor vehicle.

The Convenience of Pedestrian and Cyclist Access to the Site

Footpaths are provided on both sides of all roads within the vicinity of the site, which provides a link to the nearby public transport services.

In addition, the site has very good access to nearby bicycle facilities, including off-road shared paths along the railway line and on-road bicycle lanes along Cottage Street, Wolseley Crescent, Surrey Road, Blackburn Road and Springfield Road.

These facilities provide a viable means of alternative sustainable transport that will reduce future reliance on private motor vehicles.

The Provision of Bicycle Parking and End of Trip Facilities for Cyclists

The proposal includes a generous provision of 215 bicycle spaces. These facilities will help to encourage users of the development to ride to and from the site and will reduce the dependence on the private motor vehicle.

The Likelihood of Multi-Purpose Trips Within the Locality

As discussed in Practice Note 22 – *Using the Car Parking Provisions*, in some situations a trip will serve more than one function and this will tend to reduce the need for car parking.

It is expected that a proportion of the customers of the supermarket and retail tenancies will be residents / staff of the proposed development. This will reduce the overall demand for car parking.

Residential Visitor Car Parking Demand

Car parking surveys were undertaken by Cardno at 127 and 147 Beach Street, Beacon Cove to determine the visitor car parking demands generated by apartment developments.

These surveys, conducted over a 36 hour period from 6:00am Friday 19 November 2010 to Midnight Saturday 20 November 2010 indicate that visitor parking demand varies throughout the day with peak parking demands occurring during the evening and on weekends.

The recorded peak weekday visitor parking demand was 0.07 spaces per apartment after 6:30pm while the peak visitor parking demand during normal business office hours was 0.06 spaces per apartment at 11:30am. The overall peak visitor parking demand occurred at 6:30pm on Saturday with a demand of 0.09 spaces per apartment.

It is considered that a rate of 0.06 spaces per dwelling provides an appropriate estimate of the peak visitor parking demand likely to be generated by the development during weekday daytime periods, noting that the subject site has a higher level of access to public transport services than the case study site.

Application of this rate to the 187 dwellings proposed results in an anticipated peak visitor parking demand for the development of 11 visitor spaces during the day on weekdays.

This could be expected to increase to 17 visitor spaces (0.09 spaces per dwelling) during weekday evenings and weekends when visitor demand is at its peak.

Whilst it is noted that there is no statutory requirement to provide visitor parking for the proposed development (given that the site falls within the Principal Public Transport Network [PPTN] area), it is proposed to provide a total of 13 residential visitor car parking spaces within the shared pool on Basement Level 2. This level of parking is anticipated to cater for the visitor parking demand during weekdays and the large majority of visitor parking demands during weekday evenings and on weekends.

Supermarket Parking Demand

Ratio Consultants and other traffic engineering consultancies have undertaken car parking surveys of several supermarkets within Metropolitan Melbourne, with recorded parking demands generally in the range of 3.0 to 5.0 spaces per 100 square metres, inclusive of staff parking demands.

The case study data undertaken is based on supermarkets with a range of floor areas, including boutique style supermarkets and larger 'full line' supermarkets with floor areas extending up to 4,000sqm.

As discussed previously, it is considered that a significant proportion of the supermarkets trade will be associated with residents of the 187 apartments and staff of the 11,798sqm of office use proposed as part of the development. These multi-purpose trips will decrease the demand for on-site car parking for the supermarket component of the development. On this basis, it is considered appropriate to apply a reduction factor of approximately 20% to the statutory car parking rate of 5.0 spaces per 100sqm.

A parking provision of 65 spaces is proposed to be provided to the 1,686sqm supermarket (inclusive of staff and customers), which equates to a provision rate of 3.9 car parking spaces per 100sqm of floor. This parking provision allows for the reduction in car parking that is anticipated due to multi-purpose trips.

Based on the above, it is considered that proposed provision of car parking for the supermarket will meet the typical needs of staff and customers.

4.3 Allowing Fewer Spaces to be provided

Clause 52.06-7 sets out the factors to be considered when determining the appropriateness of allowing fewer car parking spaces to be provided. The relevant factors for this case are listed below:

— The Car Parking Demand Assessment.
— Any relevant local planning policy or incorporated plan.
— The availability of alternative car parking in the locality of the land.
— Local traffic management in the locality of the land.
— Access to or provision of alternative transport modes to and from the land.
— Any other relevant consideration.

These factors are discussed in more detail below:

Relevant Local Planning Policy

Clause 22.07 of the City of the Whitehorse Planning seeks to reduce car dependence by promoting walking, cycling and public transport. It includes a number of strategies, including:

- *Promotes public transport and reduced use of cars.*
- *Increases the use of sustainable transport options for travel to and within the Activity Centre.*
- *Encourages lower parking provision rates in new development*
- *Provides car parking in structures under new buildings instead of open air car parking.*

The slight reduction in car parking associated with the proposed development is in-line with the strategic intent of Clause 22.07 of the Whitehorse Planning Scheme, based on the following:

- The proposal is located close to numerous sustainable transport alternatives;
- There is a generous provision of on-site bicycle parking; and
- The reduced provision of on-site parking will discourage private motor vehicle use.

Availability of Car Parking

As discussed in Section 4.2 above (Car Parking Demand Assessment), it is considered that sufficient car parking is provided on-site to accommodate the demand generated by the development at all times (with the exception of a slight overflow visitor parking demand during weekday evenings and on weekends).

Notwithstanding this, an assessment of the availability of the surrounding on and off-street car parking has been undertaken below.

The results of the parking surveys, outlined earlier in Section 2.4 of the Report, show that the surrounding off-site car parking demand is generally moderate to high during weekday business hours and moderate on Saturdays, with lower occupancies occurring during weekday evenings.

The survey results also demonstrate that there is some spare parking capacity within close vicinity of the site to accommodate an increase in short-term parking demand in the unlikely event that the on-site car park reaches capacity.

During weekday business hours, the parking surveys undertaken suggest that at least 19 spaces are available within convenient walking distance to the site. The minimum number of available spaces increased to 41 spaces during weekday evenings.

During the Saturday survey period, the parking surveys suggest that there were at least 48 spaces available within convenient walking distance to the site.

On this basis, any short-term overflow parking associated with the development (such as the slight overflow of visitor parking anticipated during weekday evenings and on weekends) can be accommodated in suitable off-site parking locations within convenient proximity of the site without adversely impacting current parking conditions.

Alternative Transport Modes

As discussed throughout the Report, the subject site is readily accessible by alternative transport options, including public transport, bicycle infrastructure and pedestrian infrastructure.

Local Traffic Management

A slightly reduced provision of on-site parking will reduce motor vehicle travel to and from the site, resulting in a lessened impact to traffic congestion and pedestrian amenity in the vicinity of the site than what would otherwise be incurred were more on-site parking proposed.

4.4 Adequacy of Parking Provision

A total of 725 car parking spaces will be provided on-site allocated as shown in Table 4.2.

In summary, it is considered that the proposed provision of car parking is adequate for the following reasons.

— The provision of parking for residents is in accordance with Clause 52.06-5 of the Whitehorse Planning Scheme.
— There is no statutory requirement to provide visitor car parking on-site. Notwithstanding, it is proposed to provide a total of 13 visitor car parking spaces within the shared pool on Basement 2. This level of parking will entirely meet the needs of visitors during weekday business hours. During weekend evenings and on weekends there may be a small overflow demand of visitor parking (anticipated to be in the order of four spaces) and the parking surveys undertaken suggest that this demand can suitably be accommodated by the surrounding on-street parking.
— The provision of parking for the retail use is in accordance with Clause 52.06-5 of the Whitehorse Planning Scheme.
— The provision of parking for the office use is in accordance with Clause 52.06-5 of the Whitehorse Planning Scheme.
— The provision of parking for the supermarket is anticipated to meet the typical peak demands of both staff and customers noting that a significant proportion of the trade associated with the supermarket is expected to be generated by residents of the apartments and staff of the office components of the development.
— Parking surveys indicate that suitable off-site parking is available in the vicinity of the subject site at all times for any overflow parking that may occur.
— The site has very good access to the metropolitan public transport network, including train and bus services, which will reduce the dependence on private motor vehicle use in gaining access to and from the site.
— The generous provision of bicycle parking will encourage the use of alternative transport modes and reduce the reliance on private vehicle use.

On the basis of the reasons discussed above, it is considered that the proposed level of car parking is suitable for the nature and scale of the proposed development.

5.1 Clause 52.06 Design Standard Assessment

The proposed multi-level basement car park has been designed in accordance with the objectives and design requirements of Clause 52.06-9 of the Whitehorse Planning Scheme, and in accordance with the relevant sections of AS/NZS 2890.1:2004.

An assessment against the relevant design standards of Clause 52.06-9 of the Planning Scheme is provided below:

Design Standard 1 – Accessways

Vehicular access to the site will be provided via a new double-width crossover connecting to/from Railway Road. The new crossover will be designed in accordance with the Engineering Standard Drawings of the City of Whitehorse. The proposed access arrangements are generally consistent with the access arrangements of the approved development (Planning Permit No. WH/2017/277).

All other existing crossovers to Railway Road and Whitehorse Road will be reinstated with kerb, channel and nature strip to the satisfaction of the Responsible Authority. This will create additional on-street car parking along Railway Road.

Design Standard 1 of Clause 52.06-9 relates to the design of accessways. The requirements of Design Standard 1 are assessed against the proposal in Table 5.1 below:

Table 5.1: Design Standard 1 Assessment - Accessways

Requirement	Comments
Must be at least 3m wide.	**Satisfied**: Accessways have been designed with a minimum width of 6.30 metres (inclusive of 300mm wide kerbs on either side of the accessway), sufficient to accommodate two-way simultaneous vehicle movements.
Allow vehicles parked in the last space of a dead-end accessway in public car parks to exit in a forward direction with one manoeuvre.	**Satisfied**: All vehicles can depart the car park in a forward direction with one manoeuvre.
Provide at least 2.1m headroom beneath overhead obstructions, calculated for a vehicle with a wheel base of 2.8m.	**Satisfied**: A minimum headroom clearance in excess of 2.2 metres is provided throughout the car park.
If the accessway serves four or more car spaces or connects to a road in a Road Zone, the accessway must be designed so that cars can exit the site in a forward direction.	**Satisfied**: All cars can enter and exit the site in a forward direction.
Provide a passing area at the entrance at least 6.1m wide and 7m long if the accessway serves ten or more car parking spaces and is either more than 50m long or connects to a road in a Road Zone.	**Satisfied**: A double-width through ramp exceeding the required dimensions has been provided at the entrance/exit of the accessway. Swept paths (refer to Appendix A) demonstrate that two opposing vehicles can pass in a satisfactory

	manner at the entrance to the site. Accordingly, this requirement has been met.
Have a corner splay or area at least 50% clear of visual obstructions extending at least 2m along the frontage road from the edge of an exit lane and 2.5m along the exit lane from the frontage, to provide a clear view of pedestrians on the footpath of the frontage road. The area clear of visual obstructions may include an adjacent entry or exit lane where more than one lane is provided, or adjacent landscaped areas, provided the landscaping in those areas is less than 900mm in height.	**Satisfied**: A pedestrian sight triangle is provided adjacent to the exit lane of the accessway (eastern side), measuring 2.0 metres along the site frontage and extending 2.5 metres into the site in accordance of the requirement of Design Standard 1. Any landscaping in this area will be below 900mm in height to ensure clear visibility. Given that the ramp is double-width where it meets the property boundary, a sight triangle is not required on the western side of the ramp.

Design Standard 2 - Car Parking Spaces

It is proposed to provide a total of 725 car parking spaces (including six DDA spaces) within a five-level basement car park, accessed via Railway Road.

It is also proposed to provide a total of 12 motorbike parking spaces within the basement car park.

Design Standard 2 of Clause 52.06-9 relates to the design of car parking spaces. The requirements of Design Standard 2 are assessed against the proposal in Table 5.2 below:

Table 5.2: Design Standard 2 Assessment - Car Parking Spaces

Requirement	Comments
Car parking spaces and accessways must have the minimum dimensions as outlined in Table 2 of Design Standard 2.	**Satisfied**: All car parking spaces are dimensioned in accordance with Table 2 of Design Standard 2 of Clause 52.06 of the Whitehorse Planning Scheme, with car spaces comprising dimensions of 2.6 metres wide by 4.9 metres long accessed via a 6.4 metre wide aisle.
A wall, fence, column, tree, tree guard or any other structure that abuts a car space must not encroach into the area marked 'clearance required' on Diagram 1 of Design Standard 2, other than: - A column, tree or tree guard, which may project into a space if it is within the area marked 'tree or column permitted' on Diagram 1. - A structure, which may project into the space if it is at least 2.1m above the space.	**Satisfied**: All car parking spaces are clear of any encroachment into the area marked on Diagram 1 of the Design Standard 2.
Car spaces in garages or carports must be at least 6m long and 3.5m wide for a	**Not Applicable**: No garages or carports are proposed.

single space and 5.5m wide for a double space measured inside the garage or carport.	
Where parking spaces are provided in tandem (one space behind the other) an additional 500mm in length must be provided between each space.	**Not Applicable**: No car parking spaces are proposed in a tandem arrangement.
Where two or more car parking spaces are provided for a dwelling, at least one space must be under cover.	**Satisfied**: All car parking spaces are located within the basement.
Disabled car parking spaces must be designed in accordance with Australian Standard AS2890.6-2009 (disabled) and the Building Code of Australia. Disabled car parking spaces may encroach into an accessway width specified in Table 2 of Design Standard 2 by 500mm.	**Satisfied**: Six accessible car parking spaces and adjacent shared zones have been provided. The accessible spaces comprise a width of 2.4 metres and a length of 5.4 metres as per the requirements of AS2890.6:2009. The adjacent shared zones are provided with the same dimensions. A headroom clearance in excess of 2.5 metres has been provided above the disabled spaces.

Design Standard 3 - Gradients

The basement ramps incorporate the following gradients:

Entry Ramp

— An upwards gradient of approximately 1:12 for the first 4.7 metres from the property boundary.
— A flat section for 4 metres at a RL of 105.25 metres;
— A 1:12 downwards gradient for 4.0 metres from a RL of 105.25 metres;
— A downwards gradient of 1:6.5 for 6.76 metres;
— A midblock gradient of 1:12 for 4.0 metres; and
— A final 1:20 gradient for 6.0 metres to a RL of 103.25 metres.

The proposed ramp gradients are consistent with the ramps within the approved development (Planning Permit No. WH/2017/277).

Internal Ramps

(All internal ramps typically have the same gradients and transitions)

— An initial 1:10 gradient for 2.0 metres;
— A midblock gradient of 1:5 for 13.5 metres; and
— A final 1:8 gradient for 2.0 metres.

Design Standard 3 of Clause 52.06-9 relates to the design of gradients. The requirements of Design Standard 3 are assessed against the proposal in Table 5.3 below:

Table 5.3: Design Standard 3 Assessment - Gradients

Requirement	Comments
Accessway grades must not be steeper than 1:10 (10%) within 5m of the frontage to ensure safety for pedestrians and vehicles. The design must have regard to the wheelbase of the vehicle being designed for; pedestrian and vehicular traffic volumes; the nature of the car park; and the slope and configuration of the vehicle crossover at the site frontage. This does not apply to accessways serving three dwellings or less.	**Satisfied:** Gradients no steeper than 1:12 have been proposed for the first 5.0 metres from the property boundary in accordance with this requirement.
Ramps (except within 5 metres of the frontage) must have the maximum grades as outlined in Table 3 of Design Standard 3 and be designed for vehicles travelling in a forward direction.	**Satisfied:** The proposed grades are in accordance with Table 3 of Design Standard 3, with grades no steeper than 1:5.
Where the difference in grade between two sections of ramp or floor is greater than 1:8 (12.5%) for a summit grade change, or greater than 1:6.7 (15%) for a sag grade change, the ramp must include a transition section of at least 2 metres to prevent vehicles scraping or bottoming. Plans must include an assessment of grade changes of greater than 1:5.6 (18%) or less than 3 metres apart for clearances, to the satisfaction of the responsible authority.	**Satisfied:** Appropriate transition sections have been provided to prevent scraping or bottoming.

Design Standard 6: Safety

The proposed development will rely upon on the following methods to control access and provide security to the basement car park:

— Resident and staff will have access to the boom gate and security gates via remote-control units;
— Customers will be required to use an automatic ticket system; and,
— Access to visitor car parking spaces would be controlled via the proposed ticketing machine and boom gate during operating hours of the retail tenancies. Outside of the operating hours of the retail tenancies, residential visitors would access the basement car park via the intercom system.

5.2 Swept Path Assessment

An assessment (refer to Appendix A) of the accessibility to/from the site using the 'Autodesk Vehicle Tracking' software has been conducted. The B99 (99.8th percentile car) was used in the assessment and it was found that two opposing vehicles could pass at the site access in a suitable manner. Furthermore, all vehicles will be able to enter / exit the site in a forward's direction.

An assessment of the accessibility to/from the critical parking bays was also undertaken using the B85 (85th percentile car) and it was found that each parking space could be accessed (ingress and egress) in a satisfactory manner.

The assessment indicates that the access arrangements and car parking layout have been designed appropriately and in accordance with the requirements of the Whitehorse Planning Scheme and/or AS/NZS 2890.1:2004.

6.1 Bicycle Parking Provision

Clause 52.34-3 of the Whitehorse Planning Scheme outlines the requirements for bicycle parking for various uses.

The bicycle parking requirements for the proposed development are outlined in Table 6.1 below:

Table 6.1: Bicycle Parking Requirement

Use	Type	Number / Size	Rate	Requirement
Dwellings	Resident	187 dwellings	1 space per five residential dwellings	37 spaces
	Visitor		1 space per ten residential dwellings	19 spaces
Office	Staff	11,798 sqm	1 space per 300sqm of leasable floor area	39 spaces
	Visitor		1 space per 1,000sqm of leasable floor area	12 spaces
Retail premises	Staff	2,323 sqm	1 space per 300sqm of leasable floor area	8 spaces
	Customers		1 space per 500sqm of leasable floor area	5 spaces
Supermarket	Staff	1,686 sqm	1 space per 600sqm of leasable floor area	3 spaces
	Customers		1 space per 500sqm of leasable floor area	3 spaces
Total				**126 spaces**

On the basis of the above assessment, the proposed development has a statutory requirement of 126 bicycle parking spaces.

The development proposes a total of 215 parking spaces, in the following arrangements:

— 101 bicycle parking spaces within a secure bicycle storage room located on ground floor. This will include 90 vertically hung bicycle parking spaces and 11 horizontal bicycle parking spaces;
— 16 horizontal bicycle parking spaces along Whitehorse Road fronting the subject site;
— 10 horizontal bicycle spaces within the ground floor plaza adjacent the staircase;
— 42 bicycle parking spaces on Basement Level 1 (mixture of vertical and horizontal spaces); and
— 26 horizontal bicycle parking spaces on Basement Level 2; and
— 20 horizontal bicycle parking spaces on Basement 3.

Accordingly, the development exceeds the bicycle parking requirements of the Whitehorse Planning Scheme and is considered acceptable.

6.2 Bicycle Parking Design

Bicycle parking spaces have been designed in accordance with the dimensional requirements of AS2890.3:2015.

More specifically, the following standards have been met:

— AS 2890.3:2015 requires that 20% of bicycle parking be provided via ground level rails. The proposed bicycle parking provides more than 20% of the bicycle spaces at ground level, in excess of the minimum requirement;
— Vertically hung bicycle rails are spaced at 500mm intervals. Furthermore, vertically hung bicycle rails are provided with an envelope of 1.2 metres and a 1.5 metre access aisle.
— Horizontal bicycle rails are spaced at 1.0 metre intervals. Furthermore, horizontal bicycle rails are provided with an envelope of 1.8 metres and a 1.5 metre access aisle.

Accordingly, it is considered that the bicycle parking room has been designed appropriately and in accordance with the relevant sections of AS2890.3:2015.

The bicycle parking specifications are provided within Appendix B.

6.3 End of Trips Facilities

Showers

Table 2 to Clause 52.34-5 outlines the requirements for shower facilities and states the following:

If 5 or more employee bicycle spaces are required, None 1 shower for the first 5 employee bicycle spaces, plus 1 to each 10 employee bicycle spaces thereafter

A total of 50 employee bicycle parking spaces are required to be provided (as outlined in Section 6.1) which results in a requirement to provide six showers. The architectural plans show a total of 10 showers for employee use which exceeds this requirement and is therefore considered satisfactory.

It is noted as per Clause 52.34-5 no showers are required for short-term users such as visitors or customers.

Change Rooms

Table 3 to Clause 52.34-5 outlines the requirements for change rooms and states the following:

1 change room or direct access to a communal change room to each shower. The change room may be a combined shower and change room.

Each of the shower facilities has access to a communal change room which satisfies this requirement.

Accordingly, the requirements of Clause 52.34-5 of the Whitehorse Planning Scheme have been met.

7.1 Loading Arrangements

Clause 65.01 'Decision Guidelines' of the Whitehorse Planning Scheme outlines the provision of loading requirements, and states the following:

"Before deciding on an application or approval of a plan, the responsible authority must consider, as appropriate:

— *The adequacy of loading and unloading facilities and any associated amenity, traffic flow and road safety impacts."*

Loading and unloading activities associated with the proposed development will primarily be related to the delivery of goods for the supermarket and retail tenancies.

Some vans / small trucks may occasionally seek to access the site for the loading / unloading of furniture and goods into and out of the dwellings. This will largely occur when residents initially move into a dwelling, and relatively infrequently thereafter.

Retail & Residential Loading Bay

A loading bay has been provided to the south of the refuse and recycle storage rooms on Basement Level 1 to service the residential and retail component of the development and is accessed via Railway Road. The loading bay comprises dimensions of 5.63 metres wide and 8.40 metres long.

The swept path assessment (refer to Appendix C) demonstrates the ability for a 6.4-metre-long Small Rigid Vehicle (SRV as defined by AS2890.2:2002) to access the residential loading area via Railway Road and utilise the loading area in a suitable manner. This is anticipated to be the largest vehicle that will access the basement level.

Supermarket Loading Bay

A loading bay has been provided on ground floor to service the supermarket in the southwest corner of the site, which is suitable to accommodate a 12.5 metre long Heavy Rigid Vehicle (HRV as defined by AS 2890.2:2012), which is the largest vehicle expected to access the loading bay.

The swept path analysis included in Appendix C of this report demonstrates the ability for the 12.5 metre long HRV to reverse into the loading bay from Railway Road and depart the loading bay in a forward direction.

It is considered appropriate for service vehicles to reverse into the loading bay from Railway Road on the basis of the following:

— A reverse entry manoeuvre to a service area from a minor road is permitted under Clause 3.2 of AS2890.2:2012, which specifies that manoeuvring on-street should be strictly limited to one reverse manoeuvre either onto or off the street, which is the proposed arrangement of the service area;
— The proposed arrangement is similar to several supermarkets within metropolitan Melbourne which require service vehicles to reverse off the frontage road into a loading bay (often from roads with a higher classification and level of traffic than Railway Road); and
— Loading would be restricted to off-peak times to minimise the impact of through traffic on Railway Road. This could be implemented through the preparation of a Car Parking Management Plan (CPMP).

Office Loading Bay

Whilst office tenancies typically do not generate a large amount of deliveries, it is anticipated that the office tenancies will occasionally attract vans and small trucks for the delivery of goods.

To facilitate these deliveries, it is proposed to provide a dedicated loading bay within the office car park. The loading bay is able to accommodate a 6.4 metre long SRV which would be sufficient to cater for the vast majority of deliveries associated with the office tenancies.

Accordingly, it is considered that the all loading and unloading associated with the proposal can suitably be undertaken via the on-site loading bay.

7.2 Waste Collection Arrangements

Dedicated waste collection areas have been provided for each of the different land uses, as outlined below:

- Supermarket refuse and recyclables will be stored within a dedicated waste room located on ground floor (adjacent to the supermarket loading bay).
- Residential refuse and recyclables will be stored within three separate dedicated waste rooms located within Basement Level 1;
- Office refuse and recyclable will be stored within a dedicated waste room located within Basement Level 1; and,
- Refuse and recyclables for the retail tenancies will be stored within a dedicated waste room located within Basement Level 1.

A waste management plan has been prepared for the development by Leigh Design.

Residential, retail and office waste is proposed to be collected from within Basement 1 by a private contractor using the mini rear loader truck (height of 2.08 metres, length of 6.35 metres, width of 1.7 metres). Supermarket waste is proposed to be collected from the ground floor loading bay by a private contractor using the 8.8 metre long Medium Rigid Vehicle (MRV as defined by AS2890.2:2002).

The swept paths attached to Appendix D of this report demonstrate the ability for these trucks to enter and exit the site in a suitable manner.

This is considered to be an acceptable arrangement from a traffic engineering perspective.

8.1 Traffic Generation

Residential Traffic Generation

In consideration of the locality of the site and level of accessibility to public transport, it is expected that the residential component of the development will generate traffic at a daily rate of up to four vehicle movements per dwelling allocated one car space and six vehicle movements per dwelling allocated two car spaces.

Application of these rates to the proposed 187 dwelling development results in a daily traffic volume of 772 vehicle movements per day, including approximately 77 vehicle movements (10%) per hour during periods of peak activity.

About ten percent of the total trips will occur in each of the morning and evening peak hours. Residential trips will be mainly departing in the morning peak (80% depart and 20% arrive) and mainly arriving in the afternoon peak (40% depart and 60% arrive).

Accordingly, the residential traffic generation for the AM and PM peak hours are as shown in Table 8.1 below:

Table 8.1: Residential Traffic Generation

	AM Peak	PM Peak
Arriving trips:	15 vph	46 vph
Departing trips:	62 vph	31 vph
Total trips:	**77 vph**	**77 vph**

Office Premises

Based on surveys at other office developments in Melbourne, it is expected that the development will generate 0.5 vehicular trips per car space during the morning peak hour and 0.5 vehicular trips per car space during the afternoon peak hour.

Employee trips will be mainly arriving in the morning peak and departing in the afternoon peak with approximately 90% of employees assumed to arrive in the morning and depart in the evening peak.

Accordingly, the office traffic generation for the AM and PM peak hours are as shown in Table 8.2 below:

Table 8.2: Office Traffic Generation

	AM Peak	PM Peak
Arriving trips:	159 vph	18 vph
Departing trips:	18 vph	159 vph
Total trips:	**177 vph**	**177 vph**

Retail Premises

Based on the rates outlined in the RMS Guide to Traffic Generating Developments – Updated Traffic Surveys (August 2013) the retail

tenancies are expected to generate in the order of 5.6 trips per 100sqm per peak hour for staff and customer trips.

On this basis, it is estimated that for the PM commuter peak hour the 2,323 sqm of combined floor area of retail use will generate in the order of 130 trips per hour.

Outside the PM peak period the traffic generation rate will decline. On the basis of an hourly traffic generation rate of 5.6 movements per 100sqm per peak hour during the PM peak period it is considered that 25% of this rate will occur during the AM peak period, with a 50:50 split between arrivals and departures in the PM peak, and 75% arrivals and 25% departures during the AM peak period.

Accordingly, in the AM and PM peak hours on a typical weekday the traffic generation for the retail use will be approximately as shown below in Table 8.3:

Table 8.3: Retail Traffic Generation

	AM Peak	PM Peak
Arriving trips:	25 vph	65 vph
Departing trips:	8 vph	65 vph
Total trips:	**33 vph**	**130 vph**

Supermarket Premises

GTA Consultants have undertaken case study surveys of the traffic generation rates of several ALDI supermarkets (noting that ALDI is the intended supermarket operator) within metropolitan Melbourne, as outlined in Table 8.4 below.

Table 8.4: ALDI Supermarket Traffic Generation Rates

Facility	Location	Size	Date	PM Peak vehicle movements per 100sqm of floor area	PM Peak time
ALDI	80-128 Gap Road, Sunbury	1,274sqm	Friday	13.5	5-6pm
ALDI	400 Pound Road, Hampton Park	1,291sqm	Friday	14.6	5-6pm
ALDI	Corner Burwood Highway & Glenfern Road, Ferntree Gully	1,274sqm	Friday	10.8	4:30pm – 5:30pm
ALDI	493 Frankston-Dandenong Road,	1,284sqm	Friday	13.2	5-6pm

	Carrum Downs				
ALDI	1313-1335 Point Nepean Road, Rosebud	1,454sqm	Friday	10.7	4:00pm – 5:00pm
ALDI	1-3 Portobello Road, Pakenham	1,382sqm	Friday	12.0	3:45pm – 4:45pm
Average				**12.5**	

Based on the above, it can be seen that the average traffic generation of the ALDI supermarkets was 12.5 vehicle movements per 100sqm of floor area. A review of the above ALDI supermarkets reveals that car parking for these sites is provided at a rate of 5.0 spaces per 100sqm of floor area (in accordance with the requirements of Clause 52.06 of the Planning Scheme) or more. Given that a suppressed provision of car parking is proposed for the supermarket, it is considered appropriate to factor down the traffic generation rate accordingly. On the basis of the above, a traffic generation rate of 10.5 vehicle movements per 100sqm of floor area has been adopted for the supermarket.

Outside the PM peak period the traffic generation rate will decline. On the basis of an hourly traffic generation rate of 10.5 movements per 100sqm per peak hour during the PM peak period it is considered that 25% of this rate will occur during the AM peak period, with a 50:50 split between arrivals and departures in the PM peak, and 75% arrivals and 25% departures during the AM peak period.

Accordingly, in the AM and PM peak hours on a typical weekday the traffic generation for the supermarket use will be approximately as follows:

Table 8.5: Supermarket Traffic Generation

	AM Peak	PM Peak
Arriving trips:	33 vph	88 vph
Departing trips:	11 vph	88 vph
Total trips:	**44 vph**	**176 vph**

Overall

A summary of the peak hour traffic generation for the proposed development is presented in Table 8.6 below:

Table 8.6: Overall Traffic Generation

Use	AM Peak	PM Peak
Residential	77	77
Office	177	177
Retail	33	130
Supermarket	44	175
Total trips:	**331 vph**	**559 vph**

On the basis of the above, it is anticipated that the development will generate traffic at a rate of 331 vehicles trips during the AM peak hour and 559 vehicle trips during the PM peak hour.

8.2 Traffic Comparison

A comparison between the traffic anticipated to be generated by the amended development and the development which received a Planning Permit (WH/2017/277) is shown in Table 8.7 below. The traffic generation of the approved development has been taken from the Traffic Expert Evidence Statement (23355A#1).

Table 8.7: Comparison of Traffic Generation

	AM Peak	PM Peak
Proposed Amendment	331 vph	559 vph
Approved Development (Planning Permit No WH/2017/277)	191 vph	316 vph

As can be seen in Table 8.7 above, the proposed amendment is anticipated to result in a higher level of traffic in both the AM and PM peak hours. To assess the impact of this additional traffic on the surrounding road network, a traffic distribution and impact analysis has been undertaken below.

8.3 Traffic Distribution and Assignment

Traffic Distribution

The local road network servicing the subject site provides access to the greater road network primarily via the following routes:

— Whitehorse Road to the east;
— Whitehorse Road to the West;
— Blackburn Road to the south; and
— Surrey Road to the north.

The overall directional distribution of traffic generated by the proposed development will vary depending on each land use. A detailed analysis has been undertaken of the distribution of each of the land use proposed, with consideration given to the following:

— Residential trip distribution has been broken down into employment trips (based on Journey to Work data), shopping trips, education and recreation trips;
— Office trip distribution has been determined from Journey to Work data;
— Supermarket and retail trip distribution has been determined by the location of residential catchment areas and the location of existing supermarket and shopping centres.

Having consideration of the above, the overall directional distribution of the proposed development is anticipated to be as follows:

— 22% to/from the north via Surrey Road;
— 21% to/from the west via Whitehorse Road;
— 33% to/from the south via Blackburn Road; and
— 24% to/from the east via Whitehorse Road.

Traffic Assignment

The following assumptions have been made in regards to the assignment of traffic accessing the site:

— All vehicles approaching the site from the north via Surrey Road will turn left onto Whitehorse Road and then right into Railway Road;
— All vehicles departing the site to the north will turn left from Railway Road onto Whitehorse Road and then turn right onto Surrey Road;
— The majority of vehicles approaching the site from the west via Whitehorse Road will turn right onto Chapel Street and then left onto Railway Road (assumed to be 70% of traffic). Some of the vehicles approaching the site from the west will continue through the intersection of Surrey Road and turn right into Railway Road (assumed to be 30% of traffic);
— All vehicles departing the site to the west will turn left from Railway Road onto Whitehorse Road;
— All vehicles approaching the site from the south via Blackburn Road will turn right onto Railway Road;
— All vehicles departing the site to the south via Blackburn Road will turn right onto Railway Road and then left onto Blackburn Road;
— Vehicles approaching from the east will turn left into Railway Road during both the AM and PM peak hour;
— In the AM peak hour, vehicles departing to the east will turn right onto Chapel Street and right at Whitehorse Road (noting that the U-turn at the Surrey Road intersection is banned during the AM peak hour); and
— In the PM peak hour, the majority of vehicles departing to the east will turn right onto Railway Road then turn right at Chapel Street and right at Whitehorse Road (assumed to be 60%). In the PM peak hour, some vehicles will turn left onto Whitehorse Road and undertake a U-turn at Surrey Road (noting this U-turn movement is permitted during the PM peak hour). It is noted that between 3:00pm and 4:00pm (slightly before the anticipated commuter PM peak hour, this U-turn movement is also banned and therefore a higher proportion of vehicles will take alternate routes.

Based on the above traffic generation, distribution and assignment the following site traffic volumes and post development traffic volumes have been derived and are shown in Figures 8.1 and 8.2.

Figure 8.1: Site Traffic Volumes

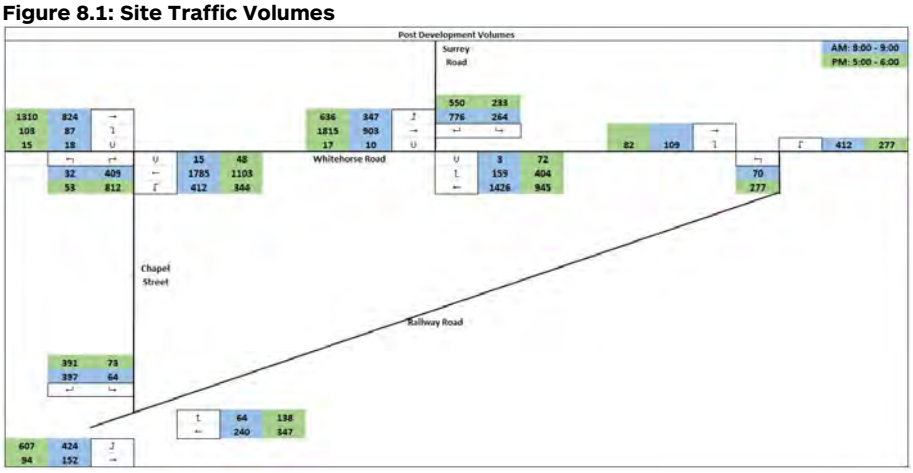
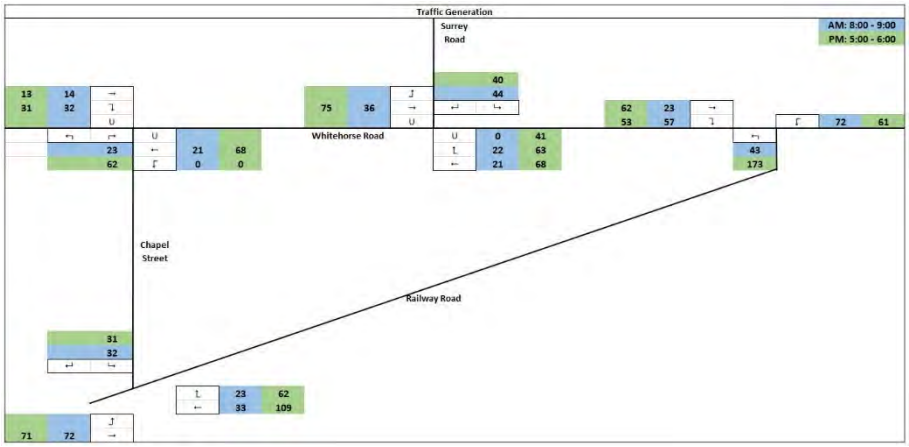


Figure 8.2: Post Development Traffic Volumes



8.4 Traffic Impact

Based on the Traffic Expert Evidence Statement prepared for the previous Application on the subject site, it is understood that VicRoads required the following level of traffic analysis to be undertaken:

— Traffic modelling of the signalized intersection of Whitehorse Road and Chapel Street using SIDRA;
— Traffic modelling of the signalized intersection of Railway Road and Chapel Street using SIDRA; and
— Gap acceptance analysis and capacity assessment of the Whitehorse Road and Railway Road unsignalised intersection.

Accordingly, the following traffic analysis focuses on the impact of these three intersections.

Intersection of Whitehorse Road and Chapel Street

To assess the impact of the proposal on the intersection of Whitehorse Road and Chapel Street, a SIDRA analysis of the existing and post development operation has been undertaken.

SIDRA is a computer software program that was developed by the Australian Road Research Board (ARRM) to design and analyse the performance of both signalised and unsignalised intersections.

The parameters used to assess the intersections are summarised below.

Degree of Saturation (D.O.S.) is a ratio of arrival (or demand) flow to capacity. Degrees of saturation above 1.00 represent oversaturated conditions and degrees of saturation below 1.00 represent under saturated conditions. The D.O.S. ratings are detailed in Table 8.8.

Although operating conditions with a D.O.S. of close to 1.00 are undesirable, it is acknowledged that this level of congestion is typical of many metropolitan intersections during the AM and PM peak hours.

Table 8.8: Degree of Saturation Ratings

Degree of Saturation (D.O.S.)	Rating
Up to 0.6	Excellent
0.61 – 0.70	Very Good
0.71 – 0.80	Good
0.81 – 0.90	Fair
0.91 – 1.00	Poor
Greater than 1.00	Very poor

The **95th percentile queue length (95%ile queue)** is the value below which 95 percent of all observed cycle queue lengths fall, or 5 percent of all observed queue lengths exceed.

Average Delay is the average time, in seconds, that vehicles can be expected to wait at an intersection.

The results of the existing operation of the intersection are shown in Tables 8.9 & 8.10 below.

Table 8.9: SIDRA Results Existing Volumes - AM Peak & PM Peak

Approach	Movement	AM PEAK			PM PEAK		
		D.O.S.	95%ile Queue (m)	Average Delay (s)	D.O.S.	95%ile Queue (m)	Average Delay (s)
Chapel Street (S)	Left	0.605	63.3	41.8	**0.565**	**100.0**	**27.5**
	Right	0.605	63.3	41.9	**0.565**	**100.0**	**27.5**
Whitehorse Road (E)	Left	0.606	128.3	14.5	**0.552**	**93.3**	**17.9**
	Through	0.606	131.9	8.9	**0.552**	**107.8**	**18.0**
	U-turn	0.034	1.9	14.5	**0.279**	**12.8**	**35.3**
Whitehorse Road (W)	Through	0.220	33.5	6.2	**0.515**	**99.3**	**18.7**
	Right	0.538	19.2	27.6	**0.516**	**25.5**	**37.3**
	U-turn	0.538	19.2	29.0	**0.561**	**25.5**	**38.7**
All Vehicles		0.606	131.9	13.3	**0.565**	**107.8**	**21.1**

Table 8.10: SIDRA Results Post Development Volumes - AM Peak & PM Peak

Approach	Movement	AM PEAK			PM PEAK		
		D.O.S.	95%ile Queue (m)	Average Delay (s)	D.O.S.	95%ile Queue (m)	Average Delay (s)
Chapel Street (S)	Left	0.766	74.3	48.3	**0.683**	**119.2**	**31.7**
	Right	0.766	74.3	48.3	**0.683**	**119.2**	**31.7**
Whitehorse Road (E)	Left	0.582	117.0	12.8	**0.531**	**87.5**	**15.6**
	Through	0.582	120.2	7.2	**0.531**	**106.1**	**15.3**
	U-turn	0.033	1.7	12.9	**0.253**	**11.7**	**30.4**
Whitehorse Road (W)	Through	0.213	30.8	5.0	**0.474**	**92.1**	**15.8**
	Right	0.758	37.3	39.8	**0.669**	**37.6**	**38.9**
	U-turn	0.758	37.3	41.2	**0.669**	**37.6**	**40.3**
All Vehicles		0.766	120.2	13.4	**0.683**	**119.2**	**20.2**

In summary, the SIDRA results of the intersection of Whitehorse Road and Chapel Street demonstrate the following:

— The overall DOS in the AM peak period marginally increased from 0.606 to 0.766 shifting the performance of the intersection from 'Very Good' to 'Good';
— The overall DOS in the PM peak period also marginally increased from 0.565 to 0.683 shifting the performance of the intersection from 'Excellent' to 'Very Good'; and
— Only minor increases were observed to queues and delays. The queues associated with the right turn movement from Whitehorse Road into Chapel Street can still entirely be accommodated within the dedicated right-turn lane in the post development scenario.

Intersection of Railway Road and Chapel Street

To assess the impact of the proposal on the intersection of Railway Road and Chapel Street, a SIDRA analysis of the existing and post development operation has also been undertaken.

The results of the existing operation of the intersection are shown in Tables 8.11 & 8.12 below.

Table 8.11: SIDRA Results Existing Volumes - AM Peak & PM Peak

Approach	Movement	AM PEAK			PM PEAK		
		D.O.S.	95%ile Queue (m)	Average Delay (s)	D.O.S.	95%ile Queue (m)	Average Delay (s)
Railway Road (E)	Through	0.525	59.1	32.8	**0.714**	**74.0**	**37.0**
	right	0.358	13.7	52.1	**0.569**	**25.6**	**52.1**
Chapel Street (N)	left	0.032	2.4	10.3	**0.040**	**3.0**	**9.6**
	right	0.461	82.8	21.2	**0.433**	**77.5**	**19.7**
Railway Road (W)	Left	0.417	59.4	12.5	**0.541**	**102.1**	**14.2**
	through	0.432	25.6	43.1	**0.186**	**7.5**	**45.4**
All vehicles		0.525	82.8	22.4	**0.714**	**102.1**	**22.2**

Table 8.12: SIDRA Results Post Development Volumes - AM Peak & PM Peak

Approach	Movement	AM PEAK			PM PEAK		
		D.O.S.	95%ile Queue (m)	Average Delay (s)	D.O.S.	95%ile Queue (m)	Average Delay (s)
Railway Road (E)	Through	0.485	61.1	25.8	**0.667**	**88.4**	**24.2**
	right	0.559	21.8	53.2	**0.602**	**44.2**	**47.2**
Chapel Street (N)	left	0.079	7.1	12.9	**0.086**	**7.6**	**12.2**
	right	0.580	98.2	27.4	**0.650**	**104.1**	**30.8**
Railway Road (W)	Left	0.465	59.4	12.5	**0.646**	**118.9**	**17.3**
	through	0.434	44.5	35.6	**0.304**	**27.4**	**36.3**
All vehicles		0.580	98.2	23.9	**0.667**	**118.9**	**25.3**

In summary, the SIDRA results of the intersection of Railway Road and Chapel Street demonstrate the following:

— The overall DOS in the AM peak hour period marginally increased from 0.525 to 0.580 continuing to perform under 'Excellent' conditions.

— The overall DOS in the PM peak hour period marginally decreased from 0.714 to 0.667 shifting from 'Good' to 'Very Good'. This is due to SIDRA allocating the critical through movement on the eastern leg of Railway Road more green time in the post development scenario.

— Only minor increases were observed to queues and delays.

Detailed SIDRA results can be seen in Appendix E.

It is noted that there are some differences in the existing SIDRA results between the Expert Evidence Statement and this Report, due to the upgrade in SIDRA software (SIDRA 7.0 to SIDRA 8.0) and signal cycle times adopted.

Intersection of Whitehorse Road and Railway Road

As agreed upon previously by VicRoads, a gap survey analysis has been undertaken to assess the existing and post development conditions of the intersection of Whitehorse Road and Railway Road. It is considered more appropriate to undertake a gap survey analysis rather than a SIDRA analysis for the priority controlled intersection, as the gap survey analysis accurately records real gaps, as opposed to theoretical gaps (from SIDRA).

The intersection of Whitehorse Road and Railway Road is priority controlled and allows right turn movements into Railway Road, however restricts right-turn movements from Railway Road onto Whitehorse Road (through the presence of a central median along Whitehorse Road). The geometry of the intersection is shown in Figure 8.3 below.

Figure 8.3: Intersection of Whitehorse Road and Railway Road

The gap analysis results have been extracted from the Traffic Evidence Statement (23355A#1) and assume critical acceptance gap and follow up headway in accordance with Table 3.5 of the Austroads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections as follows:

— 5 second critical gap and 3 second follow up headway for left turns from Railway Road onto Whitehorse Road; and
— 6 second critical gap and 4 second follow up headway for right turns from Whitehorse Road onto Railway Road.

The results of the gap acceptable analysis in the existing and post development scenarios are shown in Table 8.13 below.

Table 8.13: Gap Survey Analysis Results

Movement	Critical Gap / Follow-up Gap	Total Movement Capacity	Existing Volumes	Site Traffic Volumes	Post Development Traffic Volumes
AM Peak Hour					
Left-turn from Railway Road to Whitehorse Road	5 / 3 seconds	326 movements	27 movements	43 movements	70 movements
Right-turn from Whitehorse Road to Railway Road	6 / 4 seconds	163 movements	52 movements	57 movements	109 movements
PM Peak Hour					
Left-turn from Railway Road to Whitehorse Road	5 / 3 seconds	386 movements	104 movements	173 movements	277 movements
Right-turn from Whitehorse Road to Railway Road	6 / 4 seconds	208 movements	29 movements	53 movements	102 movements

On the basis of the above, it can be seen that the post development traffic volumes do not exceed the total movement capacity at the intersection of the Whitehorse Road and Railway Road.

Traffic Impact Summary

Based on the SIDRA analysis undertaken of the signalised intersections of Whitehorse Road and Chapel Street, Chapel Street and Railway Road and the gap acceptance analysis of the intersection of Whitehorse Road and Railway Road, it is considered that the additional level of traffic can be accommodated by the surrounding road network.

9 Conclusion:

It is proposed to amend the existing Planning Permit (WH/2017/277) for the mixed-use development at 160 Whitehorse Road, Blackburn. The amended application will comprise 187 dwellings, 11,798sqm of office, 2,323sqm of retail and a supermarket with a floor area of 1,686sqm.

Based on the above assessment, it is considered that:

Car Parking Provision

- The proposed on-site parking provision is considered appropriate based on the following:
  - The provision of parking for residents is in accordance with Clause 52.06-5 of the Whitehorse Planning Scheme.
  - There is no statutory requirement to provide visitor car parking on-site. Notwithstanding, it is proposed to provide a total of 13 visitor car parking spaces within the shared pool on Basement 2. This level of parking will entirely meet the needs of visitors during weekday business hours. During weekend evenings and on weekends there may be a small overflow demand of visitor parking (anticipated to be in the order of four spaces) and the parking surveys undertaken suggest that this demand can suitably be accommodated by the surrounding on-street parking.
  - The provision of parking for the retail use is in accordance with Clause 52.06-5 of the Whitehorse Planning Scheme.
  - The provision of parking for the office use is in accordance with Clause 52.06-5 of the Whitehorse Planning Scheme.
  - The provision of parking for the supermarket is anticipated to meet the typical peak demands of both staff and customers noting that a significant proportion of the trade associated with the supermarket is expected to be generated by residents of the apartments and staff of the office components of the development.
  - Parking surveys indicate that suitable off-site parking is available in the vicinity of the subject site at all times for any overflow parking that may occur.
  - The site has very good access to the metropolitan public transport network, including train and bus services, which will reduce the dependence on private motor vehicle use in gaining access to and from the site.
  - The generous provision of bicycle parking will encourage the use of alternative transport modes and reduce the reliance on private vehicle use.

Car Parking Layout and Vehicle Access Arrangements

- The proposed vehicle access arrangements and car parking layout have been designed in accordance with the dimensional requirements of the Whitehorse Planning Scheme and/or AS/NZS 2890.1:2004.
- A swept path assessment demonstrates that access to/from the site and critical parking spaces is satisfactory.

Bicycle Parking Provision and Design

- The provision of 215 bicycle parking spaces exceeds the requirements of the Whitehorse Planning Scheme (126 spaces) and is considered to meet the demands of the different users of the development.

— Bicycle Parking Devices (BPDs) have been designed in accordance with AS2890.3:2015.
— End of trip facilities have been provided in accordance with the requirements of Clause 52.34 of the Whitehorse Planning Scheme.

Loading and Waste Arrangements

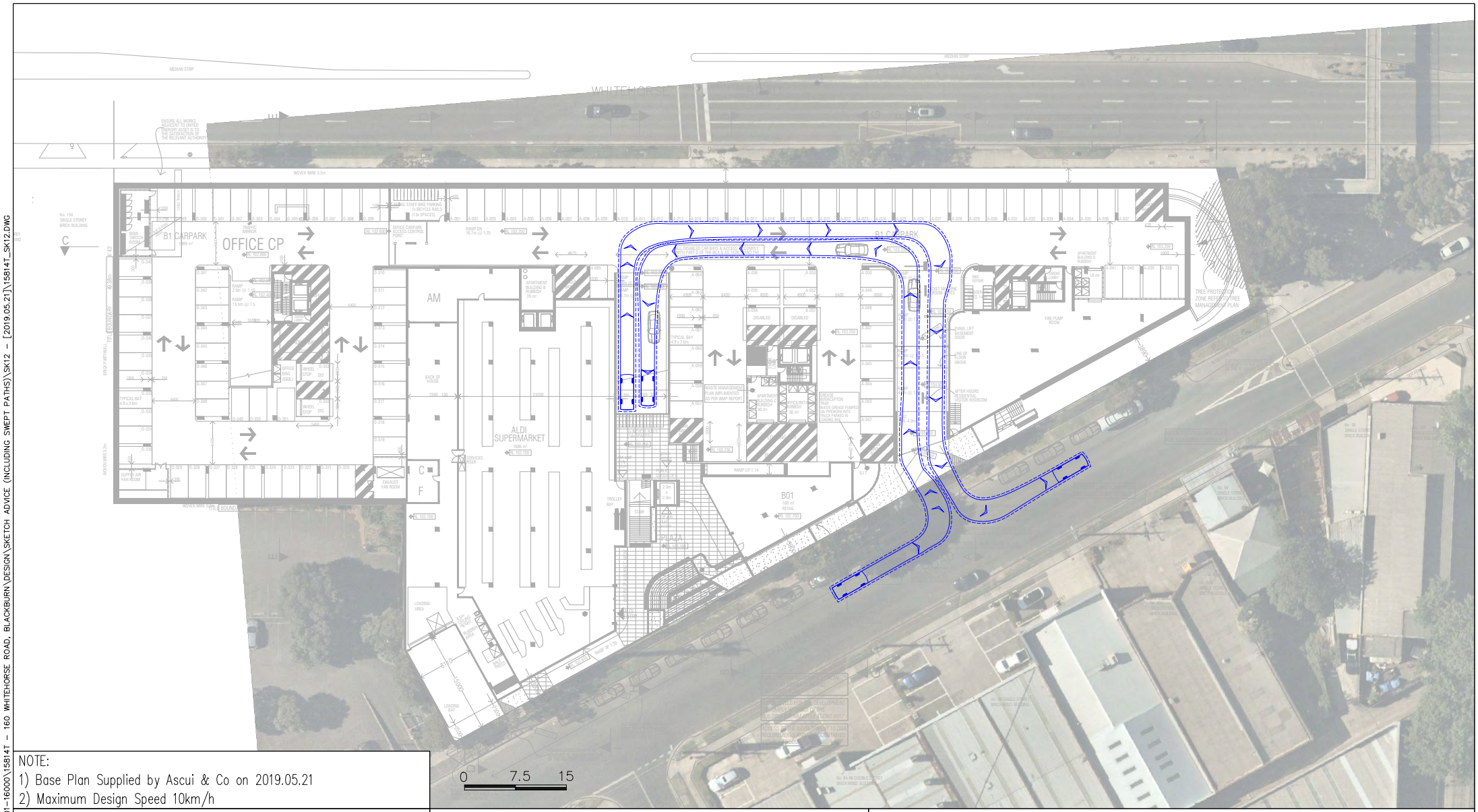
— A loading bay has been provided within Basement Level 1 for the retail tenancies, office and any residential loading requirements. The swept path assessment demonstrates a Small Rigid Vehicle (the largest vehicle anticipated to access the site) is able to access the loading area and can enter and exit the site in a suitable manner.
— A loading bay has been provided on ground floor for the supermarket tenancy. It is considered appropriate for commercial vehicles to reverse off Railway Road into the loading bay, based on the classification of the road, level of traffic and that loading will be restricted to off-peak times.
— To facilitate deliveries for the office tenancies, it is proposed to provide a dedicated loading bay within the office car park. The loading bay is able to accommodate a SRV which would be sufficient to cater for the vast majority of deliveries associated with the office tenancies.
— Refuse and recycling areas are provided within Basement Level 1 and on ground floor. Waste is proposed to be collected on-site by a private waste contractor. The swept path assessment undertaken demonstrates the ability for the nominated waste collection vehicles to enter and exit the site in a suitable manner.

Traffic Analysis

— The volume of peak hour traffic generated by the development is predicted to be up to 331 vehicle movements in the AM commuter peak hour, increasing to 559 vehicle movements in the PM commuter peak hour. Based on the SIDRA analysis and gap acceptance analysis it is considered that this level of traffic can be accommodated by the surrounding road network.

Overall, the proposed development is not expected to create adverse traffic or parking impacts in the precinct.

Appendix A **Swept Path Assessment**

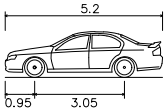


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B99 Vehicle (AS/NZS2890.1:2004)

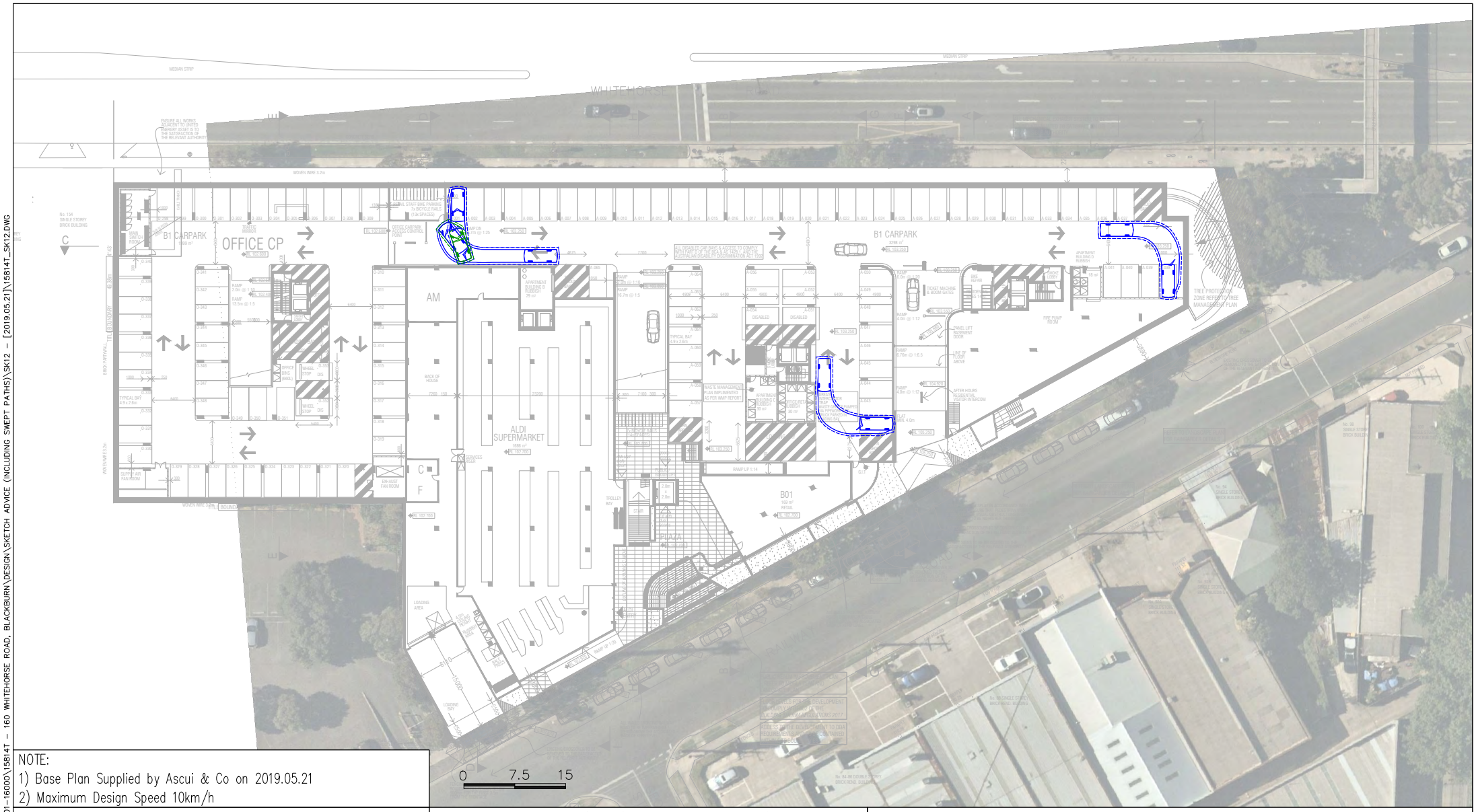


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	6.30m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT – B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	1 of 18	1:750@A4	22/05/2019

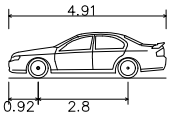


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B85 Vehicle (AS/NZS2890.1:2004)

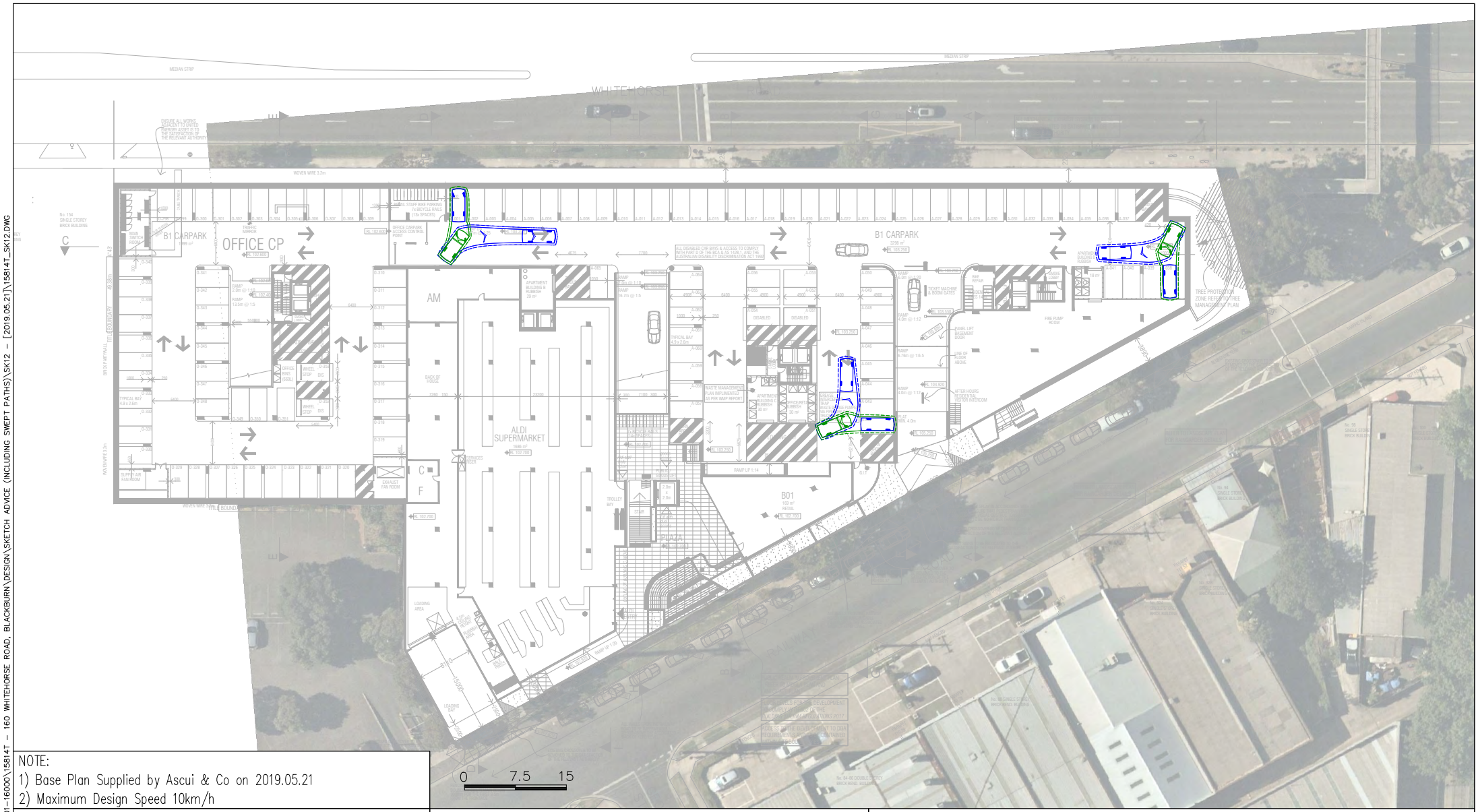


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	5.80m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	2 of 18	1:750@A4	22/05/2019

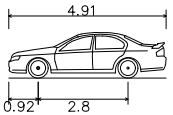


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B85 Vehicle (AS/NZS2890.1:2004)



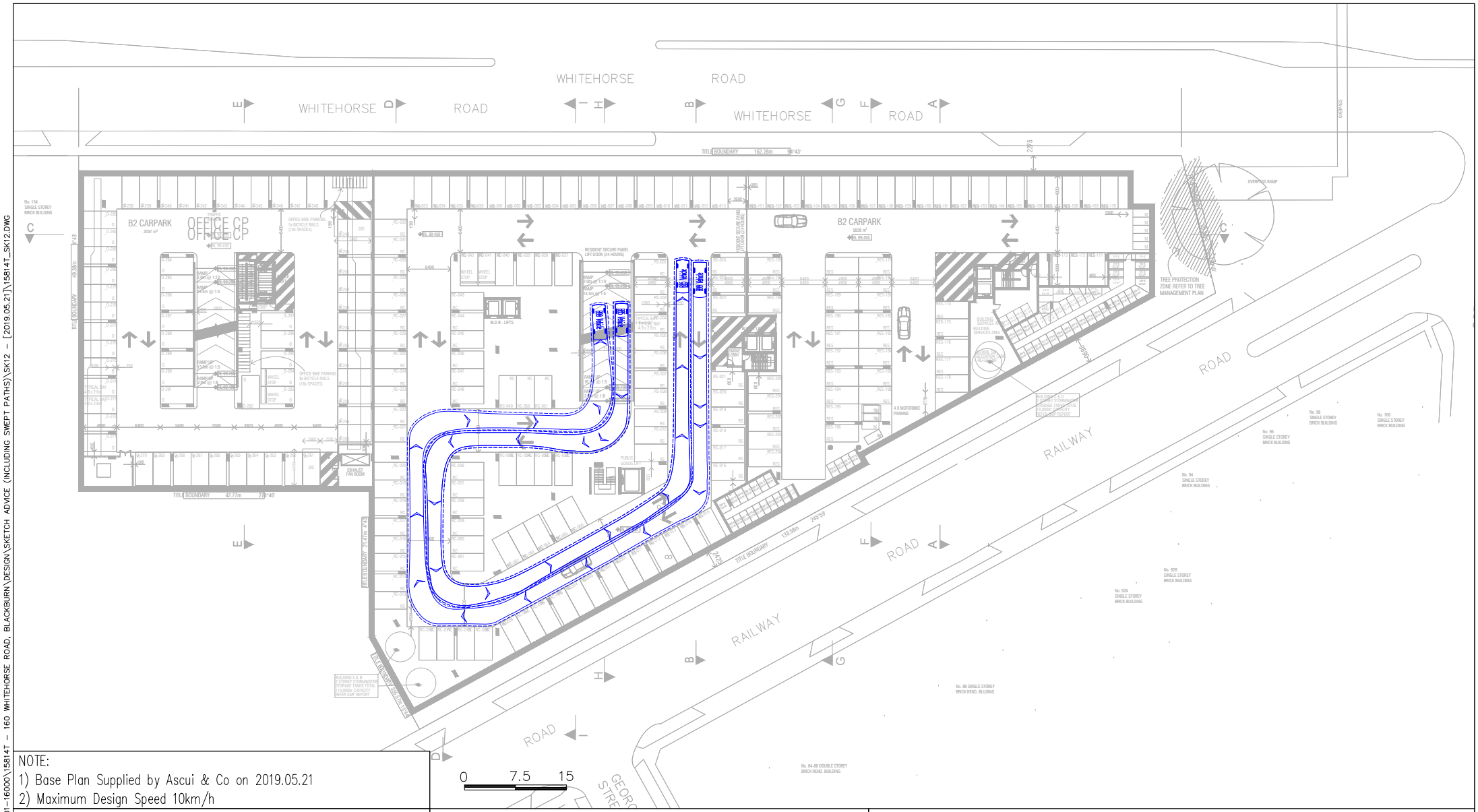
VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	5.80m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

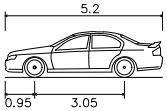
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	3 of 18	1:750@A4	22/05/2019

22/05/2019 6:04:35 PM Y:\15501-16000\15814T - 160 WHITEHORSE ROAD, BLACKBURN\DESIGN\SKETCH ADVICE (INCLUDING SWEPT PATHS)\SK12 - [2019.05.21]15814T_SK12.DWG



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

B99 Vehicle (AS/NZS2890.1:2004)



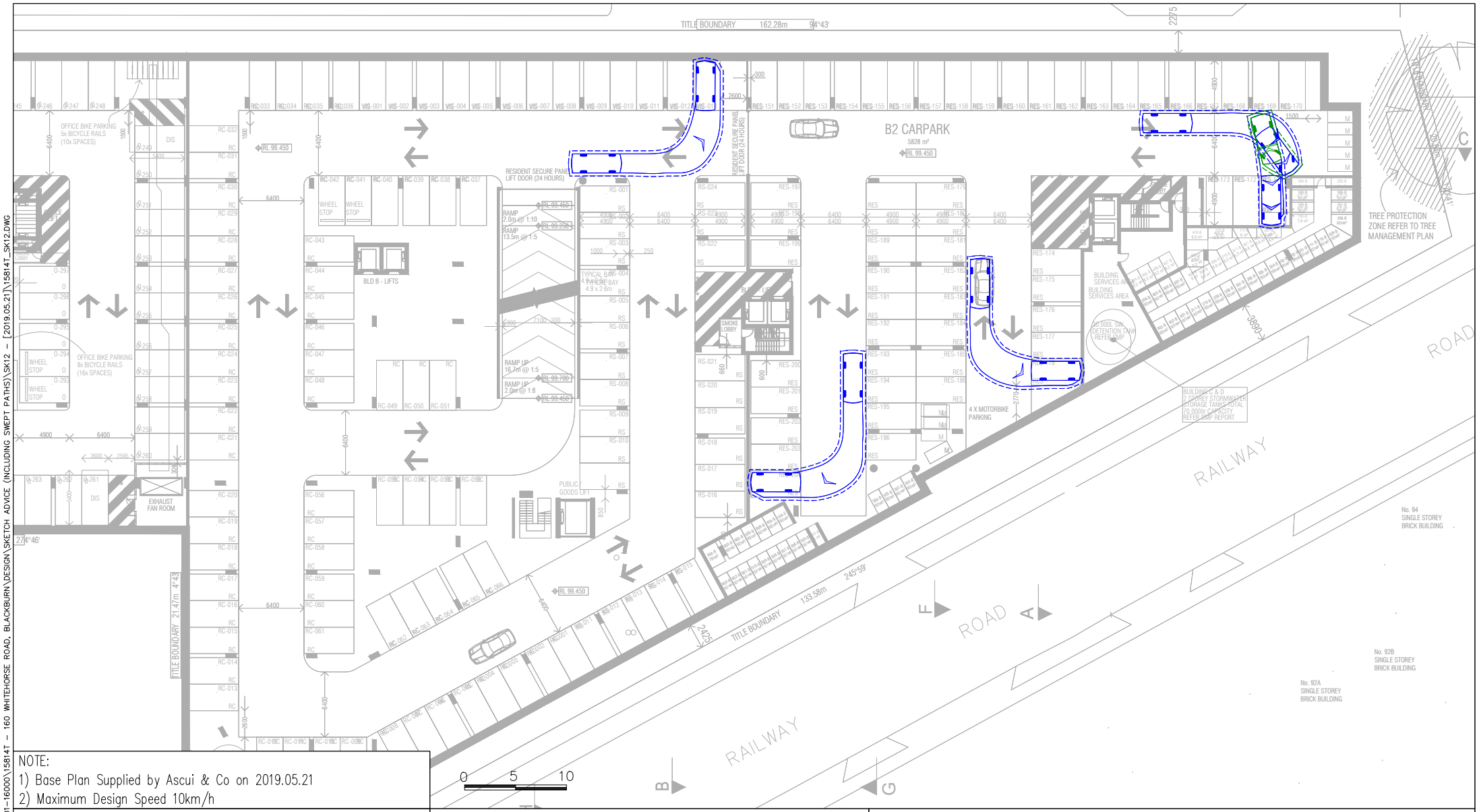
VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	6.30m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B2

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	4 of 18	1:750@A4	22/05/2019

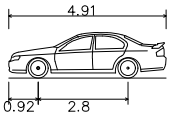


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B85 Vehicle (AS/NZS2890.1:2004)

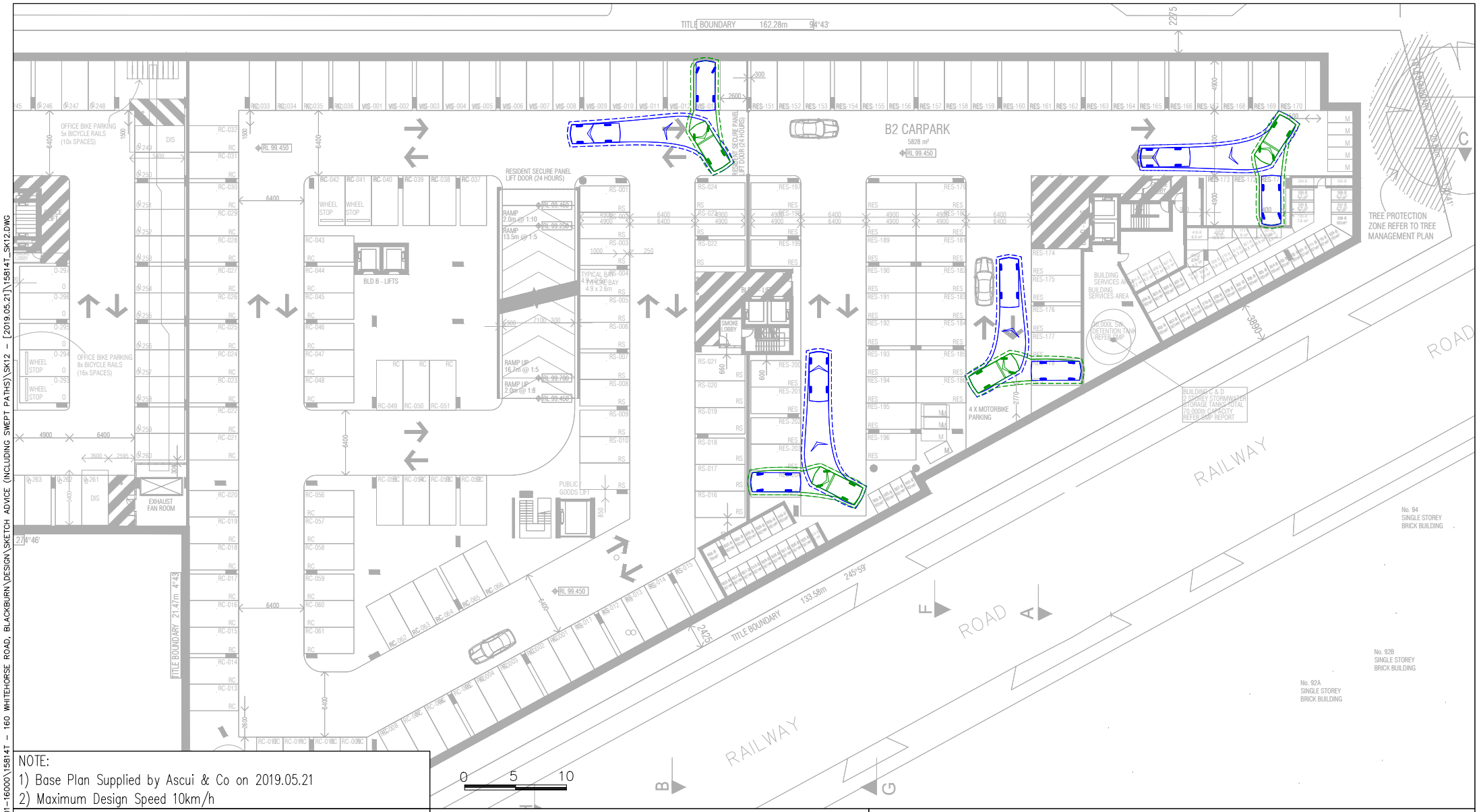


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	5.80m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B2

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	5 of 18	1:500@A4	22/05/2019

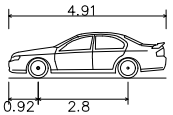


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B85 Vehicle (AS/NZS2890.1:2004)

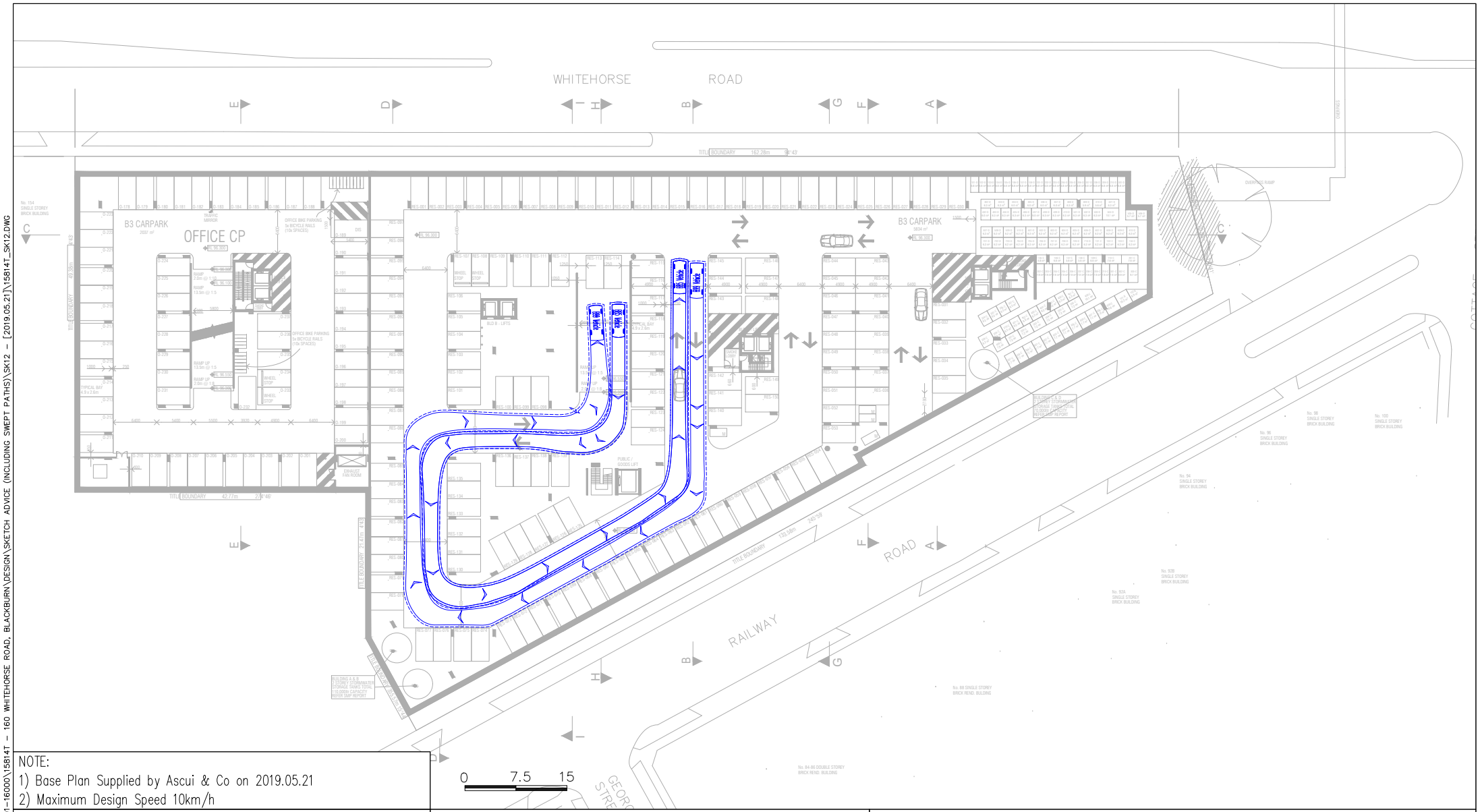


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	5.80m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B2

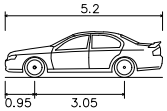
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	6 of 18	1:500@A4	22/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B99 Vehicle (AS/NZS2890.1:2004)

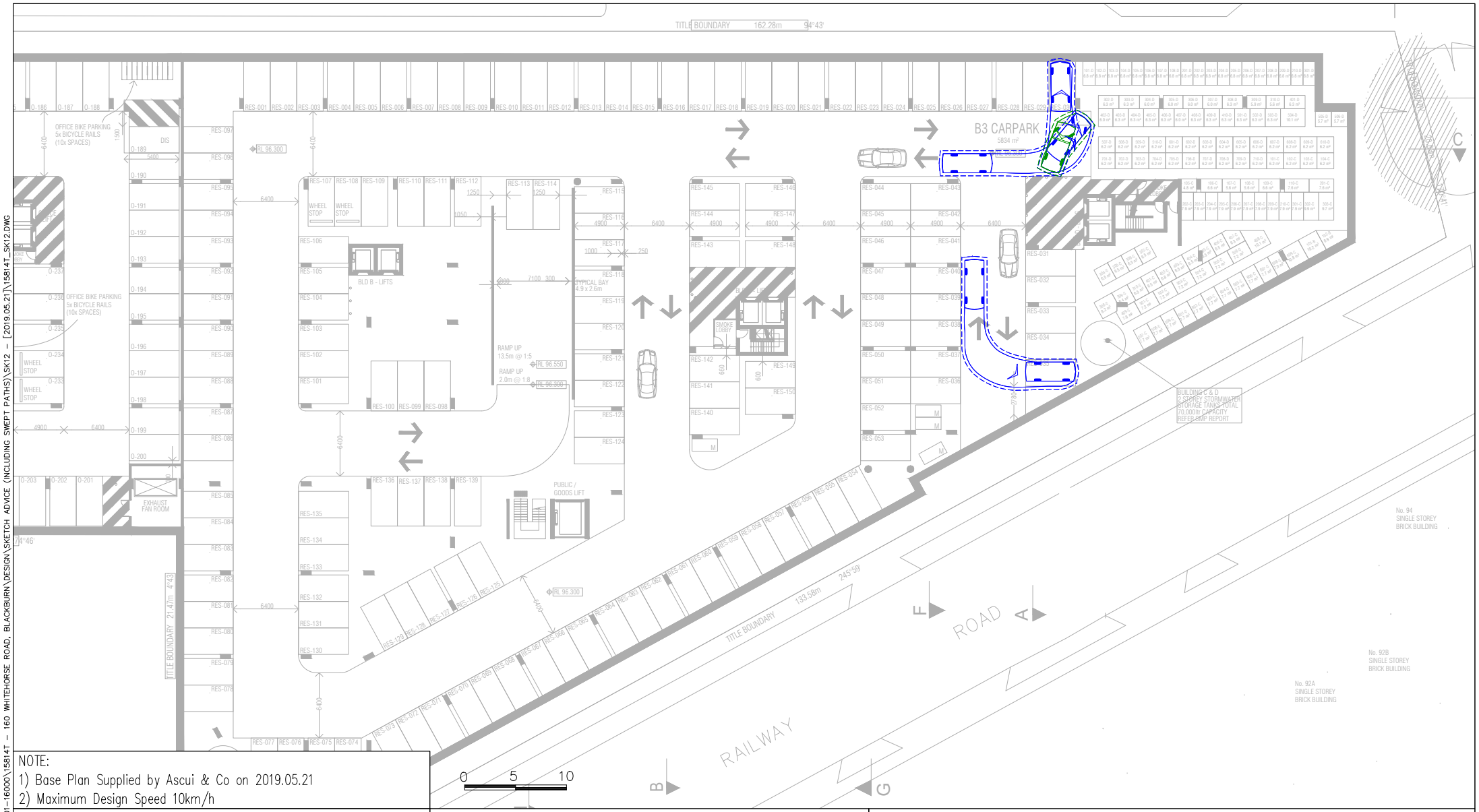


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	6.30m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B3

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	7 of 18	1:750@A4	22/05/2019

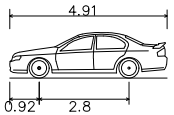


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

B85 Vehicle (AS/NZS2890.1:2004)

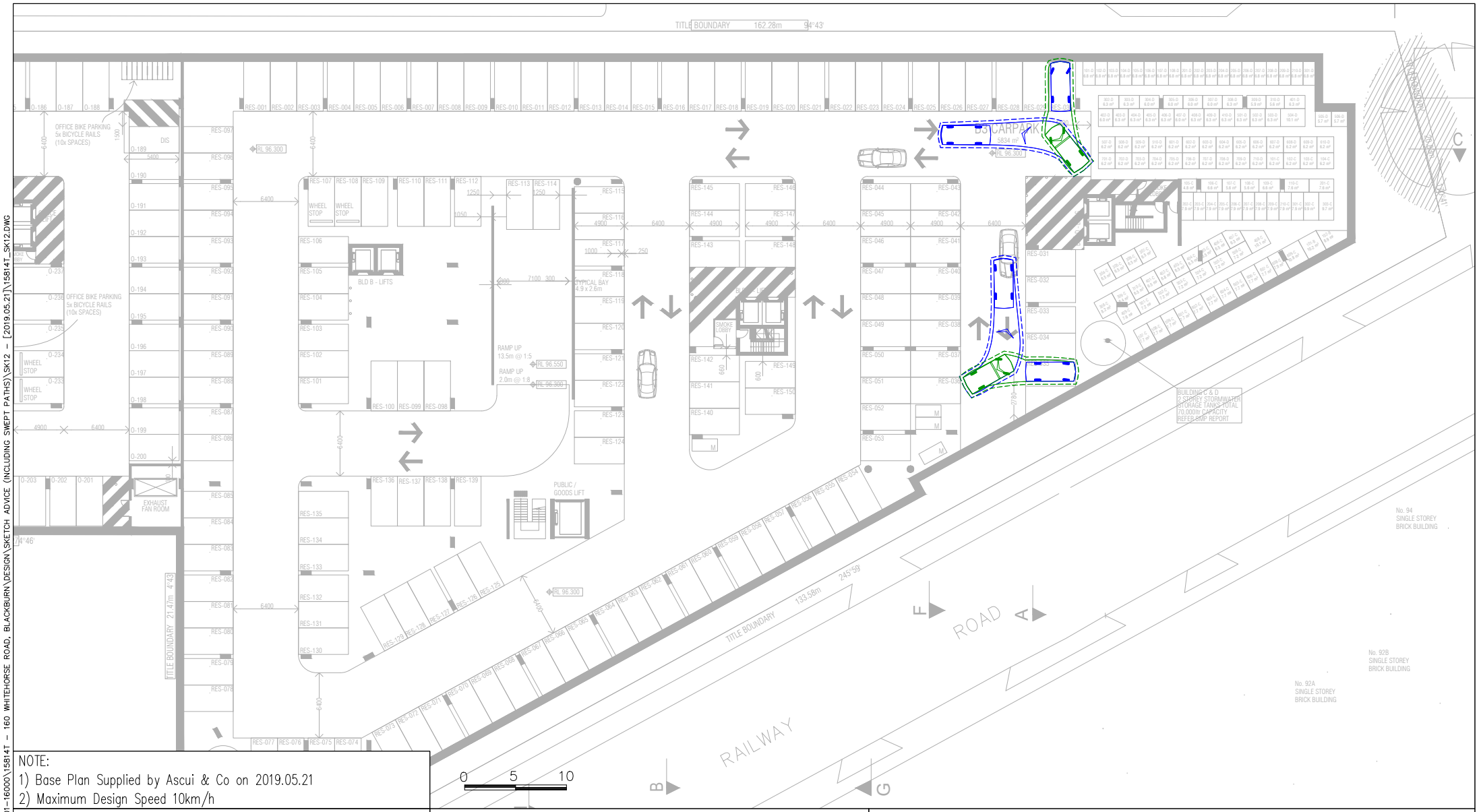


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

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	5.80m

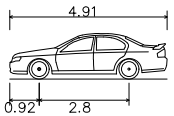
Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT – B3

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	8 of 18	1:500@A4	22/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

B85 Vehicle (AS/NZS2890.1:2004)



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

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	5.80m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B3

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	9 of 18	1:500@A4	22/05/2019

Appendix B **Bicycle Parking Specifications**

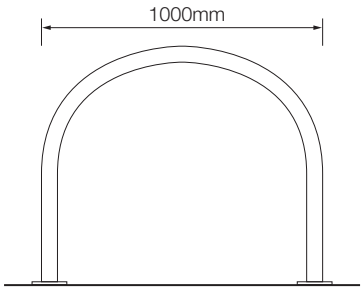
Arc de Triomphe™

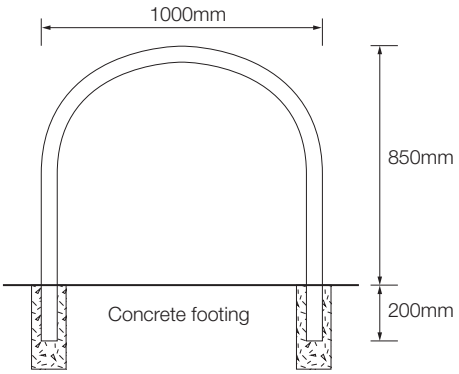
Galvanised finish / Stainless Steel finish

Features

- Each rail supports two adult bikes in an upright position
- Can be either bolted to a concrete slab or concreted in situ
- Available in stainless steel or galvanised steel
- Provides the ability to lock both wheels and frame
- Suitable for foyers and entry areas

Dimensions





Specifications

Material options

- Galvanised (Duragal)
- 316 Marine grade stainless steel

Fixing options

- Welded flange - Bolt on
- In situ

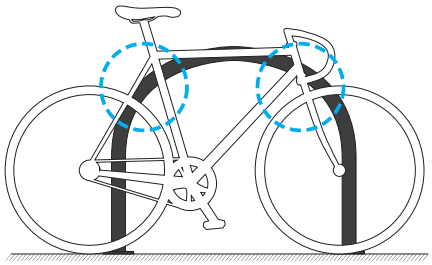
Recommended fasteners

- Galvanised Dynabolts (M10 x 65mm)
- Stainless Dynabolts (M10 x 65mm)
- Shear Nut security fasteners

Dimensions

1000mm [w] x 850mm [h]

Locking Points



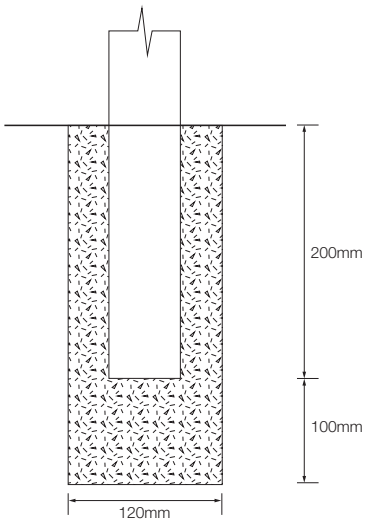
V4.1 - 1/05/2017 | Specification may be subject to change without notice. ©Bicycle Network

BICYCLE NETWORK BIKE PARKING

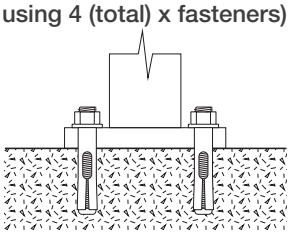
DESIGN. SUPPLY. INSTALL.
Bicycle Network ABN 41 026 835 903
p. 1300 727 563 e. parking@bicyclenetwork.com.au bikeparking.com.au
VIC Level 4, 246 Bourke Street, Melbourne VIC 3000 NSW 234 Crown Street, Darlinghurst NSW 2010
TAS 210 Collins Street, Hobart TAS 7000 NT Suite 5, 18-20 Cavenagh Street, Darwin 0800

Fixing options

In situ (Concrete footing)

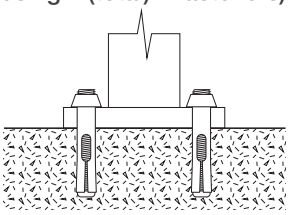


Welded flange (Bolt on)
using 4 (total) x fasteners)



Shown with M10 x 65mm fastener

Welded flange (Security heads)
using 4 (total) x fasteners)

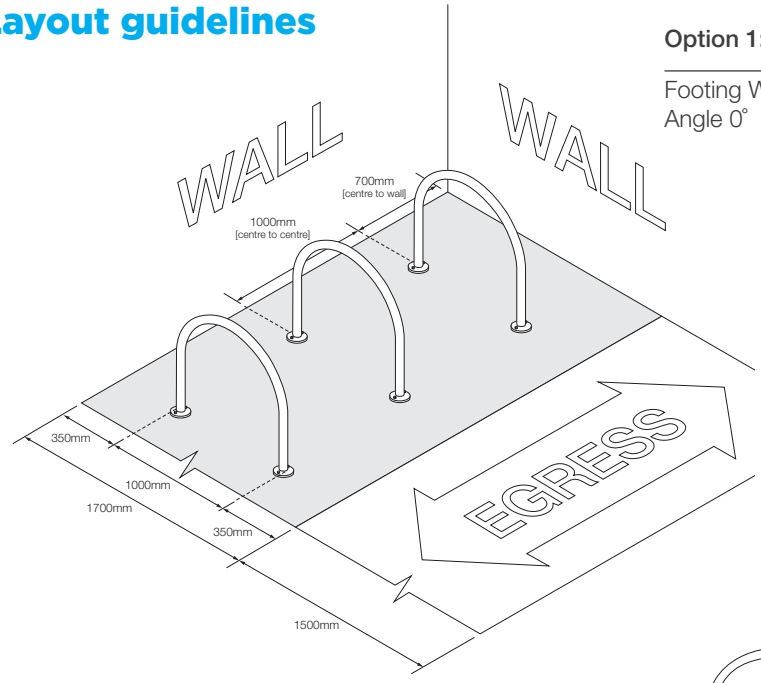


Shown with M10 x 65mm Shear Nuts

Layout guidelines

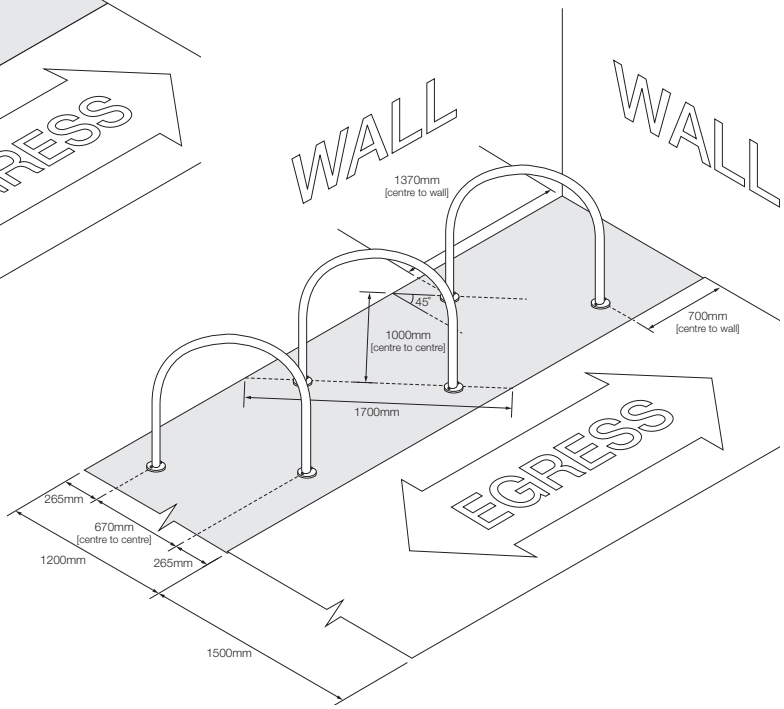
Option 1:

Footing Width 1700mm
Angle 0˚

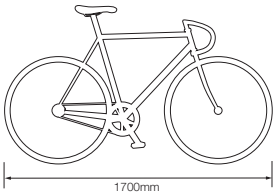


Option 2:

Footing Width 1200mm
Angle 45˚



Typical Bicycle Length



BICYCLE NETWORK BIKE PARKING

DESIGN. SUPPLY. INSTALL.

Bicycle Network ABN 41 026 835 903
p. 1300 727 563 e. parking@bicyclenetwork.com.au bikeparking.com.au
VIC Level 4, 246 Bourke Street, Melbourne VIC 3000 NSW 234 Crown Street, Darlinghurst NSW 2010
TAS 210 Collins Street, Hobart TAS 7000 NT Suite 5, 18-20 Cavenagh Street, Darwin 0800

Ned Kelly™

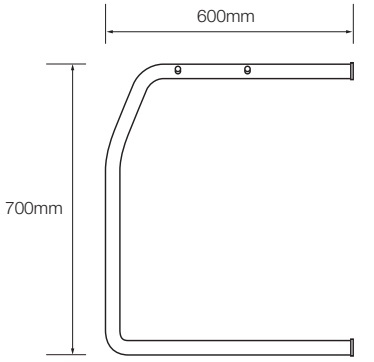
Zinc finish

Black powder coat finish

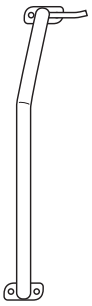
Features

- Each rail provides storage for a single bike
- Suits bikes with full length mud guards
- Available in Zinc finish or Black powder coat over mild steel
- Provides the ability to lock the main frame and one wheel
- Support prongs with protective coating prevent damage to rim
- Can be used with custom framing – no wall needed

Dimensions



SIDE



FRONT

Specifications

Material options

- Zinc finish
- Black powder coat over mild steel
- Stainless steel - *Pre-order only*

Fixing options

- Bolt on to wall
- Fixed to support framing

Recommended fasteners – wall

- Dynabolts (M8 x 40mm)
- Shear Nut security fasteners

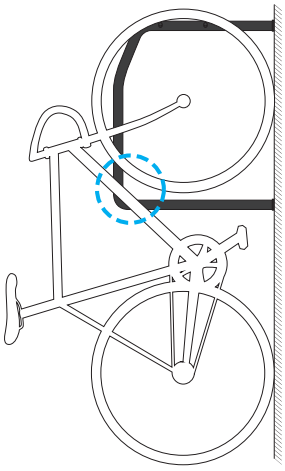
Recommended fasteners – framing

- Bolt and nut (M10 x 60mm)
- Tek screws

Dimensions

125mm [w] x 700mm [h] x 600mm [d]

Locking Points

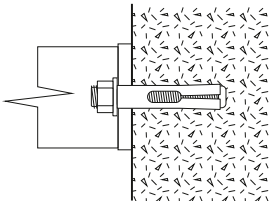


BICYCLE NETWORK BIKE PARKING

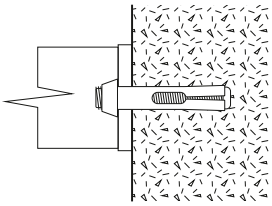
DESIGN. SUPPLY. INSTALL.
Bicycle Network ABN 41 026 835 903
p. 1300 727 563 e. parking@bicyclenetwork.com.au bikeparking.com.au
VIC Level 4, 246 Bourke Street, Melbourne VIC 3000 NSW 234 Crown Street, Darlinghurst NSW 2010
TAS 210 Collins Street, Hobart TAS 7000 NT Suite 5, 18-20 Cavenagh Street, Darwin 0800

Fixing options

Fix to a wall using 4x fasteners or Shear Nuts

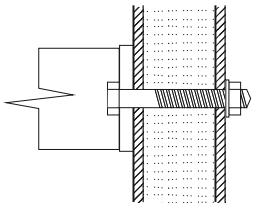


Shown with M8 x 40mm fastener

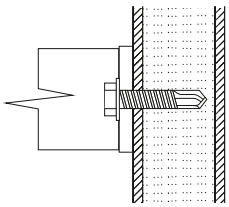


Shown with M8 x 40mm Shear Nuts

Fix to a frame using 4x bolts or Tek Screws

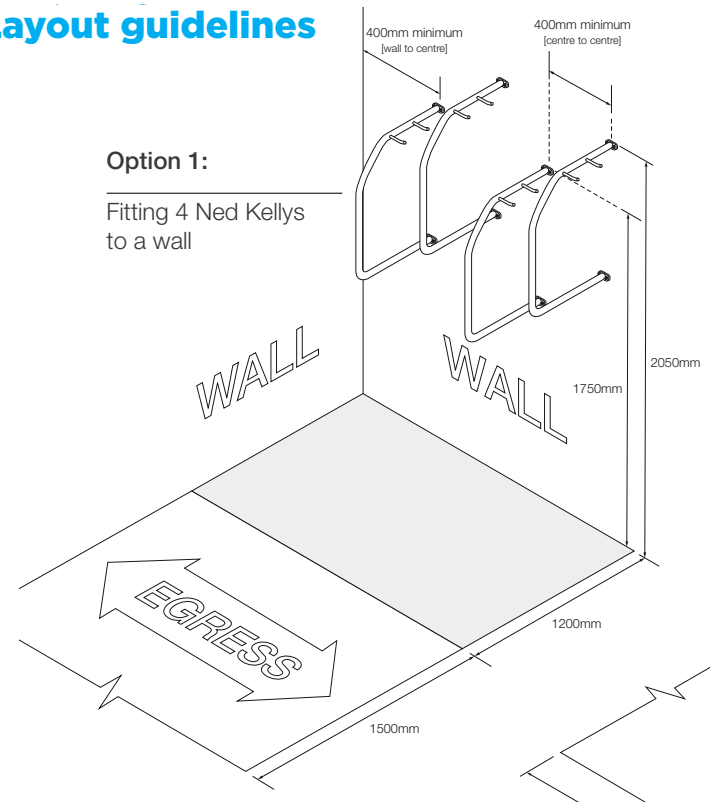


Shown with M10 x 60mm Bolt, Washer & Nut



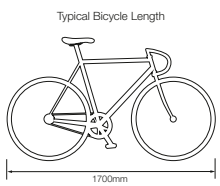
Shown with Tek Screw

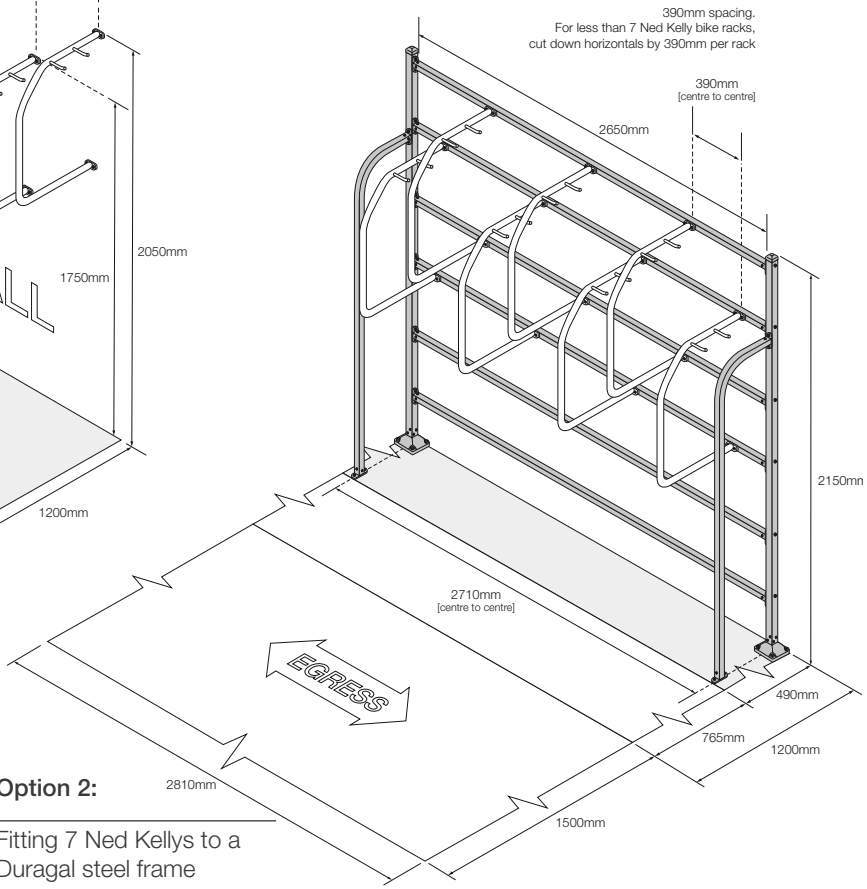
Layout guidelines



Option 1:

Fitting 4 Ned Kellys to a wall





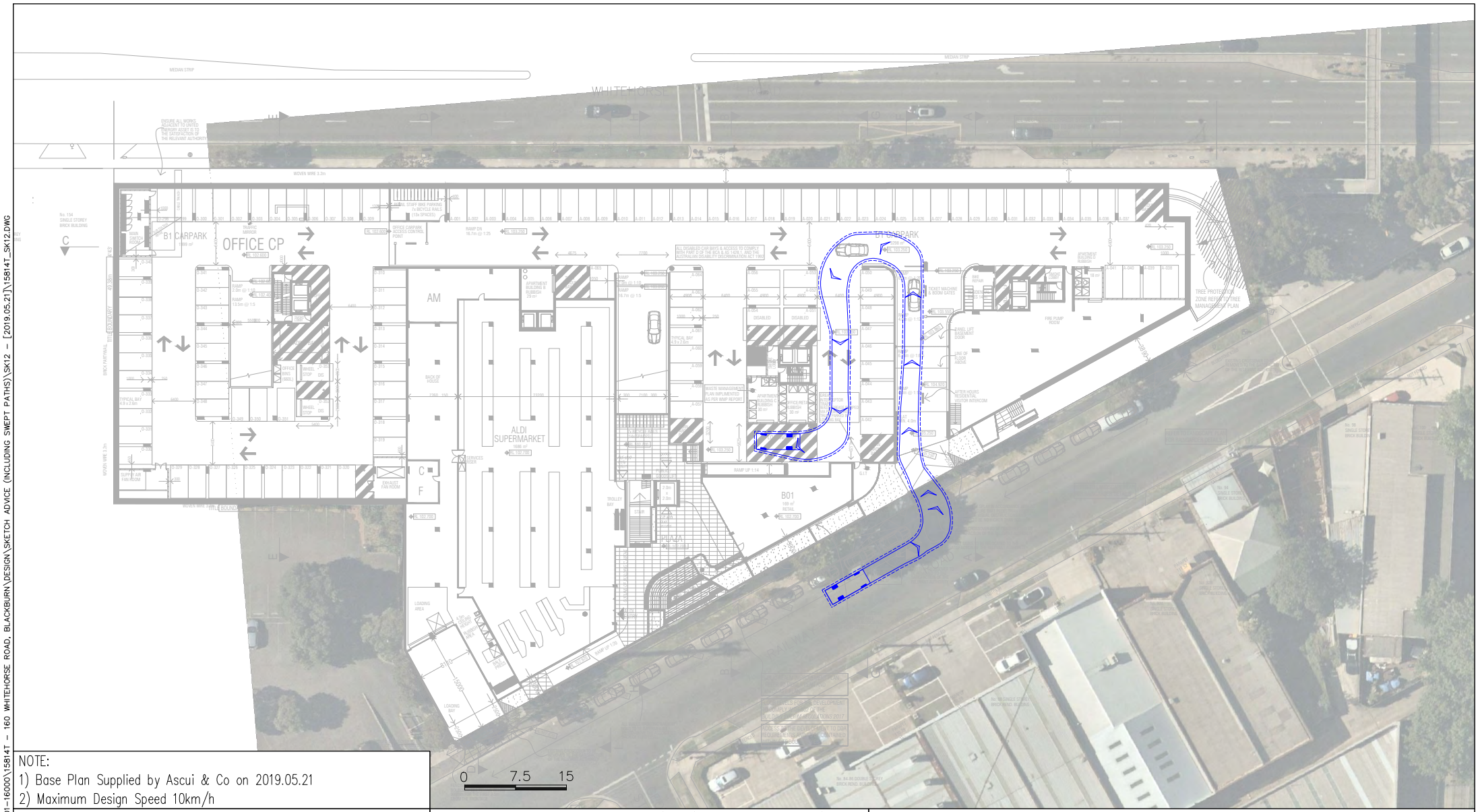
Option 2:

Fitting 7 Ned Kellys to a Duragal steel frame

BICYCLE NETWORK BIKE PARKING

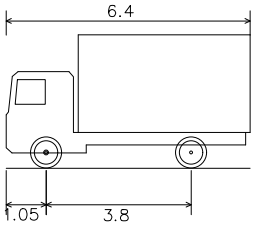
DESIGN. SUPPLY. INSTALL.
Bicycle Network ABN 41 026 835 903
p. 1300 727 563 e. parking@bicyclenetwork.com.au bikeparking.com.au
VIC Level 4, 246 Bourke Street, Melbourne VIC 3000 NSW 234 Crown Street, Darlinghurst NSW 2010
TAS 210 Collins Street, Hobart TAS 7000 NT Suite 5, 18-20 Cavenagh Street, Darwin 0800

Appendix C **Loading Arrangements**



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

SRV – Small Rigid Vehicle (AS/NZS2890.2:2002)



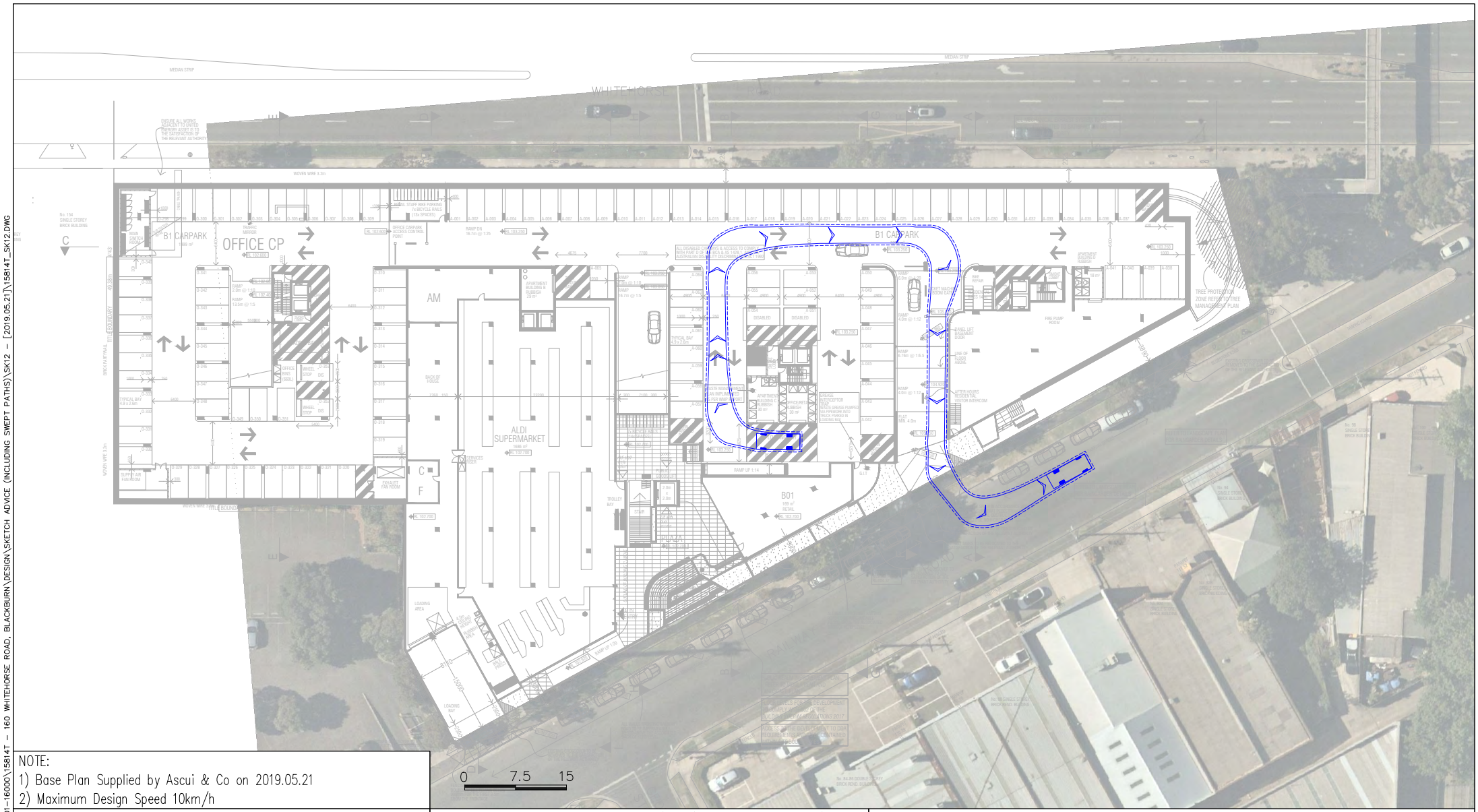
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	6.400m
Overall Width	2.330m
Track Width	2.330m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	7.100m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

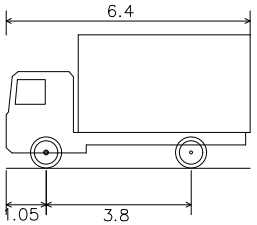
Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT – B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	10 of 22	1:750@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

SRV – Small Rigid Vehicle (AS/NZS2890.2:2002)



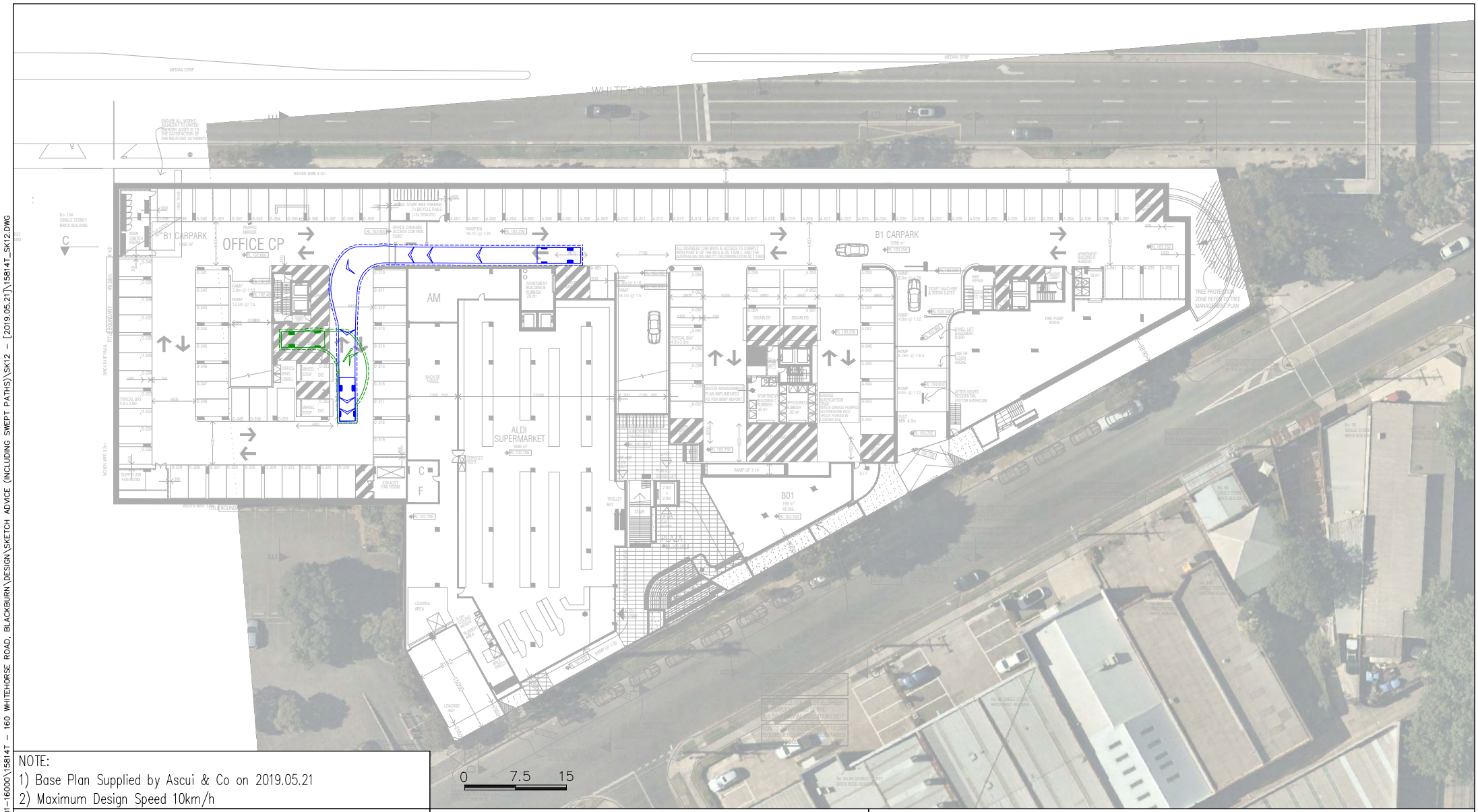
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	6.400m
Overall Width	2.330m
Track Width	2.330m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	7.100m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

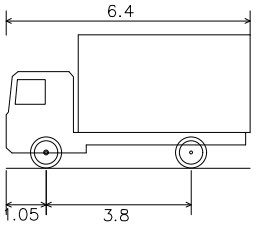
Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT – B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	11 of 22	1:750@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

SRV – Small Rigid Vehicle (AS/NZS2890.2:2002)



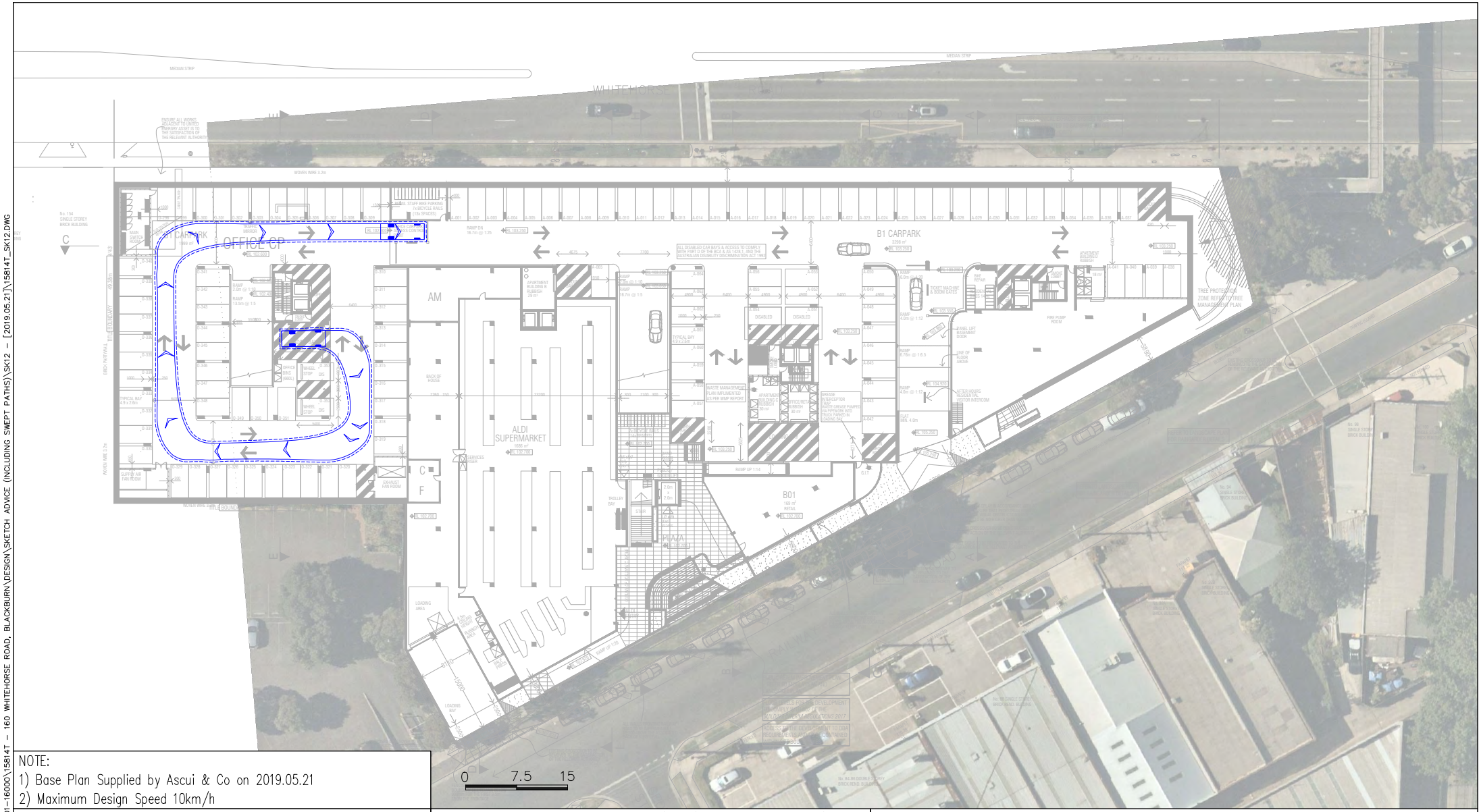
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	6.400m
Overall Width	2.330m
Track Width	2.330m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	7.100m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

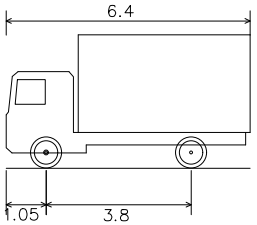
Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT – B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	12 of 22	1:750@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

SRV – Small Rigid Vehicle (AS/NZS2890.2:2002)



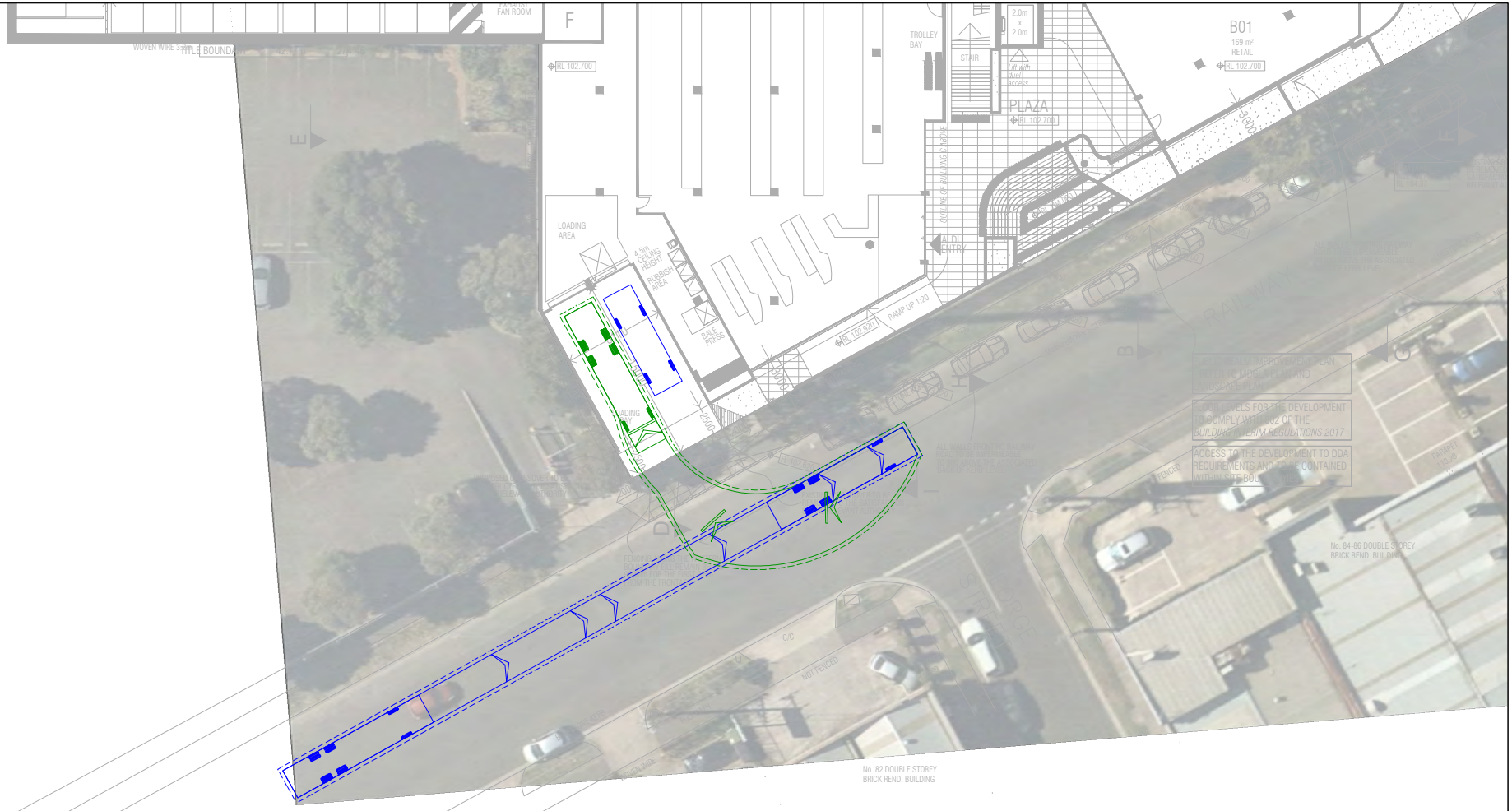
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	6.400m
Overall Width	2.330m
Track Width	2.330m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	7.100m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT – B1

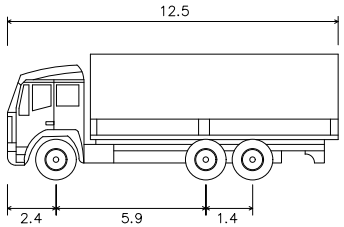
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	13 of 22	1:750@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

0 5 10

HRV – Heavy Rigid Vehicle (AS/NZS2890.2:2002)



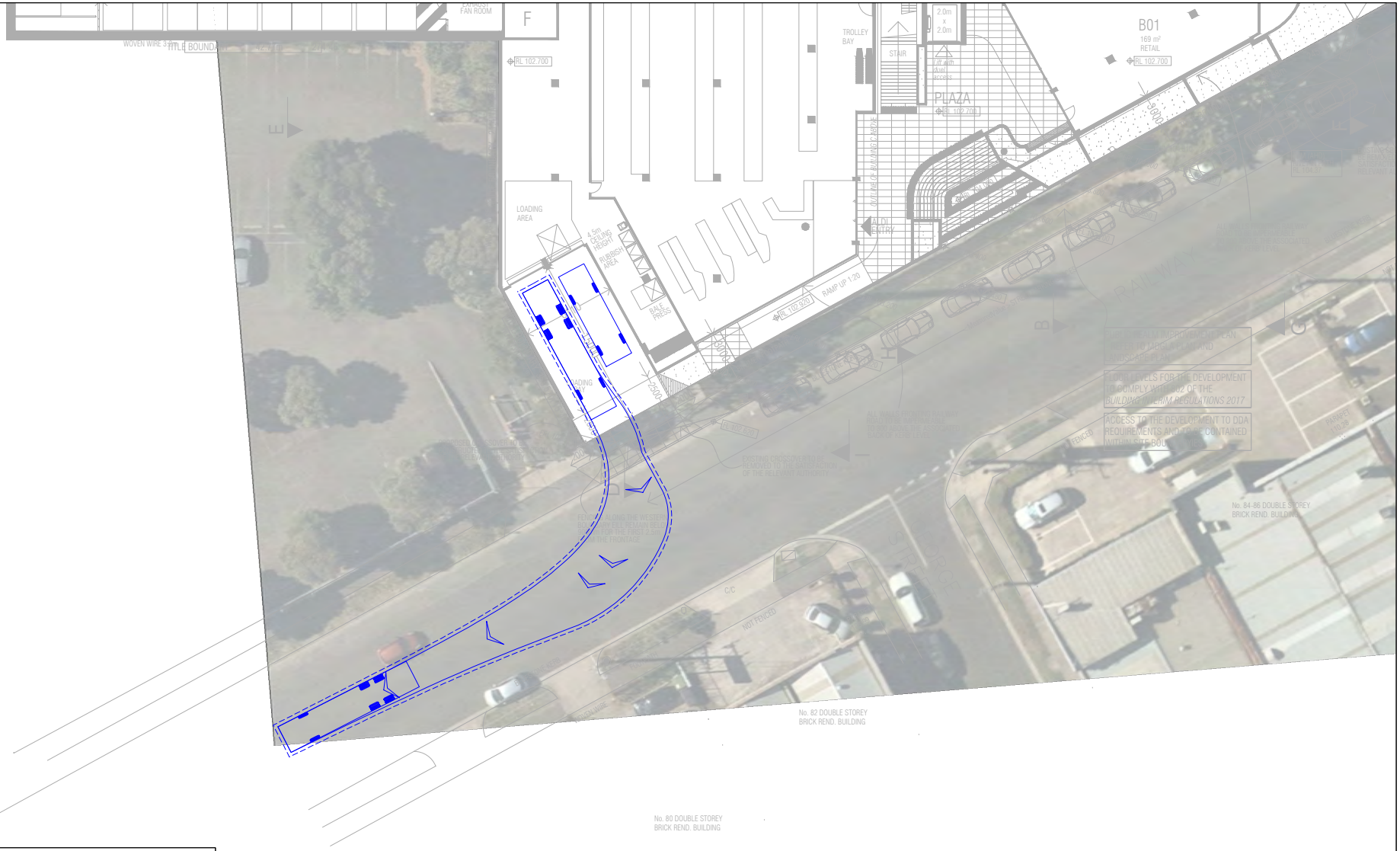
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	12.500m
Overall Width	2.500m
Track Width	2.500m
Lock to Lock Time	6.00 sec
Curb to Curb Turning Radius	12.500m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT

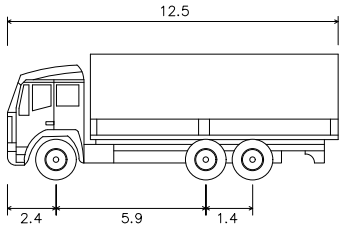
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	14 of 22	1:500@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

0 5 10

HRV – Heavy Rigid Vehicle (AS/NZS2890.2:2002)



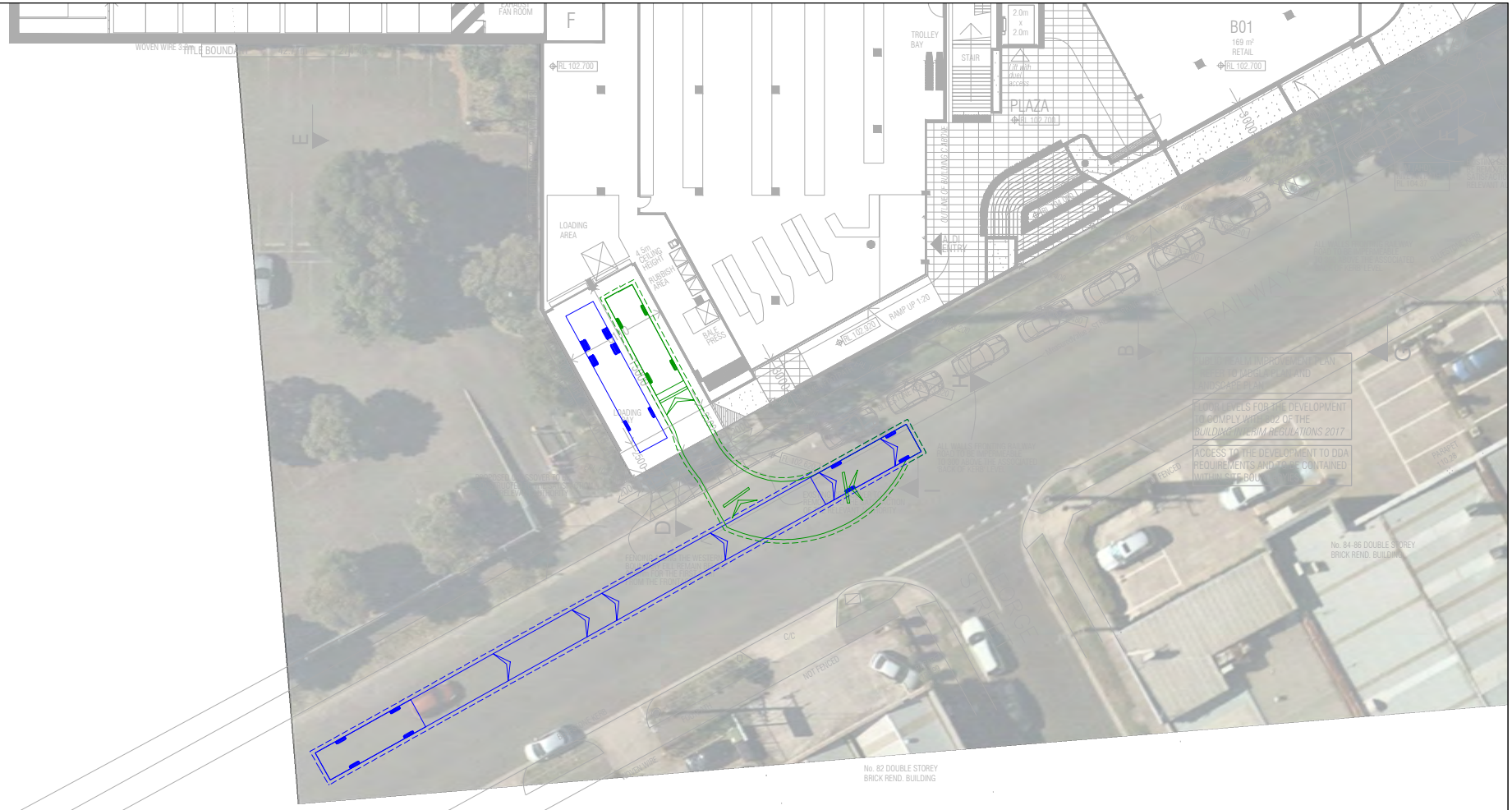
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	12.500m
Overall Width	2.500m
Track Width	2.500m
Lock to Lock Time	6.00 sec
Curb to Curb Turning Radius	12.500m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT

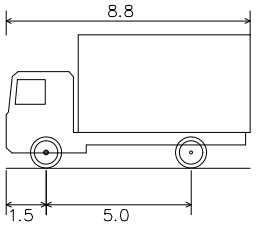
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	15 of 22	1:500@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

0 5 10

MRV – Medium Rigid Vehicle (AS/NZS2890.2:2002)



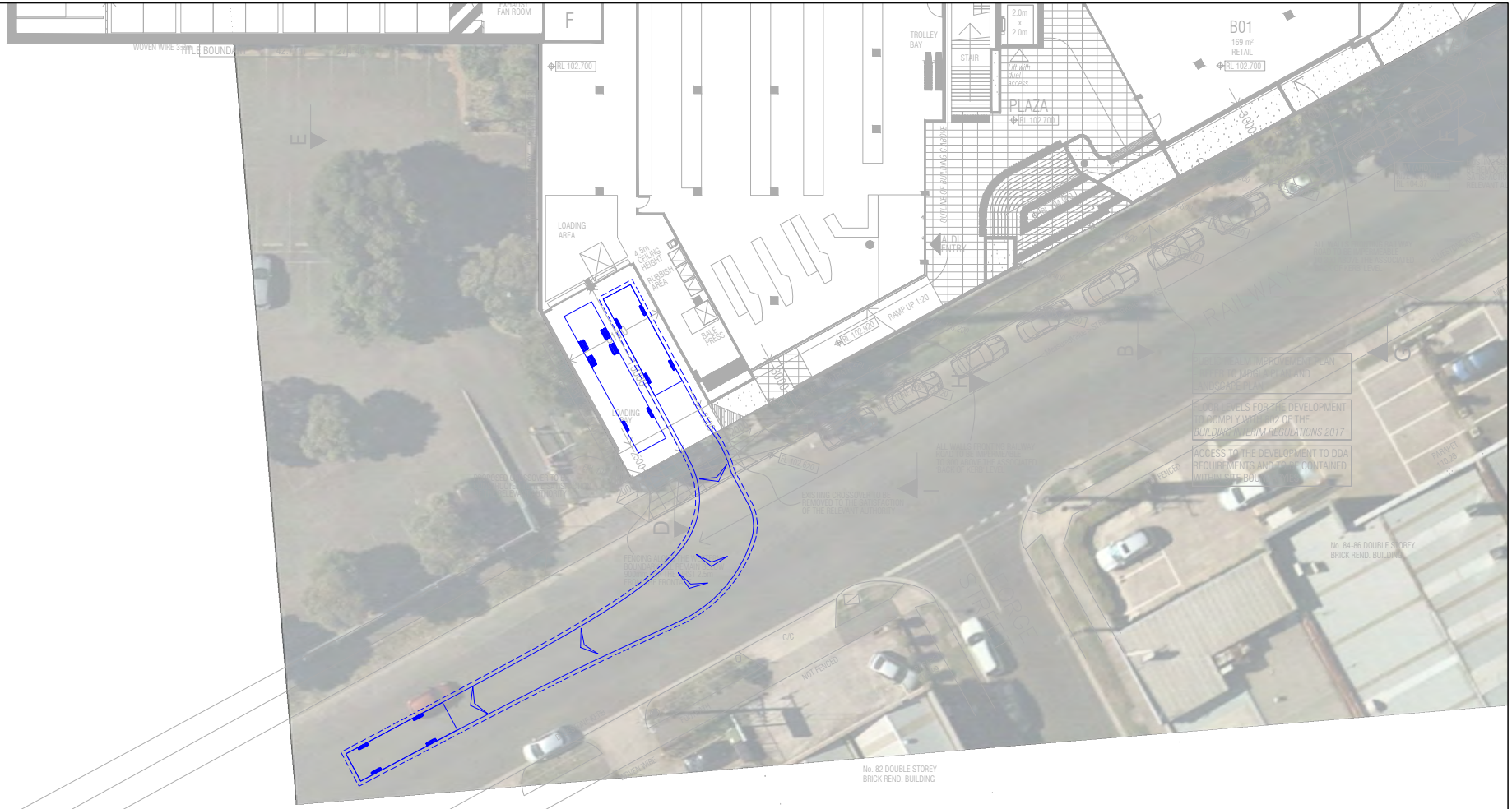
VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

Overall Length	8.800m
Overall Width	2.500m
Track Width	2.500m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	10.000m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT

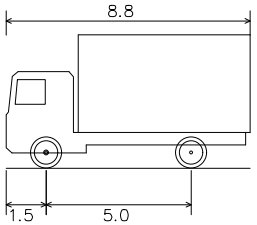
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	16 of 22	1:500@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

0 5 10

MRV – Medium Rigid Vehicle (AS/NZS2890.2:2002)



VEHICLE ENVELOPE (FORWARD)
500mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
500mm CLEARANCE (REVERSE)

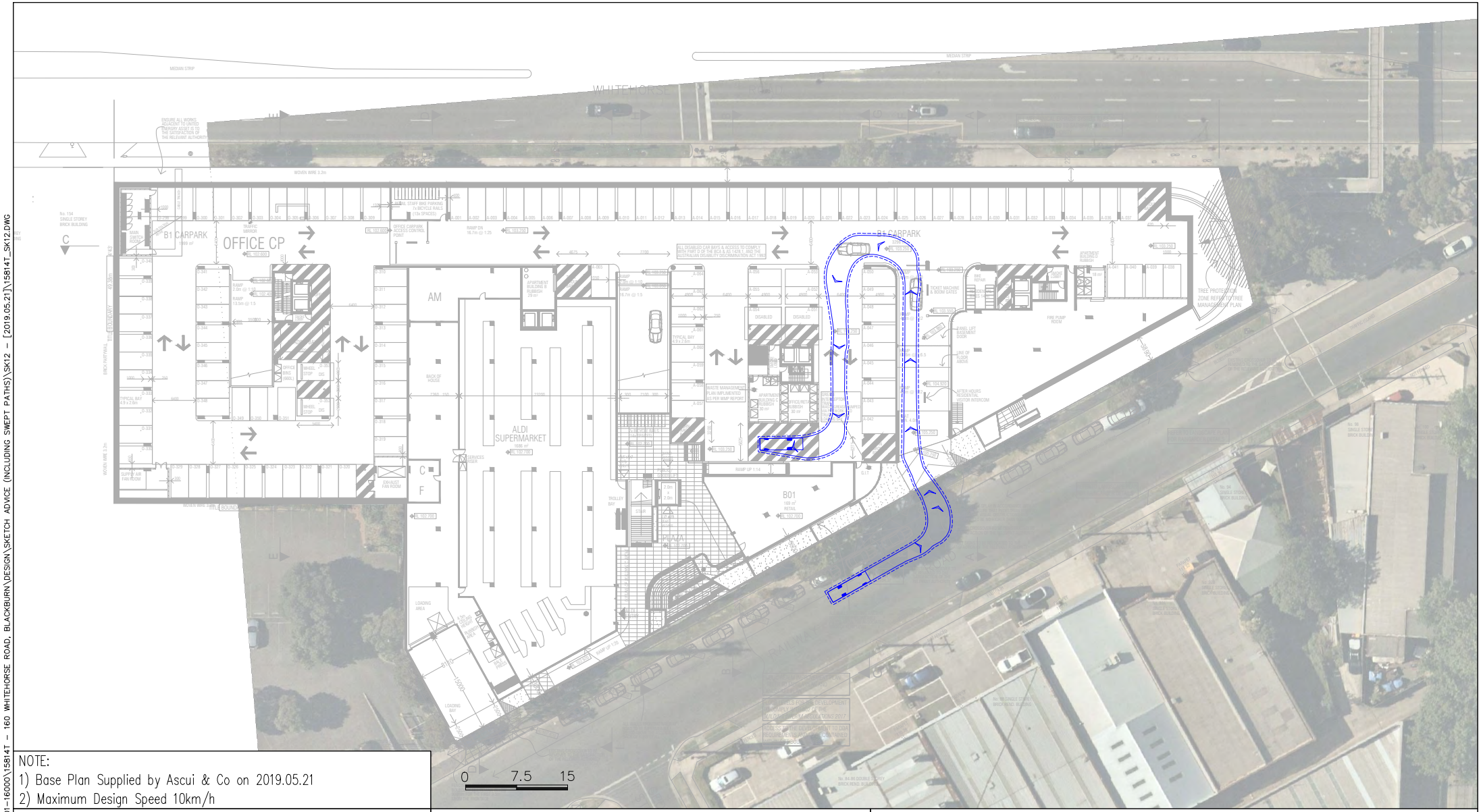
Overall Length	8.800m
Overall Width	2.500m
Track Width	2.500m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	10.000m

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	17 of 22	1:500@A4	23/05/2019

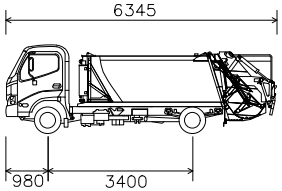
Appendix D **Waste Collection Arrangement**



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Mini-Rear Loader Waste Collection Vehicle

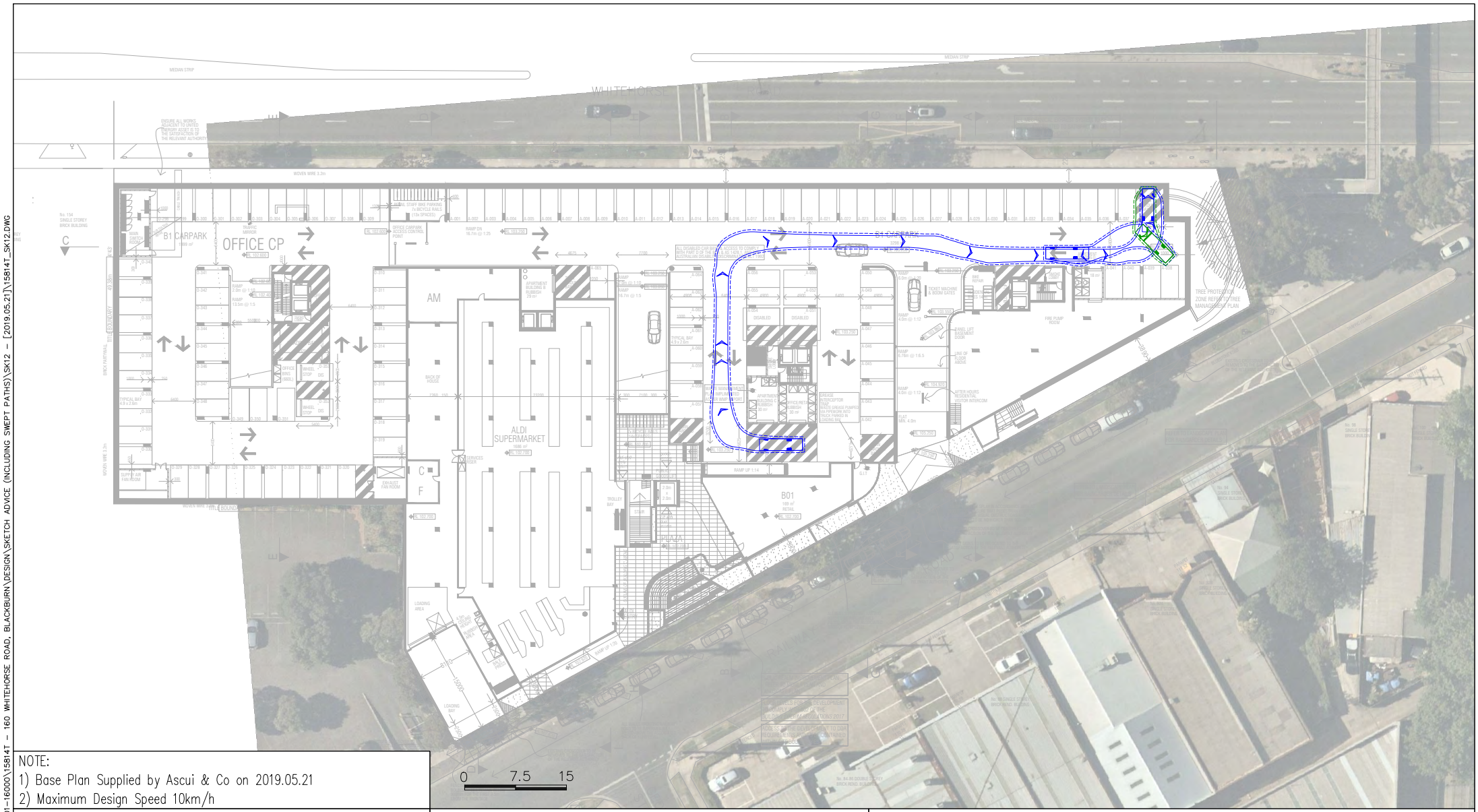


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

Overall Length	6.345m
Body Width	1.700m
Overall Body Height	2.080m
Min Body Ground Clearance	0.205m
Track Width	1.670m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.450m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

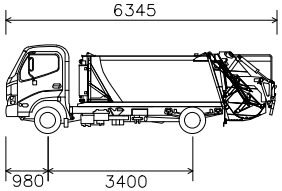
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	18 of 22	1:750@A4	23/05/2019



NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:
RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Mini-Rear Loader Waste Collection Vehicle

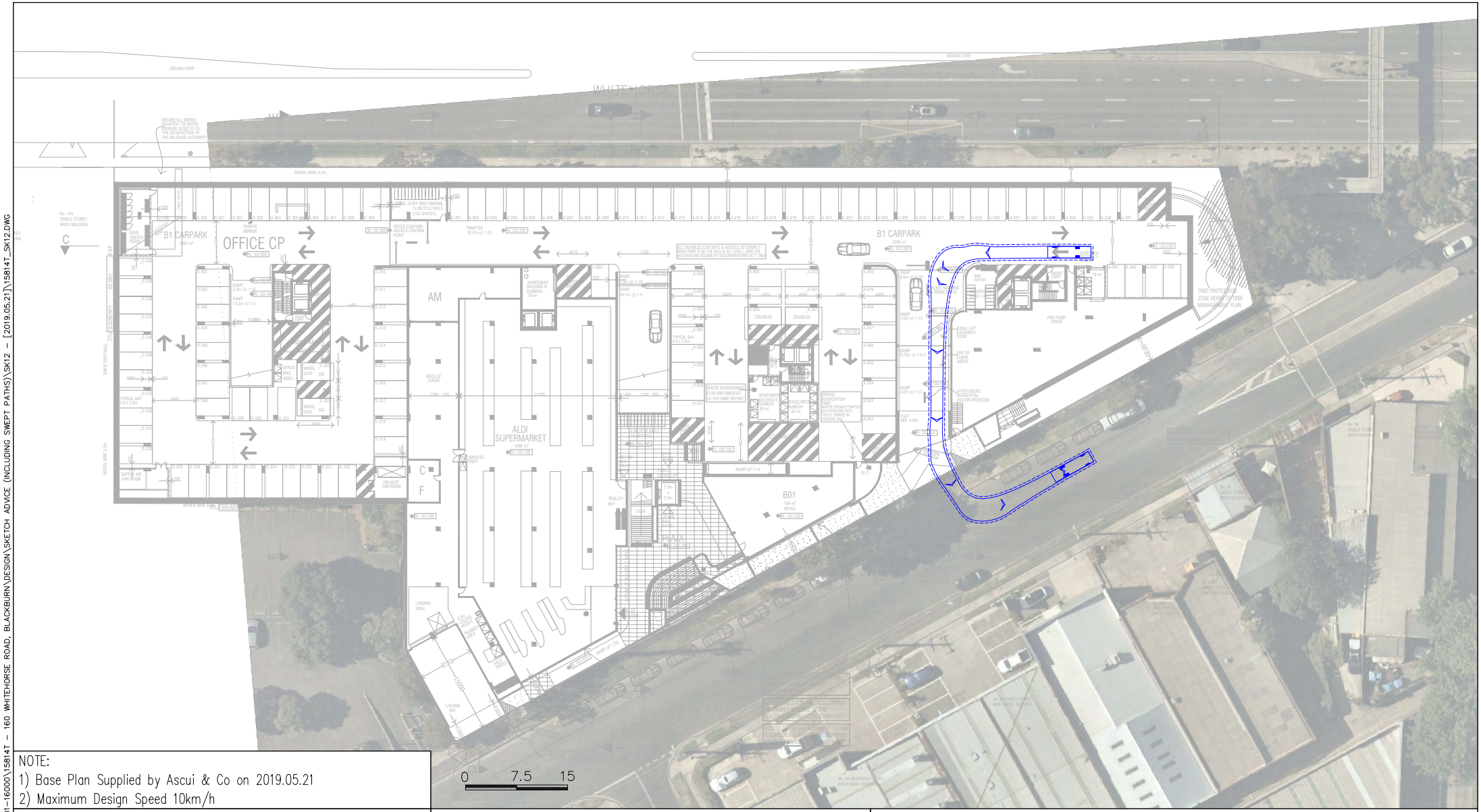


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

Overall Length	6.345m
Body Width	1.700m
Overall Body Height	2.080m
Min Body Ground Clearance	0.205m
Track Width	1.670m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.450m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	19 of 22	1:750@A4	23/05/2019

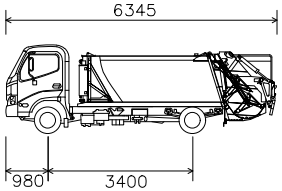


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Mini-Rear Loader Waste Collection Vehicle

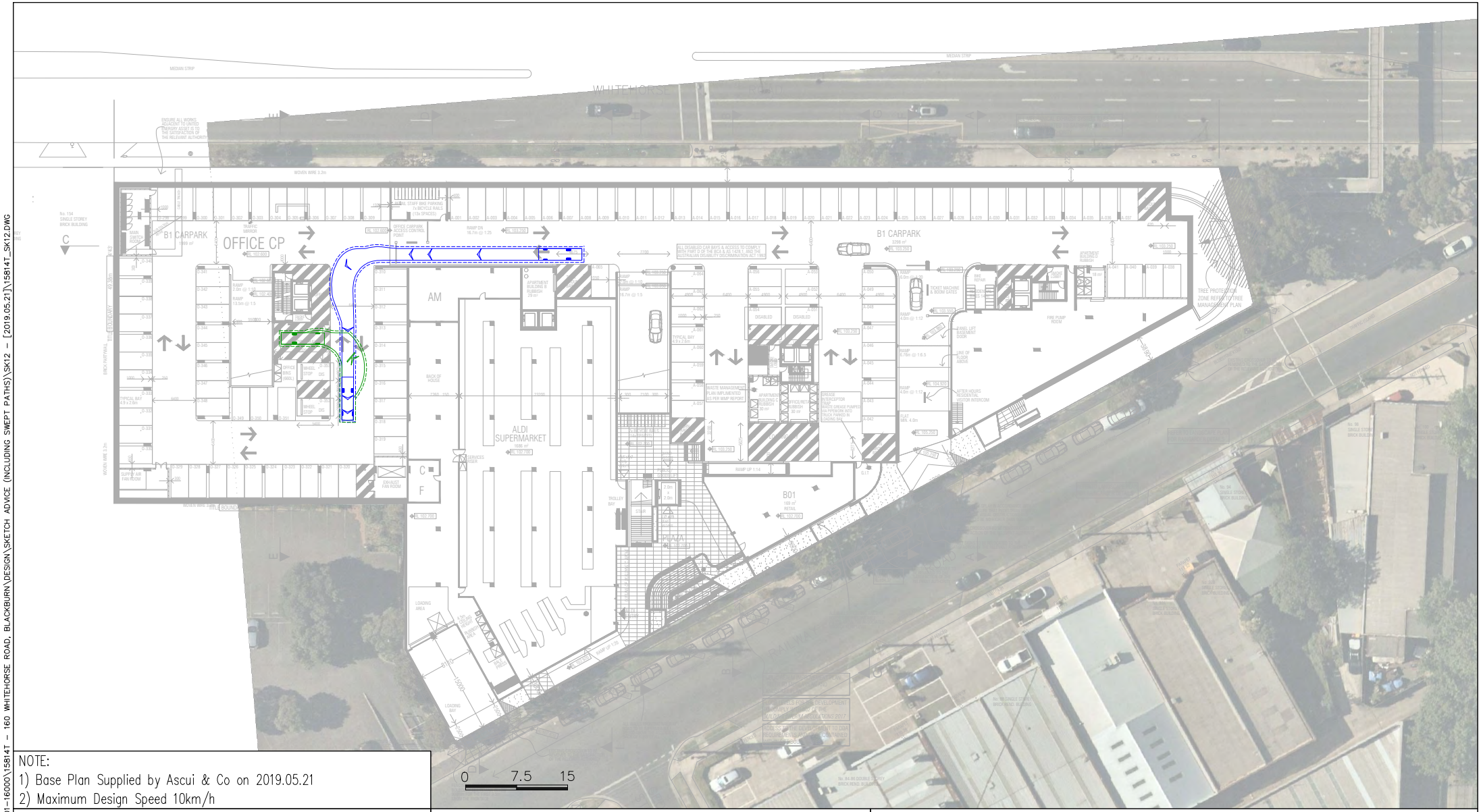


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

Overall Length	6.345m
Body Width	1.700m
Overall Body Height	2.080m
Min Body Ground Clearance	0.205m
Track Width	1.670m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.450m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	20 of 22	1:750@A4	23/05/2019

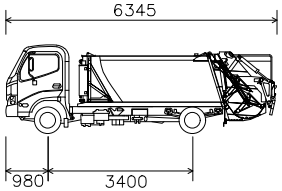


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Mini-Rear Loader Waste Collection Vehicle

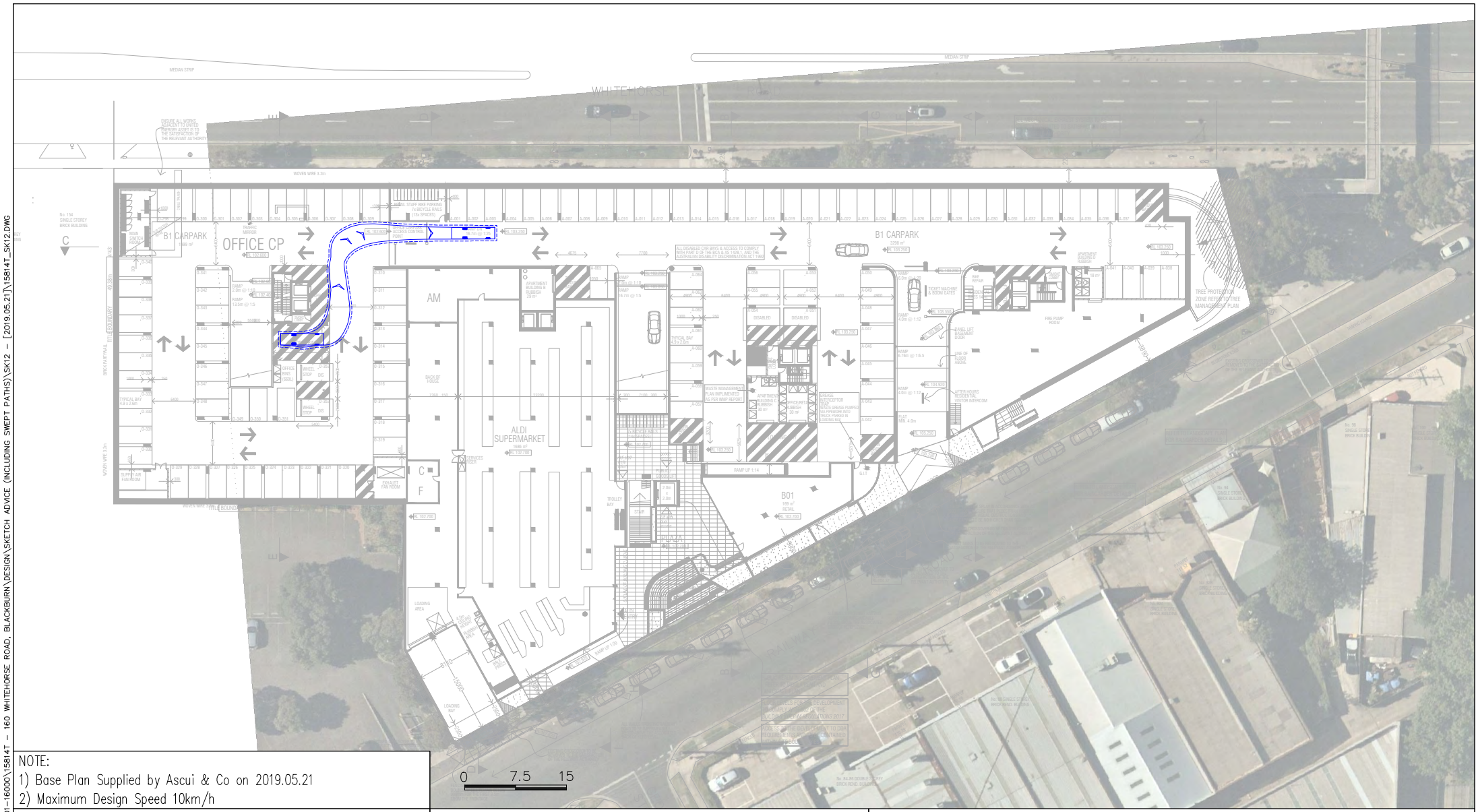


VEHICLE ENVELOPE (FORWARD)
300mm CLEARANCE (FORWARD)
VEHICLE ENVELOPE (REVERSE)
300mm CLEARANCE (REVERSE)

Overall Length	6.345m
Body Width	1.700m
Overall Body Height	2.080m
Min Body Ground Clearance	0.205m
Track Width	1.670m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.450m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	21 of 22	1:750@A4	23/05/2019

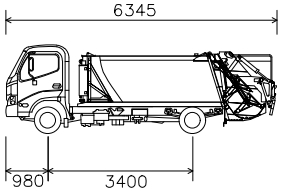


NOTE:
1) Base Plan Supplied by Ascui & Co on 2019.05.21
2) Maximum Design Speed 10km/h

ratio:

RATIO CONSULTANTS PTY LTD
ABN 005 422 104
8 GWYNNE STREET
CREMORNE, VICTORIA 3121
TELEPHONE (03)9429 3111
FACSIMILE (03)9429 3011

Mini-Rear Loader Waste Collection Vehicle



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

Overall Length	6.345m
Body Width	1.700m
Overall Body Height	2.080m
Min Body Ground Clearance	0.205m
Track Width	1.670m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	6.450m

Proposed Mixed-Use Development
160 Whitehorse Road, Blackburn
SWEPT PATH ASSESSMENT - B1

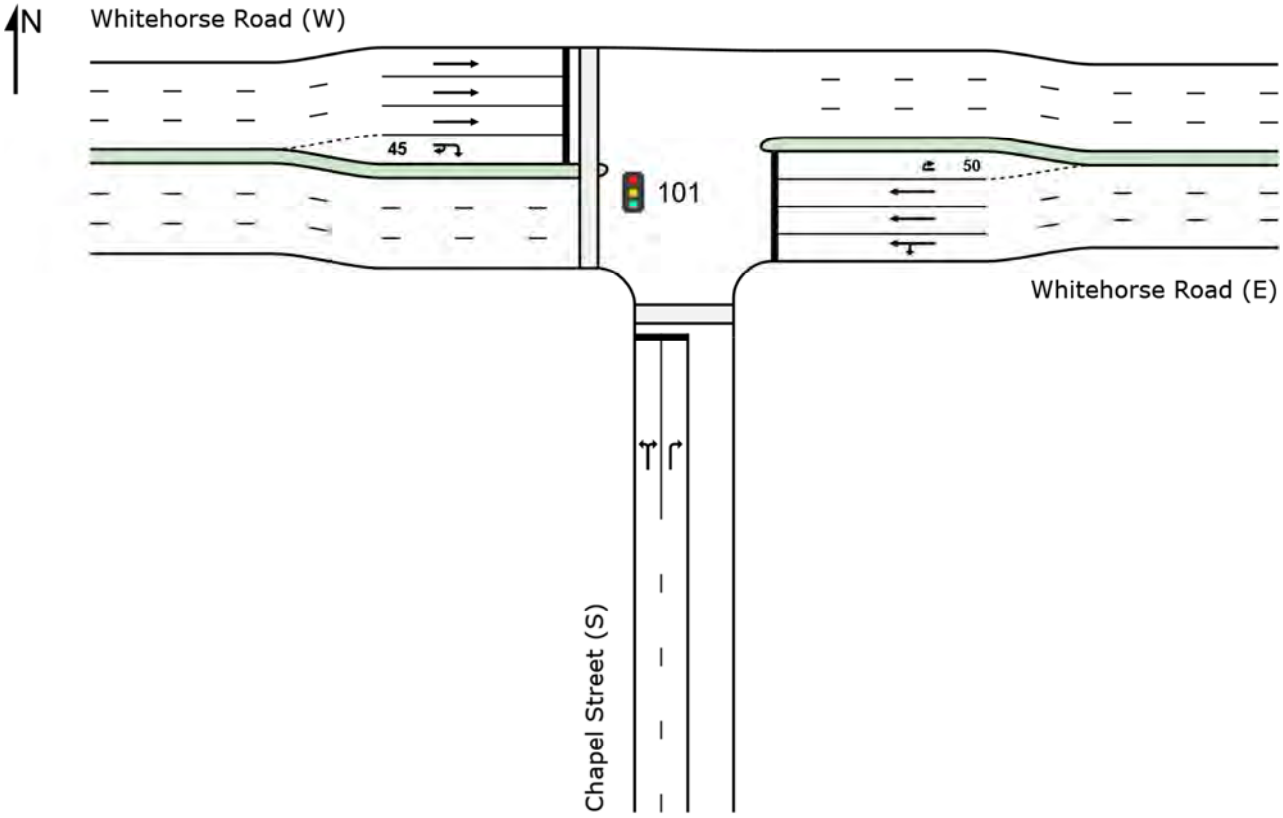
RATIO REFERENCE	SHEET No.	SCALE	DATE
15814T_SK12/JM	22 of 22	1:750@A4	23/05/2019

Appendix E **SIDRA Results**

SITE LAYOUT

Site: 101 [WhRd/ChSt-ExAM]

Whitehorse Road / Chapel Street
Existing AM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated



Organisation: RATIO CONSULTANTS PTY LTD | Created: Thursday, 21 March 2019 12:10:32 PM
Project: Y:\15501-16000\15814T - 160 Whitehorse Road, Blackburn\Work\SIDRA\15814T-SID02.sip8

MOVEMENT SUMMARY

Site: 101 [WhRd/ChSt-ExAM]

Whitehorse Road / Chapel Street
Existing AM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Chapel Street (S)												
1	L2	34	0.0	0.605	41.8	LOS D	9.0	63.3	0.96	0.82	0.96	35.0
3	R2	406	0.0	0.605	41.9	LOS D	9.0	63.3	0.96	0.82	0.96	35.2
Approach		440	0.0	0.605	41.9	LOS D	9.0	63.3	0.96	0.82	0.96	35.2
East: Whitehorse Road (E)												
4	L2	434	0.0	0.606	14.5	LOS B	18.3	128.3	0.61	0.69	0.61	48.9
5	T1	1857	0.0	0.606	8.9	LOS A	18.8	131.9	0.60	0.57	0.60	51.9
6u	U	16	0.0	0.034	14.5	LOS B	0.3	1.9	0.41	0.70	0.41	47.4
Approach		2306	0.0	0.606	10.0	LOS A	18.8	131.9	0.60	0.60	0.60	51.3
West: Whitehorse Road (W)												
11	T1	853	0.0	0.220	6.2	LOS A	4.8	33.5	0.42	0.36	0.42	54.5
12	R2	58	0.0	0.538	27.6	LOS C	2.7	19.2	0.77	0.80	0.80	40.6
12u	U	19	0.0	0.538	29.0	LOS C	2.7	19.2	0.77	0.80	0.80	40.4
Approach		929	0.0	0.538	8.0	LOS A	4.8	33.5	0.45	0.39	0.45	52.9
All Vehicles		3676	0.0	0.606	13.3	LOS B	18.8	131.9	0.61	0.57	0.61	49.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		63	39.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 101 [WhRd/ChSt-ExPM]

Whitehorse Road / Chapel Street
Existing PM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Chapel Street (S)												
1	L2	56	0.0	0.565	27.5	LOS C	14.3	100.0	0.82	0.82	0.82	40.6
3	R2	789	0.0	0.565	27.5	LOS C	14.3	100.0	0.82	0.82	0.82	40.8
Approach		845	0.0	0.565	27.5	LOS C	14.3	100.0	0.82	0.82	0.82	40.8
East: Whitehorse Road (E)												
4	L2	362	0.0	0.552	17.9	LOS B	13.3	93.3	0.73	0.75	0.73	46.3
5	T1	1089	0.0	0.552	18.0	LOS B	15.4	107.8	0.77	0.69	0.77	46.0
6u	U	51	0.0	0.279	35.3	LOS D	1.8	12.8	0.81	0.77	0.81	37.3
Approach		1502	0.0	0.552	18.6	LOS B	15.4	107.8	0.76	0.71	0.76	45.7
West: Whitehorse Road (W)												
11	T1	1365	0.0	0.515	18.7	LOS B	14.2	99.3	0.76	0.67	0.76	45.9
12	R2	76	0.0	0.516	37.3	LOS D	3.6	25.5	0.89	0.80	0.89	36.7
12u	U	16	0.0	0.516	38.7	LOS D	3.6	25.5	0.89	0.80	0.89	36.5
Approach		1457	0.0	0.516	19.9	LOS B	14.2	99.3	0.77	0.68	0.77	45.2
All Vehicles		3804	0.0	0.565	21.1	LOS C	15.4	107.8	0.78	0.72	0.78	44.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		63	39.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 101 [WhRd/ChSt-PDAM]

Whitehorse Road / Chapel Street
Post Development AM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Chapel Street (S)												
1	L2	34	0.0	0.766	48.3	LOS D	10.6	74.3	1.00	0.90	1.16	33.0
3	R2	431	0.0	0.766	48.3	LOS D	10.6	74.3	1.00	0.90	1.16	33.2
Approach		464	0.0	0.766	48.3	LOS D	10.6	74.3	1.00	0.90	1.16	33.2
East: Whitehorse Road (E)												
4	L2	434	0.0	0.582	12.8	LOS B	16.7	117.0	0.55	0.65	0.55	50.0
5	T1	1879	0.0	0.582	7.2	LOS A	17.2	120.2	0.55	0.53	0.55	53.2
6u	U	16	0.0	0.033	12.9	LOS B	0.2	1.7	0.37	0.69	0.37	48.4
Approach		2328	0.0	0.582	8.3	LOS A	17.2	120.2	0.55	0.55	0.55	52.5
West: Whitehorse Road (W)												
11	T1	867	0.0	0.213	5.0	LOS A	4.4	30.8	0.38	0.32	0.38	55.4
12	R2	92	0.0	0.758	39.8	LOS D	5.3	37.3	0.86	0.97	1.20	35.8
12u	U	19	0.0	0.758	41.2	LOS D	5.3	37.3	0.86	0.97	1.20	35.6
Approach		978	0.0	0.758	9.0	LOS A	5.3	37.3	0.43	0.40	0.47	52.2
All Vehicles		3771	0.0	0.766	13.4	LOS B	17.2	120.2	0.57	0.55	0.60	48.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		63	39.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 101 [WhRd/ChSt-PDPM]

Whitehorse Road / Chapel Street
Post Development PM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Chapel Street (S)												
1	L2	56	0.0	0.683	31.7	LOS C	17.0	119.2	0.90	0.85	0.90	38.8
3	R2	855	0.0	0.683	31.7	LOS C	17.0	119.2	0.90	0.85	0.90	39.0
Approach		911	0.0	0.683	31.7	LOS C	17.0	119.2	0.90	0.85	0.90	39.0
East: Whitehorse Road (E)												
4	L2	362	0.0	0.531	15.6	LOS B	12.5	87.5	0.68	0.73	0.68	47.8
5	T1	1161	0.0	0.531	15.3	LOS B	15.2	106.1	0.72	0.65	0.72	47.6
6u	U	51	0.0	0.253	30.4	LOS C	1.7	11.7	0.74	0.77	0.74	39.3
Approach		1574	0.0	0.531	15.9	LOS B	15.2	106.1	0.71	0.67	0.71	47.3
West: Whitehorse Road (W)												
11	T1	1379	0.0	0.474	15.8	LOS B	13.2	92.1	0.70	0.62	0.70	47.6
12	R2	108	0.0	0.669	38.9	LOS D	5.4	37.6	0.92	0.88	1.05	36.1
12u	U	16	0.0	0.669	40.3	LOS D	5.4	37.6	0.92	0.88	1.05	36.0
Approach		1503	0.0	0.669	17.7	LOS B	13.2	92.1	0.72	0.64	0.73	46.4
All Vehicles		3987	0.0	0.683	20.2	LOS C	17.0	119.2	0.76	0.70	0.76	44.8

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

Movement Performance - Pedestrians

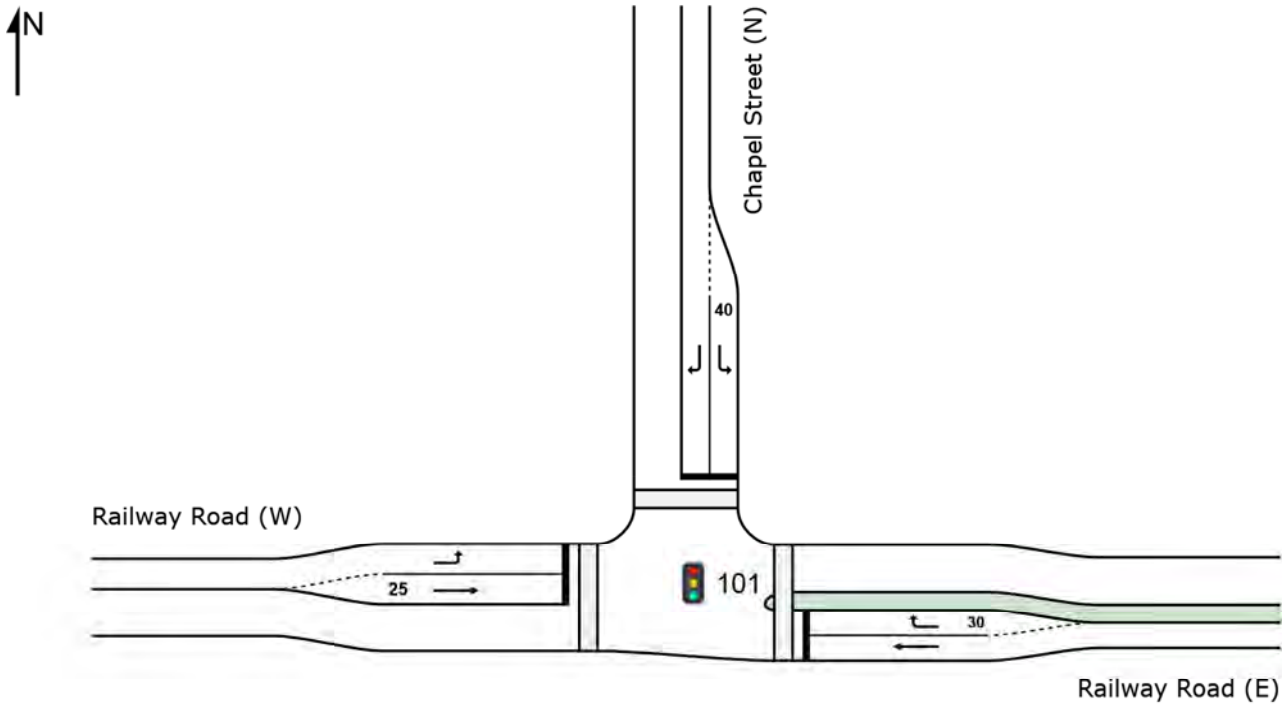
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		63	39.3	LOS D			0.93	0.93

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.

SITE LAYOUT

Site: 101 [ChSt/RwRd-ExAM]

Chapel Street / Railway Road
Existing AM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [ChSt/RwRd-ExAM]

Chapel Street / Railway Road
Existing AM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Railway Road (E)												
5	T1	218	0.0	0.525	32.8	LOS C	8.4	59.1	0.92	0.76	0.92	39.0
6	R2	43	0.0	0.358	52.1	LOS D	2.0	13.7	0.99	0.73	0.99	31.9
Approach		261	0.0	0.525	36.0	LOS D	8.4	59.1	0.93	0.75	0.93	37.6
North: Chapel Street (N)												
7	L2	34	0.0	0.032	10.3	LOS B	0.3	2.4	0.46	0.65	0.46	50.1
9	R2	418	0.0	0.461	21.2	LOS C	11.8	82.8	0.69	0.78	0.69	43.8
Approach		452	0.0	0.461	20.4	LOS C	11.8	82.8	0.68	0.77	0.68	44.2
West: Railway Road (W)												
10	L2	446	0.0	0.417	12.5	LOS B	8.5	59.4	0.47	0.72	0.47	48.6
11	T1	84	0.0	0.432	43.1	LOS D	3.7	25.6	0.98	0.76	0.98	35.1
Approach		531	0.0	0.432	17.4	LOS B	8.5	59.4	0.55	0.73	0.55	45.8
All Vehicles		1243	0.0	0.525	22.4	LOS C	11.8	82.8	0.68	0.75	0.68	43.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		95	39.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 101 [ChSt/RwRd-ExPM]

Chapel Street / Railway Road
Existing PM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Railway Road (E)												
5	T1	251	0.0	0.714	37.0	LOS D	10.6	74.0	0.96	0.85	1.04	37.3
6	R2	80	0.0	0.569	52.1	LOS D	3.7	25.6	1.00	0.78	1.04	31.9
Approach		331	0.0	0.714	40.7	LOS D	10.6	74.0	0.97	0.83	1.04	35.8
North: Chapel Street (N)												
7	L2	44	0.0	0.040	9.6	LOS A	0.4	3.0	0.43	0.65	0.43	50.6
9	R2	412	0.0	0.433	19.7	LOS B	11.1	77.5	0.66	0.77	0.66	44.5
Approach		456	0.0	0.433	18.7	LOS B	11.1	77.5	0.64	0.76	0.64	45.0
West: Railway Road (W)												
10	L2	639	0.0	0.541	14.2	LOS B	14.6	102.1	0.57	0.76	0.57	47.6
11	T1	24	0.0	0.186	45.4	LOS D	1.1	7.5	0.98	0.69	0.98	34.4
Approach		663	0.0	0.541	15.3	LOS B	14.6	102.1	0.58	0.76	0.58	46.9
All Vehicles		1449	0.0	0.714	22.2	LOS C	14.6	102.1	0.69	0.78	0.70	43.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		95	39.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 101 [ChSt/RwRd-PDAM]

Chapel Street / Railway Road
Post Development AM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Railway Road (E)												
5	T1	253	0.0	0.485	25.8	LOS C	8.7	61.1	0.83	0.70	0.83	42.1
6	R2	67	0.0	0.559	53.2	LOS D	3.1	21.8	1.00	0.77	1.05	31.6
Approach		320	0.0	0.559	31.6	LOS C	8.7	61.1	0.87	0.71	0.88	39.4
North: Chapel Street (N)												
7	L2	69	0.0	0.079	12.9	LOS B	1.0	7.1	0.57	0.69	0.57	48.4
9	R2	418	0.0	0.580	27.4	LOS C	14.0	98.2	0.82	0.82	0.82	40.7
Approach		487	0.0	0.580	25.3	LOS C	14.0	98.2	0.78	0.80	0.78	41.7
West: Railway Road (W)												
10	L2	446	0.0	0.465	12.5	LOS B	8.5	59.4	0.47	0.72	0.47	48.6
11	T1	160	0.0	0.434	35.6	LOS D	6.4	44.5	0.93	0.75	0.93	37.9
Approach		606	0.0	0.465	18.6	LOS B	8.5	59.4	0.59	0.73	0.59	45.2
All Vehicles		1414	0.0	0.580	23.9	LOS C	14.0	98.2	0.72	0.75	0.72	42.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		95	39.3	LOS D			0.93	0.93

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

MOVEMENT SUMMARY

Site: 101 [ChSt/RwRd-PDPM]

Chapel Street / Railway Road
Post Development PM Peak Hour Conditions
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Railway Road (E)												
5	T1	365	0.0	0.667	24.2	LOS C	12.6	88.4	0.84	0.72	0.84	43.0
6	R2	145	0.0	0.602	47.2	LOS D	6.3	44.2	0.99	0.81	1.01	33.4
Approach		511	0.0	0.667	30.7	LOS C	12.6	88.4	0.88	0.74	0.89	39.7
North: Chapel Street (N)												
7	L2	79	0.0	0.086	12.2	LOS B	1.1	7.6	0.55	0.69	0.55	48.9
9	R2	412	0.0	0.650	30.8	LOS C	14.9	104.0	0.87	0.83	0.87	39.3
Approach		491	0.0	0.650	27.8	LOS C	14.9	104.0	0.82	0.81	0.82	40.5
West: Railway Road (W)												
10	L2	639	0.0	0.646	17.3	LOS B	17.0	118.9	0.66	0.79	0.66	45.8
11	T1	99	0.0	0.304	36.3	LOS D	3.9	27.4	0.92	0.72	0.92	37.6
Approach		738	0.0	0.646	19.8	LOS B	17.0	118.9	0.69	0.78	0.69	44.5
All Vehicles		1739	0.0	0.667	25.3	LOS C	17.0	118.9	0.78	0.78	0.79	41.8

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	32	39.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		95	39.3	LOS D			0.93	0.93

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.