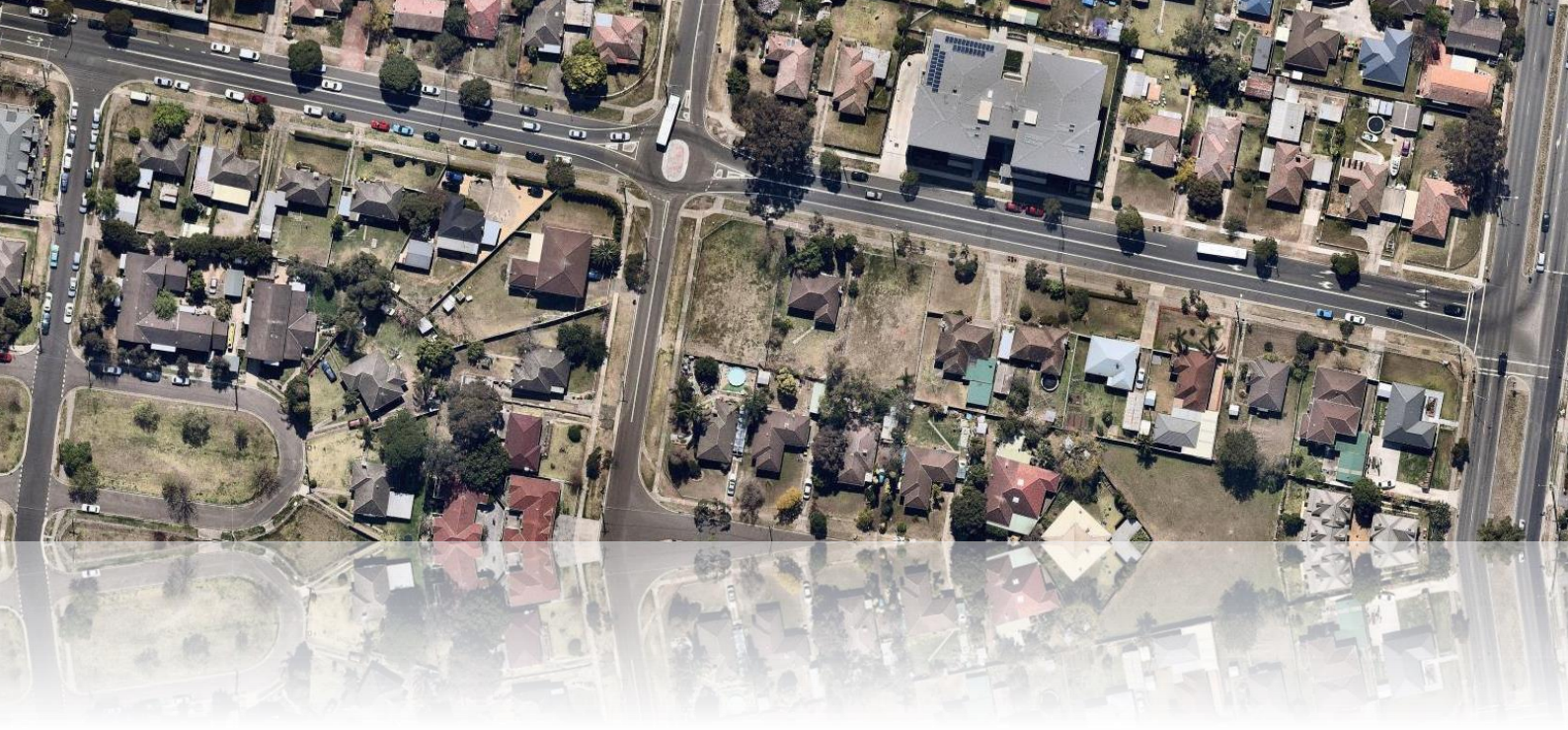

TRAFFIC AND PARKING IMPACT ASSESSMENT OF HIGH DENSITY RESIDENTIAL DEVELOPMENT AT 14-18 PHILLIP STREET, ST MARYS

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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

190540.01FB - 14th January 2020

Development Type: **High Density Residential Development**

Site Address: **14-18 Phillip Street, St Marys**

Prepared for: **Growth Built**

Document reference: **190540.01FB**

Status	Issue	Prepared By	Checked By	Date
Draft	A	LS	MM	11th November 2019
Draft	B		MM	14th November 2019
Final	A		MM	12th December 2019
Final	B		MM	14th January 2020

TABLE OF CONTENTS

1 INTRODUCTION

M^CLaren Traffic Engineering was commissioned by *Growth Built* to provide a Traffic and Parking Impact Assessment of the High Density Residential Development at 14-18 Phillip Street, St Marys as depicted in **Annexure A** for reference.

1.1 Description and Scale of Development

The proposed development has the following characteristics relevant to traffic and parking:

- A total of 44 residential units consisting of:
    - 24 x one-bedroom units;
    - 20 x two-bedroom units including eight (8) adaptable units.

All vehicular access is via a two-way driveway from Lethbridge Street into a basement car park, providing 20 residential car parking space including five (5) disabled parking spaces.

1.2 State Environmental Planning Policy (Infrastructure) 2007

The proposed development does not qualify as a traffic generating development with relevant size and/or capacity under Clause 104 of the SEPP (Infrastructure) 2007. Accordingly, formal referral to the Roads and Maritime Services (RMS) is unnecessary and the application can be assessed by Penrith City Council officers accordingly.

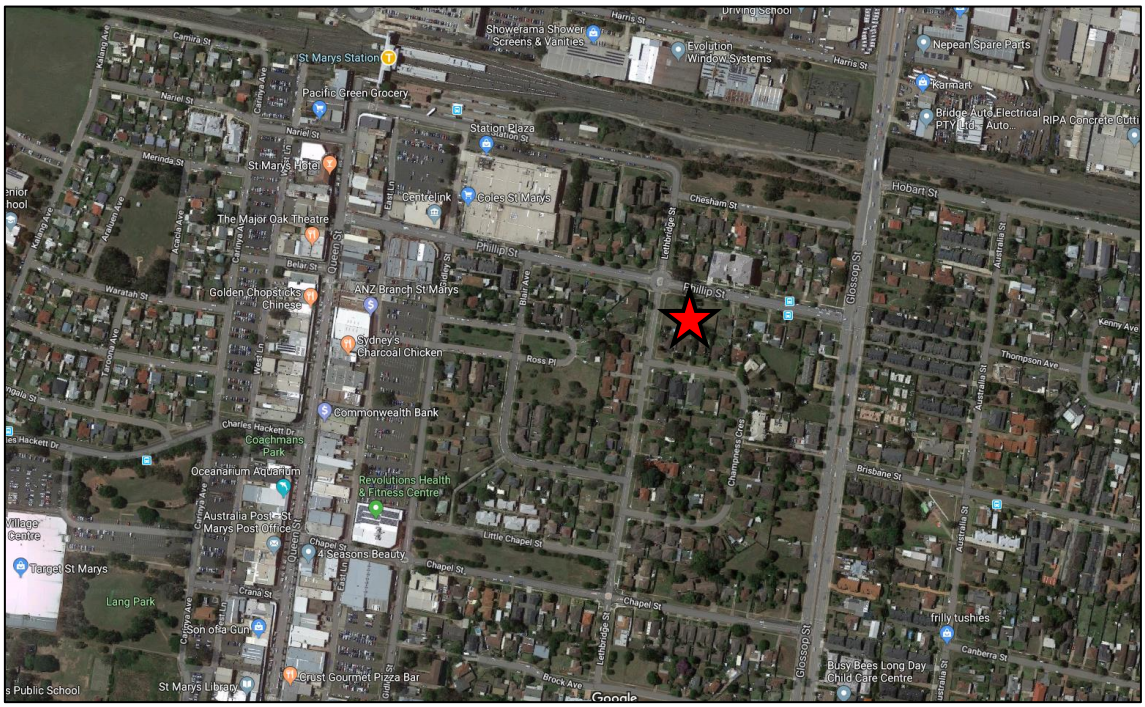
1.3 Site Description

The subject site is currently zoned *R4 – High Density Residential* in accordance with the Penrith City Council *Local Environmental Plan 2010* (LEP) and is comprised of three (3) residential lots which will be consolidated under the proposal to 1 lot, and then provisions for strata subdivision shall be sought. Two (2) lots consist of vacant land and the remaining lot contains a residential dwelling.

The site has street frontages to Phillip Street to the north of the site and Lethbridge Street to the west of the site. The site is generally surrounded by low-density residential dwellings, with a high residential development located to the north of the site, on the opposite side of Phillip Street. St Marys Town Centre and retail precinct is located to the west of the site.

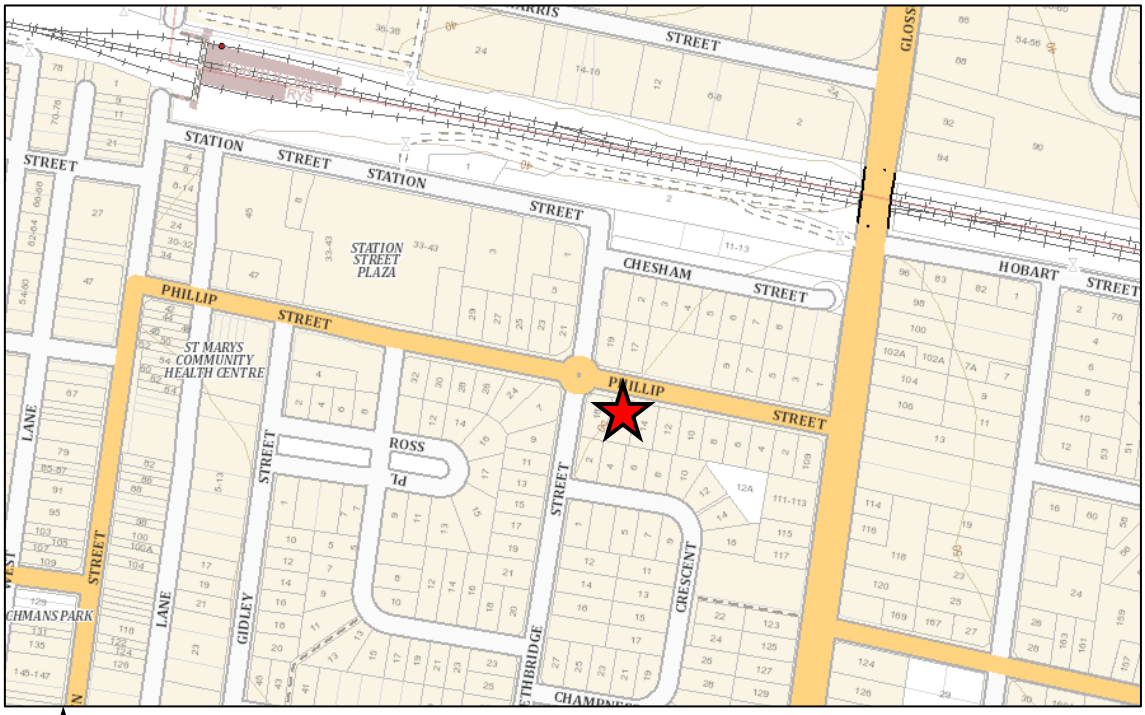
1.4 Site Context

The sites location is shown on an aerial photo and a street map in **Figure 1** and **Figure 2** respectively.



Site Location

FIGURE 1: SITE CONTEXT – AERIAL PHOTO



Site Location

FIGURE 2: SITE CONTEXT – STREET MAP

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 Road Hierarchy

The road network servicing the site has characteristics as described in the following sub-sections.

2.1.1 Glossop Street

- Unclassified REGIONAL Road (No. 7167)
- Approximately 20m in width facilitating two traffic flow lanes in each direction and a median of approximately 6m in width;
- Signposted 60km/h speed limit;
- No kerbside parking permitted on both sides of the road.

2.1.2 Phillip Street

- Unclassified COLLECTOR Road;
- Approximately 12m in width facilitating one traffic flow lane in each direction and kerbside parking on both sides of the road;
- No speed limit signposted; default 50km/h limit applies;
- Unrestricted kerbside parking permitted on both sides of the road.

2.1.3 Lethbridge Street

- Unclassified LOCAL Road;
- Approximately 7m in width facilitating one traffic flow lane in each direction;
- No speed limit signposted; default 50km/h limit applies;
- No kerbside parking permitted directly adjacent to the site, with kerbside parking permitted to the south of the site (where BB-lines are not present).

2.2 Existing Traffic Management

- Signal controlled intersection of Glossop Street / Phillip Street;
- Roundabout controlled intersection of Phillip Street / Lethbridge Street;
- Priority controlled intersection of Lethbridge Street / Champness Crescent.

2.3 Existing Traffic Volumes

Intersection traffic surveys were conducted at the intersections of Phillip Street / Glossop Street and Phillip Street / Lethbridge Street from 7:00 AM to 10:00 AM and 4:00 PM to 7:00 PM on Wednesday the 23rd of October 2019 representing a typical operating weekday. The full survey results are shown in **Annexure B** for reference.

2.3.1 Existing Road Performance

The performance of the surrounding intersections under the existing traffic conditions has been assessed using SIDRA INTERSECTION 8.0, **Table 1** summarises the resultant intersection performance data, with full SIDRA results reproduced in **Annexure C**.

TABLE 1: EXISTING INTERSECTION PERFORMANCES (SIDRA INTERSECTION 8.0)

Intersection	Peak Hour	Degree of Saturation[1]	Average Delay[2] (sec/veh)	Level of Service[3]	Control Type	Worst Movement
EXISTING PERFORMANCE						
Glossop Street / Phillip Street	AM	0.64	14.1	**A**	Signals	N/A
	PM	0.70	17.2	**B**		N/A
Lethbridge Street / Phillip Street	AM	0.26	5.8 (Worst: 10.3)	**A** (Worst: A)	Roundabout	UT from Phillip Street
	PM	0.37	6.2 (Worst: 10.6)	**A** (Worst: A)		RT from Lethbridge Street

NOTES:
(1) The Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
(2) The average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
(3) The Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.

As shown above, the two relevant intersections are currently performing at a high level of efficiency, with a level of service “A” or “B” conditions in both the AM & PM peak hour periods. The level of service “A” and “B” performance is characterised by low approach delays and spare capacity.

2.4 Public Transport

The nearest bus stop which the subject site has access to (ID: 2760210) is located approximately 80m walking distance to the east of site on Phillip Street. The bus stop services the following existing bus routes provided by Busways Western Sydney and Transit Systems:

- 745 (St Marys to Norwest Hospital via Stanhope Gardens);
- 758 (St Marys to Mount Druitt via Tregear and Shalvey);
- 759 (St Marys to Mount Druitt via Ropes Crossing);
- 774 (Mount Druitt to Penrith via Nepean Hospital);
- 782 (St Marys to Penrith via Werrington), and;
- 835 (University of Western Sydney to Prairiewood).

Additionally, the St Marys Bus Interchange is located approximately 320m walking distance to the north west of the subject site, on Station Street. These bus stops services the following additional existing bus routes provided by Busways Western Sydney and Transit Systems from those serviced by the nearby bus stop:

- 770 (Mount Druitt to Penrith via St Marys);
- 771 (Mount Druitt to St Marys via Colyton);
- 775 (Mount Druitt to Penrith via Erskine Park);
- 776 (Mount Druitt to Penrith via St Clair);
- 779 (Erskine Park to St Marys);
- 781 (St Marys to Penrith via Glenmore Park);
- S11 (St Clair to St Marys)

St Marys Train Station is located 520m walking distance to the north west of the subject site, servicing the T1 – Western Line. A train service is provided every 5 – 10 minutes in commuter peak periods and provides direct access between Emu Plains and Sydney CBD.

The sites location subject to the surrounding public transport network is shown in **Figure 3** below.

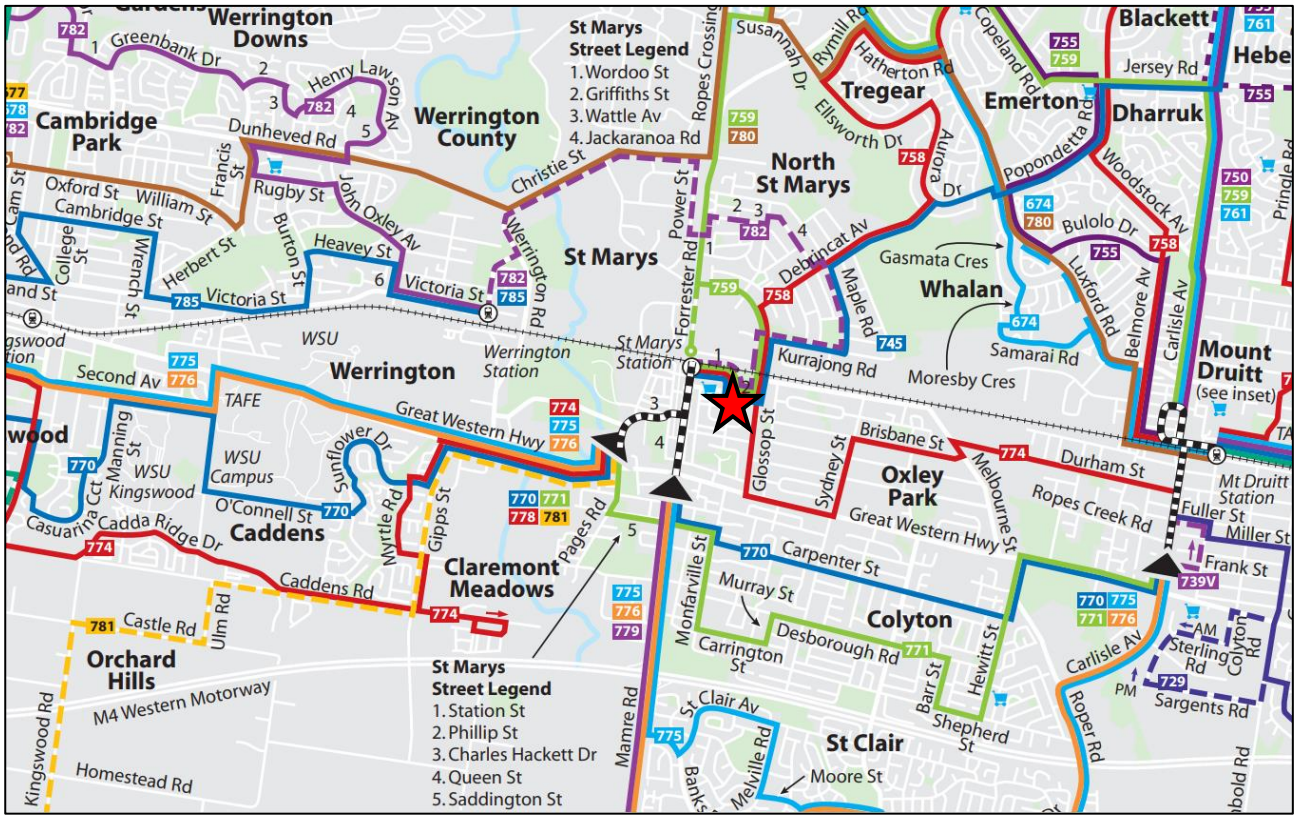


FIGURE 3: PUBLIC TRANSPORT NETWORK MAP

2.5 Future Road and Infrastructure Upgrades

From Penrith City Council Development Application tracker and website, it appears that there are no future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.

3 PARKING ASSESSMENT

3.1 Car Parking Requirements

The proposed development is being made on behalf of a social housing provider and as such the *State Environmental Planning Policy (Affordable Rental Housing) 2009* (SEPPARH) *Part 2 – New affordable rental housing, Division 1 – In-fill affordable housing* applies. The car parking requirements under the (SEPPARH) are outlined below:

> ***14 Standards that cannot be used to refuse consent***
>
> *General*
>
> *A consent authority must not refuse consent to development to which this Division applies on any of the following grounds:*
>
> *(a) parking if:*
>
> *(i) in the case of a development application made by a social housing provider for development on land in an accessible area—at least 0.4 parking spaces are provided for each dwelling containing 1 bedroom, at least 0.5 parking spaces are provided for each dwelling containing 2 bedrooms and at least 1 parking space is provided for each dwelling containing 3 or more bedrooms, or*

Where accessible area is defined by the SEPPARH as:

> ***4 Interpretation—general***
>
> *(1) In this Policy:*
>
> ***accessible area** means land that is within:*
>
> *(a) 800 metres walking distance of a public entrance to a railway station or a wharf from which a Sydney Ferries ferry service operates, or*
>
> *(b) 400 metres walking distance of a public entrance to a light rail station or, in the case of a light rail station with no entrance, 400 metres walking distance of a platform of the light rail station, or*
>
> *(c) 400 metres walking distance of a bus stop used by a regular bus service (within the meaning of the Passenger Transport Act 1990) that has at least one bus per hour servicing the bus stop between 06.00 and 21.00 each day from Monday to Friday (both days inclusive) and between 08.00 and 18.00 on each Saturday and Sunday.*

As the subject site is within a walking distance of approximately 520m of the St Marys Train Station, the proposed development is on land within an accessible area.

The car parking required for the proposed development, in accordance with the SEPPARH requirements is shown in **Table 2** below.

TABLE 2: SEPP PARKING REQUIREMENTS

Land Use	Type	Scale	Rate and (Source of rate)	Parking Required
In-fill Affordable Housing	One-bedroom unit	24	0.4 per unit (SEPP)	9.6 (**10**)
	Two-bedroom unit	20	0.5 per unit (SEPP)	**10**
Total	**-**	**-**	**-**	**20**

As shown in **Table 2**, the development requires a total of **20** car parking spaces as per the SEPPARH. The proposed plans show provision for **20** spaces, complying with the SEPP requirements.

3.2 Disabled Parking

Reference is made to Penrith City Council *Development Control Plan* (DCP) *2014, D2 Residential Development* which outlines the following requirements for adaptable housing:

> *10% of all dwellings or a minimum one dwelling, whichever is greater, must be designed in accordance with the Australian Adaptable Housing Standard (AS4299-1995), to be capable of adaptation for people with a disability or elderly residents.*

Based upon the above, the proposal requires five (5) adaptable units. Five (**5**) adaptable dwellings are included within the proposed development, complying with Council's requirement.

Council's DCP also requires that car parking and garages allocated to adaptable dwellings must comply with the requirements of the relevant Australian Standard regarding parking for people with a disability. Whilst this refers to *AS2890.6:2009*, reference is made to *AS4299:1995 Adaptable Housing* which provides the following extract relating to the provision of disabled car parking:

> *3.7.1 General Private car parking spaces shall be large enough to enable a person with a wheelchair to get in and out of both the car and the parking space. A car parking space width of 3.8m minimum is necessary to enable a driver to alight, open the passenger side door, and assist a person with a disability into a wheelchair, or for a side-loading ramp. A 3.8 m, minimum width is also required for a driver with a disability to unload a wheelchair and to alight.*

As such, it is considered acceptable for car parking spaces allocated to the adaptable dwellings to satisfy the requirements of *AS4299:1995*. In accordance with *AS4299:1995*, a total of five (**5**) adaptable car parking spaces are required and are adequately provided within the proposed plans, designed in accordance with *AS2890.6:2009* or *AS4299:1995*.

3.3 Bicycle and Motorcycle Parking Requirements

3.3.1 Bicycle Parking Requirements

Penrith City Councils DCP 2014, Part C10 Transport, Access and Parking specifies that bicycle parking is to be provided in accordance with provision rates from *Planning Guidelines for Walking and Cycling' (NSW Government 2004).* This document specifies the following bicycle parking rates applicable to the preliminary scale:

1-bedroom units/flats and bedsitters

Resident/staff (Long-term use) 20–30%U

Customer/visitor (Short-term use) 5–10%U

2- or more bedroom units/flats

Resident/staff (Long-term use) 20–30%U

Customer/visitor (Short-term use) 5–10%U

Key: U=Units and apartments

In accordance with the above rates, the proposed development requires **9** to **13** residential bicycle spaces, and **2** to **4** visitor bicycle spaces (i.e. a range of **11** to **17** total spaces). The proposed plans indicate a bicycle parking provision of **10** bicycle spaces within the basement to be shared between residents and **4** visitor bicycle spaces on ground floor, resulting in compliance with Council's DCP requirements.

3.3.2 Motorcycle Parking Requirements

The Penrith City Council Development Control Plan does not specify parking requirements for motorcycles and as such nil (0) motorcycle car parking spaces have been provided, complying with Council's DCP.

3.4 Servicing & Loading

Reference is made to the *Penrith City Council DCP 2014, C5 Waste Management*, which specifies the following loading and servicing requirements applicable to the proposed development:

5.2.2.4 Residential Flat Buildings

5) On-site collection is required to service the development. Adequate and safe access must be provided for Council's Standard Waste Collection Vehicles and waste collection staff as follows:

a) The route must be designed to allow collection vehicles to enter and exit the site in a forward direction with limited manoeuvring and reversing on-site;

b) The route of travel (including vehicle manoeuvring areas) for the waste collection point is to satisfy the typical dimensions of heavy rigid vehicle. This also includes adequate vehicle clearance for the vehicle. Australian Standard AS2890.2 Parking Facilities: Off-Street Commercial Vehicle Facilities provides typical dimensions and turning circles.

An on-site waste collection area suitable for the Penrith City Council's 9.7m length Low Entry Heavy Rigid Waste Collection vehicle (in accordance with Council's *Residential Flat Building Waste Management Guidelines)* has been provided. To assess the ability of Council's waste collection vehicle to access the site, swept path analysis has been undertaken with results reproduced in **Annexure D** for reference. The swept path analysis has been undertaken using AutoCAD's 2019 Vehicle Tracking package. The results of the swept path analysis indicate that Council's vehicle can successfully enter the site in a forward direction, reverse into the designated on-site loading bay and then exit the site in a forward direction.

Any other loading or servicing for the site can be undertaken within this loading bay outside of waste collection periods which can be internally managed. All loading or servicing is to be undertaken by vehicles of sizes up to an including that of Council's 9.7m length waste collection vehicle, with a maximum vehicle height of 3.5m.

3.5 Car Park Design & Compliance

The car parking layout as depicted in **Annexure A** have been assessed to achieve the relevant clauses and objectives of AS2890.1:2004, AS2890.2:2002, AS2890.6:2009 and AS4299:1995.

The proposed car park design achieves:

- 5.5m width two-way driveway between kerbs (and 6.1m width between walls) facilitating access to Lethbridge Street;
- Minimum 6.6m width parking aisle;
- Minimum 5.4m length, 2.4m width spaces for residents;
- Minimum 5.4m length, 2.4m width disabled spaces with adjacent associated 5.4m length, 2.4m width shared space;
- Minimum 5.4m length, 3.8m width adaptable parking spaces;
- Minimum headroom of 3.5m for general circulation and loading bay, and 2.5m headroom clearance provided over disabled and adaptable parking areas.

Swept path testing of the above design has been undertaken and is reproduced in **Annexure D** for reference.

Whilst the plans have been assessed to comply with the relevant standards, it is usual and expected that a design certificate be required at the Construction Certificate stage to account for any changes following the development application.

3.5.1 Driveway Access

The existing grade outside the property boundary between the road and boundary ranges from 10-13% based upon the survey. Considering these existing grades and the requirement to provide access into the site for waste collection vehicles, the existing grades of 10-13% will not be sufficient to satisfy the requirements of AS2890.2:2018 in relation to access. As such the grades outside the property boundary are to be modified to allow vehicular access for waste collection vehicles into the basement car park without scraping.

Typically, the allowable grades outside the verge are restricted by and provided by Council. Reference is made to *Section 7.5 of Penrith City Council Engineering Construction Specification for Civil Works* which states the following:

> *The crossfall of the road reserve shall grade towards the road at 4% from back of kerb to footpath, 2% across the footpath, and a maximum of 4% to the property boundary or as specified by Council's engineer*

The above is required in relation to subdivisions. Further, reference is made to Plan SD1004 *Penrith City Council Engineering Construction Specification for Civil Works,* which allows for a maximum grade of up to 12.5% for vehicle access within the verge.

Notwithstanding the above, the maximum grade of 12.5% within the verge would be non-complaint with AS2890.2:2018 and as such cannot be adopted. The recommended design based upon the survey is shown in **Annexure E** for reference, which also includes undercarriage vertical clearance testing for the 8.8m length Medium Rigid Vehicle as specified in AS2890.2:2018, it should be noted that the Council waste collection vehicle is approximately 8.1m in length plus an add 1.6m in length due to the rear waste collection mechanism. The waste collection mechanism is not relevant to undercarriage vertical clearance testing as it is located significantly off the ground compared to the lowest point of the vehicle. As such the 8.8m length Medium Rigid Vehicle as specified in AS2890.2:2018 is a worst case scenario.

The recommended design results in a difference of 190mm at the property boundary from the existing conditions, resulting in the requirement to modify the verge (existing footpath will need to be modified). Ultimately, to provide access into the development in accordance with AS2890.2:2018 design requirements, the existing boundary RL needs to be lowered and discussions with Council should be undertaken for the preferred design within the verge in consultation with the applicant's architect and civil engineer.

4 TRAFFIC ASSESSMENT

The impact of the expected traffic generation levels associated with the subject proposal is discussed in the following sub-sections.

4.1 Traffic Generation

Traffic generation rates for the relevant land uses are provided in the *Roads and Maritime Services (RMS) Guide to Traffic Generating Developments (2002)* and recent supplements (including the *TDT 2013/04a* Technical Direction with updated traffic surveys) and are as follows:

TDT 2013/04a

High density residential flat dwellings

AM peak (1 hour) vehicle trips per unit *0.19*

PM peak (1 hour) vehicle trips per unit *0.15*

The resulting traffic generation is summarised in **Table 3** below.

TABLE 3: ESTIMATED TRAFFIC GENERATION

Land Use	Time	Scale	Generation Rate	Trips	Directional Split(1)
High Density Residential	AM	44 units	0.19 per unit	9	2 in; 7 out
	PM		0.15 per unit	7	6 in; 1 out

Note: (1) Assumes 20% inbound & 80% outbound during AM peak: Vice versa for PM.

As shown in **Table 3**, the estimated traffic generation associated with the proposed development is in the order of nine (**9**) vehicle trips.

The proposed development will not have an adverse effect on any nearby intersections and can be readily accommodated within the existing road network with minimal impacts in terms of traffic flow efficiency, residential amenity and road safety considerations.

Indeed, the computer models that are available to assess these impacts are not sensitive to such small changes and it may be concluded that the road network will operate with no change in the existing levels of service. In this regard, the proposed residential use of the site is a low-order traffic use and the proposed development is supportable in terms of its traffic impacts.

It should be noted that while the above rates are estimated, it is likely that peak traffic generation of this site will be lower than what is stipulated in **Table 3** above. The adopted traffic generation rates are based upon the provision of parking in accordance with the RMS Guide to Traffic Generating Developments, which would require 33 residential car parking spaces. The development provides 20 car parking spaces in accordance with the SEPPARH parking requirements or 60% of the parking required under the RMS Guide. As such is it likely the peak traffic generation of the site would be 60% of that stipulated in **Table 3** above.

5 COUNCIL PRE-DA COMMENTS

The applicant has completed both a Council Urban Design Review Panel meeting on 18th September 2019, as well as a pre-lodgement meeting with Council on 19th September 2019. Following these respective meetings, comments were provided by Penrith City Council within an *Urban Design Review Panel Meeting* letter dated 25th September 2019 and a *Pre-lodgement Advice* letter dated 30th September 2019. Comments relevant to traffic and parking are quoted below with *M^CLaren Traffic Engineering*'s (MTE) response thereafter.

5.1 Urban Design Review Panel Comments

> *The basement arrangement does not locate accessible parking spaces adjacent to the lift. This requires amendment with relocation of spaces 17 and 18 to allow for Accessible Spaces 3, 4 and 7 to be moved closer to the lift. Further Space 19 and 20 is not supported as it requires reversing from the aisle of traffic entering the site.*
>
> *Amendments to waste collection as outlined within separate pre-lodgement advice should enable remove of spaces 19 and 20 elsewhere within the basement.*

MTE Response: The plans assessed within the meeting have since been amended (updated plans reproduced in **Annexure A**), with all proposed accessible parking spaces located near the lifts of the development. Similarly updates to the plans have resulted in the movement of spaces 19 and 20 from those assessed in the meeting following updates to the proposed waste collection operation. The movement of these spaces places them at a location where they are not required to reverse in close proximity to the driveway entry.

> *It was confirmed that waste collection can be undertaken with a 3.5m floor to ceiling clearance and manoeuvring that can be made from within the basement and not via a separate driveway. As such, the service driveway should be removed, the turntable extent amended to increase landscape and boundary setbacks to the southern boundary. This also affords greater landscaping opportunities in the front setback to Lethbridge Street for tree canopy planting (not a substation).*

MTE Response: The service driveway has since been removed, with waste collection access available with the basement parking area, to be accessed via the proposed two-way driveway.

5.2 Pre-Lodgement Meeting Comments

TRAFFIC:

A Traffic and Car Parking report is required, which demonstrates how the proposal meets requirements of the State Environmental Planning Policy (Affordable Rental Housing) 2009.

MTE Response: This Traffic and Parking Impact Assessment details that the In-fill affordable housing requirements of the of the *State Environmental Planning Policy (Affordable Rental Housing) 2009* are satisfied by the development, as detailed further in **Section 3.2**.

The proposal shall demonstrate that entry/exit driveway complies with AS2890 for sight distances, demonstrate vehicle swept paths with all vehicles to enter/exit in a forward direction.

MTE Response: For the sightlines to/from vehicles approaching the site from northbound or southbound (Lethbridge Street and eastbound Phillip Street), the available sightlines exceed the minimum Stopping Sight Distance (SSD) of 45m required under *Figure 3.2* of *AS2890.1:2004* for the 50km/h speed limit roads. However, the proposed driveway location does not strictly comply with this sight distance for vehicle turning left at the roundabout from Phillip Street westbound into Lethbridge Street southbound.

It is relevant to note that the sight distance requirements of *AS2890.1:2004* are understood to be most applicable to frontage roads without traffic calming structures or other measures which limit the speed of vehicles. To determine the likely speed of vehicles turning left at the roundabout reference is made to Austroads' *Guide to Road Design Part 3: Geometric Design – Section 7.4 Circular Curves* which states the following equation for vehicular speeds around curves.

$$R = \frac{v^2}{(e+f)g} = \frac{V^2}{127\,(e+f)}$$

Where:

v = vehicle speed (m/s)
V = vehicle speed (km/h)
R = curve radius (m)
e = pavement superelevation (m/m)
f = side friction factor (between the tyre and pavement)
g = acceleration due to gravity (9.81m/s^2)

For the subject curve, the curve radius of vehicles movement has been assessed as approximately 9.3m from aerial imagery, the pavement superelevation is assumed to be 3% (which is a common superelevation of roads) and the maximum side friction factor for the curve is 0.35 in accordance with *Figure H 3* of the *Austroads Guide to Road Design, Part 3: Geometric Design*.

Using the above values, the speed of vehicles turning left at the roundabout is expected to be approximately 21km/h. An equivalent minimum SSD for this speed on a level grade is

16m in accordance with *Section 5.3* of the *Austroads Guide to Road Design, Part 3: Geometric Design*. There is 29m of sight distance available from the driveway (measured 2.5m back from the road) to vehicles turning left from Phillip Street (measured along the road) as shown in **Annexure F** for reference. Therefore, the site distance required exceeds the requirements under AS2890.1:2004.

> *Demonstrate that car park, including shared spaces and height clearances, complies with AS2890.1 and AS2890.6.*

MTE Response: The car park design has been assessed, as detailed further in **Section 3.6,** to be generally compliant with the relevant Australian Standards, subject to any variations detailed in **Section 3.7**.

> *A Traffic and Car Parking Report shall include details on the proposed waste arrangement, demonstrating the method of waste collection, adequate separation from car parking and pedestrian areas, and addressing potential impacts on traffic, access and pedestrian safety.*
>
> *It is noted that the plan tabled at the pre-lodgement meeting, which included separated entry/exit and a turntable for waste collection vehicles, is preferred by Council's Traffic Engineer over other options discussed at the meeting. In this regard, the design and operational benefits (as discussed at the pre-lodgement meeting) of removing the waste vehicle turntable and driveway, should not be pursued over pedestrian and driver safety in the car park in the instance that waste vehicle access and reversing is proposed within the car park area (as discussed)*
>
> *Waste vehicle reversing in the car park (which was discussed at the meeting) will not be supported for safety reasons due to the potential for conflict with pedestrians and drivers of other vehicles in the car park area.*

MTE Response: The servicing and loading operations of the site are detailed within **Section 3.5**. There is a wall separating the lift area to the loading area, and as such acts as a safety barrier to pedestrian for any waste collection vehicle reversing. There are also additional bollards to further segregate pedestrian access from waste servicing, providing additional protection.

Waste collection operations at the site are expected to occur once a week and are likely to occur outside of peak hourly AM and PM commuter periods such any other vehicular or pedestrian movements occurring within the basement whilst the waste collection operations are undertaken are to be quite rare.

There are no significant obstructions to sight lines surrounding the loading bay from pedestrians and vehicles such that all other basement users will be able to clearly identify the position and or movement of waste collection vehicles. In addition, typical safety features fitted to heavy vehicles that are activated during reverse manoeuvres including flashing lights and the reversing sound alarm will ensure the safety of any pedestrians travelling within the basement by alerting the pedestrians to the vehicle's movements. As such, the

reversing movement of the proposed waste collection vehicle into the loading bay within the basement is considered to be functionally safer to that of a car reversing into parking spaces within the basement such that there will be no adverse safety impacts to vehicles or pedestrians resulting from this operation.

In addition to the above, measures can be implemented to improve the safety of the waste collection vehicle if required by Council:

- Have a secondary pedestrian (i.e. passenger in waste collection vehicle) monitor pedestrians during waste collection movements in the car park. This would be similar to a traffic controller.

- Pick-up waste outside of peak operating times (this is typically undertaken and is a normal practice).

It should be noted that the Waste Management plan provided by Elephants Foot further supports this proposed servicing arrangements and does not consider this set up a safety risk.

The statement made by Council's Traffic Engineer that reversing in the car park by a waste vehicle is contrary to Penrith Council's DCP which states that waste vehicles are to enter and exit the site in a forward direction "*with limited manoeuvring and reversing on-site".* The Penrith Council DCP does not state that no reverse movements are to occur, but reverse movements are to be limited, hence the proposed development complies with this requirement.

Reference is also made to *Clause 3.2.2 of AS2890.2:2018* which states that reverse manoeuvres at the property boundary, if permitted by the relevant authority shall be limited to one only, either on entering or departing, and be subject to determination of both safety and obstruction to other on-street traffic.

Hence, reverse manoeuvres into or out of a development are allowable from a public road subject to consideration to both safety and obstruction to other on-street traffic. This clause from AS2890.2:2018 is highly relevant as it does not specifically say that consideration needs to be undertaken to pedestrians. In MTE's view, a reverse movement into and out of a development should only be allowable from a local road (or lower order road than a local road) subject to consideration to traffic flow (which informs the safety) and any other safety considerations such as sight lines.

Notwithstanding the above consideration, *M^CLaren Traffic Engineering* (MTE) are practicing road safety consultants who have multiple accredited auditors registered with *Transport for NSW Register of Road Safety Auditors (*https://www.roadsafetyregister.com.au/). The highest level of accreditation within the register is level 3, of which is held by MTE. As such, the proposed design and layout of the basement is fully supportable and can be certified based upon the Australian Standards and road safety considerations.

An assessment of the risk associated with a waste collection vehicle reversing into the loading bay is reproduced in **Annexure G** for reference. The results indicate that pedestrian and vehicle conflicts have a risk of “Low” resulting in the recommended following treatment approach “*should be corrected or the risk reduced, if the treatment cost is low*” based upon AUSTROADS. As such the proposed mitigation measures mentioned above are adequate in reducing the risk and as such the proposed design and operation of the waste collection vehicle is fully supportable.

6 CONCLUSION

In view of the foregoing, the subject High Density Residential Development proposal at 14-18 Phillip Street, St Marys (as depicted in **Annexure A**) is fully supportable in terms of its traffic and parking impacts. The following outcomes of this traffic impact assessment are relevant to note:

- The proposal includes **20** residential car parking spaces including five (5) adaptable parking spaces, satisfying the SEPP requirements for the proposed in-fill affordable housing.

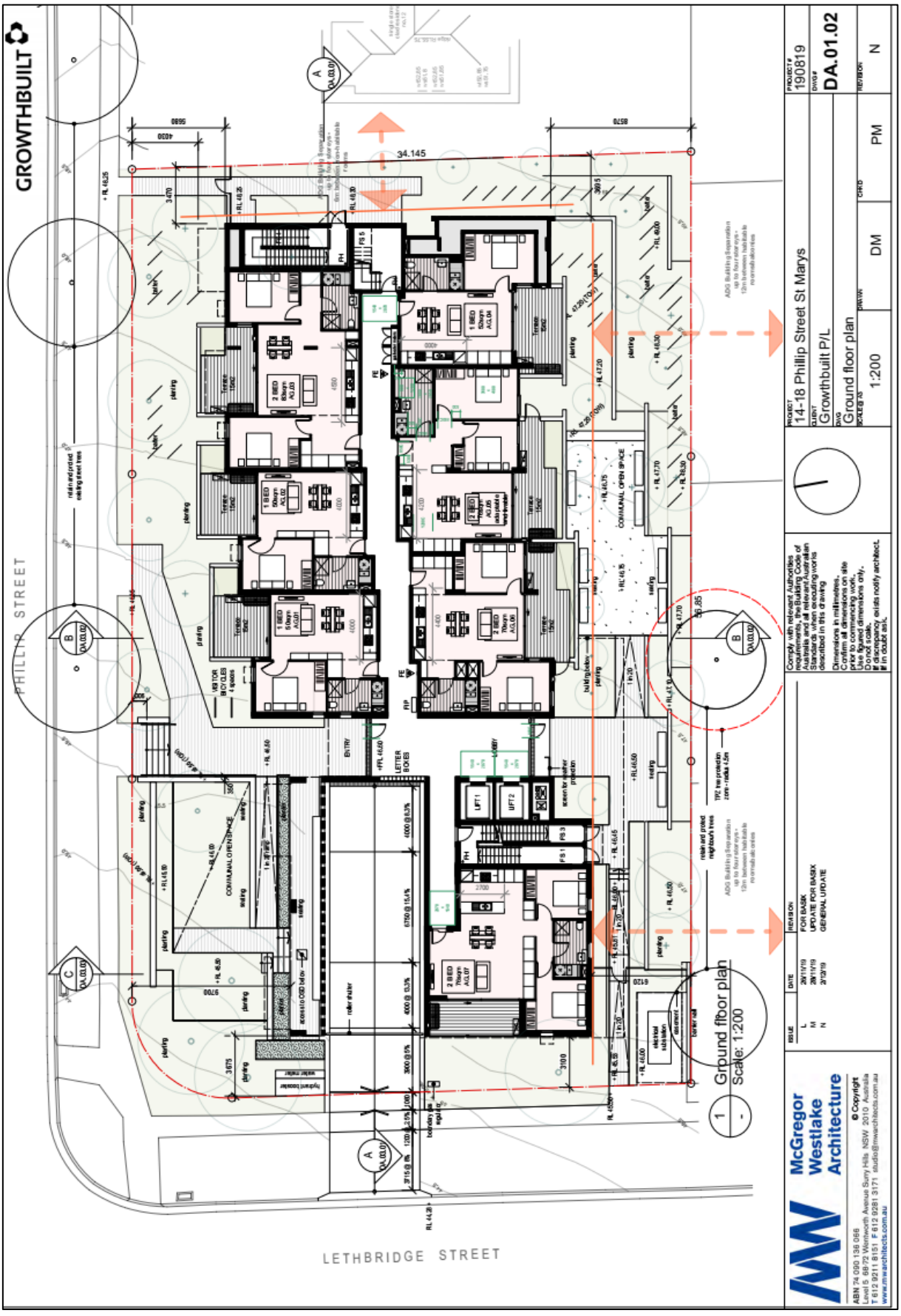
- In accordance with the above rates, the proposed development requires **9** to **13** residential bicycle spaces, and **2** to **4** visitor bicycle spaces (i.e. a range of **11** to **17** total spaces). The proposed plans indicate a bicycle parking provision of **10** bicycle spaces within the basement to be shared between residents and **4** visitor spaces on ground floor, resulting in compliance with Council's DCP requirements.

- The parking areas of the site have been assessed against the relevant sections of AS2890.1, AS2890.2, AS2890.6 and AS4299 and have been found to satisfy the objectives of each standard. Relevant swept path testing is reproduced in **Annexure D** for reference.

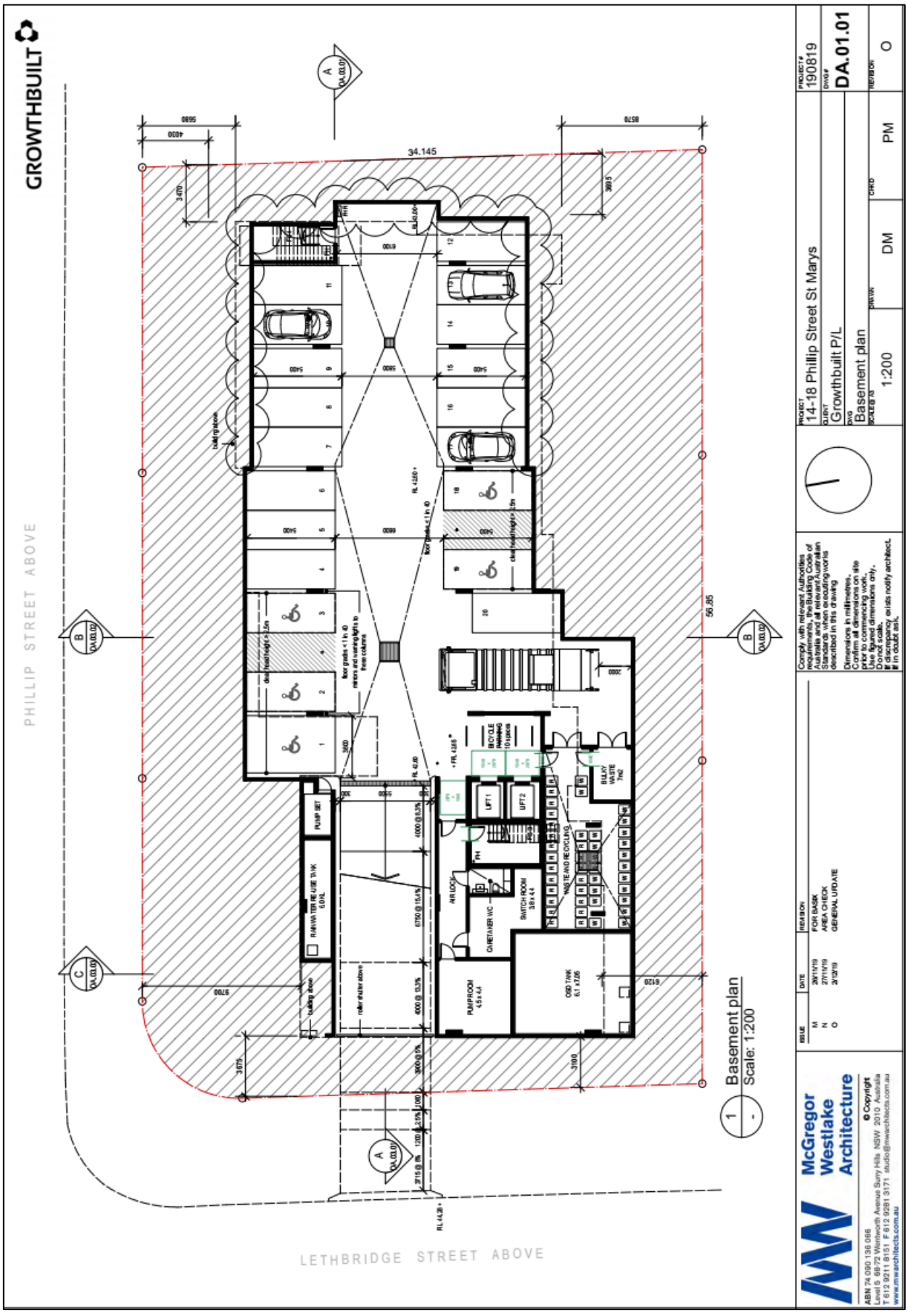
- The peak traffic generation associated with the proposed development is estimated in the order of nine (**9**) vehicle trips. The proposed development will not have an adverse effect on any nearby intersections and can be readily accommodated within the existing road network with minimal impacts in terms of traffic flow efficiency, residential amenity and road safety considerations.

- There is a wall separating the lift area to the loading area, and as such acts as a safety barrier to pedestrian for any waste collection vehicle reversing. There are also additional bollards to further segregate pedestrian access from waste servicing, providing additional protection. There are no significant obstructions to sight lines surrounding the loading bay from pedestrians and vehicles such that all other basement users will be able to clearly identify the position and or movement of waste collection vehicles. The reversing movement of the proposed waste collection vehicle into the loading bay within the basement is considered to be functionally similar to that of cars reversing into parking spaces within the basement such that there will be no adverse safety impacts to vehicles or pedestrians resulting from this operation. It should be noted that the Waste Management plan provided by Elephants Foot further supports this proposed servicing arrangements and does not consider this set up a safety risk. Further, low cost mitigation measures consist of having a pedestrians from the waste collection vehicle monitoring the pedestrian movements during waste collection and picking up the waste outside of peak operating times.

ANNEXURE A: PROPOSED PLANS
(Sheet 1 of 2)



ANNEXURE A: PROPOSED PLANS
(Sheet 2 of 2)



ANNEXURE B: TRAFFIC SURVEY RESULTS

(Sheet 1 of 2)

TRANS TRAFFIC SURVEY trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Phillip St and Glossop St, St Marys

GPS	*-33.76465, 150.78052*						
Date:	Wed 23/10/19	***North:***	Glossop St	***Survey Period***	AM:	7:00 AM-10:00 AM
Weather:	Overcast	***East:***	N/A		PM:	4:00 PM-7:00 PM
Suburban:	St Marys	***South:***	Glossop St	***Traffic Peak***	AM:	8:00 AM-9:00 AM
Customer:	McLaren	***West:***	Phillip St		PM:	4:30 PM-5:30 PM

All Vehicles

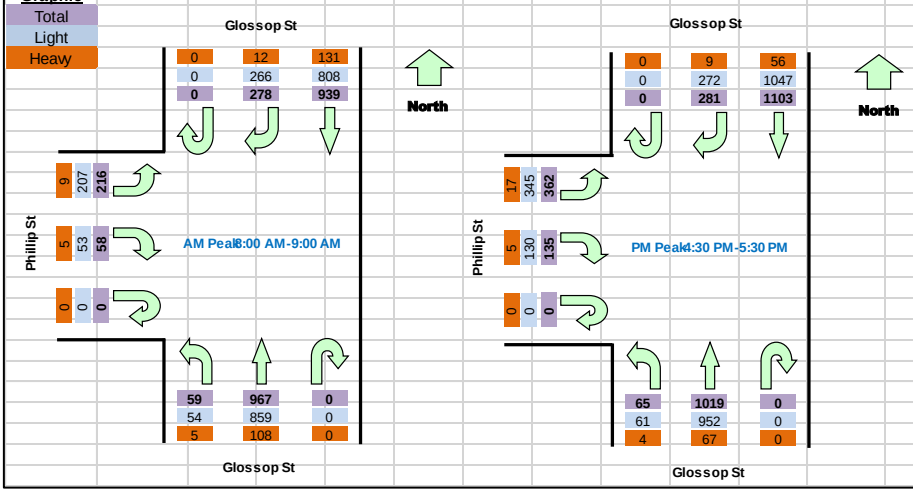
Time		North Approach Glossop St			South Approach Glossop S			West Approach Phillip St			Hourly Total	
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	Hour	Peak
7:00	7:15	0	29	140	0	251	10	0	13	34	2113	
7:15	7:30	1	32	154	0	239	15	0	10	44	2237	
7:30	7:45	0	42	197	0	229	19	0	16	40	2377	
7:45	8:00	1	51	179	0	288	14	0	16	49	2469	
8:00	8:15	0	52	216	0	238	16	0	10	69	2517	Peak
8:15	8:30	0	59	242	0	248	12	0	15	59	2516	
8:30	8:45	0	68	254	0	239	15	0	13	46	2468	
8:45	9:00	0	99	227	0	242	16	0	20	42	2324	
9:00	9:15	1	93	190	0	232	11	0	17	56	2158	
9:15	9:30	1	91	182	0	215	14	0	18	66		
9:30	9:45	0	75	158	0	160	15	0	24	59		
9:45	10:00	0	81	156	0	172	5	0	20	46		
16:00	16:15	0	64	300	0	267	9	0	30	81	2951	
16:15	16:30	0	62	304	0	268	25	0	35	76	2947	
16:30	16:45	0	75	284	0	233	17	0	31	80	2965	Peak
16:45	17:00	0	71	256	0	258	7	0	40	78	2913	
17:00	17:15	0	67	282	0	248	18	0	28	104	2835	
17:15	17:30	0	68	281	0	280	23	0	36	100	2651	
17:30	17:45	0	69	221	0	244	20	0	41	73	2471	
17:45	18:00	0	62	178	0	233	14	0	30	115	2342	
18:00	18:15	0	61	185	0	193	14	0	46	64	2188	
18:15	18:30	0	63	184	0	200	14	0	45	102		
18:30	18:45	0	52	175	0	199	14	0	31	68		
18:45	19:00	0	56	149	0	171	10	0	33	59		

Peak Time		North Approach Glossop St			South Approach Glossop S			West Approach Phillip St			Peak
Period Start	Period End	U	R	SB	U	NB	L	U	R	L	total
8:00	9:00	0	278	939	0	967	59	0	58	216	2517
16:30	17:30	0	281	1103	0	1019	65	0	135	362	2965

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy



ANNEXURE B: TRAFFIC SURVEY RESULTS

(Sheet 2 of 2)

TRANS TRAFFIC SURVEY trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Phillip St and Lethbridge St, St Marys

GPS	*-33.76427, 150.7783*						
Date:	Wed 23/10/19	*North:*	Lethbridge St	*Survey Period*	AM:	7:00 AM-10:00 AM
Weather:	Overcast	*East:*	Phillip St		PM:	4:00 PM-7:00 PM
Suburban:	St Marys	*South:*	Lethbridge St	*Traffic Peak*	AM:	8:45 AM-9:45 AM
Customer:	McLaren	*West:*	Phillip St		PM:	5:00 PM-6:00 PM

All Vehicles

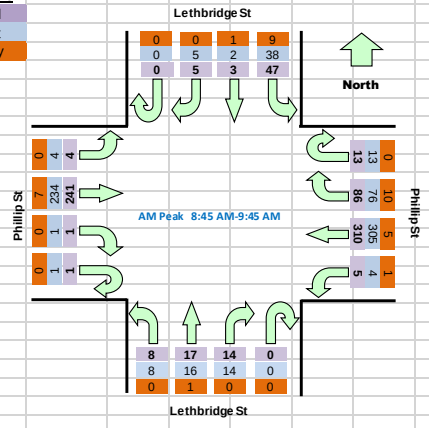
Time		North Approach Lethbridge St				East Approach Phillip St				South Approach Lethbridge St				West Approach Phillip St				Hourly Total	
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
7:00	7:15	0	0	3	10	1	11	26	1	0	0	1	1	0	0	37	1	485	
7:15	7:30	0	0	0	8	1	21	23	2	0	0	11	3	1	0	46	1	552	
7:30	7:45	0	0	0	9	3	20	37	1	0	4	7	2	0	1	43	1	589	
7:45	8:00	0	1	3	7	3	18	43	1	0	1	10	4	0	0	57	0	613	
8:00	8:15	0	1	0	13	2	19	46	1	0	4	5	2	1	2	62	1	649	
8:15	8:30	0	1	1	14	4	18	46	3	0	1	5	2	0	0	59	0	678	
8:30	8:45	0	0	0	10	3	12	68	0	0	4	5	2	1	0	45	2	726	
8:45	9:00	0	1	0	7	4	22	86	3	0	5	3	2	0	0	50	1	755	Peak
9:00	9:15	0	0	1	11	2	23	79	0	0	3	4	5	0	1	59	0	737	
9:15	9:30	0	2	1	13	3	24	77	1	0	4	6	1	1	0	67	2		
9:30	9:45	0	2	1	16	4	17	68	1	0	2	4	0	0	0	65	1		
9:45	10:00	0	0	2	16	5	18	63	0	0	1	7	2	3	0	49	0		
16:00	16:15	0	2	3	22	5	21	46	1	0	0	5	6	2	1	89	3	874	
16:15	16:30	0	2	1	21	4	30	52	1	0	2	11	1	1	0	88	3	913	
16:30	16:45	0	1	2	21	6	18	65	3	0	9	7	3	2	3	81	7	942	
16:45	17:00	0	3	3	19	6	14	57	1	0	6	14	3	1	3	93	0	937	
17:00	17:15	0	4	7	27	4	15	63	3	0	2	10	2	1	2	103	2	966	Peak
17:15	17:30	0	1	1	27	4	20	66	1	0	6	9	2	2	2	103	2	933	
17:30	17:45	0	2	3	27	6	21	60	2	0	4	7	0	3	1	83	4	929	
17:45	18:00	0	3	6	18	3	19	52	2	0	3	9	2	1	4	124	6	888	
18:00	18:15	0	4	6	21	1	23	50	1	0	5	6	1	2	4	84	4	806	
18:15	18:30	0	2	5	34	4	21	49	3	0	4	4	2	0	2	109	3		
18:30	18:45	0	3	3	27	1	17	47	1	0	1	7	0	2	2	71	0		
18:45	19:00	0	0	4	24	2	18	41	5	0	1	5	0	2	0	67	1		

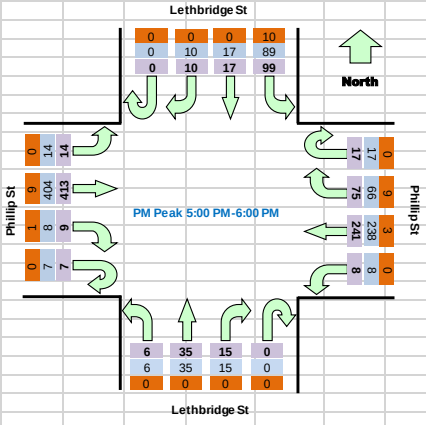
Peak Time		North Approach Lethbridge St				East Approach Phillip St				South Approach Lethbridge St				West Approach Phillip St				Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	total
8:45	9:45	0	5	3	47	13	86	310	5	0	14	17	8	1	1	241	4	755
17:00	18:00	0	10	17	99	17	75	241	8	0	15	35	6	7	9	413	14	966

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy





MOVEMENT SUMMARY

Site: 101 [Phillip Street / Glossop Street EX AM]

Intersection of Phillip Street / Glossop Street
Existing Conditions
AM Peak Period
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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Glossop Street (S)												
1	L2	159	0.0	0.526	19.0	LOS B	15.2	106.6	0.68	0.66	0.68	47.1
2	T1	967	0.0	0.526	13.4	LOS A	15.6	109.2	0.68	0.63	0.68	48.7
Approach		1126	0.0	0.526	14.2	LOS A	15.6	109.2	0.68	0.63	0.68	48.5
North: Glossop Street (N)												
8	T1	939	0.0	0.323	4.1	LOS A	6.8	47.7	0.36	0.32	0.36	56.2
9	R2	278	0.0	0.640	26.0	LOS B	10.7	75.0	0.96	0.90	1.03	41.2
Approach		1217	0.0	0.640	9.1	LOS A	10.7	75.0	0.50	0.45	0.51	51.9
West: Phillip Street (W)												
10	L2	216	0.0	0.355	32.4	LOS C	7.0	49.3	0.83	0.78	0.83	38.5
12	R2	58	0.0	0.355	47.4	LOS D	2.9	20.5	0.97	0.76	0.97	33.1
Approach		274	0.0	0.355	35.5	LOS C	7.0	49.3	0.86	0.78	0.86	37.2
All Vehicles		2617	0.0	0.640	14.1	LOS A	15.6	109.2	0.61	0.56	0.62	48.4

Site Level of Service (LOS) Method: Delay (RTA NSW). 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 SUMMARY

Site: 101 [Phillip Street / Glossop Street EX PM]

Intersection of Phillip Street / Glossop Street
Existing Conditions
PM Peak Period
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: Glossop Street (S)												
1	L2	65	0.0	0.547	21.5	LOS B	16.0	111.9	0.73	0.67	0.73	46.1
2	T1	1019	0.0	0.547	16.0	LOS B	16.2	113.1	0.73	0.66	0.73	47.3
Approach		1084	0.0	0.547	16.3	LOS B	16.2	113.1	0.73	0.66	0.73	47.2
North: Glossop Street (N)												
8	T1	1103	0.0	0.411	6.4	LOS A	10.4	72.5	0.47	0.42	0.47	54.3
9	R2	281	0.0	0.696	32.2	LOS C	11.4	80.0	0.98	0.94	1.16	38.5
Approach		1384	0.0	0.696	11.7	LOS A	11.4	80.0	0.57	0.52	0.61	50.1
West: Phillip Street (W)												
10	L2	362	0.0	0.521	31.1	LOS C	12.0	84.1	0.85	0.81	0.85	39.0
12	R2	135	0.0	0.521	43.7	LOS D	6.4	44.5	0.96	0.80	0.96	34.3
Approach		497	0.0	0.521	34.5	LOS C	12.0	84.1	0.88	0.81	0.88	37.6
All Vehicles		2965	0.0	0.696	17.2	LOS B	16.2	113.1	0.68	0.62	0.70	46.5

Site Level of Service (LOS) Method: Delay (RTA NSW). 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 SUMMARY

Site: 101 [Phillip Street / Lethbridge Street EX AM]

Intersection of Phillip Street / Lethbridge Street
Existing Conditions
AM Peak Period
Site Category: (None)
Roundabout

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: Lethbridge Street (S)												
1	L2	8	0.0	0.041	6.6	LOS A	0.2	1.4	0.49	0.63	0.49	51.7
2	T1	17	0.0	0.041	6.9	LOS A	0.2	1.4	0.49	0.63	0.49	52.4
3	R2	14	0.0	0.041	10.0	LOS A	0.2	1.4	0.49	0.63	0.49	52.1
Approach		39	0.0	0.041	8.0	LOS A	0.2	1.4	0.49	0.63	0.49	52.2
East: Phillip Street (E)												
4	L2	5	0.0	0.261	5.1	LOS A	1.7	11.6	0.08	0.53	0.08	53.0
5	T1	310	0.0	0.261	4.8	LOS A	1.7	11.6	0.08	0.53	0.08	54.1
6	R2	86	0.0	0.261	7.9	LOS A	1.7	11.6	0.08	0.53	0.08	53.7
6u	U	13	0.0	0.261	9.5	LOS A	1.7	11.6	0.08	0.53	0.08	54.3
Approach		414	0.0	0.261	5.6	LOS A	1.7	11.6	0.08	0.53	0.08	54.0
North: Lethbridge Street (N)												
7	L2	47	0.0	0.053	5.8	LOS A	0.3	1.9	0.42	0.58	0.42	52.9
8	T1	3	0.0	0.053	6.1	LOS A	0.3	1.9	0.42	0.58	0.42	53.7
9	R2	5	0.0	0.053	9.3	LOS A	0.3	1.9	0.42	0.58	0.42	53.4
Approach		55	0.0	0.053	6.2	LOS A	0.3	1.9	0.42	0.58	0.42	53.0
West: Phillip Street (W)												
10	L2	4	0.0	0.209	5.8	LOS A	1.1	8.0	0.32	0.51	0.32	52.6
11	T1	241	0.0	0.209	5.5	LOS A	1.1	8.0	0.32	0.51	0.32	53.7
12	R2	1	0.0	0.209	8.6	LOS A	1.1	8.0	0.32	0.51	0.32	53.3
12u	U	1	0.0	0.209	10.3	LOS A	1.1	8.0	0.32	0.51	0.32	53.9
Approach		247	0.0	0.209	5.6	LOS A	1.1	8.0	0.32	0.51	0.32	53.7
All Vehicles		755	0.0	0.261	5.8	LOS A	1.7	11.6	0.20	0.53	0.20	53.7

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Phillip Street / Lethbridge Street EX PM]

Intersection of Phillip Street / Lethbridge Street
Existing Conditions
PM Peak Period
Site Category: (None)
Roundabout

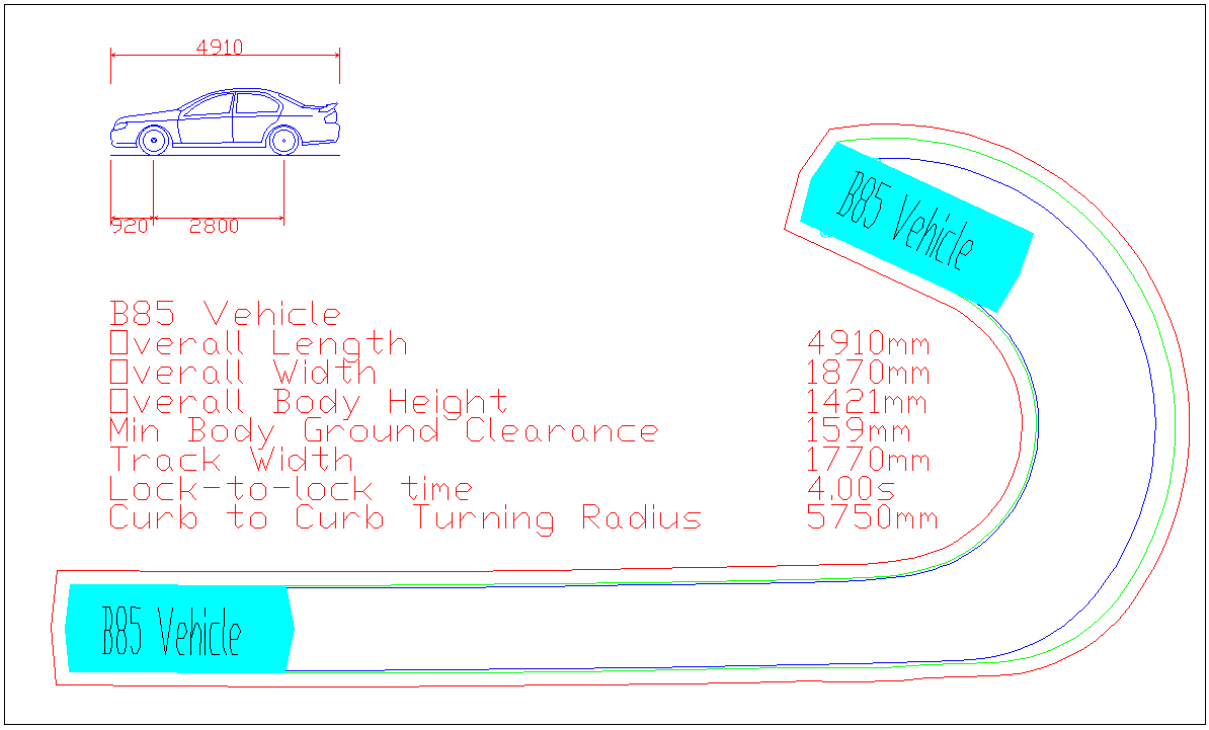
Movement Performance - Vehicles

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: Lethbridge Street (S)												
1	L2	6	0.0	0.057	6.3	LOS A	0.3	2.0	0.47	0.61	0.47	52.0
2	T1	35	0.0	0.057	6.5	LOS A	0.3	2.0	0.47	0.61	0.47	52.7
3	R2	15	0.0	0.057	9.7	LOS A	0.3	2.0	0.47	0.61	0.47	52.4
Approach		56	0.0	0.057	7.4	LOS A	0.3	2.0	0.47	0.61	0.47	52.6
East: Phillip Street (E)												
4	L2	8	0.0	0.244	5.3	LOS A	1.5	10.7	0.19	0.52	0.19	52.6
5	T1	241	0.0	0.244	5.0	LOS A	1.5	10.7	0.19	0.52	0.19	53.7
6	R2	75	0.0	0.244	8.0	LOS A	1.5	10.7	0.19	0.52	0.19	53.2
6u	U	17	0.0	0.244	9.7	LOS A	1.5	10.7	0.19	0.52	0.19	53.8
Approach		341	0.0	0.244	5.9	LOS A	1.5	10.7	0.19	0.52	0.19	53.5
North: Lethbridge Street (N)												
7	L2	99	0.0	0.143	7.1	LOS A	0.8	5.6	0.59	0.68	0.59	52.1
8	T1	17	0.0	0.143	7.4	LOS A	0.8	5.6	0.59	0.68	0.59	52.9
9	R2	10	0.0	0.143	10.6	LOS A	0.8	5.6	0.59	0.68	0.59	52.6
Approach		126	0.0	0.143	7.4	LOS A	0.8	5.6	0.59	0.68	0.59	52.2
West: Phillip Street (W)												
10	L2	14	0.0	0.368	6.0	LOS A	2.4	16.7	0.39	0.54	0.39	52.3
11	T1	413	0.0	0.368	5.7	LOS A	2.4	16.7	0.39	0.54	0.39	53.4
12	R2	9	0.0	0.368	8.8	LOS A	2.4	16.7	0.39	0.54	0.39	52.9
12u	U	7	0.0	0.368	10.5	LOS A	2.4	16.7	0.39	0.54	0.39	53.5
Approach		443	0.0	0.368	5.9	LOS A	2.4	16.7	0.39	0.54	0.39	53.4
All Vehicles		966	0.0	0.368	6.2	LOS A	2.4	16.7	0.35	0.56	0.35	53.2

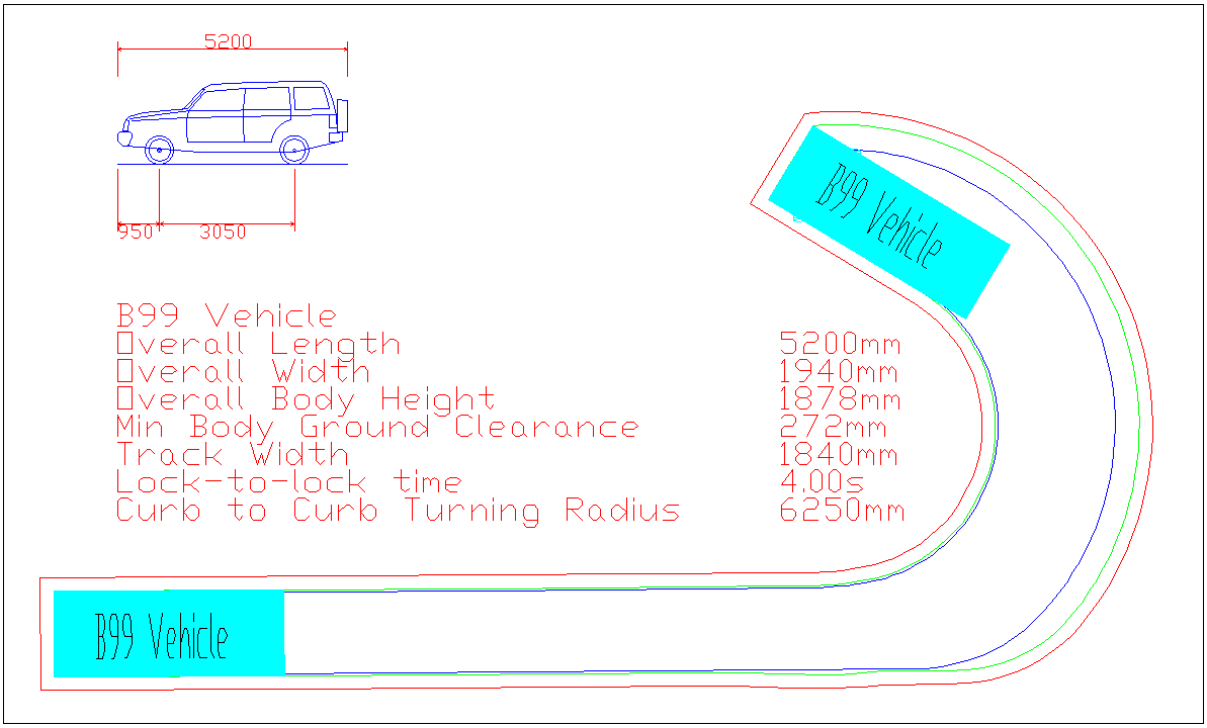
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
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.

ANNEXURE D: SWEPT PATH TESTING

(Sheet 1 of 5)



AUSTRALIAN STANDARD 85TH PERCENTILE SIZE VEHICLE (B85)



AUSTRALIAN STANDARD 99TH PERCENTILE SIZE VEHICLE (B99)

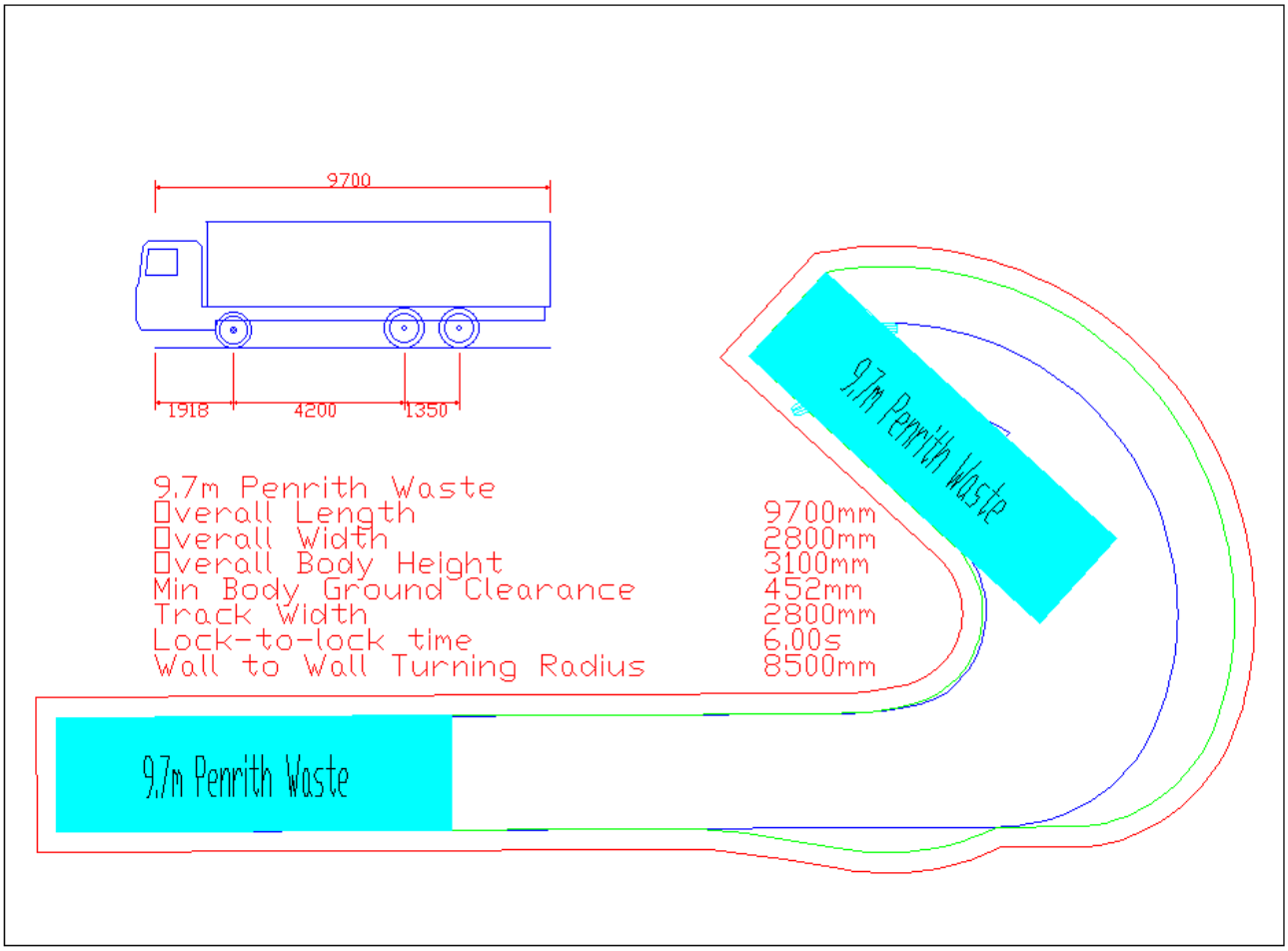
Blue – Tyre Path

Green – Vehicle Body

Red – 300mm Clearance

ANNEXURE D: SWEPT PATH TESTING

(Sheet 2 of 5)



9.7M LENGTH PENRITH WASTE COLLECTION VEHICLE

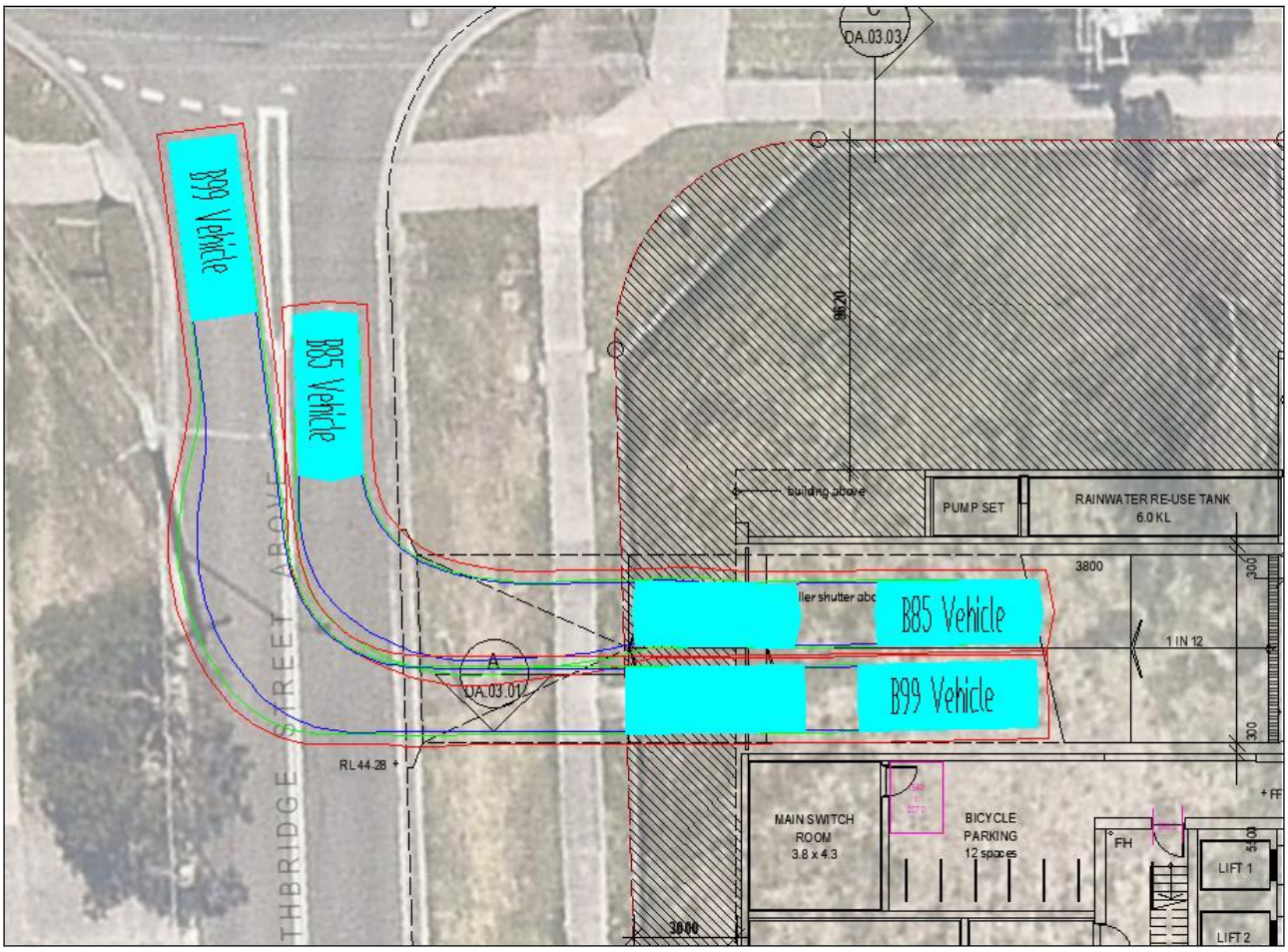
Blue – Tyre Path

Green – Vehicle Body

Red –500mm Clearance

ANNEXURE D: SWEPT PATH TESTING

(Sheet 3 of 5)



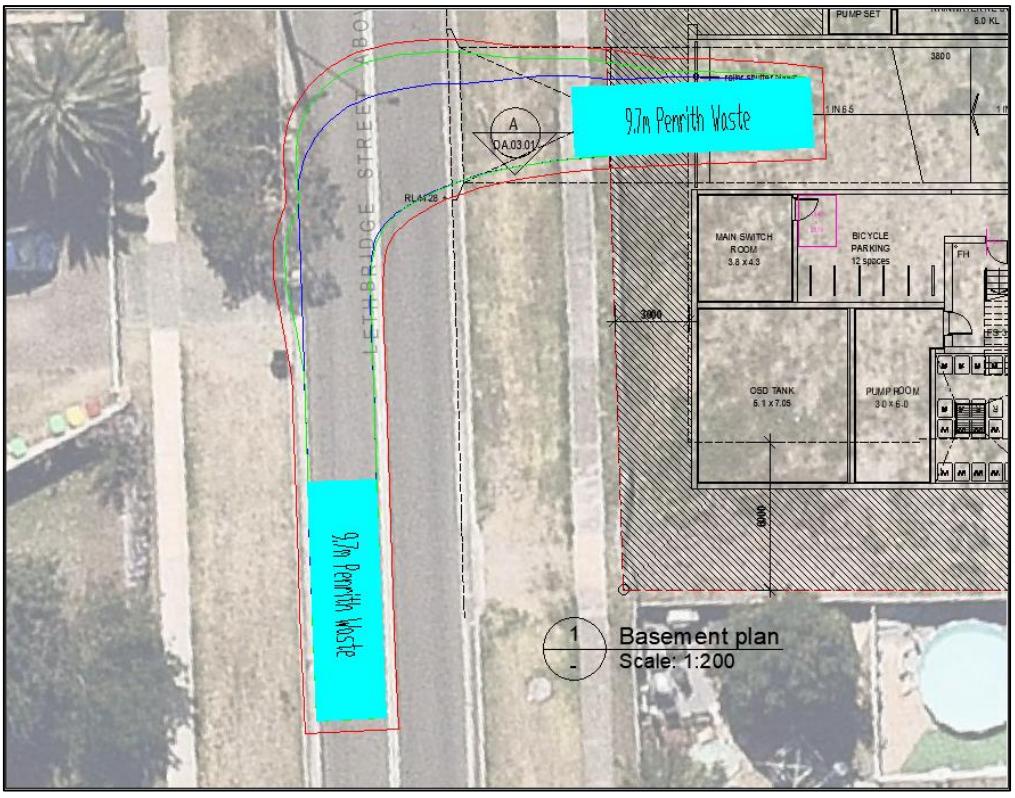
Driveway Two Way Passing

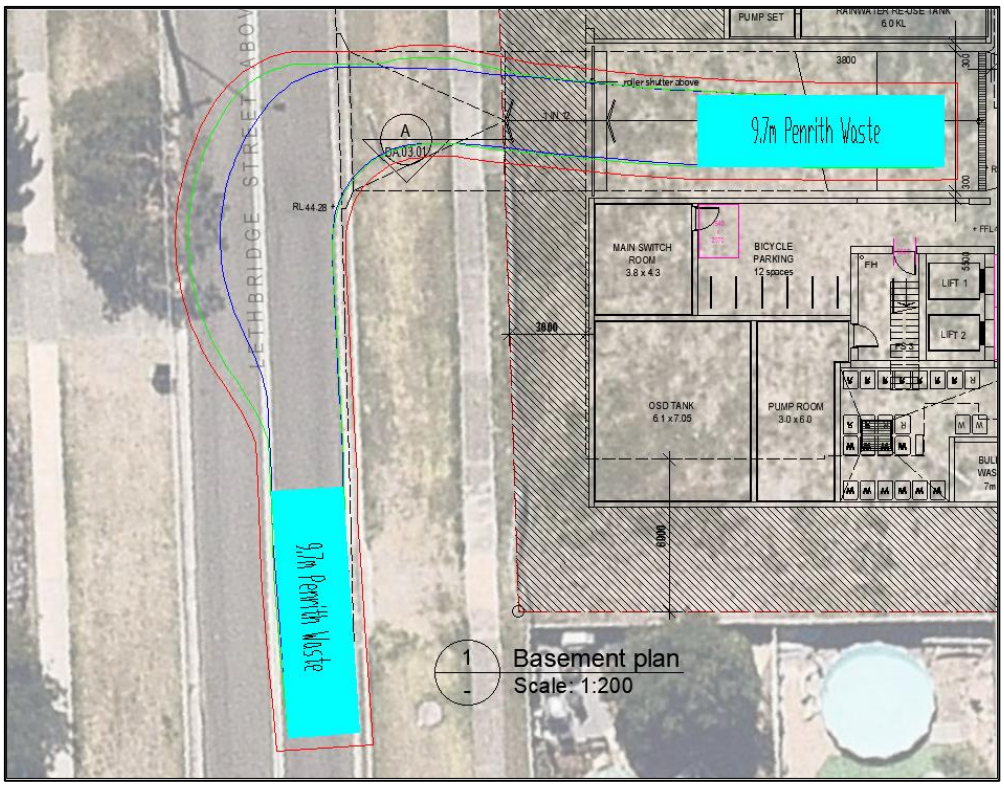
B85 Left Turn IN / B99 Right Turn OUT

Successful

ANNEXURE D: SWEPT PATH TESTING

(Sheet 4 of 5)





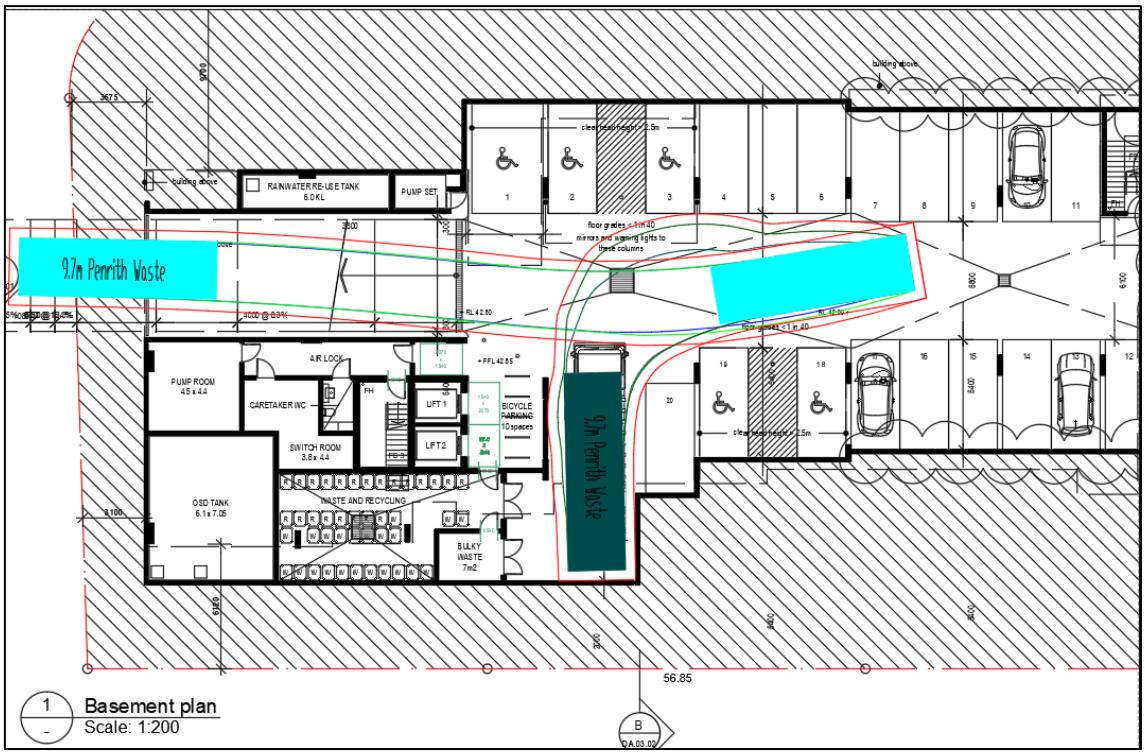
Penrith Waste Vehicle Driveway Access

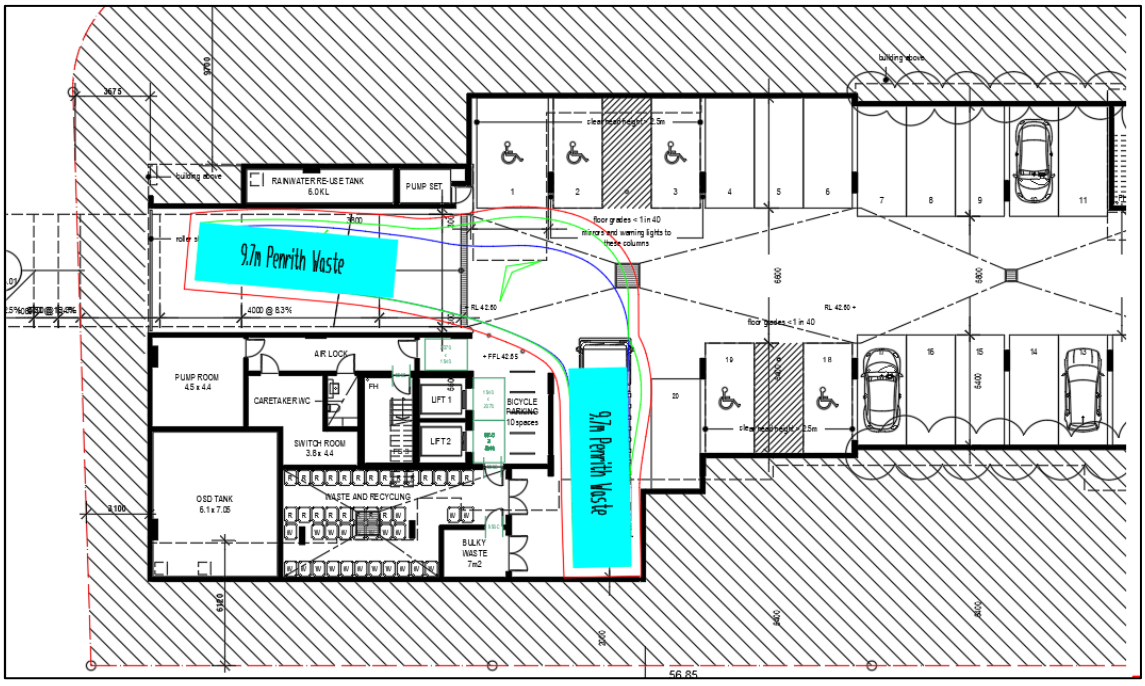
Right Turn IN / Left Turn OUT

Successful

ANNEXURE D: SWEPT PATH TESTING

(Sheet 5 of 5)

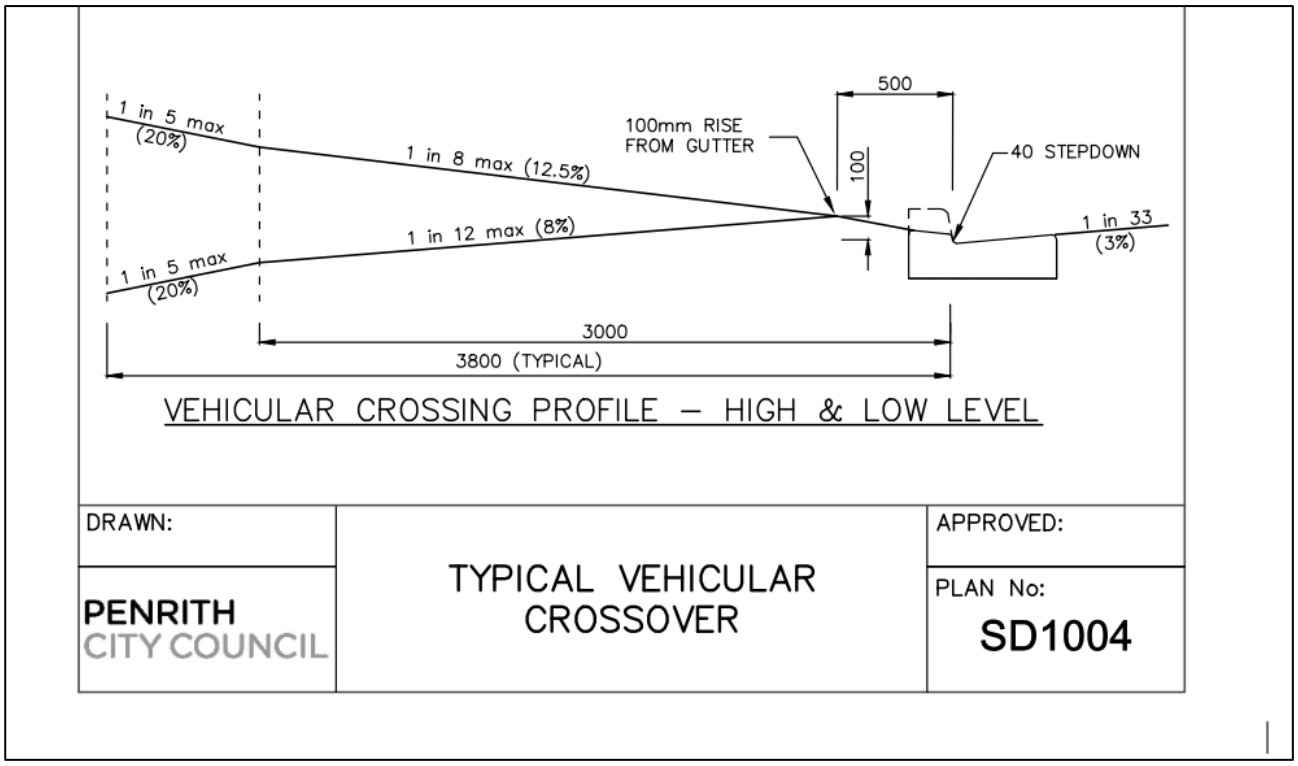




Loading Bay – Penrith Waste vehicle Entry and Exit
2 Manoeuvres Reverse IN / 1 Manoeuvre Forward OUT
Successful

ANNEXURE E: RECOMMENDED LONG SECTIONS

(Sheet 1 of 5)



COUNCIL CROSSOVER DESIGN

2.3 DESIGN SPECIFICATIONS REAR LOAD WASTE COLLECTION VEHICLES

The following dimensions are provided for a standard heavy rigid vehicle as identified in Australian Standard 2890.2:

2.3.1 Low Entry Heavy Rigid Waste Collection Vehicle

Vehicle Classifications	Heavy Rigid Vehicle Dimensions
Overall Length (m)	9.7
Operational Length (m)	11.7
Design Width (m)	2.8
Design Height (m)	3.1
Swept Circle (m)	17.0
Clearance (travel height) (m)	3.5
Roadway/ramp grade (max)	1:6.5 (15.4%)
Rate of change of grade (max)	1:12 (8.3%) in 4.0m of travel
Gross Weight (max tonnes)	28.0
Front Chassis Clearance	13°
Rear Chassis Clearance	16°

Table 1: Standard dimensions in accordance with AS 2890.2

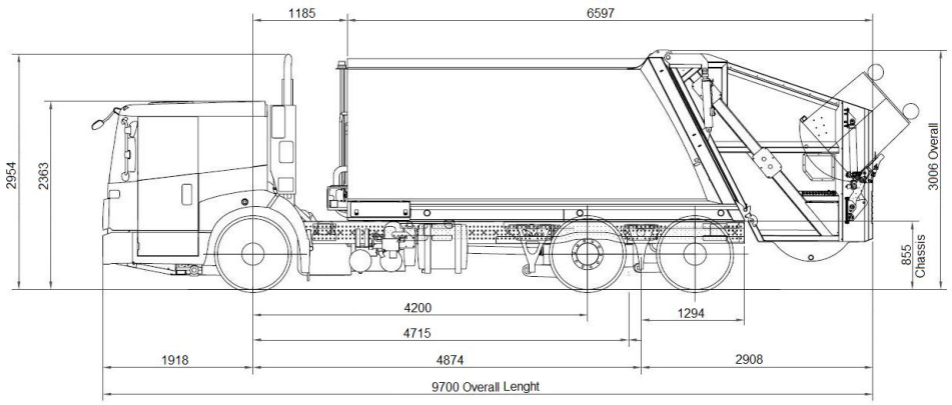


Figure 1: 9.7m Heavy Rigid Rear Load Waste Collection Vehicle specifications

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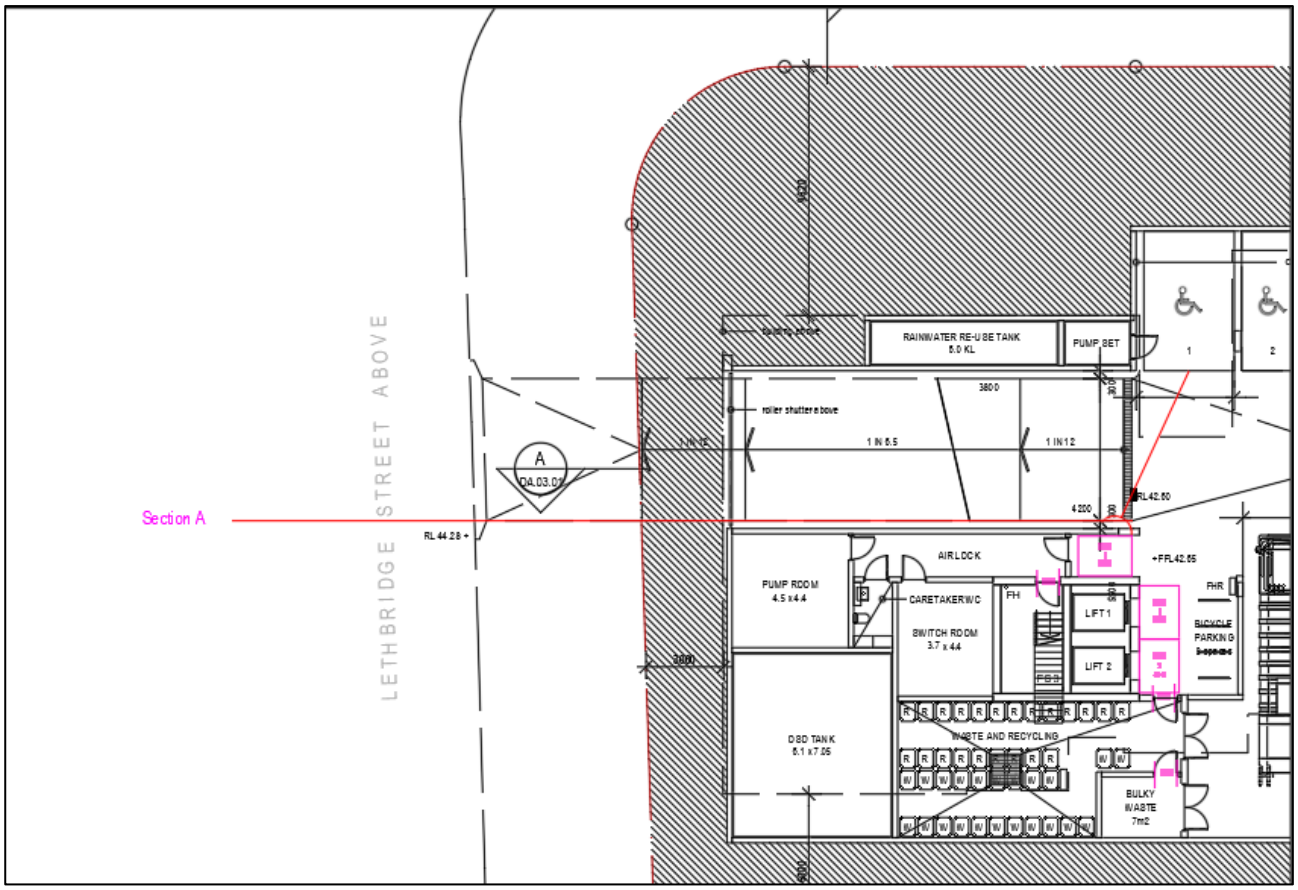
penrithcity.nsw.gov.au

ANNEXURE E: RECOMMENDED LONG SECTIONS

(Sheet 3 of 5)

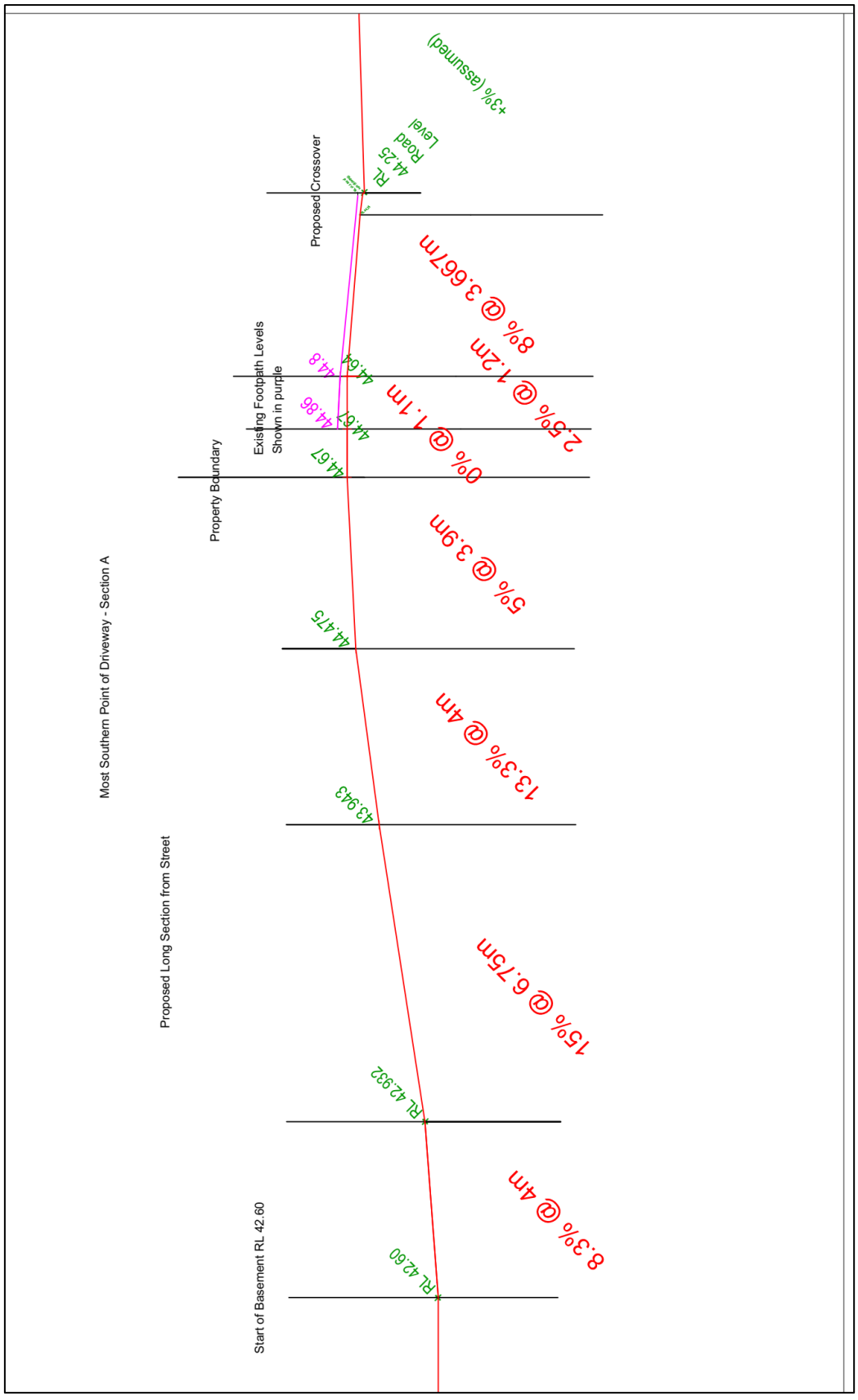


SECTIONS

Note southern side of the driveway shown only as it is the worst case.

ANNEXURE E: RECOMMENDED LONG SECTIONS

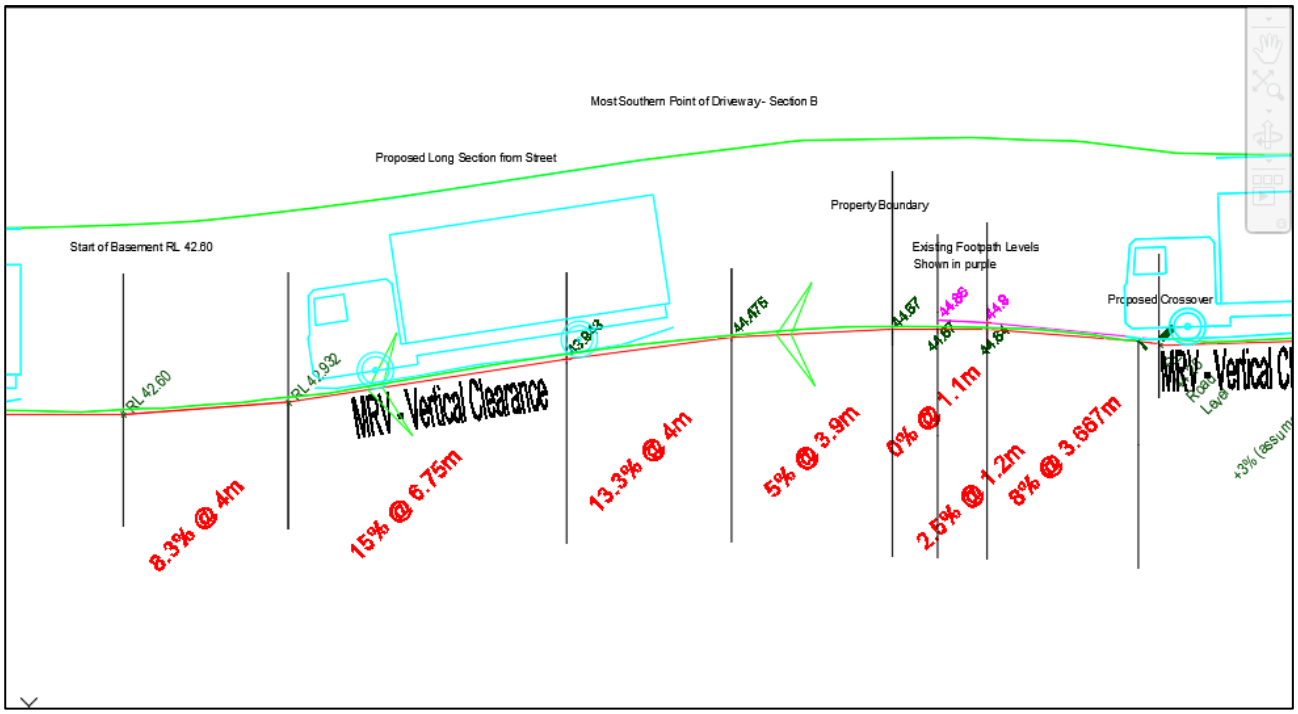
(Sheet 4 of 5)

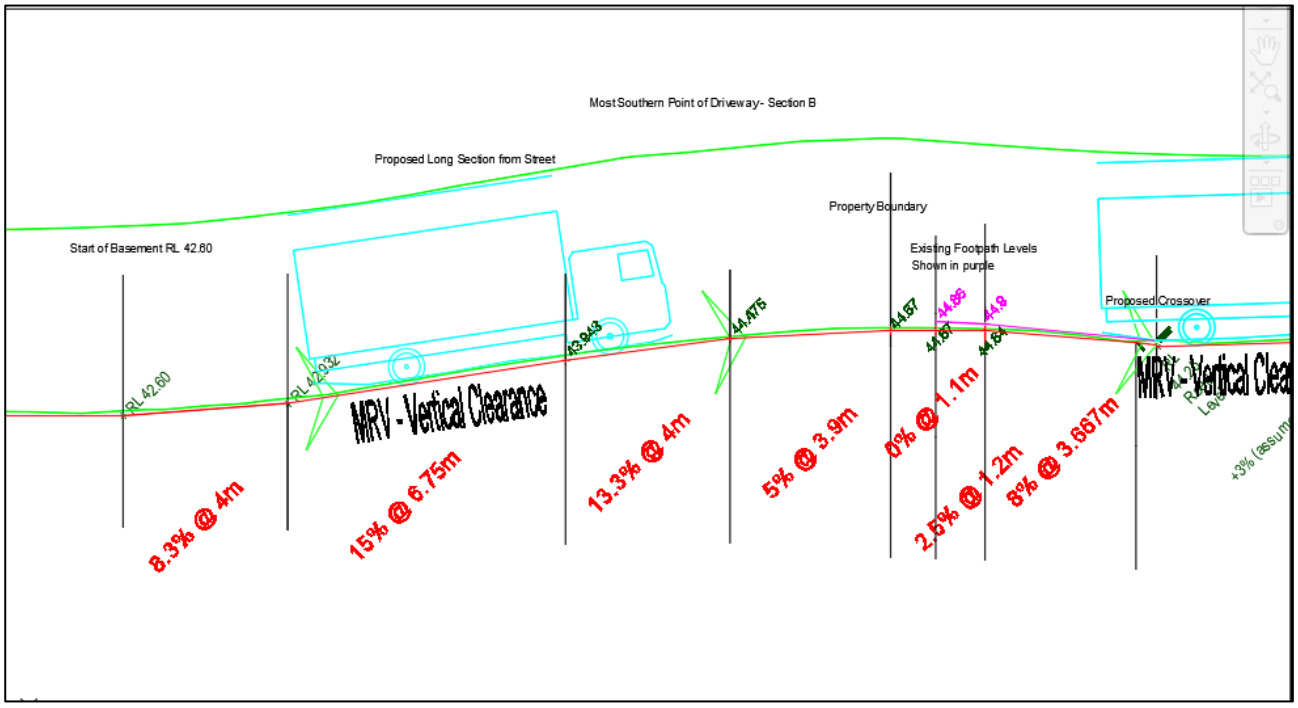


Section A

ANNEXURE E: RECOMMENDED LONG SECTIONS

(Sheet 5 of 5)

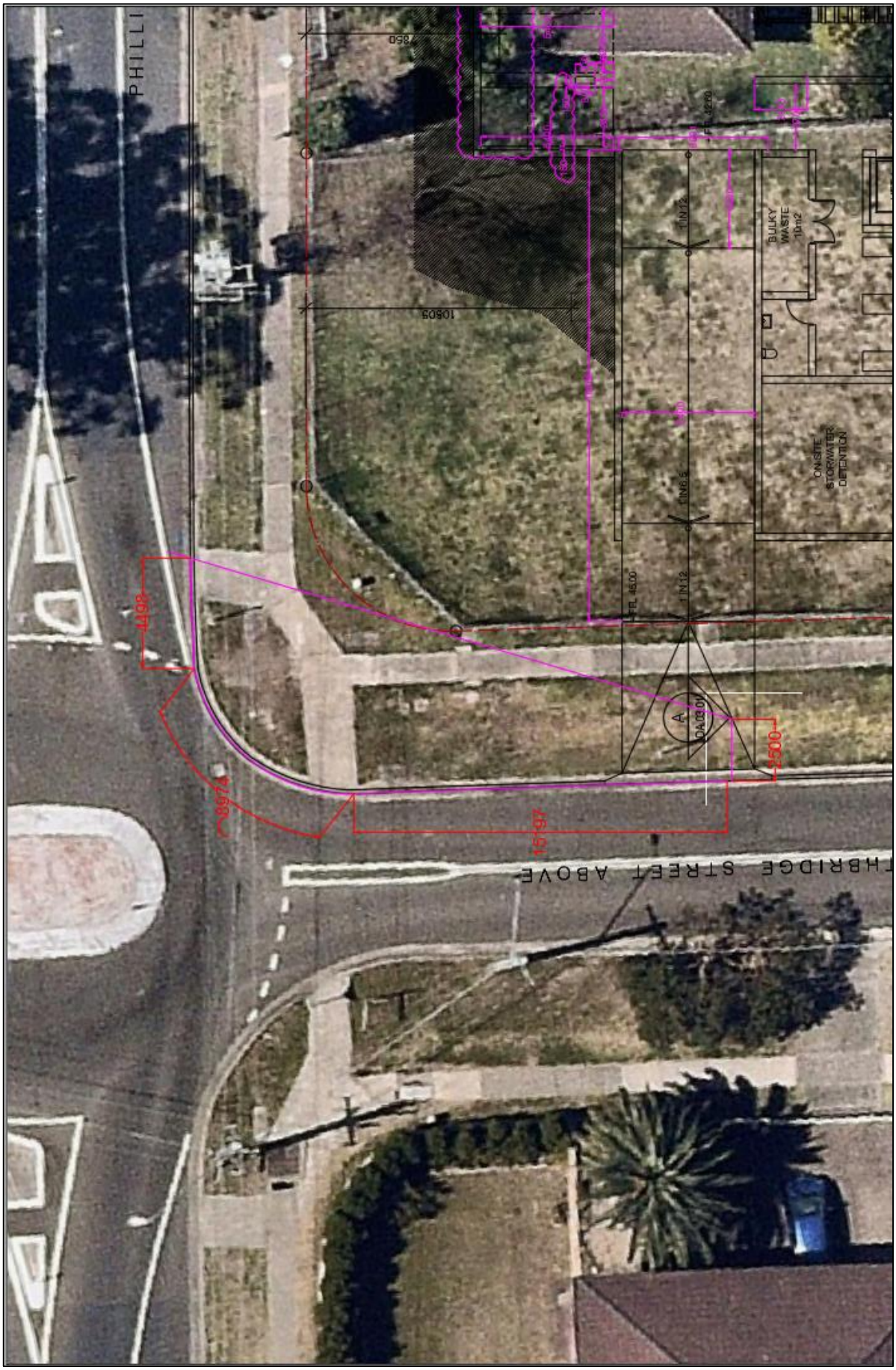




Section B – Undercarriage Vertical Clearance Testing for the 8.8m Length Medium Rigid Vehicle

Successful – No scraping occurs

ANNEXURE F: SIGHT DISTANCE



ANNEXURE G: ASSESSMENT OF RISK

Reference is made to AUSTROADS "*Guide to Road Safety Part 6 2019* and *"Guide to Road Safety Part 6A"* which provides guidance on indicating the level of risk and how to respond to it. The process is to assess the hazard into two categories based upon **Table 4** & **Table 5**, before determining the level of risk shown in **Table 6**. All tables outlined below are taken from *Guide to Road Safety Part 6A.*

TABLE 4: HOW OFTEN IS THE PROBLEM LIKELY TO LEAD TO A CRASH

Frequency	Description
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five or ten years
Improbable	Less often than once every ten years

TABLE 5: WHAT IS THE LIKELY SEVERITY OF THE RESULTING CRASH TYPE

Severity	Description	Examples
Catastrophic	Likely multiple deaths	High-speed, multi-vehicle crash on a freeway. Car runs into crowded bus stop Bus and petrol tanker collide Collapse of a bridge or tunnel
Serious	Likely death or serious injury	High or medium-speed vehicle collision High or medium-speed collision with a fixed roadside object Pedestrian or cyclist struck by a car
Minor	Likely minor injury	Some low-speed vehicle collisions Cyclist falls from bicycle at low speed Left-turn rear-end crash in a slip lane
Limited	Likely trivial injury or property damage only	Some low-speed vehicle collisions Pedestrians walks into object (no head injury) Car reverses into post

The concern raised by Council is outlined below:

> *Waste vehicle reversing in the car park (which was discussed at the meeting) will not be supported for safety reasons due to the potential for conflict with pedestrians and drivers of other vehicles in the car park area.*

Based upon the hazard of a waste vehicle reversing in the car park and the potential for a conflict with pedestrians and drivers of other vehicles within the car park area, the likelihood that this movement would lead to a crash is improbable (the occurrence of this would be more than once every ten years).

Similarly, the severity of a pedestrian conflicting with a waste vehicle when it is reversing at low speeds within a basement which is akin to a shared zone of 10km/h would be minor. The severity of serious for a pedestrian struck by a car or cyclists relates to this being

undertaken at speed and is not a reasonable severity within a low speed environment. Further, the severity of a vehicle collision at low speed with the waste collection vehicle would be limited severity.

Based upon the above, the level of risk of a vehicle - waste vehicle collision is low, whilst a collision of a waste vehicle and pedestrian would be low.

TABLE 6: LEVEL OF RISK RESULT TABLE

	Frequent	**Probable**	**Occasional**	**Improbable**
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low