TERRANORA ROAD DEVELOPMENT
TRAFFIC IMPACT ASSESSMENT

FOR

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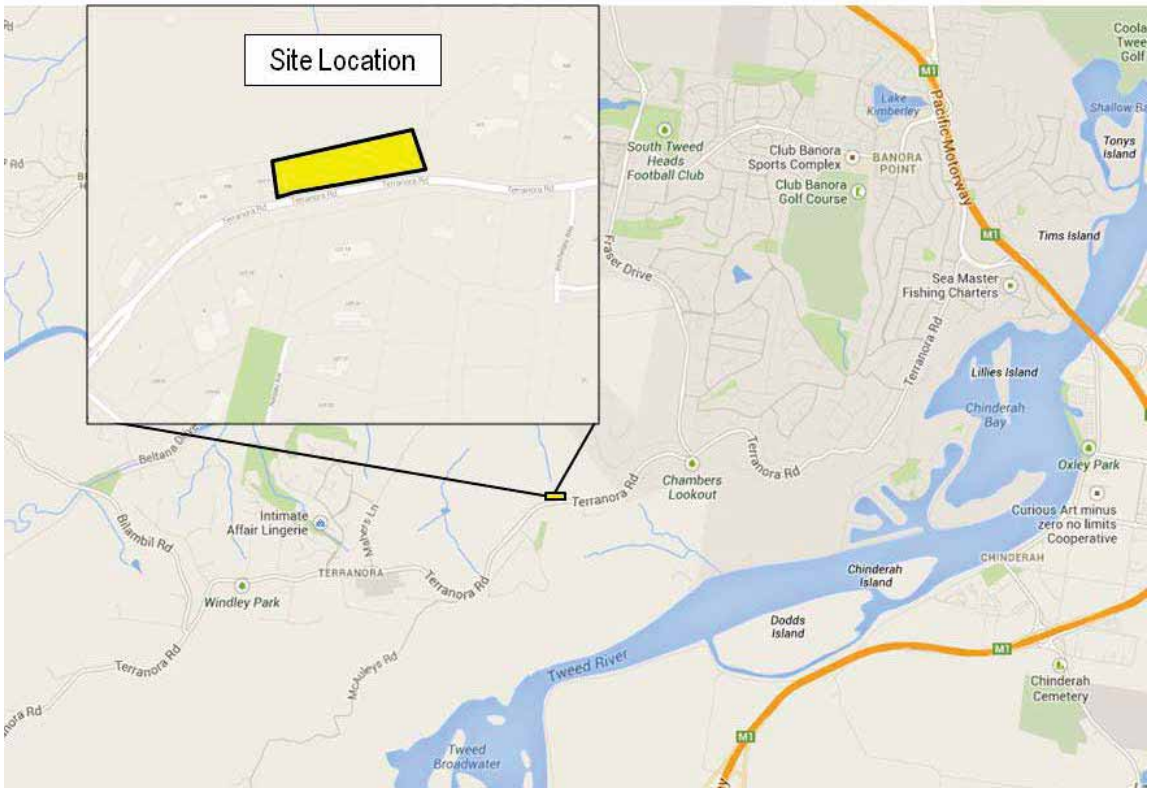
1. INTRODUCTION

1.1 BACKGROUND

Bitzios Consulting has been commissioned on behalf of the client in accordance with a Memorandum of Understanding (MOU) presented by Tweed Shire Council to prepare a Traffic Study and Access Assessment for a proposed development of seven residential lots on Terranora Road, Terranora. The site location is shown in Figure 1.1 below.



Source: Google maps

Figure 1.1: Site location

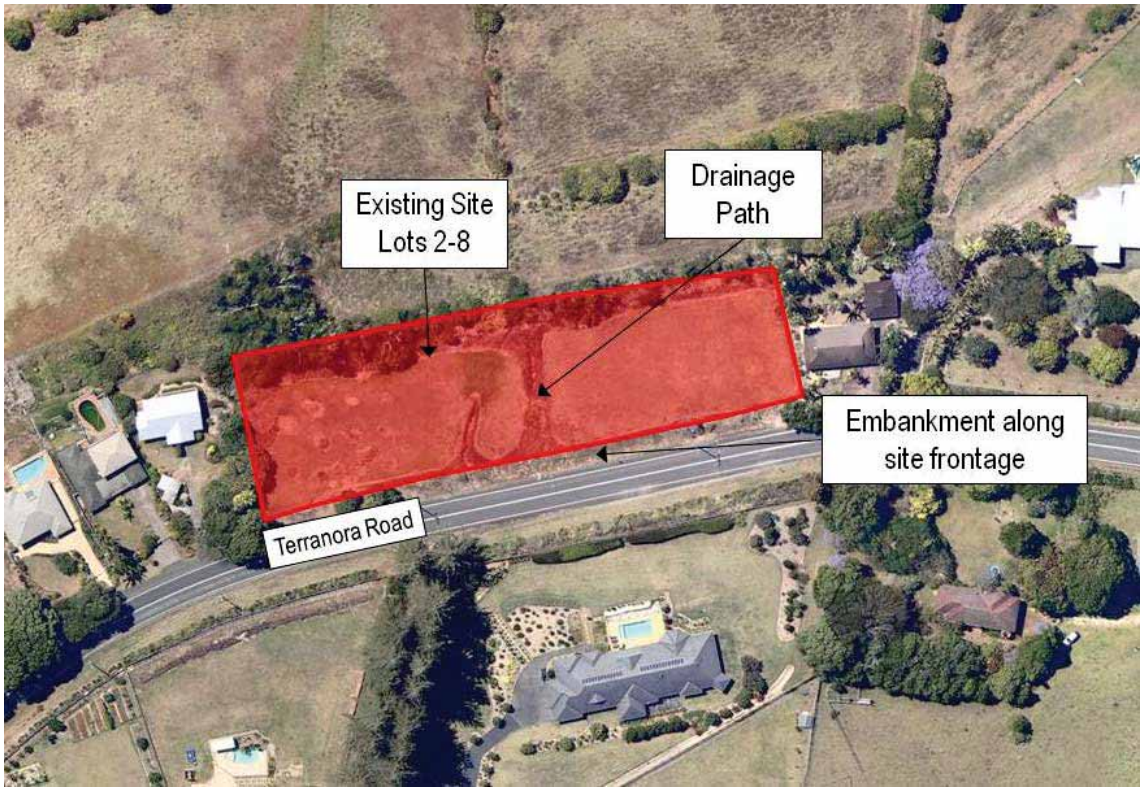
1.2 SCOPE OF ASSESSMENT

The scope of this traffic assessment included the following:

- assessed the sight distance to identify the most appropriate location of access driveway/(s);
- identified preferred options for driveway access and proposed a revised site access plan;
- assessed the requirement for intersection works on Terranora Road (ie Turn Warrants) for the development;
- calculated the peak hour traffic generation for the proposed development;
- assessed the developments traffic impact on the local road network;
- an assessment of the driveway access constraints including maximum gradients, vehicle access and turning requirements; and
- assessed the active transport accessibility and safety connecting to the existing network.

1.3 EXISTING SITE

The existing site has two informal drainage paths through the centre of the lots and has a steep embankment along its frontage onto Terranora Road.



Source: nearmap.com

Figure 1.2: Existing Development Site

1.4 PROPOSED DEVELOPMENT

The proposed development involves the rezoning of the subject lots (Lots 2-8) from Agricultural to Residential. Previously, the proposed access to the subject site included a single driveway crossover fronting Lot 5 with shared driveways connecting to each lot. This access was not supported by Council due to a combination of design issues relating to stormwater, civil and site servicing.

This assessment determines an appropriate access configuration for the lots with consideration of Councils previous concerns and relevant guidelines.

The resulting proposed access configuration for the lots is shown in Figure 1.3.

Source: Nearmaps.com (Designed in AutoCAD)

Figure 1.3: Preliminary Concept Plan for the Proposed Development

Two driveway crossovers are shown fronting the corners of Lot 2 and Lot 8 along the site frontage in order to minimise the impacts of the embankment on civil works and maintenance. The two crossovers are connected by an internal service road that runs parallel to Terranora Road and that connects each residential driveway access.

2. EXISTING CONDITIONS

2.1 EXISTING ACTIVE TRANSPORT

2.1.1 Pedestrian and Cycle

No pedestrian footpaths currently exist fronting the development site. However, opposite the site there is a small local pedestrian footpath running up beside Nassau Avenue and connecting to the Azure residential estate.

Source: Nearmaps.com

Figure 2.1: Existing Footpath Facilities

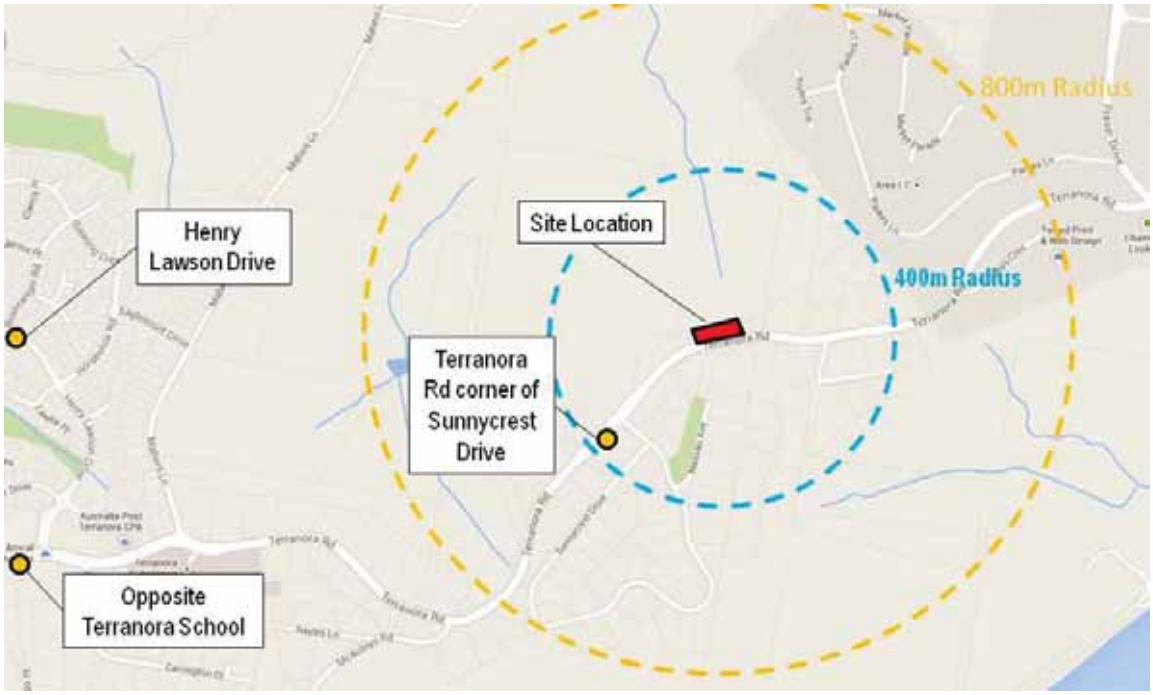
No designated cycle ways are available within close proximity to the site with the nearest cycle way shown in Figure 2.2. However, it is noted that Terranora Road is a common route for sports cyclists particularly during mornings and on weekends.

Source: Tweed Shire Council – Cycleway Network

Figure 2.2: Tweed Shire Council Cycle Ways

2.1.2 Public Transport

Existing public transport for the site is provided via Bus Route 605 which travels between Murwillumbah and Tweed Heads, operating at 1 hour frequencies during weekdays. The nearest westbound bus stop to the development is located approximately 380 meters west near Sunnycrest Drive and the closest eastbound stop at Henry Lawson Drive over 1km away. Bus stop locations and proximities are shown in Figure 2.3.



Source: Google Maps

Figure 2.3: Proximity of Public Transport (Bus Stop Locations)

3. TRAFFIC ASSESSMENT

3.1 ROAD NETWORK

A summary of the surrounding road network has been provided in Table 3.1 below.

Table 3.1: Surrounding Road Network Hierarchy

Road Name	Jurisdiction	No. of Lanes (two-way)	Hierarchy	Median Divided	Posted Speed	Details
Terranora Road	Twee Shire Council	2	Rural Arterial	No	60 kph	*Major east-west connection for the area. Provides access to Pacific Highway and local commercial areas.*

3.2 EXISTING TRAFFIC VOLUMES

The Tweed Shire Council's traffic surveys identify the Average Annual Daily Traffic (AADT) for Terranora Road at Fraser drive east of the development to be 7,049 vehicles in 2013. This assessment conservatively assumes 10% of 7,049 vehicles as the average peak hour traffic for the developments location. The traffic volumes calculated for the AM and PM peak periods assume the following traffic split percentages as shown in Table 3.2 applied.

Table 3.2: 10% AADT Background Traffic Splits (Peak Hour)

Component	Peak	Traffic Splits		Traffic Volumes (veh/hr)	
		East	West	East	West
Terranora Road Background Traffic using 10% of AADT (705veh)	AM	65%	35%	458	247
	PM	35%	65%	247	458

Resultant background traffic volumes for 2013 in the AM and PM peak periods are shown below in Figure 3.1

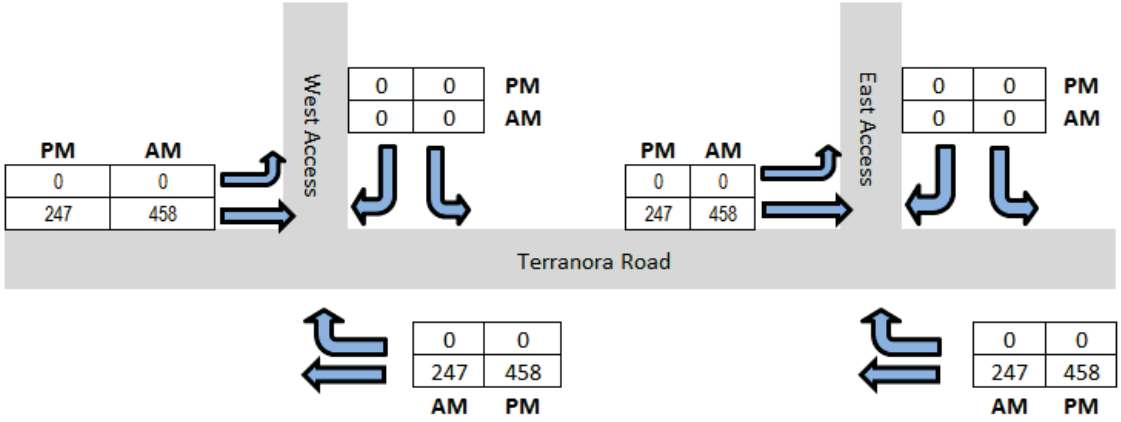
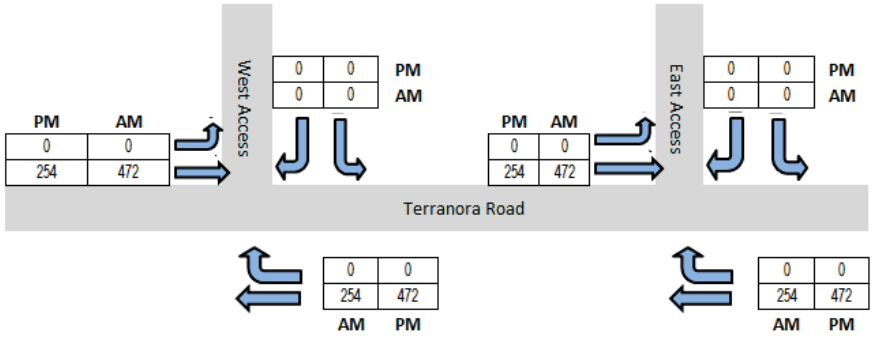


Figure 3.1: 2013 Peak Hour Traffic Volumes

A traffic growth rate of 3% per annum (linear) was adopted for the background traffic in calculating future year traffic volumes. This rate is considered appropriate given the previous historical traffic volumes exhibited on Terranora Road. Background traffic volumes calculated for the purpose of this traffic assessment for the 2014 and 2024 (10 year design horizon) assessment years traffic volumes are shown in Figure 3.2 overleaf.

2014 Base



2024 Base

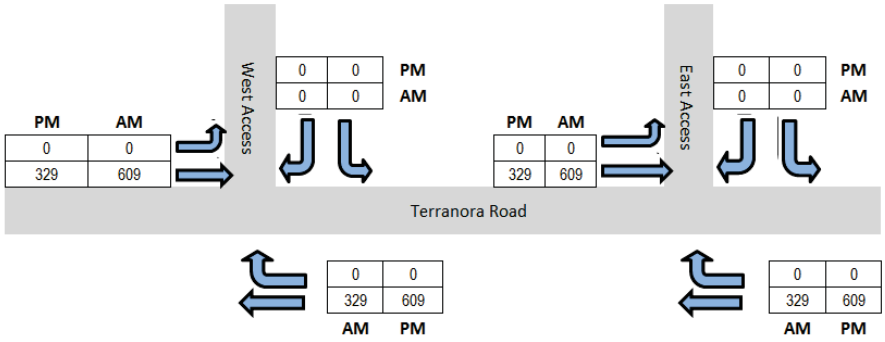


Figure 3.2: 2014 & 2024 Background Traffic Volumes

3.3 DEVELOPMENT TRAFFIC AND DISTRIBUTION

3.3.1 Traffic Generation

Development Traffic has been calculated using a rate of 0.85 peak hour trips per dwelling as sourced from the *Roads and Maritime Service (RMS) - Guide to Traffic Generating Developments* (2002). Table 3.3 shows the proposed development trip generation summary. Whilst this traffic generation is considered low, for the purpose of confirming the need for any potential impacts or resultant widening of the carriageway at the access points a detailed analysis of traffic volumes has been conducted below.

Table 3.3: Development Trip Generation

Land Use	Trip Generation Rate	Quantity	Peak Hour Trips
Residential House	0.85 per dwelling	7	6
Total			6

Based on the above rate, the proposed development is forecasted to generate 6 vehicle trips / hour in the AM and PM peak periods.

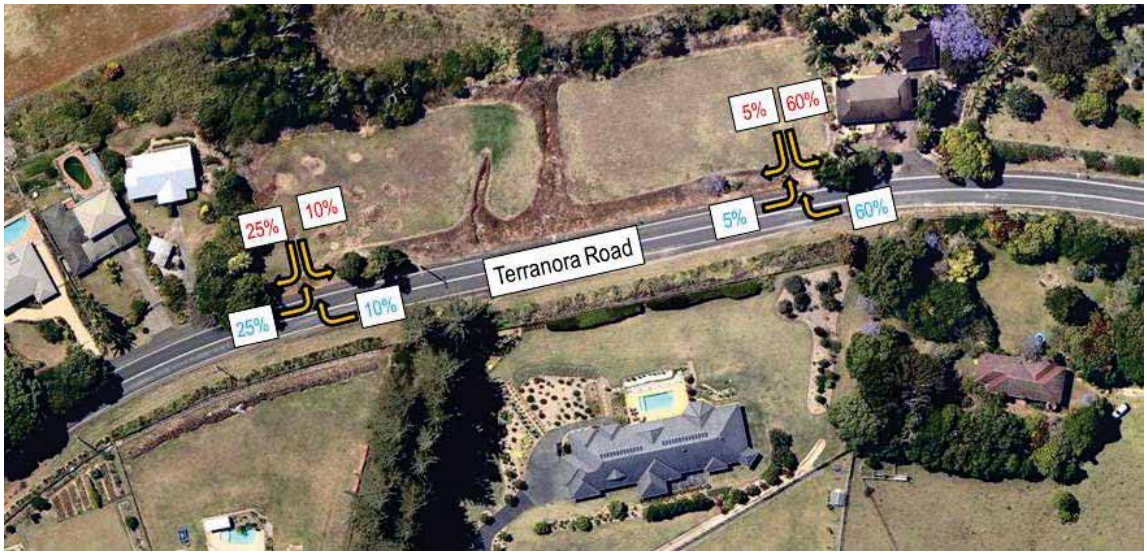
3.3.2 Traffic Distribution

Table 3.4 overleaf outlines the calculated directional traffic splits for the development based on an understanding of likely travel patterns for the development and the location of nearby key trip generators.

Table 3.4: Development Traffic Splits

Component	Peak	Traffic Splits		Traffic Volumes (veh/hr)	
		In	Out	In	Out
Development	AM	20%	80%	1	5
	PM	80%	20%	5	1

The key trip generators in the surrounding area are connected via Terranora Road, with the Pacific Highway to the east and schools/shops to the west. The site's assumed traffic distributions as used in the traffic intersection analysis are shown in Figure 3.3



Source: Nearmaps.com

Figure 3.3: Development Traffic Distribution

The calculated peak hour development traffic volumes are shown in Figure 3.4 and are based on the previous directional traffic splits. All values have been rounded to the nearest whole number.

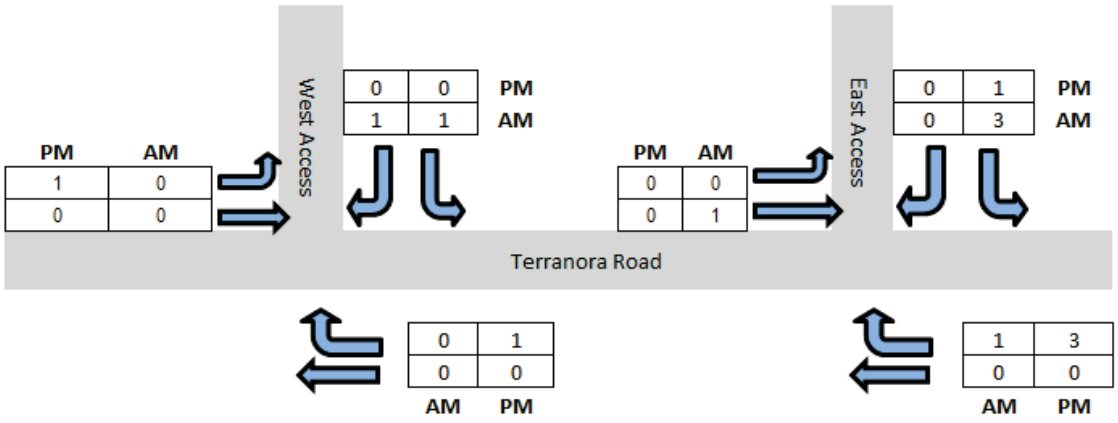


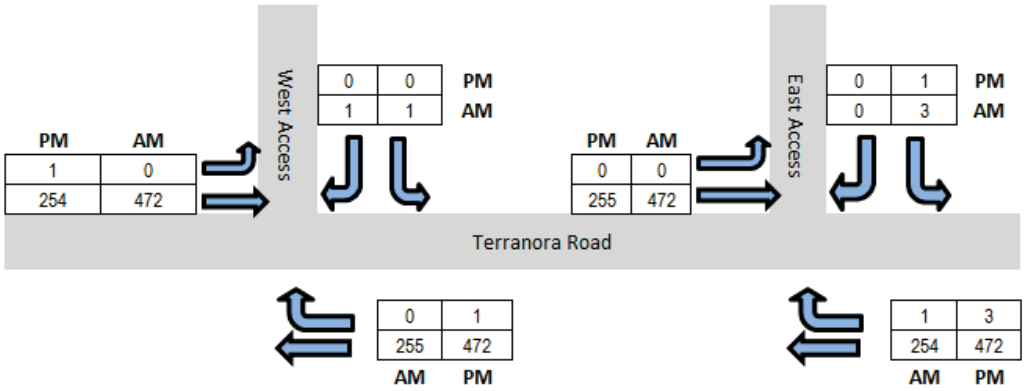
Figure 3.4: Development Traffic Volumes

The maximum turning movement will be the right-turn into the eastern driveway during the PM peak period and left-turn out of the eastern driveway in the AM peak period. All other movements exhibit only one vehicle movement per hour.

3.3.3 Development Traffic + Background Traffic

2014 and 2024 design traffic volumes (ie. Development generated traffic + background traffic) are shown in Figure 3.5.

2014 Development + Base



2024 Development + Base

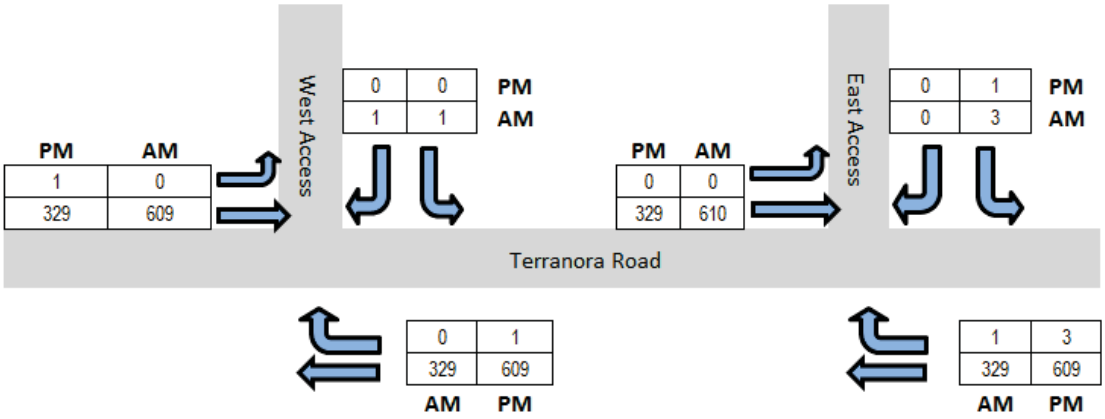


Figure 3.5: 2014 & 2024 Development + Background Traffic Volumes

Due to the low development traffic volumes and the location of the site, no in-depth traffic analysis was deemed warranted.

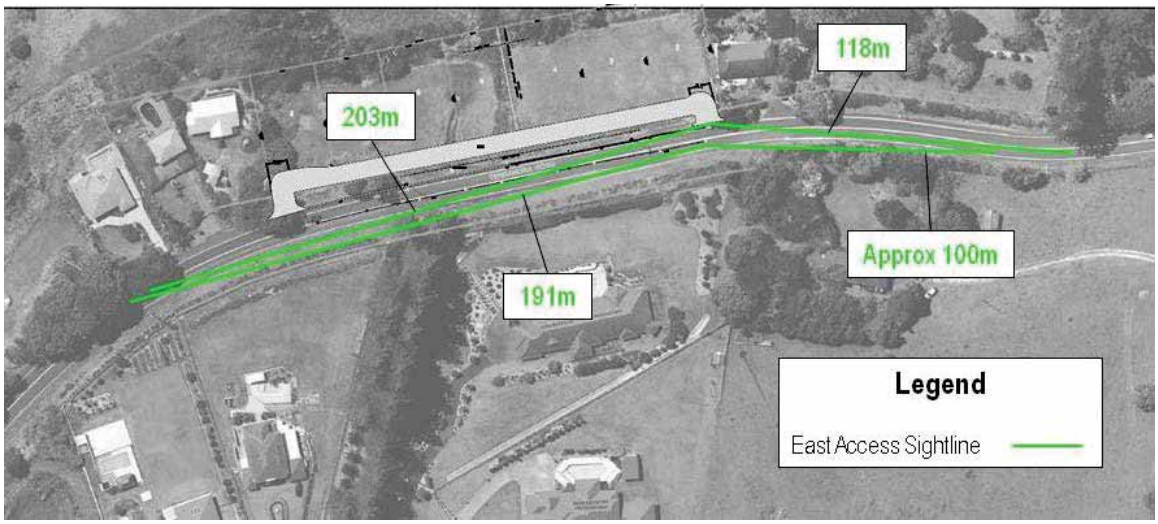
4. SITE ACCESS

The proposed access points for the development include two driveways connected by an internal service road. The driveways are to be located at the eastern and western points of the development site (refer to Appendix A). This configuration is aimed at maximising sight lines and providing access for service vehicles.

4.1 SIGHT DISTANCE

The proposed private driveway access points for the development have been assessed using sight distance requirements as specified in Austroads Guide to Road Design: Part 4a for a road design speed of 70km/hr (10km/hr above posted speed of 60km/hr). However, it is noted that this assessment has conservatively used Austroads intersection SISD requirements which exceeds Tweed Shire Councils standard driveway sight distance requirement (140 metres).

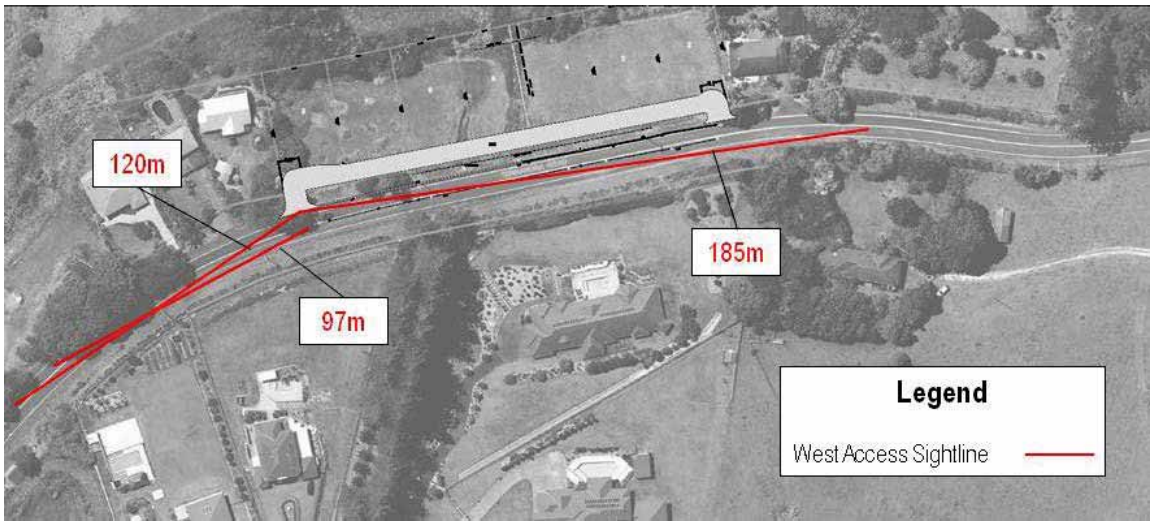
The proposed driveway access points have been identified to require a 151 metre Safe Intersection Sight Distance (SISD). The sight distances for east access and west access development traffic are shown in Figure 4.1 and Figure 4.2 respectively.



Source: Nearmaps.com

Figure 4.1: East Access Development Traffic Existing Sightlines

The sight distances for traffic at the eastern access are acceptable at approximately 191 metres (ingress movement) and 203 metres (egress movement) as per SISD requirements. Though the sightline for the right-out movement (118 metres) does not comply with SISD standards, the shortfall may be partially remedied by removing an obstructing tree in the road reserve and is considered acceptable due to the residential driveway nature of the access and extremely low turnover of vehicle movement turning right from this access (ie. 1 per hour).



Source: Nearmaps.com

Figure 4.2: West Access Development Traffic Existing Sightlines

The SISD sight distances for traffic at the western access are approximately 120 meters, 185 meters (egress movements) and 97m (ingress movement). Given the low turnover (1 vehicle) per hour, this access sight line complies with Councils requirement of 85 metres.

Current SISD obstructions to be altered or removed for the eastern and western driveway accesses are shown in Figure 4.3 and Figure 4.4 respectively.

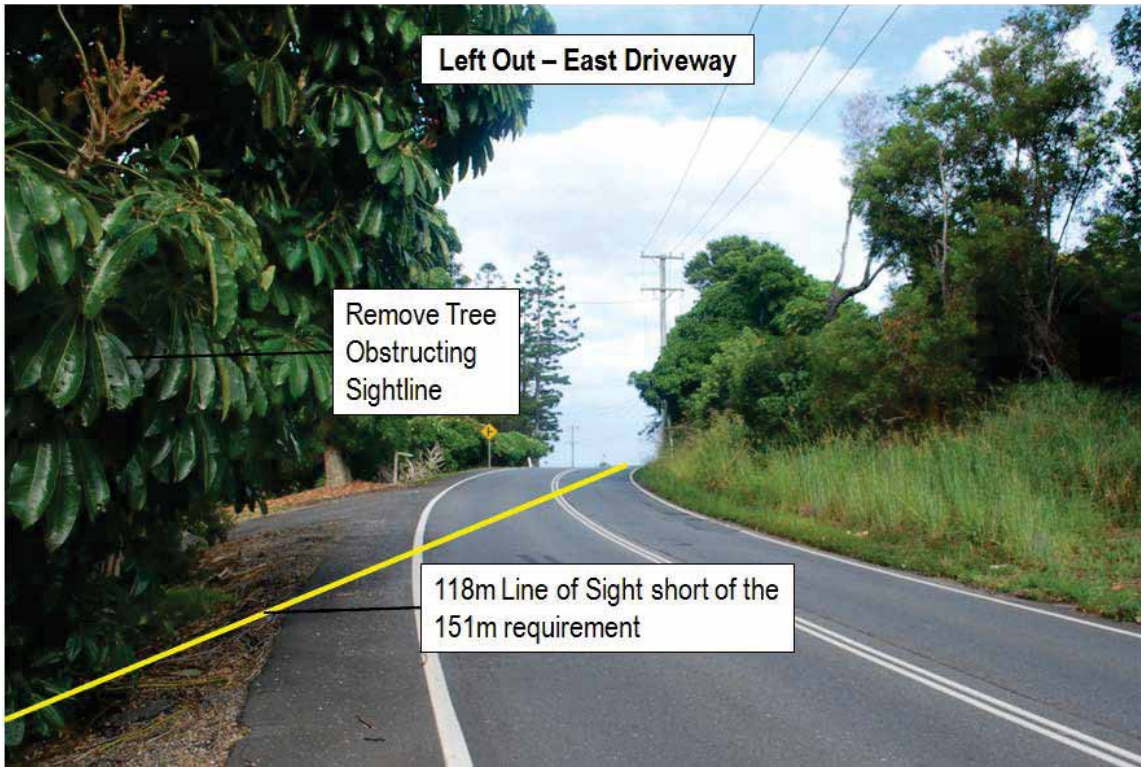


Figure 4.3: Eastern Driveway Access (East Facing)

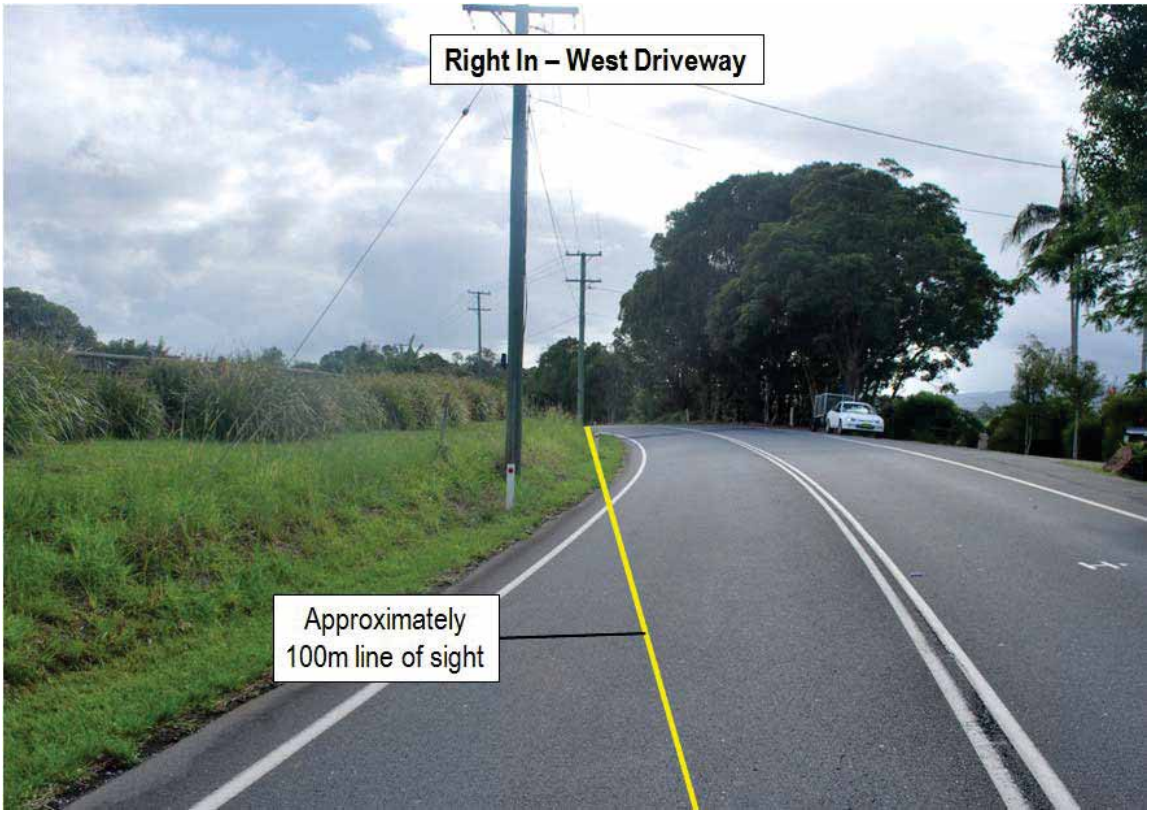


Figure 4.4: Western Driveway Access (West Facing)

4.2 BAR Treatment Review

An assessment was undertaken for the two site accesses to assess if a Basic Right Turn Treatment (BAR) is required. This treatment would require widening of the adjacent westbound carriageway to 6.5 metres to allow vehicles to pass turning traffic. The largest expected traffic volume for any turn movement into the development is three (3), occurring during the PM peak our period at the eastern access.

To establish any impact of the development traffic on Terranora Road, an analysis was completed using the estimated 2024 traffic volumes. Average headway distance for eastbound and westbound traffic in the peak hour was calculated using the posted speed limit of 60km/hr, with the results shown in Table 4.1.

Table 4.1: Peak Hour Average Headways for Terranora Road

Movement	Peak Traffic (Veh/Hour)	Average Headway (sec)	Average Headway (m)
Eastbound	329	11	183.3
Westbound	609	5.98	98.5

The estimated peak frequency of right-in traffic is three (3) vehicles per hour or one (1) vehicle per 20 minutes on average. Each vehicle will conservatively require a gap of 5 seconds between the headways of oncoming (eastbound) traffic. The required headway distance between consecutive eastbound vehicles is shown in Table 4.2.

Table 4.2: Peak Hour Right-In Turn Required Headways

Movement	Peak Traffic (Veh/Hour)	Required Gap (sec)	Required Gap (m)
Right-In	3	5	83.35

Due to the average eastbound headway being significantly larger than the required gap acceptance distance for vehicles turning (right-in) into the development, no impacts on westbound traffic are expected to occur. Furthermore, as the development will consist of low density residential and in turn will have low development traffic volumes entering and exiting the site a BAR turn treatment is not considered required.

Whilst the western driveway right-in movement does not meet SISD requirements, the required gap of 83.35 metres to safely complete the movement is still possible with a 97 metre sightline.

5. LAYOUT ASSESSMENT

5.1 BACKGROUND

The proposed access includes two driveway access points located at either end of the site to be connected via an internal service road. Each dwellings driveway crossover will then be connected to the service road.

Below details a series of design parameters to be considered as part of the various engineering disciplines in accordance with the Memorandum of Understanding.

5.2 INTERNAL SERVICE ROAD REQUIREMENTS

Grade requirements for each development access shall be as per AS2890.2 Off-street commercial vehicle facilities and Tweed Shire Council's Driveway Access to Property – Design Specification (2013). The following requirements will allow for a Heavy Rigid Vehicle (HRV) Access:

- across pedestrian footpath area (as outlined by Tweed Shire Council) grade shall be a maximum of 2.5% (it is noted that no pedestrian footpath is present, or likely to be constructed, along this section of Terranora Road);
- maximum grade shall be 15.4% for the driveway ramp, with the grade measured along the inside curve (Table 3.2 AS2890.2);
- maximum 'rate of change' grade shall be 6.25% over 7 metres of travel;
- the eastern access shall be a minimum of 7.1 metres wide to allow for service vehicle turn path;
- the western access shall be a minimum of 6.8 metres wide to allow for service vehicle turn path; and
- the internal service road width shall be a minimum of 5.5 meters wide.

5.3 RESIDENTIAL DRIVEWAYS

Grade requirements for each residential driveway shall be in accordance with the Tweed Shire Council's Driveway Access to Property – Design Specification (2013), as outlined below:

- across pedestrian footpath area (as outlined by Tweed Shire Council) grade shall be a maximum of 2.5%; and
- maximum grade of driveway shall be 25%.

5.4 SITE SERVICING AND SWEPT PATH CHECKS

To ensure a standard refuse vehicle can access and leave the site in a forward gear a turn path assessment using AutoTURN software was carried out for the required turn movements. Figure 5.1 details the 'indicative' refuse vehicle path.

An access turn path assessment was also undertaken for a standard B99 vehicle to ensure two-way accessibility.

Full swept paths for Refuse Vehicle and B99 vehicles using the AutoTURN software are available in Appendix B.

Source: Nearmaps.com

Figure 5.1 Service Vehicle Movement

6. CONCLUSION

The key findings from the Terranora Road Development Traffic Study and Access Assessment are:

- the site is forecasted to generate a total of 6 peak hour trips;
- access to the lots is proposed via two access driveways connected by an internal access road;
- Sight distance for the access driveways is considered acceptable in accordance with Councils Driveway Access Design Specifications;
- an assessment of a BAR treatment requirement using first principles found that no treatment is required for either site access;
- internal roadways shall be designed to comply with Australian Standards AS2890.1 Off-street parking facilities, AS2890.2 Off-street commercial parking facilities and Tweed Shire Council's Driveway Access to Property – Design Specification (2013);
- AutoTURN swept paths have been undertaken an demonstrate that all movements can be successfully undertaken by B99 and Refuse Vehicles;
- all design vehicles can enter and exit the site in a forward gear; and
- the proposed development site has minimal access to pedestrian footpaths due to lack of an existing path network. Public transport facilities are also minimal. However, due to the location and expected use of the development lots as stand alone dwellings the available amenities are deemed adequate.

Based on the above assessment we conclude that the proposed concept poses no significant traffic or transport impacts to preclude its approval and relevant conditioning on transport planning grounds.

APPENDIX A

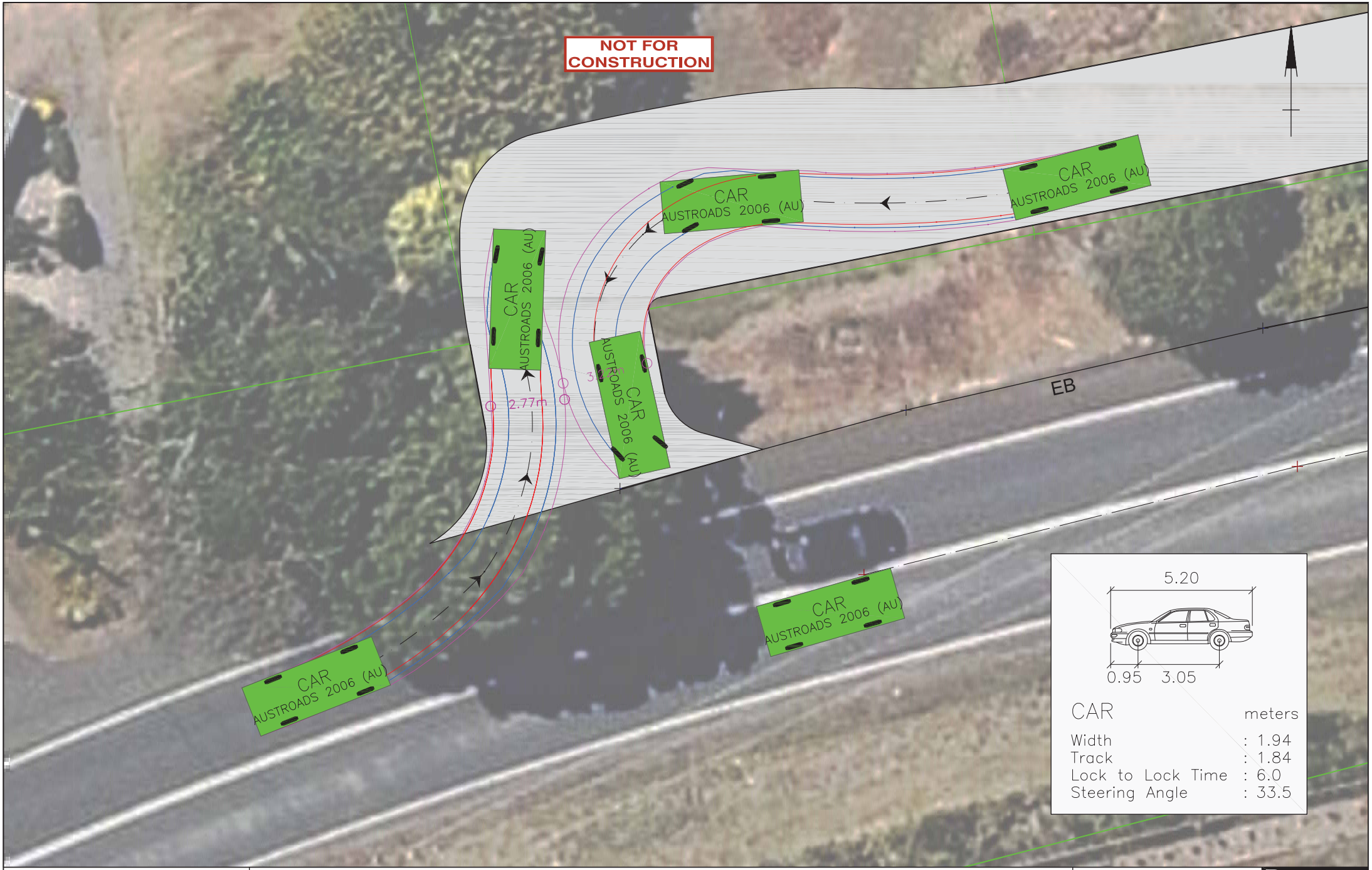
PRELIMINARY CONCEPT DEVELOPMENT PLANS

NOT FOR CONSTRUCTION

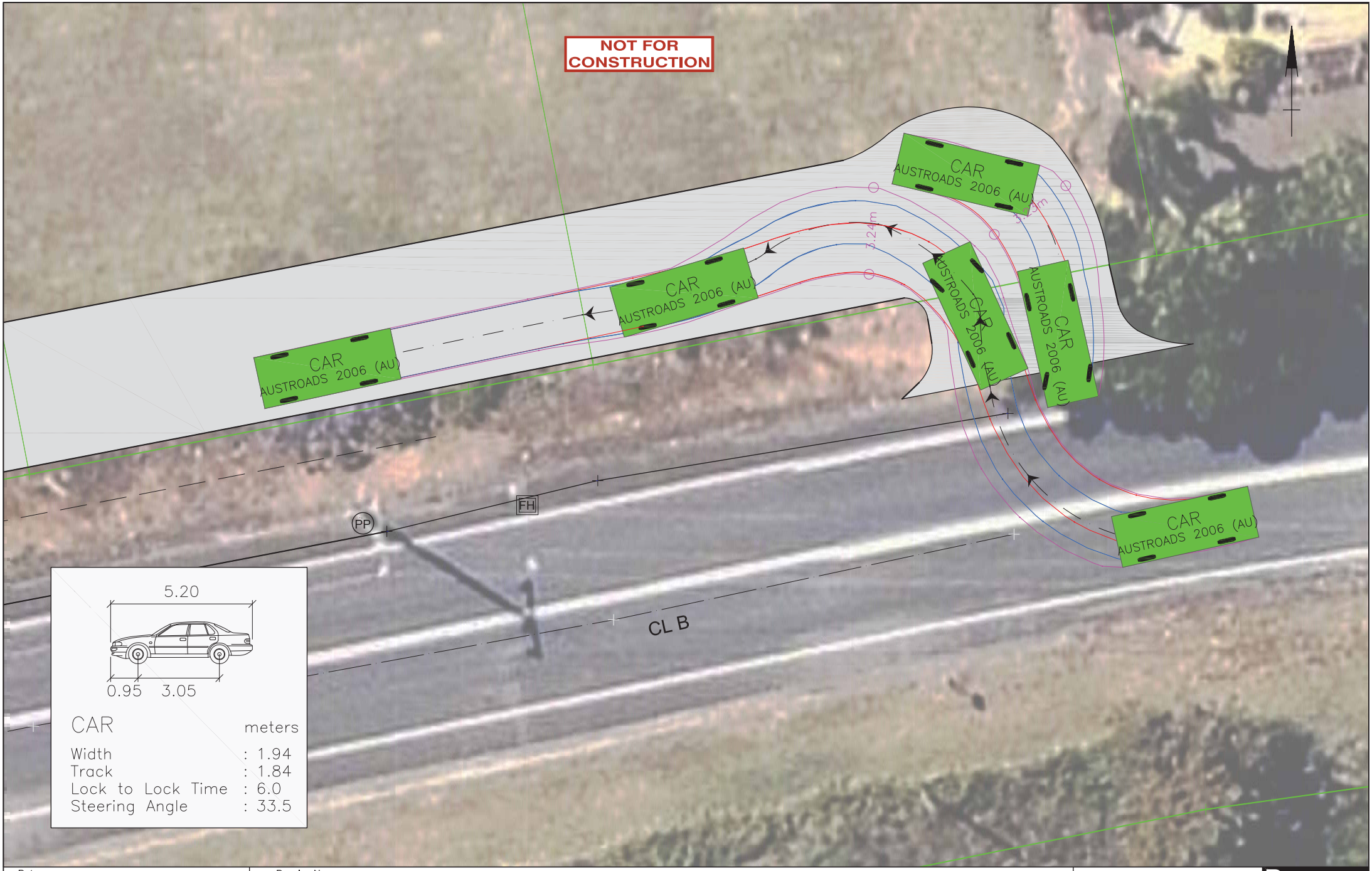
Date: 07/02/13	Drawing Name: Bitzios - Preliminary Concept Design		BITZIOS consulting
Project No: P1525	Project Name: Terranora Road Traffic and Access Study	0 5 10 15 20m Scale 1:500 (A3)	Drawing 001 / Version A

APPENDIX B

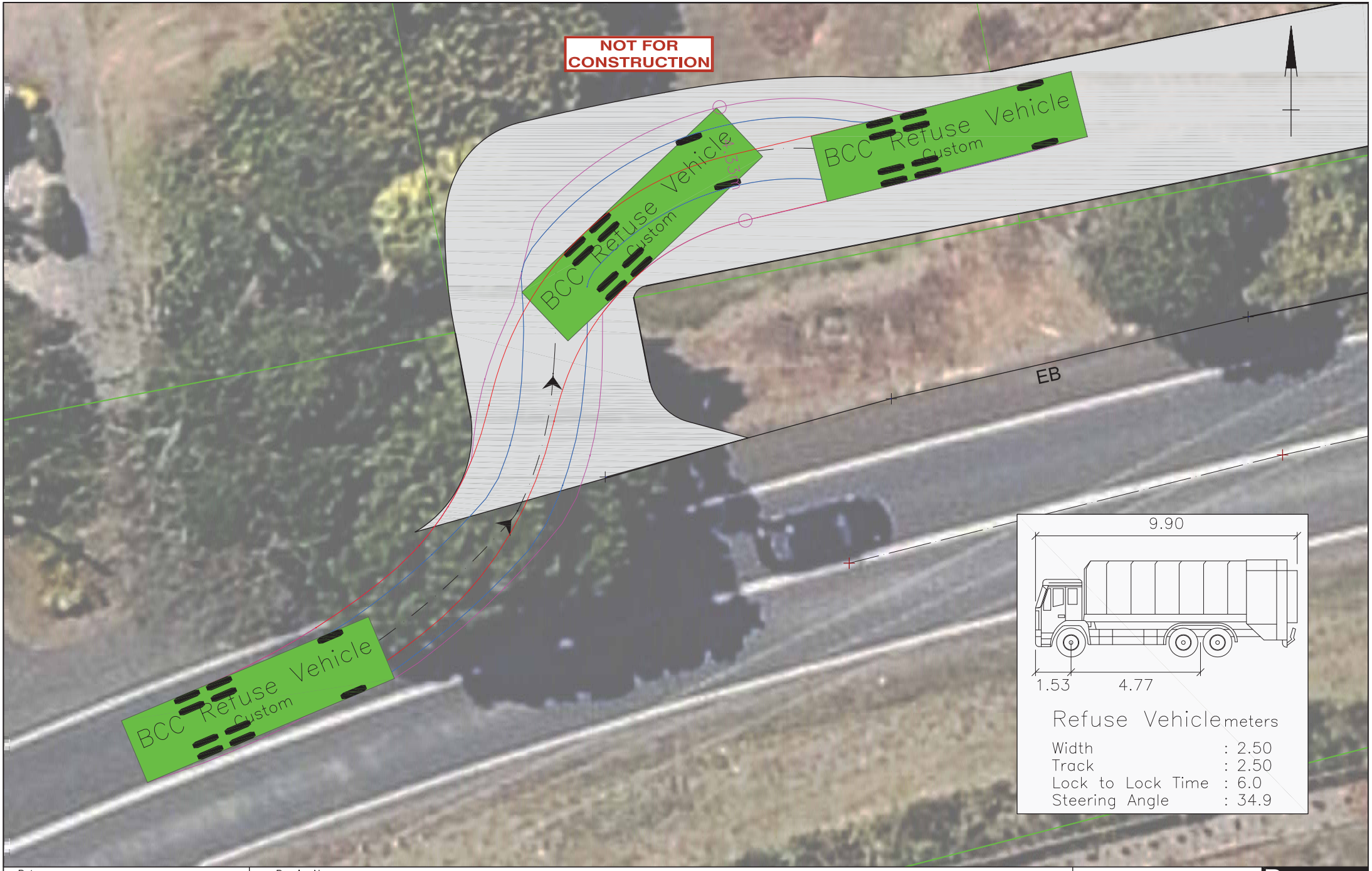
SWEPT PATH ASSESSMENT



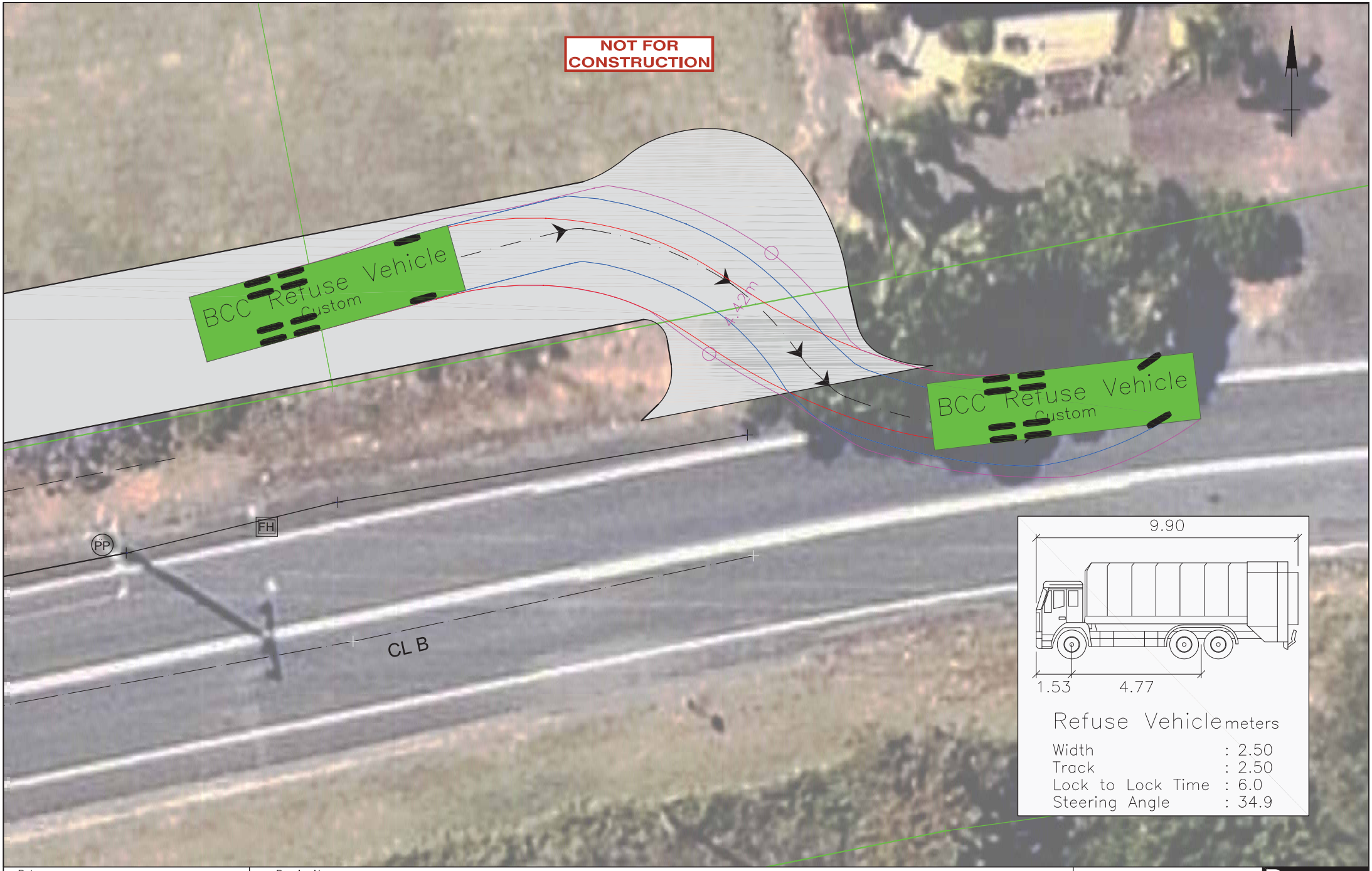
Date: 07/02/13	Drawing Name: West Access Swept Path - B99		BITZIOS consulting	
Project No: P1525	Project Name: Terranora Road Traffic and Access Study	0 1 2 3 4 5m Scale 1:125 (A3)	Drawing 004	Version A



Date: 07/02/13	Drawing Name: East Access Swept Paths - B99		BITZIOS consulting	
Project No: P1525	Project Name: Terranora Road Traffic and Access Study	0 1 2 3 4 5m Scale 1:125 (A3)	Drawing 005	Version A



Date: 07/02/13	Drawing Name: East Access Swept Path - Refuse Vehicle		BITZIOS consulting	
Project No: P1525	Project Name: Terranora Road Traffic and Access Study	0 1 2 3 4 5m Scale 1:125 (A3)	Drawing 002	Version A



Date: 07/02/13	Drawing Name: East Access Swept Path - Refuse Vehicle		BITZIOS consulting
Project No: P1525	Project Name: Terranora Road Traffic and Access Study	0 1 2 3 4 5m Scale 1:125 (A3)	Drawing 003 / Version A