

HEAVY VEHICLE ROUTE ASSESSMENT  
- DULGUIGAN ROAD  
ADDENDUM 1  
TUMBULGUM, NSW

## Document Control Sheet

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## 1. SUMMARY OF ADDITIONAL ACTIONS AND INFORMATION

Brief summary of additional actions undertaken and additional information considered since the submission of "Heavy Vehicle Route Assessment - Dulguigan Road" report on 20 March 2019, as follows:

### 1.1 Trucking Company and Tumbulgum Community Association Correspondence (11.06.2019)

The following correspondence was received from Tweed Shire Council on 11.06.2019 (refer *Appendix A: Letters from Trucking Companies and Tumbulgum Community Association*):

- Letter (no date) from Col Moore & Sons Pty Ltd to Tweed Shire Council
- Letter (dated 15 May 2019) from Brims Earthmoving Pty Ltd to Tweed Shire Council
- Letter (dated 24 April 2019) and powerpoint presentation (dated 17 April 2019) from Tumbulgum Community Association to Tweed Shire Council

Consideration has been given to the two (2) letters submitted by trucking companies when preparing this addendum with an on-site vehicle swept path trial undertaken using a 19.6m PBS vehicle.

Note: Mass limits (ie: tonnes per load) was not considered in the initial "Heavy Vehicle Route Assessment - Dulguigan Road" report and again not considered when preparing this addendum.

Consideration was given to the relevant aspects contained in the letter and powerpoint presentation from Tumbulgum Community Association when preparing this addendum.

The letter contained the following two points:

- "The unlimited number of heavy vehicles able to travel to and from the Quarry on any day."
- "50% of heavy vehicles continuing to travel over the 60kph speed limit"

Both of these aspects impact on the risk associated with heavy vehicles travelling on Dulguigan Road.

### 1.2 Meeting with Representatives from Tweed Shire Council (26.08.2019)

Attended meeting with Tweed Shire Council (TSC) representatives (Ray Clark - Engineer - Traffic, Danny Rose - Manager Roads and Stormwater, Alana Brooks- Road Safety Officer) at the Tweed Shire Council Chambers in Murwillumbah.

- Agreed in principal (verbal) to the design approach being adopted by TSC
- Agreed in principal (verbal) that the higher risk locations should be prioritised
- Vehicle swept path drawings to be provided by TSC for review
- Proposed linemarking modifications at the quarry entrance to be provided by TSC for review
- Design showing proposed signs to be installed on Dulguigan Road to be provided by TSC for review
- Agreed in principal to removing some of the vegetation on the inside of the curve at Hogans Road
- Agreed in principal to the heavy trimming being undertaken on Dulguigan Road
- Concept design for road widening at various curves to be provided by TSC for review
- Agreed to attend on-site trial to assess actual travel path of PBS vehicle

### **1.3 Meeting with Representatives from Tweed Shire Council (25.09.2019)**

Attended meeting with TSC representatives (John McIntosh - Supervisor / Civil Engineering Design, Stephen Sharp - Engineering Assistant) at the Tweed Shire Council Chambers in Murwillumbah to review proposed design options, proposed design speeds and vehicle swept paths being used to determine extent of road widening to be undertaken at various curves on Dulguigan Road.

### **1.4 Meeting with Representatives from TSC, Hy-tec Quarry, Truck Haulage Companies (01.10.2019)**

Attended meeting with representatives from Brims Earthmoving, Sykes Haulage, Hardy Excavations, Col Moore and Sons, Hy-tec quarry, Mayor Katie Milne, Deputy Mayor Chris Cherry, Alana Brooks, Ray Clark, Danny Rose, John McIntosh and Stephen Sharp.

- "Truck drivers use two-way radio to keep informed on driving conditions on Dulguigan Road"
- General agreement to formalise suitable UHF channel for drivers on Dulguigan Road, including signage
- "UHF Radio Channel 28 used when exiting quarry to avoid 'truck entering / truck exiting' scenario"
- "Daily auditing of truck driver behaviour along the route is being undertaken including follow up with drivers"
- Quarry exit - On site sight distance measurements (126m to the west, 380m to the east) provided by TSC
- Traffic data in the vicinity of the quarry entrance to be provided by TSC
- Profile of trucks using the quarry to be provided by TSC via Hy-tec Quarry

### **1.5 Submitted Letter regarding Suitability of Proposed Signage (03.10.2019)**

Submitted letter (dated 3 October 2019) to Tweed Shire Council regarding suitability of proposed signage to be installed on Dulguigan Road. (refer *Appendix B: Letter re Review of Proposed Signage*).

### **1.6 Attended On-site Trial of 19.6m PBS Vehicle (09.10.2019)**

Attended on-site trial of 19.6m PBS vehicle (supplied by Rob Moore). On-site trial attended by TSC representatives Alana Brooks, Ray Clark, Danny Rose, and John McIntosh.

Front seat passenger in the PBS vehicle driven along Dulguigan Road between the quarry entrance and McAuleys Road, both directions. PBS vehicle also drove within the quarry and undertook left turn movement onto Dulguigan Road.

Front seat passenger in vehicle following directly behind PBS vehicle whilst PBS vehicle exited the quarry and drove along Dulguigan Road between the quarry entrance and McAuleys Road, both directions.

Passenger in PBS Vehicle (18 month old vehicle) - Comfortable ride, reached 60km/h in some sections, travelled at less than 60km/h when negotiating curves, remained on road seal at all times although close to edge at isolated locations through curves east of Maynes Hill Road, driver stress and work rate low.

Passenger in vehicle following PBS vehicle - PBS vehicle wheels remained within travel lane (just) when exiting quarry and turning left onto Dulguigan Road, slowed down on approaches to curves however negotiated curve at Hogans Road and curves east of Mayes Hill Road at speeds greater than 30km/h, tracked off the sealed road surface at isolated location when negotiating curves east of Mayes Hill Road.

Refer *Appendix C: Images of On-site Vehicle Swept Path Trial*.

## 1.7 Reviewed additional information provided by TSC (18.10.2019)

Reviewed additional information provided by TSC on 18.10.2019:

- Truck profile using the quarry access (refer *Appendix D: Truck Profile*)
- Traffic volumes approaching quarry access

## 2. CONTROL MEASURES

Since submitting the "Heavy Vehicle Route Assessment - Dulguigan Road" report on 20 March 2019, the following 'Control Measures' are either in place or imminent and considered as 'in place' when preparing "Risk Assessment" spreadsheet (Revision: 10 November 2019):

### 2.1 Control Measure No.1: On-site Assessment of Vehicle Swept Path

An on-site assessment of vehicle swept path for 19.6m PBS vehicle undertaken on 09.10.2019 showed the vehicle remaining within the travel lane when travelling in either direction along Dulguigan Road between the quarry entrance and McAuleys Road, except at two (2) isolated locations. Vehicle wheels only just remained within the linemarked travel lane when exiting the quarry and when travelling westbound on Dulguigan Road and negotiating the left hand curve at Hogans Road.

Videos were taken of the PBS vehicle whilst travelling in both directions on Dulguigan Road and later referenced to confirm travel path compliance.

### 2.2 Control Measure No.2: Truck Profile

The "Truck profile using the quarry access" was provided by TSC via Hy-tech Quarry.

The truck profile indicates that 52% of the trucks hauling material from the quarry are single and 3 axle trucks and only 3% of the trucks are 19m semi-trailers.

Note: The 19m semi-trailer swept path is the worst case scenario when assessing the various haulage vehicles using the quarry.

A review of the Truck Profile information provided by TSC assisted in gaining a better understanding of the risks associated with haulage vehicles exiting the quarry and travelling along Dulguigan Road, including the negotiating the curve at Hogans Road and the series of curves east on Mayes Hill Road.

### **2.3 Control Measure No.3: Additional Signage on Dulguigan Road**

A review of proposed signage to be installed on Dulguigan Road has been undertaken and deemed suitable.

Traffic data shows high maximum speed figures for vehicles travelling eastbound on Dulguigan Road and approaching the quarry entrance. Introducing a combined W1-3L curve sign and 65km/h advisory sign, along with a combined W5-22 Symbolic Truck, W5-25 "Turning Traffic" and "100m" sign will assist with speed compliance.

Vehicles travelling eastbound on Dulguigan Road at excessive speed when negotiating this left hand curve located immediately west of the quarry entrance increases the risk at this location

### **2.4 Control Measure No.4: Clearing of Vegetation on Dulguigan Road**

At the time of latest site visit (09.10.2019) the clearing of vegetation along Dulguigan Road was still being undertaken with 80-90% of the clearing work already completed.

Feedback from truck drivers has been very positive in relation to the clearing of vegetation completed to date, with drivers confirming that when driving a haulage vehicle along Dulguigan Road the travel path taken is dependent on whether vegetation is protruding into the travel lane.

## **3. RECOMMENDED ACTIONS**

### **3.1 Action No.1: Formalise Quarry Protocol for Trucks exiting the Quarry**

Advised (verbal) at the meeting held on 01.10.2019 that the driver of a vehicle exiting the quarry advises drivers of trucks travelling on Dulguigan Road that a truck is exiting the quarry. This provides the drivers of trucks travelling on Dulguigan Road the opportunity to slow down to avoid the scenario of a truck exiting and a truck entering the quarry at the same time. No records of a formal protocol; was tabled at the meeting.

Hy-tech Quarry to develop a formal protocol for trucks exiting the quarry.

### **3.2 Action No.2: Proposed Linemarking Modifications at Entrance to Quarry**

Tweed Shire Council is presently preparing a design that revises the linemarking on Dulguigan Road at the entrance to the quarry as shown in *Figure 3.1* below. Refer *Appendix E: Proposed Linemarking Modifications at Quarry Entrance*.

The existing linemarking caters for:

- Eastbound - single eastbound lane
- Westbound - single westbound lane with combined straight-through arrow and right-turn arrow for vehicles turning right into the quarry
- Westbound - wide road shoulder for westbound vehicles to pass stationary vehicle waiting to turn right into the quarry

Note: The vehicle swept path shown in *Figure 3.1* is for a 20m PBS vehicle. It shows the vehicle entering the middle lane when turning left out of the quarry. With reference to *Control Measure No.1: On-site Assessment of Vehicle Swept Path* a 19.6m PBS vehicle was able to just remain within the single eastbound lane (ie: not enter the middle lane) when turning left out of the quarry, hence the 20m PBS vehicle turn path template may be considered conservative.



Figure 3.1: Portion of Preliminary Sketch titled "Turns - 20m PBS Vehicle, Quarry Entrance"

Note: The vehicle swept path for a 19m semi-trailer turning left out of the quarry shows the vehicle entering the existing westbound road shoulder.

Advantages associated with preliminary sketch include:

- Large chevron areas will better delineate/define the quarry access for all road users
- Trucks exiting the quarry and turning left are less likely to cross into the oncoming traffic lane
- Trucks are able to extend further into Dulguigan Road before entering the live traffic lane resulting in improved sight distance for truck drivers

TSC advised that on-site sight distance measurements were undertaken at the quarry exit with the following results:

- 126m sight distance to the west
- 380m sight distance to the east

A sight distance assessment using AS 2890.2:2018 "Parking facilities, Part 2: Off-street commercial vehicle facilities" confirmed that sight distance requirements at the quarry exit are achieved.

Traffic data and the relevant portion of AS 2890.2:2019 are included in *Appendix F: Sight Distance*.

Note: Based on Traffic Speed Data an 85<sup>th</sup> percentile speed on 82km/h, "Figure 3.3: Sight distance requirements at access driveway exits" requires a distance of 113.8m along the road frontage.



### 3.3 Action No.3: Road Widening Works at Dulguigan Road / Hogans Road Intersection

Tweed Shire Council is presently preparing a design that widens the road formation and the road seal at three (3) locations around the curve. The proposed road widening works will cater for a 19m semi-trailer and a 20m PBS vehicle. With reference to *Section 2.1: Control Measure No.1* the 19.6m PBS vehicle travelling at 30-40km/h closely replicates TSC's swept path analysis for a 19m semi-trailer travelling at 15km/h. Therefore, the proposed road widening works at the Dulguigan Road / Hogans Road intersection is based on a 19m semi-trailer travelling at 15km/h as shown in *Figure 3.2* below (Refer *Appendix G: Proposed Road Widening at Hogans Road*).

Road widening works will assist all road users in safely negotiating the curve on Dulguigan Road in either direction, as well as assist all road users when undertaking the various traffic manoeuvres at the Dulguigan Road / Hogans Road intersection.

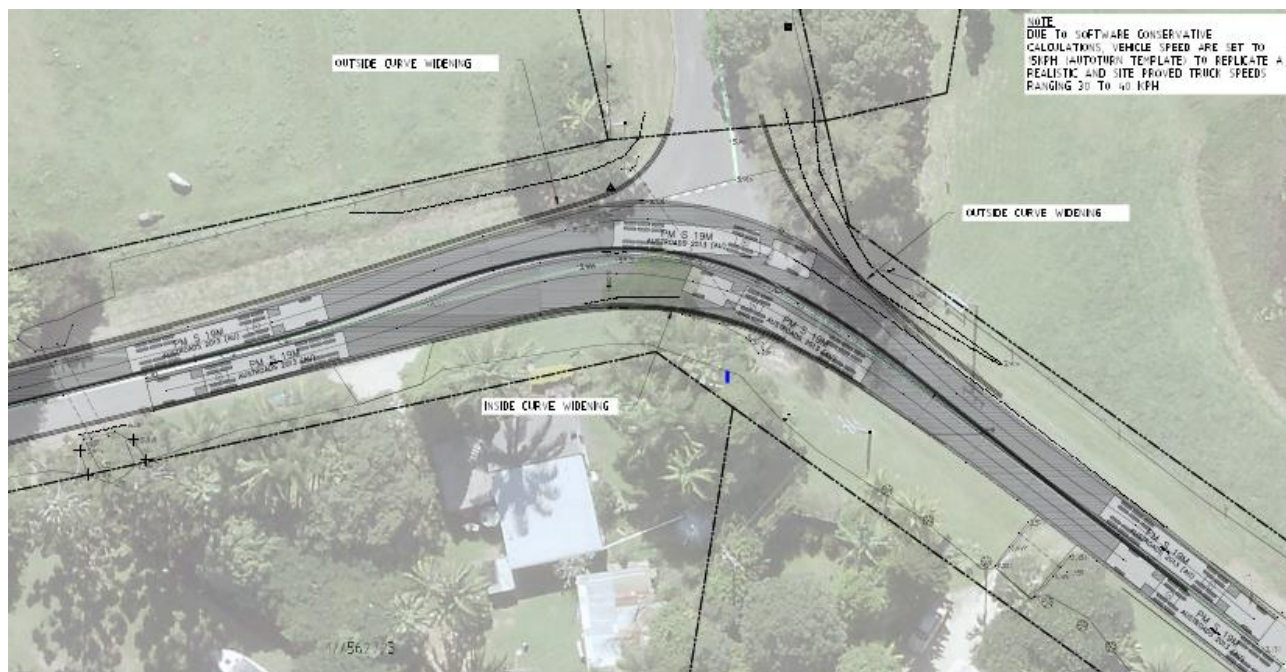


Figure 3.2: Portion of Preliminary Sketch titled "Turns - 19m Semi, Hogans Road Intersection"

### 3.4 Action No.4: Road Widening Works on Curves East of Mayes Hill Road

Tweed Shire Council is presently preparing a design that widens the road formation around the series of curves located east of Mayes Hill Road. The design also includes pavement reconstruction at two (2) of the curves.

With reference to *Section 2.1: Control Measure No.1* the 19.6m PBS vehicle travelling at 30-40km/h closely replicates TSC's swept path analysis for a 19m semi-trailer travelling at 15km/h. Therefore, the proposed road widening works on the curves east of Mayes Hill Road is based on a 19m semi-trailer travelling at 15km/h as shown in *Figure 3.3* below (Refer *Appendix H: Proposed Road Widening East of Mayes Hill Road*).

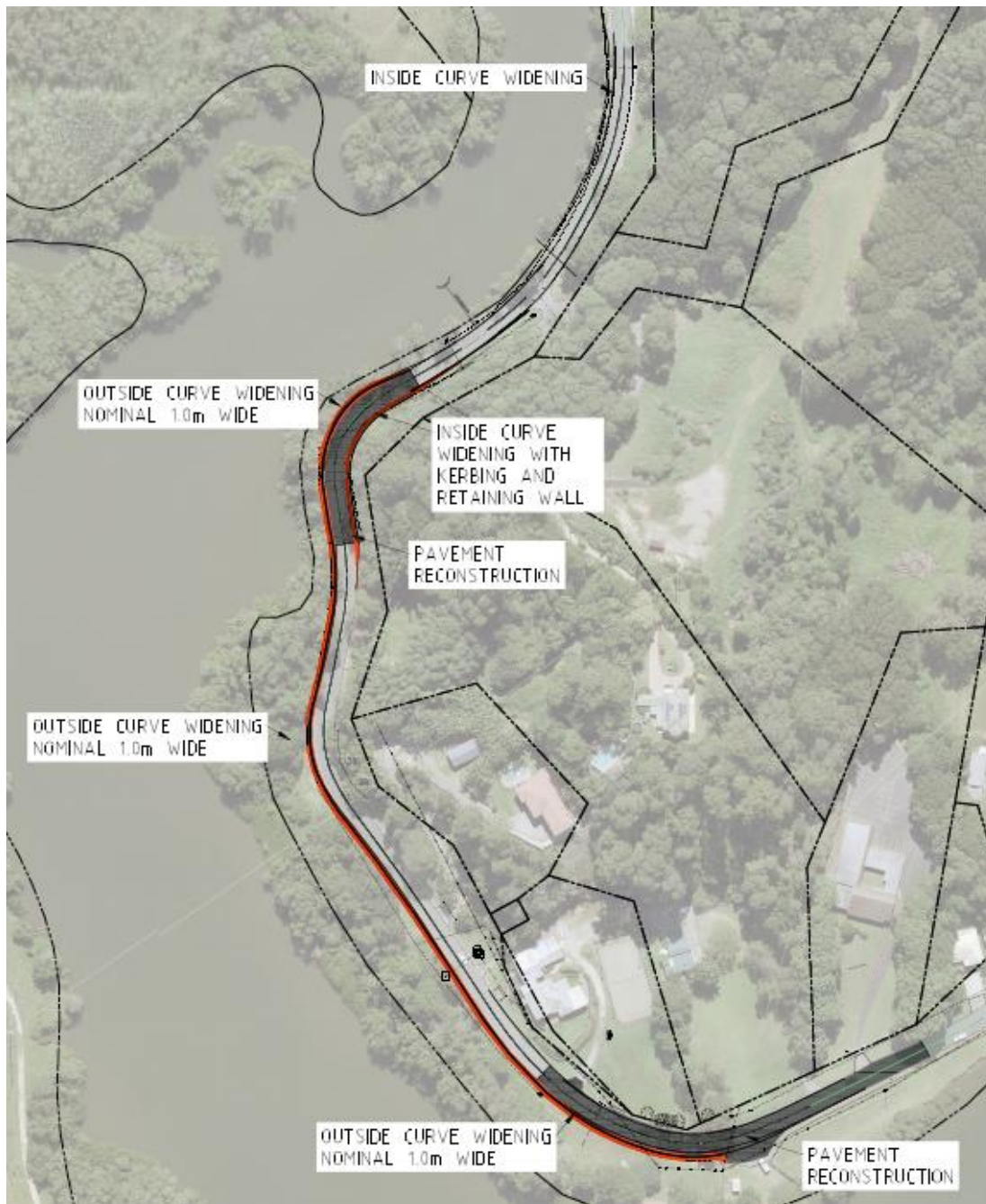


Figure 3.3: Portion of Preliminary Sketch titled "Turns - 19m Semi, Tumbulgum Section"

### 3.5 Action No.5: Formalise Quarry Protocol Regarding UHF Channel

Tweed Shire Council to take the lead on establishing a common UHF Channel to be used by all quarry haulage vehicles travelling on Dulguigan Road. Signage to be provided at quarry exit and towards McAuleys Road advising drivers of UHF channel to be in operation.

Hy-tech Quarry to develop a formal protocol requiring all truck drivers to use this common UHF Channel and details of its intended use (eg: advise on road hazards - branch on road; advise on pedestrians, cyclists, speeding vehicles, etc).

Note: Appropriate use of UHF channel is important due to possibility of others accessing the channel.



### 3.6 Action No.6: Formalise Quarry Protocol re Daily Audit on Truck Driver Behaviour

Hy-tech Quarry representative advised (verbal) at the meeting held on 01.10.2019 that the quarry undertakes a daily audit on truck driver behaviour whilst a haulage vehicle is being driven along Dulguigan Road, and feedback provided to the driver. No records of a formal protocol or register of audits were tabled at the meeting.

Hy-tech Quarry to develop a formal protocol relating to the daily audits of truck driver behaviour and keep a register of audit details including feedback provided to driver.

## 4. CONCLUSION

A revised risk assessment titled "RISK ASSESSMENT - Dulguigan Road Heavy Vehicle Route Assessment (Addendum 1)" (refer *Appendix I: Risk Assessment*) has been completed. It includes the outcomes of the initial risk assessment to clearly display the aspects that have been revised.

Features to note in the revised risk assessment:

- Risk levels have reduced.
- The "Medium" risk associated with some activities is due to the severity level (Serious) if an incident were to occur. 'Control Measures' in place or imminent and 'Recommended Actions' to be taken will assist in reducing the likelihood of an incident occurring.
- The risk associated with heavy vehicles travelling on Dulguigan Road is dependent on the speed that heavy vehicles are travelling, and the speed of other road users. 'Control Measures' and 'Recommended Actions' assist all drivers travelling on Dulguigan Road to travel at an appropriate speed.



Craig Frazer  
RoadNet Pty Ltd

## **APPENDIX A – LETTERS FROM TRUCKING COMPANIES AND TUMBULGUM COMMUNITY ASSOCIATION**

# COL MOORE & SONS PTY. LTD.

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Po Box 5126 Sth Murwillumbah NSW 2484 PHONE: 02 6672 1289 FAX: 02 6672 1279 E: [admin@colmooreandsons.com.au](mailto:admin@colmooreandsons.com.au)

**Troy Green**  
**General Manager**  
**Tweed Shire Council**  
Email: [tsc@tweed.nsw.gov.au](mailto:tsc@tweed.nsw.gov.au)

Dear Mr Green,

RE: Dulguigan Road – Heavy Vehicle Route Assessment

I wish to discuss the issue of the Heavy Vehicle Route Assessment that has been undertaken on Dulguigan Road and the effects of this report on many heavy vehicle operators within the Tweed Shire such as myself.

We acknowledge that this report has been undertaken to assess the risk associated with operating PBS Heavy Vehicles travelling on Dulguigan Road between Hy-Tec Tumbulgum Quarry and Tweed Valley Way, however the assessment that was undertaken fails to identify PBS vehicles or any identifiable risk due to the use of a 19m Semi Trailer, rather than the prescriptive 3 Axle Truck & 4 Axle dog trailer combination.

As the methodology in this report is based on Low Speed Swept Path (LSSP) analysis using a 19m Semi Trailer this cannot provide any accurate risk assessment surrounding PBS Vehicles as irrespective of mass 50.50 tonne or 57.50 tonne, the LSSP of a 19m semi-trailer is approximately 7m yet a PBS 3 Axle Truck & 4 Axle dog trailer combination is only 6.2m. This cannot provide any accurate assessment of 20m PBS 3 Axle Truck & 4 Axle Trailers vehicles tracking along Dulguigan Road.

Our company has operated PBS 3 Axle Truck & 4 Axle dog trailer combinations up to 20 metres for a number of years due the numerous safety, productivity and environmental benefits for our company and the wider community to minimise vehicles movements, fuel usage, carbon dioxide emissions and potential for damage to infrastructure such as our local roads.

As PBS vehicles are designed for increased freight (mass), a greater volume can be moved in the same number of trips – National Heavy Vehicle Regulator (NHVR) estimates these productivity gains of 15-30% and up to 260 million fewer kilometers are travelled annually. Travelling fewer

kilometers means that our vehicles are using less fuel and carbon dioxide emissions. NHVR estimates that as of March 2019 the PBS Fleet annually will provide annual savings of 200 million liters of fuel and 486,000 tonnes in carbon dioxide emissions – a number that will continue to increase as the PBS Fleet grows in size.

Reducing the mass limits on Dulguigan Road by 7 tonnes per load will result in us having to make more trips and there becomes greater risks for driver fatigue, acceleration to road pavement damage and the safety for other road users. Currently non PBS vehicles are not required to have the latest specifications for vehicle safety and environmental emissions which increases the total number of vehicles on our roads and increases the risk of crashes and road trauma incidents impacting the safety of all users of Dulguigan Road.

We are a local business having operated in the Tweed Valley for upwards of 20 years; many of these years have included providing truck haulage services directly to Tweed Shire Council. We appreciate the position of the Quarry at Tumbulgum in which we can continue the majority of our business activities within our local area. If your council motions for PBS Vehicles to be reduced to 50.50 tonne when hauling from Hy-Tec Tumbulgum Quarry, we will no longer be in a position to operate our business activities within the Tweed Shire. This will result in it no longer being economically viable due to losses of work from the quarry and increases in fuel and mechanical expenditures. These changes to regulation will impact our business due to the financial investments we have made to operating PBS vehicles which is advocated by both the NHVR and Roads and Maritime Services. We currently employ upwards of 30 locals and operating at lower mass limits being no longer economically viable we will be forced to move our works resulting in leaving our staff with the potential for unemployment.

We ask for you to take into consideration the number of benefits to these combinations we have identified such as minimising damage to infrastructure and our local Tweed Roads and the risk for a number of local contractors and locals employed by companies such as ourselves being forced into closures and unemployment.

Thank you for your time

Regards

Rob Moore  
Col Moore & Sons Pty Ltd

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15 May 2019

The General Manager  
Tweed Shire Council  
PO Box 816  
MURWILLUMBAH NSW 2484

Dear General Manager & Councillors

### **HEAVY VEHICLE ROUTE ASSESSMENT – DULGUIGAN ROAD**

We refer to the recent Heavy Vehicle Route Assessment conducted along Dulguigan Road prepared by Roadnet Pty Ltd for Tweed Shire Council on 11 March 2019 and wish to bring to your attention the following.

The design vehicle used for the swept path analysis was a 19m semi-trailer used as a guide is not an accurate template as suggested in item 3. of the report. The reason for this is that from the wheel base between the truck and the front steerable axles of the dog (trailer), are half the distance of those between the truck and the semi-trailer thus this tracks differently. This has been confirmed by the manufacturer and tracking could differ by up to 1m. Therefore the report is not comparing apples with apples in this instance and is not a true indication whatsoever.

Should PBS permits not be permitted on this route it will mean that truck movements could increase by approximately 20%. The reason local businesses have invested in equipment such as the PBS configuration is to reduce the amount of loads which in turn reduces the amount of truck movements, fuel consumption and emissions, driver fatigue, wear and tear on roads along with general safety of less traffic on the roads.

Our business commenced using PBS systems to enhance safety, reduce environmental harm and assist with less maintenance of roads due to fewer truck movements.

We understand that the assessment was possibly carried out to satisfy residents that are less than happy about the truck movements on this road. Could we possibly ask, how long has the unhappy residents been in the area? As the quarry has been operational for quite some time (possibly over 50 years). How many residents are we considering about this issue as if this is a step to close the quarry, it would mean at least 50+ jobs within the community along with the cost to replace the products the quarry produces which will need to be trucked in from somewhere, just at a higher cost to our locals. We have witnessed this with the closure of the Terranora Quarry and watched as other communities thrive through job creation purely because of the industry. We continue to receive backlash for expensive products, having to source materials from out of town and locals having to pay more.

We are happy to meet with you, to show you the different between the 3 vehicles – 1 x PBS truck & dog (trailer), 1 x truck & dog (trailer) (NON PBS) and 1 x truck with 19m trailer to help put this into perspective.

Look forward to working to achieve an outcome that is beneficial to all parties.

Yours sincerely

**BRIMS EARTHMOVING PTY LTD**

A handwritten signature in black ink that reads "I Brims". The signature is written in a cursive, slightly slanted style.

**IAN BRIMS  
DIRECTOR**



Tumbulgum Community Association  
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Mr Troy Green  
General Manager  
Tweed Shire Council  
PO Box 19  
Murwillumbah NSW 2484

24 April 2019

Dear Troy,

**Re: Road Safety Dulguigan Rd and North Tumbulgum Quarry DA04/0162**

I write further to my email of Thursday 18 April 2019, in which the community again sought information on the consent conditions of the North Tumbulgum Quarry (Quarry) DA 04/0162.

We are also seeking commitment from the Tweed Shire Council (Council) to compliance monitoring of the quarry's operations and review of the risk management strategy for the route between the Quarry and the Tweed Valley Way (TVW).

In support of this, the following material is provided to recap our community's concerns.

Item 18 on the agenda on the Council meeting on Wednesday 17 April 2019 related to a report and recommendations arising from the recent Dulguigan Road Heavy Vehicle Road Study by RoadNet. This study was proposed by Mr Danny Rose, Manager Roads and Stormwater, at a meeting with representatives of the Council, National Heavy Vehicle Regulator (NHVR), Roads and Maritime Services (RMS) and Tumbulgum Community Association (TCA) all in attendance on the 21 March 2018.

The TCA has regularly raised with Council serious concerns re suitability of Dulguigan Road for the volume and size of heavy vehicle traffic traversing it and hence safety of the public.

Four (4) of the eight (8) hazards identified in the RoadNet Study are deemed **high risk**. Some of the recommended actions to reduce risk propose significant roadworks. Some of these may not even be achievable.

We draw your attention to the following from this Study/Report, recent Council Traffic Count data, and other contextual information:

1. Latest traffic count data for this same section of road in October 2018 show heavy vehicle traffic has increased significantly since 2012, and was likely 3 ½ times higher in the period when a truck and dog rolled over in August 2017;
2. Earlier crashes that have occurred on this road - a heavy vehicle rollover approaching the curves near Mayes Hill Road intersection, a crash west of the quarry and a crash



- involving car and heavy vehicle at Hogans Road in which the truck mounted the bonnet of a stationary car waiting to turn;
3. 50% of heavy vehicles continuing to travel over the 60 kph speed limit;
  4. The Quarry generates the majority of heavy vehicle traffic;
  5. The study identifies intersections and corners where there is potential for a head on collision;
  6. High-risk hazards identified in the study requiring significant road works for which there is no allocated budget or timeframe - a point acknowledged by the Director of Engineering at the 17 April Council meeting;
  7. The studies for two of the intersections were incomplete, it also did not include study of sight lines, available shoulders and verges, nor the intersection with Tweed Valley Way;
  8. Contrary to the intent of the PBS system, allocation of Permits for this road has been associated **with increased vehicle movements not fewer**, including activity from out of the shire with little or no value to ratepayers while increasing road maintenance costs; e.g. many trucks such as HXR Heavy Vehicles from Casino collecting material for delivery in the Ballina Shire - an extra 7.5 tonnes per load. There is serious potential adverse long-term effect on growth in Tweed as scarce resource is removed.
  9. The unlimited number of heavy vehicles able to travel to and from the Quarry on any day.

**The Road Study shows that damage and injury is foreseeable.**

Nevertheless, Council Staff recommended to Councillors to accept the report and implementation of its recommendations, while at the same time Council would continue to accept and assess new applications for PBS Heavy Vehicles to use the road.

The TCA emailed councillors prior to the 17 April meeting and **strongly** recommended that the Council seek legal advice on behalf of the Councillors and Council Staff re their respective liability, individual or collective, for any foreseeable damages, injuries, deaths that could be attributed, in full or in part, to:

1. The veracity and analysis of material provided to and assessed by Council Staff;
2. Degree of understanding and consideration of other contextual material such as standards and guidelines that Council Staff should be aware of in the execution of their duties when assessing such material and providing a report to Council;
3. The report provided by Council Staff to Councillors based on this material and assessment, including recommendations;
4. The decisions made by Councillors based on the material made available to them, both by Council Staff and other interested parties.

The Tumbulgum community notes the Councillor's decision at the meeting on 17 April to adopt Option 2 as the safest option offered to them by Council Staff - i.e. not issue any new PBS permits until the required work to address at least the high-risk hazards has been undertaken.

We would expect that this will be an interim measure while the Council reviews its risk management approach, which should include adoption of best safety management option(s) for the elimination of risks.



The report shows significant safety concerns along the current route between the Quarry and the TVW.

The cost of the significant roadworks proposed in the study needs to be compared to other options, including the Alternate Route Option put forward by the TCA in 2017.

It is of great concern to the community that many strategies in the report focus on behaviour change, the lowest order of safety management. This concern should be seen in the context of the poor history of compliance with consent conditions and related protocols by the quarry operator and contractors.

The TCA also takes exception to the characterisation of the community's concern about this important road safety matter in the section on community engagement on page 231 of the report from the Director of Engineering to the Council. The matter is not just an issue for "several landholders and road users". It is discussed and agreed at community meetings, the subject of regular correspondence within the community and features in newsletter articles. We ask that your records are corrected in this respect.

We have a right to know how a specific development operates within our community. The community has had no response regarding the quarry development consent conditions from the Council since its 1 November 2018 Meeting.

The TCA represents a community of local ratepayers, whose aggregated contribution to the council finances are larger than that provided by the quarry as single ratepayer.

Aside from this, the safety of the community should be of greatest concern to the council when fulfilling its obligations and responsibilities to all constituents.

The TCA seeks the following:

1. Written confirmation of the definitive DA 04/0162 Consent definitions that the quarry is operating to;
2. Effective compliance monitoring and reporting of quarry related activities;
3. A review of the risk management strategy on this road as a result of the recent Heavy Vehicle Road Study and Traffic Studies.

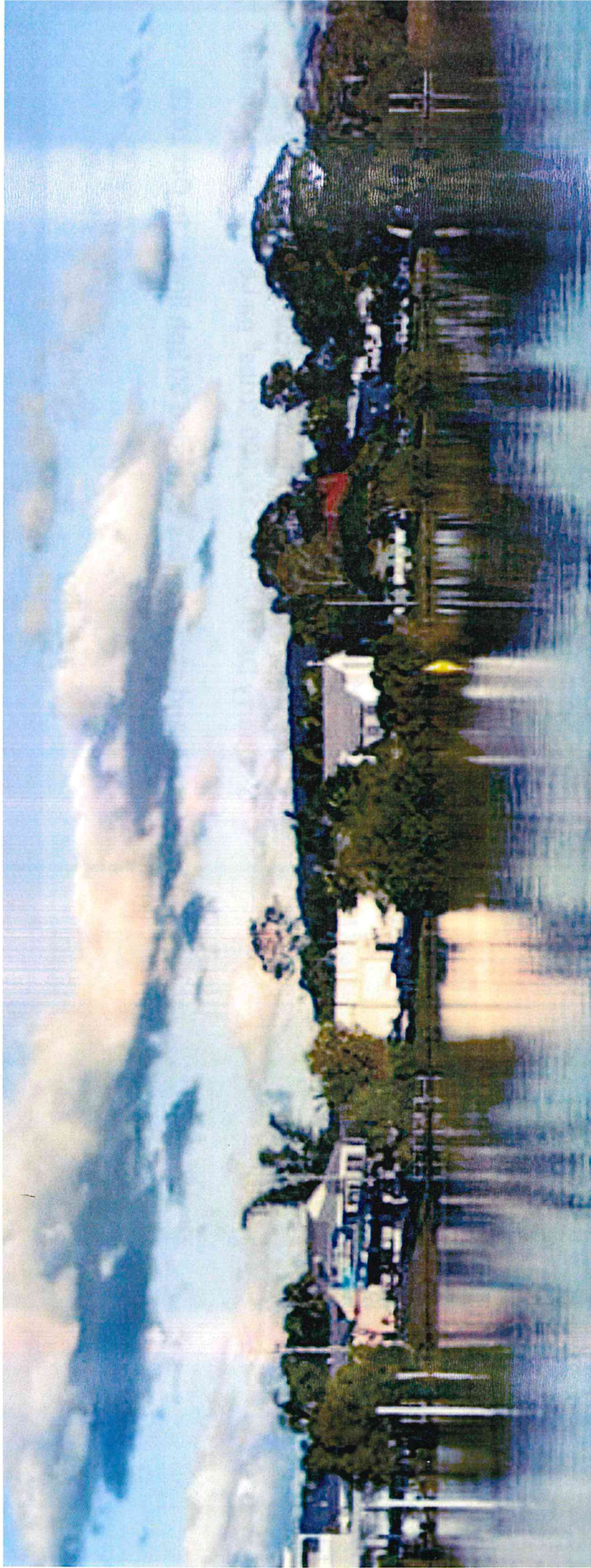
For your information I have included a copy of our presentation to the Council meeting last week, as well as the Alternate Route presented in 2017.

(Mrs) Jennifer Kidd  
President  
Tumbulgum Community Association Inc  
0431 989 477

cc Mr Geoff Provest MP, Member for Tweed  
Mayor Katie Milne  
Deputy Mayor Chris Cherry

Attachments x2

TCA Presentation to Council Meeting on 17 April 2019  
Road Safety Dulguigan Road - Alternate Route Option



Item 18 - Tweed Shire Council Meeting 17 April 2019

# ROAD SAFETY RISK

Presentation by

Tumbulgum Community Association Inc



# Dulguigan Road Traffic Count

	Near Terranorra Rd				Near 1039				Near 809**		
	All vehicles		Heavy Vehicles > Cat 3		All Vehicles		Heavy Vehicles > Cat 3*		All Vehicles	Heavy Vehicles > Cat 3	
	Increase	7 days	Mon - Fri	7 days	Increase	7 days	Increase	Mon-Fri	7 days	Mon - Fri	
2012	882			839		58		70		188	244
2017											
Oct-18	1102		178	889		144		183		142	179
Nov-18	1109	↑126%		895	↑107%						

\* 91% Heavy Vehicle >Category 3 travelled Mon to Fri

\*\* Site of Truck and Dog Rollover in Aug 17

Source: Tweed Shire Council



Report at p. 228 para 1. ? Consistent Definition of trips

- 142 Trips/day (data = both directions)
- Quarry DA 04/0162 - 14,600 "trips" pa i.e. 7,300 truckloads

50% of class 4 and above trucks exceeded 60 kph limit in Oct 2018 study. (sample size = 1,297)

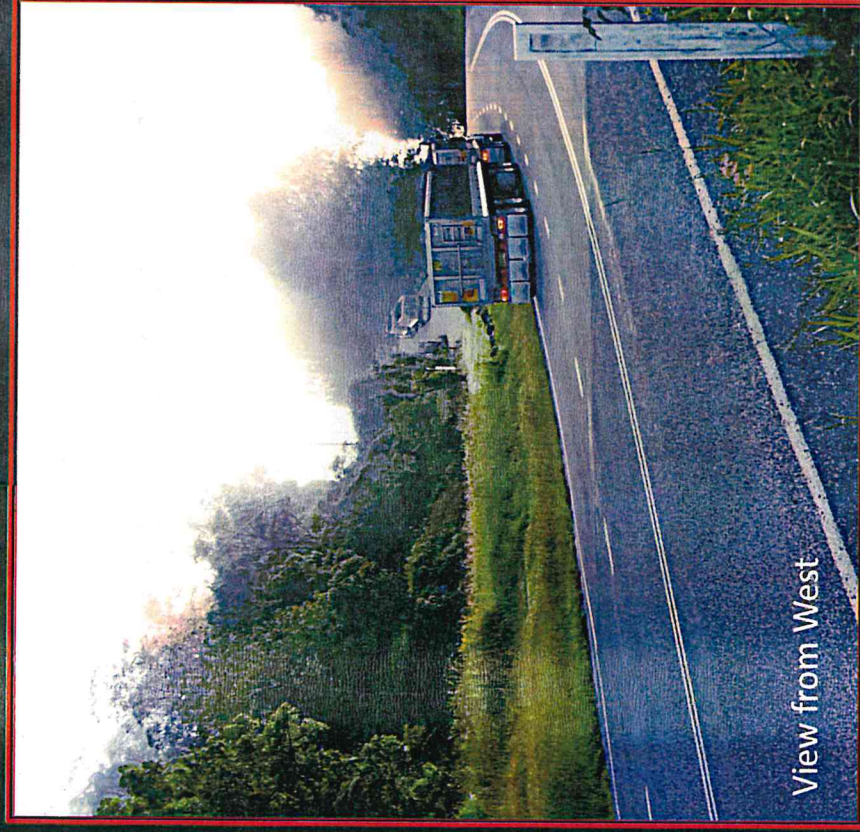
↑ activity = ↑ risk





# Quarry Entrance

1. **High Risk** (trucks leaving quarry to east)
2. **Medium Risk** (trucks approaching from east)



View from West



View from west



# Quarry Entrance (Cont.)

1. **High Risk** (trucks leaving quarry to east)
2. **Medium Risk** (trucks approaching from east)

Entrance designed for max 40 x 20m<sup>3</sup> trucks on any given day and 10,000 p.a. as condition - 2004 Quarry DA04/0162

Study identifies vehicles crossing onto opposite side of road when turning east into 100 kpm traffic



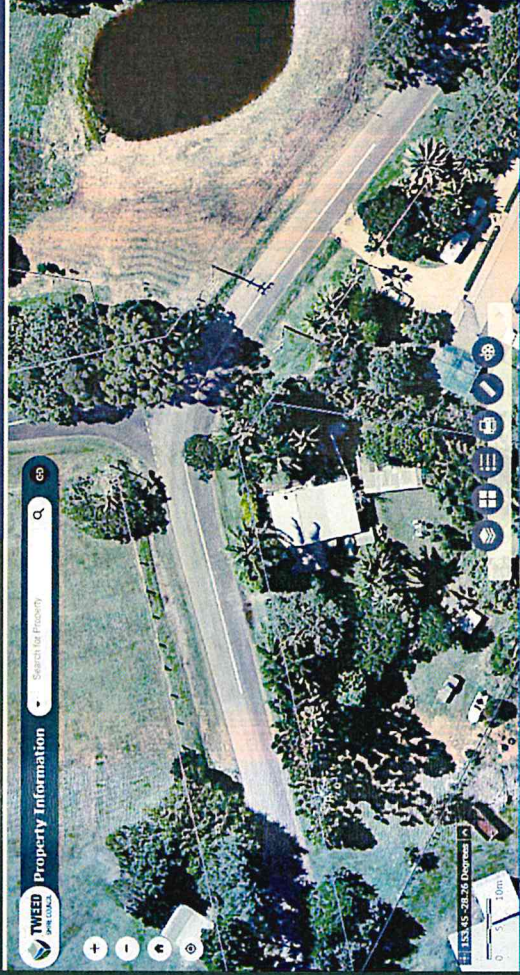
**Risk Control Measure**  
relies on behaviour change  
**lowest order safety control**

Note: Unless entrance is redesigned, safer for traffic to enter from and leave the quarry to the west, where it is easier for trucks to stay in correct lane.



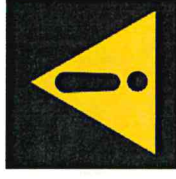


### 3. Hogans Rd Intersection



## High Risk

*Site of truck and car crash - trailer of semi mounted the bonnet of stationary car waiting to turn.*



Easy low/medium cost actions may result in a **worse** scenario.

Roadnet Study p31

To reduce the risk to medium requires acquisition of land from multiple properties and redesign of corner.

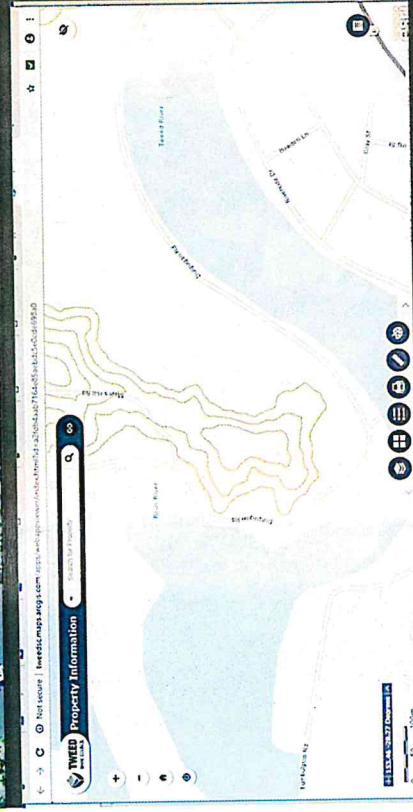
\$\$\$ and timeframe for roadworks **NOT** identified





# 4. Mayes Hill Curves High Risk

Truck rollover on approach from west c. 2011



To reduce the risk to medium requires major work - acquisition of properties and redesign of curves.

Topography and proximity of river

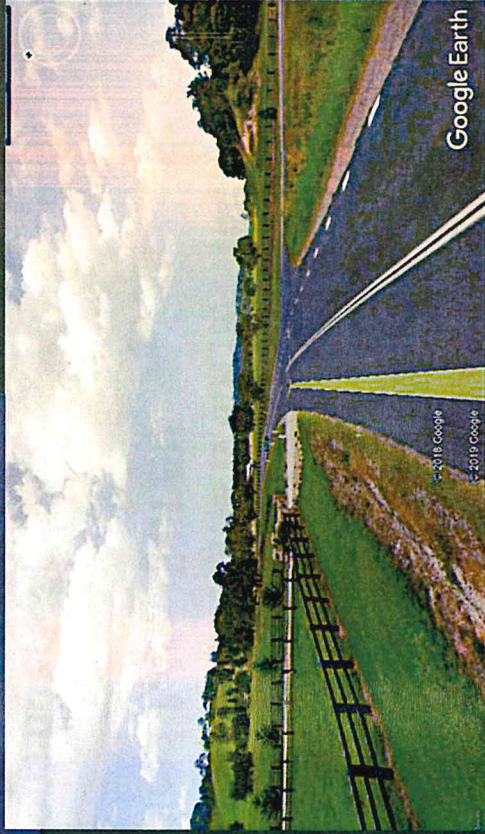
\$\$\$\$\$ and timeframe are **not** identified


? Achievable      ? Realistic



## 5. Terranora Rd Intersection

Low risk ????

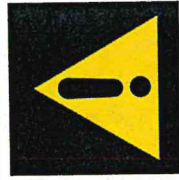
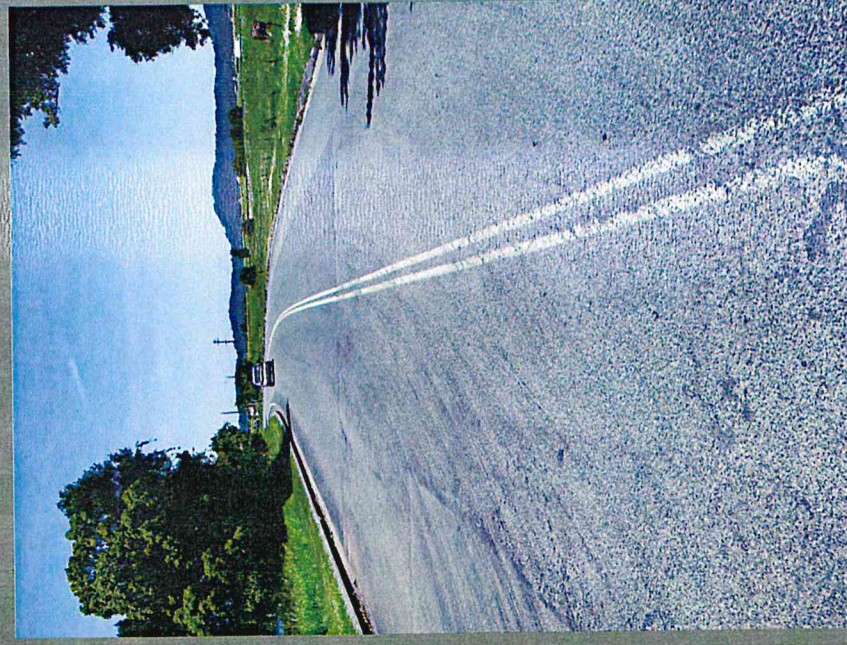
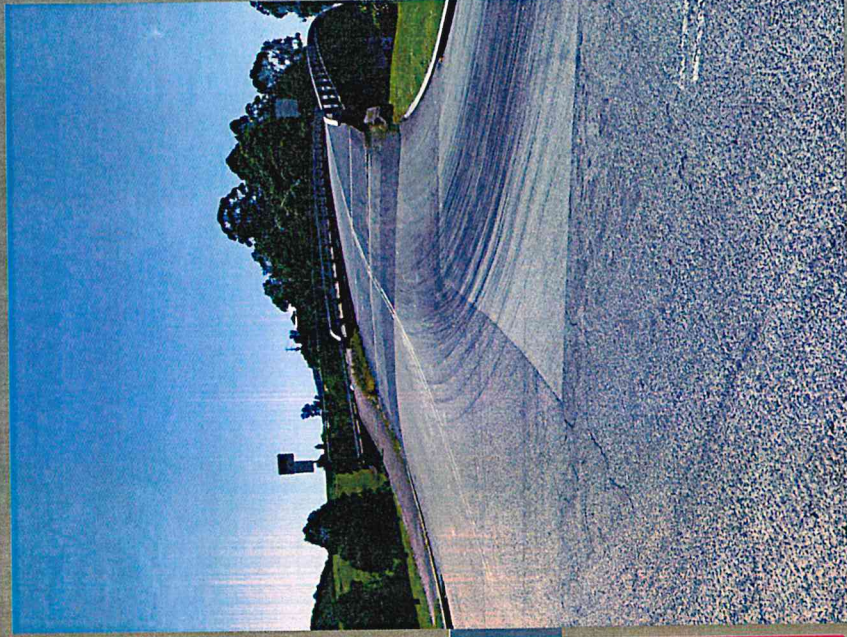


 Proposed right turning lane in Dulguigan Rd does NOT address the community concern of cars travelling north east along Terranora Rd being run off the road by trucks turning left on Terranora Rd from Dulguigan Rd **NO Verge**



## 6. Terranora Rd and Riverside Dr Intersection

**Medium risk** for Trucks turning  
onto Bridge



### **Incomplete assessment**

Risk for heavy vehicles turning OFF the bridge NOT identified. Swept path available in this lane is 6m not the required 7.4m (NHVR)

Actions not clear

\$\$\$ and timeframe **not** identified



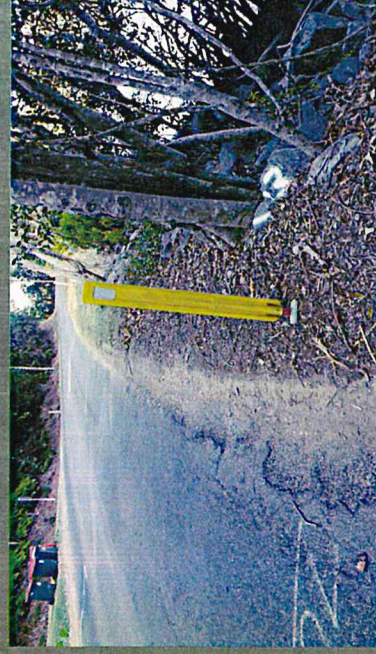
# 7. & 8. Dulguigan Road in General

**High Risk**

Narrow seal width

**Medium Risk**

Vegetation



Current carriageway width  
not spelt out (requires 2.4m  
i.e 2 x1.2 m of sealed  
shoulder

NO Verge NO Shoulder + Topography

→ **RISK**

Trimming = potential damage to  
riverbank vegetation legal and \$\$\$  
\$\$\$ and timeline not identified for  
road widening program



# Summary

Road Carriageway Width	Failed	X
Shoulders on both sides	Failed	X
Quarry entrance and exit	Failed	X
Hogans Rd Intersection	Failed	X
Mayes Hill Curves	Failed	X
Terranora Rd Intersection	Incomplete	
Twohill Bridge	Not tested	X
Terranora Rd/Riverside Dr Intersection	Incomplete	X
Tweed Valley Way Intersection	Not tested	
Sightlines	Not tested	
Driver Protocol Test – stay in lane	Not tested	
Driver Protocol Test – speed	Not tested	



# Key Points

1. Incorrect representation of community engagement p. 231 – Issues are **NOT** from just “several landholders and road users” - discussed, agreed at meetings, covered in newsletters and the subject of resident correspondence.
2. RoadNet Report is **DRAFT 3** – What is its standing?
3. ?No. of High Risk locations - 4 in RoadNet Report (pp 31 &32) or 5 in Agenda Papers (p 228)
4. No mention of community amenity in report.
5. Allocation of PBS vehicle permits associated with ↑ heavy vehicles **NOT** less.
6. Estimated cost works and timelines for identified High Risks **NOT** included.
7. Alternative option/s to eliminate the risks were not covered.
8. Recommendation proposes TSC continues to receive and review (and ?renew) PBS permits.
9. Legal Risk for TSC associated with this Risk Management approach.







## **APPENDIX B – LETTER RE REVIEW OF PROPOSED SIGNAGE**



# RoadNet Pty Ltd

ABN 89 070 034 347

**Specialists in Traffic Engineering,  
Civil Design and Road Safety Audits**



**Queensland Office**  
8 Sixth Avenue,  
PALM BEACH QLD 4221  
p: 07 5525 7377  
e: gold.coast@roadnet.net.au

**New South Wales Office**  
Level 12, 1 Pacific Highway  
NORTH SYDNEY NSW 2060  
p: 02 9959 1080  
e: sydney@roadnet.net.au  
www.roadnet.net.au

Reference: 18029G.008/CKF

Tweed Shire Council  
PO Box 816  
MURWILLUMBAH NSW 2484

3 October 2019

Attention: Alana Brooks, Road Safety Officer

## **REVIEW OF PROPOSED SIGNAGE ON DULGUIGAN ROAD, TUMBULGUM, NSW**

Dear Alana,

I have reviewed Tweed Shire Council's proposed sign layout provided by Stephen Sharp (Tweed Shire Council: Engineering Assistant - Traffic) in email dated 28.08.2019. The proposed sign layout (*refer Attachment No.1*) details the new signs intended to be installed along Dulguigan Road between Terranora Road and slightly West of the entrance to the Dulguigan Quarry.

I have held discussions with Stephen Sharp to confirm the exact signs to be installed and which existing signs will be subsequently removed, and have tabled this information in a Sign Review Spreadsheet (*refer Attachment No.2*).

I acknowledge the varying speed environment along Dulguigan Road and Tweed Shire Council's desire to inform all traffic of upcoming curves in the road and the appropriate speed to negotiate these curves. I also appreciate the 'Ball Bank Indicator' method Tweed Shire Council has adopted in determining the advisory speeds for the curves.

The approach Tweed Shire Council has adopted in determining the signage to be installed along Dulguigan Road between Terranora Road and slightly West of the entrance to the Dulguigan Quarry is deemed suitable for the intended purpose.

Yours faithfully

Craig Frazer  
BEng(Civil) RPEQ MIEAust CPEng NPER  
Grad Dip (Municipal Eng. and Man.)

*Attachment No.1 - Tweed Shire Council's Proposed Sign Layout*  
*Attachment No.2 - Sign Review Spreadsheet (Version: 3 October 2019)*

**ATTACHMENT NO.1**

**PROPOSED SIGN LAYOUT**



SIGN NUMBER	SIGN CODE	SPEED km	LENGTH m
1	W1-3R	45	0
2	W1-3R	25	0
3	W1-3L	45	0
4	W8-237	35	400
5	W1-3L	35	0
6	W8-237	35	400
7	W1-3R	75	0
8	W1-3R	65	0
9	W1-3R	45	0
10	W1-3L	65	0
11	W8-237	35	300
12	W1-3L	45	0
13	W1-3L	55	0
14	W8-237	35	300
15	W1-4L	45	0
16	W1-3R	55	0
17	W1-4R	45	0
18	W1-4L	65	0
19	W1-4L	65	0
20	W1-3L	75	0
21	W1-4L	65	0
22	W1-3R	65	0
23	W1-3R	55	0
24	W8-237	55	600
25	W8-237	55	600
26	W8-237	55	600
27	W8-237	55	600
28	W5-22 W5-25	0	100
29	W1-3R	65	0
30	W5-22 W5-25	0	100
31	W1-3L	65	0
32	G9-348	0	0
33	A. W1-1L+	25	0
34	B. W1-1R +	25	0
35	G9-348	0	0
36	CAM's Hogans Rd	0	0
37	CAM's 987 Dul	0	0







609986

Collards Road

28// DP1 079480

W8  
237  
55K  
600

26

10// DP1 063790

47// DP726471





Kidd



23

W8-237  
55K  
600

W8-237  
55K  
600

W8-237  
55K  
600

W8-237  
55K  
600

26

DP26052

DP726471

DP726471

DP726471

481 // DP800941

DP726471

10 // DP1063790

A // DP430040



11/DP847615

Dulguigan Road  
W1-3L  
75K 22

W1-3R  
65K 22

W1-4L  
65K 21

W1-3R  
55K 23







CAM's  
36

B 34  
25  
WI-1R

99-348  
35

Relocate  
1.5m  
away  
from  
shoulder

A  
25 33  
WI-1L

99-348  
32

REDUCE  
SPEED  
25  
km/h

REDUCE  
SPEED  
25  
km/h

A

B



Brady-



1/DP738487

2/DP852164

5/DP872256

3/DP852164

W1-4L  
65K 19

2/DP738487 685

Dulguigan Road

6/DP872256

3/DP738487

W1-4L  
65K 18

4/DP852164



Dulguigan Road

2//DP138487

1//DP118798

18

7003//DP1052274

W1-4 R  
4SK17

2//DP118798

7313//DP1129962

83

6//DP596374

32//DP755749

W1-4L  
4SK15











W1-3L  
55K  
15

W8-237  
35K  
300m  
14

W1-3L  
45K  
12

W8-237  
35K  
300m  
11

W1-3R  
45K  
9

10

979

1003

1009

1015

1015

1039

17/DP558570

16/DP558570

15/DP1021235

14/DP1021235

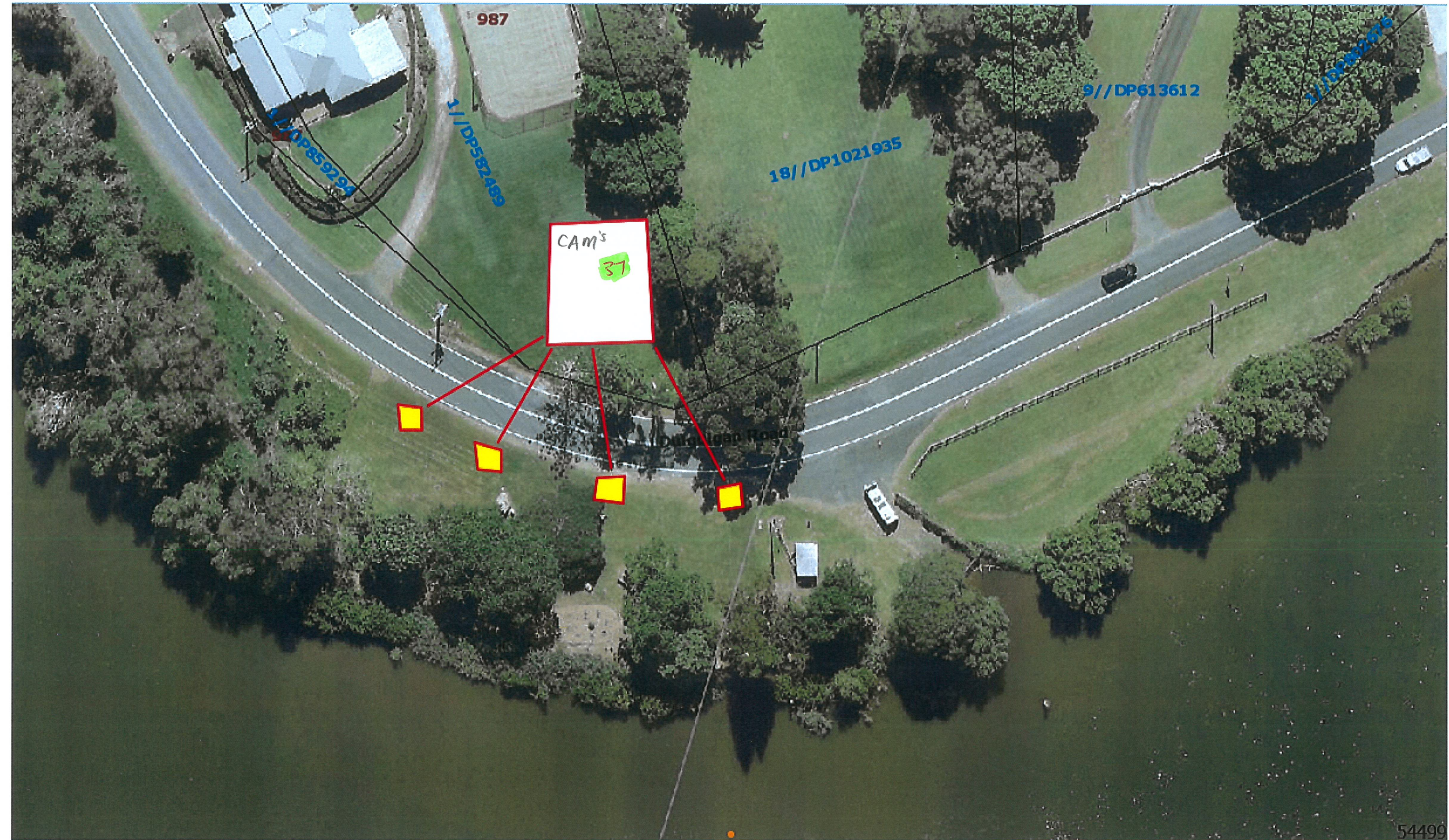
21/DP802676

11/DP802676

81/DP1021235

11/DP5822489





CAM's  
37

987

18//DP1021935

9//DP613612

1//DP613612

1//DP859294

1//DP582489

Dunlop Road



16//DP868570

21881944716

9166102755140

21881944716

1015

W1-3 R  
65K 8

1003

1015

1009

9

W1-3 L  
65K 10

18//DP1021935

in Road







W1-3 R  
7SK 7

6

Dulguigan Road

12/DP755740

13/DP755740

8/DP113331

54531232900 68





5740

8//DPI113331

61//DP774633

W1-3R  
45K 1

W8-237  
35K  
400m 6

592

62//DP774633

W1-3L  
375K

W1-3R  
25K 2

Terranora Road

Dulguigan Road

1121

2//DP561870

W1-3L  
35K 5

Mcauleys Road

W8-237  
35K  
400m 4









**ATTACHMENT NO.2**

**SIGN REVIEW SPREADSHEET  
(VERSION: 3 OCTOBER 2019)**

## SIGN REVIEW SPREADSHEET

Version: 03 October 2019

Sign No.	Sign Code	Speed	Existing Signs	Comment
1	W1-3R	45	Nil	Ok. Compliments Sign No.3. Advisory speed signs to be included with all curve signs.
"END 80, Reduce Speed to Conditions" and "60 Truck Speed Limit" signs to remain.				
2	W1-3R	25	Yes 	Ok. Existing sign to be replaced with new sign. Suggest new sign show adjoining side road as per existing sign. Compliments Sign No.5.
3	W1-3L	45	Nil	Ok. Compliments Sign No.1.
"CAUTION School Bus" sign to remain.				
"Reduce Noise - Please limit Compression Braking" sign to remain.				
4	W8-237	35	Yes 	Ok. Existing sign to be replaced with new sign. Compliments Sign No.6.
5	W1-3L	35	No	Ok. Compliments Sign No.2. (NOTE: 45km/h from one direction and 35km/h from other direction.)
6	W8-237	35	No	Ok. Compliments Sign No. 4.
7	W1-3R	75	No	Ok. Stand alone sign.
8	W1-3R	65	No	Ok. Compliments Sign No.10.
9	W1-3R	45	Yes 	Ok. Existing sign to be replaced with new sign. Compliments Sign No.12.
10	W1-3L	65	No	Ok. Compliments Sign No. 8.
Signs No. 37 CAMs to be installed at this location				
11	W8-237	35	No	Ok. Series of curves presently signed further to the east - Refer Sign No.9. Compliments Sign No.14.
12	W1-3L	45	No	Ok. Compliments Sign No. 9.
Exisitng dual direction CAMs on curves to remain.				
13	W1-3L	55	No	Ok. Compliments Sign No.16.
14	W8-237	35	No	Ok. Compliments Sign No. 11.
15	W1-4L	45	No	Ok. Compliments Sign No.17.
16	W1-3R	55	No	Ok. Compliments Sign No.13.
17	W1-4R	45	No	Ok. Compliments Sign No.15.
18	W1-4L	65	No	Ok. Stand alone sign identifying first of 2 curves..
Existing signs to remain (Westbound).  				
19	W1-4L	65	No	Ok. Stand alone sign identifying first of 2 curves..
Sign No.s 32, 33, 34, 35, 36 to be installed at Hogans Road Intersection.				
Existing sign to remain 				
20	W1-3L	75	No	Ok. Compliments Sign No.22.



(W1-3) Curve between 15 and 90 degrees, to left



(W1-3) Curve between 15 and 90 degrees, to right



(W1-4) Reverse curve less than 60 degrees, first to left



(W1-4) Reverse curve less than 60 degrees, first to right



(D4-6) Curve marker (right)



(W1-1) 90 degree turn, to left



(W1-1) 90 degree turn, to right



(W8-237) indicates that there are 3 or more curves in a row on the road ahead.



(G9-348)




(W5-22) Trucks Crossing or Entering



(W5-25) Turning Traffic



21	W1-4L	65	No	Ok Compliments Sign No.23.
22	W1-3R	65	No	Ok. Compliments Sign No.20. Note: 75 km/h from one direction and 65 km/h from the other.
23	W1-3R	55	No	Ok. Compliments Sign No.21. NOTE: Sign type varies to Sign No.21 (change required).
24	W8-237	55	No	Ok. Compliments Sign No.25.
25	W8-237	55	No	Ok. Compliments Sign No.24.
26	W8-237	55	No	Ok, however relates to 2 curves when typically used for 3 or more curves. Compliments Sign No.27.
Existing sign to remain (Westbound) 				
27	W8-237	55	No	Ok, however relates to 2 curves when typically used for 3 or more curves. Compliments Sign No.26.
Existing signs to be removed (Westbound)   				
28	W5-22, W5-25	0	Yes	Ok. Compliments Sign No.30. "100m" sign to be included.
Existing sign to remain (Eastbound) 				
29	W1-3R	65	Yes	Ok. Compliments Sign No.31.
30	W5-22, W5-25	0	Yes	Ok. Compliments Sign No.28. "100m" sign to be included.
31	W1-3L	65	Yes	Ok. Compliments Sign No.29.
Assume existing signs to be removed (Eastbound)  				
32	G9-348	0	No	Ok. Compliments Sign No.35.
33	W1-1L 	25	Yes 	Ok. Existing sign to be replaced. Compliments Sign No.34. How will side road be identified?
Sign No. 36 CAMs to be installed at this location.				
Existing signs located opposite Dulguigan Rd / Hogan Rd intersection to be relocated 1.5m away from road shoulder.				
34	W1-1R 	25	Yes	Ok. Existing sign to be replaced. Compliments Sign No.33. How will side road be identified?
35	G9-348	0	No	Ok. Compliments Sign No.32.
36	CAM's Hogans Rd	0	No	Ok. Dual direction CAMs.
37	CAM's 987 Dul	0	No	Ok. Dual direction CAMs.

Existing signs



(W1-5) Series of curves ahead, first to left



(W1-5) Series of curves ahead, first to right

## APPENDIX C – IMAGES OF ON-SITE VEHICLE SWEEP PATH TRIAL



On-site Vehicle Swept Path Trial: 19.6m Performance-Based Standards (PBS) Vehicle

Dulguigan Road between Quarry Entrance and McAuleys Road

(Trial undertaken on 9 October 2019)

PBS vehicle remained within the travel lanes at all times, excluding isolated locations (Sites 3 and 4)



Site 1 Quarry entrance: PBS vehicle exiting quarry and turning left (eastbound) onto Dulguigan Road - Wheels just remained within the eastbound travel lane



Site 2 Hogan Road Intersection: PBS vehicle travelling eastbound on Dulguigan Road - Wheels remained within the eastbound travel lane when negotiating the right hand curve



Site 3 First Curve East of Mayes Hill Road: PBS vehicle travelling eastbound on Dulguigan Road - Rear wheels travelled slightly off the sealed road surface when negotiating the left hand curve



Site 4 Under Terranora Road Structure: PBS vehicle travelling eastbound on Dulguigan Road - Two sets of rear wheels travelled outside of road edge line when negotiating the left hand curve, however wheels remained on the sealed road surface



Site 5 Hogan Road Intersection: PBS vehicle travelling westbound on Dulguigan Road - Wheels just remained within the westbound travel lane when negotiating the left hand curve



## APPENDIX D – TRUCK PROFILE



## Truck profile using the quarry access

### Provided by Hy-tech Quarry 23/09/2019:

We have reviewed the truck movements for August.

The following relates to the % of variation truck types out of the quarry.

As you can see the Single and 3 axel trucks relate to 52% of the truck movements.

### Hytec Tumbulgum - Truck Movements AUGUST 2019

Truck Type	Weight	%
Single Axles	Under 8.5 Tonne	7
3 Axle Rigid	9 - 14 Tonne	45
8 Wheelers	14.5 - 16 Tonne	1
Semi Tippers	23 - 27.5 Tonne	3
Truck & Dogs (less 9 splits)	28 - 33 Tonne	29
PBS Truck & Dogs	35 - 40 Tonne	15
<b>Totals</b>		<b>100</b>

### From email from Hy-tech 12/03/2019:

I have just randomly used week 3 in February 18<sup>th</sup> to 24<sup>th</sup>.

There were 255 loads weighed out.

The percentage of each configuration for that week were:-

Truck & Dogs    3 x 3 = 9%  
                      3 x 4 = 2%  
                      3 x 4 PBS = 5%

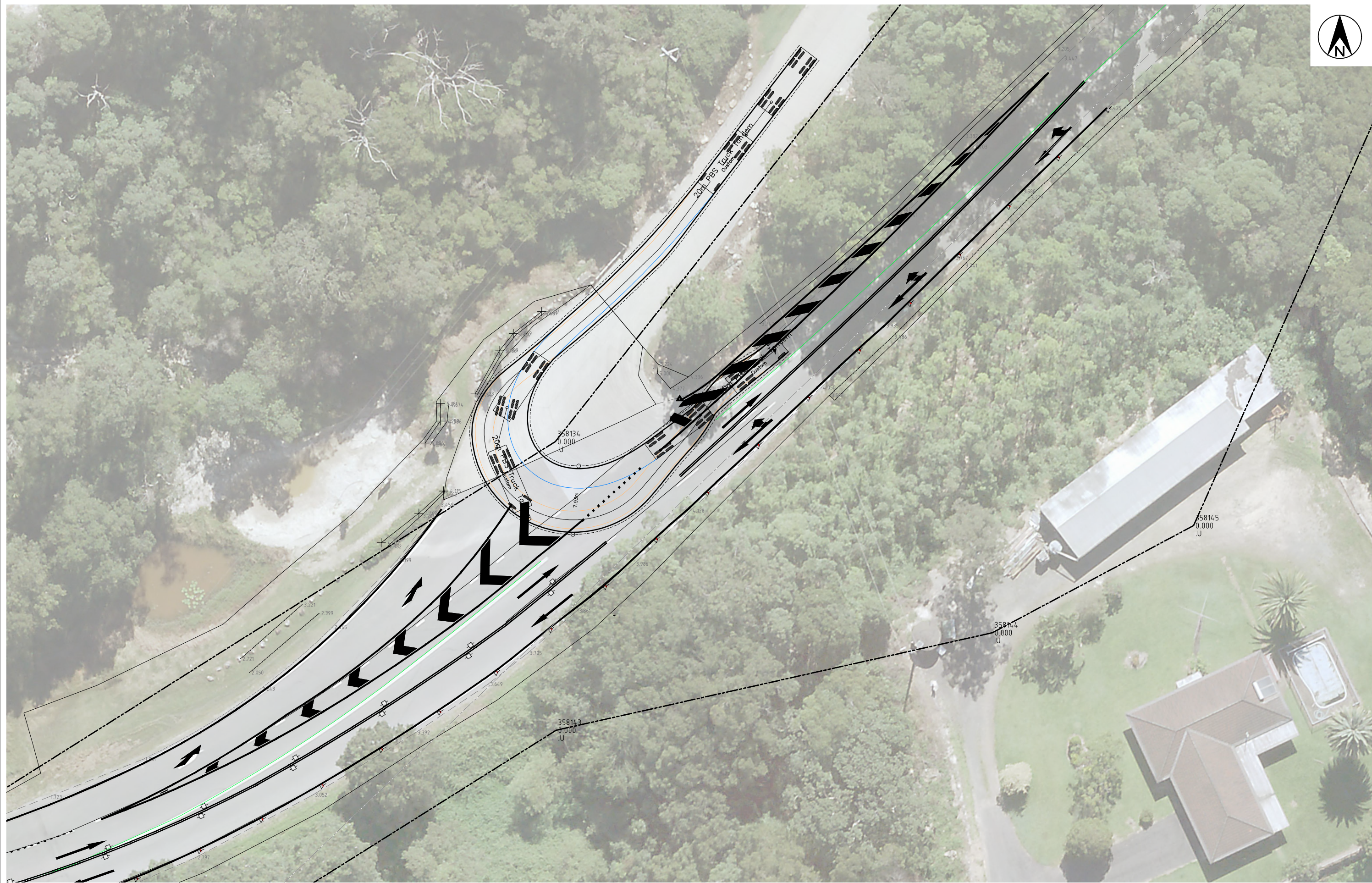
Semi Tipper     3 x 3 = 1%

Rigids            Single Axle = 1%  
                      Small Rigid = 1%  
                      3 Axle Rigid = 80%  
                      8 Wheeler = 1%



## **APPENDIX E – PROPOSED LINEMARKING MODIFICATIONS AT QUARRY ENTRANCE**





**PRELIMINARY  
NOT FOR CONSTRUCTION**

SCALE: A1 SHEET 1:200, A3 SHEET 1:400  
0 2 4 8 12 16 20 m

**DESIGN UNIT**

COUNCIL OFFICES  
TUMBULGUM ROAD,  
MURWILLUMBAH NSW 2484.



PHONE 02 66702400  
FAX 02 66727513  
WEBSITE www.tweed.nsw.gov.au

DESIGNED	J.M.M.	???.?.18	COORDS ADOPTED	
DRAWN	J.M.M.	???.?.18	EASTING	
CHECKED			NORTHING	
HORIZONTAL DATUM	MGA		R.L.	
VERTICAL DATUM	AHD			

PROJECT:  
**TRAFFIC - TRUCK TURNING ASSESSMENT  
DULGIGAN ROAD  
KYNNOBOON**

PLAN TITLE:  
**TURNS - 19m SEMI  
QUARRY ENTRANCE**

ROAD SEGMENT:	???
JOB NUMBER:	????
PROJECT NUMBER:	<b>DB219</b>
DRAWING NUMBER	<b>DB219-04</b>
ISSUE	<b>A</b>

ACAD FILE No: G:\\_AAA DESIGN PROJECTS\IDB\IDB219\_Dulgigan Road-Ternanora Road to Quarry\Drawings\A\_SKETCH DRAWINGS\IDB219\_04-A\_05-A\_06-A\_07-A\_08-A\_09-A\_10-A.dwg



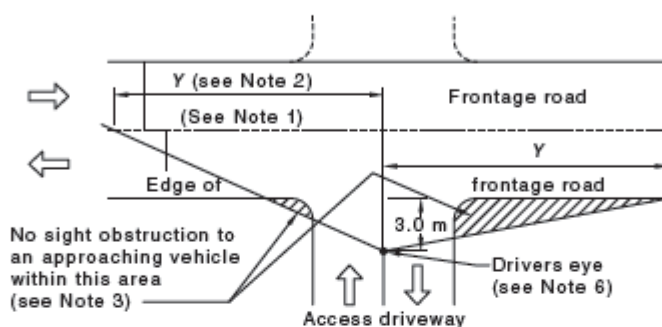
## APPENDIX F – SIGHT DISTANCE



### 3.4.5 Sight distance requirements

Sight distance requirements for commercial vehicle traffic entering a public roadway from an access driveway, shall be as follows:

- (a) *Sight distance to oncoming traffic on the public roadway* — Sight distance requirements to enable a commercial vehicle to find a safe gap in oncoming traffic when leaving an access driveway are specified in [Figure 3.3](#).



Frontage road speed (see Note 4) km/h	Distance (Y) along frontage road (see Note 5) m	
	5 s gap	8 s gap
40	55	89
50	69	111
60	83	133
70	97	156
80	111	178
90	125	200
100	139	222
110	153	244

NOTE 1 Centre-line or centre of roadway (undivided road), or right-hand edge of right-hand through lane (divided road).

NOTE 2 A check to the left is not required at a divided road where the median is wide enough to shelter a vehicle leaving the driveway.

NOTE 3 Parking on this side of the frontage road may need to be restricted on either side of the driveway so that the sight distance required by the above table to an approaching vehicle is not obstructed.

NOTE 4 This is the posted or general speed limit unless the 85th percentile speed is significantly higher.

NOTE 5 These distances are equivalent to minimum gap sight distance (MGSD) for an exiting vehicle. The minimum requirement is a 5 s gap. A right turn exit into a six lane road may require up to an 8 s gap, unless the median is wide enough to shelter a vehicle leaving the driveway.

NOTE 6 When checking sight distance the height of the object (approaching vehicle) is to be taken as 1.15 m above the road surface. The driver's eye height is to be taken as any height in the range 1.15 m to 2.5 m, to cater for both car and commercial vehicle drivers.

Figure 3.3 — Sight distance requirements at access driveway exits



## Traffic volumes approaching quarry access



Figure 1. Traffic volumes approaching the quarry access. Site 1 eastbound traffic only and Site 2 westbound traffic only

**SITE 1**



## Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-32

Site: .0.0E

Description: Dulguigan Road just west of Quarry Access eastbound only.

Filter time: 15:00 Friday, 20 September 2019 => 16:01 Friday, 27 September 2019

Scheme: Vehicle classification (AustRoads94)

Filter: Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16) |

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
								1 - 5	1 - 7
0000-0100	0.0	1.0	1.0	0.0	3.0	1.0	2.0	1.0	1.1
0100-0200	0.0	0.0	0.0	0.0	4.0	1.0	0.0	0.8	0.7
0200-0300	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.4	0.3
0300-0400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0400-0500	0.0	1.0	0.0	0.0	1.0	1.0	2.0	0.4	0.7
0500-0600	1.0	1.0	3.0	3.0	2.0	3.0	1.0	2.0	2.0
0600-0700	11.0	15.0	11.0	13.0	9.0	4.0	5.0	11.8	9.7
0700-0800	16.0	21.0	25.0	13.0	14.0	12.0	12.0	17.8	16.1
0800-0900	34.0	29.0	28.0	32.0	32.0	14.0	17.0	31.0	26.6
0900-1000	18.0	25.0	27.0	31.0	18.0	13.0	20.0	23.8	21.7
1000-1100	16.0	17.0	25.0	14.0	20.0	16.0	32.0	18.4	20.0
1100-1200	10.0	26.0	16.0	21.0	23.0	17.0	32.0	19.2	20.7
1200-1300	12.0	18.0	18.0	15.0	27.0	33.0	22.0	18.0	20.7
1300-1400	19.0	21.0	20.0	19.0	19.0	33.0	24.0	19.6	22.1
1400-1500	27.0	24.0	32.0	29.0	19.0	28.0	18.0	26.2	25.3
1500-1600	29.0	23.0	26.0	36.0	18.5	39.0	28.0	25.2	27.3
1600-1700	23.0	22.0	38.0	26.0	14.0	22.0	21.0	22.8	22.5
1700-1800	21.0	25.0	21.0	16.0	27.0	19.0	17.0	22.0	20.9
1800-1900	9.0	14.0	12.0	31.0	16.0	8.0	5.0	16.4	13.6
1900-2000	2.0	2.0	8.0	6.0	7.0	3.0	2.0	5.0	4.3
2000-2100	4.0	7.0	5.0	1.0	3.0	3.0	5.0	4.0	4.0
2100-2200	1.0	3.0	6.0	7.0	2.0	4.0	0.0	3.8	3.3
2200-2300	2.0	3.0	2.0	4.0	5.0	4.0	2.0	3.2	3.1
2300-2400	0.0	0.0	1.0	3.0	0.0	4.0	1.0	0.8	1.3
<b>Totals</b>									
0700-1900	234.0	265.0	288.0	283.0	247.5	254.0	248.0	260.4	257.5
0600-2200	252.0	292.0	318.0	310.0	268.5	268.0	260.0	285.0	278.8
0600-0000	254.0	295.0	321.0	317.0	273.5	276.0	263.0	289.0	283.2
0000-0000	255.0	298.0	325.0	320.0	285.5	282.0	268.0	293.6	288.0



**Site 2**

**Weekly Vehicle Counts (Virtual Week)**

VirtWeeklyVehicle-35

Site: .0.1NS

Description: Dulguigan Road just east of Quarry Access.

Filter time: 15:00 Friday, 20 September 2019 => 16:00 Friday, 27 September 2019

Scheme: Vehicle classification (AustRoads94)

Filter: Cls(1-12) Dir(S) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages	
								1 - 5	1 - 7
0000-0100	1.0	0.0	0.0	1.0	2.0	1.0	0.0	0.8	0.7
0100-0200	0.0	0.0	0.0	0.0	2.0	0.0	1.0	0.4	0.4
0200-0300	0.0	0.0	1.0	0.0	3.0	0.0	1.0	0.8	0.7
0300-0400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0400-0500	1.0	0.0	2.0	1.0	1.0	1.0	0.0	1.0	0.9
0500-0600	3.0	7.0	6.0	7.0	5.0	2.0	0.0	5.6	4.3
0600-0700	14.0	10.0	10.0	23.0	15.0	4.0	3.0	14.4	11.3
0700-0800	24.0	34.0	26.0	26.0	46.0	11.0	14.0	31.2	25.9
0800-0900	20.0	21.0	28.0	31.0	24.0	24.0	18.0	24.8	23.7
0900-1000	24.0	19.0	21.0	24.0	27.0	19.0	26.0	23.0	22.9
1000-1100	26.0	15.0	22.0	25.0	19.0	19.0	20.0	21.4	20.9
1100-1200	15.0	24.0	30.0	22.0	26.0	36.0	36.0	23.4	27.0
1200-1300	30.0	16.0	15.0	23.0	35.0	28.0	26.0	23.8	24.7
1300-1400	25.0	24.0	23.0	19.0	23.0	32.0	32.0	22.8	25.4
1400-1500	28.0	24.0	22.0	24.0	24.0	26.0	37.0	24.4	26.4
1500-1600	26.0	36.0	28.0	44.0	18.5	33.0	25.0	28.5	28.6
1600-1700	31.0	19.0	37.0	30.0	17.5	26.0	19.0	25.3	24.6
1700-1800	22.0	26.0	26.0	25.0	12.0	14.0	6.0	22.2	18.7
1800-1900	6.0	13.0	10.0	14.0	10.0	5.0	4.0	10.6	8.9
1900-2000	3.0	6.0	4.0	2.0	3.0	2.0	3.0	3.6	3.3
2000-2100	2.0	2.0	1.0	5.0	2.0	4.0	3.0	2.4	2.7
2100-2200	0.0	1.0	5.0	1.0	4.0	0.0	4.0	2.2	2.1
2200-2300	1.0	2.0	5.0	6.0	0.0	3.0	0.0	2.8	2.4
2300-2400	3.0	0.0	0.0	5.0	1.0	1.0	1.0	1.8	1.6
<b>Totals</b>									
0700-1900	277.0	271.0	288.0	307.0	282.0	273.0	263.0	281.4	277.7
0600-2200	296.0	290.0	308.0	338.0	306.0	283.0	276.0	304.0	297.1
0600-0000	300.0	292.0	313.0	349.0	307.0	287.0	277.0	308.6	301.1
0000-0000	305.0	299.0	322.0	358.0	320.0	291.0	279.0	317.2	308.1



## Site 1 speed profile

### Speed Statistics by Hour

#### SpeedStatHour-31

**Site:** .0.0E  
**Description:** Dulguigan Road just west of Quarry Access eastbound only.  
**Filter time:** 15:00 Friday, 20 September 2019 => 16:01 Friday, 27 September 2019  
**Scheme:** Vehicle classification (AustRoads94)  
**Filter:** Cls(1-12) Dir(NESW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Vehicles = 2066

Posted speed limit = 80 km/h, Exceeding = 402 (19.46%), Mean Exceeding = 86.33 km/h

Maximum = 115.3 km/h, Minimum = 21.2 km/h, Mean = 69.9 km/h

85% Speed = 81.99 km/h, 95% Speed = 89.10 km/h, Median = 71.37 km/h

20 km/h Pace = 62 - 82, Number in Pace = 1368 (66.21%)

Variance = 184.44, Standard Deviation = 13.58 km/h

#### Hour Bins (Partial days)

Time	Bin	Min	Max	Mean	Median	85%	95%	>PSL 80 km/h
0000	8 0.387%	51.2	85.2	69.1	68.5	84.6	85.2	2 25.00%
0100	5 0.242%	57.9	85.7	68.6	60.9	85.7	85.7	2 40.00%
0200	2 0.097%	61.1	61.8	61.4	61.5	61.8	61.8	0 0.000%
0300	0 0.000%	0.0	0.0	0.0	216.0	216.0	216.0	0 -%
0400	5 0.242%	46.3	77.5	65.8	70.6	77.5	77.5	0 0.000%
0500	14 0.678%	30.1	80.6	64.8	72.3	79.4	80.6	1 7.143%
0600	68 3.291%	26.2	97.1	75.2	76.6	89.3	95.0	27 39.71%
0700	113 5.470%	24.9	94.7	68.7	73.4	84.2	89.4	23 20.35%
0800	186 9.003%	23.7	115.3	71.0	73.7	82.3	89.5	44 23.66%
0900	152 7.357%	21.2	96.2	67.5	68.8	82.4	91.6	29 19.08%
1000	140 6.776%	21.3	99.2	66.9	68.3	77.4	84.8	14 10.00%
1100	145 7.018%	23.8	109.6	69.9	69.8	81.0	88.9	29 20.00%
1200	145 7.018%	28.1	105.1	69.9	70.7	79.8	87.4	20 13.79%
1300	155 7.502%	22.4	103.5	69.8	69.8	81.6	89.2	31 20.00%
1400	177 8.567%	26.0	93.0	69.1	71.9	80.2	88.9	28 15.82%
1500	218 10.55%	25.5	102.6	66.8	68.4	80.5	86.8	35 16.06%
1600	180 8.712%	24.9	102.5	71.8	72.0	82.1	87.0	38 21.11%
1700	146 7.067%	33.5	101.0	71.9	71.9	82.8	90.1	33 22.60%
1800	95 4.598%	53.3	110.4	74.5	73.7	83.5	91.0	21 22.11%
1900	30 1.452%	60.5	102.6	75.7	74.3	86.9	97.5	9 30.00%
2000	28 1.355%	26.7	95.9	70.6	71.9	79.9	92.9	4 14.29%
2100	23 1.113%	50.1	108.9	76.7	74.9	91.2	108.7	7 30.43%
2200	22 1.065%	31.8	84.4	67.8	68.3	81.8	84.2	4 18.18%
2300	9 0.436%	60.2	80.6	71.0	69.0	79.7	80.6	1 11.11%
----	2066 100.0%	21.2	115.3	69.9	71.4	82.0	89.1	402 19.46%



## Site 2 Speed profile

### Speed Statistics by Hour

#### SpeedStatHour-36

**Site:** .0.1NS  
**Description:** Dulguigan Road just east of Quarry Access.  
**Filter time:** 15:00 Friday, 20 September 2019 => 16:00 Friday, 27 September 2019  
**Scheme:** Vehicle classification (AustRoads94)  
**Filter:** Cls(1-12) Dir(S) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

Vehicles = 2210

Posted speed limit = 60 km/h, Exceeding = 1776 (80.36%), Mean Exceeding = 80.26 km/h

Maximum = 146.2 km/h, Minimum = 12.2 km/h, Mean = 72.6 km/h

85% Speed = 88.95 km/h, 95% Speed = 98.64 km/h, Median = 76.32 km/h

20 km/h Pace = 67 - 87, Number in Pace = 1184 (53.57%)

Variance = 371.81, Standard Deviation = 19.28 km/h

#### Hour Bins (Partial days)

Time	Bin	Min	Max	Mean	Median	85%	95%	>PSL 60 km/h
0000	5 0.226%	49.6	82.6	71.5	75.4	82.6	82.6	4 80.00%
0100	3 0.136%	72.5	88.8	81.7	83.8	88.8	88.8	3 100.0%
0200	5 0.226%	59.2	80.0	69.2	65.8	80.0	80.0	4 80.00%
0300	0 0.000%	0.0	0.0	0.0	216.0	216.0	216.0	0 -%
0400	6 0.271%	75.7	98.4	88.2	91.1	98.3	98.4	6 100.0%
0500	30 1.357%	26.1	97.7	78.7	83.7	95.3	97.5	26 86.67%
0600	79 3.575%	21.0	100.2	78.2	81.3	94.5	97.8	68 86.08%
0700	181 8.190%	12.2	121.2	69.2	76.7	90.3	98.7	128 70.72%
0800	166 7.511%	17.7	107.8	69.3	77.0	91.3	97.7	121 72.89%
0900	160 7.240%	18.6	122.9	68.6	74.3	86.1	99.0	119 74.38%
1000	146 6.606%	27.1	111.2	68.5	72.5	88.3	98.5	110 75.34%
1100	189 8.552%	21.4	110.9	72.5	76.9	86.5	96.1	153 80.95%
1200	173 7.828%	26.0	127.4	69.8	71.6	87.3	104.8	132 76.30%
1300	178 8.054%	22.0	126.6	71.9	74.7	87.1	94.9	149 83.71%
1400	185 8.371%	20.5	141.2	72.6	75.7	88.9	101.6	151 81.62%
1500	229 10.36%	23.7	118.2	72.4	76.2	89.2	100.4	184 80.35%
1600	197 8.914%	27.0	142.8	76.0	77.5	88.8	94.5	171 86.80%
1700	131 5.928%	36.0	146.2	78.1	79.1	89.6	116.7	108 82.44%
1800	62 2.805%	57.8	112.5	78.2	76.1	86.7	100.9	61 98.39%
1900	23 1.041%	43.4	105.9	79.9	81.0	97.5	105.4	21 91.30%
2000	19 0.860%	45.5	103.8	75.0	77.9	81.8	103.8	16 84.21%
2100	15 0.679%	61.9	112.6	83.4	76.8	103.6	112.6	15 100.0%
2200	17 0.769%	65.6	112.5	83.3	82.0	93.1	112.5	17 100.0%
2300	11 0.498%	39.4	102.4	73.8	76.3	89.0	102.4	9 81.82%
----	2210 100.0%	12.2	146.2	72.6	76.3	89.0	98.6	1776 80.36%



## **APPENDIX G – PROPOSED ROAD WIDENING AT HOGANS ROAD**





OUTSIDE CURVE WIDENING

OUTSIDE CURVE WIDENING

INSIDE CURVE WIDENING

**NOTE:**  
DUE TO SOFTWARE CONSERVATIVE CALCULATIONS, VEHICLE SPEED ARE SET TO 15KPH (AUTOTURN TEMPLATE) TO REPLICATE A REALISTIC AND SITE PROVED TRUCK SPEEDS RANGING 30 TO 40 KPH

1/1562723

**PRELIMINARY  
NOT FOR CONSTRUCTION**

SCALE: A1 SHEET 1:200, A3 SHEET 1:400  
0 2 4 8 12 16 20 m

**DESIGN UNIT**

COUNCIL OFFICES  
TUMBULGUM ROAD,  
MURWILLUMBAH NSW 2484.

PHONE 02 66702400  
FAX 02 66727513  
WEBSITE www.tweed.nsw.gov.au



DESIGN ENGINEER ..... DATE ???.???.18..

DESIGNED	J.M.M.	???.???.18	COORDS ADOPTED	PM ??????
CHECKED	J.M.M.	???.???.18	EASTING	55?????.???
HORIZONTAL DATUM	MGA	NORTHING	687?????.???	
VERTICAL DATUM	AHD	R.L.	?????	

**PROJECT:**  
**TRAFFIC - TRUCK TURNING ASSESSMENT  
DULGUIGAN ROAD  
DULGUIGAN**

**PLAN TITLE:**  
**TURNS - 19m SEMI  
HOGANS ROAD INTERSECTION**

ROAD SEGMENT:	???
JOB NUMBER:	????
PROJECT NUMBER:	<b>DB219</b>
DRAWING NUMBER	<b>DB219-05</b>
ISSUE	<b>A</b>

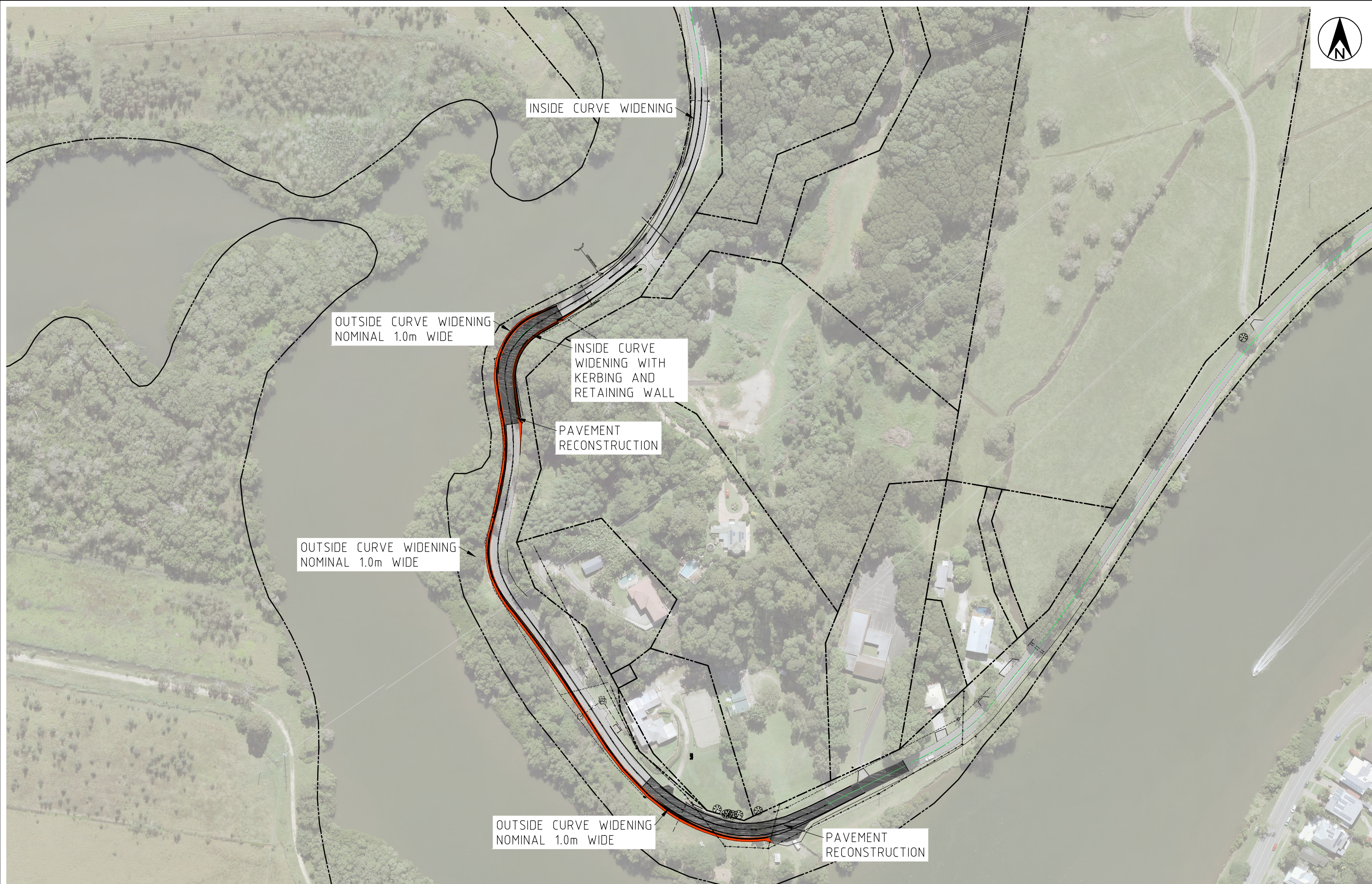
A	ORIGINAL ISSUE	???.?	???.?	???.???.18
ISSUE	AMENDMENT DETAILS	DRAWN	CHECK	DATE

# USE FIGURED DIMENSIONS ONLY. DO NOT SCALE.



## APPENDIX H – PROPOSED ROAD WIDENING AT MAYES HILL ROAD





**PRELIMINARY  
NOT FOR CONSTRUCTION**

SCALE: A1 SHEET 1:1000, A3 SHEET 1:2000  
0 10 20 40 60 80 100m

**DESIGN UNIT**

COUNCIL OFFICES  
TUMBULGUM ROAD,  
MURWILLUMBAH NSW 2484.



PHONE 02 66702400  
FAX 02 66727513  
WEBSITE www.tweed.nsw.gov.au

DESIGNED	J.M.M.	???.?.18	COORDS ADOPTED	PM ??????
DRAWN	J.M.M.	???.?.18	EASTING	55?????.???
CHECKED			NORTHING	687?????.???
HORIZONTAL DATUM	MGA		R.L.	?????
VERTICAL DATUM	AHD			

PROJECT: **TRAFFIC - TRUCK TURNING ASSESSMENT  
DULGUIGAN ROAD  
DULGUIGAN**

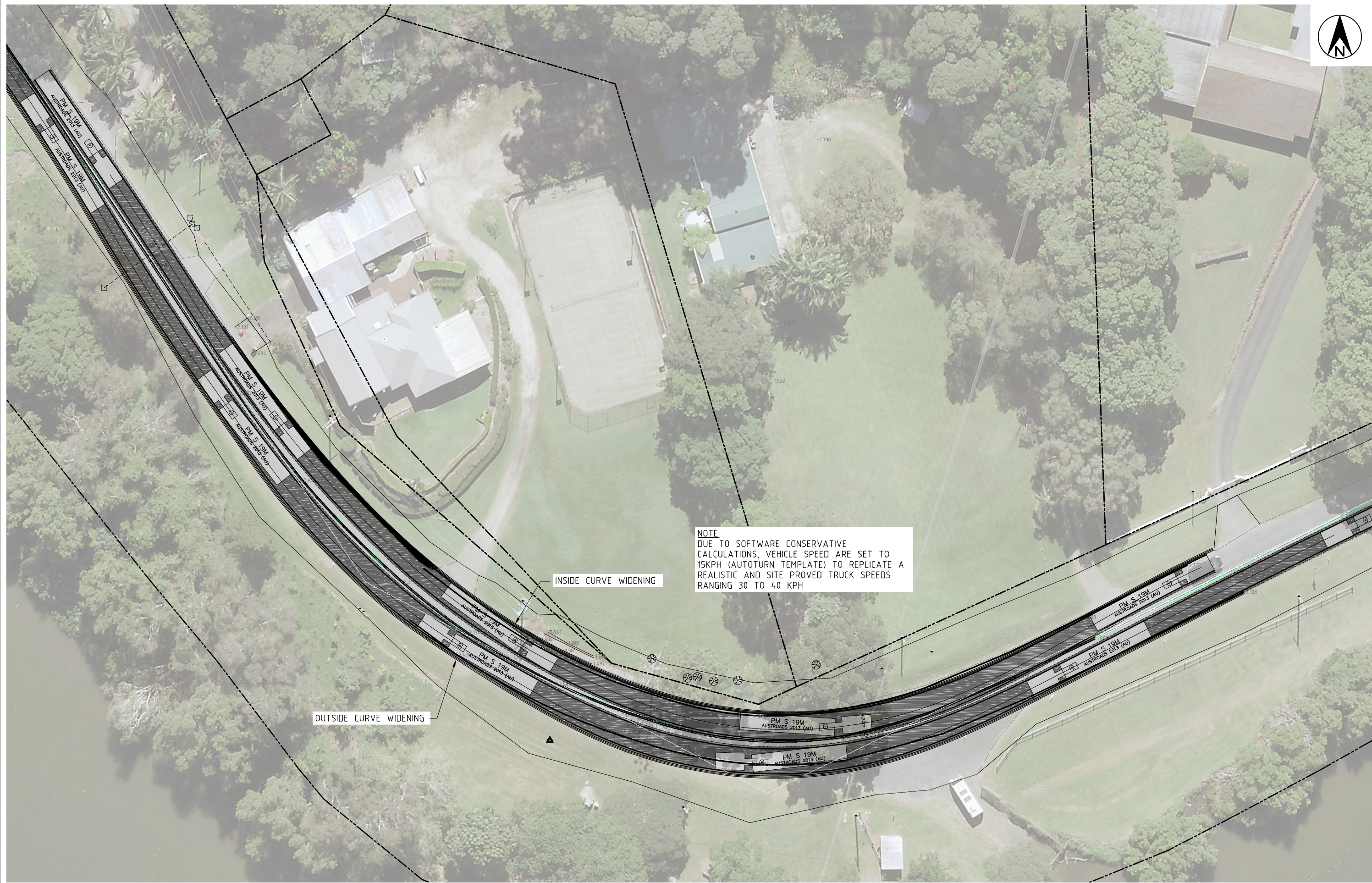
PLAN TITLE: **TURNS - 19m SEMI  
TUMBULGUM SECTION**

ROAD SEGMENT: ???
JOB NUMBER: ????
PROJECT NUMBER: <b>DB219</b>
DRAWING NUMBER <b>DB219-09</b>
ISSUE <b>A</b>

A	ORIGINAL ISSUE	???.?	???.?	???.?.18
ISSUE	AMENDMENT DETAILS	DRAWN	CHECK	DATE

# USE FIGURED DIMENSIONS ONLY. DO NOT SCALE.





**NOTE**  
 DUE TO SOFTWARE CONSERVATIVE CALCULATIONS, VEHICLE SPEED ARE SET TO 15KPH (AUTOTURN TEMPLATE) TO REPLICATE A REALISTIC AND SITE PROVED TRUCK SPEEDS RANGING 30 TO 40 KPH

INSIDE CURVE WIDENING

OUTSIDE CURVE WIDENING

**PRELIMINARY**  
**NOT FOR CONSTRUCTION**

SCALE: A1 SHEET 1:250, A3 SHEET 1:500  
 0 2.5 5 10 15 20 25 m

**DESIGN UNIT**

COUNCIL OFFICES  
 TUMBULGUM ROAD,  
 MURWILLUMBAH NSW 2484.

PHONE 02 66702400  
 FAX 02 66727513  
 WEBSITE www.tweed.nsw.gov.au



DESIGNED	J.M.M.	???.?.18	COORDS ADOPTED	PM ?????
DRAWN	J.M.M.	???.?.18	EASTING	55?????.???
CHECKED			NORTHING	687?????.???
HORIZONTAL DATUM	MGA		R.L.	?????
VERTICAL DATUM	AHD			

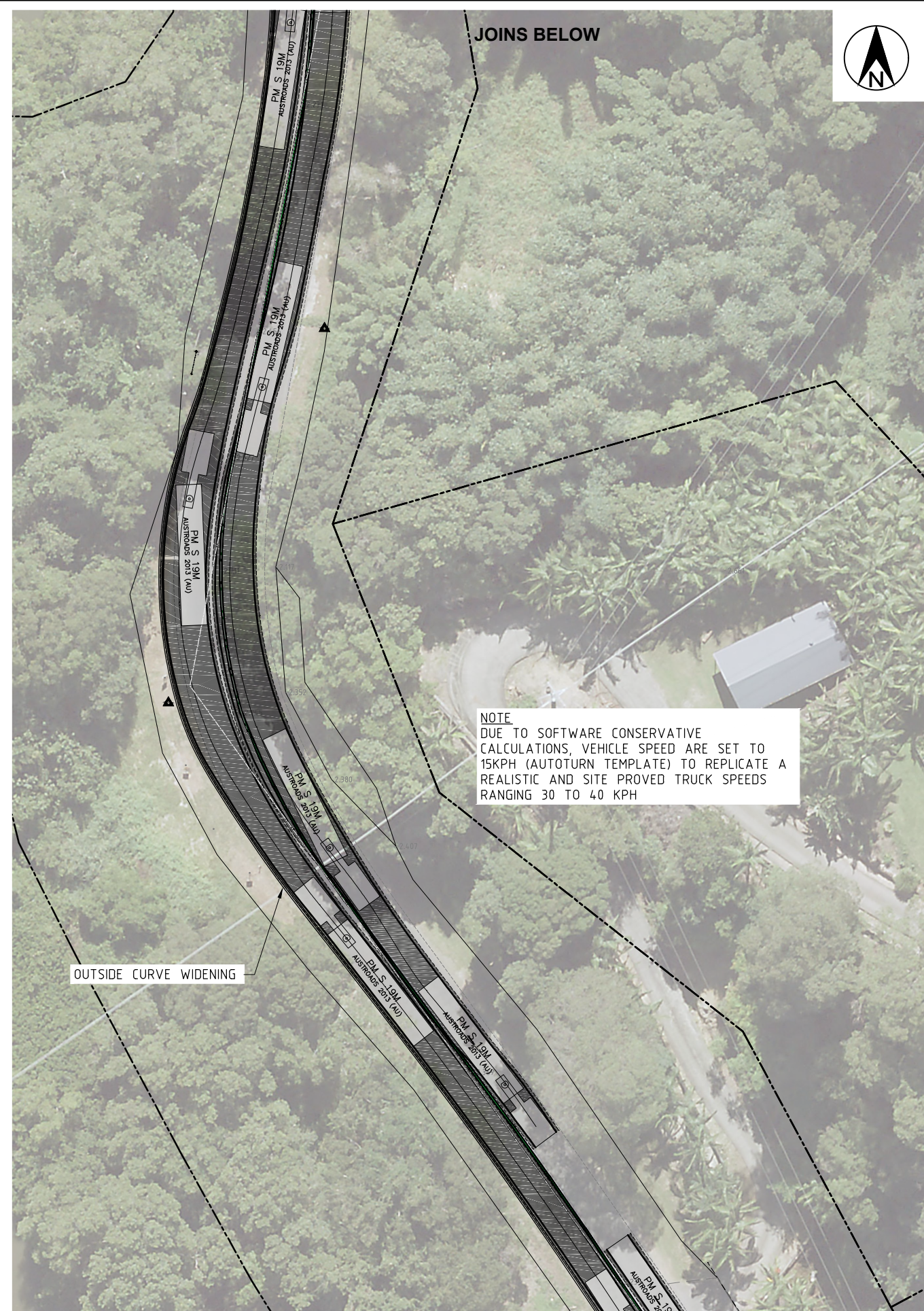
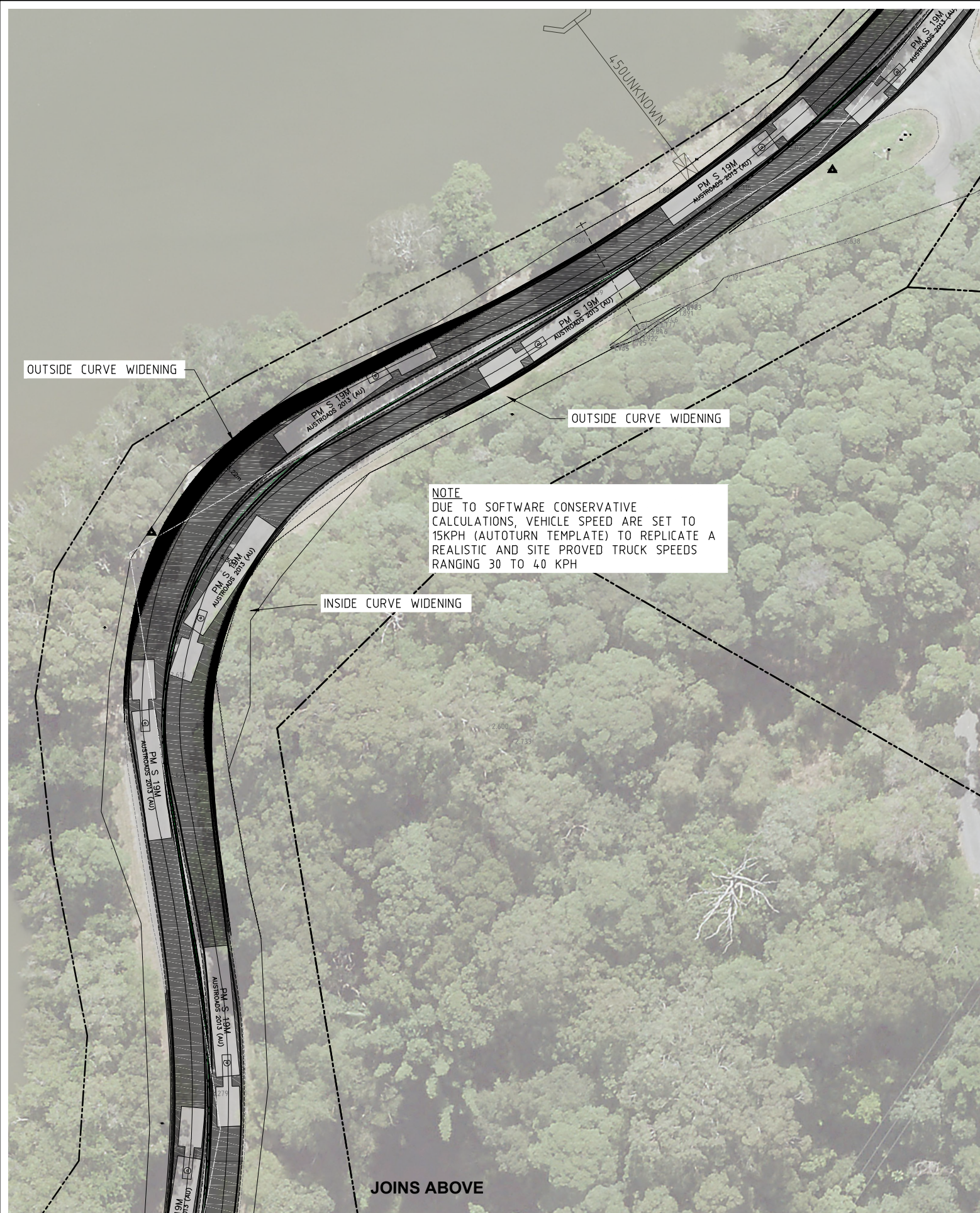
PROJECT:  
**TRAFFIC - TRUCK TURNING ASSESSMENT**  
**DULGUIGAN ROAD**  
**DULGUIGAN**

PLAN TITLE:  
**URNS - 19m SEMI**  
**TUMBULGUM SECTION**

ROAD SEGMENT:	???
JOB NUMBER:	????
PROJECT NUMBER:	<b>DB219</b>
DRAWING NUMBER	<b>DB219-05</b>
ISSUE	<b>A</b>

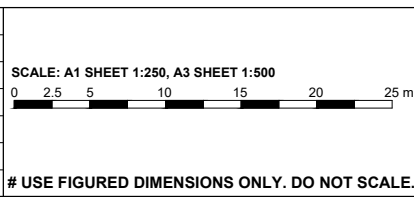
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**PRELIMINARY  
NOT FOR CONSTRUCTION**

ISSUE	AMENDMENT DETAILS	DRAWN	CHECK	DATE	# USE FIGURED DIMENSIONS ONLY. DO NOT SCALE.
A	ORIGINAL ISSUE	???.?	???.?	???.??-18	



**DESIGN UNIT**

COUNCIL OFFICES  
TUMBULGUM ROAD,  
MURWILLUMBAH NSW 2484.

PHONE 02 66702400  
FAX 02 66727513  
WEBSITE [www.tweed.nsw.gov.au](http://www.tweed.nsw.gov.au)

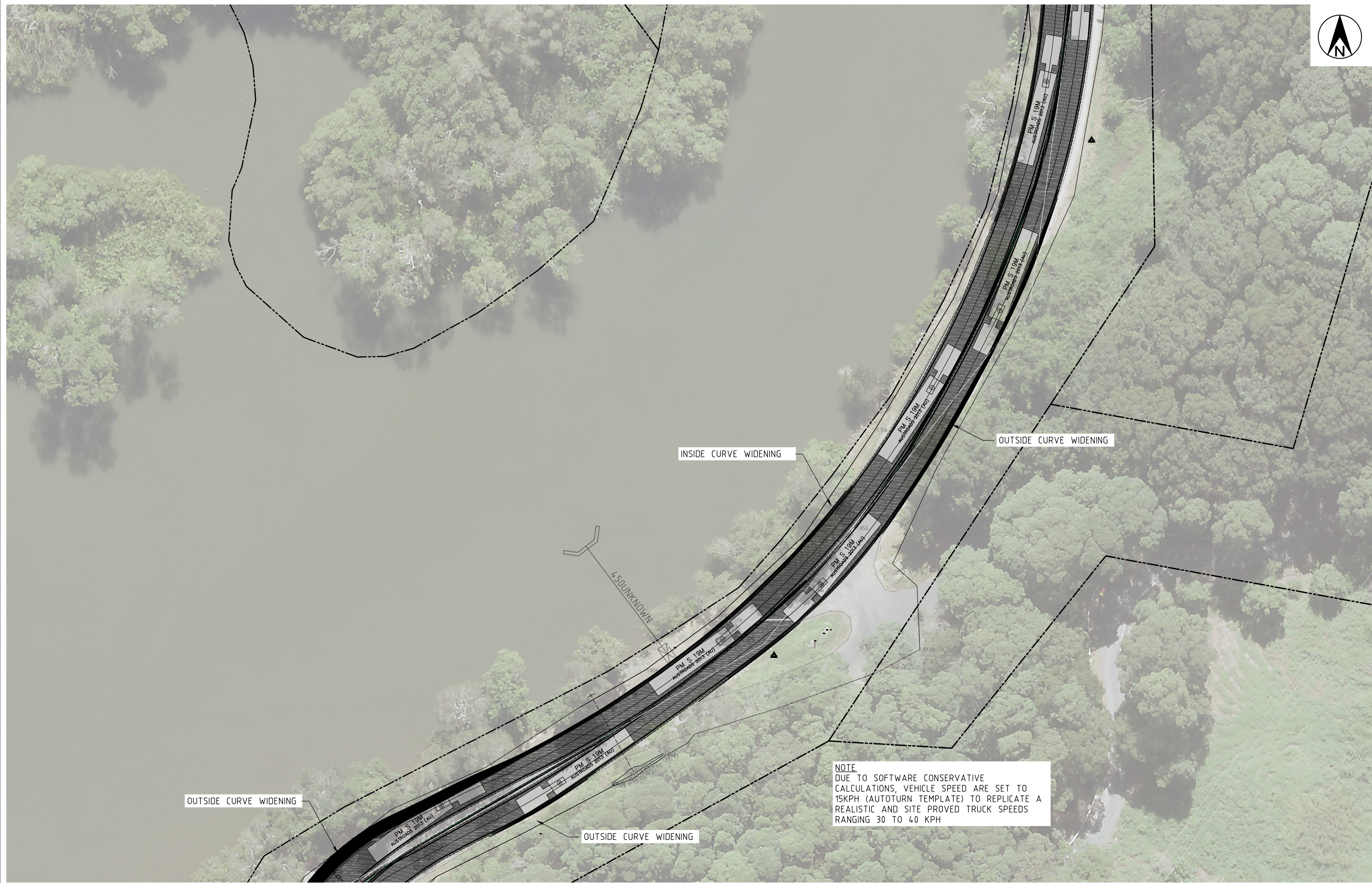
DESIGNED	J.M.M.	???.?.18	COORDS ADOPTED	PM ??????
DRAWN	J.M.M.	???.?.18	EASTING	55?????.???
CHECKED			NORTHING	687?????.???
HORIZONTAL DATUM	MGA		R.L.	?????
VERTICAL DATUM	AHD			

PROJECT:  
**TRAFFIC - TRUCK TURNING ASSESSMENT  
DULGUIGAN ROAD  
DULGUIGAN**

PLAN TITLE:  
**TURNS - 19m SEMI  
TUMBULGUM SECTION**

ROAD SEGMENT:	???
JOB NUMBER:	????
PROJECT NUMBER:	<b>DB219</b>
DRAWING NUMBER	<b>DB219-07</b>
ISSUE	<b>A</b>





**NOTE**  
 DUE TO SOFTWARE CONSERVATIVE CALCULATIONS, VEHICLE SPEED ARE SET TO 15KPH (AUTOTURN TEMPLATE) TO REPLICATE A REALISTIC AND SITE PROVED TRUCK SPEEDS RANGING 30 TO 40 KPH

<b>PRELIMINARY NOT FOR CONSTRUCTION</b>			
A	ORIGINAL ISSUE	???.?	???.?.18
ISSUE	AMENDMENT DETAILS	DRAWN	CHECK DATE

SCALE: A1 SHEET 1:250, A3 SHEET 1:500

# USE FIGURED DIMENSIONS ONLY. DO NOT SCALE.

**DESIGN UNIT**

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DESIGNED	J.M.M.	???.?.18	COORDS ADOPTED	PM ?????
DRAWN	J.M.M.	???.?.18	EASTING	55?????.???
CHECKED			NORTHING	687?????.???
HORIZONTAL DATUM	MGA		R.L.	?????
VERTICAL DATUM	AHD			

PROJECT:	TRAFFIC - TRUCK TURNING ASSESSMENT	ROAD SEGMENT:	???
	DULGUIGAN ROAD	JOB NUMBER:	????
	DULGUIGAN	PROJECT NUMBER:	<b>DB219</b>
PLAN TITLE:	<b>URNS - 19m SEMI TUMBULGUM SECTION</b>	DRAWING NUMBER	<b>DB219-08</b>
		ISSUE	<b>A</b>



## APPENDIX I – RISK ASSESSMENT






# RISK ASSESSMENT - Dulguigan Road Heavy Vehicle Route Assessment (Addendum 1)

Project: 18029G Tweed Shire Council - Heavy Vehicle Route Assessment




Client: Tweed Shire Council (TSC)

Reference: Heavy Vehicle Route Assessment - Dulguigan Road Addendum 1



Revision: 10 November 2019

Ref No.	Specific Activity	Hazard	Risk	Frequency	Severity	Risk Level	Control measures	Recommended Actions	Action by Whom	Frequency	Severity	Risk Level
<b>Dulguigan Quarry Access (Ch: 00)</b> - Swept path analysis (Drawing No. 18029G-TP-1001 Rev 02) and on-site observations undertaken to assess risk associated with heavy vehicles exiting Dulguigan Quarry and turning left onto Dulguigan Road, and heavy vehicles travelling on Dulguigan Road and turning right to enter Dulguigan Quarry. Swept path analysis indicates 'almost certain' that 19m heavy vehicles will cross into opposing lane when exiting the quarry and turning left onto Dulguigan Road. No trucks exited the quarry at the time of on-site observation. Markings on the road surface indicate that vehicles utilise the opposing lane however these markings may relate the heavy vehicles entering and not exiting the quarry.												
1	Heavy vehicles exiting Dulguigan Quarry and turning left (eastbound) onto Dulguigan Road	Heavy vehicles entering the opposing traffic lane resulting in the potential for 'head-on' vehicle collisions.	Vehicle damage and injury	Occasional	Serious	High	<p>Wide access at Dulguigan Quarry provides an area for heavy vehicles to use when exiting the quarry and turning left onto Dulguigan Road.</p> <p>Reasonable sight distance for drivers of heavy vehicles when exiting the quarry and turning left onto Dulguigan Road, and for motorists travelling westbound on Dulguigan Road. Dulguigan Road widening on southern side provides a travel path for westbound traffic if an evasive manoeuvre is required.</p> <p>Combined "Trucks Entering" and "50m" sign installed prior to Dulguigan Quarry access.</p> 	<p>Undertake trial in conjunction with quarry owners to assess actual vehicle swept path for the longest heavy vehicle utilised at the quarry to determine if heavy vehicle cross into the opposing lanes (turn lane, through lane) when exiting the quarry and turning left onto Dulguigan Road.</p> <p>Confirm quarry operators have internal protocol(s) in relation to heavy / light vehicles entering and exiting the quarry to prevent the risk of heavy vehicle exiting the quarry striking heavy / light vehicle in Dulguigan Road that is stopped to turn right into quarry, or striking westbound traffic on Dulguigan Road.</p>	TSC Representative / Quarry Owner	Improbable	Serious	Medium
1 (ADD 1)	Heavy vehicles exiting Dulguigan Quarry and turning left (eastbound) onto Dulguigan Road	Heavy vehicles entering the opposing traffic lane resulting in the potential for 'head-on' vehicle collisions.	Vehicle damage and injury	Improbable	Serious	Medium	<p>CONTROL MEASURE NO.1: On-site Assessment of Vehicle Swept Path</p> <p>CONTROL MEASURE NO.2: Truck Profile</p> <p>CONTROL MEASURE NO.3: Additional Signage on Dulguigan Road</p>	<p>ACTION NO.1: Formalise Quarry Protocol for Trucks Exiting Quarry</p> <p>ACTION NO.2: Linemarking Modifications at Quarry Entrance</p> <p>ACTION NO.5: Quarry Protocol Regarding UHF Channel</p> <p>ACTION NO.6: Formalise Quarry Protocol re Daily Audit on Truck Driver Behaviour</p>	TSC Representative / Quarry Owner	Improbable	Serious	Medium*
2	Heavy vehicles travelling westbound on Dulguigan Road and turning right into Dulguigan Quarry	Heavy vehicles stopped in westbound lane on Dulguigan Road waiting to turn right may result in 'rear end' collisions.	Vehicle damage and injury	Occasional	Minor	Medium	<p>Dulguigan Road has been widened at this location to allow westbound traffic to pass heavy vehicles stopped to turn right into the Dulguigan Quarry access.</p> <p>Combined symbolic "right curve" sign and "65km/h" advisory speed sign followed by combined "Turning Traffic" and "100m" sign installed prior to Dulguigan Quarry access.</p>  <p>Linemarking denoting right turn movement into Dulguigan Quarry provided.</p> 	<p>Review the present linemarking and signage layout at the quarry access, and implement modifications, if required.</p>	TSC Design Representative	Improbable	Minor	Low
2 (ADD 1)	Heavy vehicles travelling westbound on Dulguigan Road and turning right into Dulguigan Quarry	Heavy vehicles stopped in westbound lane on Dulguigan Road waiting to turn right may result in 'rear end' collisions.	Vehicle damage and injury	Occasional	Minor	Medium	<p>CONTROL MEASURE NO.3: Additional Signage on Dulguigan Road</p>	<p>ACTION NO.2: Linemarking Modifications at Quarry Entrance</p> <p>ACTION NO.5: Quarry Protocol Regarding UHF Channel</p>	TSC Design Representative / TSC Representative	Improbable	Minor	Low*
<b>Dulguigan Road / Hogans Road Intersection (Ch 2500)</b> - Vehicle swept paths (Drawing No. 18029G-TP-1002 Rev 02) and on-site observation showed the travel path for a number of heavy and light vehicles travelling eastbound on Dulguigan Road was close to the road centreline or partly within the opposing travel lane when negotiating the curve. Observed travel speeds appeared to exceed the posted 25km/h advisory speed. Driver behaviour altered with high level of compliance (ie: remaining in travel lane) when other vehicles were present.												



3	Heavy vehicle travelling eastbound or westbound on Dulguigan Road	Heavy vehicles entering the opposing traffic lane resulting in the potential for 'head-on' vehicle collisions. 	Vehicle damage and injury		Occasional	Serious	High	Combined symbolic "curve and side road" sign and "25km/h" speed advisory sign installed in Dulguigan Road on both approaches to the curve at Hogans Road. <b>Note:</b> The speed environment on both approaches to the curve at Hogans Road makes it unlikely that motorists will adopt the advisory speed of 25km/hr when negotiating the curve. 	Install more prominent signage highlighting the advisory speed.	TSC Design Representative / TSC Maintenance Representative		Improbable	Serious	Medium
								Reasonable sight distance for 25km/h advisory speed. 	Remove vegetation to provide additional sight distance around the curve. ( <b>Note:</b> This action may result in vehicles travelling at higher speeds around the curve and thus increase the likelihood of vehicles travelling in the opposing travel lane.) Redesign curve and intersection layout to higher design speed and implement works.					
3 (ADD 1)	Heavy vehicle travelling eastbound or westbound on Dulguigan Road	Heavy vehicles entering the opposing traffic lane resulting in the potential for 'head-on' vehicle collisions.	Vehicle damage and injury		Improbable	Serious	Medium	CONTROL MEASURE NO.1: On-site Assessment of Vehicle Swept Path CONTROL MEASURE NO.2: Truck Profile CONTROL MEASURE NO.3: Additional Signage on Dulguigan Road CONTROL MEASURE 4: Clearing of Vegetation on Dulguigan Road	ACTION NO.3: Road Widening at Dulguigan Road / Hogans Road Intersection ACTION NO.5: Quarry Protocol Regarding UHF Channel ACTION NO.6: Formalise Quarry Protocol re Daily Audit on Truck Driver Behaviour	TSC Design Representative / TSC Maintenance Representative		Improbable	Serious	Medium*

**Dulguigan Road east of Mayes Hill Road (Ch: 3650)** - Vehicle swept paths (Drawing No. 18029G-TP-1003 Rev 02) and on-site observation showed the travel path for heavy vehicles travelling westbound on Dulguigan Road was close to the road centreline or partly within the opposing traffic lane when negotiating the series of curves.


4	Heavy vehicle travelling eastbound or westbound on Dulguigan Road	Heavy vehicles entering the opposing traffic lane resulting in the potential for 'head-on' vehicle collisions.	Vehicle damage and injury		Occasional	Serious	High	Combined symbolic "Windy Road" and "45km/h" speed advisory sign installed on both approaches to a series of bends in the vicinity of Mayes Hill Road. CAMs also provided to assist in delineating this series of bends. 	Review road geometry and the potential to widen seal width sufficiently (including curve widening requirements) to accommodate a double barrier centreline and possibly edge lines through this series of bends, and implement works.	TSC Design Representative / TSC Maintenance Representative		Improbable	Serious	Medium
								Ongoing monitoring of road pavement condition and the undertaking of pavement repairs when required. 	Continue monitoring of road condition (edge breaks, edge drop offs, seal defects, shoulder integrity, etc) with maintenance regime to maintain maximum effective seal width.					
4 (ADD 1)	Heavy vehicle travelling eastbound or westbound on Dulguigan Road	Heavy vehicles entering the opposing traffic lane resulting in the potential for 'head-on' vehicle collisions.	Vehicle damage and injury		Improbable	Serious	Medium	CONTROL MEASURE NO.1: On-site Assessment of Vehicle Swept Path CONTROL MEASURE NO.2: Truck Profile CONTROL MEASURE NO.3: Additional Signage on Dulguigan Road CONTROL MEASURE NO.4: Clearing of Vegetation on Dulguigan Road	ACTION NO.4: Road Widening Works on Curves east of Mayes Hill Road ACTION NO.5: Quarry Protocol Regarding UHF Channel ACTION NO.6: Formalise Quarry Protocol re Daily Audit on Truck Driver Behaviour			Improbable	Serious	Medium*

**Dulguigan Road / Terranora Road Intersection (Ch: 5400)** - Vehicle swept paths (Drawing No. 18029G-TP-1004 Rev 02) and on-site observation showed a high percentage of heavy and light vehicles northbound on Terranora Road and turning right into Dulguigan Road were crossing into the opposing travel lane when negotiating the right turn manoeuvre. Driver behaviour altered with high level of compliance when other vehicles were present.

5	Heavy vehicle turning right form Terranora Road into Dulguigan Road	Heavy vehicle striking vehicle waiting to turn right from Dulguigan Road into Terranora Road.	Vehicle damage and injury		Improbable	Minor	Low	Very good sight distance on all approaches to the intersection. Standard linemarking and signage provided.	Review linemarking layout at intersection with consideration to the position of a vehicle in Dulguigan Road waiting to turn right into Terranora Road.	TSC Design Representative		Improbable	Minor	Low
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**Terranora Road / Riverside Drive Intersection (Ch: 5900)** - Vehicle swept paths (Drawing No. 18029G-TP-1005 Rev 02) and on-site observation showed a high percentage of heavy and light vehicles travelling on Riverside Drive and turning right into Terranora Road were crossing into the opposing travel lane when undertaking the right turn manoeuvre. Driver behaviour altered and high level of compliance when other vehicles were present.



6	Heavy vehicle turning right from Riverside Drive into Terranora Road	Heavy vehicle striking vehicle waiting to turn right from Terranora Road into Riverside Drive.	Vehicle damage and injury	Occasional	Minor	Medium	Reasonable sight distance on 2 of the 3 approached to the intersection with poor sight distance on Terranora Road approach. Combined symbolic "Intersection" sign and "Reduce Speed" sign installed on Terranora Road prior to the intersection. 	Continue monitoring of road condition including linemarking and signage with maintenance regime to maintain appropriate level of delineation.	TSC Infrastructure Delivery Representative / TSC Maintenance Representative	Improbable	Minor	Low
Dulguigan Road (Route Length 5.4km) - On-site observations and measurements reveal narrow seal width for road with reasonably high number of heavy vehicles, and isolated pavement failures on outer edge of seal.												
7	Heavy vehicles travelling eastbound and westbound on Dulguigan Road	Narrow seal width may result in heavy vehicles crossing the road centreline or leaving the sealed road surface, resulting in the possibility of 'head-on' or 'off road' collisions.	Vehicle damage and injury	Occasional	Serious	High	Ongoing monitoring of road pavement condition and the undertaking of pavement repairs when required. Signage such as "60 Truck Speed Limit", symbolic "Road Narrows" signs and "Advisory Speed" signs used to control heavy vehicle speeds and advise drivers of narrow road seal width. 	Continue monitoring of road condition (edge breaks, edge drop offs, seal defects, shoulder integrity, etc) with 'quick response' maintenance regime to maintain maximum effective seal width. Prepare and implement a road widening works program with consideration to the high priority locations identified in this risk assessment. Implement works.	TSC Infrastructure Delivery Representative / TSC Maintenance Representative	Improbable	Serious	Medium
7 (ADD 1)	Heavy vehicles travelling eastbound and westbound on Dulguigan Road	Narrow seal width may result in heavy vehicles crossing the road centreline or leaving the sealed road surface, resulting in the possibility of 'head-on' or 'off road' collisions.	Vehicle damage and injury	Improbable	Serious	Medium	CONTROL MEASURE NO.1: On-site Assessment of Vehicle Swept Path CONTROL MEASURE NO.2: Truck Profile CONTROL MEASURE NO.3: Additional Signage on Dulguigan Road CONTROL MEASURE NO.4: Clearing of Vegetation on Dulguigan Road	ACTION NO.3: Road Widening at Dulguigan Road / Hogans Road Intersection ACTION NO.4: Road Widening Works on Curves east of Mays Hill Road ACTION NO.5: Quarry Protocol Regarding UHF Channel ACTION NO.6: Formalise Quarry Protocol re Daily Auit on Truck Driver Behaviour	TSC Infrastructure Delivery Representative / TSC Maintenance Representative	Improbable	Serious	Medium*
8	Heavy vehicles travelling eastbound and westbound on Dulguigan Road	Vegetation extending into roadway may result in heavy vehicles crossing the road centreline and entering the opposing travel lane, resulting in the possibility of 'head-on' collisions.	Vehicle damage and injury	Improbable	Serious	Medium	Ongoing monitoring of vegetation and the undertaking of vegetation maintenance when required.	Continue monitoring of vegetation with 'quick response' maintenance regime (trimming, removal) that maintains sufficient clearance for maximum size, heavy vehicles using the road.	TSC Maintenance Representative	Improbable	Serious	Medium
8 (ADD 1)	Heavy vehicles travelling eastbound and westbound on Dulguigan Road	Vegetation extending into roadway may result in heavy vehicles crossing the road centreline and entering the opposing travel lane, resulting in the possibility of 'head-on' collisions.	Vehicle damage and injury	Improbable	Serious	Medium	CONTROL MEASURE NO.1: On-site Assessment of Vehicle Swept Path CONTROL MEASURE NO.2: Truck Profile CONTROL MEASURE NO.3: Additional Signage on Dulguigan Road CONTROL MEASURE NO.4: Clearing of Vegetation on Dulguigan Road	ACTION NO.5: Quarry Protocol Regarding UHF Channel	TSC Maintenance Representative	Improbable	Serious	Medium*

NOTE: 1. The above Risk Assessment is based on general access (Level 1) 19m semi-trailer. Based on a review of swept paths associated with (Level 2) 26m B-double the risk of a high number of these heavy vehicles is deemed not acceptable unless road modifications (horizontal geometry, road widening) are implemented.  
2. Pedestrians, cyclists and bus operations are excluded from the above Risk Assessment.

Based on Risk Assessment from Austroads: Guide to Road Safety Part 6: Road Safety Audit - Section 4.8

**C. Risk ranking of safety issues**

The following tables may be useful to provide an indication of the level of risk and how to respond to it. Determine into which category in Table 4.1 and Table 4.2 the issue best fits. From this select the risk category in Table 4.3 and its suggested treatment approach in Table 4.4. This is not a scientific system and professional judgement should be used. Section 9.3 provides an evidence based approach to prioritising the treatment of works emanating from road safety audits of existing roads.

Table 4.1: 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 4.2: 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/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. Pedestrian walks into object (no head injury). Car reverses into post.

Table 4.3: The resulting level of risk

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

Table 4.4: Treatment approach

Risk	Suggested treatment approach
Intolerable	Must be corrected.
High	Should be corrected or the risk significantly reduced, even if the treatment costs is high.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
Low	Should be corrected or the risk reduced, if the treatment cost is low.

\* Refer Report Section 4: Conclusion