Mount Lindesay Highway Safety Review March 2016

Queensland Government

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1. Overview

Stretching south from Trinity Way at Browns Plains to the Queensland/New South Wales border, the approximately 100km long state-controlled Mount Lindesay Highway is a key link connecting several important regional centres including Jimboomba, Beaudesert and Rathdowney. The highway serves many different functions along its length; it currently provides an important heavy haulage, freight and tourism route for regional and interstate traffic.

Continued urban development along this corridor has resulted in traffic volumes growing slowly but steadily each year which has in-turn, placed increased pressure on the road network.

The Mount Lindesay Highway has been identified as one of Queensland's poorest safety performing roads with a very high rate of Fatal and Serious Injury (FSI) crashes. Over the 8 year period from 2007-2014[1], 370 casualties have been reported from 493 crashes on the Mount Lindesay Highway. Of the 370 casualties, 15 people were killed. Of all Queensland roads with a length of 100km or more, excluding the Bruce Highway and Warrego Highway, it has the highest Fatal and Serious Injury crash rate per kilometre on the state controlled road network.

The Mount Lindesay Highway Safety Review is a 'pilot project' and the first of its type for Queensland. The safety review followed the model adopted by New South Wales, Roads and Maritime (RMS). The Department of Transport and Main Roads (TMR) chose this approach due to its proven nature and RMS success with developing strong business cases to support the recommended initiatives, and the funding to deliver them. The model used for the safety review aims to recommend road safety treatments that are known to be effective and can be implemented without major engineering works.

Currently safety improvements along the Mount Lindesay Highway are captured in a number of programs including: Capital Works, Safer Roads Sooner and Black Spot programs. Whilst these programs generally respond well, they are reactive in nature and generally only address problem areas in isolation. The Mount Lindesay Highway Safety Review project is different in nature due to its emphasis on community and stakeholder consultation and problem solving initiatives, and the integration between traditional engineering, behavioural and enforcement disciplines – a holistic approach.

The Mount Lindesay Highway Safety Review was established to consider and report on a number of road safety issues including:

- Circumstances surrounding FSI crashes and casualty crash cluster locations.
- General road conditions along the highway.
- Historic information and road safety issues raised by the community.
- Future planning and growth along the corridor.
- Current issues associated with driver behaviour and fatigue.
- Current enforcement activities.
- Physical inspection of the highway to examine the road environment and suitability of current road safety treatments.
- Appropriateness of current speed limits and speed zones.

A range of analyses, community engagement and highway inspections were undertaken during the safety review. These included:

- A desk based review of fatal crash reports, crash trends (such as severity), crash types and crash factors.
- Community consultation through: social media, online survey, and community and stakeholder representation at the safety review stakeholder workshop.
- Field inspections with engineering, behavioural, enforcement and technical specialists.

[1] Represents the most current road crash data between 1 Jan 2007 to 31 Dec 2014. Data for all reporting categories are not complete during this period due to availability of information and changes to data collection/reporting methods.

2.Introduction

2.1 Background

The Mount Lindesay Highway from Logan to the Queensland/New South Wales border has been identified as one of Queensland's poorest safety performing roads with a very high rate of Fatal and Serious Injury (FSI) crashes per kilometre. Out of all Queensland roads with a length of 100km or more, excluding the Bruce Highway and Warrego Highway, it has the highest FSI crash rate per kilometre on state controlled roads at 2.58 FSI crashes per kilometre (for crashes occurring between 2004 and 2011).

The Mount Lindesay Highway can be described as having three main road types (Urban, Semi-Rural and Rural) and two traffic volume sections; Major - Logan to Beaudesert, and Minor - Beaudesert to New South Wales order. The traffic volumes are highest at the Logan end of the highway and noticeably reduce at Beaudesert and continue to reduce to the New South Walesborder.

Along with the steady increase in urbanisation adjacent to sections of the highway, there has been a reflected increase in the volume of highway traffic. Consequently, some sections of the Mount Lindesay Highway are nearing capacity, impacting its operational efficiency and raising road safety issues not evident when traffic volumes were much lower.

Photograph 1: Cedar Vale intersection

The overall goal of this safety review is to assist the TMR with the identification of possible recommendations that could help reduce the number or severity of FSI crashes. Chart 1 depicts the number of FSI crashes observed for the Mount Lindesay Highway between 2007 and 2013.

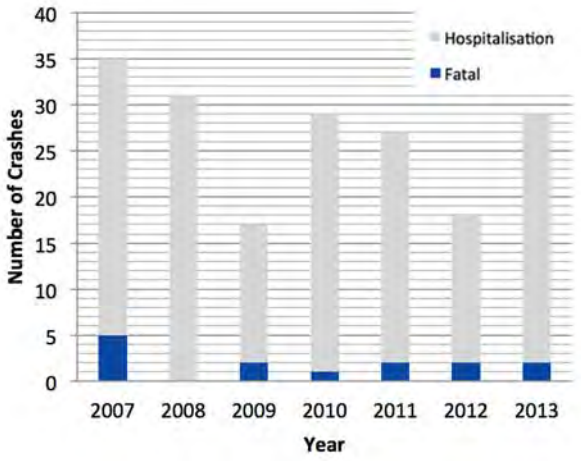


Chart 1: Mount Lindesay Highway FSI Crashes 2007 to 2013

This 'pilot project' forms part of a safety program that aims to recommend proven road safety treatments that can be implemented without major engineering works. Currently safety improvement projects along the Mount Lindesay Highway are captured in a number of programs including: Capital Works, Safer Roads Sooner and Black Spot programs. Whilst these programs generally respond well, they are reactive in nature and generally only address problem areas in isolation. The Mount Lindesay Highway Safety Review is different in nature due to its emphasis on community and stakeholder consultation and problem solving initiatives, and the integration between traditional engineering, behavioural and enforcement disciplines – a Safe System approach. A Safe System has the underlying philosophy that people will make mistakes and crashes will happen, so a road system in which the forces created by crashes are lower than the forces that can be absorbed by the human body needs to be provided. The ultimate aim is for a road transport system that is able to accommodate human error. While congestion reduction strategies are not within the scope of this project, the safety review considers the effects of the frustration due to congestion for road users as it manifests in risky behaviour as well as the type of crashes observed.

The review will help guide future funding requests and improvements for the highway. A key component of this report is recommendations for individual projects as well as 'mass action' programs - to improve the safety for all road users. These recommendations will be considered, prioritised and taken forward as appropriate to implement road safety interventions as part of TMR's short term works program/s.

2.2 Safe System

This safety review combines the inputs from community consultation, multi-faceted and cross-government technical inspections, behavioural analysis, enforcement considerations, and 'traditional' road safety data. Figure 1 depicts these inputs.

The Safe System approach to road safety has been adopted for this project as it underpins Queensland and national road safety strategies and action plans. This approach recognises that humans, as road users, are fallible and will make mistakes that will result in crashes. It requires that road infrastructure be designed to take account of these errors and vulnerabilities to reduce the risk of serious injury.

Further to embedding of the Safe System methodology within the project, TMR has modelled elements of the safety review project on the approach utilised successfully by RMS to audit a number of its highways. This process has allowed RMS to develop strong business cases to support the recommended initiatives and secure funding to deliver them. It is TMR's expectation that through the successful execution of the safety review - that combines the Safe System and RMS holistic safety review approach - that it too will develop a prioritised list of business cases that, if funded, will improve the safety of the Mount Lindesay Highway for all road users.

2.3 Terms of Reference

The basis of the safety review is to undertake a holistic assessment of the road environment, driver behaviour and enforcement along the highway. Items considered in this phase of the project include:

- Circumstances surrounding FSI crashes and casualty crash cluster locations.
- General road conditions along the highway.
- Historic information and road safety issues raised by the community.
- Future planning and growth along the corridor.
- Current issues associated with driver behaviour and fatigue. Current enforcement activities.
- Physical inspection of the highway to examine the road environment and suitability of current road safety treatments.
- Appropriateness of current speed limits and speed zones.

Figure 1: Safe System Approach

2.4 The corridor review process

The underlying objective of the safety review is to provide recommendations that could be used to complete a prioritised list of projects that, if funded, will improve the safety of the Mount Lindesay Highway. The review includes consultation to understand the issues and possible solutions from the community and stakeholders, engineering investigations of the corridor to help identify safety improvements, and communication with behavioural and enforcement specialists. The approach to this safety review was multidisciplinary and engaged people include Jacobs, Centre for Accident Research and Road Safety – Queensland (CARRS-Q) and TMR's road safety, planning, and asset maintenance areas. It also involved representatives from the Queensland Police Service (QPS), RACQ and the community. A holistic approach was adopted and the highway reviewed as a system following the methodology of the Safe System approach.

Key to the success of this safety review included undertaking the following activities:

2.4.1 Consultation

Community and stakeholder engagement was completed through a number of different mediums including:

- Social media (i.e. TMR's 'Join the Drive to Save Lives' Facebook and Twitter), refer to Figure 2 for an example.
- Online Survey.
- Community and stakeholder representation at the safety review stakeholder workshop.
- Field inspections with engineering, enforcement and technical specialists.

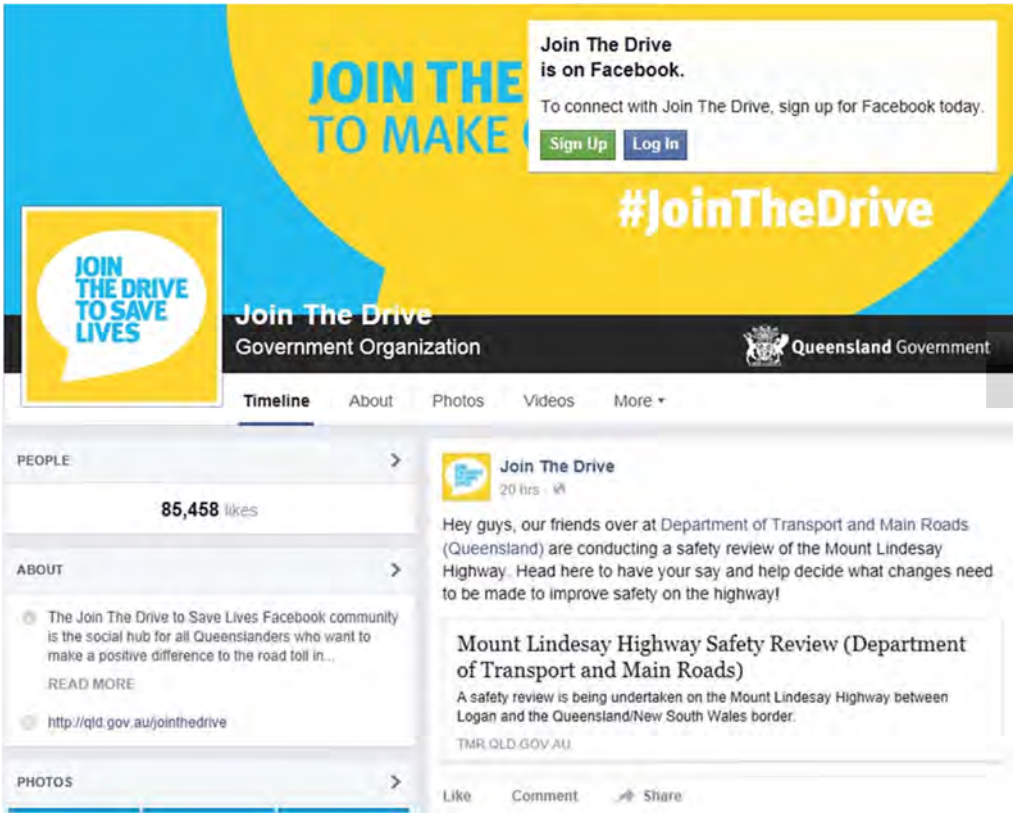


Figure 2: TMR's 'Join the Drive to Save Lives' Facebook post advertising the safety review survey

2.4.2 Engineering

Key to achieving a safe road environment requires appropriate treatments to make the road corridor as 'forgiving' as possible. The desktop and field based engineering review focused on opportunities to identify value for money high benefit treatments including but not limited to:

- Roadside hazard removal or protection.
- Intersection improvement and/or rationalisation.
- Linemarking, signage and delineation improvement.
- Wide centreline treatment.
- Overtaking opportunities.
- Shoulder sealing and widening.

A highway field inspection was undertaken on 26 August 2015. A team of road safety engineering, road user behaviour and asset management practitioners from TMR, local government, CARRS-Q and Jacobs undertook the inspection. Representatives from the QPS, RACQ and community members were also consulted prior to undertaking the field inspection.

The team inspected the locations of some fatal crashes and crash clusters to discuss the contribution of road corridor factors to the crashes. The team also reviewed other road environment issues that were observed or raised during the consultation process.

The analyses and highway inspection was undertaken as part of the review included:

- Identification of crash trends such as severity, crash type and crash factors from available crash data.
- Review of information provided at the community consultation workshop and through the online survey.
- Physical inspection of the highway by the project team to examine possible road environment contributing factors.

2.4.3 Behavioural program

As part of the holistic and multi-disciplinary approach taken for the safety review, specialist assistance to link back to existing TMR campaigns was undertaken by the project team that included CARRS-Q. In particular, CARRS-Q provided strategic advice to modify both the stakeholder workshop and online survey to improve the opportunity to receive responses that also included behavioural information.

Representation between the project team and key TMR staff allowed for:

- Acknowledging the contribution driver behaviour and enforcement issues have along the corridor such as tailgating, impatience, not driving to conditions, speeding and fatigue.
- Alignment with road safety education campaigns.
- Understanding of the current state of driver fatigue reviver areas and the rest area expansion program.

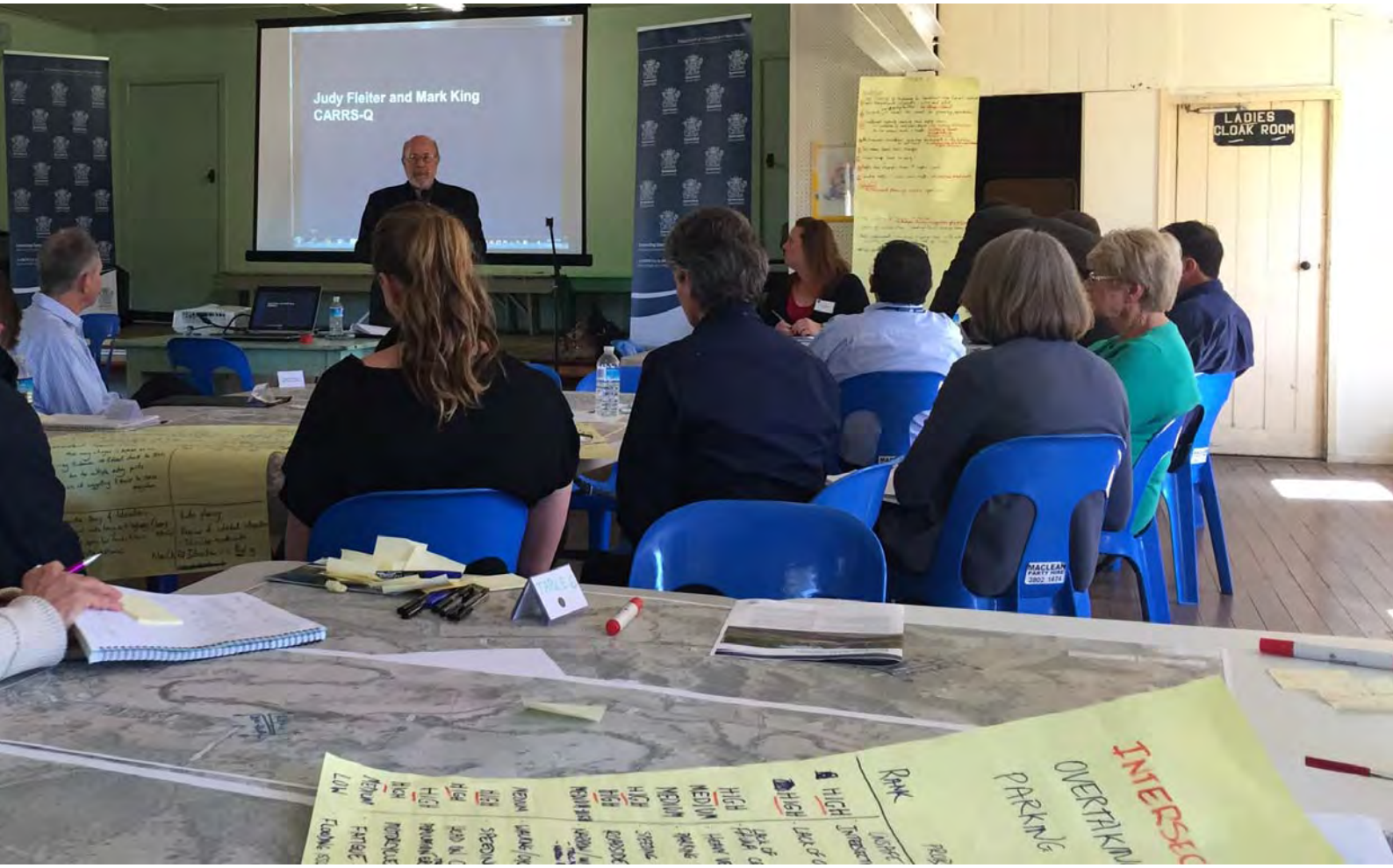
2.4.4 Enforcement program

The safety review project was another forum for TMR staff to interact with QPS officers to understand the issues and opportunities with enhancing QPS' ability to influence the safety of road users.

Discussions between TMR and QPS during the stakeholder workshop included:

- Increasing the profile of road safety education campaigns (i.e. 'fatal five').
- Discussion on possible locations for speed cameras and/or 'point to point' speed cameras.
- Discussion on locations for enforcement (e.g. enforcement bays).
- Maintaining and strengthening the existing partnership with road asset owners.

3. Community and Stakeholder Engagement



A key component of the safety review is the engagement of key stakeholders and the community. Prior to the highway field inspection, stakeholders and the community were invited to comment.

To maximise the opportunity to receive feedback on user experiences, a number of different mediums were used. In addition to traditional feedback channels (phone, letter and email), social media, an online survey, a stakeholder workshop and a technical field inspection were used to provide the opportunity for issues to be raised and suggestions to be made. Table 1 below details the feedback received for the safety review. Contact was also made with key stakeholders requesting that they communicate with their respective organisations, to publicise the online survey and collate feedback from their groups for discussion at the workshop. All workshop participants were able to discuss issues of concern and were also able to actively input into targeted solutions.

Method of feedback	Number of submissions
Online survey	280
Email/letter	21
Social media	12
Phone call	2

Table 1: Safety Review - Telephone and Written Submissions Received

3.1 The corridor review process

The objective of the community and stakeholder engagement was to:

- Inform the key stakeholders and wider community about the safety review.
- Gain an understanding of the local issues relating to road safety along the various segments of the Mount Lindesay Highway.
- Manage community expectations.
- Use the feedback gathered from all sources to inform and assist with the formation of recommendations.

3.2 Online Survey

The project team produced an online survey for the community to provide feedback. The survey included questions designed to gather information on issues of concern with location data for these issues captured via an interactive map. The online survey provided the opportunity to learn about what is important to the community, and thus gather meaningful opinions, comments, and feedback. Figure 3 shows the electronic online survey.

Once closed, the survey results assisted with the determination of similar issues and potential opportunities for the aggregating of items in the key study areas of behavioural, engineering and enforcement.

280 submissions were received through the online survey during the six week public consultation period that closed on 23 August 2015. The project team compiled and analysed the submissions. Figure 4 shows a ‘heat-map’ of the number and issue location for the online and social media submissions.

One of the themes from the respondents was the concern around the adequacy of a historically old road becoming increasingly unable to cope with its current demands, together with the traffic pressures it will inevitably be expected to support through higher levels of urbanisation. Specifically, how parts of the Mount Lindesay Highway will operate safely and efficiently with the addition of the significant demands of Flagstone and the expanding satellite city of Yarrabilba.

While the majority of the highway operates generally well outside peak periods, many submissions prioritised the need to address general congestion and the lack of safe merging, turning and overtaking facilities, especially at peak times but also at particular locations. A summary of the main trends and issues raised by respondents include wide-ranging behavioural and road design factors are presented below:

3.2.1 Behavioural factors and Enforcement

- Congestion and the inability to enter the highway from various intersections causes driver frustration and aggression, in-turn causing drivers to make risky decisions.
- Drivers are reported to be using turning lanes as overtaking lanes due to congestion.

Photograph 2: Information sharing at the facility workshop, Woodhill Community Hall August 2015

- Drivers, particularly those towing horse floats and caravans, should be considerate to other motorists and pull over to allow them to pass. This is hampered due to limited opportunities to do this.

- An increase in motorcycles (especially recreational riders on weekends) was seen as a potential safety issue.

3.2.2 Engineering treatments

- Overwhelming view of inadequate provision for turning traffic as well as road capacity during peak periods. Duplication/additional lanes, increase in lane, bridge and shoulder widths considered a priority both now and into the future to cope with continuing growth.

- Congestion at intersections during peak periods that is leading to motorist's frustration and, in turn, risky decisions.

- Sharing the road with trucks is unsafe at some locations because of inadequate safe passing distances combined with a lack of shoulder width.

- Road geometry (i.e. tightness of corners) in some locations may take some drivers by surprise.

- Improvements to sign consistency and calls for more signage in specific locations, particularly alerting drivers to slower traffic entering the highway, changing road geometry and signalling upcoming turn-offs and concealed driveways.

- Treatment of school zones (i.e. signage, speed zone, congestion in and out of schools, parking, pedestrian crossings and vehicle movements) needs rationalisation to provide consistency along the link.

- General maintenance of road surface, edge condition, vegetation management and signs, linemarking and delineation was raised as a concern.

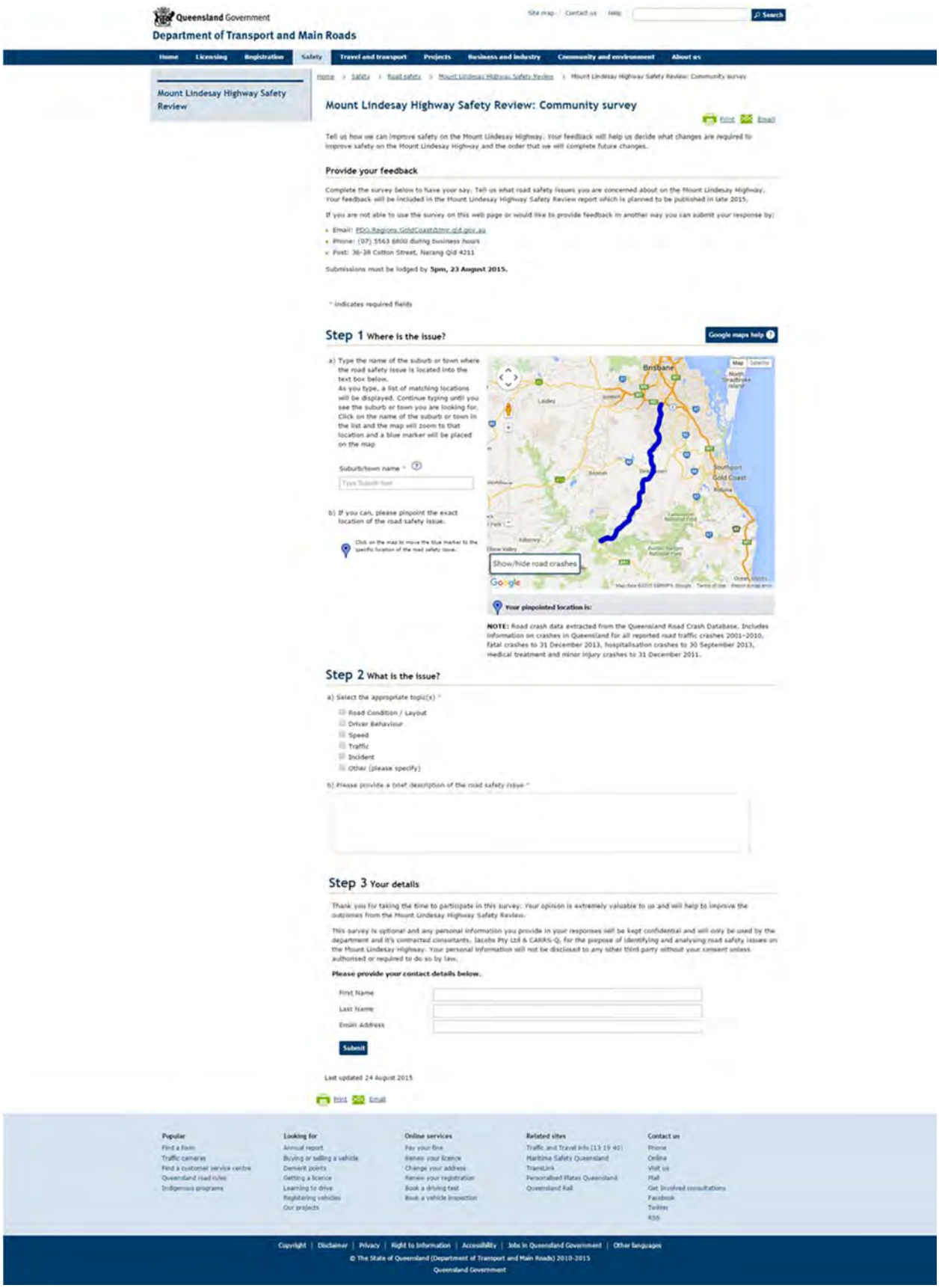


Figure 3: Mount Lindesay Highway Online Survey

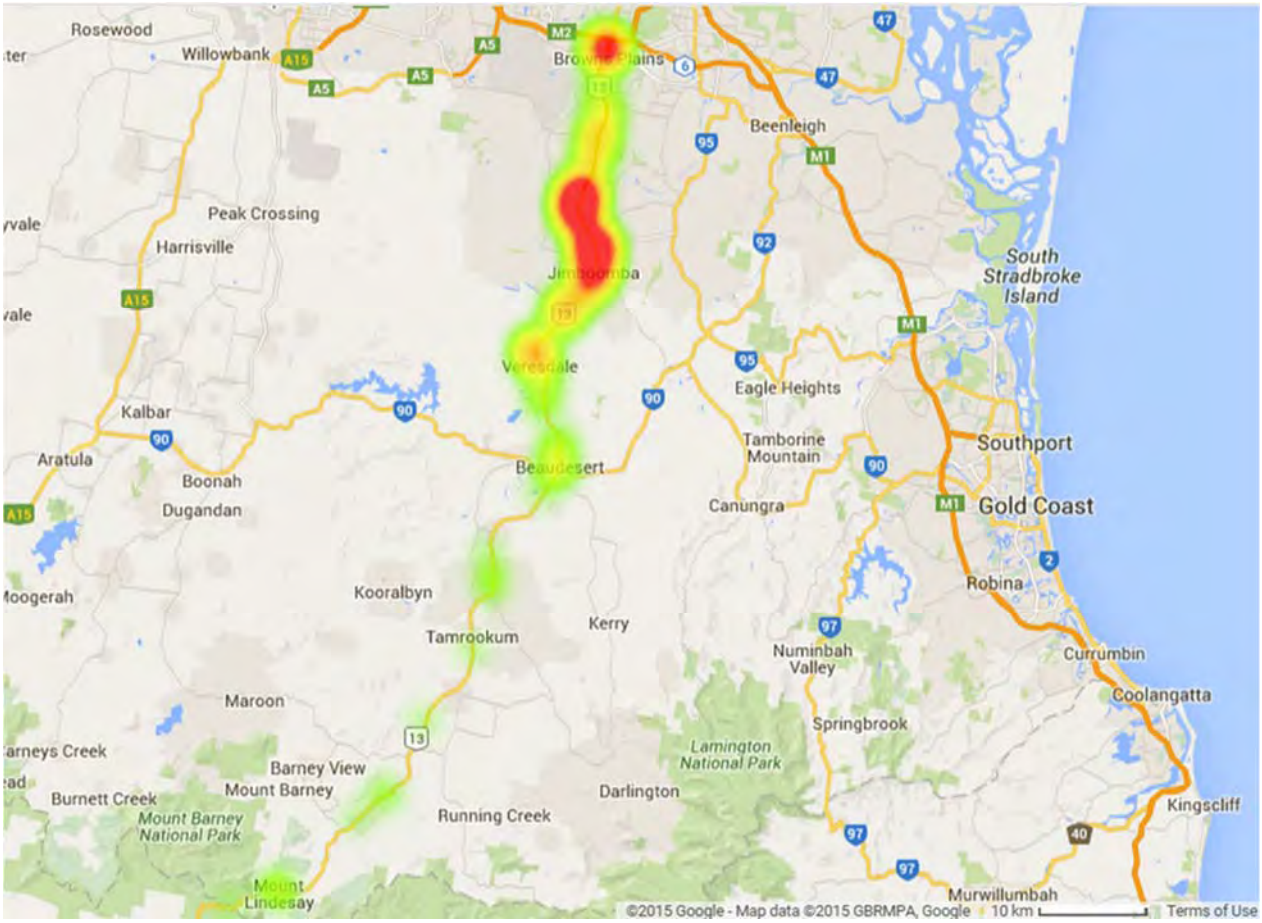


Figure 4: Heatmap for Mount Lindesay Highway showing Social Media and Online Survey Submissions

3.3 Stakeholder Workshop

A major component of the safety review was the facilitated stakeholder workshop. The workshop provided a high level of engagement from stakeholders, and a forum for the attendees to voice their personal concerns and the concerns of those they represented. Additionally, the initial findings of both the desktop crash data analysis and the online survey were presented by the safety review team. The workshop successfully brought together 49 key stakeholders including Members of Parliament and local councillors from Logan City Council and Scenic Rim Regional Council, environmental and community group representatives, as well as members of the QPS, the RACQ, transport operators and representatives of local school communities.

The stakeholder workshop, facilitated by the safety review team, was held on Thursday 13 August 2015 at the Woodhill Community Hall (refer Photograph 3 for an example of feedback gathering).

The workshop was conducted as a series of round table discussions with each table focusing on different sections of the highway.

Stakeholders then rotated through all tables to ensure everyone had a chance to comment on all sections of the highway.

Photograph 3: Example of Feedback and Working Groups from the Stakeholder Workshop

The active participation of the broad and diverse stakeholder group ensured a number of potentially sensitive issues were identified and discussed openly and respectfully. This overwhelming spirit of goodwill and positivity continued throughout discussions, focusing on the possibility of immediate, short-term solutions to improve the operational safety and efficiency of the Mount Lindesay Highway. A 'heat-map' of the location of the issues raised at the stakeholder workshop is shown in Figure 5. Of interest is that both the online survey ('heatmap' Figure 4) and the feedback from the stakeholder workshop ('heatmap' figure 5) show a strong grouping of issues towards the northern end of the highway (i.e. the Logan to Beaudesert section). The Logan to Beaudesert section also carries the most traffic. A grouped summary of the main issues raised by stakeholders at the workshop are presented below:

3.3.1 Connectivity, operational safety and engineering treatments

- Acknowledging the highway's significant operational and geographical differences between its urban, semi-rural and rural sections. Given these differences, it is neither possible nor feasible to adapt a single solution to the entire corridor.
- The Logan end performs a different transport function and carries far greater traffic volumes than the highway's central and southern sections combined.
- A service road network is needed to connect to interchanges for safer cross-highway travel and to keep local trips on local roads.
- Channelised turning lanes at major intersections.
- Acceleration/deceleration lanes could help traffic flow from the surrounding local network, but not without significant intersection treatments to help improve merges.
- Better quality road shoulders.
- Grade-separated intersections needed at major bottlenecks (ultimate solution).
- Signalisation is an option to improve safety for congested intersections however, in certain sections, is not viewed as a preferred treatment due to it being at odds with a 'highway' standard.
- Improvement required for both the quality and consistency of signage and linemarking.

Photograph 4: Working groups at stakeholder workshop, August 2015

3.3.2 Driver Behaviour, Compliance and Administrative controls

- Poor driver behaviour including excessive speed (especially at school zones).
- QPS requested more safe opportunities to conduct enforcement (i.e. poor road shoulders and lack of safe stopping areas).
- Inconsistent speed zone to the corresponding roadside environment, especially towards the Logan end of the highway where it is more urbanised.
- Driver awareness and behaviour along the corridor needs to improve, as drivers are failing to modify their behaviour to suit the prevailing road or traffic conditions.
- Reiteration of *The Fatal Five*: speeding, driving tired (fatigue), drink and drug driving, driver distraction and seatbelts and restraints.

3.3.3 Latent Demand

- Lack of provision for pedestrians to reach trip generators such as schools and local shopping centres.
- Limited alternative local transport options other than private vehicle or local infrequent bus service.
- Limited pedestrian or cycling connectivity.

- Limited provision for ‘Park ‘n Ride’ or immediate plan to adapt the Brisbane to Sydney rail corridor to enable trips between metro areas (ultimate solution).

3.3.4 Planning

- Perception of a lack of integrated, long-term transport planning between local, state and federal governments.

- Infrastructure and public transport not keeping up with land use planning, creating sprawl and entrenching car-dependence.

- In finding safety related solutions for the Mount Lindesay Highway, an important point was raised not to concentrate solely on trying to resolve peak congestion, as outside these times the Mount Lindesay Highway corridor operates relatively well and provides its intended transport function. It was discussed that better cooperation across government will help ensure proposals are coherent and integrated, and any proposed improvements keep pace with the surrounding land use and residential developments.

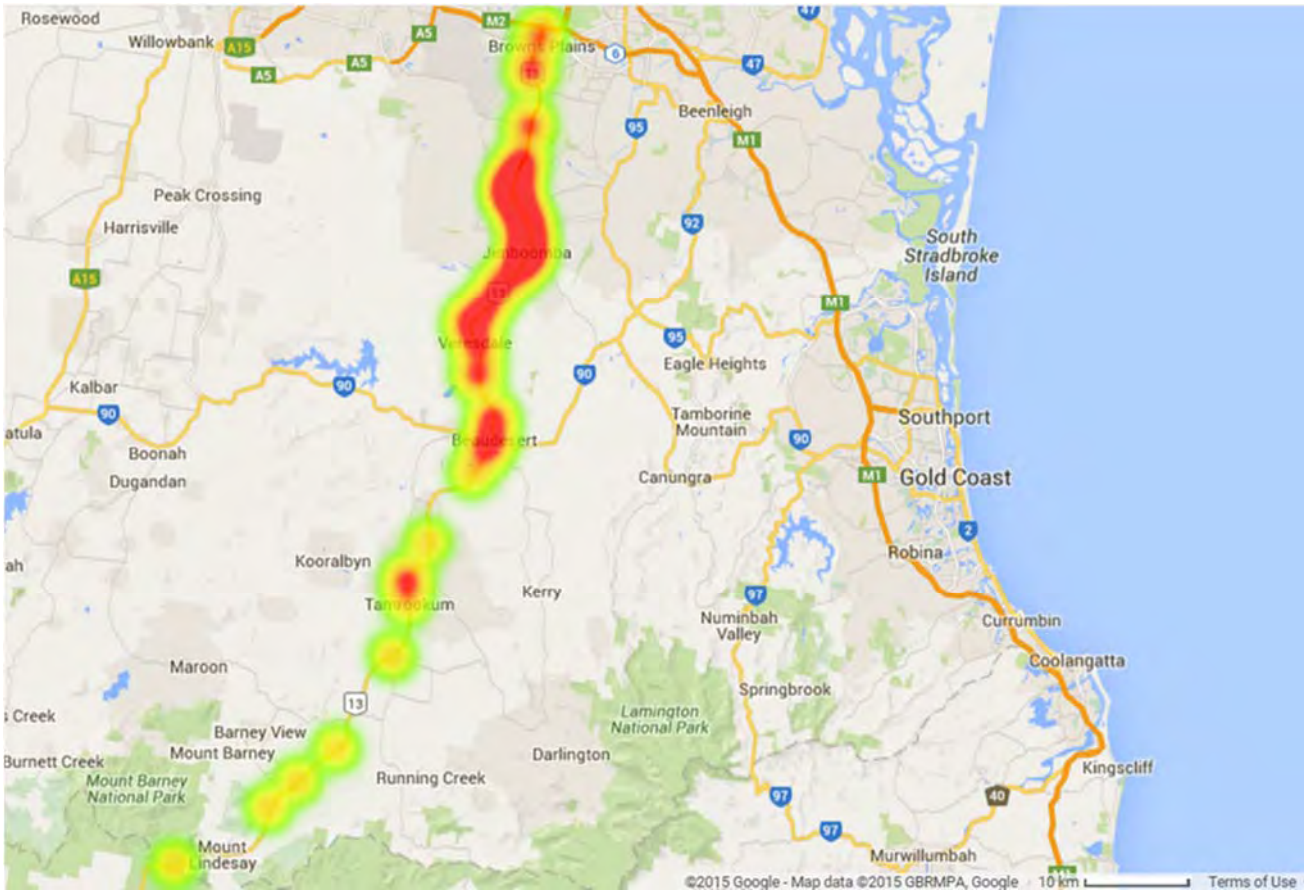


Figure 5: Heatmap for Mount Lindesay Highway showing locations of Stakeholder Workshop Issues and Suggestions

3.4 Technical Field Inspection

A key component of the review was the on-site inspection of key areas along on the highway. The inspection was conducted to confirm and finalise the project team’s understanding of the issues raised from the desktop analysis of the data and feedback received from the various mediums (e.g. stakeholder workshop, online survey, etc).

Technical representatives from Jacobs, Logan City Council, Scenic Rim Regional Council accompanied the project team on the corridor site visit on 26 August 2015 and provided feedback of relevant issues during the inspection.

The field inspections were determined by the:

- Location of crash clusters;

- Location of fatal crashes;

- Previous knowledge of road safety issues;

- Safety issues and locations identified by the community during the consultation period.

The evaluations included the major intersections of Stoney Camp Road, St Aldwyns Road, Wearing Road, Greenbank Road, Round Ridge Road, Cedar Grove Road, Allan Creek Road, and Boonah–Rathdowney Road.

The technical officers also examined the corridor, traffic volumes, geometry and operational status of the highway as far south as Boonah-Rathdowney Road, between Rathdowney and Palen Creek (an example of the inspection of a bus facility is shown in Photograph 5).

Information and observations from the technical inspection group has been considered and as appropriate incorporated into the recommendations.

Photograph 5: Technical Field Inspection example showing group discussion relating to a newly installed Bus Shelter on the highway

4. Highway Data and Information

The Mount Lindesay Highway provides a north-south link between northern New South Wales and Brisbane. Due in part to the extremes in topography and level of urbanisation, the alignment and pavement width vary substantially over the length of the highway. A better alignment, including wider pavement and road shoulders of the highway, is towards the northern, Logan end. The Logan end of the highway carries the greatest amount of traffic. The southern end of the highway towards the New South Wales border has a poorer alignment and generally narrower pavement. The border crossing also has a substantially lower observed traffic volume than that of the northern end.

4.1 Traffic Types and Volumes

The Mount Lindesay Highway can be described as having three main road types (Urban, Semi-Rural and Rural) and two traffic volume sections with the major section being Logan to Beaudesert and the minor being the Beaudesert to New South Wales border section.

The traffic volumes substantially reduce at Beaudesert and continue to reduce to the New South Wales border. The average number of commercial vehicles using the highway reduces substantially from the north to the south.

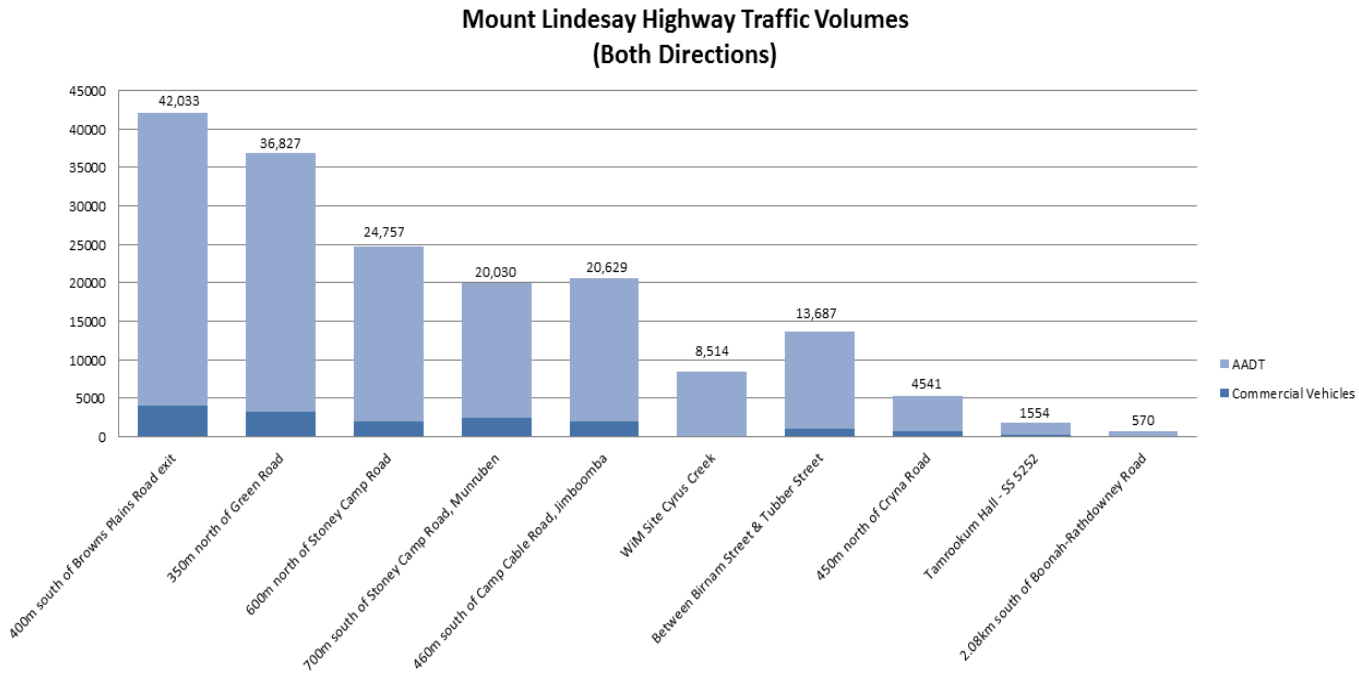


Chart 2: Mount Lindesay Highway - Annual Average Daily Traffic (AADT) Counts – Both Directions 2014
(Note: Heavy Vehicle Data not available for WiM Site Cyrus Creek)

The chart shows the 2014 Annual Average Daily Traffic (AADT) counts for the highway for Logan to the New South Wales border

4.2 Existing Speed Zones

The number of speed zones for Mount Lindesay Highway reflects the amount of both adjacent and off-corridor development to the highway, proximity of schools, as well as historic safety issues at a number of intersections. A recent speed zone review was undertaken for the Logan to Beaudesert section and some rationalisation of speed zones was undertaken. Chart 3 details the length of different speed zones for the highway's two main segments.

Photograph 6: Cedar Vale Intersection

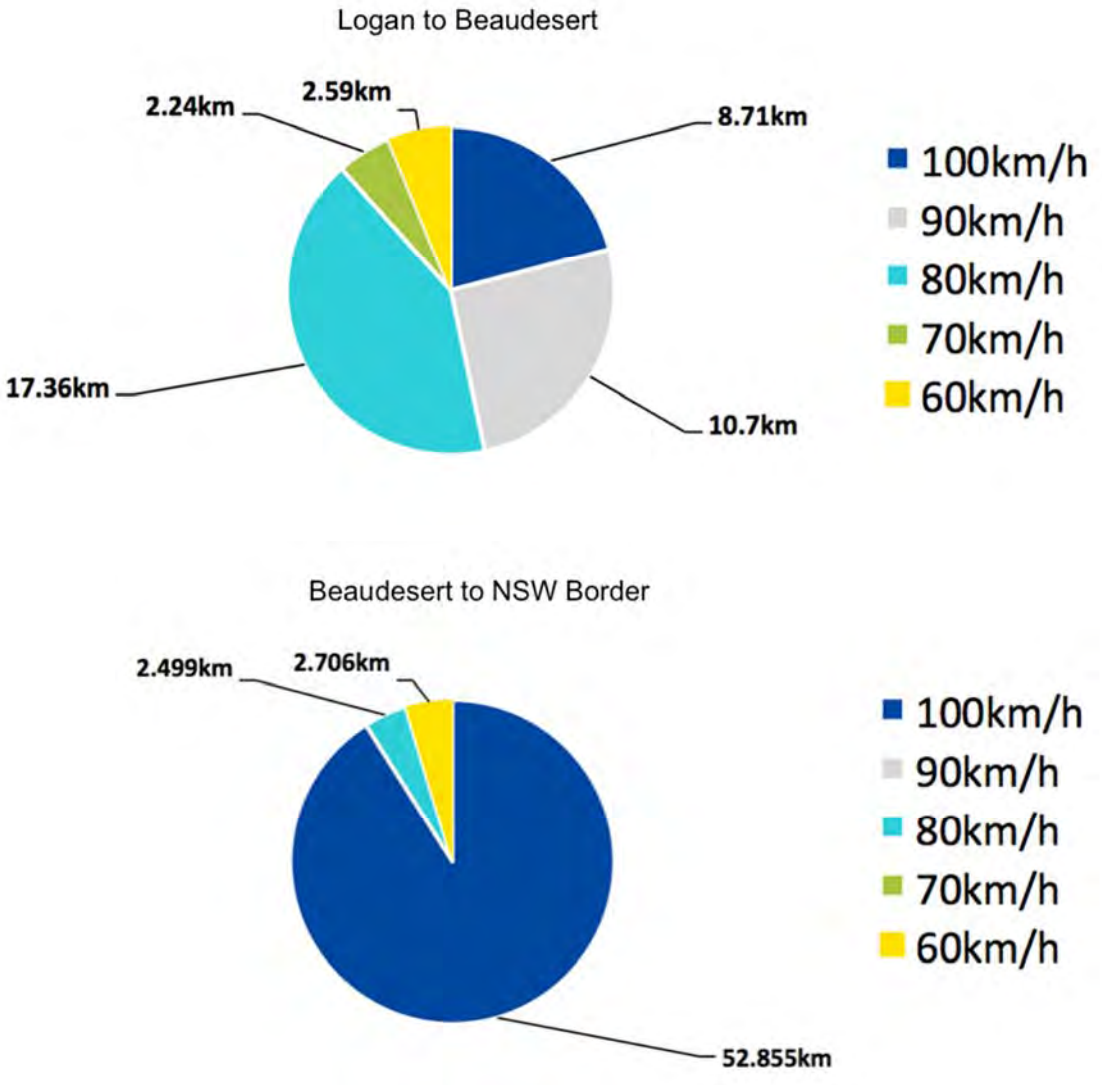


Chart 3: Mount Lindesay Highway – Speed Zones by Length

5.Crash Data and Analysis

5.1 Definitions

Crash data used by TMR only include those crashes that conform to the Australian National guidelines for classifying and reporting road vehicle crashes. For a crash to be included in the dataset, the main criteria that must be met are:

1. The crash occurred on a public road, and
2. A person was killed or injured, or
3. At least one vehicle was towed away, or
4. The value of property damage was:
    a) $2500 damage to property other than vehicles (after 1 December 1999);
    b) $2500 damage to vehicle and property (after 1 December 1991 and prior to 1 December 1999);
    c) $1000 damage to property (prior to 1 December 1991).

Note: crashes resulting from medical conditions or deliberate acts are excluded.

5.1.1 Crash and casualty definitions

- Fatal crash – A road traffic crash where there was at least one fatality.
- Hospitalisation – A road traffic crash which resulted in the most severe casualty being a hospitalised casualty.
- Medical Treatment – A road traffic crash which resulted in the most severe casualty being a medically treated casualty.
- Minor Injury – A road traffic crash which resulted in the most severe casualty being a person with minor injuries (that is, an injury requiring no medical treatment, requiring first-aid treatment only or extent of injury unknown).
- Property Damage – A crash which resulted in a crash where no person was a fatality or injured casualty and,
    - at least one vehicle is towed away, or
    - there was $2500 damage to property other than vehicles.
- Definitions for Coding Accidents (DCA) – asystem for classifying crash types based on the movement of units prior to the collision. The DCA crash types are defined in the Australian Road Research Board Report ARR227, July 1992.
- The crash data reflects the differing character of the highway with a greater proportion of crashes occurring on the Logan to Beaudesert section, and the types of crashes generally reflective of the roadside environment and traffic volumes.

Table 2 represents the most current crash information (at time of reporting). It presents the reported road traffic crashes along the Mount Lindesay Highway for:

- Fatal crashes: 1 January 2007 to 31 December 2014.
- Hospitalisation crashes: 1 January 2007 to 31 December 2013.
- Non-serious casualty (medical treatment and minor injury) crashes: 1 January 2007 to 30 June 2012.
- Property damage only crashes: 1 January 2007 to 31 December 2010.

5.2 Crash data and interpretation

Over the eight year period from 2007-2014[2] 370 casualties have been reported from 493 crashes on the Mount Lindesay Highway. Of the 370 casualties, 15 people were killed.

Notably, alcohol-related crashes represent just over half of all the fatal crashes that occurred on the corridor between 2007 and 2014 (8 of the 15 fatal crashes).

[2] Represents the most current road crash data between 1 Jan 2007 to 31 Dec 2014. Data for all reporting categories are not complete during this period due to availability of information and changes to data collection / reporting methods.

	2007	2008	2009	2010	2011	2012	2013	2014
Fatal	5	0	2	1	2	2	2	1
Hospitalisation	30	31	15	28	25	16	27	-
Medical Treatment	25	22	27	17	25	17(P)	-	-
Minor Injury	12	12	12	12	12	2(P)	-	-
Property Damage	29	26	30	26	-	-	-	-
Total Fatal	5	0	2	1	2	2	2	1
Total FSI	35	31	17	29	27	18	29	-
Total Injury	67	65	54	57	62	35(P)	-	-
Crash Total	**101**	**91**	**86**	**84**	**64**	**37**	**29**	**1**

Table 2 Severity and Number of Recorded Crashes for Mount Lindesay Highway (2007 to 2014) $N^{(total)}$=493, (P)=Part Data (i.e. crash data for full 12 month period not available)

The character of the highway is further understood through the study of the crash location and the type of crash via DCA code. The crashes and main DCA categories are presented in Table 3. As shown, the highways main road segments Logan to Beaudesert and Beaudesert to the New South Wales border have different observed crash characteristics due (in-part) to a combination of road function, traffic volumes, peak demand, and speed zones.

The highway segment between Logan and Beaudesert's highest crash category was for vehicle travelling in the same direction and occurred in the vicinity of intersections, whilst the segment between Beaudesert and the New South Wales border was for 'vehicles off road on curve' and generally involved single vehicles.

Photograph 7: Quarry traffic using Allan Creek Road Intersection

	Logan to Beaudesert		Beaudesert to New South Wales Border	
DCA TYPE	Count	% of Total	Count	% of Total
Pedestrian	12	3%	0	0%
Intersection(Second)	76	18%	2	3%
Opposing Direction(Third)	67	16%	6	9%
Same Direction(First)	**118**	**28%**	6	9%
Manoeuvring	24	6%	1	1%
Overtaking	4	1%	3	4%
Obstruction on Path(Equal Second)	19	4%	10	14%
Off Road on Straight(Equal Second)	62	15%	10	14%
Off Road on Curve(First)	40	9%	**29**	**42%**
Passengers and Misc.	2	0%	2	3%
Total	**424**	**100%**	**69**	**100%**

Table 3: DCA Crash Types Mount Lindesay Highway (2007 to 2014) and Top Three Categories for each Road Segment $N^{(total)}$=493

Due to the differing nature of the traffic volumes, road corridor (e.g. urbanisation) and speed environment for Logan to Beaudesert and Beaudesert to the New South Wales border, key recommendations have been tailored for these varying road segments.

A 'heatmap' of the number of crashes along the Mount Lindesay Highway is shown in Figure 7. There is a higher concentration of crashes in the Logan to Beaudesert road segment with 424 crashes compared to 69 for the Beaudesert to New South Wales border segment.

Photograph 8: Round Ridge Road Intersection

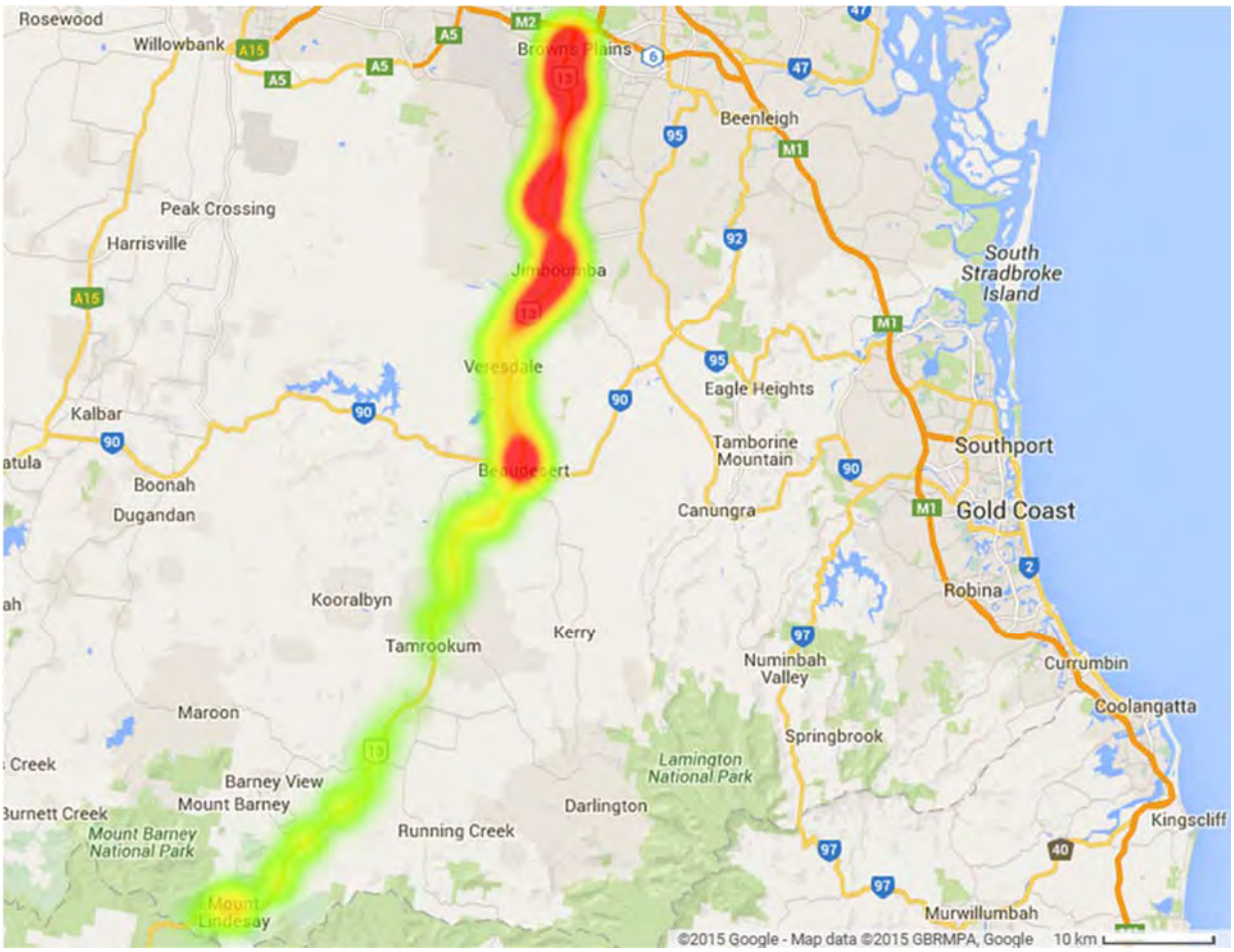


Figure 6: Heatmap for Mount Lindesay Highway Crash Data (2007-2014) $N^{(total)}$=493

5.3 Features of recorded crashes

The following series of pie charts present different features of the crash data. The data is shown for the two road segments of the highway (Logan to Beaudesert and Beaudesert to the New South Wales border) due to there being a clear difference in the traffic volumes and types of crashes observed in the data.

As can be seen in Chart 4, 66% of crashes involved more than one vehicle for the Logan to Beaudesert segment, whilst for the Beaudesert to New South Wales border segment, 64% were single vehicle crashes. This is a reflection of the amount of traffic on the more northern section where the majority of the crashes are rear end, turning, or opposed crashes. The southern section's predominate crash type is single vehicle off road.

Chart 5 presents the number of crashes for each of the main DCA crash categories. For Logan to Beaudesert, over half of the crashes are related to intersections, whilst for Beaudesert to New South Wales border, over half are related to a vehicle leaving the road

Chart 6 shows the apparent over representation of motorcycle crashes that have occurred on the Beaudesert to New South Wales border section. In addition the majority of these crashes on the Beaudesert to New South Wales border section occurred on weekends and are likely to be recreational motorists unfamiliar with the road network.

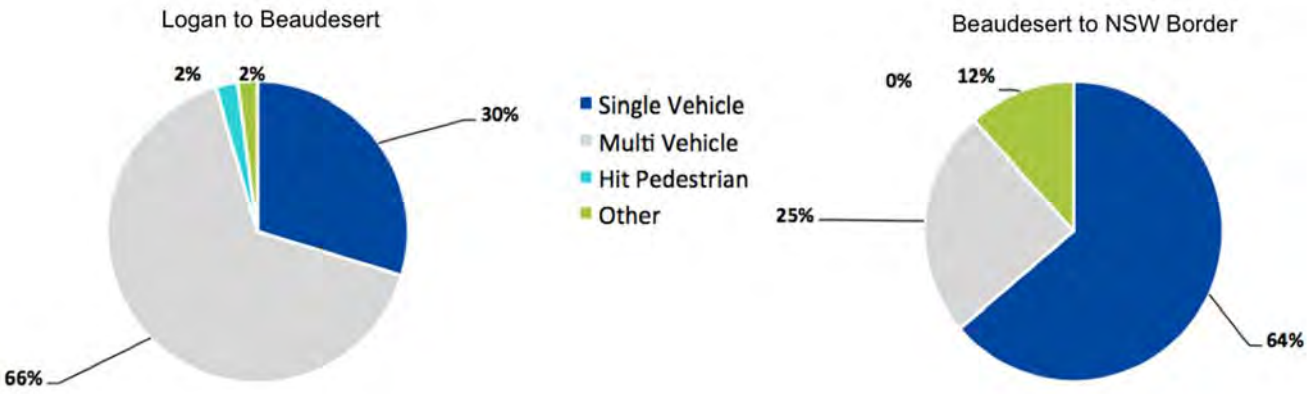


Chart 4: Mount Lindesay Highway Percentage of Crashes by Number of Vehicles Involved

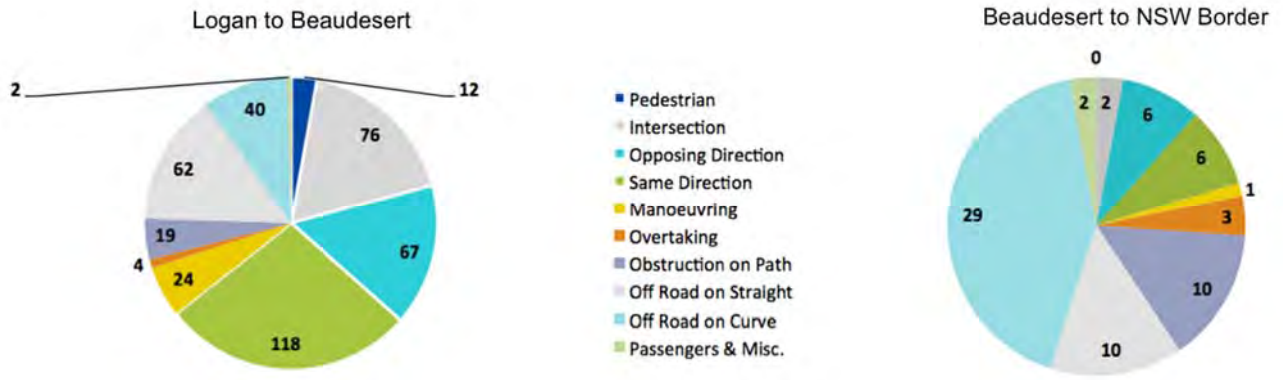


Chart 5: Mount Lindesay Highway Number of Crashes by Crash Type ($N^{(total)}$ = 493)

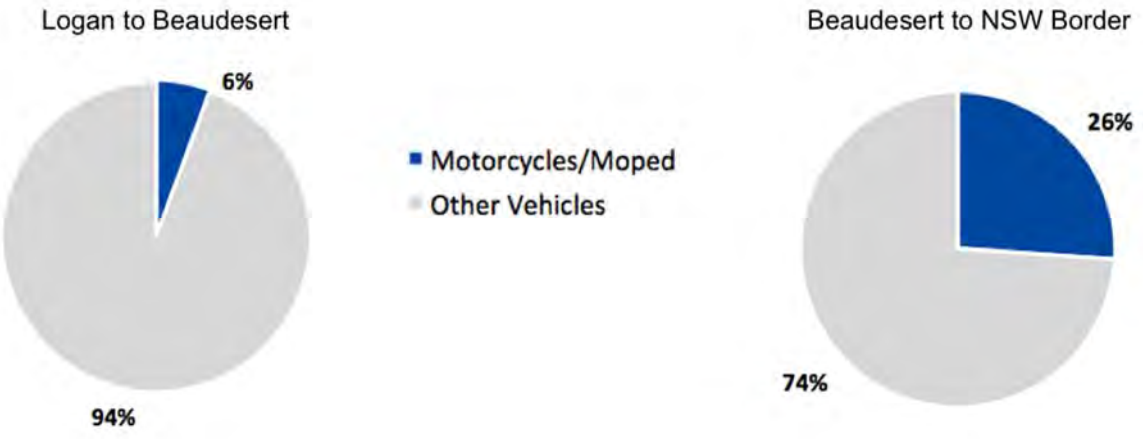


Chart 6: Mount Lindesay Highway Percentage of Crashes Involving Motorcycles ($N^{(total)}$ = 493)

6.Key Issues and Recommendations

6.1 Intersections

The age of the Mount Lindesay Highway and the development that has occurred over time - both adjacent and connecting to the highway - has resulted in a 'needs based' reactive approach to the upgrading of individual intersections.

A common issue experienced by road users is the inability at some locations along the highway to provide a reasonable 'level of service' during peak times. Congestion reduction strategies are not within the scope of this project. There are observed effects of the frustration due to congestion for road users in both their 'trade-off in risk' behaviour as well as the type of crashes observed. These effects are considered within the recommendations and are consistent with the overarching 'Safe System' approach.

From a road user perspective, the highway presents a myriad of different intersection treatments over the 100km length. General comments and proposed recommendations for the different intersection classes are found below.

Mount Lindesay Highway intersections are many and varied along its length due to the age and function of the highway. The intersection treatments currently utilised include:

Photograph 9: Signage near Greenbank Road Intersection

6.1.1 Traffic Signalisation

Description: Traffic signals provide control by separating conflicting vehicle movements on a time basis.

Advantages: Provides gaps in traffic flows to allow side street access to major direction flow and improved safety for pedestrians and cyclists.

Disadvantages: Inter peak and out of peak delays can be unreasonable. Traffic signals can only be installed on roads with posted speeds up to and including 80 km/h.

6.1.2 Staggered T-intersections

Description: Staggered T-intersections are used as a safer alternative to four-way unsignalised intersections.

Advantages: Conflict points (involving through movements from minor legs) generated by staggered T-intersections are deemed to be safer than those generated by 4-way intersections.

Disadvantages: Can be expensive especially for treatments requiring 3rd party land takes due to corridor constraints associated with long acceleration lanes.

6.1.3 Channelised Intersections – Type CH

Description: Conflicting vehicle travel paths are separated by raised, depressed, or painted medians and/or islands. Auxiliary lanes are often used in conjunction with channelisation.

Advantages: Appropriate where turning traffic movements are heavy, multi-leg intersections, improvement to safety when an intersection is shown to be susceptible to a particular crash type (e.g. opposing side swipe, right turn opposing and high speed rear end collisions).

Disadvantages: An expensive form of at-grade intersections and therefore may be cost prohibitive.

6.1.4 Intersections with Auxiliary Lanes – Type AU

Description: Short lengths of auxiliary lanes allow traffic to bypass a vehicle waiting to turn right.

AUR turn treatments are not beneficial, especially when compared to CHR treatments and are now being phased out where practical.

6.1.5 Basic Intersection Turn Treatments – Type BA

Description: A widened shoulder allows through vehicles to pass turning vehicles.

Advantages: Simplest at grade layout that is designed to be as compact as possible. It is most

appropriate when the volume of turning traffic and through traffic is low.

Disadvantages: BAR type intersections record a Rear-End-Major vehicle crash rate 52 times higher than do CHR type treatments (Arndt 2004).

6.1.6 Interchanges

The interchanges appear to be designed for a lower design speed than a highway standard (i.e. highway design speed generally 110km/hr design speed for 100 km/hr posted speed limit). It has been reported that traffic is queueing onto the highway from some exit ramps during peak periods. Additionally side friction caused by entering traffic to the highway from entry ramps is adding to the congestion experienced during peaks and a number of crashes have occurred at these locations. Improvements to both safety and congestion can be gained by instigating a 'Managed Motorways' approach and ramp metering for on-ramps could be considered.

An observation from the safety review team is that the behaviour of traffic at all of these locations during peak times (either through traffic counts, or temporary mobile cameras) should be confirmed to ascertain if traffic is queueing onto the highway, or unsafe behaviours are exhibited with traffic merging onto the highway. If this is the case, consideration for the following site-specific approaches should be given:

1. Investigate the current phasing for the 'off highway' traffic signal intersections; with the view to find the optimum balance between the safe operation of the highway ramps and these intersections.

2. Investigate the opportunity to provide additional storage on the exit ramps via the extension of the existing ramps.

3. Consider the installation of Variable Speed Control (VSC) on the approach of the at-grade intersections with a 'plan' to be evoked during peak times that reduces the speed limit.

4. Investigate the opportunity to improve off highway connectivity via service roads to allow 'local' trips to remain on local roads.

5. Consider additional opportunities for the provision of emergency breakdown bays. The placement of these new facilities should consider that they could also be utilised for enforcement.

6. Consider ramp metering to assist with the management of congestion during peak periods. This will require extension of ramps to manage queuing and acceleration.

Photograph 10: Observed traffic mix on highway

6.1.7 Site Specific Intersections

It was reported (and is evidenced in the crash data) that as traffic volumes increase, treatment of the at-grade intersections is becoming more critical to maintain the safety for all road users. A common issue for a number of the at-grade intersections on the northern section of the highway is that during peak periods the opportunity to join the highway from side roads/streets is becoming extremely difficult due to factors such as:

- Little or no centre median storage;
- Road geometry as it relates to visibility;
- The approach traffic speed;
- The 'busyness' of the intersection (i.e. bus stop proximity, pedestrians, multiple vehicles stored or turning, etc);
- Shielding of turning vehicles behind larger vehicles;
- The challenge of new development pressures to the network;
- Differential speed between the entering and highway traffic; and
- A limited number of available 'gaps' in the highway traffic stream.

In addition, due to the multiple different at-grade intersection treatment types, highway users are required to have a higher level of alertness - especially first-time or non-regular users of the highway. This inconsistency of treatment types leads to unexpected road user behaviour, creating a less than optimum road safety environment.

Observations from the project team include:

1. Further investigate driver behaviour at individual intersection via temporary mobile cameras.

2. Consider the standardisation of treatments for sections (along the highway) that have similar traffic volumes on the highway.

3. Consider deceleration slip lane 'wide painted island' treatments as currently being trialled on the Warrego Highway (Brisbane to Toowoomba) segment.

4. For intersections affected by congestion during peak periods, consider a staged approach to the upgrading of individual locations – commencing with dedicated channelised treatments through to traffic signal installation prior to grade separation.

5. Investigate the opportunity to utilise service roads, combine closely spaced intersections, close medians and reduce the number of at-grade intersections along the highway.

6. Investigate the opportunity with relevant councils to improve off-highway connectivity via the local road network to allow 'local' trips to remain on local roads.

7. Provide additional enforcement opportunities to enhance driver behaviour with respect to speed management.

8. Undertake full intersection traffic counts to assist with the prioritisation of potential upgrades.

Based on operational efficiency and/or demonstrated crash history, the following locations are recommended for further investigation:

1. Cedar Grove Road / Cedar Vale Road

    a. The issue: The acceleration lanes are relatively short for a vehicle to accelerate up to a speed similar to the through traffic of Mount Lindesay Highway. A large speed differential increases the risk of vehicular conflict.

    b. Crash history suggests angle type crashes were common at this location.

    c. Recommendation: Consideration of upgrading the intersection by increasing the length of the acceleration lanes or installing traffic signals depending upon relevance to future planning projects.

2. Round Ridge Road

    a. The issue: There are no right turn treatments provided for this intersection (current situation appears to be an AUR), there appears to be limited visibility due to the approach side street being located on the inside of the curve, and there is a bus stop in close proximity to the intersection.

    b. Crash history suggested that rear ends were common in this location.

    c. Recommendation: Provide CHR and investigate the opportunity to relocate the bus stop.

3. Camp Cable Road

    a. The issue: The intersection is operating at capacity during peak periods, with motorists taking undesirable gaps. Also there is a bus stop located on the Mount Lindesay Highway adjacent to the intersection with Camp Cable Road. With motorists focussing on the road ahead and interpreting the signage and linemarking on approach to the intersection, there is potential that this increased demand on a drivers attention may result in a failure to observe a bus pulling out into the main trafficked thoroughfare.

    b. Crash history suggests that rear end and angle type crashes are common at this location which suggests that some of these crashes are caused by motorists undertaking turn movements with insufficient gaps in the through traffic flow.

    c. Recommendation: It is understood that this intersection is to be upgraded in the near future under an existing program of works that includes full signalisation with extended turn lane pockets and dedicated left and right turn lanes from the Camp Cable Road approach leg.

4. Worendo Street, Veresdale Scrub Road, Kooralbyn Road and Undullah Road

    a. The issue: Same for all – these locations appear to have a sub-standard AUR treatment that allows a turning vehicle to be passed by essentially 'undertaking' the vehicle.

b. Crash history doesn't suggest that these locations are currently problematic due to significant population growth it is considered that these intersections pose an emerging risk for motorists.

c. Recommendation: This is a proactive measure as these locations, if upgraded, would provide a safer passage for highway traffic. These locations could be upgraded to a CHR treatment through the use of minor pavement widening and/or linemarking only.

5. South Street

a. The issue: The approach from South Street towards its intersection with the Mount Lindesay Highway includes a set of traffic signals located prior to the right turn into the adjacent service road. There is also another set of traffic signals acting as secondary signals located further back to the Mount Lindesay Highway. The location, position and number of different signal aspects are potentially confusing. This increases the risk of vehicular conflict caused by distraction and/or misinterpretation of the signals.

b. Crash history at this location suggested that angle and rear end crashes were the common crash type.

c. Recommendation: Consider the rearrangement of the lantern hardware configuration.

6. Wearing and Greenbank Road

a. The issue: Greenbank Road and Wearing Road are located approximately 300m apart from each other. This causes multiple conflicting movements with the through traffic of the Mount Lindesay Highway travelling at a relatively high speed. With future residential development likely to be using these two roads, turning volumes are expected to increase over the long term.

b. Crash history suggests that rear end collisions are a common crash type in this location. CHR treatments have been recently installed that significantly reduce the likelihood and severity of rear end crashes occurring.

c. Recommendation: As part of the future planning for this location, consider consolidating these two intersections into a four way intersection in combination with a service road – as this would reduce weaving, merging and conflicting movements, and also address the limited opportunities for vehicles to identify and choose a gap when turning right onto the highway. This recommendation will keep some local trips off of the Mount Lindesay Highway.

Photograph 11: Technical Site visit issue identification and discussion

7. St Aldwyn Road

a. The issue: High traffic volumes on the through alignment of Mount Lindsay Highway result in limited opportunities for vehicles to identify and choose a gap sufficient to turn right out of St Aldwyn Road. The painted median does not appear to be sufficient for right turning vehicles to store in the median and as such, drivers must make this turn in one movement. This causes long wait times for vehicles turning out of St Aldwyn Road. On the technical site visit, several vehicles were observed waiting in excess 1 minute and 30 seconds in the middle of the day (considered an off peak time) to identify and choose a gap sufficient to turn right onto the Mount Lindesay Highway. Drivers were also observed choosing a gap in traffic that was less than desirable and it would be assumed that a high proportion of right turning vehicles would make similar decisions. A main generator of traffic for this intersection is the adjacent commercial businesses comprising of a large medical centre, produce outlet and various other speciality retailers (as such it would be expected that any significant modifications to vehicle movements would not be introduced until after appropriate

consultation with the local businesses had occurred).

b. Crash history suggests that rear end and angle type crashes are common on the highway at this location which suggests that some of these crashes are caused by motorists undertaking turn movements with insufficient gaps in the through traffic flow.

c. Recommendation: This location has a relatively low crash history, however significant local growth and the high speed environment are factors that should be considered when deciding the appropriate treatment. Solutions should identify options of eliminating conflicting turn movements and encouraging local traffic off of the Mount Lindesay Highway. One possible solution would be to utilise the nearby Chambers Flat Road interchange and service road which runs parallel to the highway. Possible closure for right turn movements out of St Aldwyns Road in conjunction with extending the service road to meet St Aldwyn Road would eliminate some conflicting turn movements on the Mount Lindesay Highway – this however needs to be considered with the future planning vision for the area. The impact on the nearby commercial district would require further investigation and consultation.

8. Temple Entrance

   a. The issue: A temple of religious and cultural significance has been constructed adjacent to the Maclean Street intersection, just to the south of the Logan River Bridge. Feedback from the stakeholder workshop indicated that significant vehicular movements into this precinct occur just prior to times of worship. In the southbound direction, the intersection has a small left turn lane but no channelised right turn lanes into the temple itself. In the northbound direction, there are no left turn lanes or deceleration lanes into the temple or acceleration lanes turning out of the temple. The turn treatments of this intersection are not suitable for the likely turn volumes experienced during times of worship. This results in queuing on the Mount Lindesay Highway increasing vehicular conflicts and the risk of crashes occurring.

   b. This is an emerging issue as (at the time of the technical field inspection) the temple is nearing completion of its facilities.

   c. Recommendation: Solutions should investigate options of addressing large turn volumes that only occur during times of worship. Options could include:

      - Consultation with the temple to ascertain times of worship and to confirm intersection upgrade conditions linked to the approval for the facility.

      - Suggest the temple: uses temporary VMS units to provide advance warning about localised traffic congestion, utilise temporary traffic control during times of worship or during large celebrations, and/or reconfigure the intersection to provide a channelised right turn lane into the temple.

9. Mundoolun Estate, Jimboomba Woods, Glen Logan Lakes and the Yarrabilba priority Urban Development Area (20km south of Logan Central)

   a. The issue: Large developments at varying stages of planning/development that are traffic generators will place additional strain on the Mount Lindesay Highway road network.

   b. This is a potential future issue.

   c. Recommendation: Whilst this issue is outside of the scope of the safety review, it is an important consideration for TMR's planning division and will require involvement and agreement from all levels of Government.

6.2 Signage

The safety review identified that signage along the route has inconsistency of treatments (e.g. school zone, repeater signage, speed zone, advanced directional, etc), is not installed correctly (i.e. height, angle to driver, and lateral location), and in locations requires rationalisation (sign number 'growth' over time). In addition, this lack of consistency and treatment is causing community frustration and concern as reported at both the stakeholder workshop as well as from respondents of the online survey.

Observations from the project team include:

1. Undertake a ‘Mass-Action’ program to update and improve the consistency of both signage and linemarking treatments along the highway with a particular focus to ‘correctness’ of application, replacement of aged signs (legibility and retroreflectivity) and removal of superfluous signage. This program should consider a holistic consistency of treatment for roadside amenities, concealed entrances, and approaching intersections (major and minor). Consideration for the correctness of sign footings and pole diameters and numbers with respect to frangibility should also be included in this program.

2. ‘Gateway’ signage to be considered for alignment to TMR Road Safety campaigns. As an example, this would be relevant for Beaudesert to New South Wales Border where the current ‘Join the Drive to Save Lives’ campaign is focused on motorcycle safety and motorcycle crashes are currently over represented in this area.

3. A review of the roadside amenity, rest area and fatigue signage be undertaken and that a holistic and consistent approach be adopted. It is suggested that a Mount Lindesay Highway themed version of Fatigue Zone signage could be developed and delivered in conjunction with an updated rest area signage program.

4. Undertake a night-time audit of the signage along the route to check for retroreflectivity and legibility.

5. Consider the installation of temporary variable message signage to highlight speeding traffic, fatigue management, or other safety related messaging.

6. Include additional speeding and enforcement signage.

6.3 Linemarking and delineation

The standard, application and maintenance of linemarking and delineation varies along the highway. Some areas are well maintained and have ‘fit for purpose’ controls whilst others require urgent attention.

Observations from the project team include:

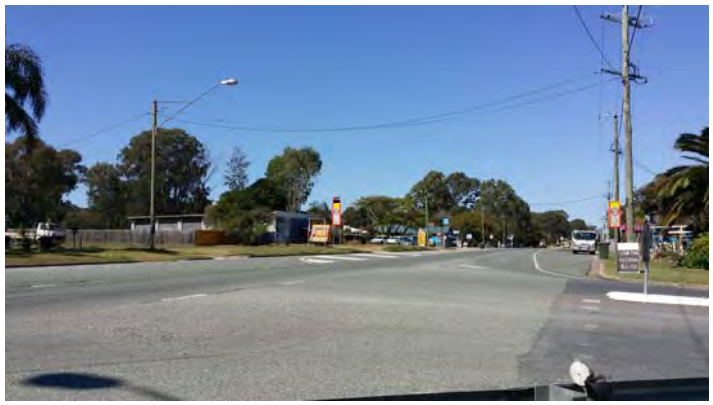
1. Undertake a night-time audit of the linemarking and delineation. Attention to both surface delineation and guide post numbers and location should be considered during the audit.

2. Inconsistency of treatment and maintenance would best be improved via a targeted ‘Mass Action’ program and considered/combined with the ‘Mass Action’ signage program.

3. Undertake an additional investigation as to suitability of roadway widths to support the installation of a wide centreline treatment (an example location is possibly ‘600m South of Hinds Road’). It is understood that a wide centreline treatment is proposed for the Beaudesert to New South Wales Border segment between chainages 4.2km to 5.0km.

4. Undertake an additional investigation into the placement of audible edge lines. Additional locations would be particularly relevant for the Beaudesert to New South Wales border segment.

5. Installation at targeted locations for ‘Keep at Least 2 Chevrons Apart’ signage and delineation – similar to that installed on the Bruce Highway.



Photograph 12: Gleneagle township near Allan Street Intersection

6.4 Speed Zones

The review identified that the application of speed zoning along the highway was an issue for the community and also for enforcement. From a road user perspective, sections of the highway lends itself

to a higher speed posting, however both the standard of the entering side roads and ramps, and the roadside verge and edge treatment, preclude this from being a safe option. Additionally speed zone lengths, signage, and consistency of treatment, particularly for the Logan to Beaudesert segment is a frustration for road users. It should be noted that for this section of the highway, the recommendations from the state-wide speed limit review were recently implemented reducing the number of speed zones from 12 to 9.

A key recommendation of this study is for the speed zones along the Mount Lindesay Highway be reconsidered in conjunction with the take-up of any other projects associated with improving the standard of intersections, ramps or roadside verges linking or along the highway. In addition, it is recommended that a speed limit review for the Beaudesert and New South Wales border segment be undertaken with the view to rationalise the number and location of speed zones.

6.5 Lighting

As a night-time audit of the highway was not within the scope of this project, the standard and application of the current lighting of the highway is not known.

Observations from the project team include:

- Undertake a night-time audit of the existing lighting to understand the current lumination standard and to possibly consider the opportunity for the installation of new lighting at minor intersections (i.e. flag lighting).

6.6 Overtaking opportunities

The lack of safe overtaking opportunities along the Mount Lindesay Highway is particularly evident on the semi-rural sections of Logan to Beaudesert and along the Beaudesert to New South Wales border segment. Creating safe overtaking opportunities is also linked to the quality of road shoulders and pavement conditions.

Observations from the project team include:

- Undertake an investigation to determine appropriate locations for overtaking lanes (both North and Southbound). As an example, at the stakeholder workshop it was suggested to consider additional overtaking opportunities north of Jimboomba to Park Ridge.

6.7 Road shoulders and pavement condition

The Mount Lindesay Highway shoulder and pavement surfacing vary in both width and condition along its length. It was observed that the maintenance program appeared to be linked to traffic volumes (i.e. the higher the traffic volume, the better the standard of maintenance). The pavement conditions also vary with generally a higher standard of surfacing, rideability and general maintenance for higher trafficked areas.

Observations from the project team include:

1. Liaise with the maintenance contractor/s to understand their forward works program and request checks to be made for superelevation and transitions (to current standards) prior to any major rehabilitation works being undertaken. Additionally reassess shoulders in locations where eroded table drains are in close proximity to the edge line with the view to reconstructing the road shoulder and reforming the table drain to improve run-out areas.

2. Liaise with the maintenance contractor/s to understand their backlog with respect to pavement and shoulder conditions and address any lag between the identification of safety related issues and completion of rectification works.

3. Undertake an additional investigation to form the basis of a ‘Mass Action Program’ that considers creating a more forgiving roadside environment.

Photograph 13: St Aldwyn Road Intersection

6.8 Roadside environment

In 2014 TMR undertook a program to remove roadside hazards at locations along the highway. Vegetation control within the road corridor is deemed critical to maintaining a safe roadside environment. There are still non-frangible vegetation growing within clear-zones, and the size, number and type of some sign poles also appeared to be non-frangible or not suitable.

The technical field inspection also identified a number of other roadside hazards (e.g. culvert headwalls, steep embankments, eroded v-drains, obsolete guardrail end treatments, bridge approach guardrail and bridge rail, and sign post size/number/base type).

The control of vegetation within the road corridor as well as the provision of wildlife fencing at key areas could reduce the potential for wildlife strikes.

Recommendations from the project team include:

1. Undertake a 'Mass Action' program that takes a holistic view to vegetation management that considers the removal of vegetation (as appropriate) or protection of critical vegetation.

2. Undertake a 'Mass Action' program that considers the identification, protection or removal of roadside hazards (such as culvert headwalls, steep batters, roadside drainage scour, sign installations, electricity poles, vendor signage, guardrail clear zones, etc). It is understood that some treatment of hazards and guardrail installation works are being progressed for the Beaudesert to New South Wales section between chainages 49km to 54km and works are also being undertaken between Millstream Road south to Undullah Road.

3. Discuss with the maintenance contractor/s their response times to maintaining vegetation, especially as it relates to sightlines at intersections, and address any lag between the identification of safety related issues and completion of works.

4. Confirm with other organisations including the Department of Environment and Heritage Protection (DEHP), the location and number of recorded wildlife strikes to ascertain appropriate controls/measures.

6.9 Road geometry

The highway geometry is a reflection of when it was originally constructed. This review considered the horizontal geometry only as full 3D survey was not available and as such, this high level design check did not take into account superelevation or surfacing for side friction. Based on the geometric information available, there are a minimum of 13 horizontal curves on the highway that should be considered further.

Recommendations from the project team include:

1. It is suggested that the curves identified be further investigated to determine the appropriateness of the posted and advisory signage through the curves.

6.10 Public transport, cyclists and pedestrians

Stakeholders advised areas along the corridor, like Jimboomba, do not have regular public transport services, pedestrian access, or active transport infrastructure, to enable people to take short trips - other than by car.

A train from Beaudesert to Brisbane was suggested (in-line with TMR's 2010 study on passenger services utilising the existing interstate freight line from Salisbury to Kagaru - before connecting to Beaudesert) as a solution to reduce peak congestion and in-turn improve safety on the northern section of the highway. The ability of allowing residents the opportunity to change their mode of transport from motor vehicles to public transport will ease congestion especially during peak periods. This is an 'ultimate solution' and outside the scope of this safety review.

In relation to bus services along the Mount Lindesay Highway, some of the feedback questioned the ability for vehicles, especially haulage trucks and other heavy vehicles, to safely pass buses stopped on the highway given the narrowness of the corridor. Suggestions included indenting bus stops, as well as examining whether existing stops were optimally placed along the highway from both an operational and safety perspective.

There were also a number of requests for better and/or consistent pedestrian provision along the corridor especially in vicinity of schools and bus stops. Infrastructure improvements to accommodate

student travel patterns (e.g. lack of provision for students to cross the highway at Beaudesert State High School) were suggested.

The lack of amenity for pedestrians or cyclists to safely travel from Millstream Road towards Jimboomba without walking on the highway itself, particularly through the cutting just north of the bridge, is an issue that needs to be further investigated.

An active transport proposal included a shared cycleway/walking track on the eastern side of the Mount Lindesay Highway. The Mount Lindesay Highway, between Logan and Beaudesert, is identified within the South East Queensland Principal Cycle Network as being a 'Future Principal Route'.

Recommendations from the project team include:

1. Undertake an active transport study to consider appropriate treatments to support safe movements in and around townships and schools.

    a. Treatments could include signalised pedestrian crossings, refuge and blister island crossing points, active transport corridors and paths (pedestrians and cyclists), and consideration for the mobility impaired (i.e. electric scooters, etc).

2. Undertake a 'Mass Action' program that focuses on updating existing crossing points to the latest standards.

Photograph 14: Typical directional signage installation

6.11 Motorcyclists

A safer roadside environment for motorcyclists will be achieved through the implementation of the suggested recommendations contained within this report. In addition, QPS officers raised their concerns (during the stakeholder workshop) of the emerging trend of crashes involving recreational motorcyclists occurring on the Beaudesert to New South Wales border section. Figure 7 shows the Join the Drive to Save Lives website portal.

Recommendations from the project team include:

1. Undertake an audit of the existing installed guardrail within the Beaudesert to New South Wales border section of the highway that includes a prioritised list of locations for the installation of rub rail.

2. Increase the exposure of the motorcycle messaging from the 'Join the Drive to Save Lives' program through the installation of both static and variable message signage.

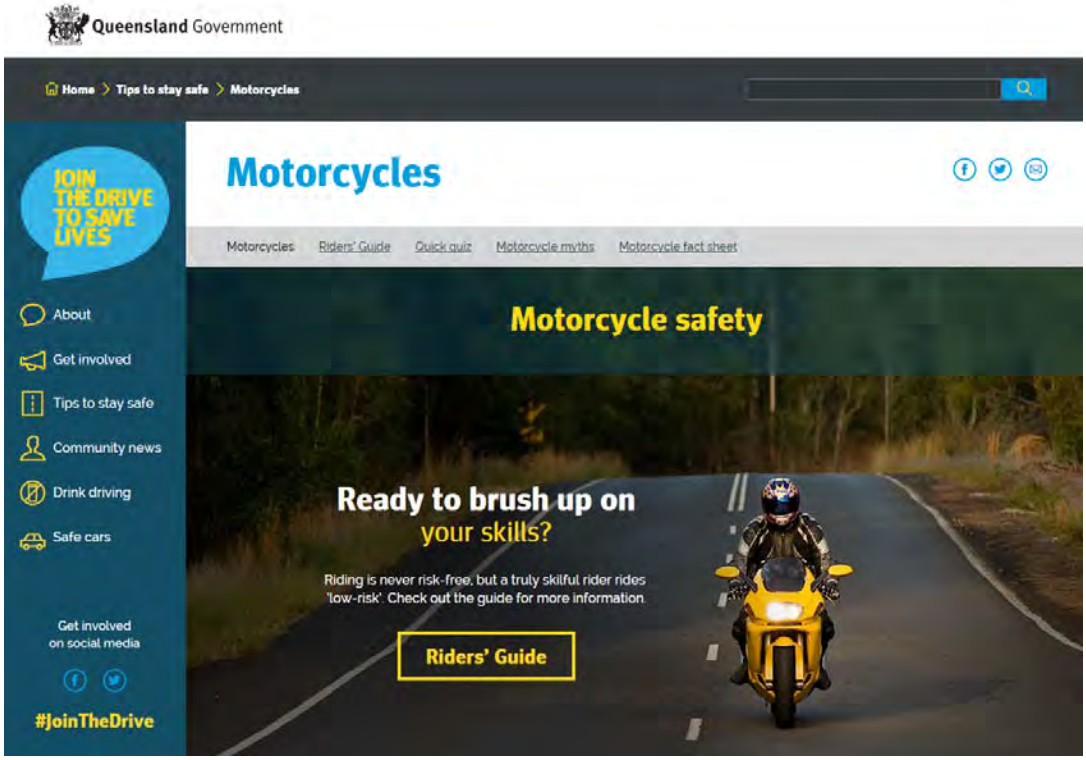


Figure 7: TMR's 'Join the Drive to Save Lives' Website – Motorcycle Safety Section

6.12 Behavioural Issues and Recommendations

The broad category of 'Disobey road rules' represents the largest behavioural contributing factor nominated by police across all types of crashes. This category contains a large number of road rule violations, including: dangerous driving, disobeying give way and stop signs, failing to stop or give way; disobeying traffic light or sign, driving without due care and attention, improper overtaking, following too closely, failing to signal intention, driving a vehicle of excess dimensions, failing to keep left, improper overtaking, and insecure load.

The next most prevalent factor was 'alcohol-related', which indicates that a driver, rider, pedestrian or cyclist was attributed with either having an overprescribed concentration of alcohol, or being under the influence of liquor and/or drug. Where 'drink driving/riding' was determined as a contributing factor, the controller of the vehicle had an illegal blood alcohol concentration (BAC) for their licence level, vehicle type or purpose of vehicle use at the time of the crash. Alcohol-related crashes represent just over 50% of all the fatal crashes that occurred on the corridor between 2007 and 2014 (8 of the 15 fatal crashes).

The third most prevalent factor across all crash types was 'controller condition'. This is a broad reporting category which includes things such as taking evasive action to avoid hazards or people, distraction from the driving task, inattention, negligence, excessive speed for the circumstances, and medical conditions.

Being unlicensed and driving/riding an unregistered vehicle were noted as making relatively minor contributions across all crash types. Road conditions represent a relatively small proportion of overall contributing factors across the various crash types (10 -14.5%) when compared to behavioural factors overall, and that lighting, atmospheric, and vehicle defect factors contributed in a minor way across all crash categories.

Consistent with fatal crash trends elsewhere, some factors show a stronger association with fatal crashes than with other crash types. Disobeying road rules, alcohol-related issues, drink driving/riding, controller condition, fatigue, speeding, and non-use of restraints feature more prominently in fatal crashes, relatively speaking, than in all other crash types. Of particular note is 20% of fatal crashes involved at least one unrestrained person, whereas the figure is much lower for other crash severities.

6.12.1 Road Safety Awareness Campaigns

Since 2013, the Queensland Government has focussed on promoting road safety through a state-wide program called 'Join the Drive to Save Lives' (http://jointhedrive.qld.gov.au/). Join the Drive aims

to achieve cultural change in how we think about and approach road safety. Strategies to achieve this include social marketing campaigns, engagement with the community, business and industry, and a road safety community grants program.

The overarching messages for the program reflect the Queensland Road Safety Strategy:

- Don't accept road trauma as just part of using our roads;
- Death and serious injuries from road crashes are preventable;
- Road safety is everyone's issue and everyone's responsibility;
- Take action today so everyone arrives home safely.

To date in Queensland, the campaigns listed below have been run through the 'Join the Drive to Save Lives' program targeting the following issues:

- Speeding - http://jointhedrive.qld.gov.au/road-safety-topics/speeding
- Sharing the road safely - http://jointhedrive.qld.gov.au/share-the-road/tvcs (plus see the other link on the top of this page – 'Infographic')
- Drink driving - http://jointhedrive.qld.gov.au/mates-motel (TV ads at the very bottom of this page)
- Driver distractions - http://jointhedrive.qld.gov.au/distractions
- Vehicle Safety – http://jointhedrive.qld.gov.au/safe-cars
- Motorcycle safety - http://jointhedrive.qld.gov.au/motorcycles

Priorities for ongoing campaigns for 2016-17 are identified through the Queensland Road Safety Strategy, Queensland Road Safety Action Plan, road toll data, infringement statistics, post-campaign surveys and behavioural research and include:

- Drink and drug driving;
- Motorcycle safety;
- Speed;
- Young people and the role of parents;
- Vehicle safety;
- Bicycle safety.

A significant social media program, utilising Facebook, Twitter and digital and social media advertising supports campaigns and other engagement efforts. Community events, such as Queensland Road Safety Week and Fatality Free Friday are conducted across the state. Regional TMR staff also run local road safety initiatives.

6.12.2 Community Road Safety Grants program

The Community Road Safety Grants Program provides funding to not-for-profit and community groups to implement road safety initiatives to meet local needs.

Although the current approach supports the implementation of local road safety education programs, the scope and sustainability of local road safety campaigns is typically an issue. For example, a co-ordinated approach between TMR, Local Government Association (LGA) and schools can conduct awareness raising, but the scope is usually limited to parents and students of that particular school and only for issues that are relevant to their student safety. There are also many examples of community-based groups that initiate road safety campaigns in their local area, but are reliant on the efforts of a small core of members such that campaigning is difficult to sustain. An alternative approach would involve coordination between local government, QPS and TMR regional road safety staff to:

- Develop a campaign calendar according to the road safety issues along Mount Lindesay Highway.
- Undertake local public relations aligned with the campaign calendar through local news outlets.
- Invite and support local groups (schools, interest groups) to undertake their own campaigning activity consistent with the issues identified in the calendar.
- Ensure co-ordination of Road Safety Stakeholder groups is improved/elevated including the cross sharing of information between the Logan and Scenic Rim Councils.

6.13 Enforcement Issues and Recommendations

The Queensland Police Service conducts a state-wide enforcement program which includes an emphasis on the 'Fatal Five':

- Speeding;
- Drink and drug driving;
- Failure to wear a seatbelt;
- Driving while fatigued;
- Distraction / Inattention.

QPS currently have five speed enforcement sites along the corridor and both overt and covert enforcement is used. They also advised (consistent with the crash data) that driver error, sometimes linked to impatience due to traffic congestion or lack of overtaking facilities, was a primary contributor to crashes.

QPS are of the opinion that there are sufficient facilities for motorists to take rest breaks along the corridor.
The presence of heavy vehicles on the corridor was not seen by them as a large contributor to crashes. The crash data supports this view as heavy vehicles are not over represented.

Observations from the project team include:

1. Consider the opportunity to co-locate enforcement bays with new infrastructure;
2. Install additional 'mobile patrol' and site to site 'speed camera' signage;
3. Undertake regular enforcement in the vicinity of school zones;
4. Continue the regular meeting and sharing of safety and operational issues between TMR and QPS local staff.

7.Summary and Conclusion

The multidisciplinary and consultative approach adopted for the Mount Lindesay Highway Safety Review allowed for the compilation of recommendations in an integrated manner. These observations should be considered in a holistic manner. Successful business case development and the ultimate receipt of funding for these initiatives will be a measure of the success of this new safety review process.

The level of community and stakeholder involvement and engagement was highlight of the review and the mature manner in which the community assisted with the development of possible solutions in a funding constrained environment was very positive.

The best outcomes for the Mount Lindesay Highway will be achieved by integrating the behavioural, engineering and enforcement programs, with the ultimate aim of a road transport system that is able to accommodate human error.

The key engineering, behavioural and enforcement programs to be considered for implementation includes:

- Upgrade of at-grade intersections.
- Improve grade-separated interchange configuration, linkage to service roads and length of ramps.
- Improved signage, linemarking, lighting and delineation for consistency and direction 'way finding'.
- Signage (including fixed and variable) for road safety messaging and 'Gate-way' signage for high-risk zones.
- Utilise wide-centreline treatments for areas of high head-on crash rates, especially where there is sufficient width of pavement.
- Investigate the opportunity to provide additional safe overtaking opportunities.
- Review suitability of roadside maintenance (including vegetation management, drainage works and pavement shoulder sealing) to provide a safer roadside environment.
- Undertake a public and active transport study to consider appropriate treatments to support safe movements for vulnerable road users (i.e. pedestrians and cyclists) within the road corridor.
- Maintain continuing open dialogue between TMR, LGA's and QPS to share emerging safety and operation issues and trends.
- Incorporate messaging from 'Join the Drive' for signage and combine with other community awareness opportunities.
- Maintain open dialogue between TMR and QPS to determine appropriate locations for enforcement - especially as new trends develop.

Key lessons learnt and opportunities for improvement have been captured as part of the safety review process and will be encapsulated and documented for the use of future similar projects.