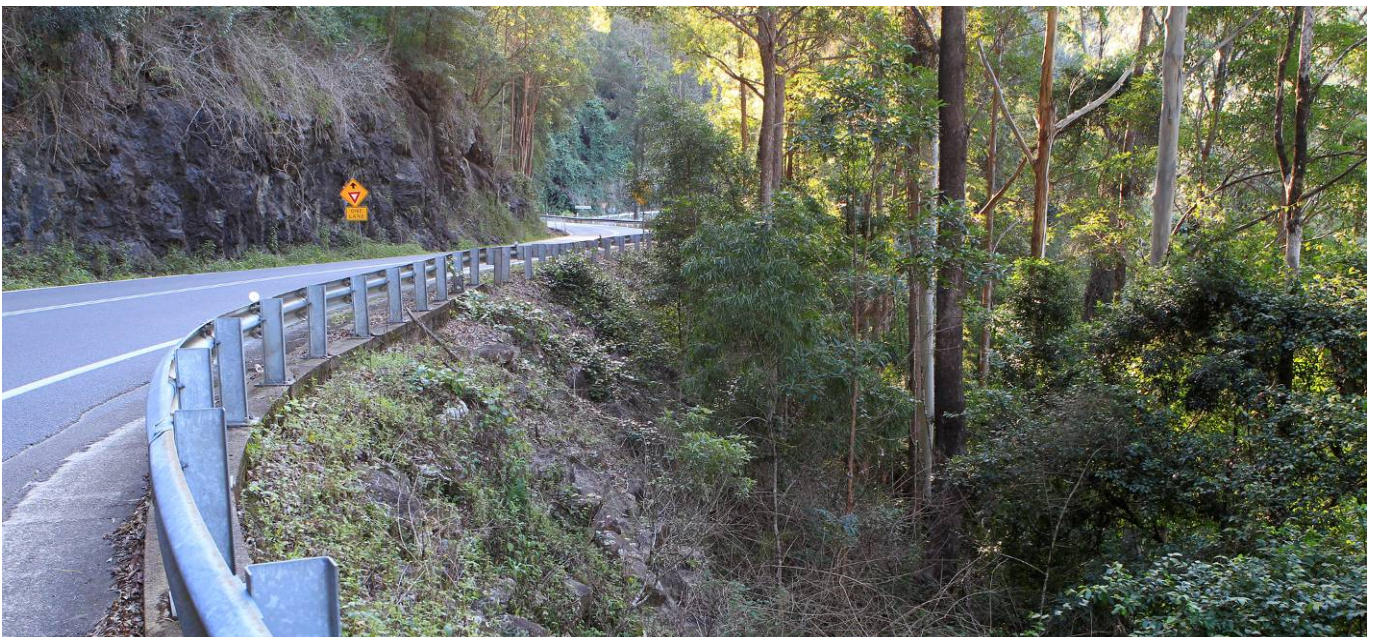


WATERFALL WAY

Pacific Highway to Dorrigo

Road safety review

SEPTEMBER 2014



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Overview

Earlier this year the community raised concerns about the impact from increased truck movements due to the Megan Quarry expansion. The quarry expansion is linked to the haulage of materials to the Pacific Highway upgrade between Nambucca Heads and Urunga.

The concerns raised by the community were considered by the NSW Government and a decision was made to carry out a road safety review. Roads and Maritime worked with the Centre for Road Safety to complete the review.

This report is a summary of investigations completed as part of a thorough road safety and road user behaviour analysis of Waterfall Way. It has recommendations that look at short and medium-long term strategies to address the different needs of the community and transport industry.

A total of **32** short term and **five** medium to long term recommendations have been made as a result of the outcomes from investigations and are detailed at the end of this report. The recommendations recognise the importance of ongoing monitoring, particularly after October 2014 when it is expected that heavy vehicle numbers will increase.

1. Introduction

1.1 Description of the road

Running between Coffs Harbour on the New South Wales coast and the inland city of Armidale, the Waterfall Way is a 200 kilometre drive along one of the most scenic routes in NSW. This review focuses on the first 40 kilometres of the road between the Pacific Highway and Dorrigo.

Starting from the intersection with the Pacific Highway at Raleigh, midway between Urunga and Coffs Harbour, it follows the south bank of the Bellinger River, passing through the town of Bellingen. After crossing the Bellinger River, the road swings north and climbs the escarpment of the Great Dividing Range, skirting the southern edge of the Dorrigo World Heritage rainforest and crossing the Newell and Sherrard waterfalls for which the route is named.

The road is sealed but relatively narrow and has a steep 14 kilometres winding section. In recent years storms and associated flash flooding have washed away sections of the roadway where it rises to the ranges, leading to traffic being limited to one lane at a number of locations.

For the purpose of this road safety review, the Waterfall Way has been divided into four sections. Each location has particular characteristics exceptional to that section:

Section one	Pacific Highway to Bellingen	11km
Section two	Bellingen township	
Section three	Bellingen to Thora	15km
Section four	Thora to Dorrigo	14km

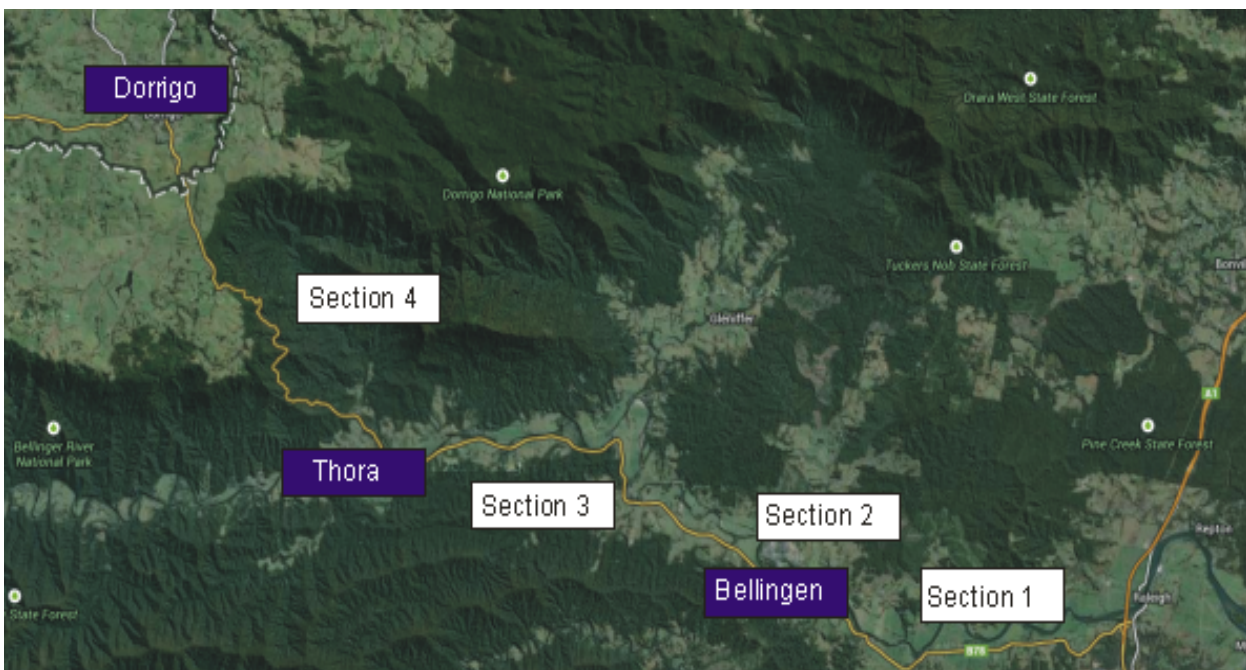


Figure 1: The Waterfall Way road safety review was divided into four sections

1.2 Background

The Bellingen community raised concerns about the immediate impact from the increase in truck movements due to the Megan Quarry expansion. The quarry expansion is linked to the haulage of materials to the Pacific Highway upgrade between Nambucca Heads and Urunga.

The concerns raised by the community were considered by the NSW Government and a decision was made to carry out the Waterfall Way road safety review.

The scope of this review was to carry out a road safety assessment of the Waterfall Way, from the Pacific Highway to Tyringham Street in Dorrigo. The total length of the review is about 40 kilometres.

The road safety review focused on safety associated with an increase in truck movements along this section of the road. As the safety review is not a broader road corridor strategic planning process, it has not included consideration of a bypass of Bellingen.



Dorrigo Mountain: Looking west along Waterfall Way
(Located in section 4: Thora to Dorrigo)

1.2.1 Terms of Reference

A safe road environment (road and roadside) is integral to managing and improving road safety outcomes.

Improved safety will be achieved through the identification of road safety issues, developing recommendations and implementing targeted road safety engineering, behavioural and enforcement programs.

The Waterfall Way road safety review considered:

- Community and stakeholder engagement
- Route analysis - desk top and site inspections
- Crash analysis - statistics on clusters and trends.

The assessment process has taken a solution focused approach. Recommendations arising from this report will inform and assist Roads and Maritime Services to implement short term and medium-long term strategies.

1.2.2 The review process

Since 2004, road safety reviews have been carried out to improve road safety along key transport corridors. Previous reviews include the Pacific Highway (2004, 700km), Princes Highway (2004, 430km), Newell Highway (2007, 1060km), CENWEST review (Great Western, Mid Western, Mitchell Highways) (2010, 700km), the New England Highway (2010, 600km), the Kings Highway (2012, 117km) and the Oxley Highway (2014, 516km).

The approach to these safety reviews was multidisciplinary and engaged people from Roads and Maritime road safety, road user behaviour and asset maintenance areas and the NSW Centre for Road Safety. It also involved representatives from the NSW Police, NRMA, local councils, community groups, residents and landowners.

A holistic approach was taken to the road safety review process for Waterfall Way and has been reviewed following the methodology of the Safe System approach.

Safe System approach

The Safe System approach is adopted in highway route safety reviews. This approach recognises that a highway is a system with many inputs: the vehicle, the driver and the road environment. The Safe System approach aims to promote safe travel, yet recognises that drivers will make mistakes. However these mistakes should not result in serious injury or death. The system aims to provide a roadside environment that responds to driver error and reduces the occurrence and severity of road crashes. Figure 2 is a representation of the Safe System approach.

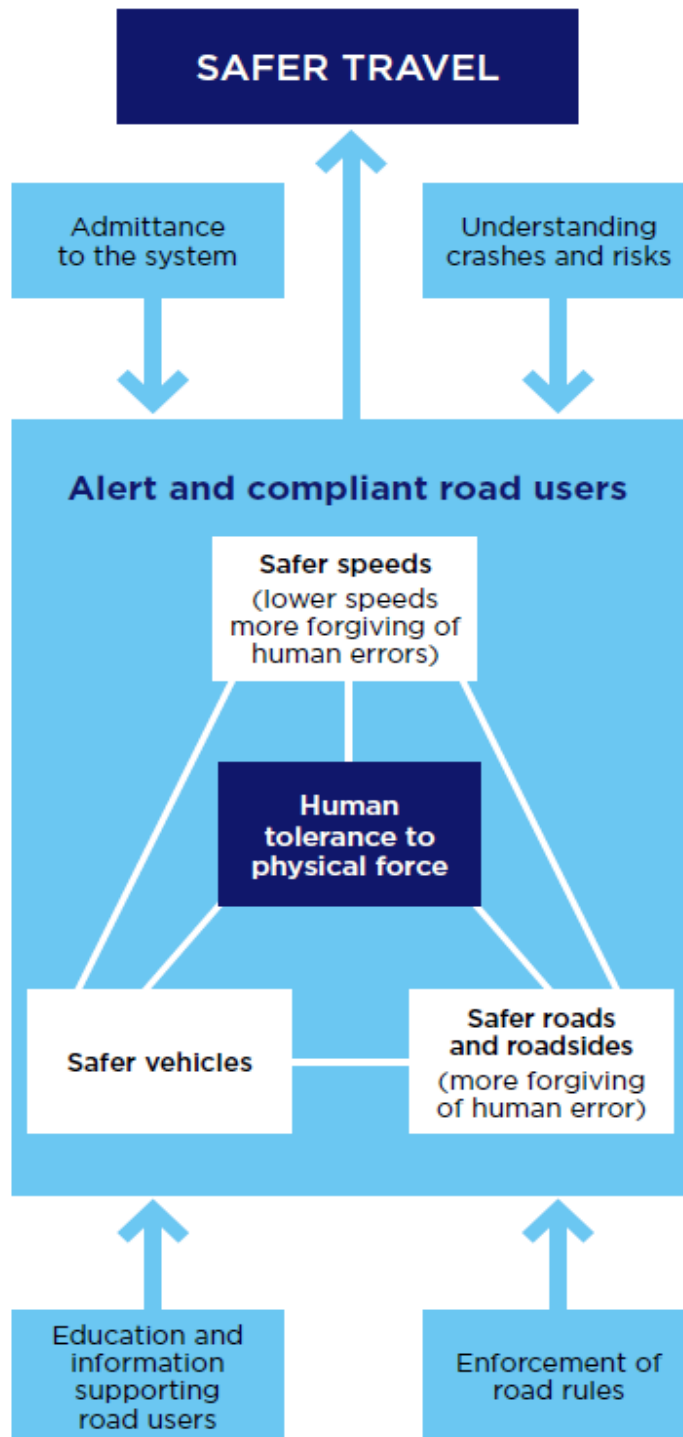


Figure 2: Diagram of the Safe System approach

2 Community and stakeholder engagement

The Bellingen community raised concerns about the immediate impact from the increase in truck movements due to the Megan Quarry expansion. The quarry expansion is linked to the haulage of materials to the Nambucca Heads to Urunga Pacific Highway upgrade. The concerns raised by the community were considered by the NSW Government and a decision was made to carry out the Waterfall Way road safety review.

Prior to field inspections and data analysis, community members and stakeholders were invited to express their views about issues on Waterfall Way at drop-in sessions, workshops, through the use of feedback forms and an online feedback process.

2.1 Objectives

The objectives of the community and stakeholder engagement were to:

- Inform the community and other relevant stakeholders about the review and its scope
- Present the road safety issues to be considered by the Waterfall Way route safety review
- Gain an understanding of the local issues relating to road safety along Waterfall Way
- Manage community expectations
- Use the information gathered from the drop-in sessions, workshops and feedback to further inform the review.

2.2 Initial drop in session

Community information drop-in sessions were held on 27 March 2014 at the Bellingen Council administration building in Hyde Street.

- 10am – 2pm
- 4pm – 7pm.

2.3 Community engagement workshops

Workshops were held with community members as an information sharing session to provide a brief summary of the community issues raised in feedback forms, and to share information on crash trends, statistics and vehicle movements. Within these sessions Roads and Maritime collected community feedback on areas/locations of concern. The site information collected was further investigated during field inspections. These investigations have further informed the review and assisted with developing recommendations to this report.

Community workshops were held at:

- Bellingen, Wednesday, 4 June 2014 (evening)
- Dorrigo, Thursday, 5 June 2014 (evening).

At the workshops Roads and Maritime gave presentations on the:

- Background and scope of the Waterfall Way route safety review
- Crash history and statistics.

The communities of Bellingen and Dorrigo provided feedback at these presentations. Issues raised included:

- Road not maintained properly – potholes, crumbling edges, mud/rock landslides possible
- Lack of pull over bays
- Heavy vehicles using the road
- Narrowness of the road with trucks crossing the centreline
- Blind corners and lack of signage
- Cyclist and pedestrian facilities inadequate
- Speed limit was seen as too high
- People unfamiliar with road get confused (tourists).

Following the presentations, community members were invited to look at aerial photos of Waterfall Way and indicate on the maps other issues and areas of concern. These areas, along with others identified by Roads and Maritime, were reviewed on a site inspection.

2.4 Key stakeholders and community groups

A number of key stakeholders and community groups were involved in the community engagement process:

- Local council staff and elected representatives
- State and Federal members of parliament
- Road safety associations and committees
- NSW Police
- NRMA
- Chambers of Commerce
- Bus operators
- Heavy vehicle freight operators
- Members of the public, including local residents of Bellingen, Thora and Dorrigo
- Community groups:
 - People with an interest in road safety on Waterfall Way group
 - Bellingen Environment Centre.
- Transport for NSW – Centre for Road Safety
- Roads and Maritime Services.

2.5 Contacting community members and stakeholders

For the purpose of the Waterfall Way route safety review, Roads and Maritime used a number of tools to inform and involve the community. A community update was issued in March 2014 and the Roads and Maritime website was updated with information. In addition, there were radio advertisements promoting the workshops, newspaper advertisements and media articles encouraging the community to participate in the review.

MEDIA RELEASE



27 FEBRUARY 2014

SAFETY REVIEW FOR WATERFALL WAY

Road safety will be reviewed on Waterfall Way following community feedback about increased truck movements along the road.

Roads and Maritime Services will carry out the review on the 40 kilometre stretch of road from Tyringham Street, Dorrigo, to the junction of the Pacific Highway.

"All aspects of safety will be examined during the review and the findings will be used to help develop a strategy to improve road safety," a Roads and Maritime spokesperson said.

The review will look at ways of improving road safety along the route but will not examine bypassing the Bellingen township.

Community members are invited to contribute to the review through a "drop-in" session, workshops, and written submissions via email or the post.

The first drop-in session will be held on Thursday 27 March from 10am to 2pm at the Bellingen Council administration building in Hyde Street. It will help the review team identify community concerns and issues which need examining.

Two further community workshops at Bellingen and Dorrigo will be an integral part of the review and provide information about crash trends, statistics and vehicle movements as well as identify sites to be visited.

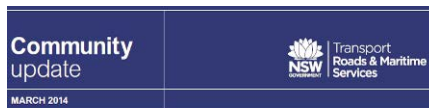
Some of the issues the review team will consider include speed limits, road markings and signs, pull over zones and truck movements during certain hours.

"The community is encouraged to attend the drop-in session and workshops and submit their concerns and suggestions to the safety review team," the Roads and Maritime spokesperson said.

"The review is expected to be completed by July."

A copy of the review team's findings and recommendations will be available on the internet.

Information about the safety review will be available on the internet at <http://www.rms.nsw.gov.au/roadprojects> (click northern region and follow the links) before the drop-in session.



Waterfall Way safety review and program update

Waterfall Way is an important route connecting the mid north coast and Coffs Harbour district with the coastal hinterland of Bellingen, Dorrigo, Armidale, and beyond. The NSW Centre for Road Safety and Roads and Maritime Services recently announced a review of road safety along Waterfall Way. This update contains information about the review, including a feedback form, and information about the various projects along Waterfall Way.



Example of media articles that appeared in the local newspapers: Don Dorrigo Gazette, Bellingen Courier, and Coffs Advocate



Safety review on Waterfall Way reminder

Two community information sessions will be held on Thursday 27 March as part of the Waterfall Way Road Safety Review.

Roads and Maritime Services will examine the 40 kilometre stretch of road from Tyringham Street at Dorrigo to the junction of the Pacific Highway following community feedback about increased truck movements.

"Community members are invited to contribute to the review through the drop in sessions, workshops, and written submissions via email or post," a Roads and Maritime spokesperson said.

"The drop in sessions will be held on Thursday from 10 a.m. to 2 p.m. and from 4 p.m. to 7 p.m. at the Bellingen Council administration in Hyde Street.

"The sessions are informal and residents and business owners are welcome to attend at any time. The review team will use these meetings to identify community concerns and issues which need examination".

The review will look at ways of improving road safety along the route but will not examine bypassing Bellingen.

A community update and feedback form is available online for people to take to the drop in session or mail to the project team.

The drop in sessions will be followed by two community workshops to discuss issues raised by the community and provide information about crash trends, statistics and vehicle movements.

The review is expected to be completed by July.

The community update and feedback form is available online at www.rms.nsw.gov.au/road/projects (click on northern region and follow the links).

2.6 Key issues raised

Submissions made by the community and feedback provided at the community workshops focused on road safety along the 40 kilometre stretch of Waterfall Way from the Pacific Highway to Tyringham Street, Dorrigo. The main areas of focus for the community, shown in Figure 3, were road conditions, heavy vehicle usage and speed limits.

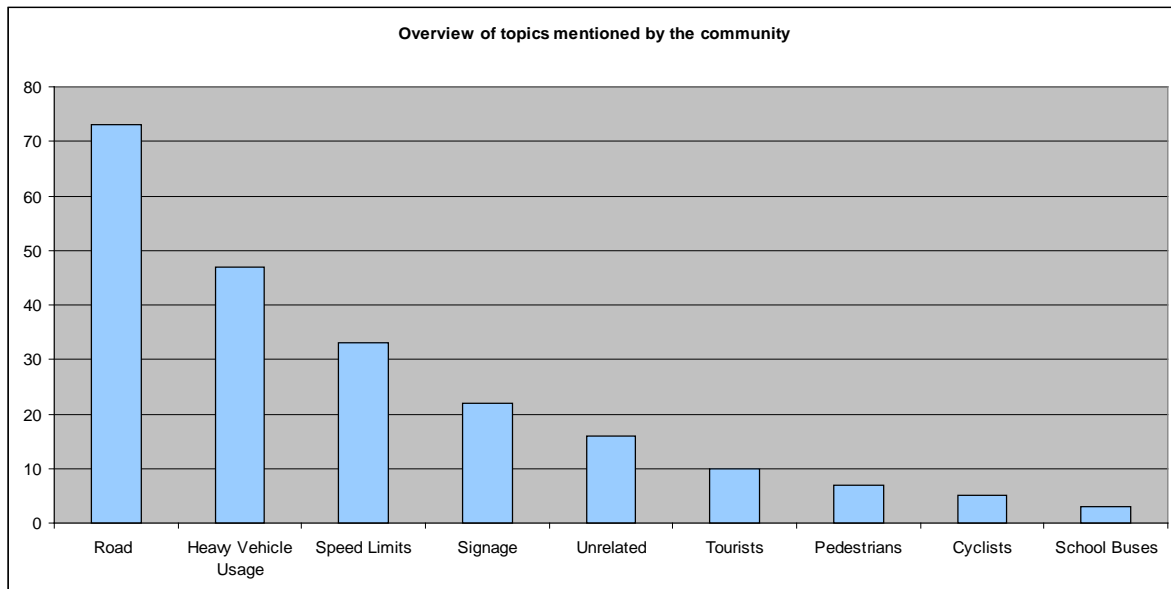


Figure 3: Overview of main topics mentioned during the feedback process

A summary of the key road safety issues raised by the community in the submissions and at the workshops were grouped into three main categories: Engineering, Behavioural, and Traffic and pedestrians. These are detailed below:

2.7 Issues raised by the community: Engineering

Overtaking and turning lanes, passing areas

- Many submissions acknowledged the lack of options for safely overtaking other vehicles at various sections along Waterfall Way, including between Dorrigo and Raleigh, and beyond
- A submission identified safe passing for all vehicle types – cars, caravans and trucks.
- Submissions raised the concern at the lack of options for westbound traffic to safely move off the road
- Submissions proposed more passing lanes, or pull over bays at regular intervals to allow vehicles to pass or pull over in an emergency
- Suggestion was made for more passing lanes to reduce overall travel times to Coffs Harbour and Armidale.

Road alignment and width

- Multiple submissions were concerned with the narrowness of the road between Thora and Dorrigo
- Submissions suggested widening of the road would make it safer for large vehicles

- Other submissions felt wider road shoulders would improve the safety for motorists, cyclists and pedestrians
- Some submissions noted the Roads and Maritime plans to straighten road sections between Raleigh and Bellingen and this would be beneficial. Another submission opposed this view
- One submission felt strongly that there is little margin for error on the very narrow sections of road with minimal shoulders, especially when used by drivers unfamiliar with the road
- Several submissions indicated they felt many trucks had no alternative to crossing the centre line in order to negotiate many curves on Waterfall Way.

Road design

- A number of specific issues relating to the section of Waterfall Way near Maynards Plain Road were raised in submissions. Issues mentioned included the safety of entry and exit to Maynards Plain Road from both directions; road width; passing; camber of the road pushing traffic over the centre line; increased risk during fog and heavy rain; uncertain behaviour from drivers of vehicles pulled over in an unofficial bay near the intersection
- Submissions suggested improvements in road design near the Maynards Plain Road area should include widening of the road; a proper passing lane; a pull over bay for large vehicles to get completely off the road; and road warnings about passing conditions
- Myers Bluff was identified in submissions as being too narrow for buses and trucks to pass through safely
- Other submissions felt road warnings should be installed about the size of vehicles able to pass in certain sections
- Several submissions identified a section of the Dorrigo Mountain where there is a low concrete ledge, referred to as the “ledge of terror”, as requiring widening or safety barrier
- Other suggestions included priority removal of tight or dangerous curves on the most mountainous sections of the road; and for the current program of kerb and guttering to be extended to reduce erosion and allow safer passing by semi-trailers.

Road condition

- Submissions noted poor road maintenance as a problem, including eroded and absent road shoulders, narrow roads that force vehicles to favour the centre of the road; and pot hole repairs that quickly fall apart
- Myers Bluff was specifically identified as the road embankment is eroding into the river
- Some comments concluded that the poor road conditions meant the sign posted speed limit of 100 km/h is too high.

Bridges

- The need for bridges was mentioned in submissions in relation to roads remaining open and safe to use during flooding events at Cameron’s Corner and Rocky Creek Bridge
- One submission noted the poor drainage at Rocky Creek Bridge causes vehicles to aquaplane or spray water into oncoming traffic.

Delineation/line marking

- Submissions suggested dangerous overtaking could be reduced by increasing the length and number of locations where double lanes are located.

Safety barriers

- Several submissions indicated that the road section with the low concrete wall in the Sherrads Falls area is currently two lanes but vehicles have trouble passing each other at this location. It was suggested that it be made 'one way' with a better safety barrier installed.

Speed zones

- Submissions felt the recommended speed limit posted on road signs was too high given the condition of Waterfall Way
- The various speed zones were considered a distraction from paying attention to the condition of the road.

Signage

- A number of submissions requested better signage along Waterfall Way to assist motorists to drive to the conditions
- Suggestions include signs that indicate blind corners and steep descents; the need to give way; stop sign ahead; improving the visibility of signs by increasing their size and having them lit; and relocating some existing signs to more appropriate locations
- Safety issues associated with drivers travelling much slower than the signposted limit was also raised and the need to encourage them to pull over and let others pass
- Signage should be placed at frequent intervals to remind road users to pull over if travelling more slowly than the sign posted speed limit.

2.8 Issues raised by the community: Behavioural

General driver behaviour

- A number of submissions noted that poor driver decisions contributed to the lack of safety when travelling on Waterfall Way. The lack of appropriate signage and law enforcement was seen as contributing to poor driver behaviour
- Poor knowledge of the local roads and rules by visiting drivers was considered by a number of submissions to be the cause of many unsafe practices
- Several submissions indicated they felt many truck drivers had no alternative to crossing the centre line in order to negotiate many curves on Waterfall Way.

Speed

- Speed through all road sections, and in town centres, was considered a significant issue in submissions. This was reflected in observations that motorists did not deliberately speed but that signposted speeds misinforms motorists about safe driving limits.

Enforcement issues

- A number of submissions felt the existing road would benefit from an increase enforcement. Suggested measures included regular inspection of trucks for roadworthiness; and the issuing of penalties to all motorists for non-compliance of road rules.

Traffic Monitoring Cameras

- One submission suggested that a number of cameras be installed to measure vehicle movement
- Noise monitoring was also raised in one of the submissions.

2.9 Issues raised by the community: Traffic and pedestrians

Pedestrian safety

- There is some concern that the 40 km/h speed zone through Bellingen is too slow and causes pedestrians to dart in front of traffic and cross the road illegally
- Some thought the community would benefit if the high volume of pedestrians could be made more visible to motorists. This is particularly an issue when motorists have the sun in their eyes
- There is a view that the safety of children would be improved with a new pedestrian safety education program
- A submission suggested the safety of volunteers removing roadside litter needs to be considered.

Heavy vehicles

- Submissions expressed a desire for the noise of trucks entering and driving through towns to be addressed. Suggestions included a reduction of speed and signage that limits compression braking
- Vehicles towing caravans or horse floats need signs at the top of the mountain reminding them to use a low gear
- Submissions raised concern with cattle truck effluent and diesel/oil spills from vehicles on Dorrigo Mountain
- Several submissions indicated they felt many truck drivers had no alternative to crossing the centre line in order to negotiate many corners on Waterfall Way
- Some submissions suggested that restricted hours should be placed on heavy vehicles during the peak school travel periods
- Community feedback requests included signage for trucks to reduce the noise of engine braking
- Noise, emissions and threat presented by trucks on visitors are perceived to reduce the tourism dollars spent in the area.

Speed

A suggestion was made to help reduce the noise from the use of engine braking that the speed zone in some sections could be reduced from 70km/hr to 50km/hr.

2.10 Issues raised by the community: General

Active Transport

- Some submissions expressed a desire to see consideration given to other transport modes when considering any upgrade, including facilities for pedestrians, cyclists, public transport and rail options.

Tourists

- A number of submissions expressed concern about the negative impact the current condition and management of Waterfall Way is having on the value of local and international tourism in the area. This included the impact of Roads and Maritime advertising about road works associated with land slips on the mountain and the hysteria created by the community itself in relation to the 'unsafe' road due to use
- Some submissions felt that visiting tourists did not understand the protocol for giving way on single lane sections of the road.

School buses

- Some submissions suggested that restricted hours should be placed on heavy vehicles during the peak school travel periods.

Unrelated

A sample of unrelated issues raised in submissions regarding this safety review includes:


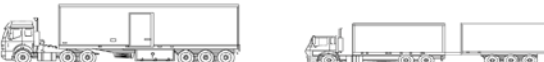
- The condition of the landscaping around Dorrigo Cemetery
- Dorrigo National Park is listed as a World Heritage area and should be considered
- Roadside litter
- One submission felt an environmental assessment is required to consider the impact of all vehicle emissions (not just fuel) on local businesses.

Another issue was appropriate road design or signs need to be installed at the Dorrigo War Memorial to reduce confusion about the road rules to be followed at this intersection. This issue will be considered separately by Roads and Maritime.

3 Route analysis

3.1 Traffic types and volume

For the purpose of this report vehicles have been classified using the Austroads Classification system, shown below in Figure 4. For Class 9 vehicles, which includes 19 metre B-Doubles, there are two sub-categories:

- Class 9A** 6 axles and 4 groups 
- Class 9B** 6 axles and 3 groups 












VEHICLE CLASSIFICATION SYSTEM	
AUSTRADS	
CLASS	LIGHT VEHICLES
1	SHORT Car, Van, Wagon, 4WD, Utility, Bicycle, Motorcycle 
2	SHORT - TOWING Trailer, Caravan, Boat 
HEAVY VEHICLES	
3	TWO AXLE TRUCK OR BUS *2 axles 
4	THREE AXLE TRUCK OR BUS *3 axles, 2 axle groups 
5	FOUR (or FIVE) AXLE TRUCK *4 (5) axles, 2 axle groups 
6	THREE AXLE ARTICULATED *3 axles, 3 axle groups 
7	FOUR AXLE ARTICULATED *4 axles, 3 or 4 axle groups 
8	FIVE AXLE ARTICULATED *5 axles, 3+ axle groups 
9	SIX AXLE ARTICULATED *6 axles, 3+ axle groups or 7+ axles, 3 axle groups 
LONG VEHICLES AND ROAD TRAINS	
10	B DOUBLE or HEAVY TRUCK and TRAILER *7+ axles, 4 axle groups 
11	DOUBLE ROAD TRAIN *7+ axles, 5 or 6 axle groups 

Figure 4: Austroads vehicle classification system

Traffic counters were placed at various locations along Waterfall Way to monitor traffic types, speeds and volumes. Analysis of the data received from those traffic counters revealed only three sites provided complete data sets for the month of June 2014. At some sites the rubber tubing that runs across the road had been broken or there had been some sporadic data that could not be obtained and did not give adequate information.

The sites that did give full data set information were located at:

- Section one (Pacific Highway to Bellinghen): 780m west of Short Cut Road
- Section two (Bellinghen): two locations east and west of Bellinghen
- Section three (Bellinghen to Thora): 530m west of Willis Creek
- Section four (Thora to Dorrigo): 4.4km east of Maynards Plains Road.

The annual average daily traffic counts at three of these locations were:

- Section one (Pacific Highway to Bellinghen): 6350 with 453 heavy vehicles
- Section three (Bellinghen to Thora): 2259 with 336 heavy vehicles
- Section four (Thora to Dorrigo): 1789 with 223 heavy vehicles.

Figure 5 shows the total number of vehicles using Waterfall Way, and the percentage of heavy vehicles in the three sections of Waterfall Way.

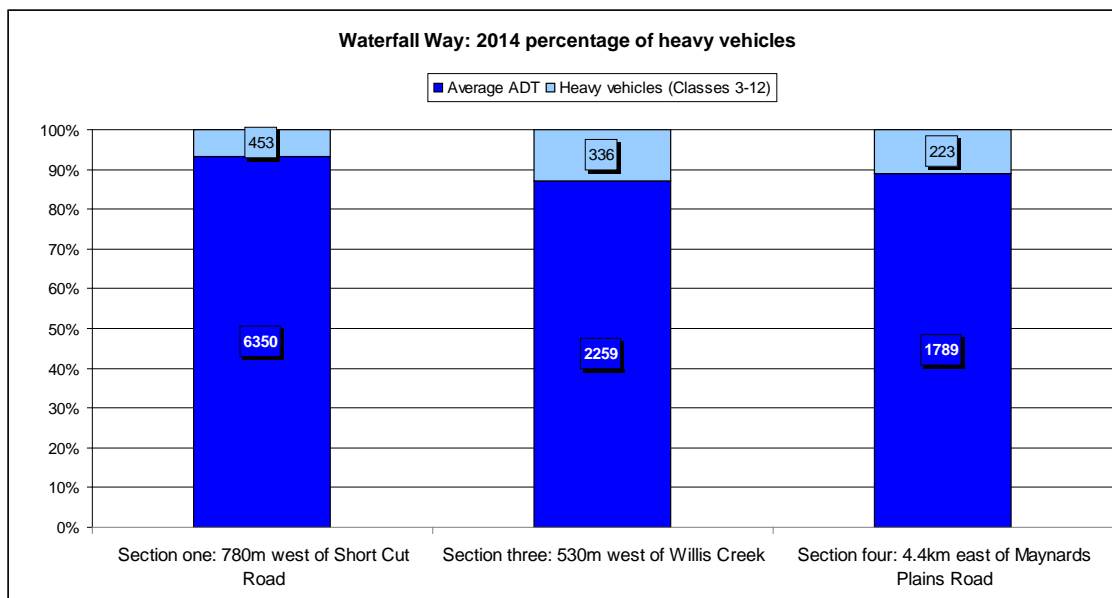


Figure 5: 2014 - Percentage of heavy vehicles on three sections of Waterfall Way

The above information was compared with permanent traffic counters that are located at Fernmount and Thora.

The table below shows that traffic volume data captured over a six year period from 1998 to 2007 indicates that data captured in June 2014 are consistent with previous traffic counts.

Location	1998	2001	2004	2005	2006	2007
Section One: Fernmount	5179	5244	6341	7963	7357	6687
Section Three: Thora	2190	2001	2198	NA	NA	2455

Figure 6 shows a graph of the Annual Average Daily Traffic (AADT) volumes at Fernmount, which is located in section one and Thora, located between sections three and four. It is noted that at Thora there were no traffic data available for years 2005 and 2006.

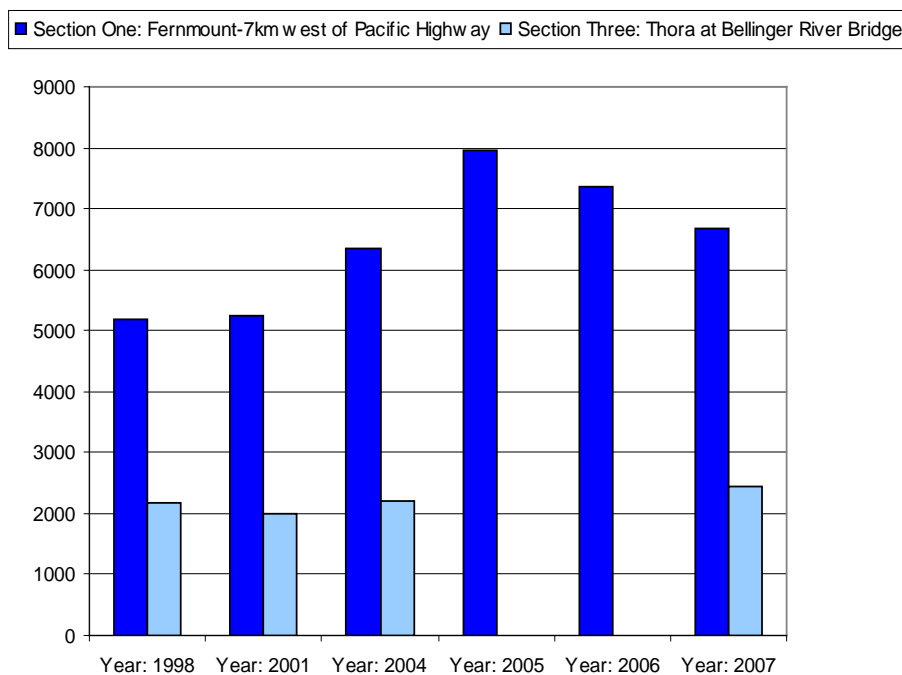


Figure 6: Annual traffic volumes for a six year period (1998 – 2007)

3.2 The road in context – Average Daily Traffic / Heavy vehicles

Section one: 780 metres west of Short Cut Road



From Average Daily Traffic (ADT) data received during June 2014, an analysis of the type of heavy vehicles and number of heavy vehicles using the road, 780 metres west of Short Cut Road, are shown in Figure 7.

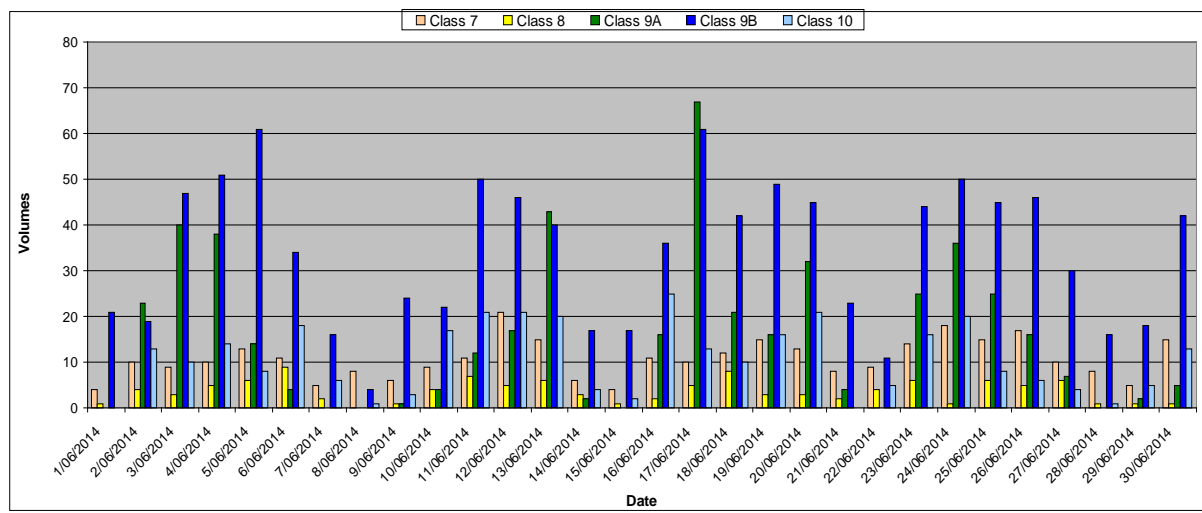


Figure 7: West of Short Cut Road, heavy vehicle volumes/day – classes 7 to 10

Traffic volumes by classification of vehicle

All vehicles	1	2	3	4	5	6	7	8	9A	9B	10
6350	5759	139	314	47	7	9	11	4	16	34	11

At this location the speed limit is 80km/h and the daily average mean speed for Classes 3 to 12 was 77km/hr, with classes 9A and 9B recording an average speed of 75km/h and 73km/h respectively.

Daily Average Mean Speeds by classification of vehicle

All vehicles	1	2	3	4	5	6	7	8	9A	9B	10
77	77	75	77	75	73	77	76	72	75	73	74

Section two: Bellingen



In Bellingen, two temporary Variable Message Signs (VMS) were installed in the 50km/h speed zones, in advance of the 40km/h limit, for a three week period.

Eastern entrance to Bellingen

The traffic counter situated on the eastern side of Bellingen was located 525 metre west of Mill Street. The average speed for westbound traffic from 5 April 2014 to 13 May 2014 was **49.5km/h**.

A speed checker was also placed approximately 625 metre west of Miller Street. The average speed whilst the variable message sign was in place was reduced to **47km/h**.

Western entrance to Bellingen

The traffic counter on the western side of Bellingen was located 100 metre west of Coronation Street. The average speed for eastbound traffic from 1 April to 22 May 2014 was **49km/h**.

A speed checker was also placed approximately 250 metre west of Miller Street. The average speed whilst the VMS was in place was reduced to **47km/h**.

Section three – 530 metres west of Wills Creek



From Average Daily Traffic (ADT) data received during June 2014, an analysis of the type of heavy vehicles and number of heavy vehicles using the road, 530 metres west of Wills Creek, are shown in Figure 8.

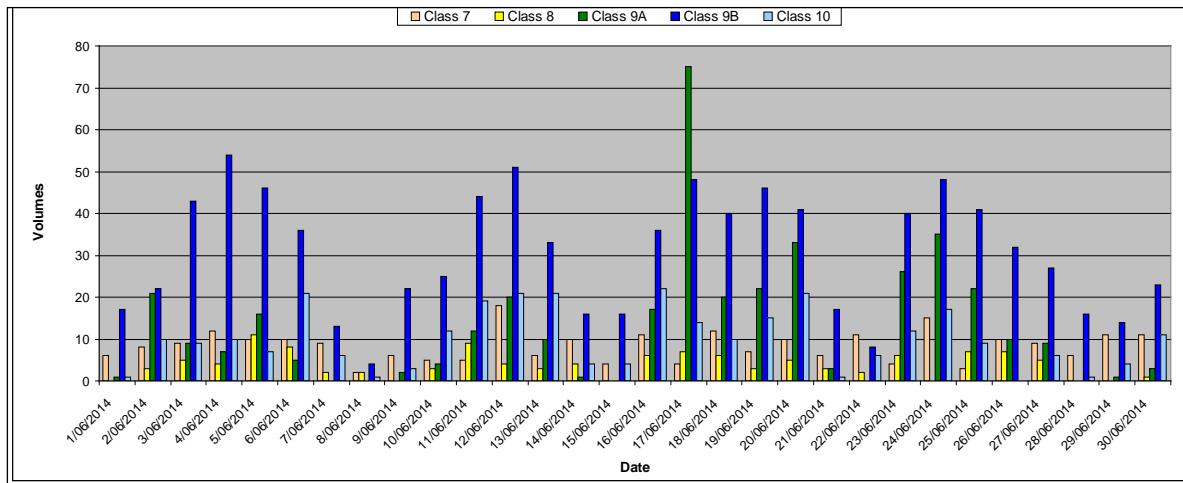


Figure 8: 530 metres west of Wills Creek, heavy vehicle volumes/day

Traffic volumes by classification of vehicle

All vehicles	1	2	3	4	5	6	7	8	9A	9B	10
2259	1858	66	223	33	4	9	8	4	13	31	10

At this location the speed limit is 100km/h and the daily average mean speed for Classes 3 to 12 was 89 km/h, with classes 9A and 9B recording an average speed of 86km/h and 85/h respectively.

Daily Average Mean Speeds by classification of vehicle

All vehicles	1	2	3	4	5	6	7	8	9A	9B	10
89	89	83	88	84	84	85	83	85	86	85	87

Section four: 4.4 kilometres east of Maynards Plains Road



The Average Daily Traffic for heavy vehicles is shown in Figure 9. The speed limit at this location is 100km/h and the daily average mean speed for Classes 3 to 12 was 55km/h, with classes 9A and 9B recording an average speed of 46km/h and 42km/h respectively.

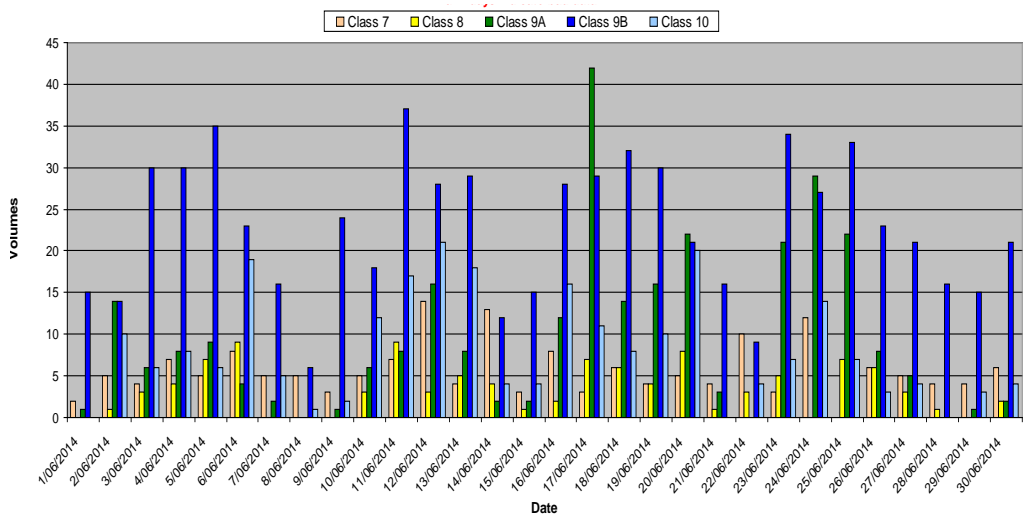


Figure 9: East of Maynards Plains Road, heavy vehicles/day – classes 7 to 10

Traffic volumes by classification of vehicle

All vehicles	1	2	3	4	5	6	7	8	9A	9B	10
1789	1510	57	132	32	4	4	6	3	9	23	8

At this location the speed limit is 100km/h and the daily average mean speed for Classes 3 to 12 was 55 km/h, with classes 9A and 9B recording an average speed of 46km/h and 42km/h respectively.

Daily Average Mean Speeds by classification of vehicle

All	1	2	3	4	5	6	7	8	9A	9B	10
55	56	51	53	44	45	53	46	42	46	42	41

3.3 Existing speed zones

The existing speed zones along Waterfall Way are indicated on the map below, in Figure 10. It should be noted that these are permanent speed zones and represent fourteen changes in zones between the Pacific Highway and Dorrigo.

It is acknowledged that there are also a number of temporary speed zones, predominantly relating to road works that have not been included in the diagram below that may also impact on travel times for motorists.

In addition a 60km/h truck and bus speed zone exists in the Gordonville Cutting area, west of Bellingen.



Figure 10: Indicative location of the speed zone changes along Waterfall Way

3.4 Road safety bus inspection

A bus inspection was held on 25 June 2014 to conduct a visual inspection of various aspects of Waterfall Way. Representatives who attended the inspection were from:

- Road and Maritime Services
- NSW Centre for Road Safety
- NSW Police
- NRMA
- Bellingen Shire Council
- Consultants - ID Planning.

Community feedback and crash analysis, including statistics and trends were considered as part of the inspection. Issues considered included:

- Fatal crash and other casualty crash cluster locations
- Delineation and line marking, especially around curves
- Clear zone issues
- Low radius curves
- Intersection geometry and delineation
- Narrow lanes and road shoulders
- Speed zones
- Regulatory, warning and advisory sign posting
- Motorcyclists, heavy vehicle and school bus issues
- Pedestrian and cyclist facilities.

The inspection stopped at 11 specific areas along the 40 kilometre section of the Waterfall Way between the Pacific Highway and Dorrigo. Representatives carried out a detailed examination and discussion of short term initiatives that could address immediate safety concerns within existing funding and also medium to long term strategies and/or monitoring that should be considered as part of the recommendations from this review. The locations, travelling east to west, along Waterfall Way were:

1. Shortcut Road intersection
2. Sweedmans Lane intersection
3. Marx Hill
4. Boggy Creek curve
5. Horse Shoe Road, after Gordonville Cutting
6. Myers Bluff
7. Thora rest area
8. 200 metres east of Newell Falls
9. The Challet
10. Maynards Plain Road
11. Dome Road.

3.5 Road condition assessment

Roads and Maritime carried out an annual review of road pavement conditions of all State roads in the northern region, including Waterfall Way.

The annual review of Waterfall Way is carried out collaboratively with Clarence Valley, Bellingen and Armidale/Dumaresq Councils. These reviews assist in the determination of future maintenance priorities for the state road network.

The annual maintenance review for Waterfall Way was completed on 19 August 2014 and information / analysis will be used to develop a three year forward planning program for maintenance, including heavy patching, resurfacing and rehabilitation of the road pavement.

4 Casualty crash analysis

Crash statistics recorded by Roads and Maritime Services are confined to those crashes that conform to the national guidelines for reporting and classifying road vehicle crashes (*Road Traffic Accidents in New South Wales 2001: Statistical Statement*). The main criteria are:

- The crash was reported to NSW Police
- The crash occurred on a road open to the public
- The crash involved at least one moving road vehicle
- The crash involved at least one person being killed or injured or at least one motor vehicle being towed away.

4.1 Overview of crash analysis

For the Waterfall Way road safety review, casualty crash data from 10 metres west of the Pacific Highway to Tyringham Street, Dorrigo was examined.

Casualty crashes for the five year period 2009 to 2013 and fatal crashes in 2013 (as at 18 February 2013) were analysed.

The analysis carried out covered various aspects of crash characteristics such as motor vehicle controllers' behaviour, crashes by road user movement in low speed and high speed zones and single or multiple vehicle crash types.

4.2 Casualty trends 2009 to 2013

Figure 11 shows details of the casualty crashes for five years from 2009 to 2013 in which 81 casualty crashes on Waterfall Way were recorded. In the 81 casualty crashes, 114 casualties were reported, one person was killed and 113 people were injured.

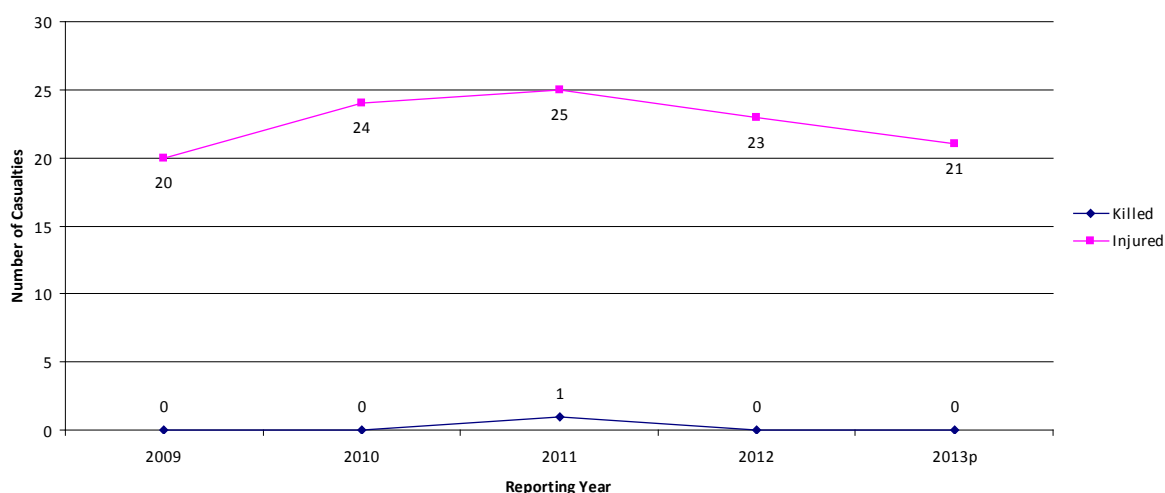


Figure 11: Casualty crashes/reporting year

4.3 Location of casualty crashes

Figure 12 shows the location of casualty and fatal crashes along Waterfall Way for the period 2009 to 2013. This data was used to assist in the identification of crash cluster locations which were one of the discussion points on a bus inspection conducted on 25 June 2014 (Refer to section 3.4 in this report for details of the inspection).

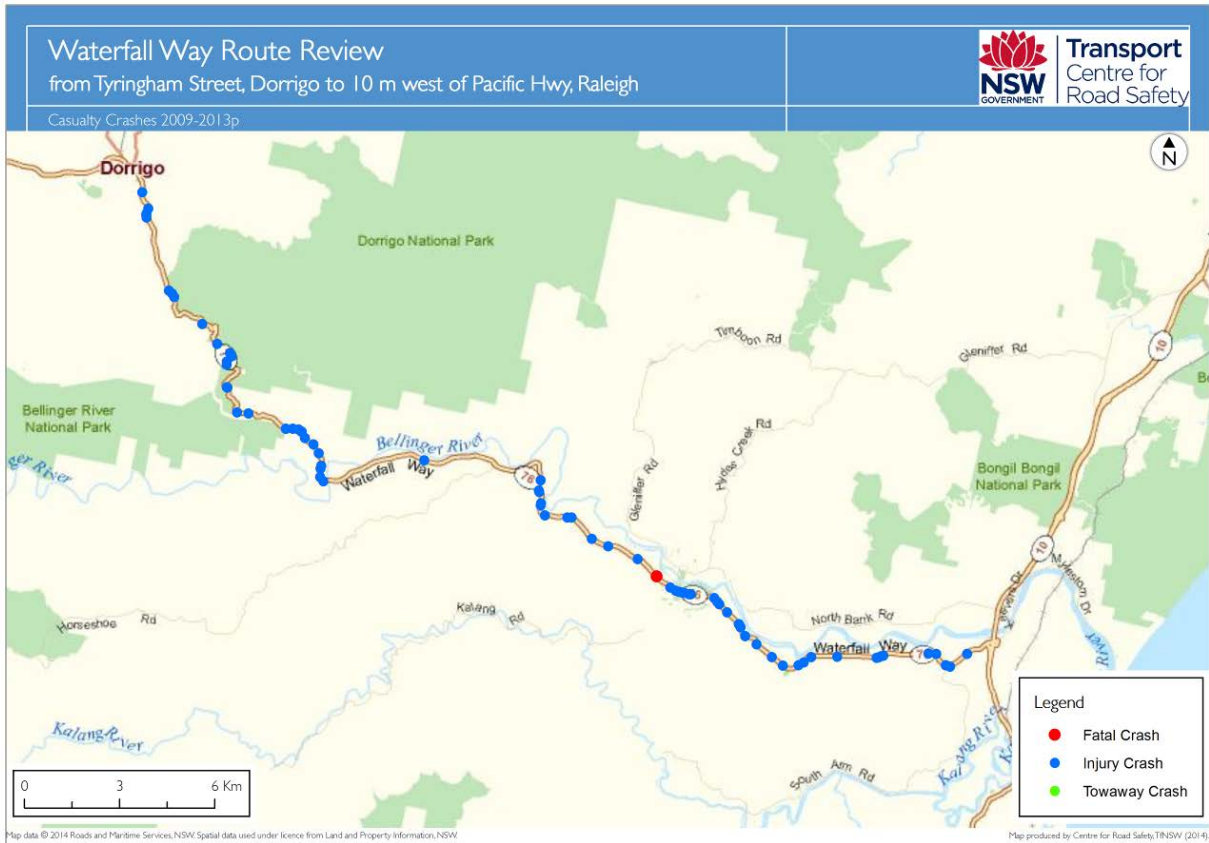
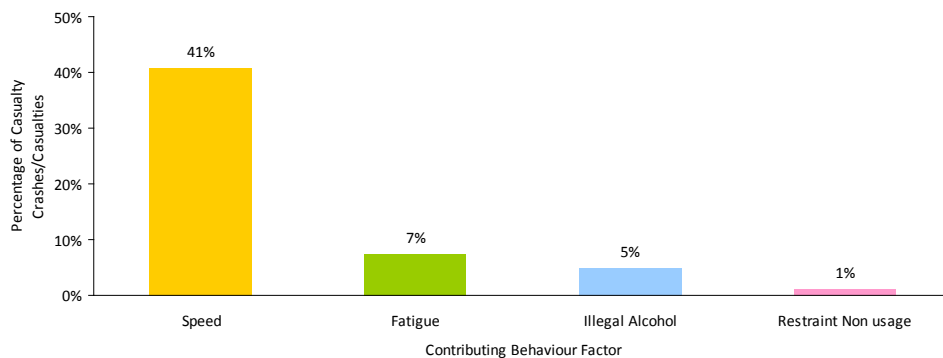


Figure 12: Location of casualty and fatal crash locations 2009 – 2013

4.4 Casualty crash characteristics

Data indicated that 41 per cent of casualty crashes identified speed as a contributing factor in the crash. This does not suggest that motorists were disobeying the speed limit, rather they were travelling too fast for the road environment and/or conditions.



4.5 Who/Age groups and gender

Data gathered for the five year period are highlighted in Figure 13.

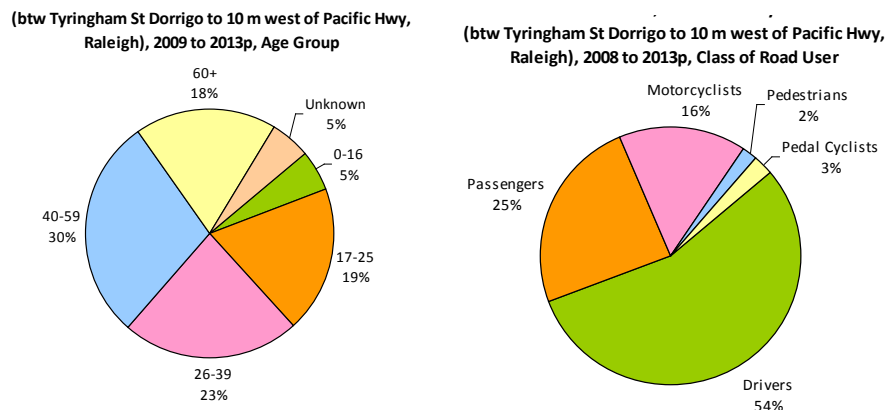


Figure 13: Graphs showing age group and gender of reported casualties

4.6 Residence

Analysis of the crash data shows a majority of drivers and riders involved in crashes on Waterfall Way were residents of Bellingen Shire Council (59 per cent) or from the neighbouring local government area of Coffs Harbour and Nambucca (18 per cent). Refer to Figure 14.

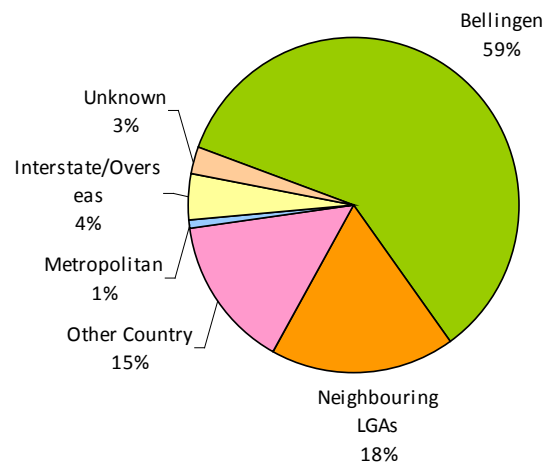


Figure 14: Graphs showing residence of casualty crashes

4.7 When

A higher proportion of the crashes, 25 per cent, occurred on a Monday, Tuesday had 17 per cent and Wednesday to Saturday had 14 per cent of crashes.

The lowest amount of crashes occurred on a Sunday with seven per cent.

Summer and spring months accounted for the highest number of casualty crashes. Refer to Figure 15.

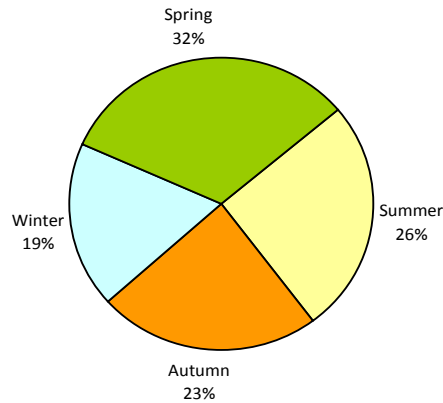


Figure 15: Graphs showing the time of year crashes occurred

4.8 Where

Figure 16 shows features of where crashes occurred. Over half of the crashes occurred in speed zones signposted at 100km/h or more (58 per cent).

The majority occurred away from intersections (81 per cent).

Over half occurred on curved lengths of Waterfall Way (62 per cent).

Over two in every five crashes occurred on a wet road surface (46 per cent), which is higher than other country roads (21 per cent).

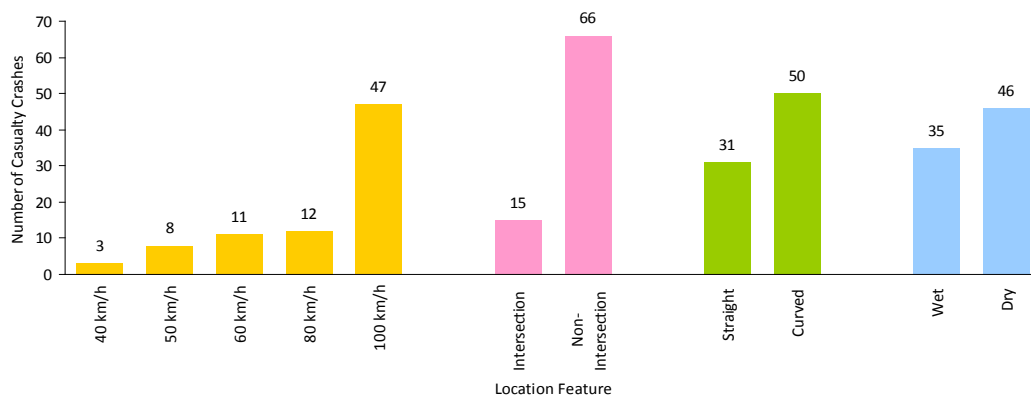


Figure 16: Graphs showing location features of casualty crashes

4.9 What

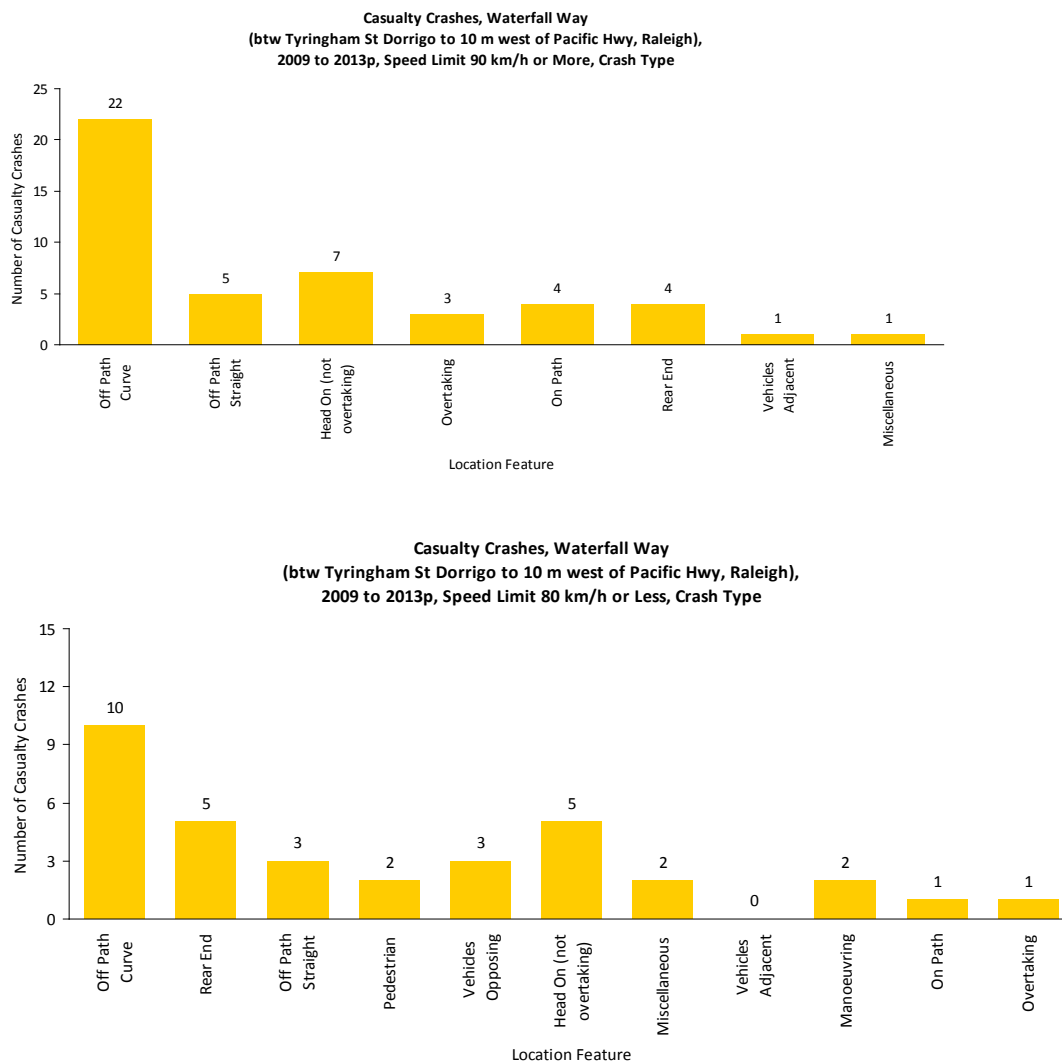


Figure 17: Graphs shows main feature of casualty crashes

4.10 Involvement of heavy vehicles

Of the 81 crashes on Waterfall Way, five crashes involved heavy trucks, with no heavy truck fatal crashes.

Waterfall Way has a slightly lower incidence of heavy truck casualty crashes (six per cent) compared to country NSW (7 per cent). However, on Waterfall Way heavy vehicles account for 14 per cent of traffic, with the NSW average seven per cent.

4.11 Involvement of motorcycles

Compared with all of NSW country roads (14 per cent), Waterfall Way has a higher incidence of motorcycle casualty crashes (19 per cent).

4.12 Crash analysis conclusions

Over the five year period analysed there were 81 casualty crashes resulting in one fatality and 113 injuries.

The majority of drivers and motorcycle riders involved in the casualty crashes live in Bellingen Shire Council area.

Crashes on curves and on wet roads were common.

Just over half of all crashes occurred on sections signposted at 100km/h. Of these, the majority were single vehicle crashes into fixed objects or vehicle rollover crashes.

Compared with casualty crashes on all country roads, there was a high proportion of speed related crashes and a high proportion of motorcycle crashes.

Speeding and fatigue were not considered to have contributed to any of the four heavy truck crashes.

5 Recommendations

5.1 An integrated approach to improving road safety along Waterfall Way

The Safe System approach has been used to investigate improvements to road safety along Waterfall Way.

While this review was being completed, a number of road safety initiatives were immediately implemented. These initiatives were:

- A speed zone review of the Waterfall Way between Bellingen and Thora
- Temporary vehicle activated signs were placed either side of Bellingen
- Enhanced Police enforcement program for Waterfall Way was carried out.
- Enforcement operations were held by Roads and Maritime heavy vehicle inspectors.

Taking into consideration all of the information provided by the community, as well as data analysis, bus inspection, road condition assessment and community feedback a number of recommendations have been made that will focus on short term and medium to long term strategies.

Short term strategies

Short term strategies have been recommended as a result of the Waterfall Way safety review. These have been divided into the following four categories:

- Traffic and pedestrians
- Engineering
- Behavioural
- Site specific:
 - Section one – Pacific Highway to Bellingen
 - Section two - Bellingen
 - Section three - Bellingen to Thora
 - Section four – Thora to Dorrigo.

Traffic and pedestrians recommendations

No.	Subject	Recommendation
S1	Heavy vehicles	Heavy vehicle movements are expected to increase significantly between October 2014 and July 2015. Roads and Maritime will continue to monitor traffic to December 2014 to better inform enforcement programs being conducted and heavy vehicle inspection operations.
S2		Roads and Maritime will continue to monitor the performance of Waterfall Way to ascertain if other strategies need to be considered.
S3		The contractors for the upgrade of the Pacific Highway between Nambucca Heads and Urunga have developed an Action Plan to demonstrate to the community how it proactively manages project truck movements on Waterfall Way, including behaviour of drivers.
S4	School bus safety	Roads and Maritime will liaise with Transport for NSW to arrange bus companies to install reflective tape on the back of buses to improve visibility. This initiative would be particularly effective in areas of high rainfall and heavy fog.

Engineering recommendations

No.	Subject	Recommendation
S5	Night time audit	A detailed night time audit of signs and delineation along Waterfall Way will be completed. The results of this audit will look at reflectivity of signs and identify if maintenance or replacement is required.
S6	Vehicle Activated Signs (VAS)	Roads and Maritime will investigate further opportunities / locations and if sites are identified, install permanent Vehicle Activated Signage as funding becomes available.
S7	Guide sign posting review of Waterfall Way	Roads and Maritime will develop a strategy to address guide signposting, including street name signs and advance intersection signs on Waterfall Way to ensure signage meets current standards.

Behavioural recommendations

No.	Subject	Recommendation
S8	NSW Police enhanced enforcement	Roads and Maritime will develop a strategy with NSW Police to look for opportunities to run joint operations on Waterfall Way from October 2014 to July 2015.
S9	Enforcement by Heavy Vehicle Inspectors	Roads and Maritime will continue with road surveillance by deploying a monitoring device (TRTL) at various times between October 2014 and July 2015 to monitor heavy vehicle movements. This information will inform the enforcement program of scheduling heavy vehicle inspections.
S10	Road safety education	Roads and Maritime will investigate opportunities to develop education campaigns to inform motorists and pedestrians of road safety and sharing the road with heavy vehicles. Also, investigate opportunities for inclusion of road safety in school curriculums.
S11	Helping Learner Drivers workshops	Roads and Maritime to organise a Helping Learner Driver workshop in Bellingen in October 2014 and promote future workshops that will be held in Coffs Harbour during December 2014.
S12	Information sharing	Roads and Maritime will liaise with Bellingen Shire Council to consider establishing a working group to look at sharing information, promoting road safety and other initiatives.
S13	Real time information	Roads and Maritime will liaise with Bellingen and Dorrigo communities to consider future SMS alerts for interested residents. The SMS alerts could include project information, temporary traffic light locations and impacts to travel times for motorists using Waterfall Way.



Site specific recommendations: Section 1 – Pacific Highway to Bellingen

No.	Subject	Recommendation
S14	Speed zone review	Roads and Maritime will carry out a detailed speed zone review from the Pacific Highway to Fernmount. Investigation will include opportunities to reduce the number of changes and rationalise zones to achieve consistency along the route.
S15	Pacific Highway to Fernmount shoulder widening	Roads and Maritime will start in early 2015, Stage 1 of the \$750,000 Sweedmans Lane project to rehabilitate the road, install one metre road shoulders and improve the intersection. This first section will be completed by mid 2015, weather permitting. It is expected that Stage 2 will also be developed for delivery in future years as funding becomes available.
S16	Connells Creek curve improvements	Roads and Maritime will investigate additional signage at Connells Creek curve and install as funding becomes available.
S17	Fernmount signposting	Roads and Maritime will install improved signage at Fernmount to meet current standards, including additional speed limit repeater signs, intersection and warning signs.

Site specific recommendations: Section 2 - Bellingen

No.	Subject	Recommendation
S18	Bellingen - High pedestrian activity area	<p>Roads and Maritime will provide funding to Bellingen Shire Council to develop and design a plan for the high pedestrian activity area in Bellingen.</p> <p>Roads and Maritime will work with council and the community to consider entry treatments, traffic calming, line marking and urban design for the CBD.</p>

Site specific recommendations: Section 3 – Bellingen to Thora

No.	Subject	Recommendation
S19	Myers Bluff	Roads and Maritime will ensure the Myers Bluff project is completed by the end of 2014, weather permitting. This will ensure that road safety benefits are being received by the community as soon as possible.
S20	Gordonville Cutting	Roads and Maritime will ensure the Gordonville Cutting project is completed by the end of 2014, weather permitting. This will ensure that road safety benefits are being received by the community as soon as possible.
S21	Boggy Creek Road curve realignment	Roads and Maritime to investigate the curve near Boggy Creek Road for future funding to improve the geometry of the curve.

Site specific recommendations: Section 4 –Thora to Dorrigo

No.	Subject	Recommendation
S22	Speed zone review	Roads and Maritime will undertake a detailed speed zone review from Thora to Dorrigo . Investigation will include opportunities to reduce the number of changes and rationalise zones to achieve consistency along the route.
S23	Drainage on Dorrigo Mountain	Roads and Maritime will investigate opportunities to continue the installation of concrete dish table drains on Dorrigo Mountain to increase road widths.
S24	Shoulder widening	Roads and Maritime will develop a strategy to incorporate future concrete dish drains and shoulder widening in any future projects.
S25	Maynards Plain Road	Roads and Maritime will investigate the installation of No Stopping signage and/or yellow line marking indicating no stopping along the widened section of road shoulder to the east of Maynards Plain Road.
S26	Pull over areas on Dorrigo mountain	Roads and Maritime will consider formalising 'pull over' areas on Dorrigo mountain when rehabilitation work is planned to enable slow moving vehicles to pull over and allow other vehicles to pass.
S27	Curve Warning and Speed Advisory Signs	Roads and Maritime will undertake a detailed investigation of the speed advisory signs on Dorrigo mountain and prepare a signage plan for implementation as funding becomes available.
S28	Chevron Alignment Markers	Roads and Maritime will undertake an audit of the location of all chevron alignment markers and liaise directly with Bellingen Shire Council on any changes identified.
S29	Curve near North Arm Road	Roads and Maritime will install Slippery When Wet signs in advance of the curve at the bottom of Dorrigo mountain as an interim measure. In addition further detailed investigations, including survey, will determine medium-long term solutions, once funding becomes available.
S30	Low concrete wall adjacent to road	Investigate and install give way signage as soon as possible on Dorrigo Mountain at the narrow sections adjacent to the low concrete wall.
S31	Fog / rain periods	Investigate opportunities for high visibility line marking, raised pavement markers and fluorescent signage to assist motorists during times of fog and rain. Outcomes from the investigation will be implemented as funding becomes available.

No.	Subject	Recommendation
S32	Dome Road, Entrance to Dorrigo Rainforest Centre	Advanced side road name signs to be installed by the end June 2015.

Medium - long term strategies

Corridor Strategy planning longer term solutions

No.	Recommendation
M1	<p>Roads and Maritime Services will develop a corridor planning strategy for Waterfall Way and will look at longer term / major project upgrades required along the route.</p> <p>Roads and Maritime will ensure that the outcomes of the Road Safety Review are incorporated into future corridor / planning strategies.</p>

Heavy vehicle information days

No.	Recommendation
M2	<p>Roads and Maritime will investigate opportunities to have on-going education / information days for all heavy vehicle operators. These opportunities could include an Inspection Station BBQ / information days.</p>

Vegetation - Table drain maintenance

No.	Recommendation
M3	<p>Roads and Maritime will investigate future planning of vegetation management along Waterfall Way, particularly to the west of Bellingen in Sections three and four.</p>

Vegetation - Clear zone at Give way signs on Dorrigo mountain

No.	Recommendation
M4	<p>Roads and Maritime will investigate future planning of clear zones along Waterfall Way, particularly to the west of Bellingen.</p>

Guardrail upgrade

No.	Recommendation
M5	<p>As sections of road are upgraded / rehabilitated, Roads and Maritime will upgrade the guard rail to meet current standards. This will be dependent on funding as it becomes available.</p>

6 Summary and conclusion

Roads and Maritime Services would like to thank the residents of Bellingen and Dorrigo, Bellingen Shire Council, Centre for Road Safety, NSW Police, NRMA and other organisations that provided feedback, contributed information and assisted during the road safety investigation process.

The success of other route safety reviews such as those conducted on the Pacific, Princes and Newell Highways provides reliable evidence that similar road safety outcomes will be best achieved by implementing an integrated series of engineering, behavioural and enforcement programs as well as targeting specific locations.

The recommendations made as a result of the Waterfall Way road safety review focus on an integrated approach to improving road safety from the Pacific Highway to Dorrigo.

Roads and Maritime will consider funding requirements from the strategies to be developed as part of future funding priorities for the NSW state road network.

