



Kings Highway Route Safety Review

March 2013



Transport
for NSW



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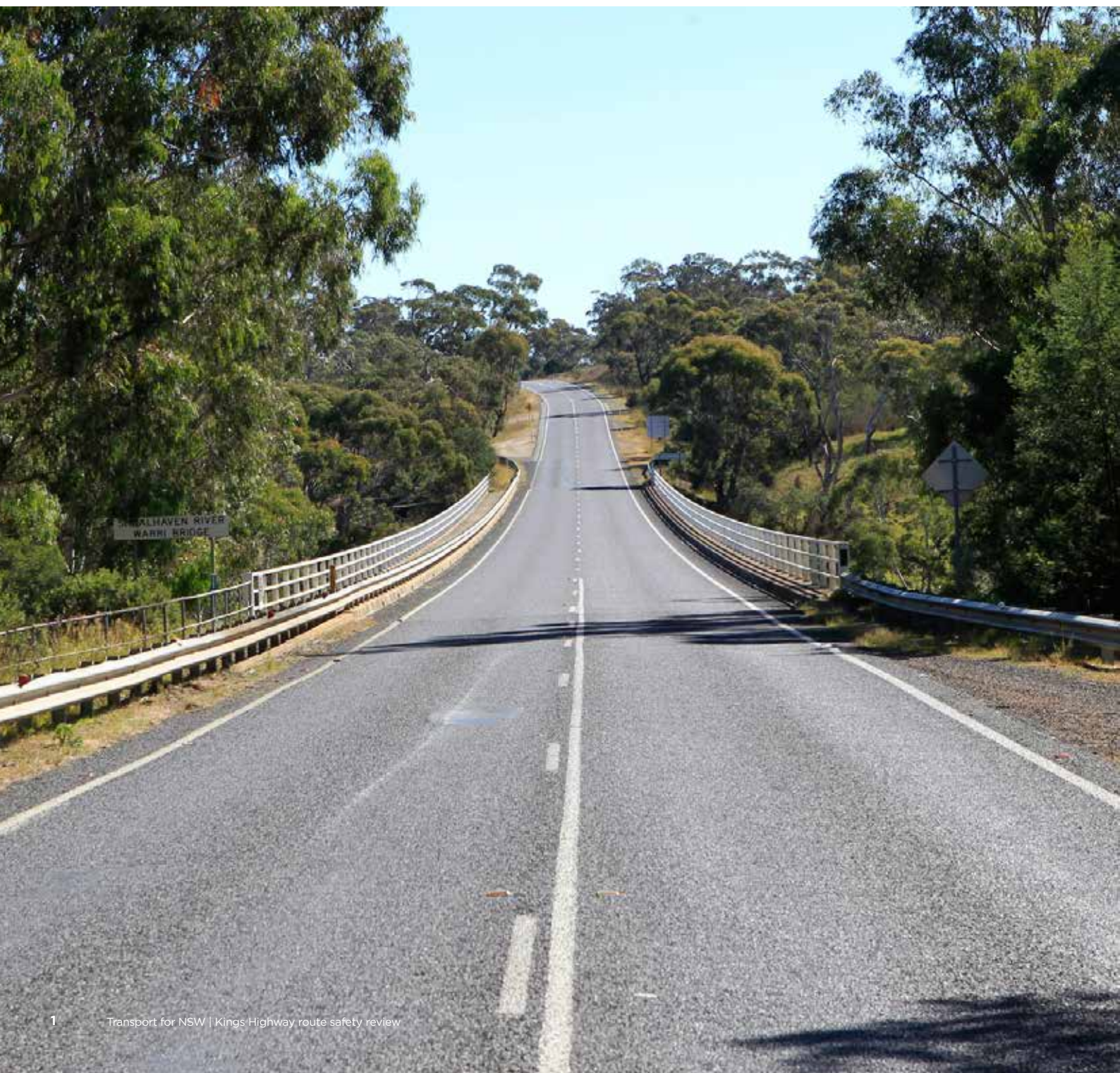
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Overview



The Kings Highway, also known as Main Road 51, is approximately 137 km long. It commences at the New South Wales (NSW) border with the Australian Capital Territory (ACT), to the west of Queanbeyan and terminates at the Princes Highway north of Batemans Bay on the south coast.

In 2012 a route safety review was conducted on the length of the highway from the eastern most border of the ACT, just south of Bungendore, to its junction with the Princes Highway immediately north of Batemans Bay, a distance of approximately 117 km.

The western most section of the highway (approximately 20 km) was not covered by this review. This section of the highway has had recent large scale engineering improvements and also has a significant urban environment with a low fatality crash rate.

The Kings Highway forms an integral part of the rural transport network. It provides one of the main east-west routes crossing the coastal escarpment between Wollongong and the Victorian border. The highway is the major link from the ACT region to the Princes Highway and the south coast. It also connects a major part of the Southern Tablelands, including Goulburn, via Main Road 79, to the south coast. Funding for the highway is generally a State Government responsibility.

The road is a two-way single carriageway highway. It traverses mainly undulating country, except for the section that crosses the coastal escarpment which is characterised by steep grades, winding and often narrow alignment. The Kings Highway passes through the towns of Braidwood and Bungendore and the village of Nelligen.

It is recognised that sections of the Kings Highway can be improved to address particular road environment issues and provide a more consistent and safer travelling experience. Recent crash trends on the highway have shown an increase in casualty crashes.

Over the past 12 years (2000-2011^{p1} and fatal crashes 2012^p) 757 casualties have been reported from 481 crashes on the Kings Highway. Of the 757 casualties, 38 people were killed and 719 persons were injured.

The Kings Highway route safety review followed the model adopted for previous route safety reviews:

- Pacific Highway (2004)
- Princes Highway (2004)
- Newell Highway (2007)
- Great Western, Mid Western, Mitchell Highways (CENWEST) (2010)
- New England Highway (2010)

The model used for route safety reviews aims to recommend road safety treatments that are known to be effective and can be implemented without major engineering works.

The Kings Highway route safety review was established to examine and report on the following road safety issues:

- The circumstances surrounding recent fatal crashes and other casualty crash cluster locations.
- General road conditions along the highway and particular road safety issues raised by the community and stakeholders at community consultation workshops.
- Facilities, such as signage, intersection treatments, line marking, safety barriers and the configuration of overtaking lanes along the highways.
- The appropriateness of current speed limits and speed zones.
- Issues associated with driver behaviour, such as speeding and fatigue.
- Enforcement activities.
- Future priorities for rehabilitation and maintenance programs and the way in which road safety outcomes can be integrated into these programs, especially at high risk locations.

¹ The data for the years marked p is provisional, it has not been finalised.

A range of analyses, Community Engagement and highway inspections were undertaken during the review. These included:

- Analysis of reports on fatal crashes.
- Analysis of crash trends, such as severity, crash type and crash factors.
- A desk based review of the Kings Highway including the use of the Roads and Maritime Services (RMS) GIPSI-CAM (Global/Inertial Positioning System and Image Capture for Mapping) system to review areas of highway road environment that require closer scrutiny.
- Community consultation workshops held in Bungendore and Batemans Bay to obtain details of specific road safety issues along the highway for further investigation.
- Physical inspections of the highway to examine the locations and circumstances of fatal crashes, casualty crash cluster locations identified by the community, speed limits and speed zones and to assess the road from both a behavioural and road environment perspective.

The review adopted the Safe System approach. This approach aims to influence the behaviour of road users, but acknowledges that people will inevitably make mistakes. It requires the system to anticipate and 'forgive' driver error. Consequently, a safe road environment (road and roadside) is integral to managing and improving road safety outcomes.

Based on the above analysis a road safety strategy for the Kings Highway has been developed. The goal of this strategy is to achieve a substantial reduction in the incidence and severity of road crashes on the Kings Highway.

The following components have been developed to support this goal:

- Safer operation of the highway through targeted road safety engineering improvements.
- Review and upgrade signage, safety barriers and line marking.
- The identification of targeted improvements for higher risk locations, particularly with regard to improving clear zones.
- The reassessment of speed limits and speed zones for consistency along the route and to ensure that the limits are appropriate to the road environment and in accordance with the RMS NSW Speed Zoning Guidelines.
- The management of speeding and driver fatigue and the enforcement of speed limits.
- Address driver fatigue.

The following programs underpin these components.

Road safety engineering program

The route safety engineering program is prioritised based on risk. It aims to address issues such as the impact of head on and run off road crashes, inadequate clear zones, substandard road alignment, narrow road shoulders, inconsistent signage, inconsistent line marking arrangements and the lack of suitable facilities at some intersections.

Typical treatments include:

- Improvements to clear zones, especially in those sections east of Braidwood and on the coastal escarpment. This includes a safety barrier review and upgrade to ensure that adequate protection from roadside hazards is provided.
- Improvements to the road alignment at several locations to reduce the potential for serious crashes on curves by providing wider sealed road shoulders.
- Review and upgrade junction treatments at key locations to ensure that suitable and adequate facilities are provided, particularly in high speed zones.
- A review of speed zones to ensure speed limits are suitable for the road environment. This will help to provide a consistent application of speed zones along the full length of the highway, in accordance with RMS NSW Speed Zoning Guidelines.
- Identify and develop suitable roadside enforcement sites that meet technical and safety requirements. This will allow RMS and NSW Police to undertake enforcement activities.
- Review and upgrade overtaking opportunities and overtaking lane arrangements.
- Review and upgrade signposting to ensure that it is consistent along the highway.

Road user behaviour program

The road user behaviour program is designed to address issues such as speeding, driver fatigue and drink driving with initiatives including:

- Maintain and strengthen the Kings Highway Road Safety Partnership.
- Provide informal 'green reflector'² heavy vehicle rest stop locations.
- Continue community education campaigns.

Enforcement program

The enforcement program is designed to address speeding, driver fatigue, drink driving and general compliance to road transport regulations for both light and heavy vehicle drivers. The initiatives include:

- Increasing the profile of police speed enforcement.
- Undertaking joint Police and RMS speed enforcement operations.
- Provision of safe enforcement infrastructure.

2 Green reflectors on guide posts are used to mark informal rest areas for drivers of heavy vehicles.

Section 1 Introduction



1.1.1 Description of the highway

The Kings Highway is approximately 137 km in length from the Australian Capital Territory border, west of Queanbeyan, to the Princes Highway on the south coast just north of Batemans Bay. It is the major corridor link between Canberra and the south coast.

The highway is a two-way single carriageway east of Queanbeyan to the Princes Highway. The highway mainly traverses rural farming land over undulating countryside on the western sections of the highway. However, the environment changes substantially to the east of Braidwood as it crosses the eastern escarpment over the Clyde Mountain where the terrain is steep with a winding narrow alignment bordered by a National Park and State Forests.

For the purposes of the route safety review, the highway was divided into five sections as shown in the table below.

The sections of the highway are not of equal length as they have been identified for their distinctive traffic characteristics, crash profile and topography, including the road alignment. For example, the terrain through the Clyde Mountain escarpment, with its very winding and narrow alignment, is substantially different from the rest of the Kings Highway which travels through more undulating country on a straighter alignment.

The change in road environment is most noticeable at the top of the Clyde Mountain where it is abrupt for eastbound vehicles travelling into section with a lower standard of alignment. This is reflected in the casualty crash cluster in this vicinity, with the majority of at fault vehicles travelling east.

Traffic volumes are highest west of Bungendore, influenced by the populations of and attraction to Canberra and Queanbeyan. Traffic volumes increase significantly during the warmer months, especially on weekends, between Canberra and the coast.

Land to the western end of the highway has experienced the development of large rural subdivisions, driven by the demand from Canberra and to a lesser extent Queanbeyan.

The Clyde Mountain is often subject to inclement weather and reduced visibility caused by fog. These conditions combined with the challenging horizontal and vertical alignments, can make it a difficult section of road to travel safely.

TABLE 1.1: Sections of the highway

Section	From	To	KM	LGA
Western	ACT Border, west of Bungendore	Bungendore (junction of Malbon & Molonglo Sts)	8	Pallerang
Bungendore	Bungendore (junction of Malbon & Molonglo Sts)	Braidwood (junction of Wallace and Lascelles Sts)	52	Pallerang
Braidwood	Braidwood (junction of Wallace and Lascelles Sts)	Pallerang/Eurobodalla Shire Boundary (top of Clyde mountain)	19	Pallerang
Clyde Mountain	Pallerang/Eurobodalla Shire Boundary (top of Clyde mountain)	Nelligen (junction of Kings Highway & Wharf Rd)	30	Eurobodalla
Nelligen	Nelligen (junction of Kings Highway & Wharf Rd)	Junction of Kings Highway & Princes Highway	8	Eurobodalla
		Total	117	

1.1.2 Background

Since the turn of the century (2000 to 2010) NSW has experienced a significant downward trend in crashes and casualties, particularly for fatalities. In 2000 more than 600 persons were killed on NSW roads and by 2010 the road toll had been cut by 33 per cent. The 2008 road toll of 374 fatalities was the lowest annual total recorded for NSW since 1944. The number of injuries and recorded crashes on NSW roads also showed improvements, decreasing by around 15 per cent and 20 per cent respectively between 2000 and 2010.

There has not been a similar trend for fatalities on the Kings Highway. The number of fatalities since 2000 peaked in 2004 (six killed), 2008 (five killed) and again in 2012p with five fatalities to 30 June. The number of casualty crashes did trend downward from 2002 to 2009 but has increased slightly since then.

The short lengths of the highway immediately either side of Braidwood have high casualty crash rates, with four fatal crashes between 2007 and 2011. This route safety review will encompass the work already undertaken by RMS on the roadside hazards on the Kings Highway near Braidwood.

The Kings Highway route safety review was initiated following two fatal crashes east of Braidwood in March 2012, in which five people were killed.



Photograph 11: Fatal crash site, east of Braidwood

Kings Highway, casualty crashes 2000 to 2011, fatal crashes 2012p

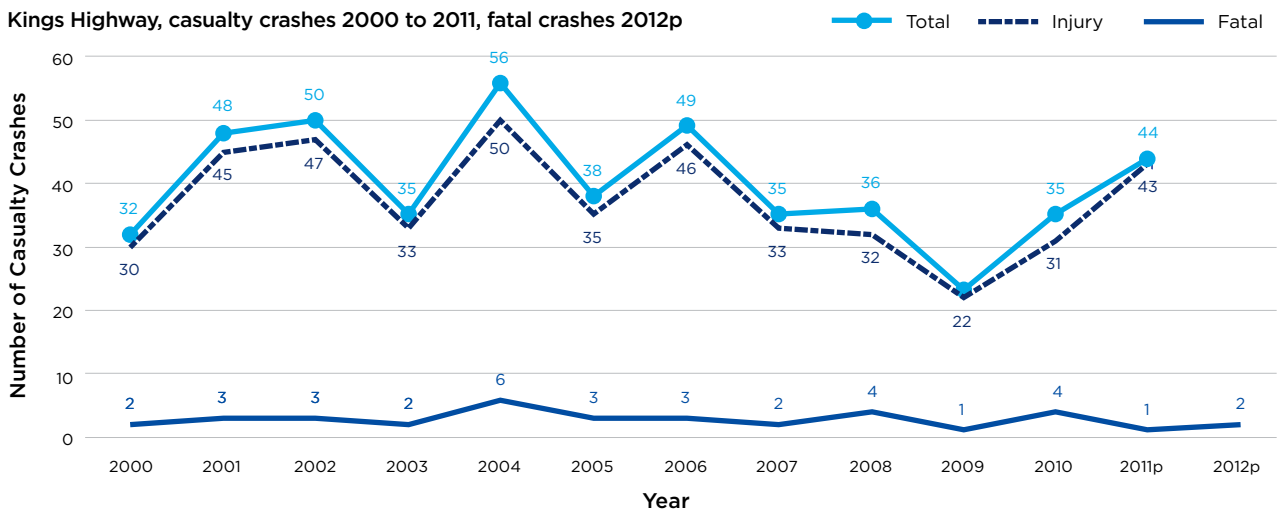


FIGURE 1.1: Kings Highway, casualty and fatal crashes

Kings Highway, casualties 2000 to 2011p, fatalities 2012p

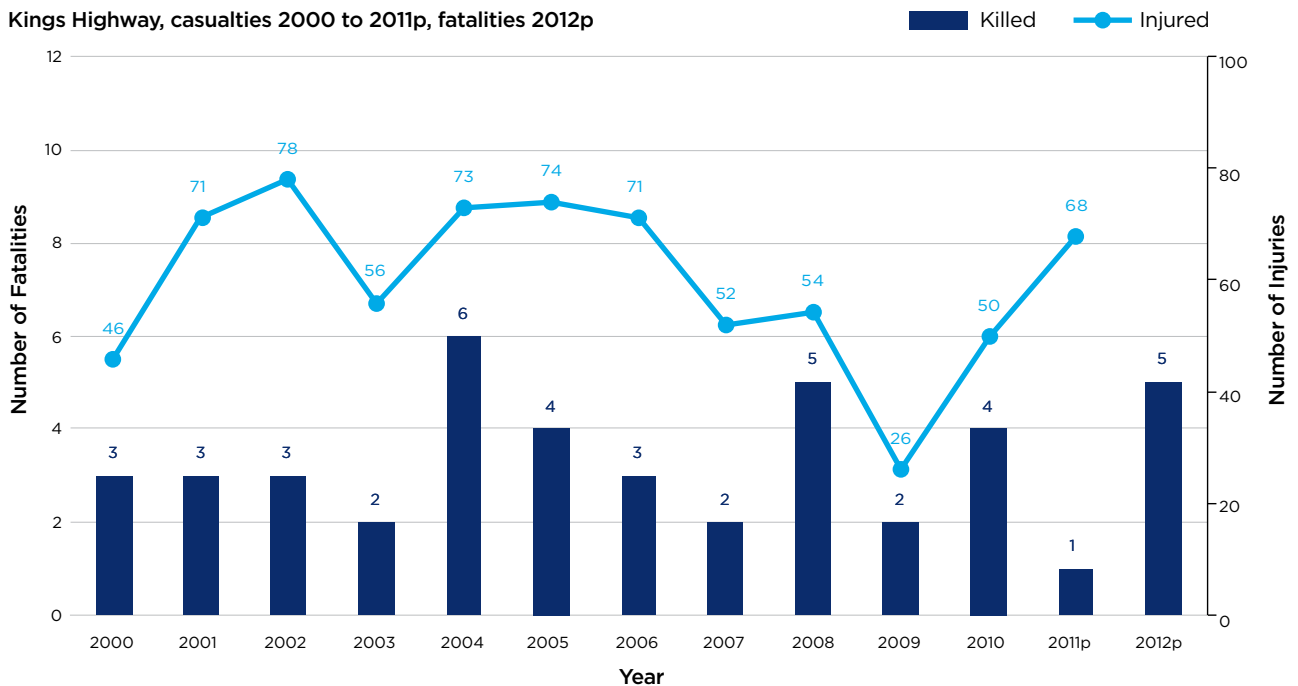


FIGURE 1.2: Kings Highway casualties and fatalities

1.1.3 Terms of reference

The Kings Highway route safety review was established to review the length of the highway from the eastern most border of the ACT to the junction with the Princes Highway. The purpose of the review was to undertake a holistic assessment of road safety conditions along the highway and to investigate and report on the following:

- The circumstances surrounding fatal crashes.
- The circumstances surrounding crash cluster locations.
- Road safety issues advised by the community at community consultation workshops.
- The appropriateness and consistency of speed limits.
- Driver behaviour issues.
- Police enforcement issues.
- Future priorities for highway rehabilitation and maintenance programs.

1.1.4 The review process

Since 2004, highway reviews have been undertaken by RMS to improve road safety along key transport corridors. Previous reviews include the Pacific Highway (2004, 700 km), Princes Highway (2004, 430 km), Newell Highway (2007, 1060 km), CENWEST review (Great Western, Mid Western, Mitchell Highways) (2010, 700 km) and the New England Highway (2010, 600 km).

The approach to this highway route safety review was multidisciplinary and engaged people from the Centre for Road Safety (CRS) and RMS road safety, road user behaviour and asset management areas. It also involved representatives from the NSW Police, NRMA and the community. A holistic approach was taken and the highway reviewed as a system following the methodology of the Safe System approach.

The objective of the Kings Highway route safety review is to reduce the occurrence and severity of road crashes. Road safety issues have been identified and recommendations developed. Targeted road safety engineering, behavioural and enforcement programs should be implemented.

A safe road environment (road and roadside) is integral to managing and improving road safety outcomes. The Kings Highway review examined:

- Fatal crash and other casualty crash cluster locations.
- Delineation and line marking, especially around curves.
- Clear zone issues.
- Low radius curves.

- Junction geometry and delineation.
- Narrow road shoulders.
- Speed zones.
- Regulatory, warning and advisory sign posting.
- Pedestrian and cyclist facilities.
- Heavy vehicle issues.
- School bus operations and the location of school bus stops.

Highway field inspections were undertaken on 24 May 2012. The inspections were undertaken by a team of road safety engineering, road user behaviour and asset management practitioners from the CRS and RMS Southern Region. Representatives from the NSW Police, NRMA and three community members were also present.



Photograph 1.2: Field inspection site, near Bungendore

The team inspected the locations of fatal crashes and crash clusters to determine the contribution of road environment factors to the crashes.

The team also reviewed and documented other road environment issues which were observed or raised during the consultation process.

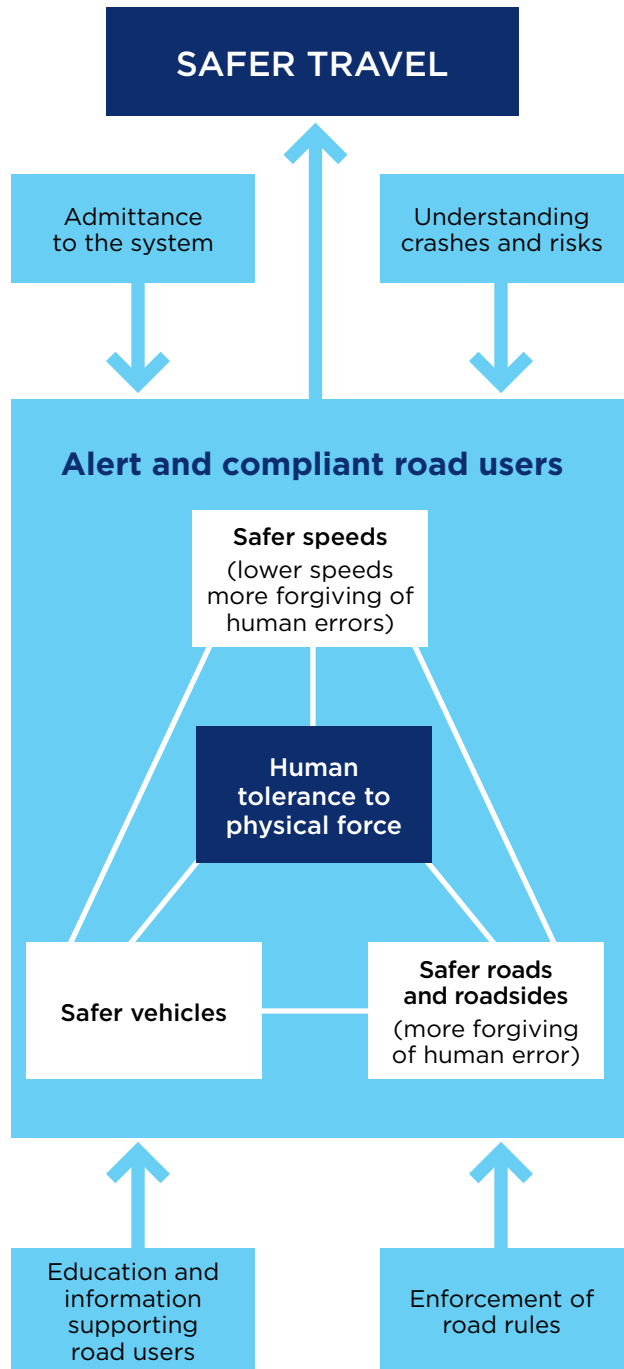
The analyses and highway inspections undertaken as part of the review included:

- Review of fatal crash reports and crash trends such as severity, crash type and crash factors.
- Review of information provided at the community consultation workshops.
- Physical inspection of the highway by the assessment team to examine the location and circumstances of fatal crash and casualty crash clusters and to assess any possible road environment contributing factors.

1.1.5 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 1.3 is a representation of the Safe System approach.

FIGURE 1.3: Safe System approach



1.2 Community and stakeholder engagement

Prior to the highway field inspections, community members and stakeholders were invited to submit comments for the Kings Highway route safety review from 24 April to 16 May 2012.

As part of the review, the CRS sought community comments on the:

- Locations on the Kings Highway where there is a perceived road safety problem.
- Locations of near miss or unreported crashes.
- General road safety concerns on the Kings Highway.
- Proposed treatments for the Kings Highway near Braidwood.

Community members and stakeholders could participate in the review by:

- Posting comments on the online Community Engagement website.
- Submitting written comments via mail or email.
- Telephoning.
- Attending Community Workshops.
- Attending field inspections.
- Meeting with project team members.

1.2.1 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 Kings Highway route safety review.
- Gain an understanding of the local issues relating to road safety along the Kings Highway.
- Manage community expectations.
- Use the information gathered from the workshops and the online Community Engagement website to further inform the review.

1.2.2 Community Workshops

The following Community Workshops were held:

- Bungendore Wednesday, 2 May 2012
- Batemans Bay Friday, 4 May 2012

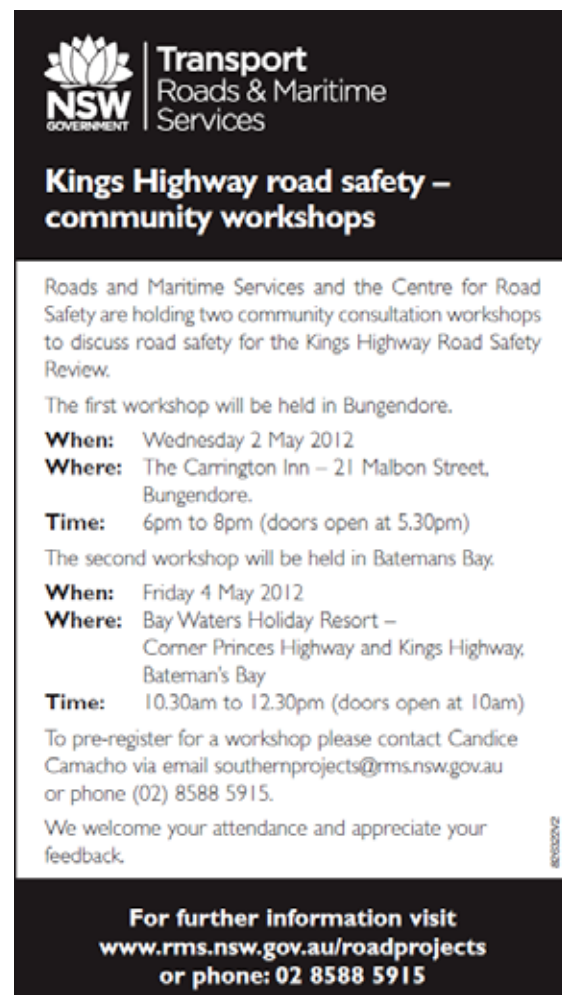
1.2.3 Community and stakeholders

- Local council staff and elected representatives.
- State and Federal members of parliament.
- ACT Government.
- Road safety associations and committees.
- Emergency Services, both local and interstate:
 - NSW Police Force
 - NSW Fire Brigade
 - NSW Ambulance Service
 - NSW State Emergency Service
 - NSW Rural Fire Service.
- NRMA.
- Local Chambers of Commerce.
- Local and ACT bus company operators
- Local and ACT heavy vehicle freight operators
- Members of the public, including interstate and local residents of:
 - ACT
 - Bungendore
 - Braidwood
 - Nelligen.
- Heritage associations.
- Local tourist associations.
- Transport for NSW (TfNSW) representatives from the CRS.
- RMS representatives from:
 - Infrastructure Communication
 - RMS Southern Region.

1.2.4 Contacting community members and stakeholders

For the purpose of the Kings Highway route safety review, RMS and the CRS used a number of tools to inform and involve the community.

Figure 1.4 is an example of the advertising for the Community Workshops.



The advertisement is a vertical flyer with a black header and footer. The header contains the NSW Government logo and the text 'Transport Roads & Maritime Services'. The main title is 'Kings Highway road safety – community workshops'. The body text provides details for two workshops: one in Bungendore on Wednesday 2 May 2012 at The Carrington Inn, and another in Batemans Bay on Friday 4 May 2012 at Bay Waters Holiday Resort. It includes contact information for Candice Camacho and a pre-registration link. The footer provides the website www.rms.nsw.gov.au/roadprojects and phone number 02 8588 5915.

NSW GOVERNMENT | Transport Roads & Maritime Services

Kings Highway road safety – community workshops

Roads and Maritime Services and the Centre for Road Safety are holding two community consultation workshops to discuss road safety for the Kings Highway Road Safety Review.

The first workshop will be held in Bungendore.

When: Wednesday 2 May 2012
Where: The Carrington Inn – 21 Malbon Street, Bungendore.
Time: 6pm to 8pm (doors open at 5.30pm)

The second workshop will be held in Batemans Bay.

When: Friday 4 May 2012
Where: Bay Waters Holiday Resort – Corner Princes Highway and Kings Highway, Bateman's Bay
Time: 10.30am to 12.30pm (doors open at 10am)

To pre-register for a workshop please contact Candice Camacho via email southernprojects@rms.nsw.gov.au or phone (02) 8588 5915.

We welcome your attendance and appreciate your feedback.

For further information visit
www.rms.nsw.gov.au/roadprojects
or phone: 02 8588 5915

FIGURE 1.4: Community Workshop advertisement

The following tables provide details of the dates and types of communications used to disseminate information.

TABLE 1.2: Communications in March 2012

March 2012

Date	Communications/ consultation activity	Subject
12 March 2012	Media release Member for Monaro, John Barilaro MP	Announcement of the Kings Highway route safety review
26 March 2012	Kings Highway route safety review web page established	

TABLE 1.3: Communications in April 2012

April 2012

Date	Communications/ consultation activity	Subject
24 April 2012	Opening of the Community Engagement website	Commencement of the consultation period
26 April 2012	Media release Member for Bega, Andrew Constance MP	Commencement of the Kings Highway route safety review
26 April 2012	<ul style="list-style-type: none"> Letter box drop to residents along the Kings Highway, including Nelligen, Braidwood and Bungendore Emails to stakeholders Letters to stakeholders 	Notification to residents and stakeholders of: <ul style="list-style-type: none"> Commencement of the review Commencement of the consultation period How to access the Community Engagement website Dates and locations of workshops
26 April 2012	Variable message signs (VMS) located on the Kings Highway.	Direct motorists to the website for information about the Kings Highway route safety review
26 April 2012	Website update – including Community Engagement website	Update of website information including: <ul style="list-style-type: none"> Status of the review Workshop dates and locations Submission period dates Contact information for submissions Community Engagement website
27 April 2012	Advertisement in the Canberra Times	Advertisement for Community Workshop

TABLE 1.4: Communications in May 2012

May 2012

Date	Communications/ consultation activity	Subject
1 May 2012	Advertisement in the Canberra/ Queanbeyan Chronicle	Advertisement for Community Workshop
2 May 2012	Advertisement in the Batemans Bay Post, Braidwood Times and Bungendore Mirror	Advertisement for Community Workshop and Community Engagement website
2 May 2012	Bungendore Community Workshop	Invitation to participants to join the Field Inspection team
3 May 2012	Advertisement in the Canberra Times	Advertisement for Community Engagement website
4 May 2012	Advertisement in the Batemans Bay Post, Moruya Examiner and Queanbeyan Age	Advertisement for the Community Engagement website
4 May 2012	Batemans Bay Community Workshop	Invitation to participants to join the Field Inspection team
8 May 2012	Advertisement in the Canberra/ Queanbeyan Chronicle	Advertisement for the Community Engagement website
8 May 2012	Website update following Community Workshop	Update information following Community Workshop and a reminder of the cut off date for submissions
10 May 2012	Email to community members and stakeholders	Update information following Community Workshop and a reminder of the cut off date for submissions
10 May 2012	Email to volunteers for the field inspection	Provide schedule/requirements for field inspection and confirm date
16 May 2012	Website update - closure of Community Engagement website	Update website to confirm the end of the submission period and close Community Engagement website
16 May 2012	Email to volunteers for the field inspection	Confirmation of attendance of participants in the field inspection
24 May 2012	Field inspection	Conduct field inspection with community and stakeholder participants
31 May 2012	Website update following field inspection	Addition of field inspection data and images to the website and upload of Community Engagement report
31 May 2012	Email to community members and stakeholders	Direct community members and stakeholders to updated website for field inspection details and the Community Engagement report.

Submissions

Community Engagement website

The Community Engagement website used a collaborative mapping tool – an online application used in a standard internet browser. It used Google Maps to enable community members and stakeholders to pinpoint locations and identify issues on the Kings Highway that they thought should be considered by the route safety review.

The tool was used to allow people to engage with the review and provide information directly. It expanded the reach of the Community Engagement.

Figure 1.5 shows the Online collaborative mapping tool on the Community Engagement website.

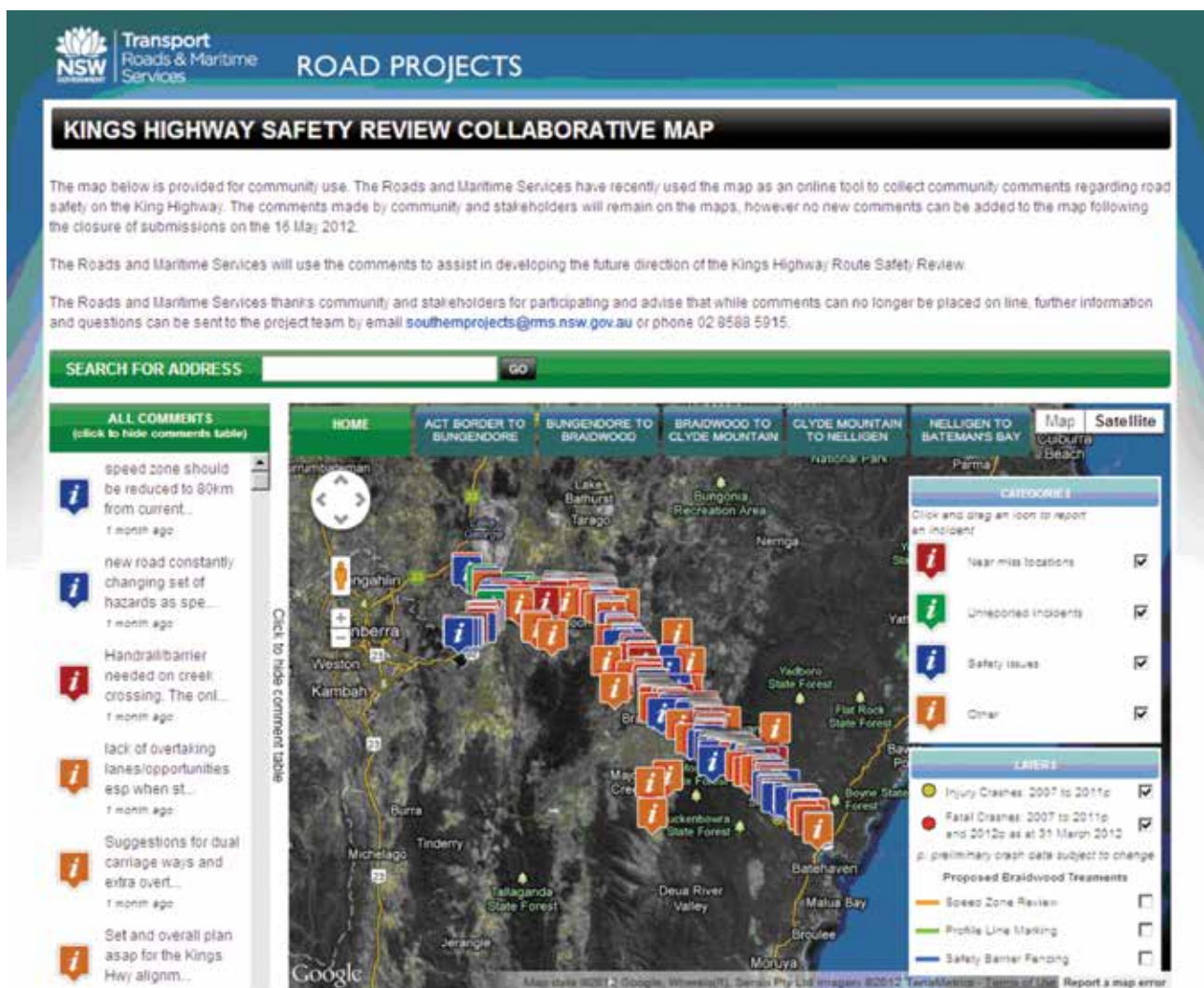


FIGURE 1.5: Online collaborative mapping tool on the Community Engagement website

All the community submissions and comments posted on the Community Engagement website, together with email, written and phone submissions were compiled and documented in the *Collaborative Community Mapping Report*.

All participants in the field inspections were provided with a copy of the report to ensure that they were aware of the community issues involved. Locations of concern identified by the community using the Community Engagement website and included in the report were investigated during the field inspection.

The *Collaborative Community Mapping Report* is available online and the contents will help to inform the recommendations of the Kings Highway route safety review.

Telephone and written submissions

Telephone, email and postal submissions were accepted from community members and stakeholders who wished to provide more detailed submissions to the review. In total the Kings Highway route safety review received the following:

- Online comments 268
- Email submissions 52
- Postal submissions 10
- Telephone submissions 4

Community Workshops

Workshops were held to provide community members with further information regarding the road safety issues on the Kings Highway and the objectives of the route safety review.

The workshops also provided feedback from local residents to the CRS. This was used to inform the field inspections and influenced the direction of recommendations for the Kings Highway route safety review.

Community Workshops were held in:

- Bungendore Carrington Inn on 2 May 2012
Attended by 27 community members and CRS and RMS representatives.
- Batemans Bay Bay Waters on 4 May 2012
Attended by 18 community members and CRS and RMS representatives.

At the workshops CRS and RMS gave presentations on the:

- Background and scope of the Kings Highway route safety review.
- Crash history and statistics.

The workshops were conducted as a round table discussion, with representatives from CRS and RMS using the collaborative online mapping tool to record the community comments.

The presentation and meeting notes from the workshops in Bungendore and Batemans Bay are available online. Community issues recorded in the meeting notes were referred to during the field inspections and helped to inform the recommendations for the route safety review.



Photograph 1.3: Information sharing, Bungendore Community Workshop, May 2012



Photograph 1.4: Community feedback, Bungendore Community Workshop, May 2012

Field inspection

Two community participants and a representative from NSW Police, NRMA and the local Rural Fire Service joined the CRS and RMS staff for the field inspection for the Kings Highway route safety review.

The field inspection initiated the technical investigations to identify the road safety issues on the Kings Highway. The field inspection investigations were determined by the:

- Locations of fatal crashes.
- Locations of crash clusters.
- Kings Highway and road safety knowledge from the field inspection team.
- Safety issues and locations identified by the community during the consultation period.

I was very appreciative of being selected to be part of the highway inspection tour conducted on the 24th of May. This tour gave me the opportunity to make some first hand comments about incidents that had occurred at specific locations between the Clyde Mt and Bungendore. I hope that it may have assisted in building a clearer picture to the RMS staff that was on the tour in relation to the circumstances relating to some of those incidents that I had attended.

I would like to finally say that RMS need to be congratulated for undertaking this whole consultation process and involving the wider community along the entire NSW section of the Kings Highway. It will hopefully lead to achieving a more appropriate plan for the Highway in the future.

Danny King, Senior Deputy Captain,
Braidwood Volunteer Rural Fire Brigade

Danny King attended the field inspection on behalf of the local Rural Fire Service.



Photograph 1.5: Cabbage Tree Creek Bridge near Nelligen

1.2.5 Key issues raised

Comments posted on the Community Engagement website and made at the Community Workshops focussed on road safety on the length of the Kings Highway between the Princes Highway roundabout at Batemans Bay and the eastern most part of the ACT border, just south of Bungendore together with the town centres along the highway. The key road safety issues raised by the community at the workshops are summarised below.

Engineering issues

Overtaking and turning lanes

- An overall lack of overtaking lanes was perceived by the community and stakeholders to be the greatest safety issue on the Kings Highway.
- The lack of overtaking lanes was the most significant issue captured by the Community Engagement website, with many suggestions for more or extended overtaking lanes. Just under half of the comments were related to the section of the Kings Highway stretching from east of Braidwood to Clyde Mountain (inclusive).
- Some submissions raised the positioning of overtaking lanes and characterised them as encouraging speeding and poor driver behaviour. It was suggested that the placement of overtaking lanes be reviewed.

Road alignment and width

- The road alignment and width was a significant issue raised in relation to the east of Braidwood to Clyde Mountain (inclusive) and east of Clyde Mountain to Nelligen (inclusive) sections of the highway.
- Sharp bends on narrow sections of road at Clyde Mountain were a key concern.
- Many submissions suggested road widening as a way of addressing the road safety issues on the Kings Highway.

Road design

- Concerns were raised about road design in relation to the section of the highway from east of Bungendore to Braidwood (inclusive). The community expressed concerns about crests and hidden dips in the road and suggested that the crests be removed.
- Access to properties, businesses and new developments between Bungendore and Braidwood was a concern.
- Many submissions raised the issue of the inconsistent design of intersections along the Kings Highway.
- Some submissions raised issues about the poor sight distance at some intersections on the highway, including the intersection at Foxes Elbow.

Road condition

Many submissions discussed the need for resurfacing of some sections of the Kings Highway.

Bridges

The majority of submissions relating to bridges mentioned the need to widen bridges that are regarded as too narrow for the volume of traffic and the size of vehicles travelling the Kings Highway.

Delineation

Submissions suggested that there is a need to prevent overtaking in dangerous locations by lengthening existing double barrier lines and adding them in other locations.

Safety barriers

Many submissions mentioned the need to install safety barriers in the centre and along the edges of various sections of the Kings Highway.

Speed zones

The issue of speed limits was raised in regards to all five sections of the highway - Western, Bungendore, Braidwood, Clyde Mountain and Nelligen. For further details of the sections of the highway, refer to 1.2.1 Description of the highway.

- Various comments were received, including suggestions that the speed limit should be lowered.
- Many submissions suggested that the speed limits on Clyde Mountain are too fast for the narrow and winding conditions.
- Most submissions discussed speed zones in relation to the towns along the highway, suggesting a review of the speed limits on the approaches to and through Braidwood, Bungendore and Nelligen, with particular reference to Braidwood.

Signage

- Many submissions raised the need to improve road safety signage along the length of the Kings Highway.
- Many submissions questioned the reason for the Variable Message Signs on Clyde Mountain that show no messages most of the time.
- Some submissions suggested the installation of signage addressing driver behaviour.

Behavioural issues

General driver behaviour

Many submissions reported that driver behaviour on the Kings Highway is generally very poor, increasing the road safety risks.

Dangerous overtaking

Dangerous overtaking was a key issue captured by the online mapping tool on the Community Engagement website. Many submissions included comments about drivers engaging in risk taking behaviour when overtaking. Behaviours mentioned included overtaking across double lines, overtaking in unsafe locations, speeding in order to overtake and tailgating in sections where there are no overtaking lanes.

Speeding

Speed was seen as a significant behavioural issue, with comments indicating that travelling either under or over the speed limit causes pressure and frustration to all road users. Road users travelling under the speed limit cause frustration and provoke risky overtaking movements.

Enforcement issues

Speed cameras

Point-to-point, fixed and mobile speed cameras were suggested. These suggestions mainly related to the sections of the highway east of Braidwood to Clyde Mountain (inclusive) and east of Bungendore to Braidwood (inclusive).

Police presence

- Many submissions suggested an increase in police presence as a recommended enforcement measure to manage driver behaviour on the Kings Highway.
- Increased police patrols on weekends and during peak times and the installation of signage indicating an increased police presence was suggested in many submissions.

Traffic and pedestrian issues

Traffic volumes

The majority of submissions identified weekends and peak holiday periods as the times of the highest safety risk due to the increased traffic volumes.

Traffic signals

Some submissions suggested that traffic signals need to be installed at the intersection of Wallace and Lascelles Streets, Braidwood.

Pedestrian facilities

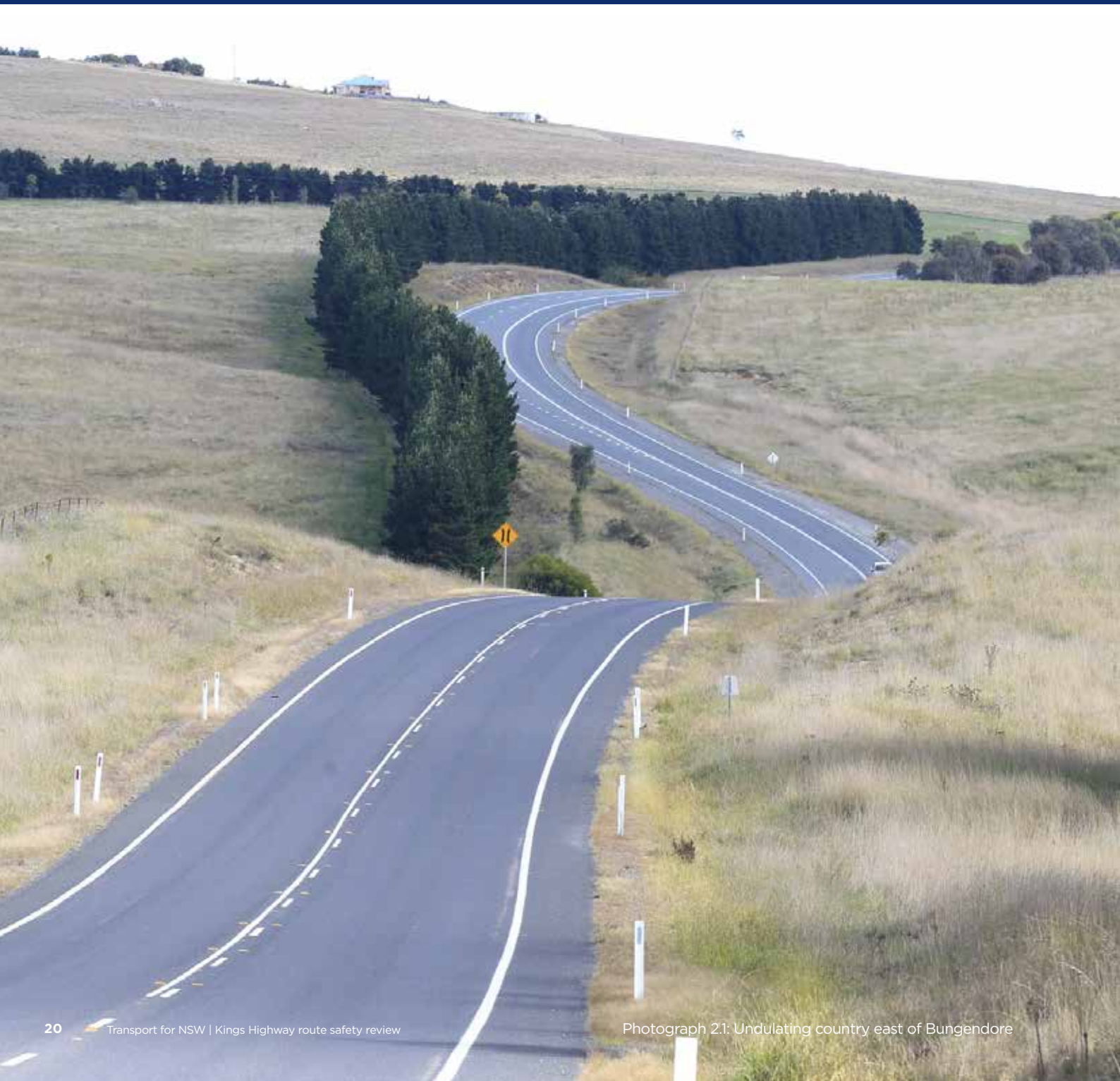
Submissions suggested that better pedestrian facilities, such as dedicated pedestrian crossings or refuges, were required to enable people to safely cross the Kings Highway in Bungendore, Braidwood and Nelligen.

General issues

- In many submissions concerns were expressed that Canberra drivers would not be penalised for driving offences committed in NSW.
- The lack of mobile phone coverage on Clyde Mountain was raised as a significant safety risk.

Section 2

Route analysis



2.1 The highway in context

The Kings Highway is the major corridor link from Canberra and the Southern Tablelands to the South Coast. It is one of only a few east west links over the eastern escarpment between Wollongong and the Victorian border and is a critical life line between the south coast and the ACT. The Kings Highway not only provides basic goods and services but also daily medical and emergency services between the two regions and towns along its route.

The alignment and pavement width vary substantially over this relatively short highway due to the extremes in topography. A better alignment and wider pavement is more evident in the western sections of the highway in the Palerang and Queanbeyan local government areas. This part of the highway also has a more forgiving road environment with roadside obstacles having less influence on fatal and serious injury crashes.

The Clyde Mountain section of the highway has a poorer alignment and narrower pavement width generally east of Braidwood and over the eastern escarpment. The lower speed limits along this section of the highway not only reflect the tight and winding alignment but also the unforgiving road environment with steep embankments and obstacles close to the travel lanes, especially through the National Park and the State Forests. This eastern section of the highway also experiences more adverse weather conditions including heavy fog during the winter months.

2.1.1 Traffic types and volume

Traffic volumes along the Kings Highway remain fairly constant for most of the year except for the summer months which experience far greater traffic volumes. Generally higher traffic volumes are evident west of Bungendore, influenced by the higher populations of Queanbeyan and Canberra.

For the majority of its length, between Bungendore and the Princes Highway, the highway carries an average traffic volume of around 4500 vehicles a day. These numbers increase slightly to just over 5000 vehicles a day from west of Bungendore to the ACT border. While these are the average annual daily traffic volumes, they vary greatly between winter and summer, with far higher volumes during the summer, especially at weekends.

The percentage of heavy vehicles remains fairly constant at about eight per cent.

Figure 2.2 shows the Annual Average Daily Traffic figures at various locations on the highway, from the Princes Highway to the ACT border.

Average Annual Daily Traffic (AADT) at selected points

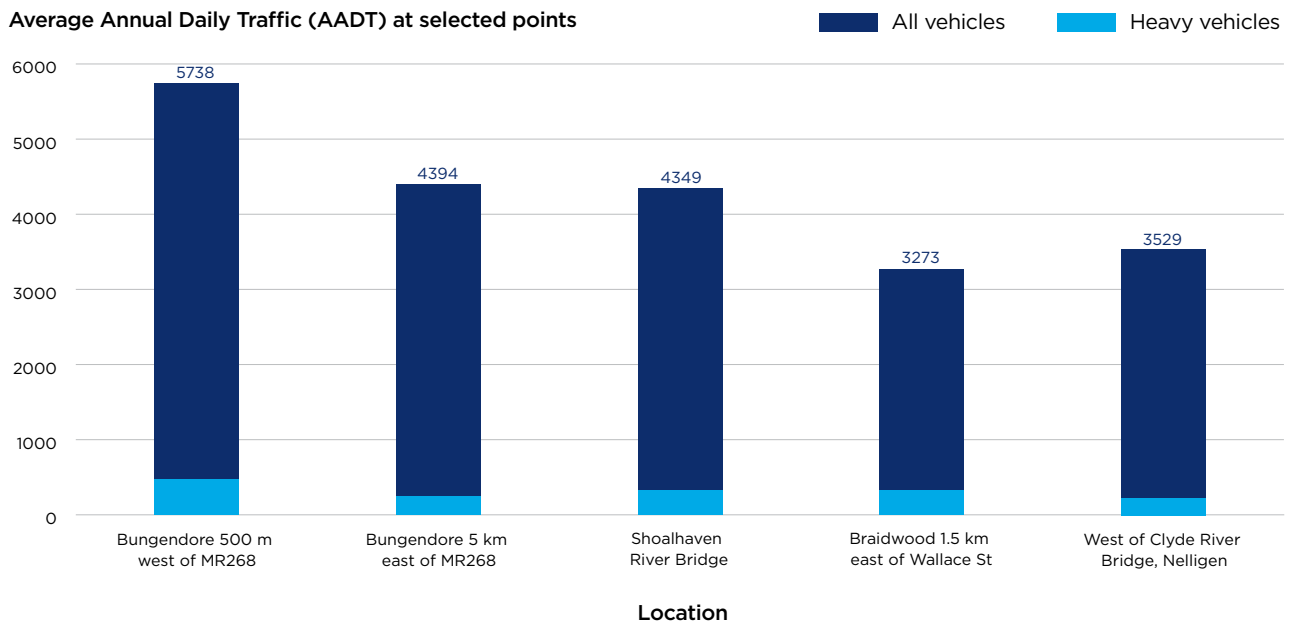


FIGURE 2.1: AADT at selected points



Photograph 2.2: Road junction on a crest

2.1.2 Existing speed zones

More than 60 per cent of the length of the highway is speed zoned at 100 km/h. The speed zones for the rest of the highway are more variable, with a number of reductions to 90 km/h and 70 km/h over the eastern escarpment.

TABLE 2.1: Existing speed zones

Speed (km/h)	Count	Combined length (km)
40	2	2
50	3	4
60	3	2
70	2	9
80	1	3
90	3	24
100	4	73
Total	18	117

2.1.3 Local government populations

The Kings Highway passes through three local government areas, Eurobodalla, Palerang and Queanbeyan together with a short rural section of the ACT. Note that the route safety review targeted the section of the Kings Highway from the Princes Highway in the east to the ACT border just west of Bungendore. The populations of the local government areas immediately surrounding the Kings Highway are listed in Table 2.2.

TABLE 2.2: Kings Highway local government populations

State	LGA	Population
NSW	Eurobodalla	37,648
NSW	Palerang	14,834
NSW	Queanbeyan	41,686
ACT		366,900

2.2 Casualty crash analysis

2.2.1 Definitions

Crash statistics recorded by RMS only include those crashes that conform to the National guidelines for reporting and classifying road vehicle crashes. The main criteria to meet for inclusion are that the crash:

- Was reported to the Police.
- Occurred on a road open to the public.
- Involved at least one moving road vehicle.
- Involved at least one person being killed or injured or at least one vehicle being towed away.

Crash and casualty definitions

- **Fatal crash** – a crash in which at least one person was killed.
- **Injury crash** – a crash in which at least one person was injured but no person was killed.
- **Casualty crash** – a crash in which at least one person was injured or killed.
- **Tow away crash** – a crash which resulted in at least one vehicle being towed away but no fatality or injury.
- **Fatality** – a person who dies within 30 days of a road crash as a result of injuries received in that crash.

2.2.2 Crash trends since 2000

Over the past 12 years (2000 to 2011p) 481 casualty crashes were recorded on the Kings Highway, within the review area. Of these, 34 were fatal crashes and 447 were injury crashes.

There have been two fatal crashes so far (to 30 June 2012) in 2012.

Between 2004 and 2009 the number of casualty crashes appears to have been decreasing, from 56 in 2004 to 23 in 2009. However, since 2009, the number of casualty crashes seems to be increasing.

2.2.3 Casualty crashes 2000 to 2011p and fatal crashes 2012p

- Over the past 12 years 757 casualties were reported, resulting from 481 casualty crashes (casualty crashes 2000 to 2011p and fatal crashes 2012p) on the Kings Highway.
- Of the 757 casualties, 38 people were killed and 719 were injured.
- The worst year was 2004, with six people killed.
- To date (to 30 June 2012) in 2012p, five fatalities have been reported as a result of two fatal crashes.

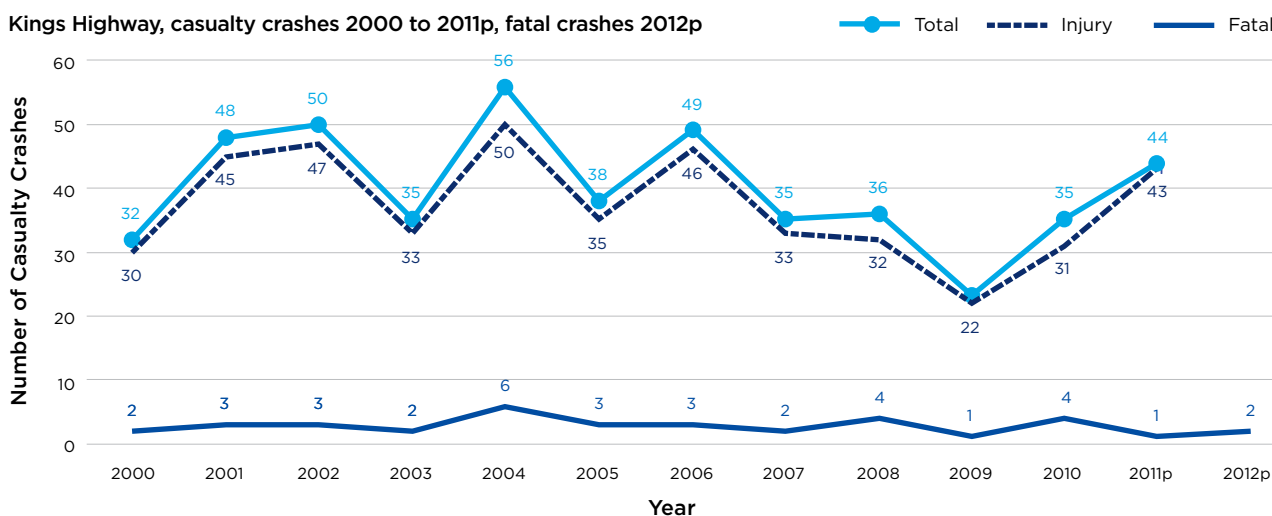


FIGURE 2.2: Casualty crashes 2000 to 2011p and fatal crashes 2012p

2.2.4 Casualty crashes 2007 to 2011p and fatal crashes 2012p

- Over the five years, 264 casualties were reported, resulting from 173 casualty crashes (casualty crashes 2007 to 2011p and fatal crashes 2012p) on the Kings Highway.
- Of the 264 casualties, 14 people were killed and 250 were injured.
- To date (to 30 June 2012) in 2012p five fatalities have been reported as a result of two fatal crashes.
- Half of the fatal crashes and nearly three quarters of the injury crashes were single vehicle crashes.

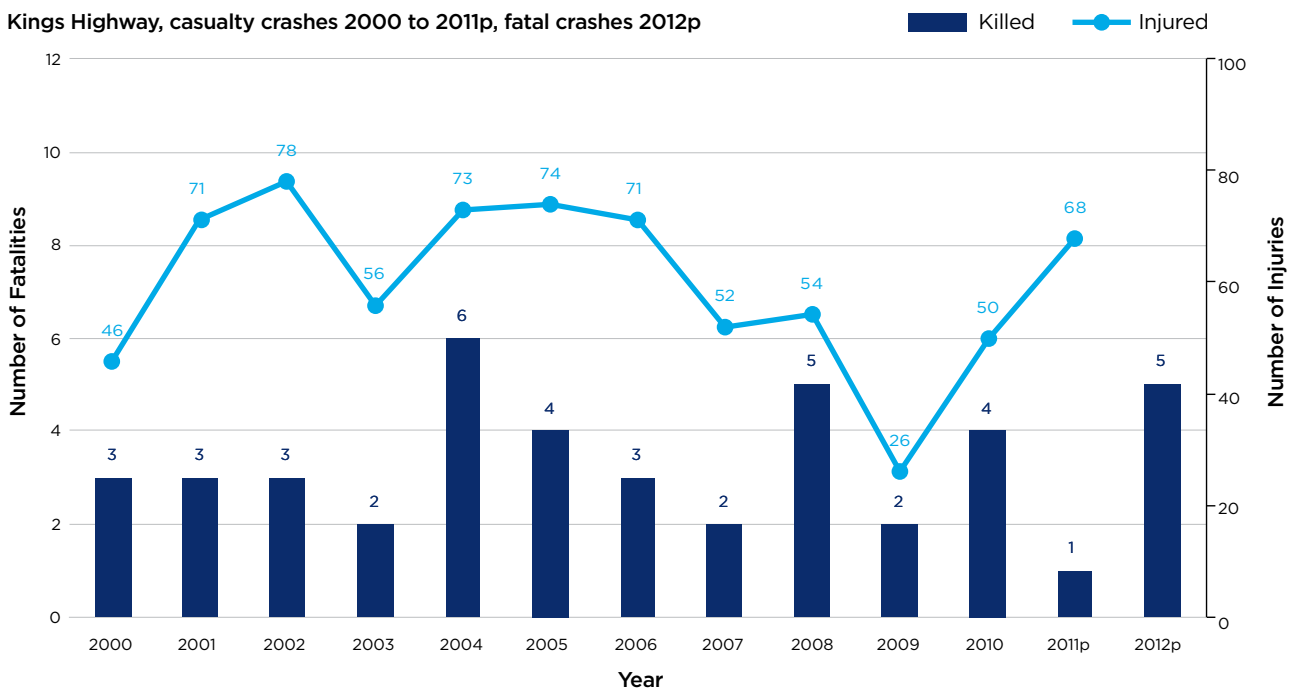


FIGURE 2.3: Casualties from 2000 to 2011p and fatalities 2012p



2.2.5 Features of recorded crashes

Who was involved

- Of the 269 casualties from 2007 to 2011 (2012p), the majority were drivers (57 per cent) or motor vehicle passengers (33 per cent).
- Ten per cent of all casualty crashes, including one fatality, involved motorcyclists.

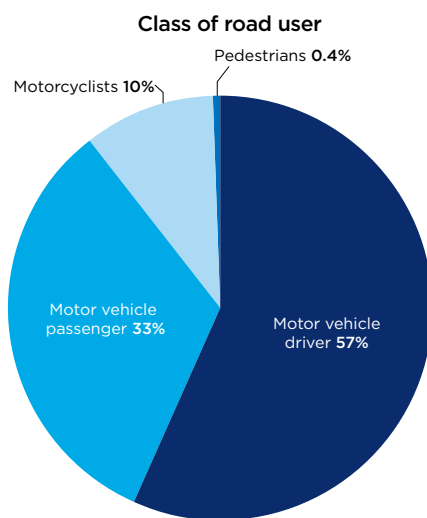


FIGURE 2.4: Class of road users

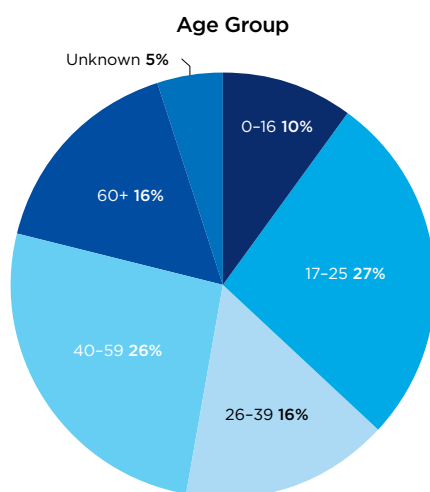


FIGURE 2.5: Age group of road users

- The large majority of drivers and riders involved in crashes on the Kings Highway were locals or country residents.
- Almost one-third (29 per cent) of drivers and riders involved in crashes on the Kings Highway resided in the local government areas along the Kings Highway.
- Twenty-four per cent of vehicle controllers involved in crashes resided in other country areas.
- Residents of the ACT were involved in 28 per cent of all casualty crashes on the Kings Highway.
- Only three per cent of those involved in crashes on the Kings Highway were residents of NSW metropolitan areas and only five per cent were from interstate (other than ACT).

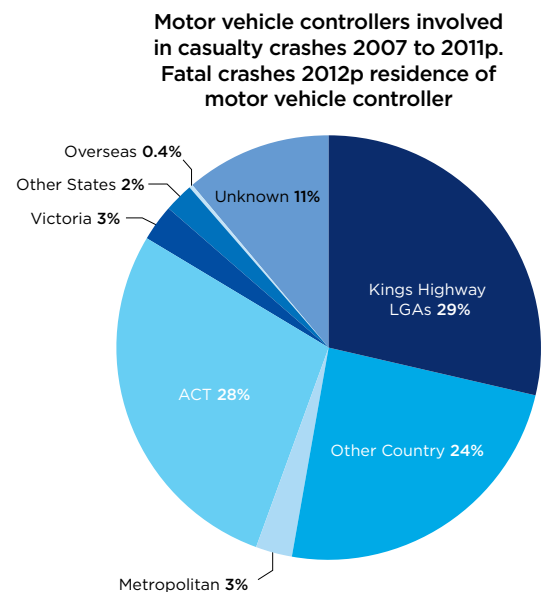


FIGURE 2.6: Residence of motor vehicle controllers

Note: Road users are categorised by age group. These are broadly accepted categories which reflect the differing characteristics: road access and usage, driver experience, risk taking behaviours, road trauma by road user class and rates of road trauma of each age group. For example, casualties in the under 17 age group are typically passengers, pedestrians and pedal cyclists as almost no-one in this category has a drivers licence while the 17 to 25 year old age group is characterised by inexperienced young drivers, risk taking behaviours and high casualty rates.

When did the crashes occur

- About 60 per cent of the casualty crashes on the Kings Highway occurred on Friday, Saturday or Sunday.
- Seventy-eight per cent of casualty crashes occurred from 8am to 8pm (mainly in daylight), peaking between 10am and 4pm.
- Summer and autumn months accounted for the highest number of casualty crashes.

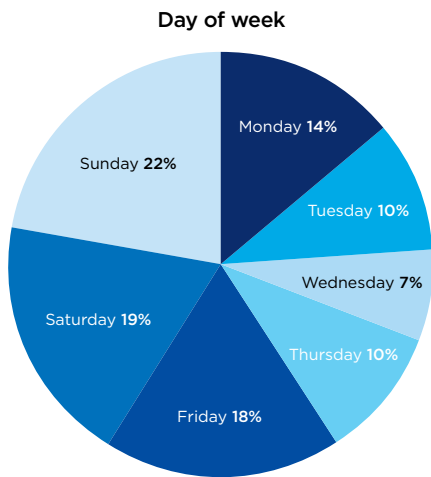


FIGURE 2.7: Day of week of casualty crashes

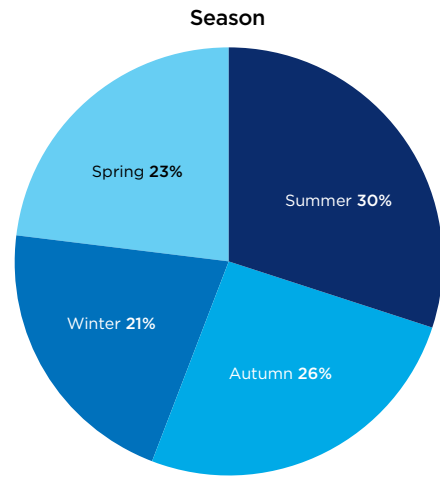


FIGURE 2.9: Season of casualty crashes

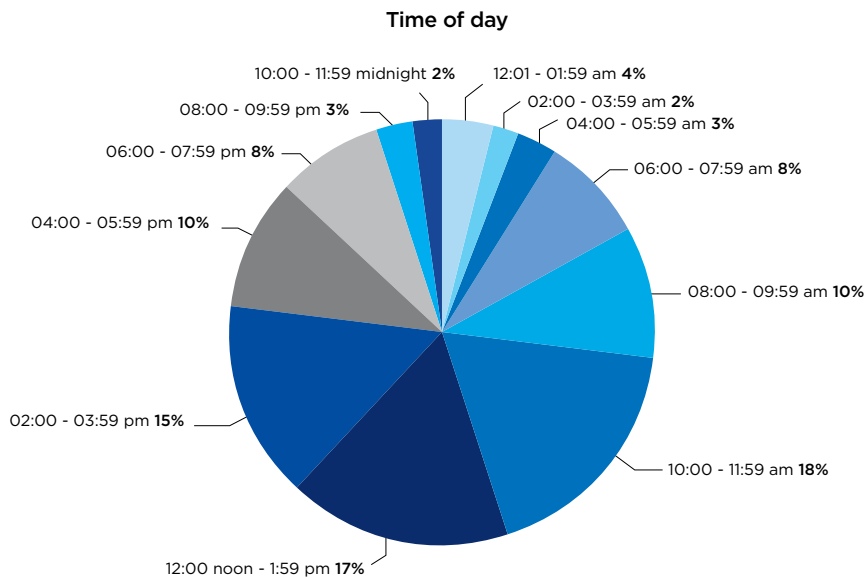


FIGURE 2.8: Time of day of casualty crashes

Where did the crashes occur

- Sixty per cent of casualty crashes and 79 per cent of fatal crashes on the Kings Highway occurred in 90 km/h or 100 km/h speed zones.
- More than 90 per cent of the casualty crashes occurred away from intersections.

- Just over 40 per cent of casualty crashes occurred on a wet road, but only 14 per cent of fatal crashes.
- Two-thirds (64 per cent) of casualty crashes occurred on curves.
- Four fatal crashes occurred immediately either side of Braidwood. They all involved a single vehicle which ran off the road into trees.

Kings Highway, casualty crashes 2007 to 2011p, fatal crashes 2012p

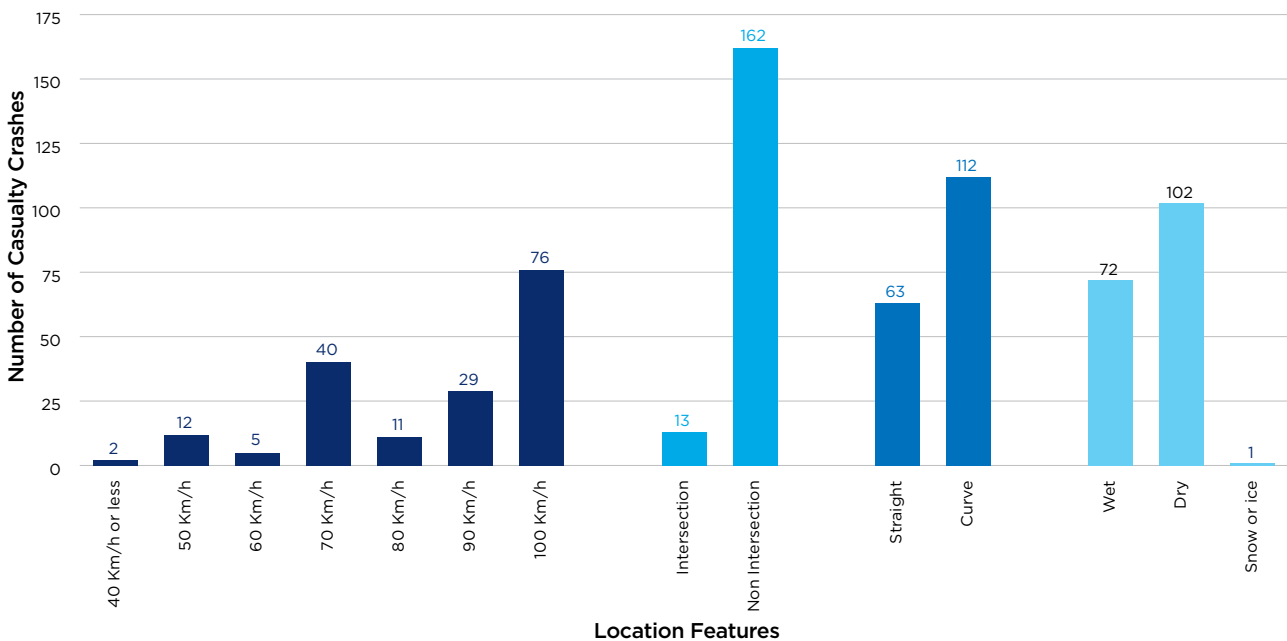


FIGURE 2.10: Casualty crashes by speed zone and location features

Percentage of Fatal Crashes, Kings Highway, 2007 to 2011p, 2012p

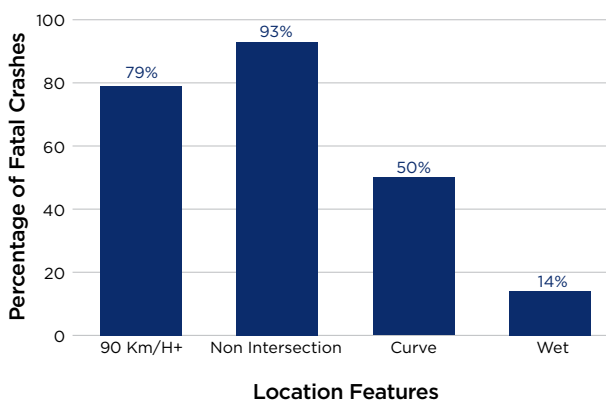


FIGURE 2.11: Fatal crashes by location features

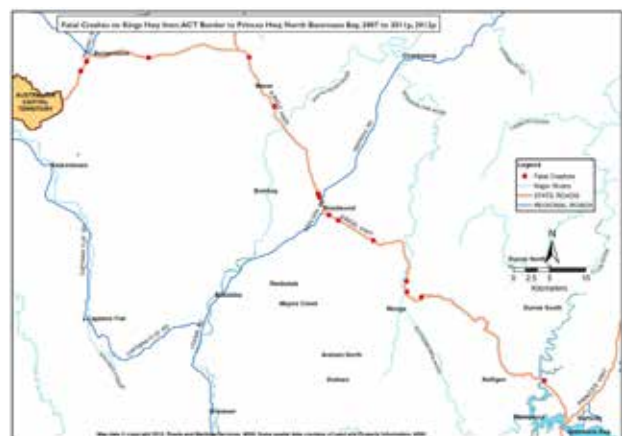


FIGURE 2.12: Fatal Crashes on Kings Highway

What type of crash

This section provides an analysis of crashes by speed zones, which are categorised as:

- Low speed – 60 km/h or lower.
- Rural – 70 km/h to 80 km/h.
- High speed – 90 km/h and higher.

Low speed zones

In low speed zones – 60 km/h or lower in urban areas:

- Eleven per cent of all casualty crashes on the Kings Highway occurred in speed zones with a speed limit of 60 km/h or lower.
- Off road on straight and rear end casualty crashes were the leading crash types, accounting for 58 per cent of casualty crashes that occurred in speed zones with a speed limit of 60 km/h or lower.
- Around one third (32 per cent) of the casualty crashes were off road crashes involving an impact with a fixed object. (Impacts with trees or bushes were the most common.)

Kings Highway casualty crashes 2007 to 2011p and fatal crashes 2012p, 60 km/h or lower speed limit

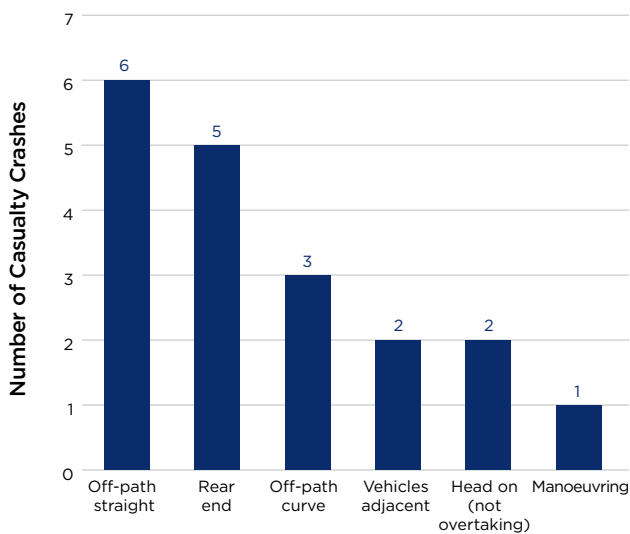


FIGURE 2.13: Casualty crash types in 60 km/h or lower speed zones

Rural speed zones

In rural speed zones — 70 km/h and 80 km/h:

- Twenty-nine per cent of all casualty crashes on the Kings Highway occurred in speed zones with a speed limit of 70 km/h or 80 km/h.
- Off road on curve and head on (not overtaking) casualty crashes were the leading crash types (accounting for 94 per cent of casualty crashes that occurred in speed zones with a speed limit of 70 km/h or 80 km/h).
- Nearly half (47 per cent) of the casualty crashes were off road crashes involving an impact with a fixed object. (Impacts with fences / guardrails or embankments were the most common.)

Kings Highway, casualty crashes 2007 to 2011p, fatal crashes 2012p, speed limit 70 km/h or 80 km/h

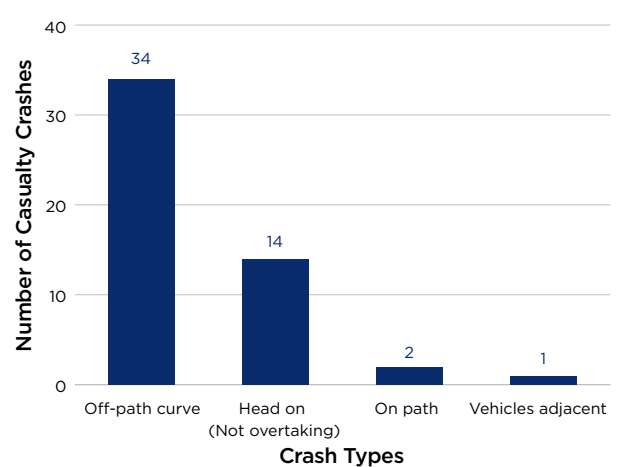


FIGURE 2.14: Casualty crash types in 70 km/h or 80 km/h speed zones

High speed zones

In high speed zones — 90 km/h or higher:

- Sixty per cent of the casualty crashes on the Kings Highway (and 79 per cent of fatal crashes) occurred in high speed zones.
- Off road on straight or bend crashes accounted for 75 per cent of all casualty crashes.
- Over 70 per cent of these off road crashes involved an impact with a fixed object. (Impacts with trees, embankments or fences / safety barriers were the most common.)

Kings Highway, casualty crashes 2007 to 2011p, fatal crashes 2012p Speed limit 90 km/h or more, crash type

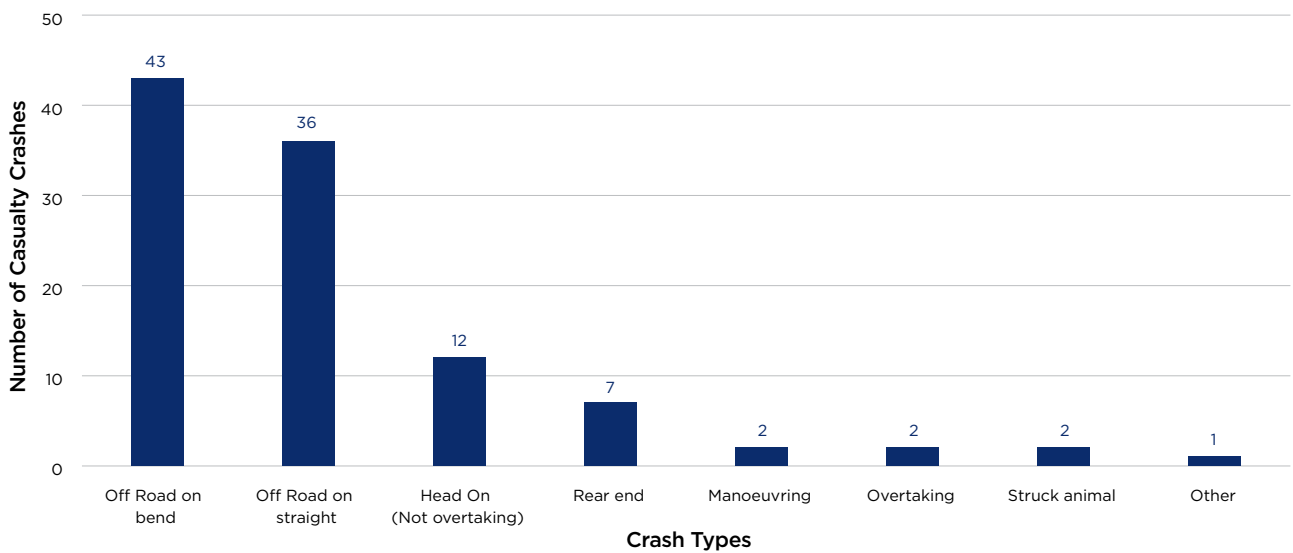


FIGURE 2.15: Casualty crash types in 90 km/h or higher speed zones

Kings Highway, fatal crashes 2007 to 2011p, 2012p speed limit 90 km/h or more, crash types

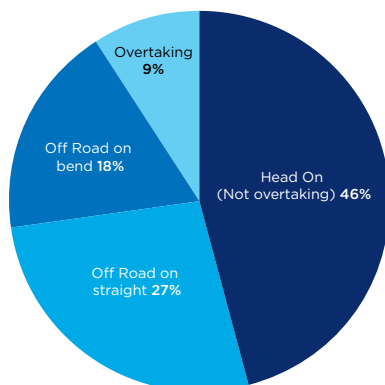


FIGURE 2.16: Fatal crash types in 90 km/h or higher speed zones

Why (driver behaviour)

- Compared with casualty crashes throughout NSW from 2007 to 2011p, the Kings Highway had a relatively very high incidence of speed related casualty crashes (51 per cent vs 17 per cent) and fatigue related casualty crashes (14 per cent vs eight per cent).
- Of the drivers and riders involved in speed related casualty crashes, 51 per cent were country residents (half of these were locals, residing in local government areas along the route) and 29 per cent were ACT residents.
- Of the fatigued drivers and riders involved in casualty crashes, 68 per cent were country residents (half of these were locals) but only 16 per cent were ACT residents.

Kings Highway, casualty crashes / casualties, casualty crashes 2007 to 2011p, fatal crashes 2012p

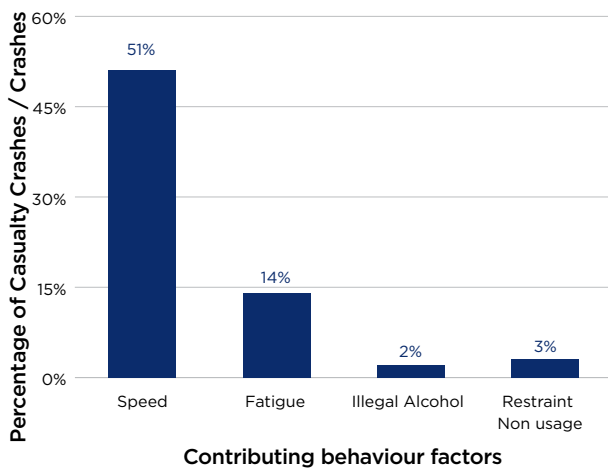


FIGURE 2.17: Behaviour factors contributing to casualty crashes

Heavy vehicle involvement in casualty crashes

- There were eight heavy vehicle casualty crashes (none fatal) on the Kings Highway, accounting for five per cent of all casualty crashes, yet heavy vehicles represent eight per cent of the traffic volume.

- Crashes were evenly split between single and multiple vehicle crash types.
- Compared with casualty crashes throughout NSW, the Kings Highway has a similar incidence of heavy vehicle casualty crashes (five per cent vs five per cent).

Four of the eight heavy vehicle drivers involved in casualty crashes were locals who lived in local government areas along the route.

Heavy vehicle casualty crashes, Kings Highway, 2007 to 2011p and fatal crashes 2012p percentage of crashes

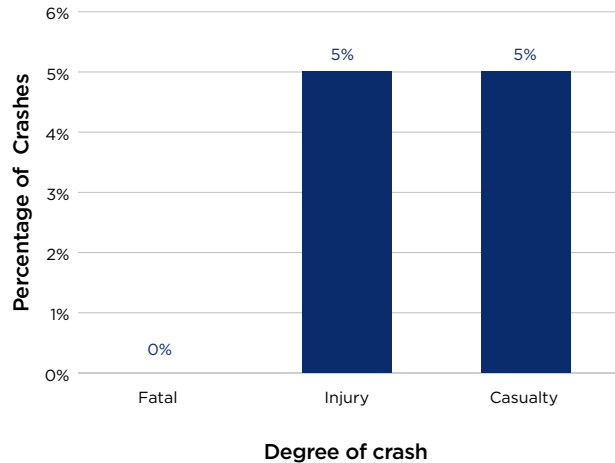


FIGURE 2.18: Heavy vehicle casualty crashes as a percentage of all casualty crashes

Heavy vehicle casualty crashes, Kings Highway 2007 to 2011p and fatal crashes 2012p single / multi vehicle crashes

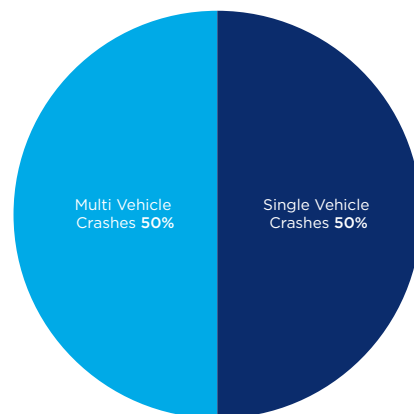


FIGURE 2.19: Heavy vehicle casualty crashes - single and multi vehicle

Motorcycle involvement in casualty crashes

- There were 23 motorcycle casualty crashes on the Kings Highway, of which one was a fatal crash.
- Seventy per cent of all motorcycle casualty crashes on this route were single vehicle crashes.
- Compared with casualty crashes throughout NSW, the Kings Highway has a similar incidence of motorcycle casualty crashes (13 per cent vs 13 per cent).
- Twenty-two per cent of motorcycle riders involved in casualty crashes were locals who lived in the local government areas along the route, while ACT residents accounted for a further 26 per cent of motorcycle rider involvements.

Motorcycle casualty crashes, Kings Highway 2007 to 2011p and fatal crashes 2012p percentage of crashes

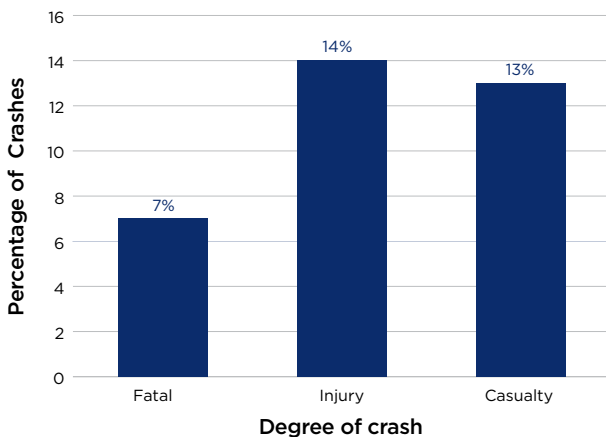


FIGURE 2.20: Motorcycle casualty crashes as a percentage of all casualty crashes.

Motorcycle casualty crashes, Kings Highway, 2007 to 2011p and fatal crashes 2012p single / multi vehicle crashes

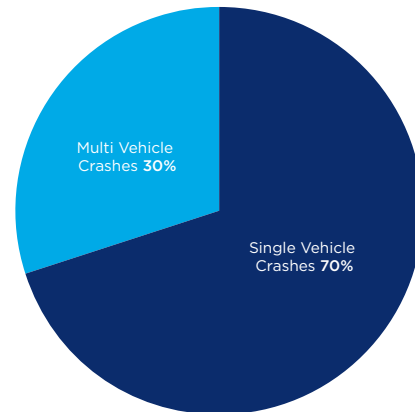


FIGURE 2.21: Motor cycle casualty crashes - single and multi vehicle

2.2.6 Crash analysis conclusions

- Country residents and those in the local government areas along the Kings Highway have an increased road traffic fatality risk compared to those living in metropolitan areas.
- Over the five year period (casualty crashes 2007 to 2011, and fatal crashes 2012) there have been 175 crashes resulting in 269 casualties.
- More than 40 per cent of all casualty crashes on the Kings Highway occurred between Clyde Mountain and Nelligen which is only 24 per cent of the route length.
- Clusters of serious crashes were apparent at several locations including the short length of road either side of Braidwood where four fatality crashes occurred between 2007 and 2011.
- Crashes were more common in summer and on weekends, which coincide with higher traffic volumes.
- Some sections of the highway have a high incidence of speed, wet roads, single vehicle crashes involving impacts with trees, fences/ barriers or embankments.
- Compared with casualty crashes throughout NSW for 2007 to 2011p, the Kings Highway has a very high incidence of speed related casualty crashes (51 per cent vs 17 per cent) and fatigue related casualty crashes (14 per cent vs eight per cent).

2.3 Key road safety issues

2.3.1 Road safety engineering issues

The key road safety engineering issues identified during the review are described under the following criteria:

Road alignment

According to the RMS study, *Retro-fitting road safety to existing rural roads* most fatal and serious injury crashes on high speed roads, 90 km/h or higher limit, occur on curves within the 200–600 metre radii range.

This study identified curves within this radii range, within 90 km/h speed zones or higher, as Priority 1 curves which should be effectively treated. These types of curves present particular issues for safety, which are not presented by tighter curves. Road users are travelling at lower speed approaching tighter curves.

The Kings Highway review found that the road alignment and severity of the curves at some locations requires review. A desktop review utilising the RMS GIPSICAM system showed that there are 120 Priority 1 curves along the route, as shown in Table 2.3.



Photograph 2.4: Tight road alignment on the escarpment

TABLE 2.3: Priority 1 curves along the route

Radius (M)	ACT to Bungendore	Bungendore to Braidwood	Braidwood to Clyde	Clyde to Nelligen	Nelligen to Princes Hwy	Total
200-600	4	30	34	41	11	120



Photograph 2.5: Road junction in overtaking lane

Junction treatments

Treatments to junctions aim to provide suitable and safe access in to and out of side roads. Treatments include improved protection for vehicles turning right across opposing traffic, increased warning of an upcoming junction and improved sight distances at the junction.

Observations from the review include:

- Right turn access to some side roads is from within the fast lane of an overtaking lane where no protected right turn facility or deceleration lane is provided.
- Some junctions do not have the minimum treatment required to allow a through vehicle to pass a vehicle waiting to turn right.
- Earth embankments and vegetation in or around some junctions restrict sight distance.
- The advance and intersection warning signage and road name signage is inconsistent and, in many cases, too small to be easily read.
- Delineation and signage at junctions along the highway is inconsistent and often difficult for the road user to interpret.



Photograph 2.6: Approaching road junction, eastern escarpment

Safety barriers

Safety barriers come in various forms and aim to provide protection for road users from adjacent roadside hazards. They protect against run-off road into object crashes and can also provide a physical separation between opposing traffic lanes to protect against head on crashes.

Observations from the review include:

- The existing guardrail or wire rope safety barriers at some locations do not extend adequately to close off access to the hazard. There is therefore still the possibility of an errant vehicle getting in behind the safety barrier and colliding with the hazard.
- Temporary concrete barriers were installed over two short lengths of the highway, midway between MR79 (Goulburn Road) and Bungendore, to contain loose material falling from steep cuttings. The end treatments for the concrete barrier were unsafe and required replacement. The barrier was also located very close to the travel lane with a loss of adequate shoulder. Since the inspections road safety works, which removed the concrete barriers and provided a wider sealed shoulder and a more forgiving rock containment barrier, have been completed.

Clear zones

Clear zones that are free of non-frangible hazards minimise the potential harm to drivers, riders and passengers of errant vehicles. When a hazard-free clear zone cannot be provided, the installation of safety barriers to protect road users from the adjacent hazard is an alternative measure.

Single vehicle run off road crashes into trees within the clear zone, accounted for six of the 14 fatal crashes along the Kings Highway over the study period.

Observations from the review include:

- Clear zones along the entire length of the highway need to be more closely examined (particularly in regard to trees), prioritised and an ongoing program to address clear zone issues should be established.
- Many unprotected culvert head walls are located within the clear zone.
- Clear zones along the Clyde Mountain escarpment and the section of road to the east of Braidwood, between Warrambucca Creek and the top of the Clyde Mountain are almost non-existent. This is mainly due to the topography and the environmentally sensitive roadside environment.

At several locations there is no protection next to large trees, steep drop-offs and culverts which are close to and adjacent to the highway.

There are avenues of trees either side of Braidwood in 100 km/h zones. They are very close to the travel lanes with no protection for road users. These two short lengths of the highway are the locations of four fatal crashes in the past five years (two either side of Braidwood). They all involved single vehicles running off the road and colliding with trees.



Photograph 2.7: Avenue of trees, east of Braidwood

Road pavement and shoulders

The provision of wide sealed shoulders assists road users to regain control of their vehicle should it leave the travel lane. This is especially important on the outside of low radius curves or other locations where more space is needed to enable road users to regain control, such as sections of road with narrow lanes.

Observations from the review include:

- The section of the highway east of Braidwood, between Warrambucca Creek and the top of Clyde Mountain, has very narrow to non-existent shoulders. This combined with narrow lanes reduces, or in some cases does not provide, any margin for error by the vehicle controller.
- Some narrow sections of road pass through cuttings where the shoulders have been reduced in width. Most of these are evident on the Clyde Mountain escarpment and to the west of the Clyde River.

Bridges

Many bridges along the state's road network were built some time ago and while they are still structurally sound, some of them do not meet today's design standards in terms of lane and shoulder widths. This can often present a 'squeeze point' for motorists on an otherwise standard width section of road.

Observations from the review include:

- A number of older bridges have little or no shoulders and reduced lane widths.
- There is a lack of consistent advance warning to motorists of the existence of narrow bridges.
- The older concrete abutments and bridge rails were difficult to distinguish, especially at night, and have little or no delineation.

Overtaking lanes

Overtaking lanes provide road users with the opportunity to pass slower moving vehicles. They are provided at suitable locations along undivided two way highways.

Observations from the review include:

- A suitable run-out area at the end of overtaking lanes is not always provided. A number of overtaking lanes terminate in curves which can foster the potential for driver error where the road narrows as vehicles merge. This is often exacerbated by the presence of guard rail located very close to the edge line where little or no run-off area is provided.
- Many of the overtaking lanes terminate just beyond a crest. This configuration often does not allow enough forward vision to enable drivers to 'read the road ahead' in time to make critical decisions when merging or completing an overtaking manoeuvre.
- At some locations right turns into side roads have to be made from the fast lane of an overtaking lane.
- Line marking and signage at the end of overtaking lanes is not consistent or is cluttered by other signs in the immediate area which are not related to the merging task.



Photograph 2.8: End of an overtaking lane, Clyde Mountain

Signage

Warning signs should provide road users with information to guide and give advance warning about the road environment ahead. Signs also provide advance information about road and weather conditions and directions to locations such as towns, side roads and features.

Observations from the review include:

- Advance and intersection road name signage is inconsistently applied and, in some cases, too small to be easily read.

- In some locations, some signs are located too close to other signs, often providing too much information at critical points on the highway.
- Curve advisory signs are not consistently applied along the highway. The location of signs prior to the curve varies and advisory speed limits are not always applied where they may be required. Some curve warning signs provide incorrect messages, such as a right hand curve sign prior to a left hand curve.



Photograph 2.9: Misleading curve warning sign



Photograph 2.10: Misleading curve warning sign

Delineation

Delineation aims to provide road users with sufficient information to guide them and warn about the road environment ahead. It can also assist them in negotiating changes in the road alignment, terrain and conditions at night.

Observations from the review include:

- Guideposts along the highway are reasonably well located and maintained and have good night time reflectivity. This standard should be maintained.
- Raised Reflective Pavement Markers (RRPMs) are often missing or inconsistently applied.
- The use of chevron alignment markers to delineate curves needs to be addressed. The location of these signs, their size and height above the pavement is very inconsistent.

Line marking

Line marking aims to provide road users with information about the layout of the road, the parts of the road that can and cannot be used and how the road should be used. It also provides delineation and indicates to road users the direction of the road, especially when visibility is limited, for instance in foggy conditions, at night or in wet weather.

Observations from the review include:

- The transitions from non-overtaking to overtaking opportunities (and vice versa) generally appear to be correct, however there are some locations where they are inconsistently applied.
- The use of audio tactile line marking should be considered on both the centre and edge line as a countermeasure for the high incidence of fatigue related casualty crashes.
- Edge lines are not consistently applied on all bridges.
- The installation of edge lines is not consistent through the town and villages.



Photograph 2.11: Clyde River Bridge, Nelligen

2.3.2 Speed zones

Speed zoning is used to establish speed limits on particular lengths of road, helping speed management by providing consistency of speed limits.

Observations from the review include:

- The application of speed zoning along the highway appears to be inconsistent and, in many cases, not in accordance with the RMS Speed Zoning Guidelines.
- The speed limit on both approaches to Braidwood is considered high for the road environment. Although the road alignment is generally straight, avenues of trees very close to the travel lanes present an unsafe road environment which has claimed the lives of four people between 2007 and 2011.
- Through the village of Nelligen, the current speed limit is 80 km/h. This appears to be too high, especially during the warmer months of the year when seasonal holiday activity increases and there are more pedestrians.
- There are locations along the highway with varying speed zone transitions, particularly on the approaches to townships. Some of these speed zones appear to be too short while others are too long.
- In some locations a higher speed limit commences in an inappropriate location, for instance on the transition to curves or within curves.
- At other locations speed zone repeater signs are installed just prior to or immediately after, curve warning advisory speed signs displaying much lower recommended speeds.



Photograph 2.12: Poorly placed speed zone signs

2.3.3 Intelligent transport systems

Intelligent transport systems are systems that use technology and communication devices to improve transport safety, efficiency and overall performance.

- Some of the existing permanent variable message signs have limited ability to provide useful road safety and operational advice to motorists due to the lack of telecommunications services. At present communications along this section of road are almost non-existent and severely limit both the safety and operational potential of the three existing large permanent variable message signs.
- The location of some of the permanent variable message signs is questionable in terms of road safety. They are very close to or in the middle of curves, where drivers should be concentrating fully on the driving task and not reading messages.
- The location is also questionable in terms of a safe road environment as some permanent variable message structures were located in high risk run-off road areas.



Photograph 2.13: Poorly located structure

Vulnerable road user issues

Vulnerable road users are those people who do not travel within an enclosed vehicle and are therefore more likely to be injured if they are in a crash. They include pedestrians, cyclists and motorcyclists.

There is significant interaction between arterial road traffic and vulnerable road users, such as pedestrians and pedal cyclists in the towns and villages located along the Kings Highway. For residents, the highway serves as a local road. It incorporates sections with urban, industrial and commercial land uses on one or on both sides of the road. It also provides a connection for residents to access various goods and services such as shopping, medical, employment, education, sport and recreation.

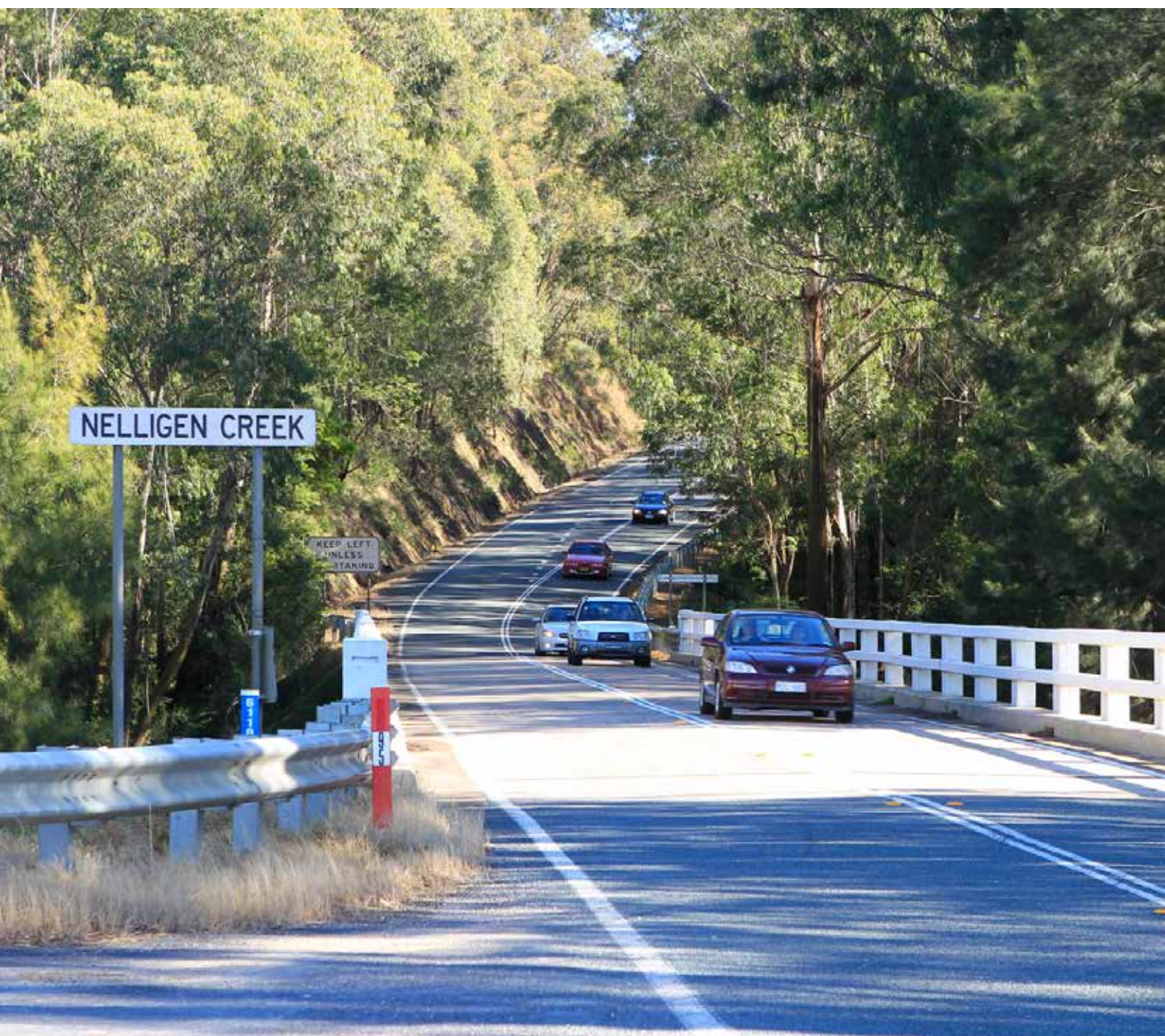
Observations from the review include:

- Pedestrian movements in Braidwood, Bungendore and Nelligen are generally uncontrolled, with little or no protection or assistance provided to cross the highway.
- Some pedestrian facilities appear to be incorrectly located or not serving the present pedestrian needs within Braidwood, Bungendore and Nelligen.



Photograph 2.14: Wallace Street, Braidwood

Section 3 Recommendations



3.1 An integrated approach to improving road safety along the highway

The multidisciplinary and consultative approach adopted for the Kings Highway route safety review allowed for the adoption of an integrated approach to improving road safety.

Road safety improvements and outcomes are maximised when the road safety engineering, road user behaviour and enforcement countermeasures are fully integrated. For example, to address speed related crashes, the engineering program will focus on:

- Road design and reconstruction, especially at identified higher risk locations, to better guide drivers through the road environment and at appropriate travel speeds.
- The consistent and effective use of regulatory and advisory signage.
- The provision of wider sealed shoulders, enhanced protection of roadside hazards and in some locations the enhanced separation of opposing travel lanes.

Speed zone reviews and behavioural and enforcement programs focusing on speeding, driver fatigue and drink driving will work in partnership with the various engineering countermeasures to provide integrated road safety outcomes.

3.1.1 Enhanced road safety engineering works program

The enhanced road safety engineering works program consists of the following:

- Review clear zones for hazards and identify options to remove or provide protection from these hazards.
- Improve the road alignment, particularly in higher risk areas and the locations of low radius curves (700m).
- Review speed zones.
- Review and improve line marking, particularly in relation to the arrangement of overtaking lanes.
- Review and improve the adequacy, consistency and location of highway signage, especially signs associated with curve warnings and advisory speeds.
- Review and improve the facilities provided at various road junctions, especially those in high speed zones.
- Improve road shoulders.
- Review school bus operations and upgrade where appropriate.



Photograph 3.2: Road junction and school bus stop near Bungendore

Modelled road safety benefits

Most road safety engineering improvements will provide a modelled road safety benefit that can be quantified with regard to its effect on reducing road crashes. The types of road safety engineering

improvements recommended in the Kings Highway route safety review are strategically targeted works known to improve road safety outcomes. The modelled crash reduction rate varies depending upon the type of crash and the speed zone. The following table provides details.

TABLE 3.1: Modelled crash reduction rates (Source: RMS Crash Reduction Matrix, NSW Centre for Road Safety)

Road safety treatment	Modelled crash reduction rate
Install new side road name sign on rural roads	15-20 per cent
Install new road feature signs, crest/dip etc	5-15 per cent
Remove sight distance restrictions at intersection	15-30 per cent
Install a protected right turn lane (painted)	40-70 per cent
Install basic right/left turn treatment at T-junction (shoulder widening)	10-50 per cent
Install raised profile edge line	5 per cent
Install raised profile centre line	5-15 per cent
Install 1.25 m wide painted profile centre line	10-70 per cent
Install guideposts with reflectors	10-30 per cent
Install curve alignment markers on outside of curve	10-45 per cent
Install shoulder from 0.5 m sealed to >1 m sealed	20 per cent
Reduce speed limit by 10 km/h	15-30 per cent

Review clear zones for hazards and identify options to remove or provide protection against these hazards

Objects within the clear zone are a potential hazard to the occupants of errant vehicles. The Kings Highway has a high proportion of casualty crashes involving hit object within the clear zone.

Undertake a safety barrier review of the highway with a specific focus on the following:

- Identification of locations, such as adjacent to trees, culverts, embankments, rock outcrops and cuttings with narrow road shoulders, where a barrier is not currently provided.
- Extension of existing safety barriers that are too short and do not fully protect against the hazard.
- Improvement of the delineation of wire rope barriers.
- Upgrade of safety barrier connections to bridges.
- Where a hazard-free clear zone cannot be provided, the installation of safety barriers to protect road users from the adjacent hazard is an alternative measure.
- Where safety barriers cannot be installed it may be possible to widen and seal road shoulders to assist drivers to regain control of their vehicles.
- Where these measures are not feasible due to the proximity of the hazard, consideration should be given to removing the hazard if possible.

Improve the road alignment, particularly in higher risk areas and the locations of low radius curves

Improve the road alignment, particularly at locations where the terrain and topography is unique and different from the rest of the highway. At these locations low radius curves can be improved by reconstructing the curve to increase the radius (where practical) and sealing the width of the shoulder around the outside of the curve. This should also include the provision of a smooth and consistent crossfall through curves. The locations identified, but not limited to, include:

- Warrambucca Creek to River Forest Road.
- A 2.5 kilometre realignment 19 km west of the Princes Highway.

- One kilometre realignment east of the Clyde River.
- A right hand curve (westbound), 800 metres east of Larbet Road.
- A right hand curve (eastbound), 650 metres east of Mongarlowe River.

Review speed zones

A comprehensive independent speed zone review will be undertaken along the full length of the highway. The aim is to ensure that the speed limits and the length of the speed zones are appropriate to the road environment, consistently applied along the length of the highway and meet the requirements of the RMS NSW Speed Zoning Guidelines.

Initial findings

- Lower the speed limit from 100 km/h to 80 km/h either side of Braidwood for the full length of both avenues of trees (2.8 km east of the existing 60 km/h zone and approximately 1.5 km on the Canberra side of Braidwood. This can be a temporary treatment until a suitable strategy can be implemented to provide a wider clear zone.
- Introduce the reduced speed limit together with a suitable frangible gateway treatment at the commencement of the 80 km zone.

Review and improve line marking, particularly in relation to the arrangement of overtaking lanes

Undertake a full review of the line marking of the highway to:

- Ensure that there is an adequate run-out area at the end of overtaking lanes.
- Identify locations where overtaking is allowed in the opposing and adjacent fast lane of an overtaking lane and consider changing the arrangement.
- Investigate the possible use of an enhanced dividing barrier and separation centreline on selected sections of the highway, especially where illegal overtaking is prevalent and where there is a cluster of head-on crashes.
- Investigate the use of audio-tactile line marking, both edge and centreline, at locations where head-on or run-off road crashes have occurred.

- Upgrade line marking on overtaking lanes, especially at the end of overtaking lanes that terminate through or near curves or just beyond crests where the forward sight distance is limited.
- Identify areas where additional overtaking opportunities could be safely provided.
- Remove other overtaking opportunities where there is limited forward sight distance.
- Investigate the possible reversal of the existing eastbound overtaking lane immediately west of Braidwood to a westbound overtaking lane. This would assist in the dispersal of traffic that builds up through Braidwood and potentially relieve some driver frustration. An overtaking lane immediately approaching a built-up area has little or no safety or operational benefit.
- Consider painting the concrete bridge rails on the narrow bridges white to further enhance delineation and to emphasise the width of the bridge, as has been done on the Nelligen Creek and Cabbage Tree Creek Bridges.

Review and improve the adequacy, consistency and location of highway signage especially signs associated with curve warning and advisory speeds

Undertake a full review of the signage along the highway with the objective of providing a more consistent and safer approach to:

- The application of and the size, location and height of advance curve warning, advisory speed and chevron alignment markers.
- The provision of easy to read advance and intersection side road junction signs.
- The location of speed zone reminder signs well away from other critical signposting, such as curve advisory speed warning signs. It should not be located on curves or in the vicinity of the commencement or termination of overtaking lanes.
- The signposting of squeeze points such as narrow bridges, causeways and longer culverts.
- On the Clyde Mountain escarpment there are a number of locations where large signs with a red background have been installed in advance of very low radius curves to highlight the significant changes in alignment. These signs could be used to advantage in other locations.

Review and improve the facilities provided at various road junctions, especially those in high speed zones

- Ensure that the location of all sign posting is uncluttered and is designed to provide a clear, gradual release of information to road users.
- Review all road junctions on the highway with the objective of providing safer access in and out of side road junctions, particularly in high speed zones, (90 km/h and higher) or where school bus turning movements occur.
- Review overtaking lanes where right turn access to side roads is permitted from the fast lane, with a view to providing protected right turn bays through adjustments to the overtaking lane or banning the right turn (if possible).
- Review and provide a consistent and standard approach to existing line marking associated with school bus stop facilities, on or adjacent to the highway at road junctions, to facilitate the safe pickup and drop off of school children.
- Provide clear and adequate sight lines to and from all road junctions.
- Review existing line marking of turning facilities at road junctions with a view to upgrading existing right turn auxiliary lanes to modified channelised right turn bays.



Photograph 3.3: Road junction Northangera Road



Photograph 3.4: Road junction Western Distributor Road

Improve road shoulders

Review narrow and unsealed road shoulders with the objective to:

- Widen and or seal shoulders, especially on the outside of low radius curves (<600 m) in speed zones 90 km/h and higher.
- Reassess shoulders in locations where eroded table drains exist close to the edge line, with a view to reconstructing and sealing the table drain.



Photograph 3.5: Narrow shoulders

Review school bus operations and upgrade where appropriate

School bus services are operated along the full length of the highway by a number of bus companies. The pick up and set down points vary greatly and adequate areas for school buses are not always available. The present provision of school bus facilities is inconsistent.

Undertake a review with the objective to:

- Provide safe turning areas for school buses at their termination points.
- Provide bus bays of adequate size for school buses to stand clear of the highway and safely pick up or set down passengers.
- Consider the provision of adequate space for parents to park.
- Consider the location of pick up and set down points on side roads rather than on the highway.
- Consider relocating school bus pick up and set down points to safer locations.

3.1.2 Road user behaviour program

RMS has established the Kings Highway road safety partnership. It includes representatives from ACT Police and Government, Eurobodalla, Shoalhaven and Queanbeyan Councils, NSW Police from Far South Coast, Shoalhaven and Monaro Commands, Greater Southern Area Health Service, NRMA ACT Road Safety Trust and RMS Southern Region.

The partnership was formed in 2008 and meets regularly to discuss and plan road safety behavioural campaigns, not only for the Kings Highway but also for the Federal and Monaro Highways. The group has coordinated enforcement activity, road safety promotions and related programs such as late night buses and breath testing machines in Batemans Bay. More recently they launched the “Please Don’t Go Over” campaign encouraging motorists to stay under the speed limit and not to drink and drive when travelling to and from the coast along the Kings Highway.

In accordance with the Safe System approach to road safety, road users should be kept informed and alerted to the road conditions. This approach also recognises that it is inevitable that road users will make mistakes and under these circumstances the system must be forgiving.

Speeding and driver fatigue are the key behavioural factors involved in fatal crashes along the Kings Highway.

The Road user behaviour program addresses:

- Speeding drivers.
- Driver fatigue, distraction and inattention
- Drink drivers.
- Road user information.
- Police and RMS enforcement.
- Signage.
- Higher-risk topography and changing conditions.
- Weather (particularly fog) related advice.



Photograph 3.6: Permanent VMS structure, eastern escarpment

Speeding Drivers

Messages about speeding are well-promoted but drivers, especially in rural communities, may not acknowledge that they are applicable to their own driving. These messages need to be reinforced and addressed through a combination of education and enforcement.

Recommendations are:

- Enhance communication mechanisms with rural communities and stress the consequences of speeding and the provision of the logic underpinning speed zoning guidelines.
- Promote the recent Government initiative of the Safer Roads website and increasing Community Engagement on speed limits.
- Promote more involvement by councils and their local communities in defining local road safety issues.
- Maintain and strengthen existing road safety partnerships. This can be achieved through the promotion and adoption of the Safe System approach to road safety through suitable learning and development modules.

Driver fatigue, distraction and inattention

Compared with casualty crashes throughout NSW for 2007 to 2011p, the Kings Highway has a high percentage of fatigue related casualty crashes (14 per cent vs eight per cent).

There is a significant issue with fatigue related crashes, especially in very close proximity to Braidwood, with four fatal crashes in five years (2007-2011p). Braidwood is located approximately half way along the Kings Highway which can be covered in about two hours.

Although heavy vehicle driver fatigue related issues were not evident in the crash analysis there is strong evidence to suggest that heavy vehicle drivers are taking breaks in non-urban areas on the Kings Highway.

Recommendations are:

- Update signage, check for consistency and consider more specific messages.
- Identify safer informal sites for heavy vehicle drivers to rest. These sites can be promoted through the 'green reflector' system.

Drink drivers

RMS continues to portray drink driving as an anti social behaviour through the following:

- Promoting safer behaviour through the development of strategies following the RMS qualitative research (June 2010) into drink driving in rural and remote communities. These strategies will be targeted to local communities to ensure that the countermeasures are relevant and aim to address particular issues in each community.
- The provision of public breath testing machines in all local towns and ensuring that these resources and their location are well communicated to the community.

Road User Information

Reliable road user information systems must have the ability to display immediate and accurate advice. In most cases this advice is displayed through variable message signs, both permanent and mobile.

Much of the existing system is of little or no benefit as the telecommunications network needed to drive the system on the eastern escarpment is unreliable or non-existent. This severely limits both the safety and operational potential of the existing large permanently positioned variable message signs in this area.

Recommendations are that RMS:

- Continue to liaise with the relevant telecommunications providers to reiterate the need to deliver adequate coverage along this section of the highway.
- Ensure that future permanent VMS sites are not located in high risk areas such as in or approaching curves.
- Implement a far more rigorous system for the location of portable variable message boards. Most of the existing locations are unprotected and well within the clear zone presenting a potential risk for an errant vehicle. Engineering works should be undertaken to provide 'protected' hard stand areas for these portable boards.
- Investigate alternative methods of delivering appropriate communication coverage to the existing permanent variable message sites.
- Develop other suitable communication strategies to inform and educate communities with important road safety messages and changes to the network that may affect them.
- Continue to engage with the community at the conclusion of the review to advise them of the findings and recommendations.

Police and RMS enforcement

Complement Police resources in rural areas through the following strategies:

- Promote mobile roadside enforcement through the identification and development of suitable roadside enforcement sites.
- Support and undertake co-ordinated education and enforcement campaigns.
- Support and undertake coordinated enforcement of heavy vehicle regulations through the RMS heavy vehicle regulation units.



Photograph 3.7: Western approach to Braidwood town centre

Improved signage

Improve signage to alert drivers to prevailing road conditions by examining the feasibility of vehicle activated signs, possibly triggered by vehicle speed. This would emphasise the need to reduce speed which is especially important for eastbound drivers at the top of the Clyde Mountain where both the alignment and road width change suddenly.



Photograph 3.8: Portable variable message sign within the clear zone

Higher-risk topography and changing conditions

Permanent variable message signs are positioned midway along the eastern escarpment warning motorists of the need to check speed when driving around curves. These signs need to be complemented with similar messages prior to the change in topography at both ends of the eastern escarpment.

Weather (particularly fog) related advice

- Upgrade and rationalise driver information about changing road conditions, especially on stretches of road that traverse significantly different terrain and conditions through the eastern escarpment.
- Enhance the effectiveness of existing adverse weather condition messages and review both electronic and static signage for consistency and the relevance of the behavioural messages.

3.1.3 Enforcement program

To be effective an enforcement program needs to consist of several strategies. The suggested strategies involve:

- Speed enforcement.
- Speed camera enforcement.
- Driver fatigue and drink driving enforcement after driving.

Speed enforcement

The speed enforcement program includes the following initiatives:

- RMS will review highway crash trends to identify appropriate locations for mobile speed enforcement sites.
- Safe, hard stand enforcement sites that meet Work Health and Safety requirements will be identified and provided along the highway at appropriate locations so that enhanced roadside speed enforcement can be undertaken by the NSW Police or through the TfNSW mobile speed camera enforcement program.
- Review and, where possible, increase existing levels of speed enforcement to target higher risk locations (at suitable sites identified and developed to meet operational and Work Health and Safety requirements for stationary enforcement), higher risk times of day and more remote areas outside larger town centres.
- Continue to co-ordinate the TfNSW mobile speed camera enforcement program with police enforcement operations.
- Identify locations where complementary operations can be conducted to provide a greater level of enforcement.
- Investigate options to improve the flexibility of regional NSW Police resources to allow for increased and targeted enforcement activities.
- Consider the use of the NSW Police Traffic Services Group (TSG) to provide Enhanced Enforcement Program (EEP) support if required and at times when existing regional resources cannot be provided.

Speed camera enforcement

Although clearly supported by some of the community, further investigation needs to be undertaken to clarify whether it is feasible to provide fixed or average speed cameras on the Kings Highway. The investigations will focus on site selection and ensuring it meets the necessary criteria.

At present almost 30 km of the Kings Highway has been identified as suitable for mobile speed camera enforcement. Three enforcement sites are currently in use near Braidwood and another two are used for westbound traffic in the vicinity of Clyde Mountain. A further four sites are being investigated for suitability.

The NSW Speed Camera Strategy outlines the selection criteria for sites for the four types of speed cameras used in NSW. Speed cameras should support existing Police enforcement on the Kings Highway.

Speed camera enforcement strategies include:

- The promotion of compliance with speed limits through the use of speed cameras which support enforcement conducted by NSW Police.
- Monitoring of the effectiveness of this enforcement through the annual review of speed cameras.

Driver fatigue and drink driving education

The following driver fatigue and drink driving education initiatives are in place:

- RMS Southern Region has ongoing media campaigns in place, targeting driver fatigue and drink driving along the Kings Highway. These campaigns are run concurrently with targeted Police enforcement of drink driving.
- Regular advertising campaigns are run, particularly during school holiday periods focusing on driver fatigue.



Photograph 3.9: Start of steep descent, top of Clyde Mountain

Section 4

Summary and conclusion

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.

The recommendations made as a result of the Kings Highway route safety review focus on an integrated approach to improving road safety along the length of the highway. They involve implementing an enhanced road safety program which includes:

- Providing greater protection from roadside hazards through the installation of appropriate safety barrier systems.
- Relocating or removing some roadside hazards.
- Improving line marking practices.
- Providing upgraded and consistent warning, advisory and directional highway signposting.
- Improving road pavement and widening road shoulders.
- Upgrading road junction treatments.
- Improving road alignment.
- Reviewing speed zones and their lengths.
- Reviewing school bus operations and upgrading the required facilities where appropriate.
- Enhancing road user behavioural campaigns, especially those targeting speeding and fatigue.
- Providing or upgrading the facilities required to strengthen enforcement strategies.
- Maintaining and strengthening existing road safety partnerships.



This information is intended as a guide only and is subject to change at any time without notice.

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