Pacific Highway Safety Review

May 2004

Contents

Executive summary

The Pacific Highway from north of Hexham to the Queensland border covers a length of almost 700km. The road serves as a key interstate corridor for the carriage of passengers and freight as well as a link that serves a region with a population greater than 500,000. This population more than doubles in peak tourist season and is projected to increase to around 800,000 within 20 years.

The nature and condition of the highway between Hexham and Queensland varies greatly, from high quality divided carriageways to stretches of narrow two-lane road. There is a recognised need to provide a consistent, high standard road to address current and future demands. Despite progress on upgrading the highway to divided carriageway and the provision of numerous bypasses of sections of road with poorer safety records, fatalities are still occurring, often on remaining two-lane undivided sections.

The review was established to examine and report on the following issues:

- The circumstances surrounding recent fatal crashes on the Pacific Highway.
- An audit of road conditions along the highway from Hexham to the Queensland border.
- Facilities along the highway, including rest areas, overtaking lanes and signage.
- The appropriateness of current speed limits.
- Police enforcement activities along the highway.
- Issues associated with heavy vehicles on the Pacific Highway.
- Future priorities for the Pacific Highway Upgrading Program.

A range of analyses and inspections has been undertaken during the review including:

- Analysis of reports on fatal crashes.
- Analysis of crash trends such as severity, crash type and crash factors, particularly in relation to the identification of safety benefits arising from the major upgrades on the highway since 1996.
- A desk based audit of the highway using gipsicam to identify areas requiring closer scrutiny.
- Physical inspections of the entire length of the highway from Hexham to the Queensland border to examine locations and circumstances of fatal crashes, review speed limits and to assess the road from both a behavioural and road environment perspective.
- Input from a range of stakeholder groups and individuals on significant safety issues relating to the highway.

The review made the following findings:

1. CIRCUMSTANCES OF RECENT FATAL CRASHES

The review found that between January and December 2003, there were 44 fatal crashes. Of these:

- Most occurred on undivided sections of the highway.
- 15 were north of Grafton and 8 between Hexham and Taree.
- 14 involved heavy vehicles.
- Fatigue was implicated in around 7% of fatalities in 2003 compared with 22% of fatalities in 2000-02.
- Head-on crashes accounted for 50% of fatal crashes.
- Out of control / off road crashes on curves and straights in 2003 (18%) were lower than 2000-02 (24%).
- Interstate drivers in 2003 (40%) were higher than 2000-02 levels (22%).
- A significant number of crashes involved speeding and not wearing a seatbelt.

2. ISSUES ASSOCIATED WITH HEAVY VEHICLES

In recent times, there has been a particularly strong growth in use of the Pacific Highway by heavy vehicles, especially since the opening of the Yelgun to Chinderah Freeway (August 2002) and the declaration of the Pacific Highway as a B-Double route. The Pacific Highway is also heavily used by semitrailers, as it is the shortest route between Sydney and Brisbane. Daily counts are, respectively, 1200 semis and 200 B-Doubles.

Speeding is a significant road safety issue for heavy vehicles. The results from speed surveys conducted on heavy vehicles in June 2003 and December 2003 show consistent levels of speeding with 15% of heavy vehicles travelling in excess of 100km/h. These speeds are of particular concern, as heavy vehicles are required by Australian Design Rules to have their maximum speed limited to 100km/h.

Around 25% of vehicles involved in fatal crashes on the Pacific Highway are heavy trucks. Given the exposure data available – heavy trucks account for 2% of NSW registered vehicles, generate around 6% of total motor vehicle travel in NSW and account for 15%-20% of traffic counts on the Pacific Highway – heavy trucks appear to be over-represented in fatal crashes.

3. SPEED AND SPEED LIMITS

The inspection of the Pacific Highway suggested a number of areas in which changes to speed zoning could lead to further improvements to road safety. These measures include:

- Increased consistency in speed zoning.
- Ensuring speed limits and signs were appropriate to their location.

4. STRATEGIC PLAN

Based on the analysis of issues outlined above a road safety strategy for the highway has been developed. The vision for this strategy is:

'A significant reduction in trauma, both injury and death, caused by road crashes on the Pacific Highway'

This vision is underpinned by six goals for the highway:

- Continue the upgrading of the highway to high standard dual carriageway from Hexham to the Queensland border.
- Facilitate safer operation of two-way single carriageway sections.
- Manage and enforce speed limits.
- Address long distance driver fatigue in both heavy and light vehicles.
- Respond to the road safety impacts of increased usage by heavy vehicles.
- Minimise the adverse impacts of traffic incidents.

Underpinning these goals is a range of programs. These programs are:

- **The Pacific Highway Upgrading Program** that continues the upgrading of the highway to high standard dual carriageway for its entire length, from Hexham to the Queensland border, with annual expenditure of $160 million by the NSW Government and $60 million by the Federal Government. The commitment of Commonwealth funding for the upgrading program expires in mid 2006. The NSW Government has been seeking to obtain a commitment from the Commonwealth to continue its joint funding arrangement to the upgrading of the Pacific Highway beyond 2006. This commitment has not yet been made and there is no commitment contained in the recent 2004/05 Federal Budget.
- An **Enhanced Road Safety Engineering Works Program** to address issues such as poor alignment; potential for head-on crashes; poor shoulders and roadside hazards; intersections and rest facilities. In addition to major upgrades to dual carriageway standards, typical treatments include improved delineation including the use of wire rope barriers in medians; pavement and drainage improvements; shoulder widening; removal of roadside hazards; provision of roadside crash barriers; provision of rest areas and upgrading of rest area facilities; and intersection improvements.

- A **Behavioural Program** to address issues such as speeding and fatigued driving. Initiatives include education campaigns, providing feedback to drivers on vehicle speed; revised speed zonings and signposting; improved signposting of rest opportunities; and Driver Reviver Programs.
- An **Enforcement Program** to address speeding and compliance with transport regulations by both heavy and light vehicle drivers. Initiatives include increasing the profile of Police speed enforcement, joint Police / RTA operations targeting heavy vehicle compliance and high profile heavy vehicle enforcement activities by RTA inspectors.
- A **Technology Program** including development of point to point speed camera technology using fixed digital speed cameras as well as the Safe-T-Cam system; and installation of Variable Message Signs that will have a range of uses including reinforcement of speed limits and behavioural messages; advice on delays and alternate routes and incident management.

It should be noted that while construction of dual carriageways results in significantly lower rates of fatal crashes (an almost 90% reduction), fatalities will still occur. As the highway improves there will need to be an increased focus on behavioural / educative and enforcement strategies targeting behaviours such as driver fatigue and speeding.

A number of components of these programs were initiated at the end of 2003 or during 2004. Further works are currently in progress or are ongoing. These include increased police enforcement through the Enhanced Enforcement Program, greater focus on heavy vehicles by RTA vehicle inspectors and a range of road works.

5. CONCLUSION AND RECOMMENDATIONS

Enhanced road safety outcomes on the Pacific Highway will best be achieved through a combination of factors including upgrading the road, appropriate education and targeted enforcement. Cooperation between agencies and across the three levels of government are also essential. The heavy vehicle industry also has a key role to play in ensuring that its drivers act safely and responsibly. The methodology used in the Pacific Highway Safety Review is a powerful tool that ensures that all the relevant road safety factors are addressed and practical countermeasures are developed. The following recommendations are made:

1. The upgrading of the Pacific Highway to dual carriageway should be expedited and ongoing significant funding commitments be sought from the Federal Government.
2. Implement the initiatives outlined in the Enhanced Road Safety Engineering Works Program to yield maximum reduction in fatalities and casualties on the Pacific Highway.
3. Many of the education and promotion strategies outlined as part of the Road Safety Behavioural Program are, by necessity, statewide strategies that have application on the Pacific Highway. Further refinement of these strategies could be undertaken.
4. Enforcement resources directed at key behaviours such as speed and fatigue in heavy and light vehicle drivers supported by tightly focussed behavioural programs are essential.
5. The methodology used for this review should be used as a model for similar reviews on other key routes such as the Princes Highway.

1 Introduction

1.1 Background

The Pacific Highway has been the subject of considerable upgrade construction, precipitated in part by two multiple fatality coach crashes on two lane undivided sections of the highway in 1989. The Federal and NSW Governments committed to a 10-year funding program for upgrade works between 1996 and 2006.

Projects such as the Taree Bypass, Bulahdelah to Coolongolook Freeway and the Yelgun to Chinderah Freeway have significantly reduced accident numbers, injuries and fatalities within the sections constructed. The Federal Government committed to funding to the amount of $60 million per year for 10 years from 1996 to 2006. The NSW Government has committed to spending $160 million per year over the same time period. Funding for maintenance, road safety and traffic management works are included in the State funded amount. The Federal funding for the Pacific Highway Upgrade Program is confirmed only until 2006.

Despite progress on upgrading the highway to divided carriageway and the provision of numerous bypasses of sections of road with poorer safety records, fatalities are still occurring, often on remaining two-lane undivided sections.

The incidence of fatal crashes on the Pacific Highway north of Hexham increased sharply in 2003. As a result, in October 2003, the Minister for Roads instigated a review of road safety on the Pacific Highway between Hexham and the Queensland border, to be undertaken by the Roads and Traffic Authority, under the direction of Dr Soames Job.

A review team was formed to review recent crashes and to examine the factors contributing to them. This report describes the highway, the types of crashes that have been occurring, the key factors in these crashes and works programs that have been developed to reduce the severity and incidence of crashes, especially casualty crashes.

1.2 Terms of reference

The review was established to examine and report on the following issues:

- The circumstances surrounding recent fatal crashes on the Pacific Highway.
- An audit of road conditions along the highway from Hexham to the Queensland border.
- Facilities along the highway, including rest areas, overtaking lanes and signage.
- The appropriateness of current speed limits.
- Police enforcement activities along the highway.
- Issues associated with heavy vehicles on the Pacific Highway.
- Future priorities for the Pacific Highway Upgrading Program.

1.3 The review process

REVIEW TEAM

A review team, comprised of experts from the various areas of road safety, traffic management and road design, was assembled to conduct the review. RTA Regional Managers for Hunter and Northern Regions and the Pacific Highway Office as well as representatives from the NSW Police were also members of the team.

CRASH ANALYSIS

An interim crash analysis report was updated in April 2004 and covered an analysis of the provisional fatal crash data for 1 January to 31 December 2003. Fatal crash data for previous years (2000-2002) has also used for comparative purposes. A map showing locations of fatal crashes appears over the page.

Map 1 Fatal crash locations

Further crash data analysis of the final crash data for 1996 to 2002 was also undertaken. Finalised annual data allow a more robust analysis of crash trends such as severity, crash type and crash factors, particularly in relation to the identification of safety benefits arising from the major upgrades on the highway since 1996.

INSPECTION BY SENIOR MANAGERS

Dr Soames Job (RTA) and Chief Superintendent John Hartley (NSW Police) personally inspected the full length of the Pacific Highway between Hexham and Tweed Heads in early January 2004. They met with RTA and Police representatives in various locations to consider issues and potential treatments.

COMPUTER BASED INSPECTION

An inspection of sections of the highway was conducted by RTA managers using the 'Gipsicam' system, which allows viewing of film footage of the highway on a desktop computer. The system is coded with Geographic Positioning System (GPS) data, enabling identification of precise locations and analysis of road environment physics. Use of this system provides valuable additional information, such as curve radii and road surface condition that enhances decision-making. Gipsicam images were upgraded during the review to ensure the currency of information in undertaking computer-based assessments of the highway.

INSPECTION GROUP

A road safety inspection was conducted on the Pacific Highway from Hexham to Tweed Heads between 15 and 18 December 2003. The main focus was to ensure that any remedial treatment that would improve safety along this road was identified for further examination.

The members of the Inspection Group were all experienced road safety experts. Two were from the RTA's Accident Investigation and Blackspot Program and Speed Management areas, one was from the RTA's Road Safety & Traffic Management Section in Goulburn and the fourth was an independent expert in behavioural road safety issues.

The inspection comprised:

- Investigation of fatal crash sites.
- A generic review of speed limits.
- An assessment of the road from a behavioural science perspective.
- An assessment of features of the road environment.

The inspection group identified a range of issues. These issues have been considered in the development of the works program. Some issues, particularly inconsistencies in speed zoning, signposting as well as local safety issues have been referred to the appropriate RTA Region for consideration and rectification.

1.4 Stakeholder input

Comment on significant safety issues was sought from a range of stakeholder groups and individuals. An analysis was also undertaken of correspondence sent to the Minister for Roads on Pacific Highway issues. Stakeholders who were consulted included local government, health and emergency services, the road transport industry, local communities and the NRMA.

In addition to providing comments to the review the NRMA made available the results of a report they commissioned in July 2003 on the overall route performance of the Pacific Highway. The review was conducted by Parsons Brinkerhoff and examines a range of factors including road conditions, overtaking opportunities, signage and rest facilities. The report concluded that:

'Overall, the route performed well on most criteria. Over 80% of the route has a speed limit greater than 90 kilometres per hour, speed limit reminder and warning signs are numerous, rest areas are frequent, lanes are generally wide, pavement is mostly of good quality, edgelines were of good quality and shoulders were mostly rated good. Some aspects that require further attention include:

- **Overtaking opportunities are low.** Although RTA plans to upgrade many of the sections with poor overtaking opportunities, less than 50 % of the route currently allows for safe overtaking and approximately 55% allows for possible overtaking (whereby vehicles cross the centreline to overtake another vehicle). Safe overtaking opportunities are particularly infrequent between Coffs Harbour and Ballina.
- **Curves** are numerous, with one curve on average every five kilometres.
- **Poor shoulders** were observed on 2.4% of the route. These areas should be protected with a crash barrier, as each represents a potential fatality should a vehicle run off the road.
- **Clear zone objects** are numerous, particularly drains and piping under property accesses. These hazards should either be removed or treated (such as by erecting a crash barrier). Grafton to Ballina had the greatest number of clear zone objects'.

The review team would particularly like to acknowledge the co-operation of the NRMA during the review.

2 The Pacific Highway in context

2.1 Description of the highway

The almost 700km of highway north of Newcastle serves a region with a population greater than 500,000. This population more than doubles in peak tourist season and is projected to increase to around 800,000 within 20 years. Much of the Pacific Highway is recognised as being less than appropriate for current and projected traffic volumes and has a poor record for road crashes and fatalities. The nature and condition of the highway between Hexham and the Queensland border varies greatly, from high quality divided carriageways to stretches of narrow two-lane road.

There is a need to provide a consistent, high standard road to address current and future demands. Map 2 (overleaf) shows the highway giving the location of dual carriageway.

The Pacific Highway corridor is dominated by the Great Dividing Range to the west, the Pacific Ocean to the east and the rivers of Hunter, Manning, Hastings, Macleay, Clarence, Richmond and Tweed, which flow between the two.

Whilst providing access to the 700 km stretch of Pacific coastline, the highway has very few views of the Pacific Ocean and is probably more accurately characterised by the mountains and foot hills of the Great Dividing Range to the west of the highway as well as the broad rivers that cross the floodplains between the mountains and the ocean.

Travelling from north to south, the road swings from the coast and Tweed River and sweeps alongside the cane fields with views of Mount Warning and Mount Burrell. Crossing the Brunswick River, brief views are available of the river mangroves and coast.

South of Brunswick, Cape Byron becomes visible and some of the best views of the Pacific Ocean and coast can be seen from the highway. The undulating coastal hills and valleys remain a constant theme until the flatter farmed land around Grafton and the Clarence River dominates. The hills, although still visible, recede into the distance.

Approaching Woolgoolga, the plateau of the Great Dividing Range around Dorrigo again becomes a dominant presence with bold ridges and valleys with lush vegetation and banana plantations extending around Coffs Harbour.

South of Coffs Harbour the mountains, although visible, again recede into the distance, giving way to the flatter rural landscape of the area around Kempsey. Near Port Macquarie, the mountains again begin to dominate and south of Wauchope three prominent wooded mountains loom over the highway and are an important reference for the road user.

Crossing the Manning River near Taree, the landscape again flattens with views of the Great Dividing Range in the distance before the highway passes Mount Talawahl near Nabiac and lifts into the wilder undulating bushland region around the Great Lakes.

Passing over a saddle, the highway enters a basin in which Bulahdelah is situated along the Myall River. A low ridge of hills blocks views to the Great Dividing Range to the west and to the east, Alum Mountain stands over the town.

A wooded, lightly undulating section of highway south of Bulahdelah gives way to open views of the Karuah River estuary from the bridge over Karuah River. The road then passes through a flatter region of woodland and agricultural land before reaching Raymond Terrace at the confluence of Williams and Hunter Rivers.

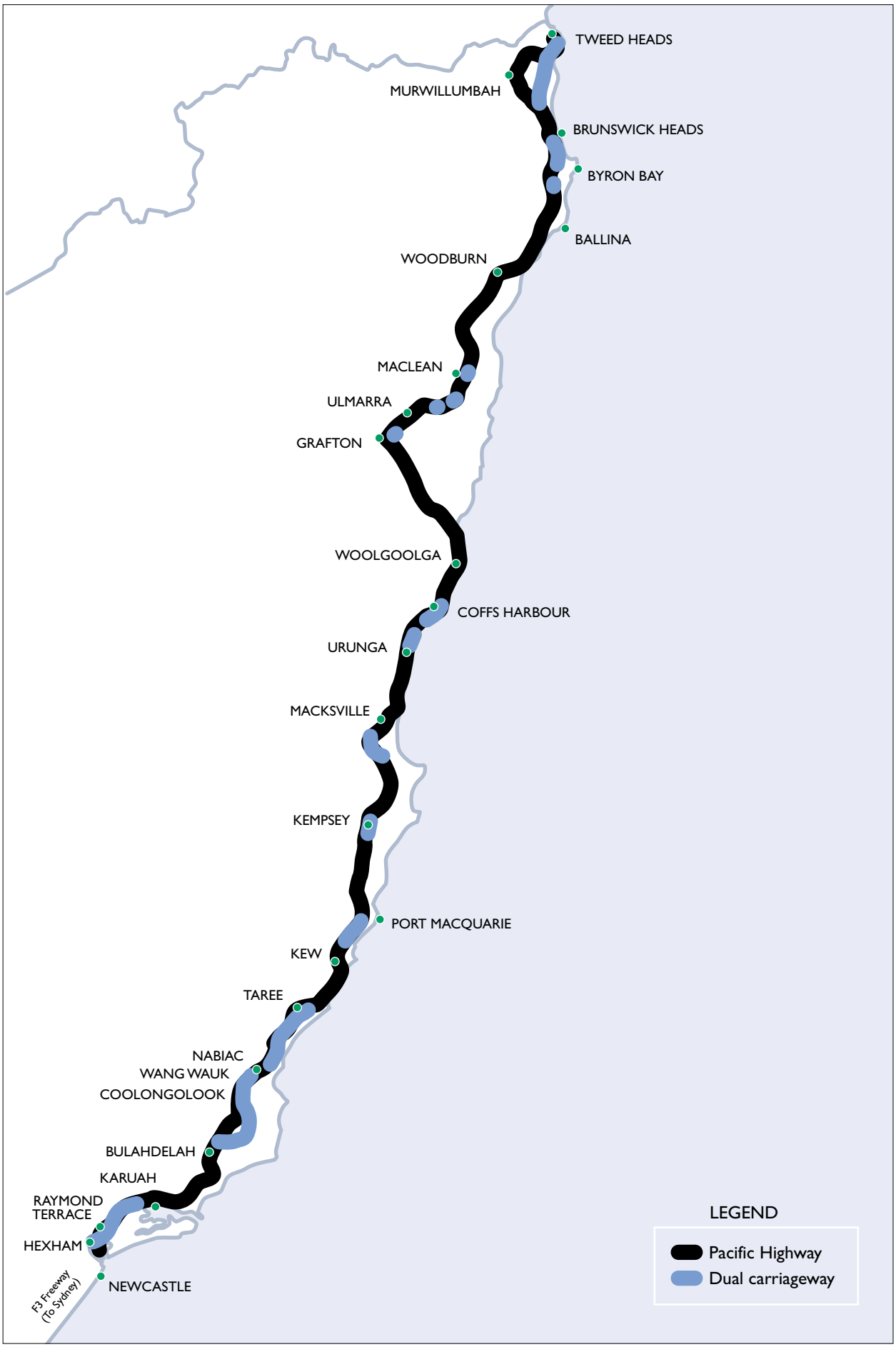
A short journey with open views to distant hills to the west takes the Pacific Highway to the Hunter River at Hexham.

2.2 Traffic types and volumes

In New South Wales, the Pacific Highway carries between 2.9 million vehicles per year near Grafton to over 12 million vehicles per year at Tweed Heads and Raymond Terrace, making it one of the most heavily used interstate road corridors.

GENERAL

The RTA has a combination of permanent and temporary traffic counting stations along the entire section of the Pacific Highway from Hexham to the Queensland border. There are approximately 16,000 vehicles per day using the section of the highway that is in the RTA's Hunter Region, which includes Local Government Areas of Port Stephens, Great Lakes and Greater Taree. This section of the Pacific Highway is mostly comprised of four-lane divided road built to a high standard, but also consists of isolated undivided sections as well. The highest traffic volumes are experienced near the Port Stephens area with some sections having more than 30,000 vehicles per day. The lowest traffic volumes are experienced around the Purfleet area with approximately 11,000 vehicles per day.



Map 2 Dual carriageway on the Pacific Highway

The section of the highway in the RTA's Northern Region consists of more undivided sections that pass through regional centres. There are a number of upgrades and bypasses that have been completed. This section has an average through-traffic volume of 12,000 vehicles per day. The highest traffic volumes are experienced within and near town centres such as Coffs Harbour (up to 27,000 vehicles per day) and Ballina (up to 28,000 vehicles per day).

TRAFFIC COMPOSITION

The Pacific Highway is a route that is used by many road users including:

- Regular journey to work commuters mostly consisting of light vehicle traffic.
- Holidaymakers, which may include a mixture of light vehicle with or without, towed caravans/trailers, as well as coaches and buses.
- Freight and other commercial heavy vehicles.
- Motorcyclists.
- Pedestrian and bicycle traffic in town centres.

In the section of the highway in the RTA's Hunter Region between Hexham and the Great Lakes/Hastings LGA boundary, heavy vehicles make up approximately 11-15% of the total traffic volume. In the section of the highway between the Great Lakes/Hastings LGA boundary and Ballina, approximately 15% of the total vehicle fleet are heavy vehicles. North of Ballina, the heavy vehicle percentage is between 8-13%.

WEEK-BY-WEEK DISTRIBUTION

In the section of the highway in the RTA's Hunter Region (Hexham to Greater Taree/Hastings LGA border), there are four permanent vehicle counting stations, which provide traffic data on a daily basis. These are located at:

- Pacific Highway, 1km north of Hunter River Bridge.
- Pacific Highway, at Karuah River Bridge.
- Pacific Highway, at Wallamba River Bridge, Nabiac.
- Pacific Highway, 1.3km south of Old Bar Road, Purfleet.

The graph in Figure 2.1 overleaf shows the week-by-week distribution of traffic at these four locations. As seen, there are several distinct peaks well above the yearly averages (the straight horizontal colour-coded lines). These include the Christmas/New Year school holiday period, the Easter holidays, and the October school holidays (also includes the October long weekend). A broad assumption is that the traffic volume pertaining to the regular users of the route are slightly less than the averages shown and that any traffic volume above that point constitutes holiday/recreational travellers. In this respect, some holiday periods result in more than 30,000 additional vehicles per week (4200 more vehicles per day).

In the section of the highway in the RTA's Northern Region, there are 11 vehicle counting stations. The week-by-week traffic volumes for a sample of four of these have been graphed in Figure 2.2. These show similar week-by-week trends as the Hunter Region.

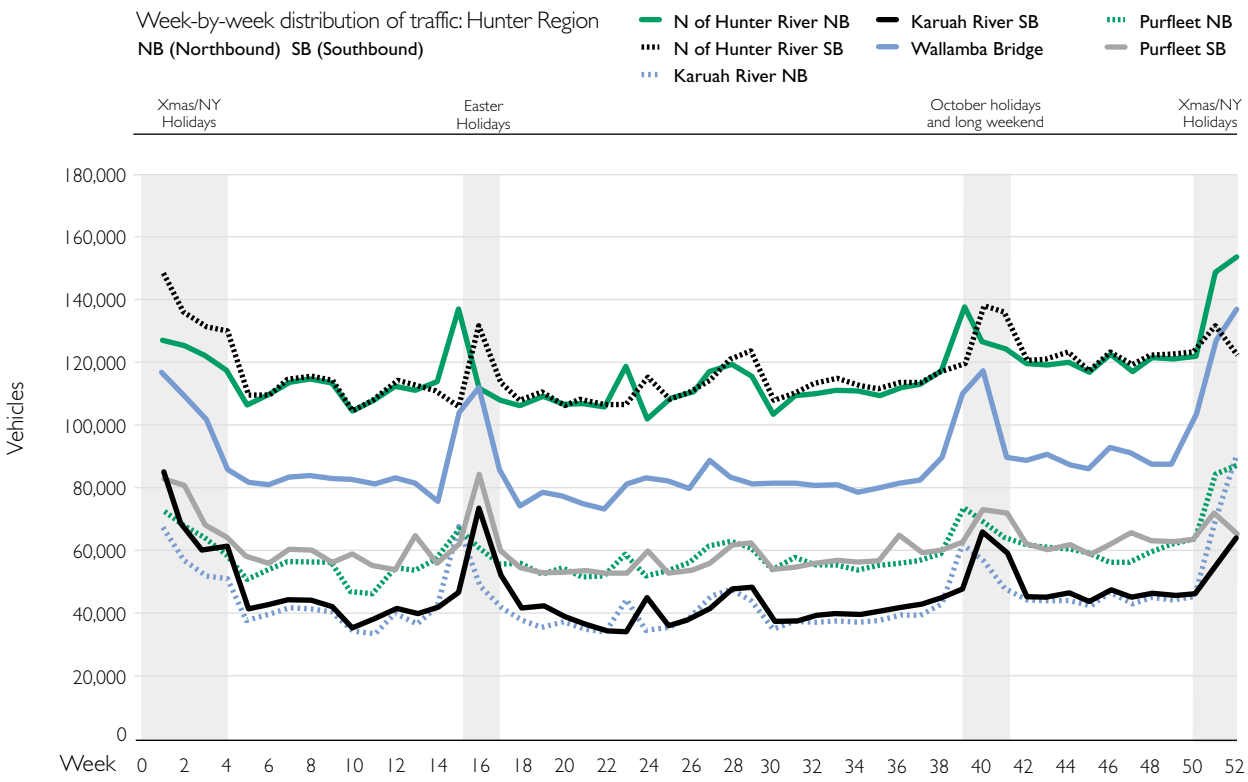


Figure 2.1: The week-by-week distribution of traffic at the four permanent vehicle counting stations in Hunter Region.

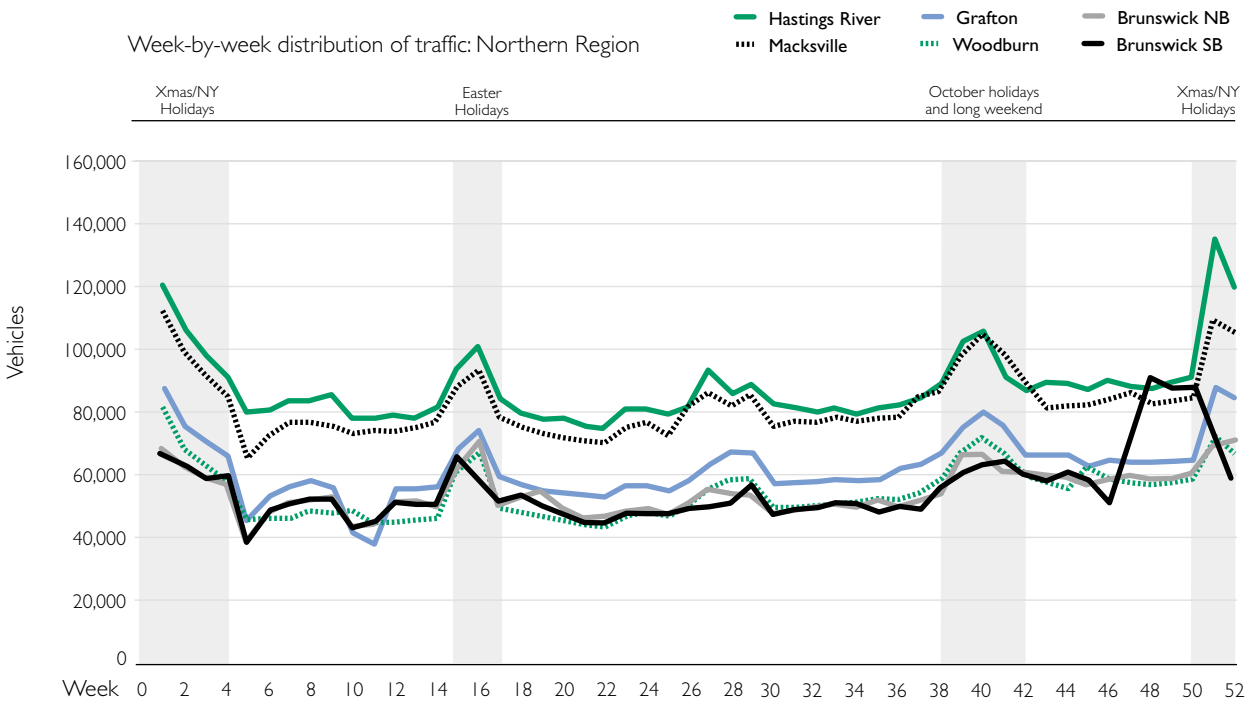


Figure 2.2: The week-by-week distribution of traffic at four selected permanent vehicle counting stations in Northern Region.

DISTRIBUTION OF TRAFFIC BY DAY OF WEEK

Figures 2.3 and 2.4 show the distribution of traffic by day of the week for the same counting stations in Figures 2.1 and 2.2. As seen, there is a distinct increase in traffic volumes on Fridays. There is however no immediately obvious explanation for this.

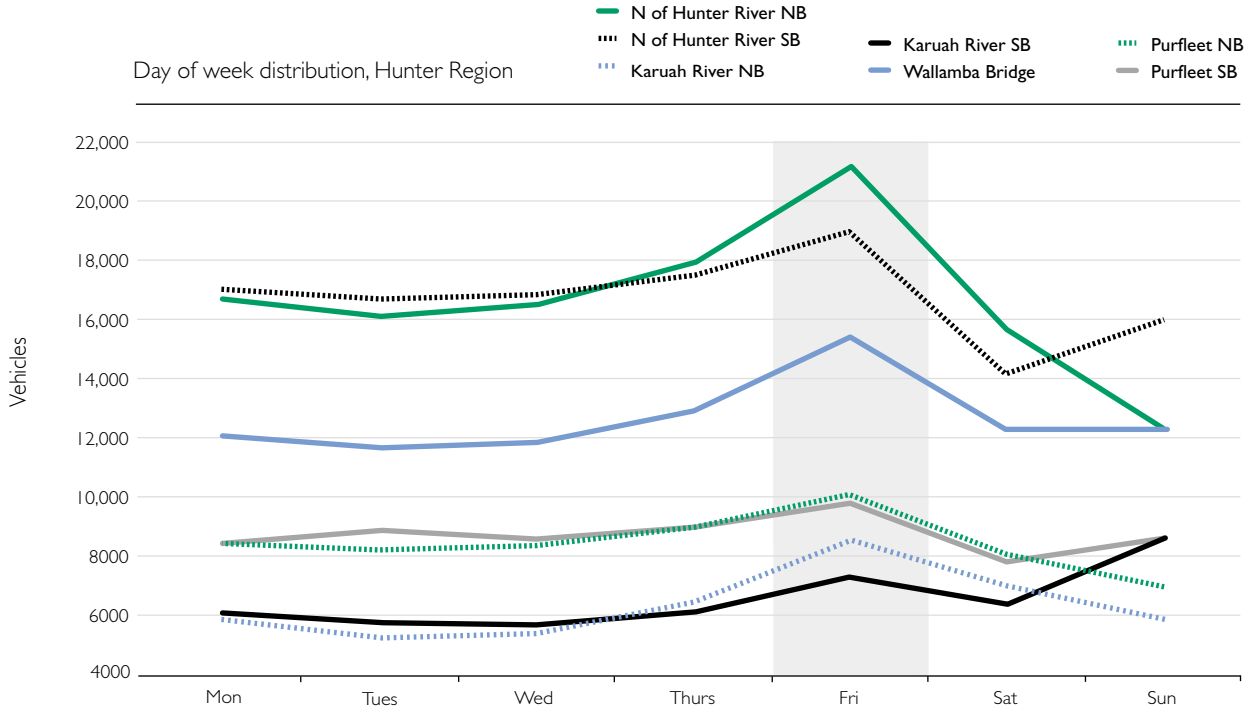


Figure 2.3: Distribution of traffic by day of the week for the four counting stations in Hunter Region.

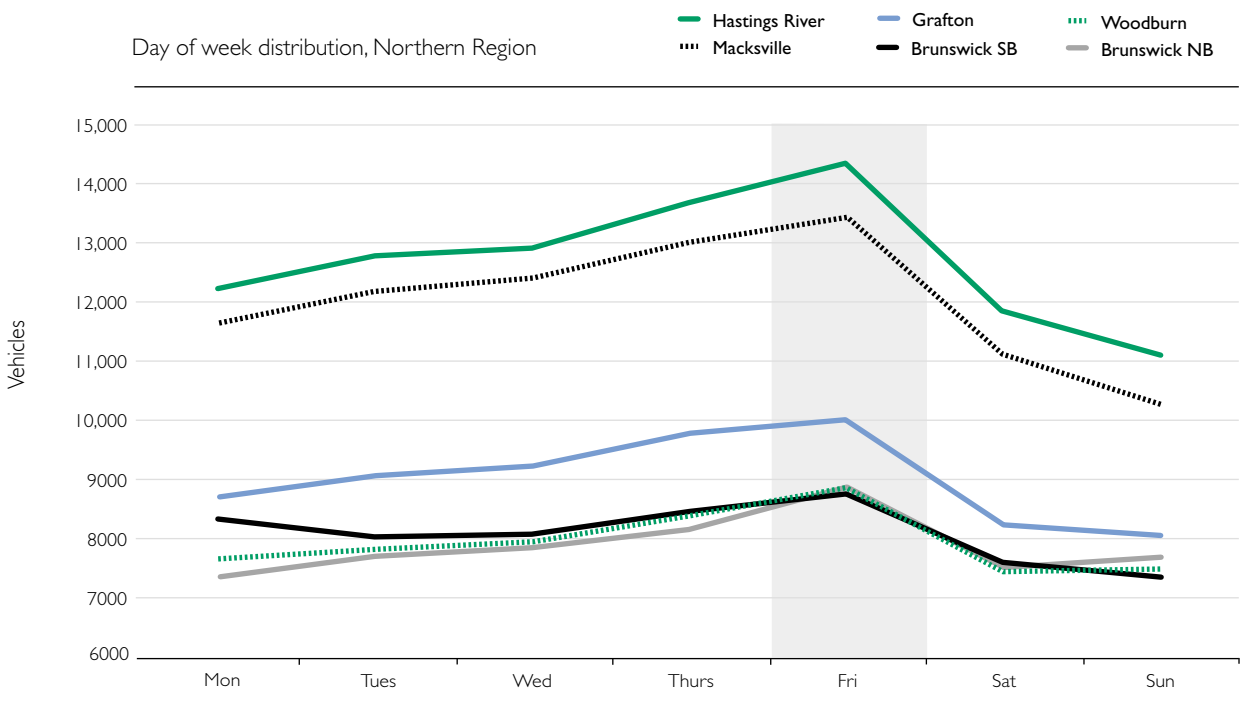


Figure 2.4: Distribution of traffic by day of the week for four selected counting stations in Northern Region.

HOURLY DISTRIBUTION OF TRAFFIC

Figures 2.5 and 2.6 show the hourly distribution of traffic for three selected sites along the highway. As seen, there tends to be much higher traffic volumes in daylight conditions as opposed to during the night time hours.

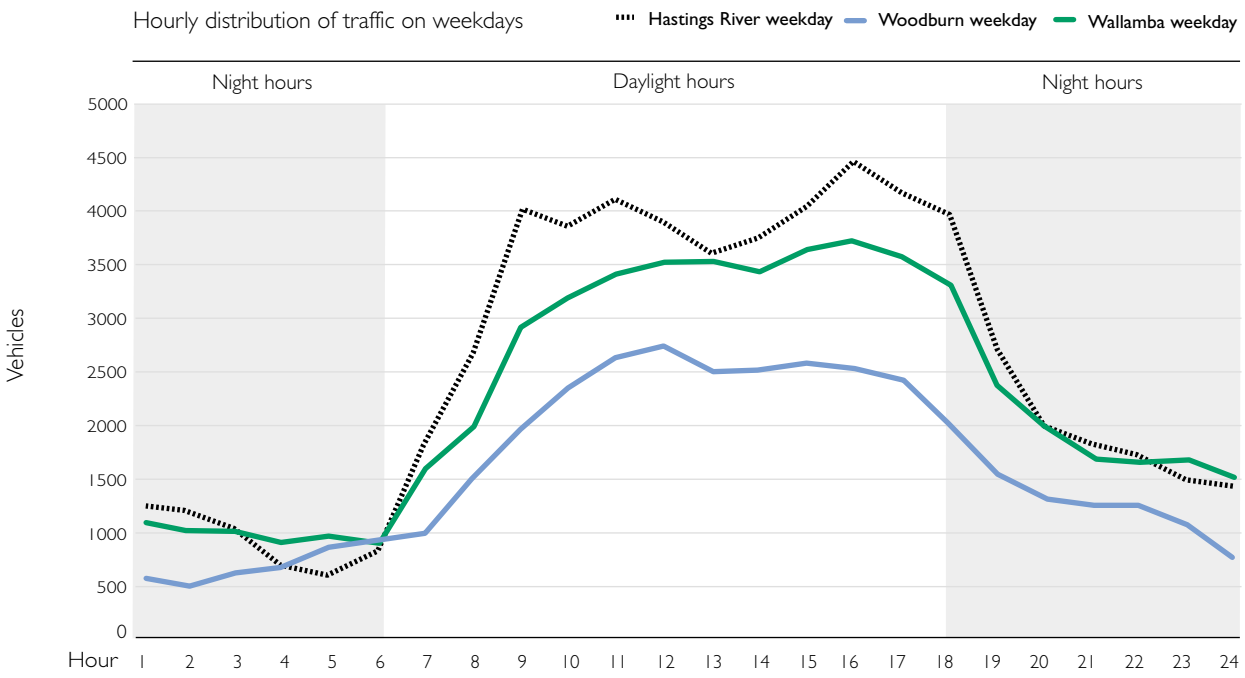


Figure 2.5: Hourly distribution of traffic on weekdays at three selected sites

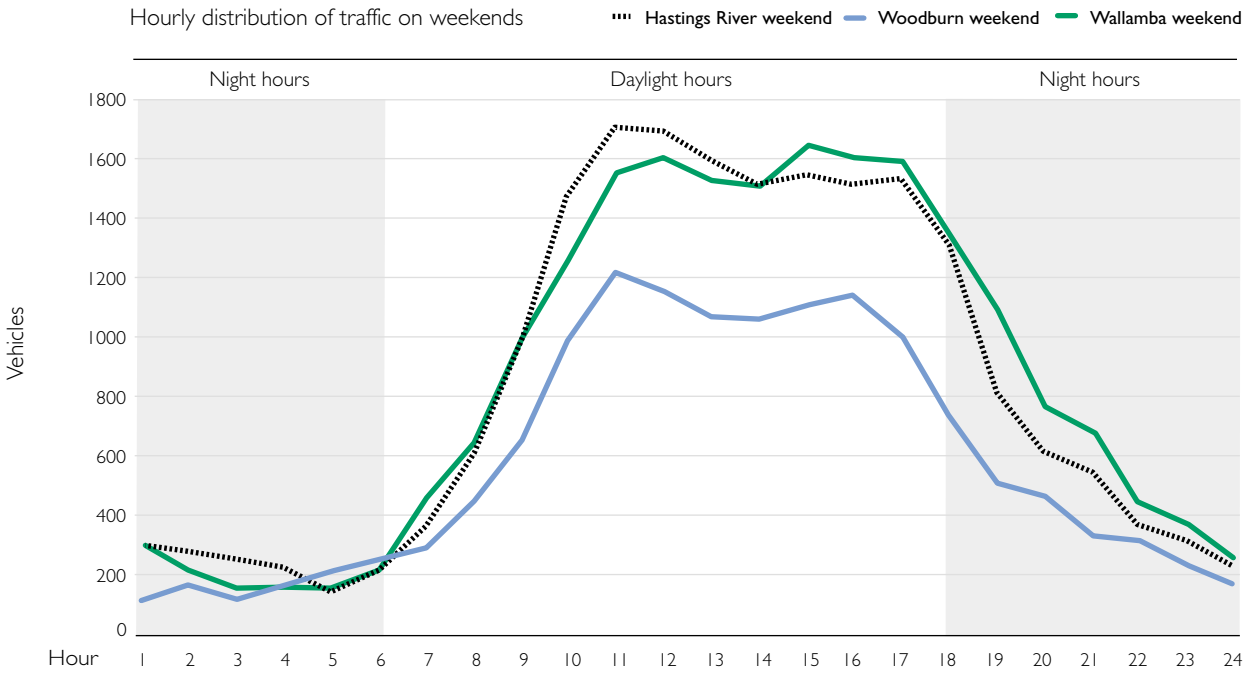


Figure 2.6: Hourly distribution of traffic on weekends at three selected sites.

3 Problem definition

3.1 Acknowledgements

The problem definition analysis utilised data and published information from a wide range of valuable sources. These included the NRMA report Pacific Highway Route Summary Performance Report, September 2003, prepared by Parsons Brinkerhoff; RTA crash data that is originally sourced from the NSW Police, RTA registration and traffic volume data as well as motor vehicle travel and demographic data from the Australian Bureau of Statistics.

3.2 Crash definitions

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

The main criteria are:

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

Statistics in this report relate to crashes rather than casualties. The crash definitions are as follows:

- **Fatal Crash** – A crash in which there is at least one fatality.
- **Injury Crash** – A crash in which at least one person is injured but no person is killed.
- **Tow-away Crash** – A crash in which at least one vehicle is towed away but there is no fatality or person injured.

3.3 Statistics

Provisional data for 2003 as at April 2004 show:

- 44 fatal crashes on the Pacific Highway north of Hexham.
- 56 fatalities north of Hexham.
- Weekly fatalities were above weekly average levels since mid-May 2003.
- Almost all fatalities were motor vehicle occupants (pedestrians were 5%).
- Though under-represented compared with fatal crashes generally, behavioural issues such as speed (34% involvement) and restraint non-usage (12% involvement) are present and significant contributory factors.
- 50% of the fatal crashes were head-on (predominantly not overtaking).
- Around 17% of fatal crashes involved a vehicle running off-road on a curve.
- Whilst around two-thirds of the highway was a two-way undivided carriageway, the majority of fatal crashes (85%) occurred on these sections of the highway.
- The age distribution of drivers involved in fatal crashes is similar to fatalities – split fairly evenly between under-40 and 40 years or more.
- 25% of motor vehicles involved in fatal crashes were heavy trucks, though only one in three heavy trucks were deemed to be the key vehicle – *the key vehicle is deemed to be the vehicle performing the manoeuvre mostly likely to have contributed to the crash.*
- 40% of drivers/riders involved in fatal crashes on the Pacific Highway were from interstate and another 17% were from the Sydney/Newcastle/Wollongong conurbation, but 32% were locals (from the same council area or nearby council area) – a contrast to country fatal crashes in general where the majority of drivers/riders involved were country residents.
- Since mid May 2003 at least 7% of drivers involved in fatal crashes did not have a valid licence.

In comparison with 2000-2002:

- There was a similar distribution of fatalities by class of road user and age group.
- Whilst there is some degree of uncertainty associated with identifying fatigue in the fatal crash data, this factor was implicated in around 7% of fatalities in 2003 compared with 22% of fatalities in 2000-02.
- Head-on crashes accounted for 50% of fatal crashes in 2000-02 and 2003.
- Out of control / off-road crashes on curves and straights in 2003 (18%) were lower than 2000-02 (24%).
- A similar age group, vehicle type and licence status distribution of drivers/riders involved in fatal crashes.
- Interstate drivers in 2003 (40%) were higher than 2000-02 levels (22%).

3.4 Crash analysis

CRASH FACTORS

An interim crash analysis report was updated in April 2004 and covered an analysis of the provisional fatal crash data for 1 January to 31 December 2003. Fatal crash data for previous years (2000-2002) have also been used for comparative purposes.

Further crash data analysis of the final crash data for 1996 to 2002 was also undertaken. Finalised annual data allows a more robust analysis of crash trends such as severity, crash type and crash factors, particularly in relation to the identification of safety benefits arising from the major upgrades on the highway since 1996.

ANALYSIS OF PROVISIONAL 2003 FATAL CRASH DATA

During 2003 (Figure 3.1, based on provisional data available in April 2004) there were 44 fatal crashes on the Pacific Highway north of Hexham, resulting in 56 fatalities. This was the highest annual number of fatal crashes and fatalities since 1989 (with 56 fatal crashes, including the Grafton and Kempsey bus crashes, and 123 fatalities).

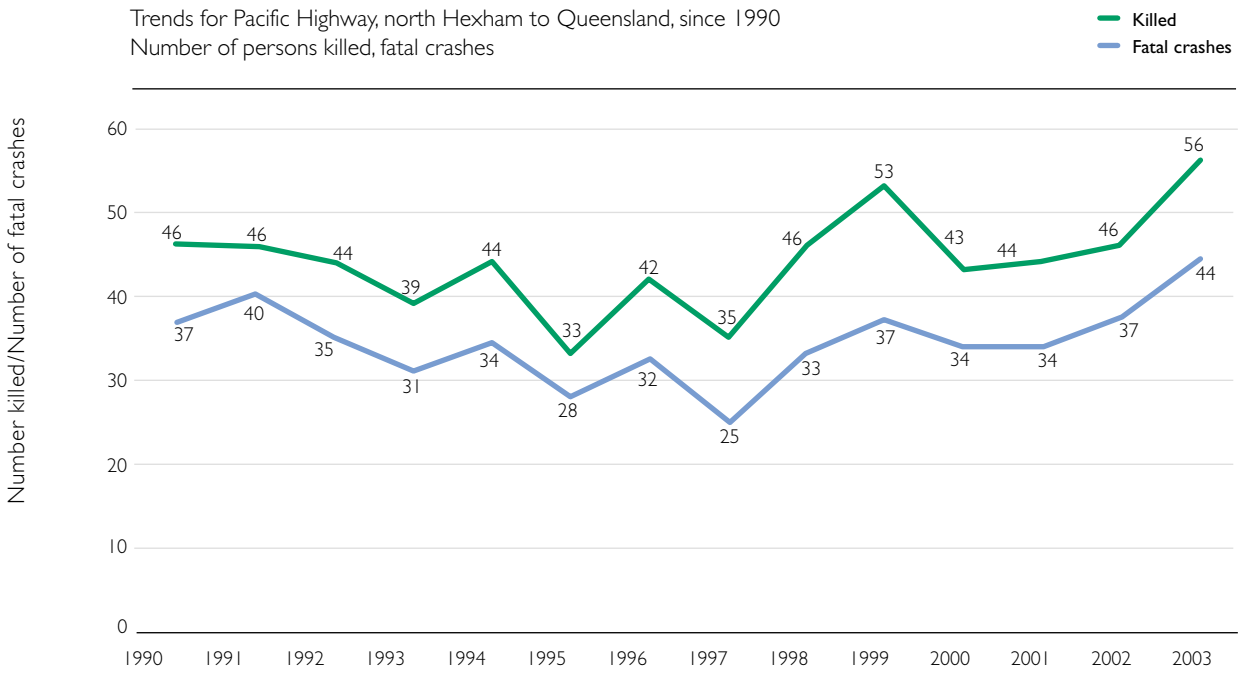


Figure 3.1 Trends for Pacific Highway, North Hexham to Qld, since 1990.

CUSUMs (Cumulative Sum of Differences) are a valuable technique used in quality control analysis to identifying changes in a process. The technique involves summing the differences between actual results and reference values such as previous average results. Where the process is in balance with the reference values then the CUSUM trend line will be horizontal. Alternatively, if the process is diverging from the reference values then the CUSUM trend line will be trending away from the horizontal. The CUSUM analysis for weekly fatalities for the Pacific Highway, using average weekly fatalities for 2000 to 2002 as the reference values, found that weekly fatalities performed above weekly average levels from mid May 2003. That is, from mid May 2003 to mid March 2004 there had been around 18 more fatalities on the Pacific Highway than would have been expected assuming the weekly average for 2000 to 2002.

FATAL CRASHES 17 MAY – 31 DECEMBER 2003

The key characteristics of fatal crashes on the Pacific Highway during the period of focus, 17 May to 31 December 2003, were the relatively high levels of head-on (generally not overtaking) crashes (48% of fatal crashes in 2003), crashes at two-way undivided road locations (85% of fatal crashes in 2003), and the involvement of heavy trucks (24% of motor vehicles involved in fatal crashes in 2003), and interstate drivers (40% of motor vehicle controllers involved in fatal crashes in 2003, compared with 22% for the three-year period 2000-2002).

Other characteristics such as road user age and gender, key vehicle directions, behavioural factors such as speed, alcohol, fatigue and restraint non-usage, licence status were all found to be not dissimilar from levels experienced previously.

ANALYSIS OF FINALISED CRASH DATA

The analysis of fatal crash data described previously has highlighted several issues relevant to the recent increases in fatal crashes on the Pacific Highway. However, given that the incidences of fatal crashes are statistically relatively rare, this analysis could be subject to relatively large random statistical variability.

It was therefore appropriate to analyse finalised crash data over recent years to gain a better understanding of the trends and characteristics for crashes on the Pacific Highway, particularly with regard to the identification of road safety benefits arising from the major upgrades since 1997.

Consequently further analyses of the casualty crash data (crashes in which at least one person has been killed or injured) and recorded crash data (casualty crashes or crashes in which at least one vehicle was towed away) was undertaken for finalised data up to and including 2002.

TRENDS IN CASUALTY AND ALL RECORDED CRASHES, 1990-2002

There has generally been a downward trend for recorded crashes and casualty crashes since 1990. However, there have been recent increases in recorded and casualty crashes since the lowest point in 2000.

In 1990 there were a total of 1,162 recorded crashes on the Pacific Highway between Hexham and the Queensland border. Of these, 569 crashes resulted in at least one casualty. By 2000, recorded crashes and casualty crashes had fallen to low points of 930 and 386 respectively. Increases over the last two years' crashes have meant that recorded crashes have rebounded to 1,009 and casualty crashes to 443.

Crash trends should be considered in the context of changes in travel exposure as measured by traffic volume data. Traffic volume data suggest that the modest improvements in absolute crash frequencies have been achieved during a period of strong increases in traffic volumes on the Pacific Highway (Figure 3.2 overleaf).

Setting 1990 as the base, traffic volumes on the Pacific Highway had increased 69% by 2002 and 80% by 2003. In contrast, estimated total motor vehicle travel in NSW had increased only 30% by 2002. Over this same time period casualties on the Pacific Highway had actually decreased by 22%.

The traffic volume data also suggested particularly strong growth in heavy vehicle counts since 1998. Whilst total traffic counts for all vehicles on the Pacific Highway increased by 27% from 1998 to 2003, heavy vehicle traffic counts increased by 38% over the same period.

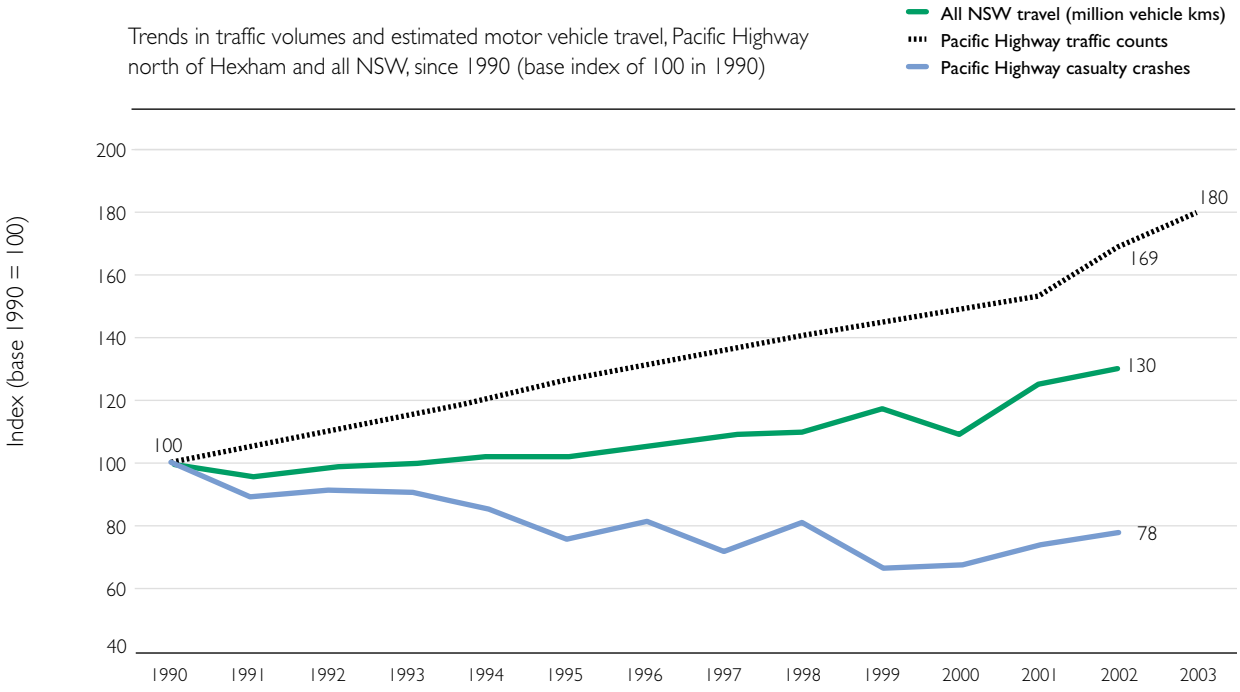


Figure 3.2 Trends in Traffic Volumes and Estimated Motor Vehicle Travel

MAJOR HIGHWAY UPGRADES AND TRENDS FOR CASUALTY AND RECORDED CRASHES, 1996 TO 2002

Further analysis of the crash data was undertaken on finalised data since 1996. This period was selected because 21 major highway upgrades had been completed by 2002. Of particular interest were the trends for crashes on those highway sections upgraded and those sections not upgraded.

The crash data suggest that the major highway upgrades have been effective in delivering road safety benefits (Figure 3.3). Since 1996, there have been significant reductions in all crash severities on sections of the highway with major upgrades whilst crashes on other sections of the highway have increased slightly.

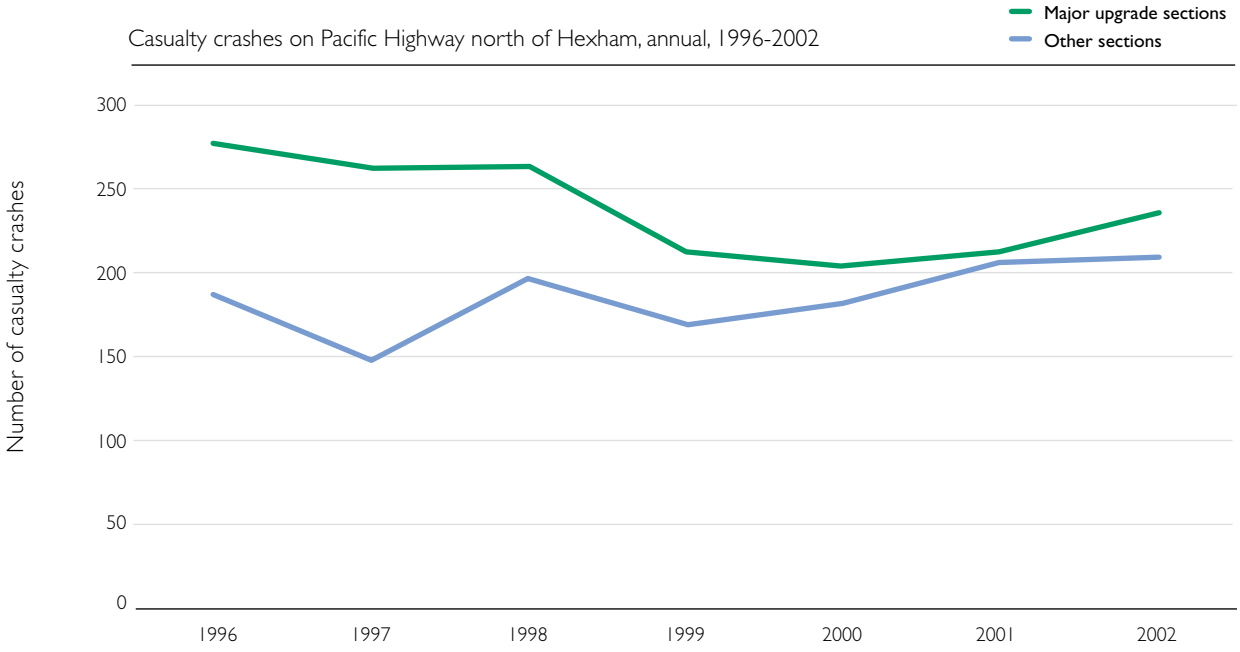


Figure 3.3 Casualty Crashes on Pacific Highway

Not only were there reductions in crashes on the upgraded sections, there were even larger reductions experienced for serious crashes of the type addressed by the road upgrades. Whilst recorded crashes on the upgraded sections decreased by 19% overall between 1996 and 2002, head-on crashes on the upgraded sections decreased by 45% over the same period.

The decrease in crashes post-1998 on the upgraded sections is the point to be noted. Although the crashes appear to remain at a high level, it should be noted that the sections upgraded first were generally the northern-most and southern-most sections of this part of the highway and carry higher traffic volumes.

Further analysis on the involvement of various behavioural, vehicle, driver and road environment factors was undertaken. The key behavioural, vehicle, driver and road environment factors investigated were speed, illegal alcohol, driver fatigue, crashes involving heavy trucks, crashes involving motorcycles, crashes involving local drivers, crashes involving interstate drivers, crashes involving Sydney/Newcastle/ Wollongong drivers, intersection crashes, crashes on two-way undivided carriageways and crashes on curves. It should be noted that these crash types are not mutually exclusive. For example a crash involving a speeding drink driver would be counted in both the speed and alcohol related crash types.

3.5 Heavy vehicles

In recent times, there has been a particularly strong growth in use of the Pacific Highway by heavy vehicles, especially since the opening of Yelgun to Chinderah Freeway (August 2002) and the declaration of the Pacific Highway as a B-Double route. The Pacific Highway is also heavily used by semi trailers. Daily counts are, respectively, 1200 semis and 200 B-Doubles. The pressures on the Pacific Highway as an interstate freight route are likely to continue.

The results from speed surveys conducted on heavy vehicles in June 2003 and December 2003 show consistent levels of speeding. Figure 3.4 below shows the overall results from the seven speed survey sites. All sites have a posted speed limit of 100km/h or above.

SAMPLE	AVERAGE SPEED	85TH PERCENTILE SPEED*
JUNE 2003	97km/h	104km/h
DECEMBER 2003	99km/h	105km/h

Note: excluding 90km/h sites
*85th percentile speeds indicate 85% of heavy vehicles are travelling at or below this speed.
Figure 3.4 Heavy Vehicle Speed Survey Data – Pacific Highway.

Speeds varied markedly across the sampling sites. At one site 15% of heavy vehicles recorded speeds in excess of 115km/h. At another site 85% of heavy vehicles recorded speeds of 93km/h or less. All recorded speeds in excess of 100km/h are of particular concern, as heavy vehicles are required by Australian Design Rules to have their maximum speed limited to 100km/h.

Around 25% of vehicles involved in fatal crashes on the Pacific Highway are heavy trucks. Given the exposure data available – heavy trucks account for 2% of NSW registered vehicles, generate around 6% of total motor vehicle travel in NSW and account for 15%-20% of traffic counts on the Pacific Highway – heavy trucks appear to be over-represented.

Even when the truck is not recorded as the 'key vehicle' in the crash, it may have been a significant contributor to the crash by virtue of its speed. For example, if a truck that is supposed to be speed-limited is travelling at 120km/h, the driver of another vehicle that is trying to stay ahead of the truck could be forced into making a judgement error or if a driver is travelling towards the truck on the wrong side of the road while overtaking another vehicle, he or she could misjudge the speed of the truck (assuming that the truck is limited to 100km/h) and reach it sooner than expected. The impact when colliding with a truck is also likely to be of greater severity than if another type of vehicle such as a car was involved.

4 Pacific Highway Upgrading Program

On 25 January 1996, a formal agreement was signed by the Commonwealth and NSW Governments to upgrade the Pacific Highway over 10 years. The program is divided into jointly funded and State only funded projects, with the NSW Government contributing $1.6 billion and the Commonwealth $600 million towards the $2.2 billion program.

The NSW Government is committed to developing the whole Pacific Highway as a dual carriageway route. The NSW Integrated Transport Plan announced in December 1998 confirms this commitment and the NSW Government is looking to the Commonwealth to match the NSW commitment by continuing the existing joint funding arrangement beyond 2006. Map 3 shows planned, in progress and completed major projects under the Pacific Highway Upgrading Program. To date 21 major projects have been completed and opened to traffic. These are as follows:

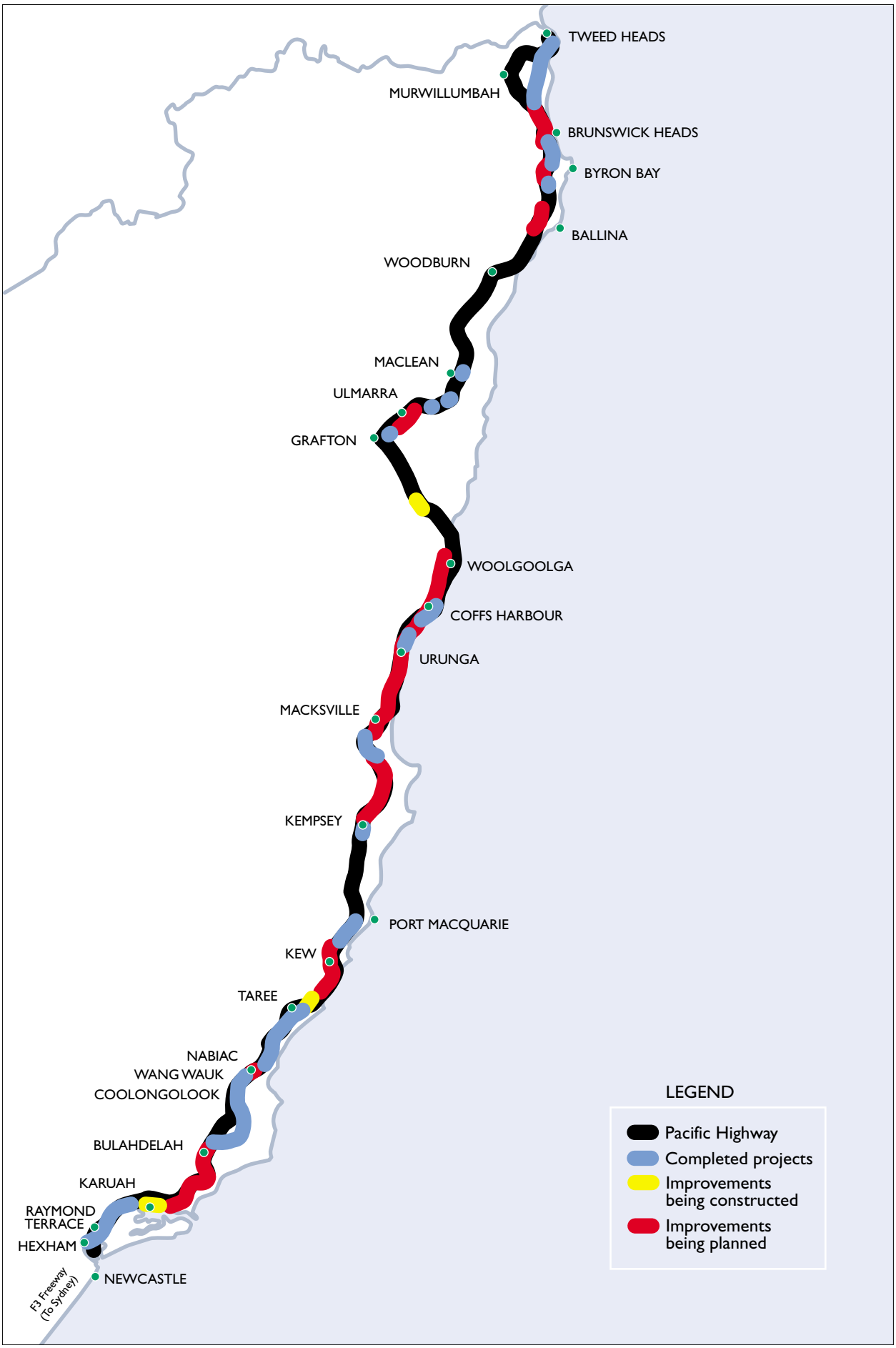
- **Chinderah Bypass** December 1996.
- **Bangalow Bypass Duplication** December 1997.
- **Korora Hill Reconstruction** December 1997.
- **Taree Bypass** December 1997.
- **Gap Road Upgrade** May 1998.
- **Brunswick Heads Bypass** 1st carriageway June 1998.
- **Herons Creek Duplication** July 1998.
- **Raleigh Deviation** September 1998.
- **Ewingsdale to Tyagarah Upgrade** October 1998.
- **Wang Wauk to Bundacree Creek Upgrade** December 1998.
- **Raymond Terrace Bypass** December 1998.
- **Eungai Duplication** December 1998.
- **Bulahdelah to Coolongolook** October 1999.
- **Tyndale Realignment** May 2000.
- **Bray Street to Arthur Street Upgrade** August 2000.
- **Raymond Terrace to Karuah** December 2000.
- **Ewingsdale Interchange** September 2000.
- **Lyons Road to Englands Road** May 2001.
- **Coolongolook to Wang Wauk** July 2001.
- **Tandys Lane Deviation** December 2001.
- **Yelgun to Chinderah** August 2002.

There are currently four major projects under construction. These are:

- **Karuah Bypass**
  Construction commenced June 2002 and expected to be completed in late 2004.
- **Taree to Coopernook**
  Upgrade site work commenced February 2002.
- **Coopernook Bypass**
  Included with Taree to Coopernook Upgrade contract.
- **Halfway Creek Realignment**
  Construction commenced March 2002. Opened in December 2003, with final surfacing work to be completed.

A further 15 major projects are being planned. These are:

- Karuah to Bulahdelah Upgrade
- Bulahdelah Upgrade
- Bundacree Creek to Possum Brush
- Coopernook to Moorland Upgrade
- Moorland to Herons Creek
- Kempsey to Eungai Upgrade
- Warrell Creek Realignment
- Macksville to Urunga Upgrade
- Bonville Deviation
- Coffs Harbour Planning Strategy
- Sapphire to Woolgoolga Upgrade
- Ulmarra Bypass
- Ballina Bypass
- Bangalow to St Helena Upgrade
- Brunswick Heads to Yelgun *(includes Brunswick Heads Bypass – Stage 2)*



Map 3 Pacific Highway Upgrading Program

5 Road asset and facility inventory

One of the Terms of Reference for the Pacific Highway Safety Review is to provide an inventory of 'facilities along the highway, including rest areas, overtaking lanes and signage'.

Table 5.1 outlines the items included in the inventory.

PACIFIC HIGHWAY, HEXHAM TO TWEED HEADS
ROAD ASSET AND FACILITIES INVENTORY

ITEM	DESCRIPTION OF REQUIRED ASSETS AND FACILITIES
OVERTAKING FACILITIES	• An inventory of overtaking opportunities along the highway
ALIGNMENT	• Curves with advisory speed signs
ROAD SIDE HAZARDS	• Inventory of hazardous versus non-hazardous clear zone hazards and type of hazards • Sections requiring hazard removal or safety barrier installations
PAVEMENT CONDITION	• Skid resistance (SCRIM) measurements • Pavement roughness survey data • Rutting data • Sealed width data
NARROW BRIDGES	• Bridges with a width deficiency greater than 2m (based on Design Code requirements)
REST AREAS	• The number and location of rest areas and distances between these
SPEED ZONING	• The location of speed zone changes • 40km/h School Zones
DELINEATION	• Inventory of guideposts and Raised Pavement Markers • Inventory of pavement markings

5.1 Overtaking facilities

The inventory of overtaking facilities includes:

- Sections of road that have more than one lane for the given direction of travel (referred to as 'same direction' lanes). These have a safety benefit in reducing driver frustration and also minimise the number of vehicle-to-vehicle conflicts as the overtaking manoeuvre does not require vehicles to enter the opposing travel lanes.
- Sections of road where there is only one lane for the given direction but where centreline treatments (extending for a distance greater than 200m) allow overtaking movements to be undertaken using the opposing lanes (referred to as 'opposing direction' lanes). These have a safety benefit of reducing driver frustration where it is safe to use the opposing travel lanes to undertake overtaking manoeuvres.

Table 5.2 provides a summary of these two types of overtaking provisions:

		NORTHBOUND DIRECTION OVERTAKING POSSIBLE USING		SOUTHBOUND DIRECTION: OVERTAKING POSSIBLE USING	
SECTION	LENGTH (KM)	SAME DIRECTION LANES	OPPOSING DIRECTION LANES	SAME DIRECTION LANES	OPPOSING DIRECTION LANES
HEXHAM TO TAREE	149	100	1	99	3
TAREE TO KEMPSEY	114	46	9	44	14
KEMPSEY TO COFFS HARBOUR	112	47	10	43	11
COFFS HARBOUR TO GRAFTON	82	24	7	22	10
GRAFTON TO BALLINA	128	22	33	22	36
BALLINA TO QLD BORDER	92	56	2	54	2
TOTAL	677	296	62	284	76

Table 5.2: Lengths (km) of the highway where 'same direction' lanes and 'opposing direction' lanes are provided for overtaking movements.
Source: Data taken and adapted from Parsons Brinckerhoff (2003).

The provision of opposing lanes for overtaking movements requires appropriate centreline treatments to permit this movement in accordance with Australian Road Rules.

5.2 Curves with advisory speed signs

It is difficult to define exactly what constitutes a curve for the purposes of the highway's Asset and Facilities Inventory. In essence, each section of the highway unless perfectly straight in alignment could be regarded as some sort of curve. Ideally, curves should be designed to be consistent with the design speed of the sections of road both 'upstream' and 'downstream' of the curve. However, due to physical, environmental and property constraints, this is not always possible. In such cases, it is acceptable to provide warning signs to advise motorists of the safe speed at which the curve can be negotiated.

The report focuses on curves that are sharp enough (low radius) to warrant advanced warning and advisory speed signage. It is not intended to be an inventory of curves but rather an inventory of curves that warrant the special signs mentioned above. The inventory of curves with advisory speed signs includes single curves with advisory speed signs as well as multiple curves signposted to the same advisory speed. A summary of this is provided in Table 5.3 overleaf.

ADVISORY SPEED (KM/H)	NO. OF CURVES
45	4
45 (TRUCKS)	2
55	2
55 (TRUCKS)	1
65	9
65 (TRUCKS)	4
75	23
75 (TRUCKS)	1
85	31
95	17
NO ADVISORY SPEED	25
TOTAL CURVES	119

Table 5.3: Inventory of advisory speed signs.

Of these 119 curves, 23 (19%) were signposted more than 15km/h below the speed limit.

5.3 Road side hazards

The road's clear zone is the nominal width measured from the outside edge of the outermost traffic lane, which should be kept free of fixed, non-collapsible hazards. The width of the clear zone depends on the design speed of the road (usually taken as less than or equal to the speed at which 85% of traffic is travelling), the traffic volume, as well as the slope of the embankment or batter aligning a road.

The RTA's Road Design Guide outlines the desirable clear zone widths. In general, on roads with flat embankments/batters, with more than 3000 vehicles per day in the outermost lane, the desired clear zones vary from 5m for a design speed of 80km/h to 11m for design speeds greater than 110km/h. Most sections of the highway are designed to speeds in excess of 80km/h.

Significant economic, social and environmental issues arise with clear zones. Many sections of the highway are lined with property boundaries well within this width. In addition, the provision of these preferred clear zones often means the extensive removal of vegetation, a lot of which is state remnant species.

			IDENTIFIABLE HAZARDS IN THE CLEAR ZONE		
ROUTE SECTION	LENGTH (KM)	DRAIN	POLE	TREE	TOTAL
HEXHAM TO TAREE	149	11	3	4	18
TAREE TO KEMPSEY	114	10	1	3	14
KEMPSEY TO COFFS HARBOUR	112	19	10	5	34
COFFS HARBOUR TO GRAFTON	82	1	1	18	20
GRAFTON TO BALLINA	128	43	2	4	49
BALLINA TO QLD BORDER	92	16			16
TOTAL	677	100	17	34	151

Table 5.4: An inventory of roadside hazards based on a subjective assessment (detected using Gipsicam). Source: (Parsons Brinckerhoff, 2003).

In many cases, where hazards cannot be removed, safety barriers such as wire rope barriers are installed.

5.4 Pavement condition

1. SKID RESISTANCE SURVEYS

Skid resistance of pavements is related to the amount of friction available between a tyre and the road surface and how this is affected when the pavement is wet. When a tyre rolls across wet pavement, the pressure of the water film coupled with the high speed of the vehicle acts to form a 'wedge' between the road and the tyre. This momentary loss of contact can lead to aquaplaning of the vehicle unless the water can be effectively 'drained through' the tyre. Adequate drainage can be provided by the tread of the tyre as well as minor surface variations in the pavement caused by the amount of and shape of the aggregate. A road surface that has little surface variation will have less skid resistance in wet weather.

Intersections and curves have a higher surface friction demand because of the number of vehicle manoeuvres (cornering, braking, changing lanes) that are undertaken. Freeways and highways do not require as much friction as there is less demand to turn the vehicle.

Pavement skid resistance surveys were undertaken for the highway in May 2003 and again in February 2004. A number of sections were identified as requiring further investigation. This information is being used to inform surfacing decisions.

2. PAVEMENT ROUGHNESS SURVEYS

As stated above, small variations are required in the road's surface to provide adequate skid resistance during wet weather. However, if the variations in the surface are too large and cover a larger area, this begins to affect the ride comfort and quality of the pavement. Roughness is a pavement condition parameter that measures these surface irregularities as Roughness Counts per kilometre, which is the cumulative total relative upward displacement between the axle and body of a standard vehicle per kilometre of road. One Roughness Count corresponds to an axle-to-body separation of 15.2mm.

Good roughness levels are considered to be less than 70 counts/km. Between 70 and 110 counts/km are acceptable, and levels greater than 110 are monitored and prioritised for future works programs.

SECTION	LENGTH (KM)	AVERAGE ROUGHNESS (COUNTS / KM)	% LENGTH > 110
HEXHAM TO TAREE	149	57	7.3%
TAREE TO KEMPSEY	114	63	6.7%
KEMPSEY TO COFFS HARBOUR	112	61	7.1%
COFFS HARBOUR TO GRAFTON	82	70	7.8%
GRAFTON TO BALLINA	128	62	3.5%
BALLINA TO QLD BORDER	92	51	1.5%
TOTAL	677	60	5.7%

Table 5.5: Pavement Roughness Data for the Pacific Highway.

3 PAVEMENT RUTTING DATA

Rutting is the deformation of pavement caused by the heavy load on wheels, which (usually) results in two longitudinal depressions in line with the left and right wheel paths. If these depressions are 'deep' enough they may result in ponding of water, which may lead to aquaplaning, and loss of control of vehicles. Rutting is quantified by measuring the maximum vertical displacement of the rut from the normal/expected road surface level.

Rut depths less than 10mm are regarded as not significant. Rutting can become a critical problem at around 20-25mm. As seen in Table 5.6, the average rut depth for each section of the highway is well below 10mm. The last column also indicates the percentage length of each section that has rutting greater than 20mm in depth.

SECTION	LENGTH (KM)	AVERAGE RUTTING (MM)	% LENGTH > 20MM RUTTING
HEXHAM TO TAREE	149	3.1	0.5%
TAREE TO KEMPSEY	114	4.2	1.2%
KEMPSEY TO COFFS HARBOUR	112	3.6	0.7%
COFFS HARBOUR TO GRAFTON	82	4.2	0.5%
GRAFTON TO BALLINA	128	3.8	0.3%
BALLINA TO QLD BORDER	92	2.9	0.4%
TOTAL	677	3.6	0.6%

Table 5.6: Pavement Rutting Data for the Pacific Highway

4. SEALED WIDTH DATA

An inventory of sealed width of pavement was undertaken for all rural sections of the highway (NB. An urban section is one where the speed limit is 60km/h or less and where the surrounding land-use is built-up with kerb and guttering on the verge side). Sealed width was defined as such:

- The width of the road pavement from edge of sealed shoulder to edge of sealed shoulder for undivided roads.
- The width of the road pavement between one edge of the median to the edge of sealed shoulder for divided roads.

The average sealed width for all rural sections of the highway is 10.4m.

5. SEALED WIDTH OF SHOULDERS

To minimise off-carriageway crashes, it is desirable for all roads to have a clear zone that is free of hazards as well as a sealed shoulder. The sealed shoulder serves several functions including:

- It is a recovery area allowing drivers of errant vehicles to decelerate or regain control of the vehicle.
- It can be used by cyclists instead of travelling within the marked traffic lanes, thus improving safety for cyclists.
- It is an area for broken down vehicles to stop in.

The RTA's Road Design Guide recommends the following shoulder widths:

Undivided roads

- A minimum shoulder width of 1.0m on the nearside of the road for roads that carry less than 1000 vehicles/day. This is to be comprised of a minimum sealed shoulder width of 0.5m.
- A minimum shoulder width of 2.0m on the nearside of the road for roads that carry more than 1000 vehicles/day. This is to be comprised of a minimum sealed shoulder width of 1.0m when the traffic volume is greater than 2000 vehicles/day.
- A minimum shoulder width of 3.0m on the nearside of the road for roads that are 2 lane undivided and have a centre barrier line. The same sealed width requirements as above apply.
- A minimum shoulder width of 1.0m adjacent to auxiliary lanes. This is to be sealed for the full width.

Divided multi-lane roads

- A minimum shoulder width of 2.0m on the nearside of the carriageway. This is to be comprised of a minimum sealed shoulder width of 1.0m.
- A minimum shoulder width of 1.0m on the offside of the carriageway. This is to be sealed for the full width.

An inventory of width of sealed shoulders was undertaken for all rural sections of the highway (NB. An urban section is one where the speed limit is 60km/h or less and where the surrounding land-use is built-up). This inventory included sealed shoulder widths on both sides of the carriageway. The following points summarise the results of the inventory:

- Approximately 340km of the route has sealed shoulder widths less than the minimum recommended widths outlined above over a length of 66m or more (arbitrary figure based on 3 seconds of travel time assuming a design speed of 80km/h).
- The average width of sealed shoulders for the Pacific Highway is 1.2m.

5.5 Narrow bridges

The above sections provided an overview of the benefits of clear zones and road shoulders. These same objectives are desirable on bridges. Whilst it is impractical to provide clear zones on bridges, the bridge should be designed and built with sealed shoulders of sufficient width. The required width under current standards is determined in accordance with the Bridge Design Code.

The bridges where width deficiency is greater than 2 metres are considered as narrow bridges. The summary inventory of these bridges is provided in Table 5.7. The table provides an indication only and does not necessarily identify the needs and priorities for widening, as other variables need to be considered.

SECTION	LENGTH (KM)	TOTAL BRIDGES	WIDTH DEFICIENT
HEXHAM TO TAREE	149	149	7
TAREE TO KEMPSEY	114	85	16
KEMPSEY TO COFFS HARBOUR	112	78	8
COFFS HARBOUR TO GRAFTON	82	74	5
GRAFTON TO BALLINA	128	45	14
BALLINA TO QLD BORDER	92	132	2
TOTAL	677	563	52

Table 5.7: Summary of inventory of narrow bridges (width less than modern standard by 2m or more)

5.6 Rest areas

Rest areas are provided to reduce the number of road accidents related to driver fatigue as well as the number of fatigued drivers on NSW roads. Rest areas enable long distance drivers to increase the frequency, duration and quality of rest breaks. They improve the driving experience on NSW roads and support tourism. They also provide places for heavy vehicle drivers to stop so that they may observe statutory regulations for driving and rest breaks to counter the effects of fatigue, as well as to check their loads and fill in log books.

The Pacific Highway/F3 Freeway Truck Rest Area Strategy Working Party recommended the following hierarchy of stopping opportunities in 2003. This hierarchy is being used for rest area planning on the Pacific Highway:

1. Rest areas – catering for 6 to 10 B-Doubles as well as cars.

2. Commercial facilities (Service Centres/Stations providing parking for at least 10 B-Doubles).

3. Stopping Bays (either 'lay-by' or area separate from the roadway).

The Working Party recommended the following aims, which now are the basis of RTA rest area planning for the Pacific Highway:

- Provide regularly spaced truck rest areas with capacity for 6 to 10 B-Doubles. The proposed initial target is to ensure that by June 2007 there is no more than 50km between rest areas (with appropriate Service Centres/Stations counting as a rest area in this period). The desirable spacing is 35km.
- Provide for roadside parking of trucks at no more than 20km intervals with a desirable interval of 10km. This is to be accomplished by formalising currently used parking locations (into Truck Parking Areas) and installation of stopping bays while taking into account the availability of commercial services and rest areas. Existing stopping bays are to be signposted appropriately.
- Install stopping bays at 5km spacing on new upgrading projects.

An inventory of rest areas along the highway has been completed. Between Hexham and the Queensland border, there are more than 40 rest areas (an average of 17km between each rest area). This includes 16 truck parking facilities as well as the recently constructed rest areas at the following locations:

- Halfway Creek, 32km south of Grafton – Two new rest areas for both directions.
- Four Mile Hill, 5km south of Taree, northbound.
- Gap Road, 89km north of Grafton, southbound.
- McPhillips Creek, south of Grafton, southbound.
- Twelve Mile Creek, south of Karuah, southbound.
- Kundabung, 15km south of Kempsey, southbound.

5.7 Speed zoning

The inventory of speed zones is as follows (Parsons Brinckerhoff, 2003):

- The speed limit changes 77 times between Hexham and the Queensland border (an average of 8.4km per speed zone).
- Speed limit changes are most common in the section of the highway between Kempsey and Coffs Harbour with the average length of speed zones being 5.8km.
- Speed limit changes are least common in the section of the highway between Coffs Harbour and Grafton with the average length of speed zones being 10.9km.
- There are 210 intermediate ('repeater') signs placed within the speed zones for the whole highway.
- There are five school zones with 40km/h speed limits during 0800-0930 and 1430-1600 on school days. These are located north of Grafton, south of Ballina, north of Kempsey, and two between Hexham and Taree.

Table 5.8 shows the percentage of route length signposted at the various speed limits.

SPEED LIMIT	PERCENTAGE OF ROUTE LENGTH
60	5.8%
70	1.2%
80	7.2%
90	4.7%
100	67.7%
110	13.4%
TOTAL	100%

Table 5.8: Speed zones by percentage of route length. Source: Parsons Brinckerhoff (2003)

5.8 Delineation

Inventory of guideposts and Raised Pavement Markers has been completed and is summarised below:

- There are more than 27,000 guideposts on the entire route.
- There are more than 260,000 Raised Pavement Markers on the entire route.

Raised Pavement Markers are devices attached to the surface of the road that are used to augment, and in some cases, to simulate, painted lines on the road surface. They are usually retro reflective (they are reflected back to the direction of a light source), but also have a limited range of applications as non-reflective devices.

An inventory of other linemarking/pavement markings was also undertaken and is summarised in Table 5.9.

TYPE	NUMBER OR LENGTH
PAINTED ARROWS (NUMBER OF)	4560
SPECIAL LANES (IN METRES)	29,974
LONGITUDINAL LINES (IN METRES)	3,581,505
MEDIAN AND SHOULDER MARKINGS (IN METRES)	63,975
MISCELLANEOUS (IN METRES)	235
OTHER MARKINGS (NUMBERS OF)	459
TRANSVERSE LINES (IN METRES)	17,113

Table 5.9: Summary of inventory of linemarking and pavement markings.

6 Strategic Plan

6.1 Vision and goals

A vision for managing road safety on the Pacific Highway has been developed. This vision is:

'A significant reduction in trauma, both death and injury, caused by road crashes on the Pacific Highway.'

This vision is underpinned by six goals for the highway:

- Continue the upgrading of the highway to high standard dual carriageway for its entire length.
- Facilitate safer operation of two-way single carriageway sections.
- Manage and enforce speed limits.
- Address long distance driver fatigue in both heavy and light vehicles.
- Respond to the road safety impacts of increased usage by heavy vehicles.
- Minimise the adverse impacts of traffic incidents.

6.2 Strategic Programs

Five strategic programs have been formulated to meet these objectives. These programs combine engineering works with behavioural, enforcement and technology measures.

6.3 Pacific Highway Upgrading Program

This program focuses on the continued delivery of high standard dual carriageway between Hexham and the Queensland border. As a result of the critical role played by the highway in economic and social development, the NSW and Commonwealth Governments in 1996 entered into a 10-year Upgrading Program. Under the agreement, NSW provides $160 million a year and the Commonwealth provides $60 million a year. This means that the NSW Government contributes almost three quarters of the total $2.2 billion to upgrade the highway.

Major dual carriageway works proposed for the Pacific Highway in 2004/05 are:

- Completion and opening of the 10km Karuah Bypass.
- Commencement of construction of the 11km length between the Karuah Bypass and north of Myall Way.
- Commencement of construction of the 9km section between two completed dual carriageway lengths in the Nabiac area.
- Continued construction of the 7km Taree to Coopernook section.
- Continued construction of the 4km Coopernook Bypass.
- Commencement of the 8km Brunswick Heads to Yelgun project.

Planning for future upgrades continues for the Bulahdelah Upgrade, the Coopernook to Herons Creek section, the section from Kempsey to Eungai, the section from south of Macksville to north of Urunga, the Bonville Upgrade, the section from Coffs Harbour to Woolgoolga and the Banora Point Upgrade. In addition, construction of the Lakes Way Interchange, which was commenced in May 2004, continues through the coming financial year.

The commitment of Commonwealth funding for the upgrading program expires in 2006. The NSW Government has been seeking to obtain a commitment from the Commonwealth to continue and increase funding for upgrading of the highway beyond 2006. This commitment has not yet been made with no commitment being contained in the recent 2004/05 Federal Budget.

It should be noted that while construction of dual carriageways results in significantly lower rates of fatal crashes (an almost 90% reduction), fatalities will still occur. As the highway improves there will need to be an increased focus on behavioural/educative and enforcement strategies targeting behaviour such as driver fatigue and speeding.

6.4 Enhanced Road Safety Engineering Works Program

The Enhanced Road Safety Engineering Works Program consists of the following six broad categories of works:

A. Works that involve an increase or enhancement to the separation between opposing traffic.

B. Works that involve the removal/relocation of road side hazards, or the provision or enhancement of safety barriers.

C. Works which involve improvement to pavement skid resistance.

D. The development of an Electronic Management System for the highway.

E. The development of new rest areas and enhancement of existing rest opportunities.

F. Blackspot and intersection treatments.

A. INCREASE THE SEPARATION BETWEEN OPPOSING TRAFFIC.

Installation of road medians:

This involves the installation of painted medians on roads that are currently undivided. The enhanced separation between the opposing flows reduces the probability of head-on crashes. The median also provides a recovery area for drivers of errant vehicles to regain control and re-enter the travel lanes. In locations where noise will not be an issue, profile linemarking will be used for the painted median.

Enhanced centreline treatments:

This includes two types of treatments: (1) conversion of separator lines to BB (double unbroken centrelines) and (2) conversion of normal BB centreline to enhanced BB centreline (with increased separation of opposing traffic). The enhanced separation between the opposing flows reduces the probability of head-on crashes. In locations where noise will not be an issue, profile linemarking will be used for the painted median. The ideal solution is to provide road medians or median safety barriers. However, this treatment enables sections that are restricted in width to be treated.

Median safety barriers (including wire rope safety barriers):

This involves the installation of a median barrier to separate opposing traffic to convert the road from an undivided road to a divided road. The median safety barrier prevents vehicles from crossing to the incorrect side of the road. This will eliminate head-on crashes and reduce the severity of off-road to the right crashes.

Wire rope safety barriers, when impacted, undergo deflection that absorbs energy, decelerates and redirects the vehicle in a safe and controlled manner. Up to the present, wire rope safety barriers have most commonly been used on road sides to offer road user protection to road side hazards such as trees, steep embankments or cuttings. To a certain extent, wire rope safety barriers have also been placed on medians of divided roads to prevent cross median crashes (including head-on crashes) as well as to provide road user protection to hazards in the median. The Pacific Highway Road Safety Program will see an increase in the use of wire rope safety barriers as a median barrier to separate opposing flows. This also includes the use of the barrier to separate opposing flows on sections of the highway that are currently undivided.

The wire rope barrier is the most 'flexible' of all barrier types. Provided that there is an adequate deflection area behind the barrier, these are the safest barrier types available. A direct contrast is the lack of deflection when a rigid barrier is impacted. It should be noted however that the use of wire rope safety barriers is not appropriate in all cases.

Current program for Group A works:
2003/04: A $2 million program is currently underway.

The current program includes projects such as the Tabbimobile and Wardell rehabilitation projects as well as the installation of a median barrier on St Helena Hill.

The photograph shows a wire rope installation on the Pacific Highway.

B. WORKS INVOLVING THE REMOVAL, RELOCATION OF ROAD SIDE HAZARDS, OR THE PROVISION OR ENHANCEMENT OF SAFETY BARRIERS

Upgrading substandard safety barrier terminals and barrier to bridge connections:

The terminal ends of safety barrier systems are usually the most hazardous feature of the system. Barrier terminals should be located where the probability of impacting them is low. The 'length of need' of the barrier is forgiving, as vehicles tend to impact the 'smooth' face of the system at low impact angles. This allows vehicles to 'glance' off the system and be safely re-directed back into the travel lanes. The terminals are often blunt ends that may snag or launch a vehicle if not designed or installed correctly. All safety barrier terminals currently accepted for use are either (i) 'gating', which allows vehicles to breach the system and decelerate in a safe run-out area, (ii) sloped or buried, or (iii) designed like a cushion, which all reduce the amount of deceleration exerted on an impacting vehicle. Safety barrier transitions to bridge parapets represent a transition from a non-rigid ('softer') system to a rigid system (the bridge parapet). When safety barriers are connected to bridge parapets there needs to be a gradual increase in the stiffness of the barrier system to prevent vehicles impacting the hard ends of the bridge parapet.

Hazard removal, relocation or safety barrier provision:

This involves the removal or relocation of fixed, non-collapsible roadside hazards or the adjustment of them to make them more forgiving when impacted. If adjustments are not possible, a safety barrier is usually provided to shield the hazard. Many crashes result when errant vehicles impact fixed, non-collapsible hazards on the road side such as trees, utility poles and exposed culverts and drains. The removal or relocation of these hazards would allow the errant vehicle to decelerate in a safe clear zone. The provision of a safety barrier as the last option provides a more forgiving structure and offers protection to the road user against the hazard.

Current program for type B works:
2003/04: A $2 million program is currently underway.

C. WORKS WHICH INVOLVE IMPROVEMENT TO PAVEMENT SKID RESISTANCE.

Resealing works:

This involves removing (rotomilling) the wearing surface of flexible pavements and resealing the road. Over time, the skid resistance properties of flexible pavements are reduced through loss of texture. A smooth surface is less skid resistant when the road surface becomes wet. When the skid resistance of pavements reduces below a set threshold, the pavement is either resealed or upgraded to a more superior type.

Current program for type C works:
2003/04: An $8 million program is currently underway.

D. ELECTRONIC MANAGEMENT SYSTEM

Involves the installation of a network of permanent Variable Message Signs that are all linked to the RTA's Transport Management Centre.

Current program for type D works:
2003/04: A $1 million program is currently underway.

E. REST AREAS

The Pacific Highway Rest Area Program involves the development and enhancement of rest opportunities along the highway. This requires a careful integration of existing facilities such as rest areas, truck stopping bays, service centres and town centres with stopping opportunities and is aimed towards both light and heavy vehicle fleets.

As detailed in the Road Asset and Facility Inventory above, there are currently more than 40 rest areas along the highway. It is recommended that further rest areas be provided in the Coffs Harbour area, subject to the provision of funding. It is also recommended that construction of a new rest area at Yelgun be commenced as part of the Brunswick Heads to Yelgun Upgrade. A Yelgun rest area could be made to be accessible in both directions from both the existing and upgraded highway.

Current program for type E works:
2003/04: A $5 million program is currently underway.

F. BLACKSPOT AND INTERSECTION TREATMENTS

This involves the treatment of hazardous locations (either intersections or short sections) that have experienced a cluster of similar crashes in the past. Typical treatments include improvements to traffic signals and traffic control, improving advanced warning and guidance for motorists, installation of turning lanes, and safety improvements for pedestrians.

Current program for type F works:
2003/04: A $1 million program is currently underway.

FUTURE PROGRAM

The review recommends an Enhanced Road Safety Engineering Works Program encompassing the above elements to be spent on these works in 2004/05 and 2005/06. This is in addition to $33 million spent in 2003/04.

6.5 Behavioural Program

Analysis of the fatal and serious crashes on the Pacific Highway between 2000 and 2003 identified speeding, driver fatigue and non-use of restraints in both heavy and light vehicles as the key behavioural factors contributing to road trauma on the Pacific Highway. To address these factors, a comprehensive behavioural program has been developed and will be implemented on an ongoing basis to enhance and support the engineering, enforcement and technology programs. The behavioural program is evidence based and strategically targets driver fatigue, speeding, non-use of restraints and heavy vehicle issues.

Program implementation strategically targets key groups commuting and travelling on the Pacific Highway. These include residents of communities surrounding the Pacific Highway, industries operating along the Pacific Highway and intrastate and interstate drivers. To change behaviour it is necessary to influence three factors, which play a key role in people adopting alternative behaviours.

These are:

- The environment which must be conducive rather than discouraging.
- The person's knowledge and skills.
- The person's intention.

DRIVER FATIGUE PROGRAMS

Driver fatigue has been targeted with two statewide campaigns 'Microsleep' and 'Circadian Rhythms' featuring Dr Karl Kruszelnicki. Both campaigns remind drivers to take notice of the early signs of driver fatigue, the dangers of a microsleep while driving and to 'Stop.Revive.Survive'.

'Circadian Rhythms' was launched in December 2003. The campaign highlights the increased risk of being involved in a fatal driver fatigue crash between 10pm and dawn because your body's circadian rhythms are programming you to sleep. The key campaign message is that it is particularly important when driving at night not to ignore the early warning signs of driver fatigue such as yawning, poor concentration, tired eyes and restlessness.

These early warning signs will be displayed using Electronic Management System Variable Message Signs (VMS) during the hours of 10pm and dawn, reinforcing the need to stop and rest to those drivers most at risk of a fatigue related crash. These signs will be strategically located to inform drivers of rest areas and Driver Reviver sites located along the highway and prompt drivers to use them.

Outdoor billboards and banners will be strategically placed at locations which are known as high risk areas for fatigue related crashes, to complement the electronic management system and target drivers travelling north and south.

The NSW Rest Area map, which also identifies Driver Reviver locations, is available at all motor registries and at various locations along the Pacific Highway.

INTRA AND INTERSTATE DRIVERS

To target drivers using the Pacific Highway during key travel periods and who may be unfamiliar with the road conditions, comprehensive Pacific Highway public education campaigns are implemented which include television, press, outdoor and radio components. These campaigns target drivers and their families travelling between Sydney and the Queensland border over holiday periods such as Christmas/New Year, Easter and school holidays.

These campaigns:

- Promote the RTA Traffic Information Line and encourage drivers to plan their trip to avoid delays and to consider the option of the New England Highway during peak periods.
- Inform drivers where traffic delays may be anticipated.
- Reinforce and support the RTA rest area and Driver Reviver strategy.
- Incorporate key behavioural messages that are aligned to the messages. that will be displayed on Variable Message Signs.

A colour strip press ad featuring a map of the Pacific Highway highlights possible problem spots with tips to ease traffic congestion and also promotes the RTA Traffic Information telephone number. Advertisements are placed in newspapers over Christmas and other holiday periods.

Television commercials promote the Traffic Information Line to drivers in the Sydney, Hunter and Northern Regions over the Christmas and Easter periods. The RTA Pacific Highway Office also incorporate Driver Reviver information into its public education campaigns.

Driver Reviver sites located on the Pacific Highways open every weekend during public holiday periods. The Driver Reviver strategy represents the most comprehensive community based road safety program in NSW. Over the past two years, the RTA has worked with the Driver Reviver network to provide standardised operating hours to maximise use. In support of this special

initiative, media releases and site manager radio interviews are used to increase public awareness. In addition the Driver Reviver radio commercial 'Hear That' which encourages drivers to stop at a Driver Reviver site, is aired in Sydney and Newcastle during peak travel times over holiday periods. The Variable Message Signs will also alert drivers to Driver Reviver locations.

Live reads, which are short advertisements read live to air at the end of traffic segments, have been featured on the Australian Traffic Network encouraging drivers not to ignore the early warning signs of fatigue. Throughout holiday periods outdoor billboard campaigns target drivers travelling through Sydney to the Pacific Highway. The outdoor billboards target driver fatigue and are located to complement VMS at strategic points along the Pacific Highway and target fatigue, speeding and non-wearing of seatbelts.

The RTA will further refine this strategic mix of behavioural campaigns in the future based on feedback and analysis of tracking and evaluations.

SPEEDING CAMPAIGNS

Operation NorthRoads will continue to be run from Hexham to the Queensland border over the next 12 months. The program that started in May 2004 will include the use of radio, television, portable VMS trailers, roadside banners as well as RTA funded Police Enhanced Enforcement.

Television ads such as 'Country Road Toll' (or 'Country Cop') featuring local, country police talking about the impact of speed on crashes and the personal consequences to families of fatal accident victims and radio ads, such as 'I Got Done' that mentions roads that residents recognise and uses real and believable people 'done' for speeding that are related to by the audience are used to support enforcement operations such as Operation NorthRoads in holiday periods.

Nine new signs were installed on the highway between Hexham and Taree (5 northbound, 4 southbound) as part of Operation NorthRoads. In conjunction with enhanced police enforcement these signs indicate the number of speeding drivers caught each week. The signs are intended to raise drivers' perception of their own likelihood of being caught for speeding on the highway.

RESTRAINT CAMPAIGN

Over the next 12 months the RTA will continue to fund TV and billboard campaigns targeting drivers and passengers travelling on the Pacific Highway. The television campaign will use the advertisements, 'Father' depicting the injuries that can be caused by an unrestrained passenger on another vehicle occupant and 'Fight', which focuses on the damage that you can do to yourself through not wearing a seatbelt, even in a relatively low speed crash. Both commercials aim to raise awareness of consistent use of seat belts, and the dangers to other vehicle occupants of an unrestrained passenger in the vehicle. The 'No Belt No Brains' creative, which positions the non-wearing of seatbelts as stupid, will be used on billboards at Kempsey, Coffs Harbour and Grafton.

In addition to this 'fillboards' with a seat belt message will be attached to fuel pumps at service stations along the highway. Local Road Safety Officers located at councils along the highway will also receive project funding to fund a 'Buckle Up Every Time' campaign. This project involves a number of components including the placement of seat belt reminder signs at hotel, club and shopping centre car parks.

TRANSPORT INDUSTRY CAMPAIGN

Statewide education campaigns have been developed and implemented targeting the heavy vehicle industry, including heavy vehicle drivers and operators/employers, on the issues of seatbelt use and speeding. Resources developed for the campaigns have been distributed through RTA regions and the local government road safety program for localised programs, including on the Pacific Highway.

These campaigns should continue to be implemented over the next three years, including localised education components targeting the Pacific Highway.

The multi-strategy approach, used initially for the heavy vehicle driver seat belt campaign, was very successful as measured by pre and post surveys of attitudes, knowledge and self reported behaviour, with a significant improvement in both knowledge, and attitudes and self reported wearing rates. The campaign included radio, rest stop convenience posters, billboards, magazine/press advertisements and stencils painted on the road at RTA heavy vehicle checking and inspection stations. Operators were targeted with a direct mail campaign, which included a brochure, T-shirt, poster and letter detailing the issues around seatbelt wearing for

heavy vehicle drivers and operators. This approach is being extended to driver fatigue and drug campaigns and will be used on a speeding campaign in 2004/05.

Drivers and operators based on and using the Pacific Highway will be a major focus for these campaigns. A new Information Kit for fleet managers will be produced and distributed to fleet owners and operators who use the Pacific Highway as a key transport route. The kit will include information about the key behavioural factors involved in crashes on the Pacific Highway including speeding, driver fatigue, fatigue-related drug use and seatbelts.

The seat belt use message should be promoted on the Pacific Highway through the Electronic Management System Variable Message Signs (VMS), banners and truck stops.

Heavy vehicle driver fatigue messages will be communicated locally through presentations to fleet operators, local publicity, and coordinated public education and awareness campaigns using banners, VMS and billboards. The dangers of using drugs to manage fatigue will also be communicated through truck stops and workplace information. Three messages have been used to date on the Pacific Highway VMS to advise truck drivers of the importance of planning trips. The messages 'Plan your trip, plan your stops and manage fatigue', 'Truckies – Plan your trip and manage fatigue' and 'Truckies – Don't die for a deadline' have been displayed on a rotating basis on the Pacific Highway.

The heavy vehicle speeding message, focusing on enforcement and penalties, will be communicated through the Electronic Management System VMS. Messages to be used include 'Police now targeting speeding trucks' (only if there is enforcement going on), 'Truckies Up to 15km over $199 and 2 Points', 'Speeding trucks – 3 strikes & you're out', 'Truck speed enforced' and 'Extra Police Patrols'. Banners have been utilised on the Pacific Highway with the message 'Speeding trucks – 3 strikes & you're out'.

6.6 Enforcement Program

NSW POLICE

The Enhanced Enforcement Program (EEP) has been developed to augment the traffic services already provided by the NSW Police and operates as a close working partnership between the NSW Police and the RTA with the objective of contributing to a reduction in road trauma. The EEP delivers a number of baseline enforcement hours extended by enhanced hours in each operation that is funded by the RTA. The NSW Police and the RTA work to an agreed set of operating guidelines to conduct this program.

The RTA works closely with the NSW Police in developing public education campaigns in support of the enforcement operations. The result is that the EEP represents a major component of road safety activity designed to enhance the effectiveness of public education campaigns and Police enforcement operations.

The aim of the Enhanced Enforcement Program is to enhance the level of visible Police enforcement activity over and above normal operating requirements. On the Pacific Highway the ratio of 'baseline' to enhanced enforcement is 5:1. This means that one hour of extra enforcement is provided for every five hours of baseline traffic policing.

The EEP delivers operations that address key road safety issues such as speeding, drink driving, non-use of occupant restraints, heavy vehicles, fatigue and pedestrian safety. In 2002/03 the Enhanced Enforcement Program funded more than 80,000 extra hours of policing at a cost of approximately $4.6 million. In 2003/04, this level has been significantly increased to well over $5 million and more than 90,000 hours.

The program relies on an effective working relationship with NSW Police to ensure that behavioural road safety programs are coordinated with enforcement. Police work closely with Council Road Safety Officers and RTA Regional Road User Safety personnel in planning, implementing and evaluating road safety initiatives. This network of stakeholders has worked closely to implement enforcement programs such as Operation NorthRoads and NightSafe on the Pacific Highway.

The Police Northern Region operates between Hexham and the Queensland border and delivers numerous enhanced enforcement operations during peak travel times such as holidays and long weekends. During the period October 2003 to February 2004 Northern Region Police conducted over 83,000 breath tests, issued more than 27,000 speeding infringements, inspected more than 7000 heavy vehicles and travelled more than 700, 000km conducting Pacific Highway enforcement operations.

The Police Northern Region will continue to focus on the Pacific Highway using Baseline and Enhanced hours. .

RTA HEAVY VEHICLE REGULATION

To address key areas of concern including heavy vehicle driver fatigue and speeding and to ensure that heavy vehicles and drivers comply with requirements under Road Transport Law, the RTA has implemented a whole of route enforcement strategy for the Sydney to the Queensland border. This strategy provides effective enforcement coverage by coordinating activities along the F3, the Pacific Highway and the New England Highway.

The key functions undertaken by the RTA vehicle inspectors (IVRs) are to:

- Monitor heavy vehicle driving hours.
- Inspect heavy vehicles for roadworthiness.
- Inspect heavy vehicles for mass and load restraint.
- Inspect heavy vehicles for dimensions.
- Detect incidents of heavy vehicle speeding through Safe-T-Cam.
- Collect information to build profiles on operators and drivers.
- Investigate and report on heavy vehicle crashes.
- Monitor and report on heavy vehicle Safe-T-Cam avoidance.

In support of this strategy the RTA will be undertaking the following enforcement activities:

A. LOGBOOK CHECKS

Detailed logbook inspections, cross-referenced against the RTA's vehicle regulation databases will be undertaken by RTA inspectors on every heavy vehicle intercepted at a roadside enforcement site along the highway.

The RTA inspectors will utilise 10 computer equipped enforcement vehicles deployed along the highway to cross reference logbooks against the RTA's licence and registration database and the Safe-T-Cam database. This will allow inspectors to verify vehicle movements and the accuracy of logbook entries. In addition, all heavy vehicles intercepted will be entered into the RTA's Truckscan system that will add a roadside vehicle sighting to the Safe-T-Cam database, greatly expanding the Safe-T-Cam network outside of the permanent sites along the highway.

B. SAFE-T-CAM SURVEILLANCE

The RTA will be deploying RTA inspectors to undertake surveillance at Safe-T-Cam sites along the highway. This activity will monitor heavy vehicles passing through the Safe-T-Cam zones to ensure that drivers are not undertaking any activity that is aimed at avoiding detection by the Safe-T-Cam system. The Police will also undertake this activity and heavy penalties will apply to those found guilty of undertaking avoidance behaviour at any Safe-T-Cam location.

C. ROADWORTHINESS

In 2003, the RTA undertook a roadworthiness survey to monitor the roadworthiness of heavy vehicles and to ensure that they are in a fit and proper condition to use NSW roads. A key outcome from the survey was that major brake defects were found to be present in 5% of the heavy vehicle fleet.

RTA inspectors will be undertaking visual and mechanical inspections of heavy vehicles to ensure heavy vehicles are travelling in a roadworthy condition. Brake checks will be undertaken using mobile Vehicle Inspection Trailers that incorporate roller brake-testing equipment.

ROADSIDE ENFORCEMENT SITES

RTA inspectors will be undertaking many of the above activities at heavy vehicle roadside enforcement sites across the state. The key sites along the highway include:

NORTHBOUND	SOUTHBOUND
MT WHITE CHECKING STATION	CHINDERAH
TWELVE MILE CREEK	PINE CREEK
JONES ISLAND*	BARRAGANYATTI
EUNGAI RAIL	COOLONGOLOOK
HALFWAY CREEK	TWELVE MILE CREEK
BALLINA	F3 FREEWAY MT WHITE**

Note: (*) To be completed by June 2004. (**) Future site currently in planning.

ENFORCEMENT RESOURCES

The RTA will be deploying vehicle inspectors to the Pacific Highway when necessary to ensure sufficient resources are available to undertake the various enforcement activities as part of this whole of route strategy.

ENHANCED ENFORCEMENT

Police will be undertaking various operations throughout the year in parallel to the RTA's Pacific Highway Enforcement Strategy. To maximise effective utilisation of resources the RTA will be liaising with the Northern Region Coordinator to coordinate enforcement activities in both whole of route operations such as NorthRoads, and other local operations that will be run in various Local Area Commands.

Communication with the Police Coordinator is through a nominated Vehicle Regulation Field Manager whose responsibility is to coordinate the RTA and Police activities to achieve the most effective use of both resources. The Police Enforcement Strategy focuses on detecting:

- Heavy vehicle speeding.
- Dangerous driving behaviour.
- The use of illegal drugs by heavy vehicle drivers.

EDUCATION & CONSULTATION

Ongoing education will occur through the RTA's Road Transport Industry Consultation Program that includes a number of events along the Pacific Highway.

6.7 Technology

A. POINT-TO-POINT SPEED CAMERAS

Speeding over long distances on major roads such as the Pacific Highway is a major concern. Speeding was involved in 38% of fatalities on NSW roads last year and it is still the largest contributor to deaths on our roads. Recent surveys indicate that motorists travelling long distances often exceed posted speed limits.

Point-to-point speed enforcement will consist of two cameras located some distance apart to read, time stamp and match vehicle number plates at each 'point' site. The system will, after matching number plates, determine if a vehicle has travelled quicker than the legally permissible travel time for that section of road.

The Roads and Traffic Authority (RTA) is at an advanced stage of planning for point-to-point trials incorporating existing Safe-T-Cam infrastructure on the Pacific Highway, as well as a second site that will incorporate an existing fixed speed camera site. Point-to-point is similar in concept to Safe-T-Cam, where heavy vehicle times are measured over considerable distances to address problems associated with speeding and fatigue.

The selected Safe-T-Cam site is situated on the new Yelgun to Chinderah Freeway near the Queensland border, which has a single speed limit of 110km/h. The length to be monitored is 10.4 kilometres. The trial site for fixed speed cameras is a 35km length of the Pacific Highway from the Harwood Bridge at Harwood to the existing speed camera at New Italy near Lismore, with a single speed limit of 100km/h.

The trials will take place from late May 2004 for a period of at least six months to ensure that the equipment being used is fully evaluated. This period will also provide a profile of the number of speeding vehicles detected, which may suggest other suitable locations on major highways such as the Pacific Highway. No infringement notices will be issued to drivers whose average speeds are found to have exceeded the speed limit during the trial period. However, existing fixed speed cameras will continue to catch drivers exceeding the limit.

B. IN-CAR DIGITAL SPEED CAMERA TRIAL

The RTA regularly conducts heavy vehicle speed surveys on major highways throughout NSW and recent surveys have confirmed that there is a speeding problem on major highways across NSW. There is also a view in some parts of the industry that the chances of being detected while speeding is low, particularly late at night and in the early hours of the morning when many long distance heavy vehicle transport movements take place.

To address the heavy vehicle speeding problem the RTA is to commence a trial of in-car digital speed cameras. The trial will involve the deployment of two camera units, which will be operated by RTA vehicle inspectors and covertly deployed at locations primarily on the Pacific Highway. The camera car locations will be selected on criteria linked to known speeding locations and also randomly deployed to provide coverage at any point along the network. Where possible the units will be strategically deployed in coordination with the Police to complement the existing level of on-road heavy vehicle speed enforcement.

A six-month trial and evaluation period is proposed. The trial will commence in late May 2004. The RTA will undertake a detailed evaluation of the trial with a taskforce being formed to assist in this task. Following the evaluation, the extent of the RTA's future involvement in the on-road detection and enforcement of heavy vehicle speed will be determined.

ELECTRONIC MANAGEMENT SYSTEM

As indicated earlier, the RTA has already started introducing an Electronic Management System of Variable Message Signs along the Pacific Highway, similar to those which are now common in many parts of the Sydney region. The Variable Message Signs will be located to provide maximum opportunity for motorists to choose to take alternative routes during unplanned traffic delays. They will be quickly activated to advise motorists of delays ahead, allowing motorists to plan accordingly. It is expected that, while behavioural road safety messages will be displayed for the vast majority of time, warnings of extreme weather conditions (bushfires, storms, etc.) will increase motorist awareness and lead to improved safety during these periods. The Electronic Management System will be progressively completed over the next three years. The Traffic Management Centre (TMC) located in Sydney will centrally control the network.

Typical Variable Message Sign applications are:

- Warning drivers of changed traffic conditions ahead, e.g. roadworks, flooding.
- Warning drivers of the need to exercise additional care, e.g. in wet conditions, fog, speed reductions at night, heavy traffic (e.g. holiday periods).
- Provide behavioural messages relating to key road safety factors – speed, fatigue, drink, seatbelt wearing or local safety issues.

The installation of the Electronic Management System on the Pacific Highway is expected to provide a number of road safety benefits. In particular drivers are:

- More informed of local driving conditions and are conditioned to drive to those conditions.
- Provided with feedback on their speed, encouraging safe behaviour.
- In a better position to plan ahead actions they might need to take.
- Provided with reliable advice.

6 Conclusion and recommendations

Enhanced road safety outcomes on the Pacific Highway will best be achieved through a combination of factors including upgrading to the condition of the road, appropriate education and targeted enforcement. Cooperation between agencies and across the three levels of government are also essential. The heavy vehicle industry also has a key role to play in ensuring that its drivers act safely and responsibly. The methodology used in the Pacific Highway Safety Review is a powerful tool that ensures that all the relevant road safety factors are addressed and practical countermeasures are developed.

The following recommendations are made:

1. The upgrading of the Pacific Highway to dual carriageway should be expedited and funding commitments should continue to be sought from the Federal Government.
2. Initiatives outlined in the Enhanced Road Safety Engineering Works Program should be implemented to yield maximum reduction in fatalities and casualties on the Pacific Highway.
3. Many of the education and promotion strategies outlined as part of the Road Safety Behavioural Program are, by necessity, statewide strategies that have application on the Pacific Highway. Further refinement of these strategies could be undertaken.
4. Enforcement resources to target key behaviours such as speed and fatigue in heavy and light vehicle drivers supported by tightly focussed behavioural programs are essential.
5. The methodology used for this review should be used as a model for similar reviews on other key routes, including the Princes Highway.

RTA/Pub.04.132