



How Safe Are Our Roads?

Rating Australia's National Highways for Risk



**AUSTRALIAN
AUTOMOBILE
ASSOCIATION**

November 2004

The National Highway System

The 18,600km National Highway System (NHS) is a network of sealed interstate National Highways linking Australia's capital cities and many major towns. The system was first declared in 1974. The Federal Government had sole funding responsibility for the National Highway System during the period examined in this report, 1998 to 2002. State and Territory Governments own the sectors of the NHS that pass through their jurisdictions.



Exclusion of Liability

The material in this report is not intended to be relied upon as advice, and in particular the Authors and Publishers accept no responsibility for loss or injury suffered by any person as a consequence direct or indirect of anything contained in this report.

How safe are our roads? Rating Australia's National Highways for risk

This report was prepared by John Metcalfe, Director Research and Policy (AAA) and Greg Smith, Research Coordinator (AAA). Camden Stephenson (AAA) provided assistance with data collection and collation. The analysis draws on EuroRAP research.

For more information on AusRAP, visit www.ausrap.org

Acknowledgments

The Australian Automobile Association (AAA) gratefully acknowledges Australia's motoring clubs, and the State and Territory road and transport authorities for providing technical assistance and data to the program, including:

- Roads and Traffic Authority (NSW);
- Queensland Department of Main Roads and Queensland Transport;
- VicRoads;
- Main Roads Western Australia;
- Northern Territory Department of Infrastructure, Planning and Environment;
- ACT Department of Urban Services; and
- Transport SA.

We would also like to acknowledge Dr Steve Lawson, EuroRAP Technical Director, for providing helpful comments on a draft of this report.

Contents

What is AusRAP?	4
Why has AusRAP been formed?	5
What are the driving forces behind AusRAP?	6
Can AusRAP help make crashes survivable?	7
Can our roads be made safe?	8
Who will benefit from AusRAP?	11
How does AusRAP map risk rates?	12
Casualty crashes	12
Traffic volumes	13
Rural road links	14
Measures of risk	15
Risk maps	17
Collective risk maps	17
Individual risk maps	25
The best and worst links in each State	33
Appendix 1: Crash types	41
Appendix 2: Complete results	45



What is AusRAP?

In 2002, the Australian Automobile Association (AAA) published a report entitled “The National Highway System: Investment Needs and Priorities”, which placed an emphasis on road safety, construction priorities and expenditure needs. The report identified where fatalities occurred on the National Highway System (NHS) and foreshadowed the development of the Australian Road Assessment Program (AusRAP).

AusRAP is a sister program to the Australian New Car Assessment Program (ANCAP), which crash-tests new cars and awards them stars for safety. AusRAP is based on the European equivalent, EuroRAP, which produces maps showing the risk of road crashes that cause deaths and life-threatening injuries and rates roads for safety. It highlights improvements that could be made to roads to reduce the likelihood of crashes—and to make those that do happen survivable.

AusRAP has developed two standard protocols—risk mapping of casualty crashes and a star rating system for roads using a Road Protection Score (RPS). In this first AusRAP report, the focus is on mapping the risk of casualty crashes. This risk is the result of interactions between roads, vehicles and road users. Results are presented in a colour-coded format for each State and Territory, with the exception of Tasmania.¹

Trials are currently being conducted to develop the Road Protection Score, which involves a “drive through” inspection in specially equipped vehicles to capture video images of the roads. From this information, inspectors will assess each road and assign star ratings based on major safety features and hazards. The results of these trials, which focus solely on the road, will be reported once research is complete.

This initial AusRAP report focuses on the National Highway System. In 2000, there were 263 fatalities on the NHS, which represented 14.6 per cent of the total road fatalities in Australia. In the same year, 14.2 per cent of the total traffic volume in Australia was carried by the NHS.

The National Highway System is essentially an inter-urban network of rural highways, though urban sections are being constructed. The emphasis in this report is on presenting risk maps for rural sections of the NHS. In the future, we aim to extend the analysis to the recently announced AusLink National Network.²

AusRAP has developed two protocols—Risk Mapping and star rating of roads through the Road Protection Score (RPS).

¹ The Tasmanian road authority, the Department of Infrastructure, Energy and Resources (DIER), did not provide the AusRAP study with the necessary traffic and crash data. We look forward to their participation in the future.

² In June 2004, the Federal Government released the AusLink White Paper: Building Our National Transport Future. A feature of AusLink is that it consolidates a number of roads and rail linkages of strategic national importance into one single National Network. In terms of roads, the National Network generally represents the National Highway System, some of the roads previously classified as Roads of National Importance, additional strategic links plus a number of metropolitan roads that link to major freight terminals.

Why has AusRAP been formed?

Every year around 1,700 people are killed and 22,000 are seriously injured on Australian roads. Preventing—or at least reducing—this toll requires vehicle manufacturers, road authorities and drivers to share responsibility for road safety.

Currently, reasonably objective and accepted measures exist of what constitutes a safe road user (essentially someone who obeys the law) and a safe vehicle (one which rates well under ANCAP). However, there is no equivalent measure of what constitutes a safe road.

By giving roads across Australia a safety rating, AusRAP will make the risk of death and injury on different roads more meaningful and stimulate public discussion—and action. It will help road users understand how risk can vary according to changes in the road environment. Risk-aware road users will be more likely to adapt their driving to reduce their risk of a crash. The ratings will also provide road planners and engineers with vital benchmarking information to show them how well, or badly, a particular road performs compared with others.

AusRAP's objectives are:

- to reduce deaths and injuries on Australia's roads by systematically assessing risk and identifying safety shortcomings that can be addressed with practical road-improvement measures; and
- to put risk assessment at the heart of strategic decisions on road improvements, crash protection and standards of road management.

Every year, 1,700 people are killed and 22,000 seriously injured on Australian roads.

AusRAP will inform drivers and raise their awareness of the risks of death and injury on different roads



What are the driving forces behind AusRAP?

The target of Australia's National Road Safety Strategy is to reduce the annual road fatality rate per 100,000 population by 40 per cent between 1999 and 2010. Many of the States and Territories have set their own targets. Further initiatives are essential if these targets are to be met. ANCAP has shown that a consistent system of star-rating crash protection in cars has encouraged manufacturers to raise standards quickly. Informed consumers demand cars that provide crash protection which meet modern safety standards. It is hoped that AusRAP will have a similar impact on road standards.

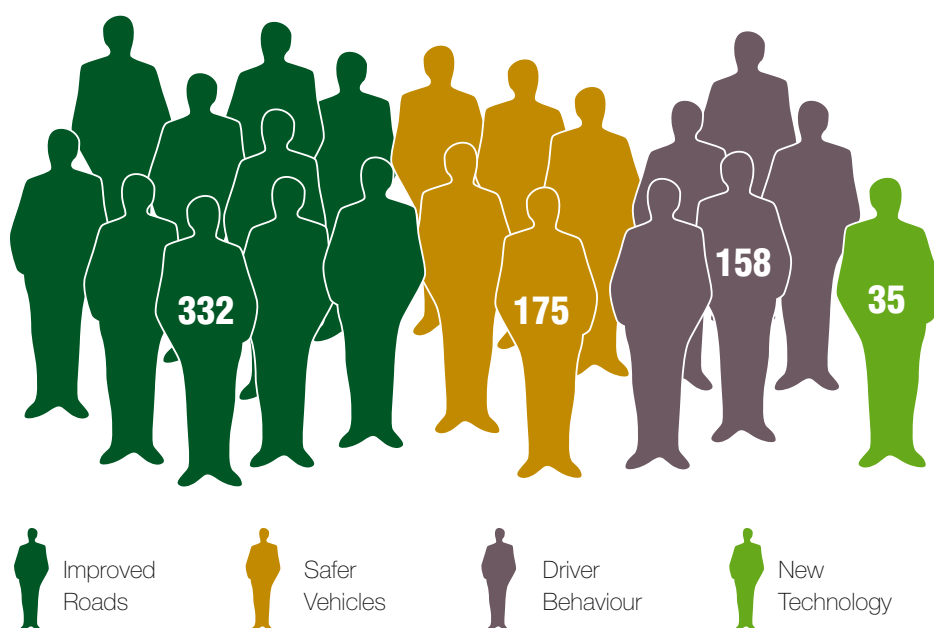
The target of Australia's National Road Safety Strategy is to reduce the annual road fatality rate by 40 per cent between 1999 and 2010

By 2010, the National Road Safety Strategy anticipates that 700 lives can be saved every year by improving the safety of the roads (332 lives), improving the safety of vehicles (175 lives), improving driver behaviour (158 lives), and adopting smarter safety technology (35 lives).

Thus, nearly half of the targeted improvement in road trauma can be achieved by upgrading Australia's roads. However, Australian Automobile Association research shows that the public is unaware of the significant contribution that road improvements can make to road trauma, despite the fact that thousands of deaths and injuries can be prevented by improving road crash protection standards and providing safer roads. By providing a consistent safety rating system for Australia's roads, AusRAP is a critical step towards raising the public's road safety awareness.

Nearly half of the targeted improvement in road trauma can be achieved by upgrading Australia's roads

Here's how the National Road Safety Strategy says we could save 700 lives a year by 2010



Can AusRAP help make crashes survivable?

Human survival in a crash depends on how well the energy from the crash is absorbed. Uncushioned, the human body cannot survive impacts much above 40km/h. A good ANCAP star rating means that some of the crash energy will be absorbed by the vehicle and its airbags. If the vehicle also hits a crash barrier, the road infrastructure will absorb more of the energy and make the crash survivable.

It is the combined energy-absorbing capabilities of the car and the road which provides optimum protection from the energies of impact. The car alone cannot protect its occupants much above 70km/h. Even quite moderate speeds will seriously injure or kill unless both car and road work together as a harmonious system to protect occupants from severe impacts. On the racetrack, drivers can walk away from 300km/h crashes because the safety features of the track and vehicle work together.

ANCAP demonstrates that well designed crash protection can make family cars safer. Similarly, AusRAP intends to show how roads can be made safer, so that car and road work together to protect life.

AusRAP is showing how roads can be made safer, so that car and road can work together to protect life

An ANCAP 5-star car plus a 5-star driver, and an AusRAP 5-star road equals no road deaths



Can our roads be made safe?

AusRAP is intended to prevent crashes and to make those that do happen survivable. Although it is unlikely that absolute safety will ever be achieved, preventable deaths that happen time and time again on the same roads must not be tolerated.

In the past, because human error contributes to nearly every crash, road safety policy focused on “fixing the driver”. And many drivers are foolish or inexperienced so driver training and education programs—for example, on wearing seat belts—are crucial. Some drivers behave with criminal disregard for the safety of others—they should expect tough policing and tough penalties.

Driver training and education programs are crucial

However, most crashes happen when ordinary people make mistakes—around 1 in 500 driving decisions can be wrong and the results can be tragic. Responsible, law abiding drivers frequently die on Australia's roads because they unexpectedly face a momentary situation with which they cannot cope. Drivers might also experience a brief lapse in concentration, but they should not pay for this with their lives. Safe roads minimise the chance of these situations arising, and if they do occur, they minimise the severity of the crash.

Protecting against human error is understood in rail, aviation and workplace safety. Unfortunately, this is not the case with roads.

Drivers should not pay for a momentary lapse of concentration with their lives

AusRAP's model for reducing death and injury aligns closely with Sweden's *Vision Zero*. It is based on roads and vehicles that have forgiving designs so that when a crash does happen, both road and vehicle work together to cushion against injury.



Six types of crashes consistently occur on the rural sections of the National Highway System. These are shown in Table 1. Appendix 1 details the contribution of each of these types of crashes on each of the highways.

Table 1 - Major crash types on the National Highway System

Run off road on straight	Involve a vehicle travelling on a straight section of road, which strays off its original path.
Run off road on curve	Involve a vehicle travelling on a curved section of road, which strays off its original path.
Head on	Involve a collision between vehicles travelling in opposite directions.
Rear end	Involve a collision between vehicles travelling in the same direction.
Intersection	Occur at intersections and involve collisions between vehicles travelling at right angles to one another.
Other	Includes all other crash types such as those involving u-turns, parking, collisions with objects on the road, pedestrians and cyclists.

Analysing crash types provides insight into the best ways to save lives. For example, because divided roads ensure that lanes of opposing traffic are separated by a median, and because they typically have wide shoulders, few intersections and barriers around roadside hazards, the risk of being involved in a crash when driving on a divided road is much lower than that of a normal two-lane two-way road. In fact, Table 2 shows that duplication (that is, separation of opposing traffic flows by dividing roads) can reduce head-on crashes by 90 to 100 per cent.

Table 2 details how specific improvements can reduce the likelihood that a particular type of crash will occur. This aspect will be the focus of subsequent stages of AusRAP, and in particular its second protocol, calculating the Road Protection Score.

Table 2 – Proven ways to save lives

Crash type	Potential reductions (per cent) in various crash types							
	Off road, on straight	Off road, on curve	Out of control on curve	Rear end	Head on	Hit permanent obstruction	Overtaking	Lane change
Install safety barriers along length of road	30–40	30–40				30–40		
Remove specific roadside hazards	60–80	60–80				60–80		
Resurface road	10–20	20–30	20–30	20–40				
Seal shoulder	Up to 60	Up to 60	Up to 60		Up to 60			
Advisory speed sign		20–40	30–40	10–20				
Linemarking and guideposts	10–20	10–30	10–20	10–20	30–40	10–20	30–40	10–20
Widen or replace bridge or culvert	30–50	30–50	30–50		30–50	30–50	30–50	
Widen shoulder	20–30	20–30	20–30		20–30			
Provide overtaking lane	30–50	20–30			20–30		30–50	
Duplication				30–40	90–100		50–80	
Improve alignment	30–50	30–50		30–50	30–50			

Source: Royal Automobile Club of Victoria (RACV), 2003. "Lifetime: Situation Critical."

Who will benefit from AusRAP?

Road users, road authorities, road planners and engineers all stand to benefit from the work being undertaken by AusRAP.

Road users

Research by the Australian Automobile Association shows that motorists can, without hesitation, list the main “bad” driving behaviours such as speeding, drink driving, fatigue, lack of concentration, insufficient driver education, inexperience, use of mobiles phones and aggression. But the constant focus on behavioural issues has left motorists with an under-developed understanding of how road infrastructure can improve road safety.³

AusRAP addresses this issue by raising awareness about the importance of safe roads and the need for well-targeted investment. As AusRAP's results are promoted, road users will come to understand road safety risk and how it changes as they turn onto roads of different standard and type. Risk-aware road users will be more likely to adapt their driving to reduce their risk of a crash. Informed road users will also be better able to understand and respect the reasons for traffic laws and speed limits that reflect the risk of being killed or injured. They will want action to see roads made safer.

Risk-aware road-users will be more likely to adapt their driving to reduce the risk of a crash

Road authorities, planners and engineers

AusRAP will benefit the people responsible for road planning and policy in three main ways. First, the overall performance of a particular road can be directly compared to other roads. Second, rising road standards can be tracked, including how quickly best practice is implemented. In particular, AusRAP will focus on the impact of route and mass-action programs such as relatively simple treatments like shoulder sealing and safety barriers that can be implemented quickly, often at low cost.

Finally, AusRAP will assist government decision-making regarding road investments. Predominantly, these decisions are based on cost-benefit analysis, though AusRAP will contribute to this process by identifying road sections with poor safety records that might therefore benefit from safety improvements.

People will know from AusRAP how well particular roads are performing compared to other roads

³ National surveys of motorists' attitudes and priorities, conducted by ANOP Research Services on behalf of the Australian Automobile Association, 2003 and 2004.

How does AusRAP map risk rates?

AusRAP's first protocol, risk mapping, is based on real crash and traffic flow data. Risk maps illustrate a road's safety performance by measuring and mapping the number of casualty crashes along a route. This report focuses on the rural links of the National Highway System in all States and Territories except Tasmania, for the period 1998-2002.

Casualty crashes

The crash and traffic volume data used in this report were obtained from the road authority in each State and Territory. The risk maps presented in this report measure "casualty crashes." A casualty crash is defined here as any road crash in which at least one person is killed or injured.

While there is consistency in the definition of a road fatality between States and Territories (that is, death occurs within 30 days of the crash), it has not been possible to reliably compare the casualty crash data because each State and Territory defines the severity of casualty crashes differently (see Table 3). In addition, the way a person's injury is actually categorised at the crash scene can vary.

Table 3 Categories of casualty crash severity used by the States

	Fatal	Injury	Serious	Hospital Admitted	Medical Treatment	Minor	Other
NSW	✓	✓					
VIC	✓		✓			✓	
QLD	✓			✓	✓	✓	
SA	✓		✓				✓
WA	✓			✓	✓		
TAS	✓		✓			✓	
NT	✓		✓			✓	
ACT	✓			✓	✓		

These differences in definition of the severity of casualty crashes preclude us from easily using the EuroRAP measure of “serious casualty crashes” in our risk maps, and from comparing results between States and Territories. Although EuroRAP applies normalising factors to compare results across countries, applying a similar procedure in Australia does result in errors of estimation.

In terms of road safety, this serious shortcoming of a lack of consistent definition requires the urgent attention of State and Federal Governments. Until there is a nationally consistent set of definitions for the severity of road crashes, we cannot readily make accurate assessments of the nation's road safety performance or benchmark serious casualty crash risk across jurisdictions.

To address this definitional problem, this report uses casualty crash numbers, rather than serious casualty crash numbers, to prepare risk maps (although we note that serious casualty crashes generally represent around one third of casualty crashes). It should also be noted that one advantage of using casualty crash data is that it increases the sample size for calculating risk rates.

A separate exercise by the Australian Automobile Association attempted to address the definitional problem through a process of normalising each of the State and Territory's crash data. However it is a complex process and is not reported here. A Discussion Paper on this issue is available from the Australian Automobile Association.

Traffic volumes

Traffic volumes on each link are estimated using Annual Average Daily Traffic (AADT) information provided by the State and Territory road authorities (see Box). Within the links, it is inevitable that traffic volumes will vary. Where this is the case, we have estimated daily traffic volumes for the entire link using a weighted average (based on length) of a series of AADT counts.

Traffic volumes

What is the “annual average daily traffic” (AADT)?

Annual average daily traffic (AADT) gives an indication of the number of vehicles that use a road each day. It is equal to the number of vehicles travelling past a particular point on a road in a year, divided by the number of days in a year.



Rural road links

This report focuses on rural road links of the National Highway System, defined as those outside metropolitan areas, and significant country towns. The links generally have a speed limit of more than 90km/h, though some lower-speed limit sections where these form an integral part of higher speed inter-urban routes are included. Using this definition of rural road links, we have analysed some 17,500km, or 95 per cent, of the 18,600km National Highway System.⁴

The highways were split into links using three criteria. First, ideally they should have a minimum 5-year total of 20 crashes resulting in death or injury over the five year period from 1998 to 2002 (for statistical reliability). Second, they should be meaningful and distinct to road users (that is, start and end at identifiable locations). Third, they should have broadly similar characteristics, such as single lane or dual carriageway, over their entire length.

Having calculated the risk of a casualty crash for each link, the links are then ranked from the lowest risk rating to the highest risk rating. The links are then allocated to one of five bands (quintiles) such that the first 20% of links are allocated to the low risk category, the next 20% to the low/medium risk category and so on up until the top 20% of links with the highest risk are allocated to the high risk category. The five risk categories are also colour coded (see Table 4) and these colours are used in the maps to highlight the different levels of risk.

Table 4 – Colour Codes for risk bands

Colour	Risk Rating	Percentage
	Low	Best 20% of links
	Low / Medium	
	Medium	Middle 20%
	Medium / High	
	High	Worst 20% of links

It should be noted that a road's risk rating reflects the average level of risk for the period 1998 to 2002. Current levels of risk might be different, particularly if roadworks aimed at improving safety were undertaken during or after this period.

⁴ 320km of the National Highway System in Tasmania is not included because data was not provided by Tasmania's road authority.

Measures of risk

In this report we have calculated two separate measures of risk—collective risk and individual risk (see Box). This is consistent with the initial research and reporting of EuroRAP.

Measures of risk

Collective Risk Maps show the density, or total number, of crashes on a road over a given length. Crashes measured in this map are the result of interaction between all elements of the road system—road users, vehicles and roads. Collective risk is calculated by dividing the number of casualty crashes on a link by the length of the link.

Individual Risk Maps show casualty crash rates per vehicle kilometre travelled. This is the risk rate for individual drivers. Individual risk is calculated by dividing the frequency of crashes by the distance travelled by vehicles on each road link.

Collective risk

Because collective risk is measured in terms of the number of crashes per kilometre, it might be expected that roads with higher traffic volumes will experience more crashes. This is generally the case. For example, the Hume Highway in New South Wales, which averages more than 18,000 vehicles per day, experiences a high number of casualty crashes per kilometre. Such roads would normally be accorded a high or medium/high risk and colour coded black or red respectively. On the other hand, roads carrying low traffic volumes, such as the Victoria Highway in the Northern Territory, averaging around 300 vehicles per day, generally experience lower numbers of casualty crashes per kilometre and would thus be colour coded green.

However, the fact that roads carry more traffic does not necessarily mean that it has a high degree of risk. For example, where a single carriageway road and a divided freeway carry a comparably high traffic volume, the single carriageway road would be expected to have a higher level of collective risk than the dual carriageway. Analysing data and comparing risk rates on the basis of road type and traffic volume in this way provides policy makers with a valuable tool for estimating the total number of crashes that could potentially be avoided if a road link were improved. It may also indicate the locations where the largest return on investment could be expected.



Individual risk

An alternative measure of risk, individual risk, takes traffic volume explicitly into account. Since this measure of risk is based on the number of crashes per vehicle kilometre travelled, it effectively represents the risk faced by an individual driver. Comparisons can be made between roads based on individual risk. For example, if there are 20 crashes on a stretch of road 10 km long that carries 1,000 vehicles a day, then the risk is 10 times higher than if the road section has the same number of crashes but carries 10,000 vehicles a day.

Using both measures of risk

Each risk map “tells a story” and provides important information about collective and individual risk for every highway. For example, some roads that carry very high traffic volumes like the Hume Highway in New South Wales tend to score poorly on the collective risk map because, in absolute terms, a large number of crashes occur on the highway. However, the same road might score well on the individual risk map—particularly on a divided section of road—after traffic volume is explicitly taken into account.

Hence, the collective and individual risk measures are most useful when used together to “tell a combined story.” Roads that score poorly on both measures—those having high collective and high individual risk—should be considered as candidates for investment. The Road Protection Score and further cost-benefit analysis will assist in determining the appropriate road treatment and priority.

However, risk cannot be eliminated from roads through infrastructure improvements alone. Nor should it be. The road user must always share responsibility for a safe road system. The AusRAP risk maps help to make the connection between infrastructure and personal responsibility by highlighting sections of road where improvements are warranted, but also where road users may need to take extra care to minimise their risk until road improvements are made.

Risk maps for each State and Territory are presented below and the results discussed.

The first set of maps illustrate collective risk rates on each of the highways in each of the States and Territories. The second set of maps show the individual risk rates.

The final Section of the report identifies the best and worst links for each State and Territory using *both* measures.

The collective and individual risk measures are most useful when used together to ‘tell a combined story’

Collective risk maps

This Section of the report presents maps for each State and Territory with the risk for links on each National Highway calculated on the basis of casualty crashes per kilometre. The results are illustrated using a colour coded format on the maps. The risk ratings range from high risk (black), medium/high risk (red), medium risk (yellow), low/medium risk (light green) to low risk (dark green).

Complete results, showing the actual crash rates per kilometre, are given in Appendix 2.

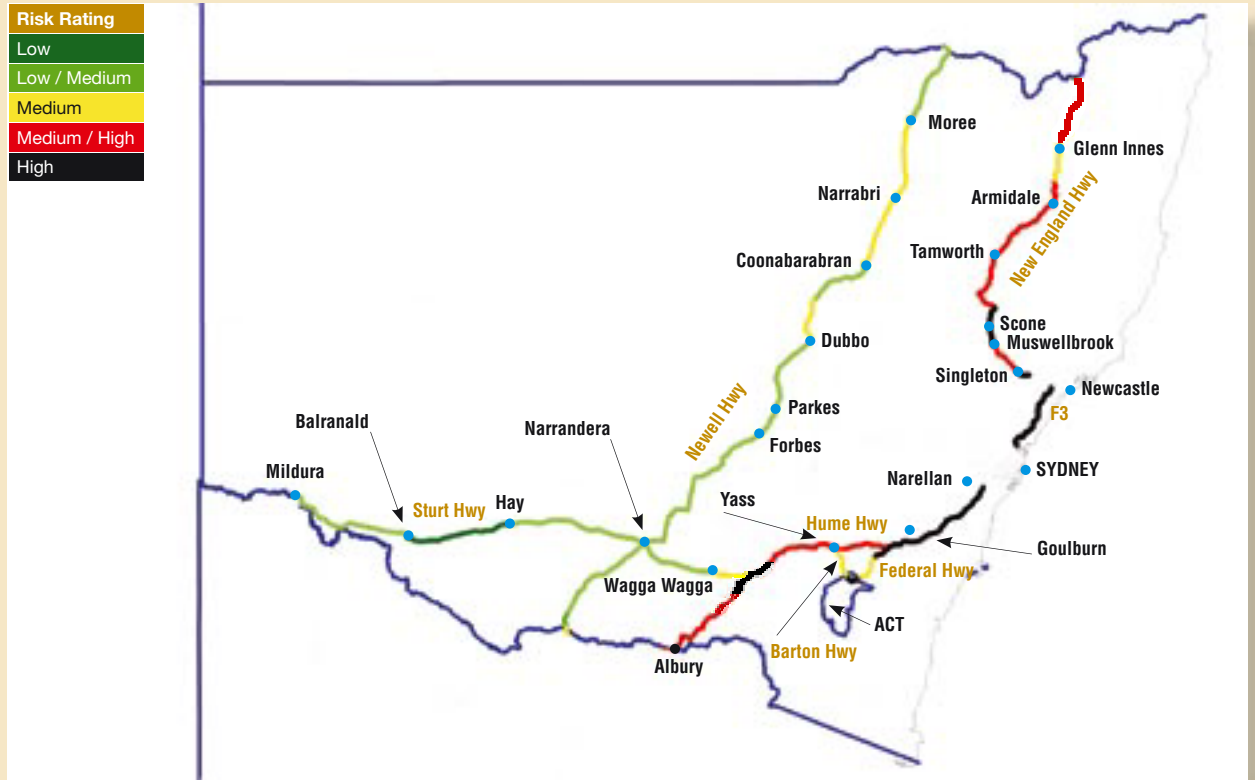
Apart from the maps, some additional information and results are reported. This includes:

- the number of fatalities on the highways in each State in the period 1998 to 2002; and
- the lengths of each highway as a percentage of the total length of the rural sections of the National Highway in each State, classified by risk rating. For example, the table on the following page shows that 14.7 per cent of rural National Highway System in NSW is classified as having high collective risk, 22.7 per cent medium/high risk, 17.1 per cent medium risk, 41 per cent low/medium risk and 4.5 per cent low risk.



New South Wales

Figure 1 Casualty Crashes per Kilometre, New South Wales, 1998–2002



† Fatalities between 1998 and 2002 **246**

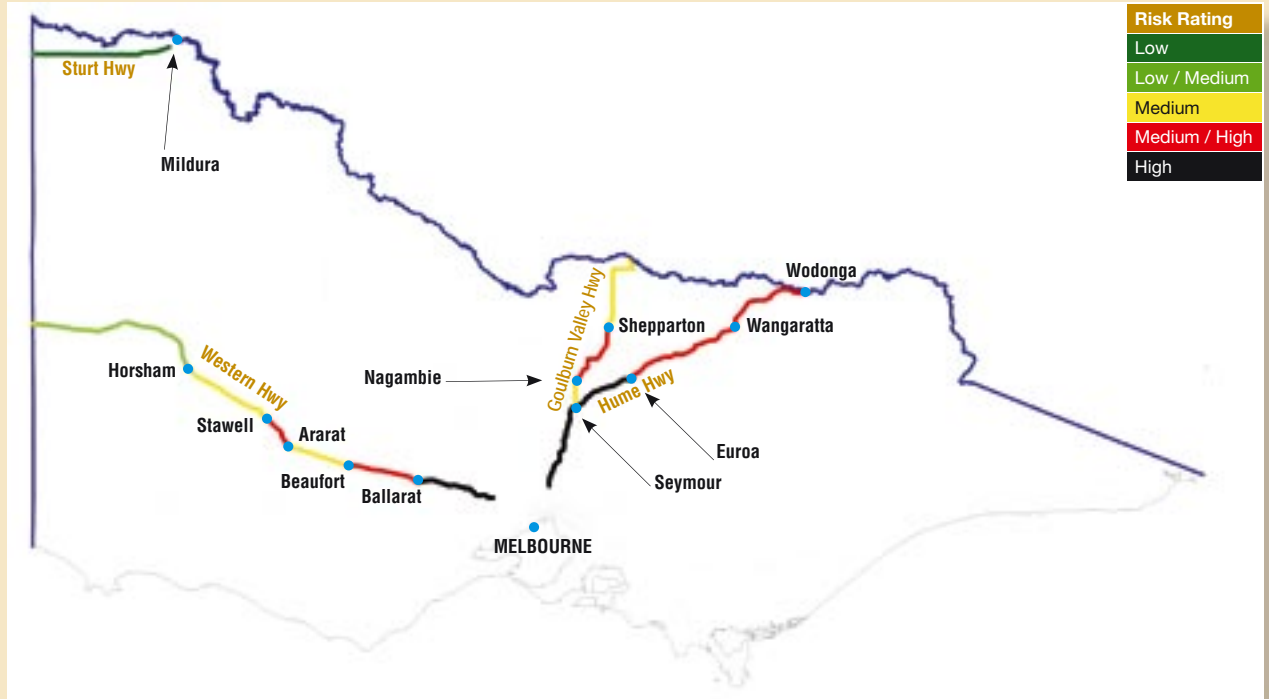
Total length of NHS analysed in New South Wales: 2,778km.

Length of rural NHS in NSW classified by collective risk rating (%)								
	Hume	Sturt	New England	Newell	F3	Barton	Federal	Total
High	7.7	0.0	2.6	0.0	3.5	0.0	0.8	14.7
Medium/High	9.7	0.0	13	0.0	0.0	0.0	0.0	22.7
Medium	0.0	1.2	1.9	9.4	0.0	2.2	2.4	17.1
Low / Medium	0.0	14.4	0.0	26.7	0.0	0.0	0.0	41.0
Low	0.0	4.5	0.0	0.0	0.0	0.0	0.0	4.5
Total	17.4	20.1	17.5	36.1	3.5	2.2	3.2	100.0

Note: Components might not sum to totals because of rounding.

Victoria

Figure 2 Casualty Crashes per Kilometre, Victoria, 1998–2002



† Fatalities between 1998 and 2002 **96**

Total length of NHS analysed in Victoria: 894km.

Length of rural NHS in VIC classified by collective risk rating (%)					
	Hume	Goulburn Valley	Sturt	Western	Total
High	13.6	0.0	0.0	9.1	22.7
Medium/High	17.2	5.6	0.0	6.8	29.6
Medium	0.0	10.8	0.0	11.1	21.9
Low / Medium	0.0	0.0	0.0	14.9	14.9
Low	0.0	0.0	10.9	0.0	10.9
Total	30.9	16.3	10.9	41.9	100.0

Note: Components might not sum to totals because of rounding.

Queensland

Figure 3 Casualty Crashes per Kilometre, Queensland, 1998–2002



† Fatalities between 1998 and 2002 **316**

Total length of NHS analysed in Queensland: 3,937km.

Length of rural NHS in QLD classified by collective risk rating (%)					
	Gore	New England / Cunningham	Warrego / Landsborough / Barkly	Bruce	Total
High	0.0	0.5	2.2	9.6	12.3
Medium/High	1.6	5.0	0.0	18.5	25.0
Medium	0.0	0.0	1.9	11.1	13.0
Low / Medium	4.0	0.0	19.2	0.0	23.1
Low	0.0	0.0	26.6	0.0	26.6
Total	5.5	5.4	49.8	39.3	100.0

Note: Components might not sum to totals because of rounding.

South Australia

Figure 4 Casualty Crashes per Kilometre, South Australia, 1998–2002



† Fatalities between 1998 and 2002 **116**

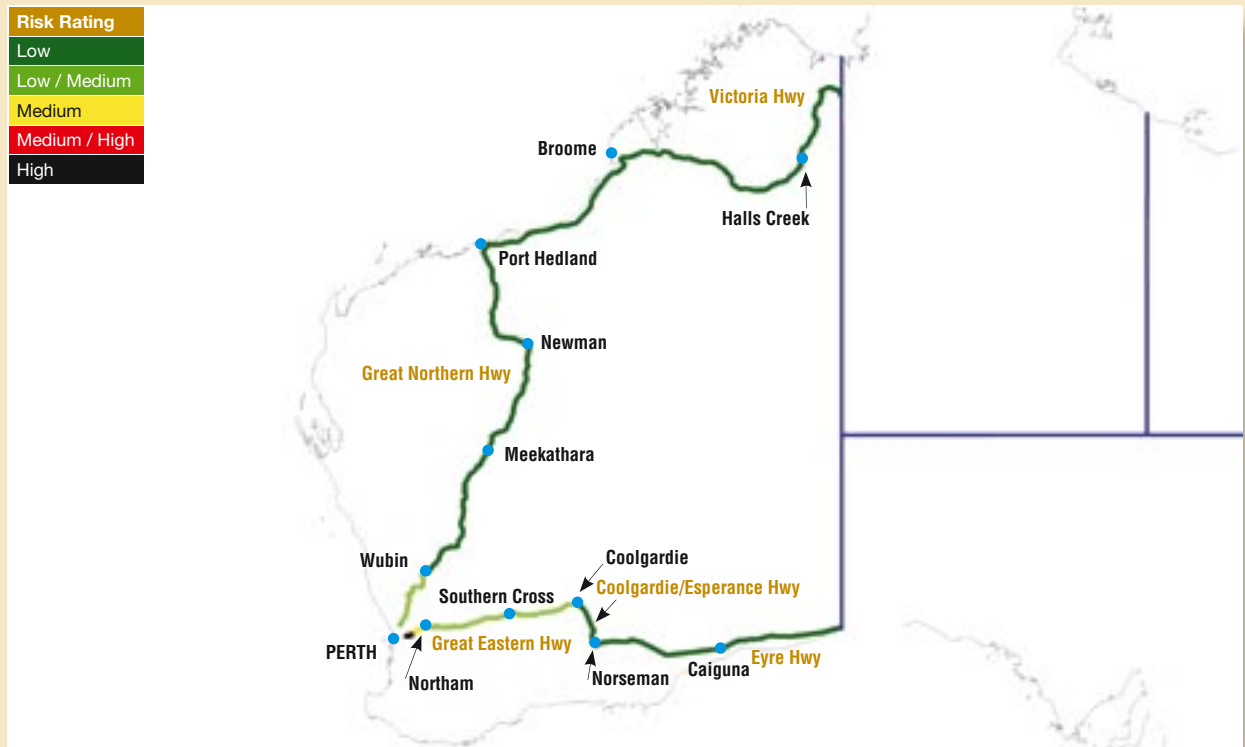
Total length of NHS analysed in South Australia: 2,531km.

Length of rural NHS in SA classified by collective risk rating (%)					
	Eyre	Port Wakefield Rd / Stuart	Sturt	Dukes	Total
High	0.0	2.8	0.6	0.0	3.4
Medium/High	0.0	0.0	2.0	0.0	2.0
Medium	0.0	4.6	5.2	7.3	17.2
Low / Medium	8.6	10.2	1.0	0.0	19.8
Low	27.7	29.9	0.0	0.0	57.5
Total	36.3	47.5	8.9	7.3	100

Note: Components might not sum to totals because of rounding.

Western Australia

Figure 5 Casualty Crashes per Kilometre, Western Australia, 1998–2002



† Fatalities between 1998 and 2002 **81**

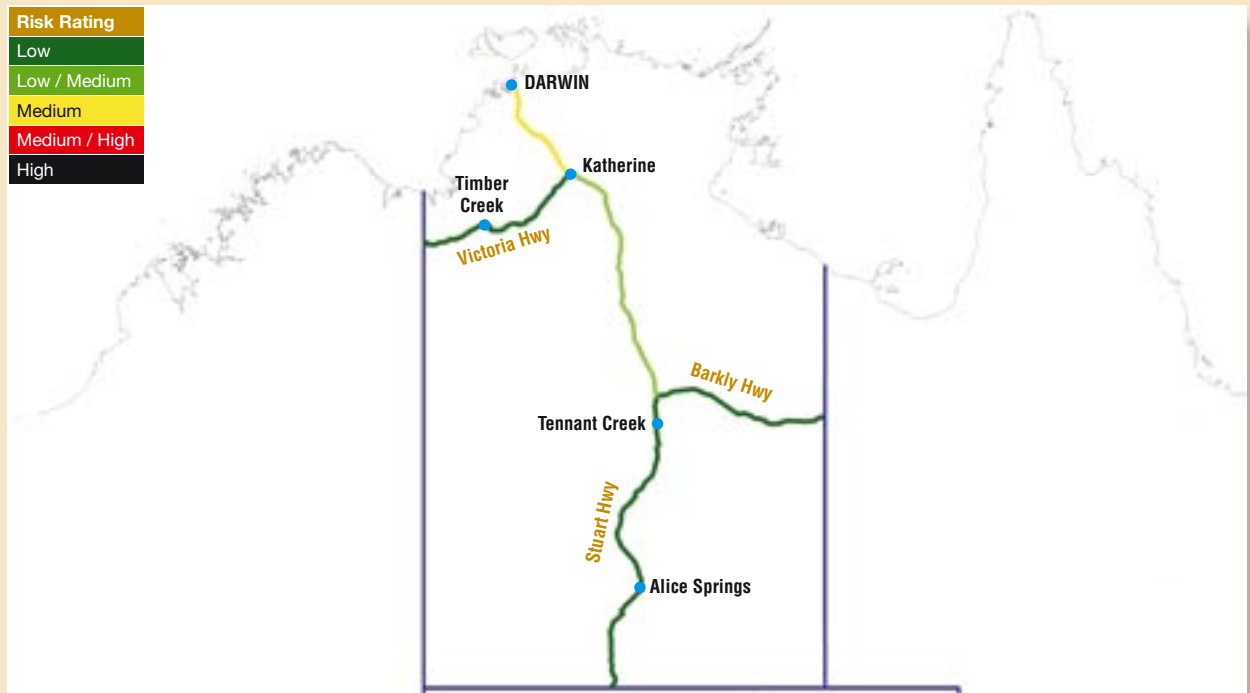
Total length of NHS analysed in Western Australia: 4,596km.

Length of rural NHS in WA classified by collective risk rating (%)			
	Great Eastern / Coolgardie-Esperance / Eyre	Great Northern / Victoria	Total
High	0.3	0.0	0.3
Medium/High	0.0	0.0	0.0
Medium	1.1	0.0	1.1
Low / Medium	10.0	4.7	14.7
Low	19.3	64.7	83.9
Total	30.6	69.4	100.0

Note: Components might not sum to totals because of rounding.

Northern Territory

Figure 6 Casualty Crashes per Kilometre, Northern Territory, 1998–2002



† Fatalities between 1998 and 2002 **70**

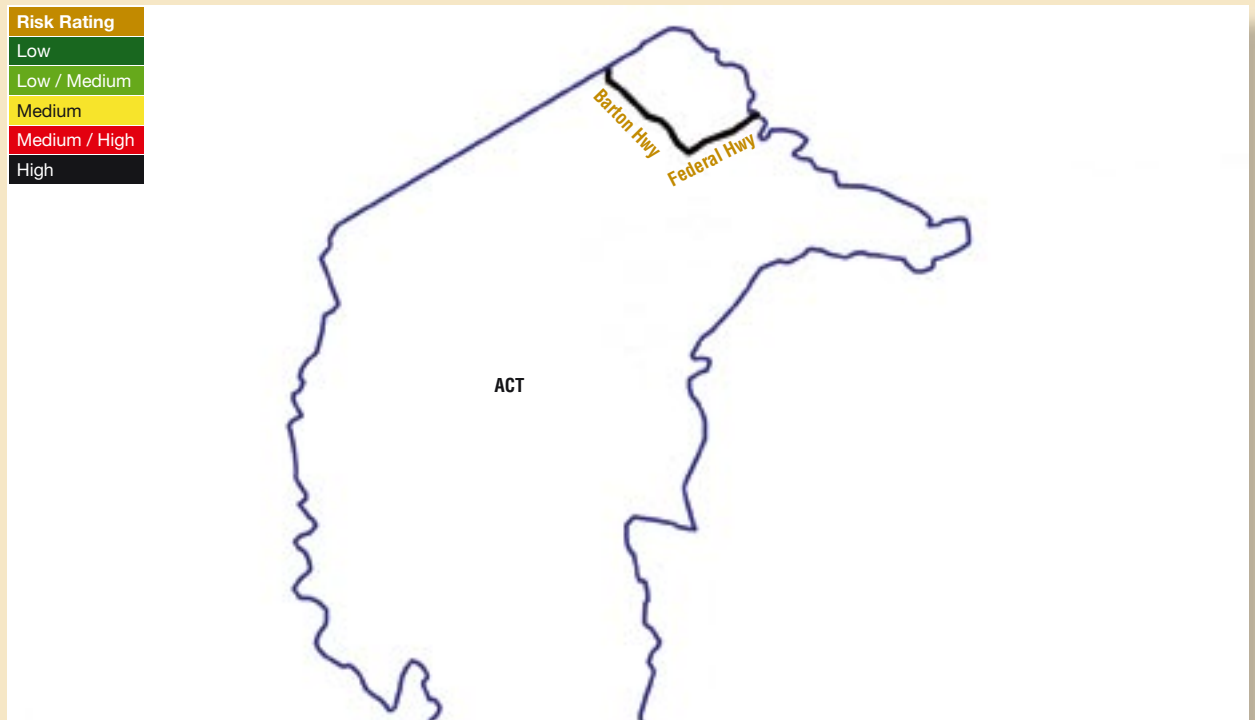
Total length of NHS analysed in the Northern Territory: 2,639km.

Length of rural NHS in NT classified by collective risk rating (%)				
	Barkly	Victoria	Stuart	Total
High	0.0	0.0	0.0	0.0
Medium/High	0.0	0.0	0.0	0.0
Medium	0.0	0.0	10.6	10.6
Low / Medium	0.0	0.0	24.7	24.7
Low	16.5	17.6	30.6	64.7
Total	16.5	17.6	66.0	100.0

Note: Components might not sum to totals because of rounding.

Australian Capital Territory

Figure 7 Casualty Crashes per Kilometre, ACT, 1998–2002



† Fatalities between 1998 and 2002 **5**

Total length of NHS analysed in The Australian Capital Territory: 18.5km.

Length of rural NHS in ACT classified by collective risk rating (%)			
	Barton	Federal	Total
High	59.5	40.5	100.0
Medium/High	0.0	0.0	0.0
Medium	0.0	0.0	0.0
Low / Medium	0.0	0.0	0.0
Low	0.0	0.0	0.0
Total	59.5	40.5	100.0

Note: Components might not sum to totals because of rounding.

Individual risk maps

This Section of the report presents maps for each State and Territory with the risk for links on each National Highway calculated on the basis of casualty crashes per vehicle kilometre travelled and illustrated in the same colour coded format as used for the collective maps.

Complete results, showing the actual crash rates per vehicle kilometre travelled, are shown in Appendix 2.

Since the measure of risk in these maps is based on casualty crashes per vehicle kilometre travelled, they effectively illustrate the risk rate faced by individual drivers for each link.

Unlike the previous collective risk maps, these maps explicitly take account of traffic volumes, so that low and high traffic volume roads can be genuinely compared. As well as providing an insight into the safety performance of individual roads, they also give the road user an indication of where they may need to take extra care to minimise their risk.

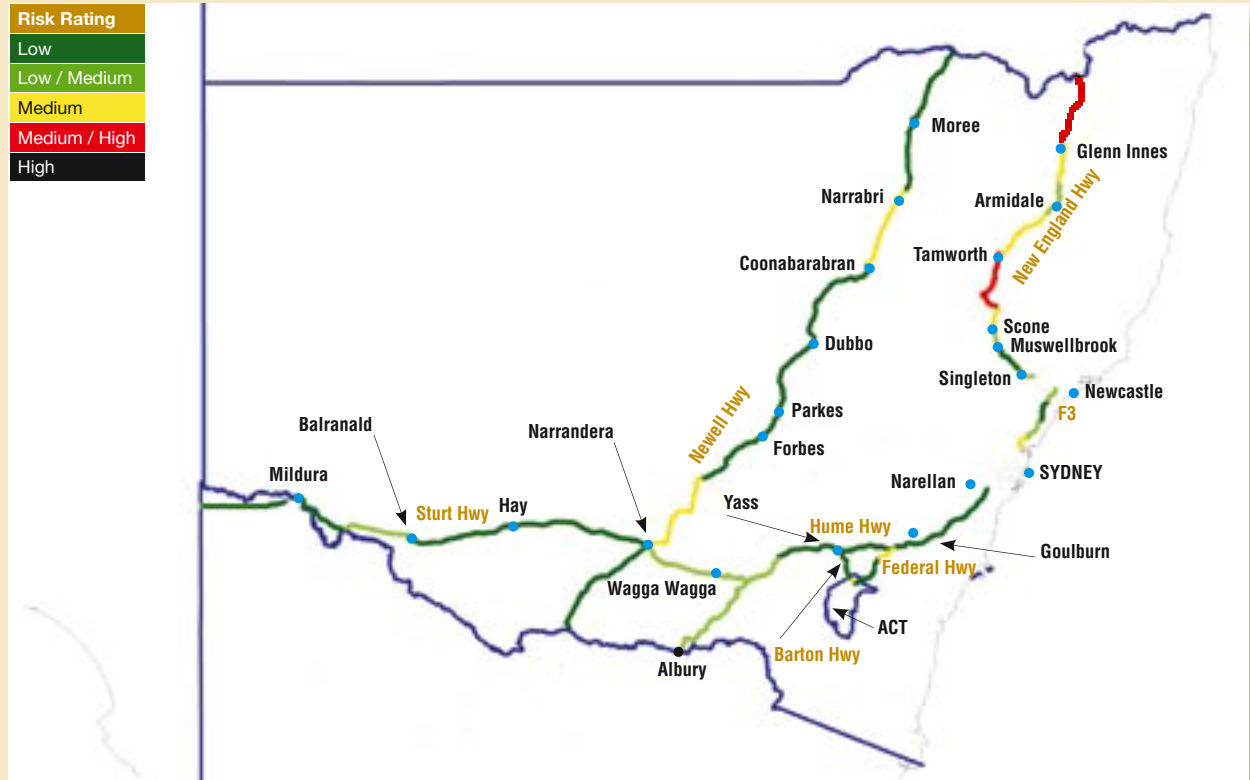
As in the previous Section, additional information and results are reported, including:

- the number of fatalities on the highways in each State and Territory in the period 1998 to 2002; and
- the lengths of highway as a percentage of the total length of the rural sections of the National Highway in each State, classified by risk rating. For example, the table on the following page shows that none of the rural sections of the National Highway System in NSW has high individual risk, 7.0 per cent has medium/high risk, 16.0 per cent medium risk, 18.8 per cent medium/low risk and 58.2 per cent has low risk.



New South Wales

Figure 8 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **246**

Total length of NHS analysed in New South Wales: 2,778km.

Length of rural NHS in NSW classified by individual risk rating (%)								
	Hume	Sturt	New England	Newell	F3	Barton	Federal	Total
High	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Medium/High	0.0	0.0	7.0	0.0	0.0	0.0	0.0	7.0
Medium	0.0	0.0	5.7	8.9	0.6	0.0	0.8	16.0
Low / Medium	6.6	7.2	3.3	0.0	1.7	0.0	0.0	18.8
Low	10.9	12.9	1.4	27.2	1.3	2.2	2.4	58.2
Total	17.4	20.1	17.5	36.1	3.5	2.2	3.2	100.0

Note: Components might not sum to totals because of rounding.

Victoria

Figure 9 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **96**

Total length of NHS analysed in Victoria: 894km.

Length of rural NHS in VIC classified by collective risk rating (%)					
	Hume	Goulburn Valley	Sturt	Western	Total
High	0.0	0.0	0.0	0.0	0.0
Medium/High	0.0	0.0	0.0	7.1	7.1
Medium	5.7	3.8	0.0	22.8	32.3
Low / Medium	25.2	10.1	0.0	12.1	47.4
Low	0.0	2.3	10.9	0.0	13.2
Total	30.9	16.3	10.9	41.9	100.0

Note: Components might not sum to totals because of rounding.

Queensland

Figure 10 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **316**

Total length of NHS analysed in Queensland: 3,937km.

Length of rural NHS in QLD classified by individual risk rating (%)					
	Gore	New England / Cunningham	Warrego / Landsborough / Barkly	Bruce	Total
High	0.0	5.0	16.8	20.4	42.2
Medium/High	1.6	0.0	23.6	13.5	38.7
Medium	4.0	0.5	6.8	5.3	16.5
Low / Medium	0.0	0.0	2.3	0.0	2.3
Low	0.0	0.0	0.3	0.0	0.3
Total	5.5	5.4	49.8	39.3	100.0

Note: Components might not sum to totals because of rounding.

South Australia

Figure 11 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **116**

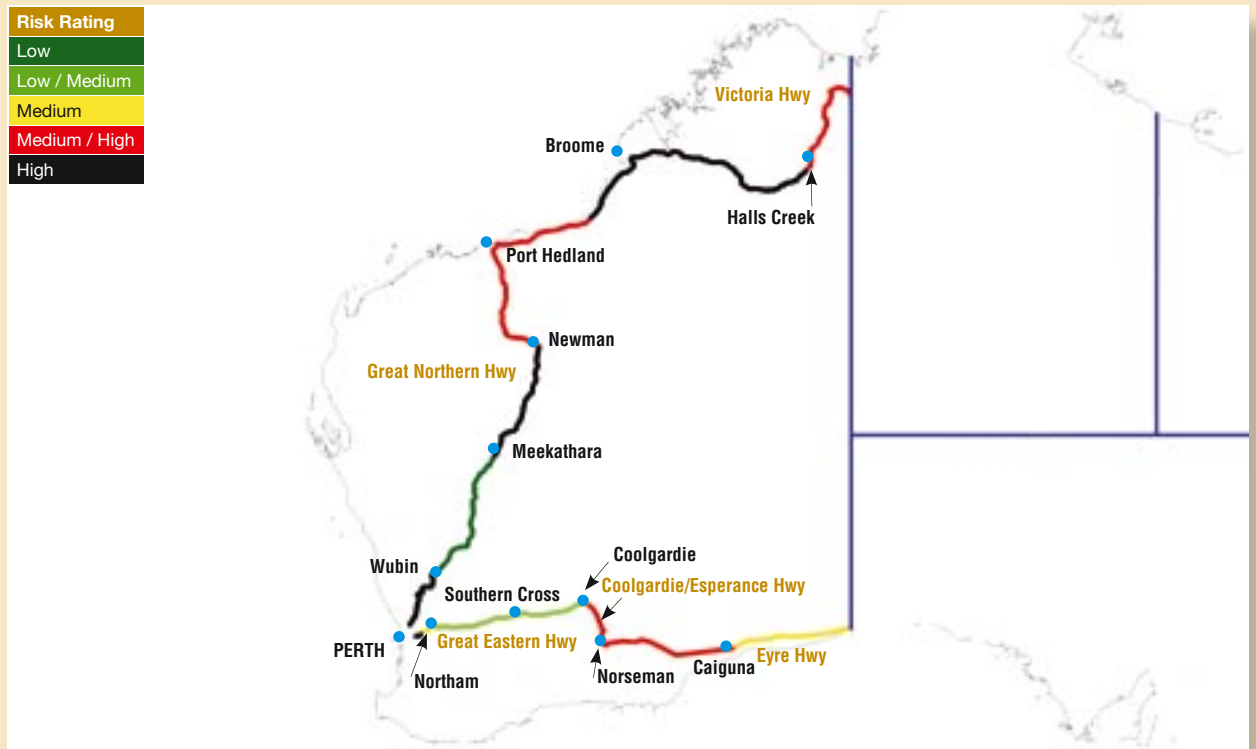
Total length of NHS analysed in South Australia: 2,531km.

Length of rural NHS in SA classified by individual risk rating (%)					
	Eyre	Port Wakefield Rd / Stuart	Sturt	Dukes	Total
High	8.6	6.8	4.3	0.0	19.7
Medium/High	8.7	31.7	3.5	2.4	46.4
Medium	0.0	9.0	0.0	4.9	13.9
Low / Medium	19.0	0.0	1.0	0.0	20.0
Low	0.0	0.0	0.0	0.0	0.0
Total	36.3	47.5	8.9	7.3	100.0

Note: Components might not sum to totals because of rounding.

Western Australia

Figure 12 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **81**

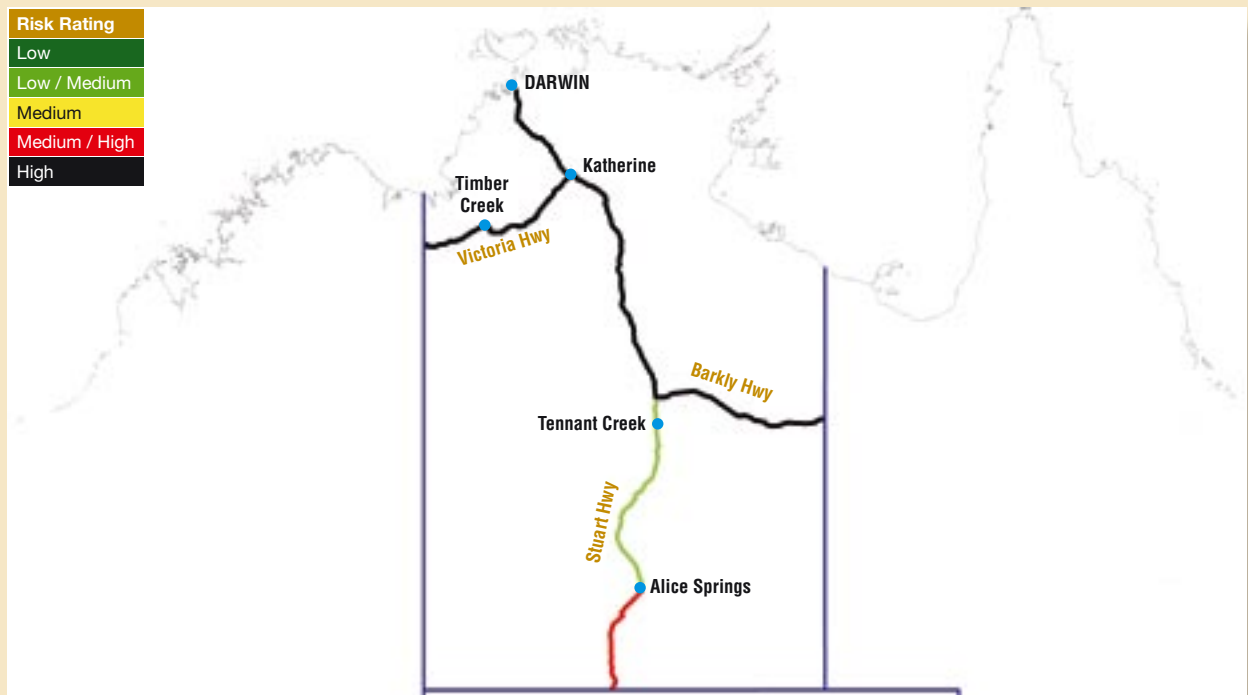
Total length of NHS analysed in Western Australia: 4,596km.

Length of rural NHS in WA classified by individual risk rating (%)			
	Great Eastern / Coolgardie-Esperance / Eyre	Great Northern / Victoria	Total
High	0.3	34.1	34.4
Medium/High	12.0	24.6	36.5
Medium	8.3	0.0	8.3
Low / Medium	10.0	0.0	10.0
Low	0.0	10.7	10.7
Total	30.6	69.4	100.0

Note: Components might not sum to totals because of rounding.

Northern Territory

Figure 13 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **70**

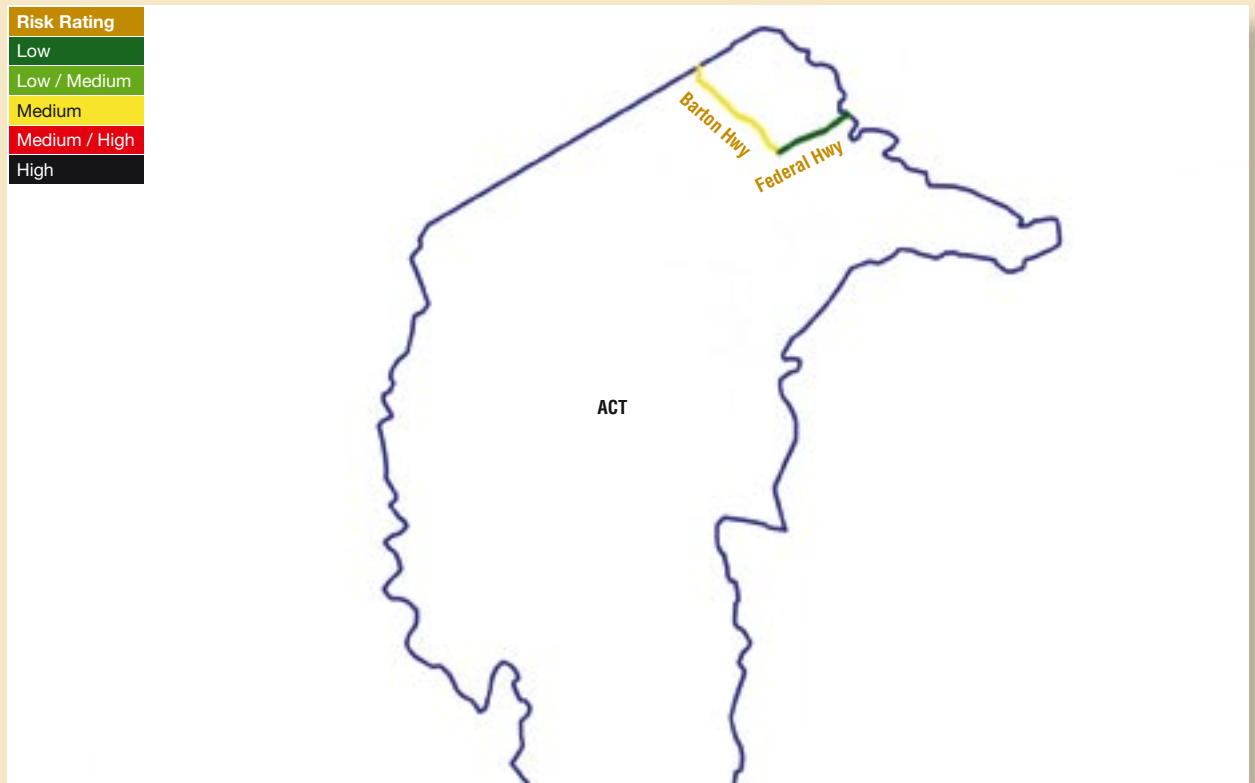
Total length of NHS analysed in the Northern Territory: 2,639km.

Length of rural NHS in NT classified by individual risk rating (%)				
	Barkly	Victoria	Stuart	Total
High	16.5	17.6	35.3	69.4
Medium/High	0.0	0.0	10.8	10.8
Medium	0.0	0.0	0.0	0.0
Low / Medium	0.0	0.0	19.8	19.8
Low	0.0	0.0	0.0	0.0
Total	16.5	17.6	66.0	100.0

Note: Components might not sum to totals because of rounding.

Australian Capital Territory

Figure 14 Casualty Crashes per 100 Million Vehicle Kilometres Travelled, 1998–2002



† Fatalities between 1998 and 2002 **5**

Total length of NHS analysed in The Australian Capital Territory: 18.5km.

Length of rural NHS in ACT classified by individual risk rating (%)			
	Barton	Federal	Total
High	0.0	0.0	0.0
Medium/High	0.0	0.0	0.0
Medium	59.5	0.0	59.5
Low / Medium	0.0	0.0	0.0
Low	0.0	40.5	40.5
Total	59.5	40.5	100.0

Note: Components might not sum to totals because of rounding.

The best and worst links in each State

The collective risk and individual risk maps each provide important information about the National Highways. However, the maps tell a more complete story when the information from the two is combined. Generally, roads that score poorly on both measures—having high collective and high individual risk—should be considered as priorities for investment and as areas where drivers should exercise care. Conversely, roads that score well on both measures—having low collective and low individual risk—may not require additional work in the short term.

However, because road crashes are the result of a complex interaction between road, vehicle and road user, high or high/medium risk ratings do not necessarily mean that the road needs improvement. But it can be a good guide.

The following Section identifies the best and worst links in each State and Territory using both measures of risk.

The best and worst links have been identified using a three step process. First, each link in a State is assigned a ranking based on its collective risk rate. The link with the lowest collective risk is assigned a rank of one, the link with the second lowest risk is assigned a rank of two, and so forth. Next, each link in a State is assigned a second rank based on its individual risk rate, as per the process for the collective risk. Finally, the overall rank of each link is determined by adding together the collective and individual risk rankings for that link. The link in each State with the lowest overall rank is identified as the best performing link, and the link with the highest rank is the worst performing link.



New South Wales

The results for New South Wales show that, in general terms, the Sturt and Newell Highways perform relatively well. The best performing link in NSW is on the Sturt Highway between the Cobb Highway and Balranald. This link is 123km long, carried an average of over 2,000 vehicles per day and experienced 18 casualty crashes and no fatalities during the period 1998 to 2002.

By contrast, the worst performing links are on the F3 Freeway between Sydney and Newcastle, the Federal Highway and the New England Highway. Intuitively, the F3 and Federal Highways should perform well since they are dual carriageway roads. However, these contrary results demonstrate the need for safety to be designed into roads systematically. Relying on one design solution, such as dividing the lanes to solve the problem is often not enough. For example, the link of the Federal Highway between the Hume Highway and Collector scores poorly, despite its dual carriageway, partly because the southbound lanes follow the alignment of the old Federal Highway. This alignment has a number of substandard bends which are often associated with increased crash rates.

The worst performing link in NSW is on the F3 between the Hawkesbury River and the Calga Interchange. This link is 16km long, carried a very high average traffic volume of over 65,000 vehicles per day and experienced 193 casualty crashes and six fatalities during the period 1998 to 2002.

Best performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Sturt	Single	Cobb Highway	Balranald	0.03	3.92
Newell	Single	VIC border	Jerilderie	0.06	4.21
Newell	Single	Forbes	Parkes	0.09	3.69
Sturt	Single	Newell Highway	Cobb Highway	0.04	5.88
Barton	Single	ACT border	Murrumbateman	0.11	3.32

Worst performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
F3	Dual	Hawkesbury River	Calga Interchange	2.41	10.07
Federal	Dual	Hume Highway	Collector	0.47	12.08
New England	Single	Scone	Blandford	0.29	11.83
New England	Mixed	Branxton	Singleton	0.46	8.91
New England	Single	Blandford	Tamworth	0.21	12.53

Victoria

The best performing links in Victoria are on the Sturt Highway, a section of the Western Highway and the Goulburn Valley Highway. Notably, the five best performing links are single carriageway roads. This suggests that safe roads do not necessarily have to be dual carriageways, but rather, must incorporate a number of features that are consistent with the road's specific purpose.

The best performing link in Victoria is on the Sturt Highway between Mildura and the South Australian border. This link is 97km long, carried an average of around 1,600 vehicles per day and experienced 14 casualty crashes and no fatalities during the period 1998 to 2002.

The worst performing link in Victoria is on the Hume Highway between Seymour and Euroa. This link is 51km long, carried an average of nearly 8,500 vehicles per day and experienced 81 casualty crashes and nine fatalities during the period 1998 to 2002.

Notably, the Goulburn Valley Highway link from Murchison East to Arcadia has been upgraded from single lane to dual carriageway since 2002. Current levels of risk might therefore be different to those shown in the table below. As we update the results as more recent crash data becomes available, it will be interesting to monitor the effect of this upgrade on risk levels.

Best performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Sturt	Single	Mildura	SA border	0.03	4.92
Western	Single	Horsham	Nhill	0.08	7.53
Goulburn Valley	Single	Seymour	Nagambie	0.13	6.35
Goulburn Valley	Single	Shepparton	Numurkah	0.15	8.02
Goulburn Valley	Single	Numurkah	NSW Border	0.10	8.95

Worst performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Hume	Dual	Seymour	Euroa	0.32	10.43
Goulburn Valley	Single	Murchison East	Arcadia	0.23	11.16
Western	Dual	Melton	Ballarat	0.41	9.58
Western	Single	Ararat	Stawell	0.20	11.73
Hume	Dual	Craigieburn	Seymour	0.57	8.76

Queensland

The best performing links in Queensland are spread between the Gore, Bruce, Warrego and Landsborough Highways. The best performing link in Queensland is on the Gore Highway between Yandilla and the New South Wales border. This link is 156km long, carried an average of around 1,600 vehicles per day and experienced 48 casualty crashes and six fatalities during the period 1998 to 2002.

Queensland's worst performing links are on the Bruce and Cunningham Highways. The worst link is on the Bruce Highway between Yandina and Gympie. This link is 50km long, carried an average of more than 12,000 vehicles per day and experienced 192 casualty crashes and 30 fatalities during the period 1998 to 2002.

Best performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Gore	Single	Yandilla	NSW Border	0.06	10.65
Bruce	Single	Mackay	Proserpine	0.15	10.12
Warrego	Single	Toowoomba	Dalby	0.17	9.09
Landsborough	Single	Barcaldine	Winton	0.02	13.34
Warrego	Single	Dalby	Roma	0.06	12.32

Worst performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Bruce	Single	Yandina	Gympie	0.78	17.49
Cunningham	Single	Willowbank	Aratula	0.26	21.37
Bruce	Single	St Lawrence	Mackay	0.24	24.48
Cunningham	Single	Aratula	Warwick	0.28	17.40
Bruce	Single	Childers	Miriam Vale	0.20	20.29

South Australia

The best performing links in South Australia are spread between the Eyre, Stuart and Sturt Highways, and the Port Wakefield Road. The Eyre Highway link between the Western Australia border and Ceduna is the best performing link in South Australia. This link is 481km long, carried an average of 630 vehicles per day and experienced 45 casualty crashes and 5 fatalities during the period 1998 to 2002.

With the exception of a section of Port Wakefield Road, the worst performing links in South Australia are exclusively on the Sturt Highway. The worst performing link in South Australia is on the Sturt Highway between Barmera and Renmark. This 26km long link carried an average of around 3,600 vehicles per day and experienced 36 casualty crashes and five fatalities during the period 1998 to 2002.

Best performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Eyre	Single	WA Border	Ceduna	0.02	8.14
Sturt	Single	Renmark	VIC Border	0.09	6.95
Stuart	Single	NT Border	Coober Pedy	0.02	12.37
Port Wakefield	Single	Port Augusta	Port Pirie	0.10	11.07
Stuart	Single	Coober Pedy	Pimba	0.02	13.10

Worst performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Sturt	Single	Barmera	Renmark	0.28	21.25
Sturt	Single	Blanchetown	Barmera	0.15	17.12
Sturt	Single	Gawler North Interchange	Templers-Daveyston Rd	0.32	13.31
Sturt	Single	Templers-Daveyston Rd	Truro	0.23	14.11
Port Wakefield	Dual	Port Wakefield	Old Port Wakefield Rd	0.29	11.54

Western Australia

The best performing links in Western Australia are spread between most of the National Highways. The best performing link in Western Australia is on the Great Northern Highway between Wubin and Meekathara. This link is 493km long, carried an average of around 600 vehicles per day and experienced 34 casualty crashes and four fatalities during the period 1998 to 2002.

The worst performing link in Western Australia is on the Great Eastern Highway between Mundaring and The Lakes. This link is 15km long, carried an average of nearly 9,000 vehicles per day and experienced 42 casualty crashes and two fatalities during the period 1998 to 2002.

Best performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Great Northern	Single	Wubin	Meekathara	0.01	6.49
Eyre	Single	Caiguna	SA Border	0.01	9.97
Great Northern	Single	Newman	NW Coastal Hwy	0.01	15.80
Great Northern / Victoria	Single	Halls Creek	NT Border	0.02	14.04
Great Eastern	Single	Southern Cross	Coolgardie	0.05	8.59

Worst performing links using both measures

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Great Eastern	Single	Mundaring	The Lakes	0.57	17.56
Great Northern	Single	Muchea	Wubin	0.06	16.63
Great Northern	Single	Broome T/Off	Fitzroy Crossing	0.02	22.76
Great Northern	Single	Sandfire Roadhouse	Broome T/Off	0.02	19.90
Eyre	Single	Norseman	Caiguna	0.02	16.13

Northern Territory

There are only eight links of the National Highway System in the Northern Territory. They are ranked in the table below from best to worst using both measures of risk. The need to consider both the collective and individual risk maps together is perhaps best highlighted by the Northern Territory results. With few exceptions, the highways in the Northern Territory perform very well in terms of collective risk but poorly in terms of individual risk. Relatively few vehicles on the road means there are relatively few crashes (low collective risk), but the individual risk is high because the actual number of crashes is high when traffic volume is explicitly taken into account.

The best performing link in the Northern Territory is on the Barkly Highway between the Stuart Highway and Wunara. This link is 280km long, carried an average of around 200 vehicles per day and experienced 18 casualty crashes and one fatality during the period 1998 to 2002.

The worst performing link is on the Stuart Highway between the Arnhem Highway turnoff and Katherine. This link is 280km long, carried an average of around 1,700 vehicles per day and experienced 209 casualty crashes and 33 fatalities during the period 1998 to 2002.

All links in order from best to worst

Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Barkly	Single	Stuart Hwy	Wunara	0.01	18.23
Stuart	Single	Alice Springs	SA border	0.02	14.12
Stuart	Single	Barkly Hwy	Alice Springs	0.03	9.37
Victoria	Single	Katherine	Timber Creek	0.02	18.27
Victoria	Single	Timber Creek	WA border	0.02	28.69
Stuart	Single	Katherine	Barkly Hwy	0.04	17.57
Barkly	Single	Wunara	QLD border	0.03	31.55
Stuart	Single	Arnhem Hwy	Katherine	0.15	23.67

Australian Capital Territory

The results of the only two links of the National Highway System in the ACT are presented below.

The results from the ACT are an exception to the focus on rural roads in this report. Although the short sections of the National Highway System that pass through the ACT are probably best characterised as being urban, they are included in this analysis in the interests of producing results for each State and Territory. When interpreting these results readers should bear in mind that urban environments often produce crash histories that differ from rural environments. Typically, crash rates per kilometre of road (collective risk rates) are higher in urban areas.

All links in order from best to worst

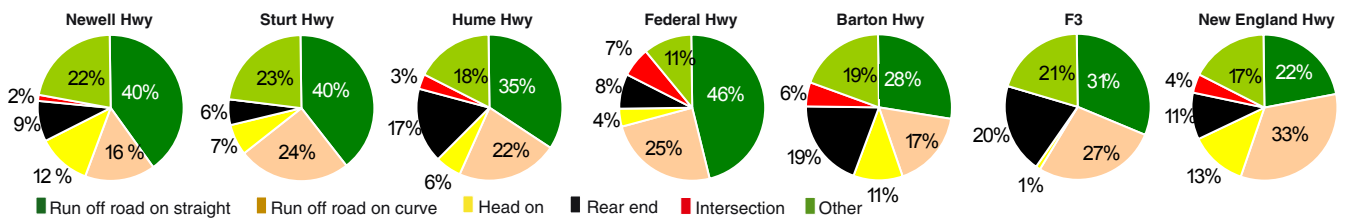
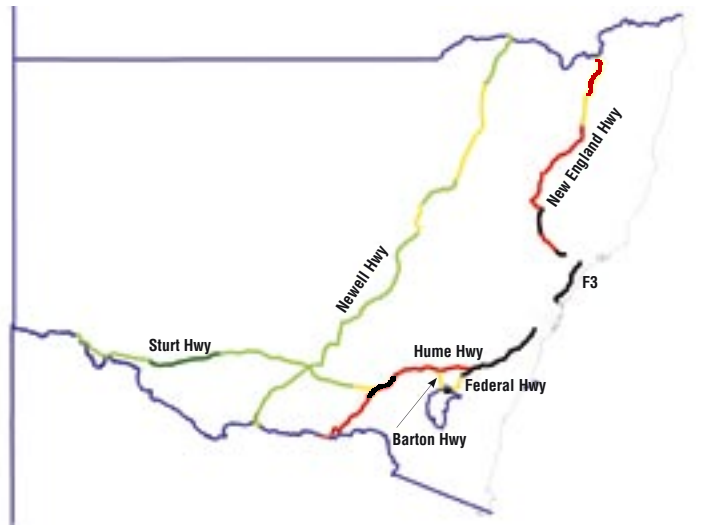
Road Name	Type	From	To	Collective Risk (casualty crashes per km)	Individual Risk (casualty crashes per 100m VKT)
Federal	Dual	ACT Border	Antill St	0.35	6.78
Barton	Dual	ACT Border	Federal Hwy	0.67	10.55



Appendix 1: Crash types

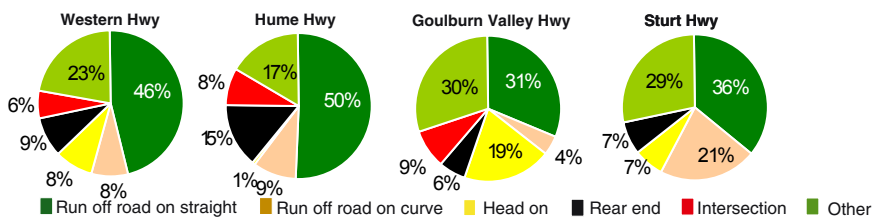
New South Wales

Figure 1a
Crash types on the
National Highways,
1998-2002.



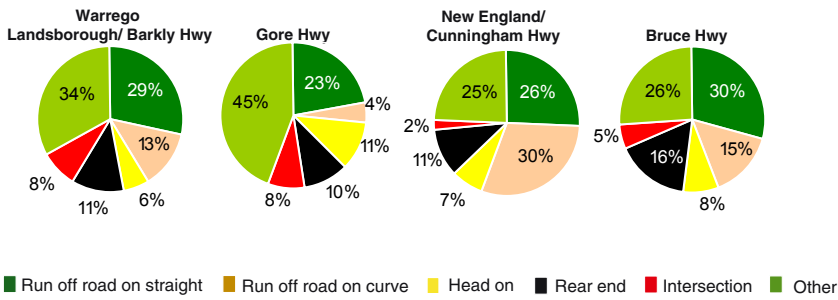
Victoria

Figure 1b
Crash types on the
National Highways,
1998-2002.



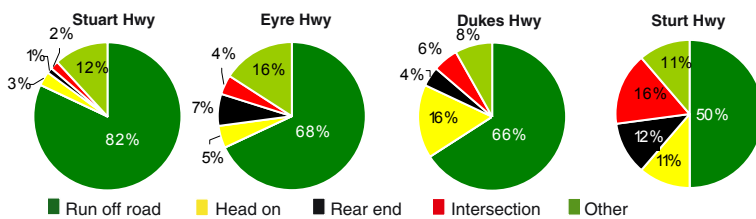
Queensland

Figure 1c
Crash types on the
National Highways,
1998-2002.



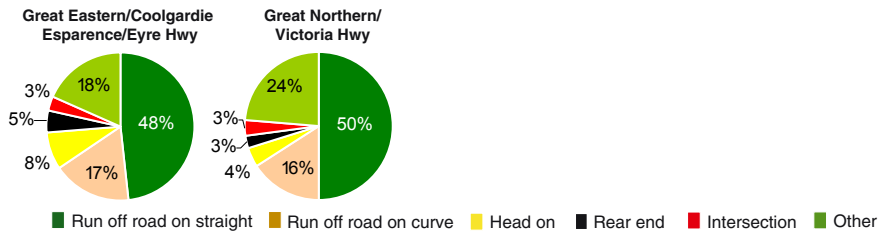
South Australia

Figure 1d
Crash types on the
National Highways,
1998-2002.



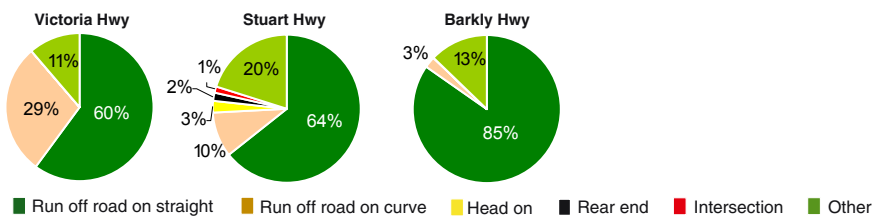
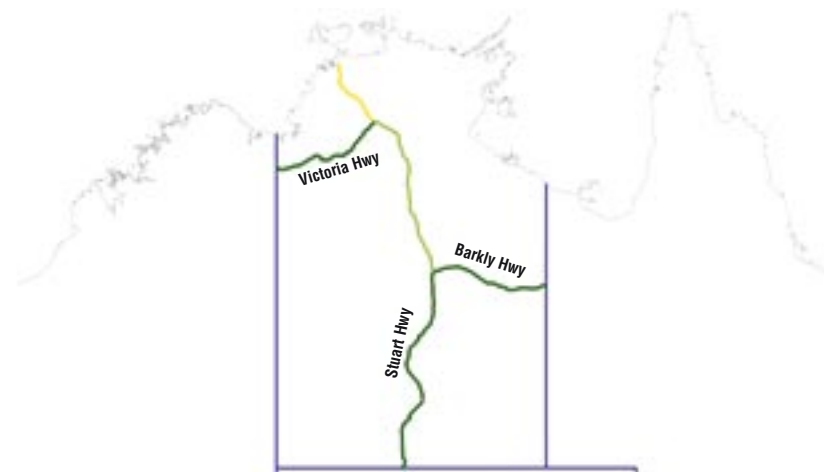
Western Australia

Figure 1e
Crash types on the
National Highways,
1998-2002.



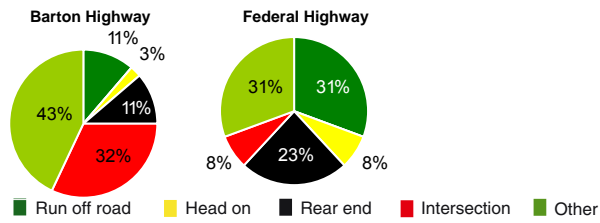
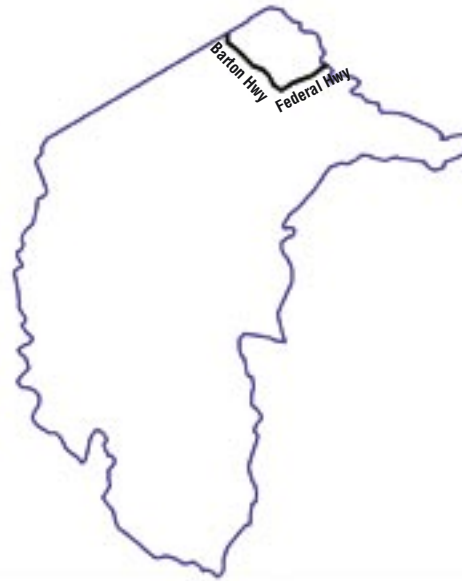
Northern Territory

Figure 1f
Crash types on the
National Highways,
1998-02.



Australian Capital Territory

Figure 1g
Crash types on the
National Highways,
1998-02.



Appendix 2: Complete results



New South Wales

Road Type	From	To	Ch 1	Ch 2	Length	Weighted AADT	Casualty Crashes	Fatalities
			km	km	km	veh/day	1998-2002	1998-2002
Hume Highway, NSW								
Dual	Narrellan Rd	Berrima (end Fwy)	16.0	89.0	73.0	26523	187	8
Dual	Berrima (end Fwy)	Federal Hwy	89.0	168.7	79.7	21630	168	11
Dual	Federal Hwy	Barton Hwy	168.7	232.4	63.7	11908	63	5
Dual	Barton Hwy	Coolac	232.4	317.6	85.2	12699	90	18
Mixed	Coolac	Tarcutta	317.6	380.0	62.4	11098	89	7
Mixed	Tarcutta	Holbrook	382.0	450.7	68.7	6711	72	8
Mixed	Holbrook	Albury	453.9	505.5	51.6	9945	72	12
Sturt Highway, NSW								
Single	Hume Highway	Wagga	0.0	34.5	34.5	4370	23	1
Single	Wagga	Newell Highway	49.5	138.8	89.3	3136	35	1
Single	Newell Highway	Cobb Highway	138.8	304.0	165.2	1691	30	1
Single	Cobb Highway	Balranald	304.0	427.9	123.9	2032	18	
Single	Balranald	Euston	432.5	508.5	76.0	1949	19	1
Single	Euston	Mildura	513.0	581.4	68.4	3263	27	1
New England Highway, NSW								
Single	Branxton	Singleton	40.8	61.3	20.5	14100	47	8
Single	Singleton	Muswellbrook	66.7	107.0	40.3	12579	46	6
Single	Muswellbrook	Scone	113.3	136.0	22.7	10596	36	2
Single	Scone	Blandford	139.0	167.8	28.8	6750	42	7
Single	Blandford	Tamworth	169.8	259.0	89.2	4560	93	13
Single	Nemingha	Uralla	272.3	349.7	77.4	5770	78	6
Single	Uralla	Guyra	351.7	401.0	49.3	5868	47	7
Single	Guyra	Glen Innes	410.0	462.3	52.3	4179	42	5
Single	Glen Innes	QLD border	466.8	573.0	106.2	3890	93	8
Newell Highway, NSW								
Single	VIC border	Jerilderie	0.0	58.8	58.8	3767	17	1
Single	Jerilderie	Sturt Hwy	58.8	164.8	106.0	2960	34	8
Single	Narrandera	West Wyalong	169.4	301.7	132.4	2309	56	8
Single	West Wyalong	Forbes	309.8	406.0	96.2	3005	35	4
Single	Forbes	Parkes	410.0	440.5	30.5	6331	13	1
Single	Parkes	Dubbo	444.5	556.0	111.5	4340	52	5
Single	Brocklehurst	Gilgandra	568.0	621.0	53.0	5120	32	8
Single	Gilgandra	Coonabarabran	626.0	714.5	88.5	3651	37	8
Single	Coonabarabran	Narrabri	719.5	833.7	114.2	3214	64	8
Single	Narrabri	Moree	837.5	931.4	93.9	5146	56	11
Single	Moree	QLD border	936.9	1054.2	117.3	4513	48	5
F3, NSW								
Dual	Hawkesbury River	Calga Interchange	22.0	38.0	16.0	65614	193	6
Dual	Calga Interchange	Wyong	38.0	66.0	28.0	49411	200	14
Dual	Wyong	Ryhope	66.0	100.8	34.8	34865	99	5
Dual	Ryhope	New England Highway	100.8	119.5	18.7	34366	83	1
Barton Highway, NSW								
Mixed	Hume Highway	Murrumbateman	0.0	19.0	19.0	7296	13	1
Single	Murrumbateman	ACT border	20.6	41.0	41.0	9271	23	3
Federal Highway, NSW								
Dual	Hume Highway	Collector	0.0	23.0	23.0	10649	54	5
Dual	Collector	ACT border	23.0	67.0	67.0	11722	48	8

Exposure	Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
100MVKT	Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
7.07	5.29	Low	0.51	High
6.29	5.34	Low	0.42	High
2.77	4.55	Low	0.20	Medium/High
3.95	4.56	Low	0.21	Medium/High
2.53	7.04	Low/Medium	0.29	High
1.68	8.56	Low/Medium	0.21	Medium/High
1.87	7.69	Low/Medium	0.28	Medium/High
0.55	8.36	Low/Medium	0.13	Medium
1.02	6.85	Low/Medium	0.08	Low/Medium
1.02	5.88	Low	0.04	Low/Medium
0.92	3.92	Low	0.03	Low
0.54	7.03	Low/Medium	0.05	Low/Medium
0.81	6.63	Low	0.08	Low/Medium
1.06	8.91	Low/Medium	0.46	High
1.85	4.98	Low	0.23	Medium/High
0.88	8.20	Low/Medium	0.32	High
0.71	11.83	Medium	0.29	High
1.48	12.53	Medium/High	0.21	Medium/High
1.63	9.57	Medium	0.20	Medium/High
1.06	8.91	Low/Medium	0.19	Medium/High
0.80	10.53	Medium	0.16	Medium
1.51	12.34	Medium/High	0.18	Medium/High
0.81	4.21	Low	0.06	Low/Medium
1.15	5.94	Low	0.06	Low/Medium
1.12	10.04	Medium	0.08	Low/Medium
1.06	6.63	Low	0.07	Low/Medium
0.70	3.69	Low	0.09	Low/Medium
1.77	5.89	Low	0.09	Low/Medium
0.99	6.46	Low	0.12	Medium
1.18	6.27	Low	0.08	Low/Medium
1.34	9.56	Medium	0.11	Medium
1.76	6.35	Low	0.12	Medium
1.93	4.97	Low	0.08	Low/Medium
3.83	10.07	Medium	2.41	High
5.05	7.92	Low/Medium	1.43	High
4.43	4.47	Low	0.57	High
2.35	7.08	Low/Medium	0.89	High
0.51	5.14	Low	0.14	Medium
1.39	3.32	Low	0.11	Medium
0.89	12.08	Medium	0.47	High
2.87	3.35	Low	0.14	Medium



Victoria

Road Type	From	To	Ch 1	Ch 2	Length	Weighted AADT	Casualty Crashes	Fatalities	Exposure
			km	km	km	veh/day	1998-2002	1998-2002	100MVKT
Hume Highway, VIC									
Dual	Craigieburn	Seymour	19.5	90.2	70.8	17936	203	12	4.63
Dual	Seymour	Euroa	90.2	141.2	51.0	8352	81	9	1.55
Dual	Euroa	Benalla	141.2	194.2	53.1	9173	74	11	1.78
Dual	Benalla	Wodonga	194.2	295.3	101.1	8795	127	7	3.25
Goulburn Valley Highway, VIC									
Single	Seymour	Nagambie	0.0	21.0	21.0	5752	14	2	0.44
Single	Nagambie	Murchison East	23.8	40.0	16.2	5769	17	7	0.34
Single	Murchison East	Arcadia	40.0	58.0	18.0	5730	21	2	0.38
Single	Arcadia	Shepparton	58.0	73.5	15.5	6451	17	1	0.36
Single	Shepparton	Numurkah	82.8	114.0	31.2	5036	23	4	0.57
Single	Numurkah	NSW Border	114.0	158.0	44.0	3199	23	4	0.51
Sturt Highway, VIC									
Single	Mildura	SA border	19.0	116.0	97.0	1607	14	0	0.57
Western Highway, VIC									
Dual	Melton	Ballarat Sunraysia Hwy	37.5	119	81.5	11720	167	8	3.49
Single	Ballarat Sunraysia Hwy	Beaufort	119	156.5	37.5	5175	36	3	0.71
Single	Beaufort	Ararat	160.0	198.2	38.2	4908	31	3	0.68
Single	Ararat	Stawell	205.0	228.5	23.5	4770	24	5	0.41
Single	Stawell	Horsham	232.8	294.0	61.2	3530	41	6	0.79
Single	Horsham	Nhill	300.0	369.5	69.5	3035	29	4	0.77
Single	Nhill	SA border	371.5	435.0	63.5	2169	32	8	0.50



Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
8.76	Low/Medium	0.57	High
10.43	Medium	0.32	High
8.33	Low/Medium	0.28	Medium/High
7.83	Low/Medium	0.25	Medium/High
6.35	Low	0.13	Medium
9.97	Medium	0.21	Medium/High
11.16	Medium	0.23	Medium/High
9.32	Low/Medium	0.22	Medium/High
8.02	Low/Medium	0.15	Medium
8.95	Low/Medium	0.10	Medium
4.92	Low	0.03	Low
9.58	Medium	0.41	High
10.17	Medium	0.25	Medium/High
9.06	Low/Medium	0.16	Medium
11.73	Medium	0.20	Medium/High
10.40	Medium	0.13	Medium
7.53	Low/Medium	0.08	Low/Medium
12.73	Medium/High	0.10	Low/Medium



Queensland

Road Type	From	To	Ch 1	Ch 2	Length	WeightedAADT	Casualty Crashes 1998-2002	Fatalities
			km	km	km	veh/day		
Gore Highway, QLD								
Single	Toowoomba	Yandilla	5.5	67.0	61.5	3718	54	8
Single	Yandilla	NSW border	67.0	223.0	156.0	1583	48	6
New England / Cunningham Highway, QLD								
Dual	Ipswich	Willowbank	0.0	18.0	18.0	15417	52	4
Single	Willowbank	Aratula	20.8	59.1	38.3	3347	50	1
Single	Aratula	Warwick	60.6	123.5	62.9	4405	88	12
Single	Warwick	NSW border	132.0	225.7	93.7	3077	100	8
Warrego / Landsborough / Barkly Highways, QLD								
Dual	Cunningham Hwy T/Off	Gatton-Esk Rd	0.0	56.0	56.0	18356	242	20
Single	Gatton-Esk Rd	Lawlers Rd	56.0	74.5	18.5	10136	31	8
Dual	Lawlers Rd	Table Top Road	74.5	87.5	13.0	14652	22	1
Single	Toowoomba	Dalby	103.0	176.5	73.5	5084	62	10
Single	Dalby	Roma	180.0	446.0	266.0	1371	82	5
Single	Roma	Morven	450.0	625.0	175.0	625	29	4
Single	Morven	Barcaldine	625.0	1040.0	415.0	291	34	5
Single	Barcaldine	Winton	1040.0	1324.0	284.0	420	29	0
Single	Winton	Cloncurry	1324.0	1671.0	347.0	327	34	3
Single	Cloncurry	Mt Isa	1674.0	1789.0	115.0	771	33	5
Single	Mt Isa	NT border	1797.0	1995.0	198.0	312	32	3
Bruce Hwy, QLD								
Dual	Bald Hills	Beerwah	0.0	50.0	50.0	47833	480	17
Dual	Beerwah	Yandina	50.0	91.0	41.0	26201	226	17
Single	Yandina	Gympie	91.0	140.5	49.5	12150	192	30
Single	Gympie	Childers	148.5	285.5	137.0	5957	203	22
Single	Childers	Miriam Vale	289.0	440.7	151.7	2759	155	6
Single	Miriam Vale	Rockhampton	440.7	604.0	163.3	3482	160	14
Single	Rockhampton	St Lawrence	620.7	779.3	158.6	2247	126	14
Single	St Lawrence	Mackay	779.3	924.0	144.7	2722	176	22
Single	Mackay	Proserpine	945.1	1062.7	117.6	4144	90	14
Single	Proserpine	Ayr	1065.3	1227.6	162.3	2599	129	19
Single	Ayr	Townsville	1247.0	1319.6	72.6	4612	80	10
Single	Townsville	Ingham	1333.7	1435.0	101.3	5898	147	9
Single	Ingham	Innisfail	1438.0	1576.0	138.0	3244	137	17
Single	Innisfail	Cairns	1590.2	1647.9	57.7	5244	74	2

Exposure	Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
100MVKT	Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
0.83	12.94	Medium/High	0.18	Medium/High
0.90	10.65	Medium	0.06	Low/Medium
1.01	10.27	Medium	0.58	High
0.47	21.37	High	0.26	Medium/High
1.01	17.40	High	0.28	Medium/High
1.05	19.00	High	0.21	Medium/High
3.75	12.90	Medium/High	0.86	High
0.68	9.06	Low/Medium	0.34	High
0.69	6.35	Low	0.34	High
1.36	9.09	Low/Medium	0.17	Medium
1.33	12.32	Medium	0.06	Low/Medium
0.40	14.54	Medium/High	0.03	Low/Medium
0.44	15.43	Medium/High	0.02	Low
0.43	13.34	Medium/High	0.02	Low
0.41	16.44	High	0.02	Low
0.32	20.39	High	0.06	Low/Medium
0.23	28.37	High	0.03	Low/Medium
8.73	11.00	Medium	1.92	High
3.92	11.53	Medium	1.10	High
2.20	17.49	High	0.78	High
2.98	13.63	Medium/High	0.30	High
1.53	20.29	High	0.20	Medium/High
2.08	15.42	Medium/High	0.20	Medium/High
1.30	19.37	High	0.16	Medium
1.44	24.48	High	0.24	Medium/High
1.78	10.12	Medium	0.15	Medium
1.54	16.76	High	0.16	Medium
1.22	13.09	Medium/High	0.22	Medium/High
2.18	13.48	Medium/High	0.29	High
1.63	16.77	High	0.20	Medium/High
1.10	13.40	Medium/High	0.26	Medium/High



South Australia

Road Type	From	To	Ch 1	Ch 2	Length	Weighted AADT	Casualty Crashes 1998-2002	Fatalities
			km	km	km	veh/day		
Eyre Highway, SA								
Single	WA border	Ceduna	0.0	481.0	481.0	630	45	5
Single	Ceduna	Kyancutta	487.0	706.5	219.5	571	31	4
Single	Kyancutta	Port Augusta	706.5	925.0	218.5	572	39	5
Stuart Highway / Port Wakefield Road, SA								
Single	NT border	Coober Pedy	0.0	391.0	391.0	408	36	9
Single	Coober Pedy	Pimba	391.0	756.2	365.2	401	35	3
Single	Pimba	Port Augusta	756.2	927.1	170.9	642	49	3
Single	Port Augusta	Port Pirie	932.8	1019.8	87.0	2504	44	7
Single	Port Pirie	Snowtown	1019.8	1090.0	70.2	3385	43	1
Single	Snowtown	Port Wakefield	1090.0	1137.4	47.4	2661	29	5
Dual	Port Wakefield	Old Port Wakefield Rd	1142.5	1213.0	70.5	6999	104	15
Sturt Highway, SA								
Single	Gawler North Interchange	Templers-Daveyston Rd	35.4	51.7	16.3	6575	26	11
Single	Templers-Daveyston Rd	Truro	51.7	77.4	25.7	4535	30	5
Single	Truro	Blanchetown	77.4	125.0	47.6	2495	27	7
Single	Blanchetown	Barmera	125.0	209.3	84.3	2354	62	7
Single	Barmera	Renmark	212.5	238.0	25.5	3640	36	5
Single	Renmark	VIC border	243.5	269.1	25.6	3697	12	3
Dukes Highway, SA								
Single	Tailem Bend	Tintinara	92.7	181.7	89.0	3926	64	4
Single	Tintinara	Keith	183.7	218.3	34.6	3926	28	4
Single	Keith	VIC border	221.7	283.4	61.7	2194	36	13

Australian Capital Territory

Road Type	From	To	Ch 1	Ch 2	Length	Weighted AADT	Casualty Crashes 1998-2002	Fatalities
			(km)	(km)	(km)	(veh/day)		
Barton Highway, ACT								
Dual	ACT border	Federal Hwy	0.0	11.0	11.0	17475	37	4
Federal Highway, ACT								
Dual	ACT border	Antill Street	0.0	7.5	7.5	14000	13	1

Exposure	Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
100MVKT	Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
1.11	8.14	Low/Medium	0.02	Low
0.46	13.56	Medium/High	0.03	Low
0.46	17.10	High	0.04	Low/Medium
0.58	12.37	Medium/High	0.02	Low
0.53	13.10	Medium/High	0.02	Low
0.40	24.46	High	0.06	Low/Medium
0.80	11.07	Medium	0.10	Low/Medium
0.87	9.91	Medium	0.12	Medium
0.46	12.60	Medium/High	0.12	Medium
1.80	11.54	Medium	0.29	High
0.39	13.31	Medium/High	0.32	High
0.43	14.11	Medium/High	0.23	Medium/High
0.43	12.45	Medium/High	0.11	Medium
0.72	17.12	High	0.15	Medium
0.34	21.25	High	0.28	Medium/High
0.35	6.95	Low/Medium	0.09	Low/Medium
1.28	10.04	Medium	0.14	Medium
0.50	11.29	Medium	0.16	Medium
0.49	14.57	Medium/High	0.12	Medium



Exposure	Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
100MVKT	Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
0.70	10.55	Medium	0.67	High
0.38	6.78	Low	0.35	High

Western Australia

Road Type	From	To	Ch 1	Ch 2	Length	Weighted AADT	Casualty Crashes
			km	km	km	veh/day	1998-02
Great Eastern / Coolgardie Esperance / Eyre Highway, WA							
Single	Mundaring	The Lakes	32.4	47.0	14.7	8931	42
Single	The Lakes	Northam	47.0	96.4	49.3	3977	43
Single	Northam	Southern Cross	96.4	368.7	272.4	2090	94
Single	Southern Cross	Coolgardie	368.7	554.6	185.9	1511	44
Single	Coolgardie	Norseman	554.6	718.9	164.2	598	24
Single	Norseman	Caiguna	718.9	1105.9	387.0	395	45
Single	Caiguna	SA border	1105.9	1440.2	334.3	395	24
Great Northern / Victoria Highway, WA							
Single	Muechea	Wubin	36.7	253.1	216.4	1005	66
Single	Wubin	Meekathara	253.1	746.0	492.9	583	34
Single	Meekathara	Newman	746.0	1160.3	414.3	150	26
Single	Newman	NW Coastal T/Off	1160.3	1574.7	414.4	218	26
Single	NW Coastal T/Off	Sandfire Roadhouse	1574.7	1888.6	314.0	382	35
Single	Sandfire Roadhouse	Broome T/Off	1888.6	2173.6	285.0	271	28
Single	Broome T/Off	Fitzroy Crossing	2173.6	2535.6	362.0	246	37
Single	Fitzroy Crossing	Halls Creek	2535.6	2824.5	288.9	308	28
Single	Halls Creek	NT border	2824.5	3224.6	400.1	332	34

Northern Territory

Road Type	From	To	Ch 1	Ch 2	Length	Weighted AADT	Casualty Crashes
			km	km	km	veh/day	1998-02
Barkly Highway							
Single	Stuart Hwy	Wunara	0.0	280.0	280.0	193.3	18
Single	Wunara	QLD border	280.0	435.0	155.0	235.3	21
Victoria Highway							
Single	Katherine	Timber Creek	4.8	284.0	279.2	300.7	28
Single	Timber Creek	WA border	284.0	468.0	184.0	176.5	17
Stuart Highway							
Single	Arnhem Hwy	Katherine	32.0	311.8	279.8	1729.3	209
Single	Katherine	Barkly Hwy	319.1	971.9	652.8	554.2	116
Single	Barkly Hwy	Alice Springs	971.9	1495.0	523.1	894.0	80
Single	Alice Springs	SA border	1507.7	1793.0	285.3	394.3	29

Fatalities	Exposure	Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
1998-02	100MVKT	Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
2	0.48	17.56	High	0.57	High
2	0.72	12.01	Medium	0.17	Medium
12	2.08	9.05	Low/Medium	0.07	Low/Medium
9	1.03	8.59	Low/Medium	0.05	Low/Medium
0	0.36	13.40	Medium/High	0.03	Low
2	0.56	16.13	Medium/High	0.02	Low
3	0.48	9.97	Medium	0.01	Low
14	0.79	16.63	High	0.06	Low/Medium
4	1.05	6.49	Low	0.01	Low
1	0.23	22.93	High	0.01	Low
3	0.33	15.80	Medium/High	0.01	Low
9	0.44	15.99	Medium/High	0.02	Low
3	0.28	19.90	High	0.02	Low
7	0.33	22.76	High	0.02	Low
6	0.32	17.25	High	0.02	Low
4	0.48	14.04	Medium/High	0.02	Low

Fatalities	Exposure	Individual Risk	Individual Risk Rating	Collective Risk	Collective Risk Rating
1998-02	100MVKT	Annual Casualty Crashes / 100Mvkt		Annual Casualty Crashes per km	
1	0.20	18.23	High	0.01	Low
0	0.13	31.55	High	0.03	Low
5	0.31	18.27	High	0.02	Low
6	0.12	28.69	High	0.02	Low
33	1.77	23.67	High	0.15	Medium
12	1.32	17.57	High	0.04	Low/Medium
12	1.71	9.37	Low/Medium	0.03	Low
1	0.41	14.12	Medium/High	0.02	Low



