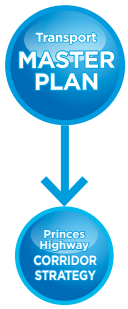
PRINCES HIGHWAY CORRIDOR STRATEGY

August 2016



NSW GOVERNMENT

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EXECUTIVE SUMMARY

The Princes Highway, running north to south, links Sydney and the Illawarra Region with the NSW South Coast and beyond to the Gippsland region of Victoria. The section of the Princes Highway covered in this corridor strategy is just over 422 kilometres in length and connects the southern end of the M1 Motorway at Yallah, approximately 20km south of Wollongong with the Victorian Border, south of Eden. The corridor serves as the main transport corridor providing freight and passenger movements to and from the Illawarra and South Coast regions, supports south coast tourist travel demand and connects towns on the south coast with Wollongong and Sydney.

This Princes Highway Corridor Strategy has been prepared by a multidisciplinary project team from Transport for NSW and Roads and Maritime with expertise in road safety, traffic, asset management, land use, environment, planning and development. The strategy sets out the Government's 20 year plan to manage and guide the development of the road corridor to improve safety, traffic efficiency and sustainability.

The purpose of this strategy is to identify:

- Objectives specific to the Princes Highway Corridor that support the NSW Long Term Transport Master Plan, Regional Transport Plans and other State plans (Chapter 2).
- The concerns, values and issues that are important to the community along the Princes Highway (Chapter 3).
- The sources of transport demand along the road corridor (Chapter 4).
- The performance of the Princes Highway in meeting specific targets, standards and objectives (Chapter 5). Measures include road safety, traffic and travel, road design and geometry and road pavement condition.
- How future transport demands that are likely to be placed on the Princes Highway over the next 20 years can be managed and what road corridor improvements are therefore likely to be needed (Chapter 6).
- Current and future challenges in meeting the objectives for the corridor and short, medium and long term priorities to address these challenges on the Princes Highway (Chapter 7).

In assessing the performance of the road corridor against performance measures and targets the corridor was segmented into 20 smaller sections. These included:

- Section 1: Yallah to Gerringong
- Section 2: Mount Pleasant lookout to Berry
- Section 3: Berry
- Section 4: Berry to Bomaderry
- Section 5: Nowra
- Section 6: Nowra to Jervis Bay Road
- Section 7: Jervis Bay Road to Milton
- Section 8: Milton-Ulladulla-Burrill Lake
- Section 9: Burrill Lake to Batemans Bay
- Section 10: Batemans Bay
- Section 11: Batemans Bay to Moruya

Cover image: Shoalhaven and Eurobodalla LGA Boundary – Southbound


Curves south of Yowaka River – Northbound

- Section 12: Moruya
- Section 13: Moruya to Narooma
- Section 14: Narooma
- Section 15: Narooma to Bega
- Section 16: Bega
- Section 17: Bega to Eden
- Section 18: Eden
- Section 19: Eden to Edrom Road
- Section 20: Edrom Road to the Victorian Border

The vision for the Princes Highway has been developed to explain what actions should be achieved over the next 20 years in order to improve the performance of the Princes Highway and meet the specific corridor objectives. The vision for the Princes Highway between Yallah and the Victorian Border over the next 20 years is that it:

- Provide **freight access** for Performance Based Standards (PBS) class 2(B) vehicles (up to 30 metres long and 85 tonnes) south to BTU Road in South Nowra, and to allow PBS class 2(A) vehicles (up to 26 metres long including B-double access) at Higher Mass Limits for the remainder of the corridor.
- Provide four lane divided carriageway north of Nowra in the short to medium term, and **manage through and local traffic issues** for major urban centres along the corridor, particularly at Albion Park Rail and Nowra.
- Provide **improved safety and efficiency** through wider clear zones, wider sealed shoulders and lanes and realigned road with smaller grades and smoother curves.
- **Maintain connectivity and safe access** along the Princes Highway in low lying areas (below four metres Australia Height Datum) and within four kilometres of the coastline in response to climate change and flooding.
- **Support the efficient management** of planned and unplanned incidents including safe access for emergency vehicles.
- Recognise the corridor to have **national importance** linking Port Kembla to Sydney and south to Jervis Bay Road.
- **Support public transport** connectivity between lower Illawarra and South Coast.

Traffic volumes along the Princes Highway vary in the rural sections from around 1000 vehicles per day to nearly 20,000 vehicles per day. In the urban centres, average daily traffic volumes range from over 60,000 vehicles per day at the northern end of the corridor (Albion Park Rail) to 6,000 vehicles per day at the southern end (Eden). The average heavy vehicle percentage along the corridor is 10.9% which ranges from 8.0% around Mogo up to 25% at Kiah, just south of Eden. This particularly high proportion of heavy vehicles reflects high volumes of logging freight and low volumes of light vehicles. The corridor also experiences significant peaks in traffic volumes being particularly evident during holiday periods due to the tourist travel demand.

Historic traffic growth ranges from 1.9% at Albion Park Rail and the northern end of the corridor and gradually decreases towards the southern end to approximately 0.5% near Bega and Eden. Projections over the next 20 years are expected to follow a similar pattern with higher rates at the northern end around Albion Park and Nowra with possible future land development in the area.

The Princes Highway corridor has undergone a number of large projects in recent years to upgrade the Highway including South Nowra upgrade to improve traffic flow and access, an upgrade at Victoria Creek including a new bridge structure and added overtaking lanes and the Bega Bypass. There are also a significant number of projects under construction or are in planning, some of which include the Albion Park Rail bypass, Gerringong upgrade, the Foxground and Berry Bypass.

Key findings of the Princes Highway Corridor Strategy

Road safety

- Between April 2009 and March 2014 there have been a total of 2045 recorded crashes, of which 953 were recorded as casualty crashes resulting in 38 fatalities.
- Off road on curve crashes (in the rural sections of the highway) were the most common type, followed by rear end crashes particularly in the urban town centres. Off road on straight crashes were the next most frequent.
- 6.4% of all crashes involved a heavy vehicle and in only 4.4% was the heavy vehicle the key vehicle.
- Rain was a contributing factor in 23% of crashes and overcast or fog/mist conditions were contributing factors in a further 13%.
- Wet road surface was identified as a contributing factor in 31.6% of crashes.
- 19.9% of crashes occurred in darkness, a further 5.8% at either dawn or dusk and the remainder of crashes occurred during daylight hours.
- 8.3% of crashes occurred at intersections with the highest incidence being in Nowra (32 crashes), Milton-Ulladulla (25 crashes), and between Gerringong and Berry (23 crashes).
- There is a high incidence of pedestrian crashes in Nowra, followed by Albion Park Rail and Eden. Nowra also has the highest number of pedal cyclist crashes followed by Albion Park Rail and Milton-Ulladulla.
- Of the motorcycle crashes in rural areas, there is a relatively high occurrence of motorcycle crashes between Narooma and Bega, followed by Jervis Bay Road to Milton, Burrill Lake to Batemans Bay and between Gerringong and Berry.
- 20% of the Princes Highway Corridor comprises curves with a radius of less than 460m. Kiama Bends and the section between Narooma and Bega have a particularly high proportion of curves less than 460m.
- 14% or 50km of the Princes Highway south of Jervis Bay Road consists of curves less than 460m radii in 100km/h speed zones.

Travel speeds and level of service

- The highest levels of traffic growth are between 1.7% and 1.9%, recorded at the northern end between Yallah, Kiama, Gerringong and Nowra. Lower levels of growth are shown in the middle section of the highway with growth at Batemans Bay at 0.9%, growth at Bodalla at 1.3% and the lowest levels are recorded at Bega and Eden of 0.5%. These figures are consistent with the predicted population growth figures.
- Level of Service between Jervis Bay Road and Sussex Inlet Road has been assessed using TRARR and has demonstrated a poor Level of Service during peak periods.
- An overtaking lane study is recommended for sections of the highway south of Jervis Bay Road. Sections for priority include Jervis Bay Road to Milton, especially southbound, Burrill Lake to Batemans Bay and Narooma to Bega.
- A detailed intersection analysis that prioritises and recommends minimum treatments needs to be completed between Jervis Bay Road and the Victorian Border to update the report completed in 2003.

- The Princes Highway includes a number of long detours in the event of a serious incident or road closure. This could be better managed with the provision of Intelligent Transport Systems at key locations along the highway.
- Traffic movement through the urban centres along the corridor will continue to be monitored and managed.

Freight productivity

- The Princes Highway passes through a number of mountainous sections. Between Batemans Bay and Moruya, Narooma and Bega and Bega to Eden have some longer section with grades steeper than 8%.
- HML Vehicles are restricted to the northern and southern ends of the corridor due to bridge constraints.
- There are height constraints on the Wagonga Inlet Truss Bridge at Narooma, with no access for vehicles over 4.5m.
- Vehicles longer than 19m are not permitted between Kianga Road at North Narooma and Jews Creek Road at Bega due to poor alignment issues on the Highway.
- Minor upgrades are required at a couple of Heavy Vehicle Inspection Sites along the corridor.
- Monitoring the adequacy of rest area facilities and ensure that they meet current standards.

Asset performance

- Just over half of the Princes Highway corridor, south of Jervis Bay Road has lane widths less than the Network Target.
- There are 13 bridges and culverts on the Princes Highway corridor that are less than 7.0m wide and a further 17 bridges and culverts less than 8.4m wide.
- Many sections of the Princes Highway corridor have sealed shoulder widths below the recommended targets.
- A targeted clear zone and safety strategy is required on the Princes Highway between Yallah and the Victorian Border.
- The increased use of Audio Tactile Edge Line should be considered in sections with a high incidence of fatigue and run off road type crashes. Median treatment and roadside barrier may also be considered in these areas where appropriate.
- The section of the Corridor between Narooma and Bega has the greatest number of slopes with a high risk ARL.
- Five bridges have been identified as being deficient for HML access and six bridges have been identified with a 'poor' Bridge Health Index. Only the Bridge over the Clyde River at Bateman's Bay is in both of these categories.

Taking action

To address the identified challenges of maintaining safe and stable traffic flow in urban centres, providing access for High Productivity Vehicles to the entire corridor, improve road safety performance, improve road alignment, lane width and pavement condition, the following short, medium and long term priorities have been identified:

Short term priorities:

- Complete planning and commence construction of the Albion Park Rail bypass.
- Complete the construction of the Foxground and Berry Bypass to four lane divided carriageway.
- Work with Shoalhaven Council to develop/ improve pedestrian and cyclist access and facilities in Nowra.
- Complete planning and commence construction of a new Shoalhaven River crossing and improve information to motorists through the use of VMS and other Intelligent Transport Systems.

- Develop a traffic model of the Nowra and Bomaderry town centres to inform the development of a traffic and transport study to address:
  - Traffic Efficiency
  - Road Safety
  - Pedestrian and Cyclist access and safety issues.

  The Nowra Bomaderry Traffic and Transport Study initiatives will be implemented on a priority basis focussing in particular on improvements to the Cambewarra Road, Bolong Road, Illaroo Road and Bridge Road intersections.
- Work with Shoalhaven Council on the Browns Road and Flinders Road connection with the Princes Highway.
- Investigate options to upgrade the northbound bridge over Currambene Creek to be suitable for HML access.
- Undertake a route safety study between Jervis Bay Road and Milton, Burrill Lake and Batemans Bay and Narooma and Bega to identify:
  - Specific intersection improvements to address crashes.
  - Other minor improvements including the installation of tactile line marking, widening shoulders including the outside of curves, increasing the clear zone and installing safety barriers where clear zones cannot be increased.
  - Investigate further opportunities to improve the road safety performance specifically between Wandandian and Conjola.
- Prepare an overtaking lane study between Jervis Bay Road and Milton, Burrill Lake and Batemans Bay and Narooma and Bega to identify suitable locations for overtaking lanes. The outcomes of this report will be considered in conjunction with the recommendations of the Route Safety Study.
- Complete investigations into the management of the bridges over Yackungarrah Creek and Currowar Creek.
- Continue to manage peak holiday traffic through Milton with manual traffic control and monitor the success and impact of the management strategy.
- Investigate options to improve driver information using Intelligent Transport Systems to inform drivers upstream of Milton of the traffic conditions.
- Continue to preserve the existing LEP corridor through Milton and Ulladulla and manage traffic through the urban centres.
- Construct the replacement bridge over Burrill Lake.
- Construction of the Termeil Creek project – Princes Highway upgrade which will realign approximately 1.6km of highway and replace the old bridge.
- Undertake an intersection safety review in Batemans Bay to identify:
  - Worst performing intersections.
  - Specific intersection improvements.
  - Potential improvements to the operation of the signalised intersections.
- Commence planning into the renewel or replacement of the bridge over the Clyde River at Batemans Bay.
- Provide a safe and efficient connection to the South Batemans Bay Link Road.
- Develop a road safety program of minor improvements to address deficiencies south of Batemans Bay.
- Work with Bega Valley Shire Council to develop a pedestrian access and safety strategy and improve the existing pedestrian and cyclists facilities through the urban centre of Eden.
- Construction of Dignams Creek project to address poor road alignment, poor intersections and property access and the narrow bridge over Dignams Creek. Further investigations are also required between Narooma and Bega to identify and prioritise other remedial works to address narrow lane and shoulder widths and insufficient clear zones.
- Develop management plans to prioritise and address slope stability issues between Narooma and Bega and between Eden and Edrom Road.

- Investigate the adequacy of clear zones along the Princes Highway corridor. Sections with less than desirable clear zones, no safety barrier and an associated crash history should be prioritised for remedial works.
- A detailed intersection analysis from a safety perspective has been conducted identifying the worst performing intersection and prioritising potential upgrades along the Princes Highway. Additional analysis needs to be completed between Bomaderry and the Victorian Border to update the report completed in 2003 and assess intersections in terms of performance and design and prioritise intersection upgrades in terms of both safety and efficiency.
- Development of an ITS strategy for the Princes Highway to manage driver expectation about travel times during peak periods and improve driver information in the event of road closures with the use of VMS and other ITS.

Medium term priorities:

- Commence investigations to identify possible improvements required to address the deficient alignment and road safety issues associated with Kiama Bends.
- Construct replacement or upgrade existing bridge on the northbound carriageway over Currambene Creek to cater for HML B-double access.
- Investigate options to replace or widen Condies Creek Bridge.
- Develop options for a new bridge over the Wagonga Inlet balancing anticipated freight and regional travel demand against the cost of infrastructure.
- Commence planning for the replacement of Brogo River Bridge including addressing the constraints and road safety hazards on the southern and northern approaches.
- Undertake a route safety study on section 17 between Bega and Eden to identify:
  - Minor improvements including the installation of audio-tactile line marking, widening shoulders and clear zones including the outside of curves and installing safety barriers and centre median treatments, where appropriate.
  - Treatments to target 'Off Road on Curve' type crashes on high speed curves.

Long term priorities:

- Continue to monitor and manage traffic issues within Nowra. This includes evaluating the implementation of a traffic and transport study for the Nowra and Bomaderry townships and if required, identifying a suitable longer term solution to improve connectivity between Bomaderry and Nowra following the implementation of short and medium traffic management solutions.
- Investigate the suitability and need of the bypass corridor through Milton and Ulladulla and determine what benefits this would provide to the network, efficiency and safety through the Milton and Ulladulla town centres.
- Undertake a route safety study between Eden and the Victorian Border to identify:
  - Minor improvements including the installation of tactile line marking, widening shoulders and clear zones including the outside of curves and installing safety barriers and centre median treatments.
  - Treatments to target 'Off Road on Curve' type crashes on curves with high speed zones.
- Prioritise any remaining sections of the corridor that continue to be a constraint to Restricted Access Vehicles including narrow bridges, culverts, lane and shoulder width.
- A long term aspiration will be to upgrade all narrow bridges to facilitate efficient freight movement and improve safety.

Albion Park Rail - Northbound

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1 A QUICK OVERVIEW

Mount Pleasant lookout – Southbound

The Princes Highway, running north to south, links Sydney and the Illawarra Region with the NSW South Coast and beyond to the Gippsland region of Victoria. This corridor strategy sets out how the NSW Government will manage road transport along the Princes Highway in the long-term – from the southern end of the M1 at Yallah to the Victorian Border.

The corridor strategy will be delivered over a 20 year timeframe, in line with the *NSW Long Term Transport Master Plan*, Regional Transport Plans and other relevant national and State planning frameworks. From road safety and transport efficiency to asset maintenance issues, this strategy sets the direction for managing the Princes Highway into the future.

The section of the Princes Highway covered in this corridor strategy connects the southern end of the M1 Motorway at Yallah, which is just to the north of Albion Park Rail and approximately 20 kilometres south of Wollongong with the Victorian Border, south of Eden as well as towns along its length. These include Berry, Nowra, Milton & Ulladulla, Batemans Bay, Moruya, Narooma, Bega and Eden. The Princes Highway intersects with the Illawarra Highway, the Braidwood-Nowra Road, the Kings Highway and the Snowy Mountains Highway.

The strategy covers the Princes Highway between Yallah and the Victorian border – 422.6 kilometres passing through five local government areas in two *NSW Long Term Transport Master Plan* regions – the Illawarra and Southern Regions.

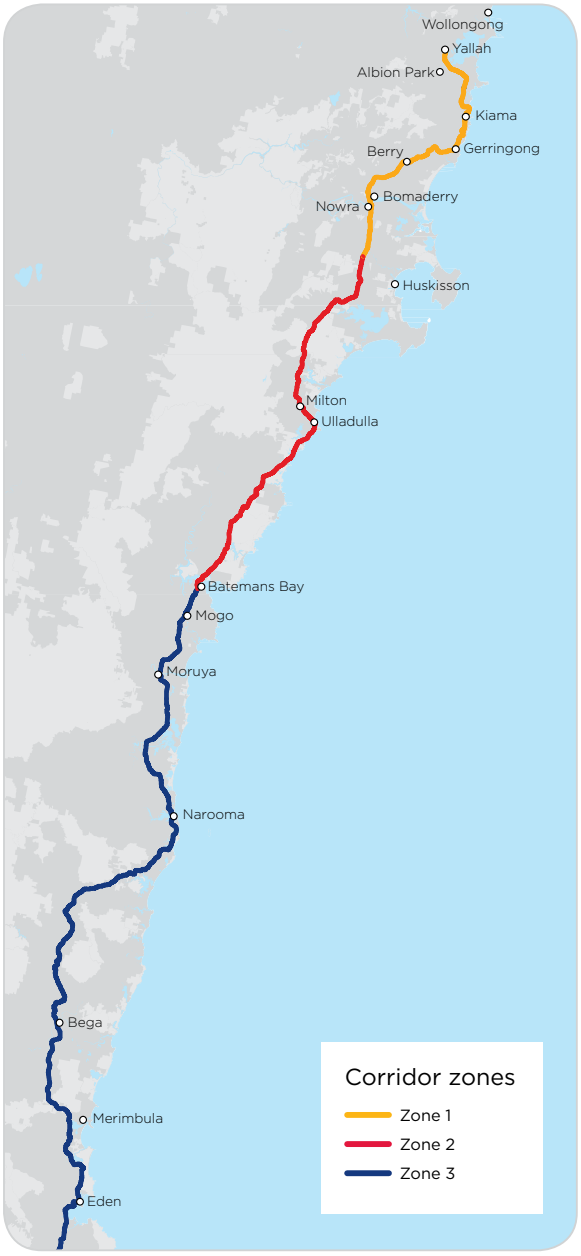
Figure 1-1 Princes Highway Corridor

> The Princes Highway between Yallah and the Victorian border is constrained by the Great Dividing Range and the coastline, and weaves through a range of natural and built landforms, from urban centres to open farmland and forested areas.

The Princes Highway has been divided into three zones because of its length and the distinct function it performs. The Princes Highway Corridor zones are:

- **Zone 1** – Yallah to Jervis Bay Road turnoff (72.2 kilometres) – Zone 1 at the northern end of the corridor has the highest traffic volumes and services the two main urban centres of Albion Park Rail and Nowra. This zone also serves an important commuter and freight function. This zone has the highest standard of road and is progressively being upgraded to a four lane highway.
- **Zone 2** – Jervis Bay Road turnoff to Batemans Bay (106 kilometres) – This zone has lower traffic volumes than zone one and services the medium size urban centres along its length. This zone performs an important tourist function as well as freight and commuter function to a lesser extent than zone one.
- **Zone 3** – Batemans Bay to Victorian Border (244.4 kilometres) – Zone three is the longest zone and typically has lower traffic volumes servicing some of the less populated urban centres. This zone has lower freight and public transport travel compared to zones one and two.

Figure 1-2 Zones within the Princes Highway corridor



The Princes Highway provides:

- A connection from the towns of the lower Illawarra and South Coast to Wollongong and Sydney to the north and Victoria to the south.
- A freight link, connecting the lower Illawarra and the South Coast to Port Kembla, Wollongong and Sydney.
- Connection to key road corridors including Illawarra Highway, the Braidwood-Nowra Road, the Kings Highway and the Snowy Mountains Highway.
- A route for inter-regional business, tourism and leisure travel including tourism and local business access to towns such as Shellharbour, Kiama, Nowra, Ulladulla, Batemans Bay, Moruya, Narooma, Bega and Eden.
- Local access to jobs, shops, education, community services, health care and tourism facilities within towns and centres.

The Princes Highway between Yallah and the Victorian border is constrained by the Great Dividing Range and the coastline, and weaves through a range of natural and built landforms, from urban centres to open farmland and forested areas.

Traffic volumes vary along the route, with 2013 average daily traffic volumes of approximately 60,000 vehicles per day north of Albion Park Rail and just under 1,000 vehicles per day near the Victorian border. However, the attraction of the south coast as a tourist destination results in seasonal peaks and associated traffic congestion, with up to double the average traffic volumes occurring along sections of the corridor. The proportion of heavy vehicles along the Princes Highway generally ranges between 8% and 13% however this increases to 25% near the Victorian border, where forestry industry traffic to the port of Eden is prominent and general traffic is light.

A variety of road safety issues are evident along the corridor with a significant percentage (29.8%) of crashes in the rural sections made up of run off road type crashes on curves. These crashes are particularly evident in the southern section of the corridor. There is also a high number of rear end type crashes through the urban centres especially through Nowra. Speeding is one of the key contributing factors to crashes on the Princes Highway with 30.8% of crashes having speed as a contributing factor.

There are 1658 culverts along the Princes Highway corridor and approximately 200 bridges. The health and maintenance priority of these bridges and culverts is an ongoing challenge for the Princes Highway.

The range of heavy vehicle types along the entire route is diverse, ranging from light trucks to 19 metre B-doubles. 26 metre B-doubles are restricted to the northern and southern extremities of the route, mainly because of geometric constraints on the Princes Highway and potential risks associated with critical infrastructure, particularly bridges.

The NSW government has a number of planning frameworks which guide and support transport improvements to the challenges identified on the road transport network.

In particular, one of the *NSW Freight and Ports Strategy* key actions is to improve productivity of the road freight network by providing necessary infrastructure to support and improve High Productivity Vehicle (HPV) access. This strategy supports greater HPV access, including the need to address “higher mass limit” (HML) and B-double access restrictions between Nowra and Bega.

This corridor strategy sets out the objectives, current performance, current and future challenges and the NSW Government’s strategy for managing the Princes Highway corridor over the long term.

1.1 Recent major achievements on the Princes Highway Corridor

South Nowra Upgrade: The $72 million upgrade of the Princes Highway at South Nowra was officially opened in March 2014. The 6.3 kilometre Princes Highway upgrade between Kinghorne Street and Forest Road has improved traffic flow for both local and 'through' travelling motorists on this busy section of the Princes Highway.

The completion of this highway upgrade is another step towards the NSW Government achieving its commitment to provide two lanes in each direction from Waterfall to Jervis Bay Road.

Victoria Creek: The $35 million upgrade of the Princes Highway at Victoria Creek was opened in March 2013. The project provided a 3.2 kilometre upgrade to the highway between Narooma Road and Corkhill Drive at Central Tilba, 13 kilometres south of Narooma. In addition to addressing the road safety concerns associated with a number of tight curves, the project added north and southbound overtaking lanes and a new bridge structure.

Bega Bypass: The $55 million Princes Highway upgrade at Bega was opened in December 2013. In addition to providing two lanes in each direction with median separation, the 3.5 kilometre bypass allows heavy vehicles to bypass the town centre. The bypass is suitable for 26 metre B-double vehicles.

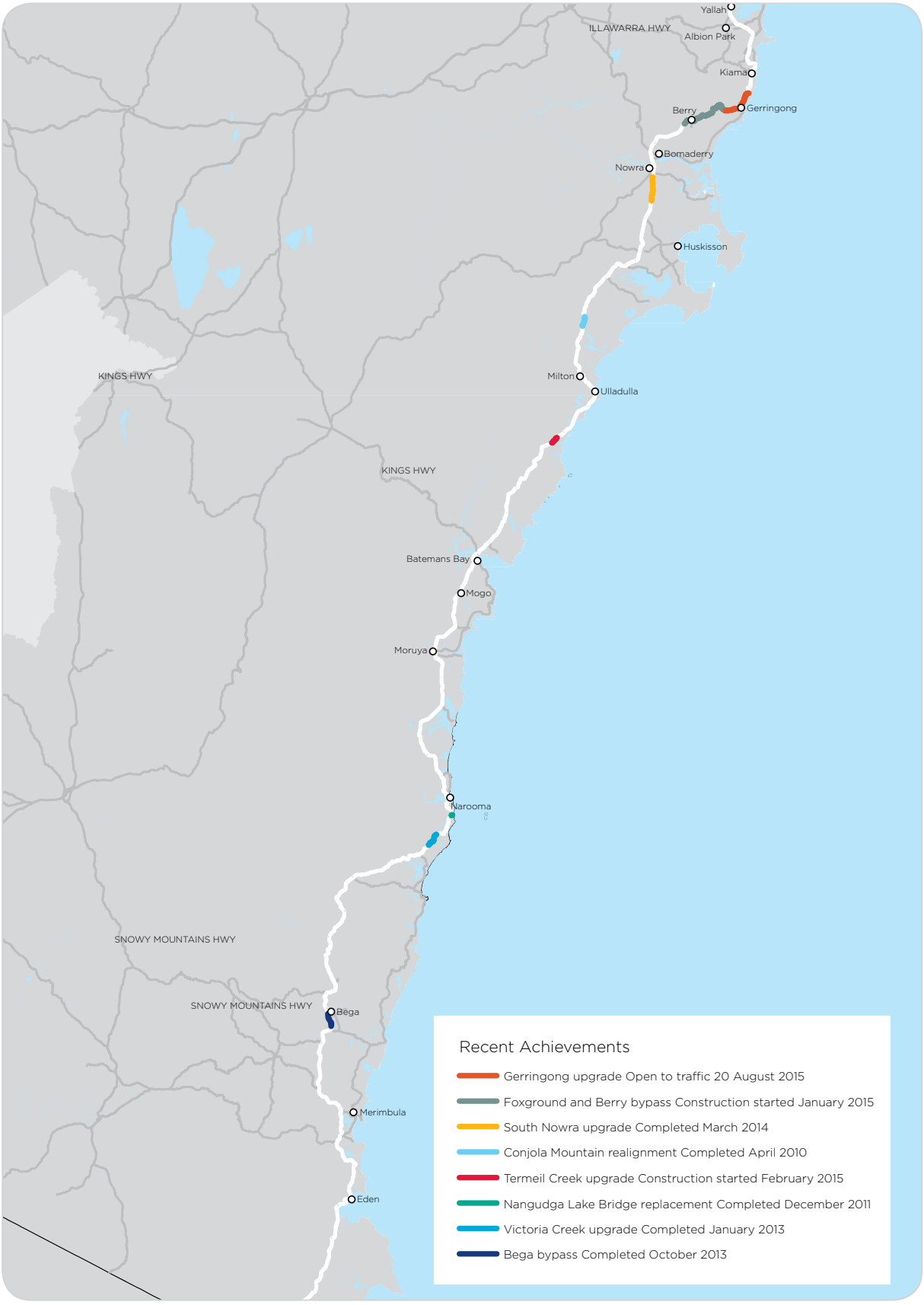
Gerringong upgrade (Under construction): The NSW Government has funded an upgrade of the Princes Highway between Mount Pleasant lookout and Toolijooa Road. The $340 million upgrade includes two interchanges with access to the towns of Gerringong and Gerroa. An important component in meeting the commitment of two lanes in each direction along the Princes Highway south to Jervis Bay Road. The project was officially open to traffic on 20 August 2015.

Foxground and Berry bypass: The $580 million Foxground and Berry bypass project is the second stage of the planned Princes Highway upgrade between Gerringong and Bomaderry. The project will provide two lanes in each direction with median separation for 11.6 kilometres of the highway between Toolijooa Road and Schofields Lane. The upgrade will include a bypass of a number of substandard curves at Foxground and a bypass of Berry with access ramps to the north and south of the town. This project is now under construction.

Termeil Creek Realignment (Under construction): Roads and Maritime Services is upgrading the Princes Highway at Termeil Creek which will be built to modern highway standards. The NSW Government has allocated $12 million this financial year (2015/16) to construct the highway upgrade. Roads and Maritime proposes to realign approximately 1.6 kilometres of the Princes Highway to modern highway standards.

Nangudga Lake Bridge Replacement: A $3.7 million project to replace the Nangudga Lake Bridge, south of Narooma. Work was completed in 2011. The new bridge is about 21 metres long, 12.2 metres wide with 3.5 metre lanes and a two metre shoulder for cyclists in each direction.

Figure 1-3 Major achievements on the Princes Highway – 2010 to 2015



2 INTRODUCTION

Kings Highway Intersection – Southbound

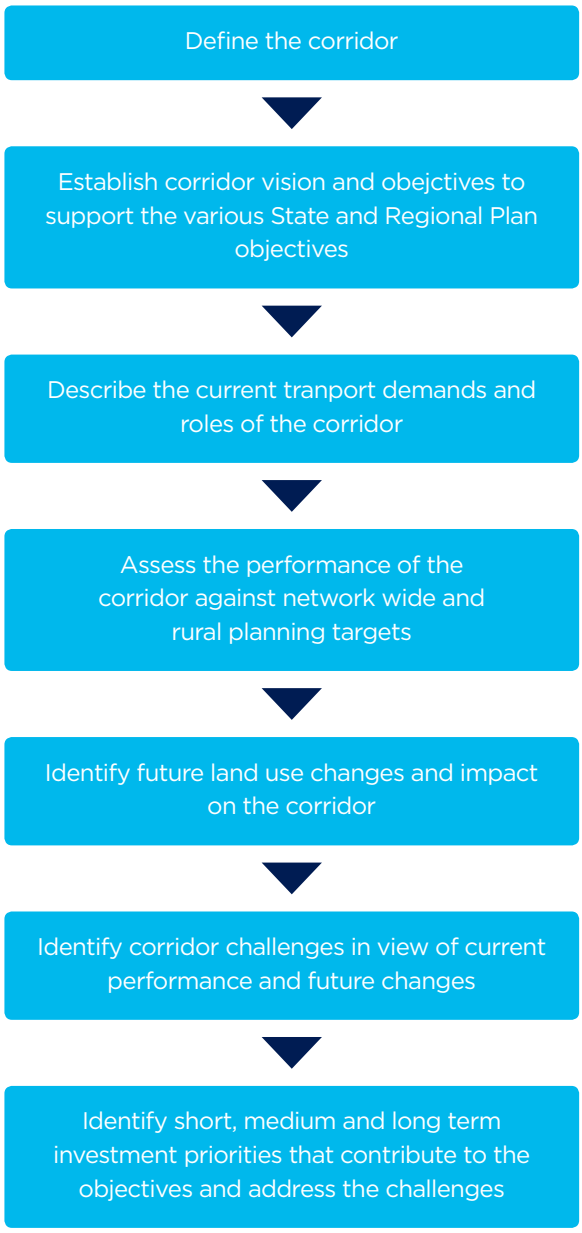
2.1 Why a corridor strategy?

Transport for NSW and Roads and Maritime Services (Roads and Maritime) are progressively preparing corridor strategies for every State road in NSW to create consistency in the way that the State Road Network is managed and planned.

- Corridor strategies make planning and investment decisions transparent to the community, councils and other government agencies.
- Drawing together a variety of elements, as shown in **Figure 2-1**, corridor strategies identify:
  - Corridor-specific objectives that support the *NSW Long Term Transport Master Plan* and *Regional Transport Plans* (and other State and National plans).
  - The performance of transport infrastructure in meeting the corridor-specific objectives.
  - Current and future challenges in meeting these corridor-specific objectives.
  - Key transport demands likely to be placed on the corridor over the next 20 years.
  - Short, medium and long term priorities and actions to manage the corridor.

Corridor strategies include priorities for future road maintenance, operation, safety, traffic and development. They set a 20 year framework, which brings together road safety, traffic efficiency and asset management activities, together with policy in relation to freight access.

Figure 2-1 Corridor planning process



Why the Princes Highway?

The Princes Highway is a vital transport corridor linking the South Coast and the Illawarra regions with Sydney to the north and Victoria to the south. Both the Illawarra Regional Transport Plan and the Southern Regional Transport Plan recognise the Princes Highway as one of the main transport corridors providing freight and passenger movements to and from these regions as well as facilitating travel within these regions.

The *NSW Long Term Transport Master Plan* identifies the importance of the Princes Highway corridor and its role to connect towns on the south coast to Wollongong and Sydney. The corridor supports the south coast tourist travel demand of which the majority of travel is along the Princes Highway creating localised congestion at urban centres along the length of the corridor.

Over the next 20 years population growth is forecast in the Illawarra region at or above the state average. This will be combined with growth in major urban areas further to the south such as Nowra and Bomaderry. With limited public transport options, cars are the primary mode of transport across the Illawarra region with about 88 percent of journeys to work made by private motor vehicle.

The Princes Highway provides a key link to Port Kembla and with the NSW freight task expecting to nearly double by 2031, there will be a significant growth in freight movements on road in the Southern and Illawarra regions. In order to increase freight productivity, the Princes Highway will need to support high productivity vehicles, including the need to address "higher mass limit" (HML) and B-double access restrictions between Nowra and Bega.

There are a number of current road safety, transport efficiency and asset maintenance issues along the Princes Highway that need to be addressed. These include issues such narrow lanes and/or narrow sealed shoulders, steep grades and tight curves, high traffic volumes through town and village centres and the condition of some key bridges along the corridor.

This corridor strategy will also identify these road safety, maintenance and traffic challenges and actions at local and regional levels with the aim to identify and maintain those sections of the Princes Highway that are performing satisfactorily and identify areas which require improvement in order to meet the Government's strategic goals for the NSW State Road network.

Process and methodology

This corridor strategy has been prepared by a multidisciplinary project team from Transport for NSW and Roads and Maritime with expertise in road safety, traffic, asset management, land use, environment, planning and development.

It draws on assessments of the Princes Highway's road conditions, traffic and safety carried out by both agencies. The corridor has been identified by describing its location and geography, key demand drivers and the transport role it fulfils. Transport for NSW and Roads and Maritime asset, traffic and safety data has been analysed to determine current levels of performance.

The corridor has been considered within the broader strategic planning context provided by key national, state and local government planning documents. Current population and employment data, together with future land-use plans for the corridor, have been sourced from the NSW Department of Planning and Environment, along with relevant local council documents and 2011 Australian Bureau of Statistics (ABS) Census data.

2.2 Planning frameworks

The NSW Government has made fundamental changes to infrastructure planning and investment. These changes ensure funding is allocated towards initiatives that deliver the best value, based on compelling evidence. Following this approach, a number of new 20 year plans have been developed to guide the State's future, including the *NSW Long Term Transport Master Plan* . Each of these plans contributes to achieving the goals of *NSW 2021* – to ensure a coordinated and community-driven approach to planning.

Premier's Priorities and State Priorities

The NSW Government has recently announced 30 priorities, or reforms, to grow the economy, deliver infrastructure, and improve health, education and other services across NSW. Of these priorities, 12 are the Premier's personal priorities. The Princes Highway Corridor Strategy contributes to achieving the following State priority:

- **Reducing road fatalities: Reduce road fatalities by at least 30 per cent from 2011 levels by 2021**

Corridor Strategy: supporting safety improvements such as road realignments, wider clear zones, wider sealed shoulders and lanes to improve the road safety outcomes for all road users.

NSW Long Term Transport Master Plan

The Master Plan outlines a clear framework to address transport challenges in NSW over the next 20 years. For the first time, it integrates planning for roads, freight and all other modes of transport and sets out initiatives, solutions and actions to meet NSW transport challenges.

- A key aim of the Master Plan is to provide **essential access for regional NSW.**

The Princes Highway Corridor Strategy advances this objective by supporting safe and efficient connections along the Princes Highway corridor to meet new travel demands, to provide access to vital services, to sustain local employment growth and to manage an increasing freight task in the NSW regions.

- The Master Plan also sets as a priority the need to support an **efficient and productive freight industry.**

This Corridor Strategy includes actions to improve the road capacity, efficiency and productivity of the Princes Highway Corridor to maintain regional industry's competitive edge and provide better access for the freight industry to the south coast.

Figure 2-2 shows how the Master Plan integrates with other NSW plans to ensure a coherent, whole-of-government approach is taken to transport planning.

Figure 2-2 Planning framework

Regional Action Plans

NSW Regional Action Plans relevant to the Princes Highway includes those for the Illawarra/South Coast and South East. Each Regional Action Plan identifies immediate actions the NSW Government will prioritise in each of the areas.

The most relevant regional priorities and actions for both regions are to provide accessible, efficient and integrated regional transport. The Illawarra/South Coast region also includes as a priority to deliver infrastructure to support population needs. The NSW Government will achieve this through the development of long term transport strategies that improve access to employment, business opportunities and services, deliver road infrastructure upgrades and manage local congestion issues, improve road safety and freight access and movement to and from the region. Also to undertake thorough and strategic regional planning for infrastructure (including transport) and land use in consultation with the community.

The two year Regional Action Plans will complement long term strategies, such as Regional Transport Plans.

Regional Plans

The NSW Department of Planning and Environment (DPE) is currently working to review the existing NSW Regional Strategies to prepare new Regional Plans for the regional areas within NSW. The Regional Plans are being developed to plan for NSW's future population needs for housing, jobs, infrastructure and a healthy environment[1].

The Illawarra-Shoalhaven Regional Plan has been approved and will guide strategic planning for the Illawarra region over the next 20 years. Some key things the new plan is focused on include:

- delivering greater housing choice
- growing greater capacity of the port of Port Kembla
- develop strong and vibrant communities through improved public transport and urban design.

The South East and Tablelands Region is currently on exhibition and feedback is being sought on the Draft South East and Tablelands Regional Plan.

1 http://www.planning.nsw.gov.au/en/Plans-for-Your-Area/Regional-Plans#

NSW State Infrastructure Strategy

In November 2014, the NSW Government delivered a new State Infrastructure Strategy, fully adopting the recommendations proposed by Infrastructure NSW and following extensive analysis and consultation.

The strategy highlights the importance of sustaining productivity growth in the major centres and regional communities of NSW, as well as supporting population growth towards more than nine million people in NSW. Good transport infrastructure helps people get to where they are going quickly and safely, and ensures regional producers can get goods to market on time and cost effectively. This brings social and economic dividends to regional communities.

The NSW Government's strategic priorities for regional transport that are relevant to the Princes Highway Corridor Strategy are:

- Improving the connectivity within and around regional centres
- Building on the major projects already underway, including funding from the $1 billion Regional Growth Roads reservation program for roads south of Wollongong.

NSW Freight and Ports Strategy

The *NSW Freight and Ports Strategy* aims to create a transport network where goods move efficiently to their markets.

The corridor strategy contributes to the following freight-specific objectives and reflects the importance of the freight transport network in creating a competitive and productive NSW economy.

- Delivery of a freight network that efficiently supports the projected growth of the NSW economy. The corridor strategy identifies inefficiencies on the road network through performance assessment of traffic, safety and asset data on the Princes Highway and aims to address some of the barriers restricting access for High Productivity Vehicles, such as the assessment of bridges on the Princes Highway.
- Balancing of freight needs with those of the broader community and the environment. The corridor strategy supports freight movement along the Princes Highway. It contributes to improvements in road safety of freight transport through provision of heavy vehicle rest areas and by progressively enhancing the corridor by providing wider clear zones, wider sealed shoulders and lanes.

NSW Road Safety Strategy

The *NSW Road Safety Strategy 2012-2021* sets the direction of road safety in NSW for this time period. NSW is committed to reducing fatalities to at least 4.3 per 100,000 population by 2016 together with at least a 30 per cent reduction in fatalities and serious injuries between 2012 and 2021.

The Road Safety Strategy is underpinned by the Safe Systems approach to improving road safety. This takes a holistic view of the road transport system and interactions among the key components of that system – the road user, the roads and roadsides, the vehicle and travel speeds. It recognises that all of these components have a role to play in helping to keep road users safe.

This corridor strategy contributes to implementing the Safe Systems approach through assessing the corridor's current performance in terms of casualty crash rates, crash types and contributing factors. The corridor strategy supports road safety infrastructure improvements, such as road realignments, wider clear zones, wider sealed shoulders and lanes, improving intersection layouts and the provision of rest areas and stopping bays to reduce the number and severity of crashes along the corridor, in particular those related to speed, wet road surface and driver fatigue.

Regional Transport Plans

Regional Transport Plans are built on the strategic direction, initiatives and state-wide context set by the Master Plan. The Illawarra and Southern Regional Transport Plans identify specific challenges the regions' transport networks face and prioritise actions to address these challenges.

They include actions and projects that will deliver better transport services, ensure effective regulation and improve transport infrastructure over the short (0-5 years), medium (5-10 years) and long (10-20 years) term.

Some of the key initiatives in the Illawarra and Southern Regional Transport Plans are:

- Continue investment in the Illawarra road network with ongoing upgrades of the Princes Highway to meet the objective of four lanes between Sydney and the Jervis Bay Road turnoff, which will increase capacity, improve traffic flow, reduce travel time and improve road safety. The upgrade will provide enhanced freight connectivity to Port Kembla.
- Investment in safety improvements and overtaking lanes south of Jervis Bay Road.
- Improve road safety by progressing the actions of the NSW Road Safety Strategy 2012-21 to achieve the NSW 2021 target of reducing fatalities to 4.3 per 100,000 population by 2016.
- Manage demand and deliver road upgrades to support growth by delivering a program of arterial road construction and major road upgrades as population and employment grows in regional cities and areas boost the demand for road travel, bus services and freight transport.
- Improve tourism-related transport services for holiday periods through various initiatives.
- Support local councils to establish park and ride facilities.
- Identify, preserve and protect future transport corridors to provide the right transport services and infrastructure where and when they are needed in line with growth and development.
- Invest in walking and cycling infrastructure through the Walking Communities Program, Connecting Centres Program and Cycling Towns Program, and by working together with local government.
- Improve cross-border connectivity by continuing to work with the Victorian government to align state regulations.
- Improve regional bus services and work in partnership with local bus operators to introduce a more robust contractual framework for local and regional buses and to develop routes and timetables which improve services for customers.

Figure 2-3 shows how the Regional Transport Plans are linked to specific mode plans and road corridor strategies to improve regional connections.

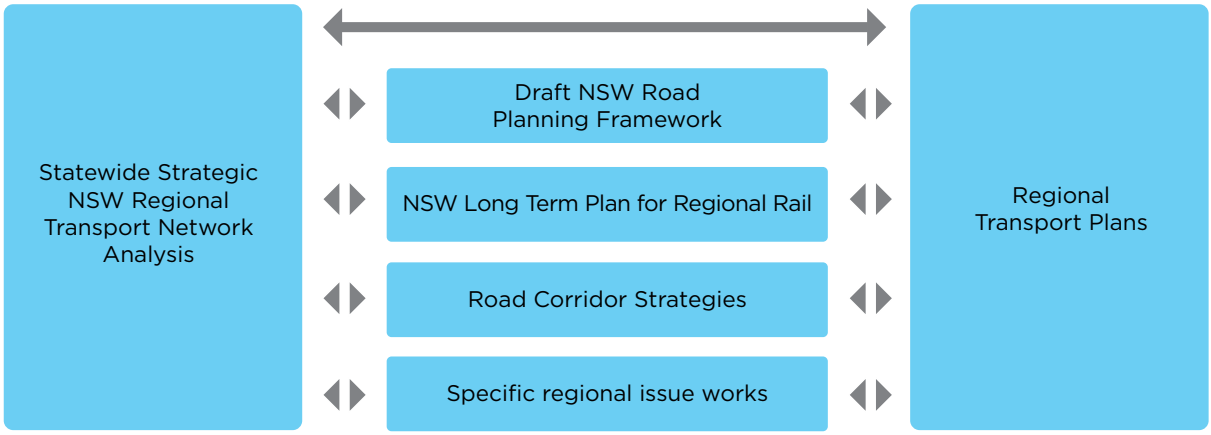
Draft NSW Road Planning Framework

The draft NSW Road Planning Framework has been developed to provide a framework for road planning in NSW. It acknowledges the important inter-relationship between transport and land use in supporting sustainable long-term growth and prosperity. The framework sets the strategic direction for improving our customers' journey experience through focusing on what our customers are telling us they need to improve their journeys.

The framework provides a:

- Consolidation of road planning principles
- Framework for integrating land use and transport
- Suite of performance measures that informs a multi-modal evidence base to guide future investment decisions and the allocation of road space
- 'Right mode for the right road' approach, identifying the function of our roads and balances priorities to improve the journeys of our customers.

Figure 2-3 Relationship with Regional Transport Plans



National infrastructure priorities

The Australian Government has identified three objectives to drive the development of a long term, coordinated national approach to infrastructure planning and investment:

- Increase the economic standard of living for Australians;
- Achieve environmental sustainability and reduced greenhouse gas emissions; and
- Improve social outcomes, quality of life and reduced social disadvantage in our cities and regions.

To achieve these objectives, seven strategic priorities have been identified. This corridor strategy supports the following Infrastructure Australia's strategic priorities:

1. Expanding Australia's productive capacity;
2. Increasing Australia's productivity;
3. Diversifying Australia's economic capabilities;
4. Building on Australia's global competitive advantages;
5. Developing Australia's cities and regions;
6. Reducing greenhouse emissions; and
7. Improving social equity and quality of life in our cities and regions.

2.3 Key corridor challenges and issues

The Princes Highway corridor issues and challenges are either already evident or are expected to emerge as a result of future changes and transport demands. These issues need to be overcome to maintain and the Princes Highway's roles and services for the community.

The key corridor issues evident on the highway provide a basis of determining corridor objectives and vision statements.

A summary of the key corridor issues and challenges is below:

- Maintaining safe and stable traffic flow in urban centres along the corridor and managing the effects of seasonal peak traffic.
- Providing access for High Productivity Vehicles (HPV) to the entire corridor, particularly 26 metre B-doubles which are currently restricted to the northern and southern extremities of the route.
- Some sections of the highway, particularly towards the southern end of the corridor have road alignment, lane width and pavement life issues.

- Risk of road closures and extensive delays as a result of flooding, closure of bridges or major incidents on the highway.
- Balancing the demand of local and through traffic with urban amenity in pedestrian and vehicle conflict areas at Nowra, Milton-Ulladulla, Narooma and Eden.
- Improving road safety in both the urban and rural sections of the corridor.

Key challenges and issues on the Princes Highway corridor are further discussed in Chapter 6 following detailed performance analysis in Chapter 5 of this document.

2.4 Corridor objectives

The key corridor challenges and issues are used to determine corridor objectives for the Princes Highway. These objectives are specific tasks that are required to address the identified issues along the Princes Highway.

The specific corridor objectives are in line with the following *NSW Long Term Transport Master Plan* objectives as shown below.

NSW LONG TERM TRANSPORT MASTER PLAN OBJECTIVES

- **Improve quality of service**: by putting the customer at the centre of transport planning and service delivery, improving the quality of travel experiences, offering more travel choices and providing integrated services that directly meet travel requirements.
- **Improve liveability:** by improving connectivity, customer service and ease of movement in our major cities and activity centres.
- **Support economic growth and productivity:** by providing a transport system that responds directly to customer needs, is more efficient, increases freight efficiency and improves the connectivity and accessibility of people to other people, opportunities, goods and services.
- **Support regional development:** by improving accessibility to jobs, services and people, improving freight connections to markets and providing better links between clusters of business activity.
- **Improve safety and security:** by placing a high priority on addressing the causes and risks of transport accidents and security incidents.
- **Reduce social disadvantage:** by reducing transport disadvantage through improved access to goods, services and employment and education opportunities for people across all parts of the State.
- **Improve sustainability:** by optimising the use of the transport network, easing congestion, growing the proportion of travel by sustainable modes such as public transport, walking and cycling and becoming more energy efficient.
- **Strengthen transport planning processes:** by improving integrated transport planning processes and identifying areas where evidence should be collated for future decision making and continually improving governance and administration of the transport system.

Figure 2-4 Meeting the Master Plan's Objectives: the Princes Highway Corridor

The Princes Highway Corridor Strategy specific objectives will guide the corridor's long term management.

These are mapped against the *NSW Long Term Transport Master Plan* objectives in Table 2-1.

Table 2-1 Meeting the Master Plan's Objectives: the Princes Highway Corridor

NSW Long Term Transport Master Plan objectives	Princes Highway Corridor Strategy objectives
Improve liveability Reduce social disadvantage	• Minimise disruption for road users during road construction between Gerringong and Nowra • Manage the road network so that it provides for reliable travel during peak traffic periods (including holiday peak periods) and road incidents, particularly though the urban centres of Albion Park Rail and Nowra • Work in partnership with local government and the community to provide appropriate access to facilities and infrastructure for all road users including public transport users, pedestrians and cyclists in towns
Economic growth / productivity	• Enable access for PBS class 2(B) vehicles up to 30 metres long and 85t south to BTU Road in Nowra and PBS class 2(A) up to 26 metres long including B-double access at HML between BTU Road and the Victorian Border • Continue to provide an appropriate number and standard of heavy vehicle rest areas • Support freight access to Port of Eden • Address bridges preventing B-double access operating at HML, including but not limited to the replacement of bridges over the Shoalhaven River at Nowra (Southbound only), Wagonga Inlet Bridge and Clyde River Bridge. • Address nuisance flooding and the impacts of climate change in the most vulnerable low lying sections of the corridor at Albion Park, Ulladulla, Moruya, Narooma and Eden
Regional development / accessibility	• Provide adequate emergency access in the event of natural disasters such as flooding or bushfires, and serious vehicle crashes • Sustainably manage the asset condition and improve pavement remaining life • Improve overtaking opportunities between Jervis Bay Road and the Victorian border to maintain stable traffic flow conditions and improve road safety by reducing unsafe overtaking
Improve sustainability	• Balance the demand of local and through traffic with urban amenity in high pedestrian and vehicle conflict areas at Nowra, Milton-Ulladulla and Narooma. • Balance the need to provide six metre wide road side clear zones along rural sections of the corridor and 10 metre wide road side clear zone on the outside of the substandard curves, against impacts on high conservation environments

NSW Long Term Transport Master Plan objectives	Princes Highway Corridor Strategy objectives
Safety and security	• Implement the Safe Systems Approach and behavioural campaigns to reduce the number and severity of crashes along the corridor, in particular related to speed, wet road surface and driver fatigue • Improve the road safety outcomes by widening sections of the corridor with narrow lanes and narrow sealed shoulders and prioritising the installation of suitable medians treatments aimed at addressing specific crash types particularly between Moruya and Narooma
Improve transport integration process	• Plan for the infrastructure to support present and future land-use development, particularly around emerging residential, commercial, port, defence and tourist areas • Work with key stakeholders including Councils to support land use planning activities along the corridor

2.5 A vision for the future

The vision for the future explains what actions should be achieved on the Princes Highway over the next 20 years in order to improve the performance of the highway and meet the specific corridor objectives.

The vision for Princes Highway over the next 20 years is to:

- Provide **freight access** for Performance Based Standards (PBS) class 2(B) vehicles (up to 30 metres long and 85 tonnes) south to BTU Road in South Nowra, and to allow PBS class 2(A) vehicles (up to 26 metres long including B-double access) at Higher Mass Limits for the remainder of the corridor.
- Provide four lane divided carriageway north of Nowra in the short to medium term, and **manage through and local traffic issues** for major urban centres along the corridor, particularly at Albion Park Rail and Nowra.
- Provide **improved safety and efficiency** through wider clear zones, wider sealed shoulders and lanes and realigned road with smaller grades and smoother curves.
- **Maintain connectivity and safe access** along the Princes Highway in low lying areas (below four metres Australia Height Datum) and within four kilometres of the coastline in response to climate change and flooding.
- **Support the efficient management** of planned and unplanned incidents including safe access for emergency vehicles.
- Recognise the corridor to have **national importance** linking Port Kembla to Sydney and south to Jervis Bay Road.
- **Support public transport** connectivity between lower Illawarra and South Coast.

2.6 Taking action

The key challenges for the Princes Highway corridor will be progressively addressed through short, medium and long term improvements, in line with the Regional Transport Plans and the *NSW Long Term Transport Master Plan* as shown below. These actions will ensure that the objectives and vision for the Princes Highway are achieved. The Princes Highway priorities for responding to these challenges are explained in Chapter 7.

SPECIFIC ACTIONS RELEVANT TO THE PRINCES HIGHWAY CORRIDOR IN THE NSW LONG TERM TRANSPORT MASTER PLAN, THE REGIONAL TRANSPORT PLANS and the *NSW FREIGHT AND PORTS STRATEGY*:

Short term (0-5 years)

- Upgrade the Princes Highway (A1) between Gerringong and Bomaderry, including the construction of the Foxground and Berry Bypass. The upgrade will provide enhanced freight connectivity to Port Kembla.
- Princes Highway improvements to safety and capacity will offer an opportunity to strengthen the connections between centres along the coast from Nowra in the Illawarra region to Eden in the Southern Region.
- Support opportunities to strengthen bus operations in major regional centres as well as improve connections between regional communities. This will require suitable interchange locations and supporting infrastructure.

Medium term (5-10 years) to longer term (10-20 years)

- Continue to enhance and expand bus services and strategic bus corridors to reflect developing demand and land use changes.
- Continue investment in the urban road network to address capacity constraints that impact on travel time reliability and public transport operations.
- Seek to establish connections to the South Coast – with upgrade works to the Princes Highway (A1) as required.
- We will deliver previously identified regional road upgrades to support the planned growth around the new release areas of West Dapto, Calderwood and Tallawarra, including the widening of the Princes Motorway (M1) and a number of new ramps and interchanges on the Princes Motorway (M1).
- Improve pedestrian facilities in Nowra on the Princes Highway.
- The Rural Highway Program will continue investment in the Princes Highway to address capacity constraints and road safety issues as they emerge.
- Improve access for Higher Productivity Vehicles on State and Local Roads.

3 COMMUNITY INVOLVEMENT

Nungarry Rest Area

In recent years a significant amount of community engagement has been carried out along the Princes Highway Corridor. The large majority of this has been linked to the infrastructure projects which have now been completed, as discussed in the Recent Major Achievements (section 1.1), or are in the development phase. Some of the completed projects include the South Nowra Upgrade, Victoria Creek Highway Improvements and the Bega Bypass. Some of the major works currently in planning and development include the Albion Park Rail Bypass and the duplication of the Shoalhaven River Bridge, both of which have been through an extensive community and stakeholder engagement process.

This chapter summarises the key customers along the Princes Highway corridor, the consultation outcomes and describes how the findings have been used during the development of the Princes Highway Corridor Strategy. Involvement from the community during the exhibition period is invaluable in the development of corridor strategies. Following the exhibition period, a community consultation report will be prepared and presented to the community as an attachment to the final corridor strategy. This submissions report will highlight the feedback received from local communities and all other stakeholders and responses to this feedback.

3.1 An integrated, customer-focused transport network

Customer focus

Improving the customer experience is an important aspect of the NSW Government's commitment to putting the customer at the centre of transport planning and service delivery.

This corridor strategy has been developed within a customer focused framework that identifies the result areas important in meeting customer needs (**Figure 3-1**).

The NSW Government has listened closely to what our transport customers want from the NSW transport system: timely services, reliable connections, comfortable journeys, a genuine choice of travel options and services that respond to where and when they need to travel. In our regions, customers want more flexible and convenient options, and public transport services that keep pace with growing and changing regional cities, towns, communities and industries.

The key customer markets along the Princes Highway are summarised in Table 3-1. The Princes Highway corridor needs to cater for all of the different transport needs of these customer groups.

Figure 3-1 Transport for NSW result areas in the Corporate Framework

Table 3-1 Customer Markets on the Princes Highway Corridor

Key customer markets	Purpose of travel
Motorists (short trips)	Travel for work, education, health, recreation, personal business
Motorists (interregional and interstate trips)	All purposes, predominantly recreation and health
Freight	The movement of goods – e.g. machinery and transport equipment, manufactured goods and articles, mineral fuels & lubricants. Also movement of goods linked to industry such as waste and recycling, agricultural and mining.
Commercial vehicle drivers	Providing trade services, maintenance, repairs, sales, health and community services
Bike riders	Travel for work, education, health, recreation, personal business
Motorcyclists	Travel for work, education, health, recreation, personal business
Pedestrians	Travel for work, education, health, recreation, personal business
Bus passengers	Travel for work, education, health, recreation, personal business

Customer consultation

The *NSW Long Term Transport Master Plan* released in December 2012 involved a wide range of consultation with customers directly affected by the transport network. Feedback raised through the consultation process varied greatly across each region. The Princes Highway corridor is within the Illawarra and Southern regions (**Figure 3-2**).

The community consultation in these regions highlighted a number of important aspects for the Princes Highway:

Illawarra Region

- Illawarra customers saw improved transport connections across the region, from east to west and to Sydney as well as improving intercity connections between Wollongong and Sydney as challenges for the region. Customers also said they wanted a customer-focused transport system that is quick, reliable and affordable as well as improved public security on public transport. Customers also wanted to see improved road safety across the region with a particular focus on Picton Road. Freight issues customers identified in this region were to have a better separation of passenger and freight train lines and encourage road freight onto rail.

Southern Region

- Feedback from customers in the Southern region focused on facilitating access to vital services for an ageing population, identifying and preserving key transport corridors and maintaining regional air services into Sydney. Customers would like to see improvements to road safety and partnering with local councils on freight access and town bypasses as well as thinking about alternative ways to transport people.

The Princes Highway Draft Corridor Strategy was released for public comment between 11 April 2016 and 27 May 2016. It was published on the TfNSW and Roads and Maritime internet websites for viewing by the general public and a process for providing feedback was detailed.

Copies of the Corridor Strategy were mailed to key stakeholders who were invited to provide comment and feedback.

The final Princes Highway Corridor Strategy and the Community Consultation Report, which summarises all the submissions received and the responses by Roads and Maritime, can be viewed on the Transport for NSW website at the following address: http://www.transport.nsw.gov. au/projects-road-network-corridor-planning.

Figure 3-2 *NSW Long Term Transport Master Plan* regional boundaries and intersecting main roads

3.2 The community: road users and different customer segments

The Princes Highway corridor is used in many different ways and there is a wide range of road users. The different road user groups can be expected to have different needs for the road and there is the potential for competing needs to cause conflict between the different groups. It is important to understand the trip types made by the different customer groups to be able to respond to their different travel needs.

A number of road user groups have been considered during the development of this strategy and these are summarised in the sections below.

Commuter groups

This traffic movement is particularly significant near the urban centres and usually characterised by a morning and afternoon peak.

These trips are generally characterised by having one point of access and egress (workplace) and being consistent and repetitive routes. Drivers of these trips are generally familiar with the road.

Car users making local trips

Residents of areas along the Princes Highway make local trips between locations served by the highway for many reasons such as shopping, social activities and access to services.

These trips are generally characterised by being variable and may have multiple points of access and egress with distances travelled on the highway typically short.

Tourists

The Princes Highway Corridor is a popular tourist route and forms part of the Grand Pacific Drive tourist route which provides access to many coastal towns and villages along its entire length. The highway is also used as a scenic alternative when travelling from Sydney to Melbourne and is particularly popular with motor-homes and motorcyclists. Tourism related trips are at their peak during the holiday periods in particular the summer months, Christmas and Easter holidays.

Drivers of these trips are generally less familiar with the road when compared to the commuter groups.

Heavy vehicle drivers

The level of freight on the Princes Highway Corridor varies along its length but generally decreases towards the southern end.

Drivers of these trips have generally travelled long distances and will favour major roads.

Motorcyclists

As mentioned above, the Princes Highway is a popular motorcycling route. The highway acts a scenic alternative to the Hume Highway and is particularly popular with motorcyclists who travel to Philip Island in Victoria for the Grand Prix. The highway also provides access to some east-west links such as the Illawarra Highway, the Kings Highway and the Snowy Mountains Highway which are all very popular with motorcyclists.

Public transport users (buses)

Bus trips including school bus trips are usually focused around the urban centres and decrease as the population decreases towards the south.

The route travelled is generally consistent and repetitive. Bus drivers are familiar with the road however can travel at variable speeds due to frequent slowing, stopping and re-joining traffic at bus stop locations.

Cyclists

Cyclists occasionally travel along the Princes Highway as commuters or for recreation purposes. Cyclists ride in the shoulder in the northern part of the corridor; however access and suitable shoulder widths are limited south of Kiama due to construction works between Gerringong and Berry. Further south beyond Jervis Bay Road suitable cyclist facilities on the highway between urban centres is limited.

Pedestrians

Pedestrian activity is focused around the urban centres that the highway passes directly through. The busiest of these include Albion Park Rail, Berry, Nowra, Milton and Ulladulla. Facilities such as signalised crossings, pedestrian (zebra) crossings and pedestrian refuges are used by pedestrians.

Agricultural vehicles

The Princes Highway passes through agricultural areas and is used by agricultural vehicles.

Agricultural vehicle journeys are typically short local journeys and they may be made by vehicles travelling at slow speeds. It is also noted that agricultural vehicles may be wider than other road vehicles.

Emergency services vehicles

Emergency service vehicles use the Princes Highway as required. At times these vehicles may travel above the posted speed limit.

4 TRANSPORT DEMANDS AND ROLES

Albion Park Rail – Southbound

4.1 The Princes and the surrounding road network

The Princes Highway's transport roles reflect the populations and industries that it passes through which include:

- Supporting travel to and from the region:
  - Forming a coastal cross-border connection to northern Victoria
  - Connecting the towns of the lower Illawarra and South Coast to Wollongong and Sydney to the north and Victoria to the south.
  - Providing a freight link, connecting the lower Illawarra and South Coast.
- Supporting travel within the region:
  - Linking smaller towns to employment, education and services in the larger towns and centres
  - Serving as a route for inter-regional business, tourism and leisure travel.
- Supporting travel in the major centres and towns:
  - Providing tourism and local business access to towns such as Shellharbour, Kiama, Nowra, Ulladulla, Batemans Bay, Moruya, Narooma, Bega and Eden
  - Supporting local access to jobs, shops, education, community services, health care and tourism facilities within towns and centers.

The Princes Highway intersects with a series of road and rail links. The east-west links are important connections with the Princes Highway providing key links for tourist, freight and commuter traffic. The performance of the east-west links can also impact the performance of the Princes Highway especially during an incident or during peak holiday periods. The Princes Highway is also the only land transport corridor south of Bomaderry with the South Coast Rail Line terminating at Bomaderry, just north of the Shoalhaven River. These are summarised in Table 4-1.

Table 4-1 Corridor connections

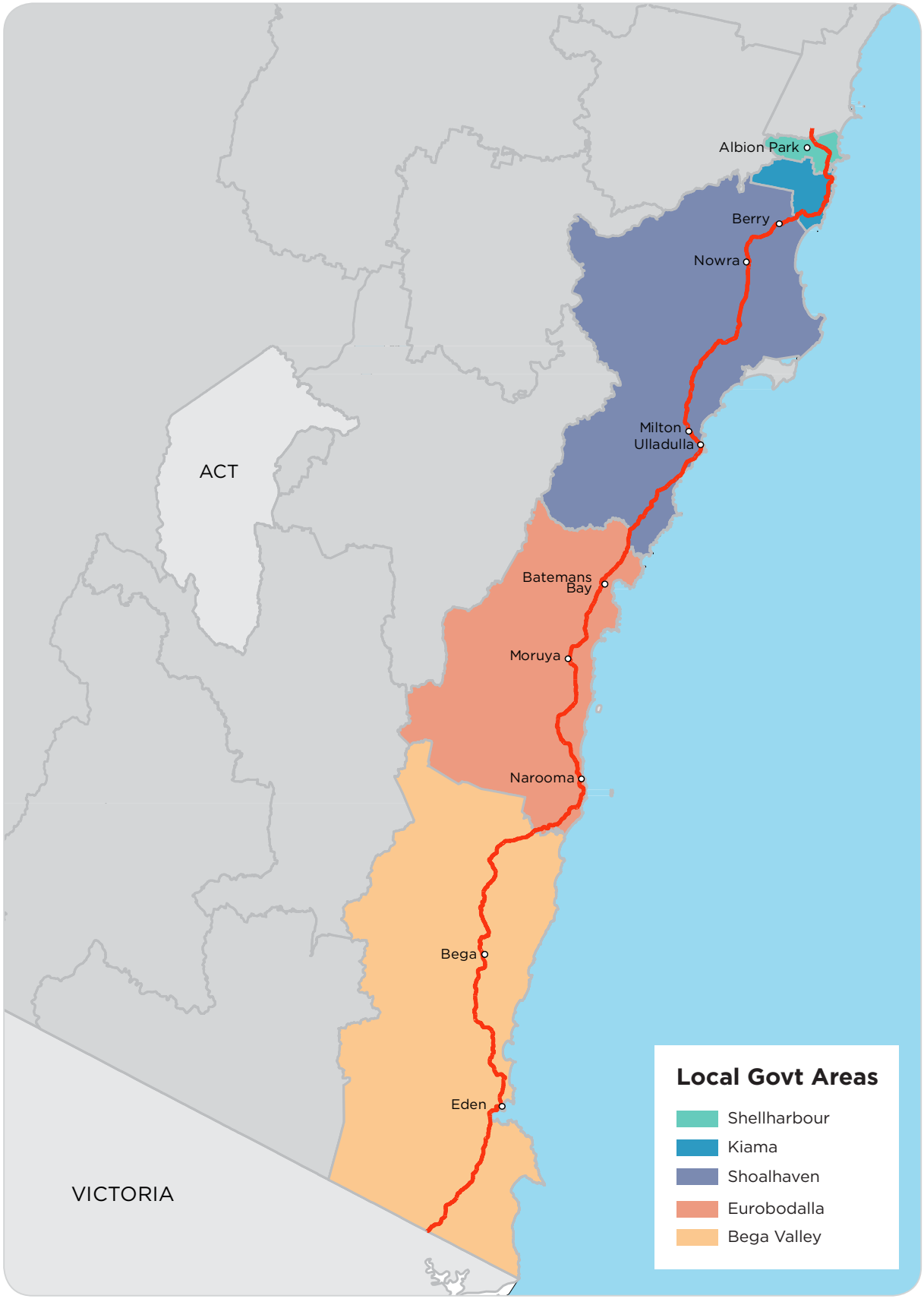
Network connection (North–South)	Transport connection
Illawarra Highway	East–west connection between the Shellharbour local government area and the Southern Tablelands.
Nowra–Moss Vale Road	Connector across the escarpment between the Princes Highway and the Hume Highway.
Nowra-Bomaderry Rail Station	The most southerly rail connection along the corridor providing access to the rail network connecting Kiama, Wollongong and Sydney
Braidwood–Nowra Road	Connector across the escarpment between the Princes Highway and Kings Highway.
Kings Highway	Linking Batemans Bay with Queanbeyan and Canberra.
Snowy Mountains Highway	Connects Bega with the Monaro plains, the snowfields and Kosciuszko National Park and ultimately joins the Hume Highway near Gundagai.

The Princes Highway becomes the Princes Motorway (M1) at Yallah which continues north connecting the South Coast to the northern parts of the Illawarra and then onto Sydney. At the southern end the corridor continues as the Princes Highway into Victoria leading to the Victorian Gippsland Region and on to Melbourne.

The Princes Highway passes directly through or next to the following towns. From north to south (**Figure 4-1**):

- Albion Park Rail within Shellharbour Local Government Area
- Kiama and Gerringong within the Kiama Local Government Area
- Bomaderry, Nowra, Milton & Ulladulla – Shoalhaven Local Government Area
- Batemans Bay, Moruya and Narooma within Eurobodalla Shire Council
- Bega and Eden – within Bega Valley Shire Council

Figure 4-1 Locality Map of the Princes Highway Corridor



Interstate coordination

The Princes Highway is an interstate road corridor linking New South Wales and Victoria and consideration must be given to the coordination that is required between State transport authorities. The Princes Highway provides an important freight link between the forestry and timber industry in north-eastern Victoria to the Port of Eden at the southern end of the Princes Highway Corridor. The South Eastern NSW Road Freight Supply Chain Study conducted in 2010 identified the Princes Highway Corridor as a vital cross border freight connection. The Princes Highway Corridor especially services the East-Gippsland-Bombala plantation which is a 47,000 Hectare plantation primarily made up of softwood trees.

Given the nature of freight and tourist travel across state borders it is important for the aims and objectives of the Princes Highway strategy to remain consistent with the aims and objectives of the Princes Highway strategies developed by the Victorian Government.

The South East Australian Transport Strategy (SEATS) has an interest in projects that go beyond the boundaries of individual council areas. SEATS will assist to provide interstate coordination and part of the consultation process to further develop the Princes Highway Corridor Strategy.

4.2 Current population and employment in the corridor

An estimated 245,000 people live in the local government areas that the Princes Highway corridor passes through, with about 35 per cent of this number in major regional towns and centres within these local government areas.

Population and employment figures for each town within the corridor vary depending on the demographic and community characteristics of each local government area. All current population and demographic data in this section is derived from ABS 2011 census data unless specified.

Key demographic data for each of the major towns is summarised in Table 4-2.

NSW Border – Northbound

Table 4-2 LGA and urban centre demographics

LGA	2011 LGA Population*	% Aged over 65 years	% Aged 0-14 years	Median age	% Labour force employed full time	Main employment by industry in the LGA	Urban Centres	2011 Urban Population
Shellharbour	63,605	21.3	14.2	37	57.1	Basic ferrous metal manufacturing, hospitality, education and healthcare.	Albion Park Rail	7,003
Kiama	19,986	20.6	17.6	45	54.7	School education, hospitality, hospitals, local government administration	Kiama	12,817
Shoalhaven	92,812	23.3	17.7	46	51.4	School education, hospitality, defence, residential care services and supermarket & grocery stores	Nowra-Bomaderry Milton-Ulladulla	27,988 12,137
Eurobodalla	35,741	25.9	16.4	50	47.3	School education, hospitality, accommodation, residential care services and supermarket and grocery stores	Batemans Bay Moruya Narooma	11,334 2,531 2,409
Bega Valley	31,950	21.4	17.5	48	50.5	School education, dairy product manufacturing, hospitality, accommodation and supermarket & grocery stores	Bega Eden	4,155 3,043
Total	**244,094**							**83,417**
NSW State average		**14.7**	**19.2**	**38**	**60.2**			

* LGA population and employment data sourced from Australian Bureau of Statistics (2011 Census Quickstats)

Albion Park Rail

Albion Park Rail – Northbound

Albion Park Rail is the northernmost urban centre within the corridor and part of the Shellharbour Local Government Area. The Shellharbour local government area (LGA) has a population of 63,605 people, and is the only area within the corridor where the average age is less than the national average. This indicates that the Shellharbour area is a young and growing community, with many young families moving into the new residential areas of Flinders and Shell Cove.

Kiama

Kiama Bypass – Southbound

Kiama LGA has a population of approximately 20,000 people. It is a popular tourist destination on weekends and in holiday periods, with attractions including its beaches, the Kiama blowhole and nearby rainforests. The Jamberoo Action Park is also a major tourist attractor. Kiama has a large proportion of residents aged over 65 years, with 20% in this age bracket compared with the NSW average of 14.7%. Kiama is identified as a "major town" in the Department of Planning and Environment's Illawarra Regional Strategy.

Nowra

Nowra – Northbound

Nowra is on the Shoalhaven River, 13 kilometres from the coast. Nowra is a significant urban centre, combined with Bomaderry, has a population of approximately 28,000 people. The Nowra CBD is home to many local, State and Federal Government offices and a large retail district, while South Nowra includes a range of bulky goods outlets and light industrial land uses. The primary employment industries in the area are the defence force at HMAS Albatross, education, hospitality and retail. The Department of Planning and Environment's Illawarra Regional Strategy has identified Nowra as a "major regional centre".

Ulladulla

Ulladulla – Northbound

The coastal township of Ulladulla, stretching from Narrawallee in the north through Mollymook to South Ulladulla, has a population of approximately 12,100 people in the urban centre. It is another popular destination in the corridor for tourists, particularly over long weekends and the summer holiday period. Like Kiama, Ulladulla also has a high proportion of its population aged over 65 years, with 23.3% in this age bracket. Employment statistics also demonstrate that Ulladulla is a popular location for retirees. Ulladulla has been identified as a "major town" in the Department of Planning and Environment's Illawarra Regional Strategy.

Batemans Bay

Batemans Bay – Southbound

Batemans Bay is the closest seaside town to Canberra, making it a popular holiday destination for residents of the ACT and surrounding areas. It has a population of approximately 11,300 people in the urban centre, which can up to triple in size during the peak holiday seasons. The area is popular with retirees, and has also begun to attract young families seeking affordable housing and a seaside lifestyle. The Department of Planning and Environment's South Coast Regional Strategy has identified Batemans Bay as a "major regional centre".

Moruya

Moruya – Southbound

Situated to the south of the Moruya River, Moruya urban centre has a population of approximately 2,500 people. Despite being far smaller than Batemans Bay, Moruya is the administrative centre of the Eurobodalla Shire Council and home to council offices and other public institutions such as the Moruya College of TAFE.

Narooma

Narooma – Southbound

A coastal town to the south of the Wagonga Inlet with a population of approximately 2,400 people in the urban centre, Narooma is renowned for its marine wildlife of seals, penguins, dolphins, whales and the endangered grey nurse shark, particularly around the Montague Island Nature Reserve. The most common employers in the area are accommodation, supermarkets, cafes and restaurants. Narooma has been identified as a "major town" in the Department of Planning and Environment's South Coast Regional Strategy.

Bega

Bega Cheese Factory

A rural town with a population of approximately 4,200 people in the urban centre, situated in a valley at the confluence of the Bega River and the Brogo River, Bega is particularly well known for its cheese and dairy industry, which is its largest employer, accounting for almost 10% of all local jobs. The Department of Planning and Environment's South Coast Regional Strategy has identified Bega as a "major regional centre".

Eden

Eden Visitor Information Centre

Eden is located on the far south coast of NSW, close to the border with Victoria, and contains a significant port. It is approximately 476 kilometres from Sydney and 555 kilometres from Melbourne. Eden has a population of approximately 3,000 people in the urban centre. Eden's main employers are log sawmilling and timber dressing, restaurants, cafes and accommodation, while fishing is a large industry in the area. Eden has been identified as a "town" within the Department of Planning and Environment's South Coast Regional Strategy.

4.3 Industry and economic development

Transport moves goods produced in the regions to domestic and international markets, contributing to the NSW economy. The regional road and rail freight network supports agricultural, manufacturing and mining industries, along with the local businesses associated with these sectors. Regional ports and airports also support freight movement to export markets.

The NSW road network is supporting a large proportion of total truck traffic and national freight productivity. Our road network joins Melbourne, Brisbane and Canberra. Around 50 per cent of all intra and interstate truck freight across Australia uses the NSW road network for at least part of its journey. Looking solely at interstate truck freight across Australia, some 75 per cent uses the NSW road network for part of its journey.

Industry in the region

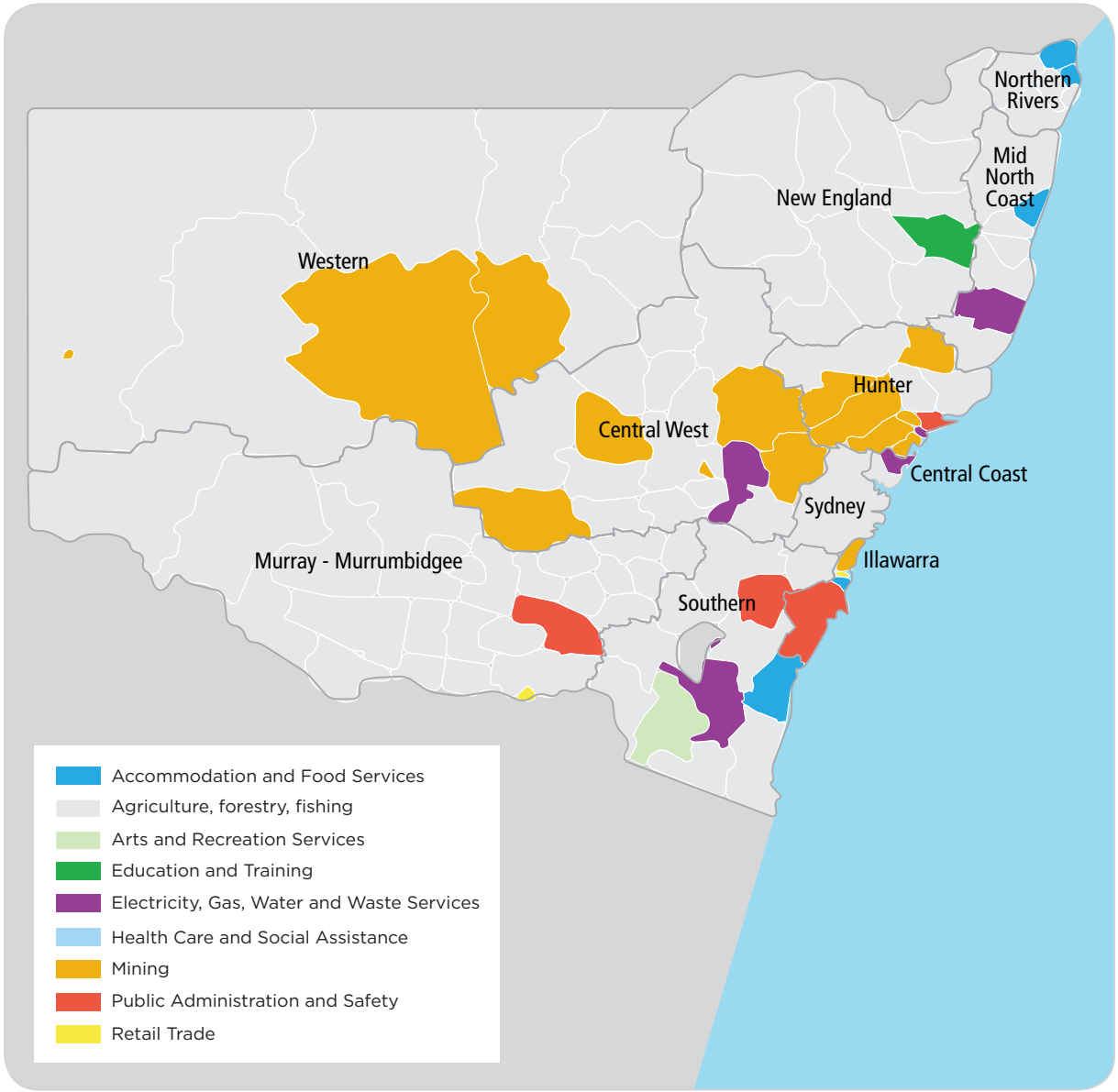
In regional NSW, a large area is dominated by agriculture. Agricultural land in the Princes Highway corridor varies across different sectors, but generally includes:

- Dairy and beef production
- Fishing

Large industries north of the corridor, such as ferrous metal manufacturing in Wollongong, attract employment from a large area, including Shellharbour. Other employment attractors to the north of the corridor or in the northern part of the corridor include the Wollongong CBD, the Port Kembla precinct, the University of Wollongong, Kembla Grange industrial lands, the Shellharbour CBD, the Shell Cove precinct and Kiama.

Mining activity in NSW is largely centred in the Hunter Valley, Central West and Western Regions, with tourism and port-related activity along the coast. Mining is however a primary employment sector in the Illawarra and is mostly contained to the north of the corridor area. The primary employment sectors in regional NSW are shown in **Figure 4-2**.

Figure 4-2 Primary employment sectors by LGA, regional NSW[2]



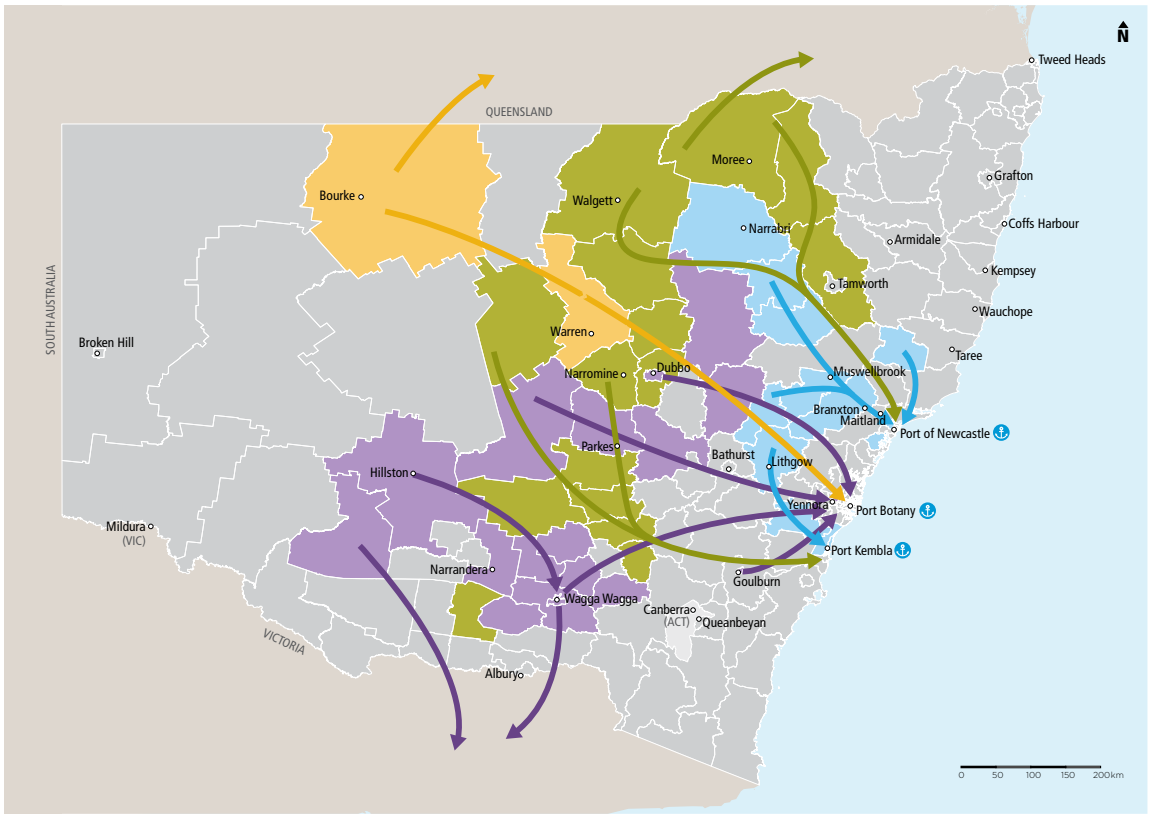
2 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney

Current freight task

Freight enables goods to be exchanged within the economy and distributes the benefits of this economic activity across the nation.

The 2011 movement of different goods across NSW is shown in **Figure 4-3**.

Figure 4-3 Selected commodity movement in NSW in 2011[3]



3 Transport for NSW 2013, N*SW Freight and Ports Strategy*, TfNSW, Sydney, p.99

Table 4-3 Freight Volumes along the Princes Highway Corridor

Corridor Planning Section	Description	2011 Freight Volume (annual tonnage, kt)
Section 1	Yallah to Gerringong	2,550
Section 2	Gerringong to Berry (Mount Pleasant lookout south to Berry)	1,650
Section 3	Berry	1,650
Section 4	Berry to Bomaderry	1,650
Section 5	Nowra	1,950
Section 6	Nowra to Jervis Bay Road	1,350
Section 7	Jervis Bay Road to Milton	1,400
Section 8	Milton–Ulladulla–Burrill Lake	800
Section 9	Burrill Lake to Batemans Bay	800
Section 10	Batemans Bay	950
Section 11	Batemans Bay to Moruya	1,050
Section 12	Moruya	1,050
Section 13	Moruya to Narooma	1,050
Section 14	Narooma	1,050
Section 15	Narooma to Bega	1,050
Section 16	Bega	1,450
Section 17	Bega to Eden	1,450
Section 18	Eden	1,700
Section 19	Eden to Edrom Road	1,700
Section 20	Edrom Road to Victorian border	1,700

The Princes Highway Corridor is home to a range of import and export industries, all of which rely on the Princes Highway for effective freight transportation. These industries include:

- **Quarries:** Quarry operators are prominent in the northern sections of the corridor, at locations such as Oak Flats and Dunmore.
- **Vehicle imports:** Port Kembla is NSW's principal vehicle importing hub. The South Eastern NSW Road Freight Supply Chain Study reported that motor vehicles represented 19.4% of major trading commodity imports in 2008/09 and some 1,807,029 trade revenue tonnes to the Port Kembla Port Corporation[4]. In future years, motor vehicles are predicted to account for over 57 per cent of the total value of trade through the port. Around 50% of motor vehicle imports arriving at Port Kembla are processed on site. This allows importers to send cars directly from the port to retail dealerships. The remaining vehicles are transported by road to bonded storage facilities. While the majority of motor vehicles are taken to storage and

4 Sd+D (for the RTA) 2010, *South Eastern NSW Road Freight Supply Chain Study*, p132.

distribution facilities and dealerships in Western and South Western Sydney, around a third of motor vehicles from Port Kembla are transported direct to dealers throughout South Eastern NSW. In 2009 around 225,000 vehicles were processed through the port with import volumes expected to increase by up to 5% p.a. over the long term. New motor vehicles destined for the NSW South Coast are transported along the Princes Motorway from Port Kembla, from distribution centres in South West Sydney, from retail outlets in Sydney and the Illawarra and from manufacturing sites in South Australia and Victoria.

- **Dairy:** Dairy farms are situated along the length of the Princes Highway Corridor and to the south in Victoria, with their products needing to be transported between dairies, milk depots and creameries. The largest manufacturers on the NSW South Coast are the Shoalhaven Dairy Co-op in Bomaderry and the Bega Cheese depot at Bega, which is also a major tourist attractor. Bega Cheese packages 65kt of cheese for other manufacturers per annum. Bega Cheese sources milk from 100 farms in Bega Valley, and a small number of farms in the Illawarra and East Gippsland in Victoria with its product moving north and south on the Princes Highway. Dairy products processed in the South East region are distributed to locations throughout the Illawarra and the NSW south coast, as well as other domestic and international markets. Typically, 97% of drinking milk produced is consumed by the Australian market, while 60% of manufactured dairy products are exported to international markets, with 40% distributed and sold to Australian markets.
- **Forestry, timber and paper:** There is an extensive timber industry on the NSW south coast, with timber being transported from plantations in the Eden–Monaro area, and from East Gippsland in Victoria, to the port of Eden, where it is exported as pulp or woodchips. Logs are also transported from these areas to nearby sawmills for processing and local distribution. Eurobodalla is also home to timber producers in the vicinity of Batemans Bay. Hardwood is primarily grown and processed in Eden and Batemans Bay, and some from Tumut/Tumbarumba to the west of the Princes Highway Corridor. Approximately 5.9Mt of sawlogs, woodchips, pulp and paper is moved through the South East NSW region to reach export points or domestic milling facilities. This equates to an average of 600 loaded movements travelling in the region each day.
- **Beef:** The beef industry transports live cattle from farms in south eastern NSW to slaughter yards and processing plants in Victoria. These heavy vehicles then return empty. After the meat is processed, refrigerated trucks transport the meat products from Victoria to towns and centres throughout the Princes Highway Corridor.
- **Retail cargo:** Demand for retail cargo services in the Princes Highway Corridor is related to population needs and surges during peak holiday periods. Growth is strongly related to population growth.
- **Fuel distribution:** Fuel is essential for consumers and industries throughout the Princes Highway Corridor, with tankers travelling daily to deliver petrol, diesel, oil and gas to towns and centres along the Princes Highway. Fuel transport from Sydney services towns and centres along the Princes Highway as far south as Bega, while fuel transport from Melbourne services towns south of Bega, including Eden.

- **Viticulture:** There are a growing number of active wineries throughout the Princes Highway Corridor. Most are small operations catering for tourists and local communities, but some larger wineries, located in the Shoalhaven, also distribute wine to the Illawarra, Sydney and the NSW south coast.
- **Defence:** The Department of Defence has a number of defence facilities in the Shoalhaven local government area, the largest is HMAS Albatross to the south of Nowra.

HMAS Albatross is the home base for the Royal Australian Navy's aviation contingent, and currently accommodates units from the Royal Australian Navy, the Royal Australian Air Force and the Australian Army. Defence personnel and support staff number almost 2,000 and inject over $60 million into the local economy.

Adjacent to HMAS Albatross is the Albatross Aviation Technology Park, which provides aviation technologies to both domestic and export markets and services the needs of defence operations at HMAS Albatross.

HMAS Creswell is another defence installation in the Shoalhaven local government area. On the shores of Jervis Bay, it consists of the Royal Australian Naval College, the School of Survivability and Ship Safety, the Kalkara Flight Range and administrative support facilities.

4.4 Current traffic volumes and heavy vehicles

In 2013, average daily traffic (ADT) volumes along the Princes Highway varied in the rural sections from around 1000 vehicles per day to nearly 20,000 vehicles per day. In the urban centres, average daily traffic volumes range from over 60,000 vehicles per day at the northern end of the corridor (Albion Park Rail) to 6,000 vehicles per day at the southern end (Eden). The average heavy vehicle percentage along the corridor is 10.9% which ranges from 8.0% around Mogo up to 25% at Kiah, just south of Eden. This particularly high proportion of heavy vehicles reflects high volumes of logging freight and low volumes of light vehicles.

Traffic volumes on the Princes Highway generally decrease from the northern end near the Illawarra towards the southern end, near the Victorian border with peaks at urban centres, especially at Nowra with nearly 50,000 vehicles.

The distributions of heavy vehicle traffic volumes generally follow those observed for light vehicles, with higher volumes towards the northern end of the corridor. The higher percentage of heavy vehicles at various locations along the corridor is reflective of a reduction in the light vehicle volumes.

4.5 Public transport and active transport in the corridor

The NSW Government actively promotes the use of non-car based modes of transport as a means of reducing congestion on our roads and reducing the impact of greenhouse gases on the environment. Public transport use also improves the economic viability of operating public transport infrastructure such as buses and trains and provides for those unable to operate a motor vehicle. Infrastructure that supports active transport modes such as walking and cycling also provides for those unable to operate a motor vehicle and helps to improve health and wellbeing. Improved health and wellbeing also reduces the costs involved in operating hospitals and other public medical facilities.Public transport

While the dominant means of transport in the corridor is private vehicle, the Princes Highway Corridor provides rail and bus public transport and taxi services.

Public bus services

A number of operators provide Public Bus Services along the Princes Highway Corridor, these include:

- Premier Illawarra – provides bus services between Kiama and Shellharbour, between Oak Flats and Wollongong and some services around Albion Park Rail. All of these services travel along the Princes Highway.
- Nowra Coaches – Provide a number of services around the Shoalhaven, linking coastal towns like Vincentia, Sanctuary Point and Jervis Bay with Nowra and Bomaderry Train Station.
- Shoal Bus – providing connections between Sussex Inlet, Ulladulla, Nowra, Bomaderry and Gerringong travelling along the Princes Highway
- Stuarts Coaches – provides a connection between Currarong, Callala Bay and Callala Beach with Nowra and the Bomaderry train station.
- Priors Bus Services – Offer some services linking Batemans bay with Long beach and Maloneys Beach which travel along the Princes highway as well as a service linking Sunshine Bay and Surfside, north of Batemans Bay.
- Bega Valley Coaches – Providing a connection between Bega and Central Tilba via Quaama and Cobargo on the Princes Highway.
- Sapphire Coast Buslines – Provide a connection between Bega and Eden, via Pambula and Merimbula
- Kennedy's Bus and Coach – Also provide connection to Bomaderry Train Station from Coastal towns such as Greenwell Point and Culburra Beach. These only travel along the Princes Highway for a short length.
- Kiama Coaches – Provide a connection to and from Kiama to surrounding areas including Gerringong, Gerroa and Jamberoo.

School bus routes

Many of the towns and villages are serviced by school bus operators and they provide services for both students within the towns and villages and for students in the rural areas between the towns and villages.

Coaches

Regional Coaches operate at the southern and northern extremities of the corridor. A regional bus service runs from Eden to Canberra via the Princes Highway Corridor passing through Pambula, Merimbula, Wolumla and Bega.

At the northern end, regional coaches link Wollongong to the Southern Highlands passing through Albion Park Rail.

Premier Transport Group also provide a service linking Eden with Sydney via the Princes Highway Corridor stopping at many of the towns and villages along the way. This operates twice a day in each direction.

Murrays Coaches also provide a service between Narooma and Batemans Bay, travelling along the Princes Highway before heading towards Canberra and then Sydney.

Taxis

Taxis operate in most towns and villages throughout the Princes Highway Corridor, with limited services and fleet sizes.

Rail services

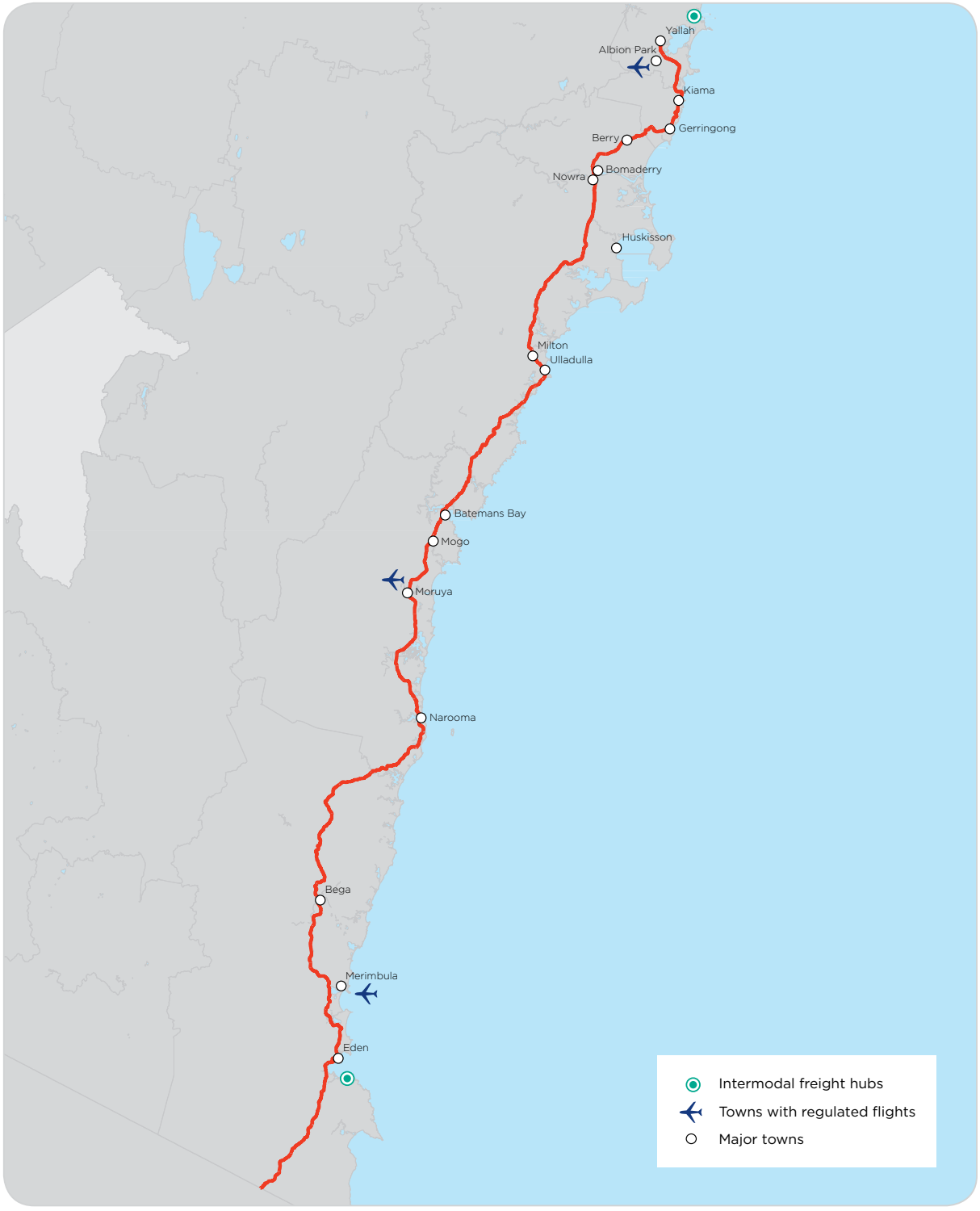
Rail transport is available via regular services on the South Coast rail line from the Illawarra to as far south as Bomaderry, covering only the northernmost 15% of the corridor. This line has nine railway stations between Albion Park Rail and Bomaderry, inclusive. Services are more frequent closer to the Illawarra. Services in the morning and afternoon peak hours on weekdays (in the peak direction) generally operate every 30 – 40 minutes from Kiama, and hourly from Bomaderry, with less frequent services throughout the middle hours of the day.

Figure 4-4 NSW rail network

Air services

Air transport is facilitated by regional airports at Albion Park Rail, Moruya (servicing Batemans Bay and surrounds) and Merimbula (servicing Bega and surrounds). With the exception of Albion Park Rail, regular flights are available between these regional centres, Sydney and Melbourne, although not all of these flights are direct (**Figure 4-5**).

Figure 4-5 Regional airports with commercial flights and intermodal terminals along the Princes Highway



Active transport

Dedicated infrastructure for walking and cycling is generally restricted to urban centres.

Between towns the sealed road shoulder should provide a facility for bicycle travel. AUSTROADS (2010) recommends a two to three metre shoulder width where the speed limit is up to 100 km/h[5]. Approximately 80% of the Princes Highway Corridor has shoulder widths less than two metres.

The *NSW Long Term Transport Master Plan* (LTTMP) identifies state-wide targets for walking and cycling. "Making walking and cycling easier and safer and giving customers choice when travelling within their towns" is one of the main transport challenges facing regional NSW.

Regional Transport Plans provide more strategic direction for walking and cycling. Actions identified to support travel within the major towns and centres of the Illawarra and Southern Region include:

- Roll out the Walking Communities Program (prioritise projects within two kilometres of major centres and transport interchanges)
- Connecting Centres Cycling Program (prioritises projects within five kilometre of major centres, extending to 10 kilometres in the longer term)
- Roll out the Cycling Towns Program
- Improve information about walking and cycling routes and facilities.

Some shared pedestrian/cyclist facilities exist on the sections of the Princes Highway that pass through town centres.

There is little demand for the provision of pedestrian or cyclist facilities between towns along most of the Princes Highway due to the distance between towns, however touring and training cyclist groups utilise sections of the highway on an infrequent basis. Cyclists can take advantage of the opportunity to ride on sealed shoulders where they are provided. There may be some scope to provide cyclist facilities between some of the towns and centres that are closer to each other such as Milton and Ulladulla, but in general the Princes Highway does not serve as a cyclist or pedestrian route between towns.

Albion Park Rail

Shellharbour City Council has 'Toward Active Transport Shellharbour' project which aims to promote cycling as a healthy and viable transport alternative. This project involves providing information to residents and visitors in the form of a cycling map as well as efforts to improve signage which provides guidance and reassurance for cyclists. The council also has a Shared Use Path Strategy which provides a combination of Off-Road Shared Use Paths and On-Road Bicycle Lanes through Albion Park Rail on the Princes Highway. There are also some proposed sections of Off-Road Shared use Paths which are still to be constructed which will complete some of the missing links along the highway.

To the south of Albion Park Rail, on road facilities are located in marked shoulder lanes, however the suitable shoulders do not go beyond the southern part of Kiama, terminating at the Kiama Bends.

Kiama

Kiama Municipal Council has a number of walking and cycling maps for the region including the Kiama Coast Walk, a 22 kilometre walk which is very popular with visitors to the area. The Kiama Cycling and Walking maps and information do not include travel on the Princes Highway which now bypasses the main urban centres within the Kiama local government area.

Berry

The Shoalhaven Bike Plan prepared by the Shoalhaven City Council is aimed at increasing bike trips and improving cyclist safety in the Shoalhaven. At this stage there are only proposed bike routes however the planned upgrades of the Princes Highway between Gerringong and Bomaderry, which include a bypass of Berry will provide these on road cycle facilities.

5 Austroads 2010, *Guide to Road Design: Part 3: Geometric Design*, Austroads, Sydney

An issue that does occur in Berry and other towns along the highway is the interaction between through traffic and pedestrians and cyclists. This issue exists throughout the year, but is exacerbated during the seasonal peak periods with high levels of tourist activities. This is particularly evident in towns like Berry where the Princes Highway is the main street and maintains a "through route" function accommodating highway traffic while also serving the commercial centre of town, with adjacent commercial and retail land uses. This creates strong pedestrian traffic along and across the Princes Highway, increasing the risk of conflict between "through" vehicles and these vulnerable road users. Until the bypass is complete, some efforts have been made to reduce the speeds of vehicles travelling through the township with the use of Vehicle Activated Signs, which alert motorists if they are travelling too fast.

Nowra

Nowra is a major urban centre along the Princes Highway with employment, retail, commercial and education precincts. The Shoalhaven Bike Plan details a combination of Shared Path and on road routes along the Princes Highway, however these are generally limited to North Nowra. A strong east-west desire line exists across the Princes Highway from the residential areas to shopping and commercial precincts in Nowra with facilities such as signalised crossings, pedestrian fencing and pedestrian refuges in place to manage this.

Milton-Ulladulla

Milton and Ulladulla is like Berry where the Princes Highway is the main street and maintains a "through route" function accommodating highway traffic while also serving the commercial centre of town, with adjacent commercial and retail land uses. During the peak holiday periods, traffic can queue back for kilometres on the approaches to these towns.

Very little provision for cyclists currently exists through Milton and Ulladulla with the Shoalhaven Bike Plan mostly identifying proposed routes along the highway.

Batemans Bay – Moruya – Narooma

The Eurobodalla Bike Plan is primarily focused on tourists and the identified tracks don't require much travel, if any at all, along the highway.

Bega Valley Shire Council

The Bega Valley Shire Council is currently preparing a draft bike plan.

5 CURRENT CORRIDOR PERFORMANCE

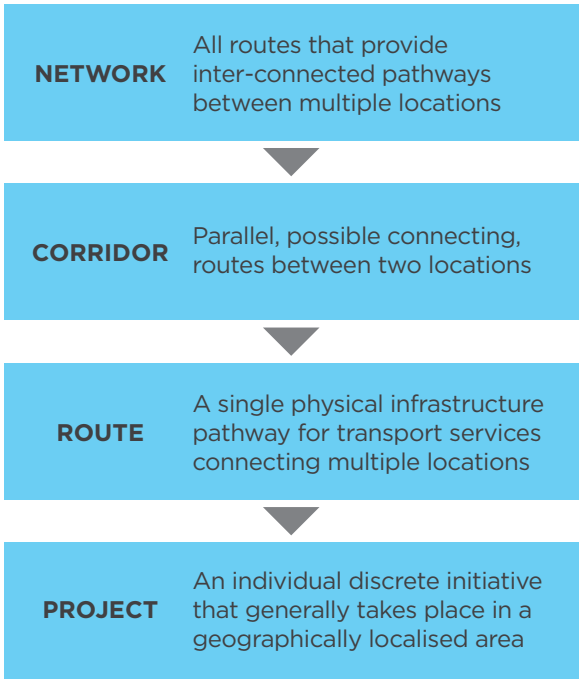
Berry – Southbound

Transport for NSW has adopted the *National Guidelines for Transport System Management in Australia*[6] to guide its high quality advice to the NSW Government on the future of the road network.

Decision making in transport is complex. A robust planning framework is needed to break down this complex process into progressive phases.

The framework starts at the high level of network and corridor planning, progressing through to specific route and project levels, as shown in **Figure 5-1**.

Figure 5-1 Road transport system planning levels[7]



Road network management hierarchy

The Road Network Management Hierarchy organises the network into logical groupings to ensure roads can be managed according to their relative importance.

Transport for NSW measures the actual performance of the State Road network against network planning targets and average class performance relating to road safety, traffic efficiency and asset condition. To undertake this comparative analysis, the State Road network is categorised into six distinct classes of roads. The classifications range from Class 6 urban (6U) and Class 6 rural (6R) standard roads to lower order Class 1 urban (1U) and Class 1 rural roads (1R).

The Princes Highway has been classified as a Class 5U between Yallah and the Lake Entrance Rd turnoff, Class 5R road between Lake Entrance Road and Jervis Bay Road, Class 4R between Jervis Bay Road and Batemans Bay and Class 3R between Batemans Bay and the Victorian border.

The *Network and Corridor Planning Practice Notes*[8] state that:

> "Class 5U roads are significant State Roads and may contribute in part to the National Land Transport Network. They may include roads within Strategic Bus Corridors. They are typified by high traffic volumes including freight, public transport and commercial vehicle travel. In areas without motorways, they provide the major traffic function. They serve interstate, strategic inter-regional and regional functions with direct access to abutting land controlled. Typically they are undivided carriageways with four or more lanes with restrictions on kerbside parking during peak periods".

6 Australian Transport Council 2006, *National Guidelines for Transport System Management in Australia*, ATC, Canberra

7 Australian Transport Council 2006, *National Guidelines for Transport System Management in Australia*, ATC, Canberra, p. 9 & 15

8 Roads and Maritime Services 2008, *Network and Corridor Planning Practice Notes*, RMS, Sydney, pp. 19-20

"Class 5R roads are significant rural State Roads and contribute to the National Land Transport Network. They are typified by high traffic volumes including freight, commercial vehicle and public transport travel. They provide a high standard of travel and serve interstate and the inter-regional functions with direct access to abutting land. Typically they have divided and undivided carriageways with 2 or more lanes with frequent overtaking opportunities."

"Class 4R roads are important rural State Roads and contribute to the National Land Transport Network. They are typified by moderately high traffic volumes including freight, commercial vehicle and public transport travel. They provide a good standard of travel and serve some interstate, inter-regional and intra-regional functions with direct access to abutting land controlled. Typically they have undivided carriageways with 2 lanes with overtaking lanes."

"Class 3R roads do not contribute to the National Land Transport Network. However, they do provide a strategic freight function. They are typified by moderate levels of traffic volumes including freight, commercial vehicle and public transport travel. They provide an acceptable standard of travel and serve inter/intra-regional functions. Typically they have undivided carriageways with 2 lanes."

Class *5U* roads typically have:

- Average annual daily traffic volumes exceeding 37,000 vehicles per day
- Average heavy vehicle volumes exceeding 2,500 vehicles per day
- Speed limits ranging from 60 km/h to 100 km/h

Class *5R* roads typically have:

- Average annual daily traffic volumes exceeding 12,000 vehicles per day
- Average heavy vehicle volumes exceeding 1,200 vehicles per day
- Speed limits ranging from 80 km/h to 110 km/h

Class *4R* roads typically have:

- Average annual daily traffic volumes exceeding 10,000 vehicles per day
- Average heavy vehicle volumes exceeding 1,000 vehicles per day
- Speed limits ranging from 80 km/h to 110 km/h

Class *3R* roads typically have:

- Average annual daily traffic volumes exceeding 4,500 vehicles per day
- Average heavy vehicle volumes exceeding 500 vehicles per day
- Speed limits ranging from 60 km/h to 110 km/h

Corridor planning sections

In addition to road classification, road segmentation is needed so planning targets can be tailored to specific areas to respond to changes in nearby land use, terrain and property access arrangements. Planning sections are manageable lengths of road that are uniform in nature.

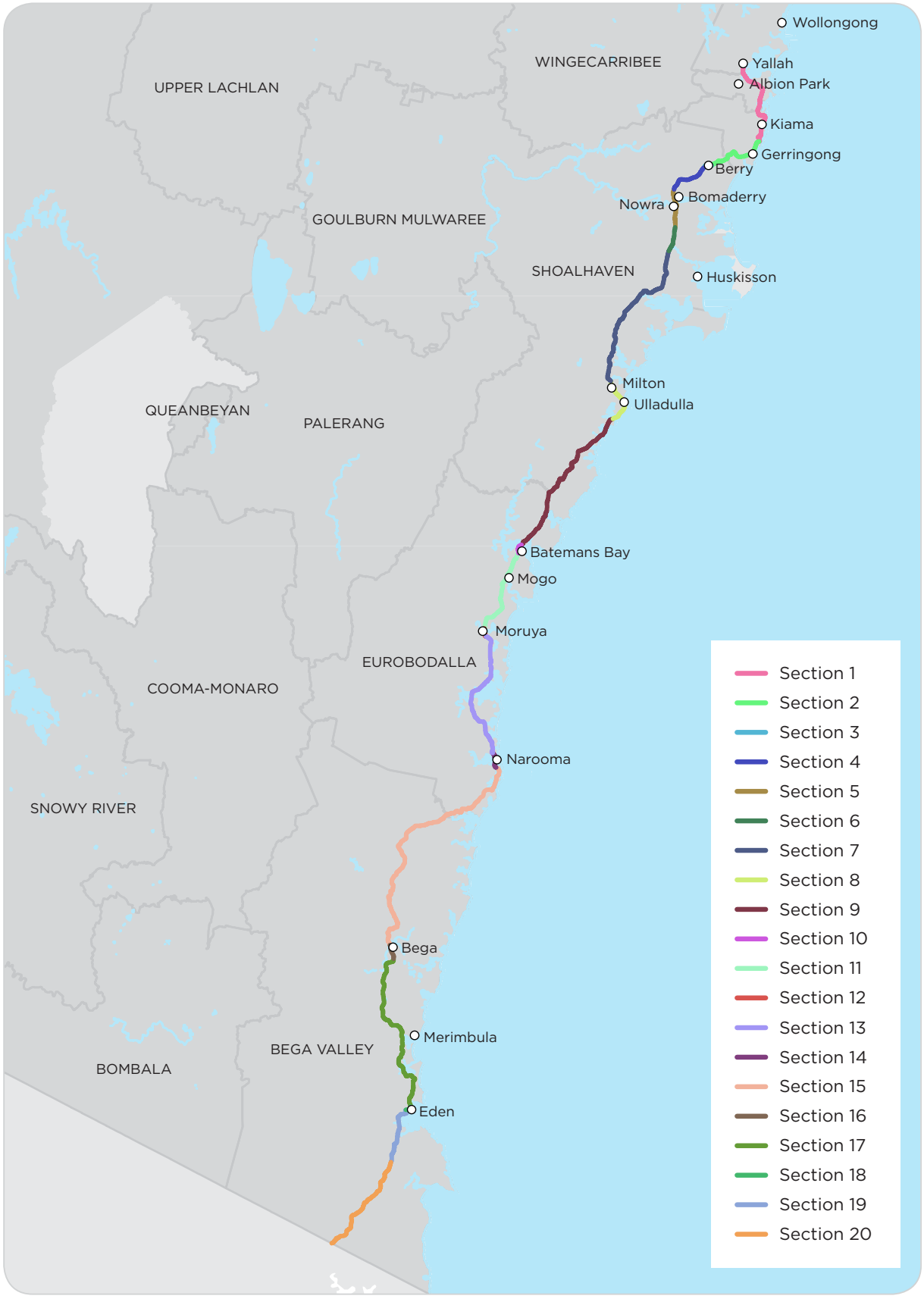
For the purpose of this analysis, the Princes Highway corridor has been divided into three zones – with a total of 20 corridor planning sections. These are detailed in Table 5-1 and shown in **Figure 5-2**.

Table 5-1 Corridor sections

Corridor Planning Section	Description	Road Class	Chainage (km)*		Length (km)
			From	To	
Section 1	Yallah to Gerringong	5U/5R	0	24.0	24.0
Section 2	Gerringong to Berry (Mount Pleasant lookout south to Berry)	5R	24.0	41.6	17.6
Section 3	Berry	5R	41.6	43.6	2.0
Section 4	Berry to Bomaderry	5R	43.6	55.8	12.2
Section 5	Nowra	5R	55.8	65.4	9.6
Section 6	Nowra to Jervis Bay Road	5R	65.4	72.2	6.8
Sub-Total Zone 1				72.2	
Section 7	Jervis Bay Road to Milton	4R	0	45.3	45.3
Section 8	Milton–Ulladulla–Burrill Lake	4R	45.3	57.6	12.3
Section 9	Burrill Lake to Batemans Bay	4R	57.6	103.2	45.6
Section 10	Batemans Bay	4R	103.2	106	2.8
Sub-Total Zone 2				106	
Section 11	Batemans Bay to Moruya	3R	0	24.4	24.4
Section 12	Moruya	3R	24.4	27	2.6
Section 13	Moruya to Narooma	3R	27	64.5	37.5
Section 14	Narooma	3R	64.5	70.2	5.7
Section 15	Narooma to Bega	3R	70.2	143.3	73.1
Section 16	Bega	3R	143.3	146.8	3.5
Section 17	Bega to Eden	3R	146.8	193.4	46.6
Section 18	Eden	3R	193.4	198	4.6
Section 19	Eden to Edrom Road	3R	198	214.8	16.8
Section 20	Edrom Road to Victorian border	3R	214.8	244.4	29.6
Sub-Total Zone 3				244.4	
Total corridor				**422.6**	

* Based on Roadloc chainage

Figure 5-2 Princes Highway planning sections



The analysis of the 20 planning sections also takes into consideration a range of projects along the highway that have either been completed in the last five years, are currently under construction or are in the planning stages. This is important because projects that have been constructed or are under construction will have an impact on the quantity and quality of the data available. Likewise, projects that are in the planning stage will have an impact on the future performance of the highway and how the highway is managed. Some major changes or proposed changes that will have an impact on the analysis include:

- Albion Park Rail Bypass – The construction of the Albion Park Rail Bypass will provide a four lane dual carriageway highway which will meet most, if not all of the planning targets for the northern part of corridor planning section 1. Analysis of this section is still included in this strategy as there are other road safety, traffic and asset issues relevant to section 1, outside of the scope of the Albion Park Rail Bypass.
- A major upgrade of the Princes Highway to a four lane divided carriageway, between Mount Pleasant lookout and the Jervis Bay Road turn off. This upgrade will meet the majority of the planning targets for class 5R roads:
  - This includes the upgrades between Gerringong and Berry, which relates to corridor planning sections 2 and 3 which is currently under construction. This section of the highway has been under construction for some time and therefore the road safety and traffic data available is not reflective of the operation of this section of the corridor and has not been used in this strategy.
  - The proposed upgrade also includes corridor planning section 4, Berry to Bomaderry which is currently in development. At the time this strategy was written, construction of this project was not yet funded and therefore the analysis of this section is included in this strategy.
- Bega Bypass – The Bega Bypass which relates to section 16, opened to the public in 2013 and the road safety and traffic data for this section is limited and has not been included for analysis in this strategy.

Performance measures and targets

The *NSW Long Term Transport Master Plan* sets out the NSW Government's 20 year vision for delivering a world-class public transport, road and freight network across the State.

Meeting community expectations of safe, efficient and well-maintained roads requires a clear set of performance measures that align with these expectations and needs. Transport for NSW and Roads and Maritime measure and monitor road performance against network performance measures and targets.

A measure is a unit or dimension that enables current and future performance to be assessed. Network measures can be used to identify priorities across the network and guide funding over the long term. Network measures are a way of comparing performance both spatially and over time, and can form the basis for developing strategies to move towards improved performance levels.

Network planning targets set out in this document are either:

- Network wide targets – condition targets that apply to the entire network unless otherwise specified.
- Rural planning targets that apply to regional NSW, not including Sydney, the Lower Hunter, Central Coast and Illawarra.

To assess the Princes Highway's current corridor performance, the following sources have been used:

- *Network Performance Measures and Network Planning Targets*[9]
- *Network and Corridor Planning Practice Notes*[10]
- Strategic Network Performance Analysis

The network planning targets have been developed to complement the *Austroads* Guides.

9 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS Sydney

10 Roads and Maritime Services 2008, *Network and Corridor Planning Practice Notes*, RMS, Sydney

Road characteristics

There are two types of road characteristics. The first type is the road's geometric or physical layout, which does not usually change significantly over time. Examples of these characteristics include lane width, alignment and shoulder width.

The second type is characteristics of the road that vary over time due to wear, loading or physical degradation. These characteristics are associated with the 'condition' of the road. Targets are used to guide the management of road conditions. The minimum acceptable condition is based on assessment of the risks associated with road conditions, and the upper end of road condition is determined based on the level of available investment.

This document groups the Princes Highway's current corridor performance into the following sections:

- **Section 5.1** – Road safety.
- **Section 5.2** – Traffic.
- **Section 5.3** – Heavy vehicles on the Princes Highway.
- **Section 5.4** – Road design and geometry.
- **Section 5.5** – Road pavement condition.
- **Section 5.6** – Environment

Road characteristics

Information on the road characteristics and performance for each planning section is stored in various Roads and Maritime databases.

For this study data has been drawn from the following sources:

- Strategic Network Performance Analysis (SNPA)
- Road Asset Management System (RAMS) database.
- NSW Centre for Road Safety's crash database (CRASHLink).
- Road Slope Management System (RSMS) database.
- Global-Inertial Positioning Systems Image Capture for Asset Management (GIPSICAM).

5.1 Road safety

Improving road safety is a key goal of this strategy with many of the recommendations for the Princes Highway targeted to improve safety for road users. Assessment of crash data, community and other stakeholder feedback have been undertaken as a part of this study to increase safety levels along the Princes Highway.

Speed zones

Speed zones on all public roads in NSW are determined with guidance from the *NSW Speed Zoning Guidelines* produced by the (then) Roads and Traffic Authority and endorsed by the NSW Centre for Road Safety. Speed zones are posted to provide motorists safe passage along roads, in relation to the geometry and environment[11]. Roads and Maritime regularly reviews speed limits in NSW, taking into account factors such as road geometry, surrounding conditions, road usage, nearby development, vehicle types and volumes, crash record and access points along the route.

11 NSW Centre for Road Safety 2011, *NSW Speed Zoning Guidelines*, RMS, Sydney

Speed limits are applied in conjunction with enforcement measures, engineering treatments and education to reduce speeding.

The speed limit along the Princes Highway is generally 100 km/h in rural areas with some sections of 80 km/h and 90km/h where the road alignment requires a reduced operating speed.

- The speed limit drops at the southern end of Corridor Planning Section 1, from 100km/h to 80km/h at what is known as the 'Kiama Bends'. This section of the highway has a number of tight curves.
- The section between the southern end of the Kiama Bends at Gerringong to Berry is signposted between 80km/h to 90km/h due to poor road alignment and steep winding sections of road. As mentioned above, this will be improved with the major highway upgrades currently underway through this section of the highway.
- A 2.5km section of highway between Wandandian and Conjola reduces from 100km/h to 80km/h. This section has a number of tight curves with some steep sections.
- The speed limit between Batemans Bay and Mogo is 90km/h. This section of highway is also quite steep with a number of tight curves and intersections which are not suitable for 100km/h speed limit.
- A 1.5km section of the highway north of Dignams Creek Road drops down to 80km/h. This section has some tight curves, with narrow shoulder widths and a narrow bridge.
- The four kilometres to the north of Brogo have a speed limit of 90km/h due to the steep and winding nature of the highway through this section of the corridor. This section also has narrow shoulders and limited sight distance.

The speed zones generally range between 60-70 km/h through the urban areas and towns with some 40km/h School Zones also on the Princes Highway. The location of speed zones along the Princes Highway is shown in **Figure 5-3**.

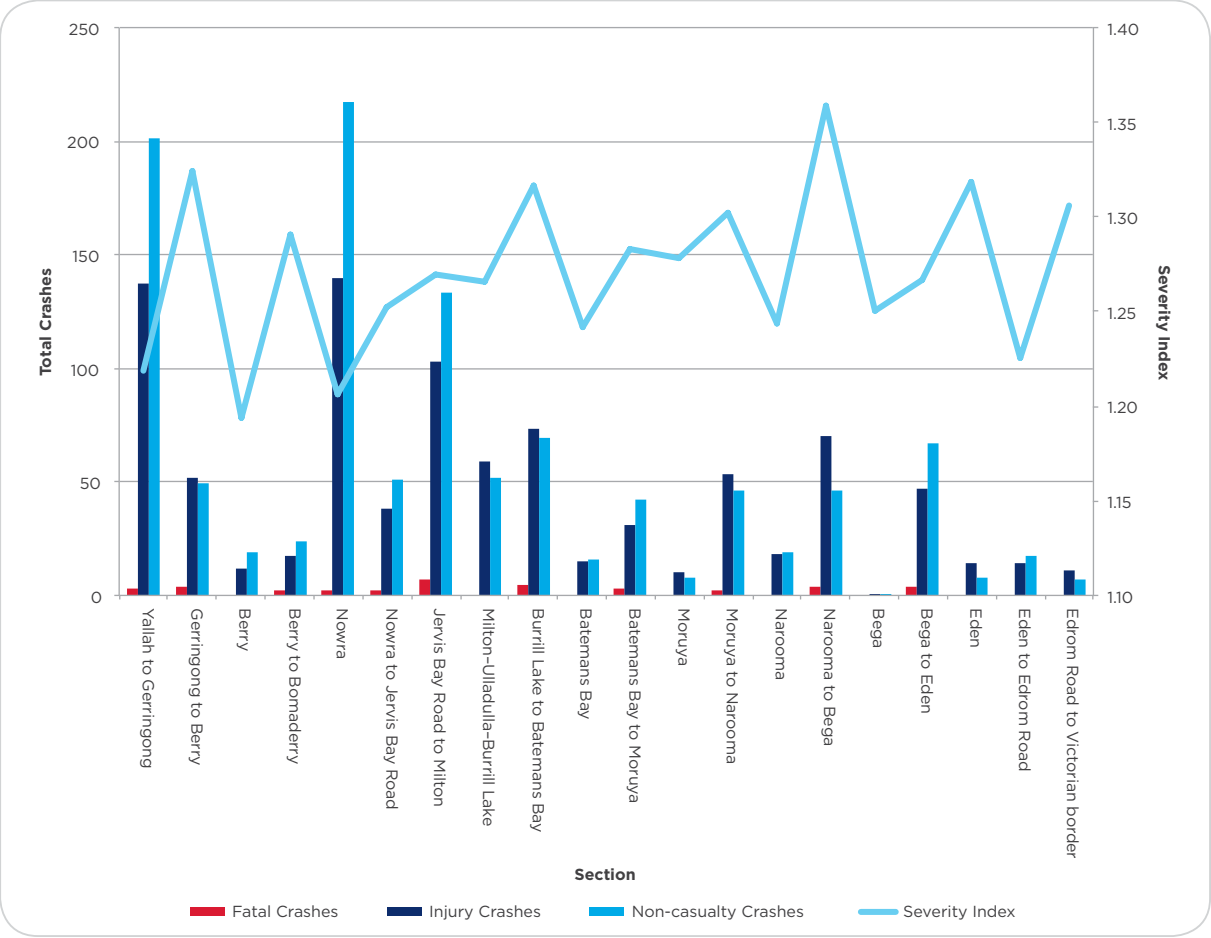
Figure 5-3 Princes Highway corridor speed zones

Number of crashes

There were 2045 crashes reported between April 2009 and March 2014 along the Princes Highway corridor. Of these crashes, 953 were 'casualty crashes', which caused either an injury or fatality to one of more of the people involved. Of the 953 casualty crashes, 38 were fatal and 915 resulted in an injury (**Figure 5-4** and **Figure 5-5**).

Figure 5-4 Location and severity of crashes, 2009 to 2014

Figure 5-5 Casualty and non-casualty crashes, 2009 to 2014



The highest number of injury and non-casualty crashes is recorded through Albion Park Rail and Nowra, the two largest urban centres along the highway. These two sections also have a relatively low severity index, possibly as a result of lower speed limits and the type of crashes that generally occur in urban centres, when compared to some of the rural sections of the highway. The worst performing sections in terms of severity index are Narooma to Bega, Gerringong to Berry and Burrill Lake to Batemans Bay. Highway upgrades between Gerringong and Berry are currently underway and some minor works are planned or in planning for some of the sections between Narooma to Bega and Burrill Lake to Batemans Bay where the number of deficient curves and high incidence of "run of road" type crashes is relatively high contributing to a high severity index.

Section 18 through Eden has quite a high severity index for an urban centre and may be related to the number of pedestrian crashes in Eden which is described in more detail later in the document. The section of highway between Edrom Road to the Victorian Border has a low number of total crashes which reflects the very low traffic volumes, however the severity of those crashes is high and may be related to the high proportion of heavy vehicles using this section of road.

In addition to measuring the number and severity of crashes, a range of other measures has been developed to compare road safety criteria across different roads.

This corridor strategy examines three of these measures over the five year period:

1. Annual casualty crash rate per kilometre.
2. Annual casualty crash rate per 100 million vehicle kilometres travelled (100 MVKT).
3. Severity index.

Casualty crash rates

Table 5-2 compares annual casualty crash rates per kilometre on the Princes Highway with NSW averages for sections of road of the same class and land use type.

Table 5-2 Annual average casualty crash rates per kilometre (urban centres are shaded grey)

Corridor planning section	Rural hierarchy class	Land Use	Princes Highway Corridor (2009-2014)	NSW class average (2008-2012)
1. Yallah to Gerringong	5R	Urban, Urban Commercial	1.17	2.215
2. Gerringong to Berry	5R	Fringe Urban, Rural	N/A	0.332
3. Berry	5R	Urban, Urban Commercial	1.23	2.215
4. Berry to Bomaderry	5R	Fringe Urban, Rural	0.31	0.332
5. Nowra	5R	Urban, Urban Commercial	**2.97**	2.215
6. Nowra to Jervis Bay Road	5R	Fringe Urban, Rural	**1.20**	0.332
7. Jervis Bay Road to Milton	4R	Fringe Urban, Rural	**0.48**	0.195
8. Milton-Ulladulla-Burrill Lake	4R	Urban, Urban Commercial	0.97	1.690
9. Burril Lake to Batemans Bay	4R	Fringe Urban, Rural	**0.34**	0.195
10. Batemans Bay	4R	Urban, Urban Commercial	1.09	1.690
11. Batemans Bay to Moruya	3R	Fringe Urban, Rural	**0.28**	0.183
12. Moruya	3R	Urban, Urban Commercial	0.77	1.136
13. Moruya to Narooma	3R	Fringe Urban, Rural	**0.29**	0.183
14. Narooma	3R	Urban, Urban Commercial	0.63	1.136
15. Narooma to Bega	3R	Fringe Urban, Rural	**0.20**	0.183
16. Bega	3R	Fringe Urban, Rural	N/A	0.183
17. Bega to Eden	3R	Fringe Urban, Rural	**0.22**	0.183
18. Eden	3R	Urban, Urban Commercial	0.61	1.136
19. Eden to Edrom Road	3R	Fringe Urban, Rural	0.17	0.183
20. Edrom Road to Victorian Border	3R	Rural	0.07	0.183

The comparison above shows the annual average casualty crash rate is higher than the NSW class average for many of the rural corridor planning sections. Of the urban sections, only Nowra is above the NSW class average.

It should be noted that several lengths of the Princes Highway, including South Nowra and Victoria Creek have been upgraded during or since the five-year crash history period between 2009 and 2014 and as such the crash rates at these locations is likely to reduce.

However, the annual casualty crash rate per kilometre does not take into account the potential for significant variations in traffic volumes along routes. This means it may understate relatively high crash rates on particular lengths of the road that operate with significantly lower traffic volumes.

For this reason, a second measure of casualty crashes per 100 million vehicle kilometres travelled is also used. This is particularly useful to compare casualty crash rates on roads that carry higher than average and lower than average traffic volumes.

The casualty crash rate per 100 million vehicle kilometres travelled is calculated as follows:

Crash rate = (No. of casualty crashes x 10^8) / (L.A.365.M)

Where:

- L= length in kilometres
- A = AADT/ADT
- M = number of years of crash data

The casualty crash rates per 100 million vehicle kilometres travelled on the Princes Highway corridor range from 9.81 through Albion Park Rail to 40.75 at Batemans Bay, both urban sections. The rural sections range from 6.57 between Berry and Bomaderry to 27.16 between Eden and Edrom Road. Burrill Lake to Batemans Bay and Edrom Road to Victoria also have relatively high casualty crash rates per 100 MVKT (Table 5-3).

Table 5-3 Casualty Crashes per 100 MVKT (urban centres are shaded grey)

Corridor Planning Section	Land Use	Crash rates per 100 MVKT
1. Yallah to Gerringong	Urban, Urban Commercial	9.89
2. Gerringong to Berry	Fringe Urban, Rural	N/A
3. Berry	Urban, Urban Commercial	24.41
4. Berry to Bomaderry	Fringe Urban, Rural	6.57
5. Nowra	Urban, Urban Commercial	17.10
6. Nowra to Jervis Bay Road	Fringe Urban, Rural	14.43
7. Jervis Bay Road to Milton	Fringe Urban, Rural	13.03
8. Milton-Ulladulla-Burrill Lake	Urban, Urban Commercial	23.87
9. Burrill Lake to Batemans Bay	Fringe Urban, Rural	20.17
10. Batemans Bay	Urban, Urban Commercial	40.75
11. Batemans Bay to Moruya	Fringe Urban, Rural	10.04
12. Moruya	Urban, Urban Commercial	26.34
13. Moruya to Narooma	Fringe Urban, Rural	17.26
14. Narooma	Urban, Urban Commercial	22.41
15. Narooma to Bega	Fringe Urban, Rural	18.04
16. Bega	Fringe Urban, Rural	N/A
17. Bega to Eden	Fringe Urban, Rural	16.23
18. Eden	Urban, Urban Commercial	27.88
19. Eden to Edrom Road	Fringe Urban, Rural	27.16
20. Edrom Road to Victorian Border	Rural	20.89

Severity index

To enable a comparison of the impacts of crashes from a wider community perspective, a third measure, the 'severity index' has been developed. The severity index considers the total number of crashes on a road and assigns a weighting to fatal and casualty crashes which aims to reflect their relative impact on the community.

The severity index is calculated on any given length of road as follows:

Severity index = (3x+1.5y+z) / t

Where:

- x = number of fatal crashes
- y = number of injury crashes
- z = number of non-casualty crashes
- t = total number of crashes

Table 5-4 shows the severity index for the Princes Highway for the five year period to March 2014. The upper limit of the severity index is three, while the lowest possible is one (provided there has been a crash on the length of road being considered).

Table 5-4 Crash types and severity (urban centres are shaded grey)

Corridor planning section	Total non-casualty crashes	Injury crashes	Fatal crashes	Severity Index
1. Yallah to Gerringong	201	137	3	1.22
2. Gerringong to Berry	49	52	4	1.32
3. Berry	19	12	0	1.19
4. Berry to Bomaderry	24	17	2	1.29
5. Nowra	217	140	2	1.21
6. Nowra to Jervis Bay Road	51	38	2	1.25
7. Jervis Bay Road to Milton	133	103	7	1.27
8. Milton-Ulladulla-Burrill Lake	52	59	0	1.27
9. Burrill Lake to Batemans Bay	69	73	5	1.32
10. Batemans Bay	16	15	0	1.24
11. Batemans Bay to Moruya	42	31	3	1.28
12. Moruya	8	10	0	1.28
13. Moruya to Narooma	46	53	2	1.30
14. Narooma	19	18	0	1.24
15. Narooma to Bega	46	70	4	1.36
16. Bega	1	1	0	1.25
17. Bega to Eden	67	47	4	1.27
18. Eden	8	14	0	1.32
19. Eden to Edrom Road	17	14	0	1.23
20. Edrom Road to Victorian Border	7	11	0	1.31
Total for corridor	**1092**	**915**	**38**	**1.26**

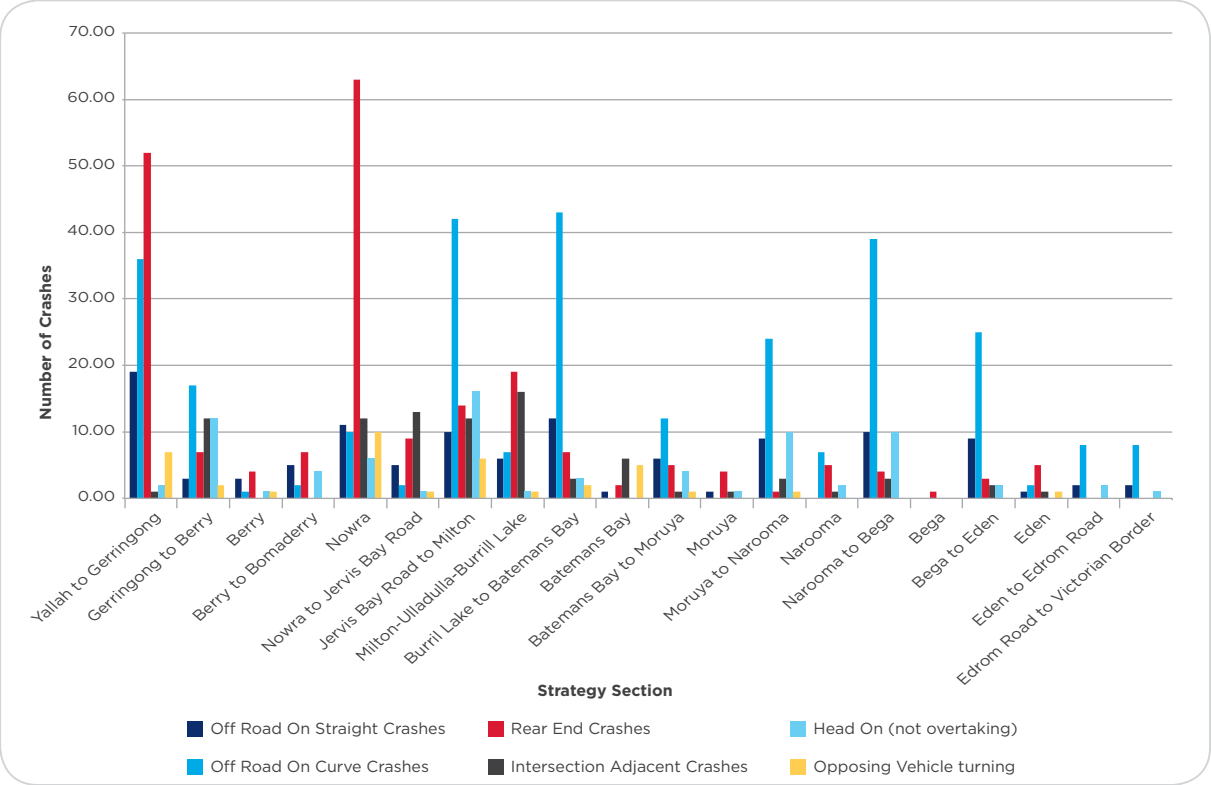
The highest severity index is in planning section 15 between Narooma and Bega at 1.36. The highest index in the urban sections is 1.32 in Eden. The section between Narooma and Bega is generally high speed (100km/h) with tight curves, narrow shoulder widths and minimal safety treatments.

In addition to the severity index, Table 5-4 above shows the number of fatal and injury crashes per planning section. The corridor section between Jervis Bay Road and Milton has seven recorded fatal crashes, higher than any other corridor section. The fatal crashes are spread throughout the section and do not occur at any particular time of day. Of the seven fatal crashes, four were run off road type crashes, two were head on collisions and one was an intersection crash. The section between Burrill Lake and Batemans Bay has 5 recorded fatal crashes and 73 injury crashes.

Crash types

Figure 5-6 shows the most prevalent crash types recorded on the Princes Highway during the five year period to March 2014.

Figure 5-6 Crash types, 2009 to 2014



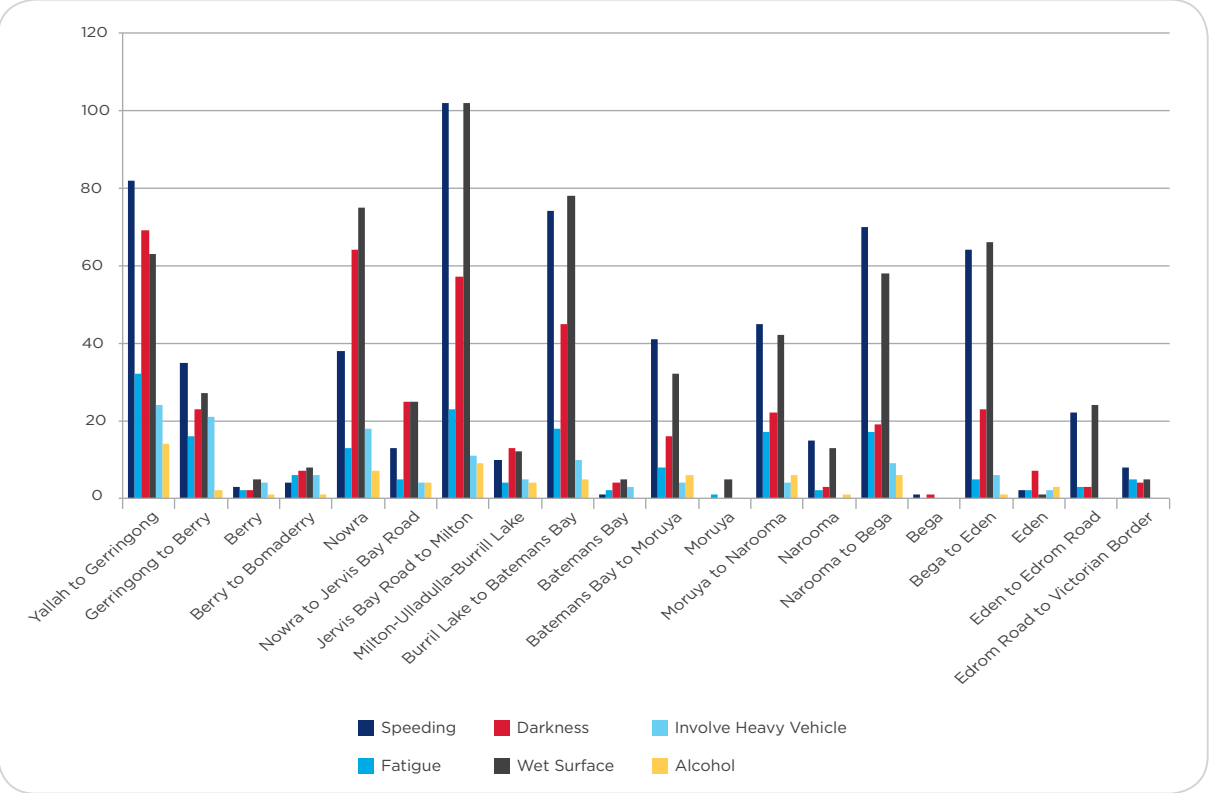
During the five-year crash history period "rear end" crashes, which were generally low-severity crashes occurring at relatively low speeds in urban areas, accounted for 25% of all recorded crashes within the corridor. "Off road on curve" crashes accounted for nearly 30% and "off road on straight" crashes a further 12%, with both of these types generally involving more severe crashes, most of them at higher speeds in rural areas.

As may be expected, most of the "rear end" and "intersection" crashes occurred in the major town centres along the corridor. In particular, section 1 at Yallah and Albion Park Rail at the northern end of the corridor as well as within corridor planning section 5, at Bomaderry and Nowra. The "off road" crashes occurred mostly along the rural lengths of the highway with areas on the northern approaches to Narooma, Eden and Kiah experiencing the highest occurrence of these crash types.

Contributing factors

Figure 5-7 summarises the contributing factors recorded for all reported crashes within the five year period to March 2014.

Figure 5-7 Contributing factors in crashes between 2009 to 2014



Only 6.4% of all crashes involved a heavy vehicle and only 4.4% of crashes involved heavy trucks as the key vehicle. Wet road surface was a major contributing factor in crashes (31.6%) as was speed (30.8%). Fatigue was a contributing factor in 8.9% of crashes and alcohol was a contributing factor in 3.4% of crashes.

In considering these statistics, it is important to note that 'speeding' does not always indicate non-compliance with the posted speed limit, but simply that the speed of a vehicle was not appropriate for the condition of the road at the time, for example during wet weather.

In addition, due to the isolated location of many casualty crashes it is difficult to identify the involvement of speed in all instances. In turn, the number of crashes identifying speed as a factor should be considered a minimum number.

The rural sections to the south of Jervis Bay Road have a high incidence of speeding and wet surface crashes. These sections are generally high speed sections of the highway that have a number of tight curves and minimal shoulder widths.

Road user behaviour

In response to the contributing factors outlined above, initiatives are deployed that aim to modify road user behaviour. These include:

- Education campaigns for drivers, cyclists, pedestrians and other road users.
- Increased police focus.
- Camera technology such as fixed or mobile speed cameras.

Fixed speed cameras target locations where the number of injury crashes is of concern and/or travel speeds are excessive. There are two fixed speed cameras located along the Princes Highway. One of these cameras is located at Brogo. The other is located at Berry, however this camera may be impacted by the current construction of the Foxground to Berry project and may result in its relocation or removal.

Mobile speed cameras produce a sustained change in driver behaviour by creating a perception that speeding can be enforced anywhere at any time. Drivers are less able to predict where the enforcement will occur meaning that speed limit compliance and consequently a reduction in crashes can be achieved more broadly across the network.

Ongoing investigations will continue to identify where speed cameras are warranted. Education programs and additional focus from the NSW Police Service would require 'third party' commitments but nevertheless are matters worthy of further consideration.

Vulnerable road users

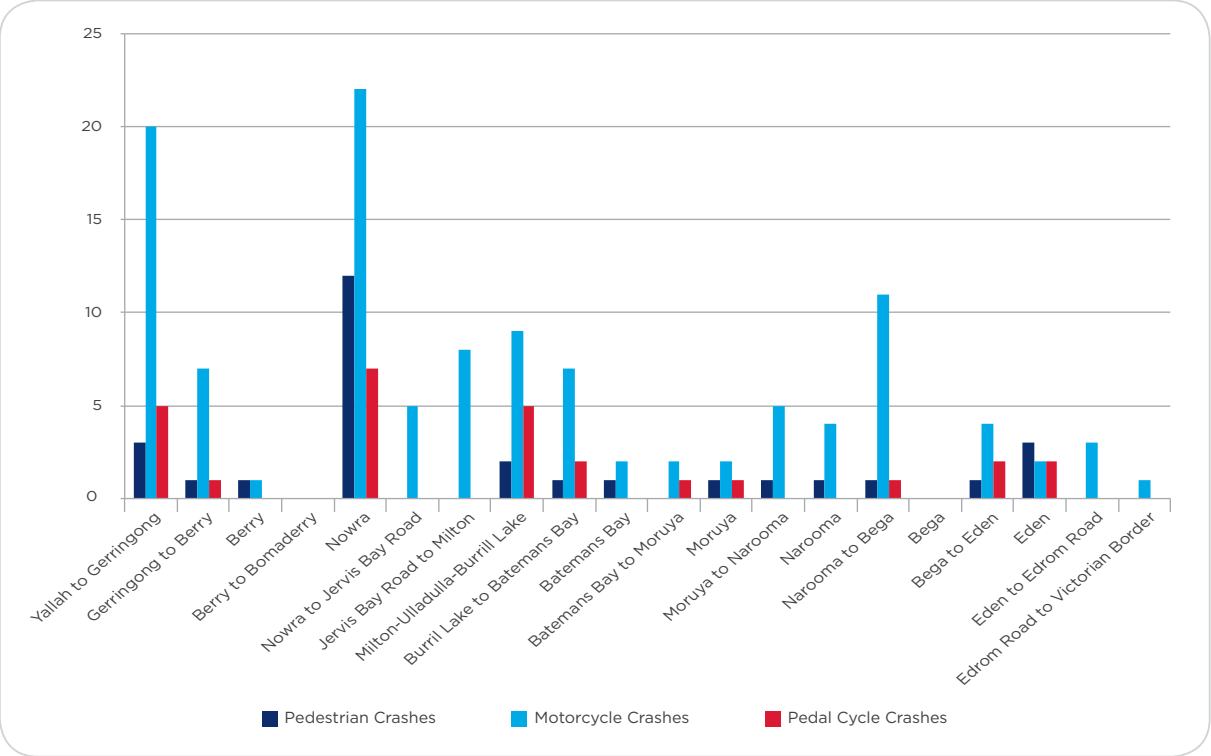
Vulnerable road users are those most at risk in the vicinity of traffic as they have greater likelihood and severity of injury if struck by an errant vehicle. This includes cyclists, pedestrians and horse riders not protected by a form of barrier.

There have been 29 pedestrian crashes along the Princes Highway between April 2009 and March 2014. 12 of these crashes involving a pedestrian have occurred through the town centre of Nowra between Bolong Road and McKay Street making this the worst performing section on the highway. This is also recognised in the Long Term Transport Master Plan. A priority will be to investigate and improve pedestrian facilities in Nowra and other urban centres. Three crashes involving pedestrians occurred in Albion Park Rail and a further three pedestrian crashes have been recorded in Eden. Of the 29 pedestrian crashes, one was fatal which occurred in Nowra. There have been a smaller number of pedestrian crashes on the rural sections of the highway (17%) and the pedestrian crash rate per kilometre for the total length of the highway is 0.19.

For the same five year period, there have been 27 pedal cyclist crashes making the pedal cycle crash rate per kilometre for the total corridor 0.12. The worst performing sections are Nowra (7 crashes), Albion Park Rail (5 crashes) and Milton-Ulladulla (5 crashes). Like the pedestrian crashes, the majority of crashes occurred in the urban centres with 25% occurring on the rural sections of the corridor. No fatal pedal cyclist crashes were recorded during this period.

Of the 2045 recorded crashes along the Princes Highway Corridor, 115 crashes (5.6%) involved motorcyclists resulting in 5 fatalities. The worst performing section is section 5 through Bomaderry and Nowra with 22 motorcycle crashes and a crash rate per kilometre of 2.30 which is significantly higher than all other sections and significantly higher than the crash rate per kilometre for the entire corridor which is 0.46.

Figure 5-8 Vulnerable road user crashes between 2009 and 2014



Summary of road safety issues

For the period between April 2009 and March 2014:

- There have been a total of 2045 recorded crashes along the Princes Highway Corridor
- Of the total crashes, 953 were recorded as casualty crashes resulting in 38 fatalities
- Speed and a wet road surface were the key contributing factors, followed by darkness and fatigue
- The casualty crash rate is higher than the state average for the relevant road classes and land use types for most of the rural sections south of Nowra. The urban centre of Nowra also has a casualty crash rate above the NSW average, in particular involving pedestrians.
- The worst performing urban section by casualty crashes per 100 million vehicle kilometres travelled are Batemans Bay, Eden and Moryua. The worst performing rural sections were Eden to Edrom Road, Edrom Road to Victoria and Burrill Lake to Batemans Bay.
- The worst performing sections by the severity index are Eden, Moruya and Milton-Ulladulla for the urban centres and Narooma to Bega, Burrill Lake to Batemans Bay and Gerringong to Berry for the rural sections
- Off road on curve crashes (in the rural sections of the highway) were the most common type, followed by rear end crashes particularly in the urban town centres. Off road on straight crashes were the next most frequent.
- 6.4% of all crashes involved a heavy vehicle and in only 4.4% was the heavy vehicle the key vehicle.
- Rain was a contributing factor in 23% of crashes and overcast or fog/mist conditions were contributing factors in a further 13%
- Wet road surface was identified as a contributing factor in 31.6% of crashes
- 19.9% of crashes occurred in darkness, a further 5.8% at either dawn or dusk and the remainder of crashes occurred during daylight hours.

- 8.3% of crashes occurred at intersections with the highest incidence being in Nowra (32 crashes), Milton-Ulladulla (25 crashes), and between Gerringong and Berry (23 crashes)
- There is a high incidence of pedestrian crashes in Nowra, followed by Albion Park Rail and Eden. Nowra also has the highest number of pedal cyclist crashes followed by Albion Park Rail and Milton-Ulladulla.
- Of the motorcycle crashes in rural areas, there is a relatively high occurrence of motorcycle crashes between Narooma and Bega, followed by Jervis Bay Road to Milton, Burril Lake to Batemans Bay and between Gerringong and Berry.

Road Safety Findings

Although the above analysis provides a useful understanding of the average performance of the corridor along larger defined sections, more detailed investigation into road safety information has identified a number of areas along the corridor with a poor road safety record across a number of these measures. These areas include:

Kiama Bends

Located south of Kiama, the Kiama bends is approximately a 2.2 kilometre section of the highway between the Weir Street ramps and Mt Pleasant lookout. This section of the highway is a four lane divided carriageway with a concrete median barrier. The road has an 80km/h posted speed limit with traffic volumes of approximately 20,000 vehicles per day. Although meeting the government commitment of achieving a 4 lane divided carriageway, this section of the highway has a number of tight curves with associated "off road on curve crashes".

A five year crash analysis for the section indicates there were 25 crashes involving 13 injuries and 1 fatality. The majority of the reported crashes were in a southbound direction which may reflect a geometric or asset condition concern or could reflect the approach speeds of drivers as they enter the bends from a higher standard road to the north. With works underway to provide a high standard highway immediately to the south of the bends (with a design speed of 100km/h), this concern could be replicated northbound. RMS will continue to monitor this section of the highway with a view of investigating options aimed at addressing the road safety concerns associated with the alignment of the road.

Nowra

Of the urban areas, Nowra is the only town centre that has a casualty crash rate per kilometre per year exceeding the class average with a rate of 2.97 compared to a class average of 2.215.

The southern component of the section is defined as being located between Bolong Road, immediately north of Nowra bridge, and Warra Warra Road. The Princes Highway splits the major commercial centre on the western side of the highway and the major retail centre on the eastern side of the highway. Access across the highway is facilitated via a number of signalised intersections which assists not only vehicular traffic but also helps address some of the pedestrian and cyclist desire lines across the highway.

Traffic volumes in Nowra are higher than the other town centres toward the southern end of the corridor and as a result it experiences crash types typical of its more congested urban environment. A more detailed review of the crashes occurring within the section shows that pedestrian crashes are highest within the Nowra town centre. A total of 12 out of 29 recorded pedestrian crashes along the corridor occurred on a 4 kilometre length of the highway. These 12 crashes have resulted in 11 injuries and 1 fatality.

In addition, the 4.5 kilometre length of highway between Bolong Road, north of Nowra Bridge and Hillcrest Avenue in South Nowra experienced 221 crashes resulting in 91 injuries and 2 fatalities. Works completed as a result of the South Nowra upgrade may address some of the road safety issues however these works only upgraded a small component (15%) of this 4.5 kilometre section.

The management of this section of the highway through Nowra into the future will need to have a strong focus on road safety and traffic efficiency. The management strategy will need to consider and balance the movement needs of freight and all other road users, including traffic efficiency and travel reliability, with supporting the life and vitality of places and enabling services of businesses.

Jervis Bay Road to Sussex Inlet Road

Section 7 of the corridor between Jervis Bay Road and Milton has a casualty crash rate per kilometre per year of 0.48 which is significantly higher than the NSW average of 0.195. A more detailed investigation into this section identified that approximately 20 kilometres of the 45 kilometre section (between Jervis Bay Road and Fitches Creek Road) experienced 179 or around 73% of the total crashes within the section. These crashes resulted in 79 injuries and 3 fatalities.

Within this section there are a number of distinct challenges. To the north, there are a high number of rural accesses located in the 100km/h posted speed zone which results in unexpected stopping and rear end crashes. Sections of the road have clear zones that contain hazards including open drains and as such provide a less forgiving roadside environment during emergency braking situations. South of this between Tomerong and Sussex Inlet Road there are a number of major access points to coastal towns, deficient curves and steep grades.

Middle Creek

A 28km section of road within section nine of the corridor between River Road and the Shoalhaven/Eurobodalla LGA border has a total of 104 crashes, of which 51 resulted in an injury and 4 fatalities. Middle Creek is located north of Pebbly Beach Road, East Lynne and the highway has a traffic volume of around 4,500 vehicles per day including 10% heavy vehicles. A review of the crash history in this area indicated a total of 27 crashes occurred on a 500m section of the highway, with 16 injuries and 4 fatalities as a result of these crashes. This represents around 26% of the total crashes within this 28 kilometre section. The alignment on the approaches to Middle Creek has deficient horizontal curves for the target 100km/h posted speed limit. Vertical grade and clear zones at this location are also a concern. The deficient alignment is reinforced by the fact that around 74% of the crashes occurring at the location are "off road on curve hit object crashes". Roads and Maritime are planning some treatments at this location including improvements to clear zones, shoulder widening, improved signposting and guard fence extensions, however this may require a more extensive investigation to adequately address the issue in the longer term.

Batemans Bay to Moruya

A closer examination of Section 11 of the corridor between Cranbrook Road, South Batemans Bay and Toose Street, Moruya indicates that the northern component of this 24.4 kilometre section has a poor casualty crash rate. Specifically, the 7.3 kilometre length between Cranbrook Road, South Batemans Bay and Dog Trap Road, Mogo has experienced 38 or approximately 56% of the total crashes along this section of the highway resulting in 20 injury crashes with a total of 30 injuries.

This 7.3 kilometre length of the highway is characterised by a number of deficient horizontal curves often in combination with steeper vertical grades, narrow shoulders and limited clear zones. These alignment concerns are reflected in the crash statistics that indicate that 60% of the crashes reported on this section of the highway are "off road on curve" and "off road on curve hit object" crashes. The majority of these crashes (87%) have occurred in the 4 kilometre section south of Cranbrook Road to a point 1 kilometre north of Runnyford Road.

In 2014 the NSW Government announced a $10 million funding commitment to Eurobodalla Shire Council for the construction of the South Batemans Bay Link Road. The Council proposed link road is being constructed to take pressure off the existing Beach Road/Princes Highway junction and to accommodate future growth in land use both within the existing urban centre as well as in coastal towns accessed via Beach Road. The link road is expected to be open to traffic by 2017.

Although the final junction location and configuration is yet to be determined, it will be located within the 4 kilometre section of the highway discussed above and as such is likely to place additional pressure on the highway at this location. The existing junction location has a number of specific challenges due to the poor horizontal and vertical alignment of the highway and Roads and Maritime has previously identified specific sight distance and road safety concerns when commenting on possible "link road" junction configurations. Roads and Maritime will continue to work with council to identify a safe and efficient junction location and configuration, which may require some level of highway realignment within the short to medium term. In developing the solution Roads and Maritime will also need to consider the impact of future growth scenarios and the possible traffic efficiency and road safety impacts associated with this growth on this substandard section of the highway. These impacts may require additional or larger scale works along this section of the highway.

North Narooma

Section 13 of the corridor between Moruya and Narooma has also been investigated as it performed poorly in a number of the road safety measures.

The Princes Highway between Bodalla and Narooma is bordered by National Park and has a number of deficient curves, narrow shoulders, narrow lane widths and limited clear zones in some areas. As may be expected, the majority of the crashes are "off road on curve hit object crashes". With the section one kilometre further south of this location also experiencing a poor crash history and including the Wagonga Inlet Bridge crossing, RMS will need to target this area and investigate short and longer term options aimed at addressing these issues.

Narooma to Bega

Section 15 of the corridor between Narooma and Bega is the longest section of the corridor with a length of 73 kilometres. A total of 120 crashes were recorded along this length of the highway resulting in 70 injuries and 4 fatalities.

The 23.5 kilometre northern component of section 15 recorded a total of 42 crashes resulting in 28 injuries and 1 fatality. Projects including the Victoria Creek realignment (which was opened in March 2013) and the proposed Dignams Creek realignment have and will address some of these concerns.

The remaining 10 kilometres of the highway between the Victoria Creek and Dignams Creek projects has a number of deficient curves, narrow shoulders (particularly adjacent to cuttings), deficient lane widths and minimal clear zones.

The 5.02 kilometre southern component of section 15 between the Snowy Mountains Highway and Bega River Bridge recorded a total of 20 crashes resulting in 10 injuries and 1 fatality. Of these 20 crashes, the majority occurred on curves (62%) and on a wet surface (68%). Short term maintenance actions at this location in 2014 provided a higher friction surface and improved delineation. Ongoing monitoring of this is required to evaluate the success of the treatment but also to determine what if any additional works may be required along this length of road.

5.2 Traffic

This section outlines the traffic assessment undertaken for the Princes Highway Corridor Strategy, and the overall traffic performance over the past several years. It outlines the current traffic volumes (light and heavy vehicles) and past traffic growth trends. Forecast performance for the highway is discussed in Chapter six, which takes into account future changes along the corridor.

This section will discuss the following:

- Location of available traffic data counts and historical data sets.
- Overall trends in the performance of the highway throughout the day and over the past 20 years.
- The current average level of service and the peak hour level of service.
- Overtaking opportunities and deficiencies.
- Intersection performance.
- Incident management.
- Regional centre and town bypasses.

Traffic volumes

Traffic data for the Princes Highway was available between 2011 and 2015 for various locations along the corridor. The majority of the data was available for 2013 and all other sites have therefore been scaled to 2013 for consistency. Where possible, only one traffic volume is provided for each of the 20 corridor planning sections, however due to the large variation in traffic volumes within some planning sections, 31 traffic count locations have been used for analysis. This is shown in Table 5-5.

Table 5-5 Traffic volumes by corridor planning section and sub section (urban centres are shaded grey)

Corridor Planning Section	Count Location Description	Average Daily Traffic	Average heavy vehicle volume	% heavy vehicles
1	Yallah – Macquarie Rivulet (start of corridor)	60439	5397	8.9%
1	Bombo – Adjacent to Bombo Railway Station	34079	3199	9.4%
1	Kiama – Saddleback Mountain Road	19757	2640	13.4%
2	Gerringong – 500m south of Omega Flat	12444	1713	13.8%
3	Berry – 100m south of Victoria Street	13763	1559	11.3%
4	Bomaderry – 100m north of Moss Vale Road	12918	1799	13.9%
5	Nowra – South of Shoalhaven River Bridge	47544	1886	4.0%
6	Falls Creek – 50m north of Comberton Grange Road	22777	2095	9.2%
7	Falls Creek/Tomerong – 200m south of Gorindah Road	12169	1131	9.3%
7	Conjola – 350m north of Martins Ridge Road	7487	595	8.0%
8	Ulladulla – 200m south of Village Drive	11093	731	6.6%
9	Burrill Lake – 100m south of Dolphin Point Road	5744	601	10.5%
9	Benadarah – 500m north of Cherry Hill Road	4445	475	10.7%
10	Batemans Bay – 700, South of Beach Road	7312	651	8.9%
11	Mogo – 100m north of Runnyford Road	7597	608	8.0%
12	Moruya – 100m south of Albery Street	7996	650	8.1%
13	Bergalia – 150m north of Bergalia Link Road	5167	462	8.9%
13	Bodalla – 100m south of Bodalla Park Drive	3812	409	10.7%
14	North Narooma – North side of Wagonga Inlet Bridge	7705	685	8.9%
15	Victoria Creek – 200m north of Victoria Creek*	2578	272	10.6%
15	Angledale – 100m north of Snowy Mountains Highway	3221	372	11.6%
15	Coopers Gully – 1km north of Coopers Gully Road	4666	558	12.0%
16	Bega – Bridge over Bega River	7829	812	10.4%

Corridor Planning Section	Count Location Description	Average Daily Traffic	Average heavy vehicle volume	% heavy vehicles
17	Kingswood – 700m south of Candelo-Bega Road	3848	415	10.8%
17	Wolumla – 50m south Coral Park Road	5792	544	9.4%
17	Millingandi – Turnoff from Merimbula Drive	2702	406	15.0%
18	North of Eden – 750m south of Broadwater Road	3858	413	10.7%
18	Eden – Approx 150m north of Mitchell Street	5958	547	9.2%
19	South of Eden Approx 450m north of Quarantine Bay Rd	1981	295	14.9%
19	Kiah – 1km south of Burrawang Road	929	232	25.0%
20	Timbillica – Victorian Border	976	164	16.8%

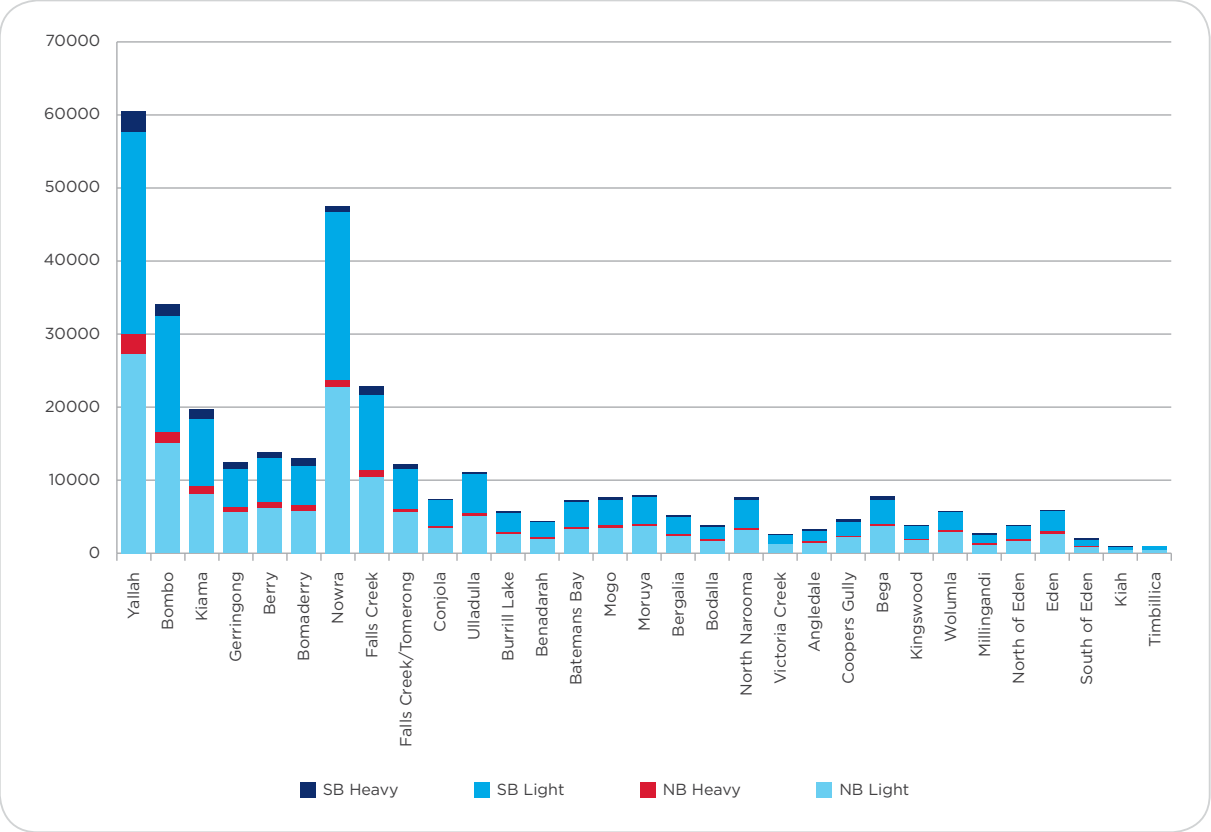
*Count station on old alignment

The 2013 Average Daily Traffic volume at the northern end of the Princes Highway Corridor at Yallah was more than 60,000 vehicles consisting of nearly 9% heavy vehicles. The traffic volumes drop to the south of Albion Park Rail at Bombo to around 35,000 vehicles and continue to drop to just under 13,000 vehicles at Bomaderry to the north of Nowra. The traffic volumes through Bomaderry and to the north of Nowra are expected to increase when the Berry Bypass is opened to traffic as it is anticipated that a proportion of the light vehicle traffic currently using Bolong Road as an alternative north-south connection will use the Princes Highway.

Traffic volumes in Nowra increase significantly to nearly 48,000 vehicles, with about 4% of those being heavy vehicles. This significant increase in traffic volumes through Nowra illustrates its role as a major generator and attractor of traffic being the main employment and commercial precinct in this area.

South of Jervis Bay Road the traffic volumes drop to approximately 12,000 and gradually decrease in the rural sections towards the Victorian Border where traffic volumes are less than 1000 vehicles, with a relatively high proportion of heavy vehicles. Although volumes decline towards the southern end of the corridor, volumes peak through the urban centres such as Ulladulla with approximately 11,000 vehicles and Batemans Bay, Moruya, Narooma and Bega with just over 7,000 vehicles.

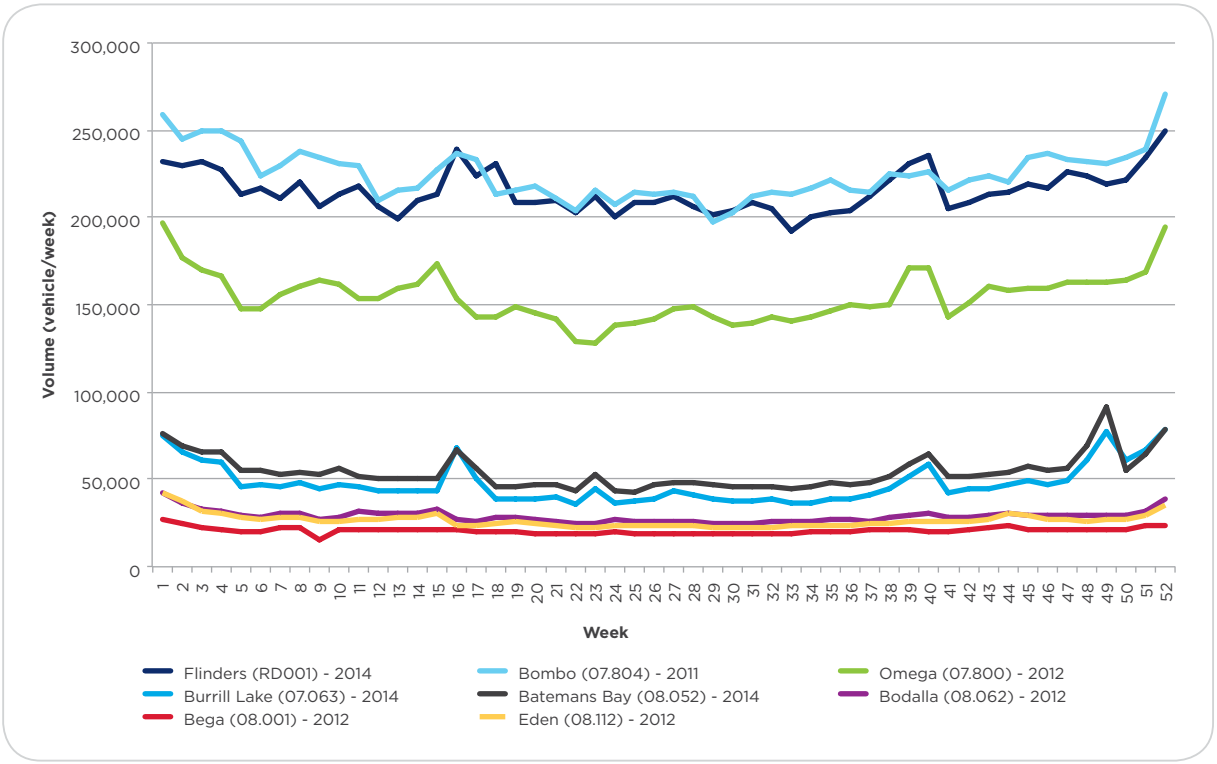
Figure 5-9 Annual Average Daily Traffic (ADT) volumes in 2013



The proportion of heavy vehicles along the Princes Highway generally ranges from 8% between Bateman's Bay and Moruya to nearly 14% at the northern end of the corridor. The southernmost section of the corridor, south of the Edrom Road junction south of Eden, provides a notable exception to this distribution, with a particularly high proportion of heavy vehicles (approximately 25%), reflecting high volumes of logging freight and low volumes of light vehicles in this section of the corridor. The distributions of heavy vehicle traffic volumes generally follow those observed for light vehicles, with higher volumes towards the northern end of the corridor

Figure 5-10 illustrates the seasonal variations in traffic volumes experienced on the Princes Highway. The graph shows the peaks currently experienced along the highway with peaks in traffic volumes being particularly evident during the Christmas and New Year holidays and during long weekends and school holidays. Due to the significant variation in traffic volumes during the peak holiday periods, some additional monitoring and management is required to maintain flow on the highway. This is already being done in Milton with traffic controllers placed at the pedestrian crossing in town to maintain flow and improve pedestrian safety.

Figure 5-10 Seasonal variations in traffic on the Princes Highway

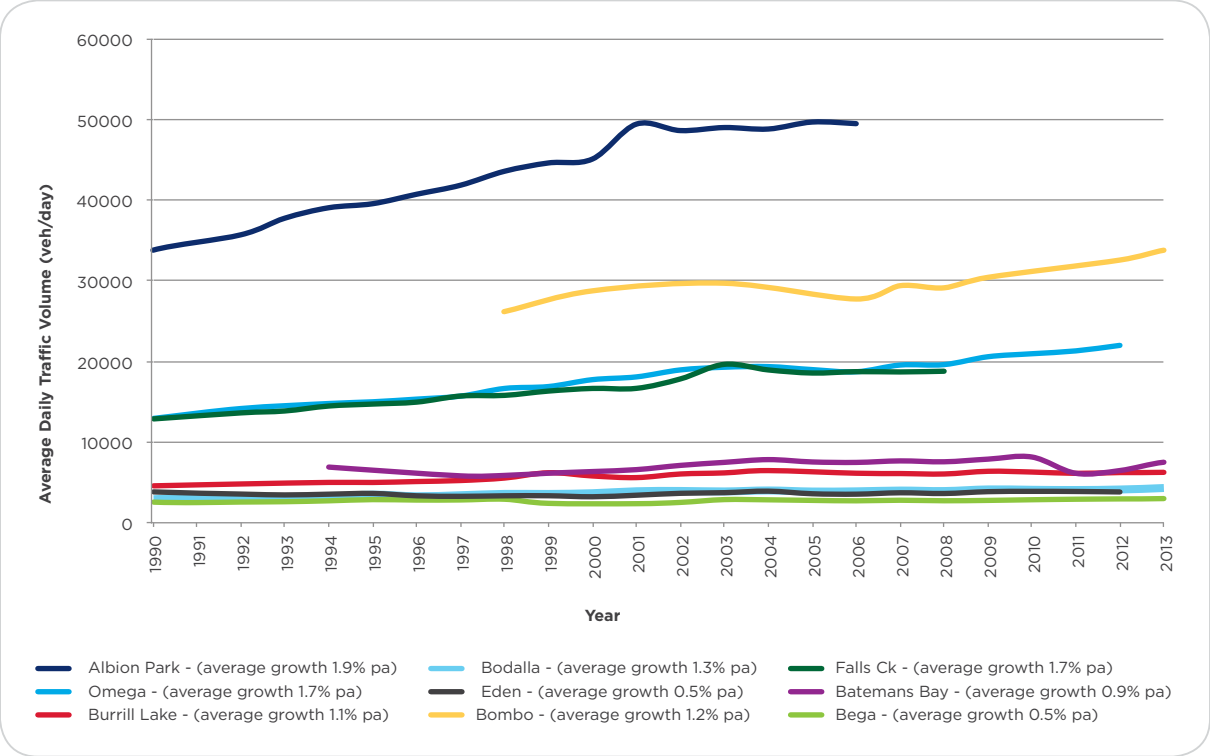


Growth rates and trends

Measuring the volumes of traffic travelling along a route through time can be used to determine a growth rate and forecast a future traffic volume. Vehicle growth rates along a corridor are generally linear unless they are impacted by a significant change in adjacent land use, such as an airport, a freight terminal or a new residential subdivision or regulatory changes such as a gazettal allowing access to new higher productivity vehicles.

The annual traffic growth rate along the Princes Highway ranges from nearly 2.0% in the northern section of the corridor, down to 0.5% at the southern end near Bega and Eden. Areas of the highway near Flinders and Shell Cove, just south of Albion Park Rail, have shown high growth rates and a significant increase in traffic volumes which is reflective of the new housing developments in this area. These growth rates would not be representative of long term sustainable growth rates and have not been included in the analysis. Traffic growth rates for the Princes Highway Corridor are shown in **Figure 5-11**.

Figure 5-11 Traffic growth along the Princes Highway – 1990 to 2013



Number of lanes and level of service

The number of through lanes along a route is a function of either the demand along the route, or a specific commitment to provide a particular standard of route generally between interregional or interstate locations. Rural class 5R roads typically have 2 or more lanes with frequent overtaking opportunities. Rural class 4R roads are generally two lane rural roads, with overtaking lanes spaced to reflect their traffic volumes and the types of vehicles using the route. Rural Class 3R roads typically have two lanes.

The number of through lanes on a class 4R road can be calculated using the level of service rating method. The level of service of highways is used to determine if the capacity of the highway is adequate and is influenced by the number of lanes in each direction on a road and the number and length of overtaking lanes provided.

The Princes Highway corridor between Yallah and Gerringong has two lanes in each direction and between Gerringong and Bomaderry it generally has one lane in each direction. However current and planned projects will provide two lanes in each direction from Waterfall to Jervis Bay Road. From Bomaderry, through Nowra to Jervis Bay Road, the highway generally has two lanes in each direction and from Jervis Bay Road to the Victorian border, the highway generally has one lane in each direction. The Roads and Maritime Network Performance Measures and Network Planning Targets[12] have a target for the number of through lanes on the Princes Highway. The target for the 5R class road, between Yallah and Jervis Bay Road is four lanes on divided carriageway and on 4R and 3R class roads it is two lanes and increased to four if required to provide Level of Service C. If the travel demand for any particular road is such that the target level of service C is forecast to be exceeded within the planning horizon, an assessment should be made as to the viability of increasing the number of lanes available. However, there are several treatments (such as Intelligent

12 NSW Centre for Road Safety 2011, *NSW Speed Zoning Guidelines*, RMS, Sydney

Transport Systems technology or strategically located overtaking lanes) that should also be considered first to improve travel reliability along the corridor and improve the level of service.

The Austroads definition of the level of service of a road is a measure of how easily traffic flows on the road. It assesses the operating condition of a road based on various factors, including traffic volumes, proportion of heavy vehicles, terrain and frequency of intersections. Levels of service range from 'A' to 'F' with 'A' representing free-flowing traffic and 'F' representing severe congestion. Table 5-6 defines each level of service on uninterrupted two-lane two-way roads.

Table 5-6 Level of service definitions

Level of service (LOS)	Description[13]
A	Motorists experience high operating speeds on Class I highways and little difficulty in passing. Platoons of three or more vehicles are rare.
B	Passing demand and passing capacity are balanced. On both Class I and Class II highways, the degree of bunching becomes noticeable. Some speed reductions are present on Class I highways.
C	Most vehicles are travelling in platoons. Speeds are noticeably curtailed on all three classes of highway.
D	Bunching increases significantly. Passing demand is high on both Class I and II facilities, but passing capacity approaches zero. A high percentage of vehicles are now travelling in platoons, and percentage of time spent following is quite noticeable.
E	Demand is approaching capacity. Passing on Class I and II highways is virtually impossible, and percentage of time spent following is more than 80%. Speeds are seriously curtailed.
F	Exists whenever arrival flow in one or both directions exceeds the capacity of the segment. Operating conditions are unstable, and heavy congestion exists on all classes of two-lane highway.

The *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* outlines the process to calculate the level of service of a two-lane two-way road. The process is based on the *Highway Capacity Manual (HCM) 2010*[14]. The HCM 2010 distinguishes between three categories of two-lane highways as follows[15]:

- Class I two-lane highways are generally major intercity routes, primary arterials, daily commuter routes or primary links in state or national highway networks. There is an expectation from motorists to travel at relatively high speeds. These facilities often serve long-distance trips or provide connecting links between facilities that serve long-distance trips.
- Class II two lane highways are generally those that function as access routes to Class I facilities, serve as scenic or recreational routes (except primary arterials), or pass through rugged terrain. Motorists do not necessarily expect to travel at high speeds. These facilities often serve relatively short trips, the beginning and ending of longer trips, or trips for which sightseeing plays a significant role.

13 Austroads 2013, *Guide to Traffic Management Part 3: Traffic Studies and Analysis*, Austroads. Sydney, p.46

14 Transportation Research Board 2010, *Highway Capacity Manual: HCM 2010*, TRB, Washington

15 Austroads 2013, *Guide to Traffic Management Part 3: Traffic Studies and Analysis*, Austroads. Sydney, p. 42

- Class III two lane highways are generally those that serve moderately developed areas. They can be sections of Class I and Class II highways that pass through developed areas, where there is a mix between local and through traffic and the density of roadside access points is noticeably higher. These segments are often accompanied by reduced speed limits that reflect the higher activity level.

Princes Highway is a Class 1 road. Per cent time-spent-following and average travel speed are the criteria used to determine the level of service on Class 1 highways.

The Princes Highway corridor performance has been evaluated to understand the existing level of service. The assessment has been based on various factors including traffic volumes, proportion of heavy vehicles, speed limit and overtaking opportunities using 'Traffic on Rural Roads' (TRARR) modelling software developed by the Australian Road Research Board. TRARR analyses traffic flow on uninterrupted two lane rural road segments. Each vehicle's progress is measured at one second intervals. The TRARR model can be used to simulate platooning and the percentage of vehicles following due to slower freight vehicles, for example on steeper grades where there are no overtaking opportunities.

The section of the Princes Highway between Jervis Bay Road and Milton was assessed based on the per cent time following another vehicle and average travel speed with the performance criteria outlined in Table 5-7. The section of the Princes Highway north of Jervis Bay Road is generally four lanes divided carriageway, or has current or planned construction for four lanes divided carriageway between Gerringong and Bomaderry, therefore a TRARR analysis was not conducted. South of Ulladulla, the low average daily peak hour volumes did not warrant analysis using TRARR in this strategy but may be included in a future more detailed overtaking lane analysis of the highway.

Table 5-7 Level of service performance criteria[16]

Level of service	Class 1 Highway	
	Average travel speed ATS (km/h)	Per cent time-spent-following PTSF (%)
A	>90	≤35
B	>80 – 90	>35 – 50
C	>70 – 80	>50 – 65
D	>60 – 70	>65 – 80
E	≤60	>80

Results of a TRARR analysis provide guidance as to where additional overtaking opportunities might improve the level of service. RMS Network Performance Measures and Network Planning Target[17] recommend an overtaking lane should be provided at locations where 65 per cent of time is spent following other vehicles which means that the level of service is worse than C.

The level of service for the section of the Princes Highway between Jervis Bay Road and Milton is shown in Table 5-8 for the southbound direction and Table 5-9 for the northbound direction. Level of service for future predicted traffic volumes is presented in Chapter six.

16 Austroads 2013, *Guide to Traffic Management Part 3: Traffic Studies and Analysis*, Austroads. Sydney, p. 45

17 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, Sydney, p. 42

Table 5-8 Princes Highway corridor performance – Southbound

Corridor section	% time spent following			Average Speed (km/h)			Level of Service		
	AM peak hour	PM peak hour	Day time^	AM peak hour	PM peak hour	Day time^	AM peak hour	PM peak hour	Day time^
Section 7 – Jervis Bay Road to Sussex Inlet Road – Southbound	70.4	80.8	69.2	75.0	65.2	72.9	D	E	D
Section 7 – Sussex inlet Road to Milton	56.9*		49.3	74.2*		75.9	C		C

* No defined AM or PM peak. Peak hour is 1400-1500

^ Day time is an average day time volume between 6am and 6pm with the peak volumes removed

Table 5-9 Princes Highway corridor performance – Northbound

Corridor section	% time spent following			Average Speed (km/h)			Level of Service		
	AM peak hour	PM peak hour	Day time^	AM peak hour	PM peak hour	Day time^	AM peak hour	PM peak hour	Day time^
Section 7 – Jervis Bay Road to Sussex Inlet Road	77.6	73.5	69.3	69.5	76.8	73.9	D	D	D
Section 7 – Sussex Inlet Road to Milton	48.8*		45.2	81.8*		80.5	B		B

* No defined AM or PM peak. Peak hour is 1400-1500

^ Day time is an average day time volume between 6am and 6pm with the peak volumes removed

The results of the TRARR analysis show that the section between Jervis Bay Road and Sussex Inlet Road are performing at or below level of service C during most of the day (6am – 6pm) and are performing worse during the PM peak southbound and the AM peak northbound.

The section of highway between Sussex Inlet Road and Milton where the traffic volumes are lower performed between level of service B and C. This section of road did not have an AM and PM peak but generally had higher volumes for a few hours in the middle of the day to late afternoon.

This analysis suggests that additional overtaking lanes between Jervis Bay Road and Sussex Inlet Road would improve the level of service and a detailed overtaking lane study is recommended to determine the most appropriate locations for new overtaking lanes.

Sections of the highway south of Milton experience lower traffic volumes with a similar proportion of heavy vehicles and therefore a TRARR analysis of these sections of the highway was not conducted for this study. However, the recommended overtaking lane study may be expanded to include sections south of Milton, prioritising those sections with a low percentage of overtaking opportunities discussed in the next section.

Overtaking opportunities

The decision to construct an overtaking lane is influenced by the prevailing level of service, traffic volumes, percentage of slow vehicles including light trucks and cars towing a load, and the availability of overtaking opportunities on adjoining sections. Overtaking opportunities include sections of road where motorists may legally overtake another vehicle in the absence of an overtaking lane, in addition to overtaking lanes. Overtaking lanes are an important part of the road network that facilitate safe vehicle passing. In the absence of overtaking lanes there is an increased likelihood that some drivers will become frustrated and engage in unsafe behaviour when overtaking in the opposing lane. Overtaking lanes can improve travel times and level of service by allowing light vehicles an opportunity to pass slower moving vehicles such as heavy freight vehicles.

Rural sections of the Princes Highway generally traverse rolling terrain, punctuated by short sections of mountainous terrain. There are frequent horizontal curve and grade constraints along the highway that add to sight distance limitations and lead to a reduction in the use of the breaks in the centerline as a means of overtaking slower moving vehicles.

The rural sections of the Princes Highway between Jervis Bay Road and the Victorian Border is approximately 318.9km in length and provides 80.4 km of overtaking opportunities in the form of overtaking lanes and 139.3km where intermediate sight distance is appropriate for vehicles to pass on the opposing lane. This equates to 34.4% of the corridor having overtaking opportunities in the form of overtaking lanes or broken centre lines. Table 5-8 shows the percentage of total overtaking opportunities for all the rural sections of the highway south of Jervis Bay Road.

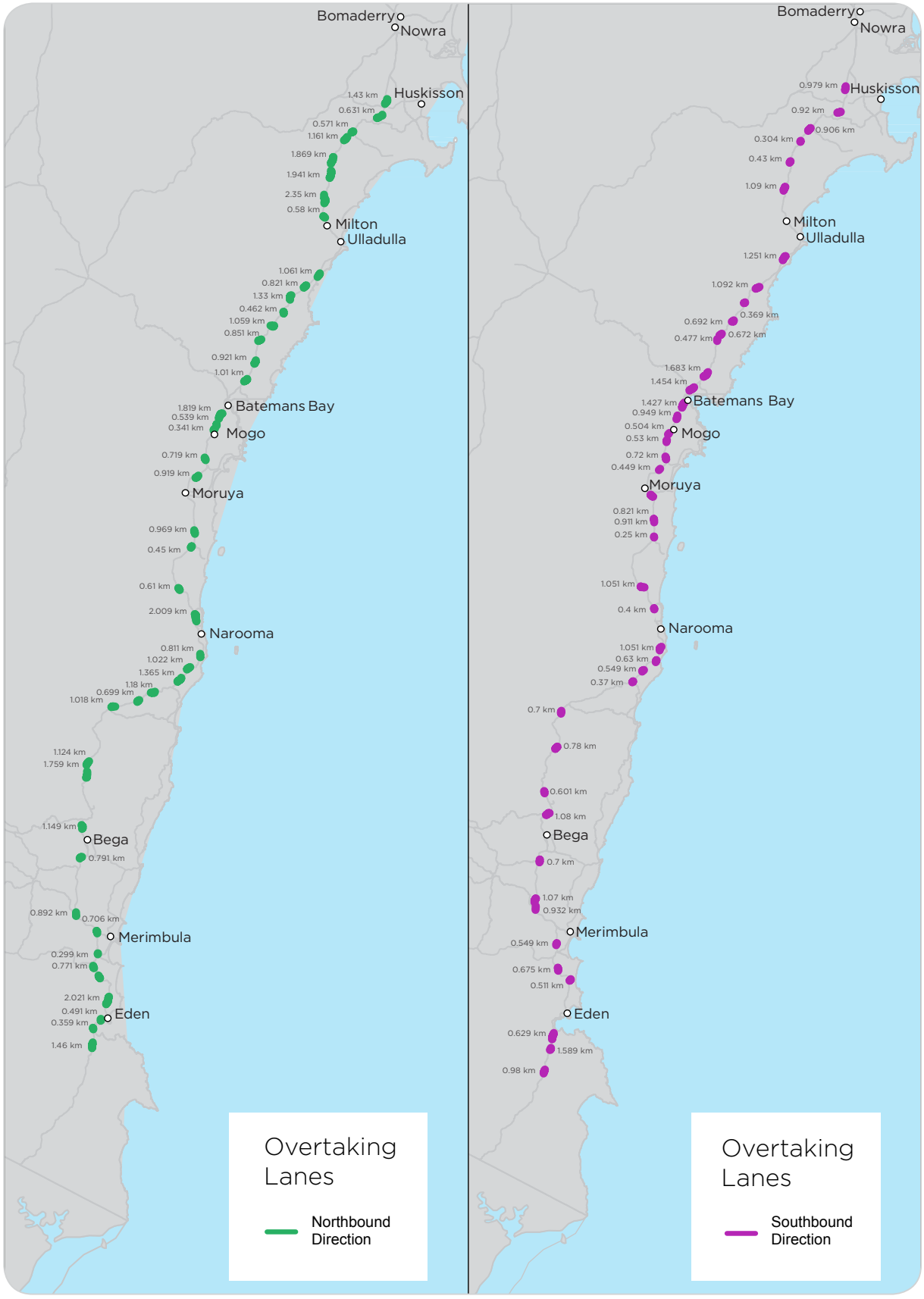
Table 5-10 Overtaking opportunities on the rural sections along the Princes Highway corridor south of Jervis Bay Road

Corridor section	% of section with overtaking opportunities – Northbound	% of section with overtaking opportunities – Southbound
7. Jervis Bay Road to Milton	43.5%	29.9%
9. Burrill Lake to Batemans Bay	35.0%	30.9%
11. Batemans Bay to Moruya	45.3%	42.7%
13. Moruya to Narooma	38.8%	38.3%
15. Narooma to Bega	35.1%	31.9%
17. Bega to Eden	46.4%	42.5%
19. Eden to Edrom Road	51.0%	47.4%
20. Edrom Road to Victorian Border	36.1%	37.1%
TOTAL by LENGTH	**128km**	**114km**

The southbound direction between Jervis Bay Road and Milton has the least percentage of overtaking opportunities. Other poor performing sections include Burrill Lake to Batemans Bay, Moruya to Narooma, Narooma to Bega and Edrom Road to the Victorian Border, which all have a low percentage of overtaking opportunities. Discussed in the section above, an overtaking lane study is recommended between Jervis Bay Road and Milton and the worst performing sections identified above could be included in this study.

The location and length of each overtaking lane is shown in **Figure 5-12**.

Figure 5-12 Existing overtaking lanes



Intersection performance

The Princes Highway intersects with many state, regional and local roads with a variety of facilities from grade separated intersections at the northern end through Albion Park and Kiama to basic at grade intersections on many of the rural sections of the highway.

A detailed intersection analysis was completed along the Princes Highway in 2003 focusing on the Shoalhaven, Eurobodalla and Bega Valley local government areas. This analysis resulted in upgrades to improve the performance of many intersections. Other major works such as the North Kiama bypass (completed in 2004) as well as the current and planned projects such the Albion Park Rail bypass and the highway upgrades between Gerringong and Bomaderry will provide mostly grade separated, high quality intersection treatments for the northern section of the corridor.

The intersections experiencing the highest levels of traffic congestion within the corridor are located in the urban centres of the Shellharbour and Shoalhaven local government areas. Notable examples include the Illawarra Highway/Princes Highway roundabout at Albion Park Rail and the signalised junctions with Bolong Road, Illaroo Road and Bridge Road at Bomaderry/Nowra. These intersections coincide with sections of the Princes Highway experiencing annual average traffic volumes in excess of 40,000 vehicle movements per day and will continue to be monitored in the context of land use changes to the north of the corridor and concerns about the Shoalhaven River Bridge crossing in Bomaderry/Nowra.

Some detailed modelling is underway in Nowra and Bomaderry, as well as some additional investigation involving detailed intersection analysis at the following intersections along the Princes Highway:

- Island Point Road, south of Tomerong
- Durras Drive, Benandarah
- Princes Highway (Quondolo Street) / Bullara Street, Pambula
- Browns Road (Flinders Road), South Nowra
- Batemans Bay Link Road
- Little Forest Road, north of Milton

This strategy recommends that a more detailed investigation of the intersections along the highway is conducted from Bomaderry to the Victorian Border. The investigation will identify poor performing intersections in terms of efficiency and safety and prioritise those that do not meet the Network Performance Measures and Network Planning Targets. These investigations will be particularly interested in the safety and efficiency performance of the intersection with some of the key east-west links such as the Kings Highway and the Snowy Mountains Highway intersections. Detailed traffic modelling is currently underway for Nowra and the results of this modelling will provide valuable information for the intersection analysis.

Incident management

Traffic incident management refers to the delivery of planning and operational tasks by the responsible road authority in response to an unplanned incident. This is achieved through collaboration with emergency services and other key stakeholders to facilitate effective management of incidents for road users across the network.

Incidents and planned activities on two lane roads often result in full or partial closures leading to the need to implement detours which in rural areas can often be long in distance, time consuming and may be restrictive to heavy vehicles.

Between April 2009 and March 2014 there were about 1400 recorded incidents along the corridor that affected all travel lanes, lasted for over 1 hour and involved accidents, hazards or fire. About 240 were in section 1, between Albion Park and north of Gerringong. This corresponds with the highest traffic volumes within the corridor. Other areas which had over 100 recorded incidents included Gerringong to Berry, Nowra, Jervis Bay Road to Milton and Narooma to Bega.

Approximately 56 Incident Response Plans (IRPs) have been developed for the Princes Highway between Yallah and the Victorian Border to minimise the impact of any road closures and to reduce the risk of secondary incidents. IRPs can be used to deal with extended disruptions as a result of incidents such as motor vehicle crashes, bushfires or floods.

IRPs are designed to support a total closure of the corridor as needed. They define the agreed diversion route and the roles and responsibilities of the agencies involved. The IRPs also incorporate a unique signposting approach that guides motorists along the diversion route until they reach permanent signs to their destination.

In the case of very serious incidents and extended road closures, detours can include the use of the Hume and Monaro Highways via a limited number of east–west arterial linkages, creating diversions of hundreds of kilometres that often do not cater for heavy vehicles. This may include detours up to:

- 186km for vehicles travelling between Eden and the Victorian border
- 298km for vehicles travelling from the north of Batemans Bay to Bega
- 179km between Nowra and Batemans Bay
- 92.4km between Albion Park Rail and Nowra

At Nowra Bridge, no detour is available and incident controllers need to assess and determine the capacity to guide traffic through the incident site.

The Princes Highway is the primary north-south route connecting the south coast of NSW with the rest of NSW and the ACT, it becomes the primary diversion route in the event of a major incident requiring closure of the key east-west links connecting these areas. These include:

- The Illawarra Highway
- Moss Vale Road
- The Kings Highway
- The Snowy Mountains Highway

Of these routes, IRP have been developed for the Illawarra Highway, the Kings Highway and the Snowy Mountains Highway. Given the limited number of east-west connections available from the Princes Highway, the length of detours within these IRPs can be extensive, sometimes between 400 and 500 kilometres depending on the location of the closure.

To ensure motorists are well informed of incidents and detour routes, Roads and Maritime uses static signposting and portable Variable Message Signs (VMS) in strategic locations to inform motorists so that travel time delays can be minimised. During peak summer holiday periods the Princes Highway is well served by portable VMS, which assist in providing timely advice to drivers about incidents on the highway. In addition, there is one permanent variable message sign located north of Batemans Bay, which allows responsive communication links to the NSW Transport Management Centre in Sydney.

The following Intelligent Transport Systems (ITS) could be provided on the Princes Highway to better inform customers on travel conditions:

- Variable Message Signs (VMS) to inform customers about the travel time variability, road conditions (fog and ice) and road closures.
- Variable Speed Limit Signs (VSLS) to improve driver awareness and safety by providing information on speed limits more appropriate to prevailing conditions along the corridor.
- Vehicle Activated Signs (VAS) to alert the drivers to a hazard so that they can adjust their driving behaviour accordingly (e.g. reduce their speed).
- Closed Circuit Television (CCTV) to manage the corridor performance during planned and unplanned events.
- Real time traffic monitoring devices to gather data on the real time performance of the corridor to provide information to customers via VMS and other technology.

Regional centres and town bypasses

Growing numbers of vehicles within towns, including freight vehicles, increases localised congestion and traffic delays and the potential for excessive noise pollution, particularly due to heavy vehicle engine breaking.

The introduction of town bypasses can facilitate the following benefits:

- Improved reliable and efficient movement of people and goods using the bypass
- Reduced vehicle traffic including freight and reduced congestion and delays on the bypassed corridor

- Improved safety on the bypassed corridor through less conflict between local and through traffic and between vehicles and pedestrians
- Improved amenity and environment in regional centres and towns
- Improved connectivity and walking and cycling between key land uses within urban areas.

The need for town bypasses on the Princes Highway has been assessed using the principles set out in the *NSW Long Term Transport Master Plan*. This included consideration of road hierarchy classification of the State Road Network, where higher order roads carry higher levels of through traffic and generate greater benefits than those where through traffic is much lower.

The approach in the NSW Long Term Transport Master Plan is aimed to consider a bypass on higher order roads adjacent to significant commercial activity (shops and businesses). Other considerations noted in the plan[18] when prioritising bypasses include the proportion of through traffic, travel time benefits, town or regional centre size, terrain, and the development pattern (e.g. dispersed development reduces the benefits of bypasses). The RMS Network Planning Targets[19] call for consideration of bypasses of urban commercial (Class 6R, 5R and 4R) and urban (Class 6R) areas on major highway classes.

The type of bypass to be provided is also an important consideration. Typical bypass options include:

- **Full bypass:** Typically, full bypasses are required where there are high volumes of through-traffic combined with a high proportion of local traffic, including pedestrians. This type of bypass is the most expensive.
- **Inner bypass:** This is where the existing road corridor is shifted away from the main street and an adjacent local road is upgraded to accommodate a new flow of traffic. This option is typically considered when volumes of hrough and local traffic are lower. This option is less expensive than a full bypass.
- **Heavy vehicle bypass:** This is where only heavy vehicle traffic is directed away from the main street. A heavy vehicle bypass can be less expensive than a full or inner bypass and can accommodate the interests of local businesses who benefit from both improved amenity and continuing passing trade.

Several towns along the highway have already been bypassed. These include Nowra (Inner Bypass), Batemans Bay (Inner Bypass), Kiama (Full Bypass) and Bega (Full Bypass). A full bypass of Foxground and Berry is currently under construction and a full bypass of Albion Park Rail is in development.

The function of the existing Princes Highway through Albion Park Rail and Berry is expected to change substantially upon the completion of these projects, transitioning from a vibrant street with large volumes of traffic and people, towards a place for people using the local facilities and their needs. The importance of the movement function of the road, where the goals include achieving acceptable traffic efficiency and reliability, is expected to reduce as the opportunity to support the place function arises, resulting in more priority given to road space allocation for public and active transport uses that support this place function.

No current plans are in place for other towns and villages on the Princes Highway however Table 5-11 lists those that may require bypassing beyond the term of this corridor strategy.

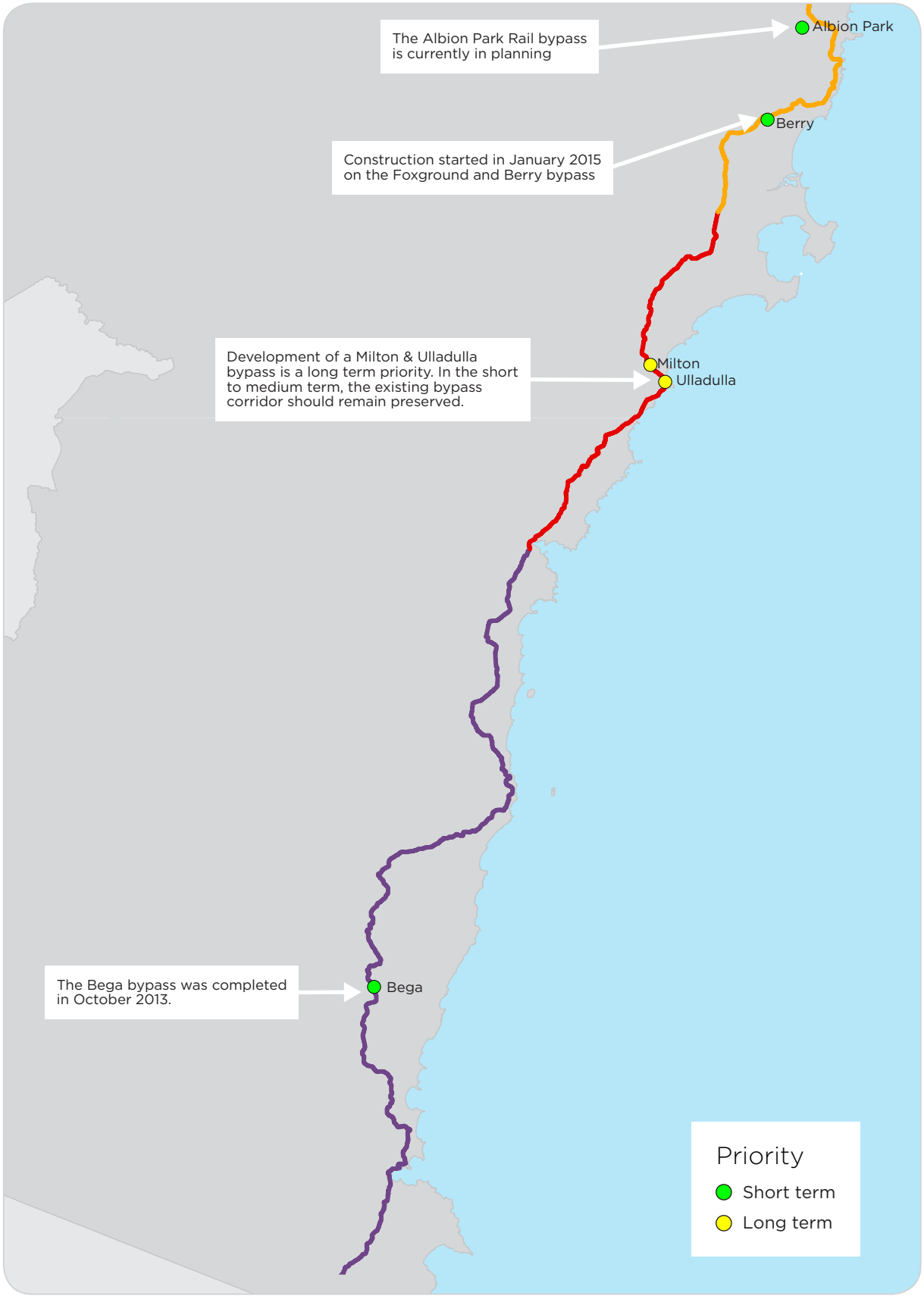
18 Transport for NSW 2012, NSW Long Term Transport Master Plan, TfNSW, Sydney, p. 244

19 RMS, 2010, Network Performance Measures and Network Planning Targets, p.38

Table 5-11 Princes Highway – Town Bypasses

Town	Type of Bypass	Priority	Status
Albion Park Rail	Full Bypass	Short/Medium Term	Funding has been committed to the Albion Park Rail Bypass construction
Berry	Full Bypass	Short	Construction is currently underway
Nowra-Bomaderry	Inner Bypass (existing) The Shoalhaven Local Environment Plan was revised and adopted in 2014 and there is currently no land reserved for a bypass at Nowra. The approach in the *NSW Long Term Transport Master Plan* is to consider a bypass on higher order roads adjacent to significant urban commercial activity. The need for a bypass in Nowra has been assessed using these principles. The through traffic currently bypasses the main urban commercial centres which is Kinghorne Steet.	A suitable solution to improve connectivity between Bomaderry and Nowra and manage travel time reliability will need to be identified in the medium to longer term.	The short and medium term priority will be to monitor land use development and manage traffic movements over the Shoalhaven bridge and consider how minor traffic improvements such as road widening and extending turn bays, re-phasing of signals, installing CCTV cameras and Variable Message Signs (VMS) could improve traffic flow across the Nowra and Bomaderry network. There is a need to develop and implement a traffic and transport study for the Princes Highway through Nowra and Bomaderry to address localised traffic issues particularly within peak times. This approach has been used successfully in other major urban centres to improve travel reliability, travel speeds and traffic flows.
Wandandian	To be determined	> 20 years	No corridor has been identified
Milton-Ulladulla	Full Bypass	Long Term	LEP corridor exists, the short and medium term priority will be to continue to preserve the corridor and manage the Princes Highway through Milton and Ulladulla.
Batemans Bay	Inner Bypass (existing)	> 20 years	No current plans for a full bypass. The short, medium and long term plans will be to monitor land use development and manage movements on the existing alignment of the Princes Highway.

Figure 5-13 Full town bypasses on the Princes Highway



Summary of traffic issues

- The main traffic function of the Princes Highway on a daily basis is a commuter function with a very strong tourist function during peak holiday periods. There is also a mix of freight and general tourist traffic during the year with freight volumes varying throughout the corridor. The proportion of heavy vehicles generally ranges from 8% to nearly 14%. However there is a notable exception of 25% proportion of heavy vehicles south of Edrom Road reflecting the relatively high volumes of logging freight and low volumes of light vehicles.
- Traffic volumes generally decrease in the rural sections of the Princes Highway corridor towards the southern end of the highway with notable peaks in the urban centres. The Average Daily Traffic volumes are highest in the urban sections of the highway with volumes of just over 60,000 vehicles per day at Yallah and nearly 48,000 in Nowra. This is consistent with traffic volumes on major urban arterial routes. The lowest traffic volumes are located on the southernmost sections of the highway between Eden and the Victorian Border with volumes of less than 1000 vehicles per day.
- Traffic has grown on the highway with the highest levels of growth, between 1.7% and 1.9%, recorded at the northern end between Yallah, Kiama, Gerringong and Nowra. Lower levels of growth are shown in the middle section of the highway with growth at Batemans Bay at 0.9%, growth at Bodalla at 1.3% and the lowest levels are recorded at Bega and Eden of 0.5%. These figures are also consistent with the predicted population growth figures.
- Level of Service between Jervis Bay Road and Sussex Inlet Road has been assessed using TRARR and has demonstrated a poor Level of Service during peak periods and would need further investigation.
- An overtaking lane study is recommended for sections of the highway south of Jervis Bay Road. Sections for priority include Jervis Bay Road to Milton, especially southbound, Burrill Lake to Batemans Bay and Narooma to Bega. The section of highway between Berry and Bomaderry may also be included to assess the impact of the Berry Bypass and Gerringong Highway upgrade on traffic flows on this section of highway.
- A detailed intersection analysis that prioritises and recommends minimum treatments needs to be completed between Berry and the Victorian Border to update the report completed in 2003.
- The Princes Highway includes a number of long detours in the event of a serious incident or road closure. This could be better managed with better provision of Intelligent Transport Systems at key locations along the highway.
- Traffic movement through the urban centres along the corridor will continue to be monitored and managed.

5.3 Heavy vehicles on the Princes Highway

Freight productivity is affected by the type of vehicles allowed on a road, the access they are provided and the regulatory, safety and asset management costs of that access. Consequently, Transport for NSW and Roads and Maritime manage all these aspects of heavy vehicle productivity, providing dedicated resources to:

- Assess access requests for restricted vehicles on the network
- Meet heavy vehicle driver needs
- Improve safety
- Enforce heavy vehicle road regulations.

Following commencement of the National Heavy Vehicle Law, which creates a nationally consistent law for Australia's heavy vehicle industry, the National Heavy Vehicle Regulator (NHVR) has been established as a new national one stop shop to consider requests for access and liaise with road managers, both Roads and Maritime and local councils, to grant access.

Freight productivity is expected to nearly double over the next 20 years[20]. This aspect of future challenges for the next 20 years is discussed in more detail in Chapter 6.

South of Eden there is a high proportion of heavy vehicles between Edrom Road and the Victorian Border. These heavy vehicles are primarily logging trucks accessing the Port of Eden.

An important consideration is the impact of heavy vehicles on local residents of towns on the corridor. Where a heavy vehicle bypass is not feasible, careful consideration is required to assess the noise, congestion and safety impact an increase in heavy vehicles could have on the town.

Restricted access vehicles

Heavy vehicles are generally classified by their length, mass and axle configuration. Typically, they are grouped by axle configuration as rigid, articulated or multi-articulated (see Austroads vehicle classification system in Appendix B).

Between 1971 and 2007, increases in road freight vehicle size and capacity have enabled more freight to be carried by proportionately fewer trucks, and larger trucks have captured a larger share of the road freight task. The share of the road freight carried by articulated trucks has increased from around 55 per cent in 1971 to around 78 per cent in 2007[21].

Any vehicle which carries Higher Mass Limits (HML) and/or that exceeds 19 metres in length and/or 4.3 metres in height and/or 2.5 metres in width is classified as a Restricted Access Vehicle (RAV). These vehicles are only permitted to operate on roads that have been assessed as being suitable for them and for which they have been given specific permission.

High Productivity Vehicles (HPVs) refer to RAVs that are approved to carry loads above standard mass limits under HML or PBS. Typical HPV combinations include A-doubles, B-triples, AB-triples and PBS Level 2B and above vehicles (see Appendix B).

Despite the ability of HPV to enhance the productive use of the road network, their access to some key parts of the network is currently restricted. This restriction can be attributed to insufficient infrastructure to support HPV access, such as bridges that cannot support heavier vehicles, or roads that are not wide enough to accommodate longer vehicles when turning.

Figure 5-16 below provides an overview of the 25-26m approved sections along the corridor, as well as the RAV and HML constraints.

Oversize and/or overmass (OSOM) vehicles are a subset of RAVs which have a height, length, rear overhang, forward projection or mass exceeding statutory dimensions or mass limits. OSOM loads are commonly large indivisible items, special purpose vehicles (e.g. cranes), windfarm equipment or agricultural machines/implements. These vehicles require assessment for a permit before being allowed onto the network.

Despite the ability of HPV to enhance the productive use of the road network, their access to some key parts of the network is currently restricted. This restriction can be attributed to insufficient infrastructure to support HPV access, such as bridges that cannot support heavier vehicles, or roads that are not wide enough to accommodate longer vehicles when turning.

The northern end of the corridor from BTU Road at South Nowra to Yallah are approved 25/26m B-Double routes. The southern end from Jews Creek Road, north of Bega to the Victorian Border is also a 25/26m B Double approved route. 23m B-doubles also have access between BTU Road at South Nowra and Kianga Road at North Narooma. B-doubles longer than 19m are not permitted between Kianga Road, north of Narooma and Jews Creek Road north of Bega primarily due to existing constraints such as the poor alignment on the northern approach to the Wagonga Inlet bridge and tight curves through the town centre of Narooma.

20 Transport for NSW 2013, NSW Freight and Ports Strategy, TfNSW, Sydney, p19

21 Bureau of Infrastructure, *Transport and Regional Economics 2011, Truck Productivity: Sources, Trends and Future Prospects*, BITRE, Canberra, p. xiii

HML vehicles are restricted to the northern section of the corridor, north of Bolong Road and the southern section of the corridor, south of The Snowy Mountains Highway due to bridge constraints.

Height constraints also exist on the Wagonga Inlet Bridge at Narooma which has a low clearance of only 4.5m.

In the short and medium term, investigations should commence in partnership with Local Government Areas to look at options to improve freight access such as decoupling bays into urban centres along the south coast. In the longer term, the vision for the Princes Highway is to provide access for Performance Based Standard (PBS) class 2(B) vehicles (up to 30m long and 85t) to BTU Road in South Nowra and to allow PBS class 2(A) vehicles (up to 26m long including B-double access) at Higher Mass Limits for the remainder of the corridor.

Heavy vehicle enforcement sites

Heavy vehicle fixed on road enforcement sites are part of the Roads and Maritime heavy vehicle enforcement program, which includes Roads and Maritime mobile enforcement and the Safe-T-Cam network across New South Wales. Roads and Maritime uses heavy vehicle fixed on road enforcement sites to intercept and inspect heavy vehicles which may be operating illegally or in an unsafe manner on NSW roads and which therefore pose significant risk to road users, the road infrastructure and the environment.

Currently there are 9 heavy vehicle fixed on road enforcement sites along the Princes Highway as shown in **Figure 5-14**. These are at the following locations:

Southbound

- Nungarry (5 kilometres North of Kiama) – Currently under construction to improve the acceleration lane and increase parking capacity
- South Nowra – South of Hillcrest Avenue
- Burrill Lake, south of Wallaroy Drive
- 5 kilometres South of Bodalla
- 30 kilometres south of Eden near the junction with Edrom Road

Northbound

- Jaspers Brush – In development (part of the future Berry to Bomaderry Highway upgrade)
- Benandarah (10 kilometres north of Batemans Bay)
- Northern End of Bega River Bridge
- 30 kilometres south of Eden near the junction with Edrom Road

The construction of the site at Jaspers Brush will meet the need for an additional site at the northern end of the Corridor. Currently no other potential sites have been identified, however some improvements are required at the sites at Burrill Lake and Eden. These sites are well located in terms of strategic enforcement but require some improvements to the hard stand area to make them more effective and safer for use.

There may also be potential to incorporate a Safe-T-Cam site as part of new projects and further investigation into this is required.

Figure 5-14 Fixed on road enforcement sites

Heavy vehicle rest areas

In moving freight by road, heavy vehicle operators are often required to drive for extended periods of time with fatigue a recognised workplace safety issue for many truck drivers. Heavy vehicle driver fatigue has been identified as a contributor to road crashes and presents a safety risk to all road users.

Rest areas enable heavy vehicle operators to meet their legislated rest breaks under fatigue legislation, which states that:

> *"A person must not drive a regulated heavy vehicle on a road or road related area while he or she is impaired by fatigue".*[22]

Better trip planning can help avoid driver fatigue. Rest areas and stopping bays need to be strategically located and signposted. Rest area facilities including garbage bins, toilets and showers are maintained through a road maintenance council contract with the relevant local council authority or road services contractor.

Major rest area

In 2005, the National Transport Commission released the National Guidelines for the Provision of Rest Area Facilities with guidelines for three categories of rest areas, including major rest areas:

> *"Major rest areas – designed for long rest breaks, offering a range of facilities and separate parking areas for heavy and light vehicles where possible"*[23]*.*

In 2010 Roads and Maritime Services published a *Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW*[24] , which outlines requirements major rest areas must meet, in response to NSW fatigue management legislation.

As a minimum, major heavy vehicle rest areas should:

- Be generally located at 100 kilometre intervals. Geographical and other physical constraints may require the interval range to be between 80 and 120 kilometres.
- Provide sites on both sides of the road on parts of the network with high levels of demand.
- Be well signposted for heavy vehicle drivers and have suitable access for ingress and egress.
- Provide designated hard stand parking for heavy vehicles and an appropriate number of parking spaces in line with demand.
- Meet the basic needs of heavy vehicle drivers, including provision of sealed pavements particularly for ingress and egress lanes and ramps, at least one toilet on each site, shaded areas, rubbish bins and tables and chairs.

34 Road Transport (General) Regulation: under *Road Transport (General Act 2005*, clause 45 (NSW)

35 National Transport Commission, 2005, *National Guidelines for the Provision of Rest Area Facilities*, Melbourne, pg. 26

36 Roads and Maritime Services, 2010, *Roads and Maritime Services Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW*, RMS, Sydney

Figure 5-15 Princes Highway major heavy vehicle rest areas[25]

22 Roads and Maritime Services, 2010, *Roads and Maritime Services Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW*, RMS, Sydney

The Heavy Vehicle Safety and Productivity Program (HVSPP) is part of the Australian Government Infrastructure Investment Program and provides funding support to achieve the following two objectives:

- Reduce the proportion of road crashes involving heavy vehicles by targeting heavy vehicle driver fatigue.
- Increase productivity by enhancing the capacity of existing roads.

A number of rest areas have been approved for funding under the HVSPP. In July 2012, the first heavy vehicle rest area site at Jerrawangala was opened to traffic. In addition to this southbound facility, which is located approximately 2 kilometres south of Sussex Inlet Road, three other major heavy rest areas were approved for funding and constructed on the Princes Highway under the HVSPP. These facilities are located at:

- Waldron's Swamp southbound, approximately 7 kilometres north of Moruya
- Dummetts Lane northbound, approximately 800 metres south of the bridge over Dry River at the Quaama turnoff, and
- Broulee Road northbound, 7 kilometres south of Mogo.

As a result of these works, RMS has 4 northbound and 4 southbound sites that qualify as major heavy vehicle rest areas on the Princes Highway.

An additional southbound rest area was also endorsed as part of the HVSPP funding. Due to challenges associated with the originally identified location near Christophers Road at Quaama the future provision of this facility is currently under review.

There are a number of existing rest options for heavy vehicle drivers in the vicinity of Quaama. These include:

- A southbound informal truck parking facility at McLeod's Hill. This truck parking bay is located 26 kilometres north of Bega and can accommodate two vehicles.
- A northbound and southbound truck parking facility 2 kilometres North of Bega. This truck parking bay can accommodate 3 to 4 vehicles.

While these rest options do not comply with NTC guidelines, heavy vehicle volumes on this section of the Princes Highway are low and the existing options are considered sufficient in the short term.

Delivery of projects has assisted both the road freight industry and broader logistics chain to achieve compliance with fatigue legislation.

Other rest areas

The rest areas along the Princes Highway are split into three categories, with each offering different levels of facilities and functions (Table 5-12).

Table 5-12 Rest areas along the Princes Highway

Type of rest area	Target frequency along the corridor	Compliance with the target?
Major heavy vehicle rest areas	100 km	No – An additional Heavy Vehicle Rest Area between Waldron's Swamp Rest Area and Edrom Road Rest Area requires further investigation – See discussion above
Minor rest areas	50 km*	Further investigation is required
Informal truck parking bays or green reflector sites	30 km*	Further investigation is required

* National Transport Commission, 2005, National Guidelines for the Provision of Rest Area Facilities, Melbourne, pg. 27

In addition to major heavy vehicle rest areas, there are 20 minor rest areas – or 'hard stand' opportunities – for all drivers, including local traffic, light vehicles and caravans. These are provided through truck parking bays and informal heavy vehicle stopping areas including green reflector sites.

> *"Minor Rest Areas: These areas are designed for shorter rest breaks, and at a minimum should provide sufficient parking space for both heavy and light vehicles. While it is not anticipated that these stops will be used for long rest breaks/sleep opportunities, separate parking areas for heavy and light vehicles may be required at some locations."*
>
> *"Truck Parking Bays: These areas are primarily designed to allow drivers of heavy vehicles to conduct short, purpose-based stops including load checks, completing logbooks and addressing associated operational needs."*[26]

The adequacy of the major heavy vehicle rest areas in meeting driver needs will continue to be monitored and improved where necessary. The adequacy of the minor informal parking bays will also be reviewed.

Summary of heavy vehicle issues

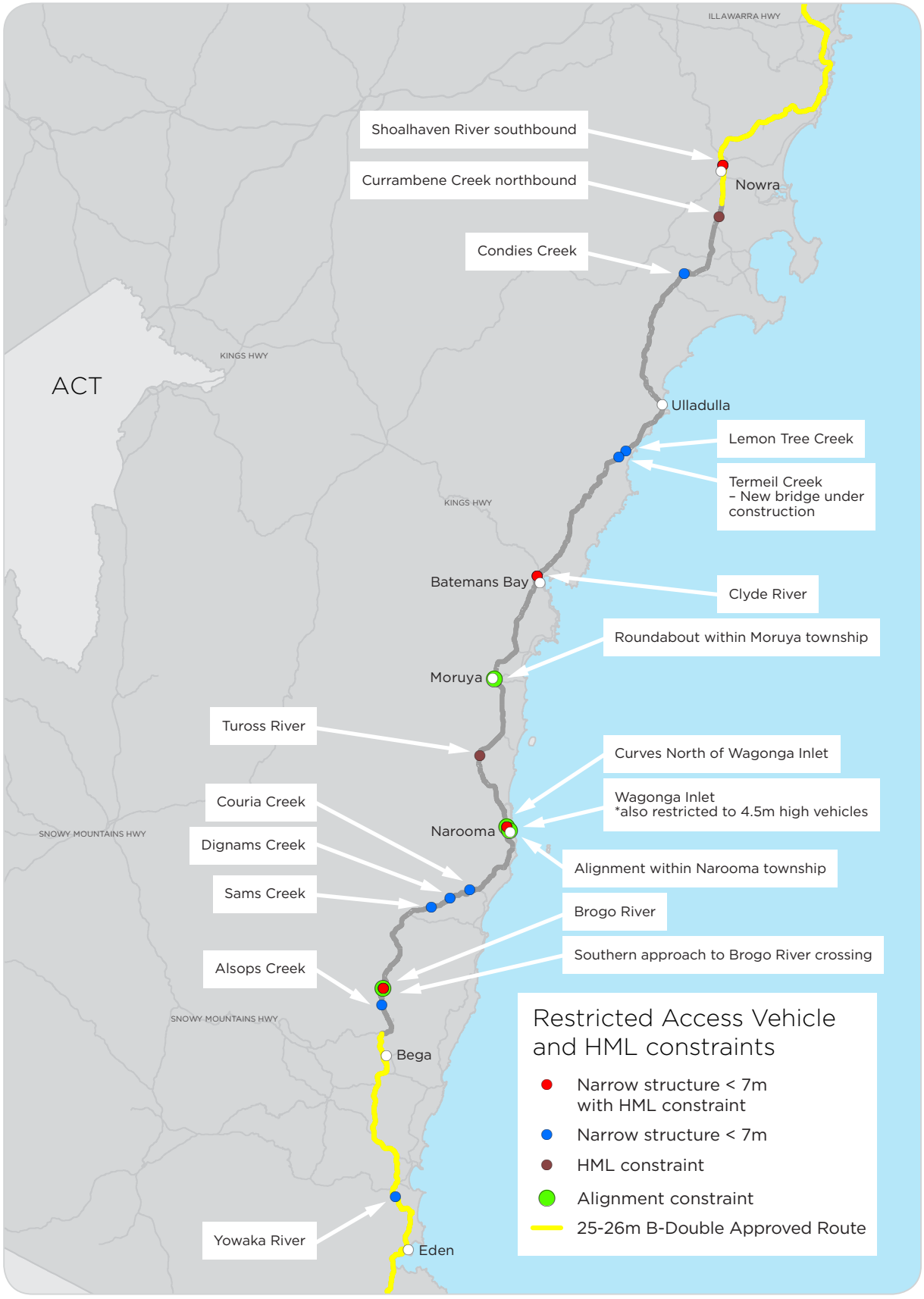
- HML Vehicles are restricted to the northern and southern ends of the corridor due to bridge constraints.
- There are height constraints on the Wagonga Inlet Truss Bridge at Narooma, limiting access to vehicles over 4.5m.
- Vehicles longer than 19m are not permitted between Kianga Road at North Narooma and Jews Creek Road at Bega due to poor alignment issues on the Highway
- Minor upgrades are required at two Heavy Vehicle Inspection Sites along the corridor.
- Monitoring the adequacy of rest area facilities and that they meet current standards.

Figure 5-16 below provides an overview of some of the major constraints restricting heavy vehicle access along the highway. This includes many of the known alignment and structural constraints along the corridor for Restricted Access Vehicle operation (including HML), including the narrowest bridges (less than 7.0m).

Other constraints include 30 bridges and culverts along the Princes Highway that do not meet the *Performance Based Standards Scheme Network Classification Guidelines* target of 8.4 metres in width as well as significant lengths of the highway which have less than the target lane and shoulder widths. This is discussed in greater detail in chapter 5.4 Road design and geometry.

23 Roads and Maritime Services, 2010, *Roads and Maritime Services Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW*, RMS, Sydney

Figure 5-16 Heavy vehicle constraints on the Princes Highway



5.4 Road design and geometry

Horizontal curves

Curves allow motorists to negotiate changes in the horizontal alignment of the road at a consistent rate. The appropriate curve radius is dependent on the design speed (sight distance also being an important consideration), super elevation and friction of the roadway. Motorists need to be able to navigate through curves efficiently while at the same time assessing any potential danger on the roadway in enough time to avoid any hazard.

Roads and Maritime's Network Performance Measures and Planning Targets recommend a target design speed of 110 km/h for most rural roads. Terrain and environmental constraints between Batemans Bay and the Victorian border can make it difficult to achieve this target. The target design speed along this section should be 100km/h with a minimum curve radius of 460m. Recognition must also be made that even this standard may also be difficult to achieve in a cost effective manner for all design elements. The general guide is that all new works should maximise the adopted geometric design parameters.

Table 5-13 Horizontal curvatures on Princes Highway Corridor (urban sections shaded grey)

Corridor planning section	Curve radii (metres)				
	< 90	90–240	240–460	460–600	> 600 or straight
1 – Yallah to Gerringong	0%	6%	7%	9%	78%
2 – Gerringong to Berry	1%	17%	12%	2%	68%
3 – Berry	3%	25%	7%	0%	65%
4 – Berry to Bomaderry	0%	1%	1%	3%	95%
5 – Nowra	1%	2%	8%	10%	79%
6 – Nowra to Jervis Bay Road	0%	0%	0%	0%	100%
Sub-total Zone 1:	0%	8%	7%	5%	80%
7 – Jervis Bay Road to Milton	0%	4%	8%	20%	68%
8 – Milton–Ulladulla–Burrill Lake	0%	6%	20%	4%	70%
9 – Burrill Lake to Batemans Bay	0%	0%	22%	11%	67%
10 – Batemans Bay	0%	0%	26%	0%	74%
Sub-total Zone 2:	0%	2%	16%	14%	68%
11 – Batemans Bay to Moruya	0%	6%	14%	10%	70%
12 – Moruya	3%	11%	16%	0%	70%
13 – Moruya to Narooma	0%	3%	16%	12%	69%
14 – Narooma	8%	40%	6%	5%	41%
15 – Narooma to Bega	0%	6%	26%	8%	60%
16 – Bega	0%	3%	3%	0%	94%
17 – Bega to Eden	0%	5%	11%	9%	75%

Corridor planning section	Curve radii (metres)				
	< 90	90–240	240–460	460–600	> 600 or straight
18 – Eden	0%	0%	22%	9%	69%
19 – Eden to Edrom Road	0%	6%	23%	15%	56%
20 – Edrom Rd to Victorian border	0%	5%	10%	19%	66%
Sub-total Zone 3:	0%	6%	17%	11%	66%
Total (by length)	**0%**	**5%**	**15%**	**10%**	**70%**

In zone 1 of the Princes Highway, sections 1 and 2 between Albion Park Rail and Berry have a significant proportion (22%-32%) of curves with a radius of less than 600m. The majority of these sub-standard curves will be addressed with the proposed upgrades between Yallah and Berry however, the section known as Kiama Bends will continue to be an issue and will need to be investigated separately.

The rural sections in zone 2 also have a high percentage of curves (32%-33%) with less than desirable radii. These lengths of the Princes Highway also have a high incidence of "run-off road on curve" type casualty crashes.

Zone 3 has the lowest performing curve radii on the Princes Highway. Specifically, Narooma to Bega (32%) and Eden to Edrom Road (29%) which have a significant amount of curves below 460 metre radii. The quantity of "run-off road on curve" type casualty crashes is also high between Narooma and Bega.

Narooma is the worst performing urban section along the corridor as over half of the highway consists of curves below 460 metre radii. A number of these curves are to the north of town where the highway alignment remains a constraint for heavy vehicle access.

Grades

Travel efficiency and road safety can be directly influenced by the grade of a road. Sections of road with steep uphill grades over long distances often experience 'bunching' of traffic and in turn perform less efficiently than roads without grade constraints. This is particularly relevant for roads with higher traffic volumes and with a high proportion of heavy vehicles.

In addition, roads with steep grades offer limited opportunities for overtaking, which may increase the incidence of crashes due to driver frustration. Steeper grades may also impede motorists' ability to see any hazards ahead on the road. On roads with a large proportion of freight vehicles, steeper grades are particularly significant because freight costs increase with fuel consumption and slower speeds. From an environmental perspective, steeper grades result in higher vehicle emissions.

As a guide, Roads and Maritime's Network Performance Measures and Planning Targets recommend maximum grades of 6% for all classes of rural roads. However, on the Class 4 sections of the Princes Highway (south of Jervis Bay Road), due the challenging terrain, the target maximum grade is increased up to 8% and on the Class 3 sections of the Princes Highway, up to a maximum of 10% grade. The *Austroads Guide to Road Design* acknowledges that grades exceeding 8% may be acceptable in certain circumstances in locations with speed limits lower than 100 km/h, and indicates maximum grades of up to 9% and 11% may be considered in certain circumstances, in 80 km/h and 60 km/h speed zones respectively.

Table 5-14 Vertical grades on the Princes Highway Corridor (urban sections shaded grey)

Segment	Approx. Length kilometre	Grades			Longer sections of the highway with grades steeper than 8%
		<6%	6–8%	>8%	
1 – Yallah to Gerringong	24	91%	9%	0%	
2 – Gerringong to Berry	17.6	89%	7%	4%	Toolijooa to Foxground (300–400m)
3 – Berry	2	100%	0%	0%	–
4 – Berry to Bomaderry	12.2	100%	0%	0%	–
5 – Nowra	9.6	93%	7%	0%	
6 – Nowra to Jervis Bay Road	6.8	100%	0%	0%	_
Sub-total Zone 1	72.2	93%	6%	1%	
7 – Jervis Bay Road to Milton	45.3	90%	10%	0%	
8 – Milton–Ulladulla–Burrill Lake	12.3	91%	9%	0%	
9 – Burrill Lake to Batemans Bay	45.6	97%	3%	0%	–
10 – Batemans Bay	2.8	99%	1%	0%	–
Sub-total Zone 2	106	94%	6%	0%	
11 – Batemans Bay to Moruya	24.4	76%	20%	4%	Batemans Bay to Mogo (300–400m)
12 – Moruya	2.6	100%	0%	0%	–
13 – Moruya to Narooma	37.5	92%	8%	0%	
14 – Narooma	5.7	97%	0%	3%	
15 – Narooma to Bega	73.1	75%	21%	4%	South of Victoria Creek (300–400m) Dignams Creek to Cobargo (600–700m)
Quaama (700–800 m)					
16 – Bega	3.5	100%	0%	0%	–
17 – Bega to Eden	46.6	87%	9%	4%	Millingandi Bypass (400–500m at two locations)
Bellbird Hill, north of Eden (600–700m)					
18 – Eden	4.6	70%	7%	23%	Mitchell Street, Eden (300–400m)
19 – Eden to Edrom Road	16.8	69%	31%	0%	–
20 – Edrom Road to Victorian border	29.6	97%	3%	0%	–
Sub total zone 3	244.4	83%	14%	3%	
Total	**422.6**	**87%**	**11%**	**2%**	

The Princes Highway Corridor mostly consists of rolling terrain, with mountainous sections in locations such as Broughton in the Gerringong to Berry section and Conjola, approaching Milton.

Most of the Princes Highway has grades of less than 6%, but some sections have grades exceeding 8%, particularly in the rural sections of the highway between Gerringong and Berry, between Batemans Bay and Moruya, between Narooma and Bega and between Bega and Eden.

The urban area of Eden also contains steep sections of road, but this is of less significance in an urban area because traffic is generally travelling more slowly and therefore there is less speed differential between fast moving light vehicles and slow moving heavy vehicles.

Deficient grades between Yallah and the Jervis Bay Road turnoff will be reduced as the Governments commitment to upgrade the highway is implemented.

There are several distinct sections of the Princes Highway that have sustained lengths of road with grades in excess of 8%, listed in Table 5-14 above. Many of these longer steep sections are in locations where the posted speed limit has been reduced below 100 km/h, and many include overtaking lanes. The worst performing sections are Batemans Bay to Moruya, Narooma to Bega and Bega to Eden. Some locations such as Dignams Creek and Gerringong to Berry where realignments are being constructed or planned will improve the general design by reducing the length and the extent of some of the more severe grades.

Steep grades on curves

Steep grades together with tight curves can combine to increase the risk to motorists travelling on the road. This combination can obstruct how far motorists can see ahead – reducing their capability to assess potential conflict. Table 5-15 summarises the proportions of each section of the Princes Highway Corridor which have vertical grades over 6% by curve radii.

Table 5-15 Horizontal Curvatures on the Princes Highway on planning sections with grades of 6% or more

Segment	Curve radii (metres)				
	<90	90–240	240–460	460–600	>600 or straight
Proportions of planning sections with grades of 6% or more on curves					
1. Yallah to Gerringong	0%	1%	3%	0%	5%
2. Gerringong to Berry	1%	2%	3%	0%	6%
3. Berry	0%	0%	0%	0%	0%
4. Berry to Bomaderry	0%	0%	0%	0%	0%
5. Nowra	0%	0%	1%	0%	6%
6. Nowra to Jervis Bay Road	0%	0%	0%	0%	0%
Sub-total Zone 1:	0%	1%	2%	0%	4%
7. Jervis Bay Road to Milton	0%	1%	1%	5%	3%
8. Milton–Ulladulla–Burrill Lake	0%	4%	1%	0%	3%
9. Burrill Lake to Batemans Bay	0%	1%	0%	0%	1%
10. Batemans Bay	0%	0%	0%	0%	1%
Sub-total Zone 2:	0%	1%	1%	2%	2%

Segment	Curve radii (metres)				
	<90	90–240	240–460	460–600	>600 or straight
11. Batemans Bay to Moruya	0%	6%	12%	3%	3%
12. Moruya	0%	0%	0%	0%	0%
Moruya to Narooma	0%	1%	3%	2%	2%
Narooma	3%	0%	0%	0%	0%
Narooma to Bega	0%	4%	12%	2%	6%
Bega	0%	0%	0%	0%	0%
Bega to Eden	0%	2%	3%	3%	5%
Eden	0%	6%	0%	3%	21%
Eden to Edrom Road	0%	4%	10%	10%	7%
Edrom Rd to Victorian border	0%	3%	0%	0%	0%
Sub-total Zone 3:	0%	3%	7%	2%	4%
Total (by length)	**0%**	**2%**	**4%**	**2%**	**4%**

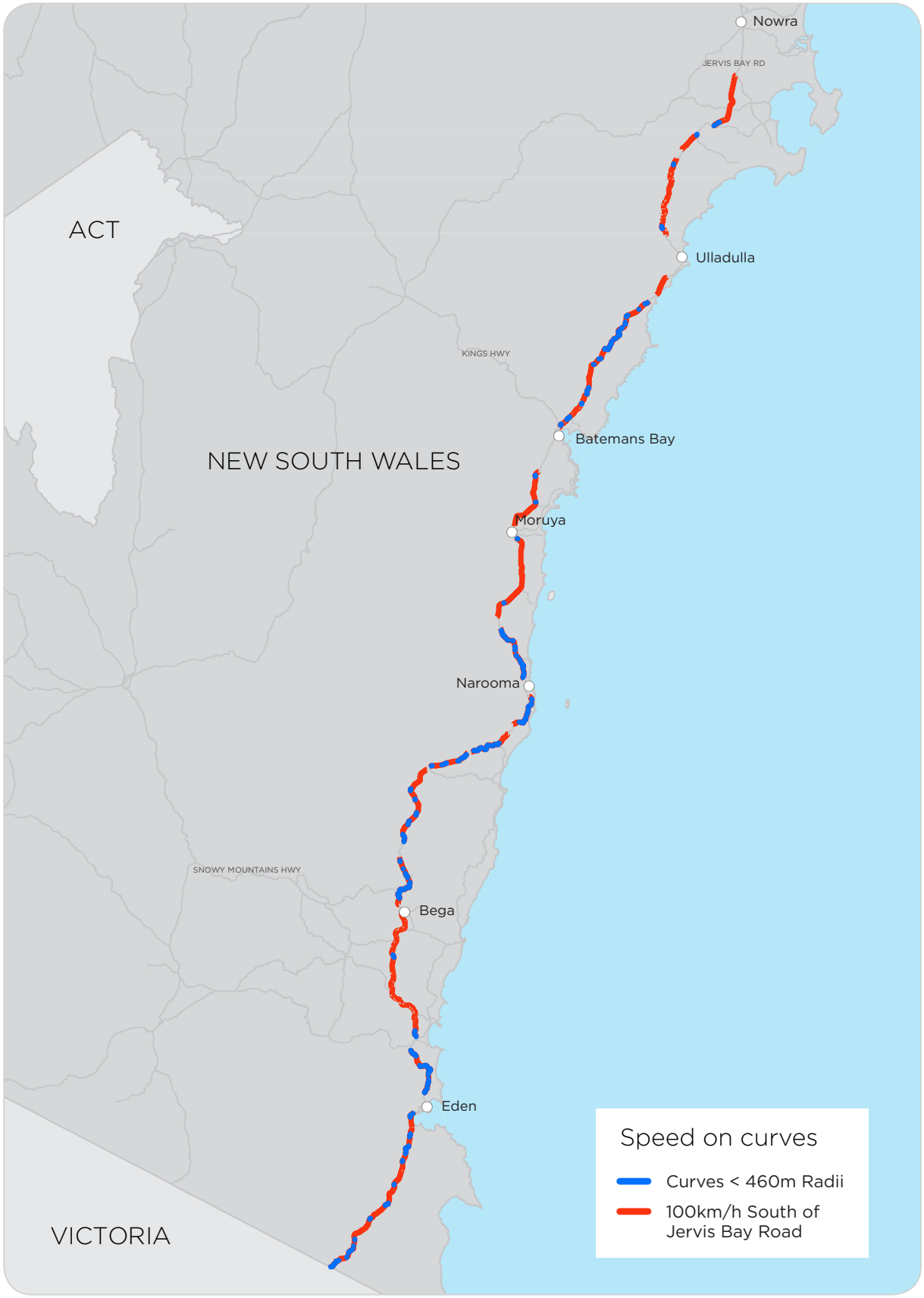
Substantial lengths of the Highway along the Corridor are relatively old and while the alignments in these locations would have been designed to the standards of the time, they are no longer suitable for current traffic and present road safety challenges. Large sections of the highway with poor alignments between towns towards the southern end of the corridor may present road safety challenges in the future. Some of the poorer performing sections are between Batemans Bay and Moruya, Narooma and Bega and Eden to Edrom Road which have a high proportion of curves between 240-460m on grades greater than 6%, when compared to other sections of the highway.

If curves cannot be improved, other safety initiatives such as increasing clear zones and widening pavements will be considered, particularly between Batemans Bay and Moruya and between Narooma and Bega.

Speed on curves

Run off road on curve crashes are over represented in NSW crash statistics on the rural network. 14% or 50km of the Princes Highway south of Jervis Bay Road has a 100km/h speed limit and horizontal curves less than 460m radii (**Figure 5-17**). This includes curves ranging from 50 metres up to 600 metres in length. Sections between Burrill Lake and Batemans Bay and between Narooma and Bega, which have a high proportion of deficient curves, a high proportion of “off road on curve” type crashes and a high severity index will be prioritised for investigation and remedial works.

Figure 5-17 Locations where curve radii are less than 460 metres within 100 km/h speed zone



Lane widths

Lane widths influence road capacity, comfort, safety as well as impacting on road maintenance. The desirable lane width on rural roads is 3.5 metres, which allows large vehicles to pass or overtake without needing to move sideways towards the lane's outer edge. Wider lane widths also increase clearance between opposing vehicles and therefore have potential to reduce the incidence of 'head-on' and 'run off road' crashes. Where lane widths are restricted, the ability of heavy vehicles to access a route can also be affected.

Roads and Maritime's Network Performance Measures and Planning Targets recommend a minimum lane width of 3.5 metres should be maintained for most sections of the Princes Highway, as it is a Class 5R, 4R and 3R asset[27]. Sections 19 and 20 between Eden and the Victorian Border at the very southern end of the corridor have an ADT of less than 1000 and therefore has a target lane width of 3.25m, although 3.5m would be recommended as the traffic volumes increase and to improve road safety.

With the work currently underway or planned between Gerringong and Bomaderry and with the construction work at South Nowra now complete, lane widths for the rural sections of the highway north of Jervis Bay Road will meet the targets for a class 5R road.

For the corridor south of Jervis Bay Road:

- 8km has lane widths less than 3.0m,
- 67.5km has lane widths between 3.0m – 3.25m, and
- 94.8km has lane widths between 3.25m – 3.5m

Approximately 56% of the Princes Highway has lane widths of at least 3.5m. Some of the worst performing sections based on lane width include:

- Section 10 – Burrill Lake to Batemans Bay – Approximately 45% of this section has lane width less than 3.5m
- Sections 13 – Moruya to Narooma – Around 24% of the lane width within this section is less than 3.25m and 46% between 3.25m and 3.5m. This is the second worst performing section on the Highway
- Section 19 – The worst performing section of the corridor with 83% of the lane widths between 3m and 3.25m and a further 8% between 3.25m and 3.5m. This section also includes a large proportion of road with curves that have a radius less than 460m.

All rural sections between Jervis Bay Road and the Victorian Border should be investigated in the shorter term and progressively addressed on a priority basis in the medium and long term. A review of lane widths for the Princes Highway, south of Jervis Bay Road is shown in Table 5-16.

24 Roads and Maritime Services 2010, *Network Performance and Network Planning Targets*, RMS, Sydney, p.43

Table 5-16 Lane widths on the Princes Highway Corridor – South of Jervis Bay Road

Planning Section	Performance Target	Lane Width (metres)		
		3.0 to 3.25 metres	3.25 to 3.5 metres	More than 3.5 metres
7 – Jervis Bay Road to Milton	>3.5m	1%	37%	62%
8 – Milton–Ulladulla–Burrill Lake	>3.5m	15%	19%	66%
9 – Burrill Lake to Batemans Bay	>3.5m	15%	30%	55%
10 – Batemans Bay	>3.5m	19%	37%	44%
11 – Batemans Bay to Moruya	>3.5m	19%	14%	67%
12 – Moruya	>3.5m	0%	0%	100%
13 – Moruya to Narooma	>3.5m	24%	46%	30%
14 – Narooma	>3.5m	33%	0%	67%
15 – Narooma to Bega	>3.5m	15%	26%	59%
16 – Bega	>3.5m	0%	0%	100%
17 – Bega to Eden	>3.5m	9%	27%	64%
18 – Eden	>3.5m	14%	21%	65%
19 – Eden to Edrom Road	>3.25m	83%	8%	9%
20 – Edrom Road to Victorian border	>3.25m	43%	17%	40%
Total (by length)		**17%**	**27%**	**56%**

Bridge widths are also a significant factor, because they are generally the narrowest point along any route. The *Performance Based Standards Scheme Network Classification Guidelines*[28] recommends a minimum width of 8.4 metres for bridges when the AADT is greater than 500 vehicles. The Princes Highway currently has 30 Bridges and Culverts that are less than 8.4m wide (kerb to kerb) and 12 of these are less than 7.0m wide (kerb to kerb) shown in **Figure 5-18** and listed below.

- The southbound bridge across the Shoalhaven River at Nowra (long span, 5.55 metres wide)
- Condies Creek bridge (short span, 6.60 metres wide)
- Lemon Tree Creek bridge (short span, 6.70 metres wide)
- Termeil Creek bridge (short span, 6.70 metres wide – bridge reaching end of life) – Being replaced
- The Clyde River lifting bridge at Batemans Bay (long span, 6.70 metres wide)
- The Wagonga Inlet lifting bridge at Narooma (long span, 6.09 metres wide)
- Couria Creek bridge (short span, 6.70 metres wide)
- Dignams Creek bridge (medium span, 6.09 metres wide)
- Sams Creek bridge (short span, 6.70 metres wide)
- Brogo River bridge (long span, 6.09 metres wide)
- Alsops Creek bridge (short span, 6.09 metres wide) and
- Yowaka River bridge (medium span, 6.09 metres wide).

37 National Transport Commission 2007, http://www.ntc.gov.au/filemedia/Reports/PBSSchemeNetwkClassifGLinesOct07.pdf

Figure 5-18 Narrow bridges and culverts on Princes Highway

The PBS Guidelines recommend that:

> *"A visual inspection and risk assessment should be undertaken for bridges not providing the recommended widths considering:*
>
> - *Bridge approach sight distance*
> - *Ability of drivers on a bridge approach to see vehicles on the opposing approach*
> - *Willingness of drivers to adjust trajectory or entry onto a bridge to accommodate the width needs of large vehicles."*[29]

Narrow bridges with curved approaches raise particular safety concerns due to potential swept path and sight distance issues.

The priority for upgrading bridges is discussed later in this chapter and refers to a number of factors including bridge health as well as the constraints the bridges create on the network.

Sealed shoulder widths

Sealed shoulder widths are the portion of the road surface that extend beyond the marked traffic lanes. Pavements with sealed shoulders are proven to last longer than road sections without them as it helps reduce the ingress of water to the pavement, facilitates drainage and provides support to the road pavement. Sealed shoulders also provide road safety benefits, providing room which can allow a driver to correct an errant vehicle.

As a guide the network planning targets recommend a minimum sealed shoulder width of 2 metres for class 4 roads and 2 metres for class 3 roads with volumes exceeding 3,000 vehicles per day (1.0 metre for class 3 roads with volumes less than 3,000 vehicles per day)[30]. Extra shoulder width is required on the outside of curves. The Strategic Network Performance Analysis indicate that on average 56.17% of class 4R and 45.49% of class 3R roads in NSW has sealed shoulder width less than the desirable minimum[31].

Table 5-17 Sealed Shoulder width on the Princes Highway Corridor – South of Jervis Bay Road

Corridor Planning Sections	Performance Target	Sealed Shoulder Widths (metres)		
		< 1.0	1.0–2.0	> 2.0
7 – Jervis Bay Road to Milton	2.0m	9%	37%	54%
9 – Burrill Lake to Batemans Bay	2.0m	20%	65%	15%
11 – Batemans Bay to Moruya	2.0m	37%	29%	34%
13 – Moruya to Narooma	2.0m	59%	37%	4%
15 – Narooma to Bega	2.0m	64%	24%	12%
17 – Bega to Eden	2.0m	42%	37%	21%
19 – Eden to Edrom Road	1.0m	76%	24%	0%
20 – Edrom Rd to Victorian border	1.0m	74%	26%	0%
Total (by length)		**45%**	**35%**	**20%**

25 National Transport Commission 2007, *Performance Based Standards Scheme Network Classification Guidelines,* NTC, p. 8

26 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 45

27 TfNSW update 2014, *Network and Corridor Planning Practice Notes*, RMS, Sydney

Approximately 56% of the 5R rural sections of the Princes Highway have sealed shoulder widths less than 2m, however these areas to the north of Jervis Bay Road will be improved as a result of recently completed and proposed works as part of the Government's commitment to provide a high standard 4 lane divided carriageway between Sydney and Jervis Bay Road. Therefore this data has not been included in the table above or in this analysis.

66% of the class 4R rural sections of the Princes Highway have sealed shoulders that are less than the 2m target. This is worse than the network class average for class 4R rural roads of 58.88% less than the target width. The section between Burrill Lake and Batemans Bay has the highest proportion of deficient sealed shoulders for this road class.

As average traffic volumes fall below 3,000 vehicles per day south of Eden, the 3R component of the highway has two different targets for shoulder widths. Approximately 84% of the highway north of Eden has sealed shoulder widths less than 2 m, approaching twice the state average of 46% and 75% or 35 km of the highway south of Eden has sealed shoulder widths less than 1 m, again much higher than the class average of 46%.

Sealed shoulders are generally seen to decrease towards the southern end of the corridor. Sections where sealed shoulder widths are mostly less than 1m are between Moruya to Bega and between Eden and the Victorian border, sections which have a high proportion of crashes involving speed, fatigue and wet weather. There is also a high proportion of heavy vehicles travelling between the port of Eden, forestry areas and the Victorian border.

Although more sealed shoulder widths are being provided where possible, a number of constraints, including the location of road cuttings, the width of the road corridor, environmental issues and general constructability issues makes achieving the recommended minimum sealed shoulder widths a significant challenge.

Progressively addressing deficient shoulders and lane widths to provide road safety improvements along the corridor is a goal of this strategy.

Clear zone and safety barriers

A clear zone is a width of roadside available which is traversable and without any obstructions available for drivers to take corrective action in an emergency. The minimum desirable width of a clear zone depends on traffic volumes, traffic speeds and road geometry.

Roads and Maritime's Network Performance Measures and Network Planning Targets[32] state that for Class 3R and 4R roads, the minimum width of the clear zone should be 3 to 5 metres depending on the speed limit. For class 5R roads, the width of the clear zone should be determined by the Austroads Road Design Guide.

For Class 3R and 4R roads the clear zone targets are:

- Three metres for speeds less than 60km/h.
- Four metres for speeds between 60km/h and 80km/h.
- Five metres or more for speeds between 80km and 110km/h

Where these clear zone widths cannot be achieved, the need for a barrier should be assessed. A roadside safety barrier is a longitudinal system that prevents vehicle access to a particular area. Barriers must meet specific requirements related to the segment of the road within the immediate area.[33]

Further investigation is required into the adequacy of clear zones along the Princes Highway corridor and sections with less than desirable clear zones and no safety barrier should be prioritised for remedial works. In the short term investigation should focus on sections between Burrill Lake and Batemans Bay, Moruya to Narooma and between Eden and the Victorian border where there are a high proportion of "off road hit object" type crashes.

28 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 51

29 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 53

Ideally, clear zones should be designed in accordance with the Austroads *Guide to Road Design*. However, there are many existing roads that were developed prior to implementing minimum requirements for clear zones. Austroads guidelines would see clear zones along both sides of the Princes Highway along its full length – including sections with challenging topography such as cut and fill batter constraints.

Any increase in the width of the corridor's clear zones would improve safety compared to the existing situation, even if it falls short of the Austroads guidelines. This would, however need to be balanced with environmental impacts.

A targeted clear zone strategy would help to ensure that a proactive and systematic approach is taken to address these clear zone concerns. The long term target is to provide roadside safety barriers where clear zone targets cannot be met.

Guidance and delineation

Pavement marking and signage provide a visual guide for drivers by delineating the edge and direction of the roadway ahead. They are implemented to make driving safer and more comfortable, particularly at night.

Signage and pavement markings can improve guidance and delineation for motorists and would typically include:

- Pavement lines, chevrons, symbols etc.
- Raised pavement reflectors ('cat's eyes').
- Audio–tactile pavement marking.
- Roadside guideposts (often reflective).
- Hazard warning/way finding/ information signage.
- Lighting.

Edge lines are important markings for motorists and in areas with high rates of run off-road crashes, audio tactile edge lines can be used to reduce the risk of errant vehicles.

Network planning targets recommend that road classes of 3R, 4R and 5R across all types of terrain should have edge lines, provided there is sufficient pavement to accommodate a minimum three metre wide lane between the edge line and centre line. The Princes Highway between Yallah and the Victorian Border has edge lines along the entire length.

The use of audio tactile edge lines and median separation treatments is supported by the NSW Centre for Road Safety as a tool to address fatigue related and run-off road type crashes. Installation of audio tactile edge line markings may be considered and further investigation is required in sections 7, 9, 13 and 15 where there is a relatively high proportion of fatigue related crashes. However the installation of audio tactile edge lines needs be carried out in consultation with the community and the road asset maintenance team to manage the noise and maintenance impacts of this treatment. Median separation treatment may also be considered where there is a high incidence of "run-off road" and "head-on" type crashes and aligning the road is not economically feasible.

Intersections

The network planning targets identify required intersection treatments based on volumes of through-traffic and turning traffic. Minimum intersection treatments relevant to the Princes Highway include:[34]

- BAR and BAL: 'basic treatment right' and 'basic treatment left'.
- CHR(s): 'short channelised treatment'.
- CHR and CHL: 'channelised treatment right' and 'channelised treatment left'.
- GS: 'grade separation'.

Every access point and intersection along a road introduces potential conflicts between road users and increases the potential for crashes to occur. Management of the conflict points at these locations is aimed at reducing both the frequency and severity of crashes.

30 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 49

There are many types intersections along the length of the Princes Highway, ranging from urban intersections controlled with traffic signals to rural junctions with major arterial roads, minor junctions with low-volume gravel roads and property access points.

The management of access points on classified roads in NSW is guided by State legislation. The legislative framework controls individual private access points to classified roads where alternative local road access is available. Where this is not feasible, accesses may be restricted to left in/left out as traffic volumes increase as right turning movements can compromise road safety and traffic efficiency.

Under the State Environmental Planning Policy (Infrastructure), prior to granting approval to a development proposal, consent authorities must be satisfied that classified roads will not be adversely impacted by adjoining development. Specifically, they must give regard to the design of the vehicular access to the land, potential emissions of smoke or dust from the development, and the nature, volume or frequency of vehicles using the classified road to gain access to the land.

Appropriate access treatments or intersection upgrade works may be required to be provided for developments in order to facilitate access to the classified road without compromising the safety and arterial function of the classified road. For large scale traffic generating developments, the works required can be substantial.

Intersection upgrades must be selected case-by-case with consideration to the existing road environment including geometric features, sight distances, speed environment, through traffic volumes on the major road and turning traffic volumes, background traffic growth and an appropriate design life for the intersection treatment, and pedestrian and cyclist movements (where applicable). Intersection treatments selected should be appropriate for the existing speed environment and should not create the need for an isolated reduction of the sign-posted speed limit. Speed limits should be intuitive to the driver, informed by the road environment and surrounding land use (among other factors).

A strategic review of the intersections along the Princes Highway, completed in the 2003 Rural Road Junction Report, has demonstrated a need for intersection upgrades towards the southern end of the corridor. Several of the junctions along the Princes Highway have been upgraded since this review and an updated rural road junction report with consideration of crash types for the Princes Highway may assist in prioritising the remaining locations.

A short term priority will be to complete a detailed investigation of intersections along the highway between Bomaderry and the Victorian Border. The investigation will identify poor performing intersections in terms of efficiency and safety and prioritise those that do not meet the Network Performance Measures and Network Planning Targets. Detailed traffic modelling is currently underway for Nowra and the results of this modelling will provide valuable information on the current and future performance of key intersections through this town centre.

Flooding

The Princes Highway crosses a number of floodplains as well as waterways subject to flooding.

Flooding can result in corridor closures at multiple locations for hours and, at times, for several days.

The impacts of flooding on the Princes Highway can be measured in terms of flood volume, speed, duration and extent:

- **Flood volume** contributes to flood duration and level.
- **Speed the water moves** as faster flowing water causes a greater risk to human life, erosion and infrastructure damage.
- **Flood duration** as flood events can isolate people and communities, increase travel times and reduce productivity for industry and other road users.
- **Extent of flooding** as flooding that affects a larger area often causes greater impact.

There are a range of flood types. These include:

- **Nuisance flooding** – Causes public inconvenience, but little or no property damage. Water is typically not deep, is stagnant and generally localised. Nuisance flooding events may last several hours and may slow or prevent access along the corridor.
- **Flooding caused by rising water ways** – This type of flooding restricts access. To manage it, water is either directed under the road through culverts and pipes or over the road through causeways and floodways. In the case of defined water ways structures such as bridges are specifically built over the water way. During flooding, approaches to these bridges can be cut off even though the bridge is still above water. This prevents damage to the bridge. The scale and volume of water may cause damage to property and infrastructure.
- **Sheet flooding where the landscape is flat** – In places such as western NSW, sheet flooding can occur when large volumes of water travel across the landscape gradually, causing significant damage to embankments, culverts and other infrastructure.

Flooding remains a problem along sections of the Princes Highway Corridor with impacts ranging from short-term traffic disruptions to network severance, resulting in major delays and detours.

In particular, floods have occurred recently at Albion Park Rail, Oak Flats, Gerringong, Berry, Conjola, Ulladulla, Moruya, Narooma, Bega, Pambula and Eden. Most of these events involved short-term localised flooding or ponding caused by the inadequate capacity of drainage structures, but some events, after extensive rainfall, lasted for several days.

Generally new work for structures seeks to build to a 1:100 year immunity for major flood events and 1:20 for short term high intensity storms (road surface drainage). The technology and understanding in flood and storm management is changing quickly and different approaches lead to different designs. New flatter and wider roads are a challenge to design effective drainage measures and minor changes to design or upstream catchment arrangements can have significant impacts on drainage design. RMS seeks to work with the other state Government Agencies and Council in developing comprehensive catchment wide flood studies and doing its part in mitigating flood risks wherever they impact the State Road Network. These flood studies are generally revised every 5 years and are an input into identifying specific small projects in the Asset Program.

Some of the locations affected by flooding in recent years, such as Oak Flats, Conjola and Pambula, have already been or are being addressed through works. Other locations could be addressed by projects currently under construction or in developement, such as the realignment of the highway between Gerringong and Bomaderry. Remaining locations on the Princes Highway that continue to pose a potential flood risk include:

- Albion Park Rail (will be addressed with the Albion Park Rail Bypass)
- Racecourse Creek, Ulladulla
- Moruya
- Narooma, and
- Palestine Creek, Eden.

Although the Burrill Lake Bridge has not experienced a flood in recent years, it remains one of the locations on the Princes Highway Corridor that is closest to sea level. The lack of suitable detour routes around Burrill Lake means this location presents a high risk of network severance should significant flood damage occur on the bridge approaches. Construction on a replacement bridge over Burrill Lake is scheduled to commence in 2015/16.

Generally however the Princes Highway through this section remains relatively robust with flooding issues unlikely to result in major infrastructure damage where the road or bridge washes away. Only minor delays experienced on an annual basis.

Road slope risk rating

Earth embankments and cuttings are constructed to provide for a gradual rise or fall in the terrain around roads. These embankments and cuttings deteriorate over time and risks associated with the deterioration increase. In addition, in mountainous terrain, the natural slope above or below the road deteriorates over time, presenting increased risk. Part of managing these embankments involves assessing measures necessary to mitigate against possible risk of slips. A road slope risk rating systematically analyses risks associated with potential slope instability on roads across the State.

These embankments are designed and built in accordance with design standards. Slope stability next to State roads is measured and assessed using Roads and Maritime's Road Slope Management System (RSMS) database. The risk posed by a slope is measured in terms of an Assessed Risk Level (ARL). Slopes considered to have the highest risk of slippage are rated ARL 1, while slopes with the lowest perceived risk are rated ARL 5. Generally, the target rating for all slopes in a corridor should be ARL 3, 4 or 5.

Table 5-18 summarises the ARL ratings for the slopes that are currently under management on the Princes Highway within the Princes Highway Corridor.

Table 5-18 Slopes assessment along the Princes Highway

Corridor planning section	Number of slopes	Number of slopes with an ARL of 1 or 2	Number of slopes with an ARL of 3, 4 or 5	Number of slopes not yet assessed
1 – Yallah to Gerringong	53	-	53	–
2 – Gerringong to Berry	10	2	8	–
3 – Berry	–	–	–	–
4 – Berry to Bomaderry	–	–	–	–
5 – Nowra	–	–	–	–
6 – Nowra to Jervis Bay Road	–	–	–	–
7 – Jervis Bay Road to Milton	20	3	17	–
8 – Milton–Ulladulla–Burrill Lake	–	–	–	–
9 – Burrill Lake to Batemans Bay	5	–	5	–
10 – Batemans Bay	1	–	1	–
11 – Batemans Bay to Moruya	12	2	10	4
12 – Moruya	–	–	–	–
13 – Moruya to Narooma	16	4	12	–
14 – Narooma	4	–	4	–
15 – Narooma to Bega	53	13	40	–
16 – Bega	2	1	1	–
17 – Bega to Eden	21	3	18	–
18 – Eden	–	–	–	–
19 – Eden to Edrom Road	18	15	3	–
20 – Edrom Rd to Victorian border	2	2	–	–
Total	**217**	**45 (21%)**	**172 (79%)**	

The sections of the corridor between Narooma and Bega and between Eden and Edrom Road are the worst performing in terms of high risk slopes. Narooma to Bega has 13 slopes with an ARL of 1 or 2 and Eden to Edrom Road has 15 slopes with an ARL of 1 or 2. Addressing the large number of high risk slopes will be a priority for these sections of the corridor.

Another priority will be to assess those slopes that do not yet have an ARL rating between Batemans Bay and Moruya.

Road culvert risk rating

A culvert is one or more adjacent pipes or enclosed channels that allow water to flow under a road. Flooding is minimised by allowing water to escape, minimising build up and preventing overtopping. There are 1,658 culverts along the highway including 1,543 pipe culverts, 105 box culverts and 10 composite culverts.

A road culvert risk rating is a systematic analysis of the risks associated with culvert condition on the State road network. If a culvert fails, under extreme conditions, the road surface above the culvert may collapse or be washed away.

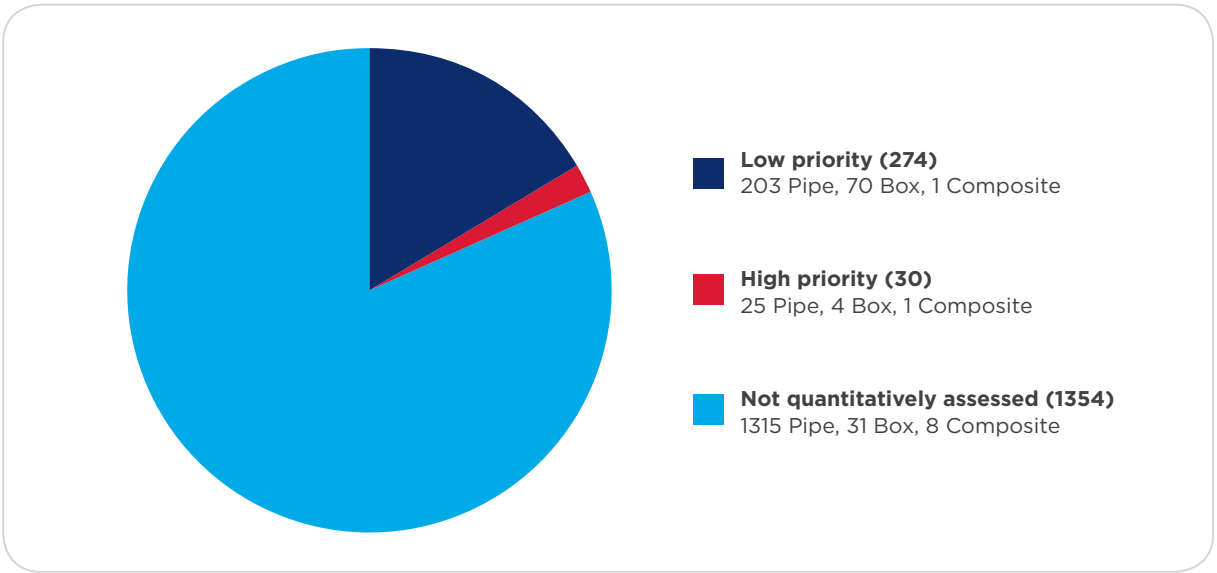
All culverts under active management are assessed for risk by calculating the culvert's Assessed Risk Level (ARL). Culverts rated as 'High Risk' are those with a rating ARL 1 or 2. Culverts rated 'Low Risk' are those with rating ARL 3, 4 or 5.

Of the culverts along the highway, 631 have been identified as having potential hazards and require further investigation. This is being undertaken on a priority basis. To date a total of 304 culverts have been assessed and given a risk rating.

Once a full risk assessment of the condition of the culverts has been completed, RMS will target higher priority culverts to be treated as part of maintaining and upgrading the Princes Highway. The aim from that point will be to progressively upgrade culvert drainage along the Princes Highway.

The overall number of culverts along with their risk levels is provided in **Figure 5-19** below.

Figure 5-19 Culvert conditions on the Princes Highway



Bridge load performance

The network planning target for bridge load performance states that all bridges on State and Regional roads should be able to carry Higher Mass Limits loads.[35]

Higher Mass Limits (HML) is a nationally agreed scheme that permits approved heavy vehicles to operate with additional mass on certain types of axle groups, on a restricted road network and subject to specified conditions.[36]

The Australian Government has approved the following axle mass limit increases for vehicles fitted with road friendly suspensions:

- 0.5 tonne increase on tandem axle groups to 17 tonnes
- 2.5 tonne increase on tri-axle groups to 22.5 tonnes
- 1 tonne increase on single drive axles on buses to 10 tonnes
- 1 tonne increase on six-tyred tandem axles to 14 tonnes
- 0.7 tonne increase on steering axles of long combination vehicle prime movers – such as road trains – fitted with wide single tyres, regardless of suspension type.

A longer term goal of the Princes Highway Corridor Strategy is to ensure that the bridges on the Princes Highway should be suitable for HML vehicles.

Of all the bridges on those sections of the Princes Highway currently gazetted to permit access by 26 metre B-doubles, only the southbound bridge across the Shoalhaven River is not considered suitable for HML vehicles.

Bridges on those sections of the Princes Highway that are not currently gazetted for access by 26 metre B-doubles have been assessed for "HML worthiness" as part of a State-wide freight access review. An additional five bridges have been identified as being deficient for HML access which would need to be upgraded to enable HML access for the length of the corridor. These bridges are as follows:

- Northbound Bridge over Currambene Creek
- Clyde River Bridge at Batemans Bay
- Tuross River Bridge
- Wagonga Inlet Bridge
- Brogo River Bridge

Bridge structural health

Bridge health is measured using the Roads and Maritime Bridge Health Index (BHI). The BHI measures a bridge's condition in terms of 'poor', 'fair', 'good' or 'as built'.

The network planning target for the rural road network is that less than 2.5 per cent of all bridges across the route should have a BHI rating of 'poor'.

There are 220 bridges on the Princes Highway Corridor of which 197 have been assessed.

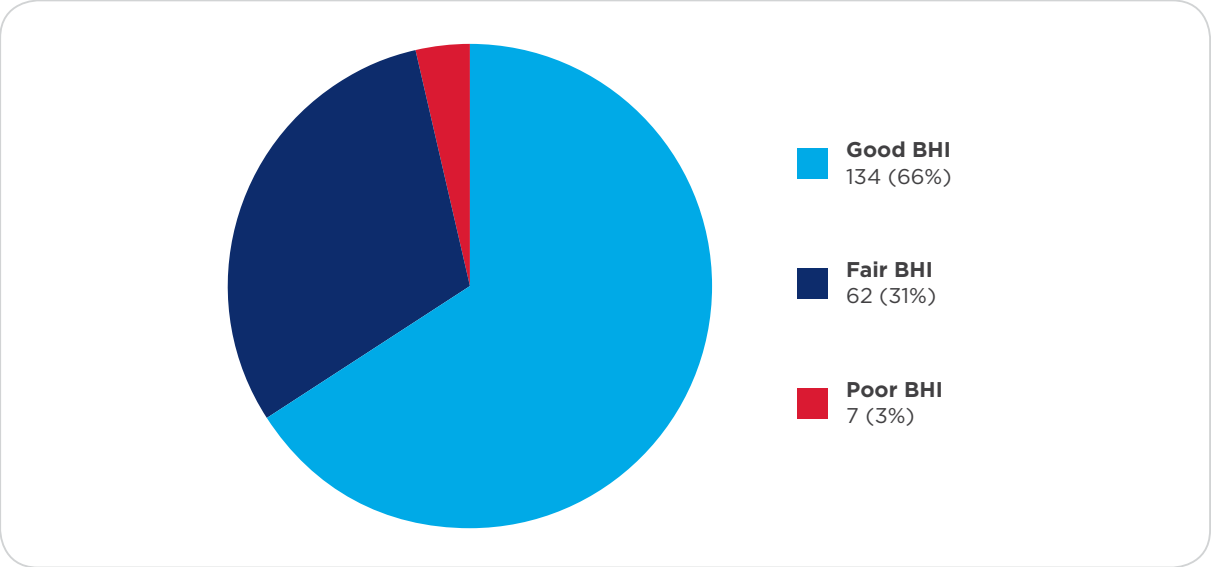
Of the 197 bridges assessed, 134 (66%) had a BHI of "Good", 62 (31%) had a BHI of "Fair" and 7 (3%) had a BHI of "Poor"[37] as shown in **Figure 5-20**.

31 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 56

32 National Transport Comission 2014, http://www.ntc.gov.au/viewpage.aspx?AreaId=37&DocumentId=1806

33 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 34

Figure 5-20 Bridge structural health on the Princes Highway



The six bridges with a 'poor' BHI are located between Bomaderry and Narooma as shown in **Figure 5-21**.

- Southbound Bridge over the Shoalhaven River – Unable to take HML loading, substandard traffic barriers, unknown condition of critical structural elements, concrete deck continuous deterioration due to no positive connection between concrete deck and stringers,
- Bridge over Currowar Creek -The longitudinal cracks on plank soffits of the bridge superstructure caused by Alkaline Silica Reaction (ASE). Even the cracks are worsening however there is no need to be concerned in the structural integrity of the bridge. Destructive testing was carried out on a similar bridge and found that the bridge had enough structural capacity. In Southern Region 26 bridges have been identified with a similar problem, therefore Bridge Engineering has been engaged to assess the condition of the bridges and recommend solutions to prevent further deterioration.
- Bridge over Yackungarrah Creek – Same problem as Currowar Creek Bridge.
- Termeil Creek Bridge – Narrow bridge, substandard traffic barriers and severe pile deterioration due to Delay Enttrigite Formation (DEF). A new bridge is under construction.
- Batemans Bay Bridge – Bridge unable to carry HML loading, concealed corrosion in critical elements, poor substructure condition, severe deterioration of the counterweight and poor condition of the painting system.
- Moruya Bridge – There are various spalled areas on concrete in critical elements that need to be repaired, cracks along the northbound and southbound footpath, scouring at pier 1 that needs to be addressed. The painting system on the steel girders is in poor condition as well requiring prompt attention to arrest further deterioration. Even though the bridge is in poor condition, the bridge is sound to carry traffic loading, as the majority of the deterioration is not in critical structural elements.

Figure 5-21 Locations of bridges with poor Bridge Health Index (BHI)

In addition to the asset maintenance problems detailed above, some of these bridges provide inadequate traffic capacity, constrain freight movements and/or present a risk of network severance with few alternative routes in the event of an incident or closure.

These bridges and proposed actions include:

Southbound Bridge over the Shoalhaven River at Nowra

This is a heritage-listed iron truss bridge dating back to 1881. The deck of this bridge has a limited life under vehicular traffic loads and cannot realistically be rehabilitated under current traffic conditions.

In addition, because of constraints associated with the truss structure, vehicles with heights exceeding 4.6m or at HML loads are not permitted to use the southbound bridge, and are instead escorted across the adjacent and newer northbound bridge under a contra-flow arrangement which requires support from police and/or traffic controllers. Vehicle configurations with heights between 4.3m and 4.6m are required to cross the lane separation line to negotiate the southbound bridge.

Traffic volumes across Shoalhaven River average about 47,000 vehicles per day (2011 data). This volume and the proximity of a number of signalised intersections that provide access between major residential areas and the Nowra CBD has led to capacity concerns and congestion problems crossing the river in morning and afternoon peaks.

Incidents have occurred with vehicles colliding with the iron truss. Should a major incident occur preventing access across the Shoalhaven River, including access via the adjacent northbound bridge, extensive detours would be required, utilising east–west links such as the Nowra–Moss Vale Road, the Braidwood–Nowra Road via Nerriga and Kings Highway and inland routes such as Hume Highway and Braidwood Road (see **Figure 1-1**). This would add hundreds of kilometres to a journey. Minimising the risk of this occurring as a result of the height constraints associated with the truss is an important consideration in any future design.

In the light of all of these concerns, management of the issues associated with this bridge is considered one of the highest priority challenges within the Princes Highway Corridor. Work is currently underway to develop a third crossing over the Shoalhaven River as an alternative to this bridge. A short to medium term priority of this strategy will be to finish the development and construction of a new bridge over the Shoalhaven River.

Bridges over Currowar Creek and Yackungarrah Creek, north of Milton

These bridges are experiencing concrete deterioration and require further investigation and ongoing management. Bridge Engineering has been engaged to conduct these investigations.

Termeil Creek south of Burrill Lake

This is a narrow 6.7m wide concrete beam bridge which was constructed in 1940. The northern approach to the bridge has a deficient alignment. Although not currently a HML constraint, the bridge is in poor condition with a number of maintenance concerns including significant areas of spalling, delamination, cracking and corroded reinforcement on the pier piles, abutments and deck.

Works for bridge replacement and improvement of road approach are underway.

Bridge over the Clyde River at Batemans Bay

This is a narrow 6.7m wide steel truss bridge with a lifting span to allow taller marine vessels to navigate the Clyde River.

This bridge operates efficiently under regular traffic conditions, but seasonal holiday peak periods and periods when the lift span is operating result in congestion on the road network on either side of the bridge. The bridge itself is narrow and is more than 50 years old, with a risk of network severance if the lift span should fail during operation or if the truss was struck by a vehicle.

In addition to being a HML constraint, the bridge is in poor condition with a number of maintenance concerns. These include significant areas of cracking, spalling and corrosion of reinforcement in the piers and deck, and corrosion in the trusses and lift span equipment, combined with issues such as deficient traffic barriers. There are various proposed maintenance works programmed in the next three to four financial years to keep the bridge safe for road users. The proposed works are counterweight rehabilitation, mechanical and electrical upgrade of the lift span, substructure rehabilitation and installation of sacrificial cathodic protection, strengthening of vertical truss members and repainting of the lift span.

Planning for a new bridge over the Clyde River has been identified as a short term priority.

Other bridges that require further investigation include:

Bridge over Wagonga Inlet at Narooma

This is a narrow 6.09m wide steel truss bridge with an opening span to cater for taller marine vessels. The bridge is over 70 years old and the opening span is suffering from corrosion.

The alignment of the Princes Highway immediately north of this bridge restricts larger southbound freight vehicles and poses a risk of impacts with the truss structure. Only "general access" vehicles, including 19 metre B-doubles with a gross vehicle mass of less than 50 tonnes, are permitted to use this section of the Princes Highway. The truss structure on this bridge also restricts vehicle configurations to a maximum of 4.5m in height.

Should an incident prevent access across the bridge, local road detours would add approximately 50 kilometres to the journey. These local roads are not of a standard that would support the turning movements of heavy vehicles at junctions, and their limited road widths restrict two-way vehicle movements. In addition, a timber bridge on the detour route could further restrict the viability of the local road network as an alternative for heavy vehicles. Minimising the risk of this occurring as a result of the height constraints associated with the truss is an important consideration in any future design.

Wagonga Inlet Bridge also has ongoing asset maintenance issues including cracking and spalling of the concrete and elements of corrosion. In addition, this bridge also has deficient traffic barriers and cumulative damage from previous vehicle impacts.

RMS is also upgrading the bridge opening system to make it safer for drivers and the caretaker. The upgrade will include advance warning signals before the bridge, automated swing gates on the bridge, traffic signals on the bridge and integration of the system so that it can be controlled from the platform under the bridge.

Eurobodalla Shire Council through its Pedestrian Access and Mobility Plan has identified the necessity of providing a safe crossing access on the Princes Highway. It has been proposed to build a pedestrian underpass adjacent to the northern abutment of the bridge. RMS would help with the pre-construction and construction of the pedestrian access.

Bridge over the Brogo River north of the Snowy Mountains Highway junction

This is a narrow 6.09m wide steel girder structure that is over 70 years old and a constraint on access by larger B-double and Higher Mass Limit vehicles. The bridge is located on poor alignment and it has substandard barriers.

Ongoing monitoring and maintenance of this bridge will be a priority for the next financial year.

Burrill Lake Bridge south of Ulladulla

Work is currently underway to replace this bridge. The new structure is currently being planned to provide 1 in 100 year flood immunity. This will reduce the likelihood of incidents associated with flooding closing the highway at this location and will help minimise the need for extensive detours around this area.

Summary of road design and geometry issues

- 20% of the Princes Highway Corridor comprises curves with a radius of less than 460m. Kiama Bends and the section between Narooma and Bega have a particularly high proportion of curves less than 460m.
- The Princes Highway passes through a number of mountainous sections. Batemans Bay to Moruya, Narooma to Bega and Bega to Eden have some longer sections with grades steeper than 8%.
- Sections between Batemans Bay and Moruya, Narooma and Bega and Eden to Edrom Road have a high proportion of curves between 240-460m on grades greater than 6%. This combination of curves on grades can significantly impact a motorists ability to respond to hazards.
- 14% or 50km of the Princes Highway south of Jervis Bay Road consists of curves less than 460m radii in 100km/h speed zones.
- Just over half of the Princes Highway corridor south of Jervis Bay Road has lane widths less than the Network Target.
- There are 13 bridges and culverts on the Princes Highway corridor that are less than 7.0m wide and a further 17 bridges and culverts less than 8.4m wide.
- Many sections of the Princes Highway corridor have sealed shoulder widths below the recommended targets.
- A targeted clear zone and safety strategy is required on the Princes Highway between Yallah and the Victorian Border.
- The increased use of Audio Tactile Edge Line should be considered in sections with a high incidence of fatigue and run off road type crashes. Median treatments may also be considered in these areas.
- A number of intersections in Nowra and other locations along the corridor will need further investigation to address efficiency and road safety issues in the future.
- The section of the Corridor between Narooma and Bega has the greatest number of slopes with a high risk ARL
- Further investigation is needed on many culverts along the Princes Highway.
- Five bridges have been identified as being deficient for HML access and six bridges have been identified with a 'poor' Bridge Health Index. Only the Bridge over the Clyde River is in both of these categories.

5.5 Road pavement condition

The surface of a road experiences very high stress under the tyres of passing vehicles, especially heavy vehicles. The natural earth material is too weak to withstand these tyre loadings and therefore a pavement material is overlaid that is strong enough. The pavement material is also stiff and thus spreads the concentrated tyre load over a wider area and passes the load through to the natural earth.

Effectively managing the Princes Highway's pavement condition for its long term preservation is a key task that involves maintenance patching, timely resealing and estimating the pavement's remaining service life to ensure appropriate rates of pavement rebuilding.

To understand how pavement is performing and to forecast future pavement condition, a number of measures are considered. These include:

- Pavement materials and surfacing
- Road pavement structural remaining life
- Road surface cracking
- Road roughness
- Road smoothness
- Rutting
- Surface friction

Pavement types and seals

Road pavements provide structural support for vehicles travelling along a route. Weaker or older pavements may fail and become uneven, rutted or rough, leading to inferior travel conditions.

Road pavements are classified as either flexible or rigid.

Flexible pavements generally consist of a number of layers of compacted gravel, unbound granular or bound materials, with a bitumen surface. Some flexible pavements incorporate cement-bound or asphalt layers, referred to as composite pavements.

Rigid pavements are Portland-cement concrete pavements. They may or may not be surfaced with asphalt over the concrete base.

The factors that are considered in selecting a pavement type include:

- Anticipated traffic loadings, including likely heavy vehicle use.
- Environmental and construction constraints.
- Material availability, familiarity with construction processes by the local industry.
- Initial and whole of life costs.
- Policies and Strategies.

Approximately 60% of the Princes Highway Corridor has gravel base pavements. Bound base pavements with thick asphalt over are stronger and are more prevalent for newer sections such as Albion Park Rail to Kiama and Nowra to Jervis Bay Road, where heavy vehicle volumes are higher. The new construction from Kiama to Berry and the proposed construction between Berry to Bomaderry will also have bound pavement with asphalt surfacing.

In terms of wearing surface, the Princes Highway between Yallah and Jervis Bay Road has asphalt. From Jervis Bay Road to Burrill Lake, south of Ulladulla, there is a mix of asphalt and spray sealed sections, and from Burrill Lake south most of the highway has sprayed seals, with small asphalt sections in towns.

For pavement rebuilding works, selection of pavement type aims to maximise whole-of-life benefits by selecting the most suitable materials, appropriate design thickness and composition of pavement, in order to provide a satisfactory level of service for anticipated traffic. The selection of pavement type will vary from section to section along the Princes Highway depending on a number of factors including current pavement condition, future traffic including heavy vehicles, environmental issues, availability of pavement materials and future maintenance strategy.

Pavement structural remaining life

Structural remaining life is used to estimate the remaining capacity of the pavement – that is, the time remaining until the performance of the road becomes unpredictable and there is an increased risk that the road pavement can quickly fail and reach an unserviceable condition, affecting productivity and safety.

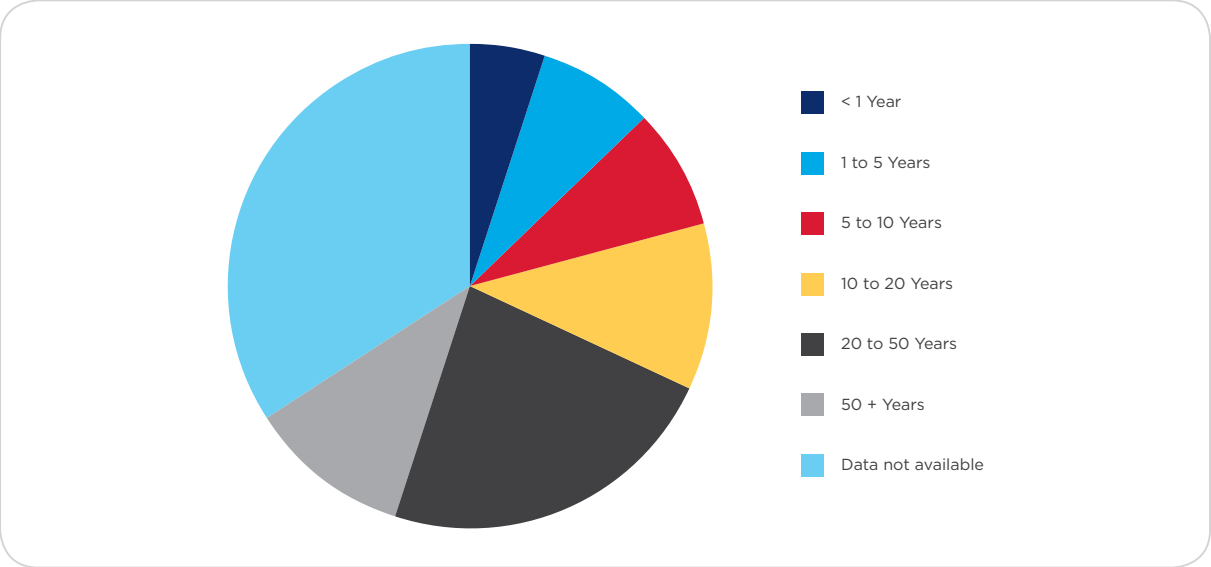
Inadequate structural capacity increases the need for lower speed limits, due to road deterioration, particularly after long, rainy periods.

Roads and Maritime has developed a risk-based approach to assessing structural remaining life. The strength of existing pavement segments is assessed using a falling weight deflectometer along the entire length of the road. These values are then analysed using established and accepted methodologies to calculate the structural remaining life.

Pavement structural remaining life information together with other data such as pavement age and the road condition are used to assess the road rebuilding needs for the network.

The data representing pavement structural remaining life on the Princes Highway is incomplete, with limited data available south of Batemans Bay and more complete data available between Jervis Bay Road and Batemans Bay. This data is shown in **Figure 5-22**. Insufficient data north of Jervis Bay Road was available and is therefore not shown.

Figure 5-22 Pavement remaining life – Jervis Bay Road to the Victorian Border



The current target replacement rate for pavements across NSW is between 1.2%-1.5% per annum, with the estimated sustainable pavement replacement rate over the long term being 2.0% per annum. On the Princes Highway the pavement replacement rate is approximately 1 to 1.5% per annum.

The majority of the Princes Highway has a pavement age of less than 20 years, however there are substantial lengths (21%) of the corridor, with a pavement age of more than 40 years. These are mostly located in the southern sections of the corridor, specifically in Narooma and from Eden to the Victorian border.

Pavement age is less of an issue in the northern sections of the corridor, as projects that are under construction or in planning at Albion Park Rail and between Gerringong to Bomaderry as well as the recently completed works at South Nowra will replace significant parts of the older pavement.

Table 5-19 Pavement Age along the Princes Highway

Highway planning section	< 20 years	20-40 years	> 40 years
7 – Jervis Bay Road to Milton	53.8%	35.4%	10.8%
8 – Milton–Ulladulla–Burrill Lake	88.6%	0.0%	11.4%
9 – Burrill Lake to Batemans Bay	73.8%	23.1%	3.2%
10 – Batemans Bay	28.9%	52.0%	19.0%
11 – Batemans Bay to Moruya	54.6%	26.7%	18.7%
12 – Moruya	100.0%	0.0%	0.0%
13 – Moruya to Narooma	25.5%	28.5%	46.1%
14 – Narooma	20.1%	0.0%	79.9%
15 – Narooma to Bega	40.8%	39.4%	19.8%
16 – Bega	100.0%	0.0%	0.0%
17 – Bega to Eden	43.1%	44.9%	12.0%
18 – Eden	0.0%	45.4%	54.6%
19 – Eden to Edrom Road	26.8%	16.5%	56.6%
20 – Edrom Rd to Victorian border	40.8%	5.0%	54.1%

Road surface cracking

The road surface plays an important role in providing both a safe running surface for traffic and a waterproofing layer to protect the underlying pavement from moisture that can significantly reduce the strength and life of the road. The prevalence of cracking in a road surface is a key performance measure determining the pavement condition and rate of pavement deterioration. Although an increase in untreated cracking of the surface material does not affect traffic efficiency or road safety, it can lead to rapid deterioration of the underlying pavement in the longer term, thereby increasing asset maintenance and bringing forward the need for pavement rebuilding.

Granular road pavements are more susceptible to rapid deterioration while asphalt and heavier duty bound pavements are less susceptible.

As a guide, the network planning targets for all State roads indicate that:[38]

- For asphalt roads, at least 67 per cent of the road lengths should exhibit cracking below or equal to five per cent, and no more than 2.6 per cent of the network should exhibit cracking above 30 per cent.
- For spray sealed surfaces, at least 80.2 per cent of the road length should exhibit cracking below or equal to one per cent, and no more than 4.3 per cent of the road length should exhibit more than 10 per cent cracking.

Figure 5-23 following summarises pavement cracking along asphaltic sections of the Princes Highway showing 88 per cent of the asphalt road lengths exhibit cracking below 5 per cent and 12 per cent of the asphalt road lengths exhibit cracking between 5-30 per cent. No lengths of the asphaltic concrete sections of the Princes Highway Corridor exhibit cracking greater than 30 per cent meeting the planning targets.

38 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 29

Figure 5-23 Cracking levels on the asphaltic concrete sections of the Princes Highway

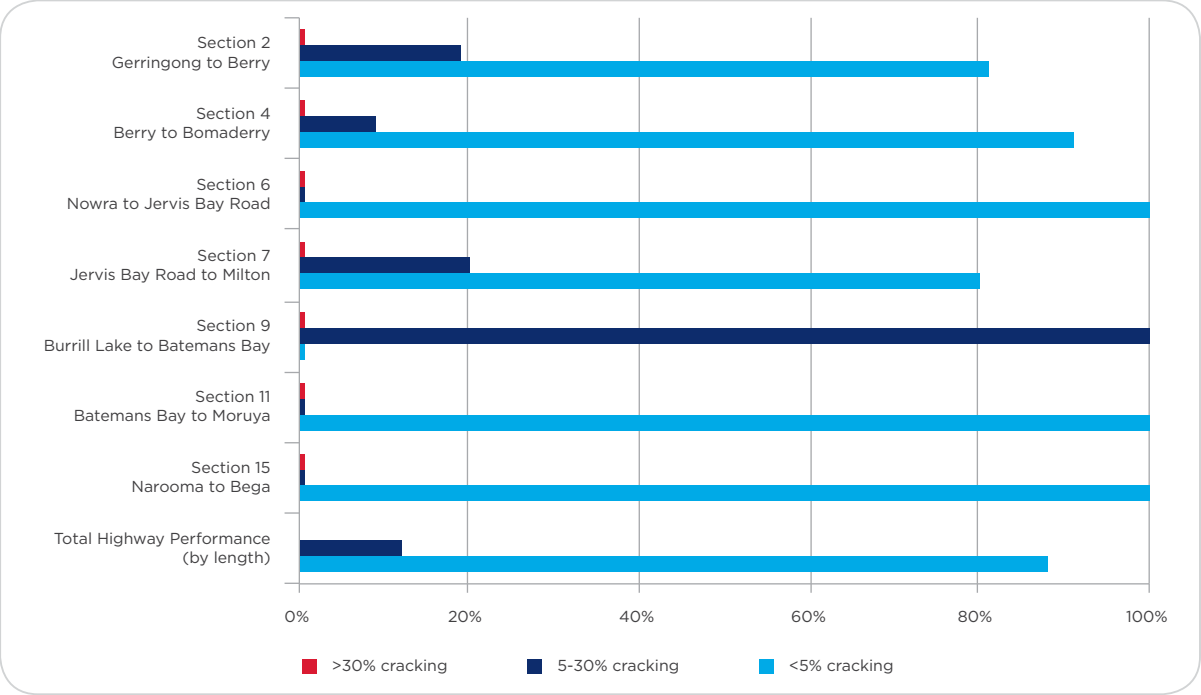
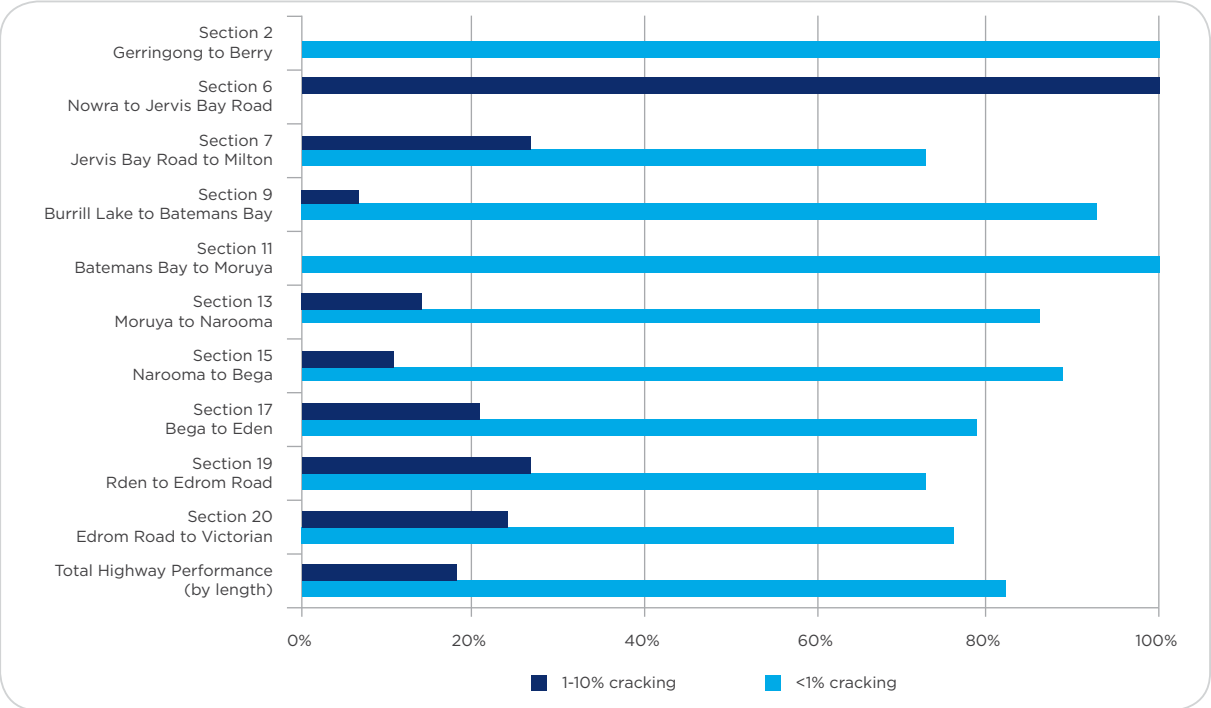


Figure 5-24 below summarises pavement cracking along spray sealed pavements on the Princes Highway, and shows 82 per cent of the spray sealed road lengths exhibit cracking below one per cent and 18 per cent of the spray sealed road lengths exhibit cracking between 1-10 per cent. No lengths of the spray sealed sections of the Princes Highway Corridor exhibit cracking above 10 per cent, also meeting the planning targets.

Figure 5-24 Cracking levels on the spray sealed sections of the Princes Highway



Roughness

Roughness measures the undulations in the road and therefore provides an indication of ride comfort experienced by the driver and passengers. Smoother roads also decrease the wear and tear on vehicles and are a significant factor in reducing heavy vehicle operating costs.

The ride quality, or longitudinal profile of the road surface, is measured using vehicle mounted laser technology. A 'roughness' score, measured using International Roughness Index (IRI), below 4.2 metres per kilometre indicates a generally smooth and comfortable ride.

On average across the state, 94.3 per cent of the combined length of class 4 rural road has a roughness level below 4.2 metres per kilometre and 91.6 per cent of the combined length of class 3 rural road has a roughness level below 4.2 metres per kilometre. The corresponding result for the Class 4 section of the Princes Highway, between Jervis Bay Road and Batemans Bay is shown in **Figure 5-25** and the class 3 result between Batemans Bay and the Victorian Border is shown in **Figure 5-26**.

Figure 5-25 International Roughness Index (IRI) value below 4.2 metres per kilometre – Class 4 rural road between Jervis Bay Road and Batemans Bay

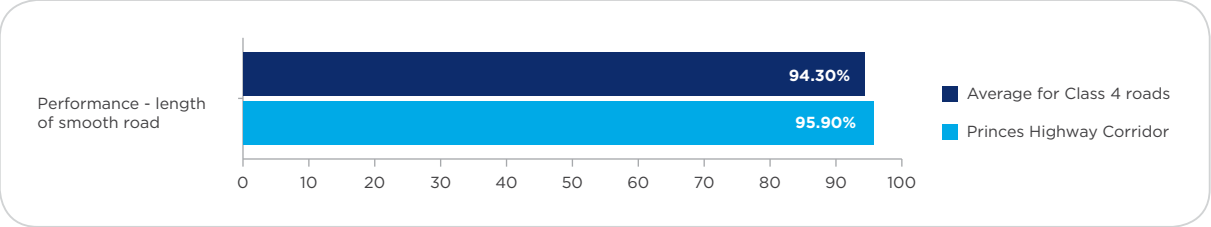
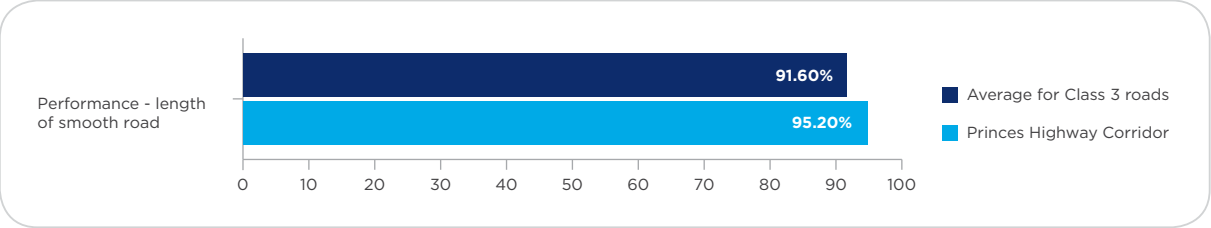


Figure 5-26 International Roughness Index (IRI) value below 4.2 metres per kilometre – Class 3 rural road between Batemans Bay and the Victorian Border



Road smoothness

Road smoothness is a travel weighted roughness measure. The NSW 2021 Plan (the State plan) sets a target to improve the smoothness of State Roads. The target is 93 per cent of roads with a travel weighted International Roughness Index value less than 4.2 metres per kilometre[39]. The Smooth Travel Exposure (STE) indicator forms one of a suite of Austroads National Performance Indicators (NPI) and is a travel weighted roughness measure that provides an indication of the proportion of total kilometres travelled on smooth roads.

The Smooth Travel Exposure (STE) over the entire length of the Princes Highway corridor is 97.12 per cent, exceeding the NSW 2021 Plan smoothness target of 93 per cent.

39 NSW Government 2011, *NSW 2021: A Plan to Make NSW Number One*, NSW Government, Sydney, p. 38

Rutting

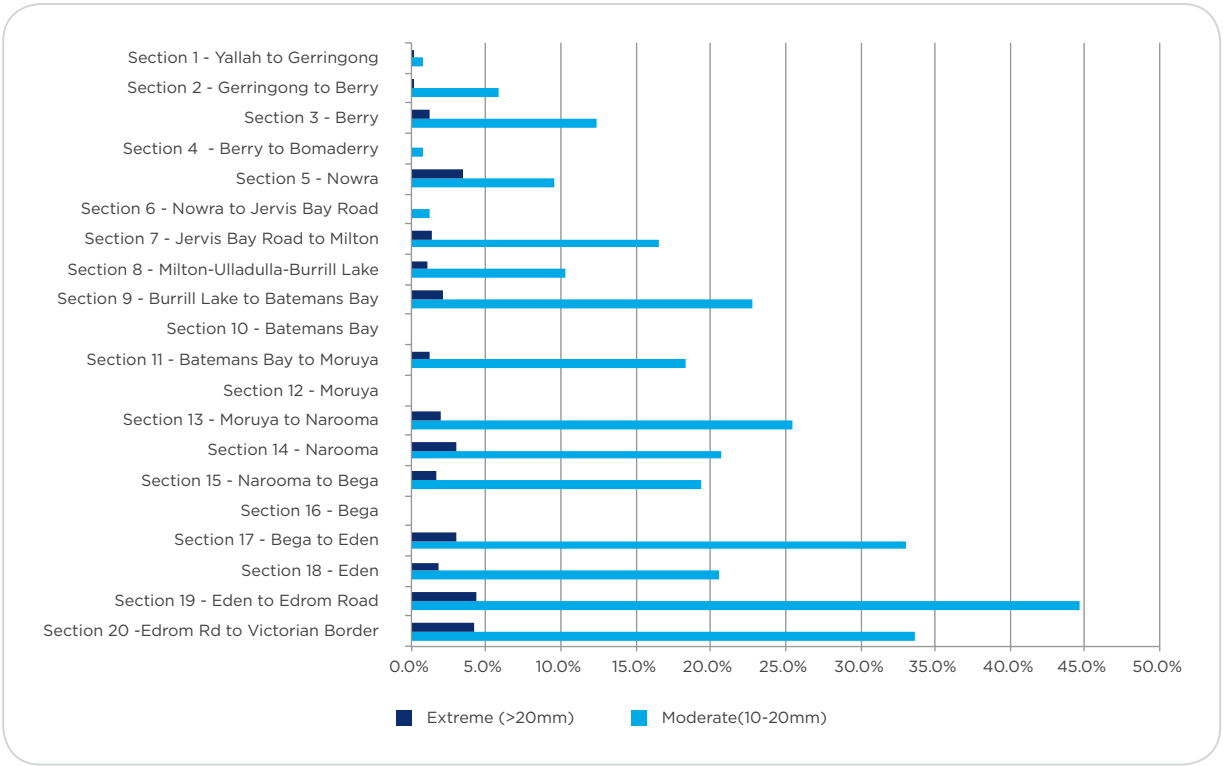
Rutting is a longitudinal distress resulting in permanent pavement deformation in the wheel paths. Rutting represents a potential road safety concern due to water ponding that can form in the depressions along the wheel paths, increase in aquaplaning risk and subsequent loss of skid resistance[40]. Rutting also indicates sheer failure of the pavement layers.

Rutting is regarded as a key distress mode and has a strong influence on Roads and Maritime's pavement maintenance and rehabilitation programs for future pavement rehabilitation or reconstruction works. Rutting may indicate structural instability in flexible pavements or excessive plastic deformation in asphalt pavements.

High levels of rutting require investigation to ascertain the structural integrity of the pavement and potential risk to safety. The deformation may occur in the wearing or base courses (upper thickness), which indicates material instability, or sub-base and subgrade (deeper level), which indicates material breakdown and loss of bearing strength. The remedial treatment will depend on the cause and varies from heavy patching to resurfacing or reconstruction.

Section 19 between Eden and Edrom Road and section 20 between Edrom Road and the Victorian Border exhibit a relatively high proportion (4%) of 'extreme' rutting. Nowra, Narooma and the section between Bega and Eden also exhibit 3% or more of extreme rutting. Insufficient data was available for Bega, Batemans Bay and Moruya. A summary of all the planning sections is shown in **Figure 5-27**.

Figure 5-27 Moderate and extreme rutting on Princes Highway sections



40 Austroads 2007, *Guide to Asset Management: Part 5C: Rutting*, Austroads, Sydney

Surface friction

The surface friction of a road surface is a key contributor to the safety of vehicle operation and skid resistance. Areas of low surface friction can further be exacerbated by wet or freezing conditions.

To measure surface friction, a Sideways Force Coefficient Routine Investigation Machine (SCRIM) is used along with visual inspection. In prioritising sites, other pavement conditions such as rutting are also considered as part of a risk based approach.

21 sites on the Princes Highway between Jervis Bay Road and the Victorian Border have been identified as having some skid resistance issues. These sites will be managed by RMS' Asset Management section with appropriate remedial action.

Summary of road pavement issues

- More complete data is needed for Pavement Remaining Life on the entire corridor, however based on the data that is available, a number of sections south of Narooma have a pavement age of more than 40 years.
- Sections of the highway through Nowra and between Eden and the Victorian Border have the highest levels of extreme rutting.
- A number of sites between Jervis Bay Road and the Victorian Border have been identified as having some skid resistance issues.

5.6 Environment and Urban Design

The Princes Highway road corridor contains a wide range of important environmental features. These include but are not limited to state conservation areas, protected wetlands and rivers, numerous Aboriginal and Non-Aboriginal heritage items, important plant and animal species and populations.

Landforms and topography range from flat floodplains to steep hillsides, translating into a route alignment that varies between lengthy straight stretches with gentle curves to steep and tightly curved sections.

The Corridor has numerous towns and urban centres located along its length. The larger urban centres such as Nowra, Bega, Batemans Bay and Ulladulla are situated on rivers and are characterised by quite diversified land uses, including civic precincts and large retail and industrial areas. Smaller townships, like Mogo and Cobargo tend to not have features that are akin to the larger townships.

Low lying locations along the corridor are sometimes at risk of flooding. Flooding is one of the key environmental constraints along the corridor.

Ecology

Much of the corridor is constrained between the Tasman Sea and steep terrain. In some areas, road users have uninterrupted views across some of the State's most impressive estuaries and wetlands. In other areas, road users experience tall open forests that provide habitat for unique flora and fauna. Agriculture and dairy farming are also familiar features of the landscape along a large portion of the corridor.

While the proximity of the coast, water bodies and forest areas is attractive it also provides challenges in the provision of accessibility while recognising and addressing environmental constraints. The corridor traverses many areas that contain threatened species; many areas are adjacent to National Parks and State Forests. Through various RMS programs and road upgrades, RMS has been able to develop a database of areas that contain important flora and fauna attributes. Many of these plant and animal species and communities are protected under both NSW State and Commonwealth legislation.

It is Roads and Maritime's responsibility to manage the road reserve in a way that balances the needs of road users with the needs of the environment. The ecological values of the flora and fauna along the corridor will require consideration for any project requiring vegetation clearance.

Aboriginal and European history

Roads and Maritime procedures developed in consultation with local Aboriginal communities ensure the identification and ongoing protection of sensitive cultural sites within the road corridor.

Notable non-Aboriginal heritage along the corridor includes the Nowra and Narooma Bridges. There are many other heritage listed buildings along the corridor, such as those between Bega and Eden for example, which need to be considered when developing plans for the future. The same can be said of known items of Aboriginal heritage. Many areas along river foreshores are well known areas of Aboriginal heritage. These are sensitive areas that require careful consideration during any planning and development of road projects.

Noise

The NSW Government funded Noise Abatement Program being delivered by Roads and Maritime can provide treatment for homes and places where communities gather that are heavily affected by traffic noise pollution. Roads and Maritime also ensures that Australia's noise limits for new vehicles meet the latest European standards by working with the National Transport Commission and other States to produce Australian Design Rules for vehicle noise.

Roads and Maritime will continue to conduct assessments of road traffic noise for road projects and apply all feasible and reasonable noise mitigation measures to avoid or minimise noise where noise exceeds criteria in the NSW Road Noise Policy.

Soil and water

Potential Acid Sulfate Soils and Actual Acid Sulfate Soils are located in low lying coastal areas along the corridor. Roads and Maritime recognises that these areas require special environmental management and thanks to more recent mapping work, Roads and Maritime has a good understanding of where they are located. A lot of research has also been undertaken by Roads and Maritime in recent times to understand how best to manage these types of soils to reduce and minimise adverse effects on the environment.

Landscape and urban design

It is important that any major road projects on the Princes Highway adopt urban design principles that ensure that the road contributes to the landscape around it rather than detracting from it. Roads and Maritime updated its urban design policy *Beyond the pavement* in 2014. The objective of the policy is to systematically incorporate urban design thinking into road and maritime infrastructure projects, resulting in improved design quality and increased customer satisfaction. Any large infrastructure projects on the Princes Highway will need to follow the policy to ensure design objectives are achieved.

Socio-economic considerations

The main socioeconomic constraint to improvement projects is any impact on the viability of businesses such as farms, wineries, vineyards and retail stores. Impacts associated with the acquisition of properties for projects would be considered during project development.

Impact of road projects on the environment

Prior to implementation, all road infrastructure projects on the Princes Highway corridor would be subject to an appropriate environmental assessment. As a general principle proposals should consider options to avoid impact on the environment. Where impact to items cannot be avoided, a justification for the impact should be provided, and appropriate mitigation, management or offset measures must be implemented in consultation with the relevant regulators and stakeholder groups.

It is noted that at some locations trees of ecological value create a hazard to motorists. It is expected that any projects at these locations would evaluate the 'do nothing' option, removal of trees and the provision of safety barriers as options, and a clear case for the preferred project be made.

6 FUTURE CORRIDOR CHANGES

Gerringong upgrade under construction – Southbound

6.1 Population and demographics

Population forecasts

Table 6-1 below shows the population growth along the corridor broken down by LGA. This analysis uses ABS Census data from 2001, 2006 and 2011. Shellharbour and Shoalhaven LGA's exhibit average annual growth of over 1% for the 10 year period with consistent growth over the 10 years. Kiama doesn't exhibit the same level of annual growth, however it has seen a significant increase in population between 2006 to 2011, when compared with the five year period from 2001 to 2006.

Table 6-1 2001, 2006, 2011 Census Quickstats

LGA	2001	2006	2011	% change (01-06)	% change (06-11)	Annual % change (01-2011)
Shellharbour	56,964	60,337	63,605	5.9%	5.4%	1.11%
Kiama	18,773	18,985	19,986	1.1%	5.2%	0.63%
Shoalhaven	83,305	88,405	92,812	6.1%	4.9%	1.09%
Eurobodalla	33,007	35,009	35,741	6.0%	2.0%	0.80%
Bega Valley	30,447	31,062	31,950	2.0%	2.8%	0.48%

The NSW Department of Planning and Environment has provided population estimates for all the Local Government Areas which the Princes Highway Corridor passes through. These are shown in the table below using assumed annual growth rates for each LGA.

Table 6-2 Princes Highway – LGA Population Predictions Department of Planning and Environment

LGA	2011	2016	2021	2026	2031	Total Change	Total % Change	Annual % Change
Shellharbour	66,200	70,650	75,350	79,950	84,250	18,050	27.3%	1.2%
Kiama	20,800	22,000	23,150	24,300	25,450	4,600	22.2%	1.0%
Shoalhaven	96,200	99,800	103,000	105,850	108,150	11,950	12.4%	0.6%
Eurobodalla	37,100	38,500	39,550	40,300	40,650	3,550	9.6%	0.5%
Bega Valley	33,150	34,200	35,100	35,850	36,450	3,300	10.0%	0.5%

Along the Princes Highway corridor, the highest population increase is expected in Shellharbour, which is set to grow from 66,000 in 2011 to just over 84,000 people in the year 2031, an annual average change of 1.2 per cent.[41]

Increased traffic on the Princes Highway, especially in Shellharbour, Kiama and Shoalhaven is a likely consequence of any population growth.

41 Department of Planning and Infrastructure 2013, *New South Wales in the future: Preliminary 2013 population projections*, Preliminary release of NSW state and local government area population projections, DPI, Sydney. http://www.planning.nsw.gov.au/Portals/0/HousingDelivery

Land use changes

The NSW Department of Planning and Environment (DP&E) is currently working to review the existing NSW Regional Strategies to prepare new Regional Growth Plans (incorporating infrastructure requirements) for NSW to reflect the NSW Government's new integrated planning approach that incorporates land use planning, infrastructure planning and transport planning. The Illawarra and South Coast Regional Strategies developed by the NSW DP&E are among these strategies being reviewed and updated.

The DP&E has released the NSW State and LGA dwelling projections from 2011 to 2031 (five year intervals). The annual change in dwellings is reflective of the population increases shown above in Table 6-2. Shellharbour is above the state average of a 1.35% annual change, Kiama is very close to the state average at 1.33% and all other LGA's are below the state average[42] (**Figure 6-1**). Current and proposed developments in Shellharbour and Shoalhaven LGA's, given the significant total change forecast, will impact the road network and will need to be monitored and managed over the next 20 years.

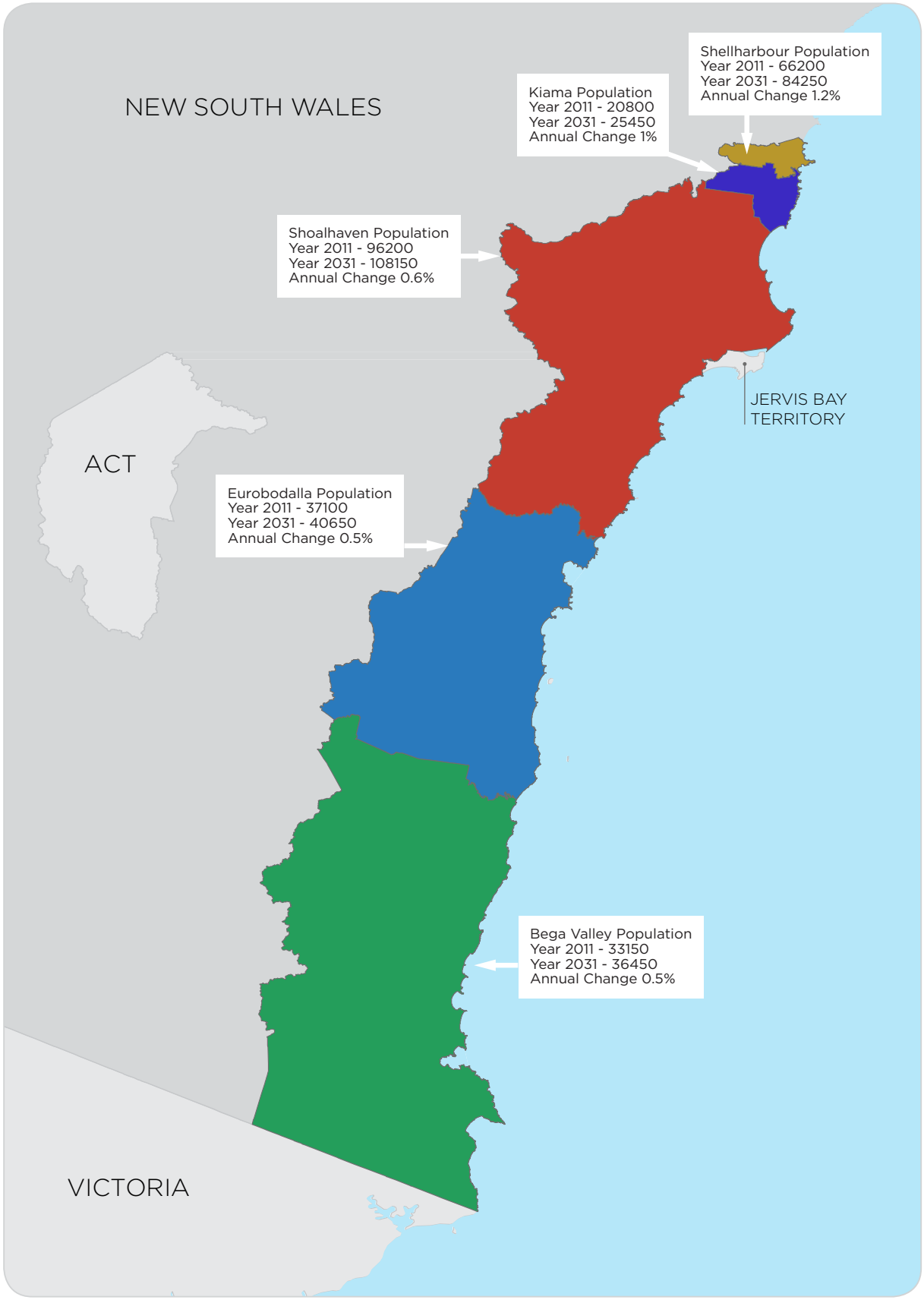
Traffic modeling is currently underway in Nowra and Bomaderry to understand the impact of population growth and proposed developments on the Princes Highway and to develop a strategy to manage traffic growth accordingly.

Table 6-3 LGA Dwelling Predictions – Department of Planning and Environment

LGA	2011	2016	2021	2026	2031	Total Change	Total % Change	Annual % Change
Shellharbour	25,800	28,450	30,950	33,350	35,600	9,800	37.98%	1.62%
Kiama	9,900	10,750	11,500	12,200	12,900	3,000	30.30%	1.33%
Shoalhaven	54,800	57,950	60,650	63,000	64,950	10,150	18.52%	0.85%
Eurobodalla	23,700	25,300	26,600	27,500	28,100	4,400	18.57%	0.86%
Bega Valley	17,650	18,600	19,400	20,000	20,550	2,900	16.43%	0.76%

42 Department of Planning and Environment 2014, *2014 NSW Population Projections* data www.planning.nsw.gov.au/en-au/deliveringhomes/populationandhouseholdprojections/data.aspx

Figure 6-1 Predicted LGA population changes along the Princes Highway corridor



Demographic changes and trends

The NSW Department of Planning and Environment age estimates for the local government areas shown below in Table 6-4 show a significant increase in the population over 65 years of age for all local government areas. This increase is most significant in Shellharbour and Kiama. In contrast, the population aged between 0-14 is expected to stay reasonably steady and in the more southerly local government areas this number is expected to drop.

Table 6-4 LGA Demographics – Department of Planning and Environment

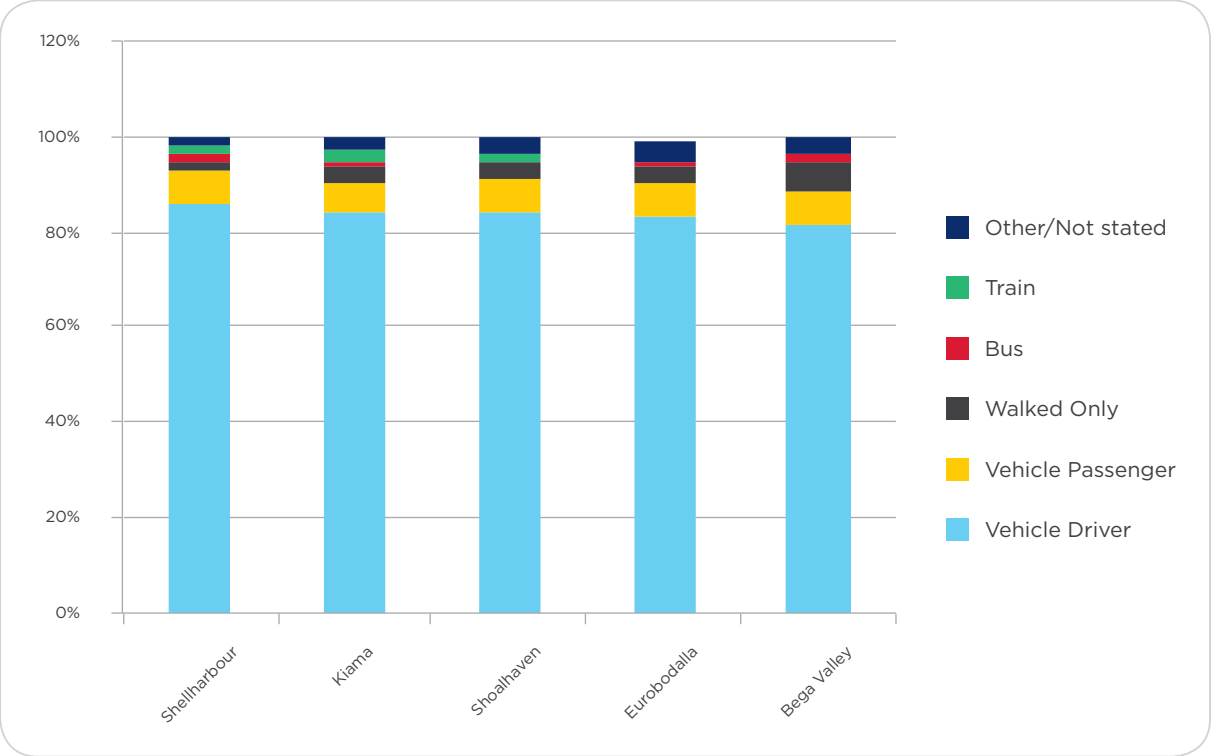
	2011	2016	2021	2026	2031	Total Change	Total % Change	Annual % Change
Kiama 0-14	3,650	3,800	3,950	4,050	4,150	500	13.70%	0.68%
Kiama +65	4,200	4,950	5,950	6,900	7,800	3,600	85.71%	4.29%
Shellharbour 0-14	13,950	14,300	15,000	15,500	15,700	1,750	12.54%	0.63%
Shellharbour +65	9,400	11,600	13,900	16,550	19,250	9,850	104.79%	5.24%
Shoalhaven 0-14	16,950	16,750	17,050	17,000	17,000	50	0.29%	0.01%
Shoalhaven +65	22,150	25,600	28,950	32,800	36,000	13,850	62.53%	3.13%
Bega Valley 0-14	5,750	5,700	5,700	5,650	5,500	-250	-4.35%	-0.22%
Bega Valley +65	7,050	8,350	9,850	11,300	12,300	5,250	74.47%	3.72%
Eurobodalla 0-14	6,200	5,850	5,700	5,450	5,150	-1,050	-16.94%	-0.85%
Eurobodalla +65	9,350	11,550	13,500	15,350	16,850	7,500	80.21%	4.01%

As the population ages, demand for public and community transport connections between towns and larger regional centres will grow.

The Bureau of Transport Statistics data shows that the workers along the Princes Highway corridor are extremely reliant on cars to commute to their selected employment destination. Mode share data for all places of residence along the corridor shows that a very high proportion of trip makers are the vehicle driver or a passenger with very small percentages choosing to walk, cycle or use public transport.[43] (**Figure 6-2**).

43 Bureau of Transport Statistics 2014, *JTW (Journey to Work) Explorer*, Transport for NSW, Sydney. http://visual.bts.nsw.gov.au/jtwbasic

Figure 6-2 Mode of choice for commuters from their place of residence (by LGA)



The level of car ownership is very high in the Illawarra and South Coast Regions and is generally the preferred mode of travel. Bus travel contributes to only a very small number of trips along the Princes Highway and mostly in the northernmost sections. Train options are limited with Bomaderry being the most southerly station, often requiring commuters to change at Kiama to change from their NSW TrainLink Intercity diesel powered service to electric powered service at Kiama. The majority of train users along the corridor use the service to connect to Wollongong and Sydney to the north of the corridor rather than for travel within the corridor.

6.2 Traffic growth

Traffic growth can be forecast by considering historical average annual daily traffic (AADT) data. However consideration should also be given to significant changes in vehicle regulation or land use that may change the forecast growth rate.

Roads and Maritime has been collecting traffic data on the Princes Highway for many years and during this time traffic volumes have continued to grow steadily, with higher growth recorded in the northern sections of the corridor and low average growth towards the southern end of the corridor.

These forecast future traffic volumes are shown below in Figure 6-3 and summarised in Table 6-5.

Figure 6-3 Forecast traffic volumes on the Princes Highway

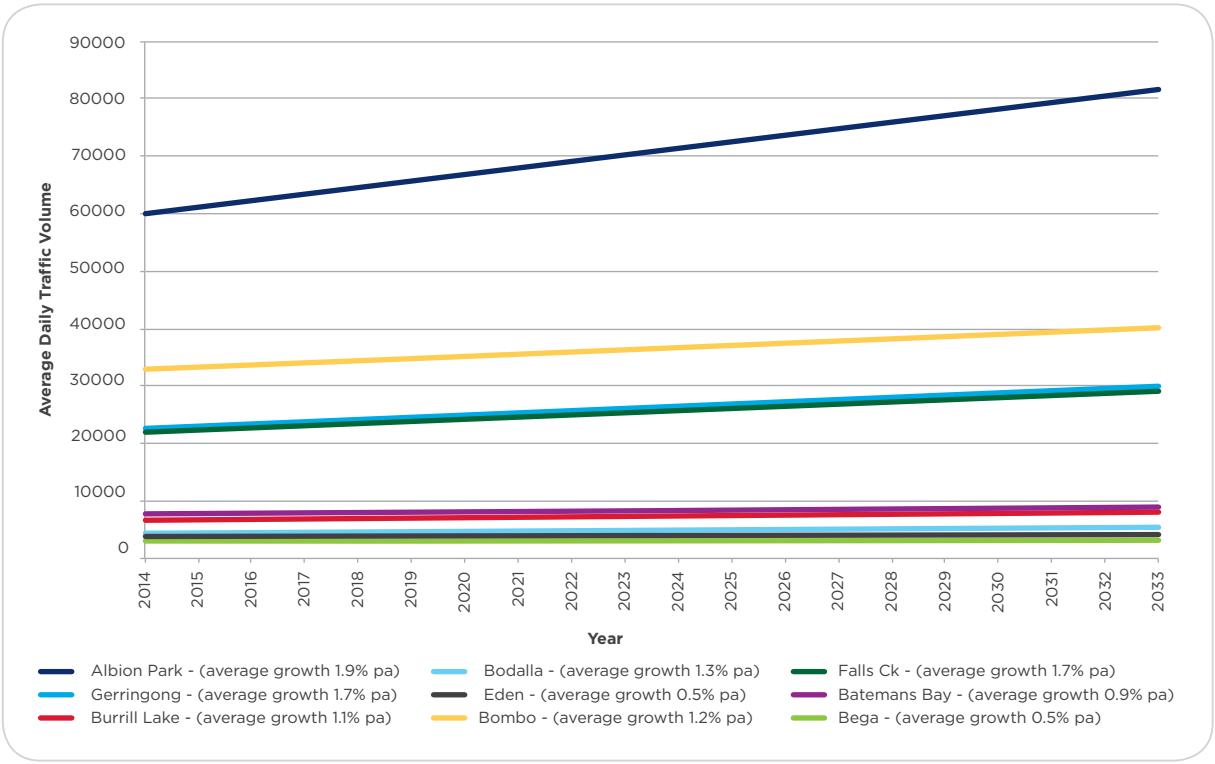


Table 6-5 Forecast traffic volumes on the Princes Highway and average growth rates

Year	Albion Park (1.9% pa)	Bombo (1.2% pa)	Gerringong (1.7% pa)	Falls Ck (1.7% pa)	Burrill Lake (1.1% pa)	Batemans Bay (0.9% pa)	Bodalla (1.3% pa)	Bega (0.5% pa)	Eden (0.5% pa)
2014	59979	32774	22629	21963	6644	7670	4378	2905	3819
2033	81597	40144	29961	29094	8053	8936	5423	3165	4150

The northern end of the corridor between Yallah and Falls Creek is expected to experience a significant increase in traffic volumes over the next 20 years.

The proposed four lanes between Yallah and Jervis Bay Road, which includes the Albion Park Rail Bypass, highway improvements between Gerringong and Berry and the Foxground and Berry Bypass will manage much of this growth from a network efficiency perspective and is being designed accordingly. As discussed previously, ongoing management of traffic through Nowra and the roll out of an overtaking lane strategy south of Jervis Bay Road will be important to manage traffic growth along the remainder of the corridor.

To illustrate the impact of traffic growth on the highway and using the forecast future traffic volumes, the level of service in the "do nothing" scenario is shown below in Table 6-6 and Table 6-7. It illustrates a decrease in the level of service for both of the sections modelled and while the actual level of service doesn't change significantly, the average percent of time spent following other vehicles and average speed is worse for all sections and times modelled.

Table 6-6 Princes Highway corridor performance – Southbound

Corridor section	Year	% time spent following		Average Speed (km/h)		Level of Service	
		AM peak hour	PM peak hour	AM peak hour	PM peak hour	AM peak hour	PM peak hour
Section 7 – Jervis Bay Road to Sussex Inlet Road	**2013**	70.4	80.8	75	65.2	D	E
Section 7 – Sussex inlet Road to Milton	**2013**	56.9*		74.2*		C	
Section 7 – Jervis Bay Road to Sussex Inlet Road	**2033**	75.1	85.3	73.0	61.3	D	E
Section 7 – Sussex inlet Road to Milton	**2033**	66.3*		70.2*		D*	

* No defined AM or PM peak. Peak hour is 1400-1500

Table 6-7 Princes Highway corridor performance – Northbound

Corridor section	Year	% time spent following		Average Speed (km/h)		Level of Service	
		AM peak hour	PM peak hour	AM peak hour	PM peak hour	AM peak hour	PM peak hour
Section 7 – Jervis Bay Road to Sussex Inlet Road	**2013**	77.6	73.5	69.5	76.8	D	D
Section 7 – Sussex Inlet Road to Milton	**2013**	48.8*		81.8*		B	
Section 7 – Jervis Bay Road to Sussex Inlet Road	**2033**	82.3	77.7	66.7	74.5	E	D
Section 7 – Sussex Inlet Road to Milton	**2033**	59.9*		77.4*		C*	

* No defined AM or PM peak. Peak hour is 1400-1500

Over time, the level of service along a route will deteriorate as traffic volumes increase, however the modelling shows this is most critical between Jervis Bay Road and Milton and the traffic volumes south of Milton will mean these sections are less of a priority from a traffic efficiency perspective. RMS has a target of maintaining level of service along rural corridors and as discussed above, this will be managed with the systematic roll out of an overtaking lane strategy south of Jervis Bay Road.

Intersection performance

Intersection performance is challenging to model over a long period. Intersections will be assessed on a five yearly basis and improvement recommendations identified in accordance with the assessed performance. A program of improvements for intersections is discussed in Section 7.

6.3 Future freight task and heavy vehicle volumes

The *NSW Freight and Ports Strategy* identifies the freight task in NSW is projected to nearly double from 2011 levels to 794 million tonnes by 2031. By volume mining represents almost half of the current task and is expected to remain the single largest freight task in NSW.

The section of the Princes Highway north of the corridor between Wollongong and Sydney is expected to be the most heavily trafficked and fastest growing section of the highway, with an average annual 2.1% growth in truck trips over the forecast period. The middle section of the corridor, from Nowra to Batemans Bay has a lower freight base than the Wollongong to Sydney section, with the average annual growth rate in truck trips of 2%. The section with the forecast lowest growth is the southern end from Bega to the Victorian border, where population growth and the demand for goods and services are lower, with a forecast growth in truck trips to 2031 of about 0.5% per annum.

The Bureau of Freight Statistics have modelled freight movements along the Princes Highway for planning purposes for 2011 and 2031, based on the NSW Strategic Freight Model (SFM) (2013 version). Key model assumptions include:

- The SFM operates at a Statistical Local Area level and may underestimate more "local" freight movements, usually transported in smaller commercial vehicles. This under-estimation is of particular relevance to the northern sections of the corridor.
- Truck volumes have been estimated based on typical vehicle fleet composition by commodity, and parameters for number of working days per year, average load by vehicle type and proportion of back loading.
- The SFM incorporates estimates of growth by commodity based on stakeholder engagement to allow for forecasts of freight movements into the future to be anticipated and planned for.

The forecast daily truck movements and freight task on the Princes Highway for 2031 are shown in Table 6-8. The highest growth is forecast to be in the northern parts of the corridor where the growth rates are expected to be around 70-80 per cent between 2011 and 2031.

Table 6-8 Forecast year daily truck annual tonnage and movements

Corridor planning sections	Description	Freight Volume (annual tonnage, kt)			Daily Truck movements		
		2011	2031	% change	2011	2031	% change
1	Yallah to Gerringong	2,550	4,550	78%	520	940	81%
2	Gerringong to Berry	1,650	2,800	70%	340	580	71%
3	Berry	1,650	2,800	70%	340	580	71%
4	Berry to Bomaderry	1,650	2,800	70%	340	580	71%
5	Nowra	1,950	3,350	72%	400	690	73%
6	Nowra to Jervis Bay Road	1,350	2,300	70%	280	470	68%
7	Jervis Bay Road to Milton	1,400	2,350	68%	290	480	66%
8	Milton–Ulladulla–Burrill Lake	800	1,300	63%	160	270	69%
9	Burrill Lake to Batemans Bay	800	1,300	63%	160	270	69%
10	Batemans Bay	950	1,600	68%	200	330	65%
11	Batemans Bay to Moruya	1,050	1,700	62%	220	350	59%

Corridor planning sections	Description	Freight Volume (annual tonnage, kt)			Daily Truck movements		
		2011	2031	% change	2011	2031	% change
12	Moruya	1,050	1,700	62%	220	350	59%
13	Moruya to Narooma	1,050	1,700	62%	220	350	59%
14	Narooma	1,050	1,700	62%	220	350	59%
15	Narooma to Bega	1,050	1,700	62%	220	350	59%
16	Bega	1,450	2,300	59%	300	470	57%
17	Bega to Eden	1,450	2,300	59%	300	470	57%
18	Eden	1,700	2,650	56%	350	540	54%
19	Eden to Edrom Road	1,700	2,650	56%	350	540	54%
20	Edrom Road to Victorian border	1,700	2,650	56%	350	540	54%

Movement of freight by rail is limited for the majority of the Princes Highway corridor. The rail line only extends as far south as Bomaderry with connections north of Port Kembla and south of Port Kembla via the Moss Vale – Unanderra line.

Anticipated land use changes, including the expansion of Port Kembla north of the corridor, can be expected to increase freight traffic volumes on the Princes Highway. Port Kembla Port Corporation has developed a Master Plan to identify future opportunities for expansion of the port. Transport for NSW is liaising closely with the Corporation at the local level, to anticipate and manage the impacts of additional freight demands as they are identified.

It can be expected that 'levels of service' on the Princes Highway will deteriorate in the future as light and heavy commercial vehicle traffic volumes increase if no remedial work is undertaken.

6.4 Future public transport and active transport

The NSW Government actively promotes the use of non-car based modes of transport for a variety of reasons beneficial to our society.

The strategy for improving public and active transport will involve integrating regional transport planning with land use planning and other NSW Government initiatives such as Regional Action Plans and Department of Planning and Environment regional land use strategies. This will ensure public and active transport services and infrastructure are provided in a timely way, particularly in regions and centres with strong growth.

Public transport

In regional NSW the provision of good public transport services requires careful planning to take account of long travel distances and dispersed demand. Public transport initiatives are addressed in the Illawarra and Southern Regional Transport Plans. For example, public transport actions include:

- Improve passenger rail services (reduce travel time between Wollongong and Sydney, timetable changes, modern signalling to improve reliability,
- Deliver public transport improvements
- Deliver Opal in the Illawarra Region
- Integrate NSW TrainLink coach services with regional bus services
- Improve public transport interchanges
- Improve public transport customer information
- Improve integration of community transport services into passenger transport system

Active transport

The NSW Government focuses on promoting the benefits of active transport, improving customer information, and developing guidelines and resources for local government. This includes improved online resources such as trip planning as well as other programs to promote cycling and walking as viable transport options.

The NSW Government is committed to making walking easier and safer and giving customer's choice for short local trips within their towns. The *NSW Long Term Transport Master Plan* states an aim to enhance cycling routes in regional centres to increase the number of people who cycle.

Regional cycling and walking initiatives are addressed in the Illawarra and Southern Regional Transport Plans. For example, active transport actions include:

- Roll out the Walking Communities Program
- Connecting Centres Cycling Program
- Roll out Cycling Towns Program
- Improve information about walking and cycling routes and facilities
- Improve opportunities for walking and cycling

Roads and Maritime is also committed to providing for all road users when planning, designing, delivering and operating the road network in NSW. The use of cycling as a transport mode and the provision of safe and convenient cycling facilities are fundamental to this commitment. RMS technical directions include improvements for safe cycling when maintenance or resurfacing work occurs on State roads. This could include pavement linemarking and shoulder sealing.

As part of this commitment Roads and Maritime will also act proactively to provide sealed road shoulders of a width that is adequate to accommodate cyclists in locations where cyclists are present, on an as needed and priority basis.

In locations where sealed road shoulders are provided to accommodate cyclists the continuity of the sealed shoulder should be maintained and constraint points including over bridges clearly signposted for all road users.

6.5 Climate change

The expected impacts of climate change in Australia vary across the continent and include changing rainfall patterns, reduced water availability and an increased frequency of severe weather events.

The NSW Office of Environment and Heritage (OEH) is developing new, fine-scale climate projections for New South Wales and the Australian Capital Territory using a regional climate model called the NSW and ACT Regional Climate Model or NARCliM. This will include the Illawarra and Southern Regions as well as the Princes Highway corridor.

NARCLiM estimates that there will be a projected increase in rainfall in Summer and Autumn, however the projected rainfall is expected to decrease during the winter period. Another projected change is the increase in fire weather and severe fire weather. This is projected to increase in summer and spring. It is likely an increase in the frequency and intensity of storms would lead to more frequent short and long term highway closures especially for those low lying areas susceptible to flooding.

Those areas identified as being at risk of flooding have been identified above, however the Princes Highway corridor also has a large number of sections (10%) below 4m Australian Height Datum (AHD). These areas are more likely to be impacted by sea level rises, storm surges and flooding. These sections are shown in the map below.

Figure 6-4 Locations on the Princes Highway Corridor with an AHD less than 4m

Climatic conditions will continue to be monitored for potential road impacts.

6.6 Road corridor changes

Albion Park Rail bypass

Although not entirely within the Princes Highway corridor, project planning has commenced for a future upgrade of the Princes Highway between Yallah and Oak Flats. This upgrade will provide a minimum 4 lane divided carriageway effectively bypassing the town centre of Albion Park Rail.

Roads and Maritime has recently awarded a contract for the concept design and environmental assessment work on this project.

Gerringong upgrade

This project includes 7.5 kilometres of upgraded highway between Mount Pleasant and Toolijooa Road. The upgraded highway will include median barrier and two new interchanges with access to Gerringong and Gerroa. The $340 million upgrade started construction in 2012 and was opened to traffic on 20 August 2015.

Foxground and Berry bypass

The Foxground and Berry bypass will provide a four-lane highway (two lanes in each direction) with median separation for 11.6 kilometres of the Princes Highway between Toolijooa Road and Schofields Lane.

The upgrade includes a bypass of the existing highway at Foxground and a bypass of Berry with access ramps at the north and south of the town.

The $580 million upgrade commenced construction in January 2015 and is expected to be open to traffic in mid 2018.

Berry to Bomaderry upgrade

This planned upgrade includes a four-lane highway with median separation for around 11.5 kilometres between Schofields Lane at Berry and Cambewarra Road at Bomaderry.

Once the highway upgrade between Berry and Bomaderry is built it will complete four lanes of divided highway between Waterfall and Jervis Bay Road, Falls Creek.

Nowra

The upgrade at South Nowra between Kinghorne Street and Forest Road in 2014 has improved traffic flow and travel reliability for both local and through travelling motorists on this busy section of the Princes Highway.

This corridor strategy has identified a high incidence of pedestrian crashes in Nowra. In the short term, the action is to continue to work with Shoalhaven Council to develop and improve pedestrian and cyclist access and facilities within Nowra, reduce conflicts between motorists and pedestrians and continue to improve the use of active transport.

The Nowra Bridge precinct and surrounding intersections is one of the key pinch points on the Princes Highway corridor. For example, there are some localised congestion and poor level of service at some intersections including Cambewarra Road, Bolong Road, Illaroo Road and Bridge Road during the peak period through Nowra. The traffic volumes also increase during holiday seasons resulting in queues and further delays through the town centre of Nowra. Turning traffic queues can spill onto the main highway and block through traffic movements. There is a need for ongoing management of traffic through Nowra and additional minor traffic improvements to cater for these localised traffic issues. In the short term, a traffic and transport study will be developed for the Nowra and Bomaderry township to consider and balance the movement needs of freight and all other road users, and provide improvements to traffic efficiency and travel reliability. The traffic and transport study initiatives will be implemented on a priority basis focussing in particular on improvements to the Cambewarra Road, Bolong Road, Illaroo Road and Bridge Road intersections.

Detailed traffic modelling is currently underway to support the development of the traffic and transport study for Nowra. The results of this modelling will provide valuable information on the current and future performance of key intersections through this town centre and the impact of population growth and proposed developments on the Princes Highway.

The most significant action in the short term to improve traffic efficiency through Nowra is to complete planning and commence construction of

the Nowra bridge project, which will focus on reducing crash rates on the Princes Highway between Bolong Road and Bridge Street and it will also support future traffic growth. Nowra bridge improvements are aimed at reducing delays and queuing on the Princes Highway between Bolong Road and Bridge Street and will provide southbound access for higher productivity vehicles including over height and HML freight on the Princes Highway across the Shoalhaven River travelling south to BTU Road. Roads and Maritime will start work on concept designs for the bridge, and start investigations into the intersections at Bolong, Illaroo and Bridge roads.

Burrill Lake Bridge

This project includes a realignment of the Princes Highway and the replacement of an existing bridge at Burrill Lake that will provide 1 in 100 year flood immunity. The key features of the project include:

- The construction of a 290m long bridge spanning the lake to the east of the existing bridge/highway.
- Improved local access through the provision of roundabouts on each approach to the bridge thereby connecting the Princes Highway to local roads.
- Improved pedestrian and cyclist accessibility across the highway.

Termeil Creek Realignment

The NSW Government has allocated $21 million to construct the highway upgrade. Construction has commenced and the project is exepcted to be completed in mid 2016.

This project includes a 1.6 kilometre realignment and bridge replacement on the Princes Highway at Termeil Creek. The new structure will meet current design guides for width and be designed to provide 1 in 100 year flood immunity.

Dignams Creek Bridge

This project is currently in planning with timing of construction yet to be confirmed. It includes a realignment of the Princes Highway and the replacement of an existing bridge at Dignams Creek. The key features of the project include:

- Construct a new section of highway to current road design standards
- Construct a new bridge over Dignams Creek replacing the existing bridge
- Relocate the intersection of Dignams Creek Road with the Princes Highway for improved road safety
- Upgrade the existing southbound overtaking lane.

7 CORRIDOR CHALLENGES AND PRIORITIES

Shoalhaven River Bridges – Northbound

Corridor challenges are the main issues that need to be overcome to maintain or improve transport roles and services that the Princes Highway provides for the community. They include challenges already evident and others that are expected to emerge as the result of future changes in land use and demographics. These challenges have been mapped below in *Table 7-1*, *Table 7-2* and *Table 7-3* against broader *NSW Long Term Transport Master Plan* objectives.

NSW Government priorities for responding to the Princes Highway corridor challenges are also set out below. The priorities are divided into short, medium and long term actions proposed to address these challenges.

The strategy identifies infrastructure (engineered) and operational (non-engineered) initiatives to improve road user safety, reduce travel times and increase reliability along the Princes Highway.

A number of improvement projects identified during the study can be considered as routine maintenance activities such as pavement repairs and line marking for which an annual budget allocation and program is already in place. These are not listed in the tables below. This section focuses on addressing concerns specific to the Princes Highway.

Regular monitoring of this corridor strategy will be undertaken, with a progress report being prepared every three years to review progress and to identify any issues that require addressing. Monitoring will also help to identify new actions or tasks that may be required to ensure ongoing opportunities along the Princes Highway are being considered.

The Strategy will be targeted for review every five years. Implementation of the final strategy will be a shared responsibility between the NSW Government and Councils in collaboration with other state agencies.

7.1 Key challenges and short-term priorities

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve liveability	1	Yallah to Gerringong – Some intersections including the Illawarra Highway/Princes Highway roundabout at Albion Park Rail are experiencing high levels of traffic congestion. Traffic volumes are expected to increase significantly over the next 20 years. Average increase of around 2% per annum.	Complete planning and commence construction of the Albion Park Rail bypass. Management of the existing Princes Highway corridor needs to be further investigated – Including bus priority, cycleway and pedestrian facilities.	5.2 Traffic / Intersection Performance 6.2 Traffic Growth / Traffic Growth
Improve liveability	3	Berry – Traffic congestion and poor pedestrian amenity through the urban centre of Berry especially during peak holiday seasons.	Continue the construction of the Foxground and Berry Bypass to four lane divided carriageway.	5.2 Traffic

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Support regional development	4	Berry to Bomaderry – The traffic volumes are forecast to increase between Berry and Bomaderry as a result of projects to the north such as the Berry Bypass and Gerringong Highway upgrade. This will have a negative impact on the Level of Service and road safety on this section. This section of highway will also be the only remaining section between Waterfall and Jervis Bay Road which is not four lane divided carriageway.	Monitor the traffic and safety impacts between Berry and Bomaderry following the opening of the Berry Bypass and the highway upgrades at Gerringong.	5.2 Traffic
Improve safety and security	5	Nowra – 12 of the 29 pedestrian crashes that have occurred on the Princes Highway corridor have occurred in Nowra including one fatality.	Work with Shoalhaven Council to develop/ improve pedestrian and cyclist access and facilities through Nowra.	5.1 Road Safety / Vulnerable road users
Support regional development	5	Nowra – The southbound bridge over the Shoalhaven River at Nowra is narrow at only 5.55m wide and only 4.6m high, restricting access for OSOM vehicles. The narrow bridge and lack of detour options makes it very difficult to maintain network connectivity in the event of an incident resulting in extensive delays to motorists. The southbound bridge over the Shoalhaven River at Nowra is not suitable for HML access and also has a Poor Bridge Health Index.	Complete planning and commence construction of a new Shoalhaven River crossing. Improve information to motorists through the use of VMS and other ITS.	5.2 Traffic / Incident Management 5.4 Road Design & Geometry / Lane Widths / Bridge Structural Health

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve liveability	5	Nowra – Nowra has an annual casualty crash rate of 2.97, higher than the NSW average of 2.215 for this class of road and the highest of all sections along the corridor. Nowra has a very high level of 'Rear End' type crashes and 'intersection' crashes. The 4.5km section between Bolong Road and Hillcrest Avenue has experienced 221 crashes resulting in 91 injuries and 2 fatalities. In 2013, the Princes Highway through Nowra had an average daily traffic volume of 48,000 vehicles leading to some localised congestion and poor level of service at some intersections during the peak periods. The traffic volumes also increase during the peak holiday season resulting in queuing and further delays through the town centre. Intersections experiencing the highest levels of traffic congestion and requiring further investigation include the signalised junctions with Bolong Road, Illaroo Road and Bridge Road at Bomaderry/ Nowra. The Camberwarra Road intersection is also expected to perform poorly after the Berry bypass is opened to traffic. Proposed land use changes in Nowra and Bomaderry will put extra pressure on the road network, especially intersections at the northern end of Nowra and Bomaderry.	Develop a traffic model of the Nowra and Bomaderry town centres to inform the development a traffic and transport study to address: • Traffic Efficiency • Road Safety • Pedestrian and cyclist access and safety issues The Nowra and Bomaderry Traffic and Transport Study initiatives will be implemented on a priority basis focussing in particular on improvements to the Cambewarra Road, Bolong Road, Illaroo Road and Bridge Road intersections.	5.1 Road Safety / Casualty crash rate, Crash types, road safety findings 5.4 Road Design & Geometry / Intersections 5.2 Traffic / Traffic Volumes / Intersection Performance 6.1 Population and Demographics / Land Use Changes 6.6 Road corridor changes

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve security and safety	5	Nowra – The intersection at Flinders Road currently has uncontrolled right hand turn from the Princes Highway. This results in safety and efficiency issues, particularly for freight.	Realign Flinders Road (council) South Nowra to connect to Browns Road. Browns Road intersection must be suitable for B-double access.	5.3 Heavy Vehicles
Support economic growth and productivity	6	Nowra to Jervis Bay Road – The northbound bridge over Currambene Creek is not suitable for 26m B-Double operation at HML.	Investigate options to upgrade the northbound bridge over Currambene Creek to be suitable for HML access.	5.4 Road Design & Geometry / Bridge Load performance
Improve safety and security	7	Jervis Bay Road to Milton – The highway section between Jervis Bay Road and Milton (45km) has had 7 fatal crashes. A 6km length of this section between Lake Conjola Entrance Road and Milton has had 3 of these fatalities. Jervis Bay Road to Milton is the worst performing of the rural sections with an annual casualty crash rate more than double the NSW average. Jervis Bay Road to Milton has the highest number of 'Off Road on curve' type crashes, much higher than any other crash type in this section. The 24.2 km section between Jervis Bay and Fitches Creek Road accounts for 73% of the total crashes for the entire 45km section. A 2.5km section of highway between Wandandian and Conjola has a reduced speed limit with a number of tight curves and steep sections.	Undertake a route safety study on section 7 between Jervis Bay Road and Milton to identify: • Specific intersection improvements to address crashes. • Other minor improvements including the installation of audio tactile line marking, widening shoulders including the outside of curves, increasing the clear zone and installing safety barriers where clear zones cannot be increased. • Investigate further opportunities to improve the road safety performance specifically between Wandandian and Conjola.	5.1 Road Safety / Speed Zones / Casualty crash rate / Crash types / Road Safety findings

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve quality of service	7	Jervis Bay Road to Milton – The results of the TRARR analysis show that the section between Jervis Bay Road and Sussex Inlet Road are performing at or below level of service C during most of the day (6am – 6pm) and are performing worse during the PM peak southbound and the AM peak northbound. The southbound direction between Jervis Bay Road and Milton has the least percentage of overtaking opportunities. The LOS between Jervis Bay Road and Milton is forecast to deteriorate over time. This will be most prevalent at the northern end north of Sussex Inlet Road.	Prepare an overtaking lane study between Jervis Bay Road and Milton to identify suitable locations for overtaking lanes. The outcomes of this report will be considered in conjunction with the recommendations of the Route Safety Study.	5.2 Traffic / Number of Lanes and Level of Service
Improve quality of service	7	Jervis Bay Road to Milton – The bridges over Yackungarrah Creek and Currowar Creek have a "Poor" Bridge Health Index.	Complete investigation into the management of the bridges over Yackungarrah Creek and Currowar Creek.	5.4 Road Design & Geometry / Bridge Structural Health
Improve quality of service	8	Milton/Ulladulla/Burrill Lake – Seasonal peak traffic volumes result in long traffic queues and delays, especially through Milton.	Continue to manage peak holiday traffic through Milton with manual traffic control and monitor the success and impact of the management strategy. Investigate options to improve driver information using Intelligent Transport Systems to inform drivers upstream of Milton of the traffic conditions.	5.2 Traffic / Traffic Volumes

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve liveability	8	Milton/Ulladulla/Burrill Lake – Milton is about 60km south of Nowra. With the upgrade to infrastructure north of Jervis Bay Road, Milton and Ulladulla may receive increased traffic volumes, especially during seasonal peaks. In the short to medium term, this may cause travel delays and road safety issues.	Continue to monitor the corridor performance through Milton and Ulladulla. Identify future network improvements that will be required. Continue to preserve the existing LEP corridor through Milton and Ulladulla and manage traffic through the urban centres.	5.2 Traffic / Regional Centres and Town Bypasses 6.1 Population and Demographics / Land Use Changes
Support regional development	8	Milton/Ulladulla/Burrill Lake – Burrill Lake is one of the lowest points on the network and is subject to flooding.	Construct the replacement bridge over Burrill Lake.	5.4 Road Design & Geometry / Flooding

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	9	Burrill Lake to Batemans Bay – This section has a high severity index and more crashes when compared to other rural sections of the highway. The casualty crash rate is nearly twice that of the NSW average on similar ranked roads. This section also has a very high proportion of 'Off Road on curve' type crashes, more than half of the total crashes. 104 of the total 147 crashes within this section occurred between River Road and the Shoalhaven / Eurobodalla LGA border. Overall, this section has the lowest percentage of overtaking opportunities (about 33%) of all the rural sections along the corridor and may be exposed to higher traffic volumes as upgrades are completed in the northern end of the corridor.	Undertake a route safety study on section 9 between Burrill Lake and Batemans Bay to identify: • Specific intersection improvements. • Other minor improvements including the installation of tactile line marking, widening shoulders including the outside of curves and installing safety barriers where target clear zones cannot be achieved. Investigate further opportunities to improve the road safety performance specifically between River Road and the Shoalhaven / Eurobodalla LGA border. Prepare an overtaking lane study between Burrill Lake and Batemans Bay to identify suitable locations for overtaking lanes. The outcomes of this report will be considered in conjunction with the recommendations of the Route Safety Study.	5.1 Road Safety / Number of crashes / Crash Types / Road Safety Findings 5.2 Traffic / Overtaking Opportunities
Improve safety and security	9	Burrill Lake to Batemans Bay – The bridge over Termeil Creek has a "Poor" Bridge Health Index and is narrow at 6.7m.	Complete construction of the Termeil Creek realignment to upgrade approximately 1.6km of highway and replace the old bridge.	5.4 Road Design & Geometry / Bridge Structural Health

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	10	Batemans Bay – This urban centre has the highest casualty crash rate per 100 million vehicle kilometres travelled for all the urban sections. Nearly twice that of other urban sections such as Milton-Ulladulla. A total of 16 crashes occurred on this section resulting in 15 casualty crashes, all of which occurred at intersections. This section of the highway is an inner bypass which bypasses the commercial area of Batemans Bay.	Undertake an intersection safety review in Batemans Bay to identify: • Worst performing intersections. • Specific intersection improvements. • Potential improvements to the operation of the signalised intersections.	5.1 Road Safety / Casualty crash rate
Support economic growth and productivity	10	Batemans Bay – Narrow bridge over the Clyde River (6.09m). Clyde River Bridge is not suitable for HML access. Bridge over Clyde River has a "Poor" Bridge Health Index.	Commence planning for the renewel or replacement of the bridge over the Clyde River at Batemans Bay.	5.4 Road Design & Geometry / Lane Widths / Bridge Load Performance / Bridge Structural Health

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve liveability	11	Batemans Bay to Moruya – The road alignment is very poor south of Batemans Bay and the northernmost 6km of the 24km section accounts for over 50% of all crashes within this section. The casualty crash rate is 0.28 compared to the NSW state average of 0.183 and has a severity index of 1.28, just higher than the total corridor average. 24% of the 24km section has grades greater than 6%, of which nearly one fifth are also located on curves less than 460m. 33% of this section has lane widths less than the target of 3.5m and 66% of the section has shoulder widths less than the target of 2.0m, however this is slightly better than other sections of the highway. Some improvements have been made to a 1 kilometre section starting approximately two kilometres south of Batemans Bay to address particularly poor performing road alignment. This includes the installation of safety barrier, central median and wide sealed shoulders. The proposed South Batemans Bay Link Road connection is located within this 6km section of the highway, just north of the improvements mentioned above.	Provide a safe and efficient connection to the South Batemans Bay Link Road. Develop a road safety program of minor improvements to address deficiencies between Batemans Bay and Moruya such as: • Increase clear zones or the installation of safety barriers. • Widen shoulder and lane widths.	5.1 Road Safety / Road Safety Findings

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	15	Narooma to Bega – A reduced speed limit for a 1.5km section of the highway north of Dignams Creek Road. This section has some tight curves, narrow shoulder widths and a narrow bridge. The section between Narooma and Bega has the equal highest severity index of all rural highway sections. The section between Narooma and Bega also has a high proportion of 'off road on curve' type crashes. The section between Narooma and Bega has a high proportion of motorcycle crashes when compared to other rural sections at the southern end of the corridor.	Undertake a route safety study on section 15 between Narooma and Bega to identify: • Minor improvements including the installation of audio-tactile line marking, widening shoulders and clear zones including the outside of curves and installing safety barriers and centre median treatments, where appropriate. • Treatments to target 'Off Road on Curve' type crashes on high speed curves. Collect speed data and travel time information to improve our understanding of driver behaviour.	5.1 Road Safety / Speed Zones / Number of Crashes / Crash Types / Vulnerable Road users

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	15	Narooma to Bega – 26% of section 15 between Narooma and Bega has curves with a radii between 240m and 460m. Only 60% of this section has curve radii greater than 600m. A significant proportion of the steep grades coincide with deficient curves. The section between Narooma and Bega has a high proportion of steep grades greater than 6%. There are some particularly poor performing sections south of Victoria Creek including up to 18% of the section having grades greater than 6% on curves less than 460m. The section between Narooma and Bega has 53 slopes and 13 of these have an Assessed Risk Level of 1 or 2 which have a higher risk of slipping. 11 of the 13 poor performing slopes are located on a 4.6km section of the highway south of Bermagui Road near Couria Creek.	Undertake further investigation between Narooma and Bega to prioritise realignment, reduce grades and improve management of high risk slopes. This should also identify other remedial works between Narooma and Bega. Locations for priority include: • Couria Creek, to address narrow lane and shoulders, insufficient clear zones and a number of high risk slopes. • Brogo River, to address narrow lane and shoulders and insufficient clear zones. • Construction of Dignams Creek project to address poor road alignment, poor intersections and property access and the narrow bridge over Dignams Creek.	5.1 Road Safety / Speed Zones 5.4 Road Design & Geometry / Horizontal Curves / Grades / Road Slope Risk Rating
Improve safety and security	18	Eden – Eden has the highest severity index of all the urban sections of the highway. Many of these crashes involved a vulnerable road user (pedestrian or pedal cyclists). Eden has the second highest number of pedestrian crashes with much lower traffic volumes when compared with urban centres to the north.	Work with Bega Valley Shire Council to develop a pedestrian access and safety strategy and improve the existing pedestrian and cyclist facilities through the urban centre of Eden.	5.1 Road Safety / Number of crashes / Vulnerable Road users

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	19	Eden to Edrom Road – 15 of the 18 slopes assessed in section 19 between Eden and Edrom Road have an Assessed Risk Level of 1 or 2 which have a higher risk of slipping.	Develop management plans to prioritise and address slope stability issues between Eden and Edrom Road.	5.4 Road Design & Geometry / Road slope risk rating
Improve safety and security	Various	RMS does not have an adequate inventory of clear zones on the Princes Highway. Meeting clear zone targets along the Princes Highway can be very difficult in those sections with very challenging topography, land use issues and environment constraints. The Princes Highway also has a significant proportion of lane and shoulder width issues. Approximately 44% of the highway south of Jervis Bay Road has a lane width less than the network planning target of 3.5m and just below 80% of the highway south of Jervis Bay Road has shoulder widths below the network planning targets.	Investigate the adequacy of clear zones along the Princes Highway corridor. Sections with less than desirable clear zones, no safety barrier and an associated crash history should be prioritised for remedial works. Develop ideal cross section to represent Network Planning Target for those sections of the highway with very challenging topography and environmental constraints.	5.4 Road Design & Geometry / Clear Zones and safety barriers
Improve safety and security Improve quality of service	Various	RMS does not have an adequate inventory of intersections and their performance in terms of safety and efficiency.	A detailed intersection analysis from a safety perspective has been conducted identifying the worst performing intersections and prioritising potential upgrades along the Princes Highway. Additional analysis needs to be completed between Bomaderry and the Victorian Border to update the report completed in 2003 and assess intersections in terms of performance and design and prioritise intersection upgrades in terms of both safety and efficiency.	5.2 Traffic / Intersection Performance 5.4 Road Design & Geometry / Intersections

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	Various	A significant number of culverts on the Princes Highway are yet to be assessed for risk rating.	Assess all remaining culverts along the length of the Princes Highway and develop a priority list for maintenance works.	5.4 Road Design & Geometry / Road Culvert Risk Rating
Improve quality of service	Various	Many sections of the highway have only a short pavement structural remaining life or have a high pavement age. The data for this is incomplete and needs improvement.	Collect data on remaining pavement life, specifically between Jervis Bay Road and Batemans Bay.	5.5 Road Pavement Condition / Pavement Structural Remaining Life
Improve quality of service	Various	Very serious traffic incidents and extended road closures can result in diversions hundreds of kilometres in length, that often do not cater for heavy vehicles.	Develop an ITS strategy for the Princes Highway to manage driver expectation about travel times during peak periods and improve driver information in the event of road closures with the use of VMS and other ITS.	5.2 Traffic / Incident Management
Improve safety and security	Various	The northbound heavy vehicle enforcement sites at Burrill Lake and Eden require improvements to make them safer and effective for use.	Seek funding to improve northbound heavy vehicle enforcements sites at Burrill Lake and Eden.	5.3 Heavy vehicles on the Princes Highway / heavy Vehicle enforcement sites
Support economic growth and productivity	Various	There are a number of B-double constraints restricting vehicle access into towns such as Batemans Bay, Moruya and Narooma.	Work in partnership with local councils to develop options to improve freight access into town centres.	5.3 Heavy vehicles on the Princes Highway / Restricted access vehicles

7.2 Key challenges and medium-term priorities

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	1	Yallah to Gerringong – There is very poor road alignment through Kiama Bends (just south of Kiama) resulting in a reduced speed limit of 80km/h. This section has a poor crash record with 13 injury crashes, the majority of crashes being "Off Road on Curve" type crashes. The existing alignment will remain a road safety concern with less than desirable horizontal alignment after the highway upgrades between Waterfall and Jervis Bay Road are complete.	Commence planning to identify possible improvements required to address the deficient alignment and road safety issues associated with Kiama Bends. Complete construction of the Albion Park Rail bypass.	5.1 Road Safety / Road Safety Findings / Speed Zones
Support economic growth and productivity	4	Berry to Bomaderry – Forecasted increase in traffic volumes on this section of the Princes Highway once the Berry Bypass is opened to traffic. This will have an impact on the Level of Service and road safety through this section of the highway.	Commence construction of the highway upgrade between Berry and Bomaderry subject to funding.	5.2 Traffic

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Strengthen transport planning processes	5	Nowra – Nowra has high incidence of pedestrian crashes and some localised congestion and poor level of service at some intersections including Cambewarra Road, Bolong Road, Illaroo Road and Bridge Road during the peak period. The traffic volumes also increase during holiday seasons resulting in queues and further delays through the town centre of Nowra. There is a need for ongoing management of traffic through Nowra and additional minor traffic improvements to cater for these localised traffic issues.	Continue to monitor and manage traffic issues within Nowra and consider ways to improve local connectivity, traffic efficiency and travel reliability. This includes implementation of the Nowra Bomaderry Traffic and Transport Study considering how minor traffic improvements such as road widening, extending turn bays, re-phasing of signals, installing CCTV cameras and Variable Message Signs (VMS) could improve traffic flow across the Nowra and Bomaderry network.	5.1 Road Safety / Casualty crash rate, Crash types, road safety findings 5.4 Road Design & Geometry / Intersections 5.2 Traffic / Traffic Volumes / Intersection Performance 6.1 Population and Demographics / Land Use Changes 6.6 Road corridor changes
Support economic growth and productivity	6	Nowra to Jervis Bay Road – The northbound bridge over Currambene Creek is not suitable for HML access.	Construct replacement or upgrade existing bridge on the northbound carriageway over Currambene Creek to cater for HML B-double access.	5.4 Road Design & Geometry / Bridge Load performance
Improve quality of service	7	Jervis Bay Road to Milton – Narrow bridges within this section include: • Condies Creek Bridge (6.60m)	Investigate options to replace or widen Condies Creek Bridge.	5.4 Road Design & Geometry / Lane Widths
Improve quality of service	9	Burrill Lake to Batemans Bay – Approximately 45% of the section between Burrill Lake and Batemans Bay has lane widths less than 3.5m.	Progressively increase lane widths between Burrill Lake and Batemans Bay through planned upgrade works.	5.4 Road Design & Geometry / Lane Widths

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve quality of service	12	Moruya – The Moruya Bridge has a "Poor" Bridge Health Index (BHI).	Develop and commence maintenance strategy to address the issues causing the Poor Bridge Health Index rating.	5.4 Road Design & Geometry / Bridge Structural Health
Improve safety and security	13	Moruya to Narooma – Between Moruya and Narooma, 24% of the lane widths are less than 3.25m, 46% between 3.25 and 3.5m.	Progressively increase lane widths between Moruya and Narooma.	5.4 Road Design & Geometry / Lane Widths
Improve safety and security	13	Moruya to Narooma – Worst performing section in terms of sealed shoulder widths with only 4% meeting the target of 2m.	Progressively address deficient shoulders and lane widths between Moruya and Narooma to provide road safety improvements.	5.4 Road Design & Geometry / Sealed Shoulder Widths
Support economic growth and productivity	14	Narooma – The Wagonga Inlet Bridge is very narrow at only 6.09m and has a 4.5m height limit due to the truss design. Wagonga Inlet Bridge at Narooma is not suitable for HML access. The alignment is poor on approaches to Wagonga Inlet Bridge and through the Narooma Urban Centre.	Develop options for a new bridge over the Wagonga Inlet balancing anticipated freight and regional travel demand against the cost of infrastructure and improving road safety. Investigations should include a bridge and improved road alignment on the bridge approaches suitable for 26m HML B-Double Access.	5.4 Road Design & Geometry / Lane Widths / Bridge Load performance

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security Support economic growth	15	Narooma to Bega – 2.5km to the north and south of Brogo River has a poor crash history including 10 injury crashes resulting in 2 fatalities. Brogo River Bridge is a narrow bridge only 6.09m wide and is a 26m B-Double HML constraint. The southern approach has very poor alignment and is also a constraint for 26m B-Doubles. The section of highway 4km north of Brogo has a speed limit of 90km/h. This section of the highway has some very steep sections and tight curves. Narrow shoulder widths and also limited sight distance.	Commence planning to improve the crossing over the Brogo River, including addressing the constraints and road safety hazards on the southern and northern approaches.	5.1 Road safety / Findings 5.3 heavy vehicles on the Princes Highway / Summary of heavy vehicle issues 5.4 Road design and geometry / Lane widths
Improve safety and security	15	Narooma to Bega – There is a lack of Major Heavy Vehicle rest areas between Waldron's Swamp and Edrom Road. The previously identified site in the southbound direction was not constructed due to challenges associated with the originally identified location.	Investigate options to improve heavy vehicle rest area options between Narooma and Bega in the southbound direction appropriate for the demand.	5.3 Heavy vehicles on the Princes Highway
Improve safety and security	17	Bega to Eden – The section of highway between Bega and Eden has a very high number of 'run off road on curve' type crashes, higher than sections to the north with higher traffic volumes.	Undertake a route safety study on section 17 between Bega and Eden to identify: • Minor improvements including the installation of audio-tactile line marking, widening shoulders and clear zones including the outside of curves and installing safety barriers and centre median treatments, where appropriate. • Treatments to target 'Off Road on Curve' type crashes on high speed curves.	5.1 Road Safety / Crash types

7.3 Key challenges and long-term priorities

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Strengthen transport planning processes	5	Nowra – Nowra has high incidence of pedestrian crashes and some localised congestion and poor level of service at some intersections including Cambewarra Road, Bolong Road, Illaroo Road and Bridge Road during the peak period. The traffic volumes also increase during holiday seasons resulting in queues and further delays through the town centre of Nowra. There is a need for ongoing management of traffic through Nowra and additional minor traffic improvements to cater for these localised traffic issues.	Continue to monitor and manage traffic issues within Nowra. This includes evaluating the implementation of a traffic and transport study for the Nowra and Bomaderry townships and if required, identifying a suitable longer term solution to improve connectivity between Bomaderry and Nowra following the implementation of short and medium traffic management solutions.	5.1 Road Safety / Casualty crash rate, Crash types, road safety findings 5.4 Road Design & Geometry / Intersections 5.2 Traffic / Traffic Volumes / Intersection Performance 6.1 Population and Demographics / Land Use Changes 6.6 Road corridor changes
Improve liveability	8	Milton/Ulladulla/Burrill Lake – The ongoing increase in traffic volumes through Milton and Ulladulla as a result of major highway upgrades to the north of Milton. The seasonal peaks are being managed by traffic control to maintain traffic flow and ensure safe pedestrian access. The section of the highway through Milton and Ulladulla is a class 4 road, through an urban commercial centre with a speed limit of 50/60km/h.	Commence investigation into the suitability and need of a bypass of Milton and Ulladulla and gain a better understanding of what benefits this would provide to the network, efficiency and safety through the Milton and Ulladulla town centres.	5.2 Traffic / Regional Centres and Town Bypasses
Support economic growth and productivity	13	Moruya to Narooma – Tuross River Bridge is not suitable for HML access.	Develop options to replace the Bridge over Tuross River or strengthen the bridge to enable 26m B-Double HML access.	5.4 Road Design & Geometry / Bridge Load performance

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve safety and security	19	Eden to Edrom Road – 83% of section 19 contains lane widths between 3m-3.25m and a further 8% of the section has lane widths between 3.25m-3.5m.	Increase lane width progressively through routine maintenance on all sections of the highway.	5.4 Road Design & Geometry / Lane Widths
Improve safety and security	19 & 20	Eden to Edrom Road & Edrom Road to Victorian Border – The section between Eden and Edrom Road has the highest casualty crash rate per 100 million vehicle kilometres of all the rural sections. Eden to Edrom Road is the worst performing rural section in terms of steep grades. Only 69% of this section is on grades less than 6%. A large proportion of the steep grades are combined with deficient curves. There is a significant change in road environment on the highway between the NSW and Victorian sides of the border.	Undertake a route safety study on section 19 and 20 between Eden and the Victorian Border to identify: • Minor improvements including the installation of audio tactile line marking, widening shoulders and clear zones including the outside of curves and installing safety barriers and centre median treatments where appropriate. • Treatments to target 'Off Road on Curve' type crashes on curves within high speed zones. Collect speed data and travel time information to improve our understanding of driver behaviour.	5.1 Road Safety / Casualty crash rate 5.4 Road Design & Geometry / Grades
Improve safety and security	Various	Approximately 56% of the Princes Highway corridor has lane widths less than 3.5m.	Progressively address deficient lane widths through routine maintenance activities along the length of the highway.	5.4 Road Design & Geometry / Lane Widths
Improve safety and security	Various	Most sections of the Princes Highway south of Jervis Bay Road have deficient sealed shoulder widths.	Progressively upgrade sealed shoulder width through routine maintenance works along the length of the highway.	5.4 Road Design & Geometry / Sealed Shoulder Widths

LTTMP objectives linkage	Planning Section	Specific challenges	Specific priorities	Strategic response reference
Improve sustainability	Various	Much of the corridor is constrained between the Tasman Sea and steep terrain. Any widening of the existing road corridor must be aware of the potential impact on National Park, State Forests and other environmentally sensitive environments.	Consideration of environmental constraints during whole asset life cycle.	5.6 Environment and Urban Design / Ecology
Support economic growth and productivity	Various	The forecast freight task on the Princes Highway is expected to grow especially towards the northern section of the corridor. A forecast 81% increase in daily truck movements between 2011 and 2031 in section 1, around 70% increase between Gerringong and Nowra.	Prioritise improvements to any remaining sections of the corridor that continue to be a constraint to Restricted Access Vehicles including narrow bridges, culverts, alignment and lane and shoulder width.	6.3 Future Freight Task and heavy vehicle volumes
Support economic growth and productivity Improve safety and security	Various	There are a number of narrow bridges and culverts on the Princes Highway Corridor.	A long term aspiration will be to upgrade all narrow bridges to facilitate efficient freight movement and improve safety. Priority should be in those areas where freight volumes are higher and demand is greatest.	5.4 Road Design & Geometry / Lane Widths
Reduce social disadvantage	Various	Limited Active and Public Transport options along the corridor especially in between urban centres. However there is low demand and private car use dominates the mode of travel.	Continue to support councils to roll out their active transport plans.	4.5 Active and Public Transport

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Termeil Creek – Southbound

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9 APPENDICES

Kiama Bypass – Southbound

Appendix A – Austroads Vehicle Classification System

VEHICLE CLASSIFICATION SYSTEM

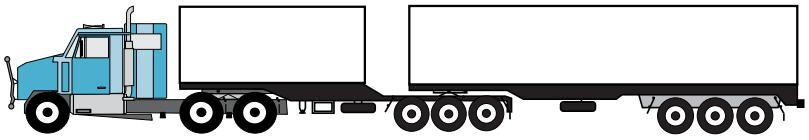
AUSTROADS

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

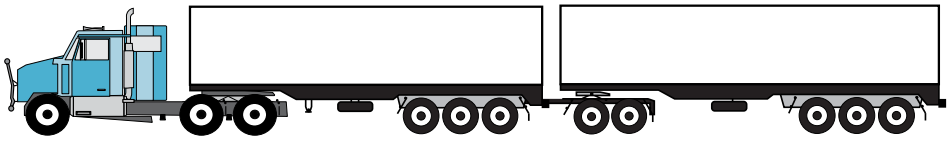
Dwg No: 0293-009

Asset and Network Information - January 2002

Appendix B – NSW Prescriptive And Performance Based Standards (PBS) Heavy Vehicle Combinations

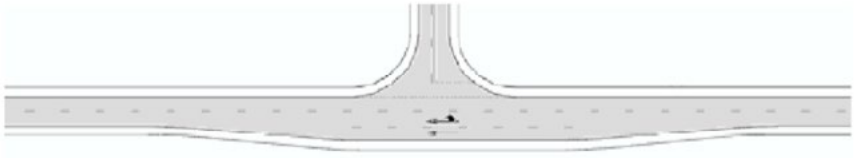


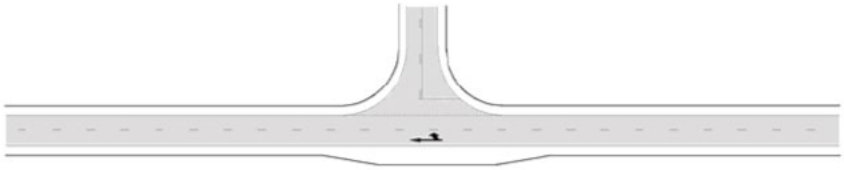
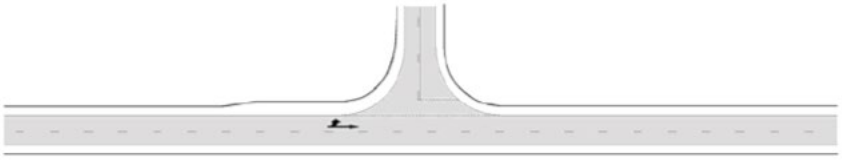
9 axle B-double combination

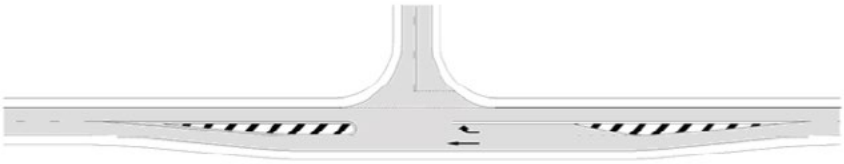
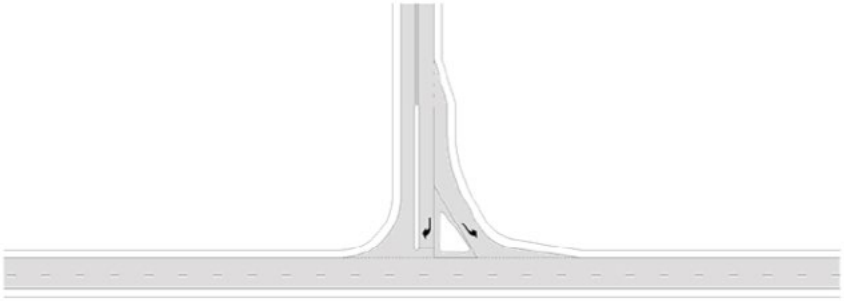


PBS A-double combination

Appendix C – Glossary of Terms

TERM	DEFINITION
AADT	The Annual Average Daily Traffic is the total yearly two-way traffic volume divided by 365, expressed as vehicles per day, in this document.
abutment	An end support of a bridge or similar structure.
	An end support of a bridge or similar structure.
ADT	The Average Daily Traffic is the total two-way traffic volume during a stated period, divided by the number of days in that period, normally over a seven day week and expressed as vehicles per day.
auxiliary lane	A portion of the carriageway adjoining through traffic lanes, used for speed change or for other purpose supplementary to through traffic movement.
AUR & AUL	Auxiliary intersection treatment Right and Left.  Auxillary Right Turn (AUR) on the Major Road (Two-lane, Two-way Road) This turn type not as safe as a channelised treatment at unsignalised intersections  Auxillary Left Turn (AUL) on the Major Road CHL treatment is preferred at unsignalised intersections to ensure a clear line of sight for vehicles turning from the minor road.
axle	An axle is a central shaft for a rotating wheel or gear. It refers to the pairs of wheels of the vehicle.
axle group	A set of closely spaced axles acting as a unit.

TERM	DEFINITION
BAR & BAL	Basic intersection treatment Right and Left.  Basic Right Turn (BAR) on the Major Road (Two-lane, Two-way Road)  Basic Left Turn (BAL) on the Major Road
bunching	A closely spaced group of vehicles on a carriageway, moving or stopped and ready to move, with relatively large spaces ahead and behind.
carriageway	That portion of a road or bridge devoted particularly to the use of vehicles, that is between guide posts, kerbs, or barriers where these are provided, inclusive of shoulders and auxiliary lanes.
casualty crash	A crash in which at least one person was injured or killed.

TERM	DEFINITION
CHR & CHL	Channelised intersection treatment Right and Left.  Channelised Right Turn (CHR) on the Major Road  Channelised Left Turn (CHL) on the Major Road  Channelised Left Turn (CHL) on the Minor Road
CHR(s)	Short Channelised intersection treatment where the channelised portion of the intersection is shorter than a CHR.
converter dolly	A trailer with one axle group or single axle and a fifth wheel coupling designed to convert a semi-trailer into a dog trailer.
coupling	Mechanical assembly that provides a connection between the drawbar of the trailer and the towbar of the drawing vehicle.
culvert	One or more adjacent pipes or enclosed channels for conveying water, a watercourse or stream below the surface of a road. Culverts minimise flooding by minimising water building up alongside the road and overtopping the road surface (causing flooding) to escape.
deflection	The vertical movement of a pavement due to the application of a load.
DESA	Design Equivalent Standard Axles.

TERM	DEFINITION
dog trailer	Is a trailer with one axle group at the front that is steered by connection to the towing vehicle by a draw bar and one axle group at the rear.
dolly	See converter dolly.
fatal crash	A crash in which at least one person was killed.
fifth wheel coupling	See coupling.
formation level	The general level of the surface of the ground proposed or obtained on completion of earthworks.
General Access Vehicle	A vehicle that has unlimited access to the road network, limits being 2.5 metres wide, 4.3 metres high, 12.5 metres long for rigid vehicles and 19 metres long for single combinations and conforming axle groups.
headstock	A beam at the top of a pier or abutment to provide support for the bridge superstructure.
HML vehicle	Higher Mass Limits is a nationally agreed scheme that permits approved heavy vehicles to operate with additional mass on certain types of axle groups, on a restricted road network and subject to specified conditions. Details are specific to each vehicle type, see http://www.ntc.gov.au.
HPV	Vehicles that exceed the carrying capacity of a standard semi-trailer. These vehicles have restricted access to the network and can operate under a Performance Based Standards Scheme, or a Restricted Access Vehicle System.
injury crash	A crash in which at least one person was injured but no person was killed.
IRI	International Roughness Index. Roughness measures the undulations in the road and provides an indication of ride comfort.
NAASRA	National Association of Australian State Road Authorities. NAASRA is now known as Austroads.
NLTN	The National Land Transport Network is a single integrated network of land transport linkages of strategic national importance.
PBS	Performance Based Standards are a national system for the regulation of heavy vehicles based on the performance, safe operation, manoeuvrability and characteristics of the vehicle on the road rather than the vehicle type. The Performance Based Standards scheme is a key element of the Council of Australian Government's national reform agenda for transport. The scheme offers the heavy vehicle industry the potential to achieve higher productivity and safety through innovative truck and bus design. PBS vehicles are designed to perform their tasks as productively, safely and sustainably as possible. These trucks and buses are tested against 16 stringent safety standards and four infrastructure standards to ensure that they can stop, turn and travel safely. Vehicles are certified as able to operate on PBS Access Level routes 1, 2, 3 or 4.
pier	An intermediate support in a bridge having more than one span.
RAV	A Restricted Access Vehicle is a vehicle that is longer than 19 metres, 4.3 metres high or 42.5 tonnes gross mass and is not given as-of-right access to the road network. Includes B-doubles, road trains and larger truck-trailer combinations.

TERM	DEFINITION
road smoothness	A travel weighted measure of the smoothness of the road surface using IRI data.
roadloc chainage	The name given to the Linear Referencing System used by Roads and Maritime Services in identifying locations along a road.
roughness	The level of irregularity in the longitudinal profile of a road with respect to the intended profile.
rutting	The longitudinal vertical deformation of a pavement surface in a wheel path, measured relative to a straightedge place at right angles to the traffic flow and across the wheel path.
shoulder	The portion of the carriageway outside of the traffic lanes and contiguous and flush with the surface of the pavement.
substructure	In a bridge, the piers and abutments that support the superstructure.
superstructure	In a bridge, that part of the structure that is supported by the piers and abutments.
through lane	A lane provided for the use of vehicles proceeding straight ahead.
trailer	Vehicle without motive power towed behind a motor vehicle.
tow away crash	A crash in which at least one vehicle was towed away but no person was injured or killed.
TRARR	Traffic on Rural Roads is a micro-simulation model of traffic flow on two-lane roads used to investigate the need for overtaking lanes.
verge	The section of the road formation that joins the shoulder with the batter.

NSW GOVERNMENT

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