NEWELL HIGHWAY CORRIDOR STRATEGY

MAY 2015

Transport MASTER PLAN

Newell Highway CORRIDOR STRATEGY

NSW GOVERNMENT

Newell Highway Corridor Strategy
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Transport for NSW
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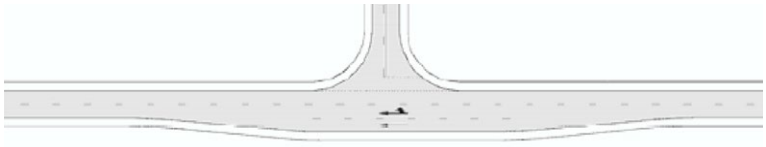
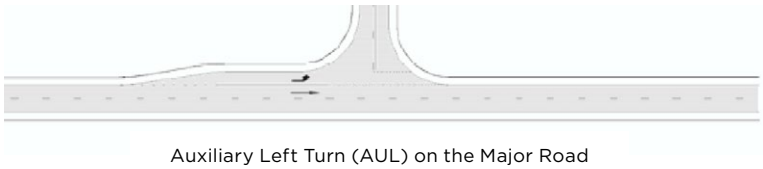
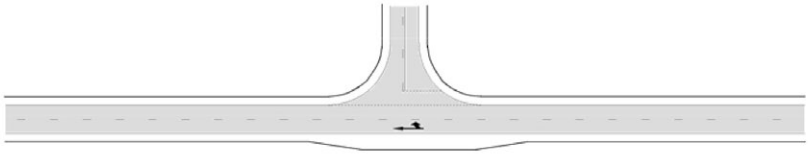
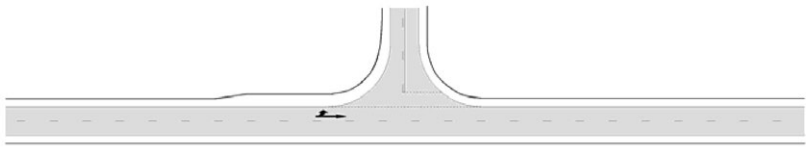
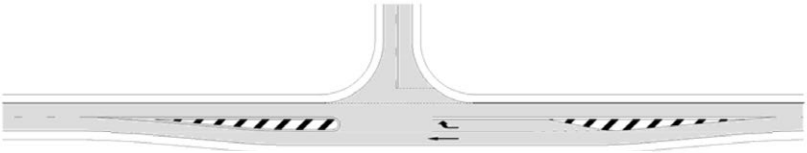
GLOSSARY OF TERMS

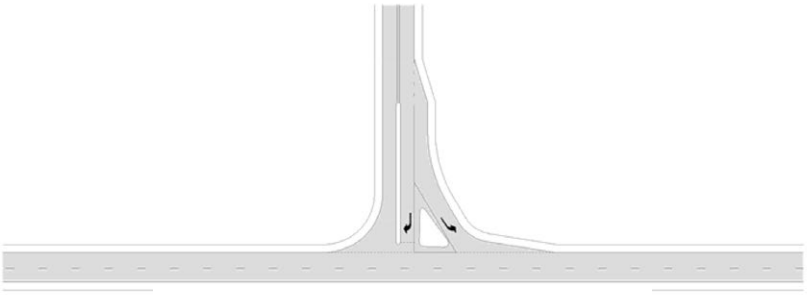
TERM	DEFINITION
AADT	The Annual Average Daily Traffic is the total yearly two-way traffic volume divided by 365, expressed as vehicles per day, in this document.
abutment	An end support of a bridge or similar structure.
ADT	The average daily traffic is the total two way traffic volume during a stated 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 purposes supplementary to through traffic movement.
AUR & AUL	Auxiliary intersection treatment Right and Left.  Auxiliary 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  Auxiliary 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.
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

TERM	DEFINITION
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.
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, 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.

TERM	DEFINITION
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.
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.
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	Higher Productivity Vehicles are vehicles approved to carry loads above standard mass limits. These vehicles have restricted access to the network and can operate under a Performance Based Standards system, or a Restricted Access Vehicle System.
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.

TERM	DEFINITION
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.
road smoothness	A travel weighted toughness measure.
roadloc chainage	The name given to the Linear Referencing System used by Roads and Maritime Services.
roughness	The consequence of irregularities 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 placed at right angles to the traffic flow and across the wheel path.
shoulder	The portion of a carriageway beyond 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 constructed to be drawn behind a motor vehicle.
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.

1 A QUICK OVERVIEW

The Newell Highway is the longest highway in NSW, running south to north through the State and providing an essential road connection for central western NSW. This corridor strategy sets out how the NSW Government will manage road transport along the Newell Highway (A39) in the long-term – from Tocumwal on the Victorian border to Goondiwindi on the Queensland 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 Newell Highway into the future.

As the major rural highway west of the Great Dividing Range, the Newell Highway services western NSW north-south corridor (Figure 1.1), connecting many major routes, including:

- Riverina Highway
- Kidman Way
- Sturt Highway
- Burley Griffin Way
- Mid Western Highway
- Goldfields Way
- Lachlan Valley Way
- Henry Parkes Way
- Mitchell Highway
- Golden Highway
- Castlereagh Highway
- Mendooran Road
- Oxley Highway
- Kamilaroi Highway
- Gwydir Highway
- Carnarvon Highway
- Bruxner Way

Figure 1.1 Newell Highway corridor

For the purposes of this strategy, the Newell Highway has been divided into three roughly equal zones (Figure 1.3), together with 19 sections (see Chapter 4 for the details).

The three zones are:

- Zone 1 – Tocumwal to Marsden (337.6 kilometres)
- Zone 2 – Marsden to Coonabarabran (379.7 kilometres)
- Zone 3 – Coonabarabran to Goondiwindi (342.1 kilometres).

The Newell Highway spans 1058 kilometres and passes through 15 local government areas in three *NSW Long Term Transport Master Plan* regions – Murray-Murrumbidgee, Central West and New England. It is part of the National Land Transport Network, and more broadly an element of the Melbourne-Brisbane via Dubbo corridor (Figure 1.2). The Newell Highway contributes to the competitiveness of Australia's agricultural and mining sectors, opening up access to essential freight networks in NSW, Queensland and Victoria.

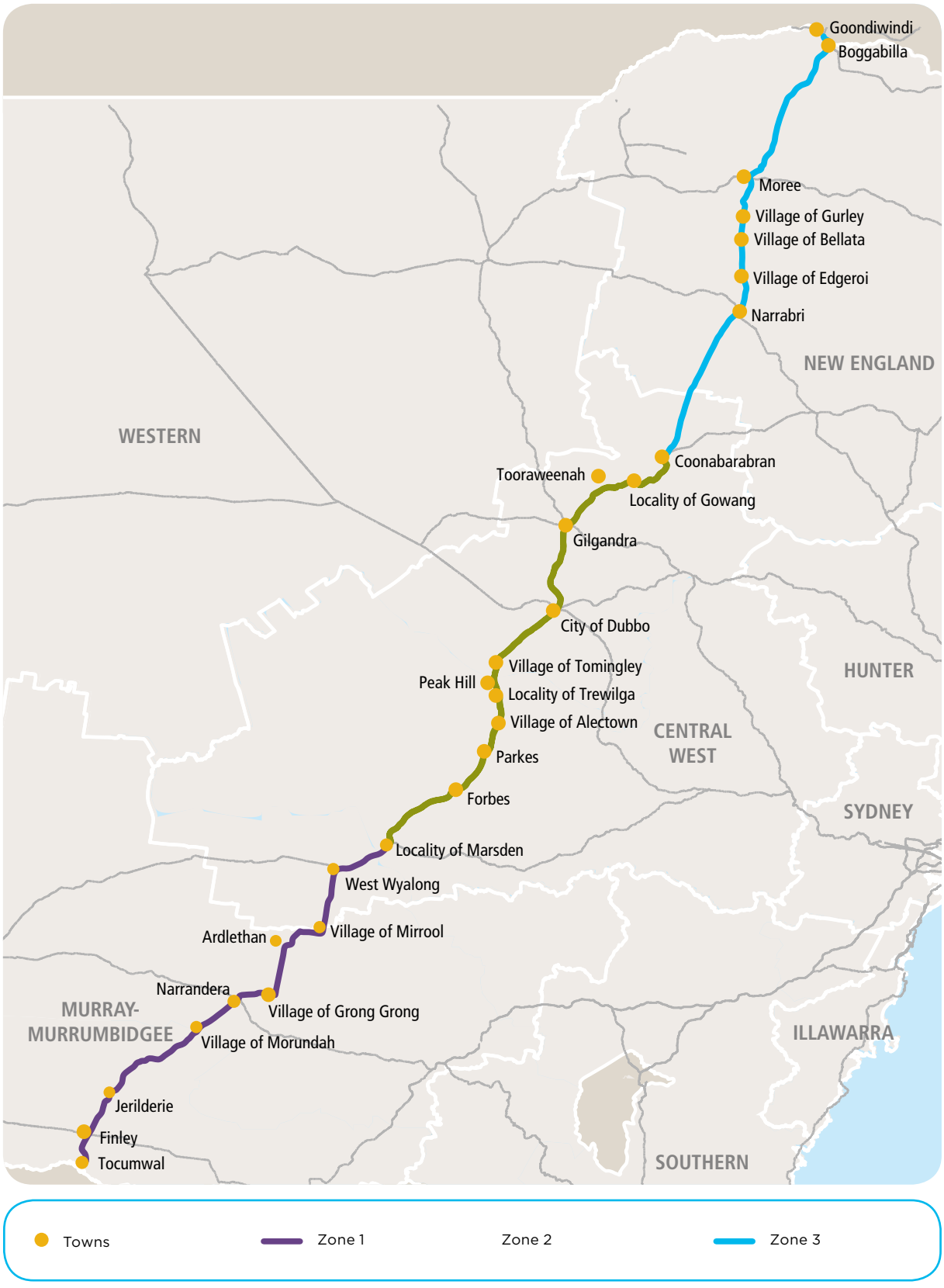
The Newell Highway provides:

- A major interstate transport connection between Victoria, New South Wales and Queensland for freight and passengers, including tourists.

Figure 1.2 Melbourne-Brisbane via Dubbo corridor – part of the National Land Transport Network[1]

1 Commonwealth of Australia 2007, *Melbourne-Brisbane Corridor Strategy: Building our National Transport Future*, Commonwealth of Australia, Barton

Figure 1.3 Zones within the Newell Highway corridor



- A significant regional traffic route serving and linking a range of towns and major centres.
- A link to domestic and export markets for agricultural products.

The Newell Highway differs markedly from one end of the corridor to the other. The highway is generally flat, with long, straight sections joined by the occasional curved section. However, passing through the Warrumbungle Ranges, near Coonabarabran, there are steeper grades and tighter curves than on the rest of the highway.

Traffic volumes along the Newell Highway vary significantly from around 1,200 to 4,000 vehicles per day in rural areas[2]. In the urban centres such as Dubbo, average daily traffic volumes exceed 20,000 vehicles a day. A large number of heavy vehicles use the Newell Highway – on average, between 26 per cent and 52 per cent of all traffic on the route[3]. As a key freight route between Victoria and Queensland, the highway sees around 650 heavy vehicles per day north and south of the Sturt Highway intersection up to around 1,500 heavy vehicles per day near the Queensland border[4]. Freight along the Newell Highway is expected to grow over the next 20 years, with daily truck movements and annual tonnage forecast to grow by approximately 67 to 103 per cent from 2009 to 2031[5]. Freight volumes on the highway near the Queensland border are forecast to grow by 82 per cent from 2011 to 2031[6].

Currently, restricted access vehicles (including 25 and 26 metre B-doubles) can access the Newell Highway along its full length, except through the urban commercial centre of West Wyalong where a combination of the Newell Highway and the restricted access vehicle bypass are used by all B-doubles and higher mass limit vehicles travelling through the town. The Newell Highway is open to double road trains from Tocumwal to Narrandera, Lachlan Valley Way south of Forbes to Back Yamma Road at Daroobalgie, in the village of Tomingley, Dubbo to Gilgandra and from Coonabarabran to Goondiwindi. Higher productivity vehicles including B-triples and AB-triples are allowed to travel along the Newell Highway from Tocumwal to Morundah, from Dubbo to Gilgandra, and from Narrabri to Goondiwindi.

Both the *NSW Long Term Transport Master Plan* and the *NSW Freight and Ports Strategy*[7] identify the need to develop a corridor strategy for the Newell Highway to support greater use of higher productivity vehicles (HPVs), and to prioritise the necessary road upgrades to enable HPV access on the entire length of the highway. This corridor strategy sets out how the Newell Highway on its full length can accommodate HPVs.

This corridor strategy sets out the objectives, current performance, current and future challenges and the NSW Government's strategic response to managing the Newell Highway corridor over the long term. While investment will continue along the entire length of the corridor to enable access for HPVs, the focus will be on the northern end of the corridor where there is a strong and growing freight demand.

2 Cardno 2011, *Traffic Counts on the Newell Highway*

3 ibid.

4 ibid.

5 Hyder Consulting for Transport for NSW 2011, *NSW Freight Supply Chain Study – Hunter, Northern, Western Regions*

6 Transport for NSW 2013, *NSW Freight and Ports Strategy*, TfNSW, Sydney, p. 180

7 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney, p. 296 and Transport for NSW 2013, *NSW Freight and Ports Strategy*, TfNSW, Sydney, p.38

Recent major achievements on the Newell Highway

First tranche of overtaking lanes: $10 million 2011 election commitment

2011/2012 – one overtaking lane constructed between Narrabri and Moree.

Southbound overtaking lane south of Bellata completed in May 2012

2012/2013 – two overtaking lanes constructed between Narrabri and Moree.

Southbound overtaking lane south of Gurley completed in September 2012

Northbound overtaking lane north of Gurley completed in December 2012

2013/2014

- two overtaking lanes between West Wyalong and Forbes, one completed in 2014 and one completed in March 2015.
- one overtaking lane constructed between Coonabarabran and Narrabri at Andys Creek.

Overtaking lane at Andys Creek in the Pilliga scrub completed in February 2014

Overtaking lanes

The NSW Government is providing overtaking lanes to ensure more frequent overtaking opportunities along the Newell Highway.

Overtaking lanes improve travel time and level of service for our road customers. They also reduce driver frustration and unsafe behaviour.

To date 18 overtaking lanes out of the original 57 identified in the Newell Highway Potential Overtaking Lane Study 2011 have been constructed or are programmed for completion by the end of the 2016/2017 financial year.

At the time of publication of this strategy eleven overtaking lanes have been completed, one is under construction to be completed in the 2014/2015 financial year, and six are in a development stage to be completed in the 2015/2016 and 2016/2017 financial years. This includes:

Second tranche of overtaking lanes: Additional $10 million commitment announced in May 2013 (State and Federal Government contribution)

Northbound overtaking lane at Girrahween, opened to traffic in March 2014

2013/2014

- two overtaking lanes constructed between Moree and Boggabilla at Girrahween.
- northbound overtaking lane between Jerilderie and Narrandera at Corobimilla.

2014/2015

- northbound overtaking lane between Gilgandra and Coonabarabran at Oxley Springs.
- southbound overtaking lane between Parkes and Dubbo near the Telescope.

Third tranche of overtaking lanes are in planning for 2014/15, 2015/16 and 2016/17: 2014/15 funding commitment of $14.4 million

2014/2015

- overtaking lane between Gilgandra and Coonabarabran currently under construction and due for completion June 2015.

2015/2016

- one overtaking lane between Jerilderie and Narrandera.
- one overtaking lane between Parkes and Dubbo.

2016/2017

- one overtaking lane between Parkes and Dubbo
- two overtaking lanes between Gilgandra and Coonabarabran
- one overtaking lane between Moree and Boggabilla.

Potential future overtaking lanes (medium to higher priorities)

Provide an additional 16 overtaking lanes to be delivered over 5 years commencing 2015/16 at the following locations in accordance with the Newell Highway Overtaking Lanes Strategy:

- 2 between Finley and Jerilderie
- 2 between Jerilderie and Narrandera
- 2 between West Wyalong and Forbes
- 2 between Gilgandra and Coonabarabran
- 2 between Coonabarabran and Narrabri
- 4 between Narrabri and Moree
- 2 between Moree and Boggabilla

Locations will be further investigated and may be subject to change.

Speed limits

The current speed limit along the Newell Highway is generally 110 km/h in rural areas. There are limits of 50 km/h to 80km/h through towns and urban areas and 40 km/h in school zones.

One of the commitments made by the current NSW Government prior to its election was to raise the speed limit on the Newell Highway back to 110 km/h, where applicable.

On 31 July 2011, the open road speed limit for light vehicles along most of the Newell Highway changed to 110 km/h, with the exception of short lengths south of Peak Hill through Trewilga, south of Forbes and north of Tocumwal, which have remained at 100 km/h due to the road alignment. The length of road from Tooraweenah to north of Coonabarabran, and north of Boggabilla was unaffected by the increased speed limit and remains speed zoned 100 km/h.

Intersection treatments

In 2013 upgrade works at the intersection of Tallimba Road and the Newell Highway near West Wyalong were completed at a project cost of $4.92 million allowing the speed limit to be increased to 110km/h on this section.

The NSW Government has also delivered turning lanes on the Newell Highway at the Oxford Street intersection in Forbes. The turning lanes allow vehicles to safely enter Oxford Street and avoid other traffic continuing along the highway. The NSW Government delivered the road works in December 2012, before schedule and under budget.

Oxford Street intersection in Forbes

Fixing country roads

In December 2013, the NSW Government announced funding to start the Fixing Country Roads program targeted at local road works to improve road freight productivity and connectivity in regional NSW.

Fixing Country Roads is about working with local councils and industry to identify the important infrastructure upgrades needed on their local roads, allowing better connection to the State Road Network.

The first $1.5 million of the Fixing Country Roads program will be provided to Forbes Shire Council to improve double road train / Higher Productivity Vehicle access to the GrainCorp Red Bend silos from the Newell Highway. It will be supported by $400,000 in contributions from the Forbes Shire Council and will complement $800,000 of future works within the silo facility by GrainCorp.

The Red Bend silos are a major intermodal terminal for grain, processing on average 60,000 tonnes of grain each year from surrounding farms across the Central West. Currently, only smaller combinations of heavy vehicles can access the site from the Newell Highway, leading to inefficiencies through increased trips and running costs.

Another $850,000 will be provided to Narromine Shire Council to enable upgrade of local intersections, an investment allowing Higher Productivity Vehicles to travel more safely and seamlessly through the Central West, helping boost economic growth in the region.

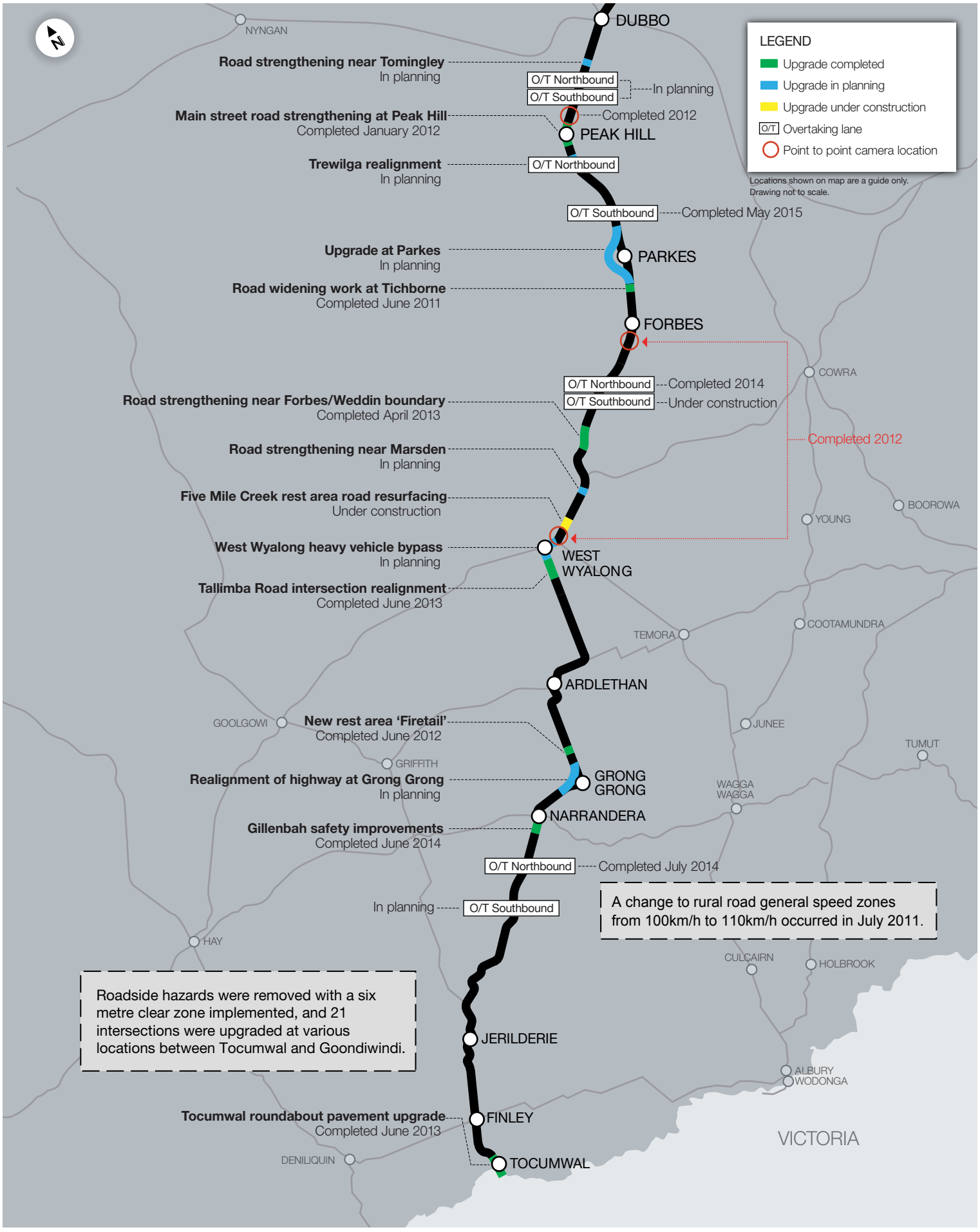
Other upgrades

The strip maps on the following two pages show other upgrades delivered to the Newell Highway since June 2011.

Upgrading the Newell Highway

Progress since June 2011 (Tocumwal to Dubbo)

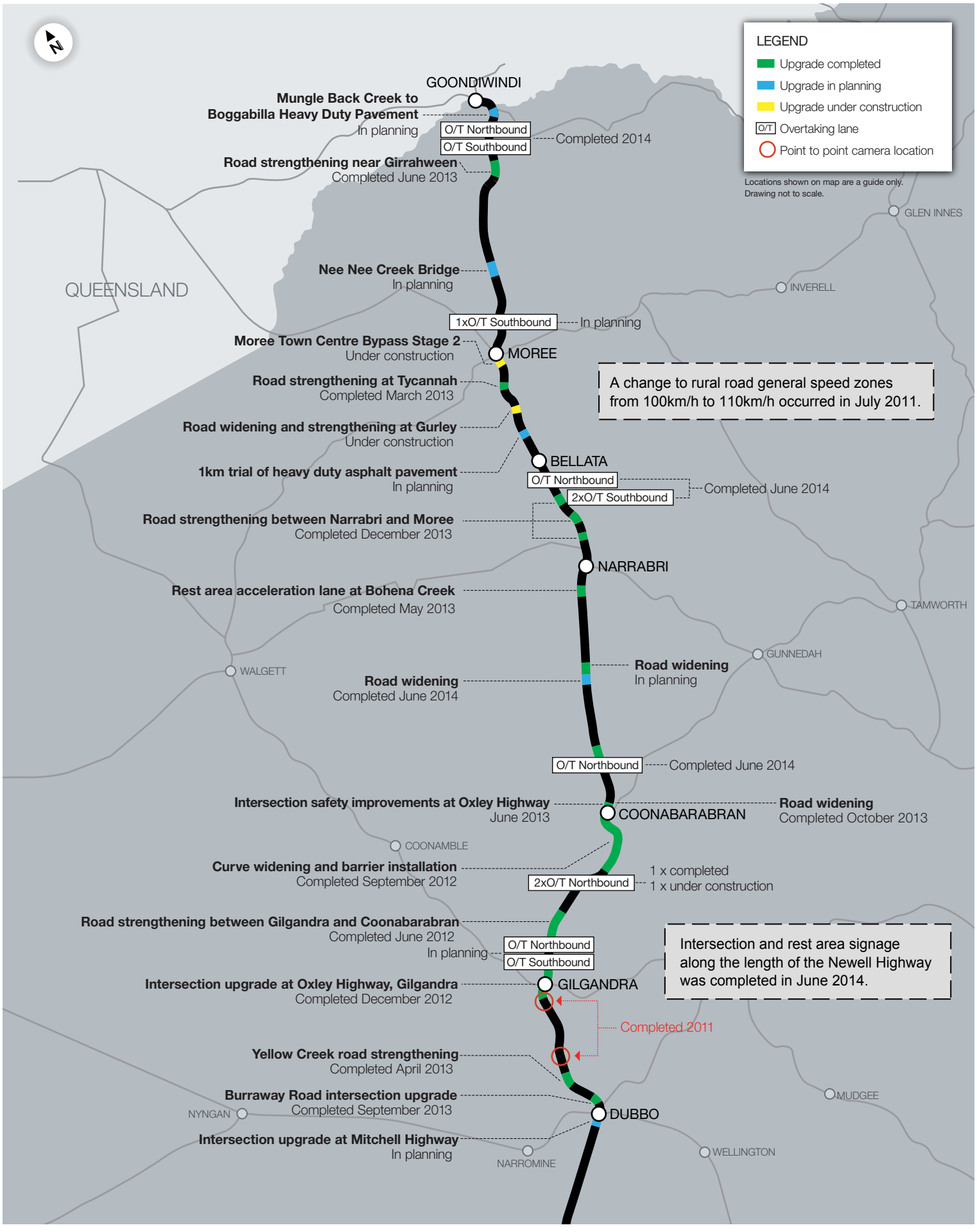
MAY 2015



Upgrading the Newell Highway

Progress since June 2011 (Dubbo to Goondiwindi)

MAY 2015



2 INTRODUCTION

2.1 Why a corridor strategy?

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

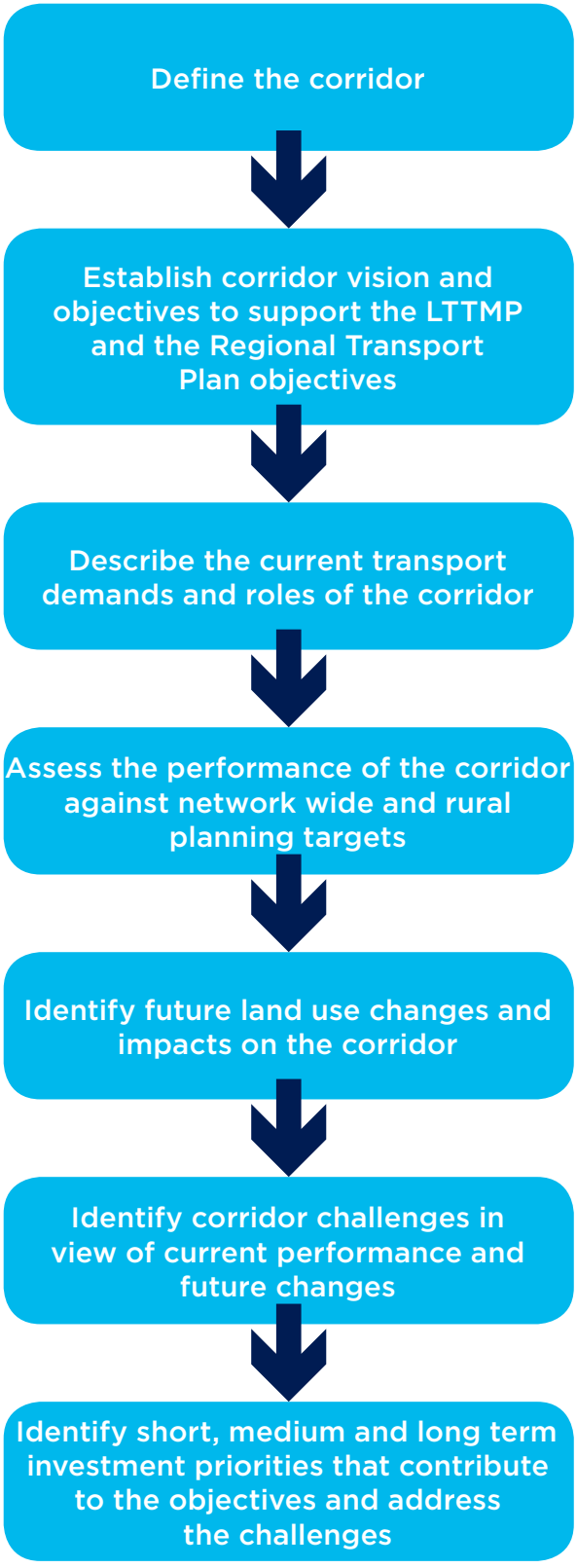
Corridor strategies make planning and investment decisions transparent to the community, councils and other government agencies.

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 Newell Highway?

The Newell Highway is a vital transport corridor between the second and third largest Australian cities – where freight productivity is expected to nearly double over the next 20 years[8].

Both the *NSW Long Term Transport Master Plan and the NSW Freight and Ports Strategy*[9] identify the need to develop a corridor strategy for the Newell Highway to support greater use of higher productivity vehicles (HPVs) and to prioritise the necessary road upgrades to enable HPV access on the entire length of the highway.

The freight transport sector's performance influences the nation's productivity and efficiency: *"Improvements in freight productivity and efficiency reduce the cost of moving freight, adding directly to national economic output."*[10] Freight productivity, in turn, depends on the type of vehicles allowed on the road, their level of access and associated regulatory, safety and asset management costs.

These issues are particularly relevant to the Newell Highway. Currently, restricted access vehicles such as 26 metre B-doubles are allowed along its entire length (with the exception of West Wyalong), however access for B-triples, double road trains and AB-triples (36.5 metres) is restricted to certain sections. Figure 2.2 shows B-double and road train routes.

Some sections of the Newell Highway have significant pavement condition issues and structural deficiencies. These issues, coupled with strong freight demand, affect travel reliability and journey times for freight between Victoria and Queensland, increase maintenance costs and reduce road safety.

This corridor strategy identifies improvements needed to ensure continual access for Performance Based Standard (PBS) Class 3(a) vehicles (less than or equal to 36.5 metres) along its entire length, while progressively phasing out double road trains. It also identifies road safety, maintenance and traffic challenges at local, regional and interstate levels.

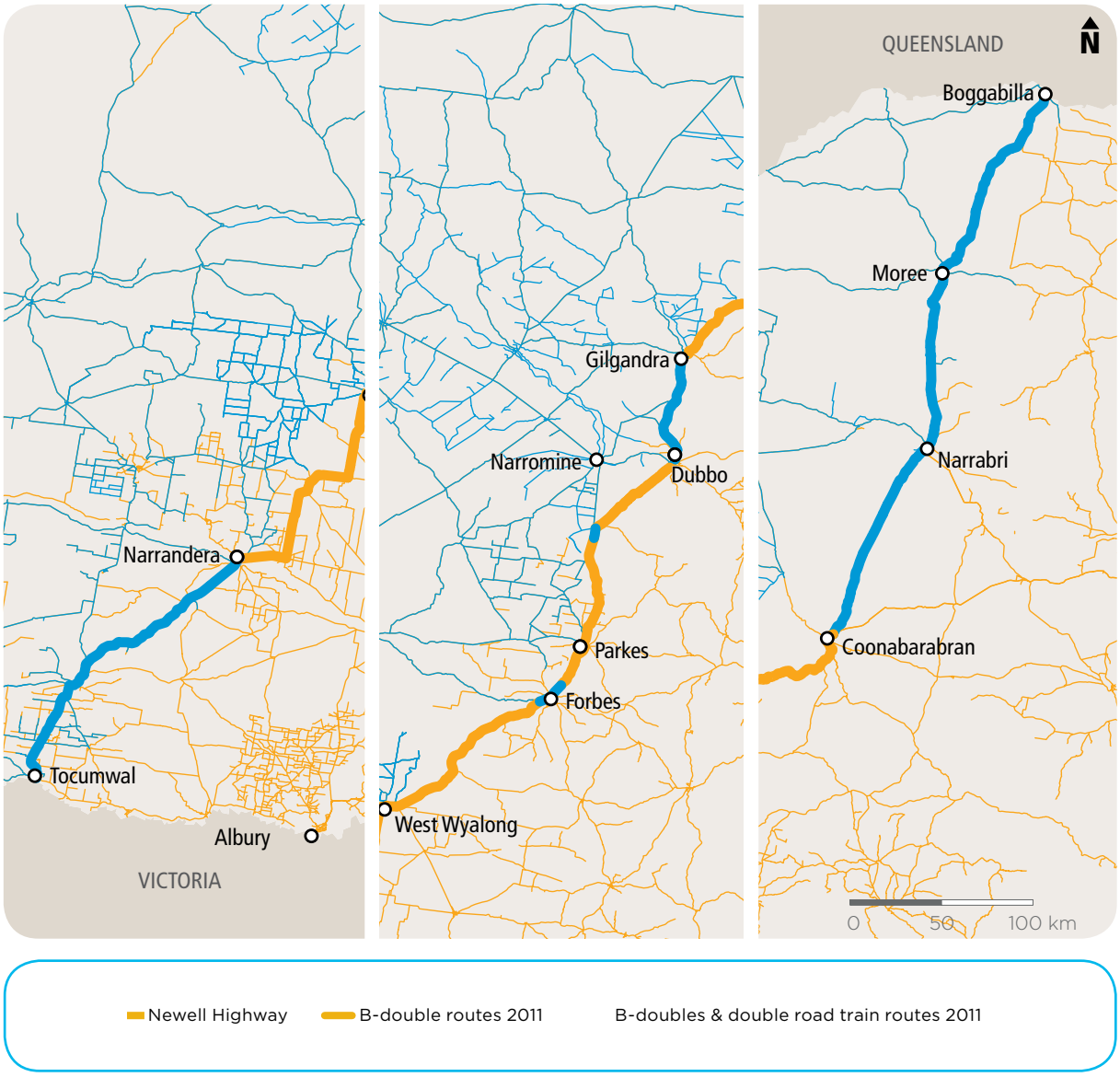
Informal truck parking area north of Parkes

8 Hyder Consulting for Transport for NSW 2011, *NSW Freight Supply Chain Study – Hunter, Northern, Western Regions*

9 Transport for NSW 2012, NSW Long Term Transport Master Plan, TfNSW, Sydney, p. 296 and Transport for NSW 2013, NSW Freight and Ports Strategy, TfNSW, Sydney, p.38

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

Figure 2.2 Road Train and B-double access along the Newell Highway



Note: Road Safety Audits and road train assessments are currently being carried out for the remaining parts of the Newell Highway. Initial findings between Gilgandra and Coonabarabran have not identified any deficiencies to prevent future road train use.

Newell Highway near Trewilga

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 Newell 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 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 (Figure 2.3).

Figure 2.3 Transport for NSW result areas in the Corporate Framework

The NSW Government has listened closely to what our transport customers want from the NSW transport system: customers want 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 Newell Highway are summarised in Table 2.1. The highway corridor needs to cater for all the different transport needs of these customer groups.

Figure 2.4 Key customer markets on the Newell Highway corridor

Table 2.1 Customer Markets on the Newell 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	Light and heavy goods – wider ranging e.g. agricultural inputs, fruit, vegetables, rice, wool, cotton, grain, livestock, mining freight task, courier goods, waste and recycling.
Commercial vehicle drivers	Providing trade services, maintenance, repairs, sales, health and community services
Bike riders (primarily within towns)	Travel for work, education, health, recreation, personal business
Motorcyclists	Travel for work, education, health, recreation, personal business
Pedestrians (primarily within towns)	Travel for work, education, health, recreation, personal business
Bus passengers	Travel for work, education, health, recreation, personal business

Customer consultation

The Draft Newell Highway Corridor Strategy was released for customer comment and feedback between May and June 2014 to help to ensure that the planned investments on the highway meet the needs of the local communities and industries the highway serves. The draft report was published on the TfNSW and RMS internet websites and copies of the draft were also mailed to relevant stakeholders and customers who were invited to provide comment and assessment.

A summary of each issue and the NSW Government's response is provided in a separated report called the Newell Highway Corridor Strategy Community Consultation Report. This report summarises the comments and feedback received and also attempts to respond to the concerns raised in these submissions.

Consideration of the issues raised during the public submissions period has led to a number of updates to the final document. This customer feedback was sought to better inform the final strategy document and was vital when developing the corridor strategy to ensure local knowledge is at the heart of any future upgrade and maintenance decisions.

Local knowledge has been invaluable in the process of developing the final strategy for the Newell Highway corridor in order accurately represent the requirements of the community it aims to support.

The NSW Long Term Transport Master Plan released in December 2012 also 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 Newell Highway corridor is within the New England, Central West and Murray-Murrumbidgee regions (Figure 2.5). The community consultation in these regions highlighted a number of important aspects for the Newell Highway:

New England Region

- New England customers saw regional growth and the expansion of the mining and agriculture industries as challenges for the area. As the region relies on export related industries, customers said they wanted better transport links from the region to Sydney, Newcastle and Brisbane and in particular, with air services to Sydney Airport retained. Road safety issues customers identified in this region were related to road freight, railway level crossings and poor quality roads. Some of the most frequently mentioned initiatives were rest areas for the Newell Highway and completion of the bypass at Moree.

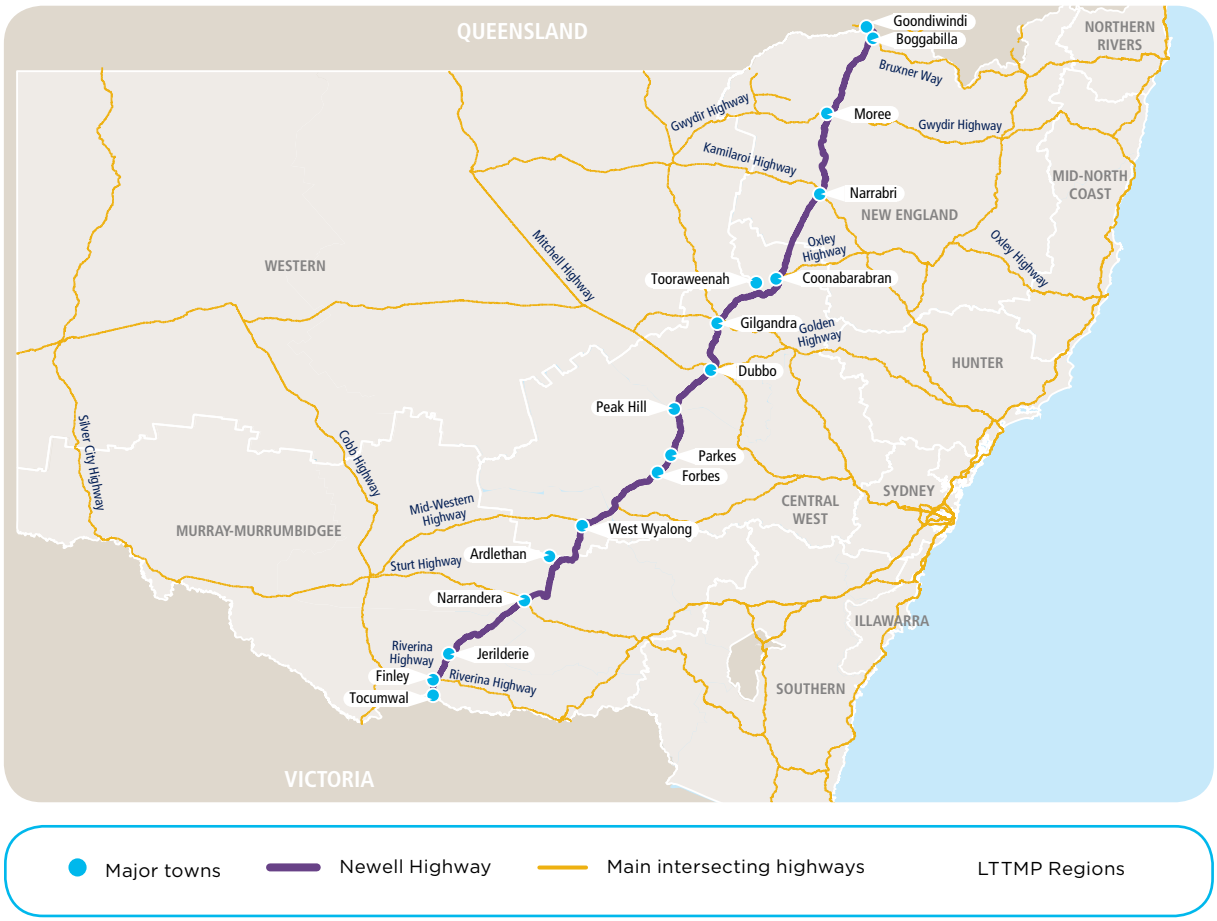
Central West Region

- Feedback from customers in the Central West focused on improving regional connectivity to Sydney and other key centres. Customers said options to address safety included heavy vehicle bypasses, additional overtaking lanes and shifting more freight onto rail to reduce trucks on the road. Some of the most frequently mentioned initiatives were upgrading the Newell Highway at Trewilga and Tallimba Road intersection at West Wyalong and creating town bypasses for heavy vehicles.

Murray- Murrumbidgee Region

- A lack of transport options and services across the regions was seen as an issue in the Murray-Murrumbidgee. Customers said better connectivity between regional towns was important to facilitating access to key services and reducing travel time. Customers said maintaining and upgrading road and rail infrastructure was important to ensure reliable and safe services. Customers said cross-border connections to Victoria, and in particular links to Melbourne, Sydney and Canberra, were critical.

Figure 2.5 NSW Long Term Master Plan regional boundaries



2.3 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.

NSW 2021

The *NSW 2021* Plan is the NSW Government's 10 year plan to rebuild the State's economy, provide quality services, renovate infrastructure, restore Government accountability and strengthen the local environment and communities.

The Newell Highway Corridor Strategy contributes to achieving the following *NSW 2021* priorities and goals:

Goal 3: Drive economic growth in regional NSW.
Corridor strategy: Contributes to the competitiveness of Australia's agricultural and mining sectors through providing access to essential and increasingly important freight networks in NSW, Queensland and Victoria.

Goal 7: Reduce travel times.
Corridor strategy: Improves the geometry of the road, pavement conditions and provision of overtaking opportunities.

Goal 10: Improve road safety.
Corridor strategy: Provided safety improvements such as realignments, wider clear zones, wider sealed shoulders and lanes, overtaking lanes and rest areas to improve road safety outcomes for the community.

Goal 19: Invest in critical infrastructure.
Corridor strategy: Continually investing in the corridor's upgrade by providing heavy duty pavement, overtaking lanes, bypasses, wider clear zones and shoulders.

Goal 28: Ensure NSW is ready to deal with major emergencies and natural disasters.
Corridor strategy: Provides emergency access in the event of natural disasters such as flooding and incidents such as vehicle crashes.

Goal 29: Restore confidence and integrity in the planning system.
Corridor strategy: Delivers a clear and transparent planning framework for the Newell Highway corridor, to ensure community needs inform the planning process and infrastructure supports customers, travel demands, and land-use.

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. It specifically identifies the development of the Newell Highway Corridor Strategy as an action to support greater use of Higher Productivity Vehicles.

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

Corridor strategy: Advances this objective by supporting efficient and safe connections along the highway to meet travel demand and provide access to increasingly important interstate freight networks.

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

Corridor strategy: Includes actions to increase productivity along the Newell Highway by opening access along its full length to HPVs.

Figure 2.6 shows how the Master Plan integrates with other NSW plans to ensure a coherent, whole-of-government approach is taken to transport planning.

Figure 2.6 Planning framework

Regional Action Plans

NSW Regional Action Plans relevant to the Newell Highway corridor include those for New England North West, Orana, Central West, Riverina and Murray Lower Darling. Each Regional Action Plan identifies immediate actions the NSW Government will prioritise in each of these areas.

The most relevant regional priorities and actions for regions include investing and improving regional and local infrastructure. The NSW Government will achieve this through providing transport infrastructure, including road upgrades and improved transport corridors to support industry expansion.

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

Regional Growth Plans

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 for the regional areas within NSW to reflect the NSW Government's new integrated planning approach that incorporates land use planning, infrastructure planning and transport planning.

The NSW Long Term Transport Master Plan will be complemented by the NSW DP&E's Regional Growth Plans, which will manage long term growth and land use changes across NSW.

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 toward more than 9 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 and interstate transport that are relevant to the Newell Highway Corridor Strategy are:

- Completion of a corridor strategy for the Newell Highway by mid-2016.
- Secure future growth for Western NSW with investment in freight productivity on the Golden Highway, New England Highway, and Great Western Highway corridors, with funding from the $2 billion Regional Road Freight Corridor program. This will include a commitment of at least $500 million of funding for the Newell Highway which is expected to deliver:
  - Additional overtaking lanes
  - Heavy duty pavement construction from Narrabri to Moree
  - Pavement upgrades from Mungleback Creek to Boggabilla
  - The Parkes bypass
  - Road widening from Coonabarabran to Narrabri.

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.

Corridor Strategy: Identifies inefficiencies on the road network through assessing traffic, safety and asset data performance and supports an increase in access for Higher Productivity Vehicles on the Newell Highway.

Balancing of freight needs with those of the broader community and the environment.

Corridor Strategy: Supports north-south freight movement between the communities of the Central West, along with interstate movements between Victoria, New South Wales and Queensland. It also contributes to reducing impacts along regional town centres by recommending bypasses.

NSW Road Safety Strategy

The NSW Road Safety Strategy 2012-2021 sets the direction of road safety in NSW for the next seven years. 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 by 2021.

The Road Safety Strategy is underpinned by the Safe System 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 these components have a role to play in helping to keep road users safe.

The Newell Highway 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 progressively implementing the wide centre line treatment, maintaining clear zones and providing the highest level of control at rail crossings to reduce the number and severity of crashes along the corridor.

Regional Transport Plans

Regional Transport Plans are built on the strategic direction, initiatives and state-wide context set by the Master Plan. The New England, Central West and Murray-Murrumbidgee 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 New England, Central West and Murray-Murrumbidgee Transport Plans relevant to the Newell Highway are:

- Improve cross-border connectivity by continuing to work with the Queensland and Victorian governments to align state regulation and cooperation
- Improve road safety by progressing the actions of the NSW Road Safety Strategy 2012-2021 to support the NSW 2021 target of reducing fatalities to 4.3 per 100,000 population by 2016.
- Invest in the road network by continuing to upgrade the Newell Highway and address pinch points on the road network by improving bus services and walking and cycling networks.
- Invest in walking and cycling infrastructure through the Walking Communities Program, Connecting Centres Program and the Cycling towns Program, and by working together with local government.
- Improve tourism related transport services during the peak holiday periods and community transport services by working with local transport operators.
- Improve regional bus services and transport services in towns by introducing a more robust contractual framework and working with operators to improve routes and timetables and online public transport services information.
- Develop annual festival servicing plans for major events to encourage public transport use.

Figure 2.7 shows how the Regional Transport Plans are linked to specific mode plans and corridor strategies to improve regional connections.

Figure 2.7 Relationship with Regional Transport Plans

National infrastructure priorities

The Newell Highway Corridor Strategy supports NSW's role in increasing Australia's productivity, developing cities and regions and improving social equity and quality of life for people across the country.

The Australian Government's Melbourne to Brisbane Corridor Strategy[11] describes the Newell Highway as a major interstate transport route and a key component of the National Land Transport Network (NLTN). The Australian Government provides major infrastructure and maintenance funding for the Newell Highway, due to its significance in terms of facilitating freight movement, transporting produce and providing access between key regional primary industries and their export markets in northern Victoria, central NSW and southern Queensland.

Road improvements such as upgrades to intersections, overtaking lanes, bypasses and provision of rest areas along the corridor aim to increase travel efficiency and freight productivity on the Newell Highway. These corridor improvements will support employment growth in the central west by increasing accessibility to the region. The Newell Highway will contribute to the competitiveness of Australia's agricultural and mining sectors providing access to essential and increasingly important freight networks in NSW, Queensland and Victoria.

2.4 Key corridor challenges and issues

The Newell 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 improve the Newell Highway's roles and services for the community.

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

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

- **Urban amenity:** The urban amenity of towns along the corridor is diminished by the through-movements of heavy vehicles, particularly when the highway passes through the main urban commercial centre of a town.
- **Overtaking lanes:** The lack of overtaking lanes along the corridor impacts travel times and increases safety risks. The high proportion of heavy vehicles and cars towing caravans groups vehicles into platoons that restrict overtaking opportunity utilising the opposite side of the road.
- **Road geometry:** Poor road geometry along some stretches of the highway such as through the Warrumbungles, Trewilga and Grong Grong is resulting in reduced travel speeds and increases in travel time.
- **Intersections:** Higher productivity vehicle access on some sections of the corridor is limited by current intersection configuration or narrow pavements.

11 Commonwealth of Australia 2007, *Melbourne-Brisbane Corridor Strategy: Building our National Transport Future*, Commonwealth of Australia, Barton

- **Pavement strength:** The existing pavement strength and thickness does not adequately address the current and future needs of freight vehicles.
- **Pavement remaining life:** The annual target pavement replacement rate exceeds the actual replacement rate. Over a third of the Newell Highway has a structural remaining life of less than five years and over half the pavement has a remaining life of less than 10 years.
- **Building material:** There is a lack of good quality natural road building materials in the corridor. The few materials that are available near the corridor generally have low shear strength. There are significant transport costs in importing good quality road building materials from quarries hundreds of kilometres away.
- **Flood immunity:** There is a low level of flood immunity along the entire route. The highway is currently susceptible to nuisance flooding, as well as flooding from larger events including swollen river systems and sheet flow over expansive flood plains.
- **Detours:** Road closures for bushfires and other natural disasters along the corridor currently require large detours because of the lack of a closely spaced support networks or local and regional roads.
- **Vegetation conservation:** There are high value vegetation conservation communities along the corridor requiring protection. There is a need to balance the need to protect these communities and the need for adequate clear zones.
- **Conflict points:** The mix of vehicles along the highway is varied including cars, caravans, light vehicles, and heavy vehicles. Heavy vehicles represent a high percentage of vehicles, regularly exceeding 50 per cent; the interaction between the different vehicle types can cause potential conflict.
- **Rest areas:** Providing infrastructure and services to help manage driver fatigue and facilitate breaks for heavy vehicle operators on this interstate freight route.
- **Rail level crossings:** Rail level crossings are a safety risks for all road and rail users
- **Various community needs:** The length of the corridor means that there are many local government, local community and other stakeholder needs to be considered and addressed.

Key challenges and issues on the Newell Highway corridor are further discussed in Chapter 6 following detailed performance analysis in Chapter 4 of this document.

2.5 Corridor objectives

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

The Newell 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 2.2 and Figure 2.8.

Table 2.2 Meeting the Master Plan's objectives: the Newell Highway Corridor

NSW Long Term Transport Master Plan objectives		Newell Highway Corridor objectives
Improve liveability **Reduce social disadvantage**	CUSTOMER	• Improve travel efficiency for local and regional road users through catering for the corridor's mix of heavy vehicles, light vehicles and tourist traffic. • Address the active transport needs of cyclists, pedestrians and public transport users in major towns and regional centres.
Economic growth / productivity		• Improve freight productivity by extending the areas accessible to High Productivity Vehicles; and supporting industry to progressively adopt modern vehicles. • Maintain and improve asset condition through progressively upgrading the highway to heavy duty pavement to ensure the corridor can accommodate High Productivity Vehicles while optimising safety, efficiency and reliability.
Regional development / accessibility		• Improve access to and from major regional facilities, as well as between existing and developing residential and commercial areas. • Support key freight movements along the corridor servicing mining, agriculture and emerging industries. • Minimise disruption to road users resulting from planned and unplanned road closures, recognising in particular the needs of isolated communities and those sections of the route which have no alternative access. • Maintain adequate access for emergency services during major flooding events and natural disasters particularly on the flood plains south of Narrandera, north of Narrabri; and support local Emergency Management Plans.
Improve sustainability		• Improve the amenity of towns and regional centres by removing through-traffic from major town centre main streets, particularly in Moree (Stage 2), Parkes, Coonabarabran and West Wyalong.
Safety and security		• Enhance road safety for all road users over the length of the corridor by implementing the safe systems approach to the road's design and management; progressively implement the wide centreline treatment. • Address safety and congestion at urban and rural rail level crossings.
Improve transport integration process		• Manage cross-border transport issues with Queensland and Victorian State Governments.

Figure 2.8 Putting the customer at the centre: *NSW Long Term Transport Master Plan* objectives

2.6 A vision for the future

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

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

- Support greater **access for Higher Productivity Vehicles** along the full length of the highway.
- Feature a sustainable **maintenance program with heavy duty pavement** between Narrabri and the Queensland border.
- **Address localised flooding** and **improve flood immunity** across the Macquarie River at Dubbo.
- **Enhance safety for all road users**, with wide centre line, sufficient overtaking opportunities, high levels of control at railway crossings, good road alignment, and quality rest facilities.
- **Improve amenity for local communities** through town bypasses.
- **Increase opportunities for cycling, walking or public transport** use with better facilities and infrastructure in regional towns.

2.7 Taking action

The key challenges for the Newell 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 Newell Highway are achieved. The Newell Highway priorities for responding to these challenges are explained in Chapter 7

SPECIFIC ACTIONS RELEVANT TO THE NEWELL HIGHWAY CORRIDOR IN THE NSW LONG TERM TRANSPORT MASTER PLAN AND THE REGIONAL TRANSPORT PLANS

Short term

- Additional overtaking lanes on the Newell Highway to improve overtaking opportunities and safety.
- Heavy-duty pavement construction on the Newell Highway between Narrabri and the Queensland border.
- Additional rest areas, as well as upgrades to some rest areas to a better standard on the Newell Highway to accommodate Higher Productivity Vehicles.
- Newell Highway upgrade including the Trewilga realignment near Peak Hill and realignment of the Newell Highway at Grong Grong.

Medium to longer term

- Provide road upgrade works including additional overtaking lanes on the Newell Highway as required to account for the impact of road freight which is set to grow over the next 20 years.

Newell Highway north of Parkes

3 TRANSPORT DEMANDS AND ROLES

3.1 The Newell Highway and the National Land Transport Network

The National Land Transport Network (NLTN) is a single integrated network of land transport links of strategic national importance, funded by Federal, State and Territory Governments. The Newell Highway is a part of the NLTN – linking Australia's second and third largest cities, Melbourne and Brisbane. The Newell Highway also contributes to Australia's competitiveness in the agricultural and mining sectors, providing access to essential and increasingly important freight networks in NSW, Queensland and Victoria.

The Newell Highway's transport roles reflect the mix of urban and rural communities and agricultural and pastoral land it passes through – along with the interstate freight connection it provides between Melbourne and Brisbane[12].

The Newell Highway intersects with a series of road and rail links. These are summarised in Table 3.1.

The highway starts in Tocumwal joining the Goulburn Valley Highway at the NSW and Victorian border. The Goulburn Valley Highway connects the Hume Highway at Seymour with the Newell Highway at Tocumwal. The Newell Highway becomes the Gore Highway in Queensland and links to Brisbane via Toowoomba.

The Newell Highway passes directly through or next to the following towns, localities and villages from south to north (Figure 3.1):

- Tocumwal* and Finley* within Berrigan Shire
- Jerilderie* and Bundure within Jerilderie Shire
- Morundah within Urana Shire
- Corobimilla, Narrandera* and Grong Grong within Narrandera Shire
- Ardlethan, Beckom and Mirrool within Coolamon Shire
- Alleena, West Wyalong* and Back Creek within Bland Shire
- Marsden within Weddin Shire
- Forbes* within Forbes Shire
- Parkes*, Alectown and Peak Hill within Parkes Shire
- Tomingley within Narromine Shire
- The City of Dubbo*
- Brocklehurst within the City of Dubbo
- Gilgandra* within Gilgandra Shire
- Coonabarabran* within Warrumbungle Shire
- Narrabri* and Edgeroi within Narrabri Shire
- Bellata, Gurley, Moree* and Boggabilla within Moree Plains Shire
- Goondiwindi within Goondiwindi Regional Council, Queensland.

* Major towns discussed in following sections and detailed in Table 3.2.

Moree bypass stage one

12 ibid.

Table 3.1 Corridor connections

Network connection (South-North)	Transport connection
Riverina Highway	Connecting Albury to Deniliquin intersecting the Newell Highway at Finley
Kidman Way	Connecting the Newell Highway near Jerilderie to Bourke
Sturt Highway	Connecting the Hume Highway east of Wagga Wagga to South Australia and intersecting the Newell Highway at Narrandera (National Land Transport Network)
Burley Griffin Way	Connecting the Hume Highway near Yass to Griffith sharing the Newell Highway carriageway between Mirrool and Ardlethan
Mid Western Highway	Connecting Bathurst to Hay sharing the Newell Highway carriageway between Marsden and West Wyalong
West Wyalong HV Bypass	Runs from the intersection of Showground Road and the Newell Highway to the intersection of Copeland Street and the Newell Highway at West Wyalong
Goldfields Way	Connecting Old Junee to Nyngan intersecting the Newell Highway near West Wyalong
Lachlan Valley Way	Connecting the Hume Highway near Yass to Boorowa and Forbes intersecting the Newell Highway at Forbes
Henry Parkes Way	Connecting the Escort Way near Orange to Condobolin intersecting the Newell Highway at Parkes
Mitchell Highway	Connecting Bathurst to Augathella in Central Queensland intersecting the Newell Highway at Dubbo (National Land Transport Network from Bathurst to Dubbo)
Golden Highway	Connecting the New England Highway near Belford to the Newell Highway at Dubbo
Castlereagh Highway	Connecting Marrangaroo near Lithgow to St George in South West Queensland intersecting the Newell Highway at Gilgandra
Mendooran Road	Connecting Mendooran to the Newell Highway near Coonabarabran
Oxley Highway	Connecting Port Macquarie to Nevertire intersecting the Newell Highway at Coonabarabran and Gilgandra
Kamilaroi Highway	Connecting Willow Tree to Bourke intersecting the Newell Highway at Narrabri
Gwydir Highway	Connecting Grafton to Walgett intersecting the Newell Highway at Moree
Carnarvon Highway	Connecting the Gwydir Highway adjacent to the Newell Highway at Moree to Rolleston in Central Queensland
Bruxner Way/ Highway	Connecting Ballina to the Newell Highway at Boggabilla

Interstate coordination

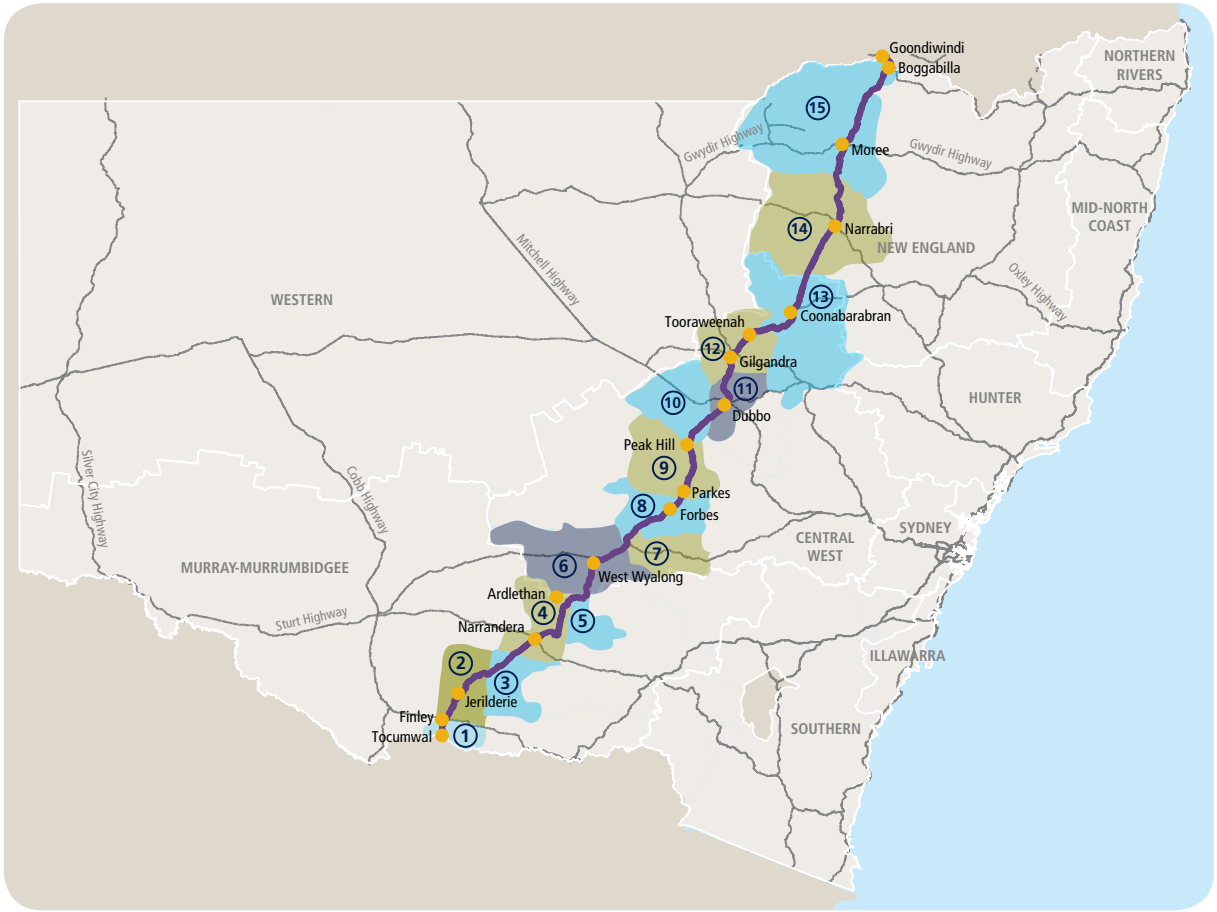
As the Newell Highway is an interstate road corridor linking Melbourne and Brisbane consideration must be given to the coordination that is required between interstate transport authorities.

The Newell Highway corridor is being utilised for an increasing number of freight movements connecting producers in western NSW to these interstate capital cities.

Given the nature of these freight movements across state borders, it is important for the aims and objectives of the highway strategy to remain consistent with the aims and objectives of the highway strategies developed by VicRoads and the Queensland Department of Transport and Main Roads.

Currently coordination meetings take place between Roads and Maritime and VicRoads to maintain the bridge crossings into Victoria. Consideration should be given to addressing issues regarding strategic corridor objectives at coordination meetings between the NSW government and their Victorian and Queensland counterparts.

Figure 3.1 Locality map of the Newell Highway Corridor



Towns
Newell Highway
Major Roads

LGAs along the Newell Highway

1. Berrigan
2. Jerilderie
3. Urana
4. Narrandera
5. Coolamon
6. Bland
7. Weddin
8. Forbes
9. Parkes
10. Narromine
11. Dubbo
12. Gilgandra
13. Warrumbungle
14. Narrabri
15. Moree Plains

3.2 Current population and employment in the corridor

An estimated 128,650 people live along the Newell Highway corridor, with about 63 per cent of this number in major regional towns and centres.

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 3.2. Towns along the Newell Highway have a higher proportion of older people compared to the NSW State average.

Table 3.2 LGA and urban centre demographics

LGA	2011 LGA Population*	Urban Centres	2011 Urban Population	% Aged over 65 years	% Aged 0-14 years	Median age	% Labour force employed full time	Main employment by industry in the LGAs
Berrigan	8,300	Tocumwal	2,154	32.2%	14.3%	54	54.6%	Agriculture, health care, retail, manufacturing, accommodation
		Finley	1,921	27.1%	16.8%	49	55%	
Jerilderie	1,550	Jerilderie	755	27.6%	17.2%	49	55.6%	Agriculture, health care
Narrandera	6,100	Narrandera	3,871	21.7%	21%	42	56.7%	Agriculture, health care, manufacturing
Bland	6,000	West Wyalong	2,643	24%	20.2%	42	61.2%	Agriculture, mining, education, retail
Forbes	9,450	Forbes	6,806	20.1%	21.3%	40	59%	Agriculture, health care, education, retail
Parkes	15,100	Parkes	10,026	18.3%	22.5%	38	60.5%	Agriculture, retail, healthcare, mining
Dubbo	40,250	Dubbo	32,327	14.5%	22.6%	35	62.4%	Retail, health care, education, public administration, construction and manufacturing
Gilgandra	4,500	Gilgandra	2,664	23.3%	20%	43	53.9%	Agriculture, health care
Warrumbungle	9,900	Coonabarabran	2,576	25.1%	18.7%	45	52.4%	Agriculture, education, retail
Narrabri	13,450	Narrabri	5,890	16.9%	21.9%	37	61.1%	Agriculture, retail, health care
Moree Plains	14,050	Moree	7,720	14.4%	21.9%	35	63.4%	Agriculture, retail, education, health care, and construction
Total	**128,650**		**79,373**					
NSW State average				**14.7%**	**19.2%**	**38**	**60.2%**	

* LGA population sourced from NSW Department of Planning and Environment data.

Tocumwal

Tocumwal is part of Berrigan Shire and is on the Victorian border. It has an ageing population, with 32 per cent of residents aged 65 years and over. There are fewer children (0-14 years) in Tocumwal compared to other urban centres and the NSW average. The median age of people in Tocumwal is 54 – the oldest in urban centres along the Newell Highway and much higher than the State average of 38.

About 54 per cent of the total labour force in Tocumwal is employed full time. Of these employees, 5.7 per cent work in sheep, beef cattle and grain farming. Other major employment industries include supermarket and grocery stores at 5 per cent, dairy product manufacturing at 4.7 per cent, school education at 4.6 per cent and accommodation at 4.4 per cent.

Finley

Finley is the largest town in Berrigan Shire, located about 21 kilometres north of Tocumwal. The Newell Highway and Riverina Highway junction is located at Finley – providing an east-west connection between Deniliquin and Albury.

New residential development in Finley is taking place predominantly on residual residential land and vacant lots. In contrast to Tocumwal, Finley has a higher proportion of younger families and a lower proportion of people aged over 65. However, the median age of people in Finley is 49 – also one of the highest of urban centres along the Newell Highway – and is much higher than the State average of 38.

Around 55 per cent of the labour force in Finley is employed full time. Of these employees, 8.1 per cent work in school education, with other major employment industries including residential care services at 6.6 per cent, road freight transport at 4.9 per cent, sheep, beef, cattle and grain farming at 4.8 per cent and supermarket and grocery stores at 4 per cent.

Jerilderie

Jerilderie, part of the Jerilderie Shire, has east-west connections with the towns of Oaklands and Conargo. Jerilderie Shire's population declined by more than 10 per cent in the period 2001 to 2009 – the largest proportional decline in the Central Murray Region[13].

Jerilderie has an ageing population, with a high proportion of residents over 65 and a median age of 49 years, one of the highest of urban centres along the Newell Highway and much higher than the State average of 38.

About 56 per cent of Jerilderie's labour force is employed full time. Of these employees, 12.3 per cent work in sheep, beef cattle and grain farming. Other major employment industries include local government administration at 10.6 per cent, fuel retailing at 4.1 per cent, road freight transport at 4.1 per cent and school education at 3.8 per cent.

Narrandera

Narrandera, part of the Narrandera Shire, is located at the junction of the Newell Highway and the Sturt Highway, which connects Narrandera with Hay to the west and with Wagga Wagga to the east.

A significant proportion of Narrandera's population is aged 65 years and over, however young families with children (0-14 years) are also well represented. The median age of people in Narrandera is 42, which is higher than the State average of 38.

About 57 per cent of Narrandera's labour force is employed full time. Of these employees, 6.5 per cent work in school education, with other major employment industries including residential care services at 4.5 per cent, cafes, restaurants and takeaway food services at 4.4 per cent, supermarket and grocery stores at 4.2 per cent and meat and meat product manufacturing at 4.2 per cent.

13 Hyder Consulting 2010, *Strengthen Irrigation Communities*

West Wyalong

West Wyalong is the main urban centre in Bland Shire and is located at the junction of the Newell Highway and the Mid-Western Highway. From West Wyalong, the Mid-Western Highway provides an east-west link to Hay where it connects with the Sturt Highway and Cobb Highway and Cowra, Blayney and Bathurst, where it connects with the Mitchell Highway and Great Western Highway.

Almost a quarter of the residents of West Wyalong are aged over 65 years. The median age is 42, compared to the NSW average of 38. By 2031, the median age of people living in Bland Shire is expected to rise to 50 years[14].

About 61 per cent of the West Wyalong labour force is employed full time. Of these employees, 12.2 per cent work in metal ore mining, with other major employment industries including local government administration at 7.5 per cent, school education at 6.8 per cent, sheep, beef, cattle and grain farming at 4.8 per cent and supermarket and grocery stores at 3.7 per cent.

Forbes

Forbes is the main urban centre in Forbes Shire, located 104 kilometres north of West Wyalong. Almost a quarter of the Forbes population are children (0-14 years), with older people aged 65 years and over representing around 20 per cent of the population. The median age of people in Forbes is 40, just higher than the State average of 38.

About 59 per cent of the Forbes labour force is employed full time. Of these employees, 8.5 per cent work in school education, with other major employment industries including supermarket and grocery stores at 4.2 per cent, sheep, beef, cattle and grain farming at 4.2 per cent, cafes, restaurants and takeaway food services at 4 per cent and residential care services at 3.3 per cent.

14 Bland Shire Council, *Community Plan 2011–2016*

Parkes

Parkes is the main centre in Parkes Shire and is located 33 kilometres north of Forbes at the junction of the Newell Highway and Henry Parkes Way. Almost a quarter of Parkes residents are children (0-14 years), while people aged over 65 years represent 18 per cent of the population – a significantly lower proportion than other towns in the Newell Highway corridor. The median age of people in Parkes is 38 – the same as the State average.

More than half of the Parkes workforce is employed full time. Of these employees, 6.6 per cent work in metal ore mining, with other major employment industries including school education at 5.8 per cent, cafes, restaurants and takeaway food services at 4 per cent, supermarket and grocery stores at 3.7 per cent and residential care services at 3.4 per cent.

Parkes has a National Logistics Hub, specifically designed for the 24 hour, 7 days per week operation of a multi-modal transport facility. Parkes is also the home of the CSIRO radio telescope.

Dubbo

Dubbo is the only city along the Newell Highway corridor and is located at the junction of the Newell Highway, Mitchell Highway and Golden Highway. From Dubbo, the Golden Highway provides an east-west link to the Hunter Valley.

Children (0-14 years) make up almost a quarter of Dubbo's population, while people aged over 65 represent 14.5 per cent – lower than in other towns along the Newell Highway. The median age of people in Dubbo is 35, which is lower than the State average of 38.

About 62 per cent of the total labour force in Dubbo is employed full time. Of these employees, 6.2 per cent work in school education, with other major employment industries including hospitals at 4.4 per cent, cafes, restaurants and takeaway food services at 4.4 per cent, supermarket and grocery stores at 2.8 per cent and residential care services at 2.8 per cent.

Dubbo is home to major tourist attractions, such as the Taronga Western Plains Zoo.

Gilgandra

Gilgandra, the main centre in Gilgandra Shire, is located at the junction of the Newell, Oxley and Castlereagh Highways. Around 20 per cent of Gilgandra residents are children (0-14 years); while people aged over 65 years represent almost a quarter of the population. The median age of people in Gilgandra is 43, which is higher than the State average of 38.

About 54 per cent of the labour force in Gilgandra is employed full time. Of these employees, 8.2 per cent work in local government administration, while other major employment industries include school education at 6.9 per cent, sheep, beef, cattle and grain farming at 4.9 per cent, supermarket and grocery stores at 4.4 per cent and residential care services at 3.7 per cent.

Coonabarabran

Coonabarabran is part of the Warrumbungle Shire and is located at the junction of the Newell and Oxley Highways. The Oxley Highway provides an east-west connection from the Newell Highway to the Pacific Highway and Kamilaroi Highway.

Less than a quarter of the Coonabarabran population are children (0-14 years) and just over a quarter of the population is aged 65 years and over. The median age of people in Coonabarabran is 45, which is higher than the State average of 38.

About half of the labour force in Coonabarabran is employed full time. Of these employees, 9 per cent work in school education, with other major employment industries including supermarket and grocery stores at 6 per cent, local government administration at 6 per cent, residential care services at 5 per cent and cafes, restaurants and takeaway food services at 4.7 per cent.

Narrabri

Narrabri, the main centre within Narrabri Shire, is located at the junction of the Newell and Kamilaroi Highways. The Kamilaroi Highway provides a connection between Narrabri and Wee Waa, the Castlereagh Highway and Gwydir Highway at Walgett and the Oxley Highway at Gunnedah.

Around 22 per cent of the Narrabri population are children (0-14 years) and around 17 per cent of the population are aged 65 years and over. The median age of people in Narrabri is 37, which is just lower than the State average of 38.

About 61 per cent of the labour force in Narrabri is employed full time. Of these employees, 4.9 per cent work in school education, with other major employment industries including cafes, restaurants and takeaway food services at 4.4 per cent, supermarket and grocery stores at 4 per cent, local government administration at 3.1 per cent and accommodation at 3 per cent.

Moree

Moree, the main centre within Moree Plains Shire, is located at the northern end of the corridor, about 125 kilometres south of the Queensland border. Moree is located at the junction of the Newell and Gwydir Highways. The Gwydir Highway provides an east-west connection from the Newell Highway at Moree to the Pacific Highway at Grafton, the New England Highway at Glen Innes and the Castlereagh Highway and Kamilaroi Highway at Walgett.

The age of people within Moree is similar to that of Narrabri, where about a quarter of the population are children (0-14 years) and about 15 per cent are people aged 65 years and over. The median age of people in Moree is 35, which is much lower than the State average of 38.

About 63 per cent of the labour force in Moree is employed full time. Of these employees in Moree, 7.1 per cent work in school education, with other major employment industries including local government administration at 4.2 per cent, cafes, restaurants and takeaway food services at 3.8 per cent, sheep, beef, cattle and grain farming at 3.6 per cent and supermarket and grocery stores at 3.3 per cent.

The artesian spas, national parks and the Gwydir Wetlands attract tourists to Moree, especially during the summer months[15].

15 Moree Plains Shire Council 2010, *State of the Environment Report*

3.3 Industry and economic development

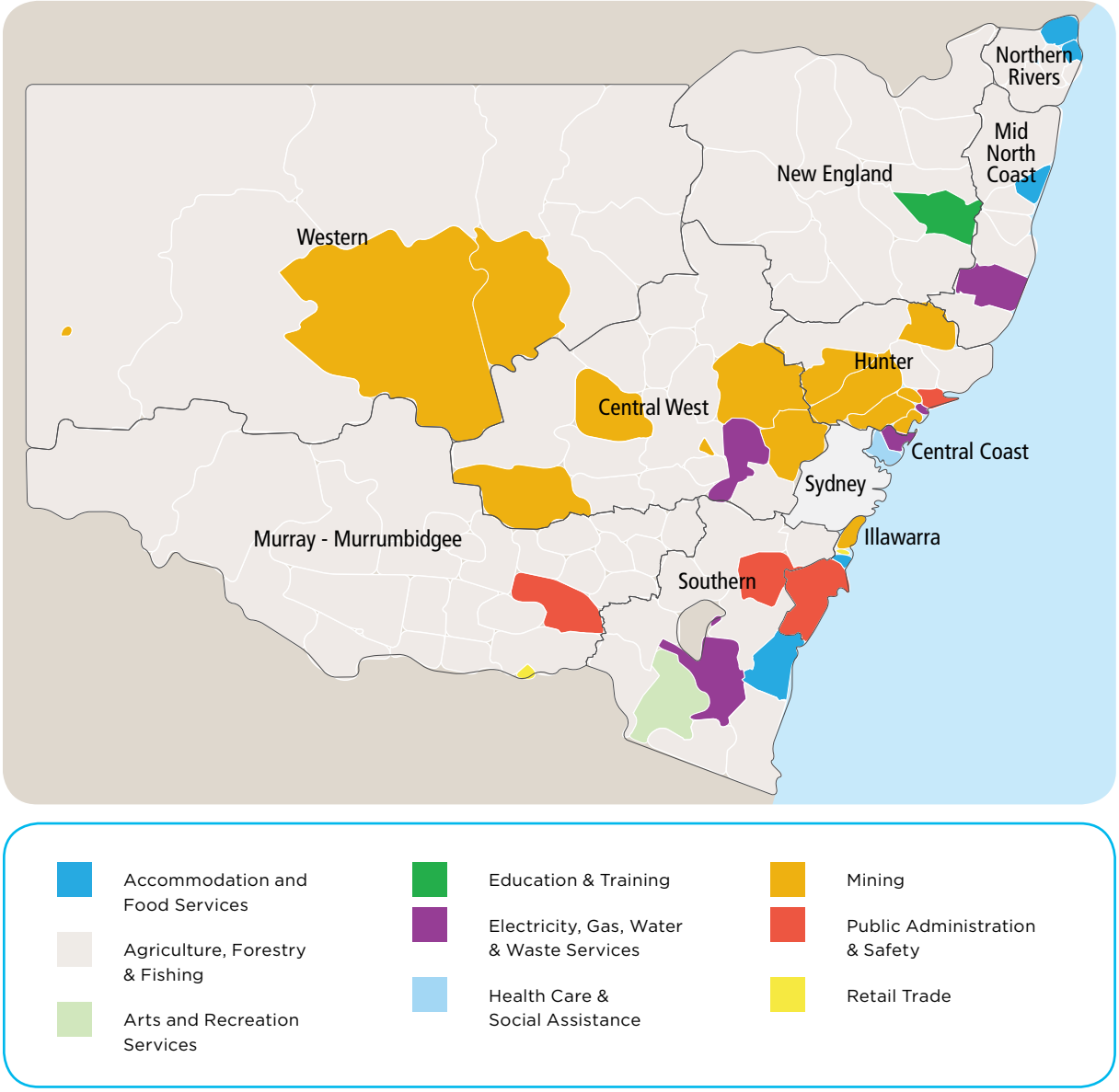
Transport moves goods produced in the regions to domestic and international markets, in turn contributing to the NSW economy. The regional road and rail freight network supports agricultural, manufacturing and mining industries, along with the local businesses associated with these sectors. Regional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

Around 50 per cent of all intra and interstate truck freight across Australia uses the NSW road network for at least some 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.

The Newell Highway facilitates freight, the transportation of produce and provides access between key regional primary industries and export markets. It services major primary industry regions in northern Victoria, central NSW and southern Queensland.

Figure 3.2 Primary employment sectors by LGA, regional NSW[16]



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

Industry in the region

The regions that surround the Newell Highway require a diverse freight task, with a range of industry supply chains – from agriculture to mining.

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

- Dairy and beef production
- Wool production
- Wheat, cereal and cotton production.
- Irrigation crops

Large demand for freight transport from these agricultural industries is impacted by seasonal fluctuations and crop sizes.

Mining activity is centred in the Hunter Valley, Central West and Western Regions, with tourism and port-related activity along the coast. The primary employment sectors in regional NSW are shown in Figure 3.2.

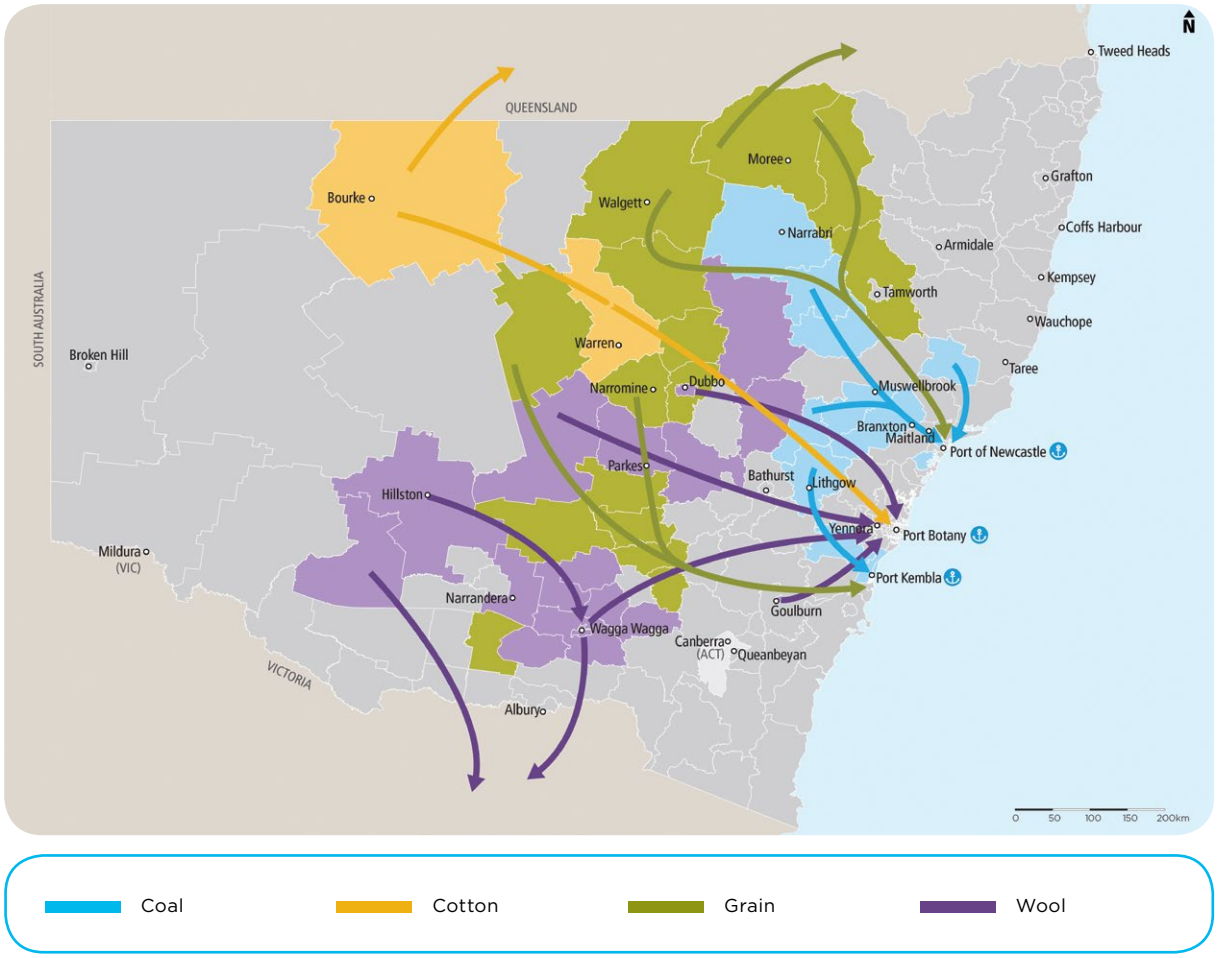
Current freight task

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

The total freight task in the Melbourne to Brisbane corridor was estimated to be 4.5 million tonnes per year in 2007. This estimate is limited to end-to-end freight and does not include freight movements within the corridor. In 2007, 61 per cent of this 4.5 million tonnes of annual freight was moved between Melbourne and Brisbane by road.

The 2011 movement of different goods across NSW is shown in Figure 3.3.

Figure 3.3 Selected commodity movement in NSW in 2011[17]



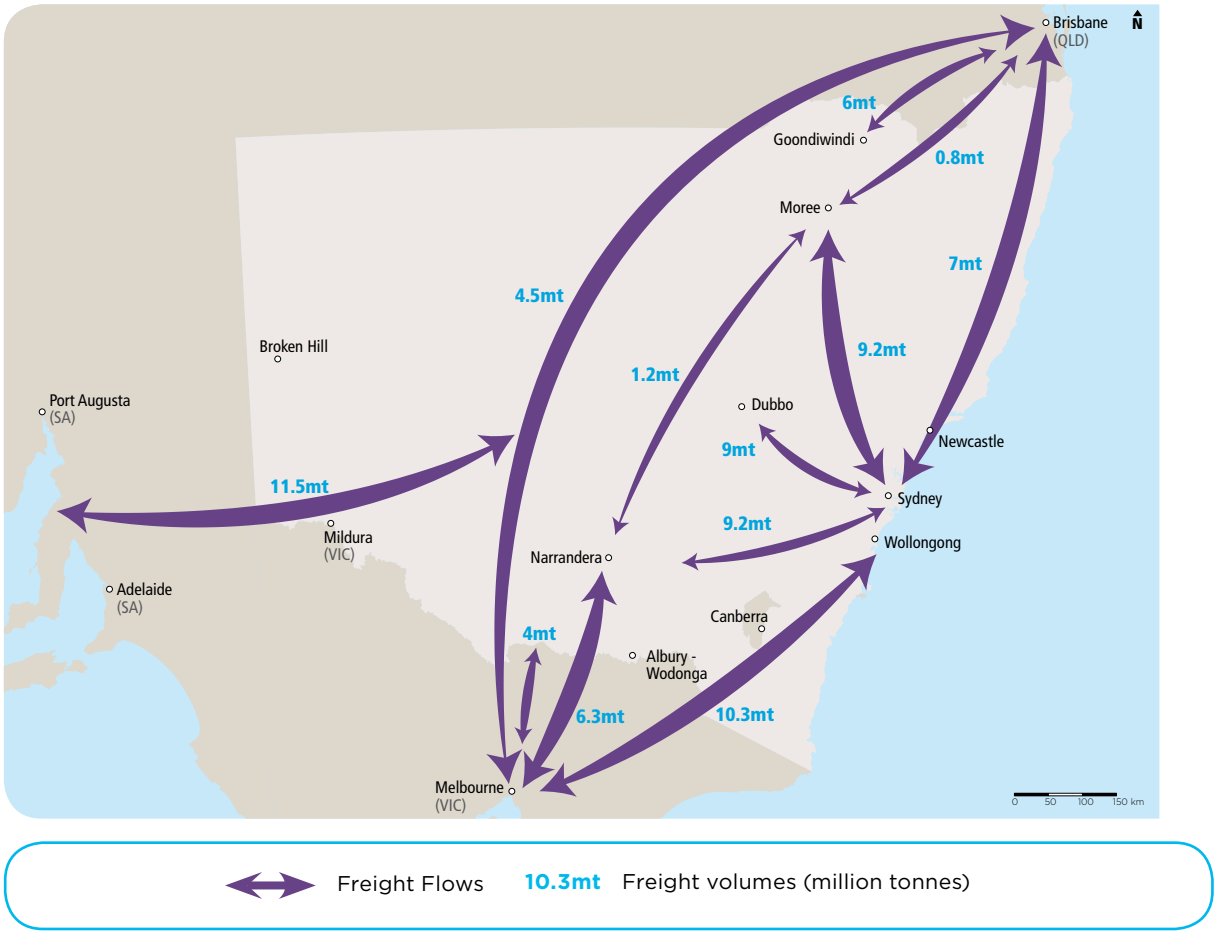
17 Transport for NSW 2013, *NSW Freight and Ports Strategy, TfNSW*, Sydney, p.99

The majority of freight travelling on the Melbourne to Brisbane corridor is not end-to-end, but rather from one part of the corridor to another – at least 17.3 million tonnes compared to 4.5 million tonnes end-to-end (Figure 3.4).

The major exports carried on the corridor are:

- Dairy and fruit from the Goulburn Valley and Riverina districts.
- Horticultural products, mainly vegetables and forage, from the irrigation area of Queensland's Lockyer Valley and the Darling Downs, destined for regional and southern markets.
- Cereals, including wheat, from along the length of the corridor. Grain exports are predominantly rail-based with bulk grain exported from Port Kembla and the Port of Newcastle. There is also a small amount of containerised grain exported from Port Botany.
- Rice crops grown in the Murray Darling Basin, which travel by road and rail to domestic and export markets.
- Cotton from cotton growing regions located along the corridor transported by both road and rail in forty foot long containers for export from Port Botany and Brisbane (Figure 3.5).
- Beef and sheep comprise around half of the meat products exported. Live animals are predominantly moved in trucks along the corridor, while processed meat is moved in refrigerated containers on both road and rail.
- Coal, particularly from the Gunnedah Basin and Narrabri, is taken to export facilities at the Port of Newcastle (Figure 3.6).

Figure 3.4 Freight flows within the corridor, excluding coal (tonnes)[18]



18 Commonwealth of Australia 2007, *Melbourne-Brisbane Corridor Strategy: Building our National Transport Future*, Commonwealth of Australia, Barton

Figure 3.5 Cotton export commodity flows through NSW in 2010-2011 in kilotonnes[19]

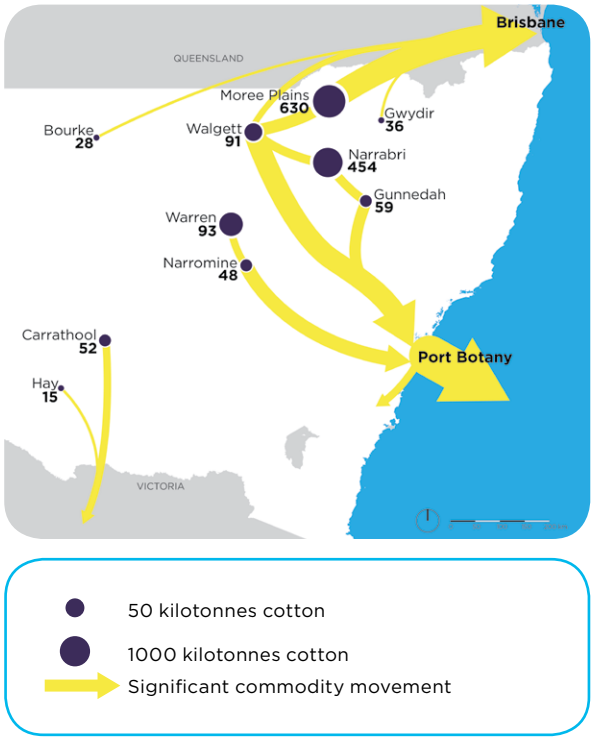
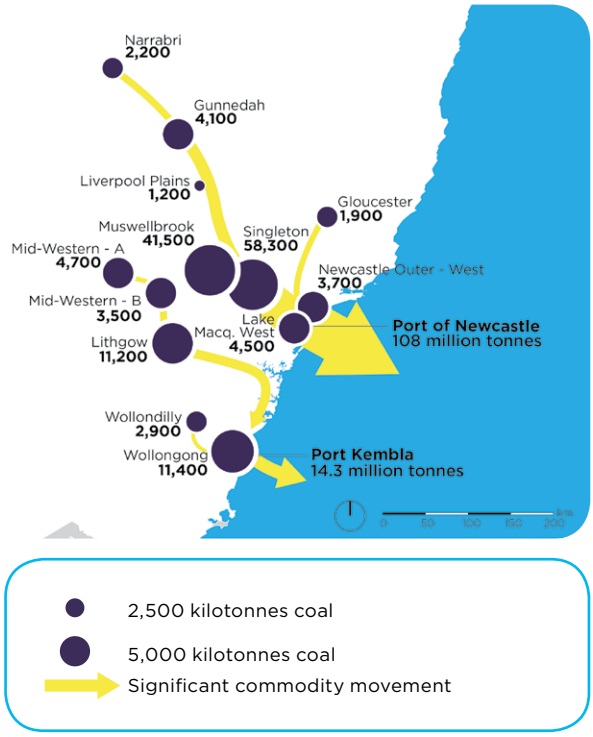


Figure 3.6 Coal exports commodity flows through NSW in 2010-2011 in kilotonnes[20]



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

20 ibid.

21 Cardno 2011, *Traffic Counts on the Newell Highway*

Intermodal transport

A number of significant intermodal freight hubs are located along the Newell corridor including major hubs at Tocumwal, Forbes, Parkes, Dubbo, Narrabri and Moree (Figure 3.8).

These successful regional transport initiatives show the importance of good road and rail connections, to facilitate the efficient transfer of containers across modes for aggregation and distribution to national and international destinations.

The NSW government aims to support the Newell corridor hubs by looking at improving inland rail access as well as supporting the road connections to existing and future planned intermodal hubs through the Fixing Country Roads initiative.

There is currently no direct, continuous inland rail link between Melbourne and Brisbane. End-to-end rail freight moves via Sydney along the Sydney–Melbourne and Sydney–Brisbane rail corridors. However, the Newell Highway is served by several sections of rail line that contribute separately to the freight task within the corridor (Figure 3.7). Standard gauge rail lines link the central NSW regions surrounding Dubbo and Parkes, via Cootamundra, to either Melbourne via Albury or to Sydney. Further north, the cotton-growing regions surrounding Moree and Narrabri are linked by standard gauge rail to Maitland where it joins the Sydney–Brisbane rail line. Within Queensland, an unconnected narrow gauge rail links Goondiwindi to Brisbane via Warwick, Toowoomba and Ipswich. The broad gauge rail line from Tocumwal to Melbourne serves the Goulburn Valley, the Murray Valley and the southern Riverina. There is also a rail line between Parkes and Broken Hill/Adelaide/Perth that allows containers on the train to be double stacked the entire route.

3.4 Current traffic volumes and heavy vehicles

Average daily traffic (ADT) volumes along the Newell Highway vary in the rural sections from around 1,200 vehicles per day to over 4000 vehicles per day[21]. In the urban centres such as Dubbo, average daily traffic volumes exceed 20,000 vehicles a day. Average daily traffic volumes between towns on the Newell

Highway vary considerably along its length. In the south of the State, volumes are lower, ranging from around 1200 vehicles per day to around 2900 vehicles per day at the Victorian border. Between Forbes and Gilgandra the ADT is between around 2500 and 3700 vehicles. North of Gilgandra, the volumes drop back to about 1800 vehicles per day, increasing closer to the Queensland border where the short section between Boggabilla and Goondiwindi reaches over 4000 vehicles per day. Traffic volumes along the Newell Highway increase substantially within urban areas such as Parkes, Dubbo, Narrabri and Moree.

The Newell Highway is the third most significant heavy vehicle route in NSW in terms of mass and number of vehicles, including High Productivity Freight Vehicles. Traffic volumes vary from 650 heavy vehicles per day at the intersection with the Sturt Highway, to around 1500 heavy vehicles per day at the Queensland border. Traffic also peaks through major centres such as Dubbo.

B-double north of Forbes

Twenty-six metre B-doubles are currently permitted along the entire length of the Newell Highway, except through the West Wyalong urban commercial centre, where vehicles use a combination of the Newell Highway and the restricted access vehicle bypass. This bypass is also the approved route for all B-doubles and Higher Mass Limit (HML) vehicles travelling through the town.

Double road trains, B-triples and AB-triples are currently allowed along the following sections of the Newell Highway:

Double road trains (all the double road train routes can also be accessed by modular B-triples but they need to operate under the Intelligent Access Program)**:**

- Tocumwal to Narrandera
- Small section at West Wyalong
- Lachlan Valley Way at Forbes to Back Yamma Road at Daroobalgie
- In the village of Tomingley
- Dubbo to Gilgandra
- Coonabarabran to Goondiwindi.

B-triples and AB-triples:

- Tocumwal to Morundah
- Dubbo to Gilgandra
- Narrabri to Goondiwindi.

Large combination vehicles – longer than 26 metres and higher than 4.3 metres – have been restricted on the network east of the Newell Highway. These restrictions relate to a combination of factors including nearby communities, pavement structure, geometry and topography, including:

- Steep grades
- Narrow pavement and substandard curvature especially on east-west connections across the Great Dividing Range
- Pavement types, narrow bridges and bridges where load limits apply.

Other factors that restrict these higher productivity vehicles include lack of overtaking lanes and rest areas.

3.5 Public transport in the corridor

Public bus services

Public transport in the corridor is generally restricted to urban areas. Very few of the towns located along the Newell Highway have local bus services due to small populations. The bus services that do operate along the Newell Highway are identified below.

Dubbo

Dubbo's local bus network, Dubbo Buslines, operates two routes that use the Newell Highway as it passes through the town. Route 572 operates 14 daily services Monday to Friday – seven in the morning and seven in the afternoon. There are also five services on Saturdays. Route 573 operates three daily services Monday to Friday.

Northbound traffic on the Newell Highway at Dubbo

Narrabri

Narrabri's local bus network, operated by Lowder & Sons, operates two routes that use the Newell Highway as it passes through the town. Route 1 Narrabri West – Town via Village and Hospital operates two services on weekdays and one on Saturday on the Newell Highway between Ugoa Street and Cameron Street. Route 2 Narrabri – Gunnedah operates two services a day on part of the Newell Highway between Gibbons Street and Ugoa Street.

Moree

Moree's local bus network, operated by Taylor's Coaches, operates one route that uses the Newell Highway as it passes through the town. Route 463 operates three services a day on the Newell Highway between the Gwydir Highway and Amaroo Drive.

Parkes

Parkes has a local bus network called Western Roadliners. Route 552 travels down the Newell Highway.

School bus routes

School bus routes are provided in each of the major towns and centres in the Newell Highway corridor. These bus routes provide a service for students who live within the towns and in the agricultural areas between the towns.

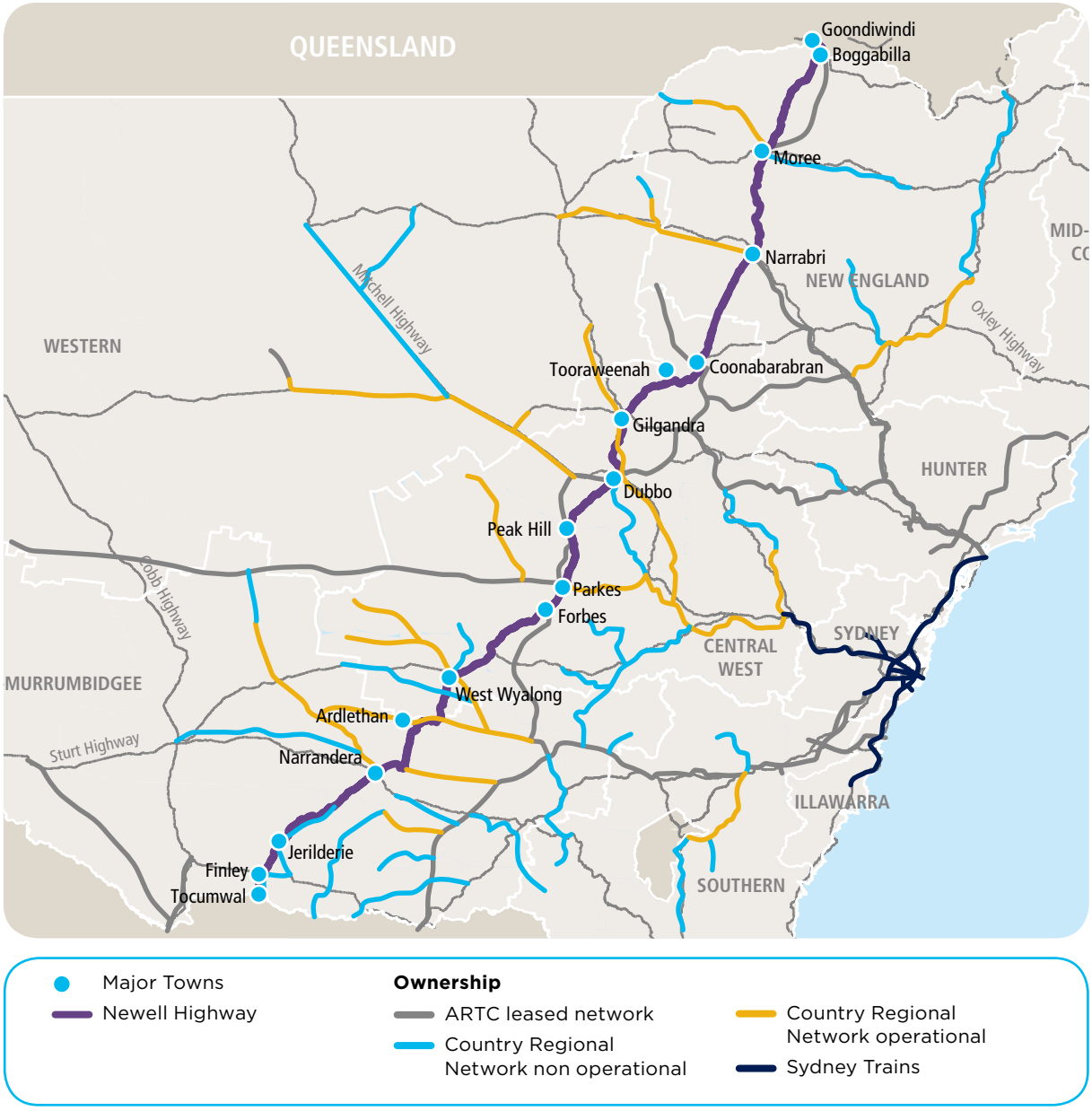
Moree local school bus

School zone on Newell Highway at Peak Hill

Coaches

The Newell Highway is used by a number of daily, long-distance coach services that provide connections to and between towns in central NSW – from major capital cities and larger regional centres. Services are provided by operators including NSW TrainLink.

Figure 3.7 NSW rail network



Rail services

There is currently no direct, continuous inland rail link between Melbourne and Brisbane. Figure 3.7 shows several sections of NSW rail network that service population clusters along the Newell Highway Corridor.

The Regional Transport Plans identify actions to improve public transport services in the town centres along the corridor.

Air services

Figure 3.8 shows regional airports along the corridor that provide commercial scheduled flights. These are located in Narrandera, Parkes, Dubbo, Narrabri and Moree.

Figure 3.8 Regional airports with commercial flights and intermodal terminals along the Newell Highway

Note: Moree and Narrabri have received services in the past from Brindabella Airlines and are expected to receive further services from another carrier in the future.

3.6 Walking and cycling in the corridor

As with bus services, dedicated infrastructure for walking and cycling is also generally restricted to urban centres.

Between towns a sealed road shoulder provides a minimum standard facility for bicycle travel.

About 70 per cent of the Newell Highway has sealed shoulders less than two metres minimum sealed shoulder width.

The Regional Transport Plans identify actions to improve opportunities for cycling and walking in urban sections of the corridor. The plans aim to improve facilities for pedestrians to encourage walking within a two kilometre radius of a town centre and to encourage cycling within a five kilometre radius.

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

Shared walkway/cycleway path adjacent to Newell Highway in Dubbo

Jerilderie

Jerilderie Shire has a bike plan that was adopted in 2003, which aims to minimise cycling on the Newell Highway as it passes through Jerilderie through creating shared off-road pedestrian/bicycle paths and safe crossing points.

West Wyalong

The 2004 West Wyalong Bike Plan recommended a regional route along the Newell Highway between West Wyalong and Wyalong.

Forbes

Forbes Shire's current bike plan was adopted in 2009. A shared path is proposed for a section of the Newell Highway in Forbes north of the rail line from Jones Street to Landrace Road. This is still to be implemented.

Parkes

Parkes Shire's current bike plan, adopted in 2008, proposes on-road cycle lanes for a short section of the Newell Highway south of the rail line from Medlyn Street to Baker Street and Station Street to Hartigan Street across the rail crossing. This is still to be implemented.

Dubbo

Dubbo currently provides some off-road cycleways on a section of the Newell Highway that passes through the town. A bike trail also runs adjacent to part of the Newell Highway along the Macquarie River.

Gilgandra

Gilgandra does not have a bike plan, but is currently building a shared path along the Newell Highway from the Cooee Heritage Centre into the town's CBD, travelling under the Newell Highway at the Jack Renshaw Bridge.

Coonabarabran

Coonabarabran has an existing network of shared paths along the Newell Highway north of the CBD that crosses the highway in a number of locations.

Narrabri

Narrabri recently completed their first bike plan. It has previously proposed a number of off-road paths along sections of the Newell Highway, including at the bridge over Namoi River and Narrabri Creek to connect south Narrabri to the CBD in the north. Bridges which divide the town do not currently meet the minimum 2.5m width requirement for a shared path. Council has proposed a loop path for active road users that includes a path across Narrabri Creek on Violet Street. Roads and Maritime and Council need to identify options for a river crossing on the Newell Highway for active road users to accommodate those in the highway corridor.

Moree

Moree has a bicycle network which includes paths along the river and the local road network. Moree has a Bike Plan adopted in 2010 which details future expansion of their network. Roads and Maritime built a shared path that follows the Newell Highway and Mehi River in Moree, as part of the first stage of the Moree bypass project. As part of stage two of the Moree bypass project Roads and Maritime will provide safe crossing points and access for cyclists and pedestrians travelling to and from the town centre.

4 CURRENT CORRIDOR PERFORMANCE

Transport for NSW has adopted the *National Guidelines for Transport System Management in Australia*[22] 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 4.1.

Figure 4.1 Road transport system planning levels[23]

NETWORK	All routes that provide inter-connected pathways between multiple locations
↓	
CORRIDOR	Parallel, possible connecting, routes between two locations
↓	
ROUTE	A single physical infrastructure pathway for transport services connecting multiple locations
↓	
PROJECT	An individual discrete initiative that generally takes place in a geographically localised area

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.

For strategic planning purposes, Transport for NSW classifies all existing roads across the network into distinct road classes. This means roads with the same classification can be compared in terms of average safety, traffic and asset performance.

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 road. 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).

Newell Highway near Tomingley

The Network Performance Measures and Network Planning Targets[24] indicate that the **Newell Highway has been classified as a Class 4 rural road (4R) along its entire length**.

The Network and Corridor Planning Practice Notes[25] state:

> *"Class 4R roads are important rural State Roads and contribute to the AusLink National 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*

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

23 ibid., p. 9 & 15

24 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, Roads and Maritime Services, Sydney, p. 19

25 Roads and Maritime Services 2008, *Network and Corridor Planning Practice Notes*, Roads and Maritime Services, Sydney, p. 20

land controlled. Typically they have undivided carriageways with 2 lanes with overtaking lanes."

Class 4R roads typically experience:

- Average annual daily traffic volumes exceeding 10,000 vehicles per day
- Average heavy vehicle volumes exceeding 1000 vehicles per day
- Speed limits ranging from 80 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 particular areas on a road 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.

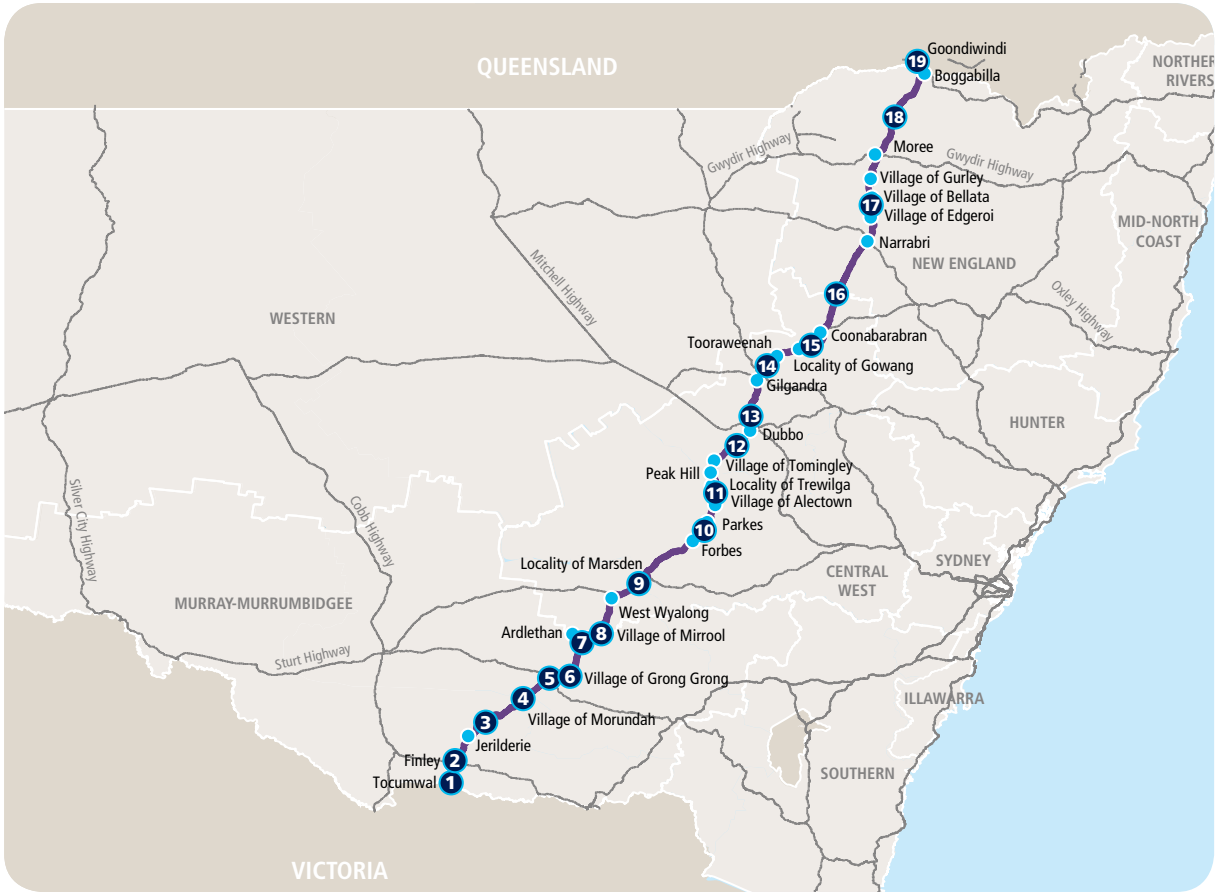
For the purpose of this analysis, the Newell Highway corridor has been divided into three zones – with a total of 19 corridor planning sections. These are shown Table 4.1 (refer to Figure 4.2).

Table 4.1 Highway sections

Highway planning section	Description	Chainage (km)*		Length (km)
		From	To	
Zone 1: Tocumwal to Marsden				
Section 1	Tocumwal to Finley	0	21	21
Section 2	Finley to Jerilderie	21	56	35
Section 3	Jerilderie to Morundah	56	134	78
Section 4	Morundah to Narrandera	134	165	31
Section 5	Narrandera to Grong Grong	165	187	22
Section 6	Grong Grong to Ardlethan	187	227	40
Section 7	Ardlethan to Mirrool	227	251	24
Section 8	Mirrool to West Wyalong	251	301	50
Section 9a	West Wyalong to Marsden	301	338	37
Sub-Total Zone 1		**0**	**338**	**338**
Zone 2: Marsden to Coonabarabran				
Section 9b	Marsden to Forbes	338	405	67
Section 10	Forbes to Parkes	405	438	33
Section 11	Parkes to Tomingley	438	505	67
Section 12	Tomingley to Dubbo	505	556	51
Section 13	Dubbo to Gilgandra	556	622	66
Section 14	Gilgandra to Gowang	622	678	56
Section 15	Gowang to Coonabarabran	678	716	38
Sub-Total Zone 2		**338**	**716**	**378**
Zone 3: Coonabarabran to Goondiwindi				
Section 16	Coonabarabran to Narrabri	716	835	119
Section 17	Narrabri to Moree	835	935	100
Section 18	Moree to Boggabilla	935	1050	115
Section 19	Boggabilla to Goondiwindi	1050	1058	7
Sub-Total Zone 3		**716**	**1058**	**342**
Total corridor		**0**	**1058**	**1058**

* Based on Roadloc chainage

Figure 4.2 Newell Highway planning sections



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, roads 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. To achieve this, 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 – cumulative condition targets that apply to the entire network, unless otherwise specified.
- Rural planning targets that apply to regional NSW, not including Wollongong, Newcastle and Sydney.

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

- Network Performance Measures and Network Planning Targets[26]
- Network and Corridor Planning Practice Notes[27]

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

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

Road characteristics

Network planning targets have been developed to complement the Austroads Guides, not to replace them. They ensure consistency between identified user requirements on a road and the design solutions available through Austroads Guides.

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 related to a characteristic of the road that may vary significantly over time due to wear, loading or physical degradation. The term 'condition' is often associated with these types of characteristics. The changing nature of road conditions means management needs to be carried out through setting cumulative network targets. These targets relate to the range of conditions across a network or sub-network of roads. The minimum acceptable condition is based on risk analysis (for example: below a certain point, increasing cracking or roughness can make driving a road unsafe) and the upper end of performance is determined based on the level of available investment.

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

- **Section 4.1** – Road safety
- **Section 4.2 and 4.3** – Road traffic – heavy vehicles and general access vehicles
- **Section 4.4** – Road design and geometry
- **Section 4.5** – Road pavement condition
- **Section 4.6** – Environment.

Road characteristics data sources

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:

- 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).

Straight alignment north of Moree

Typical alignment between Dubbo and Gilgandra

4.1 Road safety

This section of the strategy updates and expands on the Newell Highway Road Safety Review[28] through incorporating more recent crash data collected over the five years from 2007 to the end of 2011.

The crash data relates to the period when the speed limit on the Newell Highway was 100km/h, not the present 110km/h.

Speed zones

Speed zones are determined according to the Roads and Maritime Speed Zoning Guidelines and are posted to provide motorists safe passage along roads in relation to the geometry and environment[29].

The Speed Zoning Guidelines are used to determine appropriate speed limits on all roads, applied in conjunction with enforcement measures, engineering treatments and education to reduce speeding. 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.

The speed limit along the Newell Highway is generally 110 km/h in rural areas; however there are limits of 50 km/h to 80km/h through towns and urban areas and 40 km/h in school zones. The location of speed zones along the Newell Highway is shown in Figure 4.3. 100 km/h speed zones are generally located as follows:

- 19 kilometre section just north of Tocumwal
- Three and a half kilometre section about three kilometres south of Forbes
- 11 kilometre section around 40 kilometres north of Parkes (through Trewilga). This is due to poor horizontal and vertical geometry and inconsistencies with the adjacent rural road conditions.
- 52 kilometre section from the locality of Tooraweenah to just south of Coonabarabran
- Four and a half kilometre section around six kilometres north of Coonabarabran
- Five and a half kilometre section between Boggabilla and Goondiwindi.

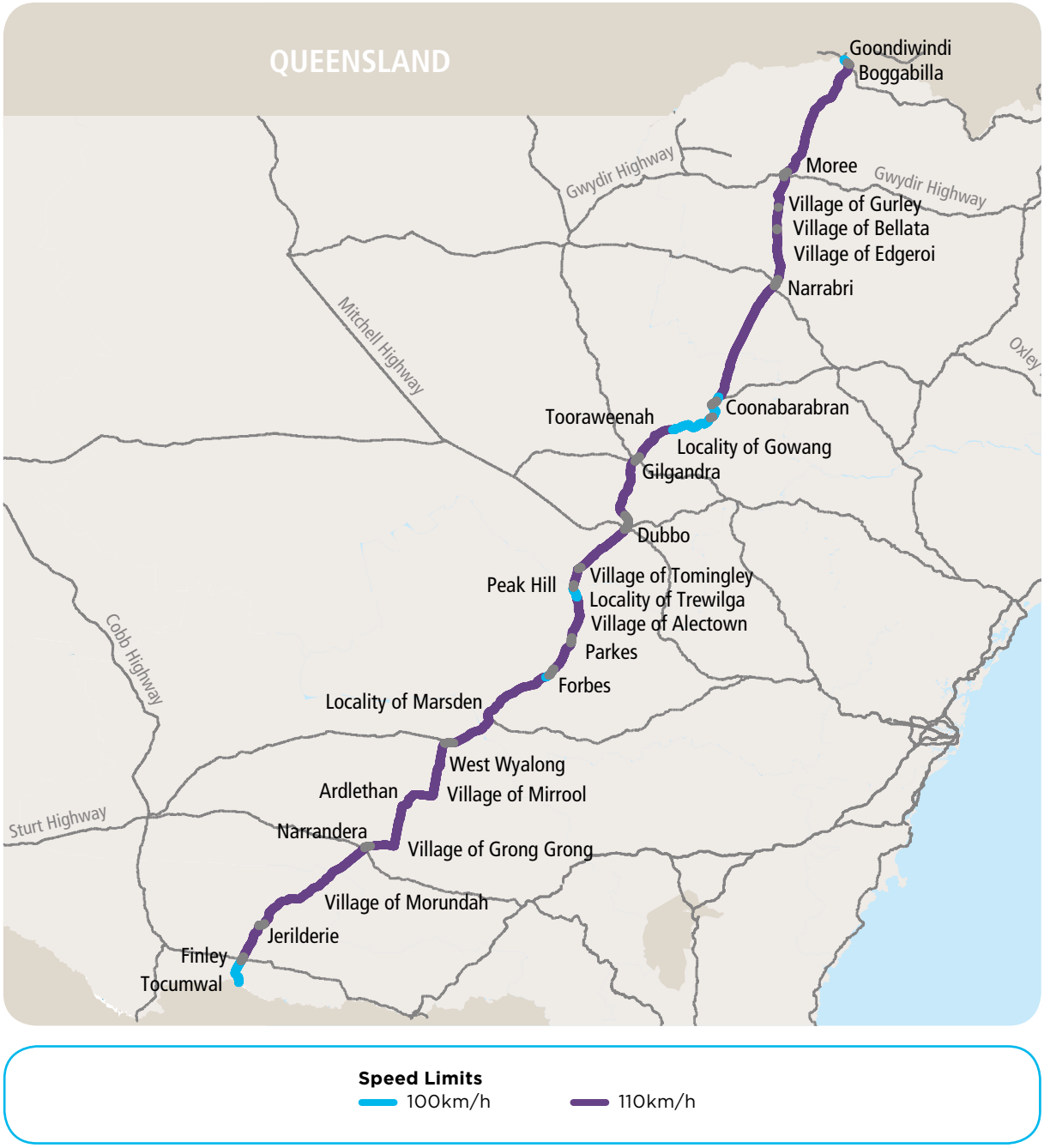
Bridge over Mehi River on Moree Bypass

Typical speed zoning sign on the Newell Highway

28 NSW Centre for Road Safety 2009, *Newell Highway: Safety Review*, Roads and Maritime Services, Sydney

29 NSW Centre for Road Safety 2011, *NSW Speed Zoning Guidelines*, Roads and Maritime Services, Sydney

Figure 4.3 Newell Highway speed zones



Note: Speed limits throughout towns and urban areas marked in grey along the highway range from 50km/h to 80km/h

Fixed speed cameras

There are no fixed speed cameras located along the Newell Highway corridor.

Criteria for fixed speed camera locations are based on crashes, injuries and travelling speeds ensuring cameras are installed on lengths of road with a high crash rate and a known speeding problem.

Number of crashes

Of the 828 crashes reported between 2007 and 2011 along the Newell Highway, 463 were 'casualty crashes', which caused either an injury or fatality to one or more of the people involved. Of the 463 casualty crashes, 36 were fatal and 427 resulted in an injury (Figure 4.4 and Figure 4.5).

Figure 4.4 Location and severity of crashes, 2007 to 2011

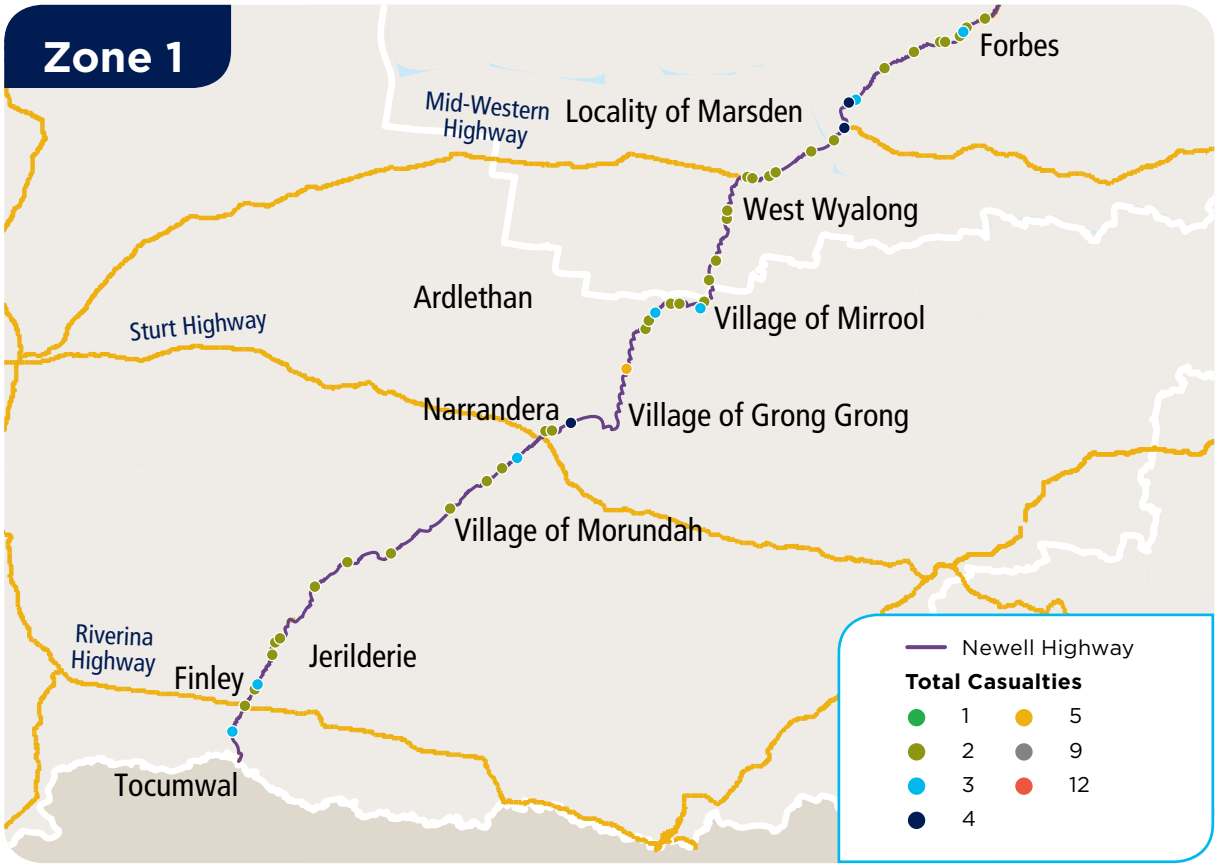


Figure 4.4 (continued) Location and severity of crashes, 2007 to 2011

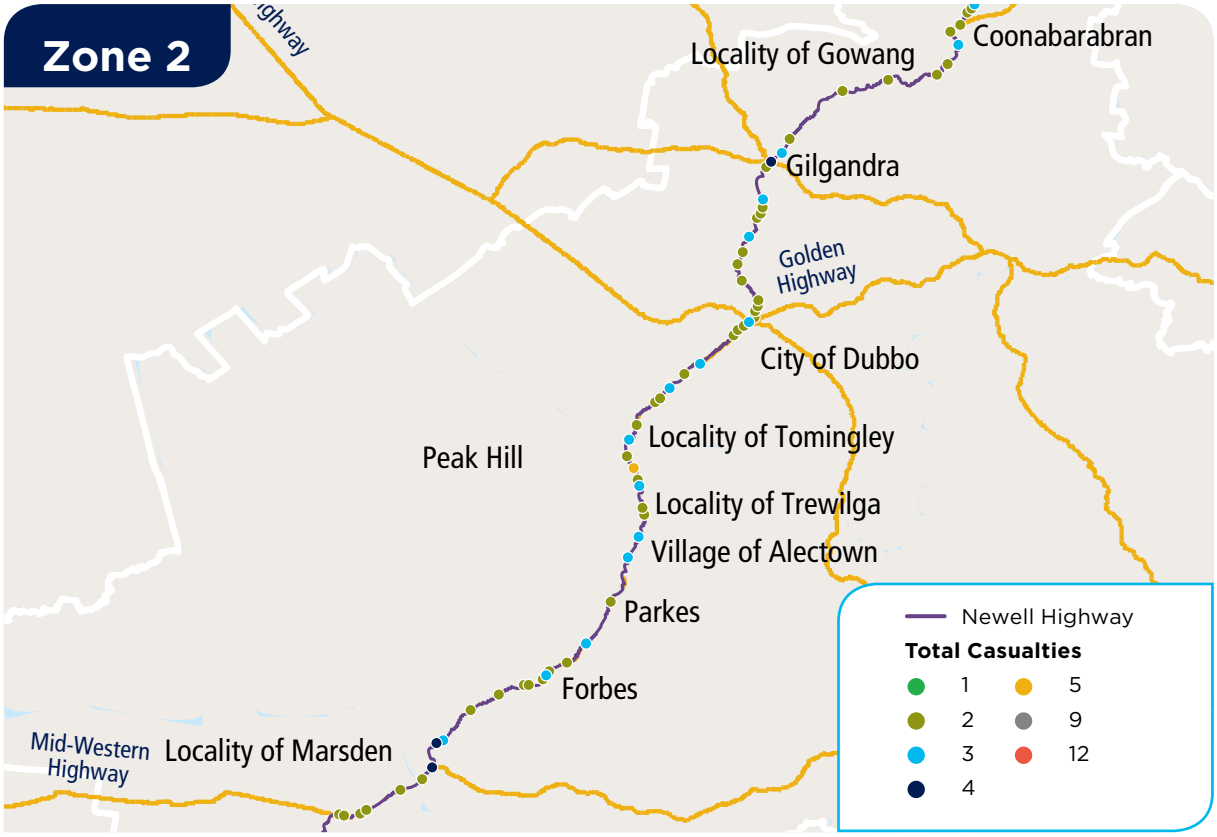


Figure 4.4 (continued) Location and severity of crashes, 2007 to 2011

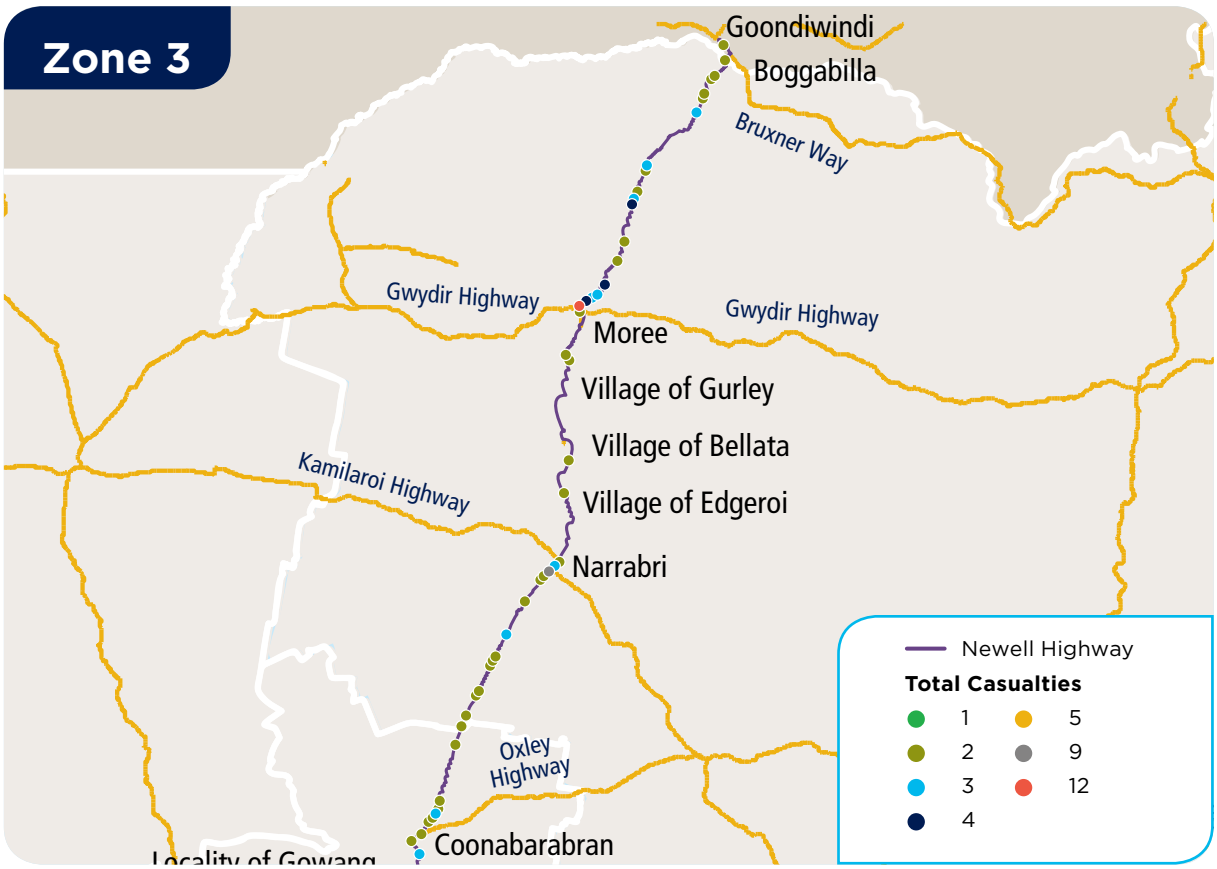
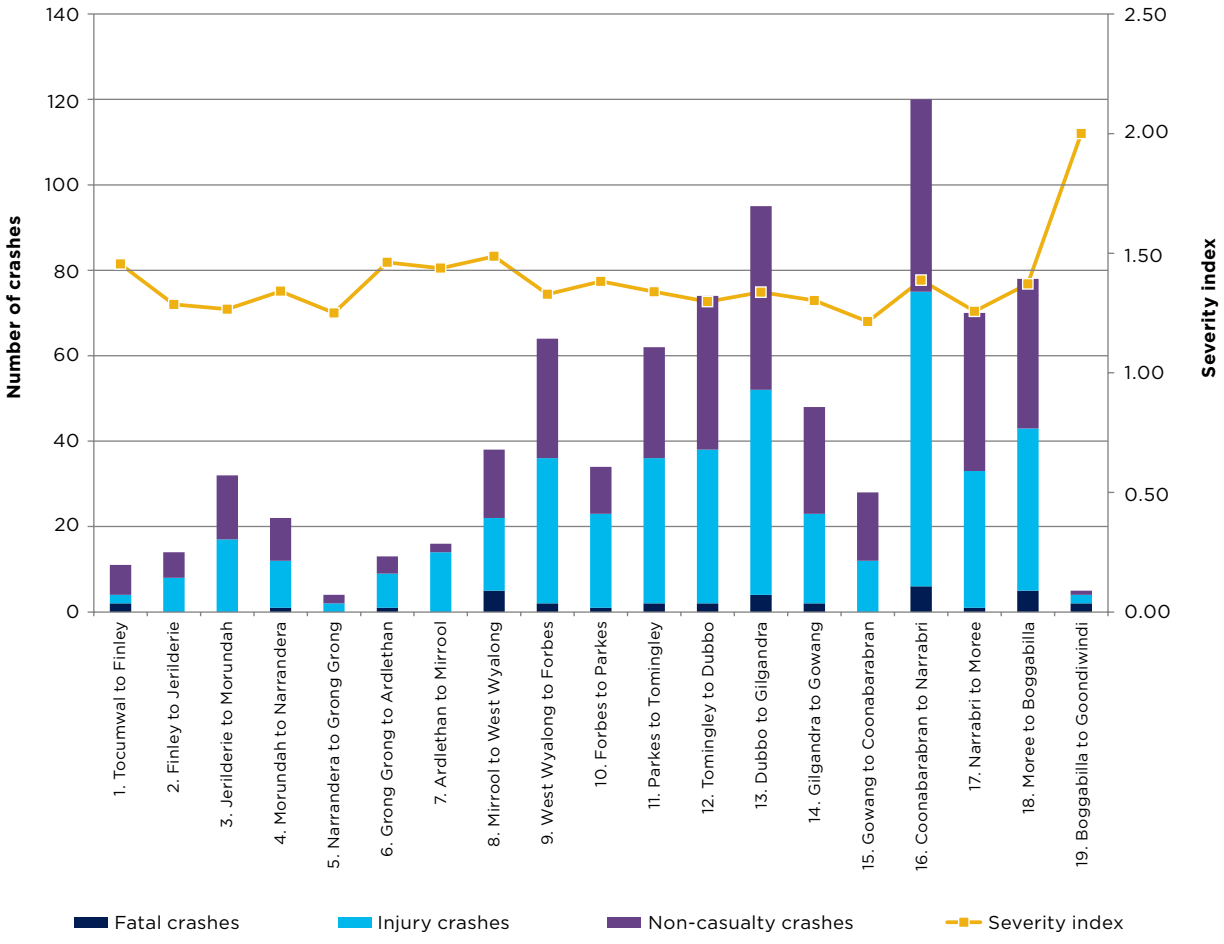


Figure 4.5 Casualty and non-casualty crashes 2007 to 2011



In addition to measuring the number of crashes, a range of other measures have 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 crashes per kilometre.
2. Annual crash rate per 100 million vehicle kilometres travelled (100 MVKT).
3. Severity index.

Casualty crash rates

Table 4.2 sets out the class average for the casualty crash rate on the rural network. Table 4.3 compares annual casualty crash rates per kilometre on the Newell Highway with the NSW class average.

Table 4.2 Network class average performance for the rural road network[30]

Rural hierarchy class	Casualty crash rate per kilometre (2007–2011)
4	0.21

The annual average casualty crash rate per kilometre for the Newell Highway ranges from 0.04 to 0.29. In comparison, the NSW state-wide average annual casualty crash rate per kilometre for Class 4 rural roads is 0.21. This means all planning sections along the Newell Highway, excluding the Tomingley to Gilgandra section, performed better than the rural state-wide average.

30 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, Roads and Maritime Services, Sydney, p.22

Table 4.3 Annual average casualty crash rates per kilometre

Corridor planning section	Newell Highway Corridor (2007 – 2011)	NSW class average (2007 – 2011)
1. Tocumwal to Finley	0.11	0.21
2. Finley to Jerilderie	0.08	0.21
3. Jerilderie to Morundah	0.08	0.21
4. Morundah to Narrandera	0.14	0.21
5. Narrandera to Grong Grong	0.04	0.21
6. Grong Grong to Ardlethan	0.07	0.21
7. Ardlethan to Mirrool	0.13	0.21
8. Mirrool to West Wyalong	0.15	0.21
9. West Wyalong to Forbes	0.12	0.21
10. Forbes to Parkes	0.21	0.21
11. Parkes to Tomingley	0.19	0.21
12. Tomingley to Dubbo	**0.29**	0.21
13. Dubbo to Gilgandra	**0.29**	0.21
14. Gilgandra to Gowang	0.10	0.21
15. Gowang to Coonabarabran	0.15	0.21
16. Coonabarabran to Narrabri	0.20	0.21
17. Narrabri to Moree	0.14	0.21
18. Moree to Boggabilla	0.14	0.21
19. Boggabilla to Goondiwindi	0.14	0.21

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 crashes per 100 million vehicle kilometres travelled is also used. This is particularly useful to compare crash rates on roads that carry higher than average and lower than average traffic volumes.

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

$$\text{Crash rate} = \frac{(\text{No.of crashes} \times 10^8)}{(\text{L.A.365.M})}$$

Where:

L = length in kilometres

A = ADT

M = number of years of crash data

The crash rate on rural sections of the Newell Highway for the five years to December 2011 ranged from zero to 25.5 crashes per 100 million vehicle kilometres travelled (Table 4.4). For urban areas the crash rate reached 70 crashes per 100 million vehicle kilometres travelled (Table 4.5).

Table 4.4 Crashes per 100 MVKT (rural areas)

Corridor planning sections (rural areas)	Crash rates per 100 MVKT
1. Tocumwal to Finley	8.20
2. Finley to Jerilderie	9.99
3. Jerilderie to Morundah	15.92
4. Morundah to Narrandera	18.89
5. Narrandera to Grong Grong	0.00*
6. Grong Grong to Ardlethan	14.49
7. Ardlethan to Mirrool	15.89
8. Mirrool to West Wyalong	19.54
9. (a) West Wyalong to Marsden (b) Marsden to Forbes	9.87
10. Forbes to Parkes	8.95
11. (a) Parkes to Peak Hill (b) Peak Hill to Tomingley	9.73
12. Tomingley to Dubbo	13.18
13. Dubbo to Gilgandra	12.92
14. Gilgandra to Gowang	13.92
15. Gowang to Coonabarabran	**25.53**
16. Coonabarabran to Narrabri	23.37
17. Narrabri to Moree	11.02
18. Moree to Boggabilla	13.61
19. Boggabilla to Goondiwindi	11.11

* No crashes occurred within this section in rural areas

Newell Highway south of Peak Hill

Table 4.5 Crashes per 100 MVKT (urban areas)

Urban areas	Crash rates per 100 MVKT
Tocumwal	36.03
Finley	12.24
Jerilderie	18.31
Morundah	-
Narrandera	32.90
Grong Grong	38.70
Ardlethan	-
Mirrool	-
West Wyalong	**70.03**
Marsden	-
Forbes	19.35
Parkes	38.93
Peak Hill	-
Tomingley	-
Dubbo	33.72
Gilgandra	38.21
Coonabarabran	25.57
Narrabri	24.12
Moree	12.42

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:

$$\text{Severity index} = \frac{(3x+1.5y+z)}{t}$$

Where:

x = number of fatal crashes

y = number of injury crashes

z = number of non-casualty crashes

t = total number of crashes

Table 4.6 shows the severity index for the Newell Highway for the five year period to December 2011. 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 the road being considered).

The severity index for the Newell Highway is equal to or higher than the average for undivided rural roads in NSW (1.25) in all but one section. This suggests that when crashes do occur on the Newell Highway they tend to be more severe than those occurring on similar roads of the same class. This can be attributed to a number of factors, including the high speeds and higher percentage of heavy vehicles along the highway. The short Boggabilla to Goondiwindi section has the highest severity index.

Table 4.6 Crash types and severity

Corridor planning section	Total non-casualty crashes	Injury crashes	Fatal crashes	Severity Index
1. Tocumwal to Finley	7	2	2	1.45
2. Finley to Jerilderie	6	8	-	1.29
3. Jerilderie to Morundah	15	17	-	1.27
4. Morundah to Narrandera	10	11	1	1.34
5. Narrandera to Grong Grong	2	2	-	1.25
6. Grong Grong to Ardlethan	4	8	1	1.46
7. Ardlethan to Mirrool	2	14	-	1.44
8. Mirrool to West Wyalong	16	17	5	1.49
9. West Wyalong to Forbes	28	34	2	1.33
10. Forbes to Parkes	11	22	1	1.38
11. Parkes to Tomingley	26	34	2	1.34
12. Tomingley to Dubbo	36	36	2	1.30
13. Dubbo to Gilgandra	43	48	4	1.34
14. Gilgandra to Gowang	25	21	2	1.30
15. Gowang to Coonabarabran	16	12	-	1.21
16. Coonabarabran to Narrabri	45	69	6	1.39
17. Narrabri to Moree	37	32	1	1.26
18. Moree to Boggabilla	35	38	5	1.37
19. Boggabilla to Goondiwindi	1	2	2	**2.00**
Total for corridor	**365**	**427**	**36**	**1.34**

Crash types

Table 4.7 and Figure 4.6 detail the most prevalent crash types recorded on the Newell Highway during the five year period to December 2011.

Table 4.7 Crash types within the corridor*

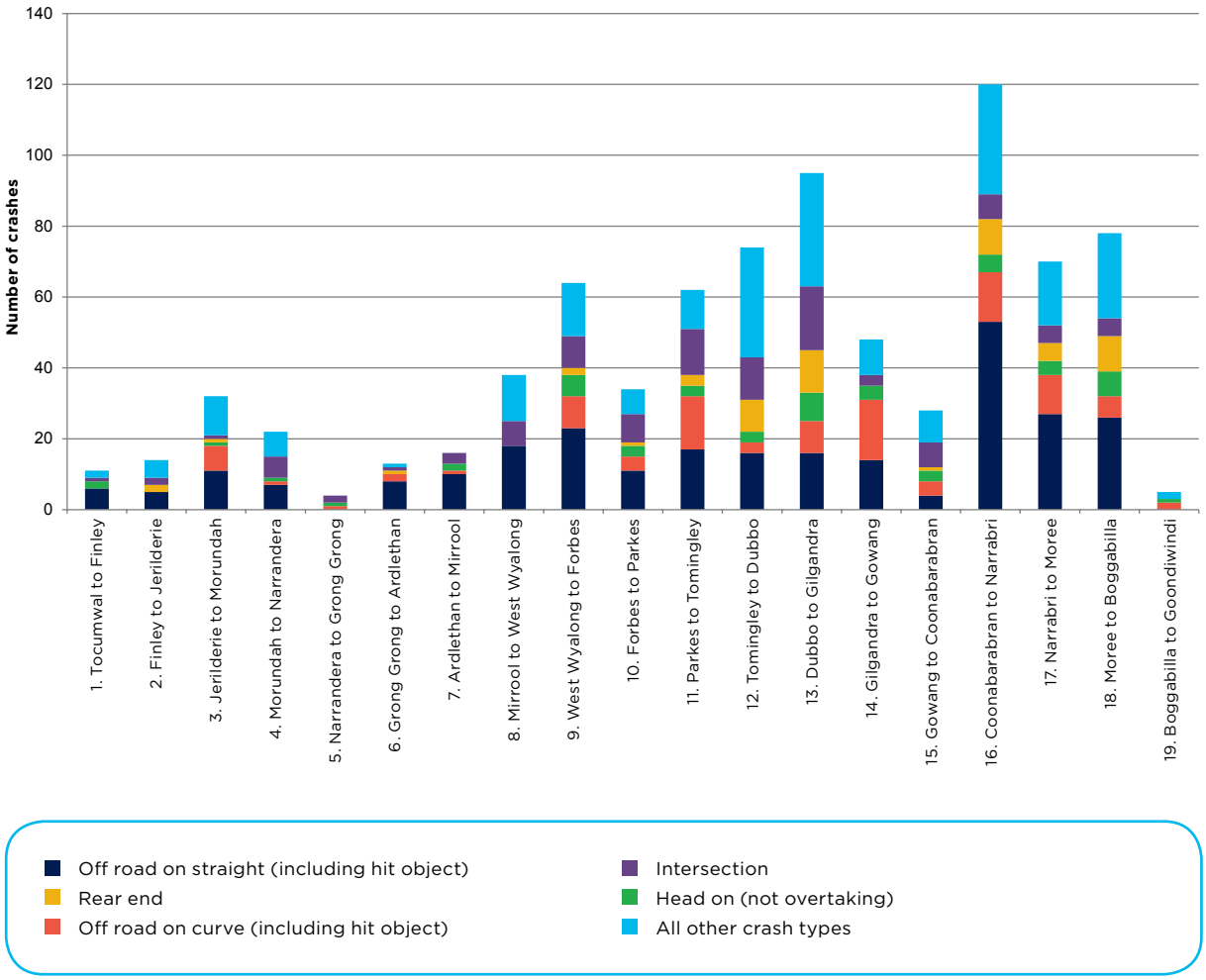
Crash Types	Number of crashes	Per cent of crashes
Off road on straight (including hit object)	272	33%
Off road on curve (including hit object)	106	13%
Head on (not overtaking)	54	7%
Rear end	57	7%
Intersection	110	13%
All other crash types	229	28%

* Some of the crash types have been grouped together

About 46 per cent of all reported crashes on the Newell Highway during this period involved vehicles running off the road either on a straight or a curved section. More specifically, vehicles running off the road on a straight section accounted for 33 per cent of all recorded crashes. Further analysis indicates that in about half of those crashes, the vehicle hit an object. Thirteen per cent of crashes recorded occurred at intersections.

Newell Highway between West Wyalong and Mirrool

Figure 4.6 Crash types, 2007 to 2011



Contributing factors

In analysing road safety information, it is important to draw on as much information as possible about the nature of each crash to determine the potential contributing factors. This information allows Roads and Maritime to understand crash patterns that may be developing on particular roads, and in turn help to formulate responses to prevent these crashes through engineering, maintenance or behavioural strategies.

Table 4.8 and Figure 4.7 summarise the contributing factors recorded for all reported crashes within the five year period to December 2011.

In addition to time of day, road surface, environmental conditions and driver behaviour are key contributing factors to crashes along the Newell Highway. Of the 828 reported crashes on the Newell Highway during the five-year period, 35 per cent had speed, fatigue or alcohol recorded as a contributing factor to the crash.

Of these three contributing factors, speed and fatigue were identified as a contributing factor in 15 per cent and 16 per cent of all crashes along the Newell Highway respectively. 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.

Table 4.8 Contributing factors in crashes on the Newell Highway, 2007 to 2011

Crash factor*	Number of crashes	Per cent of crashes
Heavy vehicle involvement		
Heavy truck crashes (excluding crashes involving a small rigid vehicle)	165	20%
Heavy truck as key vehicle	165	20%
Road surface conditions		
Wet	125	15%
Dry	703	85%
Natural lighting		
Dawn	42	5%
Daylight	555	67%
Dusk	26	3%
Darkness	205	25%
Weather		
Fine	651	79%
Rain	73	9%
Overcast	89	11%
Fog or mist	8	1%
Behavioural factors		
Speeding	122	15%
Fatigue	130	16%
Alcohol	33	4%

* these categories are not mutually exclusive

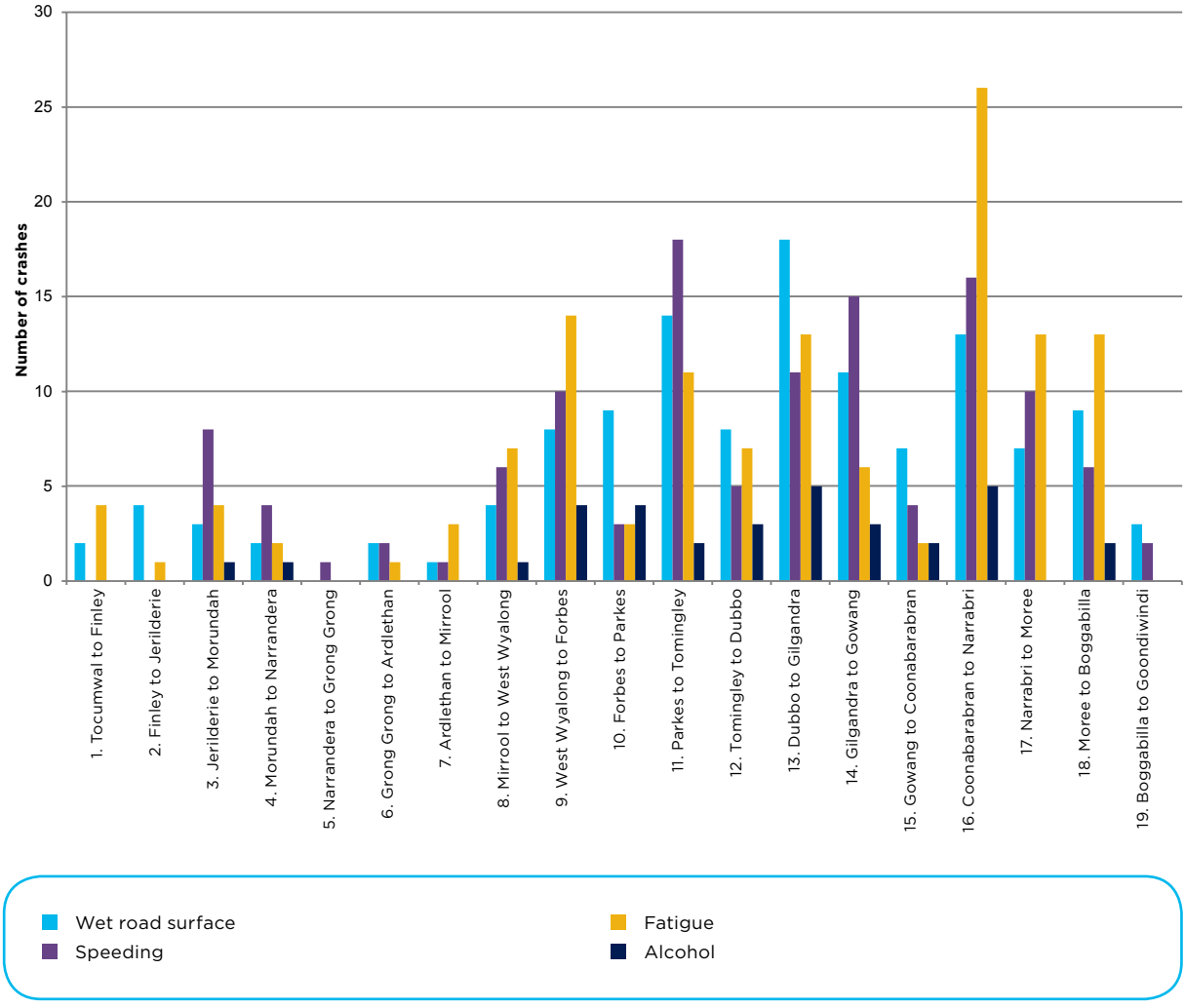
In addition, due to the isolated location of many casualty crashes it is difficult to identify the involvement of speed in all instances. In turn, the number of crashes identifying speed as a factor should be considered a minimum number. Crashes involving fatigue are likely the result of long distances between the origins and destinations on the Newell Highway.

Heavy vehicles were involved in about 20 per cent of all crashes on the corridor. This is generally an under representation of the percentage of heavy vehicles that use the road.

In summary, the road safety performance of the Newell Highway as measured by the casualty crash rate is below the class average when the highway is assessed in its entirety.

Nearly 46 per cent of crashes were off road crash types and 20 per cent of crashes involved either fatigue or alcohol. Heavy vehicles were represented in 20 per cent of crashes. Road safety interventions will continue to focus on managing road, vehicle and behavioural risk factors.

Figure 4.7 Contributing factors in crashes between 2007 to 2011



4.2 Traffic

Traffic volumes

Average Daily Traffic (ADT) volumes along the Newell Highway vary from around 1200 vehicles per day to over 4000 vehicles per day on rural sections (Table 4.9). In the urban centres such as Dubbo, average daily traffic volumes exceed 20,000 vehicles a day.

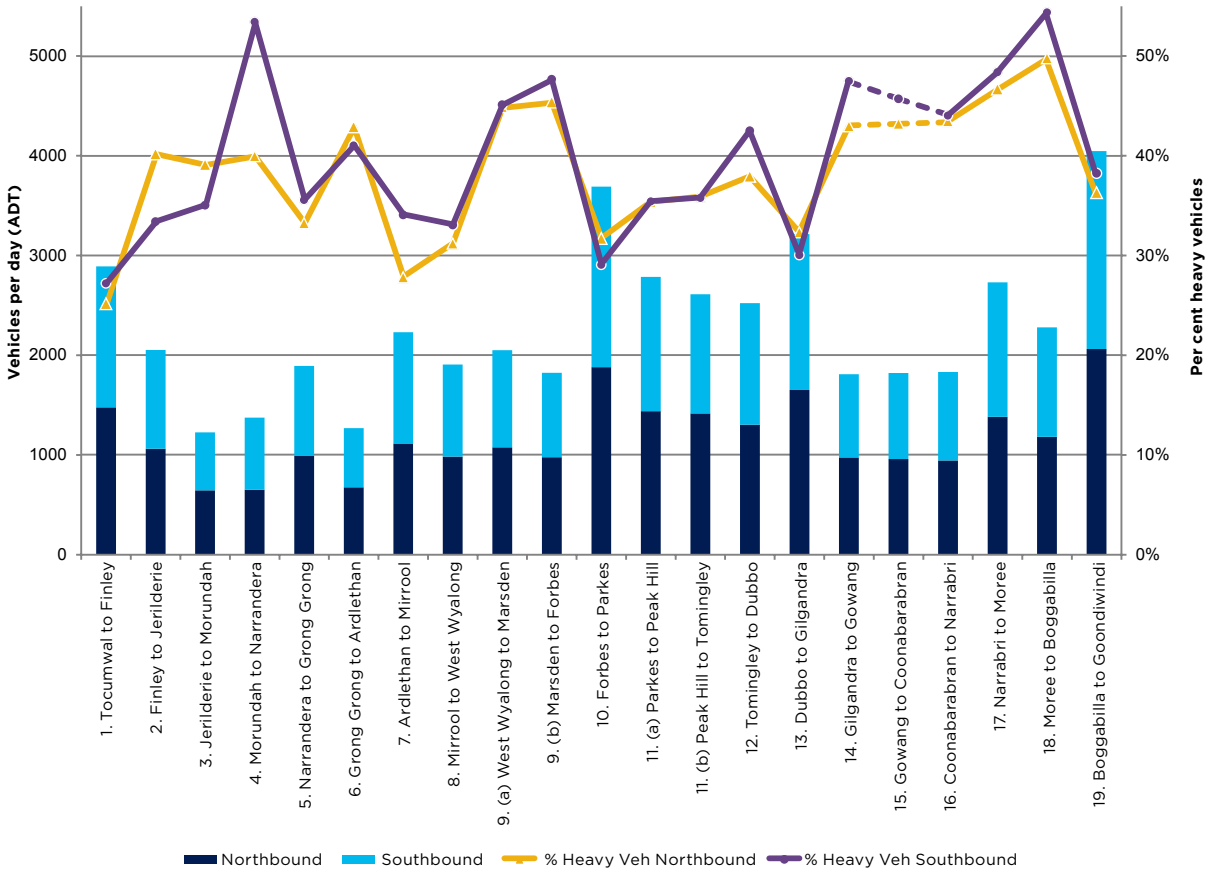
Average daily traffic volumes between towns on the Newell Highway vary considerably. To the south, volumes are lower, ranging from around 1200 vehicles per day (ADT) to around 2900 vehicles per day (ADT) at the Victorian border. Between Forbes and Gilgandra, the ADT is between around 2500 and 3700 vehicles per day. North of Gilgandra the volumes drop back to about 1800 vehicles per day, then increase closer to the Queensland border with the short section between Boggabilla and Goondiwindi reaching over 4000 vehicles per day (Figure 4.8).

Traffic volumes along the Newell Highway increase substantially within urban areas such as Parkes, Dubbo, Narrabri and Moree.

A large number of heavy vehicles use the Newell Highway as it is a key freight route between Victoria and Queensland. The vast majority of B-doubles and semi-trailers are from interstate, while the majority of rigid trucks are from local areas.

Heavy vehicles represent an average of between 26 per cent and 52 per cent of daily traffic volumes on the Newell Highway (Table 4.9). The highest percentage of heavy vehicles is in the northern sections between Narrabri and Boggabilla, and in the rural sections around Narrandera.

Figure 4.8 Average Daily Traffic (ADT) volumes in 2011 (rural sections)



* NB dotted line indicates interpolated data as no actual data available

The highway carries a seasonally high proportion of caravan and tourist traffic travelling between Victoria and Queensland. There is a general northbound increase in caravans at the beginning of winter and the reverse towards the end of winter. There are between 50 and 100 caravans per day during this time, which are primarily registered in other states.

Table 4.9 Average Daily Traffic (ADT) volumes in 2011 (rural sections)

Highway planning section (rural)	ADT (vehicles per day)	Average heavy vehicle ADT	Per cent heavy vehicles
1. Tocumwal to Finley	2891	756	26%
2. Finley to Jerilderie	2053	758	37%
3. Jerilderie to Morundah	1225	456	37%
4. Morundah to Narrandera	1375	647	47%
5. Narrandera to Grong Grong	1893	650	34%
6. Grong Grong to Ardlethan	1270	534	42%
7. Ardlethan to Mirrool	2231	690	31%
8. Mirrool to West Wyalong	1907	512	32%
9. West Wyalong to Forbes	2050	922	45%
10. Forbes to Parkes	3690	1122	30%
11. Parkes to Tomingley	2785	986	35%
12. Tomingley to Dubbo	2522	1012	40%
13. Dubbo to Gilgandra	3214	1003	31%
14. Gilgandra to Gowang	1809	815	45%
15. Gowang to Coonabarabran	1821	808	44%
16. Coonabarabran to Narrabri	1833	802	44%
17. Narrabri to Moree	2730	1297	48%
18. Moree to Boggabilla	2280	1185	52%
19. Boggabilla to Goondiwindi	4048	1508	37%

* NB underlined figures indicate interpolated data as no actual data available

B-double negotiating Clarinda St and Mitchell St intersection at Parkes

Heavy vehicles on the Newell Highway at Bellata south of Moree

Number of lanes and level of service

The 'level of service' a road provides 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 and proportion of heavy vehicles (Figure 4.9), terrain and frequency of intersections. Levels of service range from 'A' to 'F' (Table 4.10), with 'A' representing free-flowing traffic and 'F' representing severe congestion.

Level of service is also related to the number of lanes in each direction on a road and the number of overtaking lanes. An Overtaking Lane Study undertaken in 2011[31] identified potential locations for additional overtaking lanes along the Newell Highway, determined by measuring the current level of service along the corridor. In that study, the performance of the highway was modelled for 19 sections between urban centres.

Rural – Level of service

Under peak hour traffic conditions, northbound traffic on the Newell Highway generally operates at level of service of 'B' south of Parkes and level of service 'C' north of Parkes. Southbound traffic on the Newell Highway north of Parkes generally operates at a level of service 'C'. South of Parkes, the level of service experienced by southbound traffic is mostly 'A', apart from the section between West Wyalong and Forbes. Details of the level of service analysis are presented in Table 4.11 and Table 4.12.

Urban – Level of service

Urban level of service was not measured because there is not considered to be any urban sections with unstable flow conditions. The level of service along urban sections is estimated to vary from 'B' in small centres to 'C' in larger centres. Level of service is generally only an issue at urban intersections such as the intersection with the Mitchell Highway in Dubbo where delays currently occur.

Generally Parkes is estimated to have a level of service 'C' but the rail crossing in town can cause significant congestion issues. Dubbo has an estimated level of service 'C' at the northern end of the town that has potential to deteriorate to level of service 'D' sometime in the future.

These results suggest the current two lane highway with overtaking opportunities provides sufficient capacity to accommodate both current traffic volumes and projected short to medium term increases.

31 Cardno for Roads and Maritime Services 2011, *Newell Highway: Potential Overtaking Lanes Study*, Roads and Maritime Services, Sydney

Table 4.10 Level of service definitions

Level of service	% time following	Description
A	Less than 40%	Free flow conditions. Drivers are virtually unaffected by others in the traffic stream. Ease of selection of desired speed and manoeuvrability. General level of comfort and convenience is excellent.
B	40-55%	Stable flow conditions. Reasonable ease of selection of desired speed and manoeuvrability. General level of comfort and convenience is a little less than for LOS A.
C	55-70%	Stable flow conditions. Restricted selection of desired speed and manoeuvrability. General level of comfort and convenience declines noticeably at this level.
D	70-85%	Approaching unstable flow conditions. Severely restricted selection of desired speed and manoeuvrability. General level of comfort and convenience is poor. Small increases in traffic will generally cause operational problems.
E	Greater than 85%	Unstable flow conditions, with traffic volumes at or close to capacity. Virtually unable to select desired speed and manoeuvre. Minor disturbances will cause breakdown.
F	Volume greater than capacity	Forced flow conditions, with traffic volumes exceeding capacity. Flow breakdown resulting in queuing and delays.

Figure 4.9 Newell Highway peak hour traffic volumes in 2011

* Dotted line indicates interpolated data as no actual data available

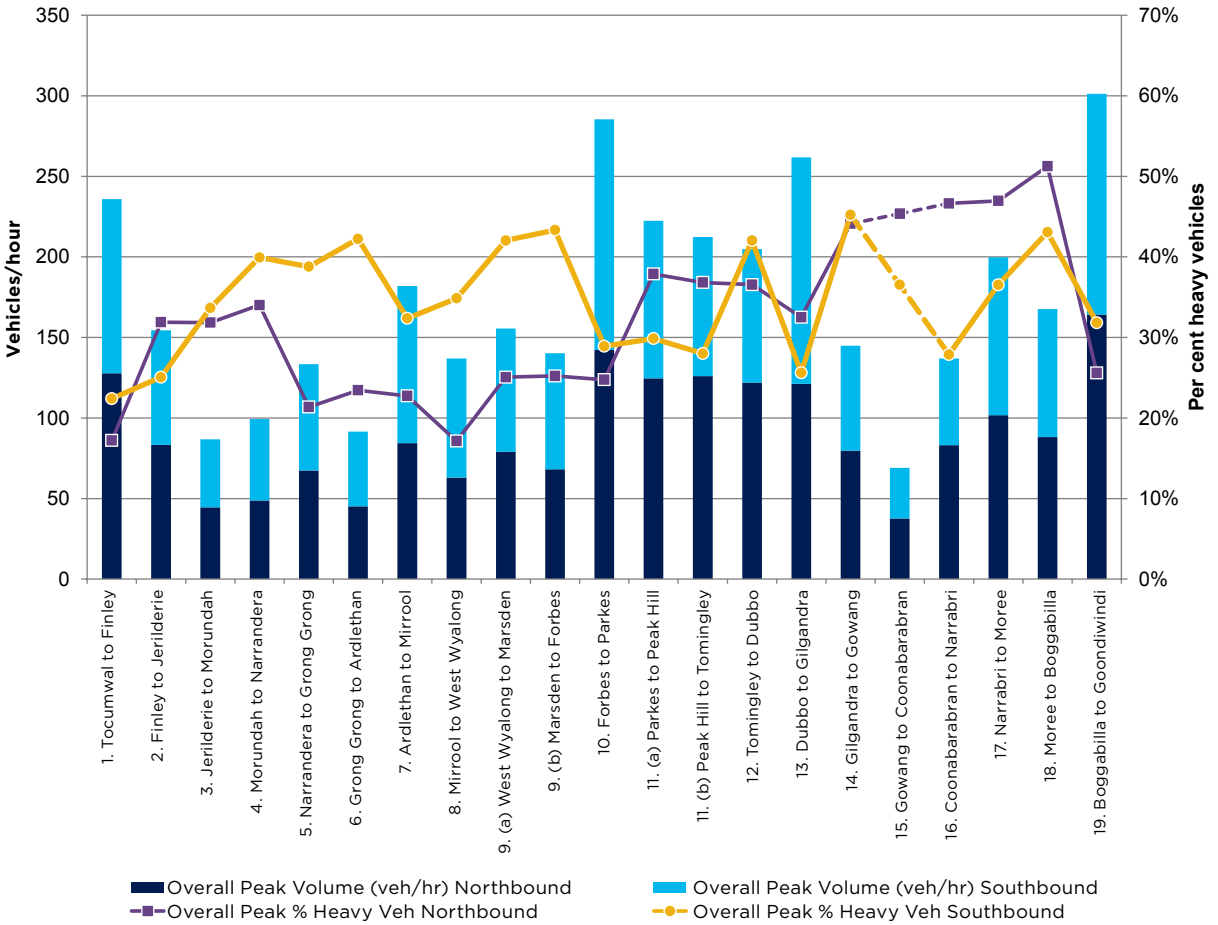


Table 4.11 2010 highway performance – northbound[32]

Highway planning section	Maximum % following	Level of Service
1. Tocumwal to Finley	39.4	A
2. Finley to Jerilderie	48.7	B
3. Jerilderie to Morundah	46.9	B
4. Morundah to Narrandera	39.1	A
5. Narrandera to Grong Grong	46.3	B
6. Grong Grong to Ardlethan	40.1	B
7. Ardlethan to Mirrool	42.8	B
8. Mirrool to West Wyalong	49.6	B
9. (a) West Wyalong to Marsden (b) Marsden to Forbes	65.1	C
10. Forbes to Parkes	53.8	B
11. (a) Parkes to Peak Hill (b) Peak Hill to Tomingley	58.1	C
12. Tomingley to Dubbo	47.5	B
13. Dubbo to Gilgandra	49.6	B
14. Gilgandra to Gowang	57.7	C
15. Gowang to Coonabarabran	65.4	C
16. Coonabarabran to Narrabri	61.6	C
17. Narrabri to Moree	65.5	C
18. Moree to Boggabilla	64.3	C
19. Boggabilla to Goondiwindi	54.5	B

Table 4.12 2010 highway performance – southbound[33]

Highway planning section	Maximum % following	Level of Service
1. Tocumwal to Finley	38.5	A
2. Finley to Jerilderie	41.4	B
3. Jerilderie to Morundah	45.1	B
4. Morundah to Narrandera	39.8	A
5. Narrandera to Grong Grong	38.5	A
6. Grong Grong to Ardlethan	35.1	A
7. Ardlethan to Mirrool	46.4	B
8. Mirrool to West Wyalong	37.2	A
9. (a) West Wyalong to Marsden (b) Marsden to Forbes	73.3	D
10. Forbes to Parkes	59.0	C
11. (a) Parkes to Peak Hill (b) Peak Hill to Tomingley	61.6	C
12. Tomingley to Dubbo	37.0	A
13. Dubbo to Gilgandra	51.1	B
14. Gilgandra to Gowang	57.0	C
15. Gowang to Coonabarabran	46.2	B
16. Coonabarabran to Narrabri	47.0	B
17. Narrabri to Moree	62.9	C
18. Moree to Boggabilla	56.9	C
19. Boggabilla to Goondiwindi	56.3	C

32 ibid., p. 30

33 ibid., p. 31

Overtaking opportunities and level of service

Providing overtaking lanes and other opportunities to pass slower vehicles improves travel time and level of service. In addition, overtaking opportunities reduce driver frustration and unsafe behaviour, also reducing the risk of road trauma.

The decision to construct an overtaking lane depends on the level of service of the road, the traffic volumes, percentage of slow vehicles, including light trucks and cars towing a load and the availability of overtaking opportunities on adjoining sections.

There are currently 54 overtaking lanes spanning 70.8 kilometres along the length of the Newell Highway, comprising 29 northbound lanes (42.3 kilometres) (Figure 4.10) and 25 southbound lanes (28.5 kilometres) (Figure 4.11).

The Newell Highway includes one kilometre of northbound overtaking lane per 32 kilometres of highway. At the time of investigation the average spacing between northbound overtaking lanes was 34.2 kilometres, however, the spacing varied from 1.9 kilometres to 240.2 kilometres.

There is one kilometre of southbound overtaking lane per 42 kilometres of highway. The average spacing between southbound overtaking lanes was 39 kilometres, however, the spacing varied from 3.6 kilometres to 201.4 kilometres.

Overtaking on the opposite side of the road is permitted in NSW on undivided roads where there is a broken centre line adjacent to the direction of travel.

Overall, 79 per cent of the Newell Highway provides overtaking opportunities (refer to Table 4.13). The percentage of overtaking opportunities varies from 45 per cent to 95 per cent across the planning sections.

Roads and Maritime Network Performance Measures and Network Planning Targets[34] recommend an overtaking lane should be provided at locations where 65 per cent of time is spent following other vehicles or the level of service is 'C' or lower. Where the annual average proportion of heavy vehicles on a road is 50 per cent or more, the time spent following other vehicles is reduced to just 50 per cent. There are some locations along the Newell where the proportion of heavy vehicles is 50 per cent or more.

B-double overtaking Road Train

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

Figure 4.10 Existing northbound overtaking lanes

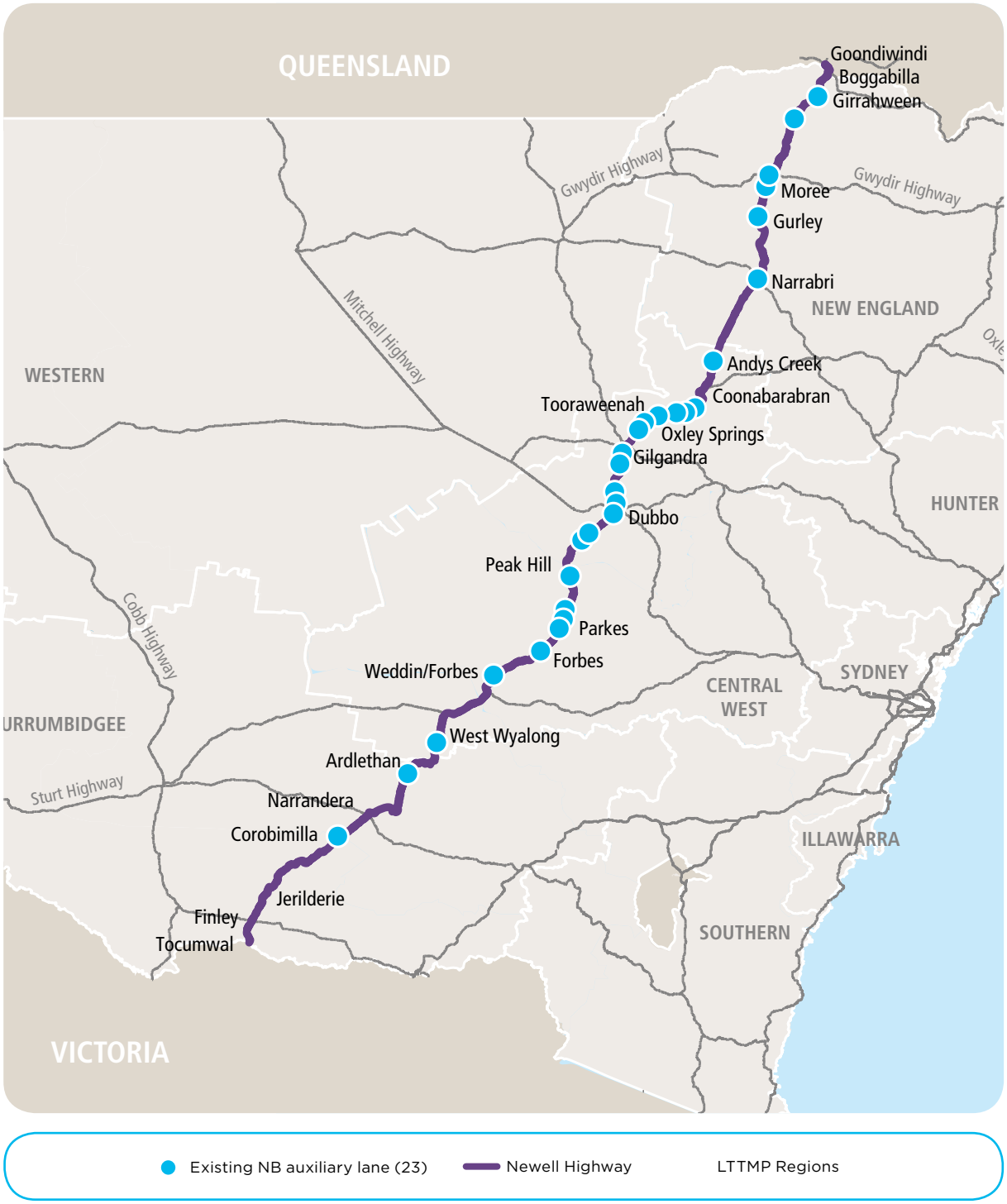


Figure 4.11 Existing southbound overtaking lanes

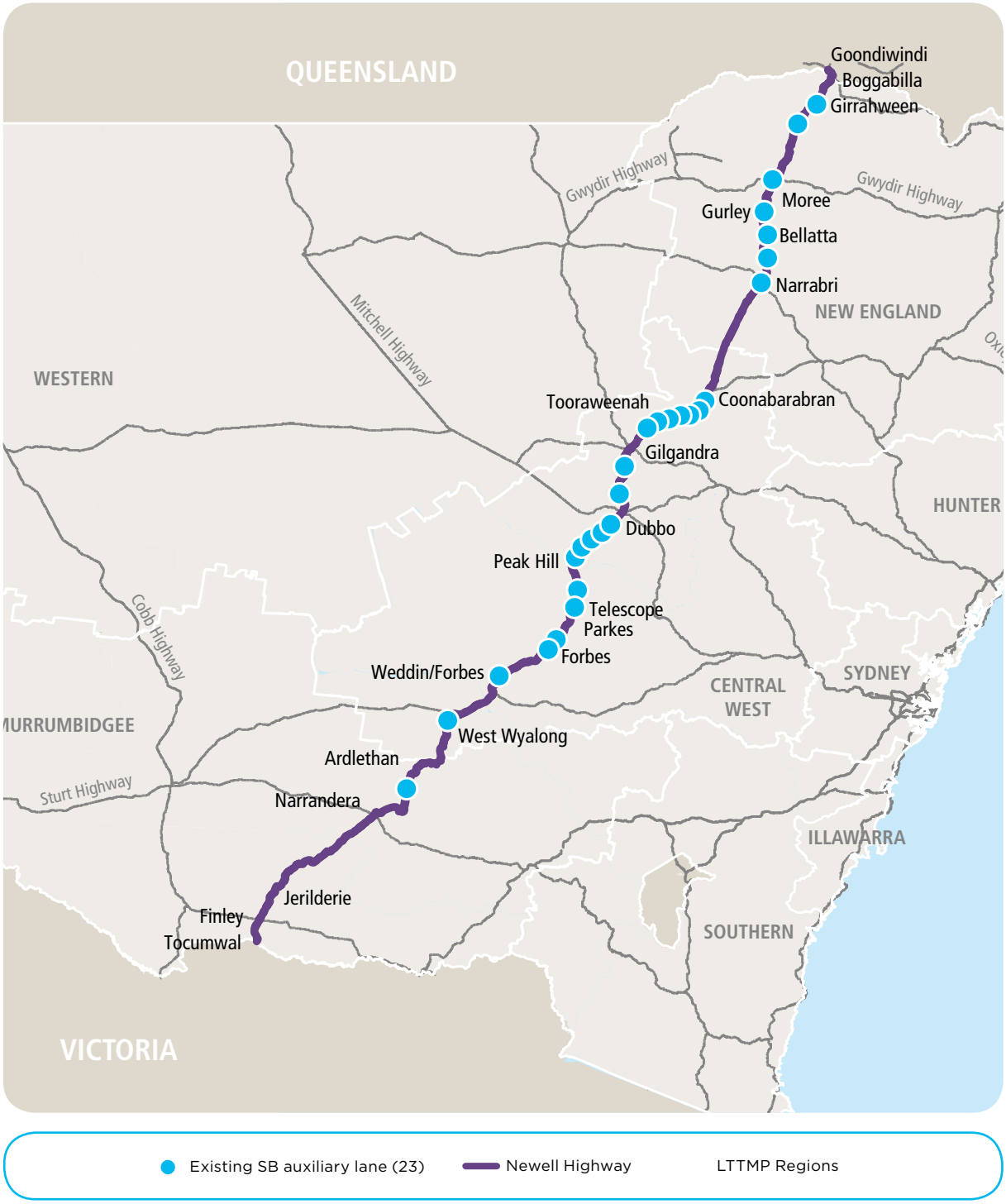


Table 4.13 Overtaking opportunities

Highway planning section	% of section with overtaking opportunities
1. Tocumwal to Finley	92.5%
2. Finley to Jerilderie	95%
3. Jerilderie to Morundah	95.5%
4. Morundah to Narrandera	77.5%
5. Narrandera to Grong Grong	83%
6. Grong Grong to Ardlethan	81%
7. Ardlethan to Mirrool	65%
8. Mirrool to West Wyalong	76%
9. (a) West Wyalong to Marsden (b) Marsden to Forbes	92.5%
10. Forbes to Parkes	53.5%
11. (a) Parkes to Peak Hill (b) Peak Hill to Tomingley	71%
12. Tomingley to Dubbo	56%
13. Dubbo to Gilgandra	70.5%
14. Gilgandra to Gowang	61%
15. Gowang to Coonabarabran	45%
16. Coonabarabran to Narrabri	79%
17. Narrabri to Moree	86.5%
18. Moree to Boggabilla	91.5%
19. Boggabilla to Goondiwindi	62%
Overtaking allowed (by length)	79%

The Newell Highway analysis was undertaken using traffic modelling software, Traffic on Rural Roads (TRARR). TRARR analyses traffic flow on interrupted two lane rural road segments. Each vehicle's progress is measured at one second intervals. The TRARR model can be used to simulate bunching and the percentage of vehicles following due to slower freight vehicles, for example, on steeper grades where there are no overtaking opportunities.

The simulated maximum per cent of vehicles following in each section of the highway ranged from 39 per cent to 66 per cent in the northbound direction (Table 4.11), and 35 per cent to 73 per cent in the southbound direction (Table 4.12). Average travel speeds for each section of the highway were estimated to vary from 82 km/h to 94 km/h in the northbound direction, and 81 km/h to 93 km/h in the southbound direction.

The results of this analysis are set out in the Newell Highway Potential Overtaking Lanes Study (2011)[35]. The highway's current performance was modelled for 19 sections between urban centres.

Typical agricultural vehicle on the Newell Highway

35 Cardno for Roads and Maritime Services 2011, *Newell Highway: Potential Overtaking Lanes Study*, Roads and Maritime Services, Sydney

The study identified five sites within four sections along the Newell Highway that do not meet the rural network planning targets for the provision of overtaking lanes. The sections that did not meet the target are set out in Figure 4.12. Three northbound sections and one southbound section of the Newell Highway have a modelled performance greater than 65 per cent of vehicles following. One additional northbound section had more than 50 per cent of heavy vehicles and more than 50 per cent of vehicles following (Table 4.14).

Table 4.14 Sections that do not meet the network planning target for overtaking lanes

Location	Maximum % following	Proportion of heavy vehicles (ADT)
Northbound between West Wyalong and Forbes	65.1	42%
Northbound between Gowang and Coonabarabran	65.4	35%
Northbound between Narrabri and Moree	65.5	43%
Northbound between Moree and Boggabilla	64.3	51%
Southbound between West Wyalong and Forbes	73.3	41%

A number of other sections are approaching these figures and are expected to meet them in the medium term, due to continued traffic growth. In addition the Study found that the highway was:

"a two-lane rural road with infrequent overtaking lanes. Local residents have suggested that additional overtaking lanes are required along the highway to improve operating performance and safety."[36]

The main criteria of the Newell Highway Potential Overtaking Lane Study for the selection of overtaking lane locations were as follows[37]:

- Per cent time spent following – locations that would address a high per cent following (generally assumed to be 40 per cent)
- Spacing – long distances between existing overtaking lanes
- Geometry – consideration for horizontal and vertical curvature (sight distance)

A first pass assessment of each individual highway section was undertaken, overtaking lanes were added if the per cent time spent following within the section was generally above 40 per cent.

A second pass added overtaking lanes to lengths with a large spacing between existing and/or potential overtaking lanes. This process was continued until there were a total of 100 existing and/or potential overtaking lanes, resulting in an average spacing of approximately 10 kilometres between overtaking lanes in either direction along the length of the highway. The study found an additional 57 overtaking lanes should be provided, 28 northbound and 29 southbound.

Potential locations were grouped by priority, based on key performance measures. There were[38]:

- 16 high priority locations
- 18 medium priority locations
- 23 lower priority locations.

Providing these lanes will provide more frequent overtaking opportunities along the route.

36 ibid., p. 4

37 ibid., p. 40

38 ibid., p. 59

Figure 4.12 Sections of the Newell Highway that do not meet the network planning target for the provision of overtaking lanes

Bunching of heavy vehicles south of Coonabarabran

Pavement widening road works at Yarrabah

Recently constructed overtaking lane north of Narrabri

Intersection with Newell Highway at Grong Grong

Heavy vehicle turning at intersection of Bruxner Way and Newell Highway near Boggabilla

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, the road network and infrastructure.

Incident Response Plans (IRPs) have been developed for the Newell Highway to minimise the impact of any road closures and to reduce the risk of secondary incidents. The incident's location determines which IRP is implemented at the time. IRPs can be used to deal with extended disruptions as a result of a motor vehicle crash, bushfire or flooding, such as recent events at Narrandera and Moree.

Developed by Roads and Maritime in consultation with councils and NSW Police, there are 76 IRPs for the Newell Highway. Specifically, 26 IRPs cover the area from Tocumwal to Marsden and 50 Draft IRPs cover the area from Marsden to the Queensland Border.

IRPs are designed to support a total closure of the highway 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.

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 minimise travel time delays. The regional VMS strategy has identified a need for more signs to improve incident management.

The Newell Highway is the primary diversion route in the event of an incident requiring closure of the following State roads:

- Riverina Highway
- Kidman Way
- Sturt Highway
- Burley Griffin Way
- Goldfields Way
- West Wyalong Bypass Road
- Mid Western Highway
- Lachlan Valley Way
- The Escort Way
- Henry Parkes Way
- Mitchell Highway
- Golden Highway
- Castlereagh Highway
- Oxley Highway
- Kamilaroi Highway
- Gwydir Highway.

The length of detours within these IRPs ranges from one kilometre to 492 kilometres, with average detour lengths of between 20 and 285 kilometres, depending on the section of the corridor (Table 4.15).

Table 4.15 Incident management detour lengths

Detour	Average length	Shortest detour	Longest detour
Tocumwal to Finley	20 km	4 km	69 km
Finley to Jerilderie	65 km	1.5 km	142 km
Jerilderie to Narrandera	56 km	1 km	138 km
Narrandera to West Wyalong	53 km	1 km	106 km
West Wyalong to Parkes	65 km	30 km	109 km
Parkes to Dubbo	81 km	23 km	146 km
Dubbo to Gilgandra	90 km	60 km	115 km
Gilgandra to Moree	187 km	28 km	455 km
Moree to Goondiwindi	285 km	117 km	492 km

Regional centres and town bypasses

The Newell Highway corridor has developed as a series of links between towns and centres, enabling both inter-regional travel and access for local trips. Over time, as town centres have developed along the Newell Highway, local traffic volumes have increased and its increasing interaction with inter-regional traffic has started to impact on the road's efficiency and safety. The growing number of vehicles within towns, including freight vehicles, increases localised congestion and traffic delays and increases the potential for excessive noise pollution, particularly due to heavy vehicle engine breaking.

Town bypasses can be a solution to this problem and can improve travel within towns, reduce delay for freight vehicles and improve road safety, by reducing conflict points between local and through traffic and between vehicles and pedestrians. In combination with this, the NSW Government funded Noise Abatement Program being delivered by Roads and Maritme can provide treatment for homes and places of community interest heavily affected by traffic noise pollution.

The *NSW Long Term Transport Master Plan*[39] prioritises a program of town bypasses to improve travel within towns, reduce delays caused to freight traffic and increase safety. Assessing town bypass proposals involves considering[40]:

- **The road's hierarchy classification**. Higher-order roads carry higher levels of through-traffic and generate greater benefits than other areas where volumes are much lower. For example, the Hume Highway (M31) and Pacific Highway (M1) have the highest classification, and roads such as the Silver City Highway (B79) and Kings Highway (B52) have the lowest road hierarchy classification.
- **Proportion of through-traffic for both light and heavy vehicles.**
- **Travel time benefits**
- **Town or regional centre size**. Large towns tend to experience many local trips, which can impact through-traffic and create localised congestion.
- **Difficult terrain, major rivers and urban development**. These factors impact project cost and influence the decision to prioritise a particular bypass.
- **Dispersed urban development.** This limits town bypass options, as does the nature of development next to the corridor. A bypass is more likely to be provided on higher order roads next to commercial development, such as shops and businesses.

Bypasses may also be provided to improve HPV access or to achieve flood immunity.

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

39 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney, p. 242

40 ibid., p. 244

- **Full bypass.** This is where the road corridor has controlled access to the town. This can mean it is separate to the town itself or runs alongside – or parallel to – a corridor through the centre of town. 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. Stage 1 of the Moree Bypass was an example of a full bypass on the Newell Highway.
- **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 through and local traffic are lower. This option is less expensive than a full bypass. Inner bypasses can be seen on the Newell Highway through Parkes and through Dubbo.
- **Heavy vehicle bypass.** This is where heavy vehicle traffic is directed away from the main street however all other local and through-traffic can continue to use the existing road. 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. An example is the West Wyalong Heavy Vehicle Bypass.

Table 4.16 identifies the Newell Highway corridor's town bypass priorities over the next 20 years.

Table 4.16 Priorities for town bypasses

Town	Short term
Moree	Construction of stage 2 of Moree bypass commenced September 2014. Completion is scheduled for early 2016.
West Wyalong	Widen existing intersections, realign curves near rail crossing and re-build pavement to the appropriate standard for Heavy Vehicle Bypass removing through-traffic from the main street of the town centre. Consideration is to be given for the heavy vehicle connection between the Mid Western and Newell Highways once the bypass is operational. This is an upgrade of an existing heavy vehicle bypass.
Parkes	The planning for a Newell Highway bypass of Parkes is a short term priority with the longer term aim of allowing HPV access around the town to be realised. $2m has been allocated in the 2014/15 state budget for the investigation and detailed design of the preferred option. Parkes Shire Council has undertaken preliminary investigations into a Western Ring Road as an option for the bypass. The bypass would avoid two level rail crossings and three intersections, which currently prevent HPVs from using this section of the Newell Highway.
Town	**Medium term**
Coonabarabran	A preferred corridor has been identified, however further investigation of this corridor is required. Commence planning of preferred bypass option, including detailed design.
Town	**Longer term**
Dubbo	A bypass of Dubbo may need to be considered in the longer term as an option to address flood impacts of the Macquarie River. Dubbo City Council has proposed a 'Freightway' ring road, using existing road alignments with improved river crossings, for consideration as a cost effective method of future proofing the Dubbo town centre.

4.3 Heavy vehicles on the Newell Highway

In a recent report on truck productivity, the Bureau of Infrastructure, Transport and Regional Economics emphasised the influence the freight transport sector has on national productivity and efficiency:

"Improvements in freight productivity and efficiency reduce the cost of moving freight, adding directly to national economic output."[41] 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 for access applications. The NHVR will consider requests for access and liaise with road managers, both Roads and Maritime and local councils, to grant access.

Heavy vehicles are particularly important to consider along the Newell Highway corridor. This is both because of its role as a vital transport link between Australia's second and third largest cities, and because freight productivity is expected to nearly double over the next 20 years[42]. This aspect of future challenges for the next 20 years is discussed in more detail in Chapter 5.

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.

Types of heavy 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 A).

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[43].

Restricted access vehicles

Any vehicle which 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 suitably assessed and approved routes.

These vehicles are also referred to as Higher Productivity Vehicles (HPVs). B-triples, which have 12 plus axles with five axle groups and AB-triples which have 14 plus axles with six axle groups are part of the Roads and Maritime Road Train Modernisation Program, which aims to provide a newer and safer group of vehicles operating with modern road friendly suspension and enrolled in the Intelligent Access Program

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

42 Hyder Consulting for Transport for NSW 2011, *NSW Freight Supply Chain Study – Hunter, Northern, Western Regions*

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

(IAP), tracking heavy vehicle movements, to supplement and eventually replace double road trains.

19 metre long B-doubles not greater than 4.3 metres high (including its load) and carrying less than 50 tonnes are allowed on all roads in NSW, including the Newell Highway.

Any vehicle which exceeds these overall dimensions, as defined in the *Road Transport (Registration) Regulation 2007,* are subject to special operating conditions.

For example, throughout NSW road trains can only travel along approved routes. These approved routes cater for different sized road trains (refer to Figure 4.13), specifically:

- Double road trains must not exceed 36.5 metres in length
- A road train must not exceed 4.3 metres high, unless it complies with conditions set out in the 4.6 Metre High Vehicle Route Notice 2008. In that instance, a road train may then be loaded up to 4.6 metres high.

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) or agricultural machines/implements. These vehicles require assessment for a permit before being allowed onto the network.

Sections of the Newell Highway pass through geographic areas where RAVs have unrestricted access to roads, unless a particular road has further restrictions or exemptions. The following RAVs are only allowed on certain parts of the Newell Highway.

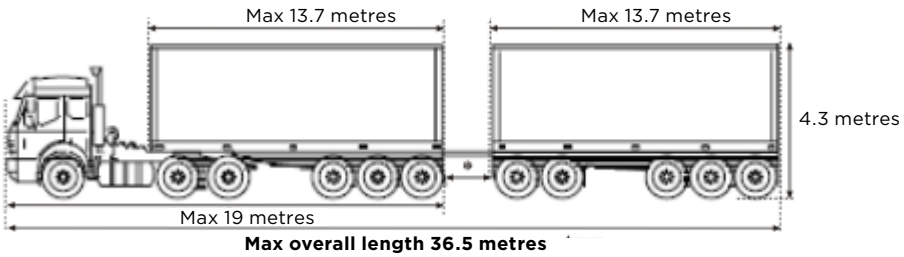
26 metre B-doubles are currently allowed on the entire length of the Newell Highway, except through the urban commercial centre of West Wyalong, where B-doubles and Higher Mass Limit (HML) vehicles travel around the town on a Heavy Vehicle Bypass. **Double road trains, B-triples and AB-triples** are allowed along the following lengths of the Newell Highway:

- Double road trains (not PBS vehicles)[44]:
  - Tocumwal to Narrandera
  - Lachlan Valley Way at Forbes to Back Yamma Road at Daroobalgie
  - In the Village of Tomingley
  - Dubbo to Gilgandra
  - Coonabarabran to Goondiwindi.

All the double road train routes can also be accessed by modular B-triples but they need to operate under the Intelligent Access Program. This is consistent with the restrictions to heavy vehicle access to the east of the Newell Highway.

- B-triples and AB-triples (modern PBS vehicles):
  - Tocumwal to Morundah
  - Dubbo to Gilgandra
  - Narrabri to Goondiwindi.

Figure 4.13 Double road train maximum dimensions



Max overall length 36.5 metres

For converter dolly (located between the two trailers) distance must be more than 3 metres, but not more than 5 metres

44 A double road train route was gazetted in 2007 for around 1 km section south from the intersection of the Newell Highway with the Tomingley Narromine Road.

Triple road trains are not allowed on any parts of the Newell Highway.

In the longer term, the vision for the Newell Highway is to provide access for Performance Based Standard (PBS) class 3(a) vehicles (up to 36.5m long) along the entire length, while progressively phasing out the use of double road trains.

Higher Productivity Vehicles intersection access

The dimensions of restricted access vehicles can at times mean they are unable to negotiate the road network at specific intersections. Therefore, in expanding the freight vehicle network, the ability of an intersection to accommodate turning vehicles must be assessed.

Roads and Maritime assessed the geometry of intersections along the Newell Highway where turning was required to stay on the highway. The purpose was to assess the ability of HPVs to manoeuvre through these intersections. The assessment was based on a 'swept path' analysis for a range of typical vehicle dimensions.

Twenty-eight intersections and tight bends were assessed and Table 4.17 outlines the degree to which each heavy vehicle class can turn through an intersection, while still maintaining minimum clearances. The assessment found:

- Seven out of 28 intersections could not accommodate a B-Triple (36.5 metres)
- Four out of 28 intersections could not accommodate an AB-Triple (36.5 metres) or double road train (36.2 metres)
- Four out of 28 intersections could not accommodate a double road train (36.2 metres)
- Two out of 28 intersections could not accommodate a double road train (32.84 metres with tri-axle dollys).

Potential intersection improvements required for adequate HPV access

Intersection with the Bruxner Way: The intersection with the Bruxner Way at Boggabilla is currently approved for B-triple, AB-triple and double road train use. This intersection was assessed under previous criteria and with low heavy vehicle volumes. As volumes increase, further works are required to bring this intersection up to current standards with consideration given to giving Newell Highway traffic priority over Bruxner Way.

Alice Street at Moree: This intersection will be eliminated once the Moree Bypass is completed. The Moree Bypass will be suitable for all PBS class 3(a) vehicles up to 36.5m in length.

Killarney Street and Tibbereena Street at Narrabri: This intersection is currently approved for double road train use, however requires further widening to accommodate B-triples and to provide a higher standard for other HPVs.

Various roundabouts: A number of roundabouts have been assessed as being able to cater for the swept path of HPVs, generally without any clearance and requiring the heavy vehicles to mount the central island of the roundabout. Further work including replacement or modification of the roundabout may be required to be carried out in the longer term to improve the standard of these intersections particularly at the intersection of Barwan Street & Killarney Street at Narrabri and John Street & Dalgarno Street at Coonabarabran. The planning phase has commenced to replace the roundabout connecting the Mitchell and Newell Highways at Dubbo with traffic signals.

Oxley Highway priority: The Oxley Highway intersects with the Newell Highway north of Coonabarabran and has priority at the intersection. This means heavy vehicles travelling south along the Newell must give way to Oxley Highway traffic. Due to the alignment and resulting sight distance all heavy vehicles are required to decelerate and stop. From a network efficiency perspective this is not ideal, as there are larger volumes of through -traffic on the Newell than the Oxley. Consideration should be given to giving the Newell Highway movement priority over the Oxley Highway traffic with the intersection improved to reflect this change.

Table 4.17 Heavy vehicle review of intersections and roundabouts along the Newell Highway

	Type	B-Triple (36.5m)		A+B-Triple (36.5m)		Double road train (36.2m)		Double road train (with triaxle dolly) (32.84m)	
		Northbound	Southbound	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
Newell Hwy & Deniliquin Rd, Tocumwal	Roundabout	●	●	●	●	●	●	●	●
Conargo Rd, Jerilderie	Intersection	●	●	●	●	●	●	●	●
Sturt Hwy (west), Narrandera	Intersection	●	●	●	●	●	●	●	●
Sturt Hwy (east), Narrandera	Intersection	●	●	●	●	●	●	●	●
Cadell St & Whitton St, Narrandera	Intersection	●	●	●	●	●	●	●	●
Newell Hwy & Berrembed St, Grong Grong	Intersection	●	●	●	●	●	●	●	●
Tallimba Rd, West Wyalong	Intersection	**Currently being upgraded by Roads and Maritime Services**							
Showground Rd, West Wyalong	Intersection	●	●	●	●	●	●	●	●
West Wyalong Bypass (State hwy)	Rail Level Crossing	●	●	●	●	●	●	●	●
Sherriff St & Dowling St, Forbes	Signalised	●	●	●	●	●	●	●	●
Hartigan Ave & Forbes St, Parkes	Intersection & Rail Level Crossing	●	●	●	●	●	●	●	●
Bogan St & Hartigan Ave, Parkes	Intersection	●	●	●	●	●	●	●	●
Bogan St & Mitchell St, Parkes	Intersection	●	●	●	●	●	●	●	●
Clarinda St & Mitchell St, Parkes	Intersection	●	●	●	●	●	●	●	●
Victoria St, Dubbo	Roundabout	●	●	●	●	●	●	●	●
Darling St, Dubbo	Roundabout	●	●	●	●	●	●	●	●
Bourke St & Erskine St, Dubbo	Signalised	●	●	●	●	●	●	●	●
Oxley Hwy, Gilgandra	Intersection	●	●	●	●	●	●	●	●
Dalgarno St, Coonabarabran	Roundabout	●	●	●	●	●	●	●	●
Oxley Hwy, Coonabarabran	Intersection	●	●	●	●	●	●	●	●
Newell & Kamilaroi Hwys, Narrabri	Roundabout	●	●	●	●	●	●	●	●

	Type	B-Triple (36.5m)		A+B-Triple (36.5m)		Double road train (36.2m)		Double road train (with triaxle dolly) (32.84m)	
		Northbound	Southbound	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
Newell Hwy & Old Turrawan Rd, Narrabri	Roundabout	🟢	🟡	🟢	🟡	🟢	🟡	🟢	🟡
Tibbereena St & Dangar St, Narrabri	Intersection	🟡	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Killarney St & Tibbereena St, Narrabri	Intersection	🟢	🔴	🟢	🟡	🟢	🟡	🟢	🟡
Barwan St & Killarney St, Narrabri	Roundabout	🟡	🟡	🟢	🟡	🟢	🟡	🟢	🟡
Forme St & Alice St, Moree	Roundabout	🔴	🔴	🟢	🔴	🟢	🔴	🟢	🟡
Alice St (Moree Bypass), Moree	Signalised	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Bruxner Way, Boggabilla	Intersection	🔴	🔴	🔴	🔴	🔴	🔴	🔴	🔴

Key to Table:

- 🟢 Meets intersection design standards for heavy vehicle type
- 🟡 Heavy vehicle can manoeuvre through intersection without meeting clearance requirements
- 🔴 Heavy vehicle cannot manoeuvre through intersection

Intersections at Parkes: The Newell Highway through Parkes features bypasses that make use of the existing local road network. The highway currently crosses the main western rail line at the southern end of the town, which creates a short, dog leg intersection presenting challenges for some vehicles in both northbound and southbound directions. In addition, the current alignment causes delays for traffic travelling east–west across Parkes when traffic banks north–south while a train uses the rail level crossing. Options for realigning the highway, together with intersection improvements at Bogan Street, Mitchell Street and Hartigan Avenue, will be necessary to improve access for 36.5m long vehicles. Further planning work and detailed assessment is required to provide a suitable route, including a potential option to bypass these intersections.

West Wyalong: The Heavy Vehicle Bypass in West Wyalong avoids the main street of the town. The bypass is being progressively upgraded to accommodate the number and type of heavy vehicles that currently use the corridor. It is accessible to B-doubles at HML. In addition to pavement strengthening, there are two intersections along the bypass that require upgrading and the rail level crossing also requires a significant upgrade.

Grong Grong: A realignment of the Newell Highway at Grong Grong is required to eliminate a 90 degree bend. This upgrade would significantly improve the highway's alignment and allow heavy vehicles to travel more smoothly and safely. A review of the sight distances and gradient of the road incline at the northern end of Grong Grong should be included in this project.

Point-to-point cameras south of Tomingley

Point-to-point speed enforcement

Point-to-point enforcement was introduced to enforce heavy vehicle speeds in NSW. Point-to-point technology can enforce speed limits over long stretches of road. It is on these longer stretches that heavy vehicle speeding is of greatest concern. Heavy vehicles make up only three per cent of vehicle registrations, and seven per cent of kilometres travelled by NSW vehicles however heavy vehicles are 25 to 50 per cent of vehicles travelling on the Newell and are involved in almost 20 per cent of road fatalities along the corridor.

There are two point-to-point enforcement areas on the Newell Highway:

- Newell Highway between Eumungerie (north of Dubbo) and Gilgandra for 27 kilometres.
- Newell Highway between Peak Hill and Tomingley for 17 kilometres.

Safe-T-Cam network

The Safe-T-Cam program is an initiative that aims to reduce the risk associated with heavy vehicle driver fatigue in an effort to prevent heavy vehicle crashes. The Safe-T-Cam system is an automated monitoring system that uses digital camera technology to read heavy vehicles' number plates to enable Roads and Maritime to monitor heavy vehicle movements.

Safe-T-Cam detects and provides data on heavy vehicle incidents relating to:

- Driver fatigue
- Registration
- Failure to enter Heavy Vehicle Checking Stations.

The broad objectives of the Safe-T-Cam program are to:

- Improve road safety by reducing the incidence of heavy vehicle crashes and changing driver and operator behaviour in relation to travel time (driver fatigue)
- Promote compliance with enforcement systems by detecting incidents of heavy vehicle avoidance behaviours
- Identify unregistered heavy vehicles operating on NSW roads and enforce vehicle registration regulations
- Improve the efficiency of Roads and Maritime enforcement strategies by establishing improved intelligence of vehicle movements
- Improve traffic management by generating accurate information on heavy vehicle movements throughout NSW.

The Safe-T-Cam network consists of 24 sites located on major routes throughout NSW, clearly marked with roadside signage. There are six sites along the Newell Highway corridor at (Figure 4.14): Jerilderie, Narrandera, north of West Wyalong, South of Forbes, Tomingley, Coonabarabran and Boggabilla.

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 six northbound and six southbound heavy vehicle fixed on road enforcement sites along the Newell Highway at the following locations:

- Grong Grong – northbound only
- East of West Wyalong – both northbound and southbound
- Daroobalgie – 8.7 km north of Forbes, both northbound and southbound
- Brocklehurst – 8.5 km north of Dubbo, both northbound and southbound
- Dog Trap Gully – 4.6 km north of Coonabarabran, both northbound and southbound
- 7.3 km north of Moree, both northbound and southbound
- Boggabilla – 121 km north of Moree, southbound only

Heavy Vehicle Safety Stations (HVSS)

Automated screening capabilities, using sophisticated technology, are the most efficient and effective system to target high risk heavy vehicles and operators. Using automatic, risk based screening technology means that a significantly higher number of heavy vehicles are viewed and assessed with a greater capability of targeting high risk, non-compliant operators and vehicles to be intercepted. This has a minimal impact on low risk, highly compliant operators and heavy vehicles, clearly supporting the safe and efficient movement of freight across NSW.

This technology is especially required on the Newell Highway due to the high current and future expected traffic over the next 20+ years.

To ensure maximum coverage and to limit avoidance behaviour, the potential HVSS would consist of a fully automated HVSS located at Moree and enforcing in both directions on a site fit for B-Triples, and two non-automated HVSS at Narrabri and Daroobalgie, each enforcing in one direction only.

These HVSS would complete the overall detection and enforcement capability on the Newell Highway when linked to the Safe-T-Cam and Point to Point sites.

Figure 4.14 Safe-T-Cam 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"*[45].

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"*[46]

In 2010, Roads and Maritime Services published a *Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW*[47], 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. While geographical and other physical constraints may require the interval range to be between 80 and 120 kilometres, the maximum limit should be 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.

Roads and Maritime identified 21 northbound and 18 southbound sites that qualify as major heavy vehicle rest areas on the Newell Highway. Northbound, a total of eight rest areas have been upgraded to major heavy vehicle rest areas, including four new rest areas. Southbound, 10 rest areas have been upgraded to meet major heavy vehicle rest area standards (Figure 4.15).

Break Down Areas

Break down areas are required to support high productivity vehicle access generally where the size of vehicle permitted to travel along a route changes. These breakdown areas should be designed for decoupling and coupling of trailers or breaking down loads particularly across Victorian and Queensland State borders or at junctions with other major freight routes where the permitted vehicle size changes.

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

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

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

Figure 4.15 Newell Highway major heavy vehicle rest areas[48]

48 ibid.

The Heavy Vehicle Safety and Productivity Program (HVSPP) is part of the Australian Government Infrastructure Investment Program and provides funding support to improve the safety and productivity of heavy vehicle operations across Australia. Its objectives are to:

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

The first two rounds of the HVSPP provided $70 million in the period 2008-09 to 2011-12. NSW received 25 per cent of this total. Already, the majority of identified major rest area enhancements have been delivered through HVSPP funding in rounds one and two, assisting both the road freight industry and broader logistics chain to achieve compliance with fatigue legislation.

On the Newell Highway the following projects have had funding approval and been completed (Table 4.18):

- Round one: Combination of three new rest areas, 10 rest area upgrades, nine green reflector site upgrades and planning for the construction of three rest areas. HVSPP funding of $5.2m was provided for the Newell Highway.
- Round two: One new rest area and upgrade of one existing rest area. HVSPP funding of $3.6m was provided for the Newell Highway.

Table 4.18 Funded projects under round one and two of HVSPP

Round 1		
1	Yarraman, Newell Highway, 70.6km north of Coonabarabran	Construction of a new heavy vehicle rest area
2	Bohena Creek, Newell Highway, 102.7km north of Coonabarabran	
3	Mungle Creek, Newell Highway, 80km north of Moree	
4	Marthaguy Creek, Newell Highway, 12.5km south of Gilgandra	Upgrade of an existing heavy vehicle rest area
5	South Tomingley, Newell Highway, 60km north of Parkes	
6	Tookey Creek, Newell Highway, 52.9km north of Narrabri	
7	Woolabrar, Newell Highway, 49km north of Narrabri	
8	North Star, Newell Highway, 84.3km north of Moree	
9	Bundure, Newell Highway, 69km south of Narrandera	
10	Sandside, Newell Highway, 51km south of Narrandera	
11	Ardlethan, Newell Highway, 81km south of West Wyalong	
12	Mahda, Newell Highway, 34km south of West Wyalong	
13	Marsden, Newell Highway, 36km north of West Wyalong	

Round 1		
14	Newell Highway, 35km north of Parkes	Upgrade of an existing green reflector parking bay
15	Newell Highway, 14km north of Gilgandra	
16	Newell Highway, 38km north of Gilgandra	
17	Newell Highway, 68km north of Moree	
18	Newell Highway, 83.9km north of Gilgandra (southbound)	
19	Newell Highway, 12.2km north of Gilgandra (southbound)	
20	Newell Highway, 38.1km north of Parkes (northbound)	
21	Newell Highway, 37km north of Coonabarabran (southbound)	
22	Newell Highway, 82.5km north of Parkes (southbound)	
23	Newell Highway, 14km east of Narrandera	Planning for the construction of a new heavy vehicle rest area
24	Gillenbah, Newell Highway, 1km south of Narrandera	
25	Charcoal Tank, Newell Highway, 9km south of West Wyalong	
Round 2		
1	Firetail rest area on the Newell Highway, 5km north of Grong Grong	Construction of a new heavy vehicle rest area
2	Boolooroo on the Newell Highway, 6.1km north of Moree	Upgrade of an existing heavy vehicle rest area

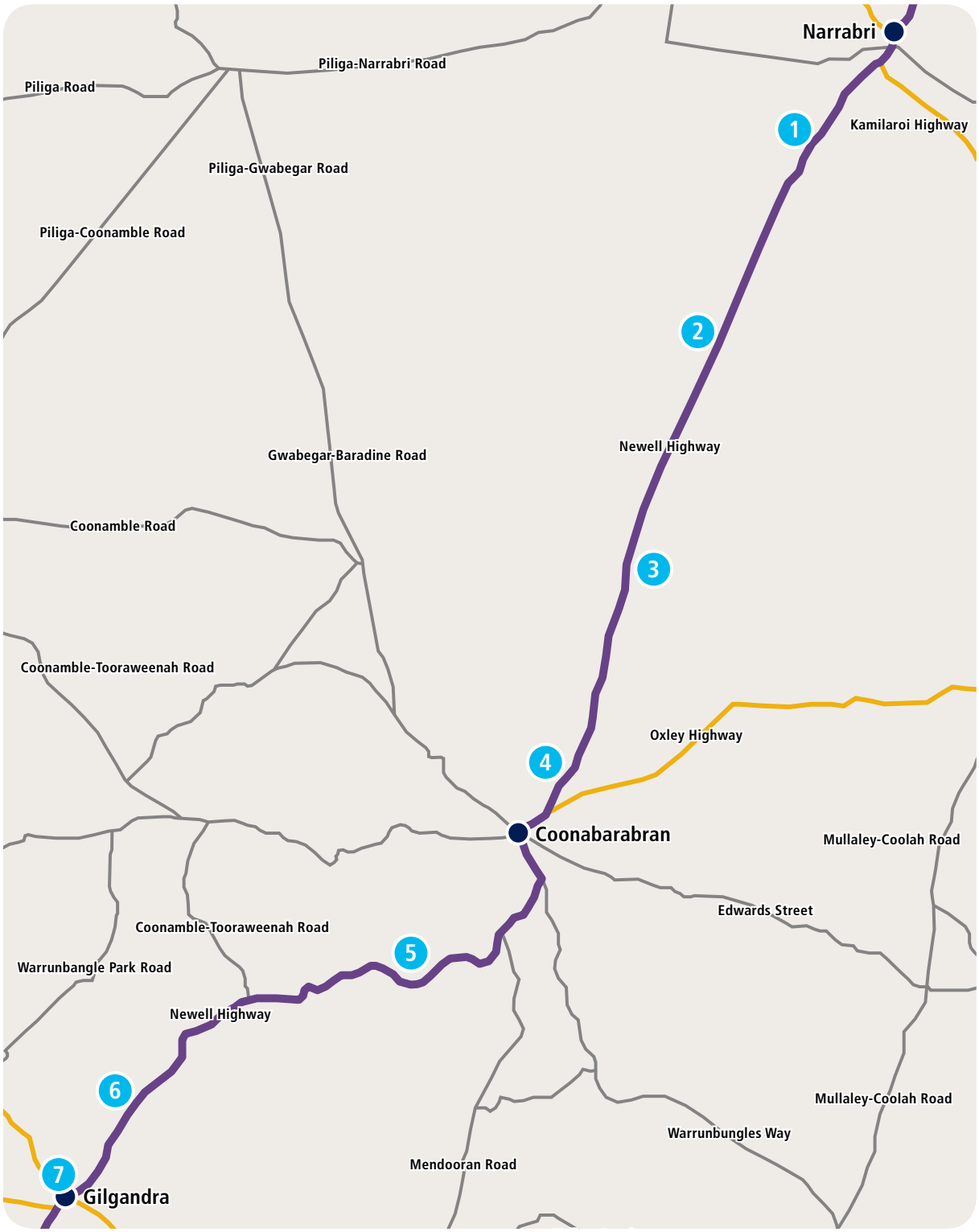
In the latest round of funding the NSW and Australian Governments were able to approve works on the Newell Highway for two rest areas upgrades and a signage strategy. These projects were completed in 2012-13 and 2013-14, as set out in Table 4.19. Funding of $6.2m was provided by the HVSPP.

Table 4.19 Funded and completed projects under round three of HVSPP

Round 3		
1	Newell Highway – Bohena rest area	Upgrade of an existing heavy vehicle rest area with an acceleration lane
2	Newell Highway – Route Signage Strategy	Consistent signage to show distance to the next heavy vehicle rest stop at all major rest areas along the route from Marsden to Goondiwindi
3	Newell Highway – Gillenbah rest area	Upgrade of an existing heavy vehicle rest area
4	Smart Rest Area – Cooperative Intelligent Transport System (C–ITS) trial Narrabri to Gilgandra*	Explore the use of C–ITS for heavy vehicle drivers to locate rest areas and to explore the potential integration with existing systems such as electronic work diaries

* Results of trial are currently being assessed. Seven sites are being trialled and are operational in the field.

Figure 4.16 Locations of the Smart Rest Areas on the Newell Highway between Gilgandra to Narrabri



1. Pilliga No. 2 Rest Area
2. Pilliga Rest Area
3. Yarraman Rest Area
4. Gowan Rest Area Northbound
5. Spire View Rest Area Northbound
6. Newell Highway, Gilgandra, rest area
7. Opposite Shell Gilgandra

An analysis of rest areas along the Newell Highway confirms that the following work has not been completed and needs more consideration:

- Upgrade/relocate Charcoal Tank rest area (127km north of Narrandera and 9km south of West Wyalong) to provide a combined rest area including parking for eight trucks, a toilet, improved access, signage, shade, shelter, landscaping, tables/chairs.

All the other major rest areas identified by Roads and Maritime for enhancement in 2010 have been funded and completed.

Other rest areas

The rest areas along the Newell Highway are split into three categories, with each offering different levels of facilities and functions (Table 4.20).

Table 4.20 Rest areas along the highway

Type of rest area	Target frequency along the corridor	Compliance with the target?
Major heavy vehicle rest areas	100 km	Yes
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 109 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. Further informal rest areas are continuing to be identified and marked with green reflectors.

Funding has been allocated through the HVSPP to improve the facilities at rest areas with regards to toilets and shade. Funding will continue to be sought from the Federal Government for further improvements to rest areas on the highway.

> *"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."*[49]

49 National Transport Commission 2005, *National Guidelines for the Provision of Rest Area Facilities*, NTC, Melbourne, p. 26

The adequacy of the major heavy vehicle rest areas in meeting driver needs will continue to be monitored and improved where necessary. The frequency of minor rest areas and informal parking areas will be further investigated to meet the above targets.

Major heavy vehicle rest area along Newell Highway at Tomingley

Minor rest area at Mountain Creek south of Dubbo

Informal parking area

Truck rest area near Tomingley

4.4 Road design and geometry

Horizontal curves

Curves are needed to allow motorists to negotiate the road at a gradual rate. The curve radius is dependent on the design speed, super elevation and friction of the roadway. One important consideration in assessing curve radii is the sight distance provided relative to the design speed. 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 a crash.

Roads and Maritime's Network Performance Measures and Planning Targets recommend a target operating speed of 110 km/h for all rural sections of the Newell Highway, as it is a class 4R asset[50]. To allow for an operating speed of 110 km/h, the Austroads *Guide to Road Design* recommends providing a minimum horizontal curve radius of 600 metres[51].

About four per cent of the Newell Highway comprises curves with radii of less than 600 metres, compared with the NSW average for rural roads of 13 per cent[52].

There are more tight curves between Gilgandra and Coonabarabran and between Boggabilla and Goondiwindi than on other rural sections of the Newell Highway.

Wire rope on curve near Trewilga

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 are particularly significant on roads where there are many heavy vehicles, because freight costs increase with fuel consumption and slower speeds. From an environmental perspective, steeper grades result in high vehicle emissions. Steeper grades may also impede motorists' ability to see any hazards ahead on the road.

As a guide, Roads and Maritime's Network Performance Measures and Planning Targets recommend maximum grades of six per cent for rural Class 4 roads on flat or rolling terrain[53]. Less than one per cent of the total road length of the Newell Highway has grades steeper than the performance target (Table 4.21).

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

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

52 Levett, S 2010, *Curves, clear zones, shoulder widths on rural roads, Centre for Road Safety internal presentation*, Roads and Maritime Services, Sydney

53 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, Roads and Maritime Services, Sydney, p.40

While the lengths of road on the Newell Highway that do exceed this nominated grade are generally less than 100 metres long and are of only minor concern, there are several longer sections of road with grades exceeding six per cent:

- Three short lengths between Uargon Creek and Wandillialbah Creek (170 metres, 140 metres and 300 metres).
- 1.3 kilometre section between Blackburns Creek and Belar Creek.
- 240 metre section between Merryula Creek and Binnaway Hill.
- Tap Hill and other steep locations between Gilgandra and Coonabarabran. These longer isolated steep grades will require the provision of climbing lanes if larger vehicles travel at very slow speeds ascending grades causing traffic to bunch behind, particularly between Gilgandra and Coonabarabran which has the highest percentage of grades exceeding 6%.

Overall, with exception to the above locations grade is not a significant issue along the entire length of the Highway.

Road over rail bridge north of Narrabri

Table 4.21 Vertical grades

Highway planning section	≤ 6% grade	> 6% grade
5. Narrandera to Grong Grong	99.7%	0.3%
11. Parkes to Tomingley	99.9%	0.1%
12. Tomingley to Dubbo	99.8%	0.2%
14. Gilgandra to Gowang	98.4%	1.6%
15. Gowang to Coonabarabran	96.4%	3.6%
Sub-total Zone 1: Tocumwal to Marsden	100.0%	-
Sub-total Zone 2: Marsden to Coonabarabran	99.4%	0.6%
Sub-total Zone 3: Coonabarabran to Goondiwindi	100.0%	-
Total (by length)	99.8%	0.2%

Steep grades on curves

Steep grades and tight road 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.

Most of the highway's excessive vertical grades occur where horizontal curves have a radius in excess of 600 metres. There are, however, rural segments with steep grades on tighter curves, in particular between Gilgandra and Coonabarabran.

Substantial lengths of the Newell Highway are relatively old and may not have been designed to account for increased heavy vehicle traffic. While alignments in these locations have been designed to meet appropriate standards at the time they were constructed, they may no longer be suitable for current traffic and could present road safety challenges in the future.

Advisory speed sign near Trewilga

Speed on curves

Run off road on curve crashes are over-represented in NSW crash statistics. To improve road safety, a road with a 110 km/h speed zone should have a minimum horizontal curve radius of 600 metres.

Most curves on the Newell Highway meet this standard. However, curves on the Newell Highway fall below 600 metres on around three per cent of lengths in 110 km/h speed zones – equal to about 20 kilometres of the highway. These tight curves are shown in Figure 4.17, Figure 4.18 and Figure 4.19.

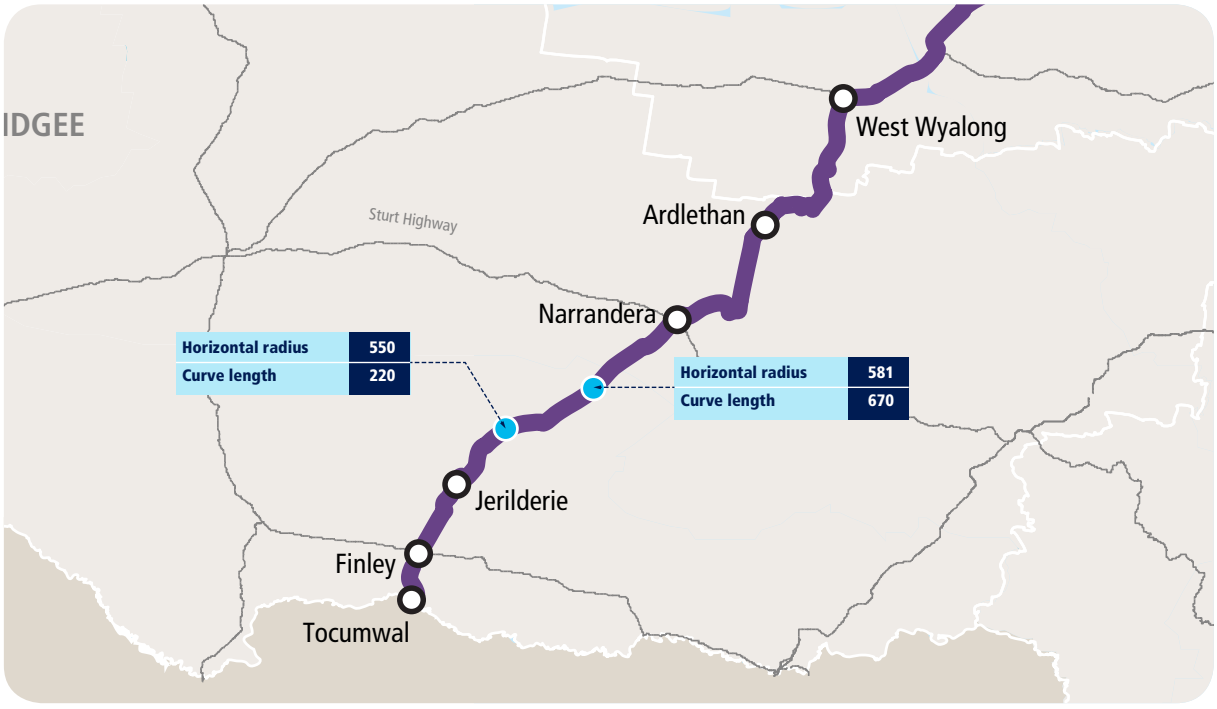
As there are a number of tight curves through the Warrumbungle ranges, the Newell Highway's speed zone has been reduced from 110 km/h to 100 km/h from Tooraweenah to just south of Coonabarabran. A longer term priority may be to improve the alignment to a 110km/h standard. In the short to medium term, some formation widening may be necessary to accommodate PBS class 3(a) and road train vehicles.

In addition, an 11 km section 40 km north of Parkes, through Trewilga, has been identified as having poor horizontal and vertical alignment, resulting in reduced travel speeds. The section at Trewilga has an elevated crash rate compared to the class average.

Warrumbungle Ranges between Tooraweenah and Coonabarabran

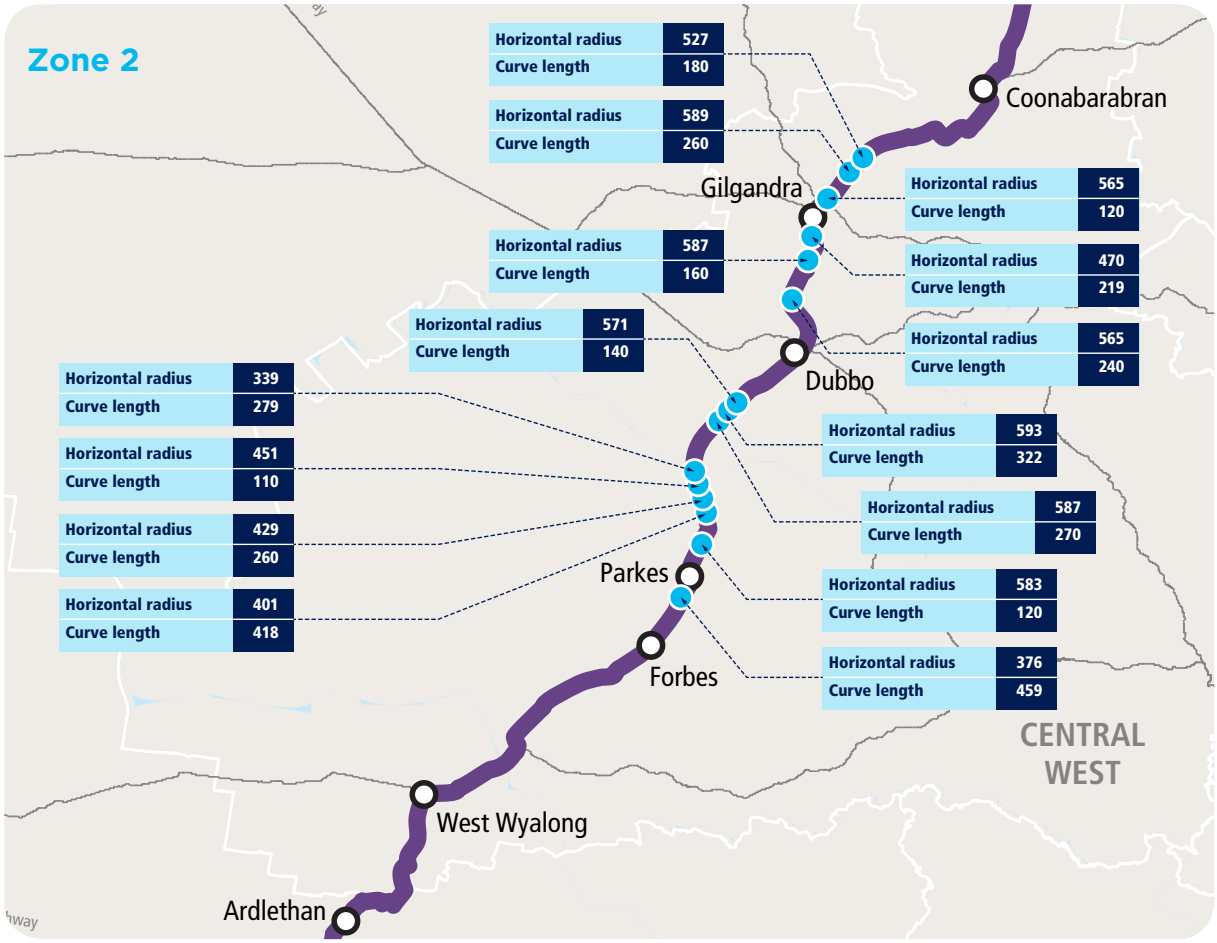
Wire rope safety barrier on road curve near Trewilga

Figure 4.17 Locations where curve radii are less than 600 metres within 110 km/h speed zones (Zone 1)



Typical alignment between Forbes and Parkes

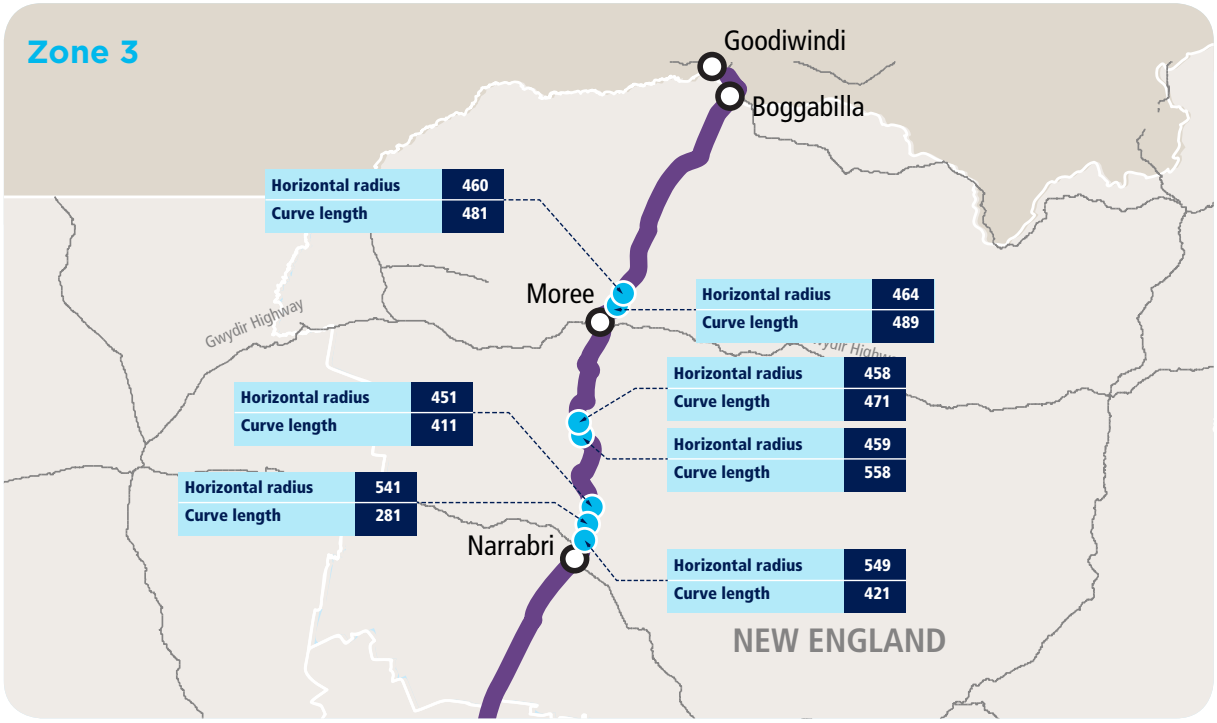
Figure 4.18 Locations where curve radii are less than 600 metres within 110 km/h speed zones (Zone 2)



curve radii < 600 metres within 110 km/h speed zone

Typical alignment between Coonabarabran and Narrabri near the Pilliga

Figure 4.19 Locations where curve radii are less than 600 metres within 110 km/h speed zones (Zone 3)



● curve radii < 600 metres within 110 km/h speed zone

Lane widths

Lane widths influence road capacity, comfort and safety. 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 all sections of the Newell Highway, as it is a Class 4R asset.

A review of lane widths for non-urban sections of the Newell Highway (Table 4.22) indicates that lane widths meet the required standards across 84.1 per cent of the corridor. The remaining 15.9 per cent of the road does not meet this minimum standard for lane width.

Coonabarabran to Narrabri is the worst performing section with around 60 per cent compliance with the 3.5 metre lane width.

Generally, sub-standard locations are scattered throughout each planning section; however there are six notable underperforming sections of road. These are:

- 33 kilometres half way between Coonabarabran and Narrabri
- 14 kilometres about 40 kilometres north of Narrabri
- 15 kilometres about 15 kilometres north of Dubbo
- 12 kilometres about 31 kilometres north of Parkes
- 11 kilometres about 74 kilometres north of Moree
- 10 kilometres about seven kilometres south of Gilgandra.

While lane widths less than 3.5 metres do not meet performance targets, particular attention should be focused on road sections which have lane widths significantly below the performance target – that is, less than or equal to 3.25 metres. There are two significant road sections along the northern end of the Newell Highway below this level:

- A 33 kilometre section about half way between Coonabarabran and Narrabri.
- An eight kilometre section leading into and out of Boggabilla, towards the northern end of the Newell Highway.

Specifically, the 33 kilometre section between Coonabarabran and Narrabri has narrow shoulders and narrow lanes.

There are other shorter sections of the highway with road widths less than 3.25 metres. However, it should be noted that while these narrower pavements do not meet the current criteria, they are likely a remnant of historical design standards.

The locations where the lane width is less than 3.25 metres are detailed in Figure 4.20. These areas should be addressed and pavements widened so that they are closer to current design standards.

Oversize vehicle south of Coonabarabran

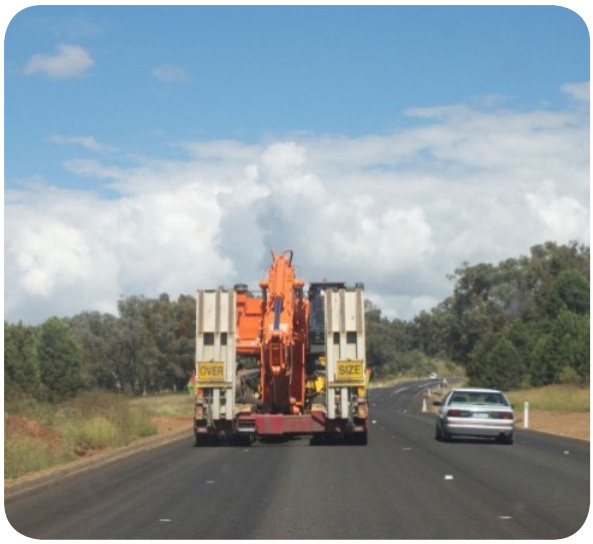


Table 4.22 Lane widths

Highway planning section	Performance target	< 3.0 m	3.0–<3.25 m	3.25–<3.5 m	Nominal Lane Width ≥ 3.5 m
1. Tocumwal to Finley	> 3.5 m	-	-	6.8%	93.2%
2. Finley to Jerilderie	> 3.5 m	-	-	4.5%	95.5%
3. Jerilderie to Morundah*	> 3.5 m	-	-	4.7%	95.3%
4. Morundah to Narrandera*	> 3.5 m	-	5.9%	4.6%	89.5%
5. Narrandera to Grong Grong*	> 3.5 m	-	-	24.5%	75.5%
6. Grong Grong to Ardlethan	> 3.5 m	-	10.6%	8.6%	80.8%
7. Ardlethan to Mirrool*	> 3.5 m	-	-	-	100.0%
8. Mirrool to West Wyalong	> 3.5 m	-	-	9.1%	90.9%
9. West Wyalong to Forbes	> 3.5 m	-	1.2%	10.0%	88.8%
10. Forbes to Parkes	> 3.5 m	-	-	2.3%	97.7%
11. Parkes to Tomingley	> 3.5 m	-	-	17.5%	82.5%
12. Tomingley to Dubbo	> 3.5 m	-	-	2.1%	97.9%
13. Dubbo to Gilgandra	> 3.5 m	-	4.4%	14.0%	81.7%
14. Gilgandra to Gowang	> 3.5 m	-	4.3%	12.0%	83.7%
15. Gowang to Coonabarabran*	> 3.5 m	1.8%	0.5%	16.4%	81.3%
16. Coonabarabran to Narrabri*	> 3.5 m	-	17.1%	22.4%	60.5%
17. Narrabri to Moree*	> 3.5 m	-	3.0%	19.0%	78.1%
18. Moree to Boggabilla	> 3.5 m	-	6.4%	8.4%	85.2%
19. Boggabilla to Goondiwindi*	> 3.5 m	-	6.3%	-	93.7%
Sub-total Zone 1: Tocumwal to Marsden	> 3.5 m	-	2.2%	6.6%	91.2%
Sub-total Zone 2: Marsden to Coonabarabran	> 3.5 m	0.2%	1.5%	12.0%	86.4%
Sub-total Zone 3: Coonabarabran to Goondiwindi	> 3.5 m	-	9.1%	16.2%	74.7%
Total (by length)	**> 3.5 m**	**0.1%**	**4.2%**	**11.6%**	**84.1%**

* See Table 4.23 for details of narrow bridges and culverts within section

Figure 4.20 Locations where lane widths are less than 3.25 metres

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* recommends a minimum width of 8.4 m for bridges when the AADT is greater than 500 vehicles. Along the Newell Highway there are 11 bridges that are less than 8.4 m wide (Table 4.23). There are also an additional five culverts between 61.4 and 67 kilometres north of Narrandera that are less than 8.4 m wide.

The PBS Guidelines recommend that:

"A visual inspection and risk assessment should be undertaken for bridges not providing the minimum 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."* [54]

Appropriate bridge widths need to be increased on curved approaches. These assessments will guide access provided to PBS Class 3(a) vehicles. Where access cannot be provided narrow bridges may need to be widened.

Table 4.23 Narrow bridges and culverts less than 8.4 m wide

Bridge Number	Description	Width
5523	Bridge over railway – 6.43 km S of Morundah	7.3 m
5529	Culvert over Poison Waterholes Creek – 4.4 km S of Narrandera	7.9 m
5530	Culvert over Gillenbah Creek – 0.5 km S of Sturt Highway	8.1 m
5545	Bridge No. 2 Mirrool Creek – 1.1 km NE of Ardlethan	7.3 m
3532	Bridge over Jack Hall's Creek – 4.56 km SW of Coonabarabran	7.4 m
3551	Bridge over Bohena Creek – 17.58 km S of Narrabri	7.4 m
3552	Bridge over Spring Creek – 12.41 km S of Narrabri	7.4 m
3856	Bridge over Doctors Creek – Narrabri	7.4 m
2888	Bridge over Little Bumble Creek – 34.84 km S of Moree	7.4 m
2898	4 Cell Culvert – 8.21 km S of Moree	7.3 m
2914	Bridge over Whalan Creek – 27.16 km SSW of Goondiwindi	7.4 m

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

Sealed shoulder widths

Sealed shoulder widths are the portion of the road that extend beyond the marked traffic lanes. Pavements with shoulder treatments last longer than road sections without them. Sealed shoulder treatments improve the pavement structure and reduce moisture levels. Sealed shoulders also provide road safety benefits, providing room which can allow a driver to correct an errant vehicle. A sealed shoulder can assist in reducing the potential likelihood and severity of a crash.

As a guide, the network planning targets recommend a minimum sealed shoulder width of two metres for rural Class 4 roads[55]. Extra shoulder width is required on the outside of curves. The Network and Corridor Planning Practice Notes indicate that, on average, 15 per cent of Class 4 roads in NSW have sealed shoulder widths less than the desirable minimum[56].

As illustrated in Table 4.24, 30 per cent of the Newell Highway has sealed shoulders at least two metres wide in both directions. The remaining 70 per cent of the highway has sealed shoulders less than the recommended minimum sealed shoulder width.

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 width a significant challenge.

Highway planning sections with greater than 10 per cent of shoulder widths less than one metre include Morundah to Narrandera, Mirrool to West Wyalong, Forbes to Parkes, Dubbo to Gilgandra and Gowang to Boggabilla. The shoulder widths of these roads need to be progressively upgraded to meet the requirements of the Roads and Maritime Network Performance Measures and Network Planning Targets.

Typical alignment between Forbes and Parkes

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

56 Roads and Maritime Services 2008, *Network and Corridor Planning Practice Notes*, Roads and Maritime Services, Sydney, p. 29

Table 4.24 Sealed shoulder width

Highway planning section	Target minimum width	Shoulder widths (metres)		
		<1 m	≥1 & <2 m	≥2.0 m
1. Tocumwal to Finley	2.0 m	2.2%	56.6%	41.2%
2. Finley to Jerilderie	2.0 m	-	73.2%	26.8%
3. Jerilderie to Morundah	2.0 m	9.1%	49.1%	41.8%
4. Morundah to Narrandera	2.0 m	18.0%	43.2%	38.8%
5. Narrandera to Grong Grong	2.0 m	8.9%	59.6%	31.4%
6. Grong Grong to Ardlethan	2.0 m	-	47.6%	52.4%
7. Ardlethan to Mirrool	2.0 m	8.6%	48.2%	43.2%
8. Mirrool to West Wyalong	2.0 m	22.2%	17.1%	60.7%
9. West Wyalong to Forbes	2.0 m	5.1%	66.6%	28.3%
10. Forbes to Parkes	2.0 m	19.6%	75.4%	5.0%
11. Parkes to Tomingley	2.0 m	7.2%	55.4%	37.4%
12. Tomingley to Dubbo	2.0 m	3.1%	55.5%	41.4%
13. Dubbo to Gilgandra	2.0 m	18.2%	67.9%	13.8%
14. Gilgandra to Gowang	2.0 m	2.5%	85.2%	12.3%
15. Gowang to Coonabarabran	2.0 m	16.4%	55.6%	28.0%
16. Coonabarabran to Narrabri	2.0 m	11.6%	74.4%	14.0%
17. Narrabri to Moree	2.0 m	11.9%	51.0%	37.1%
18. Moree to Boggabilla	2.0 m	33.2%	39.9%	27.0%
19. Boggabilla to Goondiwindi	2.0 m	-	-	-
Sub-total Zone 1: Tocumwal to Marsden		8.5%	44.5%	47.1%
Sub-total Zone 2: Marsden to Coonabarabran		10.4%	69.5%	20.1%
Sub-total Zone 3: Coonabarabran to Goondiwindi		17.3%	57.2%	25.5%
Total (by length)		**11.8%**	**57.6%**	**30.6%**

Wide Centre Line Treatment

The Wide Centre Line Treatment (WCT) is a marked line type that provides a gap 1.2 metres wide between opposing travel lanes. Unlike median strips, the WCT allows vehicles to overtake where it is safe to do so. Ideally, the line marking will have audio-tactile properties along both the centre line and edge line to alert drivers if they are drifting outside their lane. The space between the through lanes provides room for errant vehicles to correct and avoid conflict. The wide centre line treatment caters for most overtaking manoeuvres, but may also restrict overtaking if a wide barrier line is used.

The photo below shows a 100 mm wide, solid line abutted by a 100 mm wide audio-tactile line, an 800 mm gap to another 100 mm wide audio-tactile line abutted by a 100 mm wide solid line. In total, this resulted in a 1.2 m gap (800 mm + 200 mm + 200 mm) between opposing directions of travel (see Figure 4.21). The current Network Planning Target total formation width for the Newell Highway is 11 metres, two 3.5 metre wide lanes and two metre wide sealed shoulders. However, with WCT the minimum formation width is 12m. The Newell Highway Safety Review (2009) suggested a wide centre line treatment

improves road safety along the route by helping to reduce head-on and off road to the right crashes.

The Centre for Road Safety carried out a trial of the wide centre line treatment along the Newell Highway near West Wyalong and Parkes during 2011-12[57].

The Centre for Road Safety found that where the wide centre line treatment had been implemented, drivers would generally:

- Sit more towards the centre of their lane
- Drive at a more appropriate speed
- Cross the edge line and onto the shoulder less often
- Cross the centre line less often.

The analysis of results from trialling the wide centre line treatment showed a reduced risk of interaction between opposing streams of traffic, improved lane discipline and a general reduction in speed at trial locations.

The trial results suggest it is appropriate to progressively implement the wide centre line treatment along the entire length of the Newell Highway. The implementation of the treatment will accommodate bridges, barriers, overtaking lanes and intersections. As with all good road design, specific conditions at each location will influence how the treatment is applied. It is likely a minimum length of approximately one to two kilometres of WCT will be implemented in any location.

Specifically the treatment will be implemented in the following ways[58]:

- For sections with 12 metre wide pavement formation in good condition, the WCT will be applied as per the trial.
- For sections of the highway where the formation is less than 12 metres, a discussion paper will be written and appropriate treatments developed. This may include audio tactile centre line marking treatment. Further investigation is required for implementing WCT on these narrower pavement locations.
- For sections of the highway being progressively rebuilt with heavy duty pavement, the WCT will be implemented on new 12m wide formations.

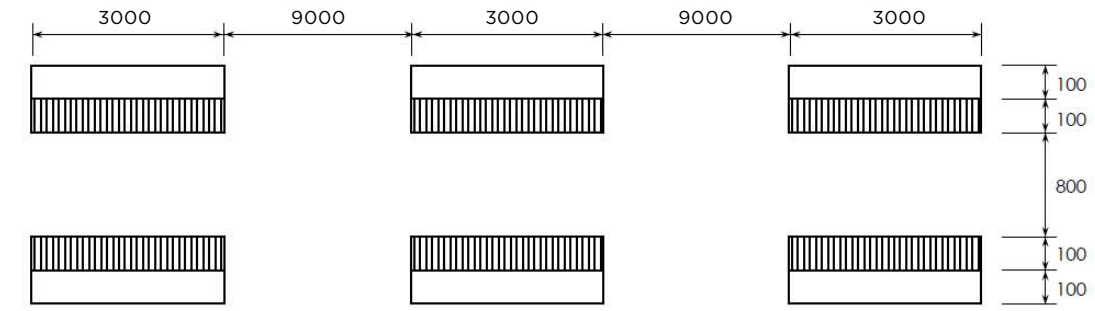
Wide centreline treatment north of Parkes

57 NSW Centre for Road Safety 2011, *Newell Highway Wide Centre Line Trial Final Report*

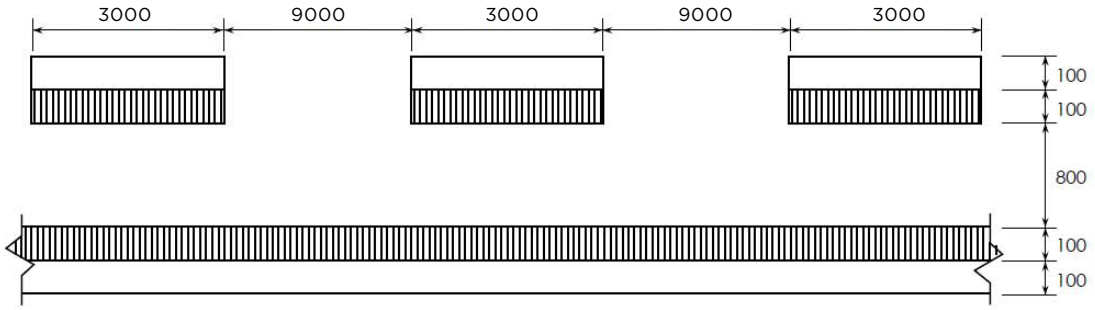
58 Specific technical details relating to the wide centre line marking is contained in separate technical directions

Figure 4.21 Wide centre line treatment road marking scheme details

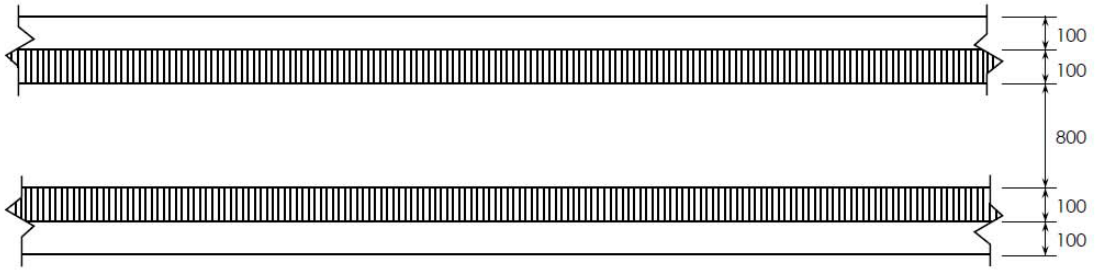
Overtaking permitted in both directions



Overtaking permitted in one direction



Overtaking not permitted



Clear zones and safety barriers

A clear zone is a width of roadside 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 state that for Class 4R roads the width of the clear zone varies depending on the speed limit[59]:

- Three metres for speeds less than 60 km/h.
- Four metres for speeds between 60–80 km/h.
- Five metres for speeds between 80–110 km/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[60].

The Newell Highway Safety Review saw clear zone works carried out along the full length of the highway. Under this program, a clear zone of six metres on straights and 10 metres on the outside of curves with a radius less than 1000 metres was achieved. Where appropriate, safety barriers were erected at locations where these clear zone widths could not be achieved.

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

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, involve trade-offs with environmental objectives, high expenditure and potentially stringent environmental mitigation works.

Typical tree replanting to replace trees lost when implementing clear zones

The long term target is to provide roadside safety barriers where needed in all instances where vegetation and clear zone targets cannot be met.

Guard rail on Moree bypass

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

60 ibid., p. 53

Edge lines

Edge lines provide a continuous, visual guide for drivers by delineating the edge of the roadway. They are designed to make driving safer and more comfortable, particularly at night. Edge lines provide important markings for motorists and in areas with high rates of run off-road crashes audio tactile edge lines can be effective.

Network planning targets recommend Class 4R roads 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[61].

The Newell Highway completely meets this guideline with 100 per cent of the corridor treated with edge lines.

However, it should be noted that:

- Edge lines need to be replaced on parts of the highway that have been resealed or patched up
- Edge lines are not practical to implement in some parts of urban towns where the road is generally adjacent to multiple lanes and parking areas.

Edge line treatments are not of concern along the Newell Highway.

Intersections

The network planning targets identify required intersection treatments based on volumes of through-traffic and turning traffic. Minimum intersection treatments relevant to the Newell Highway include[62]:

- BAR and BAL: 'basic treatment right' and 'basic treatment left'
- AUL: 'Auxiliary Treatment Left'
- CHR(s): 'short channelised treatment right'
- CHR and CHL: 'channelised treatment right' and 'channelised treatment left'.

The Newell Highway includes 294 rural intersections. Of these, 262 are T-junctions, 19 are four-way crossings and 13 are staggered four-way junctions.

An assessment of all rural intersections along the Newell Highway was carried out in February 2008. The study found:

- 46 intersections had vegetation maintenance issues, resulting in reduced sight distance for drivers
- 21 intersections had significant loose or oversized granular materials on or near the road surface
- 11 intersections had maintenance issues relating to drainage
- There were about 60 observations of poor pavement condition at an intersection
- 28 intersections included poorly located, missing, damaged or faded signage.
- 42 intersections had defective or missing guideposts and/or pavement markings.

The study identified a number of intersections requiring treatments to improve road safety and traffic including access roads to townships such as Mirrool and Cookamidgera. The intersections have been ranked by priority for improvement treatments when funding is available.

Since the 2008 study, all identified major intersections and 29 high priority minor intersections have been upgraded. There are other intersections that were identified that have not been funded and delivered.

Flooding

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

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

The impacts of flooding on the Newell Highway can be measured in terms of:

- **Flood volume** – This contributes to flood duration and level.

61 ibid., p. 48

62 ibid., p. 49

- **Speed the water moves** – Faster flowing water causes a greater risk to human life, erosion and infrastructure damage.
- **Flood duration** – Flood events can isolate people and communities, increase travel times and reduce productivity for industry and other road users.
- **Extent of flooding** – 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 highway.
- **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, or in the case of defined water ways, road 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. Flooding may also be localised, but the scale and volume of water may cause damage to property and infrastructure.
- **Sheet flooding where 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. This damage can occur even if the water is not particularly deep.

While the overall reliability of the Newell Highway corridor is considered adequate in terms of journey times, low flood immunity at a number of locations reduces reliability.

Key locations subject to flooding include:

- **Tocumwal:** Located on the banks of the Murray River, Tocumwal is subject to flooding during large local events or from river levels rising due to an event upstream, however this is usually on the Victorian side.
- **Between Victorian border and Narrandera:** Sheet flooding is experienced across the broad flat floodplains from the Victorian border to Narrandera.
- **Narrandera**: This area experiences flooding particularly on the section between Narrandera and West Wyalong. This stretch of road is prone to flooding about every five years. In addition, flooding caused by river water levels rising occurs at Narrandera from the Murrumbidgee River.
- **Marsden:** The Bland Creek system at Marsden between West Wyalong and Forbes is a series of causeways and is usually the first part of the Newell highway cut during large widespread events. The Bland Creek system flows into the Lachlan River System.
- **Forbes**: The township of Forbes is subject to flooding from the Lachlan River. There are floodplains both to the north and south of Forbes where water covers large areas, however, the road is elevated at these locations.
- **Tichborne:** The Coobang Creek system at Tichborne between Forbes and Parkes is a series of causeways where water crosses the highway for about 2-3 days during large events. The Coobang Creek system flows into the Lachlan River System.
- **The City of Dubbo:** When the Newell Highway bridge over the Macquarie River is flooded, traffic is diverted along the Mitchell Highway, around town and across a rail level crossing.
- **Dubbo to Coonabarabran:** There is frequent, generally nuisance, localised flooding between these locations. This will be progressively addressed as the pavement is renewed.
- **North of Narrabri:** Between 10 and 100 kilometres north of Narrabri, there are five locations where the road is prone to flooding about every five years, and one location where flooding occurs every 10 years on average.
- **North of Moree:** Between 10 and 90 kilometres north of Moree, there are 10 locations prone to flooding on average every five to 10 years. These locations will also be addressed as the pavement is renewed.

- **South of Narrabri to the Queensland border:** This section of the Newell Highway is subject to sheet flooding.

The Newell Highway crosses a number of other major waterways where flooding is generally not a major issue:

- Talbragar River north of Dubbo
- Castlereagh River at Gilgandra and again at Coonabarabran
- Namoi River at Narrabri
- Mehi River at Moree
- Gwydir River north of Moree
- McIntyre River at the Queensland border.

The current flood immunity of the bridges at Tocumwal, Forbes, and Narrandera is one in 100 years and is considered adequate.

However, the flood immunity of the bridge across the Macquarie River on the Newell Highway at Dubbo is less than one in 10 years and is therefore less than ideal. Further long term assessment and analysis of solutions are required to address this.

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 are designed and built in accordance with design standards.

Flooding in Forbes

Newell Highway at Dubbo in typical large flood event

B-doubles crossing Emile Serisier bridge in Dubbo at the start of a flood before the bridge is closed (Source: Dubbo Daily Liberal)

Sheet flow from Lachlan River system at Caragatel flood channel south of Forbes

Flood damage to the Newell Highway at Moree (February 2012)

Floods in Moree (February 2012)

Flood damage on the Newell Highway north of Moree (February 2012)

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.

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.

There are two locations along the Newell Highway corridor where slopes have been assessed in terms of their risk. The first is in the section leading into Forbes and the second is between Coonabarabran and Narrabri. Both have been assessed as an ARL 4, which is considered low risk.

Therefore, from the data available, no action needs to be taken along the Newell Highway, as at this stage slopes have been rated as ARL 3 or above.

ARL 4 slope with rock bolting, shot-crete and rock fall fencing near Coonabarabran.

Road culvert risk rating

There are 1559 culverts along the Newell Highway. These include 835 concrete pipe culverts, 721 concrete box culverts and three steel pipe culverts.

Culverts on the Newell Highway have not been formally assessed in terms of their condition and risk.

A road culvert risk rating is a systematic analysis of the risks associated with culvert condition on the State road network. This is part of the culvert management framework policy which details the process of monitoring road culverts, including reference to the culvert inventory collection guideline and the culvert risk assessment guideline. If a culvert fails, under extreme conditions, the road surface above the culverts 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 a 'Low Risk' are those with rating ARL 3, 4 or 5.

In June 2010, Roads and Maritime started the process of risk assessment by conducting a survey of culverts on the Newell Highway – the first stage of a full risk assessment. The survey located each culvert, recorded inventory data such as its type and size and then conducted a visual assessment of each culvert's condition. This survey has set the foundation for a more detailed condition assessment and risk rating in Stage Two.

Once a full risk assessment of the condition of the culverts has been completed, Roads and Maritime will target higher priority culverts to be treated as part of maintaining and upgrading the Newell Highway. The aim from that point will be to progressively upgrade culvert drainage along the Newell Highway. Culverts convey water from one side of a road to another, through a channel or pipe under the road. Flooding is minimised by allowing water to escape, minimising build up and preventing overtopping. Any necessary upgrades will ensure the road is accessible during flooding events up to a one in 20 year flood recurrence interval.

The overall number of culverts is provided in Table 4.25 below.

Table 4.25 Culvert conditions

Culvert type	Low priority	High priority	Not quantitatively assessed	Total
Pipe	266	56	513	835
Box	304	19	398	721
Composite	-	-	3	3
Total	570	75	914	1559

Roads and Maritime will assess the risk of culverts failing along the length of the Newell Highway and develop and implement management plans for culverts with a risk rating of 1 or 2.

Typical box culvert north of Moree

225 cell box culvert north of Moree

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[66].

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.

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.

The Newell Highway is currently a HML route along its entire length. See section 4.3 for details on which vehicles can access particular sections of the corridor.

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'[64].

There are a total of 208 bridges along the Newell Highway that have been assessed. Of these, three bridges are in 'poor' condition (Figure 4.21).

The three bridges with a 'poor' BHI are:

- The bridge over Lake Forbes about 450 metres southwest of the township. Although the bridge is generally in good condition, it has a 'poor' BHI because there is greater than 10 per cent cracking in the pavement surface.
- The bridge over Wallon Creek, located about 30 kilometres north of Moree, is generally in good condition but has a 'poor' BHI because the roughness of the pavement is considered 'very poor' and has 'minor' levels of rutting.
- The bridge over Nee Nee Creek, located about 46 kilometres north of Moree, is generally in fair condition but has a 'poor' BHI because Abutment A has significant damage and the headstocks of the original section built in 1968 show significant cracking.

Generally, bridges along the Newell Highway meet requirements.

However, the two bridges with poor pavement surface should be considered for resurfacing as part of annual re-sheeting program. The Bridge at Nee Nee Creek will be monitored.

63 ibid., p. 56

64 ibid., p. 34

Figure 4.22 Locations of bridges with poor Bridge Health Index (BHI)

Rail crossings

Rail crossings can be either a level crossing – the intersection of a road or walkway and a railway line at the same grade – or a grade separated crossing, where the road and rail line are either under or over one another.

There are currently four grade separated rail crossings on the Newell Highway. These road over rail crossings are in good condition, except for the Morundah road over rail bridge (Table 4.26).

There are nine rail level crossings on the Newell Highway with active train lines (Figure 4.23) at the following locations:

- Mirrool – 47 kilometres south of West Wyalong town centre
- West Wyalong – one kilometre west of West Wyalong town centre
- Forbes – 0.75 kilometres north of Forbes town centre
- Tichborne – 11.5 kilometres south of Parkes town centre
- Welcome – 4.1 kilometres south of Parkes town centre
- Parkes – 0.5 kilometres south of Parkes town centre
- Gilgandra – 2.1 kilometres south of Gilgandra town centre
- Narrabri – three kilometres south of Narrabri town centre
- Camurra – 11.5 kilometres north of Moree.

There are also a number of inactive road crossings or crossings adjacent to the highway which affect its operation and should be considered, such as the recently upgraded rail crossing on Whitton Street in Narrandera.

Individual rail and road agencies are responsible for managing safety at their level crossings. Roads and Maritime manages rail crossings to improve safety for road and rail users, maintain the State road network's efficiency, and comply with legislative requirements. The Australian Level Crossing Assessment Model (ALCAM) is an assessment tool used to identify key potential risks at level crossings and to assist in the prioritisation of crossings for upgrades. The risk model is used to support a decision-making process for both road and pedestrian level crossings and to help determine the most cost-effective treatments.

ALCAM captures detailed survey information to create an inventory of rail crossings. It also assesses risk and allows each rail crossing to be ranked. This, in turn, helps inform decisions about which level crossings require further treatment and what would be the most effective way to upgrade the crossing.

Safety reviews have been undertaken for all railway crossings along the Newell Highway (Table 4.27).

CASE STUDY – PARKES

The rail level crossing in Parkes averages 28 train movements per day (survey carried out peaked at 57 movements on a single day) for an average of 70 minutes of closure per day. The rail crossing can close multiple times in an hour for up to 15 minutes at a time (average is 2.5 minutes) causing substantial delays to Newell Highway traffic, primarily due to shunting operations on the rail network. Traffic backs up the Newell Highway in both directions and prevents north – south traffic flow along the Newell Highway and east – west across Henry Parkes Way and other local roads. These delays result in localised congestion which is further complicated by an adjacent 90 degree bend in the Newell Highway and the intersecting Henry Parkes Way (Hartigan Avenue). This level crossing does not adequately accommodate PBS 3(a) vehicles.

In the short term, examination of the rail crossing and adjacent intersection to determine ways to improve vehicle movements is required. In the longer term, a solution to these issues may be to realign the Newell Highway to bypass the rail level crossing. This could also provide a grade separated crossing of the main western rail line and as such avoid lengthy delays at the current level crossing.

All railway crossings are managed in accordance with their respective safety management plans. The target for the Newell Highway is to:

- Upgrade rail crossings in high speed environments
- Separate the rail crossings from vehicles where practicable as level crossings may act as a barrier to free flow of traffic and result in delays, particularly in urban areas
- If separation is not possible, apply the most appropriate form of control to reduce safety risks

Table 4.26 Road over rail bridges

Location	Description of bridge	Additional comments
Morundah (3km south of Morundah)	The Morundah road over rail bridge is narrow and has no shoulders. In addition the pavement approaches are in poor condition and require remediation.	The current bridge is too narrow to accommodate PBS Class 3(a) vehicles.

Camurra level crossing north of Moree

Rail level crossing in Parkes

Figure 4.23 Rail level crossing locations

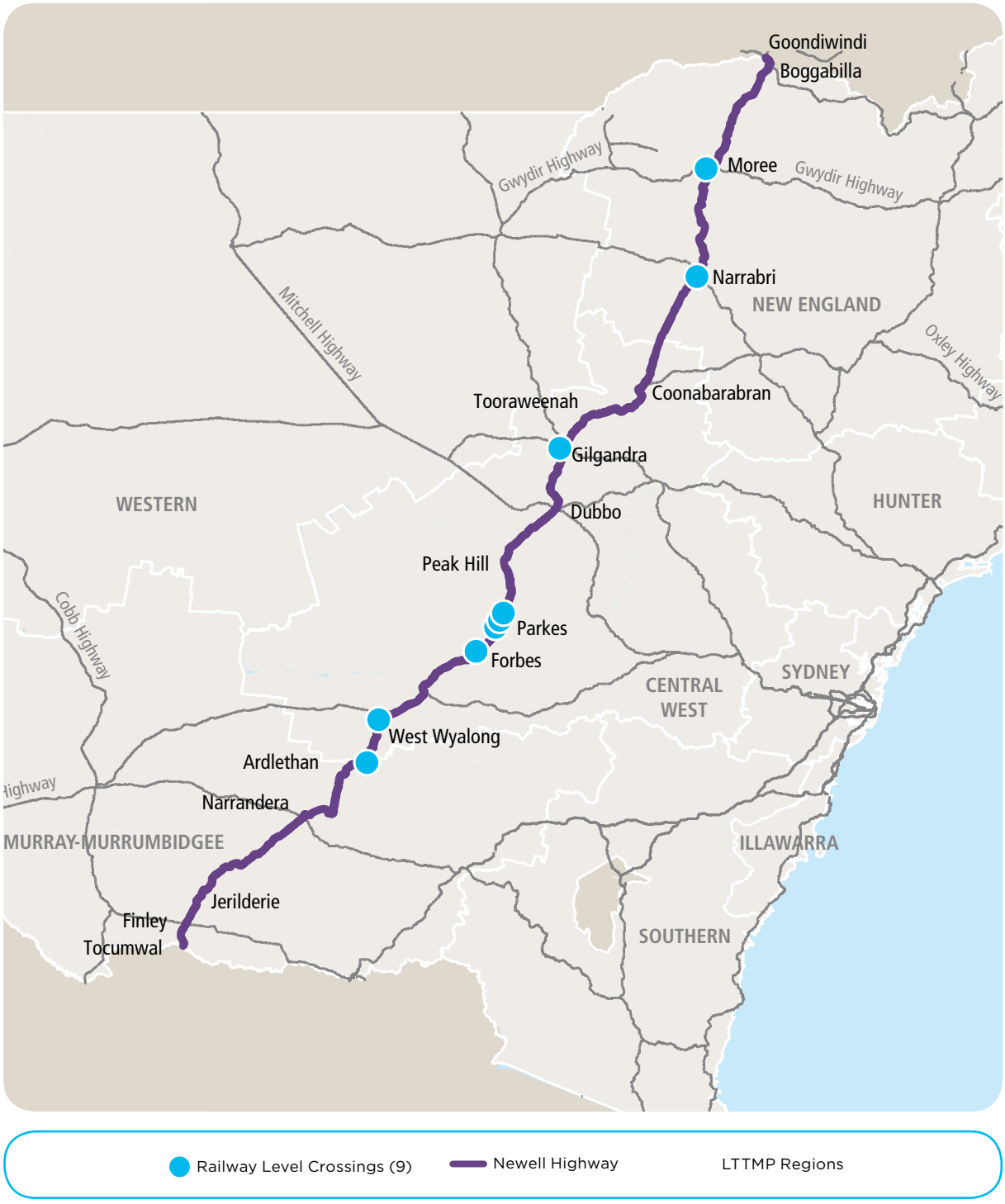


Table 4.27 Rail crossing locations

Location of rail level crossing	Rural or urban	ALCAM rating and safety management plan prepared?	Flashing Lights	Boom Gates	Additional comments
Mirrool – 47.0 kilometres south of West Wyalong town centre	Rural	Yes	Yes	No	
West Wyalong – one kilometre west of West Wyalong town centre	Urban	Yes	Yes	No	The current alignment of the crossing does not allow HPV access – see Table 4.17
Forbes – 0.75 kilometres north of Forbes town centre.	Urban	Yes	Yes	Yes	
Tichborne – 11.5 kilometres south of Parkes town centre	Rural	Yes	Yes	No	This site has been identified for further safety improvements during 2013/14
Welcome – 4.1 kilometres south of Parkes town centre	Rural	Yes	Yes	No	
Parkes – 0.5 kilometres south of Parkes town centre	Urban	Yes	Yes	Yes	The current alignment of the crossing does not allow HPV access – see Table 4.17
Gilgandra – 2.1 kilometres south of Gilgandra town centre	Urban	Yes	Yes	Yes	Railway level crossing improvements on the Newell Highway in Gilgandra (install boom gates) completed in 2012/13
Narrabri – three kilometres south of Narrabri town centre	Urban	Yes	Yes	No	Concept design for further safety improvement was developed in 2011 by the rail infrastructure manager.
Camurra – 11.5 kilometres north of Moree	Rural	Yes	Yes	No	

4.5 Road pavement condition

Road pavement is a layer of crushed rock which sits above the ground the road is built on. This rock can be either in a natural state or modified into materials such as concrete or asphalt.

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 overlayed 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 Newell Highway's pavement condition for the long term is a key task that involves estimating the pavement's remaining service life to ensure appropriate rates of pavement rebuilding.

With an inadequate rate of rebuilding, the network will deteriorate until eventually the service level is compromised. Alternatively, if the pavement rebuilding rate is too high, resources are spent unnecessarily and inefficiently.

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

- Pavement types and seals
- Pavement age
- Road pavement structural remaining life
- Road surface cracking
- Roughness
- Road smoothness
- Rutting

Pavement types and seals

Pavements provide structural support for vehicles travelling along a route. Weaker or older pavements may 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 gravel, unbound granular 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, and cost
- The need to optimise lifecycle costs.

The vast majority, over 97 per cent, of the Newell Highway is comprised of flexible pavement with a thin bituminous sealed surface. The exception is the segment from Forbes to Parkes, which has a significantly higher proportion of bound granular pavement with asphalt surface. Table 4.28 summarises the pavement types along the Newell Highway.

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Table 4.28 Pavement types

Highway planning section	Flexible	Composite				Rigid (concrete)	Bridge
	Granular sealed	Granular with asphalt	Bound granular with asphalt	Asphalt	Asphalt over lean mix		
1. Tocumwal to Finley	100.0%	-	-	-	-	-	-
2. Finley to Jerilderie	98.1%	1.9%	-	-	-	-	-
3. Jerilderie to Morundah	97.9%	-	2.1%	-	-	-	-
4. Morundah to Narrandera	100.0%	-	-	-	-	-	-
5. Narrandera to Grong Grong	100.0%	-	-	-	-	-	-
6. Grong Grong to Ardlethan	99.1%	-	0.9%	-	-	-	-
7. Ardlethan to Mirrool	100.0%	-	-	-	-	-	-
8. Mirrool to West Wyalong	100.0%	-	-	-	-	-	-
9. West Wyalong to Forbes	91.0%	-	1.0%	6.1%	0.5%	1.1%	0.2%
10. Forbes to Parkes	87.6%	2.7%	9.1%	-	0.6%	-	-
11. Parkes to Tomingley	90.6%	-	3.7%	-	5.7%	-	-
12. Tomingley to Dubbo	98.9%	-	1.1%	-	-	-	-
13. Dubbo to Gilgandra	93.2%	-	6.4%	-	-	0.2%	0.2%
14. Gilgandra to Gowang	98.9%	-	0.7%	-	-	-	0.4%
15. Gowang to Coonabarabran	99.7%	-	-	-	-	-	0.3%
16. Coonabarabran to Narrabri	99.7%	-	0.1%	-	0.1%	-	0.1%
17. Narrabri to Moree	99.2%	-	-	0.6%	-	-	0.2%
18. Moree to Boggabilla	98.7%	-	0.6%	-	-	-	0.7%
19. Boggabilla to Goondiwindi	100.0%	-	-	-	-	-	-
Sub-total Zone 1: Tocumwal to Marsden	97.0%	0.2%	0.9%	1.9%	-	-	-
Sub-total Zone 2: Marsden to Coonabarabran	95.3%	0.2%	2.8%	-	1.2%	0.3%	0.2%
Sub-total Zone 3: Coonabarabran to Goondiwindi	99.2%	-	0.2%	0.2%	-	-	0.3%
Total (by length)	**97.1%**	**0.1%**	**1.4%**	**0.7%**	**0.4%**	**0.1%**	**0.2%**

- **Zone 1:** The pavements in this zone are typically constructed of gravel materials on soft soil subgrade, and most have a sprayed seal surface. High water table and flooding are common in this zone and exacerbate the poor pavement condition. The subgrade conditions in this zone are poor and comprise highly expansive materials that exhibit large swell and shrinkage movement during changes in moisture content.
- **Zone 2:** The pavements in this zone are typically constructed of gravel material with a sprayed seal surface, however there are a few areas where the pavement was rebuilt with stabilised based course and asphalt surfacing. The subgrade is typically black silty clays. Due to the expansive nature of the black clay subgrade, the typical failure mechanism is subgrade related and results from a lack of cover over the soft subgrade.
- **Zone 3:** The existing pavement is constructed of river gravel or ridge gravel, locally sourced crushed granite, and sandstones, and does not conform to any current RMS specification for base or sub-base material. The pavement of this zone is almost exclusively built across highly expansive black soil plains.

The subgrade conditions are generally poor along the Newell Highway. Pavements are typically constructed of poor quality gravels over weak "black soil" subgrade. High water table and flooding are common in some areas and this also exacerbates the poor pavement condition. The black soil subgrades have a low strength and high swell characteristics, which can lead to loss of shape, roughness and rutting in pavement layers. River gravels have a lower strength than other granular materials as they are rounded. This reduces the mechanical stability, leading to shoving and rutting under heavy vehicle loads.

For future 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. Pavement type selection will vary from section to section along the route 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.

These are discussed below:

- **Tocumwal to Marsden (Zone 1):** the rebuilding options for this zone are binder modification of existing pavement and granular overlay conforming materials in rural areas, and thick asphalt base within the urban areas of Tocumwal, Finley, Jerilderie and Narrandera.
- **Marsden to Coonabarabran (Zone 2):** the rebuilding options for this zone are binder modification of existing pavement and/or granular overlay of heavy duty granular material in the rural areas, and heavy duty asphalt pavement in the urban areas.
- **Coonabarabran to Goondiwindi (Zone 3):** the rebuilding options for pavement are binder modification of existing pavement and/or granular overlay of conforming DGB (dense graded base) material for the high section from Coonabarabran to Narrabri.

Recent pavement rebuilding works north of Narrabri have not provided a satisfactory level of service and were heavy patched within five to ten years due to severe pavement stress. This heavy patching is ongoing, resulting in high ongoing maintenance costs. This suggests the granular pavement used was not appropriate to withstand traffic loadings along this section of the Newell Highway. The traffic volume in this section of the highway is very high and comprises 40 to 55 per cent heavy vehicles. For this section of the highway, between Narrabri and Goondiwindi, the preferred option is for a heavy duty pavement design and is likely to include binder modification of the existing pavement and overlay with Roads and Maritime conforming granular material and thick asphalt base.

A heavy duty pavement type would be able to withstand the high traffic volumes on the Newell Highway and would involve much lower maintenance costs. While the initial cost of transitioning to heavy duty pavement would be high, reduced ongoing maintenance costs would lead to an overall saving in the medium to longer term. A transition to a heavy duty pavement type should be considered for the Newell Highway for whole of life economic benefits. A heavy duty pavement would also offer other benefits, including fewer disruptions to traffic due to reduced failures and patching road works, reduced roughness and lower vehicle operating costs.

Heavy duty pavement replacement work will need to be prioritised so that the sections in the worst condition are addressed first. In the first instance priority will be given to pavement replacement for the northern end of the corridor (north of Narrabri to the Queensland border), because of the contribution the northern section makes towards heavy vehicle productivity.

Pavement age

Road pavement is designed to provide satisfactory service over a specified period, typically 20 to 30 years for flexible pavements and 40 years for rigid pavements. The age of the pavement is a further indicator of its remaining life. While pavement can continue to operate beyond its design life, it will experience increasing failures and require emergency repairs. Eventually the pavement will require full reconstruction to continue to support traffic.

Roads and Maritime faces considerable challenges in maintaining and renewing its infrastructure to ensure it is serviceable and sustainable now and in the future. Increasing freight traffic, population growth, economic prosperity and environmental sustainability all influence the need for continuing maintenance and rehabilitation of the Newell Highway.

Table 4.29 summarises the age of pavements along the Newell Highway. Pavement age on parts of the Newell Highway has exceeded its design life and the current pavement replacement rate is 1.2%, which is lower than the replacement rate required. Despite this, the majority of pavements are currently displaying ongoing structural serviceability and acceptable roughness, due to ongoing significant and costly localised repairs.

Along the Newell Highway, there is a larger number of pavement sections aged greater than 40 years than less than 20 years. Some sections of the Newell Highway include more than 50 per cent of pavement aged beyond its design life. These areas are located in the following locations:

- Finley to Morundah
- Grong Grong to West Wyalong
- Dubbo to Gowang
- Coonabarabran to Narrabri.

Particular note should be made of the two sections Coonabarabran to Narrabri and Ardlethan to West Wyalong where respectively 87 and 85 per cent of the pavement age exceeds 40 years.

Pavement deterioration south of Dubbo

Table 4.29 Pavement age*

Highway planning section	< 20 years	20-40 years	> 40 years
1. Tocumwal to Finley	50.7%	28.3%	21.0%
2. Finley to Jerilderie	25.1%	8.6%	66.3%
3. Jerilderie to Morundah	38.5%	7.1%	54.4%
4. Morundah to Narrandera	46.0%	9.8%	44.3%
5. Narrandera to Grong Grong	32.6%	21.0%	46.4%
6. Grong Grong to Ardlethan	33.8%	15.5%	50.8%
7. Ardlethan to Mirrool	15.4%	-	84.6%
8. Mirrool to West Wyalong	4.1%	9.9%	86.0%
9. West Wyalong to Forbes	65.7%	16.1%	18.2%
10. Forbes to Parkes	21.8%	64.5%	13.7%
11. Parkes to Tomingley	35.2%	28.1%	36.7%
12. Tomingley to Dubbo	56.5%	4.9%	38.7%
13. Dubbo to Gilgandra	31.5%	11.9%	56.6%
14. Gilgandra to Gowang	23.5%	9.9%	66.6%
15. Gowang to Coonabarabran	29.4%	24.8%	45.8%
16. Coonabarabran to Narrabri	6.7%	6.2%	87.1%
17. Narrabri to Moree	51.8%	0.3%	47.9%
18. Moree to Boggabilla	46.1%	33.1%	20.8%
19. Boggabilla to Goondiwindi	-	91.2%	8.8%
Sub-total Zone 1: Tocumwal to Marsden	36.4%	10.0%	53.7%
Sub-total Zone 2: Marsden to Coonabarabran	37.2%	21.4%	41.4%
Sub-total Zone 3: Coonabarabran to Goondiwindi	32.9%	15.8%	51.3%
Total (by length)	**35.6%**	**16.0%**	**48.5%**

* Where ages are given as age since pavement was last reconstructed, ignoring resurfacings of the pavement

Typical pavement cracking

Road works on Newell Highway north of Jerilderie

Pavement structural remaining life

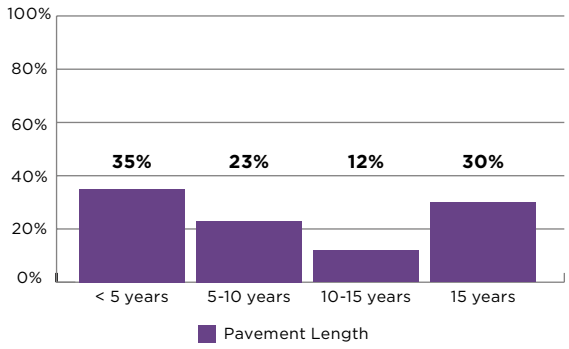
Structural remaining life is used to estimate the remaining capacity of the pavement – that is, the time remaining until the performance of the road becomes unpredictable and there is an increased risk that the road pavement can quickly fail and reach an unserviceable condition, affecting productivity 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 are assessed using a falling weight deflectometer along the entire length of the highway. These values are then analysed using established and accepted methodologies to calculate the structural remaining life.

Based on the Newell Highway analysis, more than a third of the Highway has a structural remaining life of less than five years and over half the pavement has a structural remaining life of less than 10 years (Figure 4.24).

Figure 4.24 Pavement remaining life



If the current approach to routine maintenance continues and no major pavement reconstruction is implemented – the pavement will deteriorate in strength and emergency repairs will be a necessity, creating ongoing traffic delays.

The amount of pavement reconstruction activity required on the route will need to be increased in the next few years to renew and reset the structural life of the weak and heavy loaded pavements. The structural remaining life of pavement across the network is a primary factor in determining the rate of rebuilding.

Roads and Maritime is currently developing a pavement replacement strategy for the Newell Highway that provides reasonable service levels and appropriately manages risk.

Pavement failures north of Forbes

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 seriously reduce the strength and durability of the road. The prevalence of cracking in a road surface is a key performance measure determining the 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 deterioration of the underlying pavement in the longer term, thereby increasing asset maintenance and bringing forward the need for pavement replacement.

The deterioration of a road may be accelerated significantly if the road is badly cracked allowing water ingress. Increased moisture in the pavement and formation leads to loss of strength and a shortened service life.

The extent of cracking indicates the risk exposure to rapid deterioration of the road pavement due to water ingress. Granular road pavements are more susceptible to rapid deterioration while manufactured materials (asphalt) and heavier duty bound pavements are less susceptible. The typical asphalt pavement is more resilient to prolonged rainfall and cracking poses less of a risk to pavement durability.

As a guide, the typical acceptable level of cracking of class 4R roads is:

- For asphalt roads, at least 67 per cent of the road length 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 that 4.3 per cent of the road length should exhibit more than 10 per cent cracking.

Table 4.30 below summarises pavement cracking along asphaltic concrete on the Newell Highway, and shows that the level of cracking on asphaltic surfaces is within the acceptable limit.

Table 4.30 Pavement cracking (asphaltic concrete)

	per cent of corridor planning section within cracking category		
	< 5%	5–30%	> 30%
Total Highway performance (by length)	81.5%	18.5%	-

Table 4.31 below summarises pavement cracking along sprayed seal surfaces, and shows that the sprayed seal surfaces exhibit low levels of cracking, as there are small deficiencies in meeting the target of less than or equal to one per cent surface cracking.

Table 4.31 Pavement cracking (spray sealed)

	per cent of corridor planning section within cracking category		
	< 1%	5–10%	> 10%
Total Highway performance (by length)	75.4%	3.4%	1.2%

Typical pavement deformation on the Newell 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.

Roads and Maritime uses a 'roughness' measure to indicate the quality of ride of a pavement surface.

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.

Across the State, 76.8 per cent of the combined length of Class 4R roads has a roughness level below 4.2 metres per kilometre. The corresponding result for the Newell Highway is 88.8 per cent (Table 4.32).

Table 4.32 International Roughness Index (IRI) value below 4.2 metres per kilometre

	Newell Highway	Other Class 4R roads
Performance - Length of smooth road	88.8%	76.8%

Road smoothness

Road smoothness is a travel weighted roughness measure. The NSW 2021 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[65]. 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 Newell Highway is 93.3 per cent, which satisfies both the NSW State Plan smoothness target of 93 per cent and the NSW 2021 target.

Rutting

Rutting measures the extent of permanent pavement deformation in the wheel paths. Rutting is a longitudinal distress that generally does not influence roughness. Rutting represents a potential road safety concern due to water ponding, increase in aquaplaning risk and subsequent loss of skid resistance[66].

Rutting is regarded as a key distress mode and has a strong influence on RMS' 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. Rutting affects safety as water can pond or in cold areas ice patches can form in the depressions along the wheel paths.

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 (resurface if asphalt instability, heavy patch or rebuild if deeper).

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

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

Rut measurements show 56 per cent of the Newell Highway currently exhibits 'moderate' rutting above 5 millimetres (Table 4.33). The rest of the route exhibits minimal rutting. The large proportion of the route with moderate rutting is a reflection of the long lengths with a natural gravel base layer and a thin bitumen surface, which have inadequate strength to support the increasing heavy vehicle tyre loads.

Typical edge pavement failure

Table 4.33 Rutting

Highway planning sections		Moderate (> 5 mm)
1.	Tocumwal to Finley	64.8%
2.	Finley to Jerilderie	62.3%
3.	Jerilderie to Morundah	69.8%
4.	Morundah to Narrandera	49.6%
5.	Narrandera to Grong Grong	62.2%
6.	Grong Grong to Ardlethan	58.5%
7.	Ardlethan to Mirrool	62.0%
8.	Mirrool to West Wyalong	63.4%
9.	West Wyalong to Forbes	59.7%
10.	Forbes to Parkes	51.5%
11.	Parkes to Tomingley	55.0%
12.	Tomingley to Dubbo	58.7%
13.	Dubbo to Gilgandra	59.7%
14.	Gilgandra to Gowang	55.1%
15.	Gowang to Coonabarabran	57.0%
16.	Coonabarabran to Narrabri	50.2%
17.	Narrabri to Moree	47.3%
18.	Moree to Boggabilla	58.0%
19.	Boggabilla to Goondiwindi	44.7%
Sub-total Zone 1: Tocumwal to Marsden		61.3%
Sub-total Zone 2: Marsden to Coonabarabran		56.2%
Sub-total Zone 3: Coonabarabran to Goondiwindi		50.5%
Total (by length)		**55.9%**

4.6 Environment

The Newell Highway corridor is a source of rich biodiversity, cultural heritage and agricultural production.

It passes through predominantly agricultural areas of central NSW. Most homes are set back from the road, however in some urban areas homes front the road directly.

Flora

The landscape surrounding the road corridor has been largely cleared of native vegetation to make way for agricultural activities. Land has been extensively cleared in western NSW, largely as a result of its long history of agricultural land use, including grazing and cropping.

The major exception is the Pilliga scrub, north of Coonabarabran, which comprises 3000km^2 of semi arid woodland.

The Newell Highway road reserve itself is a unique biodiversity asset.

In some parts of the Newell Highway corridor, remnant vegetation is exclusively found in the road reserve, with the surrounding environment highly modified or disturbed. The intrinsic value of standalone flora species makes remnant vegetation within the road reserve of very high conservation value.

Trees along north-south corridors such as the Newell Highway provide important connections for migratory birds and other threatened species. The corridor also has east-west habitat links, generally along creek lines, as well as vegetated road reserves, to other remnant patches, such as the wooded foothills of the Great Dividing Range.

There are 14 different endangered ecological communities present along the corridor. These communities are listed under either the *Threatened Species Conservation Act*[67] or the *Federal Environment Protection and Biodiversity Conservation Act*[68]. They include:

- The Sandhill Pine Woodland
- *Ocasuarina luehmannii* Woodland
- Myall Woodland
- Inland Grey Box Woodland
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands
- Buloke Woodlands
- Weeping Myall Woodland
- Box-gum Woodland
- Fuzzy Box Woodland
- Poplar Box Woodland
- White Box Yellow Box Blakely's Red Gum Woodland
- Brigalow, Natural Grasslands on Basalt of northern NSW
- Pilliga Box Woodland.

The diversity and complexity of remnant and regenerating vegetation in the road reserve is highly valuable in most cases.

67 *Threatened Species Conservation Act* 1995 (NSW)

68 *Federal Environment Protection and Biodiversity Conservation Act* 1999 (Cth)

Fauna

Vegetation along the Newell Highway is home to threatened fauna including the Squirrel Glider and the Brown Tree Creeper. It is also a seed resource for threatened trees, grasses and shrubs, while also forming a transparent screen for agricultural activities. It is a slice of central NSW biodiversity highly visible to motorists.

Indigenous and European history

The Newell Highway corridor also has a long Aboriginal and European history. A diverse range of Aboriginal heritage exists along the length of the Newell Highway, including scarred trees, stone implements and meeting places. Roads and Maritime Services procedures, developed in consultation with local Aboriginal communities, ensure the identification and ongoing protection of sensitive cultural sites within the road corridor.

Non-Aboriginal heritage associated with mining and agriculture also abound, for example, the gold mine at Peak Hill.

It is Roads and Maritime Services' responsibility to manage the road reserve in a way that balances the needs of road users with the needs of the environment. This can be achieved by planting native species and improving habitat conditions outside the clear zone, through re-establishing groundcover and understory species.

Typical scarred tree of significant Aboriginal cultural value adjacent to the Newell Highway

Figure 4.25 National parks, State forests and other protected areas

5 FUTURE CORRIDOR CHANGES

Population growth is expected across NSW regions into the future. With this growth, there is a need to balance increasing demand for housing, infrastructure and services with the protection of productive agricultural land and natural assets. Higher traffic volumes and increased freight flows must be managed, while at the same time preserving the amenity and character of towns and communities.

5.1 Population and demographics

Population forecast

Across regional NSW, a range of changes will influence travel demands over the next two decades. In general, populations in regional NSW have grown by 1.2 per cent per year on average since 2006. This is expected to reduce to an average 0.8 per cent per annum growth through to 2031. Regional populations will continue to get older, with 21 per cent of the population expected to be over 65 years in 2031[69].

The total population of the Newell Highway corridor is about 124,206 people – of which 63 per cent of the total population live in key towns[70].

Transport for NSW prepared population projections and growth rates for regional NSW in the *NSW Long Term Transport Master Plan*. These projections show regional NSW is likely to experience uneven population growth from 2011 to 2031. Some regions are expected to grow strongly, while other regions will experience a reduction in population.

As shown in Figure 5.2, population growth varies across NSW, but is generally occurring most rapidly in coastal areas. Along the Newell Highway corridor, the highest population increase is expected in Dubbo, which is set to grow from 40,250 in 2011 to 46,500 people in the year 2031, an annual average change of 0.7 per cent between 2011 and 2031. Parkes is also expected to increase population whilst other areas along the corridor are expected to experience a decline in population[71]. However, Narrabri and Moree may start to grow due to industry changes such as the growth in coal seam gas and coal mining in the Narrabri area and the growth of cotton in the Moree area.

Overall population growth in the corridor is not expected to have a notable impact on the critical freight task of the Newell Highway.

Demographic changes and trends

Population growth in regional NSW will be accompanied by a significant change in demographic structure. The number of people over the age of 65 will increase from 15 per cent of the regional population in 2011 to 21 per cent of the population in 2031[72].

The Newell Highway corridor is already experiencing this demographic trend. The number of young people and people of working age living in the corridor has decreased, while the number of older residents increased. During the period 2001 to 2011, the number of people of working age in the corridor decreased by 8.9 per cent. The most significant decline was among people aged 25 to 29, where the population declined by 18.2 per cent[73].

69 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney, p. 214

40 Australian Bureau of Statistics 2011, *Census Data*, ABS, Canberra

71 Department of Planning and Environment 2014, 'Your future New South Wales to 2031: Population, Household & Dwelling Projections'

72 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney, p. 215

73 Australian Bureau of Statistics 2011, *Census Data*, ABS, Canberra

Figure 5.1 Regional NSW population growth on the Newell from 2011 to 2031[74]

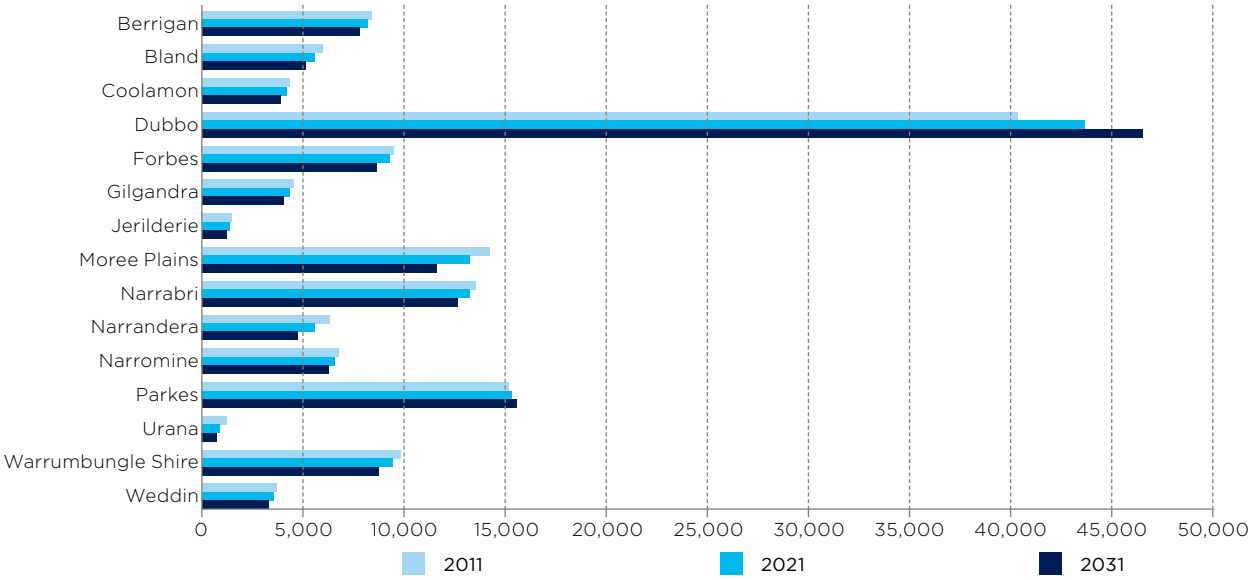
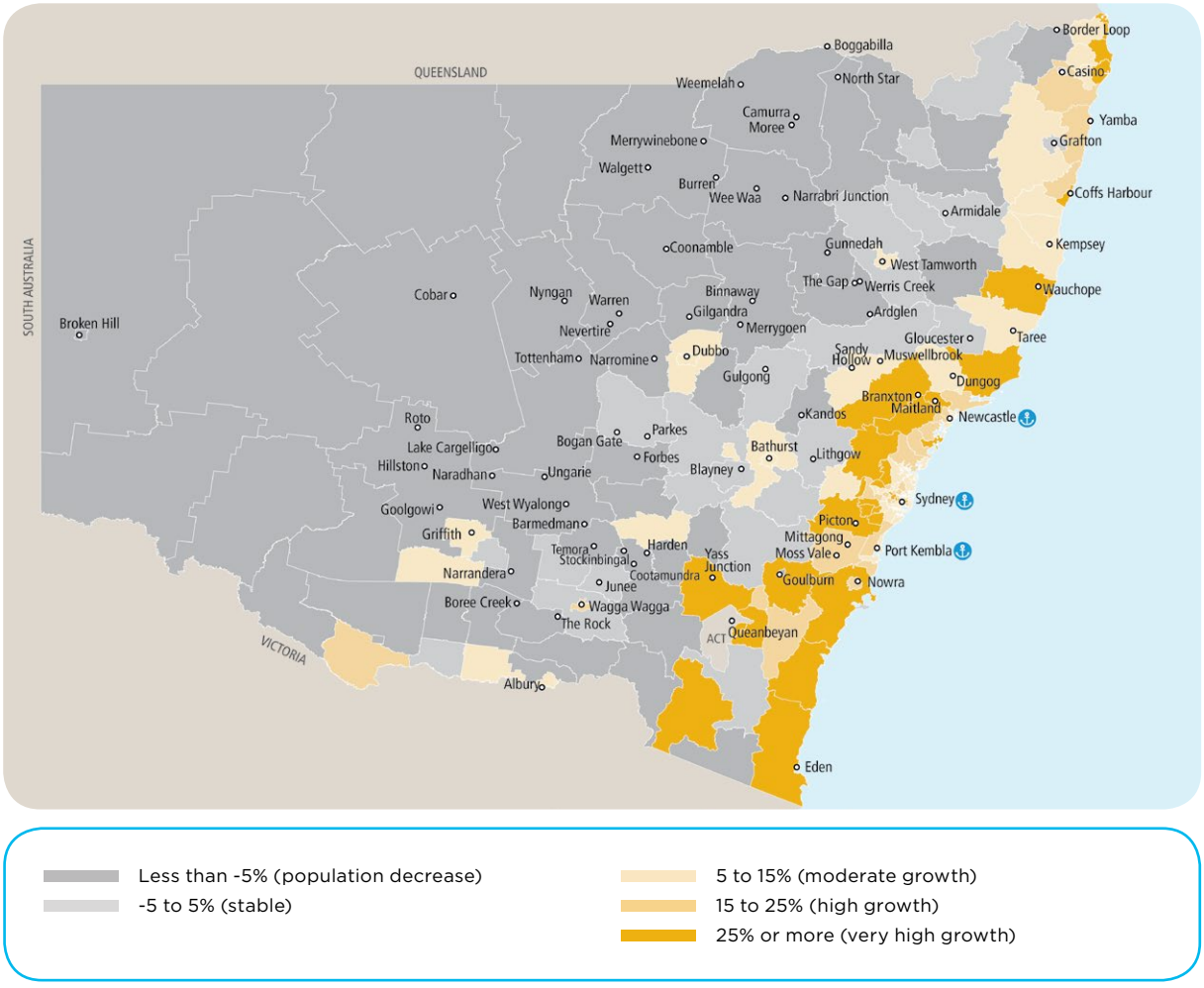


Figure 5.2 Forecast NSW population growth from 2011 to 2031[75]



74 Department of Planning and Environment 2014, *Your future New South Wales to 2031: Population, Household & Dwelling Projections*

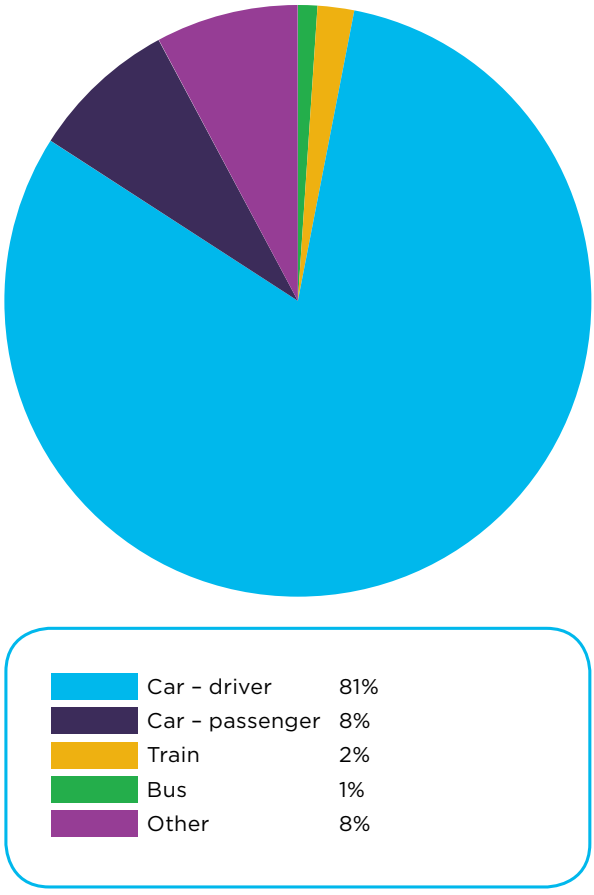
75 Transport for NSW 2013, *NSW Freight and Ports Strategy*, TfNSW, Sydney, pg. 100

In addition, during this period the number of older people in the corridor increased. For example, the number of residents in the corridor aged between 80 and 84 increased by 15.2 per cent and the number of residents aged over 85 increased by 15 per cent from 2001 to 2006.

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

Every day, people in regional NSW make around 7.5 million trips. Most journeys to work are made by car and this trend is likely to continue into the future. As illustrated in Figure 5.3, journey to work trips by train or bus account for only three per cent of regional travel.

Figure 5.3 Journey to work trips in regional NSW in 2006[76]



In regional areas, levels of car ownership are very high and motor vehicles are the main way people choose to move around. 86.8 per cent of households in the corridor own one or more motor vehicles, similar to the Australian average of 86.9 per cent[77] About 16.7 per cent of households in the corridor own three or more motor vehicles, which is slightly higher than the Australian average of 15 per cent. This represents a higher than average reliance on cars for commuter and leisure trips.

The proportion of households in the corridor that own at least one motor vehicle varies across the corridor. Moree Plains Shire – where 83.8 per cent of households own one motor vehicle or more – has the lowest rate of car ownership in the corridor, while the Bland Shire has the highest at 90.4 per cent.

76 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney, p. 216

77 Australian Bureau of Statistics 2006, *Census Data*, ABS, Canberra

5.2 Land use changes

The Newell Highway is not currently subject to any NSW Department of Planning and Environment (DP&E) regional strategies, although the draft Murray Regional Strategy[78] applies to the Murray-Murrumbidgee section of the Newell Highway, near Tocumwal, Berrigan and Finley). DP&E works closely with councils, key agencies and groups across Western NSW to manage land use and planning processes. Across the corridor, DP&E seeks to promote economic development, protect natural and built resources and help build rural and regional communities.

Urban development in the corridor is concentrated on the major towns and centres. For example, urban developments such as west Dubbo and east Dubbo are likely to result in increased traffic volumes on the Newell Highway.

There is ongoing development pressure in the coal basin at the northern end of the corridor around Narrabri and Moree Plains. This is due to increased mining activity and the exploration of coal seam gas. Growth in the mining industry is likely to result in land supply and housing issues. New and a greater variety of housing will be needed in the future to cater for expected industry and population growth, including areas like Narrabri Shire. There is likely to be ongoing demand for short-term accommodation and temporary housing. Even in areas with low population growth, there will be demand for new homes to provide greater housing choice.

Typical landscape between Forbes and West Wyalong

Box Gum Woodland Endangered Ecological Community near Alectown

78 NSW Department of Planning and Environment 2009, *Draft Murray Regional Strategy*, DoP, Dubbo

5.3 Traffic growth

Traffic growth can be forecast by considering historical average annual daily traffic (AADT) data and projecting population, land use and freight changes in the future.

Annual traffic growth from 1996 to 2005 showed that average linear growth rates for the different sections of the highway varied considerably. These growth rates are shown in Table 5.1.

The highest linear growth rate was recorded near Gil Gil Creek Bridge in Moree Plains Shire, where there was linear traffic growth of 2.7 per cent per annum.

TRARR (Traffic on Rural Roads) modelling of traffic forecasts showed the level of service along the highway deteriorated below level of service C by 2021, particularly at the northern end. Therefore, there will be an ongoing need to provide additional overtaking lanes along the corridor and specifically at the northern end.

Table 5.1 Historical AADT volumes and growth rates (1996 to 2005)

Location (chainage)	1996 AADT	2005 AADT	% Growth per annum	Predicted 2031 AADT
Marsden – at Bland Shire boundary (302 km)	3473	2856	-2.0%	2856*
At Weddin Shire boundary (319.4 km)	3010	2604	-1.5%	2604*
At Forbes Shire boundary (384.7 km)	4442	4597	0.4%	5100
Trewilga – north of Baldry Road (441.1 km)	3682	4490	2.4%	8319
At Parkes Shire boundary (454.4 km)	3964	4040	0.2%	4255
13 mile Creek – Narromine/ Dubbo boundary (488.4 km)	3715	4304	1.8%	6844
1.5 km south of HW7, Victoria Street (513.5 km)	5928	6863	1.8%	10913
Eumungerie – south of MR572, Narromine Road (552.8 km)	3964	4540	1.6%	6859
At Dubbo City boundary (556.9 km)	4347	4769	1.1%	6338
At Gilgandra – Coonabarabran Shire boundary (630.4 km)	3080	3363	1.0%	4356
0.3 km south of Bohena Creek Bridge (632.1 km)	2737	3333	2.4%	6175
Edgeroi – south of road to Curramanga (711.5 km)	4660	4994	0.8%	6144
At Gil Gil Creek Bridge (824.2 km)	3778	4686	2.7%	9368

* Where population growth is expected to decline, 2031 AADT has been assumed to equal 2005 AADT due to heavy vehicle growth predictions

5.4 Future freight task and heavy vehicle volumes

The NSW Freight and Port Strategy identifies the freight task in NSW is projected to nearly double to 794 million tonnes by 2031. Mining represents almost half the current task and is expected to remain the single largest freight task in NSW. The total freight task in the Melbourne to Brisbane corridor is estimated to increase from 4.5 million tonnes per year in 2007 to 11.5 million tonnes by 2029[79].

Road transport is forecast to account for more than two thirds of the total freight task in the Melbourne to Brisbane corridor by 2030, with much of this task assigned to the Newell Highway. Despite forecast improvements in the share of freight movement by rail corridor, it is likely that road transport will remain the dominant method of movement of both interstate and regional freight[80].

About 70% of intercapital freight currently travelling from Melbourne-Brisbane or Brisbane–Melbourne is carried by road, principally on the Newell Highway in NSW and connecting highways in Victoria and Queensland. This is expected to decrease to around 33% by 2040 if Inland Rail commences operation in 2020[81].

B-doubles were introduced to the Newell Highway in 1991. Since then, there has been a steady increase in the use of B-doubles, averaging an increase of five per cent per annum. The growth in B-doubles can be attributed to increases in freight demand. It is also noted that there has been a shift from semi-trailers to B-doubles in this time. As operators initially shifted towards B-doubles, semi-trailer numbers declined; however over the last five years this has settled with small growth again being experienced.

The forecast daily truck movements and freight task on the Newell Highway for 2031 is shown in Table 5.2. The highest growth is shown in the northern and southern parts of the corridor of around 80 per cent between 2011 and 2031.

Typical mix of traffic along the Newell Highway

79 This estimate is limited to end-to-end freight and does not include freight movements within the corridor.

80 Commonwealth of Australia 2007, Melbourne-Brisbane Corridor Strategy: *Building our National Transport Future*, Commonwealth of Australia, Barton, p. 16

81 Australian Rail Track Corporation 2010, Melbourne-Brisbane Inland Rail Alignment Study - Final Report, ARTC, Adelaide

Table 5.2 Forecast year daily truck annual tonnage (2031) [82]

From	To	Daily Trucks						Freight Volume (kilotonnes p.a.)						% increase from 2011
		2011			2031			2011			2031			
		Forward	Reverse	Total	Forward	Reverse	Total	Forward	Reverse	Total	Forward	Reverse	Total	
Tocumwal	Finley	650	650	1,300	1,175	1,175	2,350	4,600	5,800	10,400	8,500	10,300	18,800	81%
Finley	Jerilderie	595	595	1,190	1,045	1,045	2,090	4,400	5,100	9,500	7,900	8,800	16,700	76%
Jerilderie	Morundah	570	570	1,140	1,000	1,000	2,000	4,300	4,800	9,100	7,600	8,400	16,000	76%
Morundah	Narrandera	570	570	1,140	1,005	1,005	2,010	4,300	4,800	9,100	7,700	8,400	16,100	77%
Narrandera	Grong Grong	470	470	940	830	830	1,660	3,400	4,100	7,500	6,100	7,200	13,300	77%
Grong Grong	Ardletham	465	465	930	820	820	1,640	3,400	4,000	7,400	6,000	7,100	13,100	77%
Ardletham	Mirrool	465	465	930	820	820	1,640	3,400	4,000	7,400	6,000	7,100	13,100	77%
Mirrool	West Wyalong	445	445	890	790	790	1,580	3,200	3,900	7,100	5,800	6,800	12,600	77%
West Wyalong	Marsden	430	430	860	770	770	1,540	3,200	3,700	6,900	5,700	6,600	12,300	78%
Marsden	Forbes	415	415	830	740	740	1,480	3,100	3,500	6,600	5,600	6,200	11,800	79%
Forbes	Parkes	430	430	860	765	765	1,530	3,300	3,600	6,900	5,800	6,400	12,200	77%
Parkes	Tomingley	395	395	790	690	690	1,380	3,100	3,200	6,300	5,300	5,700	11,000	75%
Tomingley	Dubbo	395	395	790	690	690	1,380	3,100	3,200	6,300	5,300	5,700	11,000	75%
Dubbo	Gilgandra	505	505	1,010	890	890	1,780	4,200	3,900	8,100	7,300	6,900	14,200	75%
Gilgandra	Gowang	515	515	1,030	925	925	1,850	4,100	4,100	8,200	7,400	7,400	14,800	80%
Gowang	Coonabarabran	515	515	1,030	925	925	1,850	4,100	4,100	8,200	7,400	7,400	14,800	80%
Coonabarabran	Narrabri	495	495	990	905	905	1,810	3,900	4,000	7,900	7,200	7,300	14,500	84%
Narrabri	Moree	555	555	1,110	995	995	1,990	4,400	4,500	8,900	8,000	7,900	15,900	79%
Moree	Boggabilla	590	590	1,180	1,055	1,055	2,110	4,900	4,500	9,400	8,900	8,000	16,900	80%
Boggabilla	Goondiwindi	595	595	1,190	1,055	1,055	2,110	5,000	4,500	9,500	8,900	8,000	16,900	78%

82 Transport for NSW Strategic Freight Model (SFM) 2013

There is currently no direct continuous inland rail link between Melbourne and Brisbane, with end-to end rail freight moving via Sydney along the Sydney–Melbourne and Sydney–Brisbane rail corridors.

A study to scope the engineering and alignment of an inland railway linking Melbourne and Brisbane was released in 2010. The aim of the study was to determine the best route, economic benefits and likely commercial success of a new standard gauge inland railway between Melbourne and Brisbane (Figure 5.4).

The study found 'inland rail will be approaching economic viability in the medium term' and 'it would be appropriate to re-examine the project between about 2015 and 2020, or when tonnage approaches the level identified'[83].

The Australian Government has recently committed $300m to enable Inland Rail to commence with pre-construction activities in 2014. The detailed alignment is still to be determined, although it is proposed to pass through Parkes, Narrabri and Moree. The line is proposed to pass through Albury and Wagga Wagga in the south on-route between Melbourne and Brisbane.

The inland rail route project is identified in the Infrastructure Program in the NSW Freight and Ports Strategy, and will be constructed by the ARTC.

NSW TrainLink currently operate over parts of the potential ARTC Inland Rail Route where it is uses existing rail track corridors:

- Between Melbourne and Illabo (between Cootamundra & Junee)
- Short distance at Parkes on the Broken Hill line
- Between Narrabri and Moree.

The rail over road bridge and Newell Highway in Dubbo

83 Australian Rail Track Corporation 2010, *Melbourne–Brisbane Inland Rail Alignment Study Final Report Executive Summary*, ARTC, Adelaide

Figure 5.4 Potential Melbourne and Brisbane route of the inland railway

5.5 Future 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.

Regional Transport Plans will be integrated with land use planning and other NSW Government initiatives, such as Regional Action Plans and Department of Planning and Environment Regional Growth Plans. This will ensure transport services and infrastructure are provided in a timely way, particularly in regions and centres with strong growth. Regional cycling, walking and public transport initiatives are addressed in the New England, Central West and Murray-Murrumbidgee Regional Transport Plans to help reduce reliance on cars in the region.

For example, active transport actions include:

- Construction of Gilgandra cycleway (Jack Renshaw Bridge: part 1 of stage 2) 2.5 metre wide timber decked off-road walking and cycling path (boardwalk) along the north western foreshore of the Castlereagh River from the Jack Renshaw Bridge (Newell Highway) underpass to the existing footpath of the Newell Highway, Gilgandra in 2013/14
- Construction of Warrumbungle cycleway (Getaway Tourist Park) 2.5 metre wide concrete off-road walking and cycling path along the north eastern side of the Newell Highway from the 'Getaway Tourist Park' to Kirban Street Coonabarabran in 2013/14

5.6 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 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 western NSW and the Newell Highway[84].

It is likely an increase in the frequency and intensity of storms would lead to more frequent short and long term highway closures. Climatic conditions will continue to be monitored for potential road impacts.

Flood depth marker in Forbes

84 Office of Environment and Heritage 2013, website accessed on 20 July 2013 http://www.environment.nsw.gov.au/research/Regionalclimate.htm

5.7 Road corridor changes

Long term pavement maintenance

The Newell Highway was originally constructed during the 1960s and 1970s to provide a pavement that could accommodate general access vehicles only. The design life of the pavement was generally 20 years and in many instances the pavement has significantly outperformed this design life. The road condition analysis indicates that there are significant sections of the pavement that need to be constantly maintained because the pavement in significant sections is cracked or has shoving issues. In addition some sections require frequent maintenance which becomes so expensive that pavement replacement has become more economically viable. Part of the assessment of the value of replacement versus continued in-situ maintenance includes the delays to motorists required to reduce speed at every heavy patching location. Along some sections of the Highway this can occur as often as every 10 kilometres.

There is no definitive standard for when to replace a conventional pavement with a heavy duty pavement however in an ideal situation heavy duty pavement becomes more viable when the number of vehicle axles using the route approaches or exceeds 10^7 (DESA). Funding constraints typically restrict application to only urban areas where the benefits will be greatest because the traffic volumes are greatest. The Newell Highway has a specific combination of constraints that have helped to build a case for using this pavement in a rural context. North of Narrabri the highway has axle loadings exceeding 10^7, the pavements are in poor condition and delays are caused by road repair activities. Further it is anticipated that there will continue to be a strong demand for PBS class 3(a) freight vehicles using this section of the route, making an important contribution to productivity. Therefore all new pavement replacement north of Narrabri, will where possible, be with heavy duty pavement.

While heavy duty pavement is more expensive in the short term, it has the advantage of having an extremely long life with regular resurfacing, and can be trafficked under almost any wet weather conditions (provided that the route is open). These pavements will therefore provide a greater assurance of access. By progressively constructing this pavement along the route, delays caused by heavy patching and other emergency maintenance activities will be reduced and potentially eliminated altogether.

Heavy duty pavement replacement work will need to be prioritised so that the sections in the worst condition are addressed first. The overall strategy to maintain the Newell Highway may also include work that extends the life of the current pavement by up to 10-15 years, as an interim strategy until the entire length of the route can be replaced over the next several decades. In the first instance priority will be given to pavement replacement for the Northern end of the corridor (north of Narrabri to the Queensland border), because of the contribution the northern section makes towards HPV productivity.

Wide centre line treatment

The wide centre line treatment will be progressively implemented along the Highway for all new reconstructed sections. The treatment is provided on a 12m+ wide pavement, with two 3.5m wide lanes, and a 1.2m centreline with the remaining width being a sealed shoulder. Further investigation of the appropriateness of using wide centre line treatment on formations less than 12m wide will be undertaken.

Moree bypass

The Moree town centre bypass involves building a 4.4 kilometre realignment of the Newell Highway between Bullus Drive, to the south of the town centre, and a position north-east of the Moree Racecourse, to the north-east of the town centre.

The bypass includes:

- Upgrading the Bullus Drive/Newell Highway intersection
- Providing a new route through east Moree between Gosport Street and the railway line and allowing Gosport Street to remain a service road
- Building a new signalised intersection with the Gwydir Highway in close proximity to the railway line
- A new road bridge crossing the Mehi River
- Building the Newell Highway on a new alignment to the east of Moree Racecourse
- Noise mitigation measures where appropriate
- Landscaping.

Stage 1 has been completed with the Bullus Drive intersection upgrade, the Mehi River Bridge and the Gosport Street works finished. Stage 2 has commenced with the state and federal governments each committing $15m to the project. The planning phase has been completed with construction commencing in 2014 and aiming to finish in 2016.

Ongoing reporting on road works

A Newell Highway Taskforce was established in 2009. This Taskforce consists of representatives of local government areas, through which the Newell Highway passes, the NRMA, members of Parliament, truck operators and transport groups. The taskforce meets three to four times per year. Roads and Maritime Services is invited to attend the meetings, as a guest, to report on works being carried out on the Newell Highway. This group also works closely with groups such as the Newell Highway Promotions Committee.

Moree bypass stage one

6 CORRIDOR CHALLENGES

Challenges associated with each of the corridor objectives for the Newell Highway are listed below. These are the main issues that need to be overcome to maintain and improve transport roles and services the Newell Highway provides for the community. They include challenges already evident and others that are expected to emerge as the result of future changes. These challenges can be mapped against broader *NSW Long Term Transport Master Plan* objectives.

Key challenges	
Newell Highway corridor challenges	**Where was the issue identified**
Improve liveability **Reduce social disadvantage**	
• The urban amenity of towns along the corridor is diminished by the through movements of a significant number of heavy vehicles, particularly when the highway passes through the main urban commercial centre of a town.	• An assessment was undertaken to identify priority locations for town bypasses that address urban amenity over the next 20 years along the Newell Highway corridor. The assessment identified bypasses at West Wyalong, Parkes, Dubbo, Coonabarabran and Moree Stage 2 as priorities.
• The lack of overtaking lanes along the corridor increases travel times and impacts on safety. The high proportion of heavy vehicles and cars towing caravans means vehicles are grouped into bunches. As suitable overtaking opportunities are limited in some locations, vehicles are forced to overtake on the opposite side of the road which creates a safety risk.	• The Newell Highway's level of service and need for overtaking lanes has been assessed. There are five sites in four locations where the level of service is less than the performance target. These are the priority locations for providing overtaking lanes. To address this issue an average spacing of approximately 10 kilometres between overtaking lanes in either direction along the length of the highway is proposed. Sections with steep grades such as Tap Hill would benefit from climbing lanes to improve traffic efficiency and road safety.
Economic growth / productivity	
• Poor road geometry along some stretches of the highway results in reduced travel speeds, increased travel times and increased road safety risks. • Due to the terrain and formation of the highway, it is difficult to provide appropriate lane and shoulder widths in some sections of the corridor.	• An assessment of road design and geometry shows that formation widening is necessary, in the steep winding area from Tooraweenah to Coonabarabran to address width and alignment issues. In addition, the highway needs to be realigned at Trewilga to eliminate a series of substandard curves.

Key challenges	
Newell Highway corridor challenges	**Where was the issue identified**
Economic growth / productivity	
• Higher Productivity Vehicle (HPV) access to some sections of the corridor is limited by current intersection configurations and also by narrow pavements.	• There are intersections that need to be improved to facilitate HPV access at Grong Grong (major realignment proposed), West Wyalong heavy vehicle bypass, Parkes, Coonabarabran, Narrandera, Narrabri, Moree, Boggabilla, Forbes, Dubbo and Jerilderie. • There are locations where pavement width is below standard due to narrow shoulders and narrow lanes, specifically the section through the Pilliga scrub between Coonabarabran and Narrabri. This area should be widened to ensure pavements are appropriate for modern PBS vehicles. • The road over rail bridge at Morundah is narrow and has no shoulders. The pavement on the bridge approaches is in poor condition and requires remediation.
• The existing pavement strength and thickness does not adequately address the current and future needs of freight vehicles. • The current strategy of heavy patching to repair the road pavement is causing disruptions to traffic. • There is a lack of good quality natural road building materials in the corridor. The few materials available near the corridor generally have low strength. There are significant transport costs associated with importing good quality road building materials from quarries hundreds of kilometres away.	• Overall pavement strength and remaining life along the corridor is poor, with over a third having less than five years remaining and more than 50 per cent of the pavement estimated to have a remaining life of less than 10 years. The northern end of the corridor north of Narrabri has high axle loadings and the pavement is approaching the end of its life. Replacement of pavement at the north of Narrabri should be prioritised over the remainder of the corridor. • A transition to a heavy duty pavement type will be considered for the Newell Highway for whole of life economic benefits. Heavy duty pavement would also offer other benefits including fewer disruptions to traffic for maintenance, reduced roughness and lower vehicle operating costs.

Key challenges	
Newell Highway corridor challenges	**Where was the issue identified**
Regional development / accessibility	
• There are flood immunity issues along the entire route. The highway is currently susceptible to nuisance flooding as well as flooding from larger events including swollen river systems and sheet flow over expansive flood plains.	• The condition of culverts is being assessed and management plans developed to reduce the impact of flooding along the highway. In the short term, nuisance flooding and sheet flow flooding will be progressively addressed by providing more culverts and increasing capacity at priority locations. • Further solutions to improve flood immunity for the Newell Highway across the Macquarie River at Dubbo should be developed in the medium term.
• Road closures for traffic crashes, spillages, bushfires, flooding and other incidents along the corridor currently require large detours because there is a lack of closely spaced support networks and local and regional roads.	• Implementing heavy duty pavement will in the longer term to reduce delays caused by repairs after flooding events. • Incident Response Plans will continue to be developed to manage flooded river systems.
• Achieving the efficient movement of traffic at the Mitchell Highway intersection in Dubbo (Whylandra Street/Victoria Street).	• Local pinch points will be addressed through capacity improvements at intersections.
Improve sustainability	
• High value vegetation conservation communities exist along the Newell Highway corridor, that require protection. There is a need to balance the need to protect these communities and the need for adequate clear zones.	• Meet the needs of road users and the environment by progressively relocating trees and other vegetation, and establishing and improving habitat conditions outside the clear zone.
Safety and security	
• The mix of vehicles along the Newell Highway includes cars, caravans and heavy vehicles. Heavy vehicles represent a high percentage of vehicles, regularly exceeding 50 per cent and the interaction between the different vehicle types can cause potential conflict.	• A trial of the wide centre line treatment was implemented, and the results were successful. The treatment will be progressively implemented along the corridor. • Where the formation is narrow (less than 11m), an audio tactile treatment for edge or centre lines will be considered. • Narrow pavements will be widened progressively *(see Economic growth /productivity section)* • To reduce safety risks, expanded access for RAV's along the highway will be restricted to PBS vehicles class 3 (a). The use of other non-PBS HPV vehicles will progressively be phased out over time.

Key challenges	
Newell Highway corridor challenges	**Where was the issue identified**
Safety and security	
• Appropriate infrastructure and services to help manage driver fatigue and facilitate breaks for heavy vehicle operators on this interstate freight route.	• Provide a consistent number and standard of rest areas to cater for all vehicle types along the full length of the route. Major Heavy Vehicle rest areas are provided every 100 kilometres. • The frequency of minor rest areas and informal parking areas will be further investigated to meet the spacing targets.
• Rail level crossings are a safety risk on the rural network for all road and rail users.	• Managing all rail level crossings will continue to focus on reducing risk to both road and rail users. The longer term vision is to remove rail level crossings in the corridor. Two rail level crossings in Parkes will be examined in more detail as part of addressing the HPV access through the town.
Improve transport integration process	
• The different needs of both local and through traffic users need to be balanced. • The length of the corridor means there are many local communities whose needs must be considered and addressed.	• The broad range of stakeholders and user groups with a mix of transport needs will need to be considered in detail. Regional Transport Plans will be progressively implemented in the short term, involving community consultation.

Rest area north of Parkes

7 TAKING ACTION

NSW Government priorities for responding to Newell Highway corridor challenges set out in Chapter 6 are outlined below. The investment priorities are divided into short, medium and long term actions to be implemented over the next 20 years. Implementing these actions will improve road safety, offer whole-of-life economic benefits and increase productivity of the Newell Highway.

7.1 Short-term investment priorities

Actions	Strategic response reference
Improve intersections along the route so high productivity freight vehicles PBS (3a) can travel the full length of the highway, in particular at: • West Wyalong (Heavy Vehicle Bypass and rail level crossing) • Grong Grong (Major realignment)	4.2. Traffic *Regional centres and town bypasses* 4.3. Heavy vehicles on the Newell Highway *Potential intersection improvements required for adequate HPV access*
Complete Stage 2 of the **Moree town centre bypass** to improve the centre's urban amenity and provide better access for HPV (currently under construction).	4.2. Traffic *Regional centres and town bypasses*
Reconstruct the highway with heavy duty pavement, including the wide centre line treatment, to upgrade the asset and provide safe and efficient travel conditions for all vehicles between **Narrabri and the Queensland border** as a priority. Heavy duty pavement will be implemented specifically at the following locations: • Mungle Back Creek to Boggabilla • Narrabri to Bellata • North Moree	4.4. Road design and geometry *Wide centre line treatment* 4.5. Road pavement condition *Pavement types and seals*
Improve and upgrade heavy vehicle rest areas and facilities for heavy vehicle drivers including: • Evaluation of the Smart Rest Areas C–ITS trial	4.3. Heavy vehicles on the Newell Highway *Heavy vehicle rest areas*
Provide for **Heavy Vehicle Safety Stations** at Moree, Narrabri and Daroobalgie.	4.3. Heavy vehicles on the Newell Highway *Heavy Vehicle Safety Stations (HVSS)*
Provide additional **climbing lanes** at Tap Hill and other locations with steep grades between Gilgandra and Coonabarabran.	4.4. Road design and geometry *Grades*
Progressively **reconstruct pavements** between the **Victorian border to Narrabri** as part of asset renewal, including implementing wide centre line treatment	4.4. Road design and geometry *Wide centre line treatment*
Assess the risk of culverts and develop and implement management plans for culverts with an assessed risk level (ARL) rating less than 3	4.4. Road design and geometry *Road culvert risk rating*

Actions	Strategic response reference
Provide **additional overtaking lanes** on the highway in a prioritised way, as set out in the Newell Highway Overtaking Lanes Strategy. The State and Federal governments have recently funded and delivered 11 overtaking lanes along the Newell Highway. An additional seven overtaking lanes have been funded for construction by 2017 at the following locations: • 1 between Jerilderie and Narrandera, 2 between Parkes and Dubbo, 3 between Gilgandra and Coonabarabran, and 1 between Moree and Boggabilla. As part of the overtaking lanes between Jerilderie and Narrandera, consideration will also be given to the removal/ demolition of the Morundah road over rail bridge, which is currently too narrow to accommodate PBS Class 3(a) vehicles. Provide an additional 16 overtaking lanes at the following locations: • 2 between Finley and Jerilderie, 2 between Jerilderie and Narrandera, 2 between West Wyalong and Forbes, 2 between Gilgandra and Coonabarabran, 2 between Coonabarabran and Narrabri, 4 between Narrabri and Moree, 2 between Moree and Boggabilla. Locations will be further investigated and may be subject to change. Implement any **remaining overtaking lanes** (medium to higher priority)	4.2. Traffic *Level of service and overtaking opportunities*
Improve road alignment at Trewilga and add a northbound overtaking lane to improve the road to a 110km/h standard.	4.4. Road design and geometry *Speed on curves* 4.2. Traffic *Level of service and overtaking opportunities*
Continue to **implement clear zone and safety barrier** improvements, taking into consideration the road geometry and environmental/land use constraints along the corridor	4.4. Road design and geometry *Clear zones and safety barriers*
Upgrade minor intersections identified in the 2008 Newell Highway Rural Intersection Strategy and the 2009 Newell Highway Road Safety Review, including the provision of a protected right turn bay at Ashburnham Road, also known as Forbes Cookamidgera Road, north of Forbes, and upgrade of Blackbutt Road intersection south of Dubbo.	4.4. Road design and geometry *Intersections*
Replace the Newell Highway / Mitchell Highway roundabout (Whylandra Street / Victoria Street) in Dubbo with **traffic signals**	4.2. Traffic

Actions	Strategic response reference
Identify and develop solutions for providing **access for PBS class 3(a) vehicles through Parkes**, such as a bypass to address the three deficient intersections: • Clarinda Street and Mitchell Street • Bogan Street and Hartigan Avenue • Hartigan Avenue and Forbes Street and adjacent railway level crossing	4.2. Traffic *Regional centres and town bypasses* 4.3. Heavy vehicles on the Newell Highway *Potential intersection improvements required for adequate HPV access*
Identify solution for **improving access for PBS class (3a)** vehicles through **Boggabilla**, including addressing intersection at Bruxner Way (this could include a realignment or bypass of Boggabilla)	4.3. Heavy vehicles on the Newell Highway *Potential intersection improvements required for adequate HPV access*

7.2 Medium-term investment priorities

Actions	Strategic response reference
Reprioritise the Newell Highway at the intersection with the Oxley Highway at Coonabarabran	4.3. Heavy vehicles on the Newell Highway *Potential intersection improvements required for adequate HPV access*
Continue to monitor and improve the **adequacy** of the major, minor **heavy vehicle rest areas** and informal truck parking bays including the North Dubbo rest area upgrade. This should also include considerations to provide for break down areas at the border crossings and other major freight junctions where the permitted vehicle size changes.	4.3. Heavy vehicles on the Newell Highway *Heavy vehicle rest areas*
Identify solutions to improve flood immunity and provide a flood free route across the Macquarie River at Dubbo, which may include a bypass	4.2. Traffic *Regional centres and town bypasses* 4.4. Road design and geometry *Flooding*
Continue to assess and **manage the risks of culverts**	4.4. Road design and geometry *Road culvert risk rating*
Improve the formation width, by widening sealed shoulder and improving lane widths, particularly at the following locations: • Tooraweenah to Narrabri • Five and a half kilometre section between Boggabilla and Goondiwindi	4.4. Road design and geometry *Lane widths* *Sealed shoulder widths* *Steep grades on curves*
Continue to **implement clear zone and safety barrier** improvements taking into consideration the road geometry and environmental/land use constraints along sections of the corridor	4.4. Road design and geometry *Clear zones and safety barriers*
Implement any **remaining overtaking lanes** set out in the Newell Highway Overtaking Lanes Strategy (lower priority).	4.2. Traffic *Level of service and overtaking opportunities*

Actions	Strategic response reference
Identify solutions for providing shared path access across Narrabri Creek in Narrabri.	3.6. Walking and cycling in the corridor *Narrabri*
Remove heavy vehicle through traffic from the main urban commercial centre at **Coonabarabran.** This may include a bypass.	4.2. Traffic *Regional centres and town bypasses*

7.3 Long-term investment priorities

Actions	Strategic response reference
Identify and provide solutions for **improving access for PBS class (3a)** vehicles through the intersection of Killarney and Tibbereena Streets at **Narrabri**	4.3. Heavy vehicles on the Newell Highway *Potential intersection improvements required for adequate HPV access*
Identify solutions for **improving access through various roundabouts** along the route, particularly at the intersection of Barwan Street and Killarney Street at Narrabri, and Dalgarno Street at Coonabarabran	4.3. Heavy vehicles on the Newell Highway *Potential intersection improvements required for adequate HPV access*
Upgrade rail level crossings in high speed environments and grade separate them from roads where possible	4.4. Road design and geometry *Rail crossings*
Reconstruct with heavy duty pavement including wide centre line treatment remaining lengths at the following locations: • Narrabri to Moree • Moree to Boggabilla Also apply the same treatment between Boggabilla and the Queensland border	4.4. Road design and geometry *Wide centre line treatment* 4.5. Road pavement condition
Continue to assess and **manage the risks of culverts**	4.4. Road design and geometry *Road culvert risk rating*
Progressively **widen narrow sealed shoulders and lanes**, including the provision of wide centre line treatment, between the Victorian border and Narrabri especially narrow sections north of Dubbo, north of Parkes and south of Gilgandra	4.4. Road design and geometry *Lane widths* *Sealed shoulder widths*
Improve remaining locations where **curves** are less than 600 metres within 110 km/h speed zones	4.4. Road design and geometry *Speed on curves*
Continue to **implement clear zones or safety barriers**, considering road geometry and environmental/land use constraints along the corridor	4.4. Road design and geometry *Clear zones and safety barriers*
Address nuisance flooding on the highway	4.4. Road design and geometry *Flooding*
Replace the roundabout on Newell Highway at Darling Street / Erskine Street in Dubbo with **traffic signals**	4.2. Traffic

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Note: All documents and references to Roads and Traffic Authority (RTA) have been replaced with Roads and Maritime Services (Roads and Maritime Services).

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- Roads and Maritime Services 2010, *Roads and Maritime Services Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW*, Roads and Maritime Services, Sydney
- Road Transport (General) Regulation: under *Road Transports (General) Act* 2005, clause 45 (NSW)
- *Threatened Species Conservation Act* 1995 (NSW)
- Transport for NSW 2013, *NSW Freight and Ports Strategy, TfNS*W, Sydney
- Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney

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

NSW Prescriptive and Performance Based Standards (PBS) heavy vehicle combinations

Transport Roads & Maritime Services

FACT SHEET

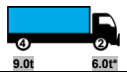
In NSW heavy vehicles are categorised as 'general access' and 'restricted access' vehicles, dependent on the vehicle mass, dimensions and configuration or a combination of all three. General access vehicles have unrestricted access to the NSW road system. General access vehicles are those that do not exceed all of the following:

Width	2.5 metres	**Length**	12.5 metres (Rigid Truck); 19 metres (Articulated Combination)
Height	4.3 metres	**Mass**	GML value shown in chart below

PRESCRIPTIVE COMBINATIONS

2 Axle Rigid Truck

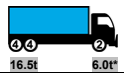
12.5 metres maximum overall length



GML^: 15.0t

3 Axle Rigid Truck

12.5 metres maximum overall length



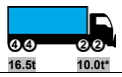
GML^: 22.5t

17.0t 6.0t*

CML^: 23.0t**

4 Axle Rigid Truck

12.5 metres maximum overall length



GML^: 26.5t

17.0t 10.0t*

CML^: 27.0t**

Twin steer vehicles fitted with a load sharing suspension are permitted 11 tonnes on the twin steer axle group increasing the Total Combination Mass of the vehicle by 1 tonne.

6 Axle Truck and Dog Combination

19.0 metres maximum overall length

GML^: 48.0t

Refer to the Class 3 Truck and Dog Trailer Combination Notice 2010 for operating conditions.

7 Axle Truck and Dog Combination

19.0 metres maximum overall length

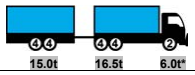
GML^: 50.0t

Total Combination mass of combination is limited to 50.0t.

Refer to the Class 3 Truck and Dog Trailer Combination Notice 2010 for operating conditions.

Truck and Pig Combination

19.0 metres maximum overall length

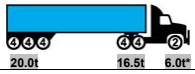


GML^: 37.5t

The loaded mass of a pig trailer must not exceed the loaded mass of the towing vehicle.

Semi-Trailer

19.0 metres maximum overall length



GML^: 42.5t

21.0t 17.0t 6.0t*

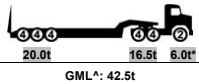
CML^: 43.5t**

22.5t 17.0t 6.0t*

HML^: 45.5t***

Truck and Low Loader Combination

19.0 metres maximum overall length



GML^: 42.5t

Special Permit required for masses over 42.5t.

19 metre B Double Combination (General Access Vehicle)

19.0 metres maximum overall length

GML^: 50.0t

17.0t 17.0t 17.0t 6.0t*

CML^: 51.0t**

Level 9, 101, Miller Street, North Sydney NSW 2060
Locked Bag 928 North Sydney NSW 2059
www.rms.nsw.gov.au | 13 22 13

May 2013
RMS. 13.259

PRESCRIPTIVE COMBINATIONS *(CONTINUED)*

19 metre B Double Combination (Restricted Access Vehicle)

19.0 metres maximum overall length

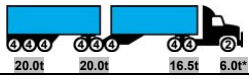
GML^: 55.5t

17.0t 17.0t 17.0t 6.0t*

CML^: 57.0t**

25 metre B-Double Combination

25.0 metres maximum overall length



GML^: 62.5t

21.0t 21.0t 17.0t 6.0t*

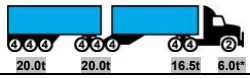
CML^: 64.5t**

22.5t 22.5t 17.0t 6.0t*

HML^: 68.0t***

26 metre B-Double Combination

26.0 metres maximum overall length



GML^: 62.5t

21.0t 21.0t 17.0t 6.0t*

CML^: 64.5t**

22.5t 22.5t 17.0t 6.0t*

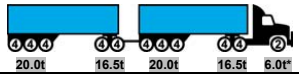
HML^: 68.0t***

Prime mover must be fitted with a Front Underrun Protection System (FUPS) and meet Cabin Strength requirements.

ROAD TRAINS

A-Double/Type 1 Road Train Combination with Tandem Axle Dolly

36.5 metres maximum overall length



GML^: 79.0t

21.0t 17.0t 21.0t 17.0t 6.0t*

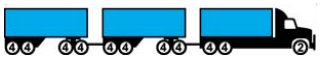
CML^: 81.0t**

22.5t 17.0t 22.5t 17.0t 6.0t*

HML^: 85.0t***

Rigid Truck and Two Dog Trailer Combination/Type 1 Road Train

36.5 metres maximum overall length



GML^: 79.0t

17.0t 17.0t 17.0t 17.0t 17.0t 6.0t*

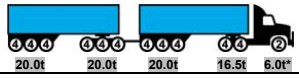
CML^: 81.0t**

HML

Combination not eligible for operation at Higher Mass Limits

A-Double/Type 1 Road Train Combination with Tri-axle Dolly / Modern Road Train

36.5 metres maximum overall length



GML^: 82.5t

21.0t 21.0t 21.0t 17.0t 6.0t*

CML^: 84.5t**

22.5t 22.5t 22.5t 17.0t 6.0t*

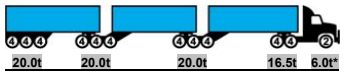
HML^: 90.5t***

Operator must be accredited in the Maintenance Management Module of NHVAS when operating on approved routes east of the Newell Highway

RFS Tri-axle converter dolly must be fitted with certified Road Friendly Suspension

Modular B-Triple Combination

35.0 metres maximum overall length



GML^: 82.5t

21.0t 21.0t 21.0t 17.0t 6.0t*

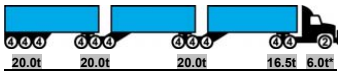
CML^: 84.5t**

22.5t 22.5t 22.5t 17.0t 6.0t*

HML^: 90.5t***

B-Triple Combination

36.5 metres maximum overall length



GML^: 82.5t

21.0t 21.0t 21.0t 17.0t 6.0t*

CML^: 84.5t**

22.5t 22.5t 22.5t 17.0t 6.0t*

HML^: 90.5t***

IAP required for operation at all mass limits

Operator must be accredited in the Maintenance Module of NHVAS

AB-Triple Combination with Tandem Axle Dolly

36.5 metres maximum overall length

GML^: 99.0t

21.0t 21.0t 17.0t 21.0t 17.0t 6.0t*

CML^: 101.0t**

22.5t 22.5t 17.0t 22.5t 17.0t 6.0t*

HML^: 107.5t***

IAP required for operation at all mass limits

Operator must be accredited in the Maintenance Module of NHVAS

AB-Triple Combination with Tri-axle Dolly

36.5 metres maximum overall length

GML^: 102.5t

21.0t 21.0t 21.0t 21.0t 17.0t 6.0t*

CML^: 104.5t**

22.5t 22.5t 22.5t 22.5t 17.0t 6.0t*

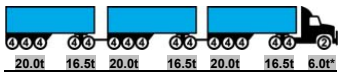
HML^ :113.5t***

IAP required for operation at all mass limits

Operator must be accredited in the Maintenance Module of NHVAS

A-Triple/Type 2 Road Train Combination with Tandem Axle Dolly

53.5 metres maximum overall length



GML^: 115.5t

21.0t 17.0t 21.0t 17.0t 21.0t 17.0t 6.0t*

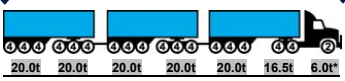
CML^: 117.5t**

HML

Combination not eligible for operation at Higher Mass Limits

A-Triple/Type 2 Road Train Combination with Tri-Axle Dolly

26.0 metres maximum overall length



GML^: 122.5t

21.0t 21.0t 21.0t 21.0t 21.0t 17.0t 6.0t*

CML^: 124.5t**

HML

RFS Tri-axle converter dollies must be fitted with certified Road Friendly Suspension

Combination not eligible for operation at Higher Mass Limits

PERFORMANCE BASED STANDARDS APPROVED COMBINATIONS

(Mass limits for PBS vehicles are subject to final PBS vehicle approval)

PBS Truck and Three Axle Dog Trailer Combination (Tri Dog)****

≤ 20.0 metres at Level 1 Access

16.5t 9.0t 16.5t 6.5t

GML^: 48.5t

PBS Truck and Four Axle Dog Trailer Combination (Quad Dog)****

≤ 20.0 metres at Level 1 Access

13.75t 13.75t 16.5t 6.5t

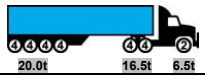
GML^: 50.5t

17.0t 17.0t 17.0t 6.5t

HML^: 57.5t***

PBS Quad Axle Semi-Trailer Combination

≤ 20.0 metres at Level 1 Access



20.0t 16.5t 6.5t

GML^: 43.0t

27.0t 17.0t 6.5t

HML^: 50.5t***

PBS Truck and Five Axle Dog Trailer Combination (Quin Dog)****

≤ 30.0 metres at Level 2 Access

20.0t 16.5t 16.5t 6.5t

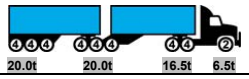
GML^: 59.5t

22.5t 17.0t 17.0t 6.5t

GML^: 63.0t***

PBS B-Double Combination

≤ 30.0 metres at Level 2 Access



20.0t 20.0t 16.5t 6.5t

GML^: 62.5t

21.0t 21.0t 17.0t 6.5t

CML^: 64.5t**

22.5t 22.5t 17.0t 6.5t

HML^: 68.5t***

Internal dimensions vary between PBS and prescriptive B-Doubles

PBS A-Double Combination

≤ 30.0 metres at Level 2 Access

20.0t 16.5t 20.0t 16.5t 6.5t

GML^: 79.5t

21.0t 17.0t 21.0t 17.0t 6.5t

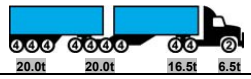
CML^: 81.5t**

22.5t 17.0t 22.5t 17.0t 6.5t

HML^: 85.5t***

PBS Super B-Double Combination (Quad Tri)****

≤ 30.0 metres at Level 2 Access



20.0t 20.0t 16.5t 6.5t

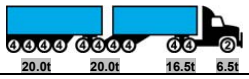
GML^: 63.0t

22.5t 27.0t 17.0t 6.5t

HML^: 73.0t***

PBS Super B-Double Combination (Quad Quad)****

≤ 30.0 metres at Level 2 Access



20.0t 20.0t 16.5t 6.5t

GML^: 63.0t

27.0t 27.0t 17.0t 6.5t

HML^: 77.5t***

* Under Gazette Notices published in NSW, vehicles with a GVM of 15 tonnes or more meeting Front Under-run Protection Systems, cabin strength and engine emissions standards (ADR80/01) can operate at 6.5 tonnes on the steer axle. The extra 500kg permitted on the steer axle increases the total gross mass of the combination by 500kg.

** Vehicles accredited under the NHVAS Mass Management Accreditation Scheme are permitted 1 tonne above the total combination mass for a vehicle or vehicle combination with an allowable gross mass not exceeding 55 tonnes and 2 tonnes above the total combination mass for a vehicle or vehicle combination with an allowable gross mass exceeding 55 tonnes.

*** Requirements for HML operation: enrolment into the Intelligent Access Program (IAP), accreditation under the NHVAS Mass Management Accreditation Scheme and certified Road Friendly Suspension fitted on all axle and axle groups except the steer axle on the prime mover

**** A PBS Permit is required for operation on NSW Roads.

GML General Mass Limits.

CML Concessional Mass Limits.

HML Higher Mass Limits.

^Mass limits refer to the Total Combination Mass (TCM) of a heavy vehicle combination.

NSW GOVERNMENT

For more information, visit www.transport.nsw.gov.au