OXLEY HIGHWAY DRAFT CORRIDOR STRATEGY

MARCH 2016

Transport MASTER PLAN

Oxley Highway DRAFT CORRIDOR STRATEGY

NSW GOVERNMENT

EXECUTIVE SUMMARY

The Oxley Highway is 514 kilometres in length, starting on the mid north coast of NSW at Port Macquarie and extending west to connect with the inland centres of Tamworth, Gunnedah, Coonabarabran, Gilgandra and Warren. It terminates at Nevertire in central west NSW where it intersects with the Mitchell Highway. The Oxley Highway has six significant intersecting corridors namely the Pacific Highway, New England Highway, Fossickers Way, Kamilaroi Highway, Newell Highway and Mitchell Highway. This corridor strategy sets out how the NSW Government will manage road transport along the Oxley Highway in the long-term from Port Macquarie to Nevertire.

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

The purpose of this strategy is to identify:

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

In assessing the performance of the road corridor against performance measures and targets the corridor was segmented into 16 smaller sections.

The vision for the Oxley Highway has been developed to explain what actions should be achieved over the next 20 years in order to improve the performance of the highway and meet the specific corridor objectives. The vision for the Oxley Highway between Port Macquarie and Nevertire over the next 20 years is to become:

- **A safer route for all road users** with the safe systems approach adopted.
- **A more productive route for freight** that provides access for Higher Mass Limits (HML) through Gunnedah, and modern High Productivity Vehicles (HPVs) including PBS 2B between Tamworth and Coonabarabran and PBS 4B between Coonabarabran and Nevertire.

Cover image: Oxley Highway westbound from Wrights Road


Westbound overtaking lane between the Pacific Highway and Wauchope

- **An accessible, efficient and reliable route** with improved network efficiency between Port Macquarie and Wauchope and within Tamworth and improved flood immunity between Tamworth and Coonabarabran.
- **Supportive of regional growth and development in growing** urban centres along the corridor.

The Oxley Highway differs markedly from one end of the corridor to the other. Commencing in the coastal Port Macquarie region the topography is reasonably flat with a higher population density. As the highway extends west over the Great Dividing Range tighter horizontal radius curves and steeper grades exist before extending further west into the Northern Tablelands and Northern Plains regions where the road grades become flatter with longer straights.

The corridor serves a variety of purposes – providing a route for commuters, public transport and heavy freight vehicles. It is also a popular motorcyclist route, particularly between Wauchope and Walcha where the Oxley Highway intersects with the Thunderbolts Way. It also interacts with rail and air transport at intermodal terminals. Dedicated walking and cycling infrastructure, as with bus services, tends to be focused on the more densely populated areas along the corridor.

Traffic volumes along the length of the Oxley Highway vary in the rural sections from about 370 vehicles per day (vpd) to about 11500 vpd. In the urban centres, average daily traffic volumes range from around 1000 vpd (Walcha) to around 30000 vpd (Port Macquarie). The common trend is that higher traffic volumes exist closer to the coast, with the exception of the large regional centre of Tamworth. Traffic volumes along the Oxley Highway corridor increase substantially within urban areas such as Port Macquarie, Wauchope, Tamworth, Gunnedah, Gilgandra and Warren. In these areas, the Oxley Highway also serves as an access road for local community connections. The largest volumes are experienced in Port Macquarie and Tamworth. The relatively high volumes between Wauchope and Port Macquarie demonstrate the high interdependence between the two urban centres.

Heavy vehicle numbers per day across the route vary considerably with the average number of heavy vehicles between urban centres and towns being:

- Port Macquarie to Wauchope: 872 (652 rigid vehicles and 220 articulated vehicles)
- Wauchope to Walcha: 91 (64 rigid vehicles and 27 articulated vehicles)
- Walcha to Bendemeer: 112 (70 rigid vehicles and 42 articulated vehicles)
- Tamworth to the Newell Highway: 585 (325 rigid vehicles and 260 articulated vehicles)
- Gilgandra to Nevertire: 147 (87 rigid vehicles and 60 articulated vehicles)

36.5 metre long vehicles are permitted west of Gilgandra and 26 metre B-doubles are permitted on most sections of the Oxley Highway between Port Macquarie and Nevertire, with the exception

being the 100 kilometre mountainous section between Wauchope and Yarrowitch (50km west of Mt Seaview) because of the steep grades and tight curves.

Over the life of this strategy, traffic growth is predicted to increase by:

- 1.8% per annum between Port Macquarie and Wauchope
- 1.4% per annum between Wauchope and the Ralfes creek Mount Seaview
- 0.5% per annum between Ralfes creek and Walcha
- 0.5% per annum between Walcha and the New England Highway, Bendemeer
- 1.3% per annum between Tamworth and Gunnedah
- 1.0% per annum between Gunnedah and the Newell Highway, Coonabarabran
- 1.4% per annum between Newell Highway, Gilgandra and Mitchell Highway, Nevertire

Key findings of the Oxley Highway Corridor Strategy include road safety, level of service, freight productivity and asset performance.

To address the identified challenges of improving road safety and optimising travel times, providing maintenance solutions and to address community feedback, the following short term priorities have been identified:

Short term actions:

- Improve the alignment and overtaking opportunities on the section of the Oxley Highway between the Pacific Highway and Wauchope.
- Raise the road levels of the Oxley Highway at Hoss Causeway and Tommy Swamp (west of Tamworth) to a 2 year Assessed Risk Level (ARL) level of serviceability by installing box culvert structures.
- Increase safe overtaking opportunities by developing and constructing additional overtaking lanes and investigating opportunities to extend existing overtaking lanes.
- Investigate opportunities to improve the capacity and standard of key intersections, incorporating heavy vehicle turning movements where needed to increase efficiency and safety
- Construct recommendations to improve pedestrian facilities identified in the Wauchope main street plan
- Investigate and develop improvements to pedestrian facilities in Port Macquarie and Tamworth
- Work with all Councils to develop or review Pedestrian Access Mobility Plans (PAMP) to assist planning for appropriate facilities.
- Investigate options for cyclist connectivity between Wauchope and Port Macquarie
- Investigate opportunities to improve road alignment particularly in higher risk locations
- Progressively improve the formation width, by widening sealed shoulder and improving lane widths.
- Implement identified clear zone works to remove or provide protection from hazards, including culverts within the clear zone, taking into consideration the road geometry and environment/land use constraints.
- Investigate potential 'Pull Over Bays' – for opportunities to pass slower vehicles along the Wauchope to Walcha range
- Implement improvements to the existing delineation and linemarking in accordance with standards on a priority basis particularly those identified along the Wauchope to Walcha range
- Develop identified recommendations of the Port Macquarie traffic study to support residential growth and retain the functionality of the highway
- Progressively rehabilitate pavements along the route as part of asset maintenance and renewal programs. Sections will be prioritised based on annual condition surveys and use of a pavement management system, in order to maintain the highway and provide safe and reliable travel conditions for all vehicles.
- Investigate opportunities to improve flood immunity at Kings creek, O'Neils creek and Timbumburi creek
- Rehabilitate defective culverts on a priority basis

- Complete construction of the Gunnedah Rail Bridge on South Street/Oxley Highway
- Investigate opportunities to improve heavy vehicle access to provide access for larger HPV between Tamworth, Coonabarabran and Nevertire including through Gunnedah. Including a heavy vehicle decoupling bay in Gunnedah.
- Review and improve the adequacy and consistency of treatments provided at narrow bridges, specifically regarding the approach alignments
- Address high risk slopes (ARL 1-2) along the corridor on a priority basis
- Investigate and recommend opportunities to improve safety at rail level crossings
- Continue to implement road safety initiatives to address identified and emerging crash types and locations, particularly within Port Macquarie and Tamworth, along the Wauchope to Walcha range and between Tamworth and Gunnedah.
- Investigate potential safety campaigns targeting driver and rider awareness.
- Improve the standard of rest areas including upgrading of toilet systems on a priority basis, including but not limited to Stockyard Creek Rest area
- Provide a consistent number of rest areas to cater for all vehicle types along the corridor particularly between Tamworth and Nevertire.
- Continue to integrate transport and land use planning to improve the performance for the corridor through effective access management
- Implement outcomes from the speed zone review between the Pacific Highway and Coonabarabran

Medium term actions include:

- Investigate options to increase capacity between Wauchope and Port Macquarie, including corridor identification and reservation
- Continue to explore opportunities to Improve the road alignment, particularly in higher risk locations
- Continue to improve the formation width, by widening sealed shoulder and improving lane widths.
- Provide access for PBS 2B vehicles between Tamworth and Gunnedah as a priority.
- Investigate the need to increase the number of heavy vehicle enforcement sites
- Investigate network solution to reduce impact of local traffic and through traffic growth Reconstruction and reshaping of the pavement on top of the black soil, this needs to be completed every 5-10 year in some areas.
- Investigate realigning the intersection of the Oxley Highway and the Newell Highway at Coonabarabran
- Continue to monitor and improve the standard of rest areas, including upgrading of toilet systems and facilities on a priority basis.
- Provide a consistent number of rest areas to cater for all vehicle types along the corridor particularly between Tamworth and Nevertire.
- Continue to address high risk slopes (ARL 1-2) along the corridor

Long term actions include:

- Continue to address high risk slopes (ARL 1-2) along the corridor.
- Continue to implement road safety initiatives to address identified and emerging crash types and locations
- Construction of identified strategic 'Pull Over Bays' along the Wauchope to Walcha range.
- Continue to upgrade sections of the highway to support growth centres and improve freight productivity
- Improve heavy vehicle access to provide access for PBS 2B and 3A vehicles between Tamworth and Coonabarabran and PBS 4B between Gilgandra and Nevertire.

Heading west form Rawdon Island Rd

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1 A QUICK OVERVIEW

Oxley Highway westbound from Gilgandra

The Oxley Highway commences at Port Macquarie and continues to Nevertire. It is 514 kilometres in length, connecting the coastal and hinterland areas of Port Macquarie and Wauchope on the Mid North Coast with the inland centres of Tamworth, Gunnedah, Coonabarabran, Gilgandra, Warren and Nevertire. This corridor strategy sets out how the NSW Government will manage road transport along the Oxley Highway in the long-term from Port Macquarie to Nevertire.

The corridor strategy will be delivered over a 20 year timeframe, in line with the *NSW Long Term Transport Master Plan* (LTTMP), 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 Oxley Highway into the future.

The Oxley Highway is intersected by seven major corridors including:

- Pacific Highway, which connects Sydney and Brisbane along the east coast of NSW, intersects the Oxley Highway between Port Macquarie and Wauchope.
- New England Highway, which serves as an inland route of the National Land Transport Network between Newcastle and Brisbane, connects the eastern section of the Oxley Highway at Bendemeer with the central section of the Oxley Highway at Tamworth.
- Fossickers Way, which connects Tamworth with the northern townships of Manilla, Barraba, Bingara and Warialda.
- Kamilaroi Highway, which connects Quirindi with Gunnedah and Narrabri.
- Newell Highway part of the National Land Transport Network (Federal) connecting Melbourne VIC directly to Brisbane QLD, which traverses western and central western NSW from the Victorian border to the Queensland border, connects the central section of the Oxley Highway at Coonabarabran with the western section at Gilgandra.
- Castlereagh Highway, which traverses central western and western NSW continuing on to St George in Qld, connects Gilgandra with the townships of Dunedoo, Coonamble and Walgett.
- Mitchell Highway, linking major settlements in central and northern New South Wales such as as Orange, Dubbo and Bourke with Charleville in south central Queensland.

Figure 1-1 Oxley Highway Corridor

The corridor's transport roles include:

- Serving urban areas and rural settlements along the corridor for local and regional trips, particularly the need to access higher order goods and services in the centres of Port Macquarie, Tamworth, Gunnedah, and Coonabarabran.
- Facilitating inter-regional commuter, leisure and business travel between inland NSW and the Mid-North Coast.
- Accommodating commuter travel between Port Macquarie and Wauchope, and increasingly between Gunnedah and Tamworth.
- Serving the movement of freight between regional centres along the corridor and to the wider transport network including the Newell, New England and Pacific Highways as well as other transport modal facilities such as rail. In particular bulk commodities including grain, livestock and mining inputs.
- Providing for public transport, cycling and walking within the more densely populated centres along the corridor.

Population is concentrated in the coastal fringes of Port Macquarie and the inland regional centre of Tamworth. Port Macquarie urban centre had a population of about 41,400 in 2011, while Tamworth had a population of about 36,100. Port Macquarie and Tamworth are both major regional centres providing higher order facilities to their surrounding communities and townships. Other populated centres along the corridor include Wauchope (6,400), Walcha (1,500), Gunnedah (7,900), Coonabarabran (2,600), Gilgandra (2,700) and Warren (1,500).

The Oxley Highway corridor serves multiple transport modes including light vehicles, public transport and heavy freight vehicles. It also interacts with rail and air transport at intermodal terminals. The dominant mode of transport along the Oxley Highway is private vehicles. Traffic volumes on the corridor are highest in Port Macquarie and Tamworth where the average daily traffic is around 30,000 and 12,000 vpd respectively. Traffic volumes significantly decrease between Wauchope and Walcha, between Gunnedah and Coonabarabran, and between Gilgandra and Nevertire however heavy vehicles particularly articulated vehicles remain relatively consistent. Dedicated walking and cycling infrastructure, as with bus services, tends to be focused on the more densely populated areas in the corridor.

The climate, environment and topography differ significantly along the length of the corridor. The eastern sections of the corridor around Port Macquarie and Wauchope receive more than twice the average annual rainfall of the western centres of Tamworth, Gunnedah and Coonabarabran, though inundation in peak rainfall events occur at various sections along the corridor. The Oxley Highway crosses low-lying coastal plains through Port Macquarie and Wauchope before rising sharply to approximately 1100 metres near Yarrowitch in the Walcha Range where it passes through the Cottanbimbang and Mummel Gulf National Parks. Between Yarrowitch and Bendemeer there is a gradual descent, with elevation falling to approximately 800 metres at the New England Highway intersection. Between Tamworth and Gunnedah the elevation descends from 400 to around 300 metres before rising to 600 metres before Coonabarabran. The altitude is around 300 metres at Gilgandra and gradually falls to 200 metres between Gilgandra and Nevertire.

This Corridor Strategy sets out the objectives, current performance, current and future challenges and the NSW Government's strategic response to managing the Oxley Highway corridor over the long term.

Recent major achievements on the Oxley Highway

Major recent achievements on the Oxley Highway include:

2014/ 2015

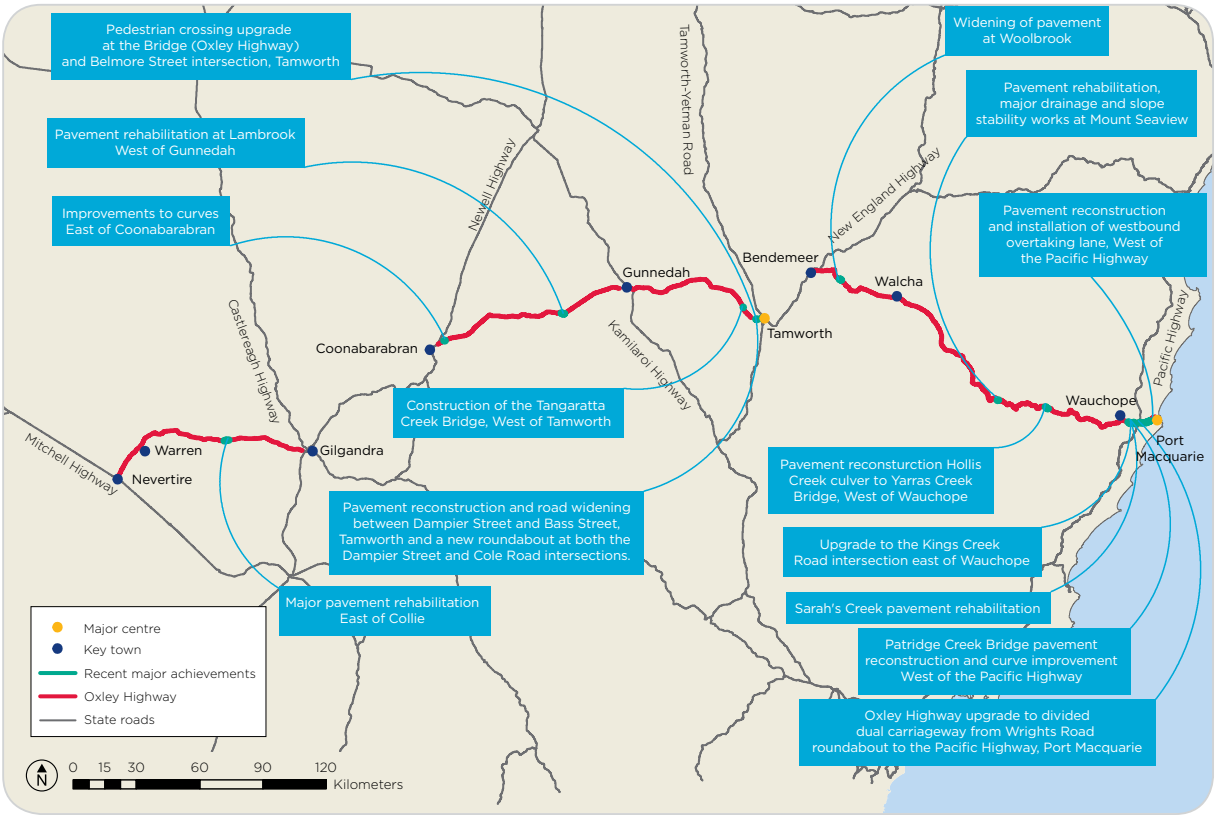
- Construction of the new Tangaratta Creek Bridge.
- Pavement reconstruction and road widening between Dampier Street and Bass Street, Tamworth and a new roundabout at both the Dampier Street and Cole Road intersections.
- Sarah's Creek pavement rehabilitation.

- Pavement reconstruction and installation of 750m long westbound overtaking lane, Stoney Creek Booster at about 2.3km west of the Pacific Highway
- Partridge Creek Bridge pavement reconstruction and curve improvements, 1.8km west of the Pacific Highway
- Widening of pavement at Woolbrook

2011/ 2012

- Oxley Highway upgraded to divided dual carriageway from Wrights Road roundabout, to the Pacific Highway, Port Macquarie.
- Upgrade to the Kings Creek Road intersection 3.3km east of Wauchope.
- Pavement reconstruction Hollis Creek culvert to Yarras Creek bridge (45km west of Wauchope).
- Pavement rehabilitation, major drainage and slope stability works at Mount Seaview.
- Pedestrian crossing upgrade at the Bridge (Oxley Highway) and Belmore Street intersection, Tamworth.
- Pavement reconstruction within Gunnedah town.
- Pavement rehabilitation at Lambrook, west of Gunnedah.
- Improvements to curves east of Coonabarabran.
- Major pavement rehabilitation west of Gilgandra near Collie.

Figure 1-2 Recent major achievements on the Oxley Highway



2 INTRODUCTION

One lane section over the Great Dividing Range between Wauchope and Walcha

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 the way that the State Road Network is managed and planned.

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

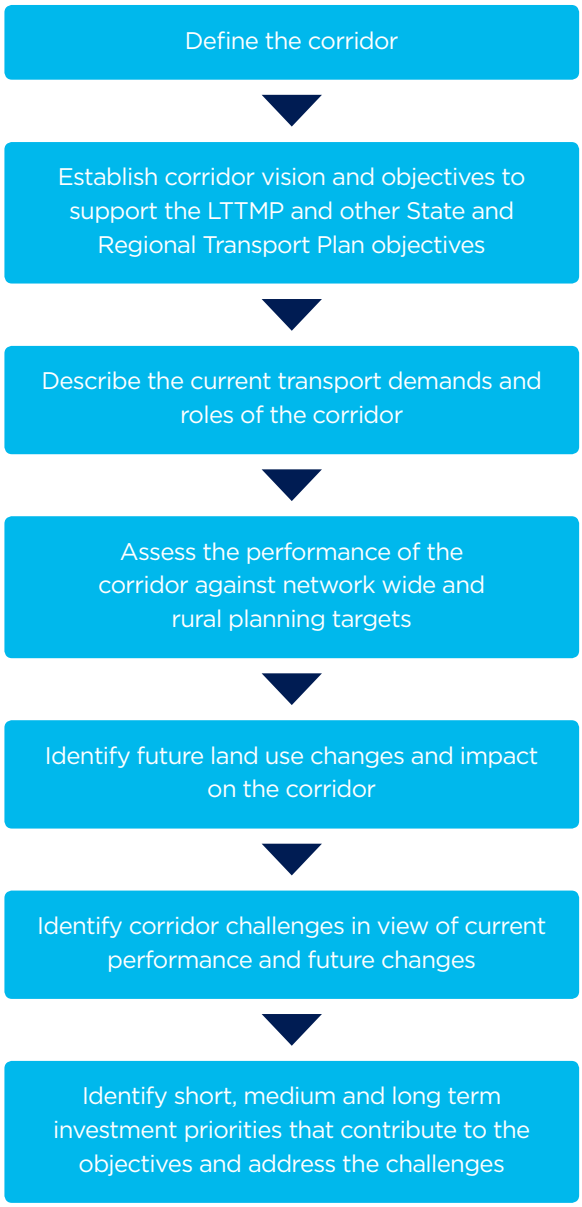
Drawing together a variety of elements, as shown in Figure 2-1, corridor strategies identify:

- Corridor-specific objectives that support the *NSW Long Term Transport Master Plan and Regional Transport Plans* (and other State and national plans).
- The performance of transport infrastructure in meeting the corridor-specific objectives.
- Current and future challenges in meeting these corridor-specific objectives.
- Key transport demands likely to be placed on the corridor over the next 20 years.
- Short, medium and long term priorities and actions to manage the corridor.

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

Figure 2-1 Corridor planning process

2.2 Why Oxley Highway?



The New South Wales Government is committed to long-term management of the road transport system in the Mid North Coast and New England North West regions. The Oxley Highway provides an important connection between the major coastal centres of Port Macquarie, Wauchope, Walcha with Tamworth, Gunnedah, Coonabarabran, Gilgandra, Warren and Nevertire. The corridor supports growth of regional economies while providing safe and efficient movement for both freight and passenger vehicles. The largest positive impact will be on the local links between Port Macquarie and Wauchope and between Tamworth and Gunnedah, where traffic volumes are highest.

There are a number of road safety, transport efficiency and asset maintenance issues along the corridor that need to be addressed. The corridor contains some areas of poor pavement particularly along the ranges and issues associated with narrow shoulder widths and slope stability on the ranges. The urban areas have the highest crash rates per kilometre while the section between Wauchope and Walcha has the highest crash rate per vehicle kilometres travelled, particularly for motorcyclists. Tamworth and Port Macquarie experience traffic congestion during the afternoon and morning peak periods particularly on the approaches to the urban centres.

The NSW Long Term Transport Master Plan identifies the need to complete upgrades to sections of the Oxley Highway between Port Macquarie and Wauchope and continue to invest in the Mid North Coast road network to address localised congestion as demand increases in the future.

It also identifies the growth in general road freight over the next 20 years, which will impact the Oxley Highway. This will require road upgrade works to address access and safety issues as required.

This strategy identifies road safety, maintenance and traffic challenges and actions at local and regional level to address these challenges.

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 Oxley 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.

2.3 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*.

Premier's Priorities and State Priorities

The NSW Government has recently announced 30 priorities, or reforms, to grow the economy, deliver infrastructure, and improve health, education and other services across NSW. Of these priorities, 12 are the Premier's personal priorities.

The Oxley Highway Corridor Strategy contributes to achieving the following State priority:

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

Corridor Strategy: Supports the need to improve the road safety outcomes for all road users, by recommending safety improvements such as road realignments, wider clear zones, lanes and shoulders, to achieve a safer road environment.

NSW Long Term Transport Master Plan

The *NSW Long Term Transport Master Plan* (LTTMP) 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 modes of transport and sets out initiatives, solutions and actions to meet NSW's transport challenges. The Oxley Highway corridor is located in the Mid North Coast and New England North West LTTMP regions with a small part in the Central West and Western region.

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

The Oxley Highway Corridor Strategy advances this objective by supporting efficient and safe connections along the Oxley Highway corridor to better meet existing and new travel demands, provide access to vital services, sustain local employment growth and manage an increasing freight task in the New England North West. The Master Plan and draft corridor strategy also sets actions to complete upgrades between Port Macquarie and Wauchope.

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

This Corridor Strategy includes actions to improve the travel efficiency and productivity of travel on the Oxley Highway to maintain regional industry's competitive edge and provide better access for the freight industry to the Central West, Western and New England regions.

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

Figure 2-2 Planning framework

Regional Action Plans

NSW Regional Action Plans relevant to the Oxley Highway include those for the Mid North Coast, New England North West and Western regions. Regional Action Plans identify immediate action the NSW Government will prioritise in each of the regions.

The most relevant regional priorities and actions for the Mid North Coast include improving access to public transport and improving road safety. The NSW Government will achieve this through:

- Fast tracking the delivery of critical road upgrades and improving regional infrastructure
- Improving the movement of freight

The most relevant regional priorities and actions for the New England North West include improving access to public transport and improving road safety. The NSW Government will achieve this through:

- Improve road infrastructure providing connections across and beyond the region
- Improve freight productivity in regional NSW

The most relevant regional priorities and actions for the Western include improving access to public transport and improving road safety. The NSW Government will achieve this through:

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[1].

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 Oxley Highway Corridor Strategy are:

- Safer, more efficient road freight corridors.
- Remove constraints on the local road network.
- Keep pace with regional population growth.

NSW Freight and Ports Strategy

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

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

- **Delivery of a freight network that efficiently supports the projected growth of the NSW economy.** The corridor strategy identifies inefficiencies on the road network through performance assessment of traffic, safety and asset data, and supports the removal of barriers to highly productive use of the road network such as addressing bridges preventing B-double access operating at HML, additional overtaking lanes to support traffic efficiency and upgrading roads to accommodate modern and safe high productivity vehicles (HPVs) such as B-triples and AB-triples under IAP and Performance-Based Standards (PBS) 2B and 3A vehicles.
- **Balancing of freight needs with those of the broader community and the environment.** The corridor strategy supports freight movement between Gunnedah Coal Basin, Tamworth and the New England Highway and managing these impacts in a manner that reduces impact on amenity within Gunnedah.

NSW Road Safety Strategy

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

1 Department of Planning and Infrastructure 2014, *Regional Strategies and New Regional Growth Plans*, http://www.planning.nsw.gov.au/en-us/planningyourregion/regionalstrategies.aspx, viewed 07/02/2014.

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

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

Regional Transport Plans

Regional Transport Plans are built on the strategic direction, initiatives and state-wide context set by the LTTMP. The Mid North Coast, New England North West, Central West and Western 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 Mid North Coast, New England North West, Central West and Western Transport Plans are:

- Identify and deliver road network improvements.
- Provide road upgrade works for the Oxley Highway as required to account for the impact of road freight which is set to grow over the next 20 years.
- Work with the mining industry and local councils to ensure the road network has the appropriate capacity to service the coal industry's growing needs to transport coal freight by road.
- Complete upgrades to sections of the Oxley Highway between Port Macquarie and Wauchope.
- Continue to invest in the Mid North Coast road network to address localised congestion as demand increases in the future.

Draft NSW Roads Plan (in development)

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

The Plan provides a:

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

National infrastructure priorities

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

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

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

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

Road improvements such as overtaking opportunities, bridge improvements and safety initiatives along the corridor are aimed to increase travel efficiency and productivity of freight movements on the Oxley Highway. These corridor improvements will support employment growth in the Mid North Coast and New England North West areas by increasing the accessibility of the region. With forecast growth in coal mining in the Gunnedah basin, a high proportion of the freight task associated with this growth will be transported by road. The Oxley Highway will become an important link with adjoining highways in servicing the mining industry's transport needs while expanding Australia's productivity.

2.4 Key corridor challenges and issues

The Oxley 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 Oxley Highway's roles and services for the community.

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

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

- **Travel conditions:** Inconsistent travel conditions and road environment between Port Macquarie and Wauchope.
- **Intersection efficiency:**
  - Increasing traffic congestion at intersections within the urban areas of Port Macquarie and Tamworth.
  - Some intersections west experience significant variations in the level of service due to seasonal factors.
  - The Oxley Highway has priority at its intersection with the Newell Highway despite having lower volumes of through traffic and the Newell Highway being a key component of the National Land Transport Network (NLTN).
- **Slope stability:** Issues over the Wauchope to Walcha range.
- **Culverts:** High number of culverts requiring strengthening along the full length of the corridor.
- **Heritage:** High heritage values of the National Parks and World Heritage Areas within the corridor.
- **Bridge safety:** Poor bridge approach alignment and narrowing at Surveyors Creek Bridge, Thone River Bridge, Ralfes Creek Bridge, Woolbrook Rail Bridge and Chimmy Swamp Creek Bridge and a narrow bridge in Tamworth at Timbumburi Creek.

- **Road environment:** Challenging topography, poor alignment, steep grades, narrow pavements, inconsistent edge lines and inadequate clear zones between Wauchope and Bendemeer.
- **Overtaking:** Lack of overtaking lanes along the corridor increases travel time and impacts on safety. There are limited safe overtaking opportunities on the Wauchope to Walcha range.
- **Motorcyclists:** High proportion of motorcycle crashes on the Wauchope to Walcha range.
- **Urban centres road safety:** Rear end crashes within urban areas of Port Macquarie, Wauchope and Tamworth.
- **Speed and fatigue crashes:** High proportion of speed and fatigue related crashes between Tamworth and Gunnedah.
- **Vulnerable road users:** Increasing number of pedestrian crashes in Wauchope and Tamworth.
- **Rail overpasses:** Narrow and substandard pavement and inadequate lighting at the Woolbrook rail overpass. Growth in coal freight rail movements in Gunnedah impedes on local traffic movements at the at grade level crossing, increased pressure on the existing rail overpass.
- **Incident management:** Notifying motorists during road closures and traffic disruptions in remote areas.
- **HML access:** Lack of HML access through Gunnedah. Heavy vehicles have difficulty negotiating the Abbott Street and South Street intersections and the approaches to the bridge in Gunnedah. There is no access for vehicles longer than 26m B-Doubles west of Tamworth.
- **Rail level crossings:** Managing the safety risk on the rural network for all road and rail users at rail level crossings.
- **Soil types:** Prolonging pavement life on the black soils west of Gunnedah, which are prone to a cycle of shrinkage and swelling.
- **Flooding:** Low lying sections of the corridor are subject to inundation during heavy rainfall and flooding which causes road closures and disruptions, particularly around Gunnedah and the Namoi River near Carroll.
- **Growth:** Managing access and traffic growth around Port Macquarie and Tamworth.

Key challenges and issues on the Oxley Highway corridor are further discussed in Chapter 7 following detailed performance analysis in Chapter 5 of this document.

2.5 Corridor objectives

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

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

NSW LONG TERM TRANSPORT MASTER PLAN OBJECTIVES

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

Figure 2-3 Meeting the Master Plan's Objectives: the Oxley Highway Corridor

The Oxley Highway Draft Corridor Strategy specific objectives will guide the corridor's long term management. These are mapped against the NSW Long Term Transport Master Plan objectives in Table 2-1.

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

NSW Long Term Transport Master Plan objectives	Oxley Highway Draft Corridor Strategy Objectives
Improve liveability Reduce social disadvantage	• Improve travel efficiency and network consistency between Port Macquarie and Wauchope • Balance the demand for travel with urban amenity in Wauchope • Cater for increasing travel demands to and within Port Macquarie • Maintain travel efficiency within and around the urban centres of Tamworth and Gunnedah • Improve travel time reliability along the corridor
Economic growth / productivity	• Support key freight movements along the corridor between the New England Highway and the Mitchell Highway, in particular those movements associated with mining and agricultural activities • Reduce the impacts of nuisance flooding on pavement condition between Tamworth and Coonabarabran
Regional development / accessibility	• Provide a road transport network which facilitates access to regional growth centres • Provide more safe and efficient access for road users crossing the Wauchope to Walcha range • Manage demand for access from residential and urban growth areas of Tamworth and its fringes • Maintain adequate access for emergency services during major flooding events, particularly on the flood plain between Tamworth and Gunnedah • Facilitate growth and link planned development from Coledale expansion with Tamworth CBD
Improve sustainability	• Identify and protect sensitive native remnant vegetation within the boundaries of the road corridor • Minimise whole of lifecycle asset cost
Safety and security	• Enhance road safety for all road users over the length of the corridor by implementing the safe systems approach to the design and management of the road • Improve poor road alignment, steep grades and narrow pavements and bridges between Wauchope and Walcha • Reduce incidents of motorcycle crashes on the Wauchope to Walcha range • Reduce crashes related to fatigue between Tamworth and Gunnedah
Improve transport integration process	• Promote whole of government approaches for State, Regional and local roads to improve traffic efficiency within urban areas • Support transport planning processes by responding to current and future land use changes

2.6 A vision for the future

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

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

- **A safe route for all road users** with the safe systems approach adopted.
- **A more productive route for freight** that provides access for Higher Mass Limits (HML) through Gunnedah, and modern Higher Productivity Vehicles (HPVs) including PBS 2B between Tamworth and Coonabarabran and PBS 3A between Coonabarabran and Nevertire.
- **An accessible, efficient and reliable route** with improved network efficiency between Port Macquarie and Wauchope and within Tamworth and improved flood immunity between Tamworth and Coonabarabran.
- **Supportive of regional growth and development** in growing urban centres along the corridor.

2.7 Taking action

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

Specific actions relevant to the Oxley Highway Corridor in the *NSW Long Term Transport Master Plan* and the Regional Transport Plans:

Short term

- Complete upgrades to sections of the Oxley Highway between Port Macquarie and Wauchope.

Medium to longer term

- Identify and deliver road network improvements.
- Provide road upgrade works for the Oxley Highway as required, to account for the impact of road freight which is set to grow over the next 20 years.
- Invest in the Mid North Coast road network to address localised congestion as demand increases in the future.

3 COMMUNITY INVOLVEMENT

Wauchope Main Street

During development of the Oxley Highway Draft Corridor Strategy consultation was carried out with local councils and other government agencies.

This chapter summarises the key customers along the Oxley Highway corridor, the consultation outcomes and describes how the findings have been used during the development of the Oxley Highway Corridor Strategy.

Involvement from the community during the exhibition period is invaluable in the development of corridor strategies. Following the exhibition period, a Community Consultation Report will be prepared and presented to the community along with the final corridor strategy. This report will highlight the feedback received from the public and responses to this feedback.

3.1 An integrated, customer-focused transport network

Key customer markets for the Oxley Highway

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

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

The consultation and research for the NSW Long Term Transport Master Plan confirmed the view that customers want a more fully integrated and seamless transport system that responds to where they want to go and when. This means not only putting the customer first but also creating a modern and customer-focussed system that makes better use of existing assets and expands networks and manages those assets efficiently and effectively. In addition, the impacts of transport on the community and the environment need to be appropriately managed. In order to ensure continuous improvement of the transport system into the future, transport and land use planning will also need to be aligned.

There are many different customers of the road network, who have different trip purposes and different preferences for time of travel. They include motorists and passengers of private cars, bus and coach customers, taxis, hire cars motorcyclists, cyclists and pedestrians. Freight and commercial services are also significant users of the road network, and include articulated and rigid trucks, vans, utilities and cars.

Road customer markets are highly segmented. Table 3-1 shows some of the major road customer markets using the Oxley Highway. The three main road user market segments are:

- Commuter trips to urban activity centres and employment centres as well as a range of dispersed multi-purpose travel patterns
- Longer personal and work-related trips between non-centre locations or requiring multiple stops including to or from regional and interstate locations.
- Heavy and light freight movements generally between industrial and business centres including to or from regional and interstate locations.

Table 3-1 Key customer markets on the Oxley Highway corridor

Urban activity centres		
Commuters travel for work		Trip purpose
Travel to Port Macquarie, Tamworth, Gunnedah and Warren regional centres and surrounding employment hubs	Travel by private car, bus, motorcycle, cycle, taxi, walking	Location and mode
Generally AM and PM weekday peak periods		Time of travel
Dispersed travel for work, education, health, recreational and business		Trip purpose
Travel to Port Macquarie, Tamworth, Gunnedah and Warren plus surrounding areas for education and health facilities, recreational centres and others such as family and friends	Travel by private car, hire car, bus, motorcycle, cycle, taxi, walking	Location and mode
Dispersed in time throughout the day and both weekday and weekends		Time of travel
Longer distances (interregional and interstate trips)		
Longer distance travel for work, education, health, recreational and business		Trip purpose
Highly dispersed travel to Mid North Coast NSW, Newcastle and Sydney via adjoining highways	Private vehicles, coaches, hire cars, mini bus	Location and mode
Dispersed in time and over the weekends		Time of travel

Industrial centres		
Heavy freight movement		Trip purpose
Dispersed locations such as Port Macquarie, Tamworth and Gunnedah plus surrounding regions	Rigid and articulated vehicles	Location and mode
Mostly weekdays and business hours, some weekends and after hours		Time of travel
Light freight movement		Trip purpose
Highly dispersed locations to commercial centres	Small trucks, vans, utility vehicles	Location and mode
Mostly weekdays and business hours, some weekends and after hours		Time of travel

These markets are diverse in terms of their trip purpose, vehicles used, and time of travel. The focus of this corridor strategy is to address the needs of those customers who for a variety of reasons rely on the use of the road network. The road network also has a major part to play in supporting connections to non-road based public transport.

The road network also comprises a number of different user networks sharing road corridors which need to be considered in terms of the allocation of future road space. These include:

- bus network,
- freight network,
- cycling network, which includes off-road cycle ways and dedicated cycle lanes.

The approach promoted in this draft corridor strategy is to make the most effective use of the limited road space available. This will involve giving priority to different road users and modes at different times of the day and week to balance mobility and access needs.

Customer consultation

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 Oxley Highway corridor is within the Mid North Coast, New England North West, Central West and Western regions of the LTTMP (Figure 3-2).

The community consultation in these regions highlighted a number of important considerations for the Oxley Highway. Feedback raised through the consultation process varied greatly across each region:

Mid North Coast Region

The Mid North Coast customers saw that the challenges for the Mid North Coast region included:

- Providing road capacity and infrastructure to support road safety, enable economic growth and opportunity, and freight efficiency
- Integrating train and coach services for travel to and from the region with regional travel needs
- Providing safer roads
- Improving connections between smaller towns and regional centres
- Seasonal tourism demands generate peak transport within Mid North Coast cities and towns.

New England North West Region

The New England North West customers saw that the challenges for the New England North West region included:

- Growth of major regional centres and the need to enhance the transport network
- Localised pinch points in and around major towns
- High level of car dependence and limited public transport availability
- Improving regional road links and road safety

- Planning for the growth of regional centres
- Supporting the regional economy
- Providing sustainable pavement for growing demand for road freight
- Improving the efficiency of HPV movements across the border to Queensland.

Central West Region

The Central West customers saw that the challenges for the Central West region included:

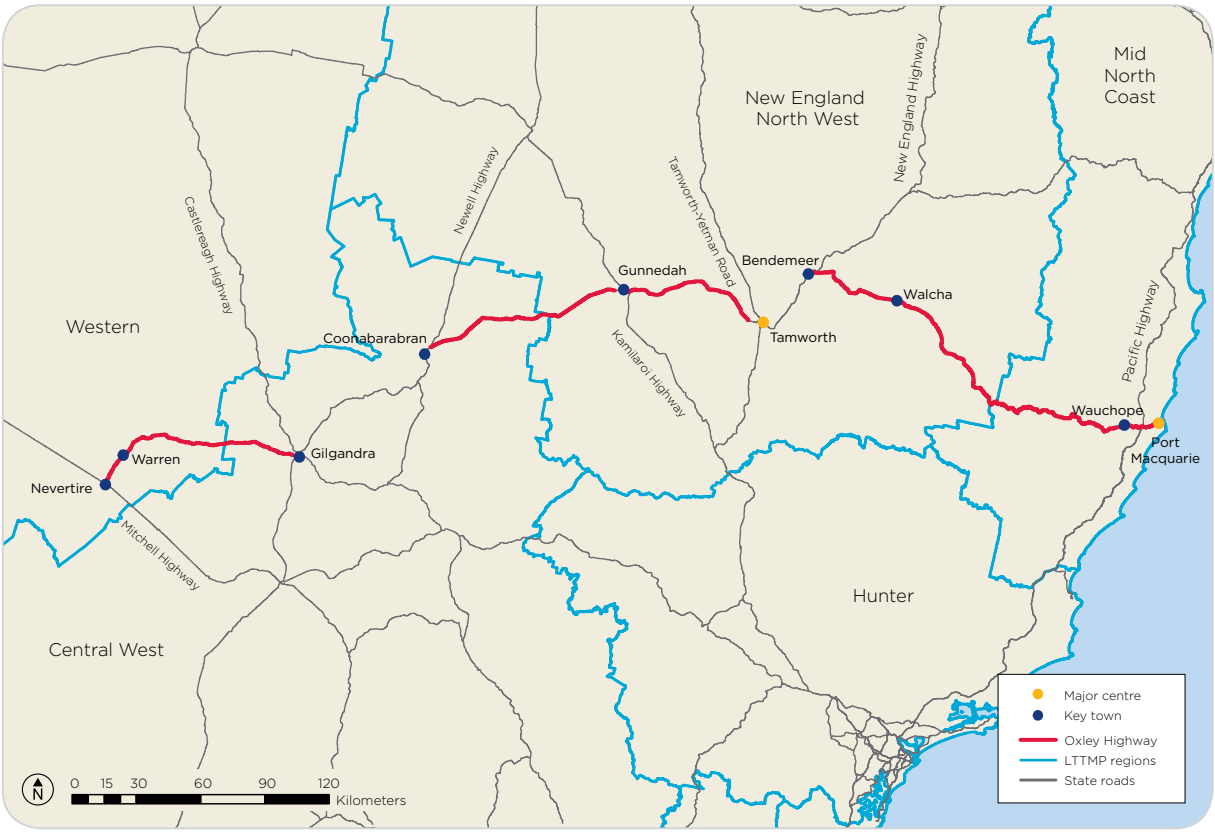
- Improving regional road links and road safety
- Planning for the growth of regional centres
- Supporting the regional economy
- Providing safer roads
- Improving connection between smaller towns and regional centres
- Seasonal tourism generates peak transport demands within some Central West towns.

Western Region

The Western customers saw that the challenges for the Western region included:

- Ensuring road connections to and from the region to enable and support growth and opportunity
- Improving access to and from the region by road, rail and air to reduce isolation and support business and economic growth
- Aligning service levels of inter-regional train and coach services with travel needs within the Western region
- Providing for the growing freight task, while recognising the impact it will have on regional town
- Providing safer roads
- Providing all-weather access to communities
- Providing for the needs of non-drivers or those with no access to transport
- Improving connections between smaller towns and regional centres.

Figure 3-2 NSW Long Term Transport Master Plan regional boundaries



4 TRANSPORT DEMANDS AND ROLES

Heading eastbound into Gilgandra from Warren

4.1 The Oxley Highway and the surrounding road network

The Oxley Highway's transport roles reflect the rural and urban populations and industries that it passes through. These roles include:

- Supporting travel to and from the region:
  - Allowing the transport of primary industry goods and associated traffic along the corridor; supporting and encouraging growth in regional areas.
  - Serving the movement of freight between regional centres along the corridor and to the wider network including the Newell, New England, Mitchell and Pacific Highways as well as to other transport modal facilities such as rail.
- Supporting travel within the region:
  - Serving urban areas and rural settlements along the corridor for local and regional trips, particularly the need to access higher order goods and services in the centres of Port Macquarie, Tamworth, Gunnedah, Coonabarabran, Gilgandra and Warren.
  - Accommodating commuter travel between Port Macquarie and Wauchope, and increasingly between Gunnedah and Tamworth.
- Supporting travel in the major centres and towns:
  - Supporting local trips for a variety of purposes
  - Providing for public transport, cycling and walking within and between the more densely populated centres of the corridor.
  - Provides an east west connection from the north south highways which generally radiate out of Sydney to the New England area and the coast for holidays.

The Oxley Highway intersects with a number of major road corridors. These are summarised in Table 4-1.

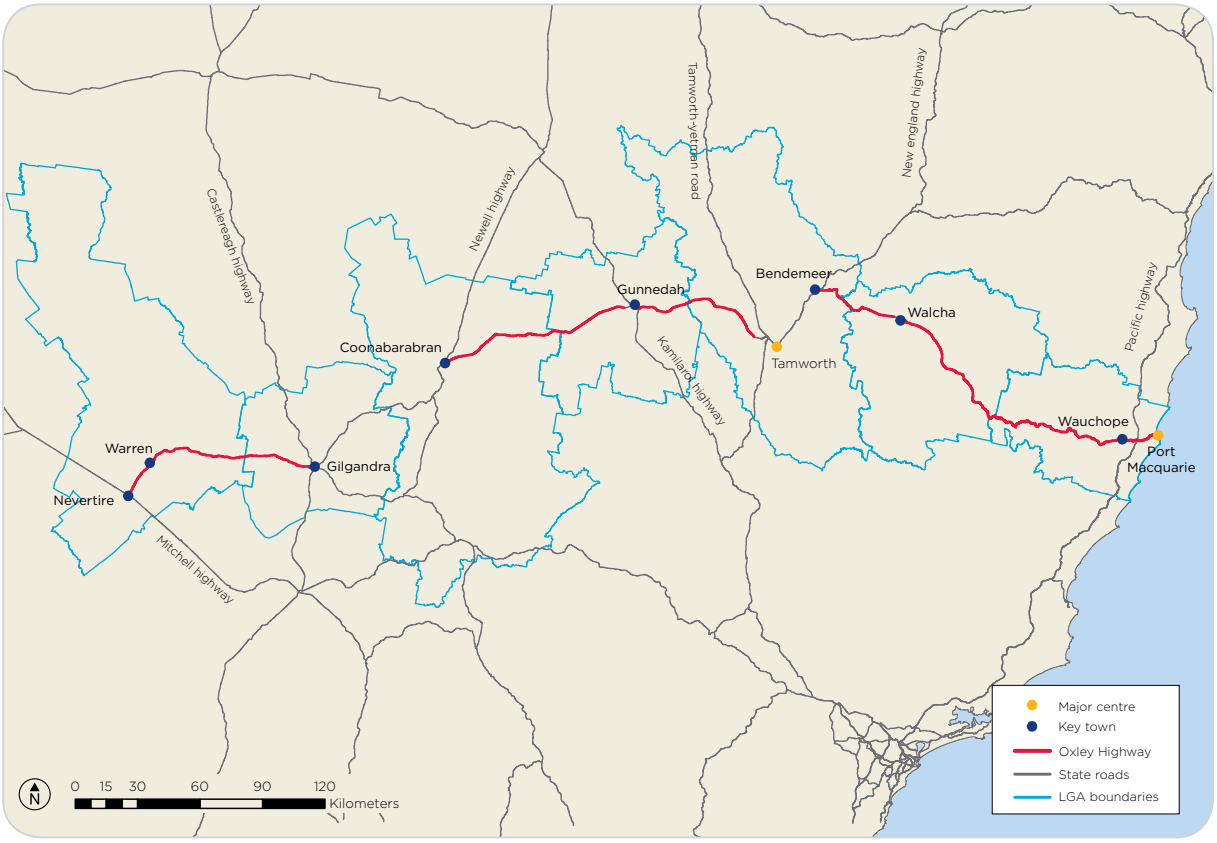
Table 4-1 Corridor connections

Network connection (East-West)	Transport connection
Pacific Highway	Connecting Sydney to the Queensland border intersecting the Oxley Highway between Port Macquarie and Wauchope
New England Highway	Inland route of the National Land Transport Network connecting Newcastle to the Queensland border. Connects the eastern section of the Oxley Highway at Bendemeer with the central section of the Oxley Highway at Tamworth.
Fossickers Way	Connecting Tamworth with the northern townships of Manilla, Barraba, Bingara and Warialda
Kamilaroi Highway	Connecting Quirindi with Gunnedah, Narrabri, Walgett, Brewarrina and Bourke
Newell Highway	Traverses western and central western NSW from the Victorian border to the Queensland border. It is a route of the National Land Transport Network and intersects the Oxley Highway at Coonabarabran
Castlereagh Highway	Traverses central western and western NSW, connecting Gilgandra with the townships of Dunedoo, Coonamble and Walgett.
Mitchell Highway	Linking major settlements in central and northern NSW such as Bourke, Dubbo and Orange with south central Queensland. It is part of the National Land Transport Network

The Oxley Highway passes directly through or next to the following towns. From east to west (Figure 4-1):

- Port Macquarie and Wauchope within the Port Macquarie – Hastings Shire
- Walcha within the Walcha Shire
- Bendemeer and Tamworth within the Tamworth Regional Council
- Gunnedah within the Gunnedah Shire
- Coonabarabran within the Warrumbungle Shire
- Gilgandra within the Gilgandra Shire
- Warren and Nevertire within the Warren Shire

Figure 4-1 Locality Map of the Oxley Highway Corridor



4.2 Current population and employment in the corridor

The Department of Planning and Environment defines regional boundaries for NSW. The Oxley Highway commences at Port Macquarie in the North Coast region and extends west into the New England – North West region passing through the local government areas (LGA) of Walcha, Tamworth and Gunnedah. Further west, the Oxley Highway extends into the Central West and Orana regions passing through the LGAs of Warrumbungle and Gilgandra before intersecting with the Mitchell Hwy at Nevertire in the Warren Shire Council.

An estimated 160,800 people live along the Oxley Highway corridor, with about 62 per cent of this number in major regional towns and centres. The overall population of the main urban centres along the Oxley Highway corridor is estimated at around 100,000. Current population and employment figures for each town within the corridor vary depending on the demographic and community characteristics of each local government area. All current population and demographic data in this section is derived from ABS 2011 census data unless specified.

Key demographic data for each of the major towns is summarised in Table 4-2. Towns along the Oxley Highway have a higher proportion of population aged over 65 years and between 0-14 years compared to the NSW State average.

Table 4-2 LGA and urban centre demographics

LGA	2011 LGA Popula-tion*	Urban Centres	2011 Urban Popula-tion	% Aged over 65 years	% Aged 0-14 years	Median age	% Labour force em-ployed full time	Main employment by industry in the LGA
Port Macquarie -Hastings	72,696	Port Macquarie	41,491	25.4%	17.4%	46	53.1%	Education, Retail and Health Care
		Wauchope	6,372	21.9%	22.5	40	51.1%	
Walcha	3,021	Walcha	1,482	26.4%	17.9%	46	58.8%	Agriculture, Education, Local Government Administration
Tamworth Regional	56,292	Tamworth	36,131	16.7%	21.1%	37	59.8%	Education, Health Care, Agriculture, Retail
Gunnedah	12,066	Gunnedah	7,888	20.7%	20.6%	39	58.3%	Agriculture, Coal Mining, Education
Warrum-bungle	9,588	Coonabara-bran	2,576	25.1%	18.7%	45	52.4%	Agriculture, Local Government Administration
Gilgandra	4,368	Gilgandra	2,664	23.3%	20.0%	43	53.9%	Agriculture, Local Government, Administration, Education
Warren	2,758	Warren	1,523	20.7%	20.5%	42	60.6%	Agriculture, Education, Local Government Administration
Total	**160,789**		**100,127**					
NSW State average				**14.7%**	**19.2%**	**38**	**60.2%**	

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

In all urban centres except Warren along the Oxley highway there is a lower percentage of full time employed compared to the NSW State average.

The dominant industries along the corridor include tourism, timber and commercial industries in the east and agricultural, service and extractive industries from Walcha west. These industries are an integral component of the local economies and require a safe, efficient and reliable road network. Future corridor management requires consideration of the access to and within the corridor to support the growth of regional economies, while providing safe and efficient movements of both freight and passenger vehicles, particularly for the local links between Port Macquarie and Wauchope and between Tamworth and Gunnedah.

Key centres, towns and employment industries in the Oxley Highway corridor are:

Port Macquarie

Port Macquarie has a population of around 41,500 and is one of the largest urban centres of the NSW north coast. It provides a large variety of public and private industry and services and a strong tourism sector. The central business district is under increasing demand for higher densities of retail, commercial and tourism space due to growth in population and regional function, and an expanding tourism market. Port Macquarie is identified in the NSW Department of Planning's Mid North Coast Strategy (2009) as a 'major regional centre' that is suited to accommodate the majority of regional population growth and employment opportunities, and to deliver state and regional services to the entire region or within the centre's subregion. Port Macquarie is expected to have strong and sustained population growth into the future. This growth will require substantial planning for commercial, industrial and residential lands.

Port Macquarie has one of the highest population growth rates in NSW outside of Sydney, with a population growth rate of 0.9% pa (2014), compared to the state average of 1.2%. This growth stems mostly from migration into the area[2].

Wauchope

Wauchope is a small settlement with a population of about 6,400 and is situated 19km west of Port Macquarie at the base of the Bago Mountains. Wauchope's local economy was originally based around the timber and forestry industries, in recent years however tourism has become increasingly significant. The proximity to Port Macquarie allows people to commute between the two centres, with Wauchope identified as being well placed to accommodate future residential and industrial growth in the area. This commuter link is expected to increase the significance of Wauchope in the Port Macquarie area. Wauchope is identified as a 'town' in the Mid North Coast Strategy. Towns are reliant on major regional centres and major towns for high order services, retailing and employment.

Walcha

Walcha is a small settlement of 1,500 people locating on the plateau of the Great Dividing Range. The Walcha region is well renowned for its wool production with the local economy dominated by sheep and cattle industries. The area is also popular for its national parks, waterfalls, trout fishing and timber plantations. In addition to the Oxley Highway, Walcha has transport links to Armidale in the north and Gloucester to the south via the Thunderbolts Way.

Tamworth

Tamworth is a large regional centre in the New England North West Region, servicing the northern tablelands of NSW. It is located approximately 300km inland from the east coast of Australia and about 400km north of Sydney. Tamworth has an urban population of 36,100. Tamworth is a regional centre for health, education, retail and entertainment. Traditional agricultural industries including sheep, cattle, poultry and wheat comprise a large part of the area's economy. In June 2009, Tamworth Regional Council (TRC) opened the Australian Equine and Livestock Events Centre (AELEC). AELEC hosts a variety of agricultural shows, contests and workshops and in combination with the neighbouring Tamworth Regional Entertainment Centre, is expected to increase the region's share in equine, livestock and entertainment industries. The annual Tamworth Country Music Festival is a significant tourist attraction, drawing crowds of up to 100 000 people. Tamworth Regional Council has identified extensive urban land release areas to encourage and cater for anticipated future growth in the region.

Gunnedah

The town of Gunnedah, located 75km west of Tamworth, has a population of 7,900. Its dominant industries are agriculture, public administration, retail and coal mining. Sheep, cattle, pigs and wheat were traditionally the prime agricultural production types. In recent times, however, other crops such as cotton have also been successfully cultivated. Gunnedah and the surrounding area is currently the subject of large scale mining projects.

2 NSW Department of Planning and Environment - 2014 NSW Population Projections data, viewed 22/10/2015

It is anticipated that the growth of these mines will have a significant impact on the local economy and the surrounding road and transport network.

Coonabarabran

Coonabarabran is a small settlement of about 2,600 people located 110 kilometres west of Gunnedah. The corridor terminates 5km east of Coonabarabran at the junction of the Oxley Highway and the Newell Highway, the major north-south route through central western NSW. Coonabarabran is the administration centre for the Warrumbungle region and is known as the astronomy capital of Australia. The local economy is dominated by primary industries including sheep and wool, beef cattle, wheat and other cereal crops and timber.

Gilgandra

Gilgandra has a population of approximately 2,700 and is positioned at the junction of the Newell, Oxley and Castlereagh highways, less than 100km west of Coonabarabran. The district is rich in agriculture, particularly wheat, cattle and lamb. The Warrumbungles National Park is approximately 50 minutes north of Gilgandra.

Warren

Warren is predominantly a rural area located approximately 100km west of Gilgandra on the Oxley Highway, in central northern New South Wales. Warren has a population of 1,500 and relies mostly on agriculture such as sheep and cattle grazing and wheat, oat and cotton growing. The wool and cotton growing industries are of national importance.

In 2011 the average unemployment rate of urban centres along the Oxley Highway corridor was 6.7 per cent, compared with a NSW average of 5.9 per cent and national average of 5.6 per cent. Within the corridor, an average of 55.7 per cent of the labour force was in full-time employment, compared with the NSW average of 60.2 per cent and national average of 59.7 per cent. Higher proportions of part-time employment and unemployment tend to be factors producing higher levels of non-peak period travel than would otherwise be the case.

Age demographics echo trends experienced in many rural and regional areas within Australia, with an ageing population. It is suggested that these trends result from both the movement of younger persons to metropolitan areas and the movement of older persons to regional areas. The average age along the whole corridor was 42, compared to the NSW average of 38 and national average of 37.

These trends presented create differing challenges in terms of the transport network and the specific needs of industry and people. Demand for public transport and road user vulnerability, for example, is a specific consideration for the elderly, while higher levels of part-time employment and shift work can result in the spreading of peak periods. Additionally, large primary produce sectors demand sufficient network standards to support inter-regional freight and to encourage regional development.

4.3 Industry and economic development

Transport moves goods produced in the regions to domestic and international markets, in turn contributing to the NSW economy. The State 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 heavy vehicle traffic and national freight productivity. Our road network joins Melbourne, Brisbane and Canberra. Around 50 per cent of all intra and interstate truck freight across Australia uses the NSW road network for at least 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.

Industry in the region

In regional NSW, a large area is dominated by agriculture.

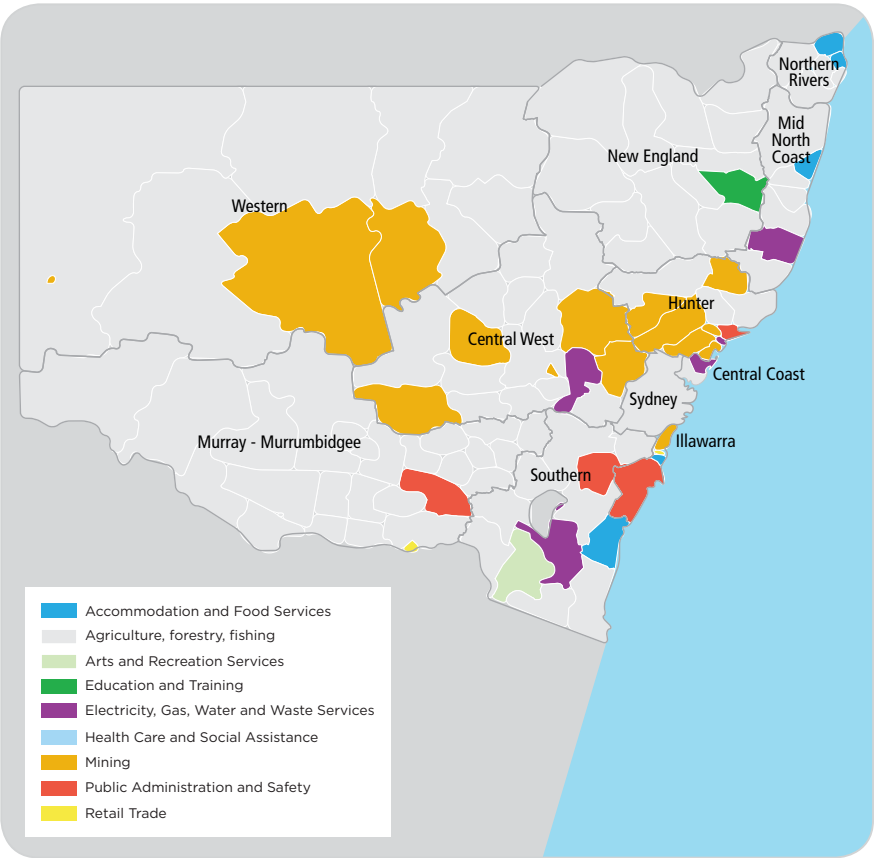
Mining activity is centred in the Hunter Valley, Central West and Western Regions, with tourism and port-related activity along the coast. The primary employment sectors in regional NSW are shown in Figure 4-2.

Agricultural land in the Oxley Highway Corridor varies across different sections, but generally includes:

- Beef production
- Wool production
- Wheat, cereal and cotton production

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

Figure 4-2 Primary employment sectors by LGA, regional NSW[3]

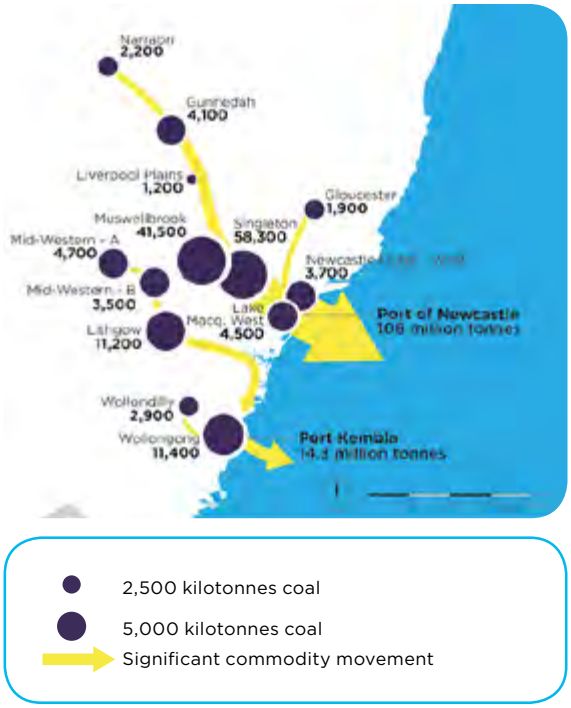


3 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney

Mining industry development in Gunnedah region

Gunnedah is located In the Sydney-Gunnedah Basin, which is one of the largest underground coal seams in NSW. Coal has been mined continually in the Gunnedah region in North West NSW for the past 130 years. The Basin is located roughly 300 kilometres north west of Newcastle and covers an area of 15,000km^2. The coal ranges from high quality ash thermal coal to exceptional quality low ash thermal coal. The mining industry provides a significant source of employment. Demand for coal movements is increasing, particularly from the Gunnedah Basin, to export facilities at the Port of Newcastle (Figure 4-3). A high proportion of the coal freight growth in the Gunnedah basin is transported by rail. The following figures show the current flows of exported coal within NSW.

Figure 4-3 Coal export commodity flows through NSW in 2010-11 kilotonnes[4]



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

Current freight task

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

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

Figure 4-4 Selected commodity movement in NSW in 2011[5]

The major exports carried on the Oxley Highway corridor are:

- Coal from the Gunnedah Basin is taken to export facilities at the Port of Newcastle.
- Cereals, including wheat, from multiple locations along the corridor.
- Beef and sheep are exported from multiple locations along the corridor.
- Wool is exported from Walcha throughout Australia and internationally through various Australian ports.
- Cotton from Warren is exported to international markets through various Australian ports.

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

4.4 Current traffic volumes and heavy vehicles

Traffic volumes along the length of the Oxley Highway vary in the rural sections from about 370 vehicles per day to about 11500 vehicles per day. In the urban centres, average daily traffic volumes range from around 1000 vpd (Walcha) to around 30000 vpd (Port Macquarie). The common trend is that higher traffic volumes exist closer to the coast, with the exception of the large regional centre of Tamworth. Traffic volumes along the Oxley Highway corridor increase substantially within urban areas such as Port Macquarie, Wauchope, Tamworth, Gunnedah, Gilgandra and Warren. The largest volumes are experienced in Port Macquarie and Tamworth. The relatively high volumes between Wauchope and Port Macquarie demonstrate the high interdependence between the two urban centres.

Heavy vehicle numbers across the route vary considerably, with the average number of heavy vehicles per day between urban centres and towns being:

- Port Macquarie and Wauchope: 872 (652 rigid vehicles and 220 articulated vehicles)
- Wauchope to Walcha: 91 (64 rigid vehicles and 27 articulated vehicles)
- Walcha to Bendemeer: 112 (70 rigid vehicles and 42 articulated vehicles)
- Tamworth to the Newell Highway: 585 (325 rigid vehicles and 260 articulated vehicles)
- Gilgandra to Nevertire: 147 (87 rigid vehicles and 60 articulated vehicles)

Of the five major NSW east-west routes north of Sydney (the Golden Highway, Oxley Highway, Waterfall Way, Gwydir Highway and Bruxner Highway), only the Golden Highway and Gwydir Highway accepts 26 metre B-Doubles on its full length. 26 metre B-doubles are permitted on all sections of the Oxley Highway between Port Macquarie and Nevertire with the exception of the 100 kilometre mountainous section of Oxley Highway between Wauchope and Yarrowitch (50km west of Mt Seaview) because of the steep grades and tight curves.

4.5 Public transport and active transport in the corridor

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

Public transport

Public bus services

There is no public bus service that uses the entire length of the Oxley Highway corridor. Bus services that use parts of the corridor include:

- Community transport Gunnedah to Tamworth (Monday to Friday)
- Community transport Tamworth to Walcha (last Friday of the month)
- Route 335, Port Macquarie – Wauchope via Base Hospital (all week, less frequent on Sunday) operated by Busways

All of the urban centres along the corridor are serviced by regional and local bus services and other various community transport services for less mobile sectors of the community such as the young and elderly. Information and timetables for bus services are available from the individual bus depots, the bus company websites and Visitor Information Centres. Regional Development Australia Northern Inland (RDANI), in conjunction with the NSW Government and the local councils in the Northern Inland, have developed a comprehensive guide to all transport options in the region. This is available at http://www.rdani.org.au/projects/northern-inland-transport-guide.php

Transport for NSW will investigate options in its Regional Transport Plans to cater for the public transport users in urban sections of the corridor.

School bus routes

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

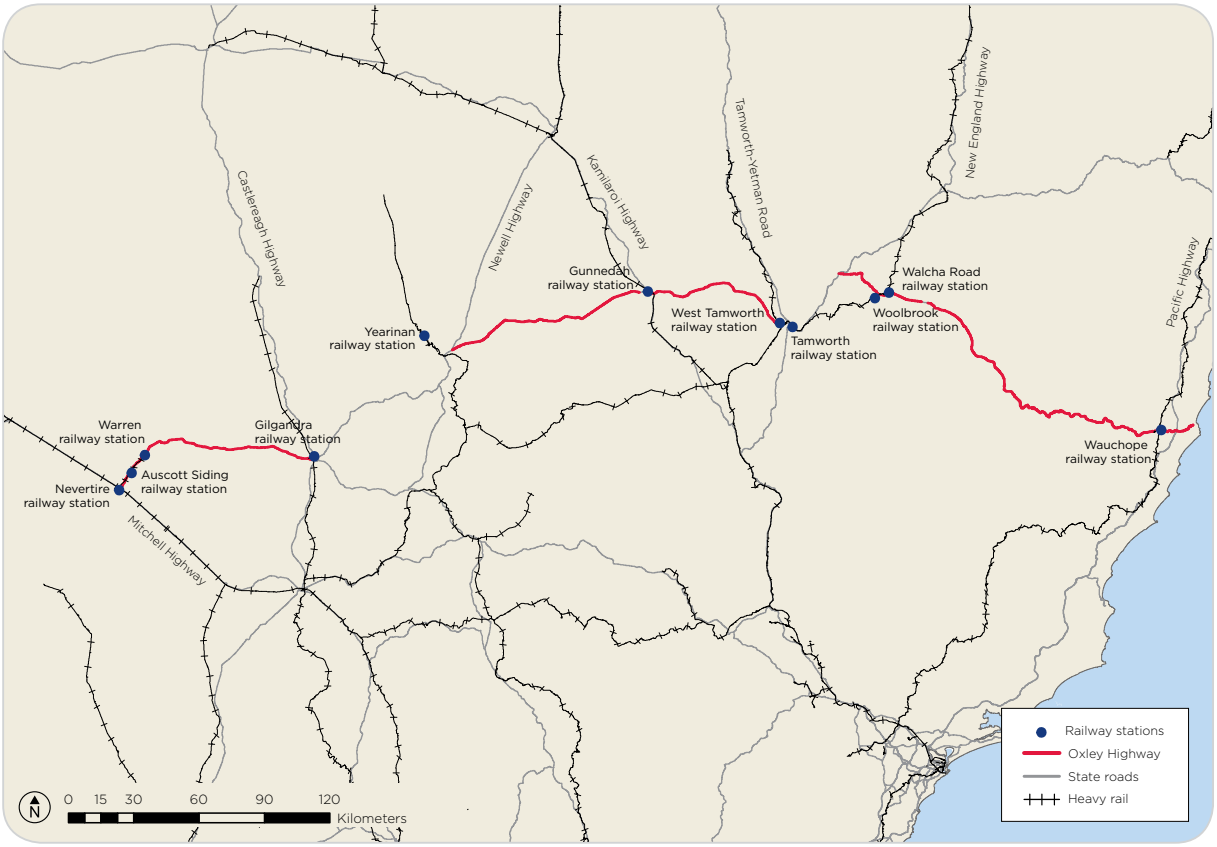
Rail services

There are three passenger rail services within the corridor operated by NSW TrainLink. The Sydney-Brisbane North Coast rail line, which parallels the Pacific Highway, passes through Wauchope and has connecting bus services into Port Macquarie. The North Western line from Sydney splits into two at Werris Creek, with one service continuing onto Tamworth and Walcha Road and terminating at Armidale. The other proceeding to Gunnedah and Narribri before terminating at Moree.

NSW TrainLink runs three regional coach services involving the Oxley Highway, from Nevertire to Warren, from Walcha Road to Walcha and from Dubbo to Lighting Ridge passing through Gilgandra.

The southbound North Coast rail line, the Moree line and the line between Nevertire and Warren also carry freight rail services, with the Moree line becoming increasingly important due to the expansion of mining activities in the Gunnedah basin.

Figure 4-5 NSW rail network in the vicinity of the Oxley Highway



Air services

There are two domestic passenger airports in the corridor, one at Port Macquarie and one at Tamworth. There are no air links between any of the other urban centres as most destinations feed back into the Sydney metropolitan transport system.

Port Macquarie Airport is conveniently located just five kilometres west of Port Macquarie's CBD. The airport services the Greater Port Macquarie and the southern part of the Mid North Coast region of NSW. Port Macquarie Airport is serviced by QantasLink and Virgin Australia. QantasLink has five return flights every weekday to Sydney and three daily on the weekends. Virgin Australia has two daily flights to/from Sydney and one daily to/from Brisbane.

Port Macquarie Airport has an ongoing development program to ensure that the airport is positioned to handle forecast growth in passenger numbers and that its services and facilities continue to meet the needs of the community. The Airport Master Plan 2010 is the principal planning document for Port Macquarie Airport.

Tamworth Airport is located 10km from Tamworth on New Winton Road via Gunnedah Road and is approximately a 15 minute drive from the city centre. Tamworth Regional Airport is the largest regional airport in Australia and capable of operations for aircraft as large as B737/A320 series. QantasLink provides services between Tamworth and Sydney with six return flights a day (Monday to Friday), three flights to Tamworth and four to Sydney on Saturdays and four flights to Tamworth and three to Sydney on Sundays.

Active transport

NSW Government is committed to supporting the development of alternative transport options that are economical, environmentally sustainable and that enhance the wellbeing of the public. Delivering cycle ways and encouraging walking that connect residents with different land uses in an integrated and accessible fashion is a key part of achieving this objective.

Walking and cycling opportunities via dedicated infrastructure are also generally restricted to the urban centres. Between towns the sealed road shoulder should provide a facility for bicycle travel. AUSTROADS (2010) recommends a two to three metre shoulder width where a speed limit is up to 100 km/h[6].

Port Macquarie Hastings Council and Tamworth Regional Council both have designated bike plans. There are various designated cycling routes on and parallel to the corridor. Port Macquarie Hastings Shire Council has a small stretch of off-road cycleway west of the town centre. The cycleway commences at Fernhill Road roundabout and terminates at Wrights Road. Although the upgraded section of the Oxley Highway between Wrights Road and the Pacific Highway has two-metre wide shoulders on the outer lanes of the upgraded highway, there are squeeze points where the shoulder widths drop below two metres.

Tamworth Regional Council has an existing off-road cycling facility which extends from Edith Street roundabout at West Tamworth to Marathon Street, Westdale. Due to the likely future growth of the Westdale area it is anticipated that this cycling link will become increasingly significant in the near future.

6 Austroads 2010, Geometric Design, Austroads Guide to Road Design, Part 3, AGRD03/10, Austroads, Sydney, NSW

As the corridor passes through many urban centres there is inevitable risk to pedestrian safety in these areas, particularly those with higher traffic volumes, poor visibility and limited sightlines. Pedestrian safety in Wauchope is a concern as eastbound traffic descends a long slope on the approach to the town centre. Although pedestrian crossings are provided, drivers unfamiliar with the town may not have adequate time to stop. Other urban areas dictate lower speed environments through the provision of local traffic calming devices, topography and signalisation.

In 2011, in Port Macquarie and Tamworth, only 3.9 per cent and 3.3 per cent of all employees walked to work respectively. Pedestrian connectivity is limited in some areas of Tamworth, particularly on the dual lane sections of road without signalised pedestrian facilities, and around highly trafficked areas such as Westdale Public School and Peel High School. Off road storage and crossing facilities in these areas expose pedestrians to greater road safety risks. The Marius Street dual lane pedestrian crossing has been relocated to the west and fitted with a signalised pedestrian facility to improve pedestrian safety and access between north Tamworth and the town centre.

Transport for NSW will investigate options in its *Regional Transport Plans* to cater for cyclists and pedestrians in urban sections of the corridor. The New England North West and Mid North Coast plans list the 'Walking Communities Program' as an initiative to improve facilities for walking within 2km of a town centre and the 'Connecting Centres Cycling Program' to improve cycle infrastructure within a 5km radius of town centres.

5 CURRENT CORRIDOR PERFORMANCE

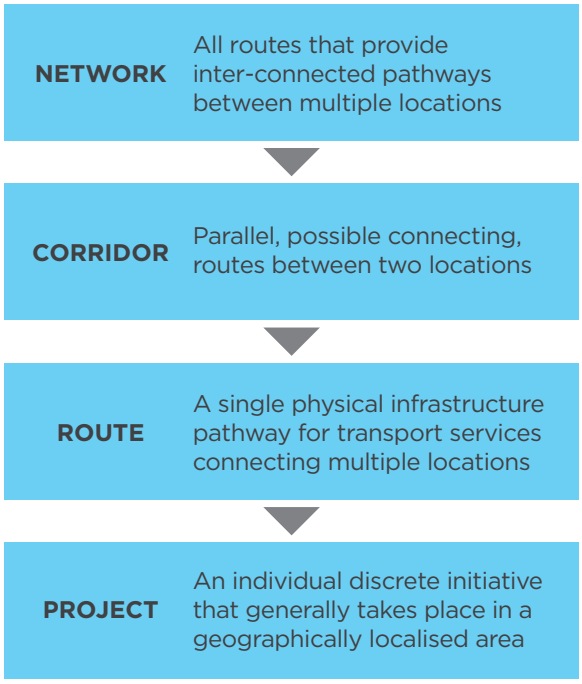
Looking west from the Pacific Highway in the morning peak

Transport for NSW has adopted the *National Guidelines for Transport System Management in Australia*[7] to guide its high quality advice to the NSW Government on the future of the road network.

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

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

Figure 5-1 Road transport system planning levels[8]



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 and Roads and Maritime 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.

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

The Network Performance Measures and Network Planning Targets[9] indicate that the Oxley Highway has been classified as 'Class 2 Rural' between Wauchope and Bendemeer, between Gunnedah and Coonabarabran, and between Gilgandra and Nevertire, 'Class 3 Rural' between Tamworth and Gunnedah, and 'Class 4 Rural' between Port Macquarie and Wauchope.

7 Transport and Infrastructure Council 2015, *National Guidelines for Transport System Management in Australia*, ATC, Canberra

8 Transport and Infrastructure Council 2015, *National Guidelines for Transport System Management in Australia*, ATC, Canberra, p.12

9 Road and Maritime 2010, Network Performance Measures and Network Planning Targets, RMS, Sydney, p.19

Figure 5-2 Oxley Highway Road Network Management Hierarchy

The Network and Corridor Planning Practice Notes[10] state that:

"Class 2R roads provide for inter-regional and intra-regional connectivity and the strategic needs of freight. They are typified by low levels of traffic volumes including freight, commercial vehicle and public transport travel. They provide a reasonable standard of travel and serve intra-regional and some inter-regional functions. Typically they have undivided carriageways with two lanes."

Where the attributes of Class 2R roads are typically:

- Average annual daily traffic volumes of around 1,500 vehicles per day.
- Average heavy vehicle volumes of around 250 vehicles per day.
- Speed limits range from 60 km/h to 110 km/h.

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

Where the attributes of Class 3R roads are typically:

- Average annual daily traffic volumes of around 4,500 vehicles per day.
- Average heavy vehicle volumes of around 500 vehicles per day.
- Speed limits range from 60 km/h to 110 km/h.

10 Roads and Maritime 2008, Network and Corridor Planning Practice Notes, RMS, Sydney, p.20

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

Where the attributes of Class 4R roads are typically:

- Average annual daily traffic volumes of around 10,000 vehicles per day.
- Average heavy vehicle volumes of around 1000 vehicles per day.
- Speed limits range 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 specific areas to respond to changes in nearby land use, terrain and property access arrangements. Planning sections are manageable lengths of road that are uniform in nature.

For the purpose of this analysis, the Oxley Highway corridor has been divided into 16 corridor planning sections. These are shown in Table 5-1 and Figure 5-3.

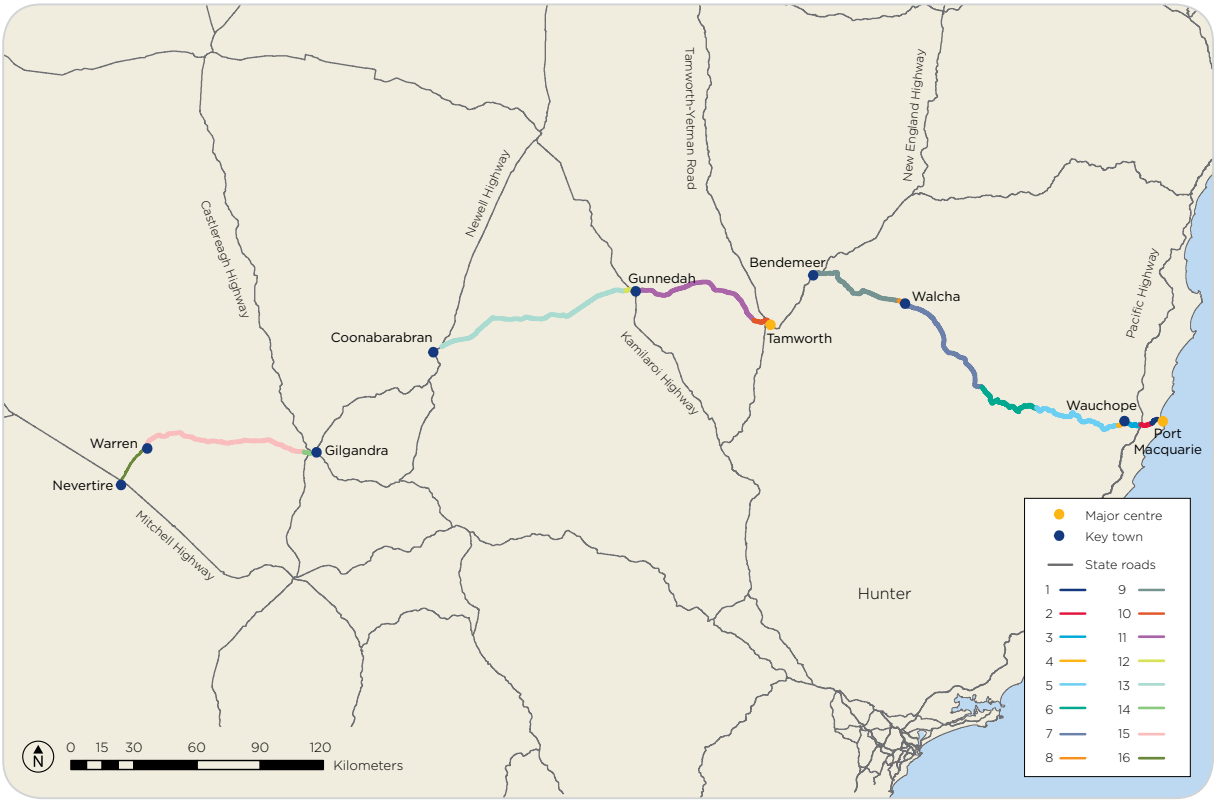
Table 5-1 Corridor planning sections

Corridor planning section		Description	Land Use (Fringe Urban, Rural, Vegetation Conservation, Urban or Urban Commercial	Chainage (km)*		Length (km)
				From	To	
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	Urban Commercial, Urban	0.000	3.436	3.436
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	Urban	3.436	8.979	5.543
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	Rural, Fringe Urban	8.979	18.067	9.088
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	Urban Commercial, Urban	18.067	21.761	3.694
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	Fringe Urban, Rural	21.761	71.406	49.645
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	Rural	71.406	117.916	46.510
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	Rural, Fringe Urban	117.916	180.549	62.633

Corridor planning section		Description	Land Use (Fringe Urban, Rural, Vegetation Conservation, Urban or Urban Commercial	Chainage (km)*		Length (km)
				From	To	
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	Urban	180.549	182.635	2.086
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	Fringe Urban, Rural	182.635	231.151	48.516
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	Urban, Urban Commercial	231.151	239.059	7.908
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	Fringe Urban, Rural	239.059	306.157	67.098
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	Fringe Urban, Urban	306.157	312.014	5.857
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	Fringe Urban, Rural	312.014	409.573	97.559
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	Urban	409.573	412.642	3.069
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	Fringe Urban, Rural	412.642	494.109	81.467
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	Fringe Urban, Urban	494.109	514.736	20.627
Total				**0.000**	**514.736**	**514.736**

* Based on Roadloc chainage

Figure 5-3 Oxley Highway corridor 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. Transport for NSW and Roads and Maritime measure and monitor road performance against network performance measures and targets.

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

Network planning targets set out in this document are either:

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

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

- Network Performance Measures and Network Planning Targets[11]
- Network and Corridor Planning Practice Notes[12]

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

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

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

Road characteristics

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

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

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

- Section 5.1 Road safety
- Section 5.2 Traffic
- Section 5.3 Heavy vehicles
- Section 5.4 Road design and geometry
- Section 5.5 Road pavement condition
- Section 5.6 Environment and Urban Design

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:

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

5.1 Road safety

Improving road safety is the most important goal of this strategy with all recommendations for the Oxley Highway ultimately targeting improved safety for all road users. Assessment of crash data, community and other stakeholder feedback along with a Route Safety Review of the Oxley Highway have been undertaken as a part of this study to increase safety levels along the Oxley Highway.

In 2013 a route safety review was conducted on the section of the Oxley Highway from the junction of the Pacific Highway west of Port Macquarie to the junction of the Mitchell Highway at Nevertire, a distance of approximately 506 km. The review aimed to recommend road safety treatments that are known to be effective and can be implemented without major engineering works.

Speed zones

Speed zones are determined according to the *Roads and Maritime Services Speed Zoning Guidelines* and are posted to provide motorists a safe passage along roads.[13]

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 Services 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 records and access points along the route.

The speed limit along the Oxley Highway is generally 100 km/h in the open rural areas except for three 110km/h zones. Two 110km/h speed zones are located in the far western sections of the Oxley Highway either side of Warren and the third section is a 50km length east of Walcha. The speed limit over the eastern escarpment is 100km/h which is inconsistent with other similar lengths of road on the network and is at variance with the NSW Speed Zoning Guidelines.

The locations of speeds zones along the Oxley Highway are shown in Figure 5-4, Figure 5-5 and Figure 5-6.

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

The Oxley Highway Route Safety Review initial findings regarding speeds zones included:

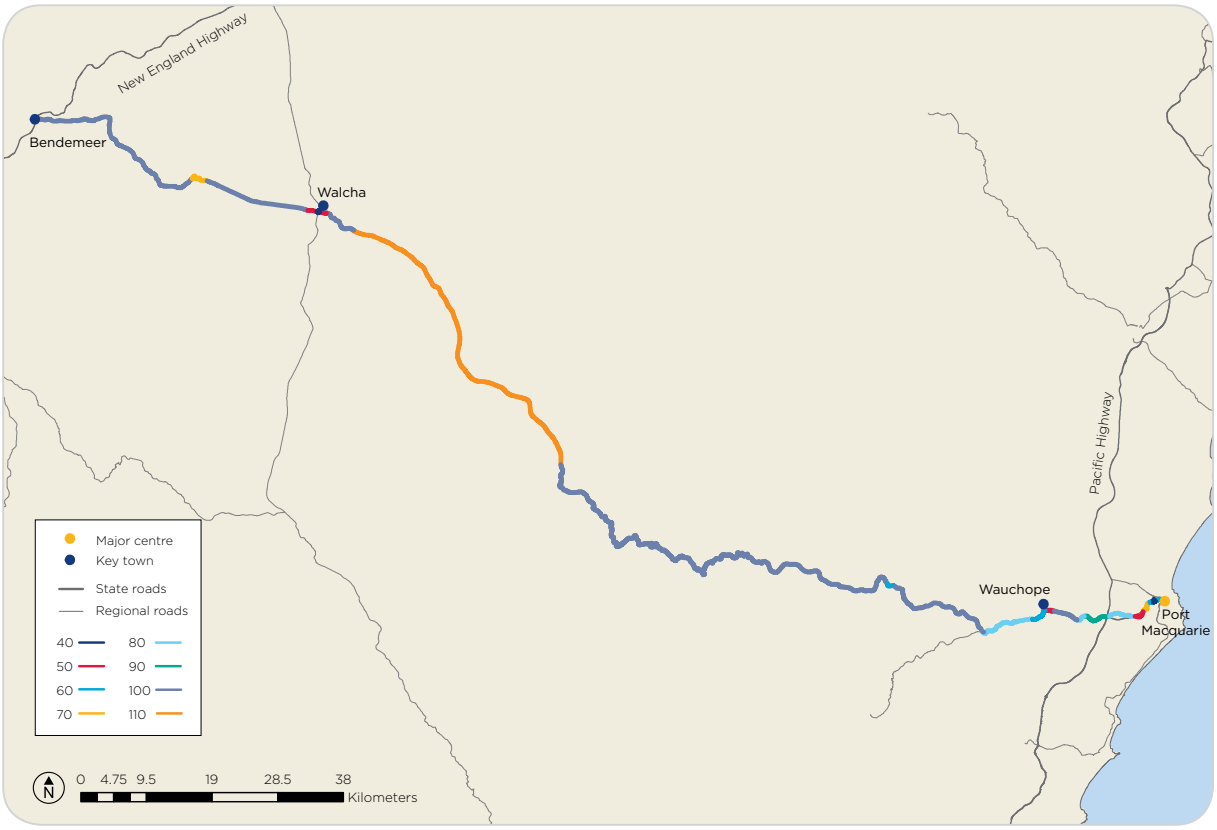
- There is a 100km/h speed limit on an extremely winding and narrow part of the highway over the entire length of the eastern escarpment. This length of highway also had a corresponding high casualty crash rate.
- An isolated 110km/h speed limit over a section of highway east of Walcha with road safety deficiencies including lack of road shoulders, deep unprotected culverts and drop-offs, substandard junction treatments and substandard safety barriers.
- Inconsistent treatment of speed limits through villages and on some town outer limits.
- A lack of speed zone reminder signposting.

The Oxley Highway Route Safety Review recommends a comprehensive speed zone review to be undertaken along the full length of the highway. The aim will be to ensure that the speed limits and the length of the speed zones are appropriate for the road environment, consistently applied along the full length of the highway and meet the requirements of the Roads and Maritime NSW Speed Zoning Guidelines.[14]

Rural locations where the speed limit differs from the general 100 or 110 km/h include:

- 80km/h for 8 kilometres between Wauchope and Comboyne Road.
- 70km/h for 3 kilometres around Wollun-Woolbrook Road, Walcha due to tight horizontal curves
- 60km/h for 3.5 kilometres around Berida-Bullagreen Road, Collie

Figure 5-4 Oxley Highway posted speed limits between Port Macquarie and Bendemeer



14 NSW Centre for Road Safety 2014, *Oxley Highway: Route safety review*, Roads and Maritime Services, Sydney

Figure 5-5 Oxley Highway posted speed limits between Tamworth and Coonabarabran

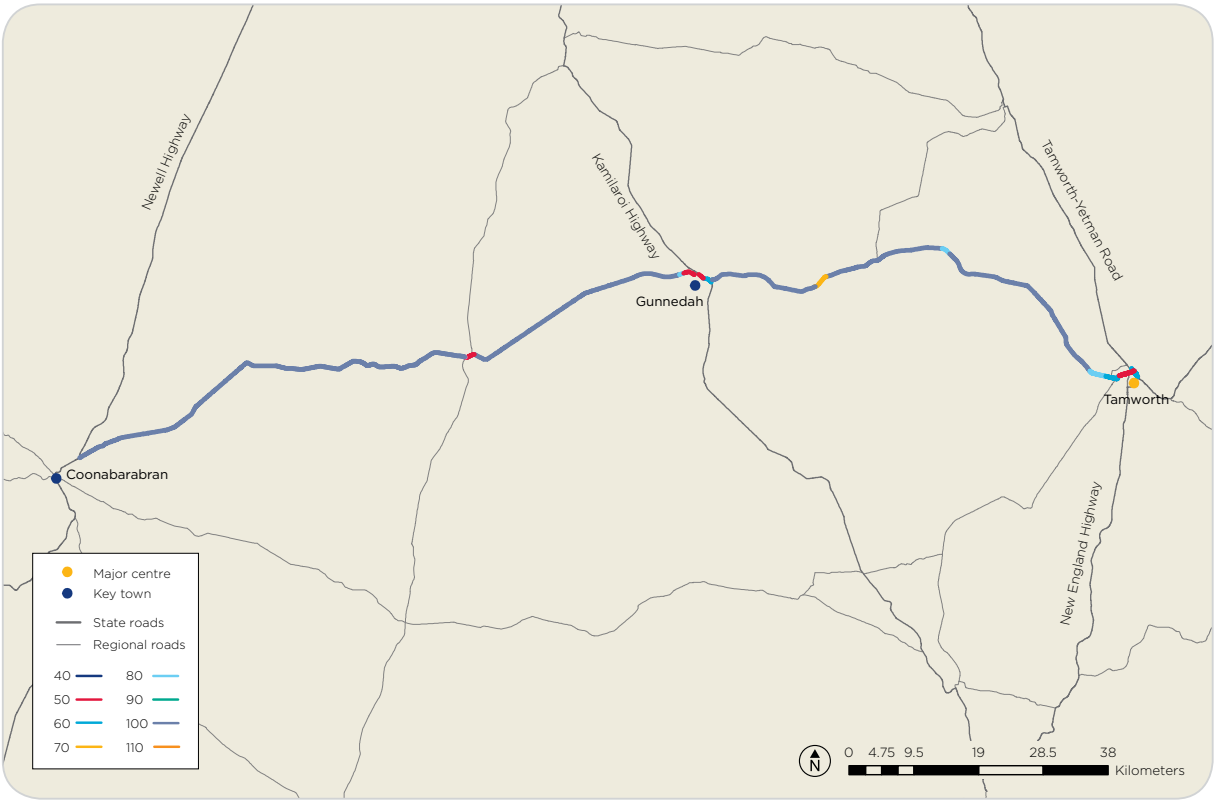


Figure 5-6 Oxley Highway posted speed limits between Gilgandra and Nevertire

Number of crashes

Of the 683 crashes reported between 2009 and 2013 along the Oxley Highway corridor, 359 were 'casualty crashes', which caused either an injury or fatality to one or more of the people involved. Of the 359 casualty crashes, 15 were fatal and 344 resulted in an injury (Figure 5-7, Figure 5-8, Figure 5-9 and Figure 5-10).

Figure 5-7 Crash concentration between the Pacific Highway and Wauchope (2009-2013)

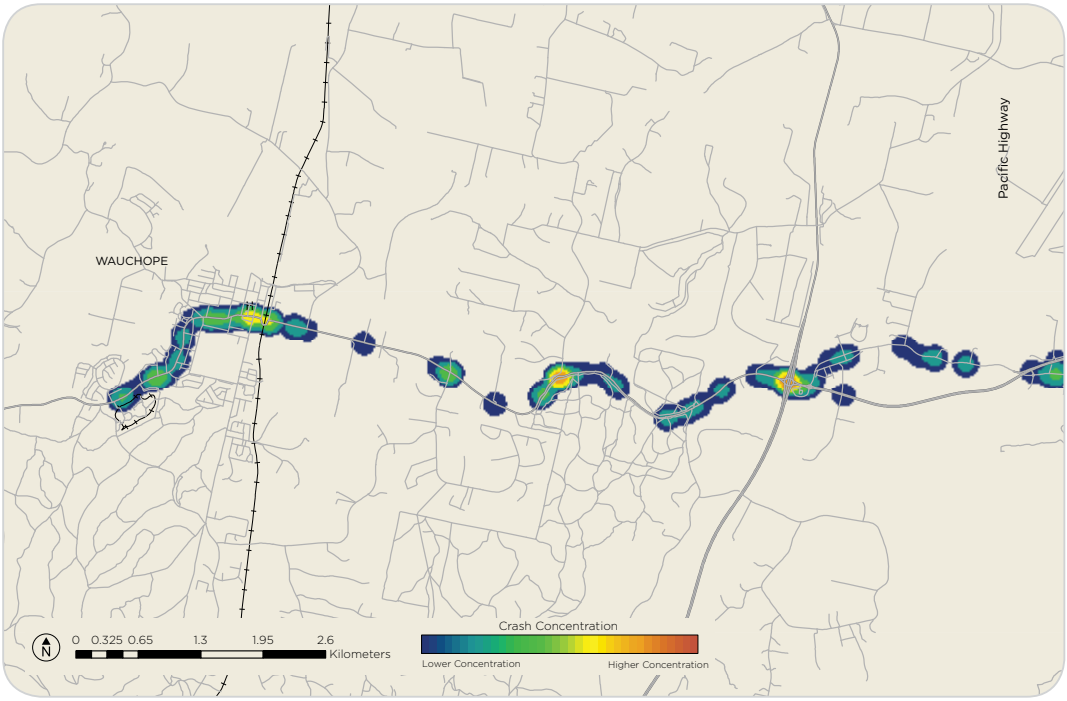


Figure 5-8 Crash concentration between the Wauchope to Walcha (2009-2013)

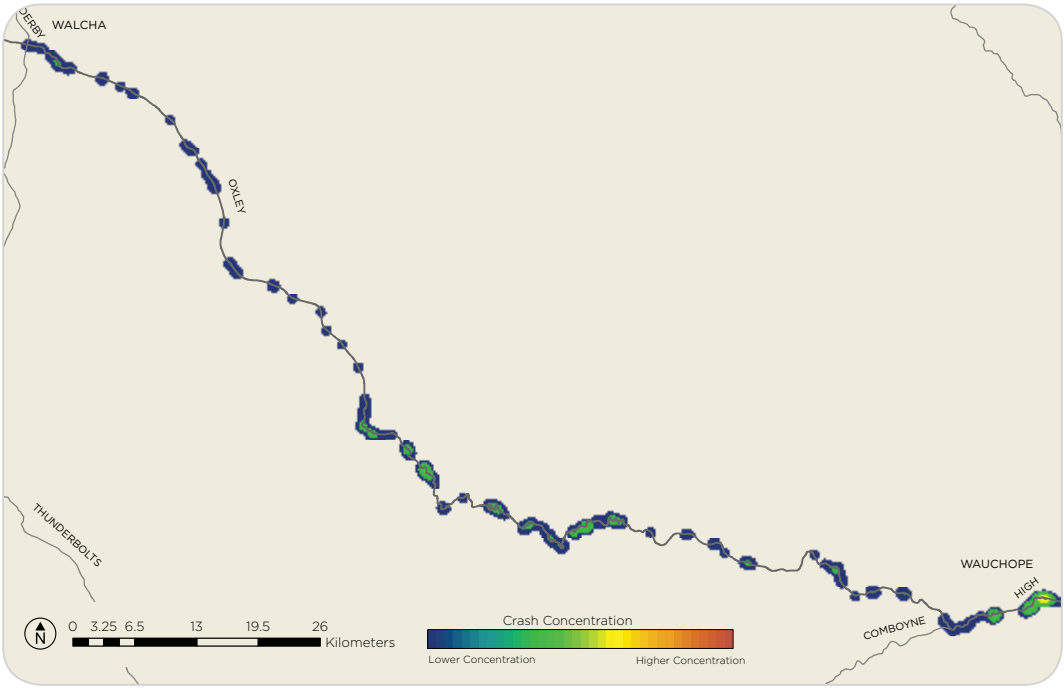
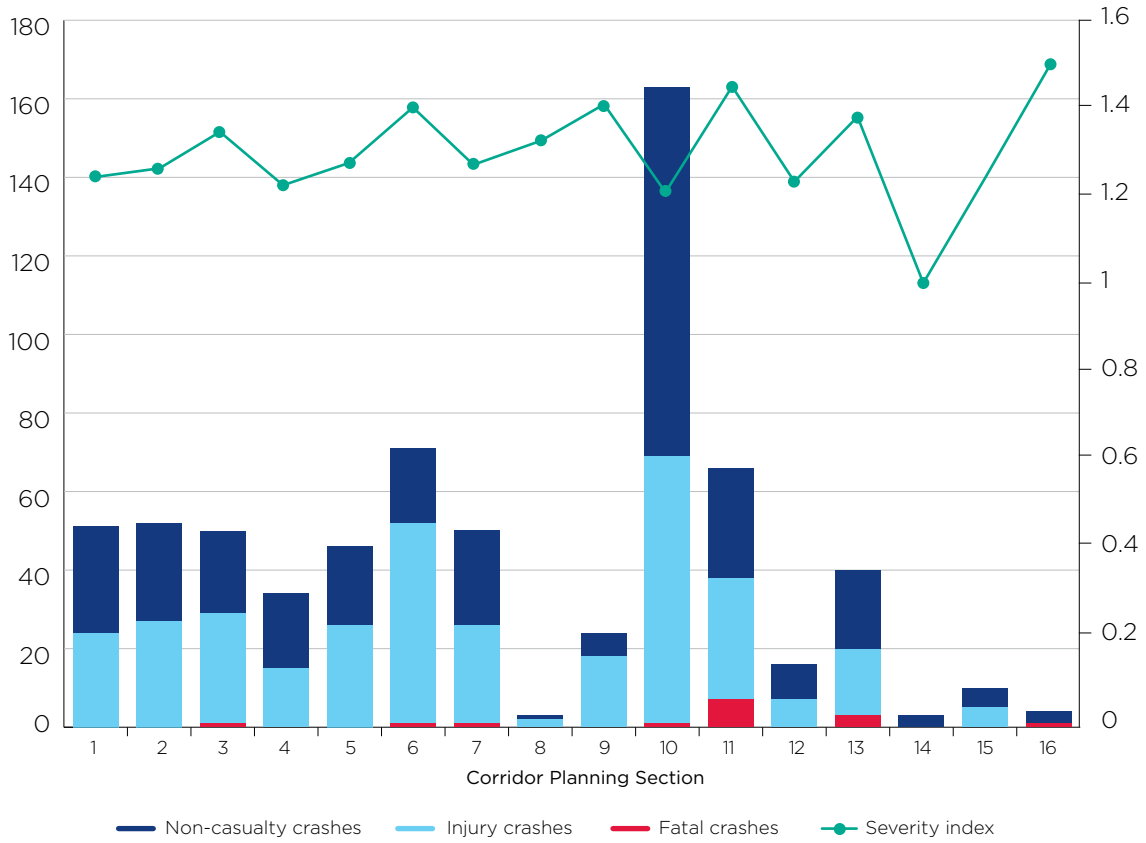


Figure 5-9 Crash concentration between the Tamworth to Gunnedah (2009-2013)

Figure 5-10 Casualty and non-casualty crashes 2009 – 2013



In addition to measuring the number and severity 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. Casualty crash rate per 100 million vehicle kilometres travelled (100 MVKT).
3. Severity index.

Casualty crash rates

Table 5-2 sets out the class averages for the casualty crash rates on the rural network.

Table 5-2 Network class average performance for the rural road network (2008-2012)[15]

Rank	Land Use	Average number of Casualty Crashes per kilometre per year
4R	Fringe Urban, Rural and Vegetation Conservation	0.186
3R	"	0.190
2R	"	0.074
1R	"	0.025
4R	Urban and Urban Commercial	1.631
3R	"	1.174
2R	"	0.706
1R	"	0.629

Table 5-3 compares annual casualty crash rates per kilometre on the Oxley Highway with class averages in NSW.

Table 5-3 Annual average casualty crash rate per kilometre 2009 – 2013

Corridor planning sections		Description	Rural hierarchy class	Land Use	Oxley Highway Corridor (2009 to 2013)	NSW class average (2008 To 2012)
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	4	UC, U	1.397	1.631
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	4	U	0.974*	1.631
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	4	R, FU	0.638	0.186
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	2	UC, U	0.812	0.706

*Duplication of section 2 Wrights Road to the Pacific Highway Port Macquarie completed in 2012.

15 TfNSW update 2014, *Network Performance Measures and Network Planning Targets, p.22*

Corridor planning sections		Description	Rural hierarchy class	Land Use	Oxley Highway Corridor (2009 to 2013)	NSW class average (2008 To 2012)
5		West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	2	FU, R	0.105	0.074
6	Wauchope to Walcha	Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	2	R	0.228	0.074
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	2	R, FU	0.086	0.074
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	2	U	0.192	0.706
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	2	FU, R	0.074	0.074
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	3	U, UC	1.770	1.174
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	3	FU, R	0.134	0.190
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	3	FU, U	0.239	1.174
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	2	FU, R	0.047	0.074
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	2	U	0.000	0.706
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	2	FU, R	0.012	0.074
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	2	FU, U	0.010	0.706

*Duplication of section 2 Wrights Road to the Pacific Highway Port Macquarie completed in 2012.

The annual average casualty crash rate per kilometre per year for the Oxley Highway ranges from 0.00 to 1.770. As the Oxley Highway road classes and land uses vary the NSW-state wide average ranges from 0.074 to 1.631. In comparison the Oxley Highway does not perform better than the rural state wide average in six out of the 16 sections, it consistently does not perform between the Pacific Highway and Walcha. Tamworth also records a figure higher than the average due to a high number of intersection and rear end crashes.

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

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

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

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

Where:

- L= length in kilometres
- A = ADT (traffic year used should be within the crash data range (or similar))
- M = number of years of crash data

The casualty crash rate on rural sections of the Oxley Highway for the five years to December 2013 ranged from 6.6 to 108.4 crashes per 100 million vehicles kilometres travelled (Table 5-4). For urban areas the crash rate ranged from 0 to 72.4.

When the sections are compared against each other and categorised into road hierarchy class the sections that perform the worst for each class include:

- Section 2 – Port Macquarie to the Pacific Highway for rural road class 4
- Section 10 – Tamworth for rural road class 3
- Section 6 – Part of the Wauchope to Walcha range for rural road class 2

Table 5-4 Casualty crash rate per 100 million vehicular kilometres travelled (MVKT) – 2009 to 2013

Corridor planning sections		Description	Land Use (Fringe Urban, Rural and Vegetation Conservation)	Crash rates per 100 MVKT	Rural hierarchy class
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	UC, U	16.4	4
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	U	18.6*	4
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	R, FU	18.2	4
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	UC, U	54.9	2
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	FU, R	25.5	2
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	R	108.4	2
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	R, FU	48.3	2
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	U	72.4	2
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	FU, R	30.3	2
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	U, UC	40	3
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	FU, R	9.6	3
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	FU, U	9.1	3
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	FU, R	13.8	2
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	U	0	2
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	FU, R	6.6	2
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	FU, U	4.7	2

*Duplication of section 2 Wrights Road to the Pacific Highway Port Macquarie completed in 2012.

Severity index

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

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

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

Where:

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

Table 5-5 shows the severity index for the Oxley Highway for the five year period to December 2013. The upper limit for this severity index is three, while the lowest possible figure is one (provided there has been a crash on the length of road being considered).

Table 5-5 Crash type and severity 2009 – 2013

Corridor planning sections		Description	Total non-casualty crashes	Injury crashes	Fatal crashes	Severity Index
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	27	24	0	1.24
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	25	27	0	1.26
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	21	28	1	1.32
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	19	15	0	1.22
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	20	26	0	1.28
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	19	52	1	1.39
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	24	26	1	1.29
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	1	2	0	1.33
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	6	18	0	1.38
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	94	69	1	1.21
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	28	38	7	1.45

Corridor planning sections		Description	Total non-casualty crashes	Injury crashes	Fatal crashes	Severity Index
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	9	7	0	1.22
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	20	20	3	1.36
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	3	0	0	1.00
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	5	5	0	1.25
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	3	0	1	1.50
TOTAL			**324**	**344**	**15**	**1.29**

The corridor planning section 16 between Warren and Nevertire has the highest severity index. The second highest section between Tamworth and Gunnedah had a total of seven fatality crashes within the five year period.

Crash types

Approximately 44% of all reported crashes on the Oxley Highway during this period involved vehicles running off the road on either a curve or straight section. More specifically, vehicles running off the road on a curve accounted for 27%. Further analysis indicates that in 18.6% of those crashes, the vehicle hit an object.

Figure 5-11 Crash types urban (Port Macquarie, Wauchope, Tamworth and Gunnedah)

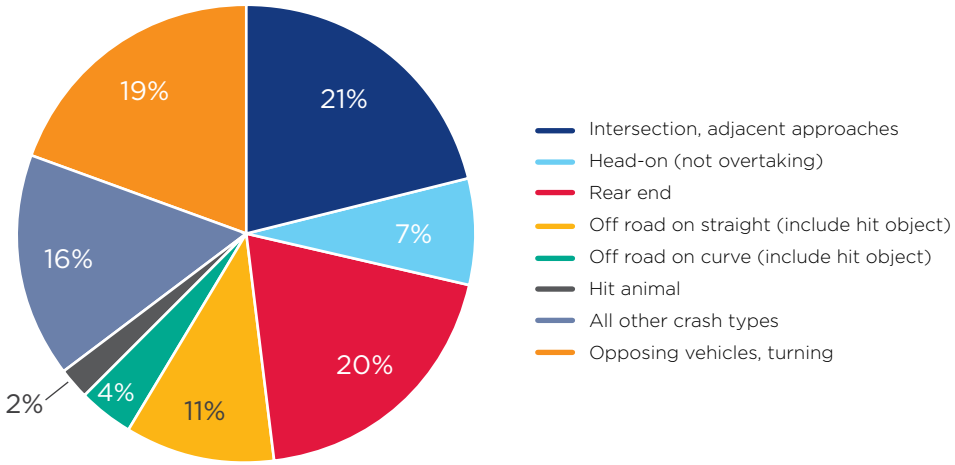


Figure 5-12 Crash types rural – mountainous

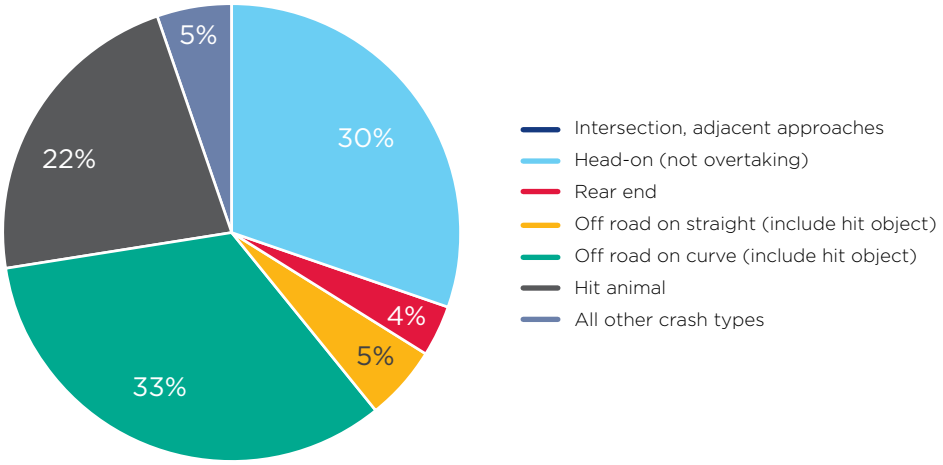
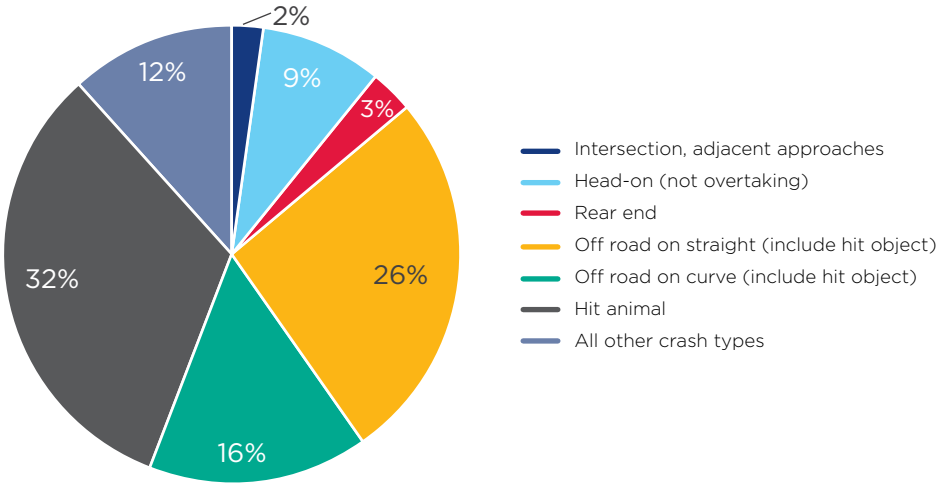


Figure 5-13 Crash types rural



When the crash types are separated into urban, rural (mountainous) and rural it can be seen that there are types of crashes that are more prominent due to varying traffic volumes and topography. As can be seen from Figure 5-11 intersection, rear end and opposing vehicles (turning) are the major crash types in the urban areas. Figure 5-12 demonstrates that head on, off road on curve and hit animal are the major crash types while Figure 5-13 shows that off road on straight, off road on curve and hit animal are the major crash types. Challenges exist along the entire corridor as traffic volumes increase and decrease and the topography of the land changes over the range and into the tablelands. These factors, as well as driver behaviour related to speeding, fatigue and drink driving present challenges to Roads and Maritime to ensure that crash rates are kept to a minimum. Addressing these challenges is discussed further in chapter 7.

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 5-6 shows the various contributing factors along the Oxley Highway including vehicle type involved, road surface condition, natural lighting, weather and behavioural factors.

Table 5-6 Contributing factors in crashes on Oxley Highway, 2009 to 2013

Crash factors	Number of crashes	Per cent of crashes
Vehicle type involved		
Heavy truck crashes (excluding crashes involving a small rigid vehicle)	43	6.3%
Heavy truck as key vehicle	43	6.3%
Motorcycle involvement	101	14.8
Road surface condition		
Wet	159	23.3%
Dry	523	76.6%
Natural lighting		
Dawn	11	1.6%
Daylight	490	71.7%
Dusk	22	3.2%
Darkness	160	23.4%
Weather		
Fine	513	75.1%
Rain	107	15.7%
Overcast	56	8.2%
Fog or mist	5	0.7%
Behavioural factors		
Speeding	203	29.7%
Fatigue	66	9.7%
Alcohol	26	3.8%

There were 101 motorcycle crashes on the Oxley Highway between 2009 and 2013 which accounted for 14.8 per cent of all crashes. For the same time period 62 per cent of all crashes on the section of the Oxley Highway over the Wauchope to Walcha range (section 6) involved motorcycles.

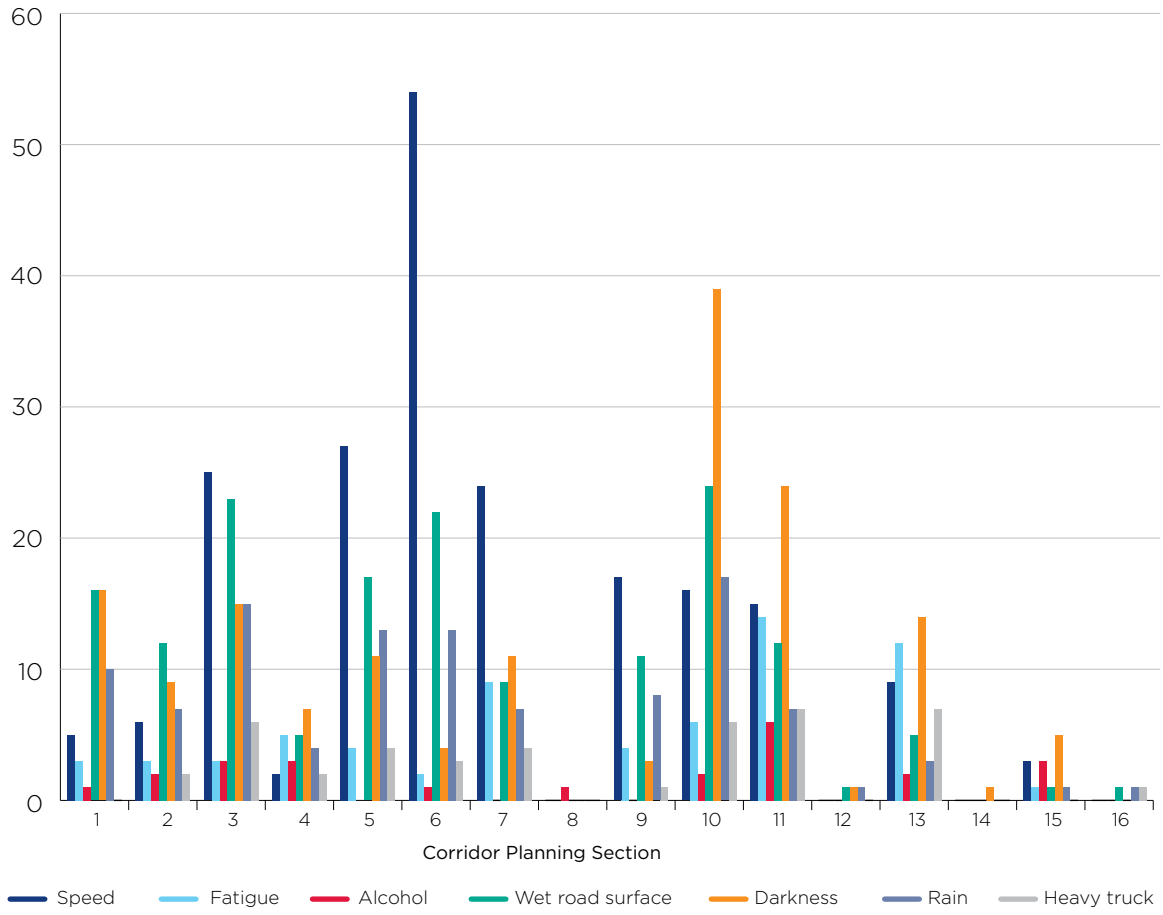
Time of day, road surface, environment conditions and driver behaviour are all key contributing factors to crashes along the Oxley Highway.

Of the 683 reported crashes on the Oxley Highway between 2009 and 2013, speed, fatigue or alcohol were contributing factors in 43.2 per cent of all crashes.

Of these three contributing factors associated with driver behaviour speed was identified as a contributing factor in 29.7 per cent of all the crashes along the Oxley Highway compared to the State figure of 16.8 per cent for the same time period. Speed was a contributing factor in 76 per cent of all crashes on the section of the Oxley Highway over the Wauchope to Walcha Range for this time period. The section of the Oxley Highway between Tamworth and Gunnedah also had a higher proportion (22.7 per cent) of speed related crashes than the State average. In considering these statistics, it is important to note that 'speeding' does not always indicate non-compliance with the posted speed limit, but simply that the speed of a vehicle was not appropriate for the condition of the road at the time, for example, during wet weather. In addition, due to the isolated location of many casualty crashes, it is difficult to identify the involvement of speed in all instances. In turn, the number of crashes identifying speed as a factor should be considered a minimum number.

Between 2009 and 2013 9.7 per cent of all crashes on the Oxley Highway involved fatigue compared to the State figure for the same time period of 8.1 per cent. Fatigue was a contributing factor in 21.2 per cent of all crashes on the section of the Oxley Highway between Tamworth and Gunnedah during this time period.

Figure 5-14 Contributing factors in crashes between 2009 to 2013



Road user behaviour

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

- Education campaigns for drivers, motorcyclists, cyclists and pedestrians.
- Increased police focus.
- Camera technology such as fixed, point to point or mobile speed cameras.

The high proportion of speed and motorcycle related crashes on the Wauchope to Walcha Range, speed related crashes between Tamworth and Gunnedah and fatigue related crashes between Tamworth and Gunnedah necessitates action to address these issues. In the short term, an enhanced police and mobile speed camera presence is warranted in these particular areas with operations targeting factors such as speeding and motorcycle and driver behaviour. Additional strategies such as public awareness programs to address these factors is also required.

Fixed speed cameras

Fixed speed cameras target a specific location where the number of injury crashes is of concern and/or travel speeds are excessive. There are no fixed speed cameras located along the Oxley Highway corridor.

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

Mobile speed cameras

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

Education campaigns

Education programs and additional focus from the NSW Police Service require 'third party' commitments but are matters worthy of further consideration.

Vulnerable road users

Vulnerable road users are those most at risk in the vicinity of traffic as they have greater likelihood and severity of injury if struck by an errant vehicle. This includes cyclists, pedestrians, horse riders and motorcyclists.

Cyclists

Between towns a sealed road shoulder provides a minimum standard facility for bicycle travel. Austroads (2010) recommends 2.0 to 3.0 metre shoulder width for bicycle travel on a two lane two-way rural road[16] which presents a challenge on many sections on this corridor in particular between Port Macquarie and Wauchope.

Pedestrians

In the last five years there have been 17 pedestrian crashes including two pedestrian fatalities on the Oxley Highway. Both of these fatalities occurred in the same crash at Sancrox. There is also a cluster of pedestrian related injury crashes in the vicinity of the pedestrian crossings in Wauchope. Transport for NSW, Roads and Maritime and Port Macquarie Hastings Council recently completed the Wauchope Main Street Plan. The Wauchope community assisted with identifying key areas for improving the Oxley Highway through Wauchope. The Wauchope Main Street Plan is an innovative document incorporating landscape design with traffic calming facilities to reduce speed, relocating and improving pedestrian facilities and improving linemarking and turning lanes aiding to reduce congestion.

There will continue to be a need to manage the speed of traffic through Wauchope recognising that there is a need for pedestrians and other vulnerable road users to cross the Oxley Highway. Port Macquarie Hastings Council, with the assistance of Roads and Maritime, has undertaken community consultation to identify appropriate

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

traffic management options for inclusion in an area-wide Traffic Management Strategy. The Strategy will provide a network approach to implementing traffic management solutions that will better accommodate the future needs of the Wauchope community.

Motorcyclists

In the five year period there were 101 crashes involving motorcycles of these 62 crashes occurred between Wauchope and Walcha. The Oxley Highway is a well renowned motorcycle route throughout Australia and is very highly used. Crashes can be attributed to inappropriate speed around the tight curves between Wauchope and Walcha and enforcement is difficult within this area due to lack of locations for the police to stop motorists. Progressive improvements over the last few years include the installation of rub rail on the safety barriers, resurfacing of high crash curves and installation of additional signage. Continued implementation of road safety delineation and consistent speed advisory initiatives is required, including investigation into potential safety campaigns targeting rider awareness.

Summary

- Of the 683 crashes reported between 2009 and 2013 along the Oxley Highway corridor, 359 were 'casualty crashes', which caused either an injury or fatality to one of more of the people involved. Of the 359 casualty crashes, 15 were fatal and 344 resulted in an injury
- The annual average casualty crash rate per kilometre per year for the Oxley Highway ranges from 0.00 to 1.770. As the Oxley Highways hierarchy varies the NSW-state wide average ranges from 0.074 to 1.631. In comparison the Oxley Highway does not perform better than the rural state wide average in six out of the 16 sections, it consistently does not perform between the Pacific Highway and Walcha. Tamworth also records a figure higher than the average due to a high number of intersection and rear end crashes.
- The corridor planning section 16 between Warren and the Nevertire has the highest severity index. The second highest section between Tamworth and Gunnedah had a total of seven fatality crashes within the five year period.
- Approximately 44% of all reported crashes on the Oxley Highway during this period involved vehicles running off the road on either a curve or straight section. More specifically, vehicles running off the road on a curve accounted for 27%. Further analysis indicates that in 18.6% of those crashes, the vehicle hit an object.
- Crash types vary between the differing sections along the corridor, the urban areas presented more rear end, opposing vehicles (turning) and intersection crashes. The rural mountainous areas demonstrates that head on, off road on curve and hit animal are the major crash types and the rural sections shows off road on straight, off road on curve and hit animal are the major crash types.
- Challenges exist along the entire corridor as traffic volumes increase and decrease and the topography of the land changes over the range and into the tablelands. These factors, as well as driver behaviour related to speeding, fatigue and drink driving present challenges to Roads and Maritime to ensure that crash rates are kept to a minimum.
- There were 101 motorcycle crashes on the Oxley Highway between 2009 and 2013 which accounted for 14.8 per cent of all crashes. For the same time period 62 per cent of all crashes on the section of the Oxley Highway over the Wauchope to Walcha range (section 6) involved motorcycles.
- Speed, fatigue or alcohol were contributing factors in 43.2 per cent of all crashes. Between 2009 and 2013 9.7 per cent of all crashes on the Oxley Highway involved fatigue compared to the State figure for the same time period of 8.1 per cent. Fatigue was a contributing factor in 21.2 per cent of all crashes on the section of the Oxley Highway between Tamworth and Gunnedah during this time period.

5.2 Traffic

This section outlines the traffic assessment undertaken for the Oxley Highway Corridor Strategy, and the overall traffic performance over the past several years. It outlines the current traffic volumes (light and heavy vehicles) and past traffic growth trends. Forecast performance for the highway is discussed in Chapter 6, which takes into account future changes along the corridor.

This section will discuss the following:

- Location of available traffic data counts and historical data sets.
- The current average level of service and the peak hour level of service.
- Current travel speeds.
- Overtaking opportunities.
- Intersection performance and results.
- Bus efficiency.
- Incident management.
- Regional centre and town bypasses.

Traffic volumes

For the purpose of the strategy automated tube counts were carried out at various locations on the highway between 17 April 2015 and 30 April 2015 to determine current traffic demands. Figure 5-15 and Table 5-7 shows the location of the conducted surveys.

Traffic volumes vary considerably along the route with around 500 vehicles per day at Yarrowitch to 30,200 vehicles per day in Port Macquarie (Figure 5-16 and Table 5-7). The common trend is that higher traffic volumes exist closer to the coast, with the exception of the large regional centre of Tamworth. Traffic volumes along the Oxley Highway corridor increase substantially within urban areas such as Port Macquarie, Wauchope, Tamworth and Gunnedah. The largest volumes are experienced in Port Macquarie and Tamworth where the Oxley Highway acts as a major collector road for local vehicle trips and in Tamworth which is also a thoroughfare for through vehicles. The relatively high volumes between Wauchope and Port Macquarie as compared to other sections along the corridor demonstrate the high interdependence between the two urban centres.

Heavy vehicle numbers across the route vary considerable with the average number of heavy vehicles between urban centres and towns being:

- Port Macquarie and Wauchope: 872 (652 rigid vehicles and 220 articulated vehicles)
- Wauchope to Walcha: 91 (64 rigid vehicles and 27 articulated vehicles)
- Walcha to Bendemeer: 112 (70 rigid vehicles and 42 articulated vehicles)
- Tamworth to the Newell Highway: 585 (325 rigid vehicles and 260 articulated vehicles)
- Gilgandra to Nevertire: 147 (87 rigid vehicles and 60 articulated vehicles)

Figure 5-15 Location of survey counts

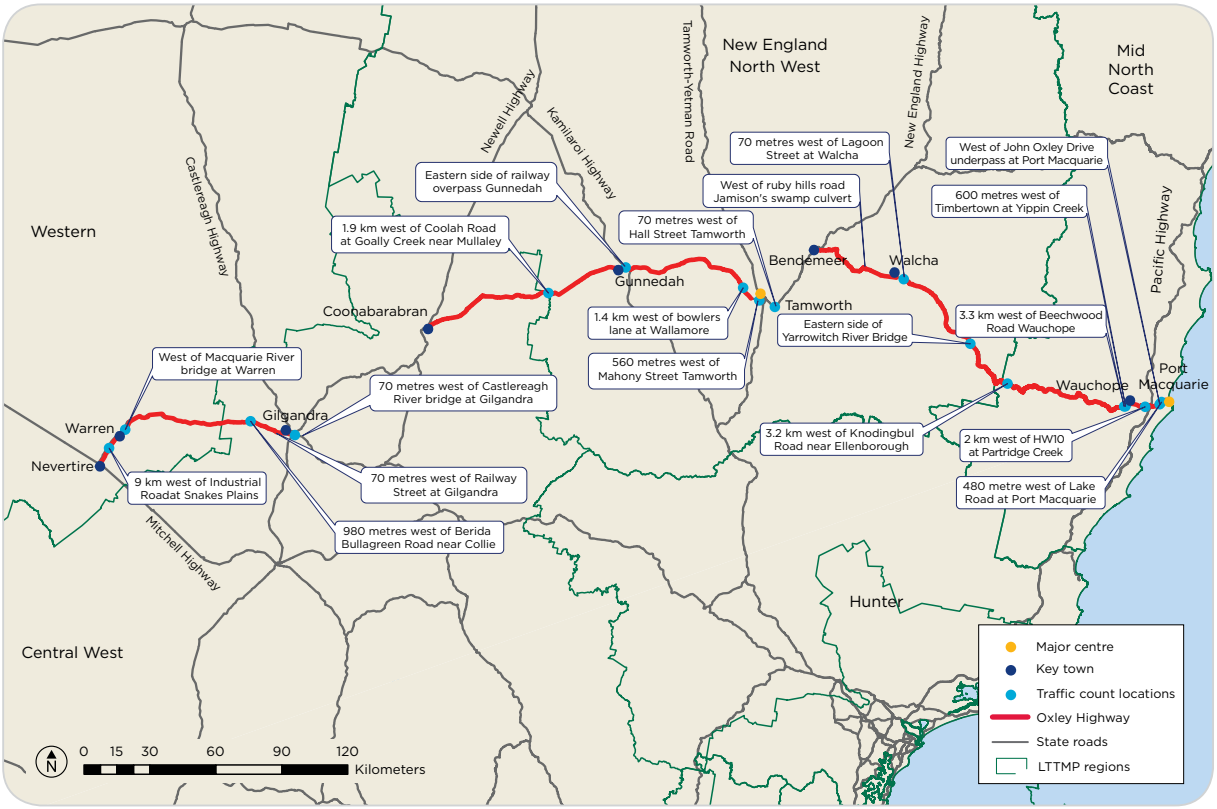


Figure 5-16 Oxley Highway – daily traffic volumes 2015

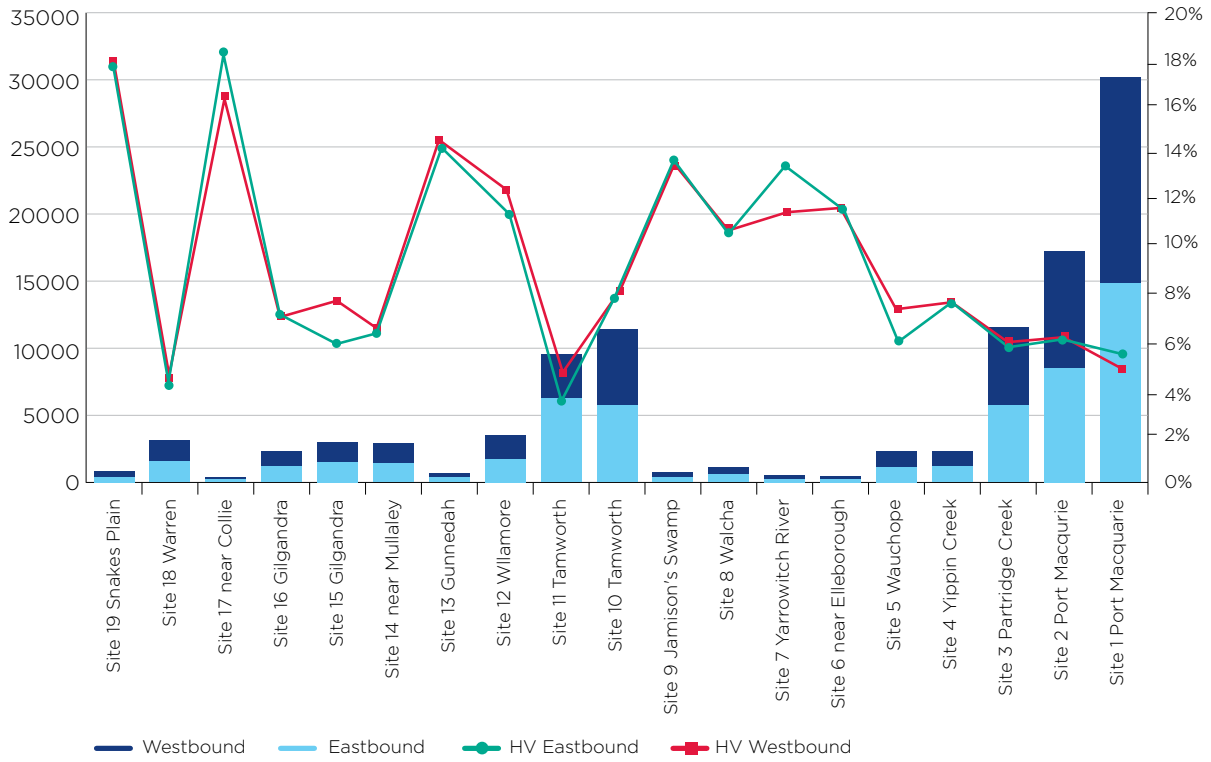


Table 5-7 Average Daily Traffic (ADT) volumes, Oxely Highway (Source: Traffic survey 17-30 April 2015)

ID	Description	E/B (vpd)	E/B HV%	W/B (vpd)	W/B HV%
Site 1	480 metre west of Lake Road at Port Macquarie	14793	815 (5.5%)	15407	738 (4.8%)
Site 2	West of John Oxley Drive underpass at Port Macquarie	8509	524 (6.2%)	8667	558 (6.4%)
Site 3	2 km west of HW10 at Partridge Creek	5718	329 (5.8%)	5815	351 (6%)
Site 4	600 metres west of Timbertown at Yippin Creek	1162	87 (7.5%)	1184	87 (7.3%)
Site 5	3.3 km west of Beechwood Road	1123	69 (6.1%)	1143	86 (7.5%)
Site 6	3.2 km west of Knodingbul Road near Ellenborough	229	27 (11.8%)	234	27 (11.5%)
Site 7	Eastern side of Yarrowitch River Bridge	248	29 (11.7%)	255	33 (12.9%)
Site 8	70 metres west of Lagoon Street at Walcha	572	63 (11.0%)	575	61 (10.6%)
Site 9	West of ruby hills road Jamison's swamp culvert	368	50 (13.6%)	375	49 (13.1%)
Site 10	70 metres west of Hall Street at Tamworth	5725	437 (7.6%)	5694	459 (8.1%)
Site 11	560 metres west of Mahony Street at Tamworth	6229	227 (3.6%)	3309	157 (4.7%)
Site 12	1.4 km west of bowlers lane at Wallamore	1729	200 (11.6%)	1734	222 (12.8%)
Site 13	Eastern side of railway overpass at Gunnedah	3740	156 (4.2%)	3622	176 (4.9%)
Site 14	1.9 km west of Coolah Road at Goally Creek near Mullaley	352	49 (13.9%)	332	48 (14.5%)
Site 15	70 metres west of Castlereagh River bridge at Gilgandra	1380	90 (6.5%)	1533	103 (6.7%)
Site 16	70 metres west of Railway Street at Gilgandra	1502	93 (6.2%)	1465	109 (7.4%)
Site 17	980 metres west of Berida Bullagreen Road near Collie	182	29 (15.9%)	186	34 (18.3%)
Site 18	West of Macquarie River bridge at Warren	1557	72 (4.6%)	1544	68 (4.4%)
Site 19	9 km west of Industrial Road at Snakes Plains	388	70 (18.0%)	387	69 (17.8%)

Number of lanes and level of service

The majority of higher order road classes have existing commitments for a progressive increase in a number of through lanes. The number of through lanes needed on the remaining lower class roads should be calculated using the Level of Service (LOS) rating method. Level of service is related to the number of lanes in each direction on a road and the number of overtaking lanes.

The Oxley Highway corridor has one lane in each direction for the entire length apart from the section between Port Macquarie and the Pacific Highway and within Tamworth which have two lanes in each direction. Roads and Maritime Services Network Performance Measures and Network Planning Target[17] state that the number of through lanes on 1-4R class road is two lanes generally, increased to four if required to provide Level of Service C. If the travel demand for any particular road is such that target Level of Service C is forecast to be reached within the planning horizon, an assessment should be made as to the viability of increasing the number of lanes available.

The LOS is a measure of how easily traffic flows on the road. It assesses the operating condition of a road based on various factors, including traffic volumes, proportion of heavy vehicles, terrain and frequency of intersections. Levels of service range from 'A' to 'F' with 'A' representing free-flowing traffic and 'F' representing severe congestion. On uninterrupted two-lane rural highways, the level of service is measured using per cent time spent following (Table 5-8).

Table 5-8 Level of service definitions

Level of service (LoS)	Description[18]
A	Motorists experience high operating speeds on Class I highways and little difficulty in passing. Platoons of three or more vehicles are rare.
B	Passing demand and passing capacity are balanced. On both Class I and Class II highways, the degree of bunching becomes noticeable. Some speed reductions are present on Class I highways.
C	Most vehicles are travelling in platoons. Speeds are noticeably curtailed on all three classes of highway.
D	Bunching increases significantly. Passing demand is high on both Class I and II facilities, but passing capacity approaches zero. A high percentage of vehicles are now travelling in platoons, and PTSF is quite noticeable.
E	Demand is approaching capacity. Passing on Class I and II highways is virtually impossible, and PTSF is more than 80%. Speeds are seriously curtailed.
F	Exists whenever arrival flow in one or both directions exceeds the capacity of the segment. Operating conditions are unstable, and heavy congestion exists on all classes of two-lane highway.

17 Roads and Maritime Services 2010, Network Performance Measures and Network Planning Targets, Sydney, p. 41

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

The *Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* outlines the process to calculate the level of service of a two-lane two-way road. The process is based on the *Highway Capacity Manual 2010*[19]. The HCM 2010 distinguishes between three categories of two-lane highways as follows:[20]

- Class I two-lane highways are generally major intercity routes, primary arterials, daily commuter routes or primary links in state or national highway networks. There is an expectation from motorists to travel at relatively high speeds. These facilities often serve long-distance trips or provide connecting links between facilities that serve long-distance trips.
- Class II two lane highways are generally those that function as access routes to Class I facilities, serve as scenic or recreational routes (except primary arterials), or pass through rugged terrain. Motorists do not necessarily expect to travel at high speeds. These facilities often serve relatively short trips, the beginning and ending of longer trips, or trips for which sightseeing plays a significant role.
- Class III two lane highways are generally those that serve moderately developed areas. They can be sections of Class I and Class II highways that pass through developed areas, where there is a mix between local and through traffic and the density of roadside access points is noticeably higher. These segments are often accompanied by reduced speed limits that reflect the higher activity level.

Oxley Highway is a Class I road between Port Macquarie and Wauchope, between Tamworth and Coonabarabran and between Gilgandra and Nevertire. These three sections are daily commuter routes or have primary links in state or national highway networks. Per cent time following and average travel speeds are the criteria used to determine the level of service on Class I highways.

Oxley Highway is a Class II road between Wauchope and Bendemeer. This section serves as a scenic or recreational route and passes through rugged terrain. Per cent time following is the criteria used to determine the level of service on Class II highways.

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

The Oxley Highway level of service was assessed based on the per cent time following another vehicle along the stretch of the Oxley Highway with the performance criteria outlined in Table 5-9 .

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

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

Table 5-9 Level of service performance criteria[21]

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

Level of service	Class II Highway
	Per cent time-spent-following (PTSF) (%)
A	≤40
B	>40 – 55
C	>55 – 70
D	>70 – 85
E	>85

Level of service along the Oxley Highway varies between A and D throughout the day depending on the number of vehicles using the route.

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

Level of service as modelled is as expected worst during the peak periods in the peak directions. Overnight usually sees free flowing conditions with level of service A or B at all locations. The level of service varies along the length of the highway and is presented in Table 5-10 and Table 5-11. Level of service for future predicted traffic volumes is presented in Chapter 6.2.

The one hour AM and PM peak period for each section were:

- Pacific Highway to Wauchope
  8-9am and 3-4pm
- Wauchope to Ralfes Creek Mt Seaview
  8-9am and 4-5pm
- Ralfes Creek Mt Seaview to Seaview Road Mt Seaview
  10-11am and 3-4pm
- Seaview Road Mt Seaview to Walcha
  10-11am and 3-4pm
- Walcha to Bendemeer
  9-10am and 3-4pm
- Tamworth to Gunnedah
  8-9am and 3-4pm

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

Table 5-10 Oxley Highway corridor performance – Eastbound (Based on 2015 Traffic counts)

Corridor section	Road Class	% time spent following			% Following Level of Service			Average Speed (km/h)			Speed Level of Service		
		AM peak hour	PM peak hour	Day time	AM peak hour	PM peak hour	Day time	AM peak hour	PM peak hour	Day time	AM peak hour	PM peak hour	Day time
Pacific Highway to Wauchope	1	72.2	74.9	71.0	D	D	D	68.9	68.1	69.2	D	D	D
Wauchope to Ralfes Creek Mt Seaview	2	65.2	65.7	63.7	C	C	C						
Ralfes Creek Mt Seaview to Seaview Road Mt Seaview	2	59.1	59.9	58.4	C	C	C						
Seaview Road Mt Seaview to Walcha	2	33.3	35.1	35.1	A	A	A						
Walcha to Bendemeer	2	37.5	38.1	38.3	A	A	A						
Tamworth to Gunnedah	1	48.4	52.9	45.8	B	C	B	86.3	84.8	87.0	B	B	B

Table 5-11 Oxley Highway corridor performance – Westbound

Corridor section	Road Class	% time spent following			% Following Level of Service			Average Speed (km/h)			Speed Level of Service		
		AM peak hour	PM peak hour	Day time	AM peak hour	PM peak hour	Day time	AM peak hour	PM peak hour	Day time	AM peak hour	PM peak hour	Day time
Pacific Highway to Wauchope	1	65.0	67.6	63.6	C	D	C	72.0	71.0	72.4	C	C	C
Wauchope to Ralfes Creek Mt Seaview	2	67.6	68.1	66.4	C	C	C						
Ralfes Creek Mt Seaview to Seaview Road Mt Seaview	2	58.5	59.5	57.4	C	C	C						
Seaview Road Mt Seaview to Walcha	2	46.4	47.6	47.6	B	B	B						
Walcha to Bendemeer	2	37.3	37.0	37.0	A	A	A						
Tamworth to Gunnedah	1	46.0	48.1	41.8	B	B	B	86.9	86.5	88.3	B	B	B

The worst performing section is between the Pacific Highway and Wauchope. The sections show the high interdependence between Wauchope and Port Macquarie for employment and education. There is a high proportion of planned growth within this area, which will increase the pressure for this section of the corridor. In the short term an eastbound overtaking lane and road realignments will show improvements to the AM peak and in the long term there will be a need to investigation into duplication between the Pacific Highway and Wauchope.

Between Wauchope and Seaview Road Mt Seaview the analysis shows a level of service C. This is a long section of tight curves, steep grades and limited overtaking opportunities. The tight curves and steep grades over the range limit the speed of larger service vehicles and cars with caravans can reach, resulting in platooning of vehicles. In the short term investigation into options such as 'Pull Over Bays' at appropriate locations could help to reduce driver frustration and improve journey times.

Between Tamworth the Gunnedah the road is generally a level of service B. This section will have impact of future traffic increases with the growth of the industrial area at Tamworth and the mining industry at Gunnedah. There will be an increase in the number and types of heavy vehicles using this section of the corridor. Additional overtaking lanes within this section will support the future traffic and heavy vehicle growth allowing smaller vehicles to safely overtake the longer heavy vehicles accessing Tamworth and Gunnedah particularly in areas with limited cross centreline overtaking or high traffic volumes providing less gaps.

Travel speeds

Roads and Maritime collects travel speed information from the automated tube counts. Automated tube counts were carried out at various locations on the highway between 17 April 2015 and 30 April 2015 to determine current traffic demands. Table 5-12 shows the posted speeds at the location of each site, the calculated average speed and the 85th percentile speed. The 85th percentile speeds is the speed at or below 85 per cent of all vehicles are observed to travel under free flowing conditions.

Two out of the 19 sites below show 85th percentile speed significantly below the posted speed limit. This is representativity of the tight curves and surrounding road environment around these two sites.

Table 5-12 Oxley Highway corridor travel speeds

ID	Description	Speeds (km/h)		
		Posted	Mean	85th*
Site 1	480 metre west of Lake Road at Port Macquarie	70	55	63
Site 2	West of John Oxley Drive underpass at Port Macquarie	90	83	90
Site 3	2 km west of HW10 at Partridge Creek	90	82	89
Site 4	600 metres west of Timbertown at Yippin Creek	80	75	83
Site 5	3.3 km west of Beechwood Road, Yippin Creek West	80	74	82
Site 6	3.2 km west of Knodingbul Road near Ellenborough	100	60	69
Site 7	Eastern side of Yarrowitch River Bridge	110	103	114
Site 8	70 metres west of Lagoon Street at Walcha	50	55	63
Site 9	West of Ruby Hills Road Jamison's swamp culvert	100	65	81
Site 10	70 metres west of Hall Street at Tamworth	60	43	49
Site 11	560 metres west of Mahony Street at Tamworth	60	55	60
Site 12	1.4 km west of Bowlers Lane at Wallamore	100	65	81
Site 13	Eastern side of railway overpass at Gunnedah	50	43	49
Site 14	1.9 km west of Coolah Road at Goally Creek near Mullaley	100	95	102
Site 15	70 metres west of Castlereagh River bridge at Gilgandra	50	35	41
Site 16	70 metres west of Railway Street at Gilgandra	60	46	54
Site 17	980 metres west of Berida Bullagreen Road near Collie	110	97	108
Site 18	West of Macquarie River bridge at Warren	50	42	48
Site 19	9 km west of Industrial Road at Snakes Plains	110	94	105

*The speed at or below 85 per cent of all vehicles are observed to travel under free flowing conditions.

Overtaking opportunities

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. 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.

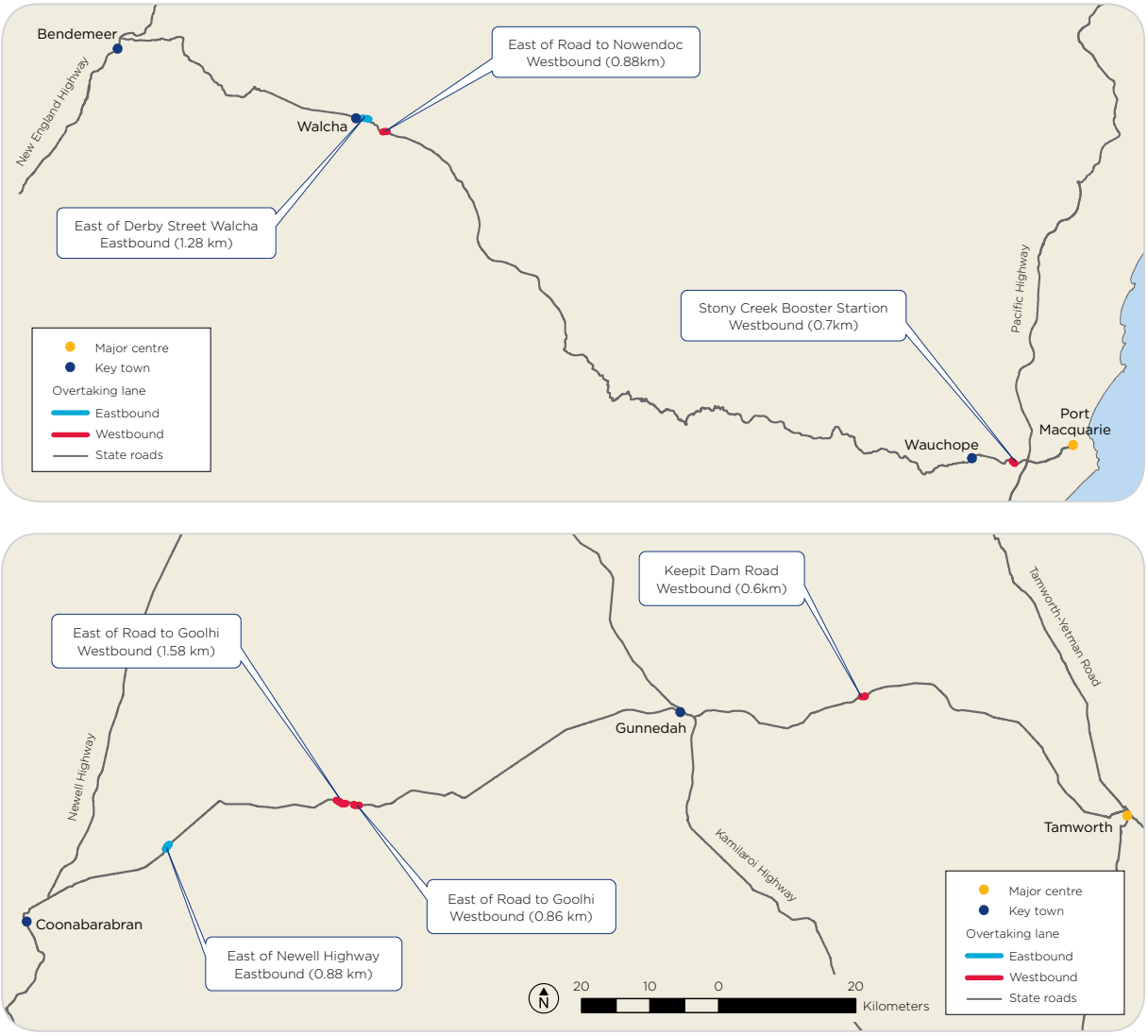
Overtaking opportunities (formal and informal) are available for 67 per cent of the corridor although this varies greatly along the corridor. For example, between Port Macquarie and the Pacific Highway there is dual carriageway for the entire section.

There is approximately 19.5 kilometres of informal overtaking opportunities which fall below minimum length of 300 metres, in these instances the informal overtaking opportunity should be assessed and removed if warranted.

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.

A linemarking review was completed and the deficiencies assessed. Where required the linemarking has been corrected.

Figure 5-17 Existing overtaking lanes



There are seven formal overtaking lanes on the Oxley Highway. (Figure 5-17)

The five westbound overtaking lanes are at:

- Entry to Stony Creek Booster Station (0.7km)
- 1.73 kilometres east of Road to Nowendoc (0.88km)
- Keepit Dam Road (0.6km)
- 5.26 kilometres east of Road to Goolhi (2nd Occurrence) (0.86km)
- 3.19 kilometres east of Road to Goolhi (2nd Occurrence) (1.58km)

The two eastbound overtaking lanes are at:

- Newell Highway (0.88km)
- 2.54 kilometres east of Fitzroy Street/Derby St Walcha (1.28km)

In the absence of overtaking lanes over the Wauchope to Walcha mountain range, in order to reduce driver frustration and improve journey times, there is also a need to investigate the potential for 'Pull Over Bays' in both directions to allow slower vehicles to safely allow following vehicles to pass. This should also be supplemented with appropriate signposting.

The overtaking lane at Keepit Dam Road has a length of 400 metres without tapers and is below the minimum standard length for a 100km/h zone of 550 metres without tapers. Investigation into extending this overtaking to meet standards will be a priority in the short term.

Intersection performance

The operational performance of key intersections along the Oxley Highway, using traffic volumes obtained by survey counts in 2015, was modelled using the SIDRA software package. SIDRA is an analytical traffic modelling software for intersections and small road networks. The key intersections assessed are listed below:

- Oxley Highway/ Fernhill Road, Port Macquarie
- Oxley Highway/ Hastings River Drive, Port Macquarie
- Oxley Highway/ John Oxley Drive, Thrumster
- Oxley Highway/Lake Road/Sherwood Road, Port Macquarie
- Oxley Highway/Pacific Highway (Interchange), Sancrox
- Oxley Highway/Widderson Street, Port Macquarie
- Oxley Highway/New England Highway, Tamworth
- Oxley Highway/ Mairus Street, Tamworth
- Oxley Highway/Peel Street, Tamworth
- Oxley Highway/Kable Avenue, Tamworth
- Oxley Highway/Ebsworth Street, Tamworth
- Oxley Highway/Denne Street, Tamworth
- Oxley Highway/ Dampier Street, Taminda
- Oxley Highway/Abbott Street, Gunnedah

The location of the intersections assessed is illustrated in Figure 5-18 and 5-19.

Operational Performance Criteria

Three operational criteria have been adopted for benchmarking existing intersection performance, being:

- Level of service.
- Average vehicle delay.
- Degree of saturation.

The Roads and Maritime's *Guide to Traffic Generating Developments* (Version 2.2, 2002)[22] provides a guide in assessing level of service for various intersections.

The average vehicle delay provides a measure of the operational performance of an intersection as indicated in Table 5-14 below which relates average vehicle delay to level of service. The average vehicle delay should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route).

Another form of operational measurement is to assess the degree of saturation of individual intersections. It is preferred to operate with a degree of saturation of less than 0.9, with a degree of saturation of up to 0.8 considered satisfactory. Intersections are deemed close to capacity as the degree of saturation approaches 0.9, with queue lengths increasing.

Table 5-13 Intersection performance criteria – level of service

Level of service	Type of intersection	
	Give way / stop sign / T junction	Traffic signal / roundabout
A	Good operation	Good operation
B	Acceptable delays and spare capacity	Good with acceptable delays and spare capacity
C	Satisfactory but accident study required	Satisfactory
D	Near capacity and accident study required	Operating near capacity
E	At capacity, requires other control mode	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode
F	Unsatisfactory and requires additional capacity	Unsatisfactory and requires additional capacity

Table 5-14 Intersection performance criteria – average vehicle delay

Level of service	Average Delay per Vehicle (seconds / vehicle)
A	<14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

47 RTA (2002), Guide to Traffic Generating Developments, Version 2.2, accessed 5 March 2015 at: www.rms.nsw.gov.au/documents/projects/guide-to-generating-traffic-developments.pdf

The results of the SIDRA analysis for each intersection reported in terms of the above performance criteria are presented in Table 5-15. The 95th percentile queue is the maximum queue length that is only exceeded 5 per cent of the time. The results show that two intersections operate unsatisfactory in the AM peak, all of the intersections generally operate to a satisfactory level in the PM peak. The intersection of Oxley Highway and Lake Road in Port Macquarie operates at a level of service D in the AM peak with a delay of 54 seconds. The intersection of Oxley Highway and Pacific Highway (interchange) in Sancrox operates at a level of service F in the AM peak with a delay of 168 seconds. Both of these intersections should be investigated for upgrades in the future to improve the level of service and reduce the delay.

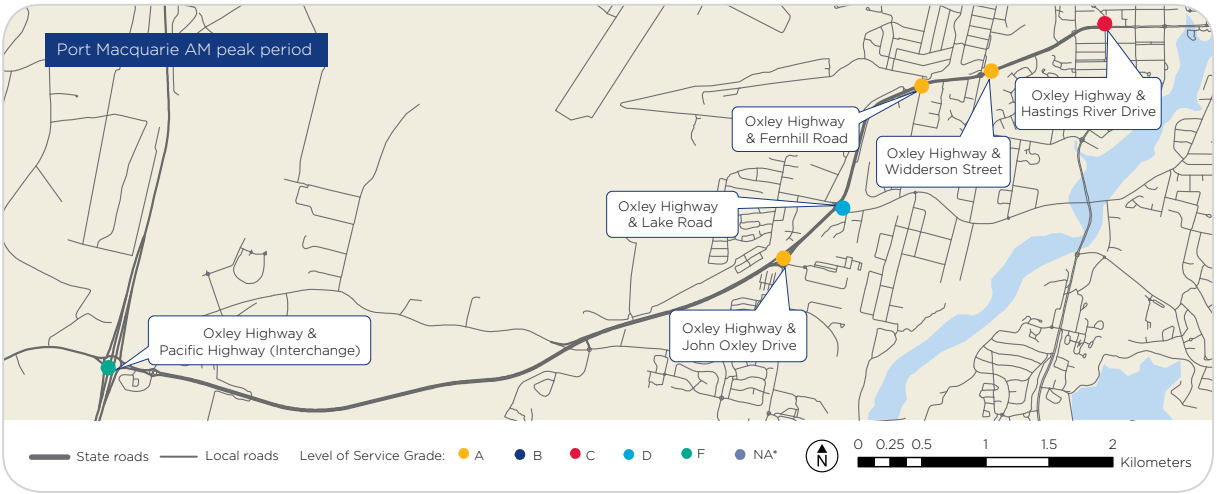
Table 5-15 Intersection performance results – Summary

Scenario	AM Peak				PM Peak			
	DOS	Delay (s)	Level of service	95th percentile queue (m)	DOS	Delay (s)	Level of service	95th percentile queue (m)
Oxley Highway/ Hastings River Drive, Port Macquarie	0.463	41.8	C	18.2	0.454	37.4	C	17.5
Oxley Highway/ Widderson Street, Port Macquarie	0.847	10.8	A	7.1	0.529	8.7	A	3.4
Oxley Highway/ Fernhill Road, Port Macquarie	0.869	9.6	A	9.8	0.955	17.3	B	15.4
Oxley Highway/Lake Road/Sherwood Road, Port Macquarie	1.058	54.0	D	69.1	1.056	24.7	B	39.6
Oxley Highway/ John Oxley Drive, Thrumster	0.490	5.3	A	3.3	0.370	4.9	A	2.2
Oxley Highway/Pacific Highway (Interchange), Sancrox	1.497	168.0	F	200.9	0.409	5.9	A	3.2
Oxley Highway/New England Highway, Tamworth	0.812	10.0	A	7.6	0.640	9.7	A	4.4
Oxley Highway/ Brisbane Street, Tamworth	0.880	32.7	C	16.3	0.549	27.7	B	18.0
Oxley Highway/Peel Street, Tamworth	0.250	19.6	B	5.1	0.894	23.7	B	11.0
Oxley Highway/Kable Avenue, Tamworth	0.879	24.8	B	10.6	0.883	34.2	C	15.6
Oxley Highway/Ebsworth Street, Tamworth	0.636	33.0	C	15.9	0.849	24.4	B	12.5
Oxley Highway/Denne Street, Tamworth	0.276	10.7	A	4.6	0.272	12.1	A	4.5
Oxley Highway/ Dampier Street, Taminda	0.372	6.8	A	3.0	0.415	6.4	A	3.6
Oxley Highway/Abbott Street, Gunnedah	0.729	12.3	NA*	6.5	0.513	7.0	NA	2.7

*NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Figure 5-18 and Figure 5-19 illustrate the level of service of the 14 key intersections modelled along the highway in the AM and PM peaks.

Figure 5-18 Level of service at key intersections on the Oxley Highway in Port Macquarie during peak periods



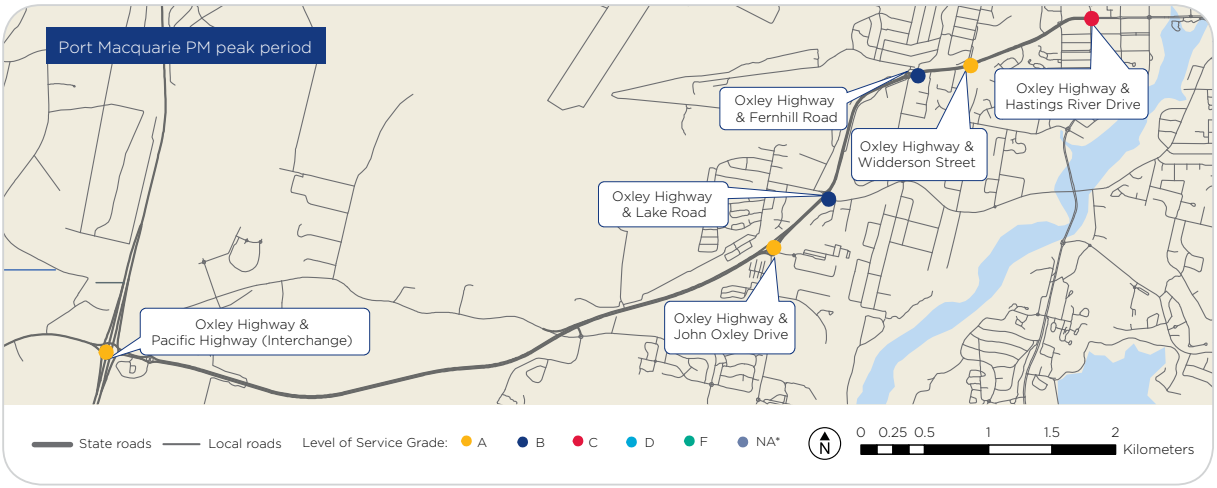
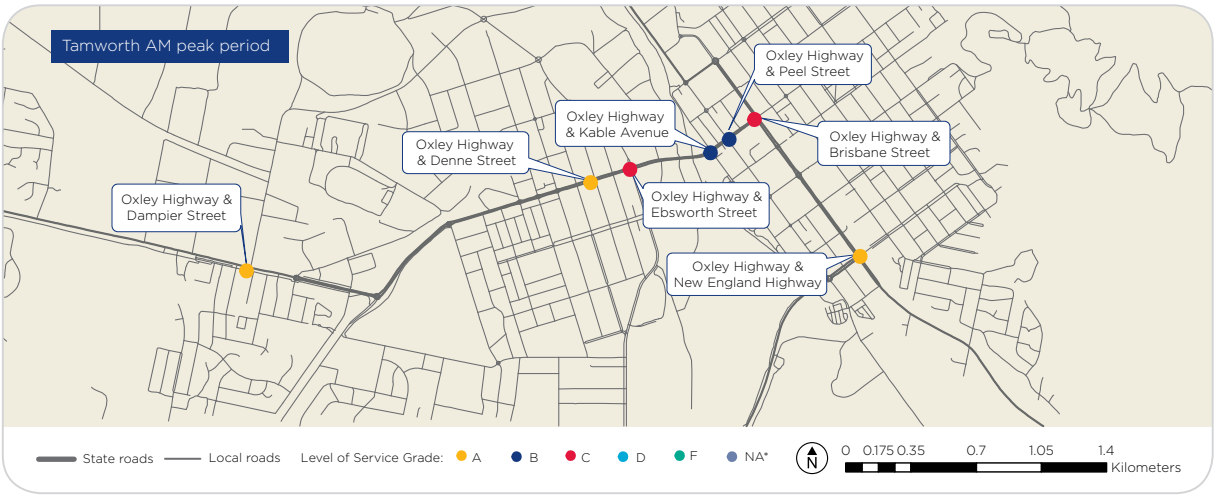
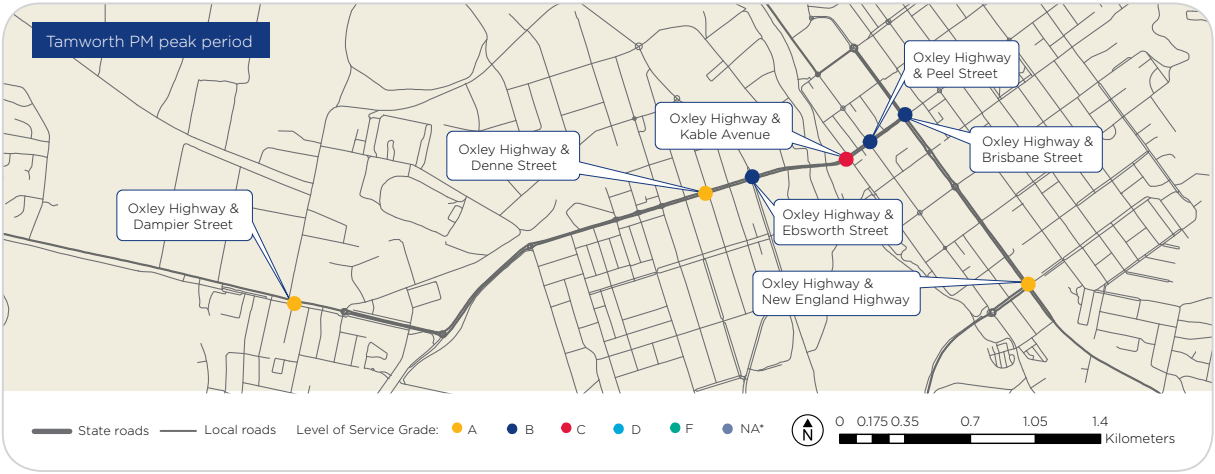


Figure 5-19 Level of service at key intersections on the Oxley Highway in Tamworth and Gunnedah during peak periods





Bus Efficiency

Bus movements on the Oxley Highway are generally catered for school children around the urban and rural areas of Port Macquarie, Wauchope, Tamworth, Gunnedah, Coonabarabran, Gilgandra and Warren.

The Dampier to Bass Street project was completed in early 2015 in Tamworth. The existing bus interchange in front of the Peel High School was extended to make a safer and more efficient bus stop. A new entry access point to Peel High School was constructed to reduce car/bus conflict and improve student safety.

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 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 accident, bushfire or flooding.

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

Developed in consultation with Councils, NSW Police and Roads and Maritime, a number of IRPs have been drafted for the Oxley Highway. These draft Oxley Highway IRPs are awaiting approval and are expected to be released for use in the near future.

To ensure motorists are well informed of incidents that may affect their journeys, the Transport Management Centre uses a range of channels to communicate with it's customers, including radio announcements and interviews, advertising, social media, mobile apps, Variable Message Signs, the 24 hour 132 701 Traffic Information Line, and the Live Traffic and Transport Info websites.

Regional centres and town bypasses

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

The road hierarchy divides the State Road Network into six classes of urban roads and six classes of rural roads. This classification system serves as the basis for assessing relative performance across the network, and enables a better understanding of relative functional roles and importance of all the State routes from a whole-of-network perspective.

The approach in the NSW Long Term Transport Master Plan is aimed to consider a bypass on higher order roads adjacent to significant commercial activity (shops and businesses). The Roads and Maritime Network Planning Targets[23] call for bypasses investigation of **Urban Commercial** (Class 6R, 5R and 4R) and **Urban** (Class 6R).

The *NSW Long Term Transport Master Plan* discusses bypasses in the context of separating through traffic and local traffic and to remove conflicts between heavy vehicles and pedestrians – for example bypassing the main urban commercial street of a town.

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.

The *NSW Long Term Transport Master Plan* 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:[24]

- **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.
- **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.

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

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

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

- **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 run 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.
- **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.
- **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.

Alternative route through Wauchope

The community of Wauchope has indicated a desire to minimise the impact of heavy vehicles travelling through the town centre. Port Macquarie Hastings Council has investigated an 'alternate route' aimed at encouraging heavy vehicles to travel through the southern area of Wauchope. This investigation included consideration for a link road connecting to the Oxley Highway adjacent to the rail level crossing.

Wauchope is a destination for people, goods and services within the Port Macquarie area. Recent data indicates that Wauchope is not subject to high volumes of inter-regional traffic and that through movements of heavy vehicles have been declining. The tight road alignment, steep grades, narrow pavements and bridges between Wauchope and the Walcha range make the route unsuitable for 26 metre B-double vehicles and result in a low volume of through freight movements.

Recent strategic planning for urban growth in the Wauchope area has identified residential land releases to the north and west of the town and a desire to expand the existing commercial precinct northwards towards the Hastings River. Investigations have highlighted potential future traffic concerns that will require a network approach to accommodate planned urban growth.

There will continue to be a need to manage the speed of traffic through Wauchope recognising that there is a need for pedestrians and other vulnerable road users to cross the Oxley Highway. Port Macquarie Hastings Council, with the assistance of Roads and Maritime, has undertaken community consultation to identify appropriate traffic management options for inclusion in an area-wide Traffic Management Strategy. The Strategy will provide a network approach to implementing traffic management solutions that will better accommodate the future needs of the Wauchope community.

Summary of traffic issues

- Traffic volumes vary considerably along the route with around 500 vehicles per day at Yarrowitch to 30,200 vehicles per day in Port Macquarie. The largest volumes are experienced in Port Macquarie and Tamworth where the Oxley Highway acts as a major collector road for local vehicle trips and in Tamworth which is also a thoroughfare for through vehicles. The relatively high volumes between Wauchope and Port Macquarie demonstrate the high interdependence between the two urban centres.
- Heavy vehicle numbers across the route vary considerable from 91 (Wauchope to Walcha) to 872 (Port Macquarie to Wauchope):
- Level of service along the Oxley Highway varies between A and D throughout the day depending on the number of vehicles using the route.

- The worst performing section is between the Pacific Highway and Wauchope. The sections show the high interdependence between Wauchope and Port Macquarie for employment and education. There is a high proportion of planned growth within this area, which will increase the pressure for this section of the corridor.
- Between Wauchope and Mt Seaview the analysis shows a level of service between B and C. This is a long section of tight curves, steep grades and limited overtaking opportunities. The tight curves and steep grades over the range limit the speed larger service vehicles and cars with caravans can reach, resulting in platooning of vehicles.
- Between Tamworth the Gunnedah the road is generally a level of service B. This section will have impact if future traffic increases with the growth of the industrial area at Tamworth and the mining industry at Gunnedah. There will be an increase in the number and types of heavy vehicles using this section of the corridor.
- Overtaking opportunities (formal and informal) are available for 67 per cent of the corridor although this varies greatly along the corridor. For example, between Port Macquarie and the Pacific Highway there is dual carriageway for the entire section. A linemarking review was completed and the deficiencies assessed. Where required the linemarking has been corrected.
- There are seven formal overtaking lanes on the Oxley Highway including five westbound overtaking lanes and two eastbound overtaking lanes.
- The results of the SIDRA analysis show that two intersections (Oxley Highway/Lake Road and Oxley Highway/Pacific Highway interchange) operate unsatisfactory in the AM peak, all of the intersections generally operate to a satisfactory level in the PM peak.

5.3 Heavy vehicles

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

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

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

Freight task is expected to nearly double over the next 20 years[25]. The challenges for the next 20 years associated with this growth are discussed in more detail in Chapter 7.

The Oxley Highway corridor is an important link between other major freight routes such as the New England Highway and the Newell Highway. There are sections of the Oxley Highway where productivity is becoming an increasingly important consideration in the planning of the road network. The section between Tamworth and Gunnedah is considered to be most impacted by freight vehicle productivity, due to the expanding mining industry in the Gunnedah basin.

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.

24 Hyder Consulting for Transport for NSW 2011, *NSW Freight Supply Chain Study* – Hyder, Sydney.

Heavy vehicle categories

In NSW, heavy vehicles are categorised as 'general access' and 'restricted access' dependant on the mass, dimensions and configuration.

General access vehicles, which can travel on all roads in the NSW network, are vehicles up to and including the allowable mass for a conventional 19 metre semi-trailer – this includes 19 metre long B-doubles not greater than 4.3 metres high (including its load) and carrying less than 50 tonnes.

Vehicles larger than those currently permitted to operate on any particular road are known as High Productivity Vehicles (HPV). HPVs include:

- Restricted Access Vehicles (RAV), which is a general term for all vehicles whose length, width, height or mass is greater than that of a standard 19 metre semi-trailer.
- Higher Mass Limit (HML) vehicles, which are a subset of RAVs that meet a number of requirements, such as road friendly suspension and enrolment in the Intelligent Access Program and can carry more than the general access limit.
- Oversize and/or overmass (OSOM) vehicles, which are a subset of RAVs that 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.

A more productive movement of freight can be achieved, with fewer vehicle movements, through the use of vehicles carrying greater loads. HPVs are vehicles bigger than B-double (e.g. B-triple, A-double or B-doubles carrying HML. These vehicles have restricted access to the network and can operate under the Performance Based Standards (PBS) system or the Restricted Access Vehicle (RAV) system.

The Performance-Based Standards (PBS) Scheme offers the heavy vehicle industry the potential to achieve higher productivity and safety through innovative and optimised vehicle design to handle the future freight task. PBS vehicles are designed to perform their tasks as productively, safely and as sustainably as possible, and to operate on networks that are appropriate for their level of performance. The PBS road network has been classified into four levels:

- Level 1: Similar to General access
- Level 2: Similar to B-double routes
- Level 3: Similar to Double (Type I) road train routes
- Level 4: Similar to Triple (Type II) road train routes

Table 5-16 shows the recommended maximum overall lengths for each level are described below.

Figure 5-20 Approved Routes for 19m, 23, 25 and 26m B Doubles and Road Trains

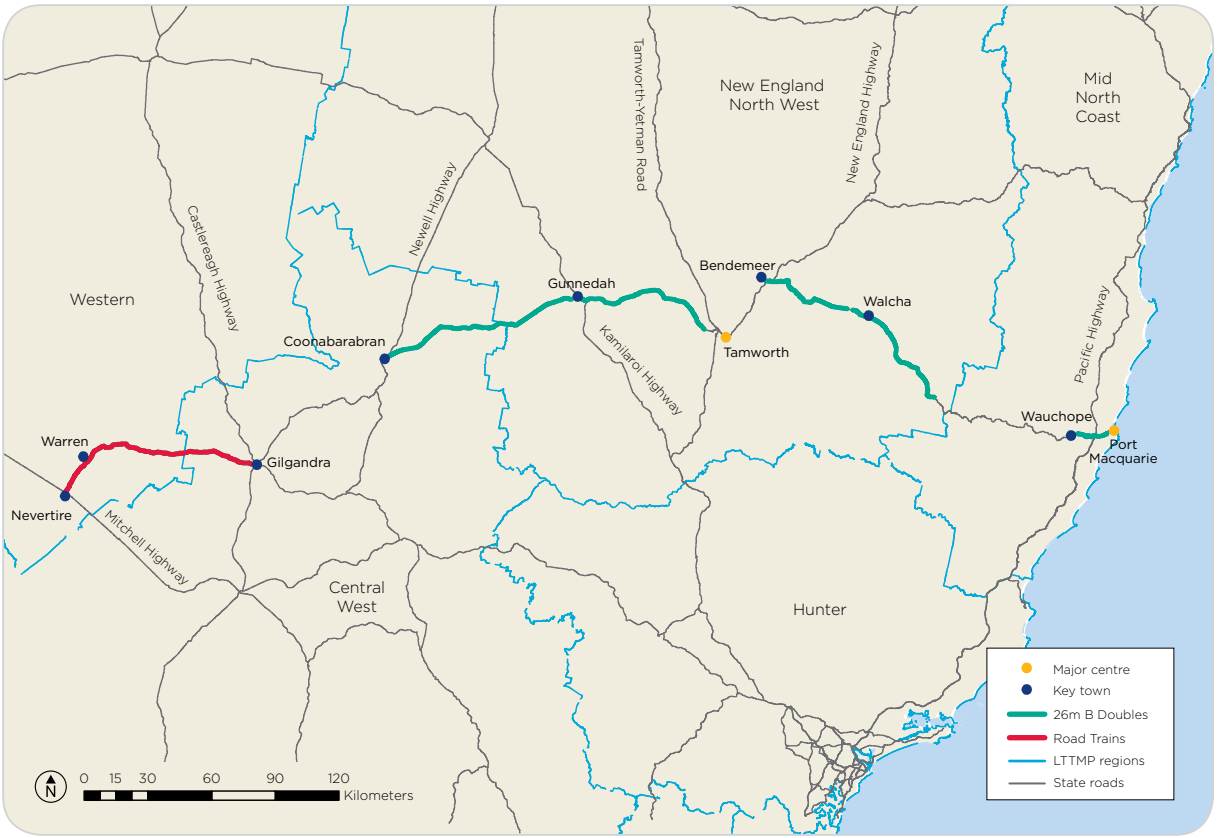


Table 5-16 Performance Based Standards vehicle lengths

Vehicle Performance Level	Network access by vehicle length (m)	
	Class A	Class B
Level 1	L≤20 (General access)	
Level 2	L≤26	L≤30
Level 3	L≤36.5	L≤42
Level 4	L≤53.5	L≤60

Heavy vehicle access and productivity

Of the five major NSW east-west routes north of Sydney (the Golden Highway, the Oxley Highway, the Waterfall Way, the Gwydir Highway and the Bruxner Highway), only the Gwydir Highway accepts 26 metre B-Doubles on its full length. 26 metre B-doubles are permitted on all sections of the Oxley Highway between Port Macquarie and Nevertire with the exception of the 100 kilometre mountainous section of Oxley Highway between Wauchope and Yarrowitch (50km west of Mt Seaview) because of the steep grades and tight curves.

Figure 5-20 shows the approved routes for RAV access up to 26m B-double and Road Trains along the Oxley Highway corridor.

PBS combinations are the next generation vehicles that are the focus on the Oxley Highway in order to improve freight productivity. Increasing use of PBS vehicles can be expected to lead to significant productivity and efficiency gains for industry through better access and mass limits afforded to these vehicles. The shift to the use of PBS vehicles should also benefit road managers and the community through enhanced safety associated with these modern vehicles and fewer truck movements on the road network for a given freight task.

Current access is approved for PBS 2A vehicles west of Coonabarabran and PBS 3A vehicles are approved between Gilgandra and Nevertire. The vision for the Oxley Highway corridor is a more productive route for freight that provides access for HML through Gunnedah, and modern higher productivity vehicles including PBS 2B between Tamworth and the Newell Highway junction near Coonabarabran and PBS 3A between Gilgrandra and Nevertire.

Through analysis, the corridor strategy defines road deficiencies along the corridor that need to be addressed in order to achieve a more productive freight movements along the Oxley Highway.

The focus of this corridor strategy is on the section between Tamworth and Coonabarabran, where the current access is PBS 2A, and the vision is to provide access for PBS 2B vehicles. Road infrastructure deficiencies will be investigated in the short term to improve HPV access between Tamworth, Coonabarabran, and Nevertire including through Gunnedah.

NSW Livestock Loading Scheme

The NSW Livestock Loading Scheme (NSWLLS) has introduced measures to minimize road pavement wear, protect vulnerable bridges and reduce the incidence of livestock vehicle roll-overs. Under the scheme, livestock carriers fitted with certified road friendly suspension may operate at increased mass limits, comparable to those in other states. The scheme also includes a driver training program to address an industry concern that rollover crashes are over-represented in livestock transport compared to other road freight.

At present the Oxley Highway is an approved route for the NSWLLS for Short Articulated Combination vehicles and also for the following:

- 19m B doubles – except for the section from Wauchope to the Walcha LGA boundary and some of the urban area of Walcha
- 23m B doubles – except for the section from Wauchope to the Walcha LGA boundary and some of the urban area of Walcha. Restrictions at the bridges at Gunnedah Rail Bridge
- 25m B doubles – except for the section from Wauchope to the Walcha LGA boundary and some of the urban area of Walcha. Road Train / B triples / AB-triples – an approved route west of Gilgandra to Nevertire

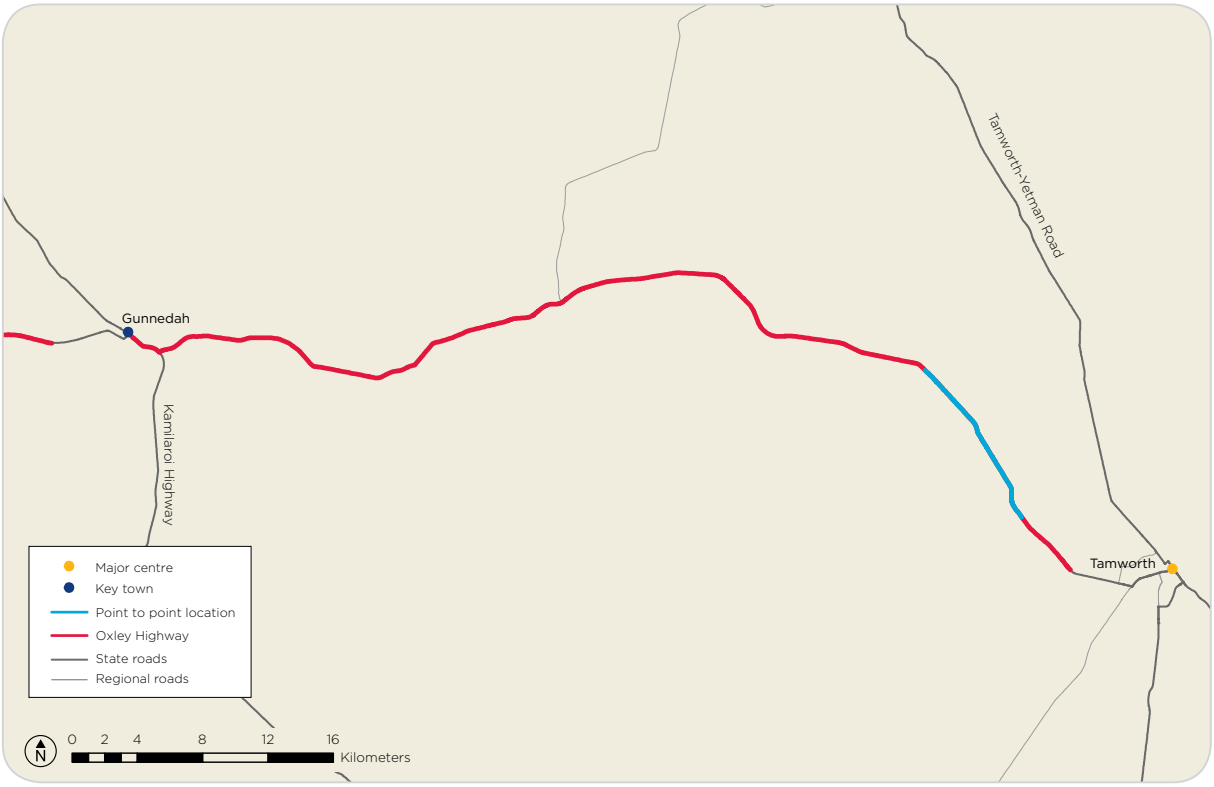
Figure 5-21 Oxley Highway/Newell Highway Intersection

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.

There is one point-to-point enforcement area on the Oxley Highway between Tamworth and Gunnedah which is approximately 60km long.

Figure 5-22 Oxley Highway Point-to-Point speed enforcement area



Heavy vehicle enforcement sites

Heavy vehicle fixed on-road enforcement 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 NSW. 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 two heavy vehicle fixed on road enforcement sites along the Oxley Highway.

- Gunnedah – 2km west of Gunnedah (westbound)
- Lincoln Grove – 10km west of Tamworth adjacent to the airport (eastbound)

Investigation into additional heavy vehicle fixed on road enforcement sites is warranted along the Oxley Highway corridor. A site for westbound traffic on the eastern side of the Lincoln Grove site in the 60km/h zone would be beneficial so enforcement could also include vehicles travelling to major industrial sites in the area.

A site for eastbound traffic close to the intersection of the Oxley Highway and the Pacific Highway may also be warranted in the future. Currently the majority of heavy vehicles travelling westbound on the Oxley Highway would pass existing sites on the Pacific Highway (at Kundabung for southbound vehicles and Jones Island for northbound vehicles). However heavy vehicles travelling eastbound between Walcha and the Pacific Highway would not pass a heavy vehicle fixed on road enforcement site.

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".[26]

Better trip planning can help avoid driver fatigue. Rest areas and stopping bays need to be strategically located and signposted.

The rest areas along the Oxley Highway are split into three categories, with each offering different levels of facilities and functions (Table 5-17).

Table 5-17 Rest areas along the corridor

Types 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	Yes
Informal truck parking bays or Green reflector sites	30 km	Further investigation is required

Major rest areas

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".[27]

There are ten heavy vehicle rest areas along the Oxley Highway. Seven of these are between Port Macquarie and Yarrowitch (100km west of Wauchope). There are two heavy vehicles rest areas between Tamworth and Gunnedah. There are no heavy vehicles rest areas between Gunnedah and Coonabaraban and only one between Gilganrda and Nevertire. The Newell Highway links the Oxley Highway between Coonabarabran and Gilgrandra and there are ten heavy vehicle rest areas.

There is a need to provide a consistent number of rest areas that can accommodate vehicles longer than 26m B-doubles particularly west of Tamworth.

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

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

Table 5-18 Major rest areas along the Oxley Highway corridor

Name and Location	Accessible from	Facilities	Maintained by
Port Macquarie Service Centre 10.1km West of Port Macquarie	Westbound direction	Toilets, Shelter, Litter bins, service station, food, wheelchair accessible	Other
Oxley Highway, Wauchope 13km West of Port Macquarie (Heavy and Light Vehicle rest area)	Eastbound	No facilities available	Roads and Maritime Services
Dewers 56km West of Wauchope (Heavy and Light Vehicle rest area)	Eastbound	Shelter Picnic tables	Roads and Maritime Services
68km West of Wauchope (Heavy and Light Vehicle rest area)	Westbound	Litter Bins	Roads and Maritime Services
75km West of Wauchope (Heavy and Light Vehicle rest area)	Eastbound	Litter bins	Roads and Maritime Services
Gingers Creek 82km West of Wauchope (Heavy and Light Vehicle rest area)	Both directions	Toilets, Shelter Litter bins Picnic tables, Wheelchair accessible	Roads and Maritime Services
Yarrowitch 101km West of Wauchope (Heavy and Light Vehicle rest area)	Both directions	Litter bins	Council
Rotary Airport Rest Area 2km West of Tamworth (Heavy and Light Vehicles)	Westbound direction	Toilets Picnic Tables Litter Bins Shelter Playground Equipment	Other
Somerton 10km West of Somerton (Heavy and Light Vehicles)	Both directions	Toilets Litter bins	Roads and Maritime Services
Berida Rest Area 19.6km West of Gilgrandra	Both directions	Toilets, shelter, picnic tables, wheelchair accessible, litter bins	Roads and Maritime Services

Minor rest areas

"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."[28]

Currently the corridor provides sufficient rest areas to meet the target, however there is also an opportunity to remove rest areas which are located at less than 50 kilometre spacings. In addition, as the road is lightly trafficked these rest areas should be made accessible from both directions. Picnic and shade structures (if there is insufficient natural shade) should be provided in all minor rest areas and toilets are recommended in rest areas at a maximum of 100 kilometre spacings. The frequency and adequacy of minor rest areas will continue to be monitored and improved where necessary.

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

Table 5-19 Minor rest areas along the Oxley Highway corridor

Name and Location	Accessible from	Facilities	Maintained by
Mount Seaview 58km West of Wauchope (Light Vehicles)	Eastbound	Shelter Picnic Tables Wheelchair Accessible Litter Bins	Roads and Maritime Services
Stockyard Creek 80km West of Wauchope (Light Vehicles)	Both Directions	Toilets Shelter Picnic Tables Wheelchair accessible Litter Bins	Roads and Maritime Services
Tia River Rest Area 127km West of Wauchope (Light Vehicles)	Westbound	Shelter Litter Bins Picnic Tables	Council
Stoney Creek Rest Area 141km West of Wauchope (Light Vehicles)	Both directions	Shelter Litter Bins Picnic Tables	Roads and Maritime Services
Aspley Falls 145km West of Wauchope (Light Vehicles)	Both directions	Toilets Picnic Tables Shelter Accessible	Other
Nowendoc Rd Turn off Rest Area 159km West of Wauchope (Light Vehicles)	Both directions	Shelter Litter Bins Picnic Tables	Roads and Maritime Services
Captain Cook Park Rest Area 163km West of Wauchope (Light Vehicles)	Westbound	Litter Bins	Council
McHatten Park 0.2km West of Walcha (Light Vehicles)	Both directions	Shelter Litter Bins Picnic Tables	Council
Lions Park1.1km West of Walcha (Light Vehicles)	Both directions	Toilets Picnic Tables Playground Equipment Shelter BBQ facilities Litter Bins	Council
Redbank 26km West of Somerton (Light Vehicles)	Both directions	Toilets Picnic Tables Shelter	Roads and Maritime Services
150 Deg Meridian Mullaley 25.3km from Gunnedah (Light Vehicles)	Eastbound direction	Shelter Litter Bins Picnic Tables	Roads and Maritime Services
Oxleys Crossing Rest Area Rocky Glen 75km West of Gunnedah (Light Vehicles)	Both directions	Shelter Litter Bins Picnic Tables	Other
Ewenma Waste Disposal Depot Warren 79km from Gilgandra (Light Vehicles)	Both directions	Shelter Litter Bins Picnic Tables	Roads and Maritime Services
Warren 7.47km South of Warren (Light Vehicles)	Both directions	Shelter Litter Bins Picnic Tables	Roads and Maritime Services

Load Checking Areas

Load Checking Areas or Truck Parking Bays are sites suitable for short stops by heavy vehicle operators.

"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."[29]

The frequency of and informal parking areas will be further investigated to meet the above targets.

There are several Load Checking Areas along the Oxley Highway corridor.

Table 5-20 Load checking areas along the Oxley Highway

Name and Location	Accessible From	Facilities	Maintained by
Hunts Road 1.9km West of Gunnedah	Both directions	Litter Bins	Roads and Maritime Services
Collie 19.6km from Gilgandra	Both directions	Shelter Litter Bins Picnic Tables	Roads and Maritime Services
Quambone turn off, Warren 78.4km from Gilgandra	Both directions	Litter Bins	Roads and Maritime Services
Warren 1.5km from Warren	Both directions	Litter Bins	Roads and Maritime Services

Summary of heavy vehicle issues

- The Oxley Highway corridor is an important link between other major freight routes such as the New England Highway and the Newell Highway. There are sections of the Oxley Highway where productivity is becoming an increasingly important consideration in the planning of the road network. The section between Tamworth and Gunnedah is considered to be most impacted by freight vehicle productivity, due to the expanding mining industry in the Gunnedah basin.
- The long term vision for the Oxley Highway is to provide access for HML and modern HPVs including PBS 2B between Tamworth and Coonabarabran and PBS 3A between Coonabarabran and Nevertire.
- At present the Oxley Highway is an approved route for the NSWLLS for Short Articulated Combination vehicles and also for the following:
  - 19m B doubles – except for the section from Wauchope to the Walcha LGA boundary and some of the urban area of Walcha
  - 23m B doubles – except for the section from Wauchope to the Walcha LGA boundary and some of the urban area of Walcha. Restrictions at the bridges at Thone River, Ellenborough, Ralfes Creek, Stony Creek and Gunnedah Rail Bridge
  - 25m B doubles – except for the section from Wauchope to the Walcha LGA boundary and some of the urban area of Walcha. Restrictions at the bridge at Ralfes Creek
- Current access is approved for PBS 2A vehicles west of Coonabarabran and Road Train/B triples/AB-triples are approved between Gilgandra and Nevertire.
- The prioritisation of the Oxley highway over the Newell Highway at this intersection should be considered and the intersection improved.
- Investigation into additional heavy vehicle fixed on road enforcement sites is warranted along the Oxley Highway corridor. A site for westbound traffic on the eastern side of the Lincoln Grove site in the 60km/h zone would be beneficial so enforcement could also include vehicles travelling to major industrial sites in the area.

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

5.4 Road design and geometry

Horizontal curves

Properly designed curves allow a motorist to negotiate changes in the horizontal alignment of the road at a consistent rate. The design radius of the curve is dependent on the design speed (sight distance also being an important consideration), superelevation and friction of the road. 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.

The *Austroads Guide to Road Design* and Roads and Maritime design supplements are used to determine the minimum horizontal curve radius for the Oxley Highway as shown in Table 5-21.

Table 5-21 Calculated minimum horizontal radii

Operating Speed	Maximum Superele-vation	Maximum Side Friction	Minimum Horizontal Radii
60	6%	0.24	95
80	6%	0.16	230
100	6%	0.12	438
110	6%	0.12	530

The use of minimum horizontal radii in rural areas can result in poor alignment and associated road safety issues, curve radii between 200 and 460 metres are considered to present the most risk to motorists due to the perception of safety while those with a curve radius of less than 200 metres often necessitates the vehicle operator to slow to an adequate speed.

Table 5-22 Corridor planning sections by curve radii

Corridor planning sections		Description	Curve radii (metres)					
			<90	90-240	240-460	460-600	>600	Straight
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	1.6%	5.2%	19.9%	2.6%	0.0%	70.6%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	0.0%	9.0%	0.0%	0.0%	9.9%	81.1%
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	2.2%	7.0%	10.8%	4.6%	11.4%	63.9%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	0.0%	27.1%	10.3%	8.9%	3.8%	49.9%
5	Wauchope to Walcha	Eest of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	1.8%	8.7%	16.0%	8.1%	17.0%	48.3%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	20.8%	29.8%	14.1%	1.0%	2.5%	31.8%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	0.0%	2.6%	4.6%	0.6%	9.3%	82.8%

Corridor planning sections		Description	Curve radii (metres)					
			<90	90-240	240-460	460-600	>600	Straight
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	0.0%	5.4%	17.9%	2.5%	5.0%	69.2%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	0.7%	4.5%	4.2%	4.2%	3.4%	83.0%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	0.0%	0.2%	1.0%	0.9%	10.5%	87.3%
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	1.0%	1.9%	6.1%	0.0%	8.2%	82.8%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	0.0%	0.3%	2.6%	1.9%	3.7%	91.6%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	1.8%	0.0%	0.0%	0.0%	15.5%	82.7%
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	0.0%	0.0%	0.0%	0.0%	16.7%	83.3%
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	0.2%	1.5%	1.4%	3.2%	10.0%	83.8%
TOTAL (by length)			**2.1%**	**5.0%**	**6.3%**	**2.0%**	**9.2%**	**75.4%**

Table 5-22 shows that 15.4 per cent of curves on the Oxley Highway have curve radii below 600m and approximately 10 per cent of curve radii are between 240 and 600 metres. The rural sections between the Pacific Highway and the New England Highway show the highest proportion of tight curve radii.

The eastern escarpment of the Wauchope to Walcha range has some of the tightest curves with 20.8 per cent of curve radii below 90m and 65.7 per cent of curve radii below 600m. The sections from Wauchope to the base of the eastern escarpment, Walcha to the New England Highway and the Pacific Highway to Wauchope have 34.6, 25.8 and 24.6 per cent of curve radii below 600m (respectively).

While these sections are below the NSW average based on full section lengths, the concentration of the curves combined with surrounding road conditions and environment result in a series of curves in these areas which present a high risk to motorists.

Due to the terrain and formations of the corridor particularly over the Wauchope to Walcha range this can result in poor road geometry, reduced travel speeds, increased travel times and road safety risks. Due to these physical constraints it makes it difficult to complete major improvements on these sections of the Oxley Highway corridor.

Three of the highest risk areas include:

1. The curves to the west of Rawdon Island Road between the Pacific Highway and Wauchope. Although a recent asphalt overlay for shape correction and increased skid resistance has been completed as well as new linemarking and new signposting for increased delineation at the intersection, in the future, there may be a need for works in this area including a realignment of the curves immediately to the west of Rawdon Island Road to improve the geometry of the existing tight radius curves.
2. The curves to the west of Rosewood Road, approximately 5.5km west of Wauchope. There are several tight radius curves in this section that require treatment to improve the geometry.
3. Surveyors Creek near Bendemeer. A series of curves to the east Surveyors Creek with a high casualty crash rate that needs to be investigated to provide a safer, consistent road environment.

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 'platoons' 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 Services' Network Performance Measures and Planning Targets recommended maximum grades are shown in Table 5-23.[30] Six per cent of the corridor is below the recommended target.

Table 5-23 Target Maximum Grade

Hierarchy Class	Flat (plains)	Rolling (slopes)	Steep (tableland or coastal range)	Very Steep (pass, escarpment or ravine)
4R	6%	6%	6%	6%
3R	6%	6%	10%	10%
2R	6%	6%	10%	10%

The lengths of the road on the Oxley Highway that do exceed these nominated grades are generally less than 100 metres long and are only of minor concern.

Overall, grade is not a significant issue along the entire length of the Oxley Highway.

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

Table 5-24 Vertical grades

Corridor planning sections		Description	≤ 6% grade	≥ 6% grade
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	97.4%	2.6%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	100.0%	-
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	94.4%	5.6%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	97.3%	2.7%
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	92.0%	8.0%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	87.9%	12.1%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	90.7%	9.3%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	96.2%	3.8%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	85.7%	14.2%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	99.1%	0.9%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	100.0%	-
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	98.3%	1.7%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	95.8%	4.2%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	100.0%	-
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	100.0%	-
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	100.0%	-
TOTAL (by length)			**94.7%**	**5.3%**

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.

Table 5-25 summarises the proportions of each section of the Oxley Highway corridor which have vertical grades of more than 6 per cent on differing curve radii.

Most of the highway's excessive vertical grades occur where horizontal curves are in excess of 600 metres. There are, however, rural sections with steep grades on tighter curves, in particular:

- Pacific Highway to Wauchope
- Wauchope to Walcha
- Walcha to the New England Highway

Table 5-25 Proportion of corridor planning sections with vertical grades exceeding 6% (by curve radii)

Corridor Planning Sections		Description	Curve radii (metres)					
			<90	90-240	240-460	460-600	>600	Straight
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	-	-	-	-	-	2.6%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	-	-	-	-	-	-
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	-	1.7%	2.9%	-	-	1.1%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	-	-	1.6%	-	-	1.1%
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	0.4%	2.4%	1.6%	0.5%	0.6%	2.5%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	2.9%	4.1%	1.9%	-	0.1%	3.1%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	-	0.1%	0.2%	-	1.4%	7.6%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	-	-	-	-	-	3.8%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	-	2.0%	5.1%	0.4%	0.4%	6.4%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	-	-	-	-	-	0.9%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	-	-	-	-	-	-

Corridor Planning Sections		Description	Curve radii (metres)					
			<90	90-240	240-460	460-600	>600	Straight
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	-	-	1.2%	-	-	0.5%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	-	-	0.0%	0.5%	0.0%	3.7%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	-	-	-	-	-	-
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	-	-	-	-	-	-
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	-	-	-	-	-	-
TOTAL (by length)			**0.3%**	**0.8%**	**0.9%**	**0.2%**	**0.3%**	**2.8%**

Roads and Maritime will continue to monitor these sections and carry out incremental improvements where possible. The NSW Long Term Transport Master Plan indicates a short term priority to complete upgrades to sections of the Oxley Highway between Port Macquarie and Wauchope.[31]

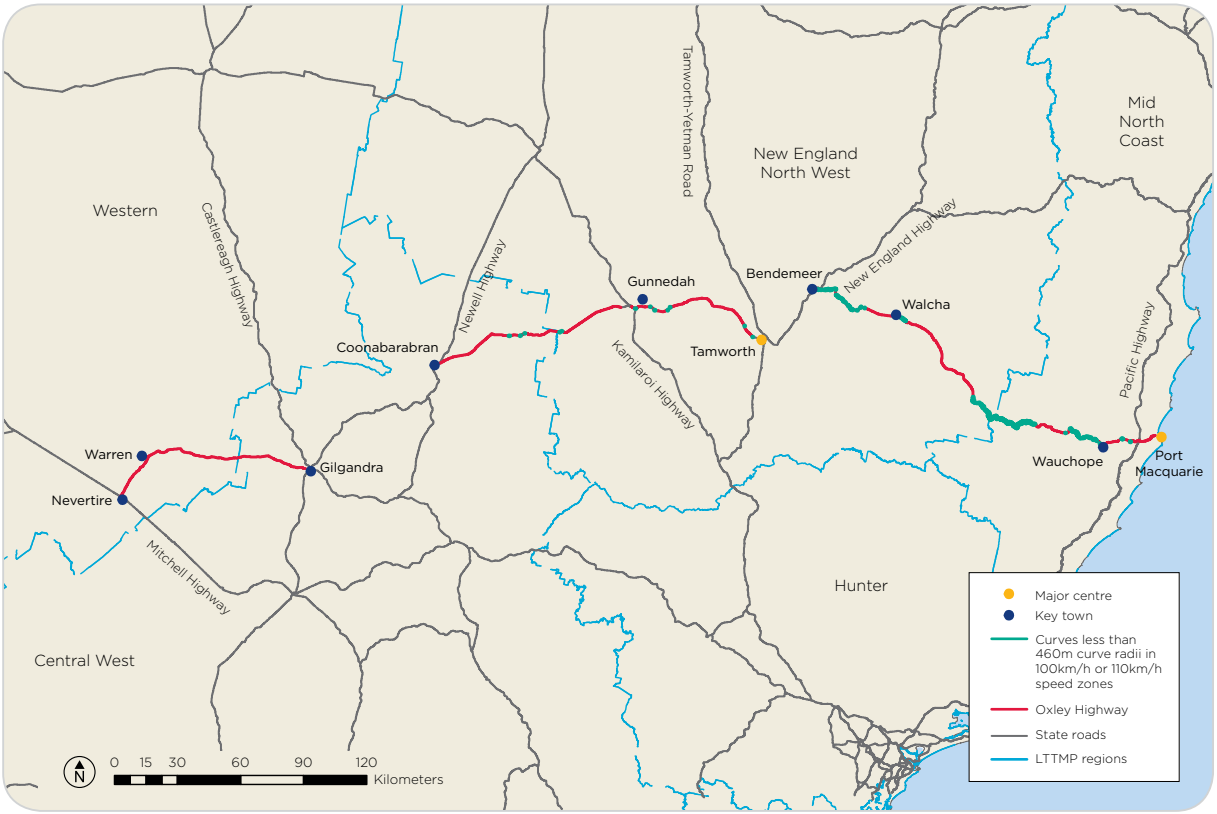
30 Transport for NSW 2012, *NSW Long Term Transport Master Plan*, TfNSW, Sydney, p.253

Speed on curves

Run off road on curve crashes are over represented in NSW crash statistics on the rural network. A road with a 100 km/h design speed and superelevation of 6 per cent should have a minimum horizontal curve radius of 438 metres[32].

For ease of analysis Figure 5-23 shows the curves on the Oxley Highway with curve radii less than 460 metres that are within a 100 km/h or 110 km/h speed zone. This is about 10 per cent or about 53 kilometres of the total length of the Oxley Highway.

Figure 5-23 Locations where curve radii are less than 460 metres within 100 km/h or 110 km/h speed zone



The sections of the Oxley Highway on the Wauchope to Walcha range have tight alignment and a high number of run off road crashes. The speed zone in this area is 100 km/h but reduced travel speeds are experienced due to the poor alignment and tight curves. Table 5-12 Oxley Highway travel speeds in section 5.2 indicates the 85th percentile speed in this section is 69km/h.

31 Austroads Guide to Road Design

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 Services' Network Performance Measures and Planning Targets guideline recommended minimum lane widths for all rural class roads are shown in Table 5-26.[33]

Table 5-26 Network Planning Targets

Hierarchy Class	Sections	Target Lane Width (m)
6R	All	3.50
5R	All	3.50
4R	All	3.50
3R	AADT >1000 or >=PBS3A area	3.50
	AADT < 1000	3.25
2R	AADT >1000 or >=PBS3A area	3.50
	AADT 500 – 1000	3.25
	AADT < 500	3.00
1R	AADT >1000 or >=PBS3A area	3.50
	AADT 500 – 1000	3.25
	AADT < 500	3.00

A review of lane widths for the Oxley Highway is shown in Table 5-27. For non-urban sections of the Oxley Highway it indicates that 80 per cent of the corridor does not meet the required standards. The following sections show lane widths below targets for more than 90 per cent of the section.

- Pacific Highway to Wauchope (approximately 9km)
- Wauchope to Seaview Road (approximately 95km)
- Walcha to the New England Highway (approximately 46km)
- Tamworth to Gunnedah (64km)
- Gunnedah to the Newell Highway (92km)

While 80 per cent of the rural section of the Oxley Highway does not meet the performance targets, particular attention should be focused on road sections which have lane widths significantly below the performance targets – that is, less than or equal to 3.00 metres. Approximately 8 per cent of the rural sections along the Oxley Highway have lane widths less than or equal to 3.00 metres. The most significantly affected section occurs between Wauchope and Seaview Road where approximately 24km out of the 96km has lane widths less than or equal to 3.00 metres.

There are shorter sections of the highway with lane widths less than 3.00 metres in particular between Gilgandra and Collie. 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.

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

Due to the terrain and formations of the corridor particularly over the Wauchope to Walcha range this can result in poor road geometry, reduced travel speeds, increased travel times and road safety risks. Due to these physical constraints it makes it difficult to complete major improvements on these sections of the Oxley Highway corridor.

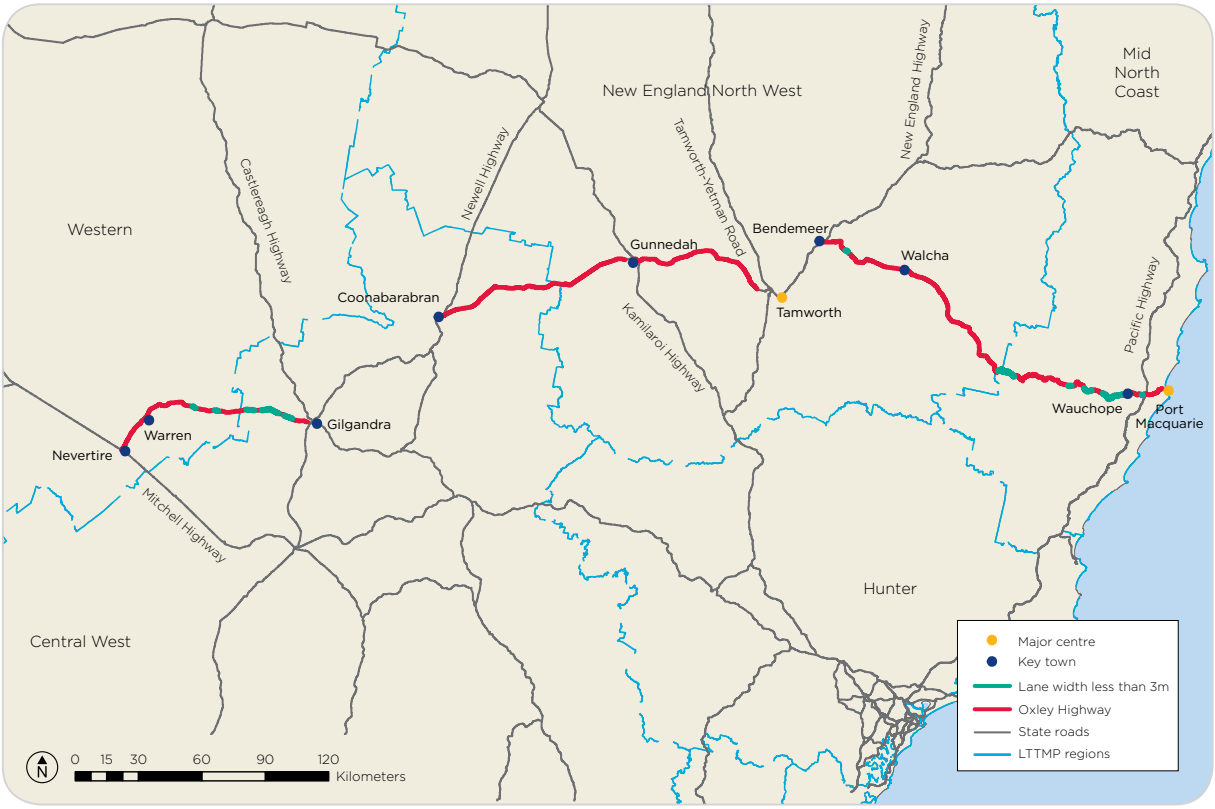
The locations where the lane width is significantly below 3.00m are detailed in Figure 5-24. These areas should be addressed and pavements widened so that they meet minimum network targets.

Table 5-27 Lane widths

Corridor planning sections		Description	Performance target	<3.0m	3.0m – <3.25m	3.25 – <3.5m	Target Width ≥3.5m
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	3.50	0.0%	0.0%	89.5%	10.5%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	3.50	0.0%	0.0%	0.0%	100.0%
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	3.50	10.1%	22.2%	67.7%	0.0%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	3.50	7.7%	80.9%	0.0%	11.5%
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	3.50	27.2%	69.1%	3.7%	0.0%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	3.25	43.5%	54.5%	2.0%	0.0%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	3.00	0.0%	26.5%	69.3%	4.2%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	3.50	0.0%	0.0%	0.0%	100.0%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	3.50	2.1%	16.9%	76.8%	4.1%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	3.50	10.6%	12.9%	55.7%	20.8%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	3.50	0.0%	33.3%	63.0%	3.7%

Corridor planning sections		Description	Performance target	<3.0m	3.0m – <3.25m	3.25 – <3.5m	Target Width ≥3.5m
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	3.50	0.0%	0.0%	0.0%	100.0%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	3.50	0.0%	1.0%	93.0%	6.0%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	3.25	0.0%	0.0%	25.7%	74.3%
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	3.25	0.0%	78.2%	17.6%	4.2%
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	3.25	0.0%	30.5%	57.4%	12.1%
TOTAL (by length)				**7.1%**	**34.9%**	**49.7%**	**8.3%**

Figure 5-24 Locations where lane widths are less than 3.00 metres



Bridge widths are also a significant factor, because they are generally the narrowest point along any route. The *Performance Based Standards Scheme Network Guidelines*[34] recommend a minimum width of 8.4 metres for bridges when the AADT is greater than 500 vehicles. Along the Oxley Highway there are 16 bridges, nine culverts and five stock underpasses that are less than 8.4 metres (Table 5-28).

The PBS Guidelines recommend that:

"A visual inspection and risk assessment should be undertaken for bridges not providing the recommended widths considering:

- *Bridge approach sight distance*
- *Ability of drivers on a bridge approach to see vehicles on the opposing approach*
- *Willingness of drivers to adjust trajectory or entry onto a bridge to accommodate the width needs of large vehicles."*[35]

Appropriate bridge widths need to be increased on curved approaches. These assessments will guide access provided for PBS Class 2B and 3A vehicles. Where access cannot be provided narrow bridges may need to be widened.

Table 5-28 Narrow bridges and culverts less than 8.4m wide (access for B-doubles)

Bridge Number	Description	Location	Width Between Kerbs (m)
BN1898	Steel truss bridge over Thone River	22 km west of Wauchope	6.09
BN3486	Bridge over Chimney Swamp Creek	24 km west of Walcha	6.09
BN3487	Bridge over Northern Railway	25 km west of Walcha	6.09
BN3485	Bridge over Surveyor's Creek	19 km west of Walcha	5.48
BN3525	Bridge over Yaminbah Creek,	43 km west of Mullaley	6.36
BN1904	Steel truss bridge over Ralfe's Creek	53 km west of Wauchope	6.09
BN3495	Bridge over Tangaratta Creek	West of Tamworth	6.3
BN3490	Bridge over Timbumburi Creek	In Tamworth	6.7
BN1894	Culvert at Mahers Creek	10 km west of Wauchope	7.92
BN1895	Bridge over Gannons Creek	13 km west of Wauchope	7.31
BN1896	Bride over Hyndman's Creek	15 km west of Wauchope	7.31
BN4767	Bridge over Boothaguy Creek	71 km west of Gilgandra	7.75
BN3484	Culvert at Jamieson Swamp	10 km west of Walcha	6.09
BN3488	Culvert at unnamed Creek	30 km west of Walcha	6.09
BN3509	Bridge over railway line	0.39 km west of Gunnedah	6.7
BN9530	Stock underpass	1 km west of Long Flat	6.9
BN7930	Culvert over unnamed Creek	45 km west of Tamworth	7

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

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

Bridge Number	Description	Location	Width Between Kerbs (m)
BN9325	Culvert over unnamed Creek	19 km east of Walcha	7
BN9531	Stock underpass	49 km west of Wauchope	7
BN3471	Bridge over Wilson's Creek	23 km east of Walcha	7.31
BN3474	Bridge over Reedy Creek	15 km east of Walcha	7.31
BN9349	Stock underpass	50 km east of Walcha	7.5
BN9348	Stock underpass	53 km east of Walcha	7.7
BN1902	Bridge over Rushers Creek	39 km west of Wauchope	7.92
BN3481	Culvert at unnamed Creek	5 km west of Walcha	7.92
BN3511	Culvert at unnamed Creek	4 km west of Gunnedah	7.92
BN9324	Culvert at unnamed Creek	20 km east of Walcha	8
BN9532	Stock underpass	52 km west of Wauchope	8
BN9533	Culvert at unnamed Creek	24 km east of Walcha	8
BN7860	Bridge over Warral Road	4 km west Tamworth	8.08

Steel truss bridges have additional limits due to their structure. For example, the bridge over Thone River has both height and width restrictions and Ralfes Creek Bridge has additional width restrictions that may impede overhanging loads.

In the long term, investigations into improving the adequacy and consistency of treatments provided at narrow bridges, specifically regarding the alignment approaches should be undertaken on a priority basis.

Sealed shoulder widths

Sealed shoulder widths are the portion of the road that extend beyond the marked traffic lanes. Pavements with sealed shoulders last longer than road sections without it. Sealed shoulders improve the pavement structure and reduce moisture ingress. 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 Roads and Maritime Network Planning Targets recommended minimum sealed should widths for each rural class road is shown in Table 5-29.[36]

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

Table 5-29 Network Planning Targets

Hierarchy Class	Sections	Target sealed shoulder width (m)
6R	All	2.5
5R	All	2.5
4R	All	2.0
3R	AADT >3000	2.0
	AADT < 3000	1.0
2R	AADT >3000	2.0
	AADT < 3000	1.0
1R	All	1.0

Extra shoulder width is required on the outside of curves. The Roads and Maritime Services Network and Corridor Planning Practice Notes indicate that, on average, 56.17 per cent of Class 4 roads (for all land use), 45.49 per cent of Class 3 roads (for all land use) and 48.38 per cent of Class 2 roads (for all land use) have sealed shoulder widths less than the desirable minimum.[37]

As illustrated in Table 5-30 approximately 26 per cent of the corridor meets the target shoulder widths although an analysis of the rural section indicated 77 per cent of rural section of the Oxley Highway does not meet this target.

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

Rural corridor planning sections with greater than 10 per cent of shoulder widths less than one metre include:

- Pacific Highway to Wauchope
- All three sections between Wauchope and Walcha
- Walcha to the New England Highway
- Tamworth to Gunnedah
- Gunnedah to Newell Highway
- Gilgandra to Warren

The shoulder widths of these roads need to be progressively upgraded to meet the requirements of the Roads and Maritime Network Planning Targets and provide a consistent width.

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

Table 5-30 Sealed shoulder widths

Corridor Planning Sections		Description	Performance target	Shoulder widths (metres)		
				<1.0m	≥1m & <2 m	≥2.0m
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	2.0	95.2%	0.0%	4.8%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	2.0	2.7%	97.3%	0.0%
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	2.0	22.2%	75.5%	2.3%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	2.0	15.4%	37.3%	47.4%
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	1.0	97.4%	2.6%	0.0%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	1.0	96.5%	3.5%	0.0%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	1.0	72.9%	27.1%	0.0%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	1.0	0.0%	48.1%	51.9%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	1.0	73.8%	26.2%	0.0%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	2.0	28.6%	21.6%	49.8%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	2.0	18.4%	78.6%	3.0%
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	2.0	23.4%	46.4%	30.2%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	1.0	39.9%	60.1%	0.0%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	1.0	0.0%	55.1%	44.9%
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	1.0	79.8%	20.2%	0.0%
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	1.0	46.5%	47.4%	6.1%
TOTAL (by length)				**59.6%**	**37.4%**	**3.0%**

* Dual carriage way outside shoulder two metres in both directions

Clear zone and safety barriers

A clear zone is a width of roadside available 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 Network Planning Targets[38] state that for Class 1-4R roads, the width of the clear zone (Table 5-31) vary based on the speed limit.

- 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

Table 5-31 Network Planning Targets

Hierarchy Class	Operating Speed	Clear Zone Width (m)
1-4R	<60 kph	3
	60-80 kph	4
	80-110 kph	5
5-6R	All	Use RDG Section 3

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.[39]

The Oxley Highway Route Safety Review (July 2015) identified the need for a review of hazards in the clear zones along the corridor and to identify options to remove or provide protection from these hazards. Some sections of the corridor, particularly on the Walcha range, west of Tamworth and west of Gunnedah have large trees within the clear zone and unprotected culverts.[40]

While an extensive program to replace out-dated barrier systems along the Oxley Highway corridor and in particular on the Walcha range has been in place, a number of locations still have chain wire fencing that needs to be replaced. These out-dated barrier types have minimal road safety benefit and are often believed to create a false sense of security for motorists. Replacement of redundant barrier should occur so that the perception of risk to motorists is not falsely reduced. Roads and Maritime are currently rolling out a program to replace the old chain wire with approved safety barrier systems. The next stage of this program will be completed by 2017 with nearly 5 km of chain wire fencing being replaced with safety barriers between Ellenborough and Mt Seaview.

The Oxley Highway Route Safety Review (July 2015) observed that the start and termination of many safety barriers fell short of the point of need, and at some locations safety barriers are not in place at the back of curves. The location and length of the safety barriers needs to be reviewed along the full length of the corridor. The review also determined that terminal treatments were not considered appropriate especially in areas known to have a high incidence of motorcycle casualty crashes, for example on the Wauchope to Walcha range.[41]

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

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

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

37 Transport for NSW 2015, *Oxley Highway Route Safety Review*, TfNSW, Sydney, p.37

38 Transport for NSW 2015, *Oxley Highway Route Safety Review*, TfNSW, Sydney, p.37

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.

The long term target is to provide roadside safety barriers in all instances where the vegetation and clear zone targets cannot be met, including where batters are not traversable and to remove those barriers which are deemed unsafe.

Guidance and delineation

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

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

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

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

Network planning targets recommend roadways across all types of terrain should have edgelines on a Class 4, 3 and 2 rural roads, provided there is sufficient pavement to accommodate a minimum three metre wide lane between the edgeline and centreline.[42]

Urban sections of the corridor without edgeline do not reflect narrow lane formation, but rather the differing line marking used in urban areas. The section with the highest proportion of no edgeline occurs in the urban area of Walcha. In context however, the Walcha section is only 2.65 kilometres long (where 68 per cent of no edgeline represents 1.8km) and largely urban section with kerb and gutter and 45 degree rear end parking.

All rural sections of the Oxley Highway have edgelines. Consideration should be also given to the use of profile linemarking at specific locations where high rates of fatigue related crashes are known to have occurred for example the Tamworth to Gunnedah section of the corridor. Profile linemarking on both the centreline and edgeline is designed to alert drivers if they are drifting outside their lane, especially in areas with high rates of run off-road crashes.

It should be noted that:

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

39 Roads and Maritime Services 2010, *Network Performance Measures and Network Planning Targets*, RMS, Sydney, p. 48

Table 5-32 Edgelines

Corridor planning sections		Description	Target	% with edge lines
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	100.0%	100.0%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	100.0%	100.0%
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	100.0%	100.0%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	100.0%	32.0%
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	100.0%	100.0%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	100.0%	100.0%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	100.0%	100.0%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	100.0%	0.0%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	100.0%	96.2%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	100.0%	100.0%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	100.0%	100.0%
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	100.0%	69.9%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	100.0%	100.0%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	100.0%	100.0%
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	100.0%	100.0%
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	100.0%	100.0%
Total (by length)			**100.0%**	**98.5%**

Intersections

The network planning targets identify required intersection treatments based on volumes of through traffic and turning traffic. Minimum intersection treatments relevant to the Oxley Highway include:[43]

- BAR and BAL: 'basic treatment right' and 'basic treatment left'
- AUL: 'auxiliary lane treatment left'
- CHR(s): 'short channelised treatment'
- CHR and CHL: 'channelised treatment right' and 'channelised treatment left'.

Along the Oxley highway, a total of 208 intersections were identified. 167 are basic intersections, 15 are auxiliary lane intersections and 26 were found to be channelised.

Of the deficiencies assessed, the major issues along the corridor were the lack of signage and adequate pavement width to enable a heavy vehicle to turn through an intersection safely within their lane. The major deficiencies common along the entire length of the highway for signage was the lack of sight boards at intersections.

Of the 167 basic intersections that were identified, 113 were identified to have deficiencies in regards to turning paths for a heavy vehicle. However, of these, 60 were found be unsealed property access tracks where semi-trailer access would be very limited or non-existent. In regards to the auxiliary intersections, five were found to have deficiencies in regards to turning path movements for a heavy vehicle and nine of the 26 channelised intersections were also found to be deficient regarding turning path movements.

Research (Arndt 2004) has shown that basic right turn treatments record a rear-end major vehicle crash rate 52 times higher than channelised turn treatments. The research also found that the rear-end major vehicle crash rate decreases substantially with increased median width, regardless of the type of median (painted, raised or depressed).[44]

Rear-end and intersection crashes are prominent in Tamworth. A number of crashes have been identified from the Dampier Street to Bass Street intersections of the Oxley Highway which is a major contributing factor to the upgrade of this section. Tamworth Regional Council and Roads and Maritime worked together to improve the condition of the pavement, road safety and traffic flow on this section of the highway. Construction of this section was completed (early 2015) with the widening the Oxley Highway between Dampier Street and Cole Road.

There is a need for more consistent infrastructure for school buses using the Oxley Highway, in particular set down and pick up areas and signposting, especially at road junctions.

The Oxley Highway route safety review[45] indicates the need to undertake a full review of road junctions along the corridor to determine:

- The appropriateness of their design, especially those junctions with higher turning movements, signposted tourist attractions or restricted sight distances.
- The need to provide a short length of seal (for a distance of 5-10m back from the junction) on some gravel side roads.
- Adequate sight distance to and from the side road.
- The possibility of upgrading auxiliary right turn treatments to modified painted right turn bays.
- The possibility of providing vehicle actuated signposting, in advance of road junctions, where heavy vehicle usage increases significantly during certain seasons.
- The need for advance road name signposting, especially in high speed areas or where heavy vehicle or tourist traffic (particularly caravans) is common.

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

41 Austroads 2009, Geometric Design, Austroads Guide to Road Design, Part 4a, AGRD04/09, Austroads, Sydney, NSW

42 NSW Centre for Road Safety 2013, *Oxley Highway: Safety Review*, Roads and Maritime Services, Sydney

Flooding

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

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

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

- Flood volume – This contributes to flood duration and level.
- 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 corridor.
- Flooding caused by rising water ways – This type of flooding restricts access. To manage it, water is either directed under the road through culverts and pipes, or over the road through causeways and floodways, 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. 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.

The Oxley Highway corridor crosses a number of floodplains, rivers and creeks and is subject to both local flash flooding where waters are fast to recede, or larger scale flooding events where the highway can be closed at multiple locations for prolonged periods. These flood events can isolate individuals or communities and impact on reliability, increasing travel times and costs of delays for industry and other road users. As the corridor traverses a number of water catchments on either side of the Great Dividing Range, these flood events occur both simultaneously across the network and as is most usually the case, within different catchments at different times.

Overall reliability of the Oxley Highway corridor is considered adequate in terms of journey times. However, low flood immunity at a number of key locations on the road reduces this reliability. In particular the frequency and severity of inundation between Port Macquarie and Gunnedah is likely to impact on productivity for freight and commuter trips. Yaminbah Creek Bridge, west of Mullaley is narrow and in a deep sag and when affected by flooding the Oxley Highway can remain closed for up to 24 hours. Borah Creek culvert has been raised previously to improve its flood immunity however the highway is still affected by flooding. There are nine locations of 11 locations between Port Macquarie and Gunnedah affected by flooding events are caused by:

- Kings Creek
- Sharas Creek
- Yippin Creek
- O'Neils Creek
- Bergen Op Zoom Creek
- Namoi River

Hoss Causeway west of Carroll needs to be upgraded to improve the current average recurrence interval (ARI) of flooding rating from 6 months to 2 years. The ARI is an estimate of the average time between occurrences of random events. Tommy Swamp east of Gunnedah has a sag curve and needs to be upgraded with 2 box culverts with scour protection to improve the current ARI from 1 to 5 years. The project will provide a more reliable route on the Oxley Highway during rain and flood events. Presently during road closures motorists wishing to travel

between Gunnedah and Tamworth have to detour via the Kamilaroi Highway adding an additional 87 km to their trip. The closures typically last for three to four days and occur two to three times a year.

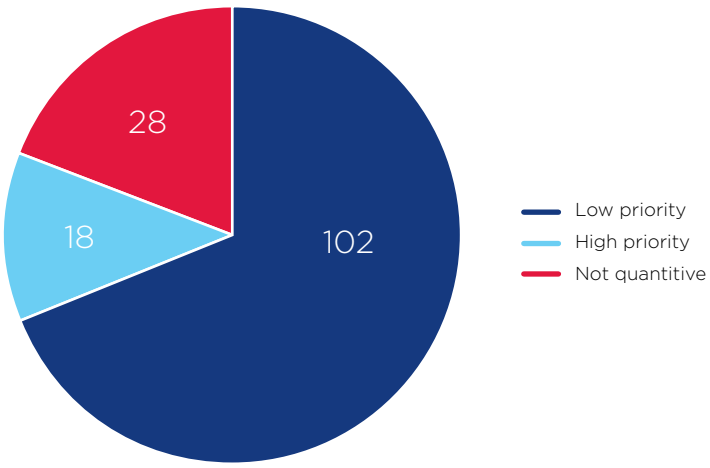
Road slope risk rating

Embankments and cuttings are constructed to provide for a gradual rise or fall in the terrain around roads. Part of managing these embankments and cuttings involves assessing measures necessary to mitigate against possible risk of failures such as slips and rock falls. A road slope risk rating systematically analyses risks associated with potential slope instability on roads across the State.

Slope stability is measured and assessed using the Roads and Maritime Road Guide to Slope Risk Analysis. The outcomes of the slope risk assessments are stored in the 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 a highest risk of instability are rated ARL 1 and 2, while slopes with the lowest perceived risk are rated ARL 4 and 5. Slopes rated at ARL 3 are considered medium risk. Generally, the target rating for all existing slopes in a corridor should be ARL 3 or better.

There are 18 slopes on the Oxley Highway with an ARL less than 3 (high risk) on the corridor. These areas are prone to slope failures in heavy rainfall (generally >100mm within a 24 hour period) and the management of these slopes is a continual program for RMS. As slope failures can result in complete closure of the corridor for undisclosed periods of time, the management of drainage systems is imperative in the prevention and management of slope stability issues. Slopes with a high priority are generally found on the Wauchope to Walcha range. Completion of earth works and large scale slope stability works recommended in the short term to reduce the assessed risk level of slopes to an ARL 3 or better.

Figure 5-25 Road Slope Risk Rating on the Oxley Highway

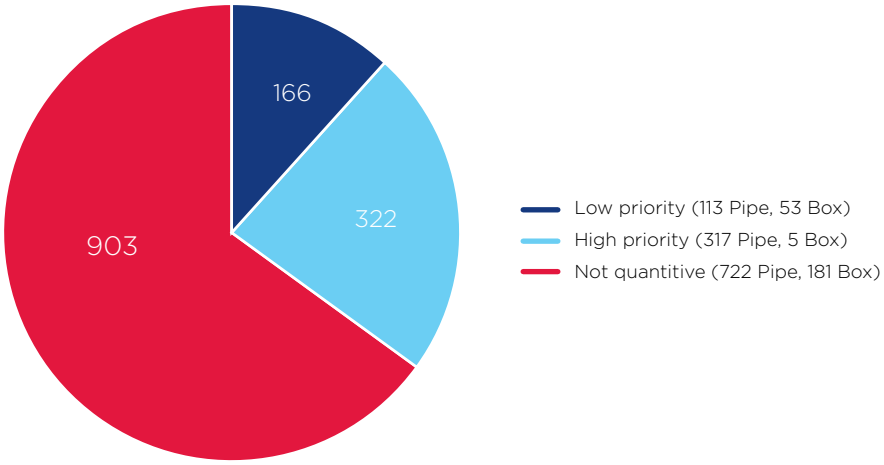


Road culvert risk rating

A culvert is one or more adjacent pipes or enclosed channels that allow water to flow under a road. There are 1391 culverts along the Oxley Highway corridor. These include 1152 pipe culverts and 239 box culverts.

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.

Figure 5-26 Culvert Conditions on the Oxley Highway



Along the corridor, there are some deep culverts with no safety barrier protection in the 100km/h speed zone east of Walcha and 110km/h speed zone west of Gunnedah close to the edgeline. A review of culverts within clear zones should be undertaken to protect them with a safety barrier or by extending the existing safety barrier based on size, proximity to the edgeline and location of the culvert. Culvert maintenance should be undertaken between Ralfes Creek and Gingers Creek on the Wauchope to Walcha range. In the short term culvert replacement should be completed on a priority basis. There are over 100 culverts that require rehabilitation around the Mount Seaview areas to minimise slope failures emerging.

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 'Low Risk' are those with rating ARL 3, 4 or 5. Preliminary assessment of the Oxley Highway corridor highlighted 66 high priority culverts.

The overall number of culverts is provided in Figure 5-26.

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.[46]

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.[47]

The Oxley Highway is an approved HML route for the following:

- HML 25/26m B double route from the western Walcha boundary to the west with a load restriction in place at the rail bridge in Gunnedah
- HML 36.5m Type 1 A-Double Road Train from Gilgandra west to Nevertire with no load restrictions in place.

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'.[48]

There are a total 156 bridges along the Oxley Highway that have been assessed and include:

- 40 bridges assessed as 'fair'
- 88 bridges assessed as 'good'
- 28 bridges assessed as 'as built'

There no bridges with a 'poor' BHI.

All bridges on the corridor are assessed on a regular basis and remediation works will be undertaken on a priority basis to avoid safety risks arising.

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 3 grade separated grade separated rail crossings on the Oxley Highway. These are included in Table 5-33.

Table 5-33 Road over Rail Bridges

Location	Description of Bridge	Additional comments
Woolbrook, 24 km west of Walcha	Bridge Number 3487	Narrow
Tamworth, 4km west of town	Bridge Number 8000	
Gunnedah	Bridge Number 3509	Oxley Highway is being re-routed

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

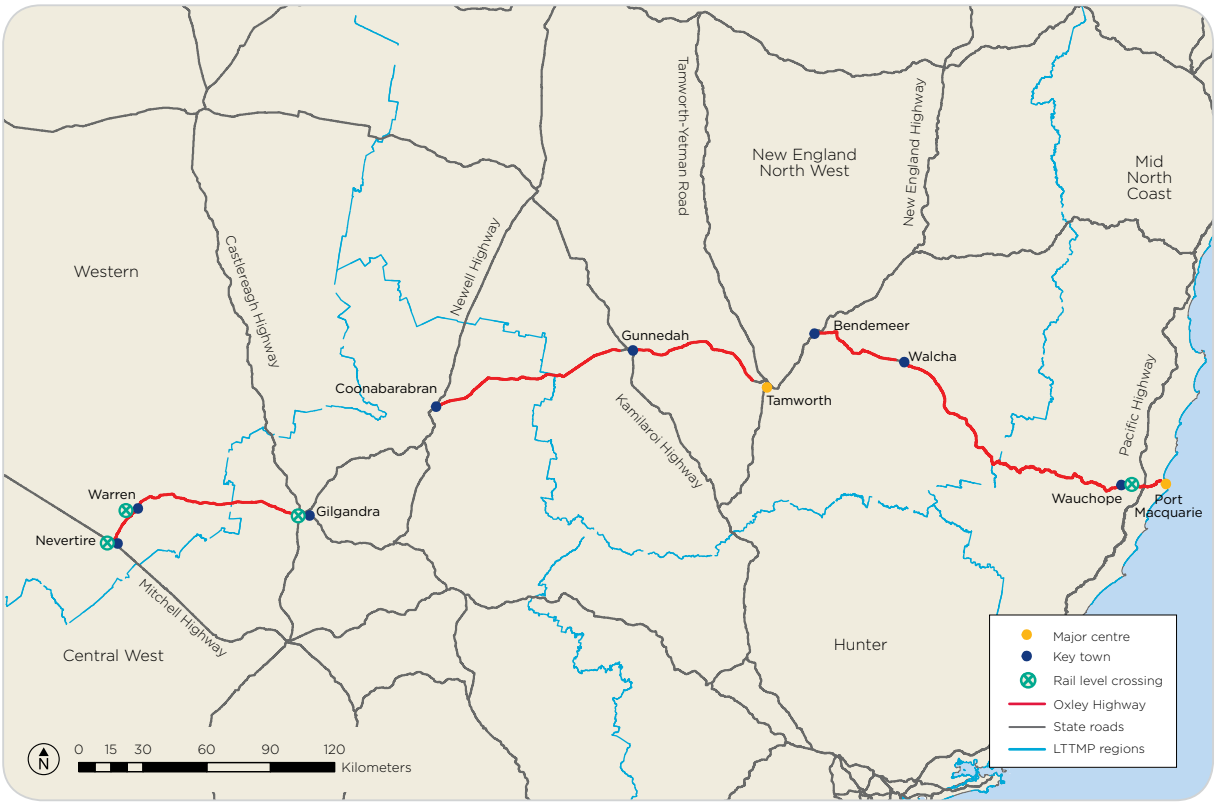
51 National Transport Comission 2014, http://www.ntc.gov.au/viewpage.aspx?AreaId=37&DocumentId=1806

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

There are 4 rail level crossings (Figure 5-27) at the following locations:

- Wauchope – in the town centre
- Gilgandra – in Gilgandra township
- Warren – 1.6 kilometres west of Warren township
- Snakes Plain – 4km east of Nevertire

Figure 5-27 Road and rail interfaces on the Oxley Highway



Individual rail and road agencies are responsible for managing safety of their level crossings. Roads and Maritime Services manage 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.

Roads and Maritime is committed to working with agencies responsible for managing safety at their level crossings to complete Road Rail Interface Agreements and subsequent Safety Management Plans at all sites. (Table 5-34).

Table 5-34 Rail crossing locations

Location of rail level crossing	Rural or Urban	ACLAM Rating and safety management plan prepared?	Flashing Lights	Boom Gates
Wauchope – town centre	Urban	Plan prepared - no	Yes	Yes
Gilgandra – township	Urban	Plan prepared - no	Yes	No
Warren – 1.6 kilometres west of Warren township	Rural	Plan prepared - no	No	No
Snakes Plain	Rural	Plan prepared - no	No	No

CASE STUDY

The Oxley Highway, in Gunnedah, is a State road and connects Tamworth with Coonabarabran via Gunnedah. With major coal development occurring in the Gunnedah basin, the length of coal trains has been increasing, causing extended delays at nearby level crossings in Gunnedah. There is a need to improve traffic efficiency. The existing Abbott Street Bridge presents an obstacle for freight efficiency, as it cannot carry Higher Mass Limit (HML) vehicles. The provision of a second road over rail bridge in Gunnedah will facilitate a HML route through Gunnedah, delivering an additional continuous 660km for HML freight vehicles. The NSW Government is committed to delivering the project as part of the Bridges for the Bush program. The new route will replace the New Street level crossing which will be closed.

Summary of Road Design and Geometry Issues

- The rural sections between the Pacific Highway and the New England Highway show the highest proportion of tight curve radii.
- The eastern escarpment of the Wauchope to Walcha range has some of the tightest curves with 20.8 per cent of curve radii below 90m and 65.7 per cent of curve radii below 600m. The sections from Wauchope to the base of the eastern escarpment, Walcha to the New England Highway and the Pacific Highway to Wauchope have 34.6, 25.8 and 24.6 per cent of curve radii below 600m (respectively).
- Most of the highway's excessive vertical grades occur where horizontal curves are in excess of 600 metres. There are, however, rural segments with steep grades on tighter curves, in particular:
  - Pacific Highway to Wauchope
  - Wauchope to Walcha
  - Walcha to the New England Highway
- Approximately 8 per cent of the rural sections along the Oxley Highway have lane widths less than or equal to 3.00 metres. The most significantly affected section occurs between Wauchope and Seaview Road where approximately 24km out of the 96km has lane widths less than or equal to 3.00 metres.
- Along the Oxley Highway there are 16 bridges, nine culverts and five stock underpasses that are less than 8.4 metres.
- The Oxley Highway Route Safety Review draft (July 2014) identified the need for a review of hazards in the clear zones along the corridor and to identify options to remove or provide protection from these hazards. Some sections of the corridor, particularly on the Walcha range, west of Tamworth and west of Gunnedah have large trees within the clear zone and unprotected culverts.[49]
- Along the Oxley highway, a total of 208 intersections were identified. 167 are basic intersections, 15 are auxiliary lane intersections and 26 were found to be channelised. Of the deficiencies assessed, the major issues along

43 55 Transport for NSW 2014, Oxley Highway Route Safety Review Draft, TfNSW, Sydney, p.37

the corridor were the lack of signage and adequate pavement width to enable a heavy vehicle to turn through an intersection safely within their lane. The major deficiencies common along the entire length of the highway for signage was the lack of sight boards at intersections.

- Overall reliability of the Oxley Highway corridor is considered adequate in terms of journey times. However, low flood immunity at a number of key locations on the road reduces this reliability. Hoss Causeway needs to be upgraded with 25 box culverts with scour protection to improve the current average recurrence interval (ARI) of flooding rating from six months to two years. The ARI is an estimate of the average time between occurrences of random events. Tommy Swamp has a sag curve and needs to be upgraded with two box culverts with scour protection to improve the current ARI from one to five years. The project will provide a more reliable route on the Oxley Highway during rain and flood events.
- There are 22 slopes with an ARL less than three on the corridor, the location of slope with an ARL of less than two are displayed in Figure 5-25 and 5-26. These areas are prone to land slips in heavy rainfall and the management of these slopes is a continual program for Roads and Maritime.

5.5 Road pavement condition

Road pavement is a layer of material that supports the traffic loading on the subgrade. This rock can be either in a natural state or modified into materials such as concrete or asphalt.

Effectively investigating and managing the Oxley Highway's pavement condition for the long term is a key task that involves estimating the pavements degrading profile to determine remaining service life, and hence budgeting to ensure adequate rates of pavement replacement and acceptable ride quality to the road user.

Without adequate rates of repair the network will deteriorate until eventually the road is compromised network restriction. Alternatively, if the pavement replacement rate is too high, resources are spent unnecessarily and inefficiently.

Measuring the remaining structural life of the pavement and condition is therefore a critical role of asset maintenance.

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

- Road pavement structural remaining life
- Intensity of pavement rebuilding
- Pavement age
- Pavement types and seals
- Road surface cracking
- Road smoothness
- Rutting
- Deflection

Pavement structural remaining life

Structural remaining life is used to estimate the remaining capacity of the pavement – that is, the time remaining until the pavement displays widespread failure and reaches an unserviceable condition. Pavement with zero structural remaining life can no longer have guaranteed ability to manage traffic volumes without unpredictable deterioration, in turn, 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 are developing a risk-based approach to assessing structural remaining life. The strength of existing pavement segments are assessed using a travel speed deflectometer along the entire length of the road carriageway. These values were then analysed with its pavement asset management system (PAMS) using established and accepted methodologies to calculate the structural remaining life.

These methodologies include:

- STEP – (Structural Testing Evaluation of Pavements)
- PLATO – (Pavement Life-cycle Analysis Treatment Optimisation)

STEP evaluates the current structural condition, as an estimated pavement configuration, and estimated remaining structural life.

STEP output is used in PLATO as its start point, and it then models forward dynamically in accordance with user selected operating parameters.

Data input requirements:

- Structural deflection data
- Surface condition data
- Traffic loading data
- Climate/seasonal information

Table 5-35 shows the pavement remaining life for each planning section along the Oxley Highway corridor. The urban areas of Wauchope (section 4) and Walcha (section 8) have 47%, and 28% respectively of pavement with less than 5 years life remaining. In comparison 52% of pavement in Tamworth (section 10) has a remaining life greater than 15 years, Gunnedah (section 12) has 61% and Gilgandra (section 15) has 95%.

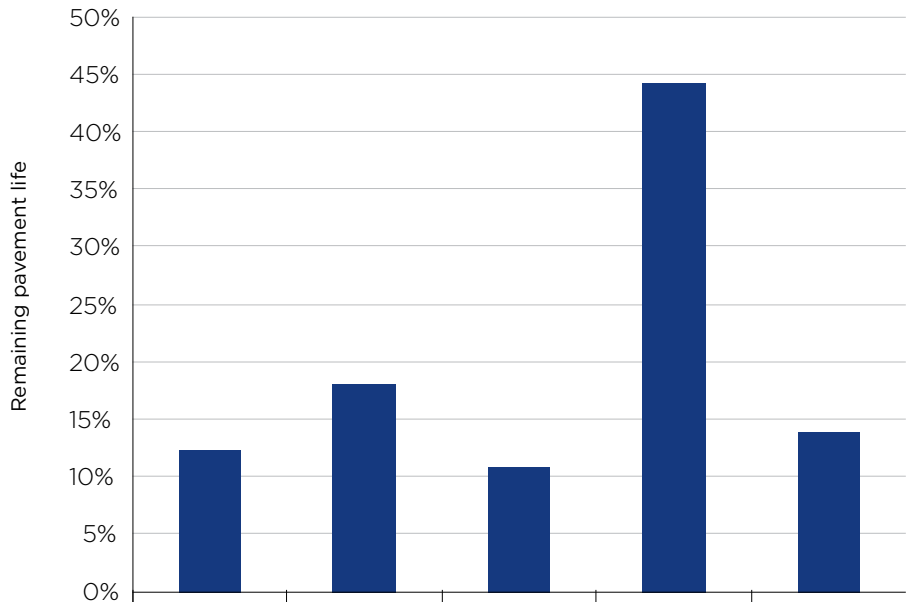
The rural section of the corridor between the Pacific Highway and Wauchope (section 3) has 41% of pavement with a remaining life of more than 15 years. The section on the Wauchope to Walcha range, between Ralfes Creek and Seaview Road (section 6) has 37% of pavement with less than 5 years of remaining life.

Table 5-35 Pavement Remaining Life

Corridor Planning Sections		Description	<5 years	>=5 – <10 years	>=10 – <15 years	>15 years	Data Gaps
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	0.0%	0.0%	0.0%	31.3%	68.7%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	0.0%	0.0%	0.0%	0.0%	100.0%
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	0.0%	22.6%	36.1%	41.4%	0.0%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	47.4%	25.8%	0.0%	26.8%	0.0%
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	12.2%	32.7%	25.7%	29.2%	0.2%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	37.4%	1.9%	0.0%	14.1%	46.5%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	19.5%	18.2%	8.3%	32.3%	21.7%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	27.6%	40.0%	0.0%	32.4%	0.0%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	13.5%	29.4%	3.8%	32.3%	21.0%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	0.0%	4.8%	0.0%	51.5%	43.7%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	21.7%	16.6%	6.5%	46.4%	8.8%
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	19.5%	3.8%	0.0%	61.5%	15.1%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	3.5%	7.6%	4.1%	84.9%	0.0%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	0.0%	4.6%	0.0%	95.4%	0.0%
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	2.6%	36.9%	30.0%	30.5%	0.0%
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	0.9%	0.0%	11.1%	88.0%	0.0%
Total (by length)			**12.5%**	**18.2%**	**11.0%**	**44.4%**	**14.0%**

Figure 5-28 shows the structural remaining life for pavement along the entire length of the Oxley Highway corridor and it indicates that as a whole 44 per cent of the pavement has a remaining life of more than 15 years. The travel speed deflector graph (TSD) had its first and only run in 2010 continued development into TSD is ongoing.

Figure 5-28 Pavement remaining life on the Oxley Highway



	<5 years	5-10 years	10-15 years	>15 years	Data Gap
% of highway	12.5%	18.2%	11.0%	44.4%	14.0%

Intensity of pavement rebuilding

The intensity of pavement rebuilding means how much of a road's pavement structure is rebuilt each year – known as the annual pavement replacement rate – compared to long-term sustainable targets.[50]

The remaining life of pavement across the network is a primary factor in determining the rate of replacement along with State network rank and condition.

The sections of pavement in greatest need of replacement due to cracking, subsidence, roughness, and other issues are reconstructed or sealed as appropriate on a priority basis. Managing risks to drivers, providing reasonable levels of service and ensuring pavement does not deteriorate to a level requiring costly rehabilitation are the primary objectives of the asset maintenance program.

The rate of pavement rebuilding for the Oxley Highway is currently 1.16% per annum which is very close to the State target of 1.2% per annum[51].

There is currently no formal pavement replacement strategy for the Oxley Highway. Generally, routine maintenance and heavy patching is applied to all segments continually to repair small areas that fail earlier than the majority of the surrounding pavement. This work generally keep roughness and shape within tolerable levels although there will always be a gradual deterioration in these values as the pavement ages.

Longer lengths, typically whole or part segments will be rehabilitated (rebuilt) when either the rate of minor repairs becomes excessive or the roughness becomes so high that it is uncomfortable to drive on the road.

44 This measure is being used until a measure of pavement remaining life becomes available.

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

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 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 and cost
- The need to optimise lifecycle costs.

Pavement design aims to maximise whole-of-life benefits by selecting the most economical thickness and composition to provide a satisfactory level of service for anticipated traffic. Different pavement configurations are used in NSW, depending on how heavy the traffic is along particular routes. Thicker, stronger and more expensive pavements are used on heavy traffic routes.

Table 5-36 summarises the pavement types along the Oxley Highway. Between the Pacific Highway and Gunnedah the rural pavements generally consist of a granular pavement type. From Gunnedah to Nevertire, the highway is typically constructed on black soil (highly expansive clay) subgrades and built with poor quality rounded gravels. Expansive clay subgrades have a low strength and high swell characteristics. This leads to loss of shape, roughness, and rutting in the pavement layers. On this section granular and bound granular with sprayed seal are used. In townships a mixture of flexible/composite pavements are used, while the newest section of the corridor between Port Macquarie and the Pacific Highway is constructed with asphalt using surface CRCP.

High quality granular materials are not readily available in the corridor. Costs to transport materials from suppliers in regional centres such as Tamworth are high.

When assessing the type of pavement to be used in a particular area a whole of life cost assessment is undertaken to determine the most cost effective option. In high traffic areas of urban centres disruptions to traffic affected by high rates of maintenance are considered as well as benefits such as reduced roughness and lower vehicle operating costs.

It is desirable that pavement replacement if required is prioritised so that the best value outcome can be achieved. However in reality, due to funding constraints an intervention with a light low cost rehabilitation may be used as an interim measure over a high cost heavy rehabilitation.

Table 5-36 Pavement types

Corridor Planning Sections		Description	Flexible	Composite			Rigid	Bridge
			Granular sealed (Includes Bound Granular with Seal – BGNFS)	Granu-lar with asphalt	Bound granu-lar with asphalt	Asphalt	(concrete) – (Includes Jointed, Plain & Continu-ous)	
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	-	31.32%	63.89%	-	4.79%	-
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	-	-	4.04%	-	95.96%	-
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	97.71%	2.29%	-	-	-	-
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	70.40%	29.60%	-	-	-	-
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	99.80%	-	-	-	-	0.20%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	89.39%	10.61%	-	-	-	-
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	100.00%	-	-	-	-	-
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	67.55%	32.45%	-	-	-	-
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	100.00%	-	-	-	-	-
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	20.73%	64.42%	-	-	11.39%	3.46%

Corridor Planning Sections		Description	Flexible	Composite			Rigid	Bridge
			Granular sealed (Includes Bound Granular with Seal – BGNFS)	Granu-lar with asphalt	Bound granu-lar with asphalt	Asphalt	(concrete) – (Includes Jointed, Plain & Continu-ous)	
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	99.63%	-	-	-	0.37%	-
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	84.51%	15.49%	-	-	-	-
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	100.00%	-	-	-	-	-
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	95.37%	4.63%	-	-	-	-
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	100.00%	-	-	-	-	-
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	99.13%	-	-	-	-	0.87%
Total (by length)			**93.10%**	**3.43%**	**0.92%**	**0.00%**	**2.42%**	**0.13%**

Pavement age

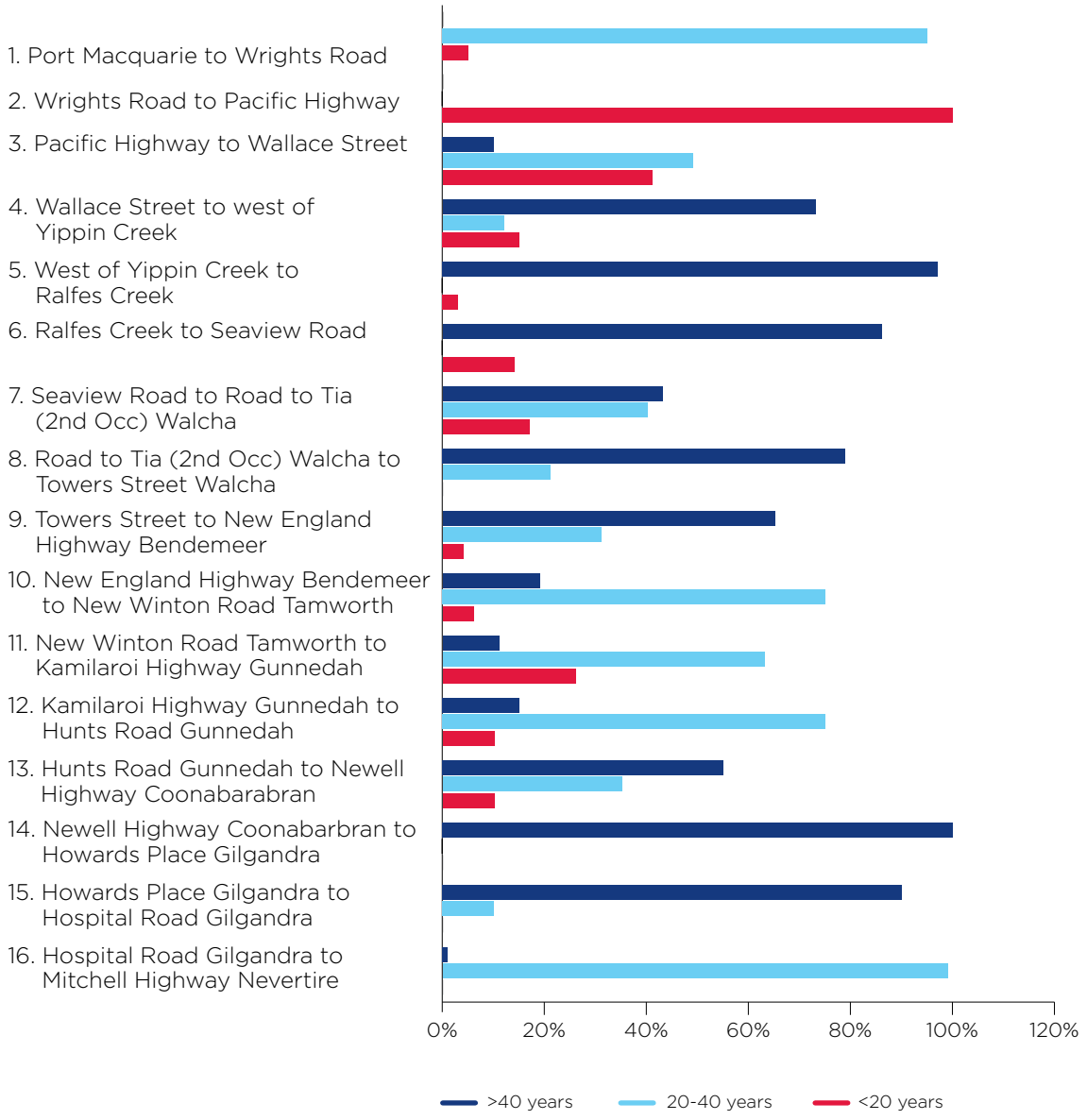
Road pavement is designed for a time span considered appropriate for the road pavement to function without major rehabilitation or reconstruction, typically 20 for flexible pavements and 40 years for rigid pavements. The age of the pavement can be a further indicator of its remaining life. Pavement will continue to operate beyond its design life and it may 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 Oxley Highway.

Figure 5-29 summarises the age of pavements along the Oxley Highway. Pavement age on many parts of the corridor, particularly in rural areas has exceeded theoretical design life. Current state network targets for reconstruction are 1.2% of the network per annum. The majority of the pavements are currently displaying ongoing structural serviceability and acceptable roughness, although with significant amounts of localised repairs at some cost to Roads and Maritime and disruption to traffic.

The areas with the highest proportion of aged pavements are east of and along the Wauchope to Walcha range and between Coonabarabran and Gilgandra. While much of the Wauchope to Walcha section has a heavy maintenance schedule complete, pavement rebuilding is constrained by topography, climate and the surrounding environment.

Figure 5-29 Pavement age



Road surface cracking

Road surface cracking results from either environmental causes or pavement component strength causes. Environmental causes is when there is swelling and shrinkage of the natural ground or even the pavement material which leads to stretching and tearing of the bitumen surface or pavement work. Pavement causes are when deflections under traffic load are large which cause the bitumen surface to stretch and tear. As a bitumen surface ages it will loose flexibility and becomes stiffer thus making it more likely to tear rather than stretch under these movement circumstances.

The prevalence of cracking in a road surface is a key performance measure determining the rate of pavement deterioration or need for resurfacing. 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 as it permits ingress of moisture, thereby increasing asset maintenance and bringing forward the need for pavement replacement.

In addition, if full pavement rehabilitation becomes necessary as a result, this produces longer delays to traffic, with fewer available lanes during the construction phase, than repairs involving the resurfacing of the existing road surface undertaken at earlier times.

As a guide, the network planning targets for all state roads indicate that:[52]

- For asphalt roads, on average, at least 67 per cent of the road lengths should exhibit cracking of less than five per cent, and no more than 2.6 per cent of these road lengths should exhibit cracking of more than 30 per cent
- For spray seal surface roads, on average, at least 80.2 per cent of road lengths should exhibit cracking of less than one per cent, and no more than 4.3 per cent of these road lengths should exhibit cracking of more than 10 per cent.

Overall the corridor performs well with many sections above the targets for maximum cracking. Figure 5-30 and Figure 5-31 summarises pavement cracking along asphaltic concrete and spray sealed pavements on the Oxley Highway. As shown there is no cracking along the Oxley Highway considered to be high risk (greater than 30 per cent for asphaltic concrete or greater than 10 per cent for spray seal).

The tables below also show that five sections out of 10 with asphaltic concrete pavement are above the target (67 per cent of the roadway should have less than five per cent cracking). However, these targets are not met between the Pacific Highway and Wauchope, within Wauchope, within Walcha and within Tamworth.

The table also shows that eight sections out of the 14 sections with spray seal pavement are above the target (80.2 per cent of the roadway should have less than one per cent cracking). There are six sections that do not meet this target and these are within and to the west of Wauchope, the Wauchope to Walcha range, within Walcha, within Tamworth and within Gunnedah.

As indicated above, cracking of the pavement should continue to be monitored as cracking can be a precursor to more severe distress.

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

Figure 5-30 Cracking levels on the asphaltic concrete sections of the Oxley Highway Corridor

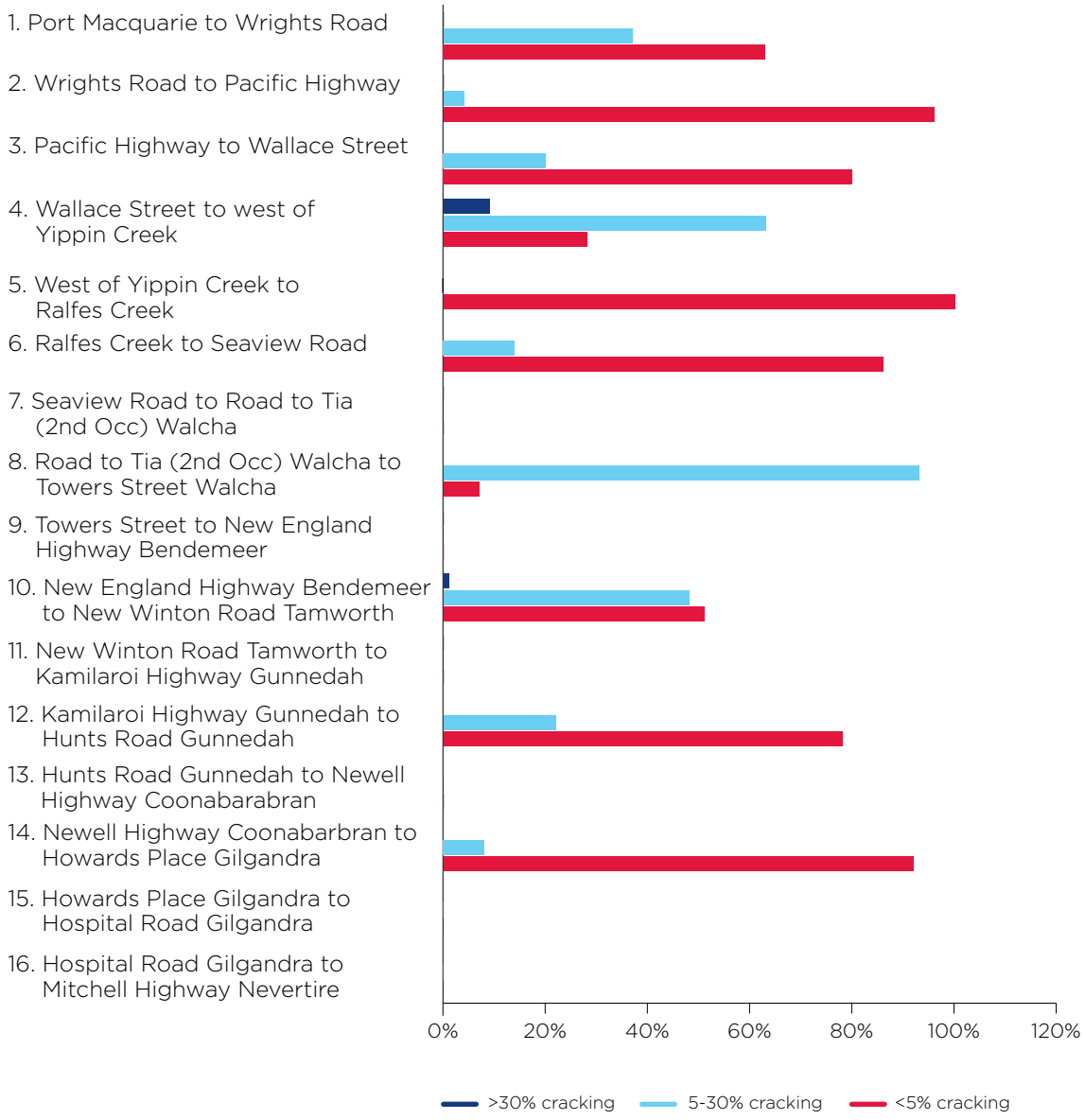
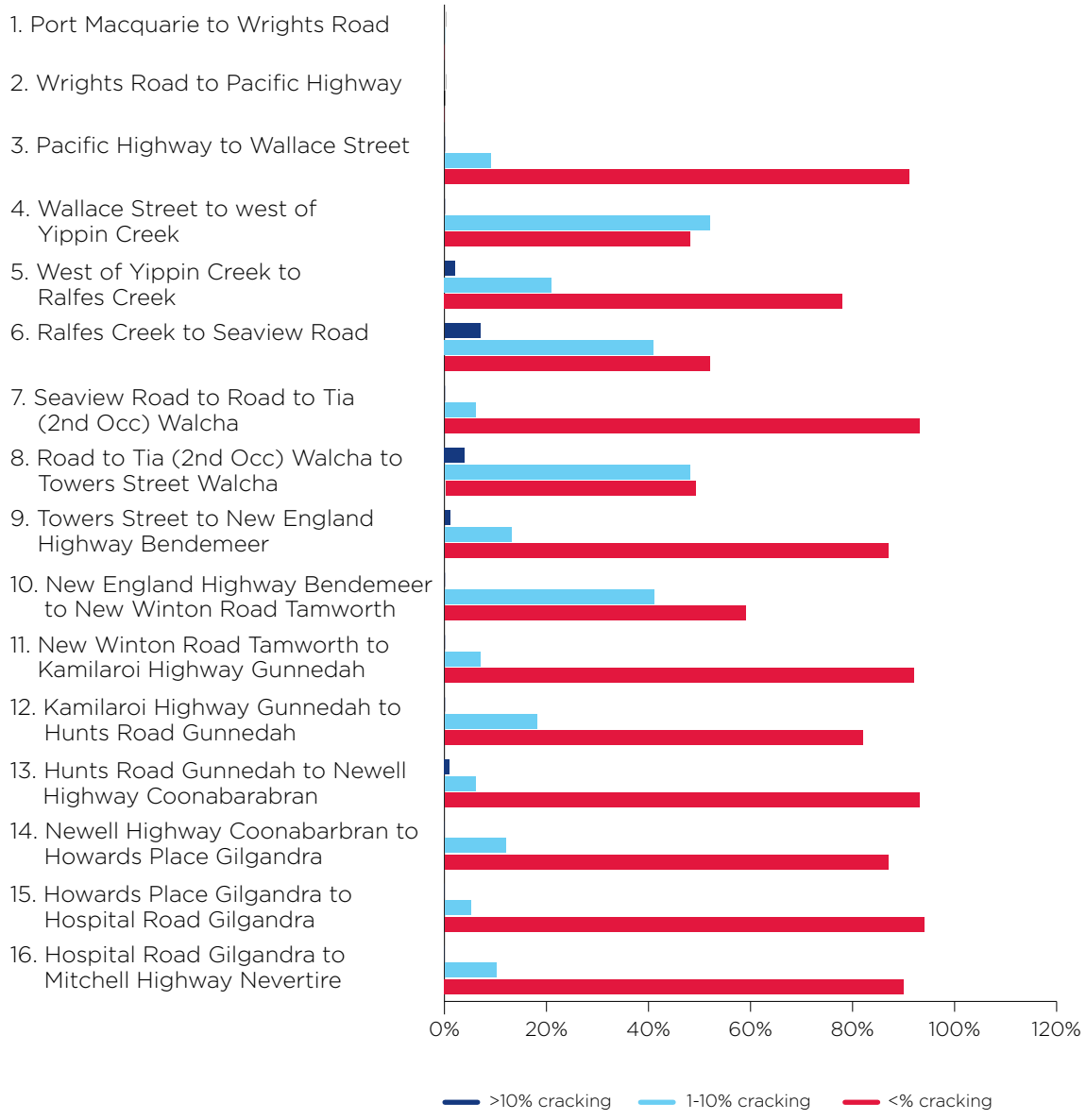


Figure 5-31 Cracking levels on the spray sealed sections of the Oxley Highway Corridor



Road smoothness

Road smoothness is a travel weighted roughness measure. Generally if around 93 per cent of the road has a travel weighted International Roughness Index value less than 4.2 metres per kilometre, the smoothness is relatively good. 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) 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.

- A 'smoothness' score (measured using IRI):
- Below 2.9 metres per kilometre indicates a good surface
- Between 3.1 and 4.2 metres per kilometre indicates an acceptable surface
- Between 4.4 and 5.0 metres per kilometre indicates a poor surface
- In excess of 5.1 metres per kilometre indicates a very poor surface condition

The smoothness of the roadway for each planning section of the Oxley Highway is shown in Table 5-37. It indicates that around 57% of the Oxley Highway has a good smoothness score. The urban centre of Port Macquarie has on average about 76% of pavement with good smoothness. Conversely, the urban centre of Tamworth has approximately 12% of the roadway with very poor smoothness and in Gunnedah this measure indicates very poor smoothness for around 34% of the roadway.

Overall only 3.7% of the Oxley Highway corridor shows very poor road smoothness and this is predominantly through urban centres.

Table 5-37 Smoothness

Corridor Planning Sections		Description	International Roughness Indicator (IRI) m per/Km					
			length	rank	<2.9m/km Good	>=2.9-4.2m/km Accept-able	>=4.2-5m/km Poor	≥5m/km Very Poor
1	Port Macquarie urban centre	Hastings River Drive Port Macquarie to Wrights Road Port Macquarie	3.436	4	76.36%	15.92%	1.07%	6.65%
2	Port Macquarie to Pacific Highway	Wrights Road Port Macquarie to Pacific Highway Port Macquarie	5.543	4	92.31%	4.11%	3.59%	0.00%
3	Pacific Highway to Wauchope	Pacific Highway to Wallace Street Wauchope	9.088	4	69.08%	21.40%	3.57%	5.95%
4	Wauchope	Wallace Street Wauchope to west of Yippin Creek Wauchope	3.694	4	23.70%	46.67%	23.70%	5.93%

Corridor Planning Sections		Description	International Roughness Indicator (IRI) m per/Km					
			length	rank	<2.9m/km Good	>=2.9-4.2m/km Accept-able	>=4.2-5m/km Poor	≥5m/km Very Poor
5	Wauchope to Walcha	West of Yippin Creek Wauchope to Ralfes Creek Mount Seaview	49.645	2	68.00%	23.95%	4.68%	3.36%
6		Ralfes Creek Mount Seaview to Seaview Road Mount Seaview	46.510	2	67.15%	25.06%	3.75%	4.04%
7		Seaview Road Mount Seaview to west of Road to Tia (2nd Occurrence) Walcha	62.633	2	79.09%	18.20%	2.39%	0.32%
8	Walcha	West of Road to Tia (2nd Occurrence) Walcha to west of Towers Street Walcha	2.086	2	30.00%	40.00%	15.00%	15.00%
9	Walcha to the New England Highway	West of Towers Street Walcha to New England Highway Bendemeer	48.516	2	60.95%	27.17%	7.21%	4.67%
10	Tamworth	New England Highway Tamworth to New Winton Road Tamworth	7.908	3	11.37%	56.83%	15.64%	16.16%
11	Tamworth to Gunnedah	New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	67.098	3	59.58%	33.28%	5.81%	1.33%
12	Gunnedah	Oxley Highway Roundabout Gunnedah to east of Hunts Road Gunnedah	5.857	3	33.70%	33.70%	11.73%	20.86%
13	Gunnedah to the Newell Highway	East of Hunts Road Gunnedah to Newell Highway Coonabarabran	97.559	2	51.68%	38.33%	7.48%	2.52%
14	Gilgandra	Newell Highway Coonabarabran to Howards Place Gilgandra	3.069	2	29.69%	39.12%	15.65%	15.53%
15	Gilgandra to Warren	Howards Place Gilgandra to east of Hospital Road Warren	81.467	2	34.46%	44.14%	15.70%	5.70%
16	Warren to the Mitchell Highway	East of Hospital Road Warren to Mitchell Highway Nevertire	20.627	2	55.77%	32.05%	7.22%	4.97%
Total Corridor performance (by length)			**514.736**		**57.21%**	**31.63%**	**7.44%**	**3.71%**

An International Roughness Index (IRI) value of less than 4.2 metres per kilometre indicates a smooth ride quality. For NSW state roads of class 4R the percentage of the network with a IRI of less than 4.2 metres per kilometre is 76.8 per cent while the corresponding result for the Oxley Highway is 88.8 per cent (Table 5-38) which shows the Oxley Highway measures below other class 4R roads.

The smoothness factor is less significant from a road safety perspective within the lower speed urban environments compared to the higher speed rural sections.

Table 5-38 International Roughness Index value <4.2 metres per kilometre

	Oxley Highway	Other Class 4R roads
Performance – Length of Smooth Road	88.8%	76.8%

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 (or in cold areas ice formations) that can form in the depressions along the wheel paths, increase in aquaplaning risk and subsequent loss of skid resistance[61].

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

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

The rut measurements in Figure 5-32 show 67.79 per cent of the Oxley Highway corridor currently exhibits 'slight' rutting (5-10mm) and 9.3 per cent represents shows 'moderate' rutting (10-20mm). No sections of the corridor exhibit 'extreme' rutting (>20mm) and the remaining 22.9 per cent shows 'good' rutting (<5mm). Overall this indicates rutting is not a problem along the corridor.

Roads and Maritime Services Assets Maintenance Northern undertakes annual inspections of all roads it has a maintenance responsibility for. If a particular segment appears to have rutting that requires repair then this segment will be planned into a future program of works. Depending on funding availability and extent of rutting, work could range from heavy patching to full segment rehabilitation.

Figure 5-32 Rutting deficiencies

Summary of road pavement issues

- The structural remaining life for pavement along the entire length of the Oxley Highway corridor is that 44% of the pavement has a remaining life of more than 15 years.
- The rate of pavement rebuilding for the Oxley Highway is currently 1.16% per annum which is very close to the State target of 1.20% per annum[53].
- The section of the Oxley Highway between Port Macquarie and the Pacific Highway has heavy duty pavement and a 107 DESA. The urban centre of Tamworth also has a 107 DESA. The remainder of the Oxley Highway corridor would have a DESA less than 10^7.
- Between the Pacific Highway and Gunnedah the rural pavements generally consist of a granular pavement type. From Gunnedah to Nevertire, the highway is typically constructed on black soil (heavy clay) subgrades and built with rounded river gravels. Black soil subgrades have a low strength and high swell characteristics. This can lead to loss of shape, roughness, and rutting in the pavement layers. On this section granular and bound granular with asphalt are used.
- In townships a mixture of flexible/composite pavements are used, while the newest section of the corridor between Port Macquarie and the Pacific Highway is constructed with asphalt over lean mix flexible concrete.
- The areas with the highest proportion of aged pavements are east of and along the Wauchope to Walcha range and between Coonabarabran and Gilgandra. While much of the Wauchope to Walcha section has a heavy maintenance schedule complete, pavement rebuilding is constrained by topography, climate and the surrounding environment.
- Overall the corridor performs well with many sections above the targets for maximum cracking. There is no cracking along the Oxley Highway considered to be high risk (greater than 30 per cent for asphaltic concrete or greater than 10 per cent for spray seal).
- Overall only 3.7% of the Oxley Highway corridor shows very poor road smoothness and this is predominantly through urban centres.
- For NSW state roads of class 4R the percentage of the network with a IRI of less than 4.2 metres per kilometre is 76.8 per cent while the corresponding result for the Oxley Highway is 88.8 per cent which shows the Oxley Highway measures above other class 4R roads.
- 67.8 per cent of the Oxley Highway corridor currently exhibits 'slight' rutting (5-10mm) and 9.3 per cent represents shows 'moderate' rutting (10-20mm). No sections of the corridor exhibit 'extreme' rutting (>20mm) and the remaining 22.9 per cent shows 'good' rutting (<5mm). Overall this indicates rutting is not a problem along the corridor.
- Increase in heavy vehicle will impact on pavement life

5.6 Environment and Urban Design

The Oxley Highway corridor is a source of rich biodiversity, cultural heritage and agricultural production. From Port Macquarie in the east, to Nevertire in the west the highway is approximately 514 kilometres in length. The Oxley Highway road reserve itself forms a unique biodiversity asset in the landscape and is up to 200m wide in sections. From east to west, the highway passes along and directly through a number of National parks including the northern boundary of Bago Bluff national park (Wauchope), Cottan-Bimbang, Mummel Gulf National Parks and also both Apsley and Tia Falls Nature reserves (Walcha region).

The Oxley Highway passes steep, tall stands of forest on the east coast, through to predominantly agricultural areas where it extents west of the great dividing range and into central NSW. The landscape surrounding the road corridor has been largely cleared of native vegetation to make way for agriculture, extensive amounts of land have been cleared in western NSW largely as a result of the long history of agricultural land use such as grazing and cropping, the exception being for the region between Mount Seaview and Walcha on it eastern slopes (National park and State forest estates) and Pilliga Forest, some 3000 square kilometres of semi arid woodland north of Coonabarabran.

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

In some parts of the Oxley Highway corridor, remnant vegetation can be exclusively found within the road reserve, as the surrounding environment is highly modified and disturbed. Due to the absence of suitable supporting habitat, and the intrinsic value of standalone flora species, the remnant vegetation within the road reserve is regularly of very high conservation value. Most threatened species are recorded in NSW road reserves, as they are easily accessible and highly visible areas. Long, east-west corridors such as the Oxley Highway provide an important connectivity function for migratory birds and other threatened species. The corridor also has east-west habitat links, generally along creek lines and vegetated road reserves, to other remnant patches, such as the wooded foothills of the Great Dividing Range.

High value vegetation conservation communities exist along the Oxley Highway that require protection. There is a need to balance the need to protect these communities and the need for adequate clear zones. It will be important to meet the needs for road users and the environment by progressively relocating trees and other vegetation, as well as establishing and improving habitat conditions outside the clear zones.

Flora

There are about 14 different endangered ecological communities listed along its length under either the Threatened Species Conservation Act (1995) or the Federal Environment Protection and Biodiversity Conservation Act (1999). These include the Sandhill Pine Woodland, Ocasuarina luehmannii Woodland, Myall Woodland, Inland Grey Box Woodland, Grey Box (Eucalyptus microcarpa) Grassy Woodlands, Buloke Woodlands, Weeping Myall Woodlands, 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 very valuable in most cases.

Fauna

The vegetation along the Oxley Highway corridor has a variety of functions. It is a home and movement corridor for threatened fauna like the Squirrel Glider, Brown Tree Creeper and Spotted Quoll. Both Port Macquarie and Gunnedah have been highlight as having major koala populations. It is a seed resource for threatened trees, grasses and shrubs and forms a transparent screen for many agricultural activities.

Aboriginal and European history

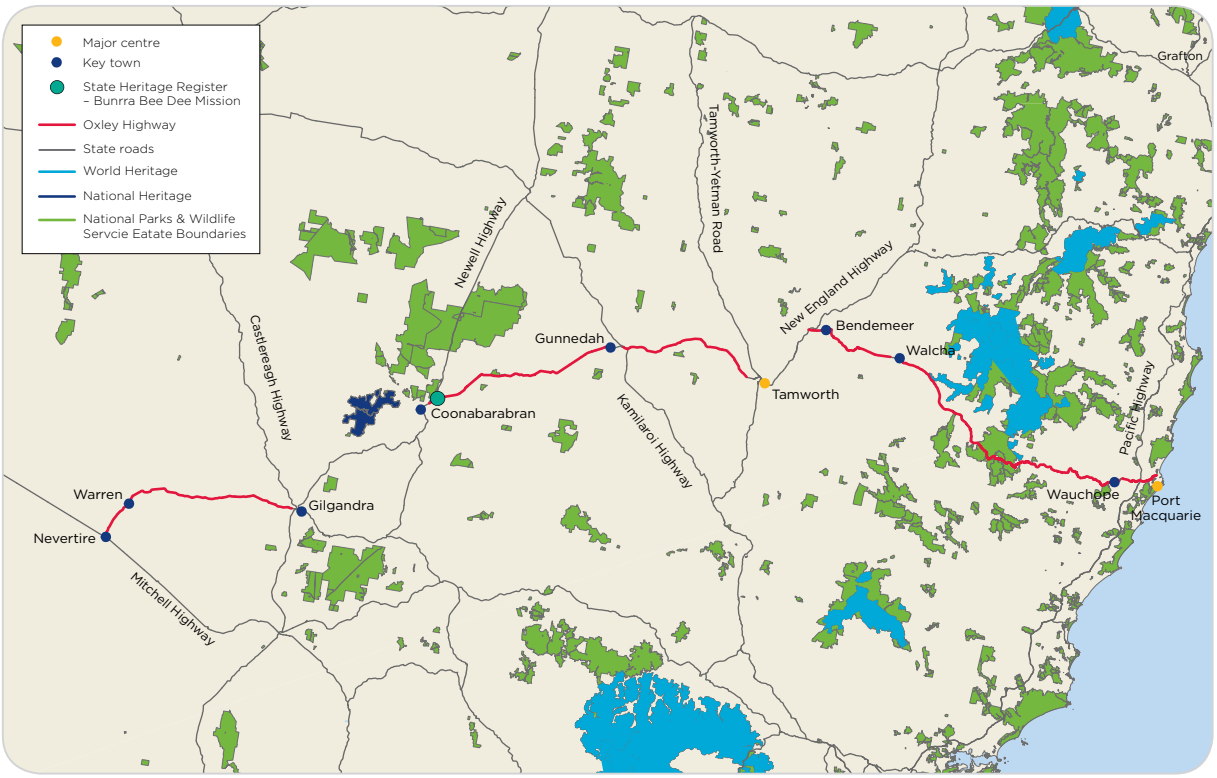
The Oxley Highway corridor is home to a long history of both Aboriginal and non-Aboriginal Australians. A diverse range of Aboriginal heritage exists within and around the Oxley Highway road reserve, such as scarred trees, stone implements and meeting places. The Burra Bee Dee Mission near Coonabarabran is considered to be an Aboriginal site of State significance and is included on the State heritage register.

Non-Aboriginal heritage associated with mining and agriculture also abound. Roads and Maritime Services procedures developed in consultation with local Aboriginal communities, ensure the identification and ongoing protecting of sensitive cultural sites within the road corridor.

It is the responsibility of RMS to manage the road reserve to balance the needs of road users with the needs of the environment. It would be desirable to meet the needs of road users and the environment by progressively relocating trees from the clear zone, as well as establishing and improving habitat conditions outside of the clear zone.

Figure 5-33 shows major rivers in the vicinity of the Oxley Highway as well as areas of World Heritage, National Heritage and NSW National Parks.

Figure 5-33 National parks, State forests, State Heritage and other protected areas



Noise

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

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

Landscape and urban design

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

Impact of road projects on the environment

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

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

6 FUTURE CORRIDOR CHANGES

Surveyors Creek Bridge

6.1 Population and demographics

Population forecasts

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.

Across regional NSW, a range of changes will influence travel demands over the next two decades. In general, the annual average growth of the regional NSW population was 0.4 per cent per year from 2006 to 2011. This is expected to remain at an average 0.5 per cent per annum growth through to 2031.[54] Regional populations will continue to get older, with 27 per cent of the population expected to be over 65 years in 2031.[55]

The total population of the Local Government Areas along the Oxley Highway corridor is about 166,350 people of which 60.2 per cent of the total population live in key towns.

The Department of Planning and Environment has prepared population projections and growth rates for regional NSW. 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.

Table 6-1 Population LGA and urban centre demographics

LGA	2011 LGA Population	Urban Centres	2011 Urban Population	Forecast 2031 LGA Population	% Change
Port Macquarie -Hastings	75,250	Port Macquarie	41,491	90,800	17.13%
		Wauchope	6,372		
Walcha	3,100	Walcha	1,482	2,750	-12.73%
Tamworth Regional	58,250	Tamworth	36,131	67,750	14.02%
Gunnedah	12,500	Gunnedah	7,888	13,300	6.02%
Warrumbungie	9,900	Coonabarabran	2,576	8,800	-12.50%
Gilgandra	4,500	Gilgandra	2,664	4,000	-12.50%
Warren	2,850	Warren	1,523	2,400	-18.75%
Total	**166,350**		**100,127**	**189,800**	**12.36%**

As shown in Table 6-1, population growth varies across NSW, but is generally occurring most rapidly in coastal areas. Along the Oxley Highway corridor, the highest population increase is expected in Port Macquarie-Hastings, which is set to grow from 75,250 in 2011 to 90,800 people in the year 2031, an annual average change of 20.7 per cent between 2011 and 2031.[56]

60 Department of Planning and Infrastructure, 2014, *New South Wales in the future: Preliminary 2013 population projections*. Sydney, p. 3-4. http://www.planning.nsw.gov.au/Portals/0/HousingDelivery

61 Ibid, p. 27.

62 Department of Planning and Infrastructure 2014, New South Wales in the future: Preliminary 2014 population projections, Preliminary release of NSW state and local government area population projections, DPI, Sydney. http://www.planning.nsw.gov.au/Portals/0/HousingDelivery

Along the corridor the major centres of Port Macquarie, Tamworth and Gunnedah are expected to experience population growth while the population in other smaller townships and localities are expected to decline. In consideration of the variances between the eastern and western section of the route in terms of industry, growth, environment and demographics, the likely future changes will be broadly discussed in two parts – the first relating to the section of the corridor between Port Macquarie and Bendemeer and the second will relate to the section from Tamworth to Nevertire.

Port Macquarie to Bendemeer

Growth in the eastern sector of the corridor will be largely associated with Port Macquarie and the demand in land for residential, commercial and industrial purposes. Outlaying catchments such as Sancrox, Thrumster and Wauchope to the west and Lake Cathie to the south, will provide much of the greenfield sites on which to accommodate the growth of the local economy and population. Subsequently infrastructure commensurate with demand will be required to ensure that these geographical distances do not hinder the efficiency of the local economy and that growth is supported and accommodated by the road network. The CBD of Port Macquarie is expected to continue to attract more trips and place increasing pressure on the capacity of the road network, particularly the efficient functioning of the intersection at Pacific Highway and Oxley Highway, intersections east of Wrights Road and of alternate routes to the CBD. Further west, trips emanating from growth areas at Wauchope and Sancrox will place additional pressure not only in the Port Macquarie CBD but along the whole section of the corridor between Wauchope and Port Macquarie. Census trends indicate that the urban centre of Walcha will continue to experience slight population growth, though the Walcha LGA will experience slight decline.

Tamworth to Nevertire

Commensurate with national trends, the corridor will experience its largest growth rates in the coastal region and lower growth in inland centres. The continued growth in Tamworth, however, demonstrates the significance of the town as a dominant economic and social service centre for the surrounding regional catchment. Key motivators include the industrial growth of agriculture, livestock and mining in the area. Projections for Gunnedah indicate that Gunnedah will experience population decline in the future, though the expansion of the mining industry is expected to reverse this trend in the near future.

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 18 per cent of the regional population in 2011 to 27 per cent of the population in 2031.[57]

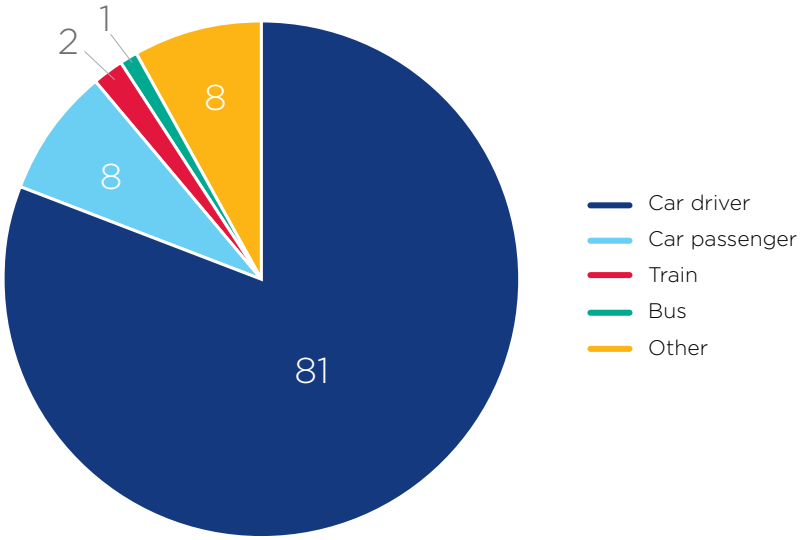
The median age of all urban centres along the corridor is above the national average of 37, except Tamworth, indicating an ageing population where age distribution shifts toward older ages due to increasing life expectancy and declining birth rates. An ageing population may have implications on services and facilities within an area, as well as road user behaviour and safety requirements. These may also include risks associated with road user safety, such as illumination, speed, visibility, asset condition as well as traffic movements and distribution.

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 6-1 journey to work trips by train or bus account for only three per cent of regional travel.

54 Department of Planning and Infrastructure, 2014, New South Wales in the future: Preliminary 2014 population projections. Sydney, p. 27.

Figure 6-1 Journey to work trips in regional NSW in 2006[58]



In regional areas, levels of car ownership are very high and motor vehicles are the main way people choose to move around.

Analysis of the car ownership of the households in Port Macquarie-Hastings Local Government Area shows that 88.9% owned at least one car while 7.7% did not. Of those that owned at least one vehicle, there was a smaller proportion who owned just one car; a larger proportion who owned two cars; and a larger proportion who owned three cars or more. Overall, 42.1% of the households owned one car; 34.2% owned two cars; and 12.6% owned three cars or more.

Analysis of the car ownership of the households in Tamworth Regional Council in 2011 compared to Regional NSW shows that 88.9% of the households owned at least one car, while 7.3% did not, compared with 86.0% and 7.6% respectively in Regional NSW. Overall, in the Tamworth Regional Council area, 35.2% of the households owned one car; 36.6% owned two cars; and 17.1% owned three cars or more, compared with 36.0%; 34.4% and 15.5% respectively for Regional NSW.

This reflects the general trend in regional NSW with a heavy reliance on car travel and will remain a very important mode of transport.

Land use changes

The NSW Department of Planning and Environment (DP&E) is currently working to review the existing NSW Regional Strategies to prepare new Regional Growth Plans 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 Mid North Coast Regional Strategy developed in 2009 and New England North West Regional Strategy developed in 2012 by the NSW Department of Planning, are among these strategies being reviewed and updated.

55 TfNSW, *Long Term Transport Master Plan*, p. 216

Port Macquarie to Bendemeer

Mid North Coast Regional Strategy

The Mid-North Coast Regional Strategy[59] covers the area from Tea Gardens to Yamba and across to the Great Dividing Range. The strategy identifies the Port Macquarie-Hastings sub-region as a major regional centre with significant capacity and potential for growth between 2006 and 2031. The recent upgrade of the Port Macquarie Base Hospital, co-location of medical services and plans for a new University campus will attract additional regional visits to the Port Macquarie area via the Oxley Highway. The Department of Planning have forecasted an additional 58,400 dwellings will be required by 2031, of which 17,800 will be required in the Port Macquarie-Hastings area. The Strategy identifies Thrumster, Lake Cathie and Bonny Hills as areas which will accommodate much of this predicted future growth. The town of Wauchope is also predicted to experience growth in response to the increasing demand for housing and commercial land supplies within Port Macquarie. Oxley Highway's regional role as a vital transport and commuter link will continue to increase in significance over the next 25 years.

Port Macquarie

Due to the high levels of expected growth in Port Macquarie a number of land releases are underway or planned which are likely to impact on the corridor. The releases include large scale residential, rural residential and industrial development generating and attracting large traffic volumes. The main development sites are Thrumster, Sancrox and north-west Wauchope.

Thrumster

Thrumster (Area 13) is a residential community on the outskirts of Port Macquarie with the benefits of easy access to the Pacific Highway as well as to the Port Macquarie CBD via the Oxley Highway. Thrumster is planned to accommodate over 2500 dwellings and will include a town centre and community facilities and schools. A significant proportion of residents are likely to use the Oxley Highway to reach employment centres.

Sancrox

Sancrox release area is comprised of two significant areas, the first component being the Sancrox Employment Lands, comprising a large scale industrial precinct of 220 hectares fronting the Pacific Highway. The most direct access to Port Macquarie being via the Pacific and Oxley Highways. The second component is the Greater Sancrox Area, comprising dispersed rural residential development of up to 900 allotments that would access the Oxley Highway at Rawdon Island Road and Billabong Drive.

North – West Wauchope

Given the growth of Wauchope as an inland beneficiary of Port Macquarie, a series of small and large residential land release area are planned north west and west of Wauchope. In combination the sites will comprise over 2000 allotments with the majority gaining primary vehicular access to the Oxley Highway via Beechwood Rd, and the remaining having direct access to the corridor. It is likely that this growth will result in increased trips along the Oxley Highway during peak periods, particularly through the intersection at Cameron Street and the rail level crossing. A network approach to the improvement of intersections across the road network will assist in the dispersal of peak traffic movements.

Walcha

Walcha township is a stable population and economy with land use changes not expected to significantly impact on the operation of the Port Macquarie to Nevertire Corridor. Due to the strong agricultural sector and the relative remoteness of the community, adequate transport infrastructure to major service centres such as Armidale and Tamworth is imperative to enable the provision of efficient and safe connections to the broader regional and State economy.

56 NSW Department of Planning, 2009, Mid-North Coast Regional Strategy

Tamworth to Nevertire

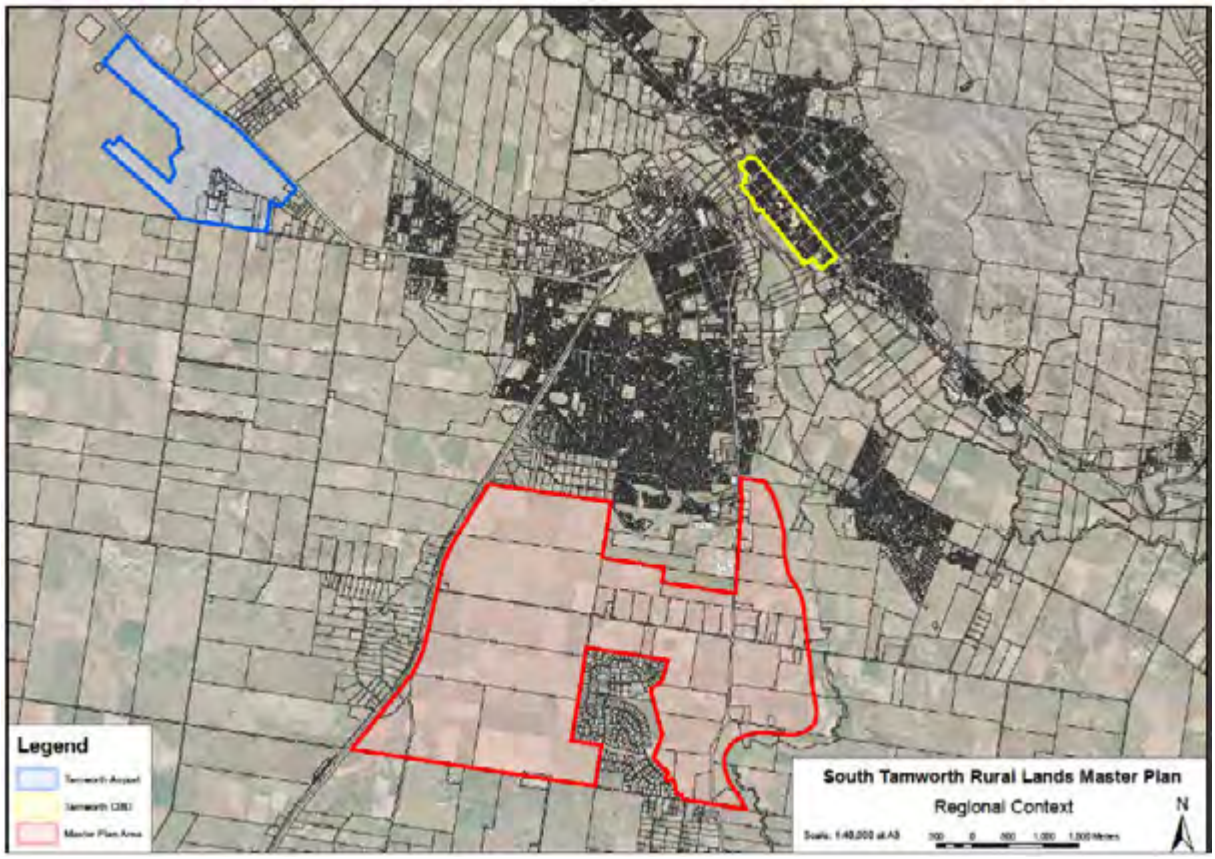
New England North West Strategic Regional Land Use Plan

A New England North West Strategic Regional Land Use Plan[60] incorporates Tamworth, Walcha and Gunnedah Local Government Areas amongst others, and includes the area west of the Great Dividing Range to Moree and from the Queensland border to Upper Hunter shires. The strategy pertains largely to the mining activities occurring in the Gunnedah basin and seeks to ensure activities do not significantly impede on the livelihood, enjoyment and agricultural values of rural lands.

South Tamworth Rural Lands Master Plan

South Tamworth Rural Lands Master Plan depicts planned growth areas south of the Australian Equine and Livestock Events Centre (AELEC) and the existing urban area. The master plan study area consists of residential, industrial, commercial and rural-residential release areas to be developed over a five to 20 year time period. While the majority of the vehicle movements would access the Tamworth via the New England Highway, the Masterplan includes an alternative heavy vehicle route, planned by Council to link the Oxley Highway to the New England Highway via Werris Creek Road (MR130) and Burgman's Lane. This will enable trips between the north and south of Tamworth without travelling through the urban centre.

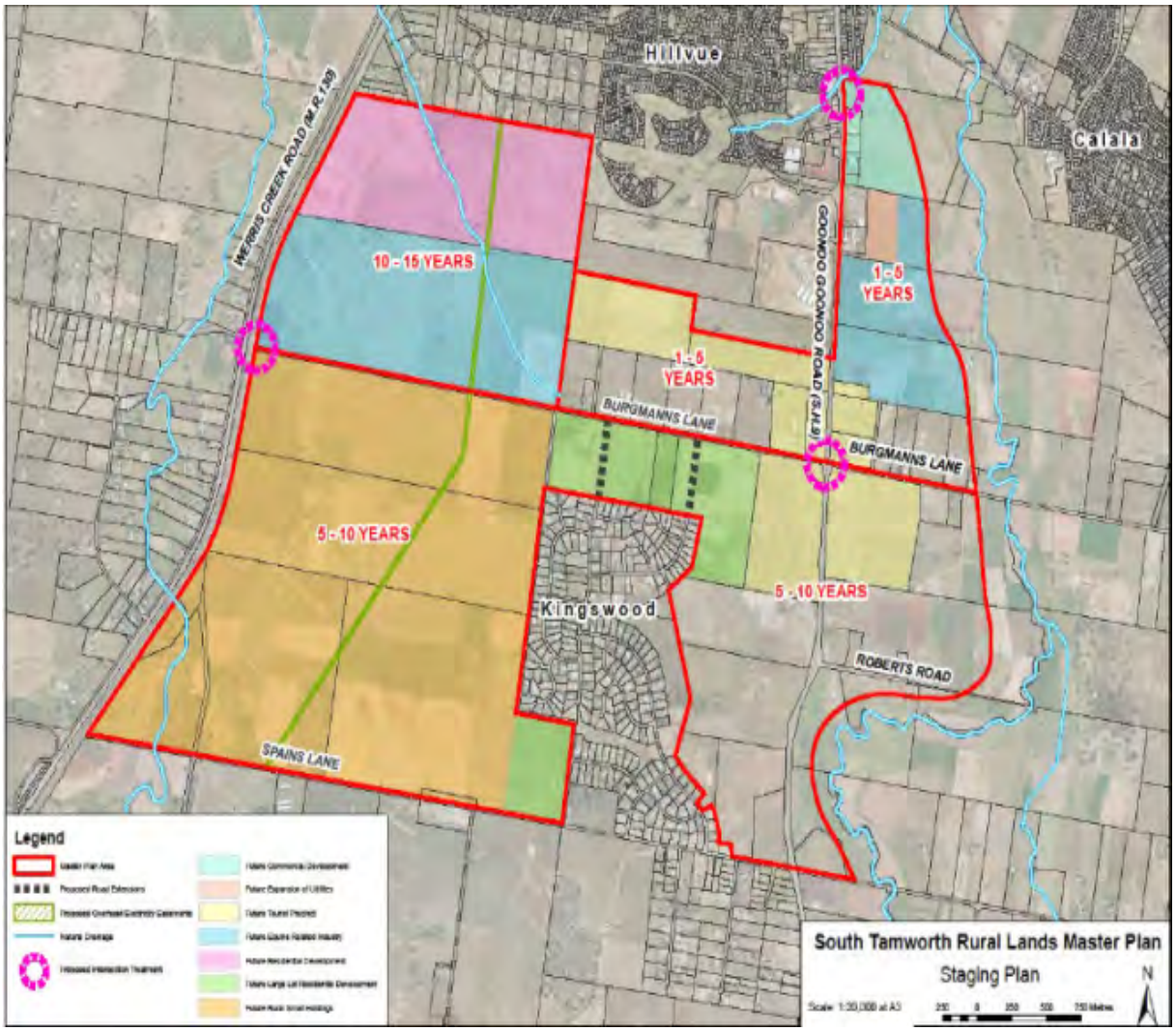
Figure 6-2 South Tamworth Rural Lands Master Plans[61]



57 New England North West Strategic Regional Land Use Plan, 2012,Department of Planning and Infrastructure

58 South Tamworth Rural Lands Master Plan,2012, Tamworth Regional Council

Figure 6-3 South Tamworth Rural Lands Master Plans[62]



Tamworth Regional Council Urban Strategy and Traffic Study

Tamworth Regional Council developed a strategic document outlining the desired future growth and direction of the greater Tamworth region. The document makes reference to industrial, commercial and residential development as well as other community facilities, activities and prospective growth directions. The Hills Plain, Westdale and South Tamworth Rural Lands areas are the major planned urban release area for the region.

Coledale Urban Renewal Masterplan

Coledale is located in west Tamworth adjacent to the Oxley Highway and Duri Rd. The site is subject to a renewal plan which involves revitalisation, improved pedestrian and vehicular connectivity with surrounding areas and the Tamworth Lifestyle Village. The resulting development is likely to improve existing access arrangements to local roads from the Oxley Highway with some minor increases in vehicular trips.

59 South Tamworth Rural Lands Master Plan,2012, Tamworth Regional Council

Hercules to Mahony Street

The section of corridor in west Tamworth between Hercules St and Mahony St has experienced continued demand for access to the corridor from adjacent commercial and industrial properties. Ongoing growth in the regional poultry industry is generating increased demand for heavy vehicle access to the facility located in Out Street. Continued access and travel demand management strategies will be required to ensure that the integrity of the network is preserved and that demand for access and road user safety is maintained.

West Tamworth to Bowlers Lane

The section of the corridor between West Tamworth and Bowlers Lane (about 6.5km) extends from the urban areas of Tamworth to its rural industrial outskirts. This section of the corridor is subject to continued and sustained growth for light industrial, industrial and commercial industry with primary vehicular access to the Oxley Highway. This length provides the primary access from Tamworth to the Tamworth Regional Airport and the Goddard Lane Industrial Precinct and the Tamworth Regional Livestock Exchange (TRLX). Subsequent increases in traffic volumes and turning movements to and from the corridor will increase demand on network capacity.

Gunnedah

Growth in coal mining activities in the Gunnedah Coal Basin has placed increasing pressure on the local and state road network in and around Gunnedah. Mine sites access the corridor via the Kamilaroi Highway (HW29) and the majority of coal is freighted by rail. Secondary impacts are expected and relate mainly to the increase in ancillary vehicle movements and an increase in train frequency generating disruptions to local trips via level crossings. The forecast additional pressure on the rail overbridge in Gunnedah has resulted in planning for the construction of a second overbridge to improve network connectivity. The increase in employment arising from the expansion of the mining industry will likely increase trips along the Oxley Highway between Gunnedah and Tamworth.

6.2 Traffic growth

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

Roads and Maritime has been collecting traffic data on the Oxley Highway since 1967, during this time there has been growth and development within the urban centres particularly Port Macquarie and Tamworth. A linear calculation was used based on historical traffic data to calculate traffic growth, forecasted 2035 traffic volumes are detailed in Table 6-2.

Table 6-2 Forecast traffic volume – Oxley Highway

ID	Description	2015 (vpd)	% Growth per annum	Predicted 2035 (vpd)
Site 1	480 metre west of Lake Road at Port Macquarie	30200	1.8%	43148
Site 2	West of John Oxley Drive underpass at Port Macquarie	17176	1.8%	24540
Site 3	2 km west of HW10 at Partridge Creek	11533	1.8%	16478
Site 4	600 metres west of Timbertown at Yippin Creek	2346	1.7%	3287
Site 5	3.3 km west of Beechwood Road, Yippin Creek West	2266	1.4%	2992
Site 6	3.2 km west of Knodingbul Road near Ellenborough	463	0.5%	512
Site 7	Eastern side of Yarrowitch River Bridge	503	0.5%	556

ID	Description	2015 (vpd)	% Growth per annum	Predicted 2035 (vpd)
Site 8	70 metres west of Lagoon Street at Walcha	1147	0.5%	1267
Site 9	West of Ruby Hills Road Jamison's swamp culvert	743	0.5%	821
Site 10	70 metres west of Hall Street at Tamworth	11419	1.7%	15997
Site 11	560 metres west of Mahony Street at Tamworth	9538	1.7%	13362
Site 12	1.4 km west of Bowlers Lane at Wallamore	3463	1.3%	4484
Site 13	Eastern side of railway overpass at Gunnedah	7362	1.0%	8983
Site 14	1.9 km west of Coolah Road at Goally Creek near Mullaley	684	1.0%	835
Site 15	70 metres west of Castlereagh River bridge at Gilgandra	2913	1.0%	3554
Site 16	70 metres west of Railway Street at Gilgandra	2967	1.0%	3620
Site 17	980 metres west of Berida Bullagreen Road near Collie	368	1.4%	486
Site 18	West of Macquarie River bridge at Warren	3101	1.4%	4095
Site 19	9 km west of Industrial Road at Snakes Plains	775	0.8%	909

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

The annual traffic growth rate along the Oxley Highway is expected to increase over the next 20 years. Larger regions such as Port Macquarie, Wauchope, Tamworth and Gunnedah are expected to grow more than smaller regional towns along the corridor. This is due to predicted population growth greater prospects of employment in these areas.

Traffic growth is predicted to increase by:

- 1.8% per annum between Port Macquarie and Wauchope
- 1.4% per annum between Wauchope and the Ralfes creek Mount Seaview
- 0.5% per annum between Ralfes creek and Walcha
- 0.5% per annum between Walcha and the New England Highway, Bendemeer
- 1.3% per annum between Tamworth and Gunnedah
- 1.0% per annum between Gunnedah and the Newell Highway, Coonabarabran
- 1.4% per annum between Newell Highway, Gilgandra and Mitchell Highway, Nevertire

Intersection performance

Intersection performance is challenging to model over a long period. Intersections are assessed on a five yearly basis and improvement recommendations identified in accordance with the assessed performance. Improvements for intersections are discussed in Section 7.

6.3 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 coal mining industry in the Gunnedah and Narrabri basin will be a contributing factor to the transport planning decisions for the Oxley Highway. A new rail over road bridge in Gunnedah is planned for construction due to the inability of the Dr. P.H Stanley Bridge on the Abbott Street section of the Oxley Highway to carry Higher Mass Limit (HML) vehicles. The second road over rail bridge will ease traffic congestion at the New Street level crossing which currently causes queuing through the intersection with the Oxley Highway and subsequent delays.[63] These delays are expected to increase as the length and frequency of coal trains using the rail line increases to keep pace with continued development of the coal industry.

Exploration in the Gunnedah Basin has increased in recent years, focusing on extraction of thermal and coking coal from several mines in the region as well as unconventional gas / coal seam methane (CSM).[64] This growing industry will also have a contribution to heavy vehicle transport demands during startup, maintenance, decommissioning and rehabilitation of these projects in the future.

The agricultural economy plays a large role in the regions along the Oxley Highway and is the largest in the Gunnedah shire.[65] Activities such as beef grazing, sheep, grain, dairy, poultry and lucerne in the Tamworth region as well as cattle, sheep, pigs, wheat, cotton and several other grown crops in the Gunnedah region contribute to the freight movements along the Oxley Highway.

Although B-Double and HML vehicle routes are currently restricted due to the road geometry passed Ralfes Creek 52.9km west of Wauchope, these types of vehicles are able to access freight routes to larger metropolitan areas and ports through the adjoining highways such as the Newell and New England.

The forecast daily truck movements and freight task on the Oxley Highway for 2031 is shown in Table 6-3. The highest growth is shown in the Port Macquarie, Tamworth, Gunnedah and west of Gilgandra of around 3.87, 3.94, 3.41 and 3.70 per cent between 2011 and 2031. (respectively)

Table 6-3 Forecast year daily truck annual tonnage (2031)

Corridor Planning Sections	Freight Flow (2011) (kilotonnes p.a)			Freight Flow (2031) (kilotonnes p.a)			% Increase from 2011	% Increase from 2011 p.a.
	Forward	Reverse	Total	Forward	Reverse	Total		
1. Port Macquarie to Wrights Road (Port Macquarie)	480	140	620	860	240	1100	1.67	3.87
2. Wrights Road to Pacific Highway (Port Macquarie)	480	140	620	860	240	1100	1.67	3.87

63 NSW Government Road and Maritime Services 2013, viewed 12th March 2015 < http://www.rms.nsw.gov.au/documents/projects/northern-nsw/gunnedah/gunnedah-prelim-concepts-options-report-app-c.pdf>

64 NSW Government Trade & Investment Resources and Energy 2015, viewed 12th March 2015 <http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/nsw-geology-overview/sedimentary-basins/gunnedah-basin>

65 Gunnedah Shire Council 2015, Gunnedah, Discover the Facts, viewed 12th March 2015 <https://www.gunnedah.nsw.gov.au/jdownloads/Residents%20%20Community/Living%20in%20our%20Community/gunnedah_-_discover_the_facts.pdf>

Corridor Planning Sections	Freight Flow (2011) (kilotonnes p.a)			Freight Flow (2031) (kilotonnes p.a)			% Increase from 2011	% Increase from 2011 p.a.
	Forward	Reverse	Total	Forward	Reverse	Total		
3. Pacific Highway, Port Macquarie to Wallace Street, Wauchope	260	150	410	350	250	600	1.46	2.32
4. Wallace Street to west of Yippin Creek (Wauchope)	120	10	130	150	20	170	1.31	1.54
5. West of Yippin Creek to Ralfes Creek	120	10	130	150	20	170	1.31	1.54
6. Ralfes Creek to Seaview Road	120	10	130	150	20	170	1.31	1.54
7. Seaview Road to west of Road to Tia (2nd Occ)	120	10	130	150	20	170	1.31	1.54
8. West of Road to Tia (2nd Occ) to west of Towers Street (Walcha)	140	90	230	180	110	290	1.26	1.30
9. West of Towers Street to New England Highway, Bendemeer	130	80	210	180	110	290	1.38	1.90
10. New England Highway to New Winton Road (Tamworth)	1550	900	2450	2820	1560	4380	1.79	3.94
11. New Winton Road Tamworth to Oxley Highway Roundabout Gunnedah	590	400	990	910	630	1540	1.56	2.78
12. Oxley Highway Roundabout to east of Hunts Road (Gunnedah)	1430	1150	2580	2170	2170	4340	1.68	3.41
13. East of Hunts Road, Gunnedah to Newell Highway, Coonabarabran	390	360	750	550	590	1140	1.52	2.60
14. Newell Highway to Howards Place (Gilgandra)	600	560	1160	850	980	1830	1.58	2.89
15. Howards Place Gilgandra to east of Hospital Road	470	220	690	820	380	1200	1.74	3.70
16. East of Hospital Road, Warren to Mitchell Highway, Nevertire (Including Warren)	480	220	700	830	330	1160	1.66	3.29

6.4 Future public transport and active transport

As noted in Section 4.5 the NSW Government actively promotes the use of non-car based modes of transport for a variety of reasons beneficial to our society.

The strategy for improving public and active transport will involve integrating regional transport planning with land use planning and other NSW Government initiatives such as Regional Action Plans and Department of Planning & Environment Regional Growth Plans. This will ensure public and active 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 Mid North Coast, New England North West, Central Western and Western Region Transport Plans to help reduce reliance on cars in the region.

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.

For example, public/active transport actions include:

- Improvements to the footpath near the transport interchange at Port Macquarie
- New footpaths and waiting area for the transport interchange at Wauchope
- Upgrading the transport interchange at Tamworth including improved bus service information and better footpaths

Active transport

In regional NSW the provision for good public transport services requires careful planning to take into account long travel distances and dispersed demand.

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

Walking

The NSW Government is committed to making walking easier and safer to make it a more appealing choice for customers. As the focus for current and future residential develop along the Oxley Highway, increased walking activity will be most likely around Port Macquarie, Wauchope, Tamworth and Gunnedah. Future pedestrian infrastructure for the Oxley Highway could be supported by:

- The NSW Government's Walking Communities Program which will deliver State funding and contribute to local government initiatives to help boost rates of walking. This includes funding for walking infrastructure within two kilometres of centres and transport interchanges.
- Safe crossing opportunities for cyclists and pedestrians. This includes pedestrian refuges, and shared walking and cycling paths on corridor along and across the highway.

Cycling

A stated aim of the *NSW LTTMP* is to enhance cycling routes in regional centres in order to increase the number of people who cycle. Increased cycling activity will be most likely to occur around Port Macquarie, Tamworth and Gunnedah.

Regional cycling initiatives are addressed in the Mid North Coast, New England North West, Central West and Western Regional Transport Plans. For example, active transport actions include

- Improve opportunities for walking and cycling within Port Macquarie, Tamworth and Gunnedah

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

As part of this commitment Roads and Maritime will also act proactively to provide sealed road shoulders of a width that is adequate to accommodate cyclists in locations where cyclists are present, on an as needed and priority basis There are an increasing number of cyclist travelling between Wauchope and Port Macquarie, Road and Maritime will continue to monitor cyclist activity between these urban centre and investigate opportunities to provide safe cycling facilities.

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

6.5 Climate change

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

The NSW Office of Environment and Heritage (OEH) is developing new, fine-scale climate projections for New South Wales and the Australian Capital Territory using a regional climate model called the NSW and ACT Regional Climate Model or NARCliM. This will include the Mid North Coast and New England North West regions and Oxley Highway corridor.

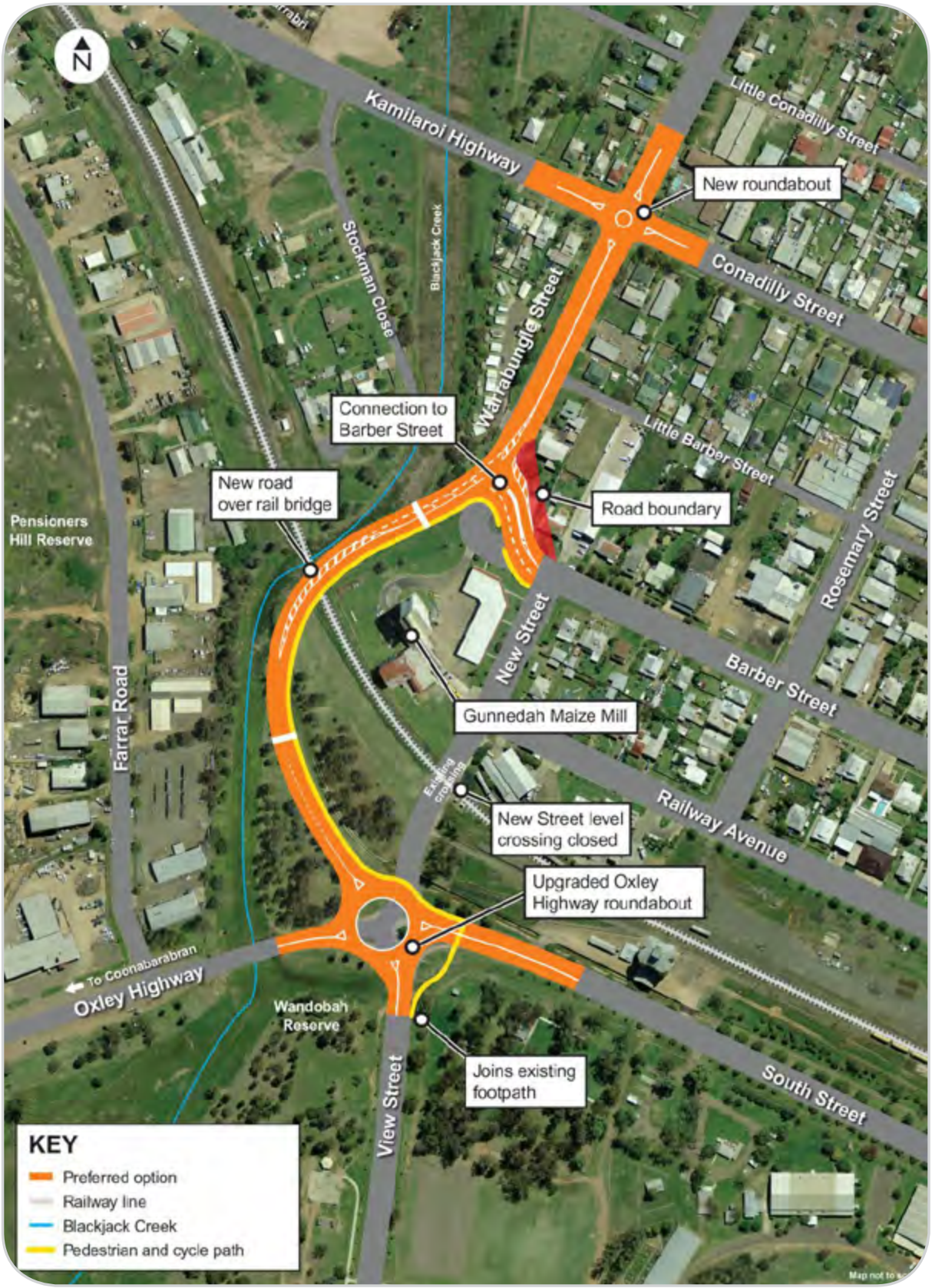
It is likely an increase in the frequency and intensity of storms would lead to more frequent short and long term highway closures. Climatic conditions will continue to be monitored for potential road impacts.

6.6 Road corridor changes

Gunnedah Rail Overpass

With major coal development occurring in the Gunnedah basin, the length of coal trains has been increasing, causing extended delays at nearby level crossings in Gunnedah. There is the need to improve traffic efficiency. The existing Abbott Street Bridge presents an obstacle for freight efficiency, as it cannot carry Higher Mass Limit (HML) vehicles and needs to be strengthened. The Gunnedah overpass will be built to allow easier movement of traffic around Gunnedah. The preferred option will provide an unrestricted higher mass limit (HML) route through Gunnedah and maintain access to the Barber Street business precinct through an upgraded intersection. The route will connect the Oxley Highway with a new roundabout at the intersection of Conadilly and Warrumbungle Streets. The new route will replace the New Street level crossing, which will be closed.

Figure 6-4 Preferred Option Gunnedah Rail Overpass



7 CORRIDOR CHALLENGES AND PRIORITIES

Hoss Causeway

Corridor challenges are the main issues that need to be overcome to maintain or improve transport roles and services that the Oxley Highway provides for the community. They include challenges already evident and others that are expected to emerge as the result of future changes in land use and demographics. These challenges have been mapped in Table 7.1, Table 7.2 and Table 7.3 against broader *NSW Long Term Transport Master Plan* objectives.

NSW Government priorities for responding to the Oxley Highway corridor challenges are also set out below. The priorities are divided into short, medium and long term investment priorities proposed to address these challenges.

The planning of these potential works will consider where multiple projects can be combined to maximise the financial investment and efficiency. Implementing these actions will improve road safety, whole-of-life economic benefits and traffic efficiency.

The strategy identifies infrastructure (engineered) and operational (non-engineered) initiatives to improve road user safety, reduce travel times and increase reliability along the Oxley Highway.

A number of improvement projects identified during the study can be considered as routine maintenance activities such as pavement repairs and line marking for which an annual budget allocation and program is already in place. This section focuses on addressing concerns specific to the Oxley Highway corridor.

Regular monitoring of this corridor strategy will be undertaken, with a progress report being prepared every three years to review progress and to identify any issues that require addressing. Monitoring will also help to identify new actions or tasks that may be required to ensure ongoing opportunities along the Oxley Highway corridor are being considered.

The draft Strategy will be targeted for review every five years. Implementation of the final strategy will be a shared responsibility with NSW Government and Councils in collaboration with other state agencies.

7.1 Short term priorities (0-5 years)

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Improve liveability Reduce social disadvantage	Existing lane and intersection configuration limit efficiency of access to and from the network. Some intersections experience significant variations in the level of service. This is especially the case in the far western sections of the Oxley Highway where a seasonal factor, such as the production of grain crops, is associated with increased numbers of heavy vehicles, and also in the urban growth areas that experience commuter peaks.	Investigate opportunities to improve the capacity and standard of key intersections, incorporating heavy vehicles turning paths where necessary to increase efficiency and safety including but not limited to: • Oxley Highway and Wrights Road, Port Macquarie • Pacific Highway and Oxley Highway, Port Macquarie • Oxley Highway and Lake Road, Port Macquarie • Appleby Lane and Oxley Highway, Tamworth. • Oxley Highway, Bloomsfield Street, Gunnedah • New Winton Road and Oxley Highway Tamworth • Rushes Creek Road and Oxley Highway, Carroll Gap • Boundary Road and Oxley Highway, Gunnedah • Federation Street and Oxley Highway and Hargarves Lane and Oxley Highway, Gilgandra • Middleton memorial drive and Oxley Highway, Gilgandra	5.4 Road design and geometry Intersections Traffic
Regional development/ accessibility	There are flood immunity issues along the entire route. The highway is currently susceptible to nuisance flooding as well and flooding from larger events including swollen river systems and sheet flow over expansive flood plains. There are a large number of defective culverts on the Oxley Highway.	Raise the road levels of the Oxley Highway at Hoss Causeway and Tommy Swamp (west of Tamworth) to a 2 year ARL level of serviceability by installing box culvert structures. Investigate opportunities to improve flood immunity at Kings creek, O'Neils creek and Timbumburi creek. Rehabilitate defective culverts on a priority basis.	5.4 Road design and geometry Flooding Road culvert risk rating

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Reduce social disadvantage	Poor road geometry along some stretches of the corridor results in reduced travel speeds, increased travel times and road safety risks.	Improve the alignment and overtaking opportunities on the section of the Oxley Highway between the Pacific Highway and Wauchope particularly Spencers cutting. Investigate options for future duplication between the Pacific Highway and Wauchope. Investigate opportunities to Improve road alignment particularly in higher risk locations including but not limited to: • Between Wauchope and Long Flat • Between Congi Creek and Bendemeer • Surveyors Creek	5.4 Road design and geometry Horizontal curves Grades Steep grades on curves NSW Long Term Transport Master Plan p253
Reduce social disadvantage	Increasing number of cyclist between Wauchope and Port Macquarie.	Investigate options for cyclist connectivity between Wauchope and Port Macquarie.	5.1 Road Safety Vulnerable road users
Reduce social disadvantage	Increasing number of pedestrian crashes in Wauchope and Tamworth.	Develop and construct improvements in pedestrian facilities within Wauchope and Tamworth along the Oxley Highway. Work with all Councils to develop or review Pedestrian Access Mobility Plans (PAMP) to assist planning for appropriate facilities.	5.1 Road Safety Vulnerable road users
Reduce social disadvantage	Due to the terrain and formations of the corridor, it is difficult to provide appropriate lanes and shoulder widths in some locations – particularly over the Wauchope to Walcha ranges. The narrow sealed shoulders between Tamworth and Gunnedah reduce road safety by not allowing room for a driver to correct an errant vehicle.	Progressively improve the formation width, by widening sealed shoulder and improving lane widths at location such as: • Pacific Highway to Wauchope • Wauchope to Seaview Road • Walcha to the New England Highway • Tamworth to Gunnedah • Gunnedah to the Newell Highway • Gilgandra to Collie	5.4 Road design and geometry Lane width Sealed Shoulders

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Safety and Security	The clear zones along the Oxley Highway corridor contain hazards such as large trees which can cause road safety issues.	Implement identified clear zone works to remove or provide protection from hazards including culverts within the clear zone taking into consideration the road geometry and environment/ land use constraints.	5.4 Road design and geometry Clear zones
Reduce social disadvantage	The lack of overtaking lanes along the corridor increases travel time and impacts on safety especially along the Wauchope to Walcha range, between Wauchope and the Pacific Highway and between Tamworth and Gunnedah.	Investigate potential 'Pull Over Bays' – for opportunities to pass slower vehicles along the Wauchope to Walcha range. Increase safe overtaking opportunities by developing and constructing additional overtaking lanes and investigating opportunities to extend existing overtaking lanes: • Pacific Highway and Wauchope • Between Tamworth and Gunnedah Implement improvements to the existing delineation and linemarking in accordance with standards on a priority basis particularly those identified along the Wauchope to Walcha range.	5.2 Traffic Level of service Overtaking Lanes and Opportunities
Regional development/ accessibility	Increasing traffic congestion within the urban areas of Port Macquarie and Tamworth. Managing access and growth associated with the Sancrox and Thrumster areas of Port Macquarie/Hastings and fostering local connectivity between these growth areas and Wauchope/Port Macquarie. Westdale/Oxley Vale – access to Taminda industrial area (Dampier St), Peel High school, airport and industrial growth area around Tamworth.	Develop recommendations of the Port Macquarie traffic study to support residential growth and retain the functionality of the highway, including a possible link from Ocean Drive to Airport and intersection improvements to Lake Road. Manage access along newly constructed section between the Wrights road and the Pacific Highway. Continue to update existing traffic models.	5.2 Traffic

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Regional development/ accessibility	Maintaining the highway and providing safe and reliable travel conditions for all vehicles.	Progressively rehabilitate pavements along the route as part of asset maintenance and renewal programs. Sections will be prioritised based on annual condition surveys and use of a pavement management system, in order to maintain the highway and provide safe and reliable travel conditions for all vehicles.	5.5 Road pavement condition
Regional development/ accessibility	There is an increasing demand for heavy vehicles between Tamworth and Gunnedah due to traffic growth from mining and agricultural activities within Gunnedah. Growth in coal freight rail movements in Gunnedah impeding on local traffic movements, which place an increased pressure on the existing rail overpass. Heavy vehicles negotiating Abbott Street and South Street intersections and the approaches to the bridge in Gunnedah. Lack of HML access through Gunnedah. Lack of access for heavy vehicles, particularly PBS 2B vehicles, between Tamworth and Coonabarabran.	Construction of the Gunnedah Rail Bridge on South Street/Oxley Highway. Investigate opportunities to improve heavy vehicle access to provide access for HPV between Tamworth, Coonabarabran and Nevertire including through Gunnedah. Investigate opportunities for OSOM movements between Tamworth and Coonabarabran.	5.3 Heavy vehicles

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Regional development/ accessibility Safety and security	Narrow bridge widths pose a significant challenge, because they are generally the narrowest point along any route. A review of the adequacy and consistency of treatments provided at narrow bridges is required and improvements are required on a priority basis. Narrow and substandard bridge deck and inadequate lighting at the Woolbrook Rail Overpass.	Review and improve the adequacy and consistency of treatments provided at narrow bridges, specifically regarding the alignment approaches including but not limited to: • Thone River • Ralfes Creek • Woolbrook Rail Overpass • Surveyors Creek bridges. • Chimmy Swamp Creek	5.4 Road design and geometry Lane widths and narrow bridges
Regional development/ accessibility	Management of roadside drainage and slope stability issues particularly on the Wauchope to Walcha range.	Address high risk slopes (ARL 1-2) along the corridor on a priority basis Slope restoration at Nombie (50km east of Coonabarabran)	5.4 Road design and geometry Road slope risk rating
Safety and security	Rail level crossings are a safety risk on the rural network for all road and rail users.	Investigate and recommend opportunities to improve safety at rail level crossings: • Wauchope – in the town centre • Gilgandra – in Gilgandra township • Warren – 1.6 kilometres west of Warren township • Snakes Plain – 4km east of Nevertire	5.4 Road design and geometry Rail crossings

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Safety and security	Lack of appropriate infrastructure and services to address: • Driver fatigue and speed crashes between Tamworth and Coonabarabran. • Motorcycle crashes on the Wauchope to Walcha range Rear end crashes within the urban areas of Port Macquarie and Tamworth Intersection safety and efficiency within Tamworth and between Port Macquarie and Wauchope.	Continue to implement road safety initiatives to address identified and emerging crash types and locations, particularly within Port Macquarie and Tamworth, along the Wauchope to Walcha range and between Tamworth and Gunnedah. Investigate potential safety campaigns targeting driver and rider awareness. Improve the standard of rest areas including upgrading of toilet systems on a priority basis including but not limited to Stockyard Creek Rest areas Provide a consistent number of rest areas to cater for all vehicle types along the corridor particularly between Tamworth and Nevertire.	5.1 Road Safety
Regional development/ accessibility	An increase of complex intersections and access points within the urban areas causing traffic efficiency and safety issues.	Continue to integrate transport and land use planning to improve the performance for the corridor through effective access management.	6.1 Population and demographic changes
Safety and security	Inconsistent speed limits with other similar lengths of road on the network and is at variance with the NSW Speed Zoning Guidelines.	Implement outcomes from the speed zone review between the Pacific Highway and Coonabarabran	5.1 Road safety Speed zones

7.2 Medium term priorities (5-10 years)

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Reduce social disadvantage	Poor road geometry along some stretches of the corridor results in reduced travel speeds, increased travel times and road safety risks.	Investigate options to increase capacity between Port Macquarie and Wauchope, including corridor identification and reservation. Continue to explore opportunities to improve the road alignment, particularly in higher risk locations.	5.4 Road design and geometry
Safety and security	Due to the terrain and formations of the corridor, it is difficult to provide appropriate lanes and shoulder widths in some locations – particularly over the Wauchope to Walcha ranges.	Continue to improve the formation width, by widening sealed shoulder and improving lane widths.	5.4 Road design and geometry Lane widths Sealed shoulders
Regional development/ accessibility Safety and security	There is an increasing demand for heavy vehicles between Tamworth and Gunnedah due to traffic growth from mining and agricultural activities within Gunnedah.	Provide access for PBS 2B vehicles between Tamworth and Gunnedah as a priority. Investigate the need to increase the number of heavy vehicle enforcement sites.	5.3 Heavy vehicles
Regional development/ accessibility	The Oxley Highway / Newell Highway intersection is not configured to allow the most efficient movement of freight vehicles.	Investigate realigning the intersection of the Oxley Highway and the Newell Highway at Coonabarabran.	5.5 Road design and geometry Intersections Newell Highway corridor strategy
Improve transport integration process	The different needs of both local and through traffic users' needs to be balanced	Investigate network solution to reduce impact of local traffic and through traffic growth particularly in: • Tamworth • Wauchope • Gunnedah	5.2 Traffic
Regional development/ accessibility	Prolonging pavement life on the expansive black soils west of Gunnedah, which are prone to a cycle of shrinkage and swelling	Reconstruction and reshaping of the pavement on top of the black soil, this needs to be completed every 5-10 year in some areas.	5.5 Road pavement condition

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Safety and security	Inconsistent standard for rest areas along the corridor including redundant toilet systems. Inconsistent number of heavy vehicle rest areas along the corridor particularly between Tamworth and Nevertire.	Continue to monitor and improve the standard of rest areas including upgrading of toilet systems on a priority basis including but not limited to Stockyard Creek Rest areas. Provide a consistent number of rest areas to cater for all vehicle types along the corridor particularly between Tamworth and Nevertire.	5.3 Heavy vehicles
Regional development/ accessibility	Management of roadside drainage and slope stability issues particularly on the Wauchope to Walcha range.	Continue to address high risk slopes (ARL1-2) along the corridor.	5.4 Road design and geometry Road slope risk rating
Safety and security	There are a large number of defective culverts on the Oxley Highway.	Continue to rehabilitate defective culverts on a priority basis.	5.4 Road design and geometry Road culvert risk rating

7.3 Long term priorities

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Regional development/ accessibility	Management of roadside drainage and slope stability issues particularly on the Wauchope to Walcha range.	Continue to address high risk slopes (ARL1-2) along the corridor.	5.4 Road design and geometry Road slope risk rating
Safety and security	There are a large number of defective culverts on the Oxley Highway.	Continue to rehabilitate defective culverts on a priority basis.	5.4 Road design and geometry Road culvert risk rating
Safety and security	Lack of appropriate infrastructure and services to address: • Driver fatigue and speed crashes between Tamworth and Coonabarabran • Motorcycle crashes on the Wauchope to Walcha range • Rear end crashes within the urban areas of Port Macquarie and Tamworth • Intersection safety and efficiency within Tamworth and between Port Macquarie and Wauchope	Continue to implement road safety initiatives to address identified and emerging crash types and locations.	5.2 Road safety
Reduce social disadvantage	The lack of overtaking lanes along the corridor increases travel time and impacts on safety, especially along the Wauchope to Walcha range. As suitable overtaking opportunities are limited, vehicles are forced to overtake on the opposite side of the road which creates a safety risk.	Construction of identified strategic 'Pull Over Bays' along the Wauchope to Walcha range.	5.3 Traffic Level of service Overtaking lanes and opportunities

LTTMP objectives linkage	Specific challenges	Specific actions	Strategic response reference
Regional development/ accessibility	There is an increasing demand for heavy vehicles between Tamworth and Gunnedah due to traffic growth from mining and agricultural activities within Gunnedah. Growth in coal freight rail movements in Gunnedah impeding on local traffic movements, which place an increased pressure on the existing rail overpass. Lack of HML access through Gunnedah. Lack of access for heavy vehicles, particularly PBS vehicles, west of Tamworth.	Continue to upgrade sections of the highway to support growth centres and improve freight productivity. Improve heavy vehicle access to provide access for PBS 2B and 3A vehicles between Tamworth and Coonabrabran and PBS 4B between Gilgandra and Nevertire.	5.3 Heavy vehicles

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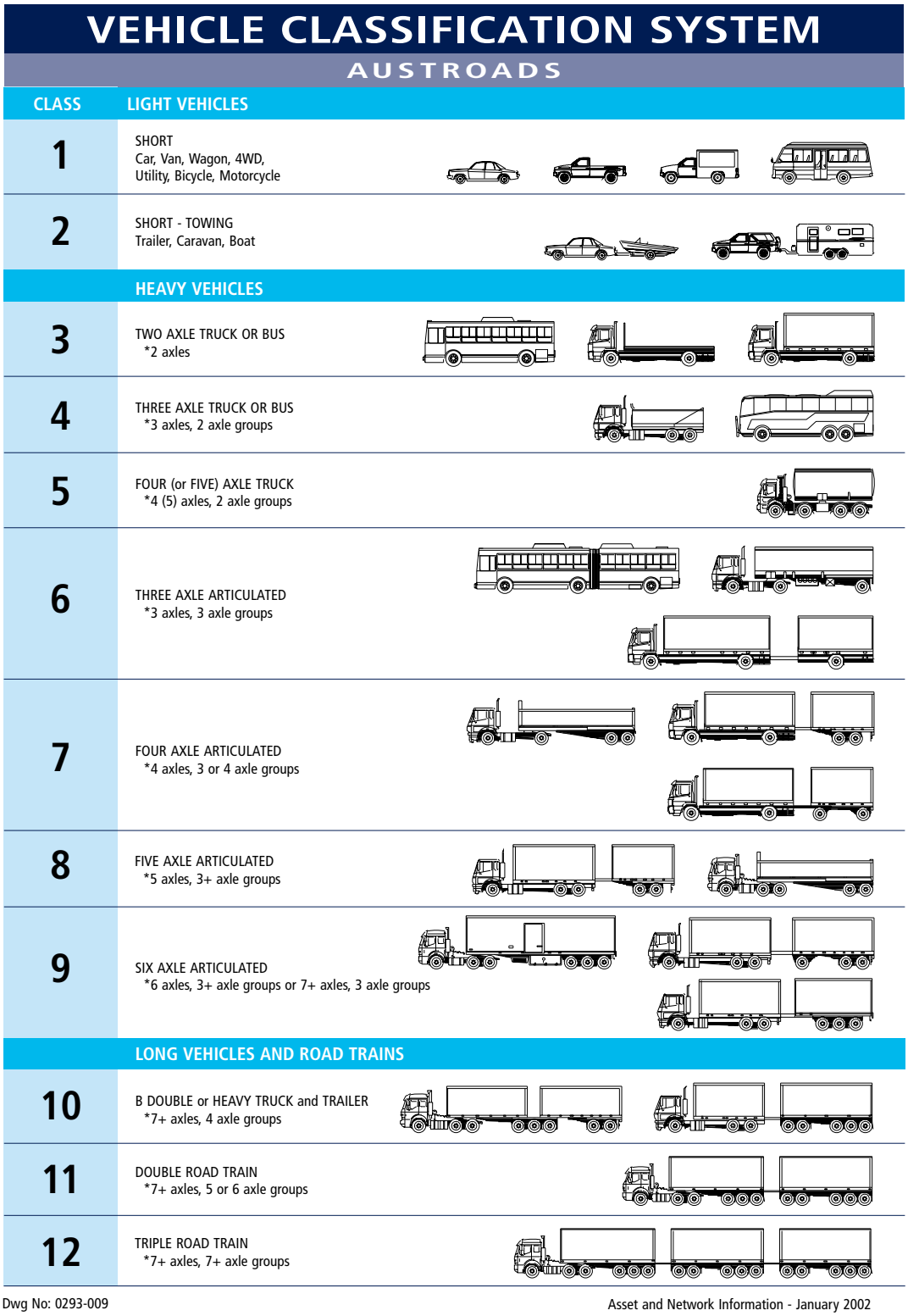
9 APPENDIX

Level crossing, Warren

Appendix A – Austroads Vehicle Classification System



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

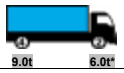
In NSW heavy vehicles are categorised as 'general access' and 'restricted access' vehicles, dependent on the vehicle mass, dimensions and configuration or a combination of all three. General access vehicles have unrestricted access to the NSW road system. General access vehicles are those that do not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

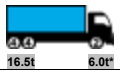


9.0t 6.0t*

GML^: 15.0t

3 Axle Rigid Truck

12.5 metres maximum overall length



16.5t 6.0t*

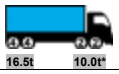
GML^: 22.5t

17.0t 6.0t*

CML^: 23.0t**

4 Axle Rigid Truck

12.5 metres maximum overall length



16.5t 10.0t*

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

16.5t 9.0t 16.5t 6.0t*

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

16.5t 16.5t 16.5t 6.0t*

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

15.0t 16.5t 6.0t*

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

20.0t 16.5t 6.0t*

GML^: 42.5t

21.0t 17.0t 6.0t*

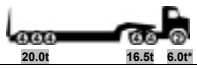
CML^: 43.5t**

22.5t 17.0t 6.0t*

HML^: 45.5t***

Truck and Low Loader Combination

19.0 metres maximum overall length



20.0t 16.5t 6.0t*

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

16.5t 16.5t 16.5t 6.0t*

GML^: 50.0t

17.0t 17.0t 17.0t 6.0t*

CML^: 51.0t**

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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

16.5t 16.5t 16.5t 6.0t*

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

20.0t 20.0t 16.5t 6.0t*

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

20.0t 20.0t 16.5t 6.0t*

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

20.0t 16.5t 20.0t 16.5t 6.0t*

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

16.5t 16.5t 16.5t 16.5t 16.5t 6.0t*

GML^: 79.0t

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

CML^: 81.0t**

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

20.0t 20.0t 20.0t 16.5t 6.0t*

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

20.0t 20.0t 20.0t 16.5t 6.0t*

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

20.0t 20.0t 20.0t 16.5t 6.0t*

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

20.0t 20.0t 16.5t 20.0t 16.5t 6.0t*

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*

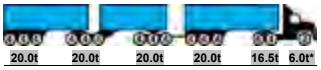
HML^: 107.5t***

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



20.0t 20.0t 20.0t 20.0t 16.5t 6.0t*

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

20.0t 16.5t 20.0t 16.5t 20.0t 16.5t 6.0t*

GML^: 115.5t

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

CML^: 117.5t**

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

20.0t 20.0t 20.0t 20.0t 20.0t 16.5t 6.0t*

GML^: 122.5t

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

CML^: 124.5t**

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

Combination not eligible for operation at Higher Mass Limits

2

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

Appendix C – Glossary of Terms

TERM	DEFINITION
AADT	The Annual Average Daily Traffic is the total yearly two-way traffic volume divided by 365, expressed as vehicles per day, in this document.
abutment	An end support of a bridge or similar structure.
	An end support of a bridge or similar structure.
ADT	The Average Daily Traffic is the total two-way traffic volume during a stated period, divided by the number of days in that period, normally over a seven day week and expressed as vehicles per day.
auxiliary lane	A portion of the carriageway adjoining through traffic lanes, used for speed change or for other purpose supplementary to through traffic movement.
AUR & AUL	Auxiliary intersection treatment Right and Left. 
axle	An axle is a central shaft for a rotating wheel or gear. It refers to the pairs of wheels of the vehicle.
axle group	A set of closely spaced axles acting as a unit.

TERM	DEFINITION
BAR & BAL	Basic intersection treatment Right and Left.  Basic Right Turn (BAR) on the Major Road (Two-lane, Two-way Road)  Basic Left Turn (BAL) on the Major Road
bunching	A closely spaced group of vehicles on a carriageway, moving or stopped and ready to move, with relatively large spaces ahead and behind.
carriageway	That portion of a road or bridge devoted particularly to the use of vehicles, that is between guide posts, kerbs, or barriers where these are provided, inclusive of shoulders and auxiliary lanes.
casualty crash	A crash in which at least one person was injured or killed.

TERM	DEFINITION
CHR & CHL	Channelised intersection treatment Right and Left.  Channelised Right Turn (CHR) on the Major Road  Channelised Left Turn (CHL) on the Major Road  Channelised Left Turn (CHL) on the Minor Road
CHR(s)	Short Channelised intersection treatment where the channelised portion of the intersection is shorter than a CHR.
converter dolly	A trailer with one axle group or single axle and a fifth wheel coupling designed to convert a semi-trailer into a dog trailer.
coupling	Mechanical assembly that provides a connection between the drawbar of the trailer and the towbar of the drawing vehicle.
culvert	One or more adjacent pipes or enclosed channels for conveying water, a watercourse or stream below the surface of a road. Culverts minimise flooding by minimising water building up alongside the road and overtopping the road surface (causing flooding) to escape.
deflection	The vertical movement of a pavement due to the application of a load.
DESA	Design Equivalent Standard Axles.

TERM	DEFINITION
dog trailer	Is a trailer with one axle group at the front that is steered by connection to the towing vehicle by a draw bar and one axle group at the rear.
dolly	See converter dolly.
fatal crash	A crash in which at least one person was killed.
fifth wheel coupling	See coupling.
formation level	The general level of the surface of the ground proposed or obtained on completion of earthworks.
General Access Vehicle	A vehicle that has unlimited access to the road network, limits being 2.5 metres wide, 4.3 metres high, 12.5 metres long for rigid vehicles and 19 metres long for single combinations and conforming axle groups.
headstock	A beam at the top of a pier or abutment to provide support for the bridge superstructure.
HML vehicle	Higher Mass Limits is a nationally agreed scheme that permits approved heavy vehicles to operate with additional mass on certain types of axle groups, on a restricted road network and subject to specified conditions. Details are specific to each vehicle type, see http://www.ntc.gov.au.
HPV	Vehicles that exceed the carrying capacity of a standard semi-trailer. These vehicles have restricted access to the network and can operate under a Performance Based Standards Scheme, or a Restricted Access Vehicle System.
injury crash	A crash in which at least one person was injured but no person was killed.
IRI	International Roughness Index. Roughness measures the undulations in the road and provides an indication of ride comfort.
NAASRA	National Association of Australian State Road Authorities. NAASRA is now known as Austroads.
NLTN	The National Land Transport Network is a single integrated network of land transport linkages of strategic national importance.
PBS	Performance Based Standards are a national system for the regulation of heavy vehicles based on the performance, safe operation, manoeuvrability and characteristics of the vehicle on the road rather than the vehicle type. The Performance Based Standards scheme is a key element of the Council of Australian Government's national reform agenda for transport. The scheme offers the heavy vehicle industry the potential to achieve higher productivity and safety through innovative truck and bus design. PBS vehicles are designed to perform their tasks as productively, safely and sustainably as possible. These trucks and buses are tested against 16 stringent safety standards and four infrastructure standards to ensure that they can stop, turn and travel safely. Vehicles are certified as able to operate on PBS Access Level routes 1, 2, 3 or 4.
pier	An intermediate support in a bridge having more than one span.
RAV	A Restricted Access Vehicle is a vehicle that is longer than 19 metres, 4.3 metres high or 42.5 tonnes gross mass and is not given as-of-right access to the road network. Includes B-doubles, road trains and larger truck-trailer combinations.

TERM	DEFINITION
road smoothness	A travel weighted measure of the smoothness of the road surface using IRI data.
roadloc chainage	The name given to the Linear Referencing System used by Roads and Maritime Services in identifying locations along a road.
roughness	The level of irregularity in the longitudinal profile of a road with respect to the intended profile.
rutting	The longitudinal vertical deformation of a pavement surface in a wheel path, measured relative to a straightedge place at right angles to the traffic flow and across the wheel path.
shoulder	The portion of the carriageway outside of the traffic lanes and contiguous and flush with the surface of the pavement.
substructure	In a bridge, the piers and abutments that support the superstructure.
superstructure	In a bridge, that part of the structure that is supported by the piers and abutments.
through lane	A lane provided for the use of vehicles proceeding straight ahead.
trailer	Vehicle without motive power towed behind a motor vehicle.
tow away crash	A crash in which at least one vehicle was towed away but no person was injured or killed.
TRARR	Traffic on Rural Roads is a micro-simulation model of traffic flow on two-lane roads used to investigate the need for overtaking lanes.
verge	The section of the road formation that joins the shoulder with the batter.

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