

NSW Roads and Maritime Services

WOOLGOOLGA TO BALLINA | PACIFIC HIGHWAY UPGRADE ENVIRONMENTAL IMPACT STATEMENT

MAIN VOLUME 1B

Chapter 14 – Traffic and transport

Chapter summary

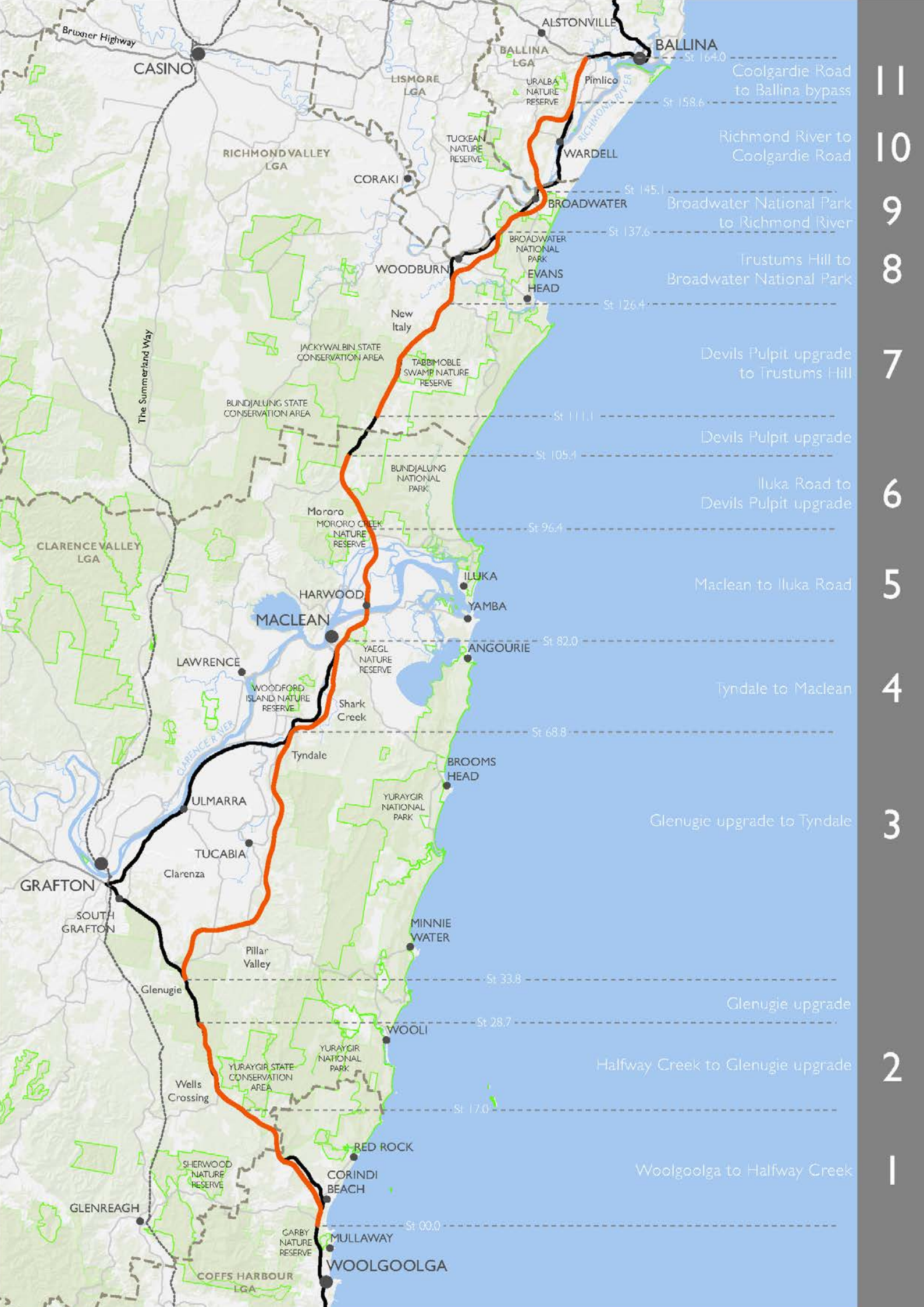
This chapter assesses the potential impacts of the project on traffic, transport and access. Traffic along the Pacific Highway is forecast to grow by 42 per cent from 2012 to 2036. By 2036, an annual average daily traffic flow of around 14,000 vehicles are expected to use the Pacific Highway between Woolgoolga and Ballina. Currently, on average, a peak of around 9800 vehicles uses the existing Pacific Highway each day.

The project would result in the following benefits for traffic and transport:

- Improved travel times: Posted speed limits would be at least 100 kilometres per hour where the highway is upgraded to arterial road standard, and 110 kilometres per hour where upgraded to motorway standard. At the planned project opening (2016), the average travel time for vehicles along the full length of the project is expected to decrease by 25 minutes
- Unimpeded traffic flow: As there would be limited access and exit opportunities, traffic flow on the highway would be unimpeded by entering or exiting traffic. Due to improved flood immunity on the project, there would be fewer delays during flood events
- Access to the region: Appropriately located interchanges would ensure access to towns and regional centres
- Fewer crashes: The project would result in a 27 per cent reduction in overall crashes when compared with the existing crash rate
- Improved conditions for cyclists and pedestrians: Pedestrian and cycle access and connectivity within towns and villages would be improved where bypasses of towns remove through traffic from town centres and surrounds. This would include Corindi, South Grafton, Ulmarra, Woodburn, Broadwater and Wardell, where traffic is expected to decrease.

However, the project would result in some residents and businesses being affected at a local and / or property level by local or access road changes and changes to highway access. This could result in longer travel times in some cases. There would be some changes to the state forest road network, but would not affect the overall use of state forest land.

Maritime users of the Clarence and Richmond rivers would not be affected once the project is opened to traffic. A high level bridge across the Clarence River would enable high mast boats to continue using the river as they do currently. During construction there would be construction impacts to highway and in some areas local traffic. In addition, construction of the Clarence River and Richmond River bridges may result in temporary disruption to maritime traffic.



Coolgardie Road to Ballina bypass

Richmond River to Coolgardie Road

Broadwater National Park to Richmond River

Trustums Hill to Broadwater National Park

Devils Pulpit upgrade to Trustums Hill

Devils Pulpit upgrade

Iluka Road to Devils Pulpit upgrade

Maclean to Iluka Road

Tyndale to Maclean

Glenugie upgrade to Tyndale

Halfway Creek to Glenugie upgrade

Woolgoolga to Halfway Creek

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14 Traffic and transport

This chapter assesses the potential impacts of the project on traffic, transport and access. These issues have been assessed to address the Director General's environmental assessment requirements. The full assessment is provided in the Working paper – Traffic and transport (SKM, 2012).

Director General's requirements	Where addressed
Traffic and Transport – including but not limited to:	
<ul style="list-style-type: none"> Demonstration of how the preferred route and road design meets the traffic and transport objectives of the project. 	Section 14.1.3
<ul style="list-style-type: none"> Construction traffic impacts, including: <ul style="list-style-type: none"> The identification of routes and the nature of existing traffic on these routes. 	Section 14.2.2 Section 14.2.3 Section 14.2.8 Section 14.2.9
<ul style="list-style-type: none"> An assessment of construction traffic volumes (including spoil haulage/ delivery of materials and equipment to the road corridor and ancillary facilities). 	Section 14.3.2 Section 14.3.4 Section 14.3.5
<ul style="list-style-type: none"> Potential impacts to the regional and local road network (including safety and level of service) and potential disruption to existing public transport/ school bus services and access to properties and businesses. 	Section 14.3.1 Section 14.3.3 Section 14.3.6 Section 14.3.7
<ul style="list-style-type: none"> Operational traffic and transport impacts to the local and regional road network, including: <ul style="list-style-type: none"> Changes to access arrangements/ service roads to properties, businesses and State forest road network. 	Section 14.4.1 Section 14.4.7 Section 14.4.11
<ul style="list-style-type: none"> Changes to local road connectivity and impacts on local traffic arrangements, road capacity/ safety, service roads and modified access to the upgraded highway (including potential impacts of changed traffic arrangements on public transport/ school bus services and access for emergency services). 	Section 14.4.1 Section 14.4.6 Section 14.4.10
<ul style="list-style-type: none"> Traffic capacity of the project and its ability to cater for predicted future growth. Consideration should be given to what effect potential major land use changes in the locality may have on the traffic assessment outcomes. 	Section 14.4.2 Section 14.4.3 Section 14.4.4
<ul style="list-style-type: none"> Opportunities for the provision of pedestrian and cycle access and connections along the highway and to adjoining communities. 	Section 14.4.9
<ul style="list-style-type: none"> Impacts on maritime use of the Richmond and Clarence rivers and safety of navigation for water based traffic. 	Section 14.4.12

14.1 Assessment methodology

14.1.1 Terminology

Various technical terms are used in this summary of traffic, transport and access issues as described in Table 14-1. For details refer to the Working paper – Traffic and transport.

Table 14-1: Terminology

Term	Description
Heavy vehicle	A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
Semi-trailer	A semi-trailer is a trailer without a front axle. A large proportion of its weight is supported by a road tractor, a detachable front axle, or the tail of another trailer.
B-double	A B-double is a truck with two trailers linked together. Different lengths of B-double can include short (up to 19 metres) and long vehicles (up to 25 metres).
Level of service	Level of service (or LoS) refers to the service level likely to be found on a section of road, when considered against performance criteria including lane numbers, traffic numbers and the frequency of intersections and junctions. Level of service is a performance measure used in the planning, design and operation of a road. Levels of service can vary between A (good) to F (poor).

14.1.2 Assessment approach

The methodology to assess potential impacts on traffic, transport and access during construction of the project involved:

- Describing the local and regional road network that could be used by construction vehicles
- Reviewing and assessing construction information and data to identify what impacts construction could have on road users in terms of:
 - Vehicle numbers, types and likely routes
 - Delays and changes in traffic arrangements (from lane closures, temporary traffic lights, traffic controls, etc)
 - Temporary diversions and changes in routing
 - Haul routes to transport materials to construction sites
 - Providing an outline of traffic management measures to inform a construction traffic management plan.

The methodology to assess potential impacts on traffic, transport and access during operation of the project involved:

- Completing traffic surveys of existing vehicle numbers and types using automated tube counters to confirm how many and what type of vehicles are currently on the Pacific Highway
- Completing traffic surveys of existing travel patterns to confirm the origin and destination of vehicles currently using the Pacific Highway
- Reviewing existing daytime and night-time traffic numbers. This data analysis on an hour-by-hour basis helps to show how traffic flows might change over the course of the day, including during morning and late afternoon peak periods
- Reviewing existing crash data to identify the number, type, severity and concentration of road crashes. This helps to identify where safety issues might exist across the project, and to consider how the project might improve the current situation
- Reviewing the concept design to confirm what local and property access changes would result from the upgrade of the project to motorway standard
- Reviewing the concept design to confirm what local and property access changes would result from the initial upgrade of individual project sections to arterial standard, prior to a future upgrade to motorway standard

- Reviewing the concept design to check what impact the 10 interchanges would have on vehicles entering and exiting the Pacific Highway
- Assessing whether the project would reduce travel times, reduce the numbers of kilometres travelled between Woolgoolga and Ballina, and reduce the crash frequency
- Identifying whether the project would change public transport arrangements across the study area.

Using this methodology, the assessment has identified traffic numbers across the existing Pacific Highway, and forecast how future traffic numbers, vehicle types and directions of travel might change once the project is built. Traffic forecasts have been prepared using SATURN software (SATURN is a traffic modelling program used to estimate how many vehicles are likely to use the Pacific Highway once it is upgraded).

The traffic model has created traffic forecasts for 2016, the planned year of project opening, as an assumed 'planning horizon' for the model. The model has also calculated traffic forecasts for 10 years after the planned project opening to traffic (2026), and 20 years after (2036).

Project interchanges have been assessed using SIDRA computer software (used to analyse the performance of interchanges or intersections). The purpose of this analysis is to confirm what level of service (LoS) the road design would provide to vehicle users at these locations.

KEY TERM – Annual average daily traffic (AADT)

The total volume of traffic passing a roadside observation point over a period of a year, divided by the number of days per year. It is calculated from mechanically obtained axle counts.

14.1.3 Traffic and transport objectives

The Pacific Highway Upgrade Program is needed, in part, because of population growth (DoP, 2008) and the impact this will have on transport infrastructure. The objectives of the upgrade program that pertain to traffic and transport are to:

- Significantly reduce road crashes and injuries
- Reduce travel times
- Reduce freight transport costs.

The ways in which the project alignment and road design meet these objectives are summarised in Table 14-2. Further information on project objectives and how the project design meets these objectives is included in Chapter 3 (Strategic justification and need).

Table 14-2: How the project would meet its traffic and transport objectives

Pacific Highway Upgrade Program objective	Project objective	Comment
Significantly reduce road crashes and injuries	Reduce crash rates to 15 crashes or less per 100 million vehicles per kilometres travelled (MVKT).	The provision of a divided, limited-access carriageway is expected to achieve at least this level of crash improvement, representing a 27% reduction in overall crashes.
	Provide a dual carriageway highway with limited or controlled access points and improved overtaking opportunities.	Access to the motorway would be provided via 10 new interchanges. Access to sections initially constructed to arterial road standard would generally allow for direct access from local roads. All sections of the project would provide a divided, dual carriageway as minimum, which would allow overtaking opportunities along the entire length.
	Provide appropriate emergency access facilities.	The project would have a shoulder up to 2.5 metres wide to allow for vehicles to pull over. Combined emergency U-turn bays, maintenance crossovers and stopping bays would be provided every three kilometres.
	Retain existing or provide appropriate driver rest areas.	Five rest areas would be constructed (two northbound and three southbound) at intervals of about 50 kilometres. These would be located at Pine Brush (Tyndale), Mororo Road and at Richmond River. These would provide rest areas additional to those already available.
	Provide a continuous alternative route to the motorway sections to maximise the separation of local traffic from through traffic.	Service roads would provide continuous alternative routes for local and regional traffic, and access to and from the upgraded highway at interchanges. Service roads would generally have a posted speed limit of 80 kilometres per hour, if possible. Initially, some sections would be built as arterial standard and would not have service roads. However, the ultimate upgrade would separate through traffic (which would use the highway) from local traffic (which would use service roads).
Reduce travel times	Increase the capacity of the highway by replacing a two-lane undivided road with a four-lane divided road.	The project would comprise a divided road with two lanes in each direction and a median sufficiently wide to allow further upgrade to three lanes in each direction (six lanes in total), if required.

Pacific Highway Upgrade Program objective	Project objective	Comment
	Provide a route and design that improves traffic flow and allows for consistent travelling speeds.	<p>Posted speed limits would be at least 100 kilometres per hour where the highway is upgraded to arterial road standard, and 110 kilometres per hour where it is upgraded to motorway standard. By limiting the access points, traffic flow on the highway would be unimpeded by entering or departing traffic.</p> <p>Appropriately located interchanges would ensure that the majority of traffic that does not use the full length of the project would have access to the region without hampering through traffic.</p> <p>The continued upgrade of the highway would improve travel times. At project opening, travel time over the full length of the project is expected to decrease by 25 minutes for all vehicles. This equates to a 19 per cent reduction in travel time from an estimated 2 hours 10 minutes to 1 hour 45 minutes (on average).</p>
	Provide a level of flood immunity that minimises the risk of delays due to flooding.	The project carriageway would be flood-free for the 1 in 20-year flood event on the Clarence River and Richmond River floodplains. Elsewhere, it would be flood-free for the 1 in 100-year flood event.
	Provide facilities for managing and maintaining traffic flow in the event of incidents.	<p>In the event of an incident, the road shoulder and emergency U-turn and stopping bays would enable traffic to continue to flow with minimal interruption.</p> <p>In addition, the divided carriageway would provide more opportunity to set up a contra-flow system in the event of a major emergency.</p>
Reduce freight transport costs	Provide a route and design that increase travel efficiency through reductions in length and improvements in alignment.	The horizontal radius of the project would range between 750 metres and 1200 metres and the vertical grade would range from a desirable maximum of 4.5% to an absolute maximum of 6%. These criteria would apply to both the duplication and deviation of the current highway. Compared to the existing alignment, the project would reduce the total distance between Woolgoolga and Ballina from 180 to 167 kilometres, a saving of about 13 kilometres.
	Provide a route that improves inter-regional connections and access.	Ten interchanges are proposed across the project to enable access to and from the project and to improve inter-regional connections to key towns and townships.
	Provide a design standard that meets or exceeds B-double truck requirements.	The project has been designed to accord with Pacific Highway Design Guidelines (Draft) (RTA, October 2009 Version R.2). This would ensure consistency with completed sections of the Pacific Highway Upgrade Program. This design would allow the operation of B-double trucks of varying sizes (up to 25 metres).

14.2 Existing environment

14.2.1 Study area

The Pacific Highway serves the major towns and centres of Coffs Harbour, Grafton, Maclean and Ballina. The study area includes the route of the existing highway and proposed upgrade. The project is located within the local government areas of:

- Coffs Harbour City: Coffs Harbour is the main town in the local government area and wider region. Other towns and villages include Corindi Beach and Red Rock.
- Clarence Valley: Grafton is the main town in the local government area. Other towns include Maclean, Yamba and Iluka. The local government area includes a number of smaller villages and townships along the coast or inland, particularly adjacent to the Clarence River. Those near the project include Tucabia, Ulmarra, Tyndale, and Harwood.
- Richmond Valley: Casino is the local government area's main town. Other towns and villages include Evans Head, Broadwater, Coraki, Rileys Hill, Woodburn, Whiporie and Rappville.
- Ballina Shire: Ballina is the main town and commercial centre for the local government area and wider region. A number of smaller villages and towns are located along the coast and in the hinterland, including Wardell, which is located nearest to the project.

The project would not pass through the Lismore local government area. However, the Pacific Highway serves this part of the North Coast via the Bruxner Highway.

The assessment has considered the relevant local and regional travel patterns within these local government areas that might be affected during construction and operation.

14.2.2 Local and regional road networks

Highways

The Pacific Highway is the main north–south route passing through the study area. The highway is the major interstate and regional route linking Sydney and Brisbane via the NSW North Coast.

Interconnecting highways within the study area include:

- The Gwydir Highway (Highway 12): This is an east–west State road linking the Pacific Highway at South Grafton with Glen Innes
- The Summerland Way (Main Road 83): This runs in a northerly direction from the Gwydir Highway via Grafton Bridge, then to Junction Hill to Casino and Queensland
- The Bruxner Highway (Highway 16): This connects the Pacific Highway west of Ballina with the regional centres of Lismore, Casino and Tenterfield.

Within both the Clarence Valley and the Richmond Valley floodplain areas, the Pacific Highway is flood-prone, and major sections are occasionally closed to traffic. This creates access issues during floods, which impact on local residents, regional and interstate vehicles.

Safety improvements and upgrades

Between Woolgoolga and Ballina, the Pacific Highway is largely undivided. It mainly has one lane in each direction with overtaking lanes at regular intervals in both directions.

However, there are short sections of dual carriageway (such as at Swan Creek, Cowper and Mororo) and several sections where safety improvements upgrading has or is occurring. These include:

- Tyndale (completed in 2000): This involved realigning a single carriageway about 900 metres long, and redesigning the intersection at Sheehys Lane
- Halfway Creek (completed in 2004): This involved upgrading around 3.4 kilometres of highway to dual carriageway, and making the former highway a service road
- Gap Road (completed in 1998): This involved realigning around four kilometres of highway to eliminate a number of sharp bends to the south of Woodburn

- Glenugie (completed in 2011): This involved upgrading around seven kilometres of highway to dual carriageway between Franklins Road and Eight Mile Lane. Part of the former highway became a service road
- Devils Pulpit (being constructed): This involves realigning around 6.4 kilometres of highway about 1.2 kilometres south of South Pine Road to north of Tabbimoble overflow (No. 2). Part of the existing highway is to be retained as a service road.

Further works are planned to maximise highway safety until such time as the highway is upgraded to dual carriageway.

Access to regional centres, townships and villages

The Pacific Highway provides the main access to smaller townships and villages near the project, including:

- Pillar Valley, Minnie Water and Wooli: Access is via Eight Mile Lane to the south of Grafton, or via Old Coldstream Road and Wooli Road, Ulmarra. Both roads are sealed and intersect with the highway at priority-controlled intersections. Speed limits on these roads are either un-posted or 100 kilometres per hour. Both routes are low-lying and flood-prone. The unsealed Firth Heinz Road, located to the south of Tucabia, is a designated flood detour route to Wooli
- Tucabia: Access is via Old Coldstream Road, Ulmarra or via the Tucabia–Tyndale Road. These are both sealed, two-lane, two-way roads that intersect with the highway at priority-controlled intersections
- Iluka: Access from the highway is via an intersection north of the Clarence River (North Arm). Access to Yamba from the highway is south of the Clarence River (Yamba is a popular local destination, for southbound traffic in particular). Both accesses are sealed, two-lane, two-way roads. Adjacent to the interchange at Yamba, Yamba access road passes under the bridge over the Clarence River. The intersections of the ramps linking the interchange with Yamba Road are priority-controlled with traffic lights
- Harwood: The highway bisects this village. Connectivity within the village is via an underpass located alongside the Clarence River. Access to the village is via an intersection at its northern end.
- Broadwater, Evans Head: Access is via Alfred Street and Wagner Street, Woodburn. This is a sealed, two-lane, two-way road. Both intersections are priority-controlled
- Woodburn, Broadwater and Wardell: The Pacific Highway passes through these villages

The city of Grafton and the township of Maclean are located away from the highway. Each has its own local access roads.

Local roads and access to properties

Property access is generally directly off the highway, with some service roads provided where recent upgrades have been completed. The local road network also provides direct access to farms. There are several fire trails and internal property access tracks (such as those passing through the sugarcane fields around Maclean). Most of these are unsealed and narrow, and may carry heavy vehicles during the sugarcane harvest.

The local road network in the project is dominated by farming access, particularly along the river flats between Grafton and Chatsworth, and between Woodburn and Ballina.

The city of Grafton and the township of Maclean are located away from the existing highway, with their own local road networks. The existing Pacific Highway passes through the villages of Woodburn, Broadwater and Wardell. Harwood is bisected by the highway, although connectivity within the village is maintained by an underpass located alongside the Clarence River. Access to the village is via an intersection at its northern end.

In addition to Grafton, Yamba represents a significant local destination, especially for southbound traffic.

14.2.3 Nature of existing traffic on local access roads

There are a large number of local roads that are intersected by, join or interact with the project. The majority of these roads service very small communities, numbers of properties or unpopulated areas. These roads generally experience very low volumes of traffic movements each day. The roads located near to the project are listed from south to north, by project section, in Table 14-3. An estimate of population numbers and indicative traffic flows (low, medium, high) are also provided.

Further details are provided in Section 2.2.3 of Working paper – Traffic and transport (SKM, 2012). Most roads service small communities or unpopulated areas and experience very low volumes of traffic each day.



Photo 1: Existing Pacific Highway near Woolgoolga

Table 14-3: Local road network: identification of routes and nature of existing traffic

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Woolgoolga to Halfway Creek (Section 1)	0	Arrawarra Beach Road	Arrawarra	515 people	Low	Yes
Woolgoolga to Halfway Creek (Section 1)	0.6	Sherwood Creek Road, Arrawarra	Upper Corindi	1090 people	Low	No
Woolgoolga to Halfway Creek (Section 1)	0.1	Eggins Drive connection to Pacific Highway near Eggins Close	Darlington Beach	220 dwellings	Low	Yes
Woolgoolga to Halfway Creek (Section 1)	2.5	Kangaroo Trail Road, Corindi Beach	Private property	Less than 10 dwellings	Low	No
Woolgoolga to Halfway Creek (Section 1)	6.55	Paper road, 600 metres north of Post Office Lane, Corindi Beach	Private property	Less than 10 dwellings	Low	No
Woolgoolga to Halfway Creek (Section 1)	9.6	Range Road, Dirty Creek	Dirty Creek	555 people	Low	No
Woolgoolga to Halfway Creek (Section 1)	9.8	New Lookout Road, Dirty Creek	NA	NA	Low	No
Woolgoolga to Halfway Creek (Section 1)	9.6	Range Road East, Dirty Creek	NA	NA	Low	No
Woolgoolga to Halfway Creek (Section 1)	10.5	Dundoo Reach Road, Dirty Creek	NA	NA	Low	No
Woolgoolga to Halfway Creek (Section 1)	11.4	Dirty Creek Road, Halfway Creek	Barcoongere and Newfoundland State Forests	NA	Low	No
Woolgoolga to Halfway Creek (Section 1)	11.95	Falconers Lane, Milleara	NA	NA	Low	No
Woolgoolga to Halfway Creek (Section 1)	12	The Siding, Milleara	NA	NA	Low	No
Woolgoolga to Halfway Creek (Section 1)	13.2	McPhillips Road, Halfway Creek	Private property	Less than 10 dwellings	Low	No
Woolgoolga to Halfway Creek (Section 1)	14.3	Dunmar Lane, Halfway Creek	Private property	Less than 10 dwellings	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Woolgoolga to Halfway Creek (Section 1)	15.65	Grays Road, Halfway Creek	Private property	12 dwellings	Low	No
Woolgoolga to Halfway Creek (Section 1)	15.75	Rediger Close, Halfway Creek	Private property	Less than 10 dwellings	Low	No
Halfway Creek to Glenugie (Section 2)	17.5	Lemon Tree Road, Halfway Creek	Private property	Less than 10 dwellings	Low	No
Halfway Creek to Glenugie (Section 2)	20.3	Kungala Road, Halfway Creek	Halfway Creek	265 people	Low	No
Halfway Creek to Glenugie (Section 2)	20.8	Luthers Road, Halfway Creek	Private property	Less than 10 dwellings	Low	No
Halfway Creek to Glenugie (Section 2)	23.5	Parker Road, Wells Crossing	Wells Crossing	310	Low	No
Halfway Creek to Glenugie (Section 2)	25.1	Bald Knob Tick Gate Road, Wells Crossing	Yuraygir Crown Reserve	NA	Low	No
Halfway Creek to Glenugie (Section 2)	28	Franklins Road, Glenugie	Calamia, Glenugie State Forest	NA	Low	No
Halfway Creek to Glenugie (Section 2)	31.2	Old Pacific Highway (southern connection), Glenugie	NA	NA	Low	No
Glenugie to Tyndale (Section 3)	36	Eight Mile Lane, Glenugie	Glenugie, Pillar Valley, Grafton Regional Airport	650	Low	Yes
Glenugie to Tyndale (Section 3)	39.1	Old Six Mile Lane, Lavadia	Grafton Regional Airport	70	Low	Yes
Glenugie to Tyndale (Section 3)	41.45	Avenue Road, Lavadia	Private property	Less than 10 dwellings	Low	No
Glenugie to Tyndale (Section 3)	41.9	Wants Lane, Lavadia	NA	NA	Low	No
Glenugie to Tyndale (Section 3)	45.5	Wooli Road, Pillar Valley	Wooli, Pillar Way, Tucabia	1135	Low	Yes
Glenugie to Tyndale (Section 3)	48.8	Mitchell Road, Pillar Valley	Private property	Less than 10 dwellings	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Glenugie to Tyndale (Section 3)	51.9	Firth Heinz Road, Tucabia	Private property	25 dwellings	Low	No
Glenugie to Tyndale (Section 3)	55.5	Bostock Road, Tucabia	Private property	Less than 10 dwellings	Low	No
Glenugie to Tyndale (Section 3)	56.9	Somervale Road, Tucabia	Pine Brush State Forest, Private property	Less than 10 dwellings	Low	No
Glenugie to Tyndale (Section 3)	63.6	No Name - From Coldstream Road, Tyndale	Private property	Less than 10 dwellings	Low	No
Glenugie to Tyndale (Section 3)	64.9	Crowley Road, Tyndale	Private property	Less than 10 dwellings	Low	No
Glenugie to Tyndale (Section 3)	66.6	Benson Lane, Tyndale	Private property	Less than 10 dwellings	Low	No
Glenugie to Tyndale (Section 3)	67.2	Sheeys Lane, Tyndale	Private property	25 dwellings	Low	No
Tyndale To Maclean (Section 4)	69.4	Connection to Bondi Hill Road, Tyndale - access road over project	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	69.4	Bondi Hill Road, Tyndale	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	71.2	Byron's Lane, Tyndale	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	74.05	Norleys Lane, Shark Creek	NA	NA	Low	No
Tyndale To Maclean (Section 4)	75.1	Gallaghers Lane, Shark Creek	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	75.2	Shark Creek Road, Shark Creek	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	75.4	Stokes Road, Gullmarrad	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	77	McIntyres Lane, Gulmarrad	Gulmarrad	1645 people	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Tyndale To Maclean (Section 4)	77.8	Clyde Essex Drive, Gulmarrad	Gulmarrad	1645 people	Low	No
Tyndale To Maclean (Section 4)	78.4	Causeleys Lane, Gulmarrad	Gulmarrad	1645 people	Low	No
Tyndale To Maclean (Section 4)	80.5	Cameron Street, Maclean	Maclean	2600 people	Low	Yes
Tyndale To Maclean (Section 4)	80.6	Goodwood Street, Maclean	Private property	Less than 10 dwellings	Low	No
Tyndale To Maclean (Section 4)	81.2	Jubilee Street, Maclean	Townsend	820 people	Low	No
Tyndale To Maclean (Section 4)	81.5	Schwonberg Street, Maclean	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	83.1	Koala Drive/Farlows Lane, Maclean	Private property	30 dwellings	Low	No
Maclean to Iluka (Section 5)	86.2	Yamba Road, Maclean	Maclean, Island, Yamba	8500 people	Medium	Yes
Maclean to Iluka (Section 5)	86.9	River Street, Harwood	Harwood	355 people	Low	No
Maclean to Iluka (Section 5)	87	Petticoat Lane, Harwood	Harwood	355 people	Low	No
Maclean to Iluka (Section 5)	87.8	Watts Lane, Harwood	Harwood	355 people	Low	No
Maclean to Iluka (Section 5)	89.1	Anderson Lane, Harwood	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	89.3	Serpentine Channel Road South, Harwood	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	90	Ryans Lane, Chatsworth	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	90.8	Chatsworth Road/Serpentine Channel Road North, Chatsworth	Chatsworth	215 people	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Maclean to Iluka (Section 5)	93.3	Carrolls Lane, Chatsworth	Chatsworth	215 people	Low	No
Maclean to Iluka (Section 5)	93.85	Chatsworth Road, Chatsworth	Chatsworth	215 people	Low	No
Maclean to Iluka (Section 5)	93.85	Fischers Road, Chatsworth	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	94.5	Garretts Lane East, Wombah	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	94.7	Garretts Lane/Lewis Lane, Mororo	Private property	Less than 10 dwellings	Low	No
Maclean to Iluka (Section 5)	95.45	Iluka Road, Woombah	Woombah	745 people	Low	No
Maclean to Iluka (Section 5)	96.05	Banana Road, Mororo	Private property	Less than 10 dwellings	Low	No
Iluka to Devils Pulpit (Section 6)	98.4	Mororo Road, Mororo	Private property	20 dwellings	Low	No
Iluka to Devils Pulpit (Section 6)	103.4	Old Pacific Highway, Mororo	NA	NA	Low	No
Devils Pulpit to Trustums Hill (Section 7)	102.75	Tullymorgan-Jacky Bulbin Road	Jacky Bulbin Flat	NA	Low	No
Devils Pulpit to Trustums Hill (Section 7)	114.3	Serendipity Road, Tabbimoble	Private property	Less than 10 dwellings	Low	No
Devils Pulpit to Trustums Hill (Section 7)	114.5	Glencoe Road, Tabbimoble	Tabbimoble State Forest and Doubleduke State	NA	Low	No
Devils Pulpit to Trustums Hill (Section 7)	118.8	Minyumai Road, Tabbimoble	Tabbimoble State Forest	NA	Low	No
Devils Pulpit to Trustums Hill (Section 7)	119.5	Cypress Road, Tabbimoble	Tabbimoble State Forest	NA	Low	No
Devils Pulpit to Trustums Hill (Section 7)	121.1	Swan Bay - New Italy Road, New Italy	New Italy	295 people	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Devils Pulpit to Trustums Hill (Section 7)	123.05	Whites Road, New Italy	Private property	Less than 10 dwellings	Low	No
Devils Pulpit to Trustums Hill (Section 7)	122.9	Red Gates Road/Turners Road, New Italy	NA	NA	Low	No
Devils Pulpit to Trustums Hill (Section 7)	124.8	Nortons road, New Italy	NA	NA	Low	No
Trustums Hill to Broadwater National Park (Section 8)	127	The Gap Road, The Gap	Bunjalung National Park	NA	Low	No
Trustums Hill to Broadwater National Park (Section 8)	127.5	Wondawee Way, Woodburn	NA	NA	Low	No
Trustums Hill to Broadwater National Park (Section 8)	127.5	Sharpe Road, Trustums Hill	Private property	Less than 10 dwellings	Low	No
Trustums Hill to Broadwater National Park (Section 8)	128.2	Brickella Road	NA	NA	Low	No
Trustums Hill to Broadwater National Park (Section 8)	128.3	Tuckombil Road, The Gap	NA	NA	Low	No
Trustums Hill to Broadwater National Park (Section 8)	129	Trustums Hill Road, Woodburn	Private property	15 dwellings	Low	No
Trustums Hill to Broadwater National Park (Section 8)	129.3	Pacific Highway, Trustums Hill, Woodburn	Woodburn	775 people	Low	No
Trustums Hill to Broadwater National Park (Section 8)	131.1	Watsons Road, Woodburn	Private property	Less than 10 dwellings	Low	No
Trustums Hill to Broadwater National Park (Section 8)	132.1	Woodburn - Evans Head road, Woodburn	Woodburn, Evans Head	3000 people	Medium	Yes
Broadwater National Park to Richmond River (Section 9)	140.7	Pacific Highway, Woodburn, Rileys Hill and Broadwater (through Broadwater National Park)	Rileys Hill, Broadwater	650 people	Low	No
Broadwater National Park to Richmond River (Section 9)	142.7	Broadwater - Evans Head road, Broadwater	Evans Head, Broadwater	3000 people	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Broadwater National Park to Richmond River (Section 9)	143.8	Broadwater Quarry Road, Broadwater	Private Property	Less than 10 dwellings	Low	No
Broadwater National Park to Richmond River (Section 9)	143.6	Fisher Street, Broadwater	Broadwater	435 people	Low	No
Broadwater National Park to Richmond River (Section 9)	144.1	Byrnes Street, Broadwater	Private property	Less than 10 dwellings	Low	No
Broadwater National Park to Richmond River (Section 9)	145.6	Pacific Highway, Broadwater	Broadwater	435 people	Low	No
Richmond River to Coolgardie Road (Section 10)	146	Back Channel Road, Wardell	Private property	Less than 10 dwellings	Low	No
Richmond River to Coolgardie Road (Section 10)	148.9	Old Bagotville Road	Private property	Less than 10 dwellings	Low	No
Richmond River to Coolgardie Road (Section 10)	149	Montis Road, Wardell	Private property	Less than 10 dwellings	Low	No
Richmond River to Coolgardie Road (Section 10)	151.25	Thurgates Lane, Wardell	Private property	Less than 10 dwellings	Low	No
Richmond River to Coolgardie Road (Section 10)	152.8	Hillside Lane, Wardell	Private property	Less than 10 dwellings	Low	No
Richmond River to Coolgardie Road (Section 10)	152.9	Wardell Road, Wardell	Wardell	960 people	Medium	No
Richmond River to Coolgardie Road (Section 10)	154.35	Lumleys Lane, Wardell	Private property	Less than 10 dwellings	Low	No

Project section	Station	Road and location	Town, village, location serviced	Population and / or number of properties (estimated)	Traffic volume	Seasonal changes
Richmond River to Coolgardie Road (Section 10)	157.5	Kays Road	Private property	Less than 10 dwellings	Low	No
Richmond River to Coolgardie Road (Section 10)	157.5	Coolgardie Road, Wardell	Wardell	Less than 10 dwellings	Low	No
Coolgardie Road to Ballina Bypass (Section 11)	159.15	Laws Road, Pimlico	Private Property	Less than 10 dwellings	Low	No
Coolgardie Road to Ballina Bypass (Section 11)	159.83	Whytes Lane, Pimlico	Pimlico	455 people	Low	No
Coolgardie Road to Ballina Bypass (Section 11)	159.8	McAndrews Lane, Pimlico	Pimlico	455 people	Low	No
Coolgardie Road to Ballina Bypass (Section 11)	160	Whytes Lane West, Pimlico	Private Property	Less than 10 dwellings	Low	No
Coolgardie Road to Ballina Bypass (Section 11)	164.3	Pimlico Road, Pimlico	Pimlico	455 people	Low	No
Coolgardie Road to Ballina Bypass (Section 11)	164.7	Smiths Drive, Ballina	Private Property	85 dwellings	Low	No

As noted in Table 14-3, most local roads experience low traffic flows (ie less than 1000 vehicles per day).

However, medium traffic flows (ie between 1000 and 5000 vehicles per day) are currently experienced on Yamba Road, Maclean in Section 5; Woodburn – Evans Head Road, Woodburn in Section 8; and Wardell Road, Wardell in Section 10 of the project.

There are no local roads likely to be used by construction traffic with high existing traffic flows (ie greater than 5000 vehicles per day).

In terms of haulage in the vicinity of Wardell, a strategy would be prepared for bulk earthworks between the crossing of the Richmond River and the interchange at Wardell. The strategy would seek to maximise the extent of haulage within the project boundary and limit the need to haul material through the town of Wardell, where possible.

14.2.4 Rail network

The North Coast Railway is the major trunk rail line connecting Sydney and Brisbane. It consists of standard-gauge mainline railway from Hornsby (Sydney) to Dutton Park Junction (Brisbane). It passes through a number of towns and cities including Newcastle, Taree, Kempsey, Coffs Harbour, Grafton and Casino. At Grafton the rail line continues west to Casino and Kyogle, then proceeds to Brisbane, with no further stations in between.

The rail network provides freight transport links to the northern parts of NSW, and between NSW and Queensland. However, rail links between the two states are hampered by the incompatibility of rail track.

14.2.5 Public transport network

Buses are the primary mode of public transport within the study area. Rail and coach services also provide intra- and interstate links to key destinations including Sydney and Brisbane.

There are around 36 companies providing local and school-only bus services in the study area. There are two CountryLink rail and coach services from Grafton to Moree and to Byron Bay. Many of these provide limited services or do not use the Pacific Highway. The major public transport services in the study area are:

- Local bus services operated by Ryan's Bus Service, Ballina Bus Lines, Busways North Coast, and Lawrence Bus Service
- Long-distance bus services operated by Greyhound and Premier Motor Service
- CountryLink coach services operated by Sunstate Coaches and Symes Bus Service
- A daily return rail service operated by CountryLink.

In most rural areas school bus drop-off bays are located along the Pacific Highway. These are either at property access points or on approach roads next to highway intersections. Key school bus drop-off bays include those at:

- Kungala Road
- Corindi Beach
- Tyndale
- Maclean
- Iluka Road
- Mororo Road
- New Italy Museum.

14.2.6 Pedestrian and cycle networks

The Pacific Highway has limited formal pedestrian and cyclist facilities outside the major towns and regional centres. However, this is changing with a policy initiative from the Department of Planning and Infrastructure (2011) called the Coastline Cycleway (the Department is co-funding its progressive development with local government). The main objective is to provide a cycling route along the NSW coast, providing opportunities to cycle between coastal towns.

The coastline cycleway is a collection of individual cycle routes. In general, the intention is to avoid major roads such as the Pacific Highway. However, there are exceptions to this including along the coastline within Bundjalung National Park and near the Bundjalung bombing range.

Within the study area, the coastline cycleway route links with the existing cycleway at South Grafton, continuing along the existing Pacific Highway via Grafton, Lawrence and Maclean to Yamba. Elsewhere, the Pacific Highway provides the core route of the NSW coastline cycleway.

14.2.7 Existing traffic on the Pacific Highway

The progressive upgrading of the Pacific Highway to meet increased travel demand has provided a safer and more efficient inter-regional travel route. This has resulted in more long-distance heavy vehicles opting to use the Pacific Highway between Sydney and Brisbane instead of the New England Highway.

Traffic surveys in 2011 measured average daily traffic along the Pacific Highway between Woolgoolga and Ballina. The survey results and nature of existing traffic are shown in Table 14-4.

Table 14-4: Surveyed average daily traffic volumes 2011 on the existing Pacific Highway

Project section	Location	Light vehicles (veh/day)	Heavy vehicles (veh/day)	Total daily volume (veh/day)	% Heavy vehicle
1	Woolgoolga to Halfway Creek upgrade	6538	2133	8671	25%
2	Halfway Creek upgrade to Glenugie upgrade	6111	2180	8291	26%
3	Glenugie upgrade to Tyndale	7377	2178	9555	23%
4	Tyndale to Maclean	7327	2151	9478	23%
5	Maclean to Iluka Road	9298	2413	11,711	21%
6	Iluka interchange to Devil's Pulpit upgrade	5149	2008	7157	28%
7	Devils Pulpit upgrade to Trustums Hill	5149	2008	7157	28%
8	Trustums Hill to Broadwater National Park	6383	2226	8609	26%
9	Broadwater National Park to Richmond River	6797	2233	9030	25%
10	Richmond River to Coolgardie Road	7512	2223	9735	23%
11 [#]	Coolgardie Road to Ballina	18,994	2758	21,752	13%

[#]Note: high vehicle count due to traffic measured north of Bruxner Highway interchange, which has been reconfigured as part of the Ballina bypass project and separated from the Pacific Highway.

Fluctuations in traffic volumes occur over the Christmas – New Year period, the Easter period, and the June–July and October school holidays. Traffic flows are also higher adjacent to towns and villages. The average daily traffic during the Christmas period is much higher than the yearly average. This is shown in Figure 14-1.

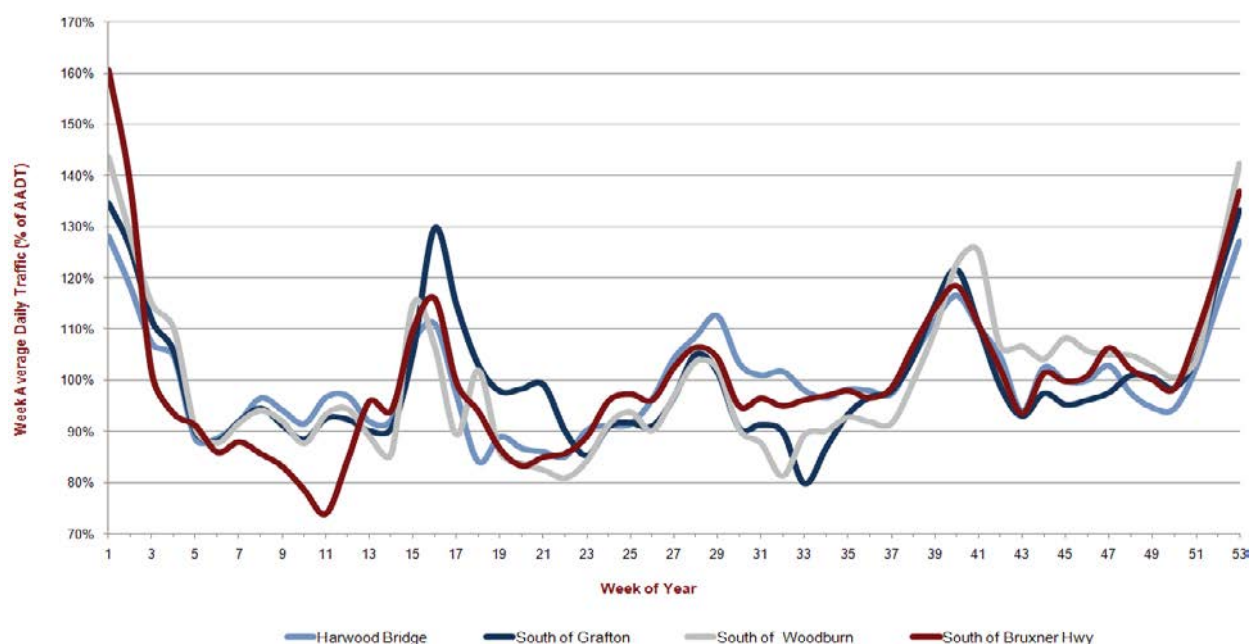


Figure 14-1: Seasonal variation of traffic on the existing Pacific Highway

14.2.8 Highway capacity and level of service

In the study area, the Pacific Highway varies between one lane and two lanes in each direction. The estimated capacity of the highway is about 1200 vehicles per hour per lane. This provides an adequate level of service except during peak holiday times. Level of Service definitions are described in Table 14-5 (From Guide to Traffic Generating Developments, (RTA, 2002, Version 2.2)).

The existing Level of Service on the Pacific Highway within the study area typically varies between B and C. However, a lower Level of Service is experienced during summer holidays and busy weekends, resulting in congestion and traffic delays. At Harwood Bridge, peak holiday traffic volumes are close to capacity, taking into account bridge approach conditions. The opening of the Harwood Bridge over the Clarence River for the occasional passage of high-masted river vessels can also interrupt traffic flows. Traffic delays may also occur occasionally due to flooding and other incidents.

Table 14-5: Level of Service definitions (lane capacity)

Level of service	Average delay per vehicle (seconds/vehicle)	Definition
A	Less than 14	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
B	15 to 28	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with level of service A.
C	29 to 42	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.

Level of service	Average delay per vehicle (seconds/vehicle)	Definition
D	43 to 56	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow would generally cause operational problems.
E	57 to 70	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream would cause breakdown.
F	Over 70	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

14.2.9 Highway travel

The average travel time along the highway between Woolgoolga and Ballina is around two hours and 10 minutes. Traffic between the two towns generates about 1.7 million kilometres of vehicle travel per day.

By 2016, without the project in place, total travel on the existing highway is expected to increase by 7.9 per cent for all vehicles. Over the same period, heavy vehicle travel is expected to increase by around 15.7 per cent. By 2036, travel by all vehicles is expected to increase by around 41.6 per cent, and heavy vehicle travel times are expected to double, increasing by some 97% per cent.

14.2.10 Vehicle trip origins and distances

Traffic along the Pacific Highway between Woolgoolga and Ballina is a mixture of through and local traffic. The survey showed there were a high number of short trips, a moderate amount of medium and very long trips, and relatively low numbers of long trips.

Grafton is the major regional centre in the study area. Around 29.5 per cent of light vehicle trips travel from Grafton, West Grafton or South Grafton, and around 28.3 per cent finish in Grafton. The average trip length for light vehicles in the study area is around 36.8 kilometres.

Heavy vehicle trips reflect the regional importance of Grafton, with 19.2 per cent of trips originating in Grafton, west Grafton or South Grafton. The average trip length for heavy vehicles in the study area is around 73.3 kilometres.

Five per cent of all trips between Woolgoolga and Ballina are for the whole 176 kilometres of existing highway. Only around three per cent of light vehicles and 22 per cent of heavy vehicles travel the full distance.

14.2.11 Freight and heavy vehicles

Road-based freight transport represents 76 per cent of Sydney–Brisbane inter-capital freight. Rail represents 11 per cent, coastal shipping 12 per cent and air around one per cent.

Heavy vehicles (rigid trucks and articulated vehicles such as semitrailers and B-doubles) make up more than 23 per cent of total daily travel along the highway between Woolgoolga and Ballina.

Heavy vehicle traffic remains fairly constant throughout the day, but can increase in places along the highway at night. This contrasts with car traffic, which peaks during the middle of the day (refer to Figure 14-2).

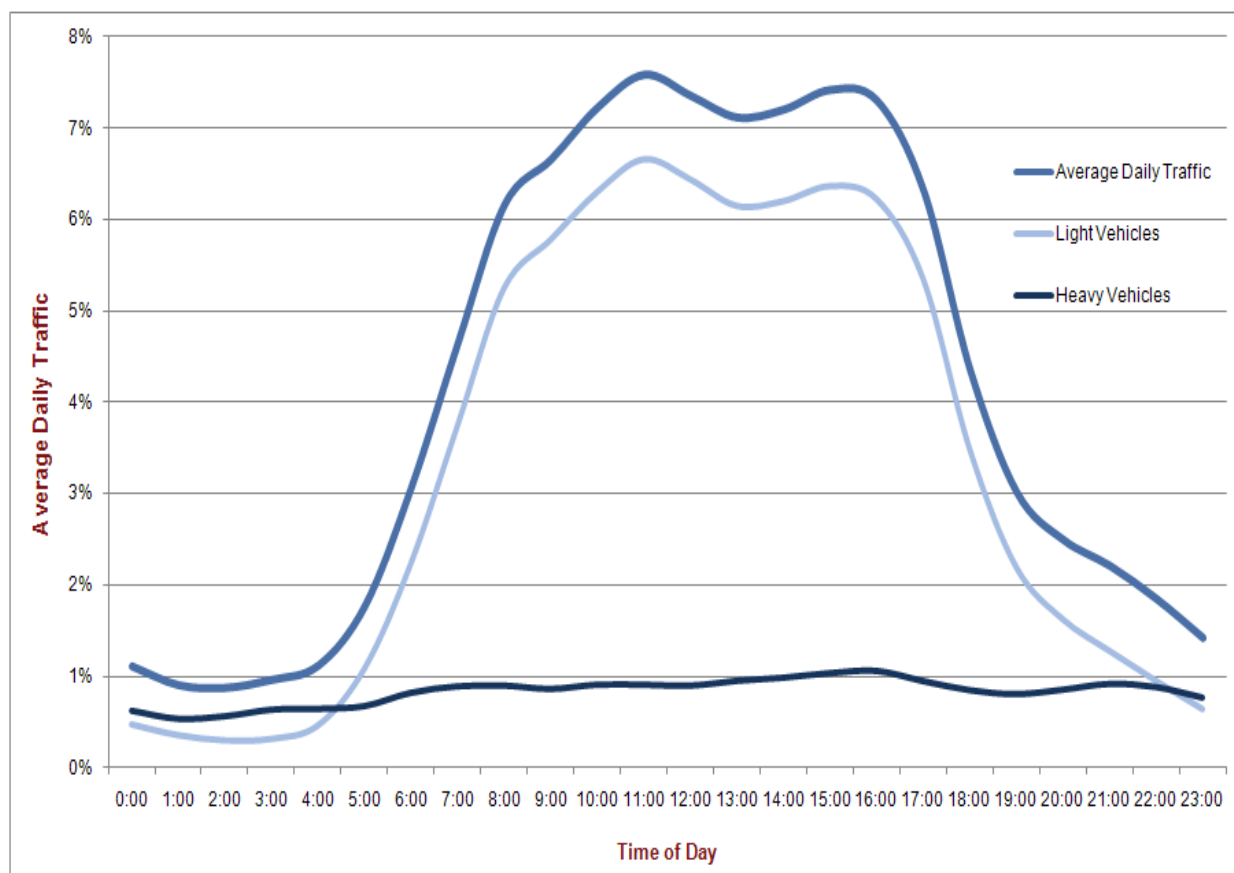


Figure 14-2: Profile of traffic on the Pacific Highway between Woolgoolga and Ballina

On average, 80 per cent of traffic using the Pacific Highway between Woolgoolga and Ballina between 6.00 am and 6.00 pm are light vehicles. Light vehicle activity is relatively constant throughout this period. However, a clear decrease is experienced outside this period, as only 20 per cent of traffic are light vehicles during the evening and night-time.

On average, heavy vehicles represent 60 per cent of traffic use on the highway between 6.00 am and 6.00 pm. Heavy vehicle movement is busiest between 3.00 pm and 5.00 pm and quietest between 1.00 am and 3.00 am. The proportions of heavy vehicles are around 10 per cent and 5 per cent respectively, during these periods, when considered as a proportion of overall average daily traffic.

14.2.12 Crash rates

There were a total of 644 crashes along the Woolgoolga to Ballina section of the Pacific Highway between 2006 and 2010. Around 38 per cent involved heavy vehicles. The number of crashes has fluctuated during this period, with a maximum of 141 crashes in 2009 and a minimum of 115 crashes in 2010. Of the total number of crashes over the 2006–2010 period, 29 involved a fatality, 255 were classified as injury crashes and 360 were non-casualty (tow away) crashes.

Crash rates are commonly expressed in terms of crashes per 100 million vehicle kilometres travelled. The crash rate along the Pacific Highway varied over the 2006–10 period. The highest crash rate was 26.7 crashes per 100 million vehicle kilometres travelled between Richmond River and Coolgardie Road (Section 10). The lowest crash rate was 9.2 crashes per 100 million vehicle kilometres travelled between Coolgardie Road and Ballina (Section 11). The crash rate for the Pacific Highway across the study area averaged 20.7 crashes per 100 million vehicle kilometres travelled.

Figure 14-3 to Figure 14-7 shows the locations of crashes in the study area between 2006 and 2010. Figure 14-8 shows the crash density (number of crashes within a one-kilometre section along the highway), and Figure 14-9 shows the density of casualties resulting from crashes in the same period.

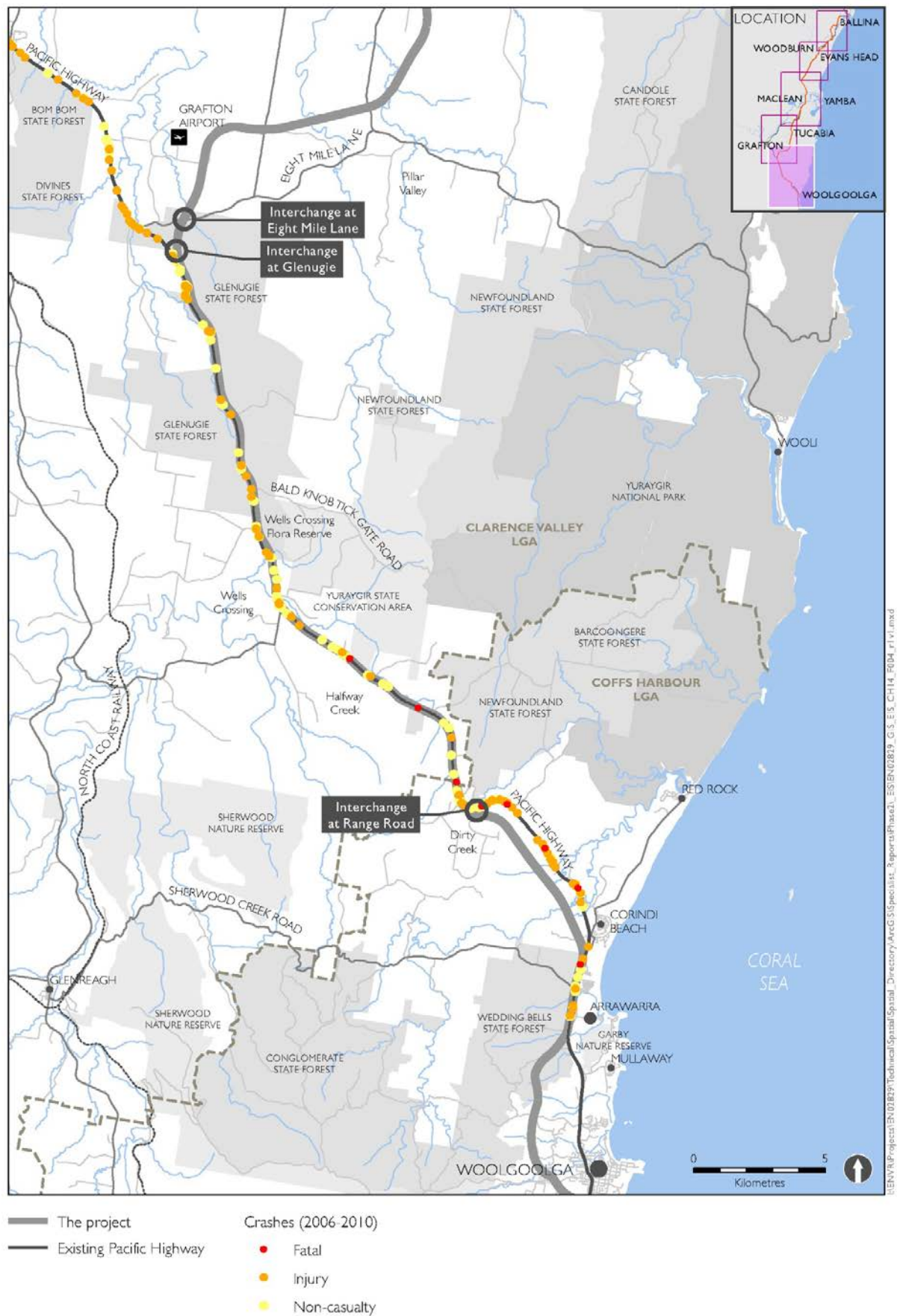


Figure 14-3: Fatal, injury and non-casualty crashes, 2006 to 2010 (Woolgoolga to Glenugie)

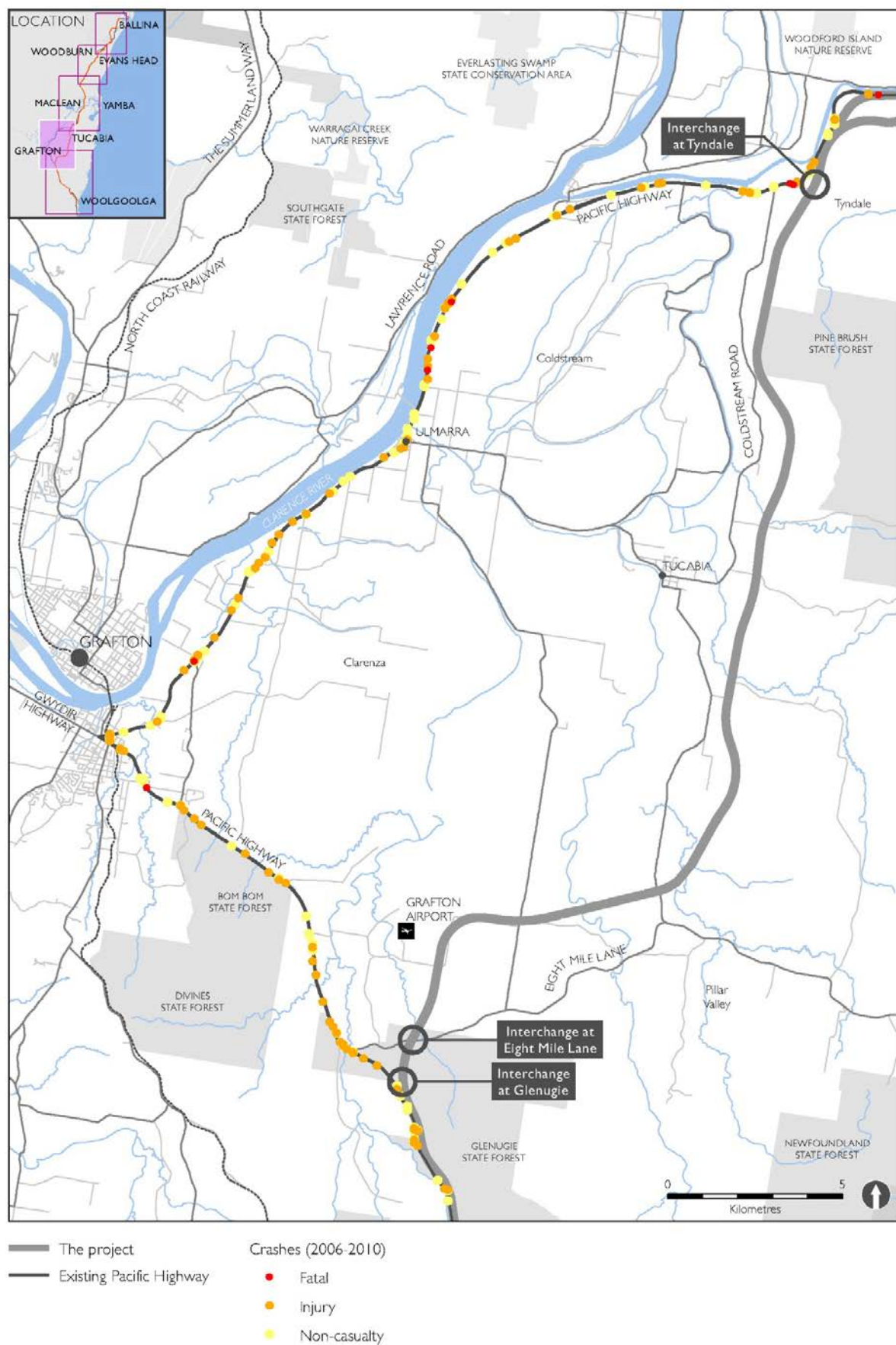


Figure 14-4: Fatal, injury and non-casualty crashes, 2006 to 2010 (Glenugie to Tyndale)

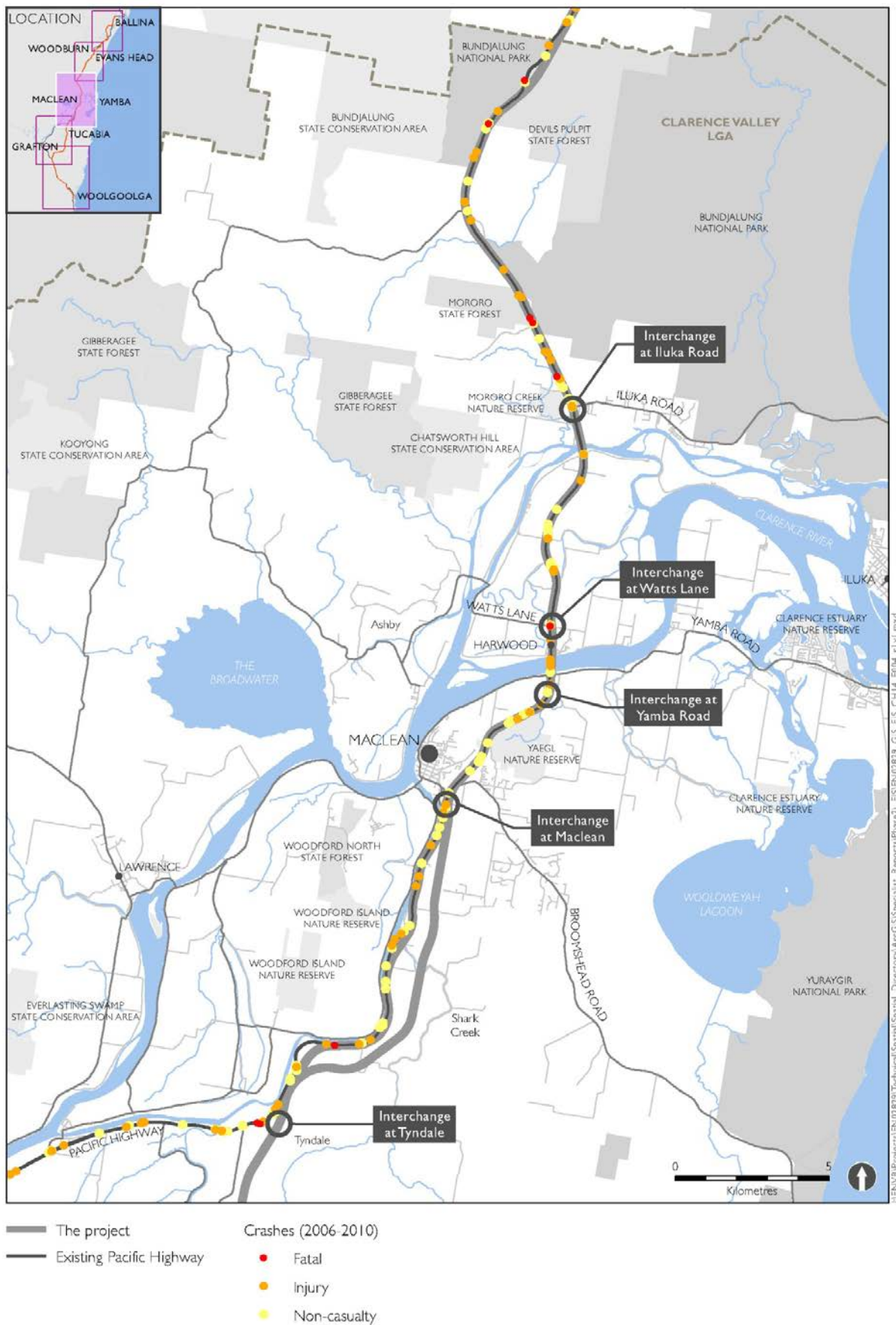


Figure 14-5: Fatal, injury and non-casualty crashes, 2006 to 2010 (Tyndale to Devils Pulpit)

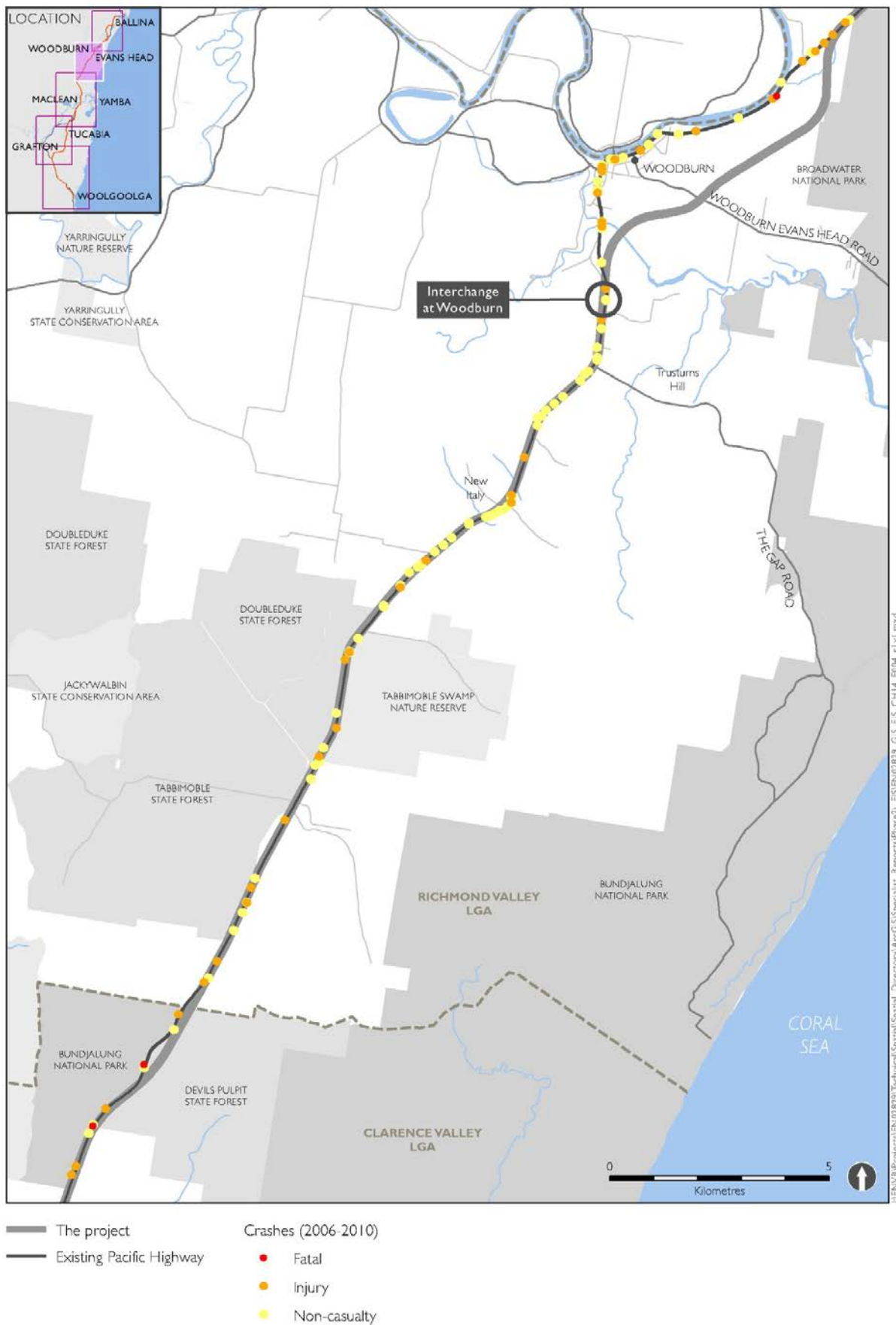


Figure 14-6: Fatal, injury and non-casualty crashes, 2006 to 2010 (Devils Pulpit to Woodburn)

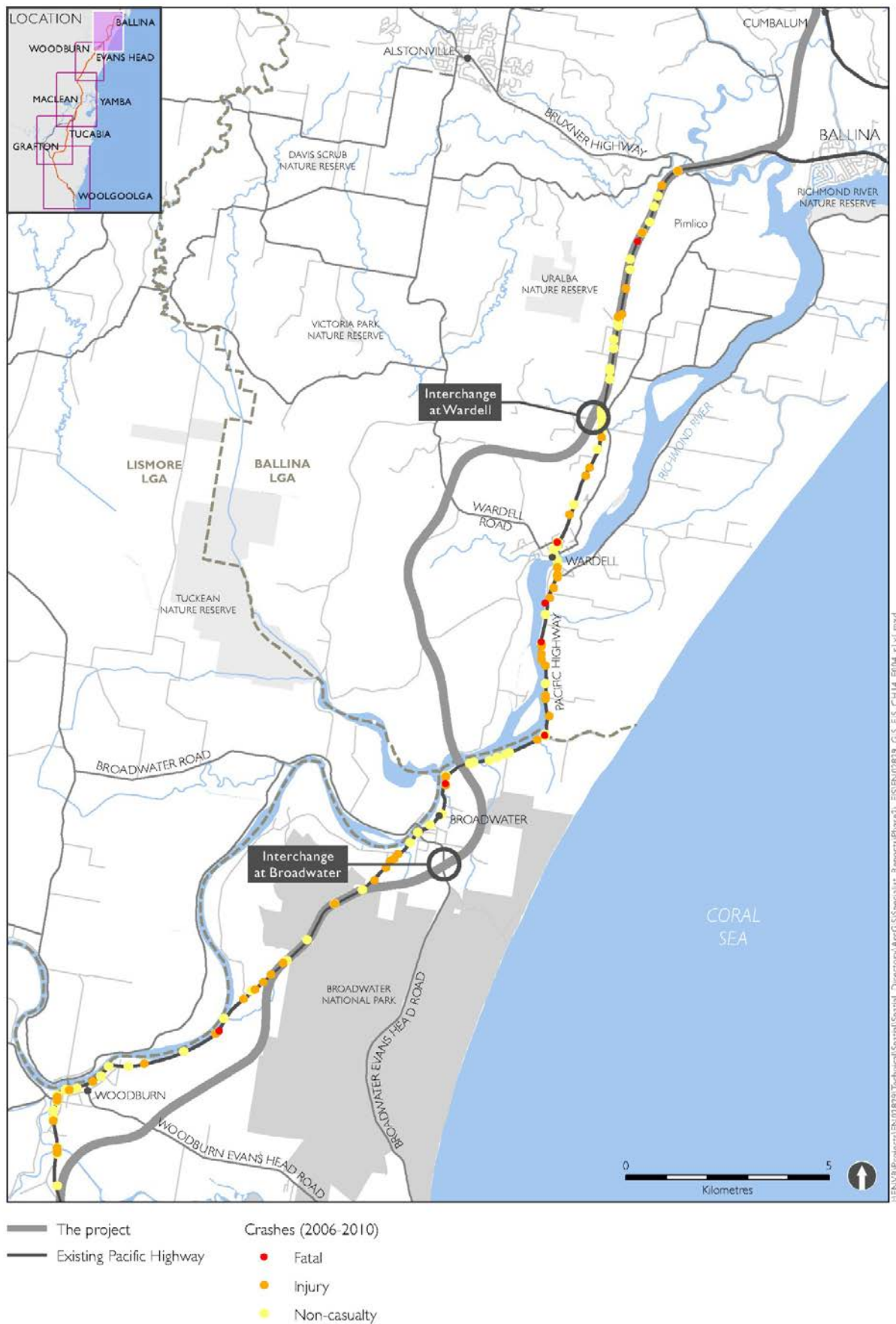


Figure 14-7: Fatal, injury and non-casualty crashes, 2006 to 2010 (Woodburn to Ballina bypass)

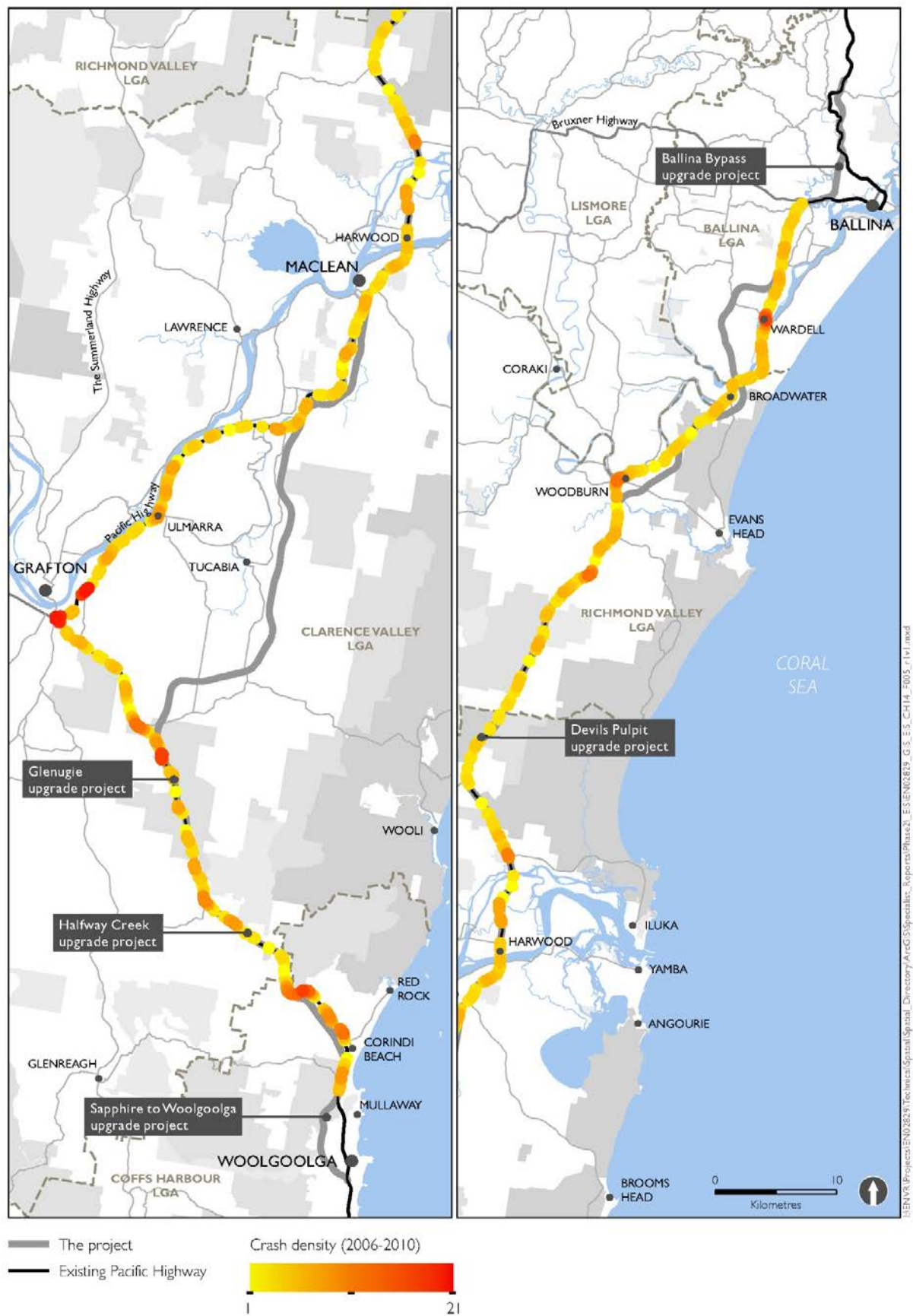


Figure 14-8: Crash density (crashes per kilometre), 2006 to 2010

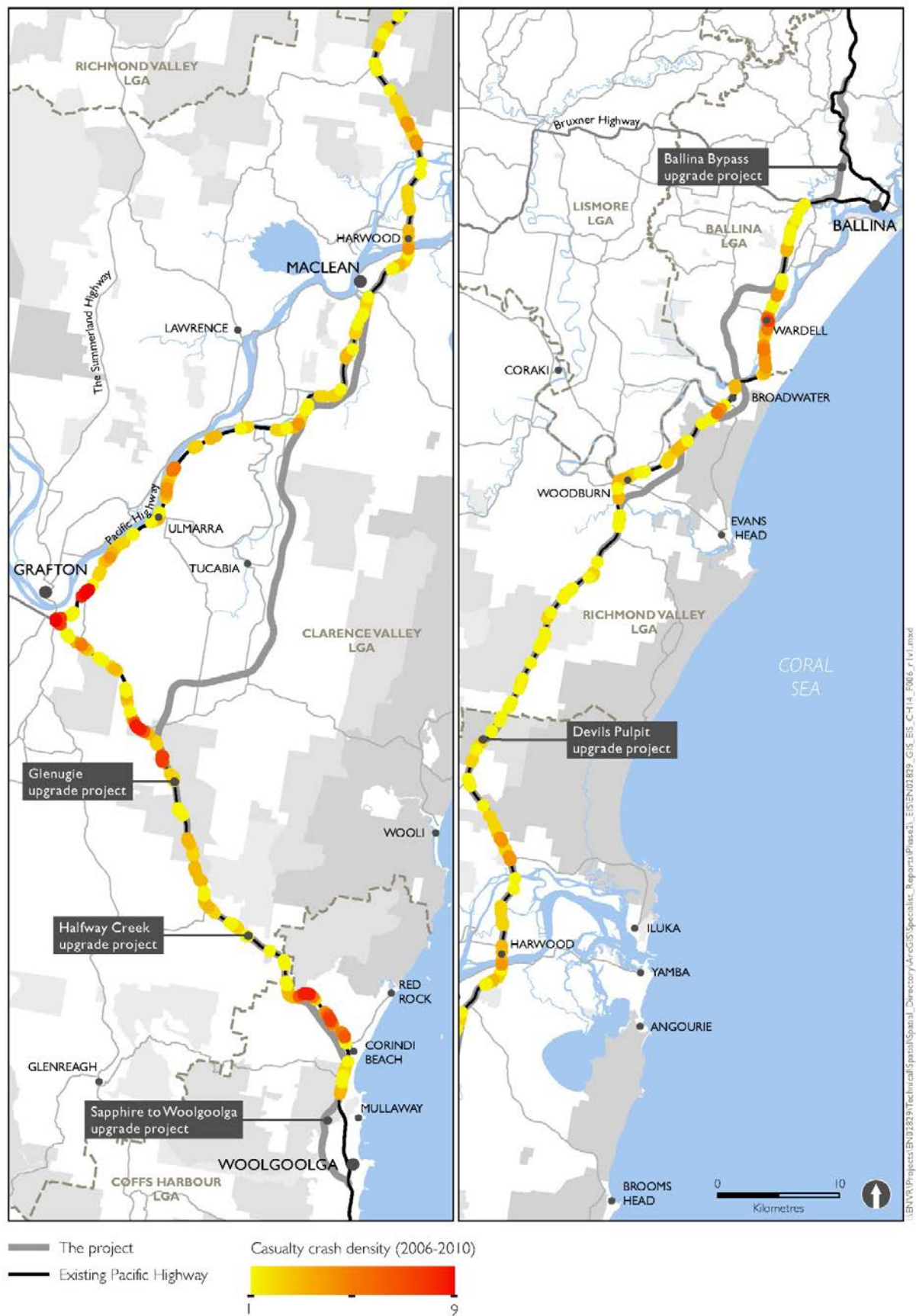


Figure 14-9: Casualty crash density (casualty crashes per kilometre), 2006 to 2010

Figure 14-8 and Figure 14-9 show that the following highway sections have a very high crash frequency:

- Range Road to Barcoongere Way, Dirty Creek
- Lookout Road to Eight Mile Lane, Glenugie (improved as part of the Glenugie upgrade)
- Centenary Drive and Viaduct Road, South Grafton.

14.2.13 State forest roads

State forests located near the project are managed for timber harvesting and occasionally leased for grazing. There are places where the project would cross state forest roads. State forests that are within or near the project boundary include:

- Wedding Bells State Forest: Located west of Arrawarra (Section 1)
- Newfoundland State Forest: Located near Milleara (Section 1) and north of Halfway Creek (Section 2)
- Glenugie State Forest: Located mainly between Halfway Creek and the proposed interchange at Eight Mile Lane (Section 2 and part Section 3)
- Pine Brush State Forest: Located south of the proposed Tyndale interchange (Section 3)
- Mororo State Forest: Located at Mororo (Section 6)
- Tabbimoble State Forest and Doubleduke State Forest: Located at Tabbimoble (Section 7).

14.2.14 Maritime transport

The Clarence (including both north and south arms) and Richmond rivers are the only navigable rivers within the study area. These provide important networks for boating and fishing. Both rivers have a history of shipping including export and import of people and freight. This function has now been replaced by road, rail and air services. Commercial fishing fleets and recreational boating are the main maritime uses for these rivers.

Prawn trawling is permitted in four estuaries in NSW: the Clarence River, Hunter River, Hawkesbury River and Port Jackson. The Clarence River is the only one of these estuaries located within the study area and is the most productive of the four estuaries.

Fishing vessels and other recreational boats are likely to be the main river users located on or near the major bridge crossing points. There are currently two low-level bridges in the study area:

- The bridge over the Clarence River at Harwood: This is a vertical-lift span bridge. It is 8.5 metres above Australian Height Datum when closed and 36.5 metres above Australian Height Datum when open. The bridge opens about 13 times per month for maritime traffic
- The bridge over the Richmond River at Wardell: This is a vertical-lift span bridge. It is 5.4 metres above Australian Height Datum when closed and 24.3 metres above Australian Height Datum when open.

The proposed bridge heights for the crossings of the Clarence and Richmond rivers were determined in consultation with NSW Maritime. For the crossings of the Clarence River, a vertical clearance of 30 metres was considered sufficient for existing and potential future users. For the crossing of the Richmond River, a vertical clearance of 15 metres was considered sufficient for existing and potential future users.



Photo 2: Existing bridge crossing of the Clarence River at Harwood

14.2.15 Rest areas

Rest areas and truck stops are located at various points along the Pacific Highway and within each town. (These are informal in nature and not comparable to those proposed as part of RMS' rest area strategy along the Pacific Highway.)

Existing tourist information centres within major towns along the highway and rest areas with direct access off the highway include:

- Ferry Park, Maclean: This is located to the west of the Pacific Highway at Cameron Street
- South Grafton: This is located to the west of the Pacific Highway between the Gwydir Highway and Spring Street.

The locations of existing rest areas are shown on Figure 14-34.

14.3 Assessment of impacts – construction

14.3.1 Access roads to be used by construction vehicles

Haulage of equipment and materials along local roads would be low when compared with quantities to be hauled along the existing Pacific Highway. Whilst it would create a substantial relative increase in vehicle numbers, existing traffic numbers are low. This increase might trigger some level of community concern but increases would be within the capacity of the local roads. However, safety issues would need to be monitored. As part of detailed construction management planning, condition surveys would need to be undertaken once detailed routing is determined. These surveys would need to monitor road, asset and traffic conditions, and be repeated during construction. Surveys would need to be repeated upon completion to check whether the roads have been returned to their pre-construction condition.

In addition to earthworks materials sourced from within the project, substantial quantities of materials would need to be imported from local quarries. These materials would be hauled along local roads. Materials would be transported from quarries and along the existing highway to the various construction sites and batch plants located along the length of the project.

The local roads that are likely to be used by construction vehicles are summarised in Table 14-6. This list is indicative and could be subject to change in response to detailed design, and traffic routing arrangements agreed via community consultation. In particular, a strategy would be prepared for bulk earthworks haulage in the vicinity of Wardell to manage construction traffic routing.

Table 14-6: Local roads that could potentially be used for construction access or haul routes

Project section	Relevant access road potentially to be used	
1	Kangaroo Trail Road Corindi access road (to be constructed) Post Office Lane	
2	Lemon Tree Road Parker Road Bald Knob Tick Gate Road Franklins Road	
3	Eight Mile Lane Aerodrome Road Old Six Mile Lane Avenue Road Wooli Road Mitchell Road Firth Heinz Road	Tucabia Road Bostock Road Somervale Road Crowleys Road Sheehys Lane Benson Lane A temporary access road at northern end of Section 3 to existing highway
4	Shark Creek Road McIntyres Lane Causleys Lane Goodwood Road Jubilee Street	
5	Yamba Road Watts Lane Chatsworth Road Carrols Lane Farlows Lane	

Project section	Relevant access road potentially to be used	
8	Existing road north of Tuckombil Canal Alfred Street Wagner Street Woodburn – Evans Head Road	Norman Street Woodburn Evans Head Road Existing access road south of Lang Hill
9	Broadwater Evans Head Road	
10	Back Channel Road Old Bagotville Road Thurgates Lane Hillside Lane	Wardell Road Coolgardie Road Lumleys Lane
11	McAndrews Lane Sartories Lane Whytes Lane	Pimlico Road Smith Street

In most cases, the local roads listed above have low levels of existing traffic (less than 1000 vehicles per day). Medium traffic flows are currently experienced on Yamba Road, Maclean in Section 4 of the project; Woodburn – Evans Head Road, Woodburn in Section 8 of the project; and Wardell Road, Wardell in Section 10 of the project. These local roads would potentially be more sensitive to road traffic increases during construction in view of the nature of existing traffic. Appropriate routing arrangements would be required during construction to minimise impacts for local road users and the communities of Harwood, Woodburn and Wardell.

14.3.2 Construction traffic volumes

The average daily number of heavy vehicles is estimated to increase by around 3.2 per cent, when compared with total daily traffic flows (refer to Table 14-9). Exact numbers and percentage increases would depend on the exact timing and duration of construction which would be determined only at construction. When compared to existing heavy vehicles, truck numbers are estimated to increase by around 13.8 per cent on average. Potentially this would increase traffic flows in some cases from low to medium levels. No local roads would be subject to high traffic levels during construction.

Indications from the 2011 traffic surveys and growth forecasts for the year the project is anticipated to open to traffic (2016) indicate the Pacific Highway has adequate capacity to absorb construction traffic. This increase is not anticipated to reduce the highway's current Level of Service except in peak holiday times.

Light and heavy vehicles would originate from the major towns, towns or villages housing workers, contractors, plant or construction materials and equipment. Construction vehicles would likely originate from the Coffs Harbour and Grafton area for works in the south and from the Ballina direction for works in the north.

Road base, sand, aggregate and earthwork material from outside the project would be hauled to site using local roads and the existing Pacific Highway. This would require around 162,000 truck trips in total. This assumes each road truck has a 12 cubic metre and or 25 tonne capacity. Chapter 6 (Description of the project (construction)) describes the materials needed for the project in further detail. The number of truck trips assume an estimated 1.23 million tonnes of road base, 0.79 million tonnes of sand and 1.44 million tonnes of aggregate are required.

A further 0.5 to 0.6 million tonnes of earthworks material is also assumed to be required from outside the project (assuming an earthworks shortfall of 315,000 cubic metres across the project). All other earthworks materials are assumed to be available from cuttings located within the project boundary. A further estimated 343,000 truck trips are potentially required to transport earthworks materials from within the project along the existing Pacific Highway, as described in Table 14-7.

14.3.3 Impacts on the regional and local road network

Access for construction activities, including the haulage of earthworks materials, would be within the project boundary, wherever possible (Section 14.3.4 presents more detail on the haulage of earthworks materials). However, there would be stages of construction and sections of the project where continuous access along the new alignment would not be available. In these situations, the existing highway or parts of the local road network would be required.

Traffic delays may be experienced at the various tie-in points along the length of the project where interchanges would be constructed. Construction staging would be developed to ensure the existing number of trafficable lanes along the existing Pacific Highway is maintained at all times. Newly constructed road and / or temporary pavement would be used to provide suitable side tracks and detours with an appropriate design speed to minimise delays to road users. However, motorists using local roads which intersect with the existing Pacific Highway and/or the highway could also experience possible delays.

Traffic management plans and construction staging would be progressively developed and refined during construction to facilitate the safe and efficient movement of traffic through and around all intersections, construction sites and local road networks affected by the project.

The passage of trucks servicing the project is not expected to adversely affect existing road networks or the access of other vehicles to the network. Regular review of the usage of local roads by construction vehicles would be carried out by personnel supervising the works, and adjustments made to traffic control plans as required. This would include locations associated with vehicle passage, manoeuvring of vehicles and site access points (described in Chapter 6 (Description of the project – construction)).

In addition, the highway and various local roads would be used for the delivery of materials and equipment and for general (controlled) access to the construction sites.

Impacts on highway function and access

Construction would generally be undertaken clear of traffic. This would result in minor impacts on the existing Pacific Highway and local traffic. The existing highway would continue to operate within capacity, but temporary disruptions and delays would occur.

The highway may need to be partially or fully closed from time to time. The number, type and duration of these road closures would depend on the construction methods adopted, particularly for construction of the tie-ins with the existing Pacific Highway. Where full road closures are required, these would be at night to minimise disruption to traffic. Detours for local traffic during full road closures would be considered where alternative routes exist.

The contractor would be responsible for liaising with RMS and other key stakeholders including local councils to ensure road closures and disruptions are managed safely and efficiently. This includes communication of closures to affected communities, identification of alternative routes, clear and unambiguous way finding, variable message signage, temporary traffic signals and traffic control personnel.

Localised access to the highway would be maintained where applicable. If required alternative access points would be identified. Consideration would be given to efficient timetabling, the implications of detours and the timing of works.

The contractor would be responsible for ensuring construction staff abide by relevant health and safety requirements. In particular, parking for staff vehicles would be provided in sufficient quantity off road and within the construction envelope.

Impacts on local road access, properties and businesses

Access to local roads, properties and businesses would be maintained throughout the construction of the project, where practicable. However, interruptions to access would occur at various times. Interruptions would be for short periods and by agreement with the affected property owners, businesses and/or relevant agencies. In addition, some delays may occur on local roads when heavy and light vehicles need to access work sites.

14.3.4 Impacts of haulage trucks

Haulage along the existing highway

The haulage of earthworks and spoil materials along the existing highway is summarised in Table 14-7. These estimates may be subject to change through further refinement of the vertical alignment, and from shorter hauls (less than 20 kilometres). The locations of quarries potentially available as material sources are shown in Figure 16-14 in Chapter 16 (Land use and property). Local roads would be used to transport materials to and from the project, as described below. In particular, haulage in the vicinity of Wardell would be subject to a bulk earthworks strategy, which would manage construction traffic routing.

Table 14-7: Haulage of earthworks and spoil materials along the existing highway

Estimated quantity (metres ³ #)	Haulage details		Approximate distance	Number of truck trips for earthworks and spoil haulage
	From	To		
70,000	Section 1 (Dirty Creek Range)	Section 1 (south of Corindi Creek)	10–15 km along the road formation, Corindi access road and highway	5800 trips
100,000	Section 1	Section 2	10–15 km	8400 trips
35,000	Section 2 and 3 (Glenugie)	Section 2	15 km	2900 trips
160,000	Section 3	Section 2	20 km	13,400 trips
10,000	Section 3	Section 3 (Glenugie)	10 km	830 trips
810,000	Section 3	Section 5	35–45 km	67,500 trips
840,000	Section 4	Section 5	10–15 km for general fill material and up to 45 km for other material	70,000 trips
325,000	Section 3	Section 6	35–45 km	27,100 trips
30,000	Devils Pulpit	Section 6	40 km	2500 trips
35,000	Devils Pulpit	Section 7	5–10 km	2900 trips
150,000	Section 3	Section 7	50–60 km	12,500 trips
20,000	Section 8	Devils Pulpit	30 km	1700 trips

Estimated quantity (metres ³ #)	Haulage details		Approximate distance	Number of truck trips for earthworks and spoil haulage
	From	To		
100,000	Section 8 south of Woodburn interchange	Section 8 (north of Tuckombil Canal)	4 km along road formation, existing highway and access road north of canal	8300 trips
80,000	Section 8 south of Woodburn interchange	Section 8 (north of Macdonalds Creek)	10 km along road formation and existing highway	6700 trips
960,000	Section 3	Section 9	70–85 km	80,000 trips
295,000	Section 3	Section 10	80–95 km	24600 trips
95,000	Section 10	Section 11	10 km	7900 trips

#: The quantities are rounded to the nearest 5000 cubic metres. The number of truck trips is based on road trucks of 12 cubic metres capacity and rounded to the nearest 100 trips. These estimates are indicative and may be subject to change through changes in the vertical alignment, and from shorter hauls (less than 20 kilometres).

Cuttings within Section 3 would potentially provide fill material for the project. The indicative start dates, duration of haulage operations and average number of truck trips per day for the movement of the material from Section 3 to Sections 5, 6, 7, 9 and 10 are shown in Table 14-8.

Table 14-8: Estimated timing of haulage operations north along highway from Section 3

Haulage details #		Indicative haulage duration	Average truck trips per day (estimated)
From section	To section		
3	5	12 month	280
3	6	6 months	230
3	7	3 months	210
3	9	18 months	230
3	10	9 months	170

#: Assuming 20 haulage days per month and rounded to the nearest 10 trips.

Assuming a 13 hour working day, the number of truck trips between Section 3 and 5 described in Table 14-8 equates to around 22 vehicles per hour, or 1 vehicle every 2.7 minutes. This would have a minimal impact on highway operation as this traffic increase is within the capacity of the existing highway. However, potential impacts could include reduced travel times from slower speeds and safety implications from drivers becoming frustrated at slower travel speeds and temporary traffic arrangements.

The townships of Harwood, Woodburn, Broadwater and Wardell are located along the existing highway and would experience a noticeable increase in construction traffic. The estimated number and duration of additional truck movements along the highway at these townships is shown in Table 14-9. These additional daily truck volumes include the delivery of materials and equipment to the road corridor and ancillary facilities.

Peak heavy vehicle activity would result in a 37.7 per cent increase in current heavy vehicle numbers using the Pacific Highway near Harwood. This represents an increase of 7.8 per cent on total daily traffic flow near this location. At Woodburn, peak increases in heavy vehicle activity would be around 18 per cent. This represents an increase of around 4.6 per cent on total daily traffic. At Broadwater, peak increases in heavy vehicle activity would be around 10 per cent. This represents an increase of 2.5 per cent on total daily traffic. At Wardell, peak increases in heavy vehicle activity would be around 10 per cent. This represents an increase of around 2.3 per cent on total daily traffic.

These increases are within the highway's existing capacity and are not anticipated to reduce the highway's level of service. However, noticeable increases in traffic levels and road user delay are predicted at Harwood (Section 5) and Wardell (Section 10) during peak construction periods.

Table 14-9: Estimated increase in average daily truck volumes on the existing highway during construction (indicative only)

Traffic levels (vehicles/day)		Harwood (Section 5)	Woodburn (Section 8)	Broadwater (Section 9)	Wardell (Section 10)
Current	All vehicles	11,711	8609	9030	9735
	Heavy vehicle	2413	2226	2233	2223
Predicted	Vehicle forecast: range	230 to 910	230 to 400	170 to 220	170 to 220
Forecast increases	All vehicles (average 3.2 per cent)	2 per cent to 7.8 per cent	2.7 to 4.6 per cent	1.9 per cent to 2.5 per cent	1.7 per cent to 2.3 per cent
	Heavy vehicles (average 13.8 per cent)	9.5 to 37.7 per cent	10.3 to 18 per cent	7.6 to 9.9 per cent	7.6 per cent to 9.9 per cent

Haulage along local roads

Some earthworks and batching materials would need to be hauled along local roads. Local roads that could be used for haulage of earthworks and batching materials are shown in Table 14-10 and Table 14-11.

Table 14-10: Haulage of earthworks materials on local roads

Estimated quantity of earthworks (m ³ #)	Haulage details		Local road used
	From	To	Truck trips # (estimated)
Section 1			
70,000	Dirty Creek Range	South of Corindi Creek	Corindi access road 5800 trips
Section 8			
100,000	South of Woodburn interchange	North of Tuckombil Canal	Local access road north of Tuckombil Canal 8300 trips
Section 9			
35,000	Section 3	Section 9	Broadwater – Evans Head Road 2900 trips

#: Quantities rounded to the nearest 5000 m³.

Earthworks haulage along the above local roads would be required for the following reasons:

- In Section 1 haulage along the formation of the upgraded highway would not be available across Corindi Creek until the new bridge is constructed. However, the rock fill material would need to be placed before the construction of the southern bridge abutment could start
- In Section 8 haulage along the formation of the upgraded highway would not be available across the Tuckombil Canal until the new bridge is constructed. However, the rock fill material would need to be placed for the soft soil treatment site before the construction of the northern bridge abutment could start
- In Section 9 haulage of earthworks material into the construction site directly from the existing highway immediately north of the Richmond River crossing would not be safe. Access would need to be by the existing intersection with Broadwater Evans Head Road.

The proposed locations for asphalt and concrete batching plants for the production of concrete and asphalt for pavement construction are described in Chapter 6 (Description of the project – construction). While the majority of these locations can be accessed directly from the existing highway, specific sites would require the delivery of materials to the site batch plants along local roads. These are shown in Table 14-11. The nature of existing traffic is described in Table 14-3.

Table 14-11: Delivery of materials to site batch plants via local roads

Project section	Local road used for material deliveries
Section 1	Kangaroo Trail Road
Section 1	Post Office Lane and local access track
Section 2	Lemon Tree Road
Section 2	Parker Road
Section 3	Local access road
Section 3	Eight Mile Lane and Avenue Road
Section 3	Eight Mile Lane and Wooli Road
Section 3	Tucabia Road and a local access road
Section 3	Coldstream Road (Tucabia Road)
Section 3	Sheeys Lane
Section 4	Shark Creek Road and access track
Section 4	McIntyres Lane
Section 5	Farlows Lane
Section 5	Watts Lane
Section 8	Alfred Street, Wagner Street and Woodburn Evans Head Road, or Norman Street and Woodburn Evans Head Road
Section 9	Evans Head Broadwater Road
Section 10	Wardell Road, Hillside Lane and local access road
Section 10	Coolgardie Road
Section 10	Local property access
Section 11	McAndrews Lane and Sartories Road
Section 11	Pimlico Road

14.3.5 Construction workforce traffic

Workforce numbers and light vehicle traffic generation

The total full time workforce is anticipated to peak at around 4300 in the third quarter of 2015. Workers would be distributed across all 11 project sections.

Table 14-12 shows the estimated full time site based construction workforce for each of the 11 project sections.

Table 14-12: Estimated light vehicle forecast per day

Project section	Light vehicle forecast per day (maximum, assuming 85% single occupancy)
Section 1	300
Section 2	170
Section 3	850
Section 4	425
Section 5	550
Section 6	170
Section 7	255
Section 8	255
Section 9	170
Section 10	380
Section 11	130
Project total	3655

The workforce numbers are based on comparable recent major highway upgrade projects undertaken by RMS and exclude part time, off-site workers and delivery trucks. To estimate the number of light vehicles, it is assumed under a worst case scenario 85 per cent of the workforce would drive to site alone. This is a conservative estimate and allows scope to consider other staff travelling to site such as those working part time.

Therefore, the peak number of light vehicle trips in Section 3 is estimated to be 850 light vehicle trips per day (two-way). Similarly, the peak number of light vehicle trips in Section 4 and 5 is estimated to be 425 and 550 per day (two way). It is likely that light vehicles could travel from Grafton and Coffs Harbour along the existing highway to access these sections. There would invariably be a level of car sharing among staff and where possible this could be encouraged by the contractor to reduce the number of single occupancy light vehicles.

While the increase in traffic would be considerable when compared to the existing situation, it is well within the capacity of the existing highway. Furthermore, the proposed working hours for the project (6am to 7pm Monday to Friday, 8am to 4pm on Saturdays) and the arrival and departure of workers would typically not correspond with general peak traffic periods.

Traffic management measures

Workforce traffic management would depend on the scale of the workforce required for the particular work site, its proximity to residential areas that would source the workforce, and the work site capacity for on-site car parking. These issues would be addressed in the construction traffic management plans to be developed for each site. Practices adopted on recent Pacific Highway Upgrade projects could be adopted, including bussing the workforce to site and preferential parking for car share. The construction traffic management plans would include recommendations for managing access points to work sites during peak traffic times to promote safe access and avoid affecting traffic on the highway and local roads. Traffic management measures are outlined in Section 14.5.

14.3.6 Changes to traffic conditions

Changes to traffic conditions are expected to be greatest near site access points, where proposed haulage routes and construction site accesses are on existing roads. Site access locations are described in Chapter 6 (Description of the project – construction). Where construction vehicles entering and exiting the road network are expected to affect traffic flows, temporary intersections with appropriate auxiliary turning lanes would be required. Under these arrangements, highway traffic would be deviated around construction vehicles waiting to turn, thus maintaining traffic flow. Safety would be improved by removing vehicles waiting to turn from the through-traffic lane.

During construction, minimal delays would be experienced at points where the project ties into the existing Pacific Highway. Construction would be staged to ensure the existing number of trafficable lanes is maintained at all times. Newly constructed work or temporary pavement would be used to provide suitable side tracks and detours with an appropriate design speed to minimise delays to road users. Motorists using local roads could also experience delays during construction.

Trucks servicing the project are not expected to adversely affect existing roads or the access of other vehicles to the road network. However, it is likely that there would be a noticeable increase in truck numbers, particularly around Harwood, Woodburn, Broadwater and Wardell. This may lead to increased journey times and traffic delays during construction for road users on the Pacific Highway or local roads.

The use of local roads by construction vehicles would be regularly reviewed by site supervisors, and traffic control plans would be amended, where required. This would include locations required for vehicles to pass, manoeuvring of vehicles, and site access points. This issue would be particularly important in areas of potential traffic conflict around Wooli Road, Tucabia Road, Bostock Road, (Section 3); Chatsworth Road (Section 5); Alfred Street, Wagner Street, Woodburn – Evans Head Road (Section 8); Back Channel Road, Wardell Road, Coolgardie Road, Lumleys Lane (Section 10); McAndrews Lane, Sartories Lane, and Pimlico Road (Section 11). These roads are important for local access, and substantive use by construction vehicles may disrupt movements of local property owners, businesses and other road users.

The project has been designed with improved flood immunity. Carriageways would be flood free across the major Clarence and Richmond river floodplains up to a 1 in 20 year flood. Elsewhere the highway would be flood free up to a 1 in 100 year flood. This would allow road users to travel unimpeded during prolonged periods of wet weather. Road users would be less susceptible to travel delays from carriageways becoming flooded, and from resulting detours. This design measure would improve traffic flow and travel times for road users.

14.3.7 Public transport and school bus services

There would be minimal disruption to existing passenger and school bus routes during construction. The existing highway would be retained for local access.

The location of any school bus stop that is close to a construction site access would be reviewed to ensure it is still safe. In some cases, it may be necessary to temporarily move the bus stop to a safer location. For example, a bus stop would be affected in Section 10 of the project. The site is NSW Government owned and appropriate alternate arrangements would be required with the bus operator.

Current local and school bus routes would generally continue to use existing bus routes. Some individual bus operators may modify bus routes or add services to use the upgraded Pacific Highway. School bus services that operate within towns would not be affected by the project.

Provision would be made to ensure that existing school bus stops are provided where required.

14.3.8 Pedestrian and cycle access

Pedestrians travelling through the construction site would be guided to cross the road at designated locations where required. This may cause minor delays but given the very low pedestrian use of the Pacific Highway, this is not likely to be a significant issue.

Construction activity along the duplicated section of the existing highway would require the narrowing of the road shoulder. This may affect cyclists passing through the construction site, who would need to move into the traffic lane as they travel through the work site. Given the low use of the Pacific Highway for cycling, and the relatively minor delay, this is not likely to be a significant issue.

14.3.9 Emergency services

Construction activity would have only minor impacts on emergency vehicles, as vehicular access along the Pacific Highway would be maintained. Emergency services would be kept fully informed of changes to traffic arrangements throughout the various construction stages of the project.

14.3.10 State forest road network

During construction, potential impacts on areas of state forest may result from the temporary use of land for construction activities such as ancillary facilities or temporary sedimentation basins. Any areas used would be rehabilitated in consultation with the Department of Primary Industries through Forests NSW.

State forests are generally managed for multiple uses including timber harvesting, recreation, bee keeping and conservation and are occasionally leased for grazing.

Access to State Forests has been maintained through the local road network and the provision of the service road along motorway sections of the project. In many cases, forest roads run along the current boundary of the forests.

At some locations, small parcels of land would need to be acquired for the project, and adjacent forest roads may be impacted. Roads, access tracks and fire trails in State forests likely to be affected by the project include:

- Section 1: Sherwood Creek Road (Wedding Bells State Forest), Dunmar Lane (Newfoundland State Forest)
- Section 2: Bald Knob Tick Gate Road, No 2 Fire Road, Lookout Road (Glenugie State Forest)
- Section 3: Dungal Road, Eight Mile Lane, No 1 Fire Road, Shields Road (Glenugie State Forest)
- Section 6: Mororo Fire Trail (Mororo State Forest)
- Section 7: Cypress Road, Darkys Road, South Pacific Trail, North Pacific Trail, (Doubleduke State Forest), Glencoe Road, McFayden Road, Serendipity Road, (Tabbimoble State Forest).



Photo 3: Existing Pacific Highway near Range Road showing local access roads within Newfoundland State Forest

Further unnamed access tracks and trails are also expected to be affected during construction of the project. However, the detail of this impact is only likely to emerge during detailed design. These details will need to be addressed with Forests NSW at that time through appropriate consultation and planning. Providing alternative access arrangements would be required, and will depend on construction details.

Figure 14-11 to Figure 14-15 show where alterations to the State forest road and access track network are likely to be required as a result of construction. Impacts would be particularly apparent through Wedding Bells, Newfoundland, Glenugie and Tabbimoble State forests in Sections 1, 2 and 7 of the project. Appropriate access arrangements would need to be agreed with Forests NSW prior to construction to provide alternative means of access and egress, in particular for timber trucks and other State forest traffic. Arrangements would be finalised in conjunction with Forests NSW following detailed design.

In particular, access to Glenugie State Forest around the interchange at Eight Mile Lane and Lookout Road would be further reviewed at the detailed design stage in consultation with Forests NSW.

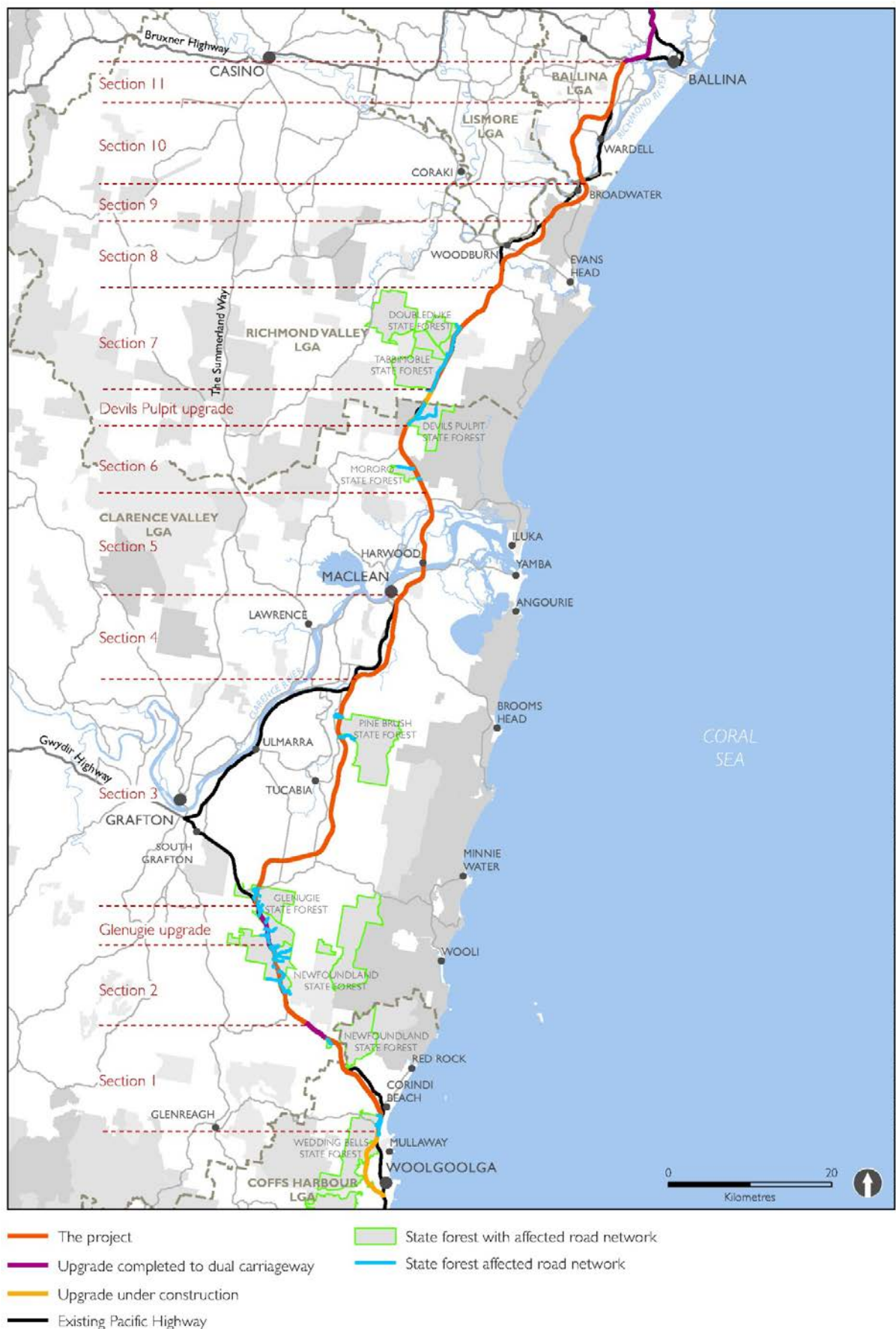


Figure 14-10: State forest road network – overview

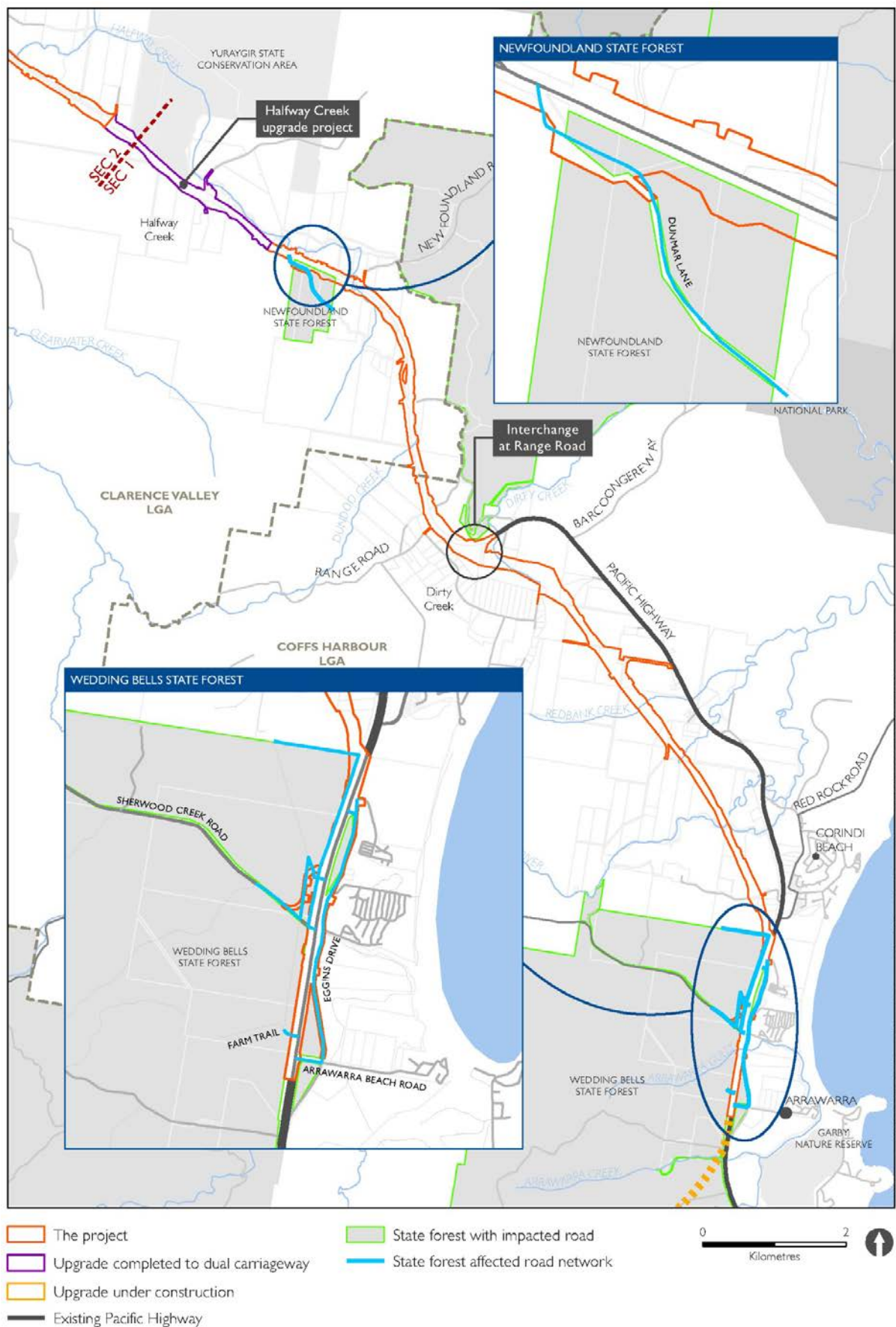


Figure 14-11: State forest road network: Section 1

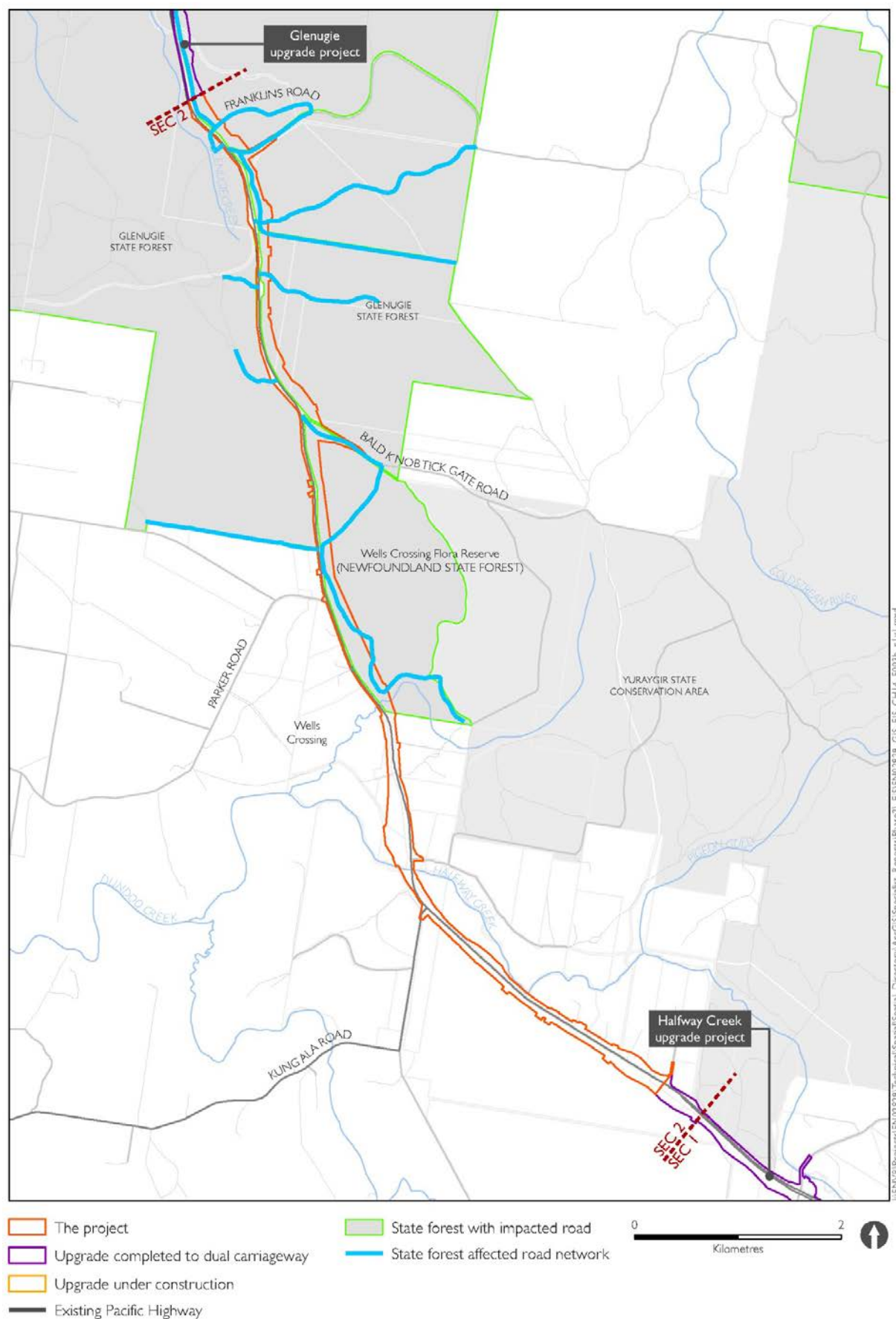


Figure 14-12: State forest road network: Section 2

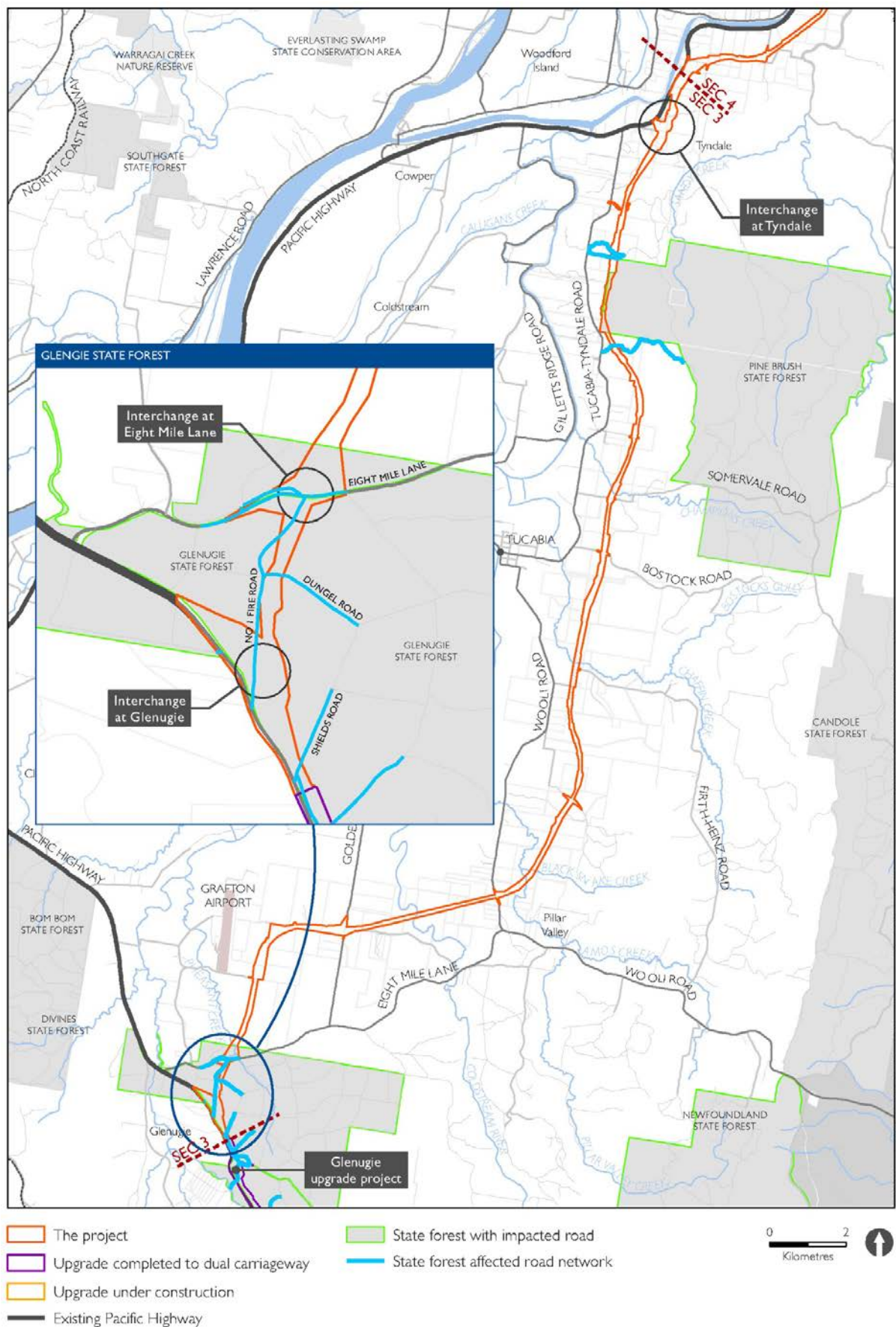


Figure 14-13: State forest road network: Section 3

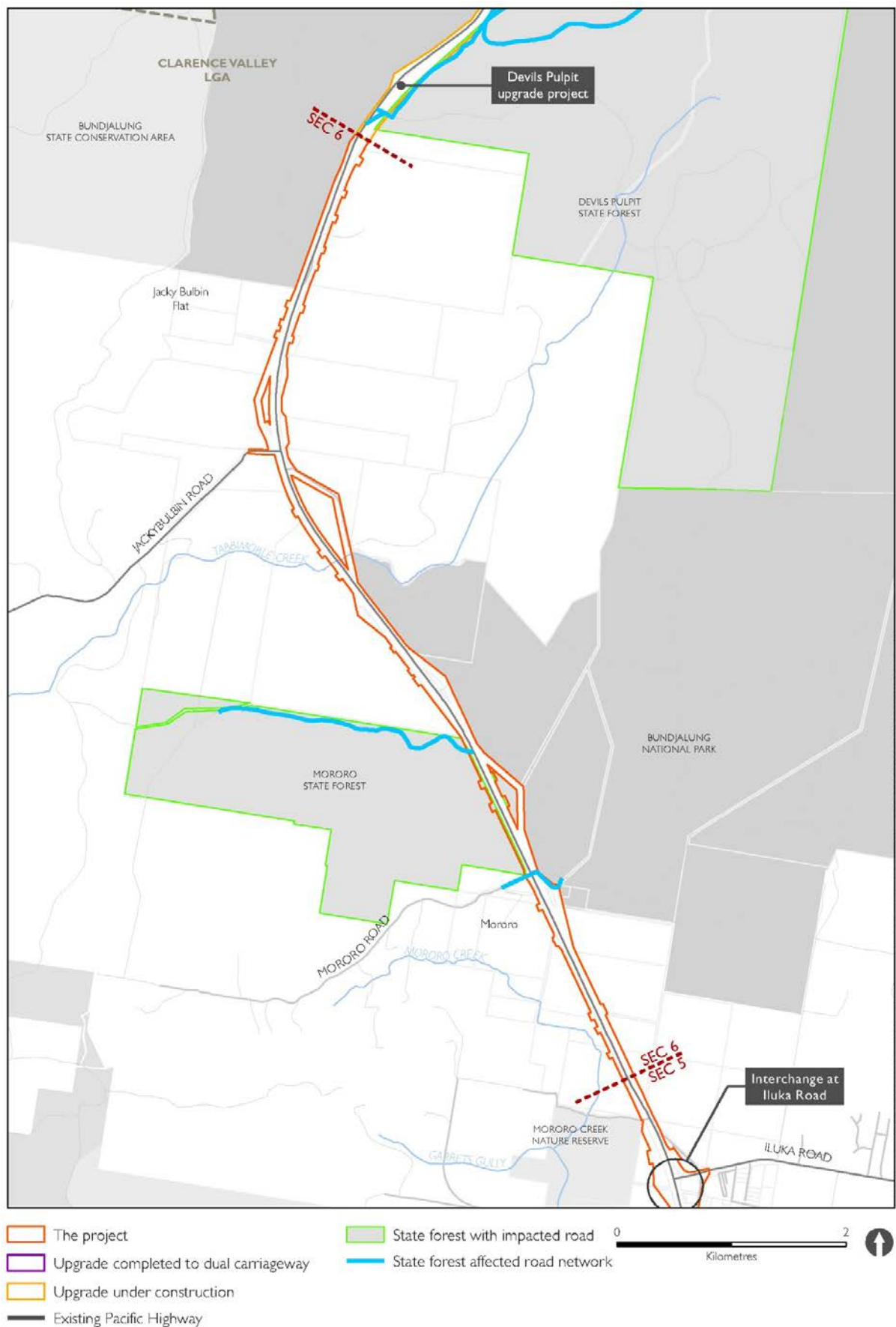


Figure 14-14: State forest road network: Section 6

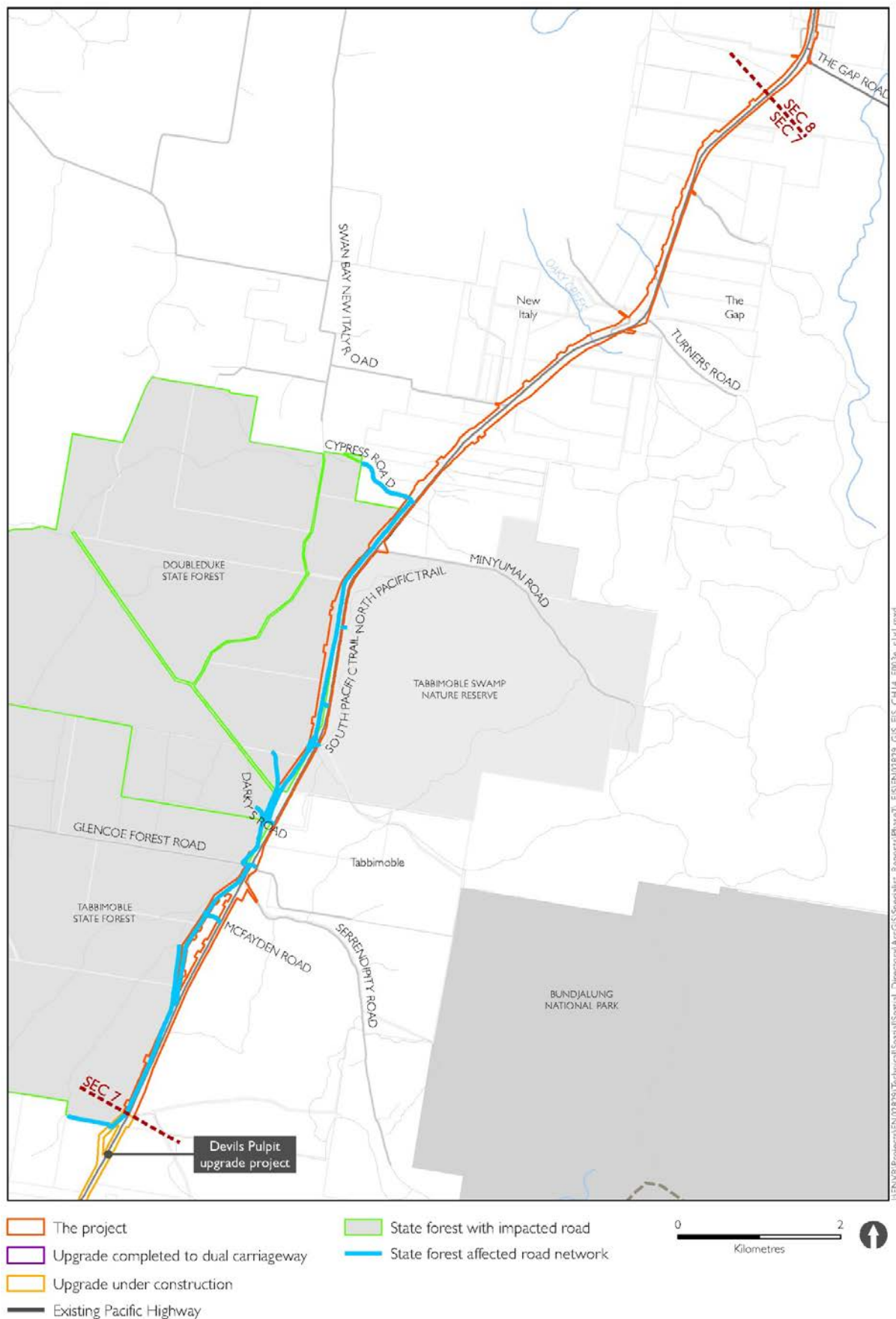


Figure 14-15: State forest road network: Section 7

14.3.11 Maritime traffic and access

The construction of the major bridge crossings of the Clarence and Richmond rivers has the potential to affect maritime traffic and related activities. The construction activities could include:

- Installing piles at pier locations
- Installing pile caps and pier columns
- Installing bridge spans
- Finishing works (such as barriers, surfacing, drainage and lighting).

The marine-based works would be conducted from barges or temporary platforms within the river. Equipment and materials would be transported to the work sites via barges from a suitable wharf facility within the river, subject to negotiation and approval.

Navigable waterway access would remain open along the Clarence and Richmond rivers during construction. For this reason, impacts on maritime activities would be minimal. However, it is possible that fishing activities could be disrupted as trawlers and other fishing and recreational vessels manoeuvre around the construction sites.

14.4 Assessment of impacts – operation

14.4.1 Changes to road access for local road users, properties and businesses

Local access to the project including service roads

Modifications to the local road network would change the way people move between and within towns and villages and access the highway. The project would construct and operate a motorway standard highway. However, the project would initially be delivered as a combination of arterial and motorway standard sections. Where the Pacific Highway is upgraded to a motorway standard, access to the highway would be via a limited number of interchanges. These are described in Chapter 5 (Description of the project – operation).

Service roads would provide local access and a continuous alternative route to the highway, reducing the need for local traffic to use the highway. The reduction in the mixing of local and through traffic would make the highway a safer route.

Where the project would cross local roads or require them to be altered, the existing road network would be maintained or alternative access provided. This would result in changed trip patterns or increased trip lengths for some local residents.

Proposed alterations to local roads and new access roads are described in Table 14-13 and shown in Figure 14-16 to Figure 14-26. These describe changes to access arrangements and potential traffic impacts for local road users, properties and businesses. In most instances the impacts relate to changed access arrangements, or changed journey times. Traffic impacts tend to be either negligible or minor. A minor impact is classified as Level of Service B or better ie drivers have reasonable freedom to select their desired speed and to manoeuvre (Austroads, 2009).

Further information regarding changes to access arrangements for properties and businesses are described in Chapter 16 (Land use and property), and Chapter 17 (Social and economic). These may be subject to change following confirmation of construction staging and detailed design.



Photo 4: Chatsworth Road intersection with the existing Pacific Highway

Table 14-13: Changes to access arrangements for local road users, properties and businesses

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
Project Section 1: Woolgoolga to Halfway Creek				
1	0.6	Sherwood Creek Road, Arrawarra	The connection to the existing Pacific Highway would be closed. The road would be deviated to the north and over the upgraded highway to a proposed service road.	Local access is maintained. Negligible traffic impact.
2	0.1	Eggins Drive connection to Pacific Highway near Eggins Close	The connection to the existing Pacific Highway south of Eggins Close would be closed. Eggins Drive would form part of the service road, connecting with the service road north of Eggins Close. This would provide a connection to the upgraded highway via interchanges at Arrawarra Beach Road and Range Road.	Local access is maintained. Negligible traffic impact.
3	2.5	Kangaroo Trail Road, Corindi Beach	The road would pass over the upgraded highway via a newly constructed overpass.	Local access is maintained. Negligible traffic impact.
4	6.2	Corindi access road	A new access road would be provided to connect the service road to properties to the west.	Local access is maintained. Negligible traffic impact.
5	4.8-7.0	Paper road along western side of project starting south of Post Office Lane, Corindi Beach, to just north of the Corindi Access Road	A new paper road would be provided to connect properties to the west of the project to the new Corindi access road. This would then connect to the service road.	Local access is maintained. Minor traffic impact.
6	9.6	Range Road, Dirty Creek	The Range Road intersection with the existing Pacific Highway would remain open. The existing highway would become the service road. Under the initial arterial road upgrade, this would provide access to the upgraded highway via the interchange at Range Road. Under the ultimate motorway upgrade, the service road would provide access to the interchange at Range Road and Glenugie.	Local access is maintained. Negligible traffic impact.
7	9.6	Range Road East, Dirty Creek	Range Road East does not currently have Pacific Highway access. This would not change under the project, but the end of Range Road East would be relocated about 100 metres to the east of the project.	Local access is maintained. Negligible traffic impact.
8	10.5	Dundoo Reach Road, Dirty Creek	The connection to the existing Pacific Highway would be closed. Dundoo Reach Road would connect to the interchange at Range Road to the south under the initial arterial road upgrade. In the ultimate motorway upgrade, Dundoo Reach Road would connect to the proposed service road.	Southbound local access is maintained/enhanced via Range Rd interchange. Extra 500 metres travelling on service road required for northbound access.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
9	11.95	Falconers Lane, Milleara	Under the initial arterial road upgrade, an intersection would be provided for Falconers Lane and the upgraded highway. This would allow left-in, left-out and right-in turns from the highway. Under the ultimate motorway upgrade, this intersection would be closed and Falconers Lane would become part of the service road.	Local access is maintained. Negligible traffic impact.
10	12	The Siding, Milleara	Under the initial arterial road upgrade, The Siding would connect to the Falconers Lane intersection. Under the ultimate motorway upgrade, it would connect to the service road.	Local access is maintained. Negligible traffic impact.
11	13.2	McPhillips Road, Milleara	In the initial arterial road upgrade, an intersection would be provided for McPhillips Road and the upgraded highway. This would allow left-in, left-out and right-in turns from the highway. A new T-intersection with a northern property access road would be created about 50 metres east of the upgraded highway. Under the ultimate motorway upgrade, the intersection would be closed and the road deviated along the property access road to an overpass over the upgraded highway to the service road. The property access road would remain and connect directly to the overpass.	Local access is maintained. Negligible traffic impact.
12	13.2-14.5	Property access road	A new access road would be created to provide property access to properties to the east of the project. It would run to the north of McPhillips Road and connect to McPhillips Road via an intersection. Under the ultimate motorway upgrade, it would connect directly to the overpass over the upgraded highway to the service road.	Local access is maintained. Negligible traffic impact.
13	14.3	Dunmar Lane, Milleara	Under the initial arterial road upgrade, an intersection would be provided for Dunmar Lane with the upgraded highway. This would allow left-in, left-out turns to and from the highway. Under the ultimate motorway upgrade, this intersection would be closed and Dunmar Lane would connect to the western service road.	Local access is maintained. Negligible traffic impact.
14	15.65	Grays Road, Milleara	There would be no change to Grays Road under the initial arterial road upgrade. Under the ultimate motorway upgrade, the intersection with the Pacific Highway would be closed, and Grays Road would be deviated to the south, crossing over the highway to connect to the service road.	Local access is maintained. Minor traffic impact.
15	15.75	Rediger Close, Milleara	Under the ultimate motorway upgrade, the Rediger Close intersection with the Pacific Highway would be closed and would connect to the western service road.	Local access is maintained. Minor traffic impact.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
Project Section 2: Halfway Creek to Glenugie upgrade				
16	17.5	Lemon Tree Road, Halfway Creek	<p>Under the initial arterial road upgrade, Lemon Tree Road would only have a left-in, left-out intersection. The left-out traffic movement would be provided by a new access road to the south-east that would connect into an existing merge lane to the southbound carriageway. A new intersection to a property access road to the north-east would also be created. Under the ultimate motorway upgrade, access to the upgraded highway would be removed. Lemon Tree Road would be deviated along the property access road to an overpass over the upgraded highway. This would connect with the western service road.</p> <p>RMS would further investigate access for highway northbound traffic into the service station adjacent to Lemon Tree Road during detailed design.</p>	8 km south to Range Road interchange, 19 km north to Eight Mile interchange. Local access is maintained. Minor traffic impact.
17	17.5 - 18.5	Property access road	A new access road would be created to provide property access to properties to the east of the project. It would run to the north of Lemon Tree Road and connect to Lemon Tree Road via an intersection. At station 18.4 on the property access road, another left-in, left-out, right-in connection would be provided. Under the ultimate motorway upgrade, the road would connect directly to the overpass over the upgraded highway to the service road, with the intersection to the highway at station 18.4 removed.	Local access is maintained. Minor traffic impact.
19	20.3	Kungala Road, Halfway Creek	Under the initial arterial road upgrade, Kungala Road would connect with the upgraded highway through a left-in, left-out and right-in arrangement. Under the ultimate motorway upgrade, the intersection would be closed, and Kungala Road would form a T-intersection with the western service road.	Local access is maintained. Minor traffic impact.
19	20.8	Luthers Road, Halfway Creek	Under the initial arterial road upgrade, Luthers Road would be deviated to the north, with a left-in, left-out and right-in intersection with the upgraded highway. Under the ultimate motorway upgrade, the intersection would be closed and the road would pass under the upgraded highway via an underpass to the western service road.	Local access is maintained. Extra 750 metres travelling on service road required.
20	23.5	Parker Road, Wells Crossing	Under the initial arterial road upgrade, Parker Road would connect with the upgraded highway with a left-in, left-out and right-in intersection. Under the ultimate motorway upgrade, the intersection would be closed and the road would connect via a T-intersection to the western service road.	Local access is maintained. Extra travel to nearest interchange (Range Road/ Eight Mile Road).
21	25.1	Bald Knob Tick Gate Road, Wells Crossing	Under the initial arterial road upgrade, Bald Knob Tick Gate Road would be deviated to the north, with a left-in, left-out and right-in intersection with the upgraded highway. Under the ultimate motorway upgrade, the intersection would be closed. Bald Knob Tick Gate Road would be straightened to pass over the upgraded highway via an overpass. This would connect to the western service road.	Local access is maintained. Minor traffic impact.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
22	28	Franklins Road, Glenugie	Under the initial arterial road upgrade, Franklins Road would be deviated to the north, with a left-in, left-out and right-in intersection with the upgraded highway. Under the ultimate motorway upgrade, the intersection would be closed. Franklins Road would be straightened to pass over the upgraded highway via an overpass to the western service road.	Local access is maintained. Minor traffic impact.
23	31.2	Old Pacific Highway (southern connection), Glenugie	The left-in, left-out intersection with the Glenugie upgrade would be closed and realigned. It would form part of the service road.	Local access is maintained. Extra travel to nearest interchange (Eight Mile Road).
Project Section 3: Glenugie upgrade to Tyndale				
24	36	Eight Mile Lane, Glenugie	The road would be straightened to pass over the upgraded highway via a newly constructed overpass.	Connectivity of the local area is enhanced with an interchange at Eight Mile Lane.
25	38.3	Old Six Mile Lane, Lavadia	The road would pass over the upgraded highway via a newly constructed overpass. To the west of the upgraded highway, a new access road would connect to the existing Old Six Mile Lane near Chevalley Lane. A new access road to run alongside the northern extent of the project would be constructed, connecting with the existing Avenue Road. To the east, a new access road would realign the road for about one kilometre, connecting back into the existing Old Six Mile Lane.	Local access is maintained. Minor traffic impact.
26	41.4	Avenue Road, Lavadia	The road would pass over the upgraded highway via an overpass. Two new intersections would be created. One would connect the access road to the north of the project with Avenue Road and the other would connect Wants Lane to the east.	Local access is maintained. Minor traffic impact.
27	41.8	Wants Lane, Lavadia	Wants Lane would be realigned to the south and connect to Avenue Road.	Local access is maintained. Minor traffic impact.
28	45.5	Wooli Road, Pillar Valley	The road would pass over the upgraded highway via an overpass.	Local access is maintained. Negligible traffic impact.
29	48.8	Mitchell Road, Pillar Valley	The road would pass under the upgraded highway and would be realigned slightly south.	Local access is maintained. Negligible traffic impact.
30	51.9	Firth Heinz Road, Tucabia	The road would pass over the upgraded highway via an overpass. The road would be realigned east of the project.	New service road provided. Negligible traffic impact.
31	55.5	Bostock Road, Tucabia	The road would pass over the highway via an overpass.	Local access is maintained. Negligible traffic impact.
32	56.9	Somervale Road, Tucabia	The road would pass under the highway via an underpass.	Local access is maintained. Negligible traffic impact.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
33	58.6	Property access road	The road would pass under the highway via an underpass.	Local access is maintained. Negligible traffic impact.
34	61.0	Property access road	The road would pass under the highway via an underpass.	Local access is maintained. Negligible traffic impact.
35	63.6	Property access road	The road would pass over the highway via an overpass.	Local access is maintained. Negligible traffic impact.
36	64.9	Crowley Road, Tyndale	The road would pass over the highway via an overpass. A minor realignment would be provided.	Local access is maintained. Negligible traffic impact.
37	66.6	Benson Lane, Tyndale	Bensons Lane would be realigned to the east of the project, with a new intersection at the interchange at Tyndale. This would provide access to the upgraded highway and the existing Pacific Highway (which would become the service road).	Local access is maintained. Minor traffic impact.
38	67.2	Sheehys Lane, Tyndale	Sheehys Lane would become a cul-de-sac at the Benson Lane intersection. Access to the existing highway would remain unchanged.	Local access is maintained. Extra travel to Tyndale Interchange.
Project Section 4: Tyndale to Maclean				
39	69.4	Connection to Bondi Hill Road, Tyndale	The road would pass over the upgraded highway via an overpass. The road would be deviated to the north.	Local access is maintained. Minor traffic impact.
40	69.4-71.1	Bondi Hill Road, Tyndale	A new connection to Byrons Lane would be provided south of the upgraded highway to provide access to properties to the south of the project. RMS would further investigate the access between Bondi Hill and Byrons Lane during detailed design.	2 km south to Tyndale interchange, 11 km north to Maclean interchange. Local access is maintained. Minor traffic impact.
41	71.2	Byrons Lane, Tyndale	The road would pass over the upgraded highway via an overpass.	Local access is maintained. Minor traffic impact.
42	74.05-74.95	Norleys Lane, Shark Creek	Norleys Lane would not have access to the project. The connection would be closed either side of the highway. Norleys Lane to the west of the project has direct access to the existing Pacific Highway. To the east, Norleys Lane would be realigned along the project length, before connecting to Gallaghers Lane in the north.	Local access is maintained. Negligible traffic impact.
43	74.95	Gallaghers Lane, Shark Creek	Gallaghers Lane would pass under the bridge at Shark Creek.	Local access is maintained. Negligible traffic impact.
44	75.2	Shark Creek Road, Shark Creek	Shark Creek Road would pass under the bridge at Shark Creek.	Local access is maintained. Negligible traffic impact

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
45	77	McIntyres Lane, Gulmarrad	McIntyres Lane would be closed either side of the project, with no access to the highway. To the west of the project, McIntyres Lane would still have direct access to the existing Pacific Highway. To the east, McIntyres Lane would connect to an eastern access road, which would connect to the interchange at Maclean. RMS would further investigate access arrangements into McIntyres Lane during detailed design.	Access to project via eastern service road to interchange at Maclean. Extra travel to Maclean interchange.
46	77.8	Clyde Essex Drive, Gulmarrad	The paper road ends about 160 metres east of the project and would therefore remain unchanged.	Local access is maintained. Extra travel to Maclean interchange.
47	80.45	Cameron Street, Maclean	The Cameron Street intersection with the existing highway would be realigned slightly to the north.	Connectivity of the local area is enhanced with an interchange at Maclean.
48	80.55	Goodwood Street, Maclean	Goodwood Street would be realigned south, connecting to the east and west of the interchange at Maclean, and passing over the highway.	Connectivity of the local area is enhanced with an interchange at Maclean.
49	81.2	Jubilee Street, Maclean	Jubilee Street would be closed either side of the upgraded highway. However, pedestrians and cyclists would be able to pass under the highway via an underpass. To the west of the project, access to Maclean would be unchanged. On the eastern side, Jubilee Street would connect to the interchange at Maclean.	Extra 1.6 km travelling required to access between western and eastern side of Jubilee Street. Connectivity to other local areas such as Yamba is enhanced.
Project Section 5: Maclean to Iluka Road				
50	83.1	Koala Drive/Farlows Lane, Maclean	Koala Drive/Farlows Lane would pass under the upgraded highway via an underpass.	Local access is maintained. Negligible traffic impact
51	86.2	Yamba Road, Maclean	There would be no change to Yamba Road, which would pass under the bridge over the Clarence River. However, the layout of the intersection at Yamba Road would be reviewed at the detailed design stage to consider the needs of truck movements from Harwood Mill. Shared user connectivity between Harwood Bridge and Yamba Road would be reviewed to further consider access for pedestrians and cyclists.	Connectivity of the local area is enhanced with an interchange at Yamba Road.
52	86.9	River Street, Harwood	There would be no change to River Street, which would pass under the bridge over the Clarence River.	Local access is maintained. Negligible traffic impact.
53	87	Petticoat Lane, Harwood	Petticoat Lane would be closed where it meets the upgraded highway.	Local access is maintained. Negligible traffic impact.
54	87.8	Watts Lane, Harwood	Watts Lane would pass over the upgraded highway, forming part of the interchange at Harwood.	Connectivity of the local area is enhanced with an interchange at Watts Lane.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
55	89.06	Anderson Lane, Harwood	Under the initial arterial road upgrade, the Andersons Lane would intersection with the Pacific Highway would be removed. A new southern access road would connect the road to the interchange at Harwood. Under the ultimate motorway upgrade, it would connect to the service road, following the alignment of the southern access road and new road north of the intersection.	Local access is maintained. Minor traffic impact.
56	89.3	Serpentine Channel Road South, Harwood	Under the initial arterial road upgrade, Serpentine Channel Road South would have a left-in, left-out intersection with the Pacific Highway. A new property access road would be constructed south of the intersection to provide access to properties to the east of the project. Under the ultimate motorway upgrade, the southern access road would be continued to the interchange at Harwood to provide access to the project.	Local access is maintained. Minor traffic impact.
57	90	Ryans Lane, Chatsworth	Chatsworth Road would pass over the upgraded highway. Under the initial arterial road upgrade, two new left-in, left-out intersections would be created with the highway (one for the northbound carriageway and one for the southbound carriageway). A new access road to the west of the highway to connect Chatsworth Road with the Ryans Lane northern access road. Under the ultimate motorway upgrade, another intersection would connect Chatsworth Road to the service road. RMS would further consider the timing for the overbridge and local access arrangements during detailed design.	Local access is maintained. Minor traffic impact.
58	90.8	Chatsworth Road/Serpentine Channel Road North, Chatsworth	Chatsworth Road would pass over the upgraded highway. Under the initial arterial road upgrade, the road to the east of the project would be deviated to the north, where it would form a left-in, left-out intersection with the highway. A new intersection would also be formed to the west of the highway to connect Chatsworth Road with the Ryans Lane northern access road. Under the ultimate motorway upgrade, another intersection would connect Chatsworth Road to the service road.	Local access is maintained. Negligible traffic impact.
59	93.3	Carrols Lane, Chatsworth	Carrols Lane would pass over the upgraded highway, and connect to a proposed service road. To the east of the project, an access road would be constructed to connect to Fischer's Road. Under the initial arterial road upgrade, this access road would also provide a left-in, left-out intersection with the highway. Under the ultimate motorway upgrade, the intersection would be removed. To the west of the project, a southern intersection would provide a left-in, left-out intersection with the highway. This would be removed as part of the ultimate motorway upgrade. Under the ultimate motorway upgrade, Carrols Lane would connect with the service road. RMS would further consider the timing for the overbridge and local access arrangements during detailed design.	Local access is maintained. Negligible traffic impact
60	93.85	Chatsworth Road, Chatsworth	Chatsworth Road would connect to the service road.	Local access is maintained. Negligible traffic impact

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
61	93.85	Fischers Road, Chatsworth	Fischers Road would be deviated to the south and connect to Carrols Lane.	Local access is maintained. Minor traffic impact.
62	94.5	Garretts Lane East, Woombah	Garretts Lane East would deviate to the north along a new access road and the Old Pacific Highway to connect to Iluka Road.	Local access is maintained. Minor traffic impact.
63	94.7	Garretts Lane/Lewis Lane, Mororo	Garretts Lane would connect to the western service road.	Local access is maintained. Minor traffic impact.
64	95.45	Iluka Road, Woombah	Iluka Road would pass over the upgraded highway, forming part of the interchange at Iluka Road and the access road / service road to the west.	Local access is maintained. Negligible traffic impact.
65	96.05	Banana Road, Mororo	The existing intersection with the Pacific Highway would be closed. The road would be deviated along a new access road to the south, connecting to the interchange at Iluka Road. Under the ultimate motorway upgrade, a service road would be constructed to the west of the highway and form an intersection with Banana Road.	Local access is maintained. Negligible traffic impact
Project Section 6: Iluka Road to Devils Pulpit upgrade				
66	98.4	Mororo Road, Mororo	Under the initial arterial road upgrade, Mororo Road would have a left-in, left-out, right-out turn intersection. A formalised bus turning bay would be provided to the north of the intersection. Under the ultimate motorway upgrade, Mororo Road would connect to the western service road.	Local access is maintained. Negligible traffic impact
67	102.5	Property access road	This road would have a left-in, left-out intersection with the highway under the initial arterial road upgrade, which would be closed under the ultimate motorway upgrade, and would connect with the service road.	New service road provided. Minor traffic impact.
68	102.7	Tullymorgan – Jacky Bulbin Road	Under the initial arterial road upgrade, Tullymorgan – Jacky Bulbin Road would connect to the highway via an intersection providing left-in, right-in, left-out traffic movements. This would be removed under the ultimate motorway upgrade and would connect to the service road.	Local access is maintained. Minor traffic impact.
69	102.7-103.4	Old Pacific Highway, Mororo	Under the ultimate motorway upgrade, Old Pacific Highway would form part of the service road.	Local access is maintained. Negligible traffic impact
Project Section 7: Devils Pulpit upgrade to Trustums Hill				
70	114.3	Serendipity Road, Tabbimoble	Under the initial arterial road upgrade, Serendipity Road would be deviated south, connecting with the highway at a left-in, right-in and left-out intersection. This intersection would be removed as part of the ultimate motorway upgrade. Serendipity Road would be straightened and pass over the upgraded highway, to connect to the service road.	Local access is maintained. Negligible traffic impact

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
71	114.5	Glencoe Road, Tabbimoble	Under the initial arterial road upgrade, Glencoe Road would connect to the highway via a left-in, left-out intersection. Under the ultimate motorway upgrade, this intersection would be closed and the road would connect to the service road to the south.	Local access is maintained. Negligible traffic impact
72	118.8	Minyumai Road, New Italy	Under the initial arterial road upgrade, Minyumai Road would be deviated to the north along a new access road to a left-in, left-out intersection with the highway. Under the ultimate motorway upgrade, Minyumai Road would connect to the service road.	Local access is maintained. Negligible traffic impact
73	119.5	Cypress Road, New Italy	Under the initial arterial road upgrade, Cypress Road would connect to the highway via a left-in, right-in, left-out intersection. Under the ultimate motorway upgrade, this intersection would be removed. Cypress Road would connect with Swan Bay New Italy Road via an access road on the western side of the upgrade.	Local access is maintained. Minor traffic impact
74	121.1	Swan Bay New Italy Road, New Italy	Under the initial arterial road upgrade, Swan Bay New Italy Road would connect to the highway via a left-in, right-in, left-out and right-out intersection. Under the ultimate motorway upgrade, this intersection would be removed. Swan Bay New Italy Road would connect to the service road on the eastern side of the upgrade via an overpass. RMS would further consider the access arrangements into Swan Bay New Italy Road during detailed design.	Connects to service road. 7 km north to Woodburn interchange, 25 km south to Iluka interchange. Local access is maintained.
75	122.8	Whites Road, New Italy	Under the initial arterial road upgrade, the road would be deviated to the west to a left-in, right-in and left-out intersection with the highway. Under the ultimate motorway upgrade, this intersection would be removed. Whites Road would connect to Swan Bay New Italy Road via an access road on the western side of the upgrade.	Connects to service road. 5.5 km north to Woodburn interchange, 27.5 km south to Iluka interchange. Local access is maintained.
76	122.9	Red Gate Road/Turners Road, New Italy	Under the initial arterial road upgrade, these roads would maintain their existing intersections with the Pacific Highway, which becomes an access road and closed at the southern end. Access onto the upgraded highway would be via a left-in, left-out intersection to the north. Under the ultimate motorway upgrade, the intersection would be removed and the roads would connect directly to the service road on the eastern side of the upgrade.	Connects to service road. 6 km north to Woodburn interchange, 26.5 km south to Iluka interchange. Local access is maintained.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
77	124.8	Nortons Road, New Italy	Under the initial arterial road upgrade, Nortons Road would connect to the highway via a left-in, left-out, right-out intersection. Under the ultimate motorway upgrade, this intersection would be removed. Nortons Road would connect to the service road on the eastern side of the upgrade.	Connects to service road. 4 km north to Woodburn interchange. Local access is maintained. Minor traffic impact.
Project Section 8: Trustums Hill to Broadwater National Park				
78	127	The Gap Road, Woodburn	Under the initial arterial road upgrade, The Gap Road would maintain its existing intersection with Tuckombil Road. Under the ultimate motorway upgrade, Tuckombil Road would form part of the service road. The road would connect to the proposed service road.	Local access is maintained. Negligible traffic impact.
79	127.5	Wondawee Way, Woodburn	The road would connect to a western access road and the interchange at Woodburn.	Local access is maintained. Negligible traffic impact.
80	127.5	Sharpe Road, Woodburn	Under the initial arterial road upgrade, Sharpe Road would maintain its existing intersection with Tuckombil Road. Under the ultimate motorway upgrade, Tuckombil Road would form part of the service road.	Local access is maintained. Negligible traffic impact.
81	127.3	Tuckombil Road, The Gap	At Tuckombil Road, a minor realignment would be required.	New service road is provided. Extra 1.5km travelling required between Tuckombil Road and Turners Road.
82	129	Trustums Hill Road, Woodburn	The end of Trustums Hill Road would be relocated about 100 metres to the north of the project. No direct access would be provided to the upgraded highway.	Local access is maintained. Negligible traffic impact.
83	129.3	Pacific Highway, Trustums Hill/Woodburn	This section of the Pacific Highway would form part of the service road and would connect via an access road to the interchange at Woodburn.	Connectivity of the local area is enhanced with a interchange at Woodburn.
84	132.1	Woodburn – Evans Head Road, Woodburn	Woodburn – Evans Head Road would deviate slightly to the north and pass over the upgraded highway.	Local access is maintained. Negligible traffic impact.
Project Section 9: Broadwater National Park to Richmond River				
85	137.2-140.7	Pacific Highway, Woodburn, Rileys Hill and Broadwater (through Broadwater National Park)	The project would deviate this section of the highway to the north. This existing highway would then become part of the service road.	Local access is maintained. Minor traffic impact.

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
86	142.7	Evans Head – Broadwater Road, Broadwater	The road would pass over the upgraded highway, forming part of the interchange at Broadwater. A new intersection to the north would be provided to connect to Rifle Range Road, which would be closed to the east of the project.	Connectivity between Broadwater and Wardell is enhanced with an interchange at Broadwater
87	143.4	Broadwater Quarry Road, Broadwater	Broadwater Quarry Road would be closed west of the project. A new access road north would connect the road to operating quarries.	Local access is maintained. Minor traffic impact.
88	145.6	Pacific Highway, Broadwater	The existing highway would pass under the bridge over the Richmond River.	Local access is maintained. Negligible traffic impact.
Project Section 10: Richmond River to Coolgardie Road				
89	146	Back Channel Road, Wardell	Back Channel Road would pass under the bridge over the Richmond River.	Local access is maintained. Negligible traffic impact.
90	148.9	Old Bagotville Road	Old Bagotville Road would be deviated along the western side of the project to an overpass over the highway.	Local access is maintained. Negligible traffic impact.
91	149	Montis Road	Montis Road would be deviated along the western side of the project to connect with the overpass over the highway and Old Bagotville Road.	Local access is maintained. Negligible traffic impact.
92	151.25	Thurgates Lane	To the west of the project, an access road would be constructed to connect Thurgates Lane, Hillside Lane, Lumley Lane and Wardell Road. To the east of the project, Thurgates Lane would be closed with no access to the highway.	Local access is maintained. Negligible traffic impact.
93	152.8	Hillside Lane	To the west of the project, an access road would be constructed to connect Thurgates Lane, Hillside Lane, Lumley Lane and Wardell Road.	Local access is maintained. Negligible traffic impact.
94	152.9	Wardell Road	Wardell Road would be deviated slightly north and over the upgraded highway via an overpass.	Local access is maintained. Negligible traffic impact.
95	154.35	Lumleys Lane	To the west of the project, an access road would be constructed to connect Thurgates Lane, Hillside Lane, Lumley Lane and Wardell Road. Lumleys Lane would be closed to the east of the project. The existing connection to Wardell from the east of the project would remain.	Extra 1km travelling required between western and eastern side of Lumley Lane. Local access is maintained.
96	157.5	Kays Road	The Kays Road intersection with Coolgardie Road would be closed and a new intersection constructed with the existing Pacific Highway.	Local access is maintained. Negligible traffic impact.
97	157.5	Coolgardie Road, Wardell	Coolgardie Road would pass over the upgraded highway via an overpass, forming part of the interchange at Wardell.	Connectivity of the local area is enhanced with a grade separated interchange at Wardell

ID	Station	Road name and location	Proposed alteration	Access and traffic impact
Project Section 11: Coolgardie Road to Ballina bypass				
98	159.83	Whytes Lane, Pimlico	Whytes Lane would be realigned to the south, connecting with the service road. A new intersection would be created to an overpass to provide connection to McAndrews Lane to the west. RMS would further consider the local access arrangements at Whytes Lane during detailed design.	Local access is maintained. Negligible traffic impact
99	159.8	McAndrews Lane, Pimlico	The road would pass over the upgraded highway, connecting to Whytes Lane and the service road. To the west of the project, McAndrews Lane would have a new intersection connecting to Whytes Lane West.	Local access is maintained. Negligible traffic impact
100	160	Whytes Lane West, Pimlico	The road would be deviated to a southern access road to provide a connection to McAndrews Lane.	Local access is maintained. Minor traffic impact.
101	164.3	Pimlico Road, Pimlico	Pimlico Road would not connect with the highway and would be closed. A new bridge across from Smiths Drive would provide an intersection with Pimlico Road.	Local access is maintained. Negligible traffic impact.
102	164.7	Smiths Drive	Smiths Drive would cross Emigrant Creek to Pimlico Road to form part of the service road.	Local access is maintained. Negligible traffic impact.

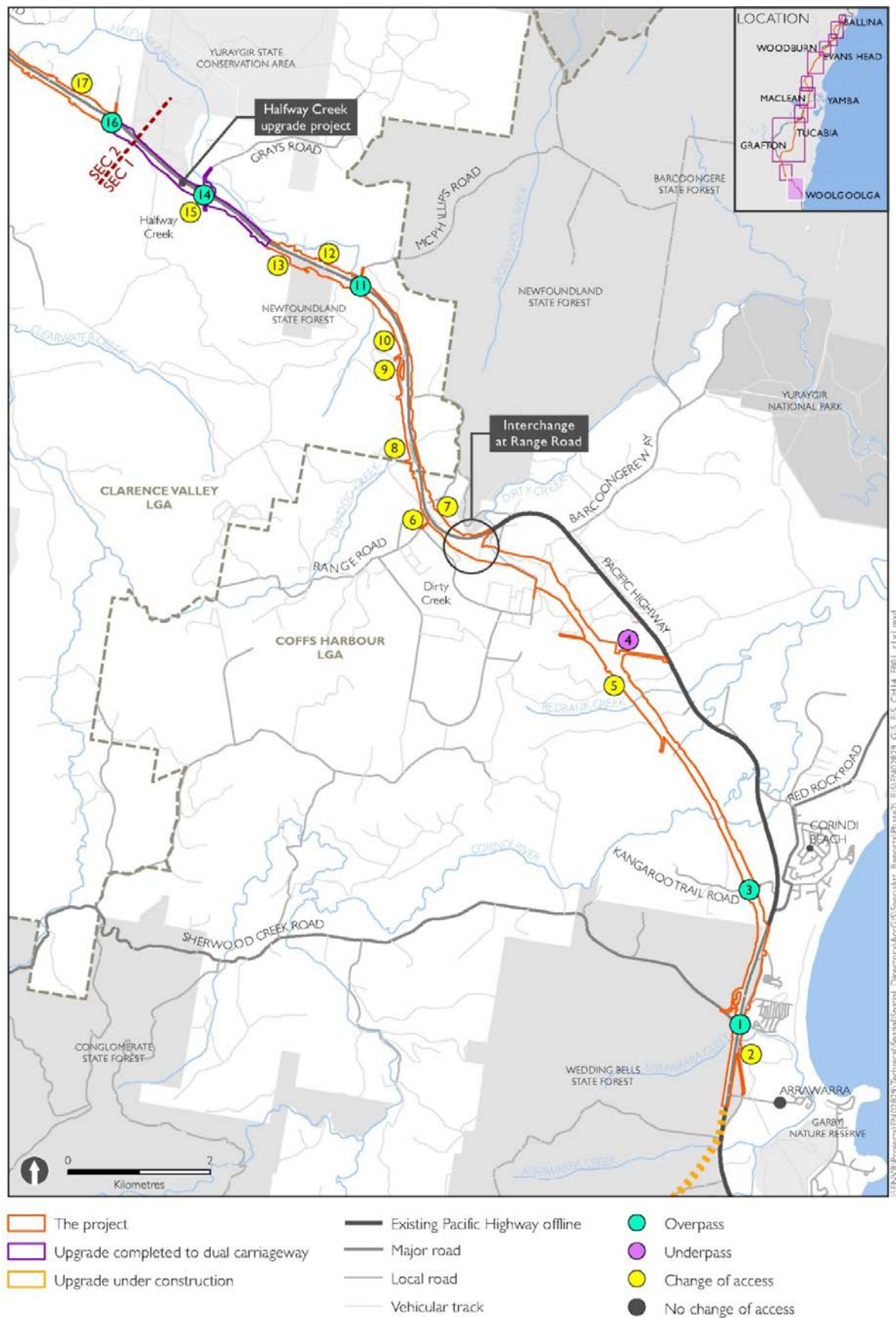
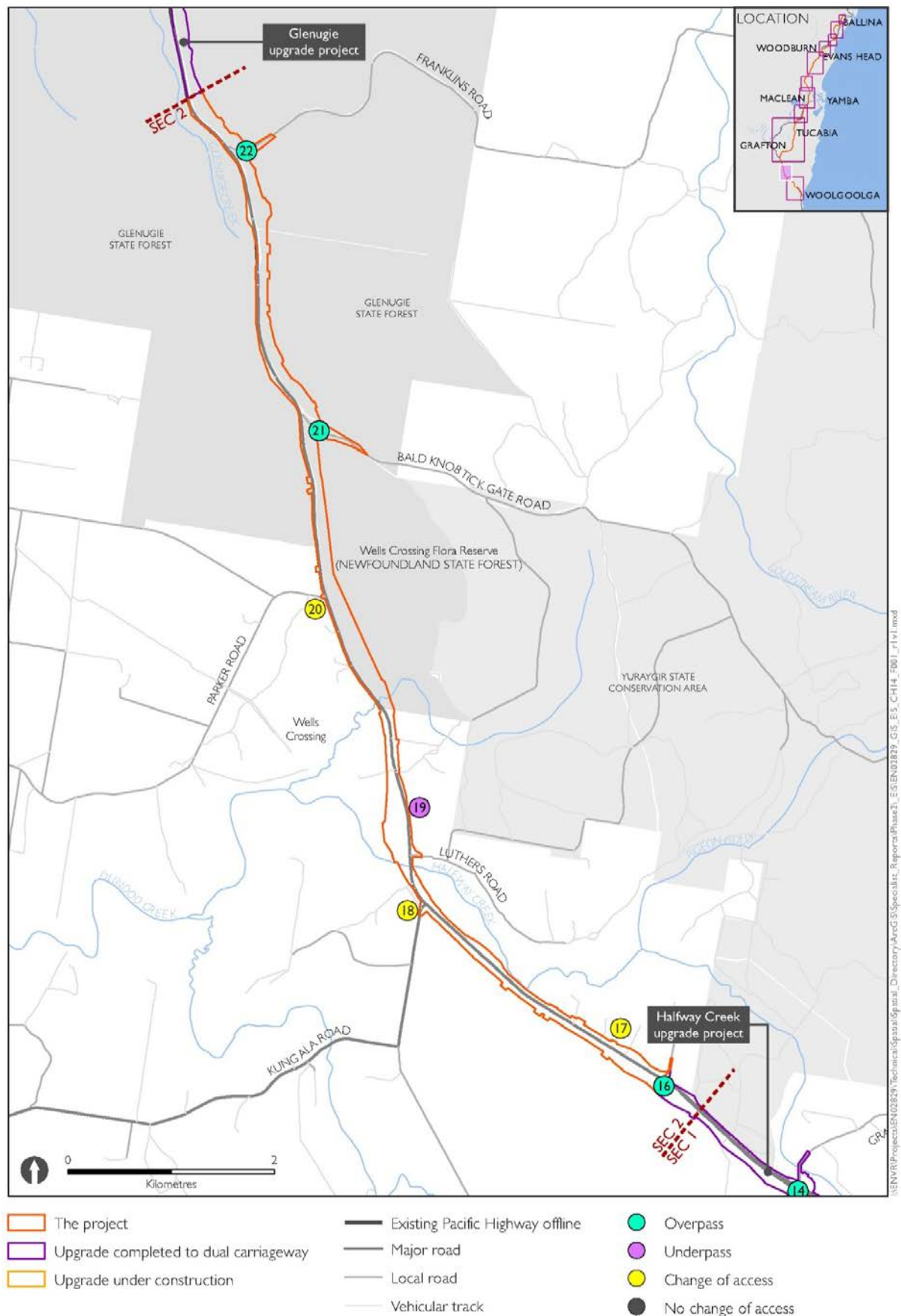


Figure 14-16: Locations of road alterations or changed access arrangements: Section 1



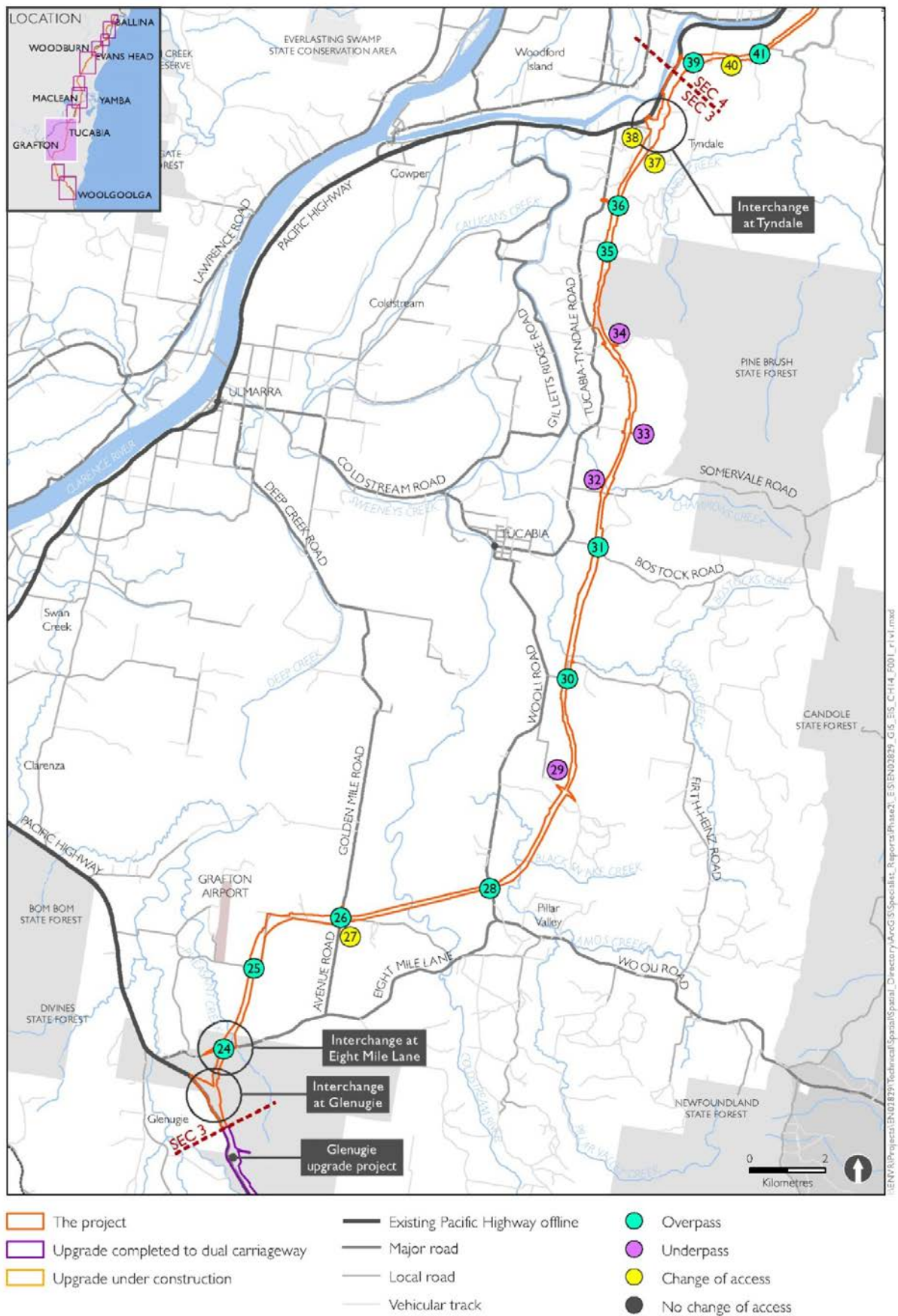


Figure 14-18: Locations of road alterations or changed access arrangements: Section 3

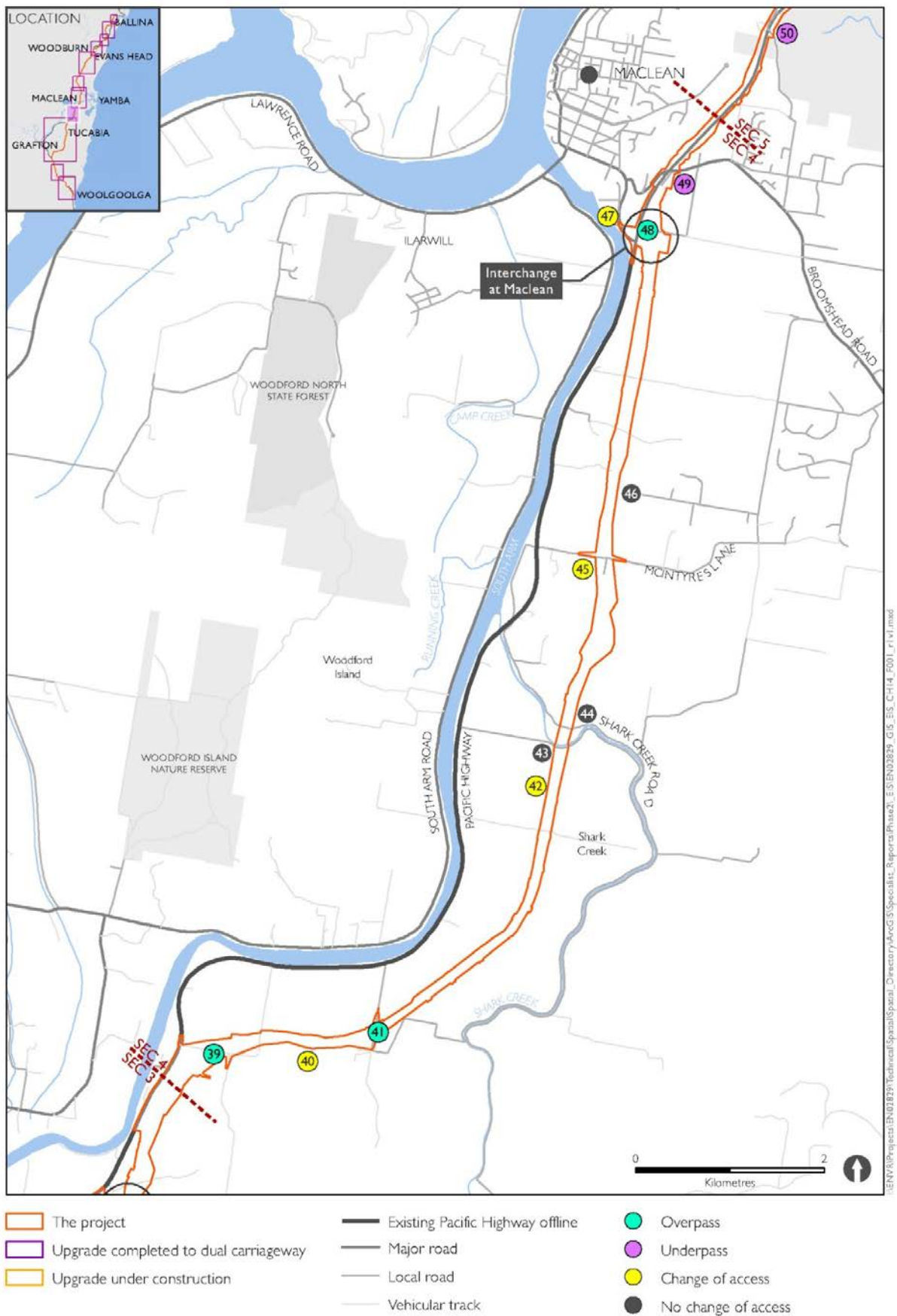


Figure 14-19: Locations of road alterations or changed access arrangements: Section 4

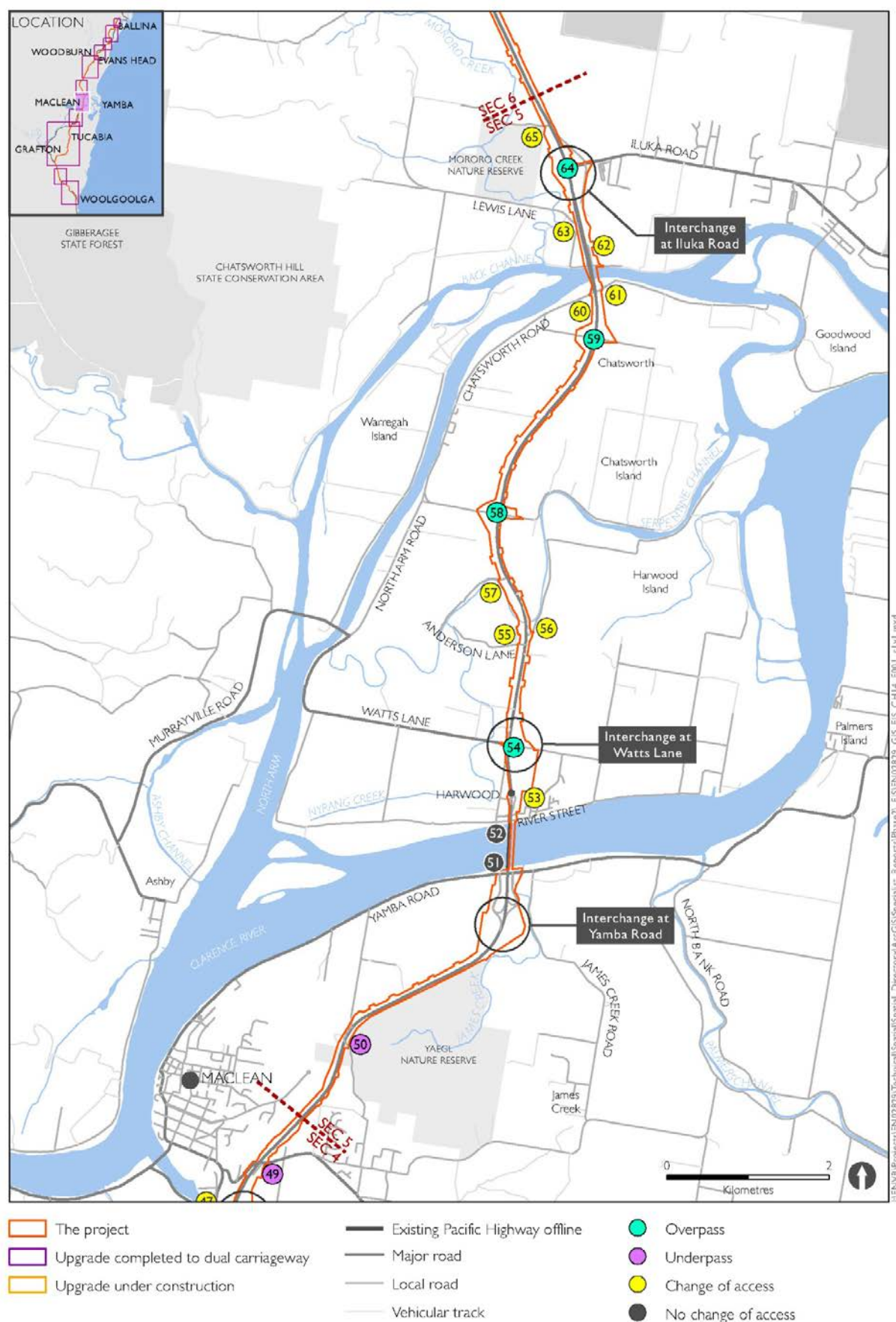


Figure 14-20: Locations of road alterations or changed access arrangements: Section 5

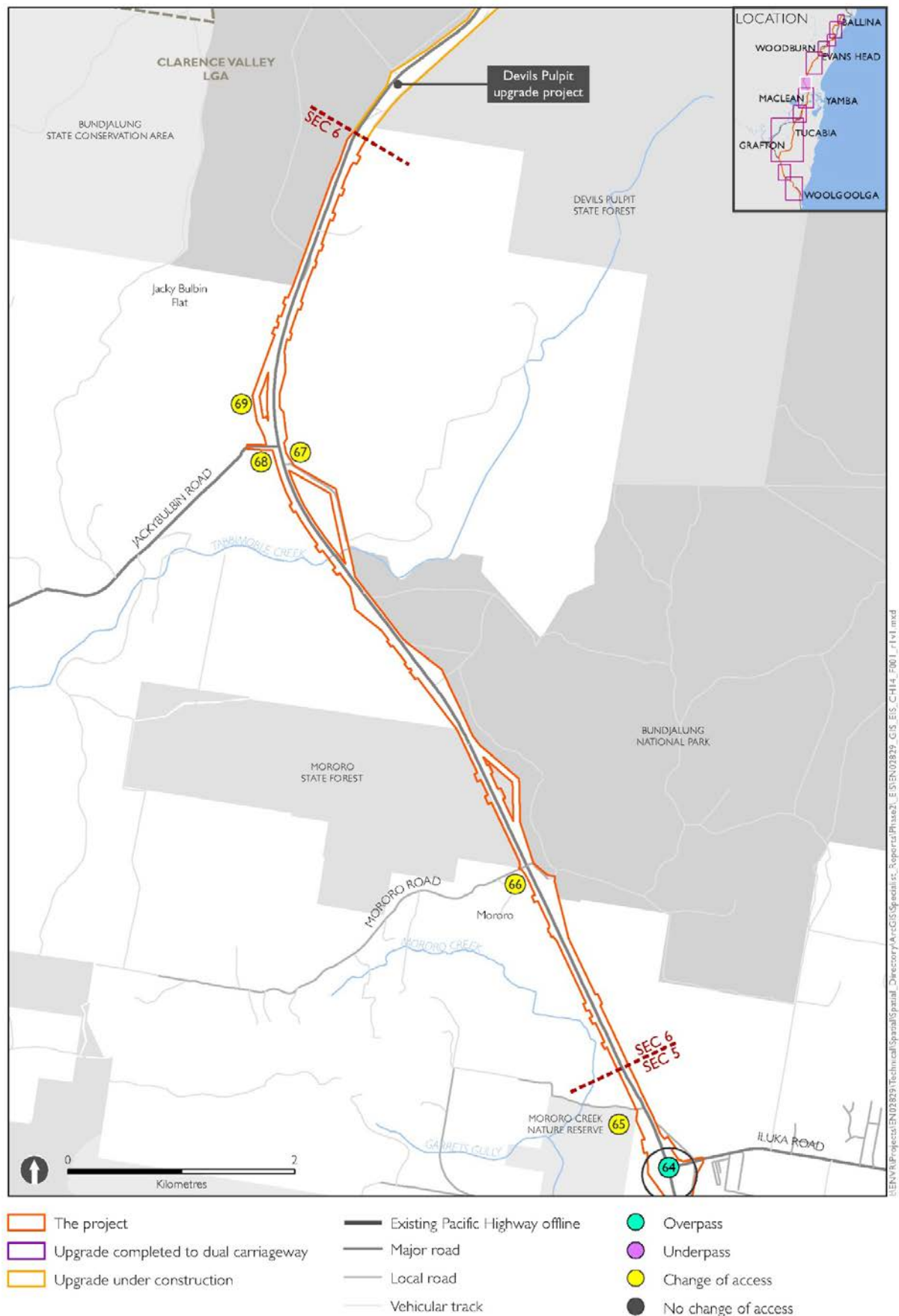


Figure 14-21: Locations of road alterations or changed access arrangements: Section 6

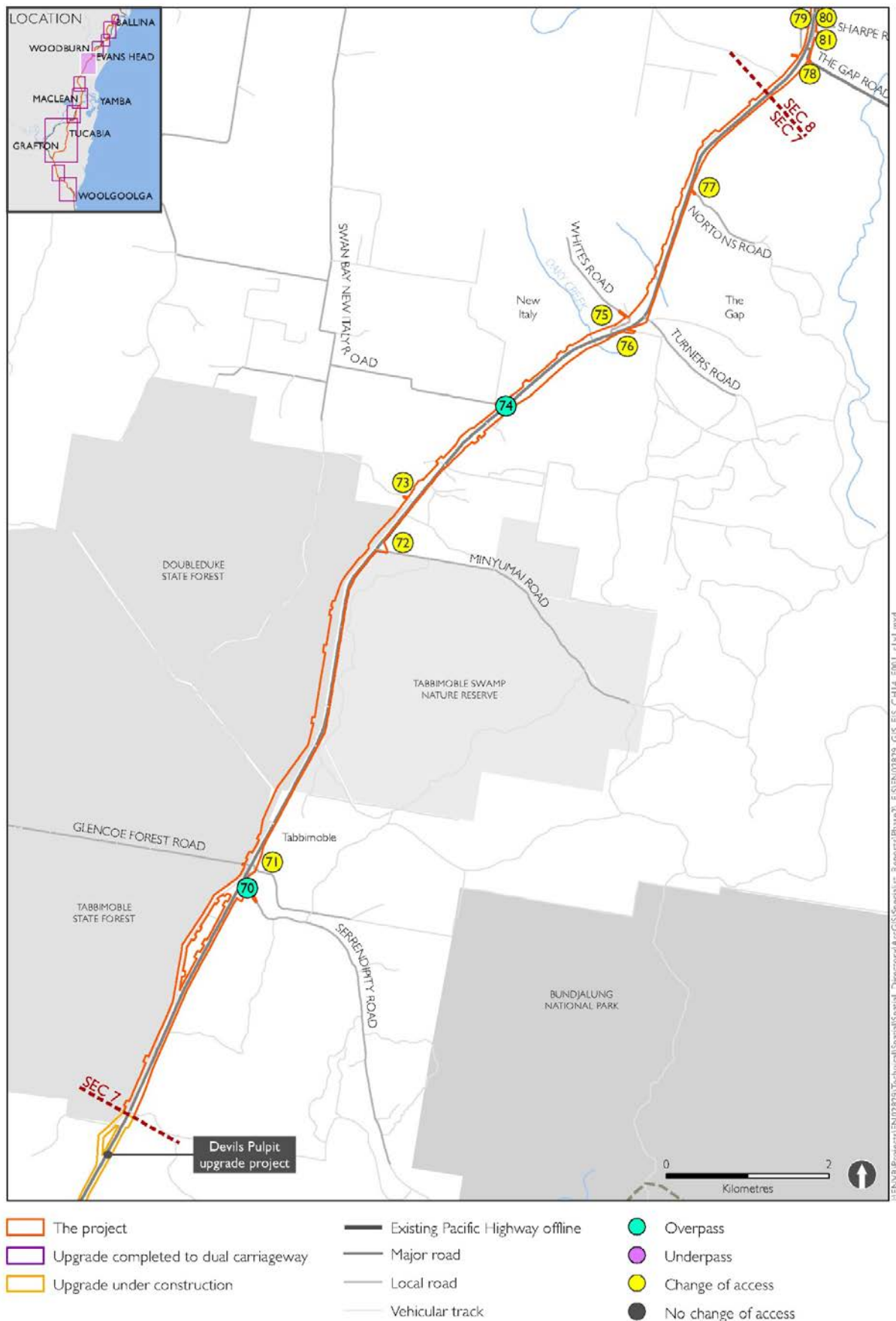


Figure 14-22: Locations of road alterations or changed access arrangements: Section 7

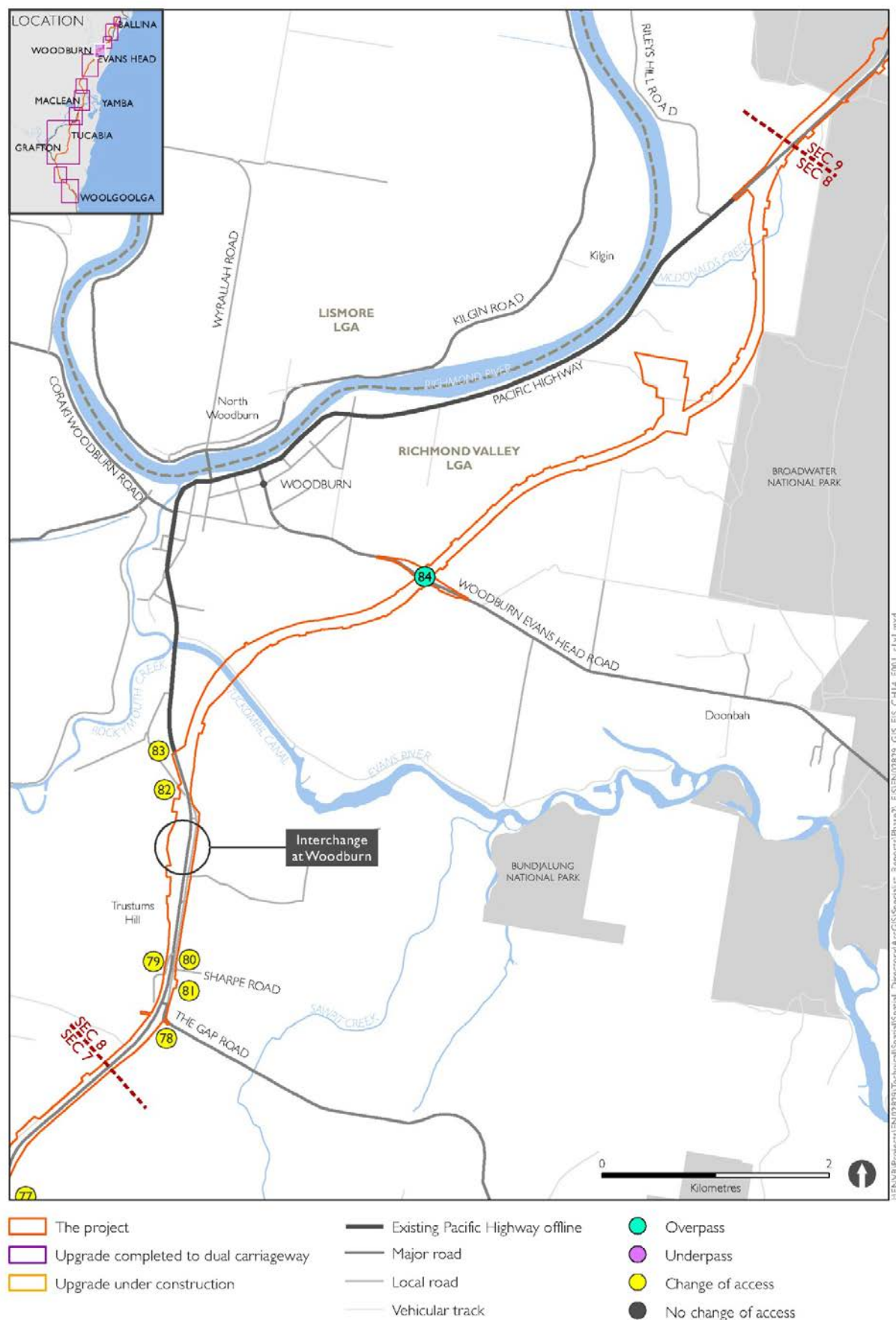


Figure 14-23: Locations of road alterations or changed access arrangements: Section 8

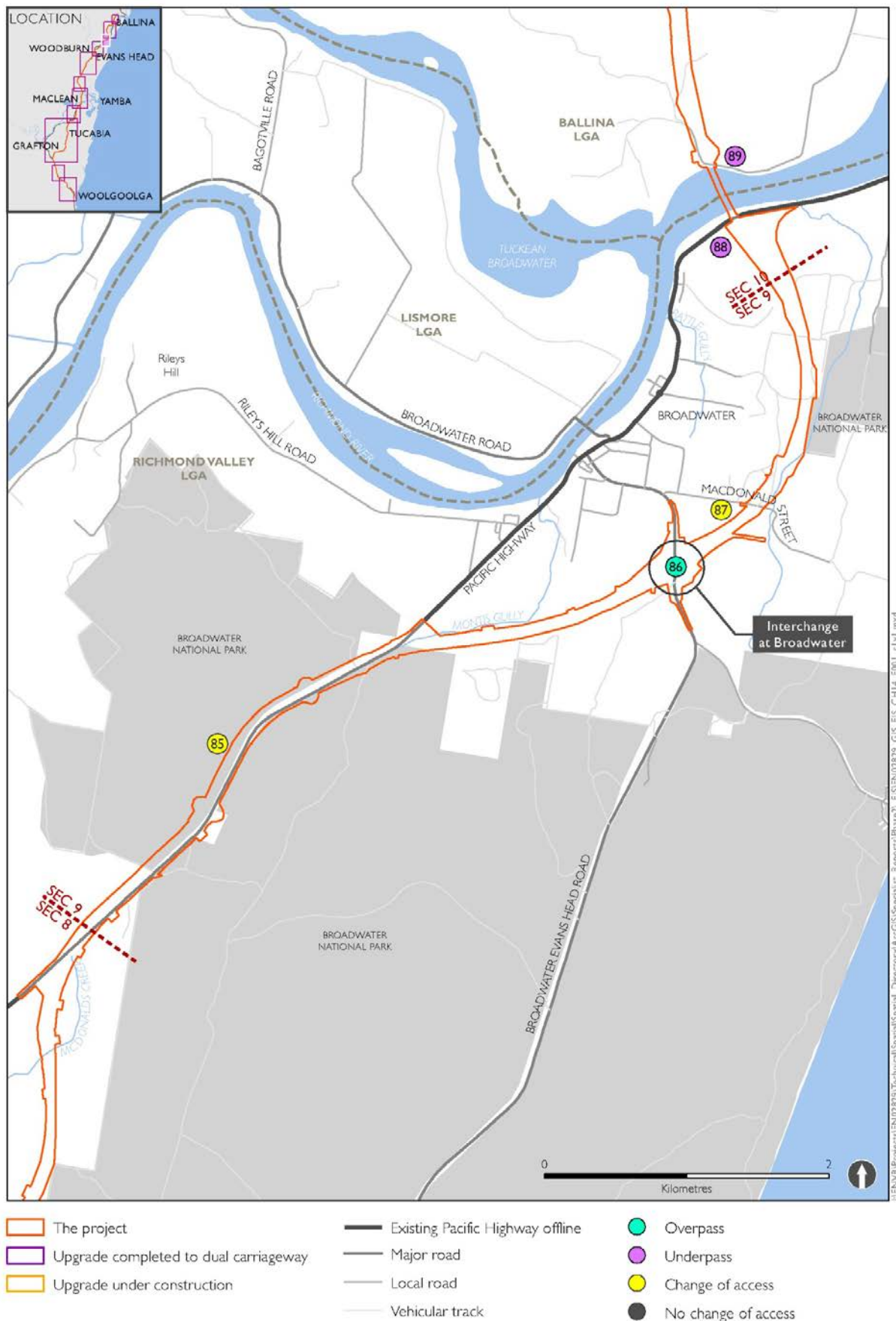


Figure 14-24: Locations of road alterations or changed access arrangements: Section 9

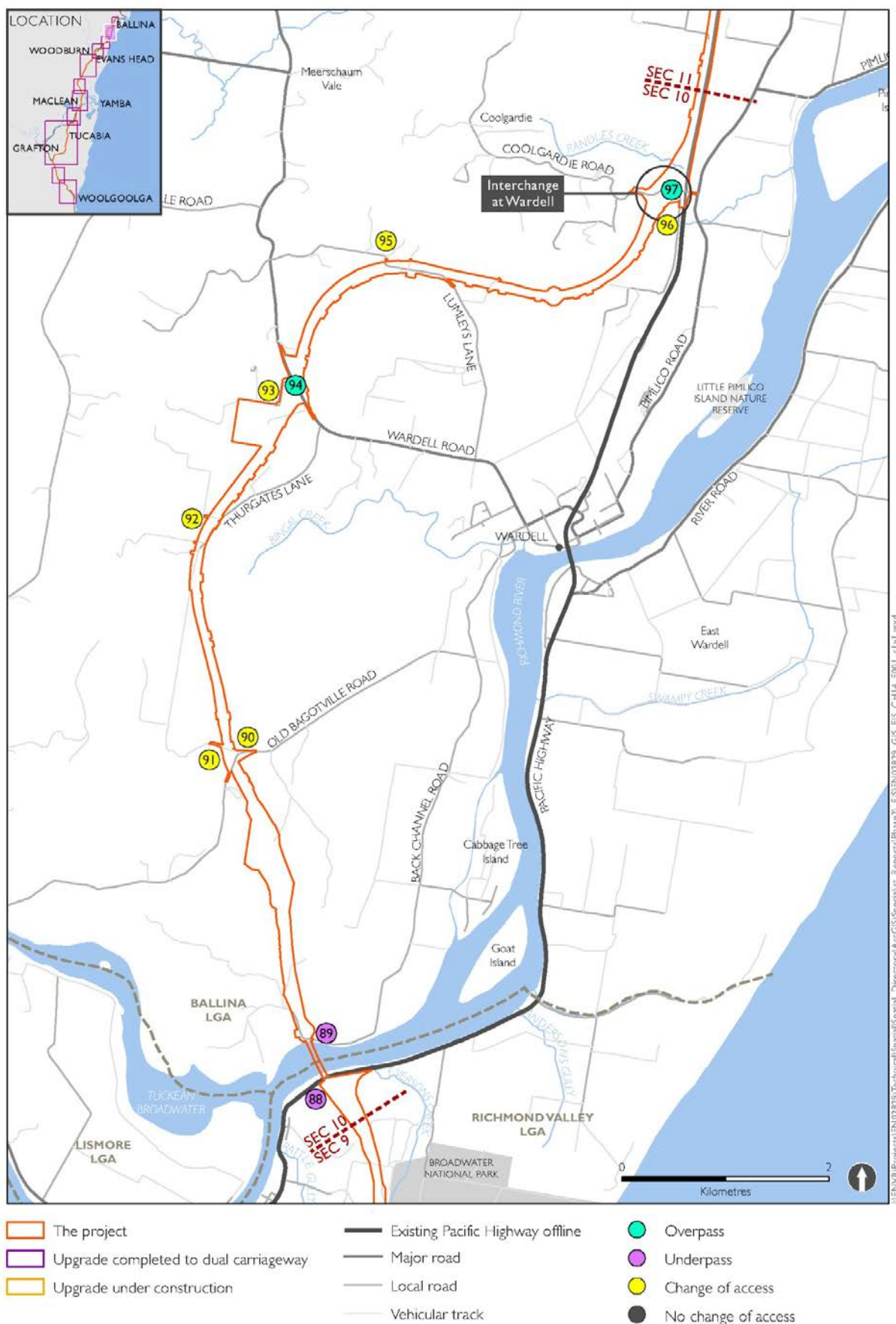


Figure 14-25: Locations of road alterations or changed access arrangements: Section 10

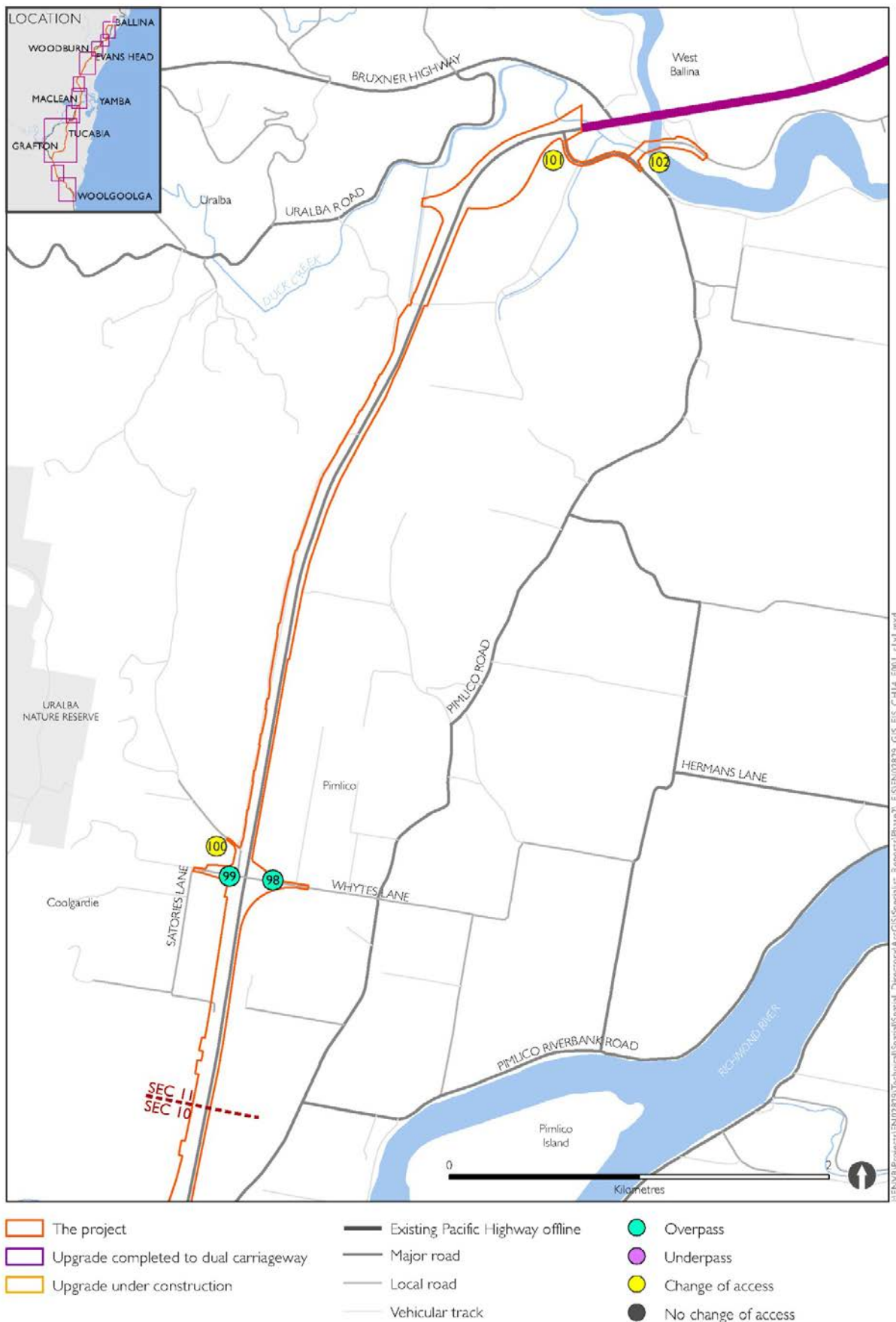


Figure 14-26: Locations of road alterations or changed access arrangements: Section 11

Regional access

At a regional scale, the project would improve access and connectivity to:

- Regional centres, towns and villages
- Employment, recreation and educational opportunities as well as healthcare and regional support services
- Regional and district level community services and facilities for local residents and visitors.

To ensure safe and convenient regional access to the project, a number of interchanges would be provided as part of the initial upgrade (locations are shown in Figure 14 27 to Figure 14 32).

Intersections would be provided along project sections initially upgraded to arterial road status. These would be closed as part of the ultimate upgrade to motorway standard. Refer to Chapter 5 (Description of the project - operation). Interchanges would not be required in areas with low traffic volumes.

Interchanges are proposed at:

- Range Road, Corindi
- Eight Mile Lane, Glenugie
- Sheehys Lane, Tyndale
- Goodwood Street, Maclean
- Yamba Road, Maclean
- Watts Lane, Harwood
- Iluka Road, Woombah
- Trustums Hill Road, Woodburn
- Evans Head Road, Broadwater
- Coolgardie Road, Wardell.

In addition, the following design refinements would be considered at the detailed design stage:

- The interchange arrangement at Range Road would be reviewed to refine local access to and from the highway
- Access arrangements between the interchange at Maclean and Townsend via Jubilee Street would be reviewed taking into consideration the current heavy vehicle movements to the industrial estate at Townsend
- The need for a full interchange at Yamba Road would be investigated should traffic growth warrant it in the future
- The need for a full interchange with south facing ramps at Watts Lane, Harwood would be investigated should traffic growth warrant it in the future.

Other access benefits

The project would also:

- Improve access for local and regional travellers in times of flooding. Road users would be less likely to be delayed during a flood as the project has been designed with improved flood immunity
- Improve access and response times for emergency services to communities across the study area
- Improve opportunities to manage traffic in the event of a highway incident, reducing delays and disruptions to motorists
- Provide a high level bridge across the Clarence River so through traffic can flow unimpeded. Maritime traffic would be able to function as normal. High mast boats would be able to travel upstream unimpeded.
- Provide safer highway access/egress at all interchange access points to the highway. For sections initially upgraded to an arterial standard, local access to the highway would be via a number of intersections. The majority of these intersections would feature left-only turns from one of the new carriageways.



Photo 5: The existing interchange at Yamba Road

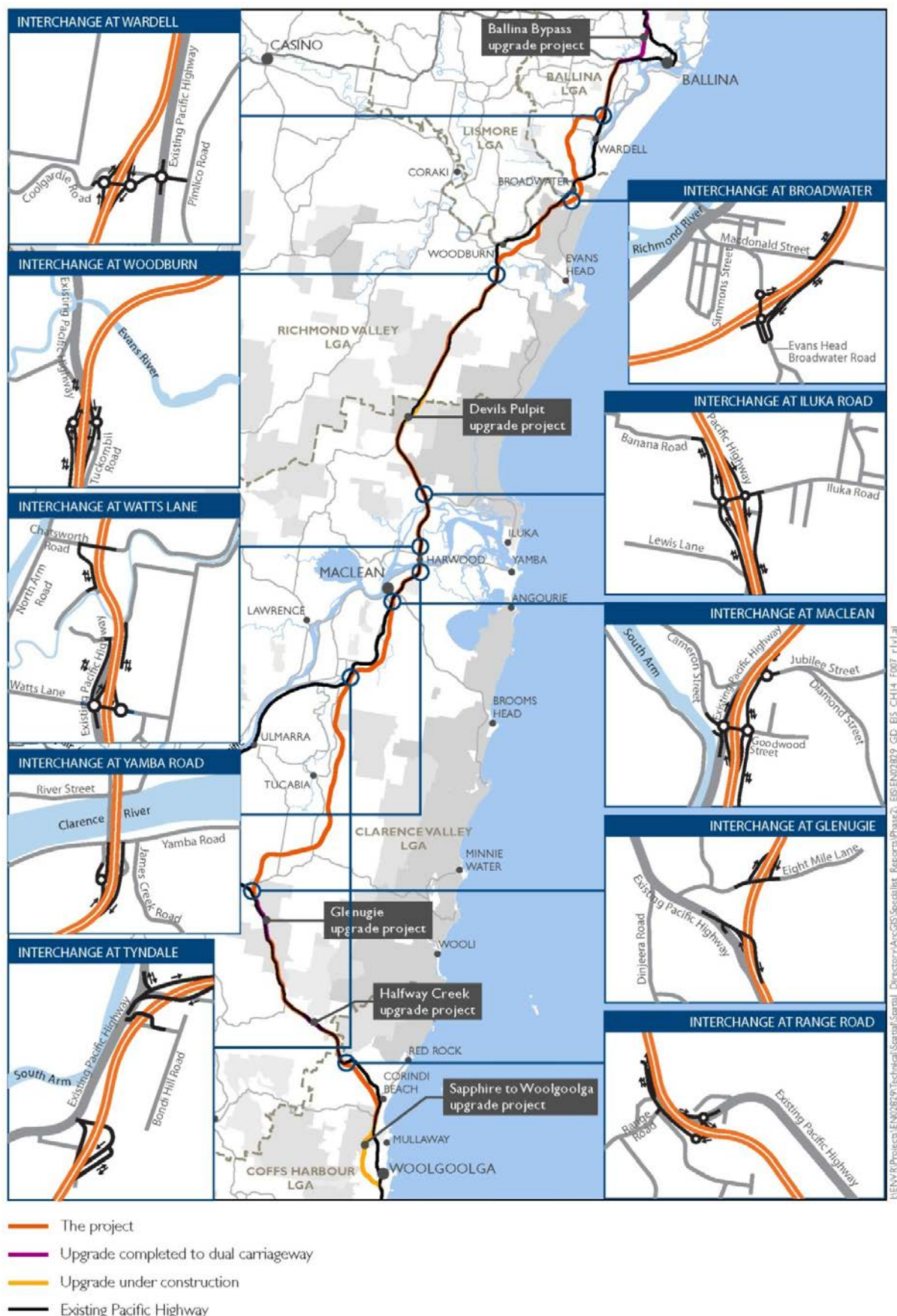


Figure 14-27: Overview of proposed interchanges

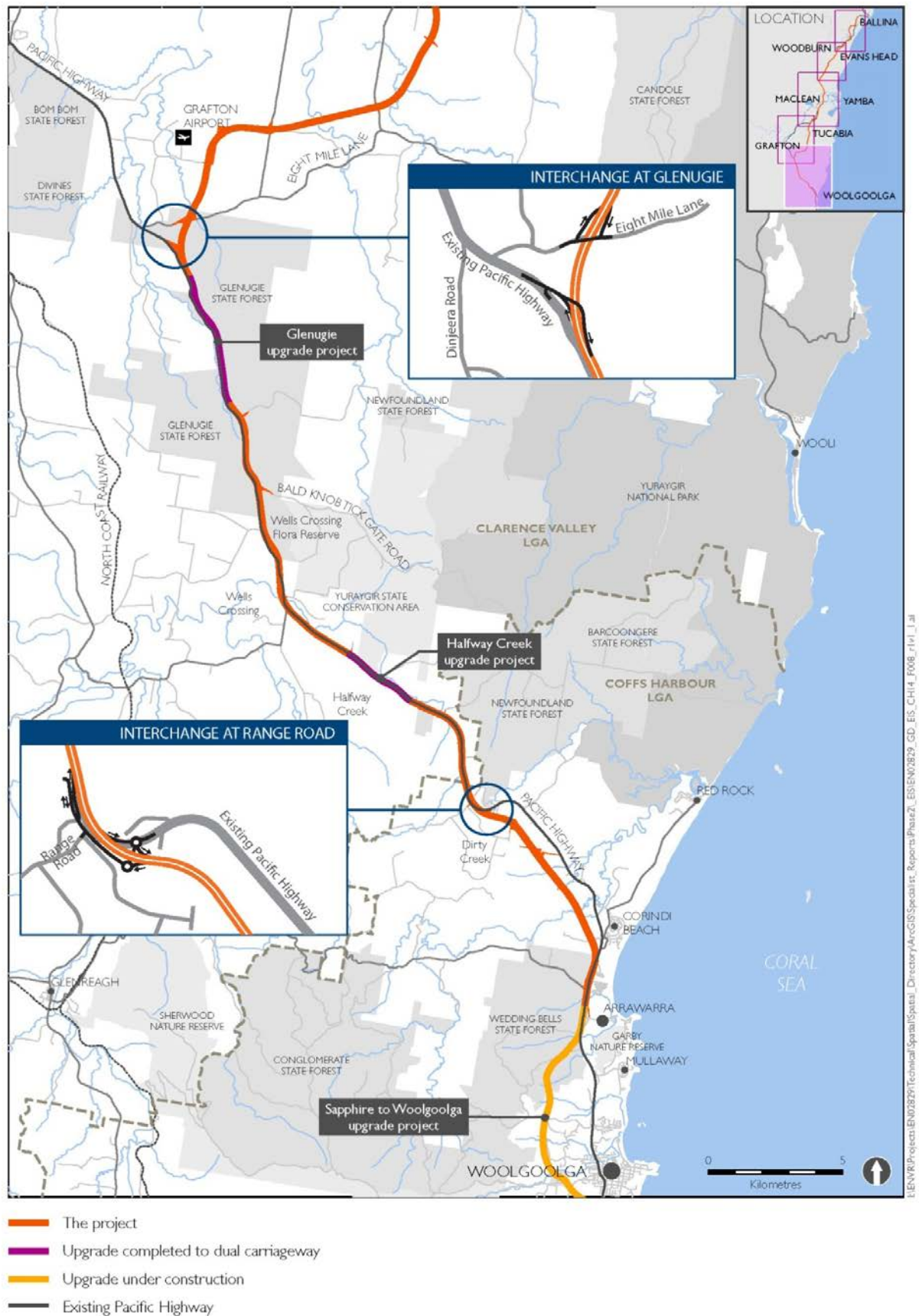
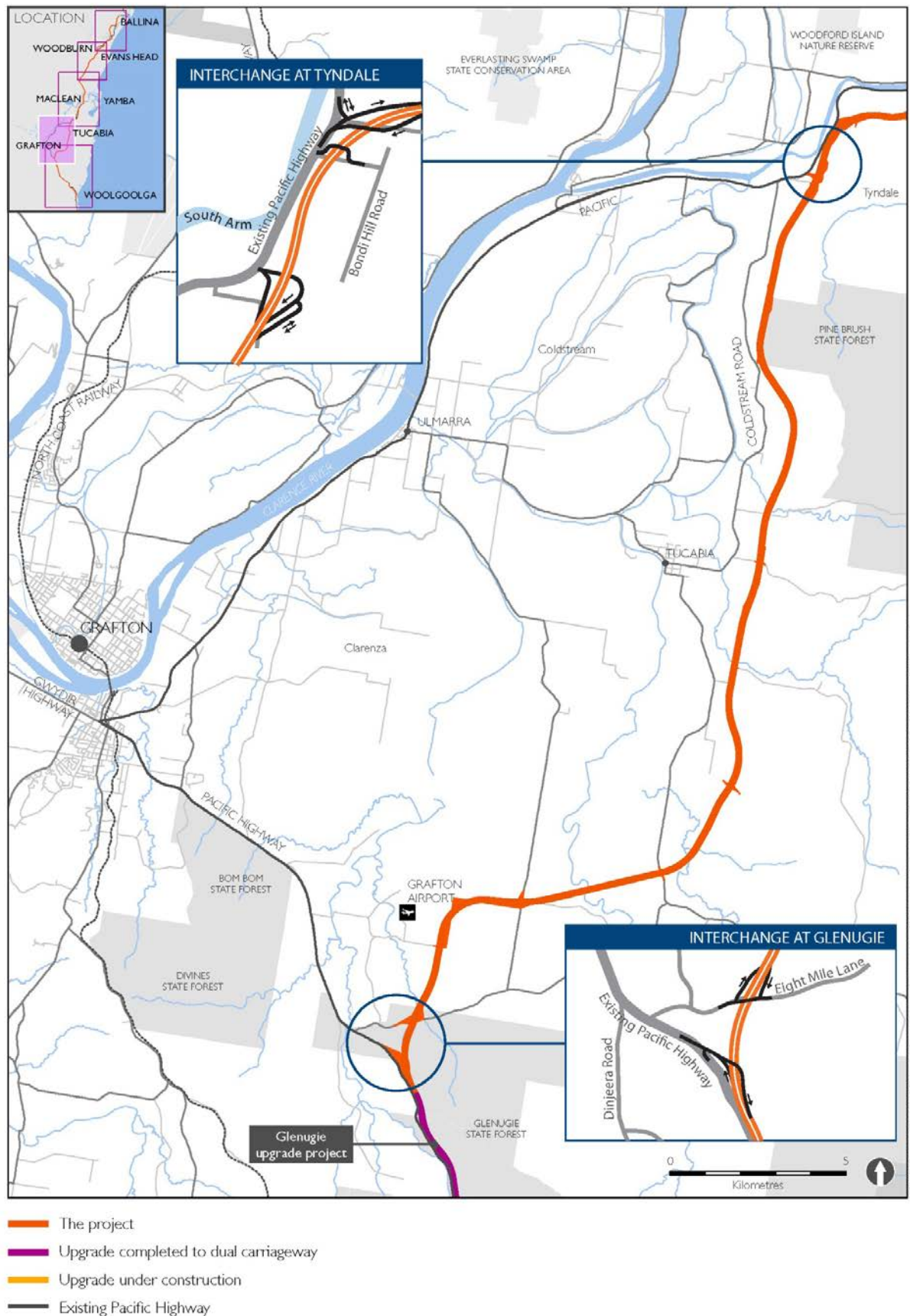


Figure 14-28: Proposed interchanges – Arrawarra to Glenugie



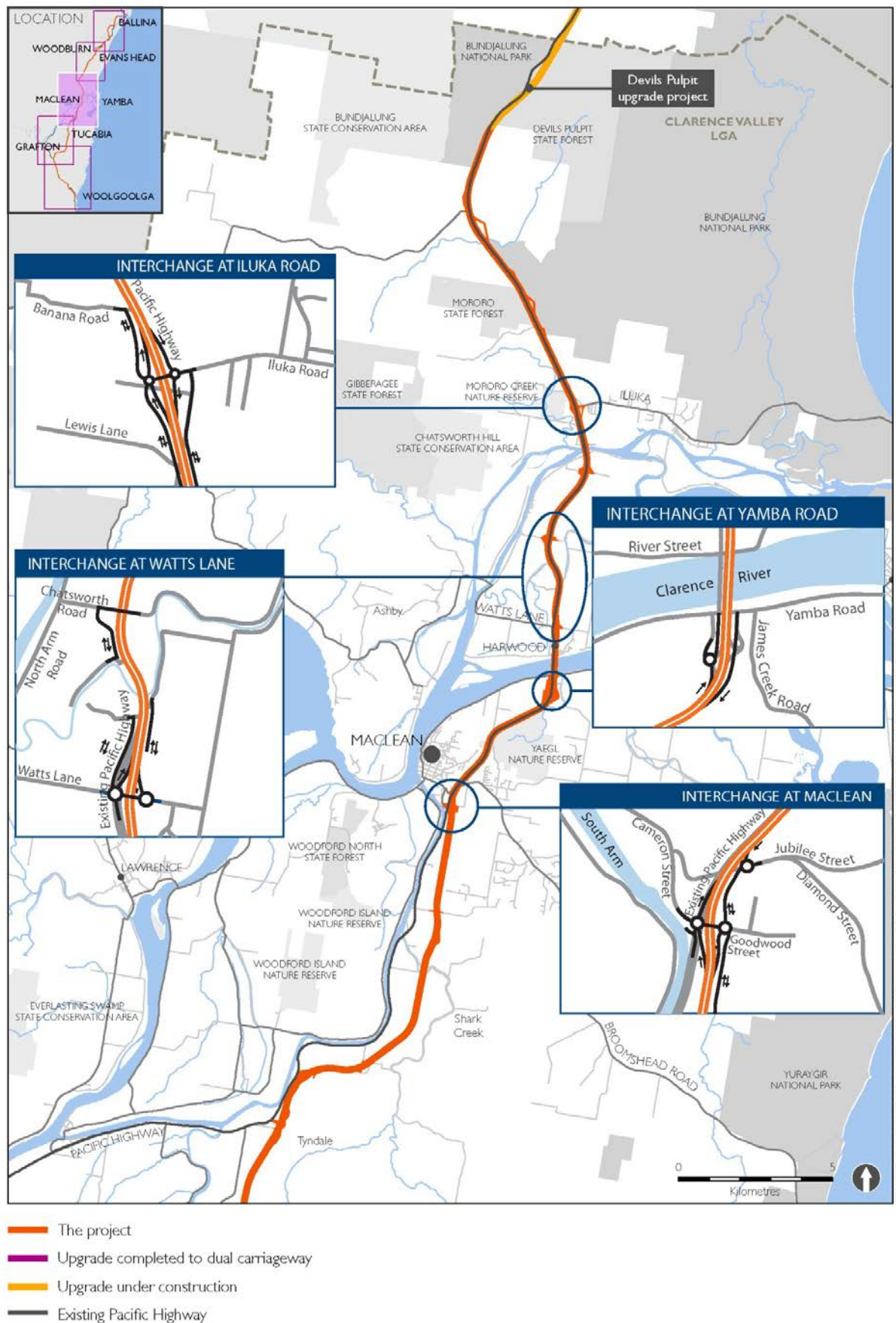


Figure 14-30: Proposed interchanges – Tyndale to Devils Pulpit

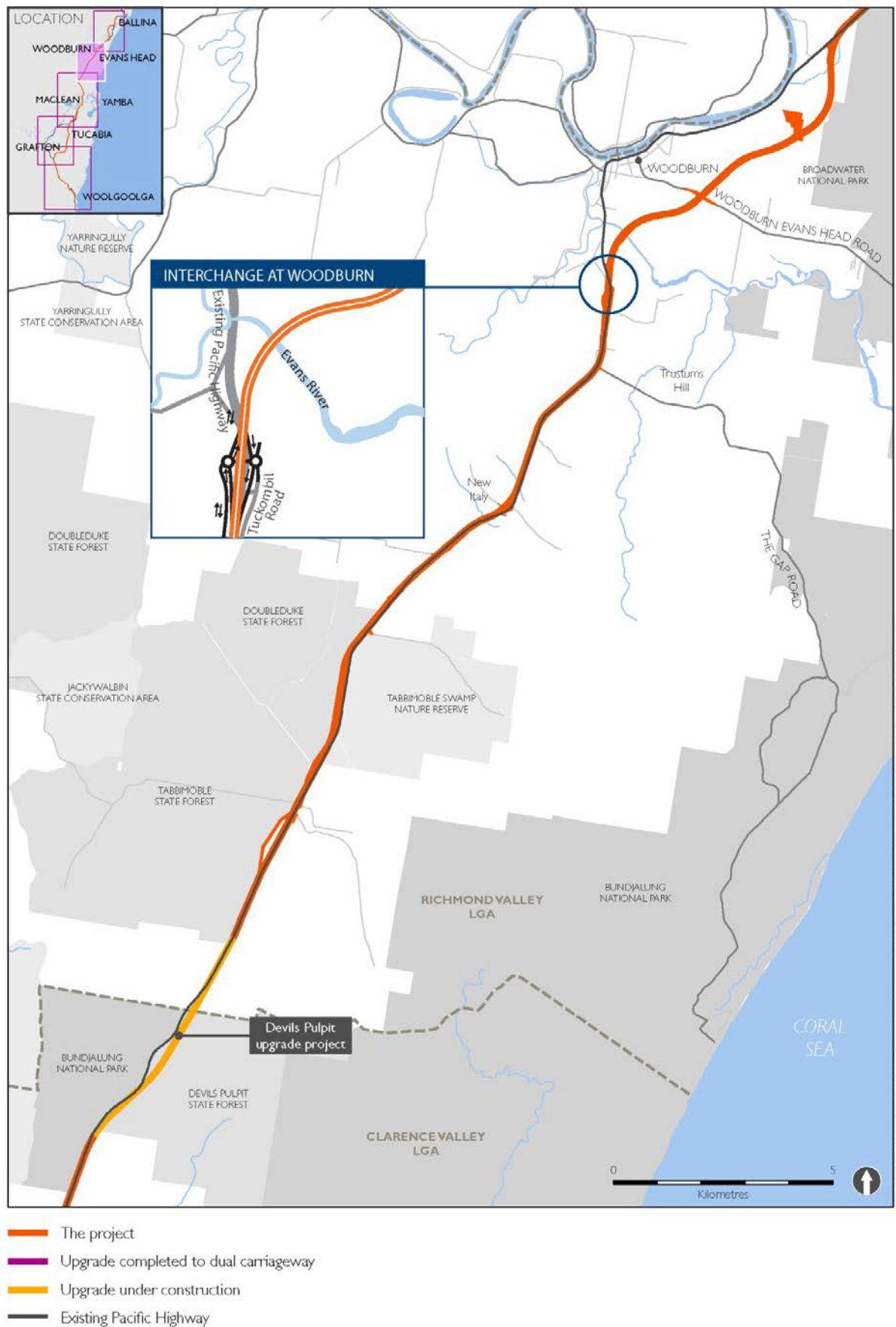


Figure 14-31: Proposed interchanges – Devils Pulpit to Woodburn

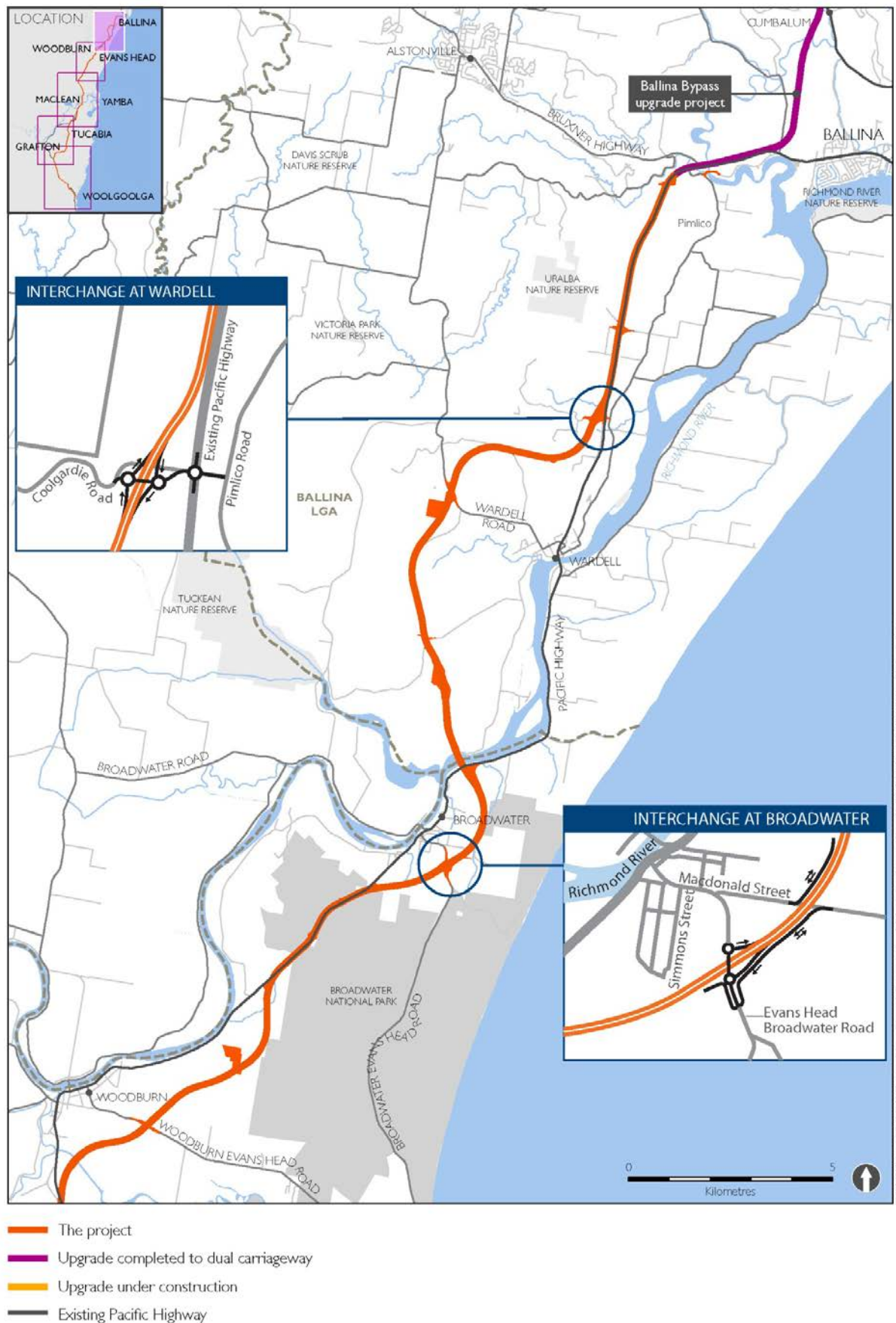


Figure 14-32: Proposed interchanges – Woodburn to Ballina

Access to businesses including cane farms

The Pacific Highway is important for local freight movements, particularly transport of raw sugar cane to the sugar mills at Broadwater and Harwood. While the project would bring important time savings to this industry, access for individual growers to the highway would be affected. Extensive consultation has been carried out with affected growers, particularly in sections 3 and 4, to maintain access where practicable. Access between the eastern and western side of the upgraded highway was identified as a key issue for cane growers. Under the arterial standard upgrade, some at-grade intersections would be provided. Under the motorway standard, parallel service roads would be provided together with overpasses and underpasses across the highway. Consultation with affected growers would continue during future stages of development.

Further information regarding access, connectivity and business impacts are included in Chapter 17 (Social and economic).



Photo 6: Vehicles accessing a cane pad adjacent to the existing Pacific Highway, Woodburn

14.4.2 Operational traffic volumes and traffic capacity

Traffic numbers along the Pacific Highway are forecast to grow by 42 per cent from 2012 to 2036. The existing Pacific Highway in the study area varies between one lane and two lanes in each direction. The estimated capacity for a two-lane two-way section of the existing highway is about 1200 vehicles per hour per lane. This reflects the current condition and alignment of the Pacific Highway.

Currently, on average, a peak of around 9800 vehicles uses the existing Pacific Highway each day. By 2036, an annual average daily traffic flow of around 14,000 vehicles are expected between Woolgoolga and Ballina. The project has been designed with sufficient traffic capacity to cater for this predicted future growth. This is based on the forecast Level of Service being categorised as “A” once the project is open to traffic (assumed to be 2016). The forecast Level of Service would remain at “A” at the design threshold of the 100th highest hourly traffic volume, 20 years after project opening.

14.4.3 Predicted future growth

Total kilometres travelled are forecast to increase by 7.9 per cent between 2011 and 2016 due to an increase in the number of vehicles on the road. Opening the upgraded Pacific Highway is expected to partly offset an increase in traffic because the total highway length would be less. The result would be a net increase in total kilometres travelled of around 1.4 per cent.

Figure 14-33 provides a forecast for heavy vehicle growth between 2011 and 2036. By 2016, heavy vehicle kilometres travelled are estimated to increase by 15.7 per cent. However, the project would result in a net increase of only 6.8 per cent in kilometres travelled. This is because the total length of the upgraded highway would be less.

In 2036, there would be an overall saving of six per cent in all vehicle kilometres travelled, equating to around 150,200 vehicle kilometres per day. For heavy vehicles, whose total travel is expected to double by 2036, there would be an 8 per cent saving in total travel.

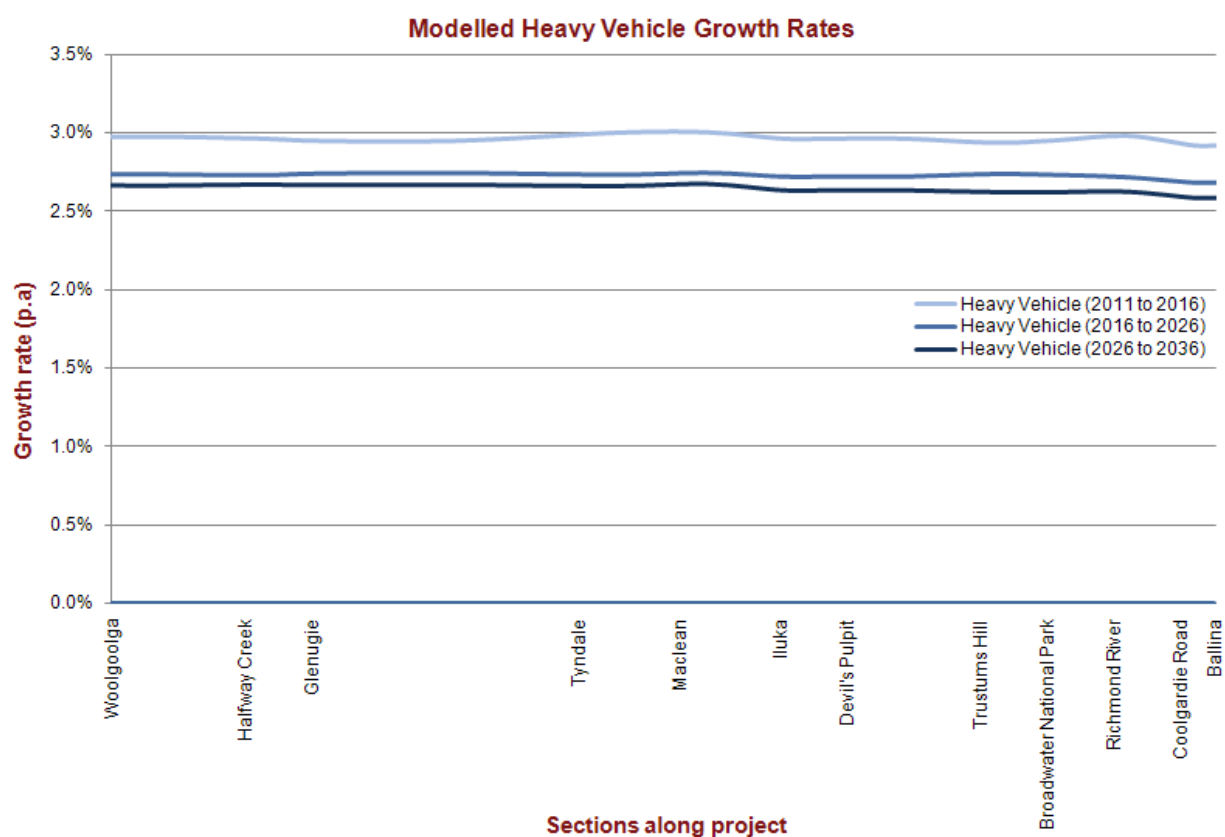


Figure 14-33: Forecast heavy vehicle growth rates

14.4.4 Land use changes

Predicted future growth in traffic numbers has also considered potential land use changes.

The Maclean Urban Catchment Local Growth Management Strategy (Clarence Valley Council, 2011) was adopted in August 2011. The purpose of the strategy is to provide guidance for the release of new residential and employment areas including timing and infrastructure needs to respond to the proposed growth in the area. Three growth areas have been identified and included in the strategy. These areas are identified in the Mid North Coast Regional Strategy and include:

- Townsend (proposed future employment lands)
- Gulmarrad (proposed future urban release areas)
- James Creek (proposed future urban release areas).

These sites are proposed to support Maclean as satellite towns. The proposed total population is 10,000 people by 2031, an increase of 5200 people over the current population. It is anticipated the project would support land use changes in these areas by promoting access from these future development areas to a major transport corridor. These regional growth initiatives are consistent with the overall population growth projections, and have been considered in developing traffic forecasts across the project.

Overall, the project would support future development across the region through improved access to major regional centres such as Coffs Harbour and Ballina and areas outside of the region such as south east Queensland.

14.4.5 Travel time savings

At project opening in 2016, total travel time for an average journey length is expected to decrease despite the growth in vehicle travel. The proposed upgrade would save around 3850 hours of travel time per day, which is equivalent to a 15 per cent travel time saving for all vehicles (based on the travel time of an average trip across the project).

The current travel time estimate is 2 hours 10 minutes for vehicles travelling the full project length between Woolgoolga and Ballina. This would decrease to around 1 hour 45 minutes once the upgrade is complete. The 25 minute saving equates to a 19 per cent reduction in travel time (on average) for a vehicle travelling the full project length. The project would also improve traffic flow creating more consistent travel speeds and reliable journey times.

14.4.6 Improved crash rate and safety

The average crash rate along the existing Pacific Highway is 20.7 crashes per 100 million vehicle kilometres travelled. At opening (2016), it is anticipated that the project would achieve the Pacific Highway Upgrade target of a reduction in the crash rate to around 15 crashes per 100 million vehicle kilometres travelled. This equates to a 27 per cent reduction in overall crashes.

By 2036, the project is anticipated to reduce the forecast number of crashes by 28 per cent from 183 (if the project had not proceeded) to 132 crashes. The greatest reduction in crash rate is anticipated to be between the Glenugie interchange and Tyndale. Following project opening, it is anticipated the project could reduce the crash rate in this area by 29 per cent, from 51 crashes to 36 crashes.

The improved crash rate is anticipated to result from the following project related factors:

- Separated carriageway separating oncoming traffic
- The project's changed vertical and horizontal alignment so that visibility is improved
- Reduced number of entry points to the highway
- Reduced travel time and distanced travelled.

14.4.7 Property access

The project would not provide direct property access from the highway. As a result, there is a requirement for service roads to provide access from the highway to local properties. Typically the existing Pacific Highway would become a service road in locations where the construction of two new carriageways is required. In areas where the project bisects existing access routes, the realignment of local roads and accesses, along with the construction of new service roads would mitigate this impact.

In all cases, local access to the motorway would be by the relevant service road, often the existing highway. Access northbound or southbound would be via an interchange. Access north or southbound on sections initially upgraded to arterial standard would vary, being via intersections and U turn bays.

For some localities or properties additional travel distances or travel time would be necessary to reach destinations currently reached directly via the existing highway. Further information is included in Chapter 16 (Land use and property), and Chapter 17 (Social and economic).

14.4.8 Public transport and school bus services

Once the highway is upgraded, it is expected that:

- Individual bus operators may modify services, including changing routes or adding services to use the highway
- Local and school buses would continue to use the existing highway where bypassed because of the number of access points and passengers living along the route. Where the highway is upgraded, local access would be provided by service roads
- Long-distance coaches are expected to use the upgraded highway but continue to make stops at regional centres within the study area. This would reduce travel time.

The upgraded highway would not affect the functioning of the North Coast railway.

School bus routes and the location of individual bus stops along the existing highway depend on various factors. These include the areas where students live, appropriate and safe points of student congregation, and safe stopping locations.

Most of the existing bus stops would be available across and near the highway under an arterial upgrade. However, some bus stop locations would need to be changed, which would affect access for school students and public transport users. Suitable bus stop locations would be determined along the remnant highway and service roads with schools and bus companies prior to opening. (It is premature to determine these locations at this stage in the planning process because school demographics are likely to change between now and when the project opens to traffic.)

Bus stops would not be provided on the motorway carriageway for safety reasons. However, the project includes pull-in bays that could be used as bus stops should this be agreed with bus operators.

14.4.9 Pedestrian and cycle access

Current NSW legislation would permit cyclists to use the project's road shoulders, including across bridges. These shoulders would provide safe and improved access for cyclists across the project. Cyclist access would be provided across the interchanges at Maclean, Iluka Road, Woodburn and Broadwater (Evans Head Road).

Signposting and crossing points for cyclists would be provided at interchanges and highway on/off ramps. Cyclists would also be able to use service roads, where there would be less traffic.

The project includes an additional shoulder at Eggins Drive near Arrawarra (Section 1). This would extend the cycle path network from Coffs Harbour. It would be considered further during detailed design in consultation with bicycle user groups and local councils. At Maclean, pedestrian and cyclist access would be provided under the upgraded highway to Jubilee Street, from the Townsend and Gulmarrad areas. The connection between the shared user path from Harwood Bridge to Yamba Road has been raised as an issue during consultation by Harwood residents interested in pedestrian and cyclist access.

The project also includes a new bridge across Emigrant Creek at Smiths Drive. This would allow for an extension to the Ballina section of the NSW Coastline Cycleway towards Pimlico via Pimlico Road. This bridge would have a shared walkway three metres wide in addition to shoulders on the road for both cyclists. Wayfinding would be included for cyclists to indicate the proximity of and access to the coastline cycleway.

Pedestrian and cyclist access and connectivity within towns and villages would be improved where the Pacific Highway is realigned away from towns and villages, including Corindi, South Grafton, Ulmarra, Woodburn, Broadwater and Wardell. These bypasses would separate through trips from local trips, reduce traffic flow through these towns. Improving the pedestrian and cyclist flow through towns would support a common community desire to walk and cycle safely within the local area.

14.4.10 Emergency services

The project has been designed to include a road shoulder with clearance to the gutter, in line with the draft Pacific Highway Design Guidelines (RTA, October 2009 Version R.2) and the Guide to Road Design (Austroads, 2010).

This road shoulder would allow for vehicles to pull over at any location in the event of a sudden breakdown or other incident, while retaining clearance to through traffic. Across bridges, shoulders would be three metres wide with no clearance width to the gutter. This would be adequate for most vehicles to be able to stop clear of through traffic.

Combined emergency U-turn bays, maintenance crossovers and stopping bays (in addition to the shoulder) would be provided about every three kilometres. These would enable:

- Emergency vehicles to conduct U-turns
- Contra-flow arrangements to be put in place.

Across the floodplains, the location of wire rope safety barriers would dictate the location of U-turns and crossovers.

In sections that are separated from service roads (sections 3, 8, 9 and 10), emergency services would have access to a locked gate for emergency access onto the highway. Access would be provided via intersections under an arterial standard. Access would also be provided to water quality control ponds for the Rural Fire Services and the NSW Fire and Rescue crews in case of fire along the project.

Under an arterial upgrade, access from the Halfway Creek rural fire brigade (on Lemon Tree Road, Halfway Creek) to the highway would be maintained via Lemon Tree Road. Under the motorway upgrade, access from Lemon Tree Road to the highway would be restricted and would be via the interchange at either Range Road or Glenugie.

Speed enforcement bays are not generally provided for new infrastructure and are determined based on crash statistics. However, the project would include shoulder and stopping bays, which could be used by Police, as required.

On-going consultation with emergency services providers would be required during the detailed design phase to ensure that appropriate allowances are made for emergency vehicle access.

14.4.11 State forest road network

About 204 hectares of State forest would be affected by the project, which would create some changes to the State forest road network. However, the overall use of state forest land would not be affected.

The Department of Primary Industries through Forests NSW has raised a number of issues in relation to the continued operation of State forests that would be affected by the project. These mainly relate to.

- Changes in access to State forests and the need to ensure that service roads allow for B-double trucks is of concern to State Forests. Accordingly, the project has been designed to maintain access to State forests via new service roads or the existing highway where the highway is realigned. These would allow continued use by B-double trucks
- The project would affect boundary fire trails within those areas of State forest to be acquired. Accordingly, fire trails impacted by the project would be relocated in consultation with the Department of Primary Industries.

State forests that would be impacted by the project discussed in Section 4.5.3 of Working paper – Land use and property, and summarised in Chapter 16 (Land use and property).

14.4.12 Maritime traffic and access

The existing bridges across the Richmond and Clarence rivers would be retained and continue to be opened as necessary for maritime access.

The bridges over the Richmond and Clarence rivers would be designed to allow for continued use of the rivers by maritime traffic. They would both be high-level bridges, and would not require opening. The Richmond River bridge would have up to 15 metres clearance to the underside of the road deck with about 6 piers in the river; the Clarence River bridge would have up to 30 metres clearance with about 13 piers in the river. Both bridge structures would require detailed design and so the stated bridge type and pier numbers are indicative only.

Currently the existing bridge at Harwood opens and closes around 13 times per month to allow boats to pass. This can slow down road users and increase travel times. Providing a high level bridge across the Clarence River means through traffic can flow unimpeded. Maritime traffic would be able to function as normal. High mast boats would be able to travel upstream unimpeded without waiting for the new bridge crossing to open or close.

Although, maritime access would not be restricted during operation of the project, occasional maintenance would be required involving inspection and works to the bridge structure from the river. However, this would not affect users of the Clarence or Richmond rivers such as commercial or recreational fishing vessels.

14.4.13 Rest areas

Rest areas would be provided at about 50-kilometre intervals for both northbound and southbound traffic (refer to Figure 14-34). There would be five rest areas located along the highway upgrade (two northbound, and three southbound). These would be consistent with rest area spacing elsewhere along the Pacific Highway.

Rest areas would be located at:

- Pine Brush, Tyndale (for northbound and southbound traffic)
- North of Mororo Road (for southbound traffic)
- Richmond River (Bagotville Road) (for northbound and southbound traffic).

There is also a rest area planned as part of the Devils Pulpit upgrade (currently being constructed). The five rest areas along the project would provide safer access and better amenity than the existing areas. However, the opportunity for incidental rest areas in towns, villages, and at tourist information centres may be reduced as the project would bypass certain locations (such as South Grafton, Grafton, Ulmarra, Woodburn, Broadwater and Wardell).

The delivery of the rest areas may be staged. The configuration of rest areas may also be staged – initial development would allow spaces for 10 trucks, with capacity to expand to up to 20 truck spaces in the future.

The need and delivery strategy for the heavy vehicle checking station at the rest area in Section 10 (north of Richmond River) would be reviewed at the detailed design stage.

14.5 Management of impacts

Measures to manage traffic and transport impacts are listed in Table 14-14. These mitigation measures are a summary of those identified in Working paper – Traffic and transport.

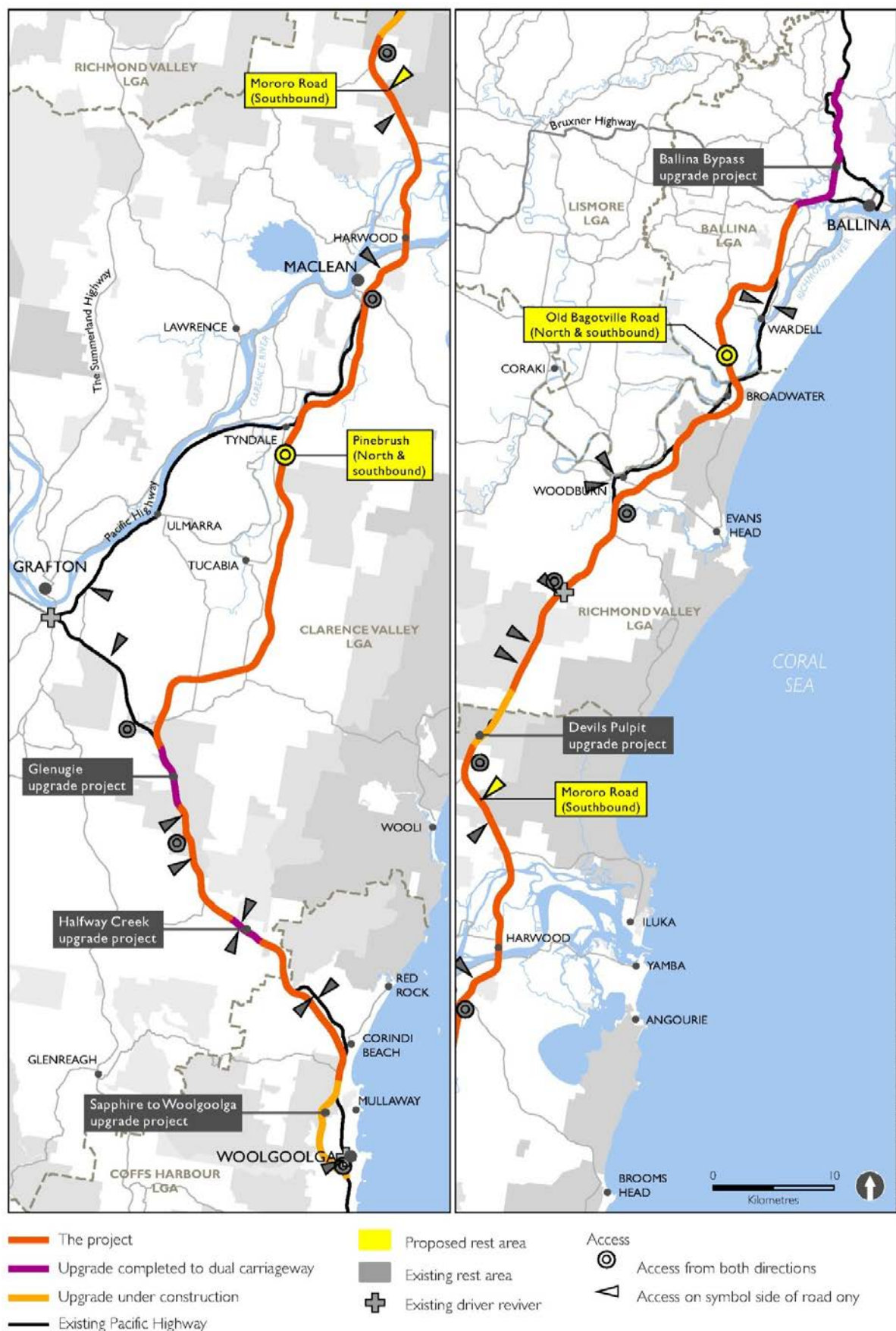


Figure 14-34: Location of proposed rest areas along the Pacific Highway

Table 14-14: Traffic and transport mitigation measures

Issue	Mitigation ID no.	Mitigation measure	Timing	Relevant section
Construction traffic management	T&T1	<p>Construction traffic management plans would be prepared and implemented for work sites. They would include:</p> <ul style="list-style-type: none"> • Identification of all public roads to be used by construction traffic • Management methods to direct construction traffic to use identified roads • Identification of all public roads that may be partially or completely closed during construction, and the expected timing and duration of closures • Details on likely impacts on existing traffic (including pedestrians, vehicles, cyclists and disabled persons) • Temporary traffic arrangement measures, including property access • Details on access to construction sites, including entry and exit locations, and measures to prevent construction vehicles queuing on public roads • A response plan for any incident involving construction traffic • Mechanisms for monitoring, reviewing and amending the success of the plans <p>The traffic management plans would be prepared in consultation with councils.</p>	Pre-construction and during construction	All
Bulk earthworks haulage	T&T2	A strategy would be prepared for bulk earthworks haulage between the crossing of the Richmond River and the interchange at Wardell. The strategy would seek to maximise the extent of haulage within the project boundary and limit the need to haul material through the town of Wardell.	Pre-construction and during construction	10
Inspection of roadwork traffic schemes	T&T3	<p>Traffic control schemes would be inspected as follows:</p> <ul style="list-style-type: none"> • Pre-start and pre-closedown inspections of short-term traffic controls • Weekly inspections of long-term traffic controls • Night-time inspections of long-term traffic controls. 	During construction	All
Vehicle movement	T&T4	<p>Vehicle movement plans and haulage route plans would be prepared. Drivers would be briefed on these vehicle movement plans during project induction.</p> <p>Deliveries would be planned to occur outside peak traffic periods, where possible.</p> <p>To minimise queuing of construction vehicles on the highway, site personnel would use two-way radios to call up haulage trucks from layover areas on a 'just in time' basis.</p>	During construction	All
Road occupancy	T&T5	Applications for Road Occupancy licences would be submitted to Roads and Maritime Services and the relevant council at least 10 working days prior to proposed occupancy.	Pre-construction and during construction	All

Issue	Mitigation ID no.	Mitigation measure	Timing	Relevant section
Road damage	T&T6	Pre-construction road dilapidation reports would be prepared by the relevant contractor for all roads likely to be used by construction traffic. Post-construction road dilapidation reports would be prepared following the completion of construction for all roads assessed prior to construction. Dilapidation resulting from construction activity would be repaired. Copies of road dilapidation reports would be sent to the relevant roads authority.	Pre-construction during construction and post-construction	All
Property and road access	T&T7	Access would be maintained to properties during construction including, where necessary and feasible, temporary alternative access unless otherwise agreed with property owners. Where any legal access is permanently affected, alternative access to an equivalent standard to and from a public road would be provided where a property has no other legal means of access and where such alternative access is feasible and practical. Where alternative access arrangements are not feasible or practical and a property is left with no access to a public road, negotiations would be undertaken with the relevant property owner for acquisition of the property and compensation will be determined in accordance with the provisions of the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	During construction	All
Bus services	T&T8	Where changes in access affect bus stop locations, temporary alternatives would be provided in conjunction with bus operators and affected schools to maintain access during construction.	During construction	All
Access to State forests	T&T9	Where access to State forest land is affected during construction, a new access route would be provided in consultation with the Department of Primary Industries (Forests NSW).	During construction	All
Maritime traffic	T&T10	Where maritime traffic access to the Clarence and Richmond rivers is affected during construction of bridge crossings, appropriate signage would be provided indicating alternative means of access and the timing of the works.	During construction	Section 5 and Section 10
Access and connectivity	T&T11	The interchange arrangement at Range Road would be reviewed to refine local access to and from the highway.	Pre-construction	Section 1
	T&T12	The location of access to the service station for northbound traffic at Lemon Tree Road, Halfway Creek would be reviewed at the detailed design stage.		Section 2
	T&T13	Access to Glenugie State Forest around the interchange at Eight Mile Lane and Lookout Road would be further reviewed in consultation with Forests NSW.		Section 3
	T&T14	Access arrangements between the interchange at Maclean and Townsend via Jubilee Street would be reviewed taking into consideration the current heavy vehicle movements to the industrial estate at Townsend.		Section 4
	T&T15	The layout of the intersection at Yamba Road would be reviewed to better meet the needs of truck movements from Harwood Mill.		Section 5

Issue	Mitigation ID no.	Mitigation measure	Timing	Relevant section
	T&T16	Connectivity between the shared user path from Harwood Bridge to Yamba Road would be reviewed to refine pedestrian and cyclist access.		Section 5
	T&T17	The need for a full interchange at Yamba Road would be investigated should traffic growth warrant it in the future.		Section 5
	T&T18	The need for a full interchange with south facing ramps at Watts Lane, Harwood would be investigated should traffic growth warrant it in the future.		Section 5
	T&T19	The need for the overbridge and the arrangement of local access at Chatsworth Road would be reviewed at the detailed design stage depending on specific staging and delivery of the highway.		Section 5
	T&T20	The need for the overbridge and arrangement of local access at Carrols Lane would be reviewed at the detailed design stage depending on specific staging and delivery of the highway.		Section 5
	T&T21	The need and delivery strategy for the heavy vehicle checking station at the rest area in Section 10 north of Richmond River would be reviewed.		Section 10

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