Traffic and Transport Assessment Report

Appendix G

Appendix G — Traffic and Transport Assessment Report

G

Berrima Rail Project

Traffic and Transport Assessment Report

Prepared for Hume Coal Pty Limited | 2 March 2017

Berrima Rail Project

Traffic and Transport Assessment Report

Prepared for Hume Coal Pty Limited | 2 March 2017

Ground Floor, Suite 01, 20 Chandos Street
St Leonards, NSW, 2065

T +61 2 9493 9500
F +61 2 9493 9599
E info@emmconsulting.com.au

www.emmconsulting.com.au

Berrima Rail Project

Final

Report J12055RP1 | Prepared for Hume Coal Pty Limited | 2 March 2017

Prepared by	**Tim Brooker**	Approved by	**Paul Mitchell**
Position	Associate Transport Planner	Position	Director
Signature		Signature	
Date	2 March 2017	Date	2 March 2017

Document Control

Version	Date	Prepared by	Reviewed by
V1	2 March 2017	Tim Brooker	Paul Mitchell

T +61 (0)2 9493 9500 | F +61 (0)2 9493 9599

Ground Floor | Suite 01 | 20 Chandos Street | St Leonards | New South Wales | 2065 | Australia

www.emmconsulting.com.au

Table of contents

Table of contents *(Cont'd)*

Appendices

Tables

Figures

Photographs

1 Introduction

1.1 Overview

Hume Coal Pty Limited (Hume Coal) is seeking approval for the construction and operation of a new rail spur and loop in the Southern Highlands region of New South Wales (NSW) (the Berrima Rail Project). Hume Coal is also seeking approval in a separate State significant development application to develop and operate the Hume Coal Project; an underground coal mine and associated mine infrastructure in the NSW Southern Coalfields. Coal produced by the Hume Coal Project will be transported to port for export or to domestic markets by rail via a new rail spur and loop, constructed as part of the Berrima Rail Project.

Approval for the Berrima Rail Project (the project) is being sought under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). An environmental impact statement (EIS) is a requirement of the approval processes. This Traffic and Transport Assessment report forms part of the EIS prepared for the project (EMM 2017). It documents the methodology and results of the assessment, the measures taken to avoid and minimise impacts and the additional mitigation and management measures proposed.

The location of the project is shown in Figure 1.1, and the local context around the project area is illustrated in Figure 1.2.

1.2 Project description

The Berrima Rail Project will enable the transportation of coal produced by the Hume Coal Project to various customers. The new rail spur and loop will be connected to the western end of the existing Berrima Branch Line; a privately owned line branching off the Main Southern Rail Line at the Berrima Junction approximately 2.5 km north of Moss Vale. The Berrima Branch Line is owned and used by Boral Cement Ltd (Boral) for the transportation of cement, limestone, coal and clinker to and from the Berrima Cement Works. It is also used by Inghams Enterprises Pty Limited (Inghams) for the transportation of grain to its feed mill east of the cement works, and by Omya (Australia) Pty Ltd (Omya) for the transportation of limestone to their Moss Vale plant at the Berrima Junction.

In addition to the construction of the new rail spur and loop, the project also involves upgrades to the Berrima Branch Line and the use of the rail infrastructure by Hume Coal and Boral. The rail project and the Hume Coal Project are the subject of two separate development applications as the rail project involves rail infrastructure used by users other than Hume Coal, as noted above.

Hume Coal will transport product coal by rail, primarily to Port Kembla for export, and possibly to the domestic market depending on demand. Hume Coal will transport up to 3.5 Million tonnes per annum (Mtpa) of product coal which will require up to eight train paths per day (four in each direction), with a typical day involving four to six paths (two to three in each direction).

In summary the project involves:

- upgrades to Berrima Junction (at the eastern end of the Berrima Branch Line) to improve the operational functionality of the junction, including extending the number 1 siding, installation of new turnouts and associated signalling;
- construction of a new rail line connected to the western end of the existing Berrima Branch Line approximately 700 m east of the Berrima Cement Works;

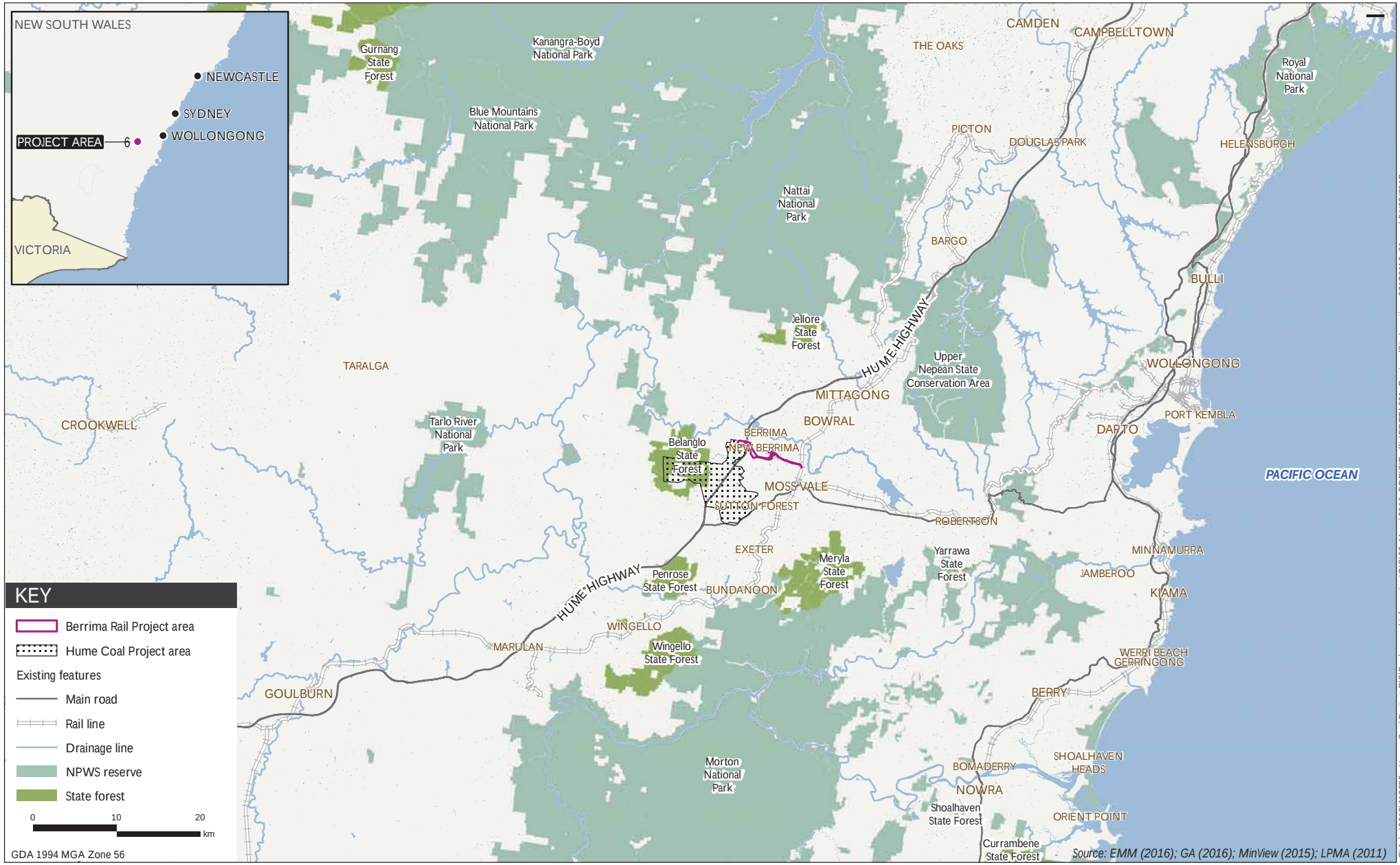
- construction of a railway bridge over Berrima Road;
- construction of a new rail connection into the Berrima Cement Works from the railway bridge;
- decommissioning of the existing rail connection into the Berrima Cement Works including the Berrima Road level rail crossing;
- construction of a new rail spur line from the Berrima Branch Line connection to the Hume Coal Project coal loading facility;
- construction of a grade separated crossing (railway bridge) over the Old Hume Highway;
- construction and operation of a maintenance siding and basic provisioning facility on the western side of the Old Hume Highway, including an associated access road, car parking and buildings; and
- construction of the Hume Coal rail loop in the Hume Coal Project Area, adjacent to Medway Road.

The conceptual project layout is illustrated in Figure 1.3. As shown, approval is sought for two alignments of the new rail line where it will cross Berrima Road. The preferred option is the blue rail alignment shown in Figure 1.3, which includes construction of a railway bridge over Berrima Road as described in the points above. This preferred project design has been developed in consultation with Boral as the owner of the Berrima Branch Line.

The alternative option (orange alignment in Figure 1.3) accounts for a proposal by Wingecarribee Shire Council (WSC) to realign approximately 700 m of Berrima Road between Taylor Avenue and Stony Creek to replace the T-intersection at Berrima Road and Taylor Avenue with a roundabout, and to replace the existing rail level crossing into the Berrima Cement Works with a rail overbridge. If WSC relocates Berrima Road to the alignment shown in Figure 1.3, then the following project components would vary:

- the turnout for the new spur line to service the Hume Coal Project would be installed on the existing Berrima Branch Line approximately 1000 m east of the cement works. A short section of the existing Berrima Branch Line would be shifted north, within the rail corridor on Boral-owned land, to accommodate the spur line;
- the construction of a railway bridge over Berrima Road would be replaced by a railway underpass beneath the realigned Berrima Road, constructed through the elevated embankment for the road;
- the construction of a new rail connection into the Berrima Cement Works from the railway bridge would no longer be required, and the cement works access would remain unchanged; and
- the existing rail connection into the Berrima Cement Works and the Berrima Road level rail crossing would not be decommissioned, since the road would be realigned to pass over the existing rail alignment using a bridge.

This Traffic and Transport Assessment report has considered the potential impacts of both options shown in Figure 1.3.

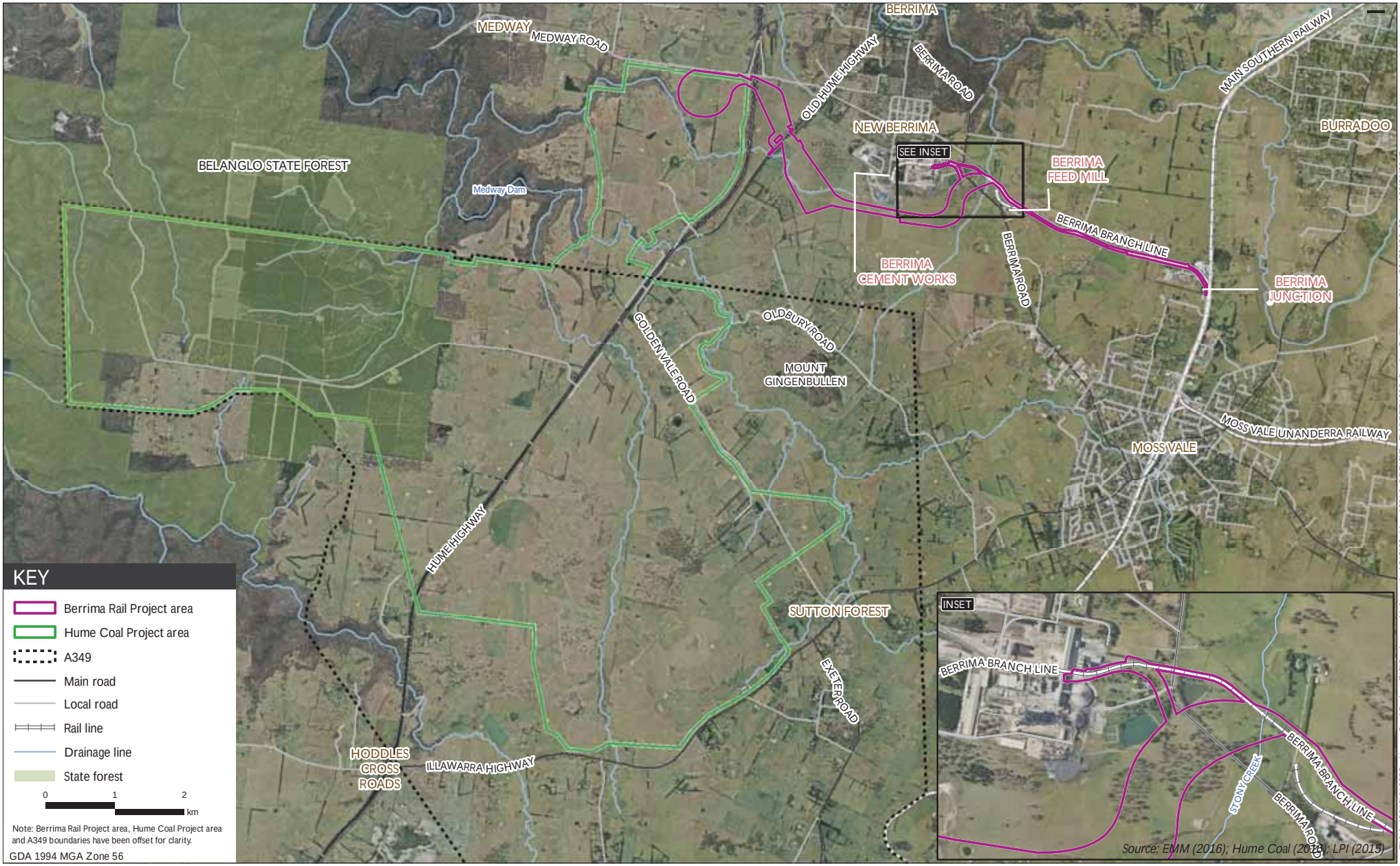


Locality plan

Berrima Rail Project

Traffic and transport assessment

Figure 1.1

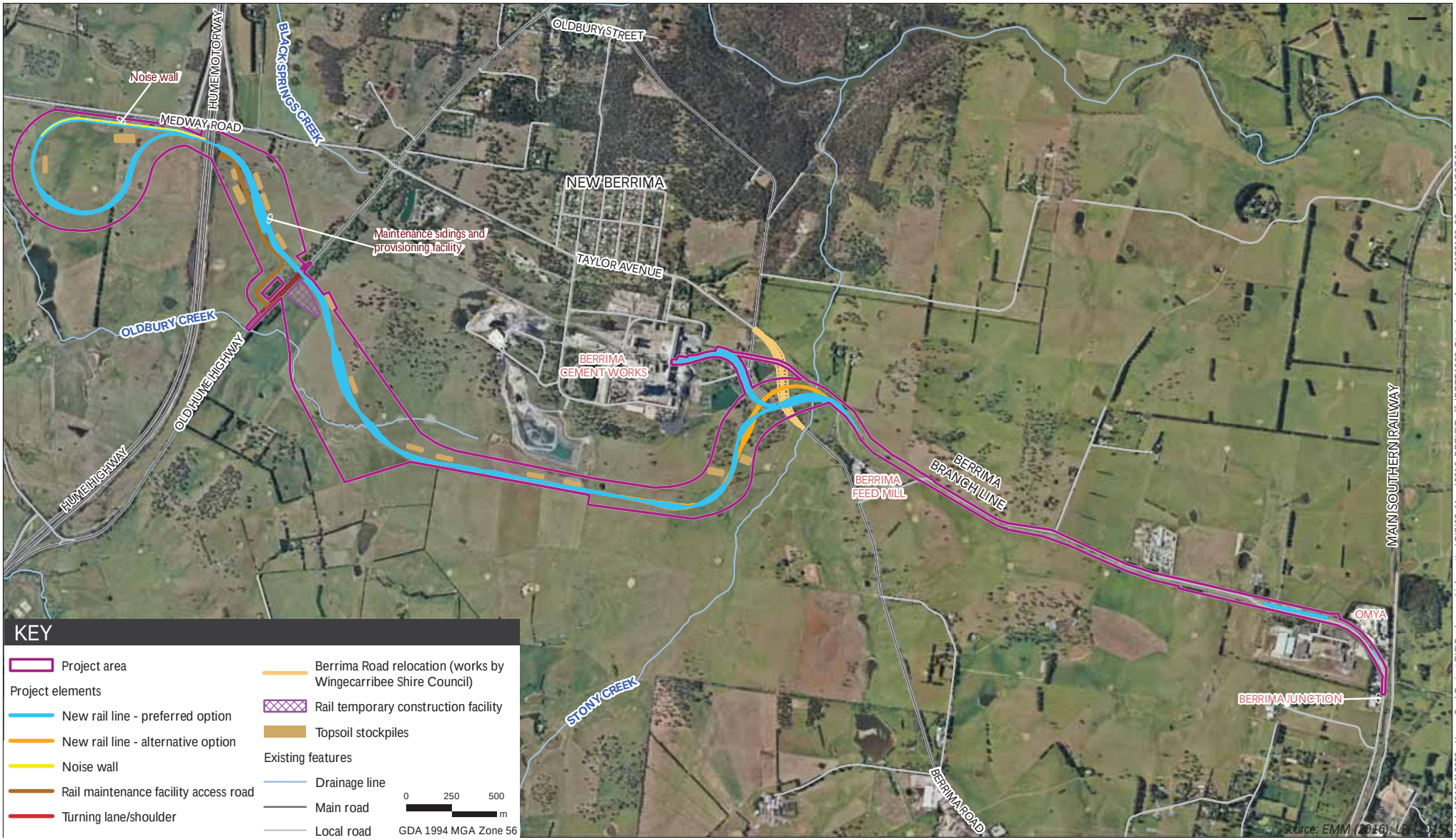


Local context

Berrima Rail Project

Traffic and transport assessment

Figure 1.2



Conceptual project components

Berrima Rail Project
Traffic and transport assessment

Figure 1.3

1.3 Project area

The project area is located ininwithin the Southern Highlands region of NSW in the Wingecarribee local government area, approximately 100 km south-west of Sydney. It occupies a corridor that is around 8 km long, stretching from the Berrima Junction on the outskirts of Moss Vale, heading west in parallel with Douglas Road past the Berrima Feed Mill, around the southern side of the Berrima Cement Works, across the Old Hume Highway and under the Hume Highway through an existing underpass into the Hume Coal Project area, south of Medway Road.

The project area is in a semi-rural setting. It is surrounded by grazing properties, small-scale farm businesses, scattered rural residences, and large and small industries and is traversed by the Hume Highway. The project area contains predominately cleared agricultural land consisting of improved pasture for grazing, and over a third of the area comprises the existing Berrima Branch Line.

The villages of New Berrima, Berrima and Moss Vale are located in the general area. Medway is also located nearby while Bowral and Mittagong are located between 6 and 10 km north-east of the eastern end of the project area, respectively. There are also scattered homesteads, dwellings and other built structures associated with agricultural production surrounding the project area.

1.4 Assessment guidelines and requirements

This Traffic and Transport Assessment report has been prepared in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies. In particular, the following guidelines and policies were considered in this assessment:

- *Austroads Guide to Road Design, Part 4A Signalised and Unsignalised Intersections, 2010;*
- *RTA (now RMS) Guide to Traffic Generating Developments, 2002; and*
- *RTA (now RMS) Guide to Traffic Control at Worksites, 2010*.

The Traffic and Transport Assessment report was prepared in accordance with the requirements of the NSW Department of Planning and Environment (DP&E). These were set out in the Secretary's Environmental Assessment Requirements (SEARs) for the project, issued on 20 August 2015. A copy of the SEARs is attached to the EIS as Appendix B, while Table 1.1 lists the individual requirements relevant to this assessment and where they are addressed in this report.

Table 1.1 Traffic and transport SEARs

Requirement	Where addressed
An assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the local and State road network.	Sections 4.1 and 4.2 (preferred option), 5.1 and 5.2 (alternative option)
..and the rail network, having regard to TfNSW's and RMS's requirements.	Sections.4.3 and 4.4 (preferred option) and 5.3 (alternative option)

The assessment recommendations made by Transport for NSW (TfNSW) and NSW Roads and Maritime Services (RMS) in relation to traffic and transport are shown in Table 1.2, including where they are addressed in the EIS.

Table 1.2 Transport for NSW and RMS assessment recommendations

Recommendation	Where addressed
Transport for NSW	
Detailed design and engineering drawings of the proposed rail spur, rail overbridges, rail loop, potential upgrades to Berrima Junction and other associated infrastructure, including staging likely works construction, operation and decommissioning (of existing Berrima Cement Works rail line).	Conceptual design drawings of project components are provided in Chapter 2 (project description) of the EIS (EMM 2017). Detailed engineering drawings will be completed prior to construction.
Details of train operating plans for existing and new users, including likely rail routes and destinations, train size and configuration, service frequency, anticipated train path requirements, expected ramp up periods and peak demand.	In Chapter 2 (project description) of the EIS (EMM 2017). Anticipated train path requirements are also discussed in Section 4.3 and it is assumed there will be minimal ramp up.
Demonstrated engagement with and confirmation from all relevant rail network owners and coal terminals regarding train path availability and future network enhancements which may be required to support the proposed operations and maintain sufficient capacity for other rail network users over the life of the project.	ARTC, Boral and other existing users of the Berrima Branch Line have been consulted about operating requirements. Details on consultation undertaken for the project are provided in Chapter 5 (consultation) of the EIS (EMM 2017).
Detailed assessment of the proposed project on the capacity, efficiency and safety of the rail networks, including level crossings. The assessment is to consider the cumulative impacts to network users (including and beyond that of the branch line) and recommend mitigation measures in response.	Section 4.3 (impacts on the rail network) and 6.1 and 6.2 (mitigation measures).
Demonstrated engagement with the relevant road authority/ies for the development of interface agreements for proposed road over rail bridges and details of traffic management during construction of the proposed overbridges.	Details on consultation undertaken for the project are provided in Chapter 5 (consultation) of the EIS (EMM 2017). Construction traffic management plans will be developed as part of the project Construction Environmental Management Plan (CEMP).
Engagement with TfNSW and the relevant rail network owners in the development of methodology for assessing noise impacts associated with the proposed rail operations, in line with relevant NSW noise guidelines and details of noise mitigation strategies.	Details on consultation undertaken for the project are provided in Chapter 5 (consultation) of the EIS (EMM 2017). Noise impacts associated with the proposed rail operations have been undertaken in accordance with relevant NSW noise guidelines, namely the *Rail Infrastructure Noise Guideline* (EPA 2013) – refer to Chapter 7 of the EIS (EMM 2017).
Roads and Maritime Services	
A traffic impact study is required using Table 2.1 of the RTA's Guide to Traffic Generating Developments.	Existing traffic conditions are described in Section 3.1. The assessment of traffic impacts is described in Sections 4.1 and 4.2 (preferred option), and 5.1 and.5.2 (alternative option).
The effects of traffic volumes and roadway configurations associated with the entry to and exit from the rail line during construction and operation. RMS will not accept any direct access to the Hume Highway. If significant road works are proposed to accommodate any changes to the traffic regime, then the EIS will need to address these proposals.	Sections 4.1 and 4.2. No direct access is proposed to or from the Hume Highway for the project.
The movement of overweight and oversize vehicles on the Hume Highway associated with the project.	This will be determined by the project's construction traffic management plan as part of the CEMP.
The impact of dust pollution on the travelling public.	This will be determined by the project's construction traffic management plan as part of the CEMP. Refer also to Chapter 8 (air quality) of the EIS (EMM 2017).

Table 1.2 Transport for NSW and RMS assessment recommendations

Recommendation	Where addressed
The impact of dust pollution or deposition of fines on the functioning of reflective signs, pavement markers and pavement line marking.	This will be determined by the project's construction traffic management plan as part of the CEMP. Refer also to Chapter 8 (air quality) of the EIS (EMM 2017).
The impacts of noise and vibration from the rail line and train movements, including from renewing and using the train line that passes under the Hume Highway, specifically undermining/destabilising of the existing bridge foundation and structure and pollution impacts on road users.	No mining is planned in this area, and it is approximately 3 km north of the nearest proposed mine workings. The railway will be constructed generally at-grade through the underpass and will not interfere with the bridge foundations. Noise and vibration impacts on the road from the rail line are considered highly unlikely. Noise and vibration levels from operation of the rail line are expected to be significantly less than that experienced by road users as a result of operating their vehicle – refer to Chapter 7 (noise and vibration) of the EIS (EMM 2017).
Changes to the water table that may affect the structural integrity of the Hume Highway.	Chapter 13 of the EIS (water resources).

2 Assessment method

2.1 Road traffic impacts

The combined impacts of traffic generated during construction and operation of the Hume Coal Project and Berrima Rail Project are described in the Hume Coal Project EIS. The following traffic impacts associated with only the Berrima Rail Project are described in this report:

- daily construction stage traffic movements requiring access to the rail project worksites;
- daily fuel and maintenance deliveries during project operations; and
- the effects of additional train movements at level crossings along the haulage route during operations.

The assessment of road network traffic impacts followed the methods in the *Guide to Traffic Generating Developments* (RTA 2002), which was tailored to the specifics of the project.

The existing road network was investigated to identify potential access points to the rail line that will be needed during construction and operations. Alternatives were assessed from an operational, cost and environmental perspective.

The roads were assessed for their capacity (focussing on intersections) and ability to safely accommodate the extra traffic associated with the project. The projected traffic volumes were compared to Austroads intersection standards to determine appropriate intersection designs.

2.2 Rail network impacts

The project's impacts on rail transport operations were assessed for four sections of the network as follows:

- the Berrima Branch Line including the proposed extension;
- 1.6 km section of the Main Southern Rail Line between Berrima Junction and Moss Vale;
- 57 km Moss Vale to Unanderra Line (Country South Line); and
- Illawarra Line from Unanderra to the Port Kembla Coal Terminal.

Existing freight train operations were examined and spare capacity for additional freight trains identified over the two main sections of the route: the Berrima Branch Line and the Moss Vale to Unanderra Line.

On the other two sections of the route, timetabling constraints were examined and the future availability of slots for freight trains identified for the short section of the Main Southern Rail Line between Berrima Junction and Moss Vale Junction, and on the Illawarra Line between Unanderra and Port Kembla.

2.3 Rail level crossing operations

The assessment of rail level crossing performance comprised preparing an inventory of rail level crossings over the length of the route to the inner harbour area at Port Kembla. The crossings were classified for the road category (major, local, minor) and the type of safety control used (lights, lights and barriers or sign control only).

Future level crossing safety and the delays to traffic when level crossings are closed to road traffic were assessed with the additional Hume Coal freight trains.

3 Existing environment

3.1 Road transport network

The existing road network near the project area includes the following roads:

- Old Hume Highway, between Mereworth Road and Medway Road;
- Medway Road and Taylor Avenue; and
- Berrima Road and Douglas Road.

The existing width and condition of the Old Hume Highway north of Oldbury Creek, which will be the main access point for the rail infrastructure construction compound and the operational access road for the rail maintenance facility, is shown in Photographs 3.1 and 3.2. The existing daily and peak hourly traffic volumes using these roads were determined from surveys conducted during June 2015 and February 2016. The results of the surveys are included in Appendix A and summarised in Table 3.1, which includes prediction of future traffic volumes without the project.

Table 3.1 Current and future traffic volumes on the surrounding road network

Road	Morning peak hour volume (vehicles)	Afternoon peak hour volume (vehicles)	Current daily traffic volume (vehicles)	Year 2020 base daily traffic (vehicles)	Daily traffic with Hume Coal Project traffic (peak construction)	Daily traffic with Hume Coal Project traffic (operations)
Old Hume Highway	99	86	1,100	1,150	1,398	1,482
Medway Road	185	193	2,100	2,200	2,282	2,278
Taylor Avenue	241	227	2,600	2,750	2,860	2,874
Berrima Road	334	440	4,300	4,500	4,602	4,610
Douglas Road	53	79	700	740	766	744

Source: Traffic volume surveys in June 2015 and February 2016; and the Hume Coal Project EIS Traffic Impact Assessment (EMM 2017b).

Forecast traffic growth over the years to 2020 is 1% annually. The additional road network traffic volumes are shown in Table 3.1 for the base case scenario (with no development, ie without the Berrima Rail Project and the Hume Coal Project) in 2020, and with the Hume Coal Project construction and operational traffic also included.

Photograph 3.1 Old Hume Highway near the proposed access to the rail maintenance siding, looking south

Photograph 3.2 Old Hume Highway near the proposed access to the rail maintenance siding, looking north

3.2 Rail transport network

The future project rail operations will use four sections of the rail network:

- Berrima Branch Line;
- Main Southern Rail Line between Berrima Junction and Moss Vale;
- Moss Vale to Unanderra Line (Country South Line); and
- Unanderra to Port Kembla Coal Terminal.

Figures 3.1 to 3.3 show the principal features of each section of the rail route to be utilised by the project.

Each of the main railway and branch lines is reasonably well used by freight services on a typical weekday, with additional regular passenger services travelling throughout the daytime (a total of 30 passenger trains daily in each direction) on the Main Southern Rail Line through Moss Vale.

The current usage of the Berrima Branch Line associated with the existing users, as advised by Boral, is 120 train movements per week, and up to 26 train movements over a 24 hour period.

The current daily usage of the Moss Vale to Unanderra Line by existing freight trains and the occasional heritage passenger train is between 11 and 12 trains in each direction, which are usually:

- 6 grain and other country freight trains;
- 4 Tahmoor underground mine coal trains;
- 1 carrying limestone from Medway Quarry; and
- 1 heritage passenger train (3 times per week).
- The Unanderra to Port Kembla section is shared between the Moss Vale Line trains and the main South Coast Line trains and has multiple tracks which enable these trains to operate simultaneously.

It is noted that Tahmoor has development consent to continue mining until 2021, although Glencore announced in mid-2016 that mining is expected to cease there by early 2019. It is therefore likely that the four Tahmoor trains listed above will not be operating when the Berrima Rail Project commences operations.

3.3 Rail level crossing operations and safety

The level crossing locations on the outer sections of the route from Berrima to Port Kembla are shown on Figures 3.1 and 3.2. There are no level crossings on the section between Dombarton and Port Kembla which is shown on Figure 3.3. The existing safety controls and recent safety improvements since 2013 at each level crossing are listed in Table 3.2.

Appropriate safety controls for each level crossing are determined by the Australian Rail Track Corporation Ltd (ARTC) and other rail line operators (ie Boral for the Berrima Branch Line) in accordance with NSW and national railway level crossing safety standards. Since 2013, new red level crossing signs (which have replaced the older white cross signs) have been installed at many level crossings along the route. Other improved safety controls, such as flashing lights, have been installed at Sheepwash Road (refer to Figure 3.2). Vegetation has been cleared alongside the rail corridor at most of the minor road and private road level crossings listed in Table 3.2, which also improves safety conditions.

Table 3.2 Inventory of existing level crossing safety controls along the route

Type of road		Existing safety treatment	Description	Comment and/or recent improvement
Major road	Berrima Road	Passive	Red level crossing signs and stop signs	The traffic speed at the level crossing location is relatively low due to the bends in the alignment of Berrima Road nearby. WSC's future road upgrading strategy for Berrima Road includes replacing the level crossing with an overpass.
	Sheepwash Road	Active	Red level crossing signs and lights with additional elevated lights above the road centre line	Additional elevated lights have been installed in a safety improvement completed since 2013.
	Illawarra Highway	Active	Red level crossing signs, lights and barriers	The pedestrian footpath and cycle paths at the crossing have been improved since 2013.
Sealed local road	Corner of Douglas Road and Collins Road	Passive	Red level crossing signs and stop signs	A concrete road surface is provided at the level crossing for improved durability.
	Collins Road angled level crossing	Passive	Red level crossing signs and stop signs	A concrete road surface is provided at the level crossing for improved durability.
	Suttor Road, Moss Vale	Active	Red level crossing signs and lights	The level crossing is within an urban area with low traffic speeds.
	Camp Street, Robertson	Passive	Red level crossing signs and stop signs	The level crossing is within an urban area with very low traffic speeds.
	Meryla Street, Robertson	Active	White level crossing signs, lights and barriers	The level crossing is within an urban area with low traffic speeds.
	Fountaindale Road, Robertson	Active	Red level crossing signs, lights and barriers	The level crossing is within an urban area with low traffic speeds.
Unsealed local and private access roads	Industrial site access at Berrima Junction (Omya)	Passive	Red level crossing signs and stop signs	Traffic volumes and speeds are low with minimal safety risk at the level crossing.
	Iona Park Road	Active	Red level crossing signs, lights and barriers	Traffic volumes are low with minimal safety risk at the level crossing.
	Private access east of Sheepwash Road (1)	Passive	Red level crossing signs and stop signs	Traffic volumes are very low with minimal safety risk at the level crossing.

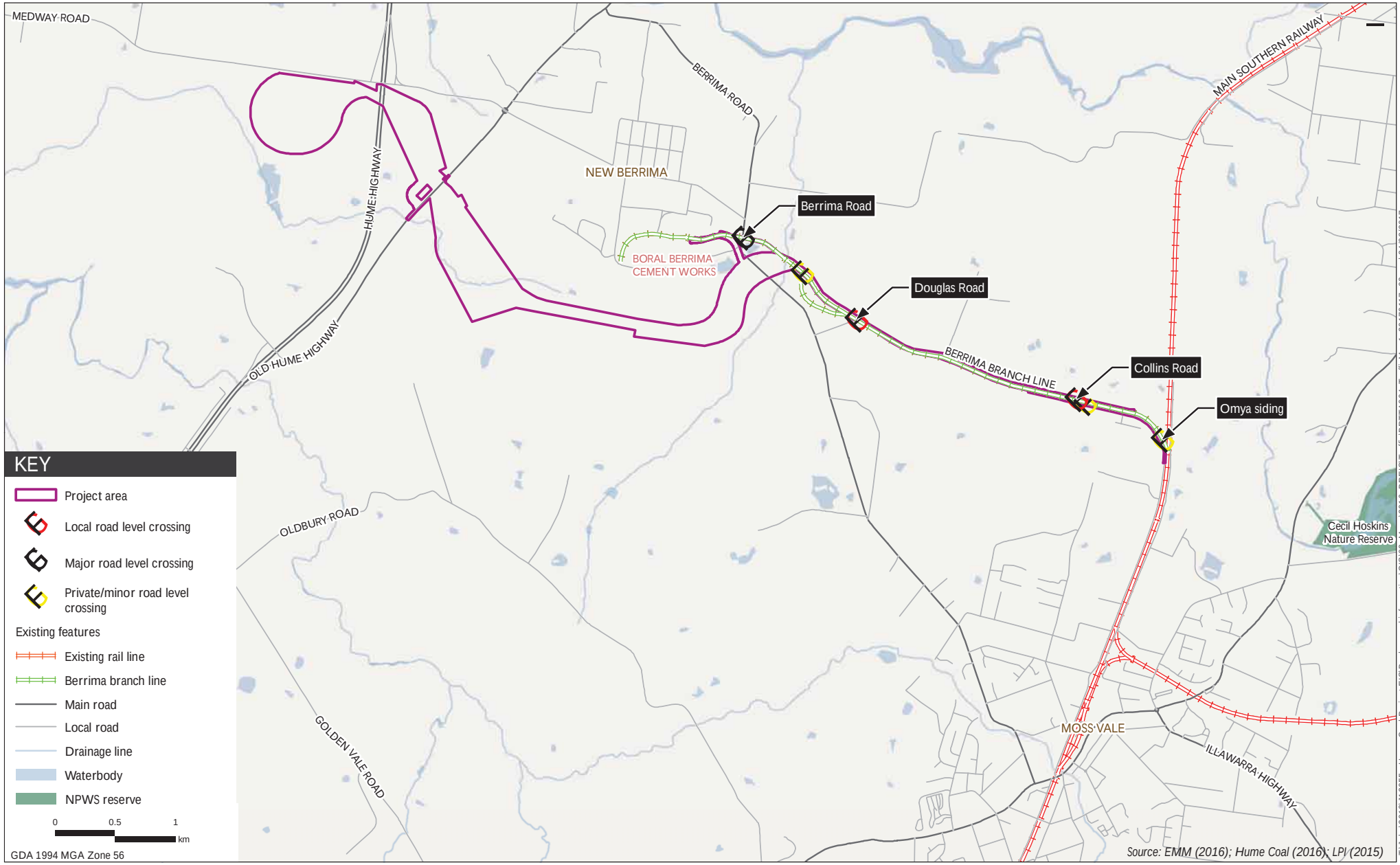
Table 3.2 Inventory of existing level crossing safety controls along the route

Type of road		Existing safety treatment	Description	Comment and/or recent improvement
	Private access east of Sheepwash Road (2)	Passive	White level crossing signs and stop signs	Traffic volumes are very low with minimal safety risk at the level crossing.
	Private access east of Sheepwash Road (3)	Passive	Red level crossing signs and stop signs	Traffic volumes are very low with minimal safety risk at the level crossing.
	Private access east of Sheepwash Road (4)	Passive	Red level crossing signs and stop signs	Traffic volumes are very low with minimal safety risk at the level crossing.
	Burrawang Station Road	Passive	Red level crossing signs and stop signs	Traffic volumes are very low with minimal safety risk at the level crossing.
	Private access east of Burrawang Station Road	Passive	Red level crossing signs and stop signs	Traffic volumes are very low with minimal safety risk at the level crossing.

On the major roads, 66% (two out of three) level crossings have active safety control, with lights and/or safety barriers. The exception is the Berrima Road crossing east of the Berrima Cement Works. However, both the train and the road traffic speeds at this level crossing are relatively low so there is minimal public safety risk. WSC's future strategy for upgrading Berrima Road (which is proposed independently of the project) has a new alignment for Berrima Road, which is east of the level crossing and includes a new bridge over the railway line so the existing railway level crossing can be closed.

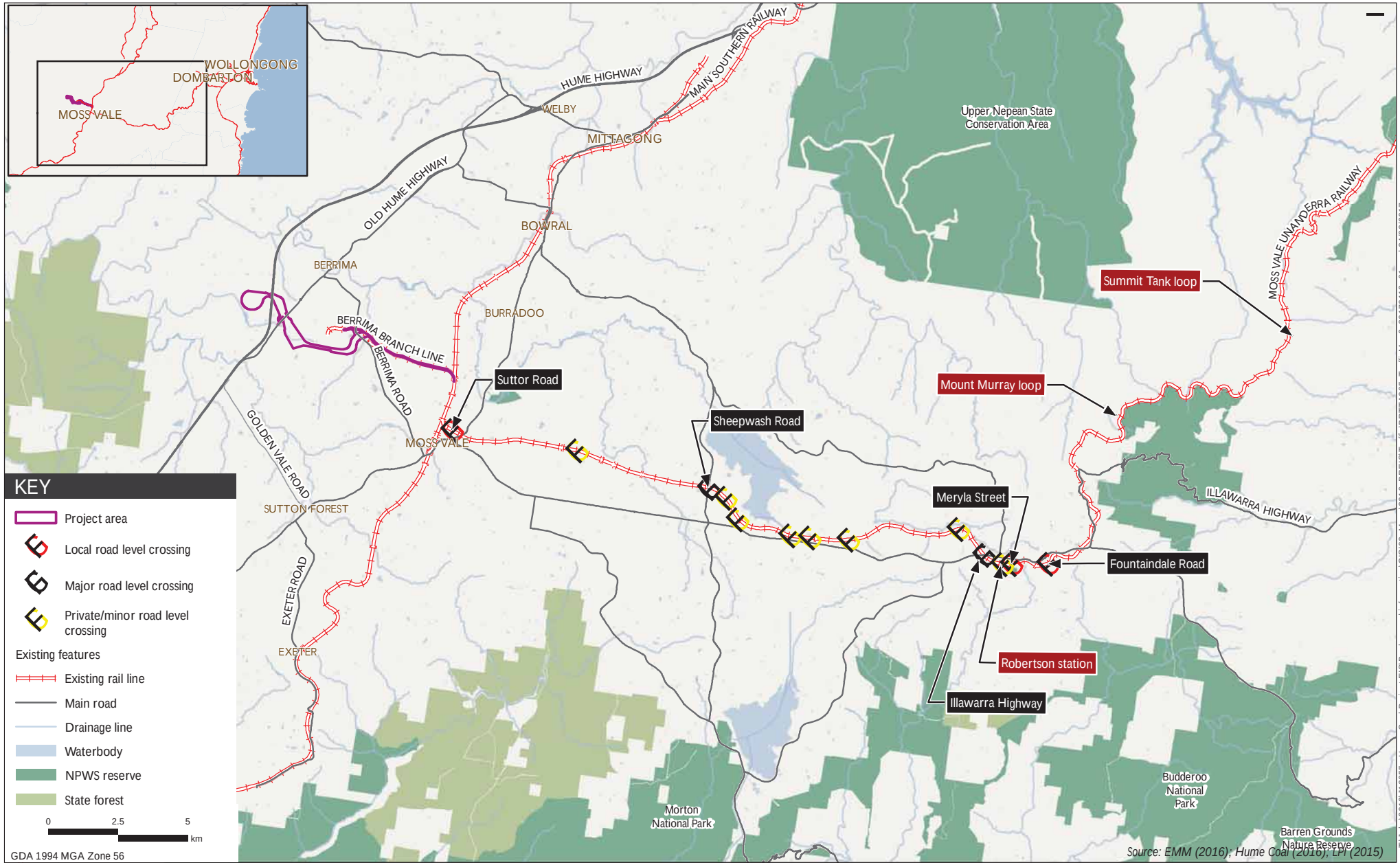
On the sealed local roads, 50% (three out of six) level crossings have active control, with lights and/or safety barriers. These crossings are within the Moss Vale and Robertson urban areas at Suttor Road, Meryla Street and Fountaindale Road. The three level crossings that have passive safety controls are on Collins Road and Douglas Road near Berrima Junction, and on Camp Street at Robertson. The safety risk at these three level crossings is relatively low as the train speeds are generally low (around 20 km/hr) on the Berrima Branch Line, and Camp Street is a very minor road, which is close to the railway station in Robertson, where the train speeds are also generally low.

On the unsealed local roads and private access roads, 12.5% (one out of eight) of level crossings have active safety control, with lights and safety barriers. The remaining nine level crossings that have passive safety controls are considered to have a low safety risk as they all have very low traffic volumes and low traffic speeds near the level crossings. Also, trees and vegetation have recently been cleared along both the road and rail corridor verges at these level crossings, which make approaching trains more visible to road traffic before reaching the crossing.



Route of the Berrima Branch Line

Berrima Rail Project
Traffic and transport assessment
Figure 3.1

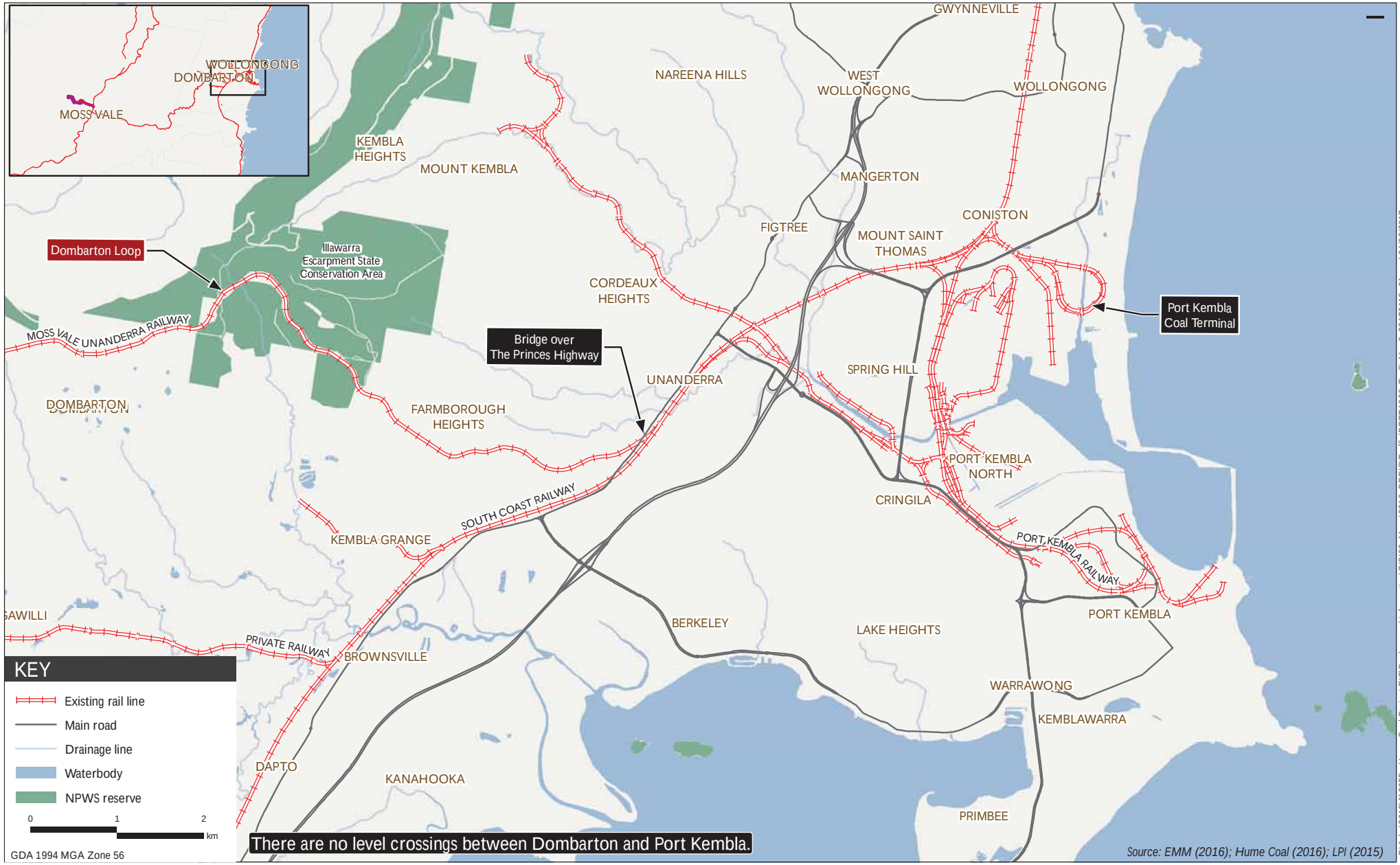


Route of the Moss Vale to Unanderra Line to Dombarton

Berrima Rail Project

Traffic and transport assessment

Figure 3.2



The Illawarra Rail Line between Dombarton and Port Kembla

Berrima Rail Project
Traffic and transport assessment
Figure 3.3

4 Impacts of preferred option

The preferred project rail route is shown in Figure 1.3. The main construction stage traffic impacts will be at the primary rail infrastructure worksites on both sides of the Old Hume Highway, north of Oldbury Creek. Lesser impacts would occur at additional secondary worksites that will be near the future rail infrastructure works near Berrima Road, Douglas Road and Collins Road.

The potential operations stage traffic impacts will occur from fuel deliveries, related workforce and materials traffic access to the rail maintenance facility, as well as additional train movements causing traffic delays at level crossings along the haulage route. Additional train movements from the project are described in Section 4.3.2.

There will also be positive impacts of the project through the construction of a new rail line over Berrima Road and a new spur into the Berrima Cement Works, resulting in the removal of the existing Berrima Road level crossing.

4.1 Construction stage impacts to the road network

The anticipated construction and operational stage daily traffic movements are summarised in Table 4.1.

The peak project construction workforce will be about 40 people based at the accommodation village in the Hume Coal Project area. The non-local elements of the construction workforce will not use private vehicles to travel to work as shuttle buses or pooled vehicles will convey them between the accommodation village and worksites.

The construction stage will last for around 230 days, with an average of 30 daily truck loads (60 daily truck movements) for materials being delivered to or removed from construction worksites along the Old Hume Highway and mainly to the rail maintenance facility access road on the western side of the Old Hume Highway. This estimate is conservative as it does not allow for some construction materials (eg rail ballast) potentially being delivered by rail. There will also be some external (visitor and delivery) traffic movements to rail project worksites by cars or similar light vehicles, which are anticipated to be at most 10 light vehicle visits (20 vehicle movements) during project construction. The total indicative daily vehicle visits and vehicle movements are shown in Table 4.1.

Table 4.1 Daily project construction and operations traffic movements

Project construction or operations stage	Daily heavy vehicle loads (movements)	Daily light vehicle visits (movements)
Project construction traffic movements, including removing surplus soil, importing crushed rock fill, ballast, track, sleepers, bridges, signalling, concrete and other building works for the rail maintenance facility.	30 (60)	10 (20)

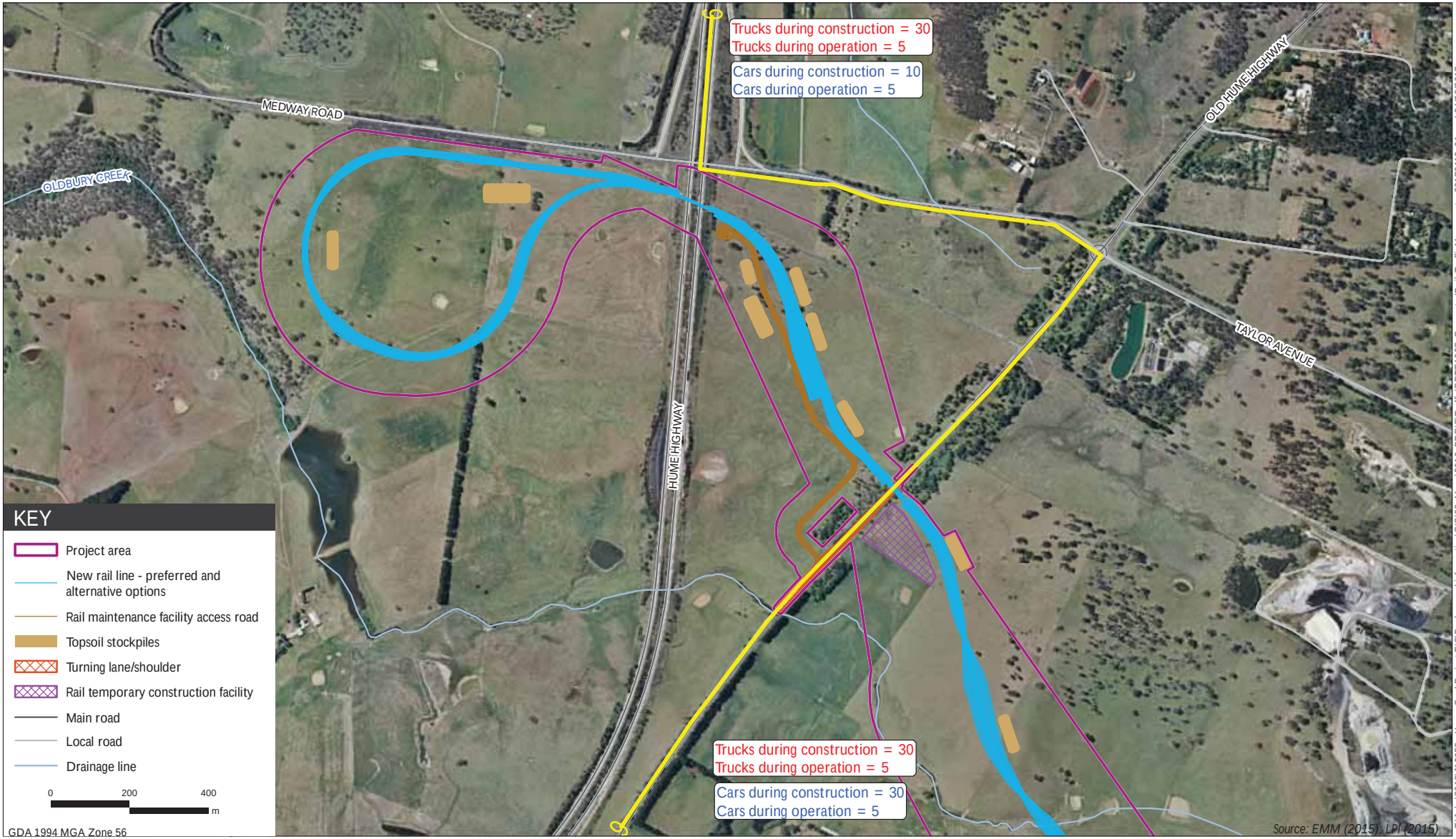
The average daily construction and operations traffic movements for the project and their anticipated distribution on the road network are shown in Figure 4.1.

The daily construction traffic increases will be 2.9% for the Old Hume Highway, based on the predicted daily traffic increase of 80 daily vehicle movements (40 daily vehicle movements travelling north and 40 daily vehicle movements travelling south) from the proposed construction access location north of Oldbury Creek, which is shown in Photographs 3.1 and 3.2.

These traffic increases have been calculated compared to the future base year (2020) daily traffic volume of 1,398 vehicles for the Old Hume Highway, which includes other traffic movements generated by the Hume Coal Project, as shown in Table 3.1.

For construction access, an improved intersection incorporating a turning lane and wider shoulders on both sides of the Old Hume Highway will be constructed over a 450 m long section. This will provide safe left and right turning vehicle access to the main rail infrastructure worksites on either side of the Old Hume Highway. The location of the proposed intersection widening is shown in Figure 4.1, and in further detail in Figure 4.2.

Construction access to a number of secondary construction worksites will also be required as construction of the rail line progresses along the project corridor. These additional access points are anticipated to be from Berrima Road, Douglas Road, Collins Road, Lackey Road, the Old Hume Highway, Medway Road and Mereworth Road, as illustrated in Figure 4.3. For these access points the maximum daily construction traffic volumes will be much less than the anticipated 80 vehicle movements to and from the main construction facility off the Old Hume Highway. The individual construction access arrangements, such as temporary traffic control arrangements using flagmen or temporary traffic signals, will be determined and documented in the CEMP, and will be managed in accordance with the requirements of the RMS publication *Traffic Control at Work Sites* (RTA 2010).



Generated daily traffic movement

Berrima Rail Project

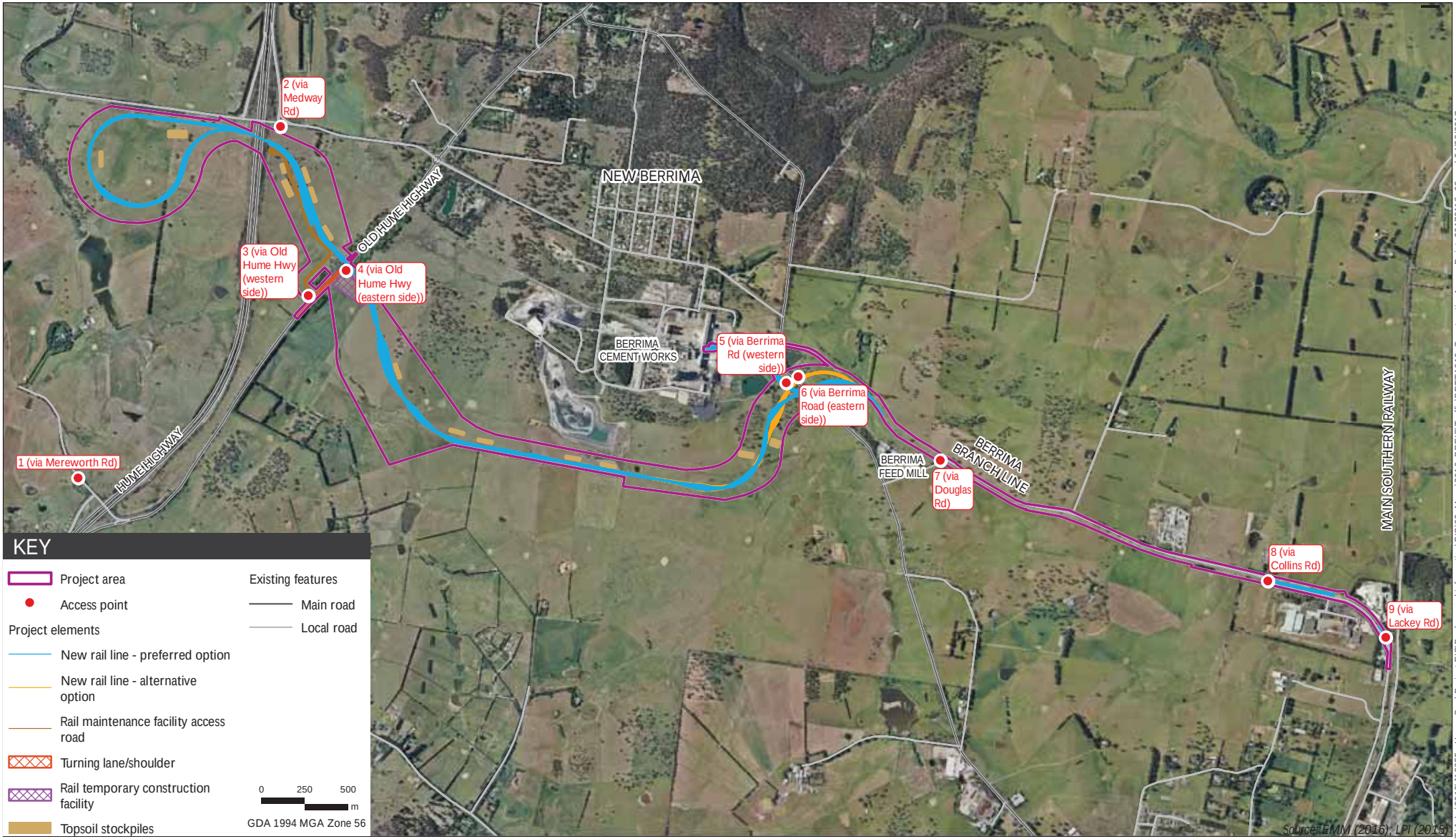
Traffic and transport assessment

Figure 4.1

Proposed temporary construction facility and Old Hume Highway widening

Berrima Rail Project
Traffic and transport assessment

Figure 4.2



Indicative construction phase access points

Berrima Rail Project
Traffic and transport assessment

Figure 4.3

4.2 Operational stage impacts to the road network

4.2.1 Additional traffic movements

During the operations stage, the surrounding road network will experience minimal additional daily traffic movements from fuel, other rail maintenance deliveries and workforce or visitor car traffic movements. These daily movements will be at most about 20 vehicle movements (10 truck movements and 10 car or other light vehicle movements) travelling via the rail maintenance facility access road on the western side of the Old Hume Highway.

The daily operations traffic increases would be 0.7% for this route, assuming the predicted daily traffic increases are 10 daily vehicle movements travelling north and 10 daily vehicle movements travelling south via the Old Hume Highway, compared to the future base year (2020) operating traffic volume of 1,398 vehicles for the Old Hume Highway at that time, which includes the other Hume Coal Project traffic movements.

For the longer-term operations access, the initial temporary turning lane and wider shoulder of the Old Hume Highway will be reconfigured to provide a channelised lane right turn (short) intersection, referred to as CHR(S), which will provide safe left and right turning access for the proposed traffic volumes to the rail maintenance and provisioning facility on the western side of the Old Hume Highway (refer to Figure 4.4).

There will be additional traffic safety benefits from the closure and removal of existing railway level crossings along the Berrima Branch Line (refer to Figure 3.1). In particular the preferred rail alignment near the Berrima Cement Works will result in a new rail overbridge crossing Berrima Road, which will permit the closure of the Berrima Road level crossing at the Berrima Cement Works.

Access to the Chelsey Park Road driveway will no longer be available once the new rail line is constructed with both the preferred and alternative options. This property is owned by Austral Bricks, and whilst there was previously a house on this property, the house has recently been demolished. Boral have advised that this driveway will no longer be used, and an alternative access will not be required to the property. In relation to the other private road level crossing, the proper access to this property exists via the existing Collins Road angled level crossing (refer to Figure 3.1).

4.2.2 Additional train movements

Future road traffic interruption from the increased number of freight trains (which will typically be four Hume Coal train movements per day in each direction) at the major road level crossings on the route, such as the Illawarra Highway crossing at Robertson, will be up to an extra 24 minutes each day.

The level crossing at Robertson now has traffic delays for about three minutes each time it is closed, which for 23 train movements at the most each day, represents 4.8% of the total time each day when the road is closed to traffic. In the future, with the added coal and freight trains on the line at Robertson, there will be 31 train movements at the most each day, which will represent 6.3% of the total time each day when the road is closed to traffic, assuming trains from Tahmoor continue to operate contrary to the announced closure in 2018/2019.

Therefore, the net effect of the additional Hume Coal trains will be to increase the proportion of the total time each day when the Illawarra Highway level crossing (and the other level crossings between Robertson and Moss Vale) will be closed by a passing train, from 4.8% of the total time each day now to 6.3% of the total time in the future.

Proposed operations stage access for Rail Maintenance Facility

Berrima Rail Project
Traffic and transport assessment

Figure 4.4

These additional delays at level crossings will not be a significant increase to the total length of time each day when the affected level crossings will be closed to road traffic.

4.3 Operational stage impacts to the rail network

Existing train movements using the rail network are described in Section 3.2 and additional train movements by existing users and those that will be added by the Hume Coal trains are described in the following sections.

4.3.1 Users

There are three existing users of the Berrima Branch Line; Boral, Inghams and Omya, although these users may vary in the future from time to time. The project will add Hume Coal as another user of the line.

As noted in Section 1.2, Boral currently uses the Berrima Branch Line for the transport of material such as clinker, cement, coal and limestone to and from the Berrima Cement Works and other rail based supply and customer/product transfer facilities. Omya uses the Berrima Branch Line to transport material such as limestone to its plant located at Berrima Junction adjacent to the Main Southern Rail Line corridor, and generally only uses the Berrima Branch Line rail facilities at Berrima Junction. Inghams transports grain along the Berrima Branch Line to its feed mill on Douglas Road.

For each full train operating on the Berrima Branch Line there is also a corresponding empty returning train. There are also a number of light train movements between the Berrima Cement Works and the Berrima Junction associated with shunting, changing locomotives, and track maintenance, which do not proceed to the Main Southern Rail Line.

The rail track manager of the Main Southern Rail Line is the ARTC. The number and timing of the existing railway operations generally reflect the agreed train paths with the ARTC, and this will continue to be the case when the Berrima Rail Project is operational.

4.3.2 Train movements

The new rail line and loop to be constructed off the Berrima Branch Line and into the Hume Coal Project area will be used to transport up to 3.5 Mtpa of coal, produced by the Hume Coal Project, to international and domestic markets. The transport of product coal will require approximately 50 train movements per week along the new rail spur, the Berrima Branch Line, and on to the Main Southern Rail Line between the Berrima Junction and Moss Vale Junction.

Hume Coal will use a combination of trains comprising 38 and 44 wagons. The 38 wagon trains will be approximately 650 m long and carry 2,930 tonnes of coal and the 44 wagon trains will be approximately 750 m long and carry 3,390 tonnes of coal.

Not including Hume Coal, there will be approximately 120 train movements (one direction journey) on the Berrima Branch Line from future users, including full and empty wagons. The actual number of train movements in any week will depend on market conditions and the operational activities of each user.

Therefore, with the Berrima Rail Project in operation, the total weekly movements along the branch line will be approximately 170 (ie around 85 trains in and 85 trains out), comprising:

- 120 train movements between the Berrima Cement Works and the Main Southern Rail Line associated with other users (currently Boral, Omya and Inghams trains).
- 50 future train movements between the Berrima Cement Works and the Hume Coal rail loop (consisting of Hume Coal trains only).
- 170 total future train movements (comprising the above 120 movements and 50 movements) on the Berrima Branch Line between the Berrima Cement Works and the Main Southern Rail Line.

4.3.3 Berrima Branch Line

The Berrima Branch Line is about 4.5 km long. The line has a practical capacity of around 44 train movements each day, 20 in each direction, including all freight train and light loco (locomotive only) movements.

As discussed in Section 4.3.2, the maximum usage of the Berrima Branch Line associated with the existing users of the line is 120 train movements per week, with up to 26 train movements over a 24 hour period. Based on the current typical train operating time for the Berrima Cement Works trains using the Berrima Branch Line, which is 21 minutes, the maximum daily capacity of the Berrima Branch Line is 68 trains.

The practical capacity is then calculated by taking 65% of the maximum capacity, which equates to 44 trains. Therefore 26 trains per day represents 59% of the practical operating capacity of the line, or 38% of the maximum line capacity.

To transport up to 3.5 Mtpa of product coal from the proposed Hume Coal mine to Port Kembla, about 25 loaded coal trains each week (50 coal train movements) will be required. This represents on average 3.57 loaded and 3.57 empty coal train movements daily. In general, this will require four daily coal train paths in each direction on most days of the year.

Table 4.2 shows the combined effects of the future train movements by all operators (including Hume Coal) on the line's capacity.

Table 4.2 Existing and future usage of Berrima Branch Line

Line operations	Daily train movements	% maximum line capacity	% practical operating capacity
Daily maximum operations (existing users)	26	38%	59%
Future maximum daily operations (existing users and Hume Coal)	34	50%	77%

The additional Hume Coal trains will increase the line's operations to 50% of the maximum line capacity (77% of the practical operating capacity) on the busiest days. This usage level would be within the ARTC recommended limits for freight line operations.

4.3.4 Main Southern Rail Line

Future coal and other freight trains will require gaps of about ten minutes between the existing timetabled northbound and southbound passenger and freight train paths on the Main Southern Rail Line at Moss Vale, to cross between the junctions with the Berrima Branch Line on the western side and the Unanderra Line on the eastern side.

These train movements will only occur over a short (1.6 km) section of the Main Southern Rail Line, and will be aided by an additional siding that will be provided at Berrima Junction in the northbound direction. The additional train 'cross over' movements will occur during slack periods in the existing timetable and will have a minimal effect on the overall Main Southern Rail Line capacity for longer distance passenger and freight train movements. Further, the Main Southern Rail Line consists of triple-track for most of the cross-over distance.

4.4 Moss Vale to Unanderra Line

The Moss Vale to Unanderra Line is 57 km long. It is also known as the Illawarra Country South Line and passes through Robertson and two former village stations at Burrawang and Calwalla. Normal weekday passenger train services on the line ceased in 1985, they have since been replaced by a bus service. However, a single weekend daily passenger train service continued in each direction until 1995, when it was replaced by a heritage passenger train service that has paths available to operate on weekdays and weekends when required.

The line is double track from Unanderra to Dombarton then generally single track to Moss Vale. It has four passing loops at Summit Tank, Mount Murray, Robertson and Calwalla, which improve its capacity by reducing the maximum distance between crossing points for trains travelling in opposing directions to less than 15 km.

The line capacity is controlled by the steep 11.2 km section from Dombarton to Summit Tank, which includes tunnels and cannot easily be widened. It has a continuous gradient of 1:30 over which trains must operate slowly both uphill and downhill. This normally requires 24 minutes for trains to traverse the section uphill (when most trains are typically travelling empty) and 36 minutes downhill (when most trains are fully loaded).

These section journey times restrict the minimum line capacity to about 18–19 train movements per day in each direction (1 train every 75 minutes in each direction) assuming alternating train movements in each direction. However, in practice, under the current ARTC timetable, the line capacity increases to about 22–23 daily train movements in each direction, as about four daily train movements in each direction follow a preceding train in the same direction and therefore have a shorter operating headway than when the preceding train is travelling in the opposing direction.

The maximum daily usage of the Moss Vale to Unanderra Line by existing freight trains and the occasional heritage passenger train is between 11 and 12 daily train movements in each direction, which are usually:

- 6 grain and other country freight trains;
- 4 Tahmoor mine coal trains;
- 1 train from Medway Quarry carrying limestone; and
- up to 1 heritage passenger train.

These existing daily train movements represent about 50% of the line's maximum operating capacity. The addition of up to four loaded and four empty daily coal train movements will increase the use to between 15 and 16 daily train movements in each direction, which will then represent about 70% of the line's maximum operating capacity. However this usage level is unlikely to be reached in practice as the Tahmoor mine coal trains are likely to cease operating between 2018 and 2021, which is before the Hume Coal trains will commence their operations.

The Moss Vale to Unanderra Line has a large number of level crossings on both major roads and local roads between Robertson and Moss Vale. The existing traffic safety control arrangements for these level crossings and the potential need for improvements for additional coal train movements using the route are discussed in Sections 3.3, 4.2 and 6.2 of this report.

4.4.1 Unanderra to Port Kembla Coal Terminal

Between Unanderra and Port Kembla there are multiple tracks. The route also contains a bridge crossing over the Port Kembla passenger rail tracks near Coniston, which eliminates delays between the passenger and coal trains on the approach to the coal unloader at Port Kembla. This bridge is shown on the RailCorp track diagram in Figure 4.5.

The availability of multiple lines and grade separation between the passenger and freight lines at Coniston means there are few capacity constraints for freight trains when operating over this section of the route.

4.4.2 Capacity for additional coal train paths between Berrima Junction and Moss Vale Junction

Consultation with the ARTC and existing freight operators using the Berrima Branch Line have confirmed the future availability of enough train paths between the Berrima Branch Line and Port Kembla for use by all future freight trains, including four future paths each day for coal trains from the Hume Coal mine.

This has also been confirmed via network modelling using the OpenTrack modelling software package and current ARTC/TfNSW timetables.

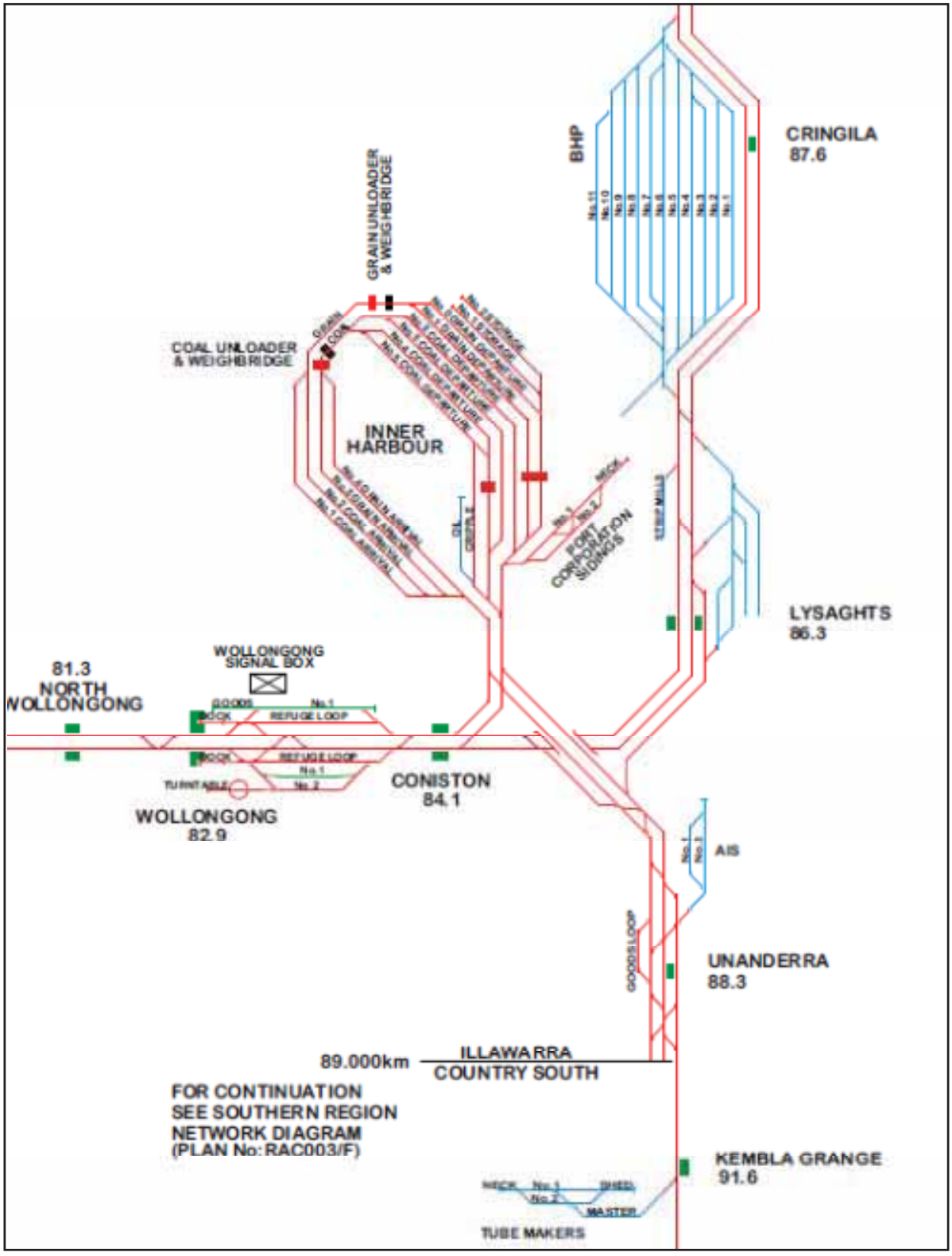


Figure 4.5 RailCorp track diagram for the Illawarra rail network at Port Kembla

5 Impacts of alternative option

The alternative route alignment is shown in Figure 1.3. The difference with the preferred rail option is near the Berrima Cement Works, where a new line will not be constructed to the cement works and the level crossing east of the cement works will not be bypassed. The crossing will remain in operation until WSC builds the new road detour alignment for Berrima Road (see Figure 1.3). This will require a temporary diversion of Berrima Road, from the new alignment back to the existing alignment, whilst the Hume rail spur is instated through the road embankment of the new road alignment (provisionally for 2-3 weeks).

5.1 Construction stage impacts to road network

The project construction stage daily traffic movements are summarised in Table 4.1 The proposed project construction stage access improvements to the Old Hume Highway, which are shown in Figure 4.2, will be implemented during this period.

The alternative option will be about 700 m (or approximately 10%) shorter than the preferred rail route option due to the absence of any new rail line connection to the Berrima Cement Works. Consequently, it will have lower construction quantities and about 10% fewer construction-related daily truck movements. For the access to the main construction worksites from the Old Hume Highway, the average daily construction traffic movements will result in 2.6% daily traffic increases, based on the predicted daily traffic increase of 72 daily vehicle movements (36 daily vehicle movements to/from the north and 36 daily vehicle movements to/from south) from the primary construction worksite areas north of Oldbury Creek.

At the secondary construction worksites shown in Figure 4.3 the maximum daily construction traffic volumes will be significantly less. The individual construction access arrangements for these worksites, using temporary traffic control with flagmen or traffic signals, will be determined in accordance with the RMS requirements in 'Traffic Control at Work Sites' (RTA, 2010) and documented in the CEMP.

5.2 Operational stage impacts to road network

The alternative rail option will have the same daily operations stage traffic movements to deliver fuel and other materials to the rail maintenance facility as the preferred route alignment. The daily operations traffic increases using the Old Hume Highway will be 0.7% based on the predicted daily traffic increases of 10 daily vehicle movements travelling north and 10 daily vehicle movements travelling south from the rail maintenance facility access road on the western side of the Old Hume Highway, north of Oldbury Creek.

For the longer-term operations access, the initial temporary turning lane and wider shoulder of the Old Hume Highway, north of Oldbury Creek, will be reconfigured to provide a type CHR(S) access intersection enabling safe left and right turning vehicle access to the rail maintenance facility access road on the western side of the Old Hume Highway. Figure 4.2 shows the proposed intersection widening.

The alternative rail option will have the same additional traffic delays at level crossings from additional daily train movements as the preferred rail route. Along the haulage route to Port Kembla, the additional trains will increase the proportion of the total time each day when the Illawarra Highway level crossing at Robertson (and other level crossings between Robertson and Moss Vale) will be closed by a passing train from 4.8% to 6.3%. However, these additional delays at level crossings will not result in a significant increase to the total length of time each day when each affected level crossing will be closed to road traffic.

The alternative rail option will have lower traffic benefits than the preferred option because the level crossing on Berrima Road will not be bypassed or removed by a new rail line provided for access to the Berrima Cement Works.

5.3 Operations stage impacts to rail network

The design differences between the alternative and the preferred rail options will not result in any changes to the future rail operations and train movements for the Berrima Branch Line users and the freight and passenger train movements using other sections of the rail route to Port Kembla. Thus the rail network impacts which are described in Sections 4.3 and 4.4 will apply equally to the alternative rail option.

6 Management and mitigation measures

6.1 Construction traffic management plan

A number of traffic management measures will be implemented during the construction stage. Traffic management and traffic control plans will be required for all construction worksites, including the access from the Old Hume Highway, north of Oldbury Creek, for the main construction worksites. Preliminary intersection designs have been prepared for the construction stage upgrade of the Old Hume Highway and the subsequent modification that will provide a type CHR(S) intersection design for the future rail maintenance facility operations access road.

Construction access requirements for the secondary worksites, from Berrima Road, Douglas Road or Collins Road will be documented in a construction traffic management plan as part of the project's CEMP, which will be prepared in accordance with RMS *Traffic Control at Worksites* guidelines (RTA 2010) and will also specify traffic control measures for:

- the movement of overweight and oversize vehicles on the Hume Highway;
- the impact of dust on the travelling public; and
- the impact of dust pollution or deposition of fines on the functioning of reflective signs, pavement markers and pavement line marking.

6.2 Traffic management at level crossings

Over the last 10 years in NSW between $20 and $50 million has been allocated annually for the combined rail transport agencies (RailCorp, ARTC, CRIA and LCIP) to improve level crossing safety through targeted measures. These include installing lights and/or barriers at level crossings, improved road markings, road resurfacing, new signage and level crossing visibility improvements.

The safety record of level crossings in NSW has greatly improved over the past 25 years (TfNSW 2014). Annual trends for level crossing collisions and fatalities are shown in Figures 6.1 and 6.2 respectively.

The drop in total accidents has been remarkable, from about 35–40 a year in 1989–90 to less than five a year now. The annual number of fatalities has also reduced from between five and ten a year in 1989–90 to either 0 or 1 now.

These major safety improvements have been achieved through the consistent application of improved railway level crossing safety measures at all railway level crossings throughout NSW.

Future decisions to upgrade railway level crossing safety will be the responsibility of the respective rail line operators; that is the ARTC for the line between Moss Vale and Robertson, and Boral for the Berrima Branch Line.

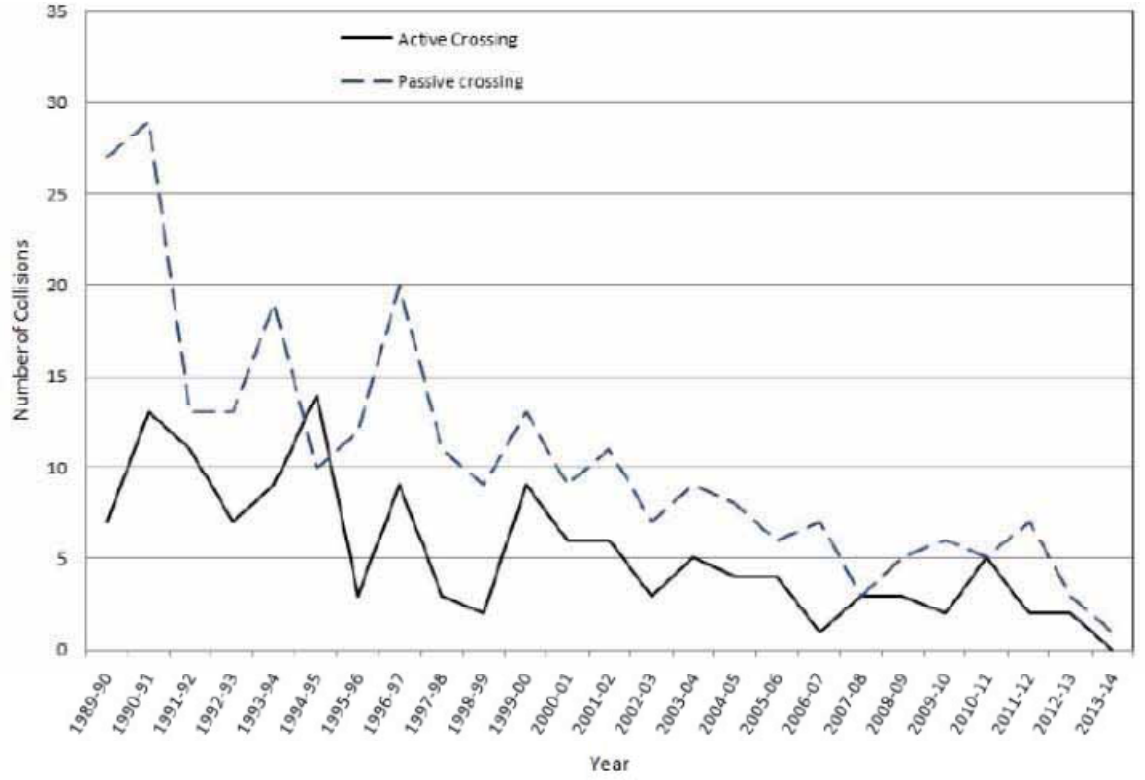


Figure 6.1 **Historic number of vehicle collisions each year at railway level crossings in NSW**

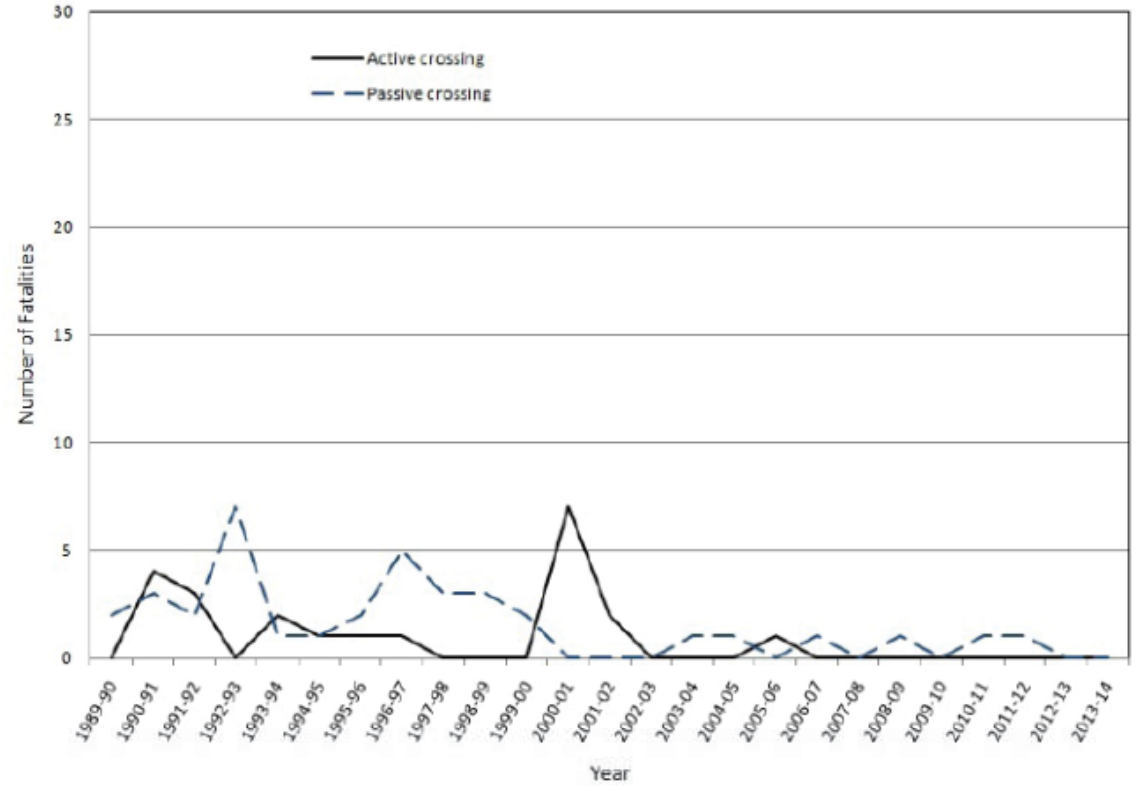


Figure 6.2 **Historic number of fatalities each year at railway level crossings in NSW**

6.3 Future rail network upgrading strategy

A recent feasibility study for the Maldon to Dombarton freight railway line (ACIL Tasman 2011) identified an alternative capacity upgrading strategy for the Moss Vale to Unanderra Line that could extend the existing passing loops and use other related works to improve the line's capacity. The feasibility study report determined that the strategy for providing additional capacity to the Moss Vale to Unanderra Line would be adequate until the growth in freight volumes accessing Port Kembla from the southern inland regions of NSW would make the Maldon to Dombarton rail line a more economically justifiable proposition.

Potential growth in this demand, including some interstate traffic such as steel, is difficult to forecast. Rail freight demand predictions for the Moss Vale to Unanderra Line have been subject to increasing uncertainty since 2011, due to various trends, including a decline in steel making for manufacturing in Australia. Trends for export grain transport demand via Port Kembla are also likely to be more variable in future years.

For the foreseeable future, the Berrima to Port Kembla route via Moss Vale and Unanderra is likely to remain the principal route and the progressive rail capacity upgrading works for this route, as described in ACIL Tasman (2011), could be built, before further consideration of the Maldon to Dombarton rail line.

7 Conclusion

This is a rail transport project and therefore impacts on the road transport network will be limited. Road access will be used during the construction stage for multiple project worksites and during the operations stage for fuel and maintenance deliveries to the maintenance facility. There will be additional train movements at railway level crossings between Berrima and Robertson.

The main conclusions relating to potential road network impacts and rail capacity are as follows.

The anticipated train path requirements for Hume Coal trains have been determined as four coal train paths daily in each direction between the future rail loading point and the Inner Harbour at Port Kembla. With the addition of these eight daily train movements, combined with the maximum daily movements of 26 trains associated with existing users, the Berrima Branch Line will be operating at approximately 50% of its maximum capacity (which is about 77% of the practical operating capacity).

Operations and safety measures were examined at 17 level crossings along the rail transport route, which are:

- three crossings on major roads;
- six crossings on sealed local roads; and
- eight crossings on unsealed minor local roads or private roads.

Traffic delays caused by additional coal trains (four trains daily in each direction) as a result of the project at the major level crossings on the route, such as on the Illawarra Highway at Robertson, will typically be an extra 24 minutes each day. Traffic is delayed for about three minutes each time a level crossing is closed.

The net effect of the additional coal trains will be to increase the proportion of the total time each day when each level crossing will be closed to traffic by a passing train by 1.5% increase in the total time each day.

The peak construction workforce will be about 40 people based at the accommodation village in the Hume Coal Project area. Non-local construction workers will not use private vehicles to travel to work because shuttle buses or pooled vehicles will convey them between the accommodation village and worksites. At the primary construction worksites on the Old Hume Highway, the peak daily traffic increases will be around 80 daily vehicle movements (40 movements to/from the north and 40 movements to/from the south). These peak movements will result in 2.9% daily traffic increases on the Old Hume Highway route, assuming there are equal proportions of traffic travelling north or south from construction worksites.

This increase has been calculated on the future base year (2020) daily traffic volume of 1,398 vehicles for the Old Hume Highway. The future traffic would include construction traffic movements generated by the Hume Coal Project travelling concurrently with the Berrima Rail Project construction traffic.

To allow construction access with safe turning movements, a temporary turning lane and wider shoulder will be constructed on the Old Hume Highway over a 450 m long section north of Oldbury Creek.

During the operations stage there will be much lower daily traffic movements generated on the surrounding road network, which will be limited to mainly fuel and other maintenance materials deliveries and relatively few site visitor car traffic movements. For longer-term operations access to the rail maintenance facility, the temporary turning lane and wider shoulder on the Old Hume Highway north of Oldbury Creek will be reconfigured to provide a type CHR(S) access intersection shown in Figure 4.4.

The preferred rail alignment for the Berrima Branch Line extension will result in a new rail overbridge crossing Berrima Road and a new rail connection to the Berrima Cement Works. There will be significant future traffic flow and safety benefits for the traffic using Berrima Road because of the closure and removal of the railway level crossing near the Berrima Cement Works.

References

ACIL Tasman 2011, *Maldon-Dombarton Rail Link Feasibility Study, Final Working Paper 1 – Demand and Engineering*. Report prepared by ACIL Tasman for the Commonwealth Department of Infrastructure and Transport.

Austroads 2010 *Guide to Road Design, Part 4A Signalised and Unsignalised Intersections.*

EMM 2017 *Berrima Rail Project Environmental Impact Statement.* Report prepared by EMM for Hume Coal Pty Limited.

- 2017a *Hume Coal Project Environmental Impact Statement.* Report prepared by EMM for Hume Coal Pty Limited.

- 2017b Hume Coal Project *Traffic Impact Assessment*. Report prepared by EMM for Hume Coal Pty Limited.

NSW Roads and Traffic Authority 2002, *Guide to Traffic Generating Developments.*

- 2010, *Guide to Traffic Control at Worksites.*

Appendix A

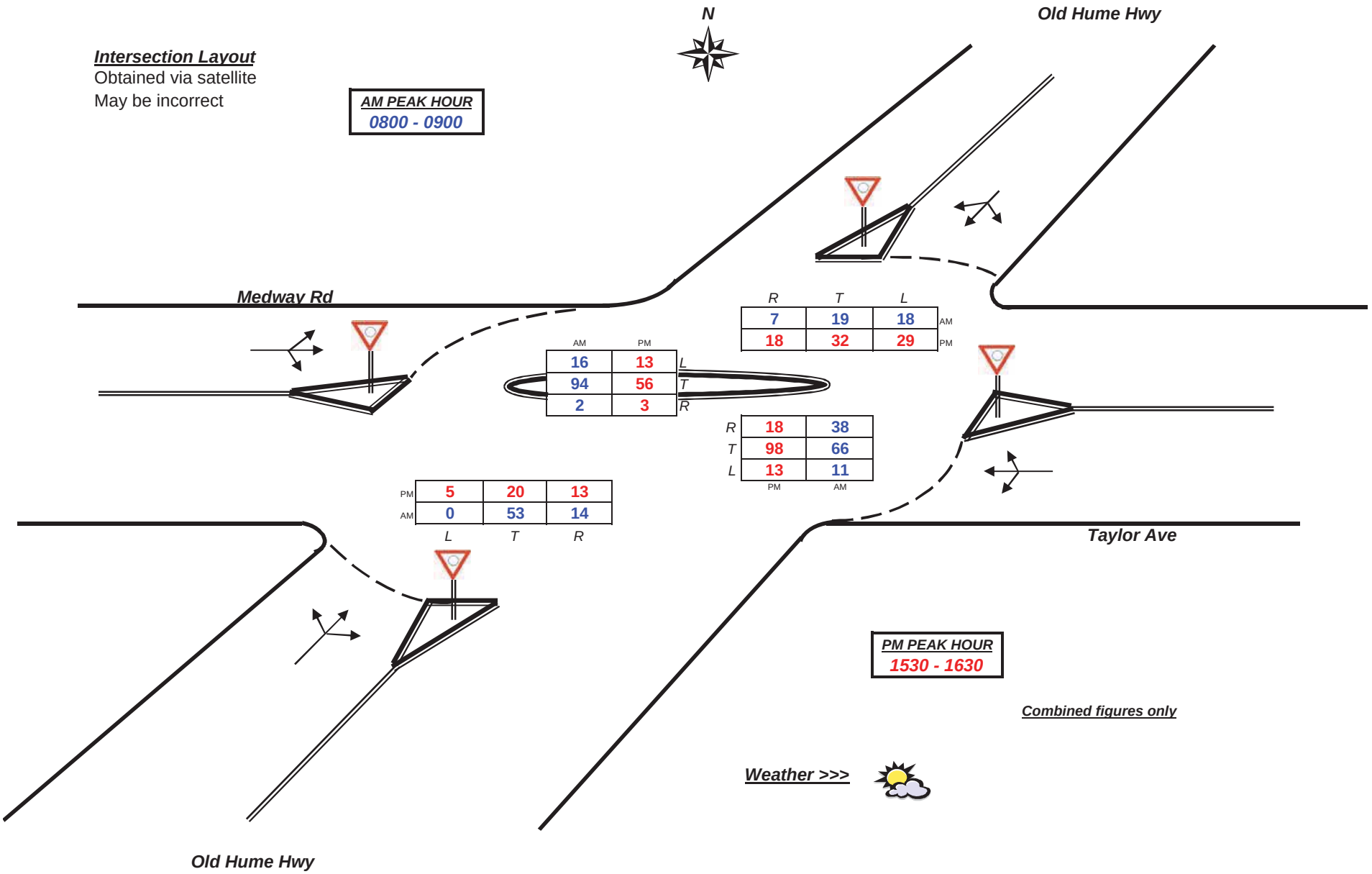
Intersection Traffic Counts

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMGA
Job No/Name : 5659 BERRIMA Traffic Surveys
Day/Date : Thursday / 25th June 2015

Intersection Layout
Obtained via satellite
May be incorrect

AM PEAK HOUR
0800 - 0900



PM PEAK HOUR
1530 - 1630

Combined figures only

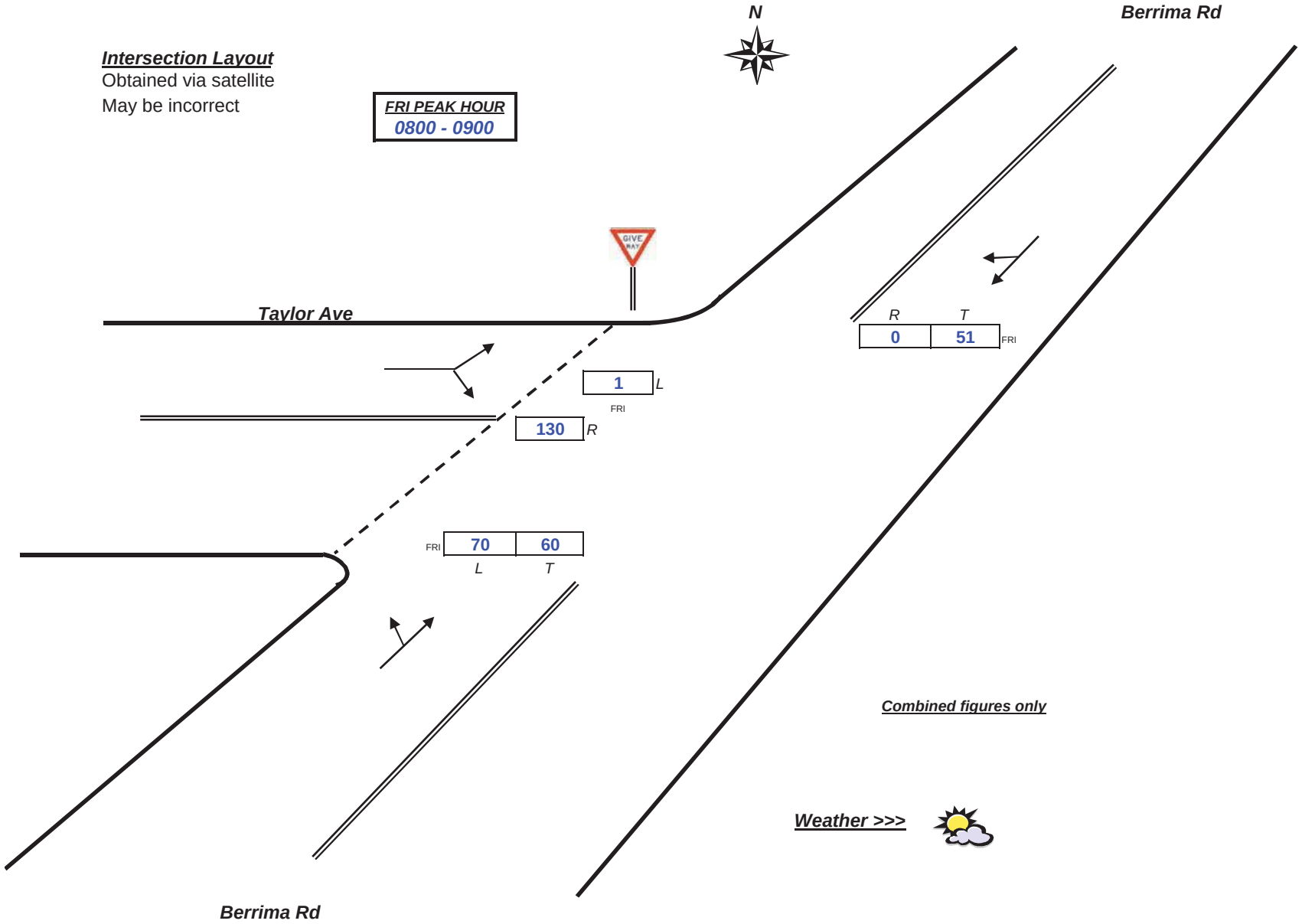
Weather >>>

R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMGA
Job No/Name : 5659 BERRIMA Traffic Surveys
Day/Date : Friday / 26th June 2015

Intersection Layout
Obtained via satellite
May be incorrect

FRI PEAK HOUR
0800 - 0900

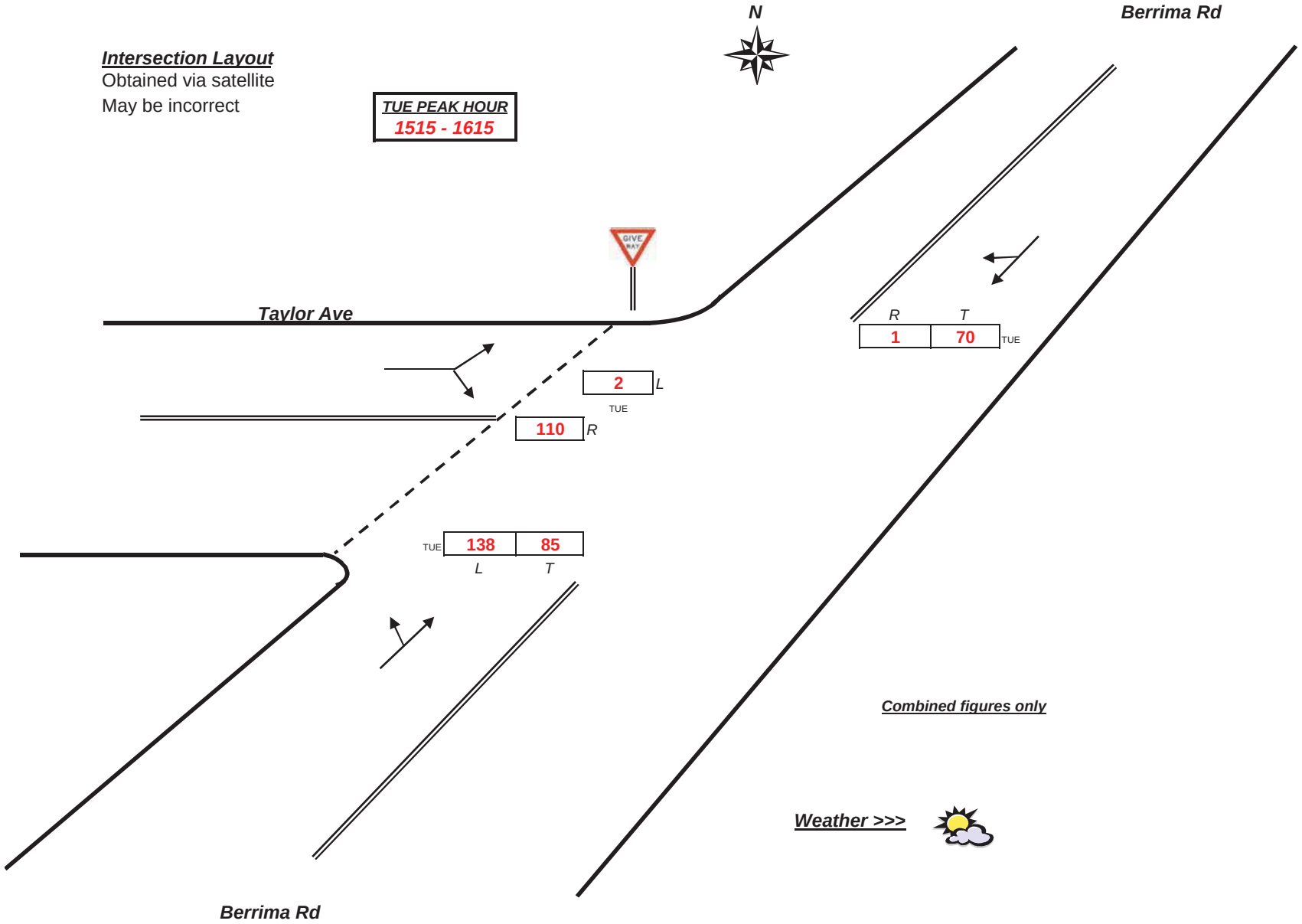


R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMGA
Job No/Name : 5659 BERRIMA Traffic Surveys
Day/Date : Tuesday / 23rd June 2015

Intersection Layout
Obtained via satellite
May be incorrect

TUE PEAK HOUR
1515 - 1615



Combined figures only

Weather >>>

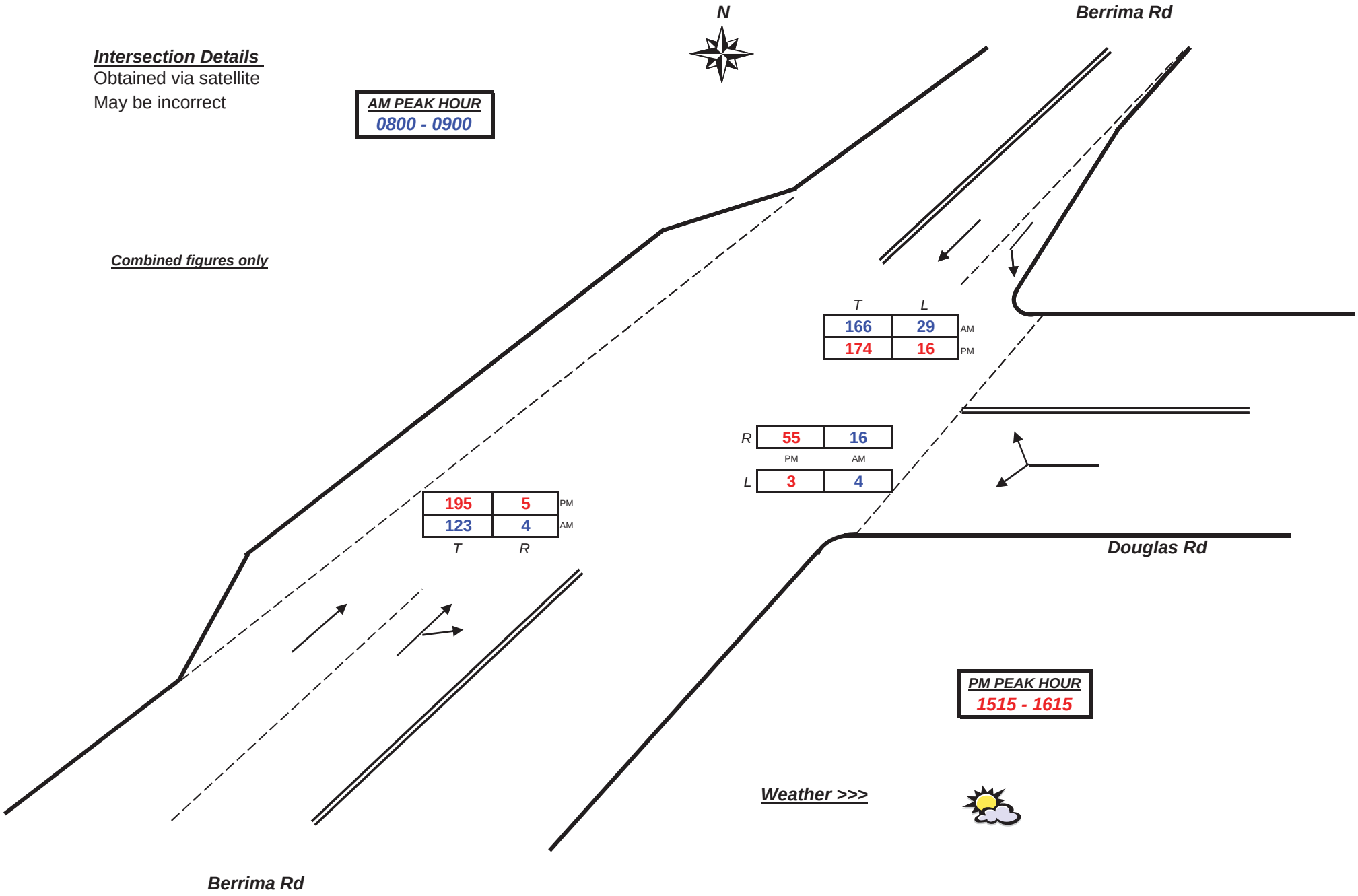
R.O.A.R. DATA
Reliable, Original & Authentic Results
Ph.88196847, Fax 88196849, Mob.0418-239019

Client : EMM
Job No/Name : 5939 BERRIMA Additional Surveys
Day/Date : Thursday 18th February 2016

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0800 - 0900

Combined figures only



PM PEAK HOUR
1515 - 1615

Weather >>>

SYDNEY
Ground floor, Suite 01, 20 Chandos Street
St Leonards, New South Wales, 2065
T 02 9493 9500 F 02 9493 9599

NEWCASTLE
Level 1, Suite 6, 146 Hunter Street
Newcastle, New South Wales, 2300
T 02 4907 4800 F 02 4907 4899

BRISBANE
Level 4, Suite 01, 87 Wickham Terrace
Spring Hill, Queensland, 4000
T 07 3839 1800 F 07 3839 1866