Appendix K

Traffic and Transport Impact Assessment

Boggabri Coal Mine Modification 8

Traffic and Transport Assessment

80021003

Prepared for
Boggabri Coal Mine (BCM)

4 May 2021

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Document Information

Prepared for	Boggabri Coal Mine (BCM)
Project Name	Traffic and Transport Assessment
File Reference	80021002_Boggabri CM Traffic Assessment_v05.docx
Job Reference	80021003
Date	4 May 2021
Version Number	5

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
1	21/12/2020	Draft	Sabal Sharma	Hayden Calvey
2	20/01/2021	Final Draft- Hansen Bailey Comments	Sabal Sharma	Hayden Calvey
3	09/02/2021	Final	Sabal Sharma	Hayden Calvey
4	10/02/2021	Final	Sabal Sharma	Hayden Calvey
5	4/05/2021	Final	Sabal Sharma	Hayden Calvey

Executive Summary

Introduction

Cardno has been engaged by Hansen Bailey on behalf of its client, Boggabri Coal Operations Pty Limited (BCOPL) to prepare a traffic and transport assessment to support a Modification application for the Boggabri Coal Mine (BCM) (MOD 8). The BCM is located approximately 15 km north-east of Boggabri in NSW within the Narrabri Shire Council local government area. Narrabri is the closest major centre located 60 km to the north. Tamworth is the closest regional centre located appoximately 120 km to the southeast.

- MOD 8 proposes to increase the approved maximum depth of mining down to the Templemore Coal Seam to recover an additional 61.6 Million tonnes (Mt) of Run of Mine (ROM) coal resource within the currently approved Mine Disturbance Boundary. It is expected that the additional ROM coal will be suitable for producing lower ash, higher energy thermal, semi-soft coking and pulverised coal injection (PCI) quality products for sale to the export market. This will result in the extension of the mine life by six (6) years; and
- Construction of a specifically designed fauna movement crossing the existing haul road between the overburden emplacement area (OEA) and the western side of the regional biodiversity corridor. The establishment of the fauna movement crossing is proposed to improve the movement of fauna from the Leard State Forest through the Southern Rehabilitation Area (SRA).

In addition to the increased mining footprint and construction of fauna movement crossings, this assessment is also required to assess the potential impacts to the regional road network of up to 770 full-time equivalents (FTE) employees on the site. This is due to the original (Hansen Bailey, 2010) assessment being based on 500 FTE. It should be noted that the 2010 Boggabri EA estimate of 500 FTE did not account for contractors employed for short-term or shutdowns or persons accessing the site for very short periods of time, which are now captured by contemporary industry reporting through the use of the FTE value recording system. At the end of December 2017, the mine shifted to a combination of owner-operator (i.e. BCOPL personnel) and mining contractor-operated. Major mining contractors operating on site from December 2017 onwards were NRW Contracting Pty Ltd (formerly BGC Contracting Pty Ltd) (NRW) and OneKey Resources (OneKey). Site-specific workforce statistics show the FTE was as high as 694 in 2016, as low as 542 in 2019 and most recently, in June 2020 is reported to be some 750 FTE employees.

Assessment Approach

In order to adequately identify and detail the potential traffic and transport impacts of MOD 8, the traffic and transport study is based on the following:

- Existing site condition review of the BCM and surrounding road network;
- Use of historic traffic data sources from on-site monitoring and surrounding development applications. It is acknowledged that at the time of preparing this assessment, traffic volumes surrounding the site may have been impacted by the COVID-19 pandemic, having influenced peoples working arrangements, and recreational trips;
- Assessment of the parking requirements with regard to Narrabri Shire Council's Development Control Plan (DCP);
- Establishment of baseline traffic conditions without MOD 8 and assessment of the MOD 8 traffic generation impact based on site information and forecast assumptions. The traffic impact assessment also considers the cumulative impacts of on-site construction activities where it overlaps with the MOD 8 mining operations as well as other development applications surrounding the site;
- Review of road safety considerations and the MOD 8's impact; and
- Identification of management and mitigation measures to appropriately control the MOD 8's traffic impact where necessary.

Parking

Employees of the existing mining operation predominantly rely on private vehicles to travel to/from the site. This existing condition is anticipated to continue under MOD 8. The BCM operations generally review parking conditions and, if parking management is required, the Traffic Management Plan will be updated accordingly.

Traffic Generation

This assessment assessed an increase of 270 staff above the previously assessed 500 operational staff in 2010.

The Social Impact Assessment supporting SSD 09_0182 describes that the operations at BCM will be supported by up to 500 employees (indicative) at the peak production of 7 Mtpa of product coal. It is reiterated that the 2010 Boggabri EA estimate of 500 FTE did not account for contractors employed for short term or shutdowns or persons accessing the site for very short periods of time, which are now captured by contemporary industry reporting using the FTE value recording system.

The current Social Impact Management Plan (SIMP) which has been submitted to the Department of Planning Industry and Environment (DPIE) for approval (October 2020), identifies in June 2020 a workforce of approximately 750 personnel (including employees and contract workers) supported the BCM.

The proposed MOD 8 workforce will be an average of 620 FTEs from 2022 to 2039, with a peak number of 770 FTE in the Project Year 5 (Year 2025). Whilst this assessment has conservatively considered the traffic related impacts resulting from an increase in employment by 270 FTEs, the actual impacts to traffic conditions will be negligible given the proposed minor increase to employees currently on site (i.e. only 20 FTEs additional to those currently onsite).

Based on the increase in 270 staff being assessed as part of the application, an additional 404 daily trips are forecast to be generated by operational staff. The forecast staff requirements have been shown to peak in Year 2025 and progressively reducing thereafter.

The assessment also considers an additional 27 movements per day for consumables and deliveries.

The estimated construction workforce associated with the fauna crossings was predicted to generate some 38 trips during the day. For the purpose of the MOD 8 assessment, it is not proposed to include traffic generation impacts associated with the low-frequency nature of material and machinery deliveries associated with construction. These short term intermittent impacts will be assessed and managed within the construction-specific traffic management plan.

The cumulative traffic generation has been based on a regional growth factor of 1% per annum, and the additional traffic generated from nearby developments based on publicly available documentation. The neighboring sites and their additional traffic considered, and applied (where necessary) are as follows:

- Maules Creek Coal Mine
- Tarrawonga Coal Mine
- Narribri Underground Mine
- Vickery Mine Extension
- Narribri Solar Farm
- Orange Grove Solar Farm
- Gunnedah Solar Farm
- Narrabri Gas Project

Road Network Performance

The traffic assessment has confirmed that the road network will continue to operate within an acceptable Level of Service A with forecast cumulative traffic volumes for Year 2025 as a result of MOD 8 in conjunction with nearby mining projects.

Management & Mitigation

The assessment has identified that the additional traffic generated by MOD 8 will have a negligible impact on the operation of the road network and that there are no specific safety concerns with the existing road transport environment that would be exacerbated by the MOD 8 traffic. As a result, there are no specific road or intersection upgrade measures warranted to address the potential adverse impacts of the MOD 8. The current BCM Traffic Management Plan (TMP), 2017 highlights the mitigation measures which remain valid and applicable for MOD 8 operational traffic management.

A Construction Traffic Management Plan (CTMP) will be prepared by suitably qualified professionals to manage and mitigation potential traffic impacts during the construction program for the fauna movement crossing. The CTMP will provide specific details on the construction program, once known. It should be

noted that there will be no construction activities required for the step down in mining operations. The BCM TMP, 2017 highlights the mitigation measures which are also valid and applicable for MOD 8 operational traffic management including BCM driver code of conduct and fatigue management.

It is concluded that the impacts of the MOD 8 application on the road transport environment in the vicinity of the BCM would be very minor and that no additional controls would be required to mitigate the impacts of the increased traffic arrangements.

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1 Introduction

Cardno has been engaged by Hansen Bailey on behalf of the Boggabri Coal Operations Pty Limited (BCOPL) to prepare a traffic and transport assessment to support a Modification application for the Boggabri Coal Mine (BCM) (MOD 8).

The BCM is located approximately 15 km north-east of Boggabri in NSW within the Narrabri Shire Council local government area. Narrabri is the closest major centre located 60 km to the north. Tamworth is the closest regional centre located approximately 120 km to the southeast.

It is understood that the BCM extension was granted consent in 2012 and has subsequent modification applications (MOD 1 to 7). The current approval for the site, specific to transport and parking is as follows:

- Condition 10 - Extraction rate of 8.6 Million Tonnes (Mt) of Run-of-Mine (ROM) coal in any calendar year
- Condition 12 – Transport for up to 10 Mt of product coal via the Boggabri Rail Spur Line in any one calendar year, comprising:
  - up to 8.6 Mt of product coal from the Boggabri Coal Mine
  - up to 3 Mt of product coal from the Tarrawonga Coal Mine (subject to commercial arrangement)
- Condition 13 – transport up to 200 tonnes of coal per year from the site by road for marketing and testing purposes. All other coal must be transported from the site via the Boggabri Rail Spur Line, except in exceptional circumstances as agreed with Roads and Maritime Services (RMS) and Narrabri Shire Council and approved by the Secretary.

1.1 Modification 8 Application Overview

MOD 8 is seeking approval for:

- Increasing the approved maximum depth of mining down to the Templemore Coal Seam to recover an additional 61.6 Mt of ROM coal resource within the currently approved Mine Disturbance Boundary. It is expected that the additional ROM coal will be suitable for producing lower ash, higher energy thermal, semi-soft coking and pulverised coal injection (PCI) quality products for sale to the export market. This will result in the extension of the mine life by six (6) years; and
- Construction of a specifically designed fauna movement crossing the existing haul road between the overburden emplacement area (OEA) and the western side of the regional biodiversity corridor. The establishment of the fauna movement crossing is proposed to improve the movement of fauna from the Leard State Forest through the Southern Rehabilitation Area (SRA).

Maximum quantities exported by road or by rail will not be modified as part of MOD 8. The traffic and transport assessment will primarily detail the impacts of increased employee requirements, consumables, and deliveries associated with changes to the increased mining activity and construction impacts associated with the specifically designed fauna movement crossing.

Workforce requirements are not specified in the conditions of SSD 09_0182. The Social Impact Assessment supporting SSD 09_0182 describes that the operations at BCM will be supported by up to 500 employees (indicative) at the peak production of 7 Mtpa of product coal. It should be noted that the 2010 Boggabri EA estimate of 500 FTE did not account for contractors employed for short term or shutdowns or persons accessing the site for very short periods of time, which are now captured by contemporary industry reporting using the FTE value recording system.

The current Social Impact Management Plan (SIMP) which has been submitted to the Department of Planning Industry and Environment (DPIE) for approval (October 2020), identifies in June 2020 a workforce of approximately 750 personnel (including employees and contract workers) supported the BCM.

The proposed MOD 8 workforce will be an average of 620 FTEs from 2022 to 2039, with a peak number of 770 FTE in the Year 2025.

Given there are no changes in coal transport by the MOD 8 (apart from increasing the number of years of coal transport from the site), hence this assessment does not address this further.

1.2 Reference Documents

- Guide to Traffic Generating Developments (TfNSW, 2002);
- Technical Direction (TfNSW, TDT 2013/04a);
- Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings (Austroads 2013);
- Continuation of Boggabri Coal Mine Traffic Impact Assessment (Parsons Brinckerhoff, 2010);
- Vickery Extension Project Road Transport Assessment, (GTA, 2018);
- Draft Boggabri Coal Mine Social Impact Management Plan (SIMP, October 2020);
- Boggabri Coal Mine 2019 Annual Review (March 2020);
- Orange Grove Sun Farm Traffic Impact Assessment (EMM, 2018);
- Maules Creek Coal Mine Employee Transport Modification Road Transport Assessment (GTA, 2016);
- Narrabri Solar Farm – Old Gunnedah Road, Narrabri Traffic and Transport Assessment (Impact, 2017);
- Proposed Solar Farm, Orange Grove Road, Gunnedah (SECA Solution, 2018);
- Tarrawonga Coal Mine Life of Mine Modification Road Transport Assessment (TTPP, 2019);
- Narrabri Underground Mine Stage 3 Extension Project Road Transport Assessment (TTPP, 2020);
- Boggabri Coal Mine Traffic Management Plan, 2017;
- Boggabri Coal Operations Traffic Audit Report, 2019;
- Boggabri Coal Operations Social Impact Management Plan, October 2020; and
- Narrabri Shire Council's Development Control Plan Parking Code, 2013.

1.3 Report Structure

Section 1 – Introduction
Overview of the proposal and requirements of the traffic and transport assessment

Section 2 – Assessment Methodology
Outlines the traffic and transport assessment methodology

Section 3 – Existing Conditions
Examination of the site and existing traffic and transport condition

Section 4 – Existing BCM Operation
Summary of the existing consent condition of the site

Section 5 – Proposal Description
Summary of the proposal

Section 6 – Parking Assessment
Assessment of the car parking requirements due to the proposal

Section 7 – Traffic Assessment
Examination of the operational and construction traffic impact due to the proposal

Section 8 – Mitigation Measures
Outline operational and construction-related mitigation measures

Section 10 – Conclusion
Summarises the findings of the traffic and transport assessment

2 Assessment Methodology

2.1 Site Assessment

To appropriately review the MOD 8 traffic and transport impact, the existing road and surrounding environment have been reviewed and assessed to understand the existing conditions. This includes undertaking a desktop review of the MOD 8 locality, historic traffic data collection, review of other transport modes, and road safety conditions.

2.2 Data Collection

The source of data is based on information for the existing site operation and MOD 8. Most of the existing site operation information utilised within this assessment are publically available.

It is noted that at the time of this assessment, the COVID-19 pandemic was ongoing. The impact of COVID-19 on peoples travel behaviour (both for commuting and recreational) is largely dependent on the NSW Government restrictions at the time as well as employer requirements (as an example, staged return to work or full time working from home). The historical traffic data relied upon in this assessment is unaffected by the pandemic and is considered a suitable reflection of the typical road conditions surrounding the MOD 8 site. Information for existing and surrounding mining/industrial projects which are likely to influence the traffic on the surrounding road network were sourced to inform the assessment.

2.3 Traffic Generation

The maximum approved quantities of product coal which are transported from the BCM by road or by rail will not be altered as part of MOD 8. The traffic and transport assessment primarily detail the impact of increased employee requirements, consumables, and deliveries associated with associated changes to the increased mining activity and construction impacts associated with the specifically designed fauna movement crossings.

The key roads assessed in this report are the Kamilaroi Highway, Leard Forest Road, Rangari Road, and the BCM access road. The roads are estimated to carry the cumulative traffic generated by the BCM operations at its peak. In line with the employee forecasts, the assessment is focused on the Year 2025, where the FTE staff is at its highest before reducing to 2039.

The future year assessment considers regional growth (or background growth) and other development applications in the region which are believed to influence the traffic volume estimates for the key road network. The other developments specifically included are Maules Creek Coal mine, Narribri Solar Farm, Orange Grove Solar Farm, Gunnedah Solar Farm, Tarrawonga Coal Mine, Narrabri Underground Mine, Narrabri Gas Project, and Vickery Coal Mine Extension.

2.4 Mitigation Measures

The impacts of the MOD 8 which includes construction of the fauna movement crossing, have been considered and addressed through a range of mitigation measures where necessary. This is to ensure the impact of MOD 8 is not detrimental to the safe and efficient operation of the surrounding road network.

3 Existing Conditions

3.1 Site Location

The BCM is located 15 km north-east of Boggabri in NSW within the Narrabri Shire Council local government area. Narrabri is the closest major centre located 60 km to the north. Tamworth is the closest regional centre located 120 km to the southeast.

Other mining/resource sites are located in close proximity to the BCM, namely Tarrawonga Coal Mine to the south and Maules Creek Coal Mine to the north. The surrounding landscape is rural in nature with single dwellings and outhouses sparsely located. Most residential properties are located to the south closer to the Boggabri township.

The location of the site is shown in **Figure 3-1**.

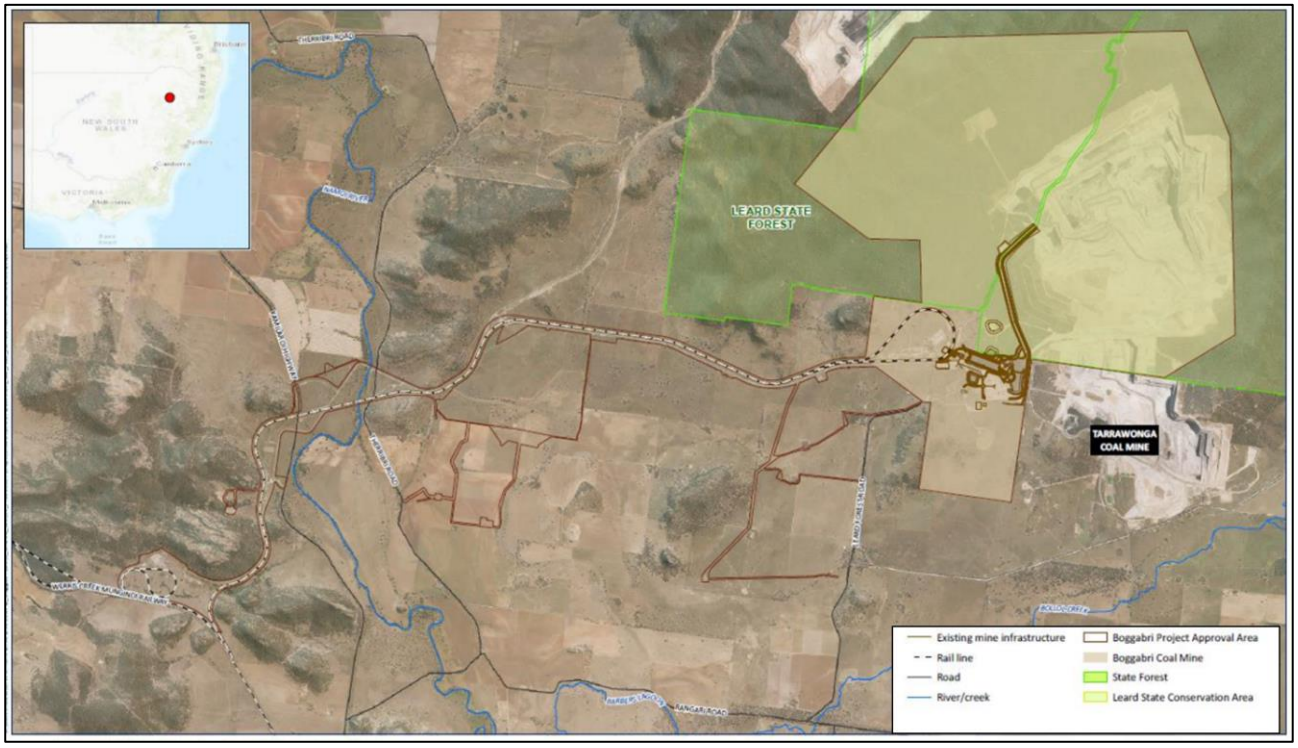

Figure 3-1 Subject Site

3.2 Road Hierarchy

Transport for NSW (TfNSW) in partnership with local government established an administrative framework of State, Regional and Local Road categories to help manage the extensive network of roads.

Typically, state roads are managed and financed by TfNSW, and Regional / Local Roads are managed and financed by Councils. Notwithstanding, Regional Roads perform an intermediate function between the main arterial network of State Roads and Council-controlled Local Roads and therefore received financial assistance from TfNSW. The key road network relevant to the subject site consists of:

> **Kamilaroi Highway**

Kamilaroi Highway is a state highway (No 70) under the care and maintenance of TfNSW linking the Upper Hunter region to north-western New South Wales via inland regional centres such as Quirindi, Gunnedah, Boggabri, Narrabri, Walgett, and Bourke. The section of the highway in the vicinity of the BCM Project boundary is a two-lane, two-way road with a posted speed limit of 100 km/h. The Kamilaroi Highway is the primary arterial road via local or private roads to access BCM.

> **Leard Forest Road**

Leard Forest Road is a local road under the care and maintenance of the Narrabri Shire Council. It is configured as a two-lane, two-way rural road and historically linked Harparary Road to the north and Manilla Road (or Rangari Road) to the south. A portion of the Leard Forest Road has been closed to facilitate the

progression of approved mining operations at the BCM. Linkage between Harparary Road and Manilla Road is maintained through an extension of Goonbri Road to the east of BCM.

- **Rangari Road**

Rangari Road (also known as Manilla Road) is a local road under the care and maintenance of Narrabri Shire Council. It is configured as a two-lane, two-way rural road with a posted speed limit of 80km/h.

- **Goonbri Road**

Goonbri Road is a local road under the care and maintenance of Narrabri Shire Council. It is configured as a two-lane, two-way road that provides the access to the Tarrawonga Mine site and properties to the east of BCM. Most of the road section is unsealed with the exception of the area near the intersection with Leard Forest Road.

- **Harparary Road**

Harparary Road is a local road under the care and maintenance of Narrabri Shire Council. It is configured as a two-lane, two-way rural road linking the Kamilaroi Highway to the west and Leard Forest Road to the east. The road provides access to the Maules Creek village and properties at the base of the Nandewar Ranges. Most of the road section is not paved and has a posted speed limit of 100 km/h.

- **Therribri Road**

Therribri Road is a local road under the care and maintenance of Narrabri Shire Council. The road has with varied width between 6 m and 8 m. It is configured as two lanes with one lane in each direction. Therribri road has a default speed limit of 100 km/h.

- **Boggabri Coal Mine Access Road**

Boggabri Coal Mine Access Road is a road that provides access to the BCM. The access roads intersect with the Kamilaroi Highway with a left in/left out configuration. It should be noted that Maules Creek Mine also use this access.

3.3 Speed Zoning

Being a rural area, the speed zoning across the road network typically ranges from 80 km/h and 100km/hr. 100 km/h is the default speed limit for the rural undivided road with sealed pavement wider than 5.6 metres, rural divided road and 80 km/hr is the default speed limit for undivided rural roads with less than 5.6 metres wide sealed pavement or no marked dividing line. 50km/h default speed zoning applies to built-up areas. The speed limits surrounding the site are as follows:

- Kamilaroi Highway – 100km/h
- Leard Forest Road – 100km/h
- Rangari Road – 80km/h

3.4 Traffic Volumes

3.4.1 Existing Traffic Volumes

Traffic volumes around the site are sourced from a number of documents, as follows:

- *Boggabri Coal Mine Traffic Management Plan, 2017*
- *Boggabri Coal Operations Traffic Audit Report, 2019*
- *Tarrawonga Mine Mod 7 Transport Assessment, 2019*
- *Vickery Extension Project Road Transport Assessment, 2015*
- *Maules Creek Coal Mine Employee Transport Modification Road Transport Assessment, 2016*

Referring to the *Boggabri Coal Mine Traffic Management Plan, 2017* shows provides traffic volume which was taken at the following locations listed within **Table 3-1**.

Table 3-1 Relevant Survey Locations (BCM TMP, 2017)

Road	2005	Sept 2010	Nov 2010	April 2016
Kamilaroi Highway (south of Manilla-Boggabri Road)	1,832	2,185	2,028	NA
Leard Forest Road (North of Goonbri Road)			311	521
Rangari Road or Manilla Boggabri Road (East of Kamilaroi Highway)	175	459	369	362

Traffic surveys obtained from *Boggabri Coal Operations Traffic Audit Report, 2019* is **Table 3-2** for the average weekday traffic during the morning and afternoon peak times at all traffic count locations.

Table 3-2 Relevant Survey Locations (BCM Traffic Audit, 2019)

Traffic Classifier Site	2018 AADT	2019 AADT	Inbound (vpd) 4:30am to 6:30am		Outbound (vpd) 4:30pm to 6:30pm	
			2018	2019	2018	2019
Kamilaroi Highway Access Road 1	604	435	145	220	19	29
Kamilaroi Highway Access Road 2	682	442	34	48	103	155
Former Haul Road – East of Therribri Road	n.a	973	n.a	288	n.a	205
Former Haul Road – East of Bifurcation	557	526	75	157	60	126
Leard Forest Road – North	962	160	147	38	125	43

Reference is made to *Tarrawonga Mine Mod 7 Transport Assessment,* 2019 which provides survey information for Rangari Road, amongst others, conducted in October 2018.

Table 3-3 Relevant Survey Locations (Tarrawonga Mine Modification 7, 2019)

	Mon	Tues	Wed	Thu	Fri	Sat	Sun	Average Weekday
Rangari Road (Between Leard Forest Road and Blue Vale Road)	933	954	1,015	996	957	535	208	971

Reference is also made to *Vickery Extension Project Road Transport Assessment, 2015* which provides average weekday traffic volumes for Kamilaroi Highway.

Table 3-4 Relevant Survey Locations (Vickery Mine Extension, 2018)

Location	AM Peak	PM Peak	Average Weekday AADT		Total	Peak Hour Flow/AADT Ratio	
	Total	Total	Light	Heavy	Total	AM	PM
Kamilaroi Highway (North of Rangari Road)	99	106	1,517	683	2,200	4.5%	4.8%
Kamilaroi Highway (South of Rangari Road)	186	143	2,129	666	2,795	6.6%	5.1%

The results demonstrate that the weekday volumes are distinctly different from those on weekend days. As weekday traffic volumes are higher, the assessment which follows considers the average weekday (rather than average daily) traffic conditions.

Also, reference is made to Maules Creek Coal Mine Employee Transport Modification Road Transport Assessment, 2016 which also provides 2015 traffic volumes for Kamilaroi Highway.

Table 3-5 Relevant Survey Location (Maules Creek Coal Mine, 2016)

Location	AM Peak (Vehicles per Hour)	PM Peak (Vehicles per Hour)	Vehicles per Day
Kamilaroi Highway (North of Rangari Road)	161	174	2,200
Kamilaroi Highway (South of Rangari Road)	186	250	2,796
Rangari Road (East of Kamilaroi Highway)	133	132	957

This assessment focuses on the following roads:

- Boggabri Coal Mine access road
- Kamilaroi Highway
- Leard Forest Road
- Rangari Road

The adopted Annual Average Daily Traffic (AADT) for this assessment for the subject roads is shown in **Table 3-6** including their source.

Table 3-6 Adopted Survey Data

No	Road	Adopted AADT	Year Survey	Source
1	Boggabri Coal Mine access Road 1	435	2019	Boggabri Coal Operations Traffic Audit Report, 2019
2	Boggabri Coal Mine access Road 2	442	2019	Boggabri Coal Operations Traffic Audit Report, 2019
3	Kamilaroi Highway (North of Rangari Road)	2,200	2015	Vickery Extension Project Road Transport Assessment, 2018
4	Kamilaroi Highway (South of Rangari Road	2,795	2015	Vickery Extension Project Road Transport Assessment, 2018
5	Leard Forest Road (North of Goonbri Road)	160	2019	Boggabri Coal Operations Traffic Audit Report, 2019
6	Rangari Road (Between Leard Forest Road and Blue Vale Road)	971	2018	Tarrawonga Mine Mod 7 Transport Assessment, 2019

The peak hour volumes are summarised in **Table 3-7**.

Table 3-7 Peak Hour Estimation

Count	Road Name	Year Survey	AADT (both Direction)	Peak Hourly Flow (both Direction)	
				AM	PM
1	Boggabri Coal Mine Access Road 1	2019	435	110(1)	15(1)
2	Boggabri Coal Mine Access Road 2	2019	442	24(1)	78(1)
3	Kamilaroi Highway (North of Rangari Road)	2015	2,200	99(1)	106(1)
4	Kamilaroi Highway (South of Rangari Road	2015	2,795	186(1)	143(1)
5	Leard Forest Road (North of Goonbri Road)	2019	160	19(1)	63(1)
6	Rangari Road (Between Leard Forest Road and Blue Vale Road)	2018	971	107(2)	107(2)

Notes: (1) Assumed 50% of 2-hour survey

(2) Assumed 11% of AADT as per Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings

The locations of the various count locations and the source are mapped in **Figure 3-2**.

Figure 3-2 Traffic count locations

3.5 Network Performance

For the purposes of determining mid-block road capacity, traffic performance was assessed using criteria contained within Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis. the midblock LoS assessment criteria contained with the Austroads Guide provide a useful benchmark to assess changes as a result of development particularly for road segments which have relatively low traffic volumes whereby intersection performance and delay is not necessarily the appropriate measure. **Figure 3-3** illustrates theoretical road performance under different flow and speed conditions, also referred to as Service Flow Rates. Austroads describes Service Flow Rate as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point under the prevailing roadway, traffic and control conditions while maintaining a designated level of service. They indicate the vehicle capacity for each level of service (LoS) and are used to determine the level of service corresponding to actual traffic volumes.

For example, a traffic flow of 1,450 passenger cars per lane travelling at 110 km/h results in LoS C, however, the same volume travelling at an average speed of 60km/h results in LoS E. These thresholds were used to assess level of service as part of the study. Furthermore, Austroads Guide to Traffic Management Part 3 stipulates the capacity for a two-lane highway as 1,700 passenger cars per hour (pc/h) in each direction whilst for extended lengths the capacity will not exceed 3,200pc/h for both directions of trave combined.

At each level of service, the service flow rate is defined as the maximum for that level. Service flow rates are discrete values, whereas the level of service represents a range of conditions. Service flow rates therefore effectively define the flow boundaries between the levels of service.

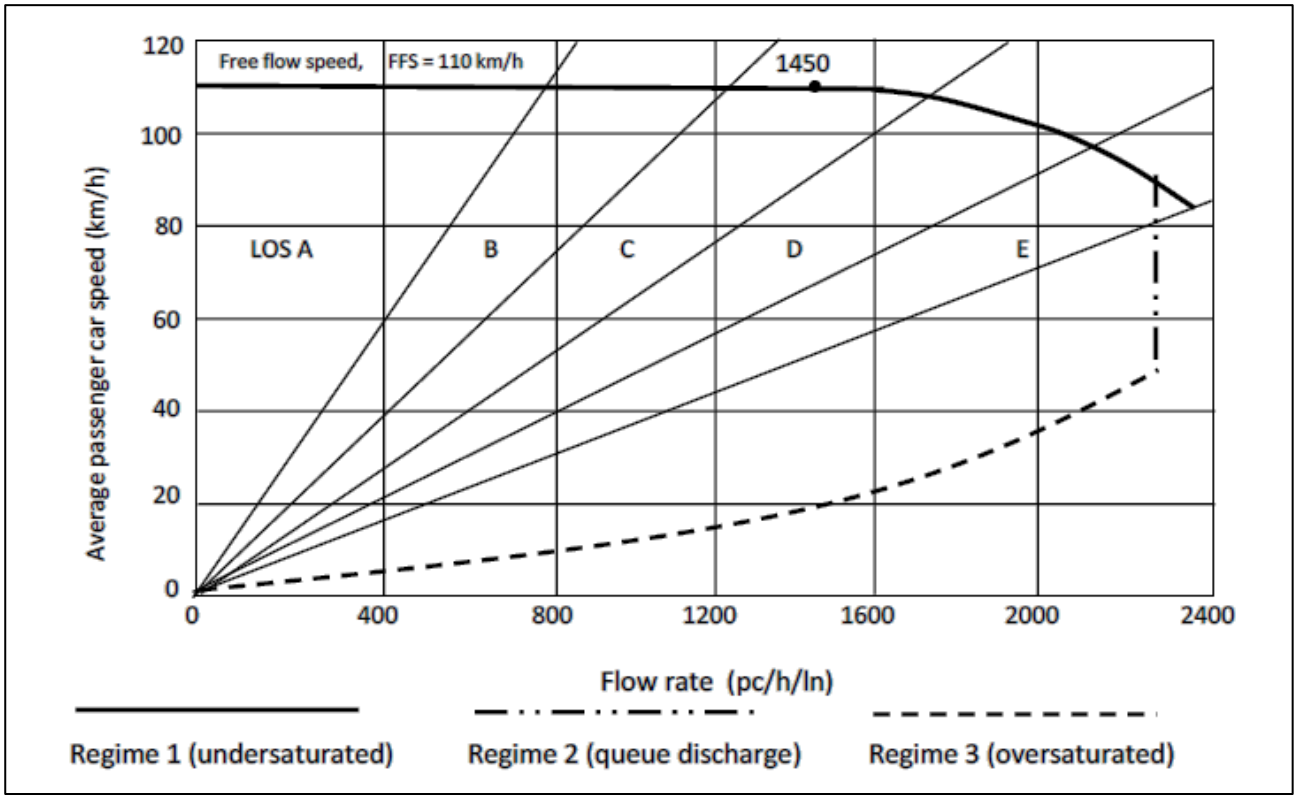

Figure 3-3 Service Flow Rates Definition of the Flow Boundaries between Levels of Service

Source: Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis

Table 3-8 provides definitions for the Service Flow Rate and LoS classifications ‘A’ to ‘F’.

Table 3-8 Level of Service and Service Flows Rates

LoS	Description	Speed and Flow Ranges *
A	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.	60km/h - 0-400 veh/h/ln 90km/h - 0-600 veh/h/ln 110km/h - 0-800 veh/h/ln
B	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.	60km/h - 400-650 veh/h/ln 90km/h – 600-900 veh/h/ln 110km/h -800-1,200 veh/h/ln
C	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.	60km/h - 650-850 veh/h/ln 90km/h – 900-1,400 veh/h/ln 110km/h -1,200-1,650 veh/h/ln
D	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 will generally cause operational problems.	60km/h – 850 – 1,250 veh/h/ln 90km/h –1,400 – 1,800 veh/h/ln 110km/h -1,650 – 1,900 veh/h/ln
E	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 will cause breakdown.	60km/h –1,250 – 1,650 veh/h/ln 90km/h – 1,800 – 2,000 veh/h/ln 110km/h – 1,900 – 2,100 veh/h/ln
F	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.	60km/h – above1,650 veh/h/ln 90km/h – above 2,000 veh/h/ln 110km/h – above 2,100 veh/h/ln

Source: Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis

** Approximate range*

For determining the existing road network performance the criteria contained within the A*ustroads Guide to Traffic Management Part 3: Traffic Studies and Analysis* was utilised. **Table 3-9** shows the existing road performance.

Table 3-9 Baseline (Year 2020) Network Performance

Road	Survey Year AADT	2020 Estimated AADT	AM Peak Hour		PM Peak Hour	
			Two-way Volume	LoS	Two-way Volume	Los
Boggabri Coal Mine access Road 1	435	439	111	A	15	A
Boggabri Coal Mine access Road 2	442	446	24	A	79	A
Kamilaroi Highway (North of Rangari Road)	2200	2310	104	A	111	A
Kamilaroi Highway (South of Rangari Road	2795	2935	195	A	150	A
Leard Forest Road (North of Goonbri Road)	160	162	19	A	64	A
Rangari Road (Between Leard Forest Road and Blue Vale Road)	971	990	109	A	109	A

The year 2020 baseline road volumes appear to be within acceptable LoS.

With regard to the intersection performance at key intersections of Kamilaroi Highway and the BCM access roads, which services majority of the mine related traffic, the peak hourly volume is low and does not warrant intersection modelling through the use of programs such as SIDRA. The left in / left out arrangement for both northbound and southbound traffic is efficient and in conjunction with the low peak hourly volume, is likely to have minimal delays for the BCM access road and unimpeded flow for the state road of Kamilaroi Highway.

Similarly for the Rangari Road and Leard Forest Road intersections, the peak hourly volume is low and accordingly it can be concluded that delays are similarly low such that there is unlikely to be any noticeable or detrimental delays experienced at this intersection.

The peak hour volume is well within the capacity of the rural road network.

3.6 Crash History

Crash data for the period 2014 to 2018 for the study area was accessed through TfNSW Centre for Road Safety. **Figure 3-4** shows the location of crashes nearby the study area.

The following key findings were identified from the analysis of the crash data on the site:

- There were two Moderate Injury crashes at the intersection of Kamilaroi Highway/Rangari Road;
- The majority of crashes observed were clustered on the Kamilaroi Highway and were of the moderate injury; and
- There was two fatal crash observed, one along Kamilaroi Highway and another along Braymont Road.

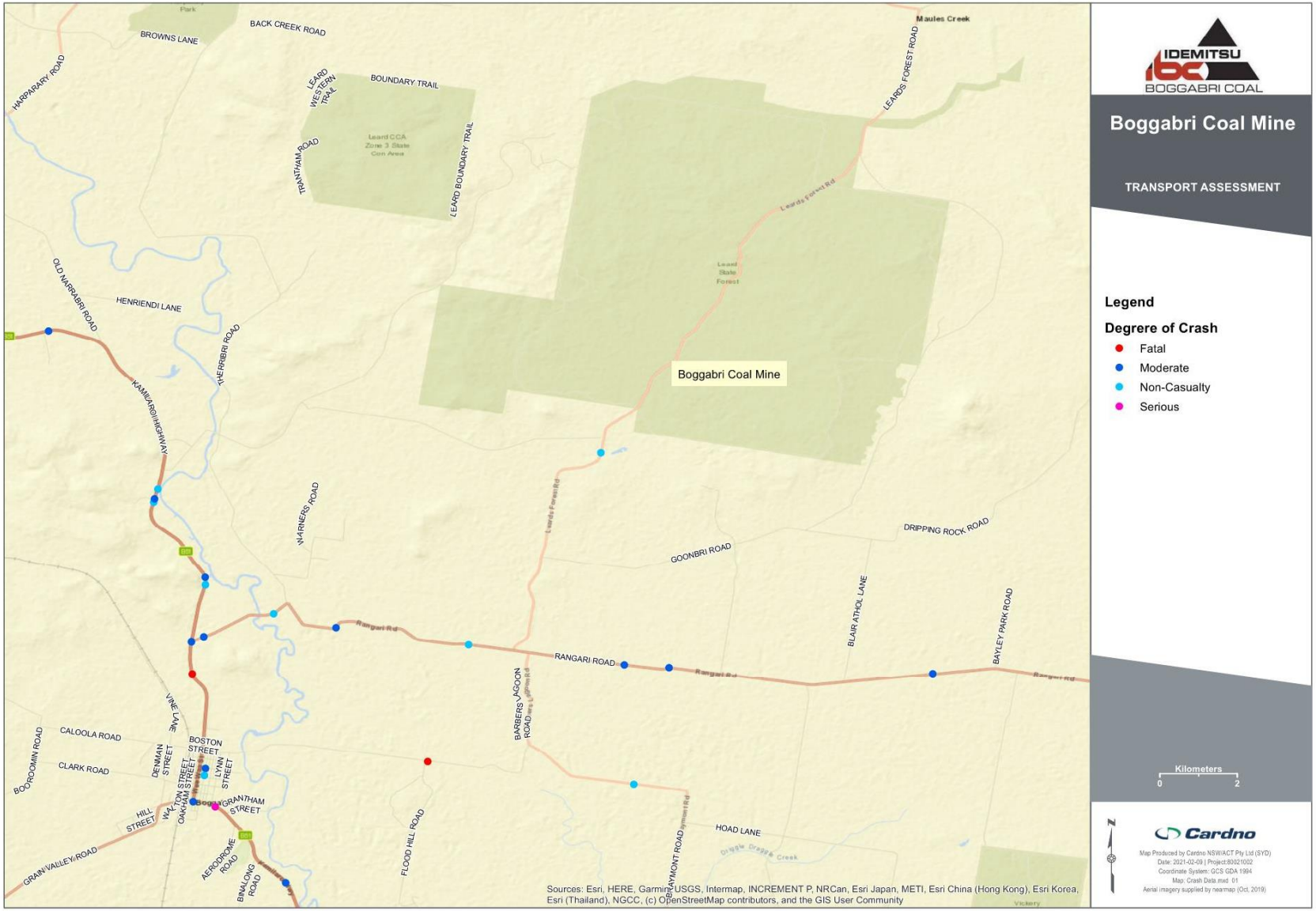

Figure 3-4 Crash locations by injury severity within study area between 2014-2018

Source: Crash and casualty statistics, TfNSW via https://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats/nsw.html?tabnsw=7, viewed 10/12/2020

Considering the key roads that are the focus of this analysis, being Kamilaroi Highway, Rangari Road, Leard Forest Road, and the BCM access roads, the crash rate is calculated as follows.

Crash rate per 100 MVKM = total no. of crashes x 100,000,000 / (no. of Years * AADT * length (KM) * 365).

The resulting crash rate along the key roads are summarised in **Table 3-10**.

Table 3-10 Crash Rate on Key Roads

Location	No. Crashes	AADT	Length	Crash Rate
Kamilaroi Highway from Rangari Road to Harparay Road	8	2,310	12.3km	15.4
Leard Forst Road from Rangari Road to BCM access	1	162	6.4km	52.8
Rangari Road from Kamilaroi Highway to Tarrawonga Mine Access Road	6	990	14.3km	23.2

Notes: There were no recorded crashes along the BCM haul access road.

Referring to the Speed Zoning Guidelines, the typical crash rate applicable to this rural setting is as follows:

- Rural Freeway – 20 per 100 MVKM
- Rural Divided Road (>4 lanes) – 33 per 100 MVKM
- Rural Undivided Road – 35 per 100 MVKM

The results of the Kamilaroi Highway show the crash rate is below what would normally be expected for this type of road (being less than the 20 per 100MVKM) and similarly for Rangari Road, whereby the result of 23.2 per 100 MVKM is below the guide of 35 per 100MVKM.

Leard Forest Road would indicate that the crash rate is abnormally high, well above the guide of 35 per 100 MVKM. This would indicate that this road segment contains a number of contributing factors. It is however noted that the single crash recorded along Leard Forest Road was a non-casualty tow-away accident and as such, the severity of crashes is relatively low based on the data to date. The single crash recorded does not indicate a safety deficiency to crash cluster that would otherwise need addressing.

3.7 Heavy Vehicles & Freight

TfNSW imposes limitations on heavy vehicle routes throughout the state. Three tiers of mass limits are defined based on vehicle mass and axle group category:

- General Mass Limits (GML): Heavy vehicles with unrestricted access to the road system
- Concessional Mass Limits (CML): Increased mass limits for eligible vehicles, requires accreditation
- Higher Mass Limits (HML): The highest level of mass except for vehicles requiring special permits, requires accreditation, and GPS tracking to manage access and compliance.

Kamilaroi Highway is approved for use by heavy vehicles up to 25/26 metre B-double shown in **Figure 3-5**.

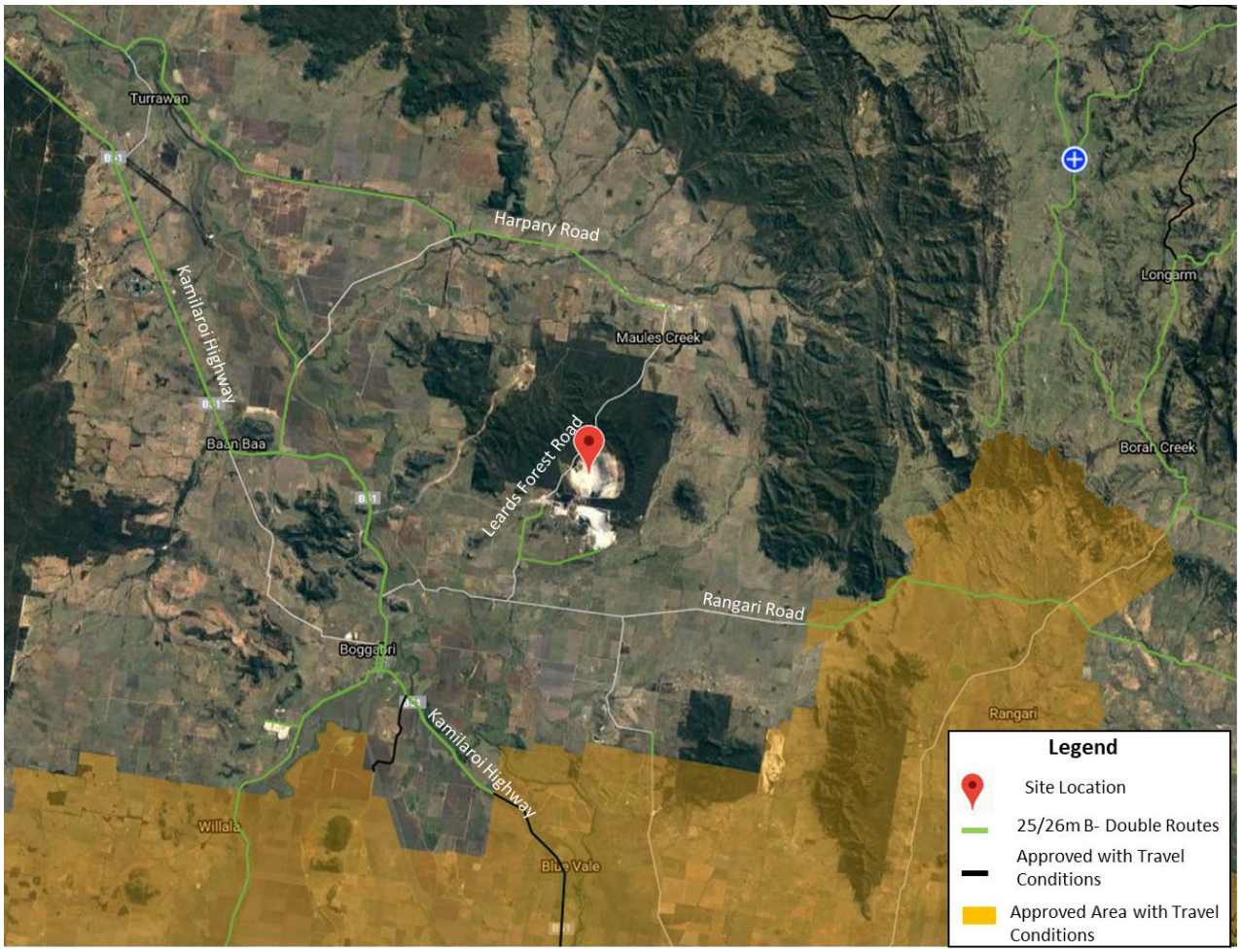

Figure 3-5 Existing Freight Network

3.8 Public Transport

Based on the desktop review it was found that there are limited regular public transport buses running near the subject site. There are no scheduled public bus services that operate on any of the surrounding local road networks with the exception of school bus services.

It is understood that The MW & JA Roy Bus Service operates the Wallah Road Bus Service, which starts at Narrabri and operates to Harparary Road, Maules Creek Road, Browns Lane, Old Gunnedah Road, and then returns to Narrabri. It also operates the Davis Nursery to Narrabri School Bus Service, which starts at Narrabri, and operates along Leard Forest Road, Black Mountain Creek Road, Old Gunnedah Road and returns to Narrabri.

It should be noted that Davis Nursery to Narrabri School Bus Service is only relevant to BCM and has a pick-up location at the intersection of Leard Forest Road and Harparary Road. The route does not currently operate beyond this intersection south along Leard Forest Road and therefore there is no potential for interaction with traffic from the coal mine.

It is also noted that CD & CA Baldwin Bus Service runs a bus service travelling along Dripping Rock Road, Goonbri Road, Leard Forest Road, and Rangari Road to the Kamilaroi Highway. The bus then travels to Baan Baa and returns via Rangari Road, Barbers Lagoon Road, and Braymont Road to Boggabri.

3.9 Active Transport

The remote location of the BCM does not encourage cycling or walking trips as a method of the journey to work travel. Due to its rural location, there is no dedicated cycling or pedestrian facilities such as bike lanes, off-road shared paths, or footpaths in the vicinity of the Project. Cyclists who do choose to ride to work would be required to share the road with both general vehicles and heavy vehicles.

4 Existing BCM Operation

4.1 Previous Assessments

4.1.1 Continuation of Boggabri Coal Mine Traffic Impact Assessment (Parsons Brinckerhoff, 2010)

Parsons Brinckerhoff (PB) undertook a Traffic Impact Assessment to support a Project Application under Part 3A of the *Environmental Planning and Assessment Act 1979 (EP&A Act)* for the Continuation of the BCM for a further 21 years (PB 2010).

Several factors were considered in the calculation of the likely future traffic and transport demands on the road network surrounding the BCM. These included:

- **Operational traffic generation:**

As a result of the increase in coal production of up to 7 Mtpa. The assessment considered to bring 353 additional staff (up to 500 from the existing operational staff of 147)

- **Construction activity traffic generation:**

Construction heavy vehicles traffic was not considered because it was likely to occur in the off-peak periods

Table 4-1 summarises the traffic generated by operational and construction staff as summarised by the PB report.

Table 4-1 Operational and Construction Traffic Generation (PB, 2010)

	Number of staff	% of total staff	Trip generation rate per day	Vehicles per staff member	Total vehicle trips per day
Operational					
Professional, supervisory and	49	14	1.83	0.834	73
office staff					
Mining operations	194	55	1.8	0.83	290
Maintenance	81	23	1.8	0.83	121
Coal preparation	29	8	1.8	0.83	43
Total	**353**	**100**			**527**
Construction					
Professional and office staff	29	19	1.8	0.83	43
Technical and trades	45	30	1.8	0.83	67
Operators and laborers	76	51	1.8	0.83	114
Total	150	100			224
Grand total	**503**				**751**

Table 4-2 and **Table 4-3** show how trips have been assigned into the AM and PM peak periods and are based on the shift arrival and departure times provided by BCM. The distribution of traffic into the AM and PM peak periods also assumed that:

> 50% of vehicle trips occur in the AM peak period

> 50% of the mining operations trips are arrivals for the AM shift.

Table 4-2 Previous Assessment AM Peak Assignment (PB, 2010)

			5:00 am to 6:00 am		5:45 am to 6:45 am		7:00 am to 8:00 am	
	Total vehicle trips per day	**Shift start and end times**	**Inbound**	**Outbound**	**Inbound**	**Outbound**	**Inbound**	**Outbound**
Operational								
Professional, supervisory and office staff	73	8:00 am to 4:00 pm	0	0	0	0	36	0
Mining operations	290	AM Shift – 6:30 am to 5:00 pm	0	0	73	0	0	0
		PM Shift – 5:00 pm to 3:30 am	0	0	0	0	0	0
Maintenance	121	6:00 am to 6:00 pm	60	0	0	0	0	0
Coal handling and preparation	43	AM Shift – 6:00 am to 3:00 pm	11	0	0	0	0	0
		PM Shift 3:00 pm to midnight						
Total	**527**		**71**	**0**	**73**	**0**	**36**	**0**
Construction								
Professional and office staff	43	8:00 am to 5:00 pm	0	0	0	0	21	0
Technical and Trades	67	7:00 am to 7:00 pm	0	0	33	0	0	0
Operators and Labourers	114	7:00 am to 7:00 pm	0	0	57	0	0	0
Total	**224**		**0**	**0**	**90**	**0**	**21**	**0**
Grand total	**751**		**71**	**0**	**163**	**0**	**57**	**0**

Table 4-3 Previous Assessment PM Peak Assignment (PB, 2010)

			3:00 pm to 4:00 pm		4:00 pm to 5:00 pm		5:00 pm to 6:00 pm		6:00 pm to 7:00 pm	
	Total vehicle trips per day	Shift start and end times	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Operational										
Professional, supervisory and office staff	73	8:00 am to 4:00 pm	0	0	0	36	0	0	0	0
Mining operations	290	AM Shift – 6:30 am to 5:00 pm	0	0	0	0	0	73	0	0
		PM Shift – 5:00 pm to 3:30 am	0	0	73	0	0	0	0	0
Maintenance	121	6:00 am to 6:00 pm	0	0	0	0	0	0	0	60
Coal handling and preparation	43	AM Shift – 6:00 am to 3:00 pm	0	11	0	0	0	0	0	0
		PM Shift 3:00 pm to midnight								
Total	**527**		**0**	**11**	**73**	**36**	**0**	**73**	**0**	**60**
Construction										
Professional and office staff	43	8:00 am to 5:00 pm	0	0	0	0	0	21	0	0
Technical and trades	67	7:00 am to 7:00 pm	0	0	0	0	0	0	0	0
Operators and	114	7:00 am to 7:00 pm	0	0	0	0	0	0	0	0
labourers										
Total	**224**		**0**	**0**	**0**	**0**	**0**	**21**	**0**	**0**
Grand total	**751**		**0**	**11**	**73**	**0**	**0**	**94**	**0**	**0**

4.2 Operational Details

The *Continuation of Boggabri Coal Mine Traffic Impact Assessment (PB Report)* summarises the operational details as listed in **Table 4-2** and **Table 4-3**. Based on upon the conclusions found in the site TMP's and Traffic Audits undertaken since that time, the assumptions of the operational details within the 2010 assessment remain applicable to today.

4.2.1 Consumables & Deliveries

The *Boggabri Coal Mine Traffic Management Plan, 2017* identifies a total of approximately 38 heavy vehicle movements per day associated with the delivery of fuel and other items (refer to **Table 4-4** below).

Table 4-4 Existing Consumables and Deliverables

Product	Product	Frequency	Heavy Vehicles movements per day
Diesel fuel	3 x b-doubles 1 x ridged	3 x daily (b- double) 1 x weekly (ridged)	6.3
Stemming	2 x b-double	3 x daily	12
Blasting – fuel to blasting reload	1 to 2 x b- double	Weekly	0.6
Ammonium Nitrate	80 – 90 b-doubles	Monthly	7.2
Emulsion product	6 – 10 b-doubles	Monthly	0.8
Explosive equipment (detonators etc)	1 to 2 x b- doubles	Fortnightly	0.3
Blasting – general deliveries	1 to 2 x semi- trailers	Weekly	0.6
Mining - general deliveries	3 x semi-trailers	Daily	6
Bulk oil deliveries	1 x b-double	Weekly	0.3
Waste oil removal	1 x b-double	3 x weekly	0.9
Rubbish collections	1 x rigid truck	3 x weekly	0.9
Septic & waste servicing	2 x rigid trucks	3 x weekly	1.7
Estimated total heavy vehicle movements (rounded)			**37.6**

Hence out of the existing 38 daily movements 6 daily movements are assumed to be associated with fuel delivery.

5 Proposal Details

5.1 Overview

MOD 8 seeks to increase the depth of approved mining operations and to facilitate the construction of a fauna movement crossing of the existing haul road to support the establishment of the alternate vegetation corridor at the BCM (the Modification).

- Increasing the approved maximum depth of mining down to the Templemore Coal Seam to recover an additional 61.6 Million tonnes (Mt) of Run of Mine (ROM) coal resource within the currently approved Mine Disturbance Boundary. It is expected that the additional ROM coal will be suitable for producing lower ash, higher energy thermal, semi-soft coking, and pulverised coal injection (PCI) quality products for sale to the export market. This will result in the extension of the mine life by six (6) years; and
- Construction of a specifically designed fauna movement crossing the existing haul road between the OEA and the western side of the regional biodiversity corridor. The establishment of the fauna movement crossing is proposed to improve the movement of fauna from the Leard State Forest through the SRA.

The conceptual Layout of the MOD 8 is shown in **Figure 5-1**.

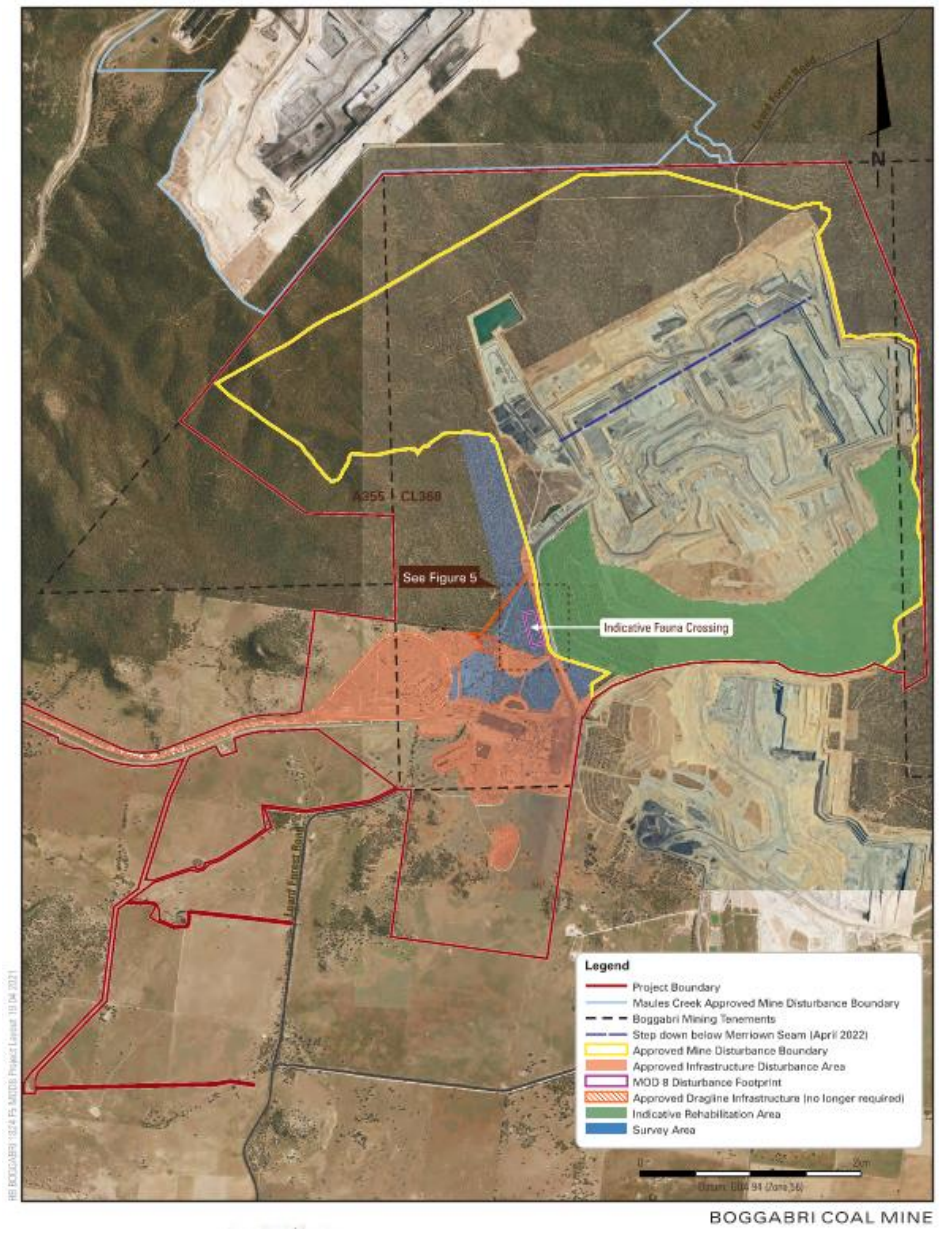

Figure 5-1 Conceptual Layout of Modification

5.2 Employee Requirements

The Social Impact Assessment supporting SSD 09_0182 describes that the operations at BCM will be supported by up to 500 employees at the peak production of 7 Mtpa of product coal. The 2010 Boggabri EA estimate of 500 FTE did not account for contractors employed for short-term or shutdowns or persons accessing the site for very short periods of time, which are now captured by contemporary industry reporting using the FTE value recording system.

The current SIMP which has been submitted to DPIE for approval (October 2020), identifies in June 2020 a workforce of approximately 750 personnel (including employees and contract workers) supported the BCM. The proposed MOD 8 workforce will be an average of 620 FTEs from 2022 to 2039, with a peak number of 770 FTE in the Year 2025.

The employee requirements detailed under the MOD 8 application are forecast to increase and peak by the Year 2025, before gradually reducing thereafter to the end of life of 2039. The figure below outlines the FTE profile for the mine by year.

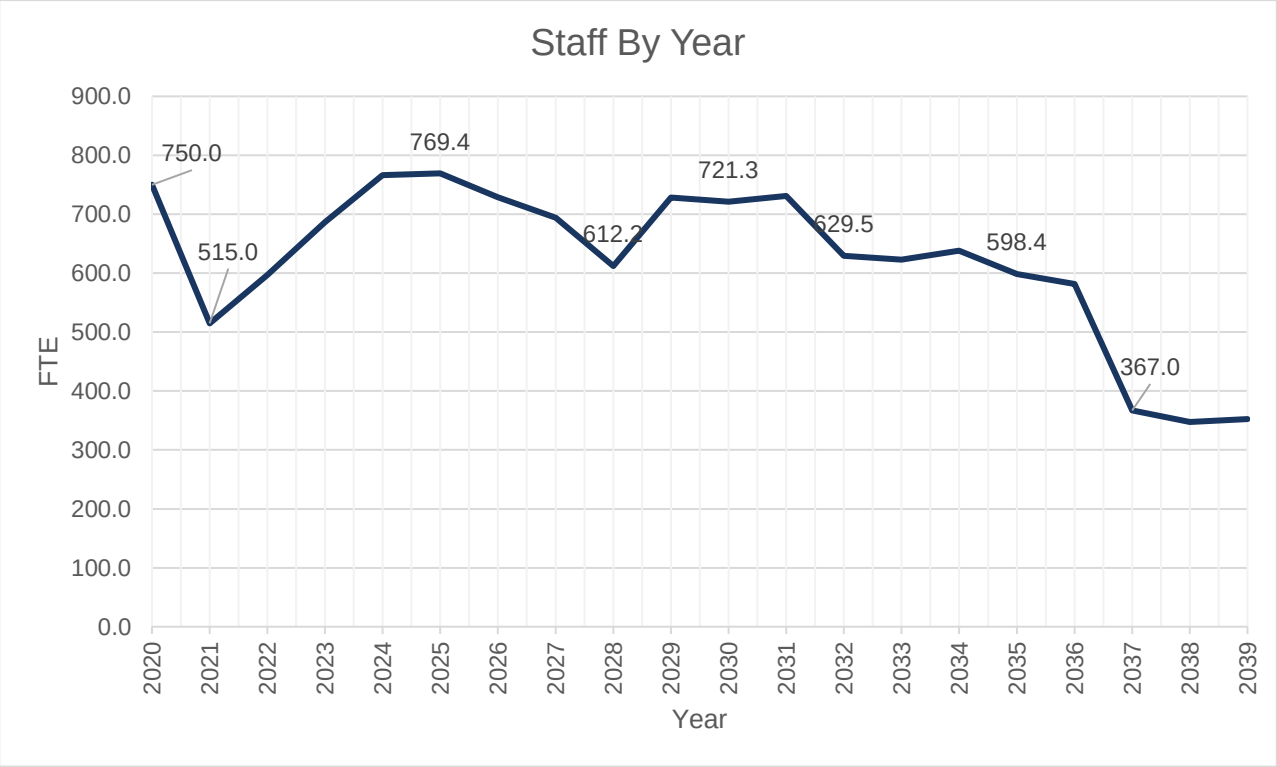

Figure 5-2 Forecast Staff Requirements (MOD 8)

6 Parking Assessment

6.1 Car Parking Requirement

Narrabri Shire Council's DCP does not provide rates for coal mines or similar industrial sites. The car parking provision shall be based on the employee requirements of the site. Employees of the existing mining operation predominantly rely on private cars to travel to/from the site. This existing condition is anticipated to continue under MOD 8.

The site is believed to provide sufficient formal and overflow on-site parking capable of servicing the employee demand. Parking for persons with a disability is also provided.

6.2 Service Vehicle Requirements

Servicing and delivery requirements for the MOD 8 are generally fuel delivery for on-site machinery, maintenance vehicles for on-site machinery, and other miscellaneous deliveries.

The frequency of consumables and deliveries to the site is not expected to result in the need for additional loading area.

7 Traffic Assessment

7.1 Operational Traffic

7.1.1 Staff

This assessment has reviewed and assessed the increase of 270 staff above the previously assessed 500 operational staff (Boggabri EA, 2010).

The current SIMP (October 2020), identifies at June 2020 a workforce of approximately 750 personnel (including employees and contract workers) supported the BCM. The proposed MOD 8 workforce will be an average of 620 FTEs from 2022 to 2039, with a peak number of 770 FTE in the Year 2025. Whilst this assessment has conservatively considered the traffic related impacts resulting from an increase in employment by 270 FTEs, the actual impacts to traffic conditions will be negligible given the proposed minor increase to employees currently on site (i.e. only 20 FTEs additional to those currently onsite).

Based on the increase in 270 staff being assessed as part of the application an additional 404 daily trips are forecast to be generated by operational staff as shown in **Table 7-1**. The analysis contained here within will consider the impacts of the forecast 770 FTE with regard to the traffic survey year.

Table 7-1 Current Operational Traffic

Operational Staff	Number of Staff	Trip Rate(1)	Vehicles per Person(2)	Trips per Day
Previous Staff	147	-	-	-
Additional Staff (Part 3A)	353	1.8	0.83	527
Additional Staff (MOD 8)	270	1.8	0.83	404
Total	**770**			**931**

Notes: Consistent with assumptions contained within the PB report:

(1) assumes 10% of staff not at work on a given day (e.g. sick, annual leave); the total number of daily trips (2 trips) is multiplied by 0.9 (90%).

(2) Occupancy of 1.2 persons / vehicle is equal to 1 / 1.2 = 0.83 vehicles per person

Hence the operational traffic AM and PM trip assignment of the additional 404 trips is summarised in **Table 7-2** and **Table 7-3** below.

Table 7-2 Operational Staff AM Assignment

	Total vehicle trips per day	Shift start and end times	5:00 am to 6:00 am		5:45 am to 6:45 am		7:00 am to 8:00 am	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Operational								
Professional, supervisory and office staff	57	8:00 am to 4:00 pm	0	0	0	0	28	0
Mining operations	222	AM Shift – 6:30 am to 5:00 pm	0	0	56	0	0	0
		PM Shift – 5:00 pm to 3:30 am	0	0	0	0	0	0
Maintenance	93	6:00 am to 6:00 pm	46	0	0	0	0	0
Coal handling and preparation	32	AM Shift – 6:00 am to 3:00 pm	8	0	0	0	0	0
		PM Shift 3:00 pm to midnight						
Total	**404**		**55**	**0**	**56**	**0**	**28**	**0**

Table 7-3 Operational Staff PM Assignment

	Total vehicle trips per day	Shift start and end times	3:00 pm to 4:00 pm		4:00 pm to 5:00 pm		5:00 pm to 6:00 pm		6:00 pm to 7:00 pm	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Operational										
Professional, supervisory and office staff	57	8:00 am to 4:00 pm	0	0	0	28	0	0	0	0
Mining operations	222	AM Shift – 6:30 am to 5:00 pm	0	0	0	0	0	56	0	0
		PM Shift – 5:00 pm to 3:30 am	0	0	56	0	0	0	0	0
Maintenance	93	6:00 am to 6:00 pm	0	0	0	0	0	0	0	46
Coal handling and preparation	32	AM Shift – 6:00 am to 3:00 pm	0	8	0	0	0	0	0	0
		PM Shift 3:00 pm to midnight								
Total	**404**		**0**	**8**	**56**	**28**	**0**	**56**	**0**	**46**

Table 7-2 and **Table 7-3** above identifies that the peak of 770 staff is estimated to generate some 404 additional daily trips above the Boggabri EA documentation of 500 staff. Shift changeover periods have remained relatively consistent throughout the years since the Boggabri EA and hence for consistency, is applied to the MOD 8 scenario.

However, as previously identified, the number of FTE staff peaked in 2016 and reduced in 2019 before rising again in 2020. This is as a result of the operations model for the site shifting to a combination of owner-operated personnel and mining contractor operator personnel. The baseline data used for the key road analysis varies between 2015 and 2019. The historical workforce statistics for this time period is shown in **Table 7-4**.

Table 7-4 Employee Requirements 2015 - 2020

Year	2015	2016	2017	2018	2019	2020
Staff	644	694	685	590	542	750
Percentage Increase	19.5%	10.9%	12.4%	30.5%	42%	

The full increase of 404 daily trips associated with employee movements should be considered in the context of the traffic survey date and the corresponding FTE statistic for that year, such that the 404 daily trips (or the resulting difference between 500 staff and 770 staff) would be reduced. The factors applied to the traffic generated from staff changes as a result of the MOD 8 application are shown in **Table 7-5**.

Table 7-5 Percentage Difference of Employee Increase

Year	2015	2016	2017	2018	2019	2020
Staff	644	694	685	590	542	750
Increase above 500 FTE	144	194	185	90	42	-
Difference between MOD 8 and Increase	126	76	85	180	228	-
Percentage of MOD 8 Traffic	46.7%	28.1%	31.5%	66.7%	84.4%	-

7.1.2 Consumables & Deliveries

As shown in **Table 4-4**, a total of 38 movements is associated with the delivery of fuel and other items. Of the 38 movements, some 7 movements are associated with fuel delivery.

Based on the 2019 Annual Review, BCM consumed some 65,988 kL of diesel. The fuel consumption forecasts for the MOD 8 is forecast to increase by a factor of 1.71 at Year 2024/2025.

Therefore, the increase in daily movements is forecasted to be a total of approximately 12 movements per day or an increase of 6 vehicles per day.

For other ancillary deliveries, the current operation generates some 31 movements to the workshop. For simplicity, the number of movements to be assessed under MOD 8 will be factored in based on the yearly consumption of fuel, being a factor of 1.73. Therefore, the daily movements associated with other delivery types are forecast to increase from 31 to 53 movements per day.

In total, this assessment will consider the additional 27 movements per day for consumables and deliveries (14 in; 13 out).

For the purpose of this assessment, consumables and delivery supply (both inbound and outbound) are conservatively assumed to overlap with the AM peak period.

7.2 Construction

7.2.1 Construction Staff/Workforce

The construction workforce for the fauna crossings is anticipated to be relatively low in comparison to the operation of the site. No construction is required for step down.

The construction of the fauna movement crossing for MOD 8 will require approximately 25 construction personnel (it is assumed the actual construction personnel will be more likely around 10 -15) during the

short-term construction phase. However, this assessment, to be conservative has assessed 25 people. A Pre-Feasibility Study (PFS) for the fauna movement crossing is currently being undertaken which will provide a preferred conceptual design. Based on detailed design, it is anticipated that construction will overlap with the peak Operation Workforce period i.e. Year 2025. Hence, for the purpose of this assessment, it will be conservatively assumed to overlap with the peak Operation Workforce period, being the Year 2025.

The assumptions for the construction workforce are summarised below in **Table 7-6**.

Table 7-6 Construction Staff/Workforce

Construction Staff	Number of Staff	Trip Rate[1]	Vehicles per Person[2]	Trips per Day
Additional Staff	25	1.8	0.83	38

Notes: Consistent with assumptions contained within the PB report:

(1) assumes 10% of staff not at work on a given day (e.g. sick, annual leave); the total number of daily trips (2 trips) is multiplied by 0.9 (90%).

(2) Occupancy of 1.2 persons / vehicle is equal to 1 / 1.2 = 0.83 vehicles per person

The estimated construction workforce is predicted to generate some 38 trips during the day.

With regards to peak hour movements, it is assumed that all movements will be inbound in the morning (on start of the construction shift hours) and outbound in the afternoon at the end of the construction shift hours.

For this assessment, the construction workforce movements are assumed to overlap with the AM and PM peak periods.

7.2.2 Construction Delivery Scheduling Assumptions

The construction of the fauna movement crossings will require the delivery of machinery and materials for the works. It is assumed the frequency of vehicles associated with the delivery of materials and machinery is relatively low. However, the traffic assessment for MOD 8 predominantly focusses on the peak hours such that the traffic generation associated with the material and machinery deliveries for the construction works is anticipated to occur outside of the peak hours.

A construction traffic management plan will to be developed to appropriately manage and mitigate the impacts of the construction works. For the purpose of this MOD 8 assessment, it is not proposed to include traffic generation impacts associated with the low-frequency nature of material and machinery deliveries.

Hence the peak hour operational and construction traffic associated with the MOD 8 is summarised in **Table 7-7**.

7.3 Peak Hours

Consistent with the *PB (2010)* assessment, the maximum traffic generated by the mine staff at the change of shifts in the AM and PM would is used to determine the most significant peak hours.

Table 7-7 MOD 8 Operational and Fauna Crossing Construction Traffic

	AM Peak Hour			PM Peak Hour		
	Inbound	Outbound	Total AM	Inbound	Outbound	Total PM
Operational Workforce	56	0	56	56	28	84
Consumables & Deliveries	14	13	27	0	0	0
Construction Staff/Workforce	19	0	19	0	19	19
Total	**89**	**13**	**102**	**56**	**47**	**103**

7.4 Traffic Distribution

The primary access to the BCM from the Kamilaroi Highway is via the former Haul Road that runs between the mine site and the former rail load-out facility.

There are access roads that link the Kamilaroi Highway which is generally referred to as Access Road 1 and Access Road 2. Access to BCM is also possible via Leard Forest Road for vehicles travelling from the east, although this route is least desirable and all access is advertised to be from Kamilaroi Highway.

The 2019 Traffic Audit, identifies the following percentage split of the traffic which is used to inform the traffic assignment:

- AM Peak
  - 80% of traffic use the access road to travel to/from BCM
  - 20% of the traffic use Leard Forest Road for vehicles travelling to / from the east
- PM Peak
  - 76% of traffic use the access road to travel to/from BCM
  - The remaining 24% utilise Leard Forest Road for vehicles travelling to the east
- Of the traffic originating from Kamilaroi Highway, some 83% travel to/from the south (assumed to be south of Rangari Road).

Hence the distribution of the traffic on the Count Location/Roads Assessed is summarised in **Table 7-8**.

Table 7-8 Traffic Distribution

Count Location/Road	Survey Date	Percentage of MOD 8 Staff Traffic	Percentage of Traffic (IN/OUT)	
			AM Peak	PM Peak
Boggabri Coal Mine access Road 1	2019	84.4%	66%	63%
Boggabri Coal Mine access Road 2	2019	84.4%	14%	13%
Kamilaroi Highway (North of Rangari Road)	2015	46.7%	66%	63%
Kamilaroi Highway (South of Rangari Road	2015	46.7%	66%	63%
Leard Forest Road (North of Goonbri Road)	2019	84.4%	20%	24%
Rangari Road (Between Leard Forest Road and Blue Vale Road)	2018	66.7%	20%	24%

The resulting MOD 8 Traffic distribution in the AM and PM peak on the surrounding road network is summarised in **Table 7-9**.

Table 7-9 MOD 8 Traffic Distribution

Road	Percentage of MOD 8 Staff Traffic	AM Peak (veh/hr) 102 Trips		PM Peak (Veh/hr) 103 Trips	
		Percentage to/from	Trips	Percentage to/fom	Trips
Boggabri Coal Mine access Road 1	84.4%	66%	57	63%	55
Boggabri Coal Mine access Road 2	84.4%	14%	12	13%	11
Kamilaroi Highway (North of Rangari Road)	46.7%	66%	32	63%	30
Kamilaroi Highway (South of Rangari Road	46.7%	66%	32	63%	30
Leard Forest Road (North of Goonbri Road)	84.4%	20%	17	24%	21
Rangari Road (Between Leard Forest Road and Blue Vale Road)	66.7%	20%	14	24%	16

7.5 Regional Traffic Growth

Regardless of the status of the specific developments in the region, other changes in traffic may be expected as a result of general growth or changes in population or travel behaviour. Historic Annual Average Daily Traffic data for Kamilaroi Highway was examined by *PB (2010)* which found there was an overall increase in traffic on Kamilaroi Highway with the traffic growth rate of 1.0% per annum and this rate was adopted taking a conservative approach.

Notwithstanding, and for the purpose of this assessment, a background growth in daily traffic of 1.0 percent per annum has been assumed to occur on the routes used by Project traffic. Background growth in daily traffic of 1.0% is consistent with other assessments in the region including, Vickery Mine Extension and the Tarrawonga Coal Mine (MOD 7).

It should be noted that applying this background growth rate to the background traffic volumes will tend to overestimate the future traffic volumes which will be more significant on those routes where the proportional contribution of the mining activity on traffic volumes is high, e.g., Rangari Road, Leard Forest Road and the Kamilaroi Highway north of Rangari Road.

The effect will be less significant on roads such as Kamilaroi South of Rangari Road. It should be noted that the regional traffic growth has not been applied to the BCM access road as it is assumed to be related only to mining-related traffic.

Table 7-10 shows the baseline 2020 traffic volumes after applying regional traffic growth.

Table 7-10 2020 Baseline Traffic Volumes without MOD 8

Road Name	Survey Year AADT	2020 Baseline AADT (both Direction)	2025 Baseline AADT (both Direction)	AM Peak Hour	PM Peak Hour
Boggabri Coal Mine access Road 1	435	439	461	117	16
Boggabri Coal Mine access Road 2	442	446	469	25	83
Kamilaroi Highway (North of Rangari Road)	2,200	2,310	2,420	109	117
Kamilaroi Highway (South of Rangari Road	2,795	2,935	3,075	205	157
Leard Forest Road (North of Goonbri Road)	160	162	170	20	67
Rangari Road (Between Leard Forest Road and Blue Vale Road)	971	990	1,039	114	114

Applying the road network performance measures from Austroads (as per **Section 3.5**), the future baseline performance (Year 2025) is shown in **Table 7-11.**

Table 7-11 2025 Baseline Network Performance without MOD 8

Road	AM Peak Hour		PM Peak Hour	
	Two-way Volume	LoS	Two-way Volume	LoS
Boggabri Coal Mine access Road 1	117	A	16	A
Boggabri Coal Mine access Road 2	25	A	83	A
Kamilaroi Highway (North of Rangari Road)	109	A	117	A
Kamilaroi Highway (South of Rangari Road	205	A	157	A
Leard Forest Road (North of Goonbri Road)	20	A	67	A
Rangari Road (Between Leard Forest Road and Blue Vale Road)	114	A	114	A

Table 7-12 2025 Network Traffic Volumes with MOD 8

Road Name	AM Peak Hour – 2020	MOD 8	AM Peak Hour w Growth + MOD 8	PM Peak Hour	MOD 8	PM Peak Hour w Growth + MOD 8
Boggabri Coal Mine access Road 1	117	57	174	16	55	71
Boggabri Coal Mine access Road 2	25	12	37	83	11	94
Kamilaroi Highway (North of Rangari Road)	109	32	141	117	30	147
Kamilaroi Highway (South of Rangari Road	205	32	236	157	30	188
Leard Forest Road (North of Goonbri Road)	20	17	37	67	21	88
Rangari Road (Between Leard Forest Road and Blue Vale Road)	114	14	128	114	16	131

Table 7-13 2025 Network Performance with MOD 8

Road	AM Peak Hour		PM Peak Hour	
	Two-way Volume	LoS	Two-way Volume	LoS
Boggabri Coal Mine access Road 1	174	A	71	A
Boggabri Coal Mine access Road 2	37	A	94	A
Kamilaroi Highway (North of Rangari Road)	141	A	147	A
Kamilaroi Highway (South of Rangari Road	236	A	188	A
Leard Forest Road (North of Goonbri Road)	37	A	88	A
Rangari Road (Between Leard Forest Road and Blue Vale Road)	128	A	131	A

The year 2025 performance with and without the MOD 8 application is predicted to operate at LoS A, indicating sufficient capacity within the road network to accommodate the MOD 8 application (not including cumulative impact of other surrounding projects which is assessed further below).

7.6 Other Relevant Projects

Cardno has considered the following approved projects and their road-based traffic generation as part of the cumulative impact assessment.

7.6.1 Maules Creek Coal Mine

The Maules Creek Coal Mine (Project Approval 10_0138 Mod 3 Approved January 2017) is an open-cut mining operation that is approved to operate until 2034.

It has vehicular access via Therribri Road and also via the left in and left out intersections on the Kamilaroi Highway, same as those used by the BCM. It should be noted that Therribri Road connects with the Maules Creek Access Road as well. Also, it should be noted that employee transport to and from Maules Creek mine site was to be primarily via buses. GTA Consultants (2016) estimated the traffic generated by the Maules Creek Coal Mine and its distribution on the road network. The vehicle trips generated by the Maules Creek Coal Mine would have been captured by the traffic counts shown for the year 2018 and 2019 as shown in **Table 3-6** except for the Kamilaroi Highway undertaken in 2015.

On the basis of the GTA assessment, the estimated contribution of the Maules Creek Coal Mine traffic vehicle movements on the Kamilaroi Highway north and south of the highway intersection vehicular accesses has been estimated as follows:

Kamilaroi Highway North of Rangari Road

- 6 light and 2 heavy vehicles in AM Peak;
- 4 light and 1 heavy vehicle in PM Peak; and
- 30 light and 8 heavy vehicles per day.

Kamilaroi Highway South of Rangari Road

- 68 light and 10 heavy vehicles in AM Peak;
- 42 light and 6 heavy vehicles in PM Peak; and
- 340 light and 38 heavy vehicles per day.

7.6.2 Narrabri Solar Farm

Development Consent (SSD-8387) was granted for the Narrabri South Solar Farm (NSSF) in December 2018. It is proposed to be located on Old Gunnedah Road approximately 10 km southeast of Narrabri.

Impact Traffic Engineering (2017) prepared an assessment of the traffic and transport implications of the NSSF and found that the external traffic generation of the NSSF would peak at approximately 76 vehicle trips per day during the busiest month of its construction stage. Those trips would include 46 trips by staff and 30 heavy vehicle trips.

Impact Traffic Engineering (2017) does not provide information about the expected distribution of those trips on the surrounding road network. At the operation stage, the Narrabri Solar Warm would generate negligible vehicle trips, as it would be remotely operated with low numbers of workers required for routine maintenance activities only.

Hence the Narrabri Solar Farm is therefore not expected to result in cumulative impacts with MOD 8, and so is not considered further in this assessment.

7.6.3 Orange Grove Sun Farm

Development Consent (SSD 8882) was granted for the Orange Grove Sun Farm in July 2019. Orange Grove Sun Farm, located on Orange Grove Road, east of Gunnedah.

EMM (2018) assessed the potential traffic implications of the construction phase of that development. The heavy vehicle access route for the development includes including Kamilaroi Highway between the Kelvin Road and Blue Vale Road, and Blue Vale Road between Kamilaroi Highway and Old Blue Vale Road.

Also, the major proportion of the Heavy vehicles is assumed to arrive from South Sydney/ Melbourne or East via Oxley Highway which does not fall in the assessed road network.

The EMM assessment states that the project light vehicle traffic mostly amongst local roads in Gunnedah and the Oxley Highway coming from Tamworth to the east and only a negligible proportion would use Kamilaroi Highway coming from the north via Boggabri.

Hence the Orange Grove Sun Farm is therefore not expected to result in cumulative impacts with MOD 8, and so is not considered further in this assessment.

7.6.4 Gunnedah Solar Farm

The application Development Consent (SSD-8658) was granted for the Gunnedah Solar Farm on 12 March 2019. The farm is located on Orange Grove Road, north-east of Gunnedah.

Seca Solutions (2018) assessed the potential traffic implications of the construction phase of that development.

It is noted that the solar panels and other specialist equipment would arrive from Newcastle or Sydney with the route which does not fall in the assessed road network.

The construction phase of the Gunnedah Solar Farm is therefore not expected to impact that part of the Approved Road Transport Route and so is not considered further in this assessment.

7.6.5 Tarrawonga Coal Mine (Mod 7)

Tarrawonga Coal mine Modification Development Consent MP11_0047- Mod 7 (9 February 2021) involves an increase in the coal production rate of Tarrawonga from 3.0 million tonnes per annum (Mtpa) of ROM coal up to 3.5 Mtpa ROM coal.

TTPP (2019) Study examines the road transport implications of the Modification. It is noted from the TTPP (2019) assessment that the additional traffic generated by the construction activity on any day would therefore be very low and no further assessment of traffic impacts during the construction phase is warranted.

Based on the assessment scenario adopted for the modification the increased number of truck trips would relevant to this MOD 8 would occur on the Rangari Road only.

Due to the Modification the increase in vehicles per hour at Rangari Road only is determined to be 6 veh/h in both 2020/2030 AM/PM Peak which is included with the cumulative impacts with MOD 8.

7.6.6 Narrabri Underground Mine Stage 3 Extension

The Narrabri Mine Stage 3 Extension SSD-10269 (Not Yet Determined) is located approximately 25 kilometres (km) south-east of Narrabri and approximately 60 km north-west of Gunnedah.

With regard to potential impacts on the road transport aspects of the Narrabri Mine, the Project proposes an extension in mine life from 2031 to 204, hence the cumulative assessment would be limited to construction traffic only.

The increase in construction project traffic in the year 2025 is provided below for the relevant road section - Kamilaroi Highway South of Kurrajong Creek Road.

> 10 veh/hr in AM/PM peak

> 22 veh daily

7.6.7 Vickery Mine Extension

The Vickery Extension Project Development Consent SSD-7480 (Approved 12 August 2020) would include the development of an on-site coal handling and preparation plant (CHPP), train load-out facility, and a rail spur to connect to the main Werris Creek Mungindi Railway. Extracted coal would be transported by rail.

The Vickery Extension Project would generate traffic on the Kamilaroi Highway in the vicinity of the Boggabri Mine.

GTA Consultants (2018) assessed the trip generation and distribution of the Vickery Extension Project for Year 1 (2019), Year 2 (2020), and Year 12 (which is assumed to be 2031).

It is assumed that the Year 1 construction and Year 12 would not be applicable for the 2025 assessment year. The project traffic for Year 2 is used to inform the cumulative assessment.

Kamilaroi Highway (North of Rangari Road)

> 3 veh/hr in AM Peak

- 2 veh/hr in PM Peak
- 18 veh Daily

Kamilaroi Highway (South of Rangari Road)

- 5 veh/hr in AM Peak
- 2 veh/hr in PM Peak
- 26 veh daily

Rangari Road (Kamilaroi Highway to Approved Road)

- 0 veh in AM/PM/Daily

7.6.8 Narrabri Gas Project

The Narrabri Gas Project Development Consent SSD-6456 (Approved 30 September 2020) would develop natural gas from the Gunnedah Basin, southwest of the town of Narrabri, NSW.

GHD assessed the traffic impacts for the Narrabri Gas Project and the key access routes of the project include Newell Highway, X-Line Road, Old Mill Road, Yarrie Lake Road, Old Gunnedah Road, Maitland Street, Tibbereena Street.

Hence the Narrabri Gas Project is therefore not expected to result in cumulative impacts with MOD 8, and so is not considered further in this assessment.

The locations of the other relevant projects are mapped in **Figure 7-1**.

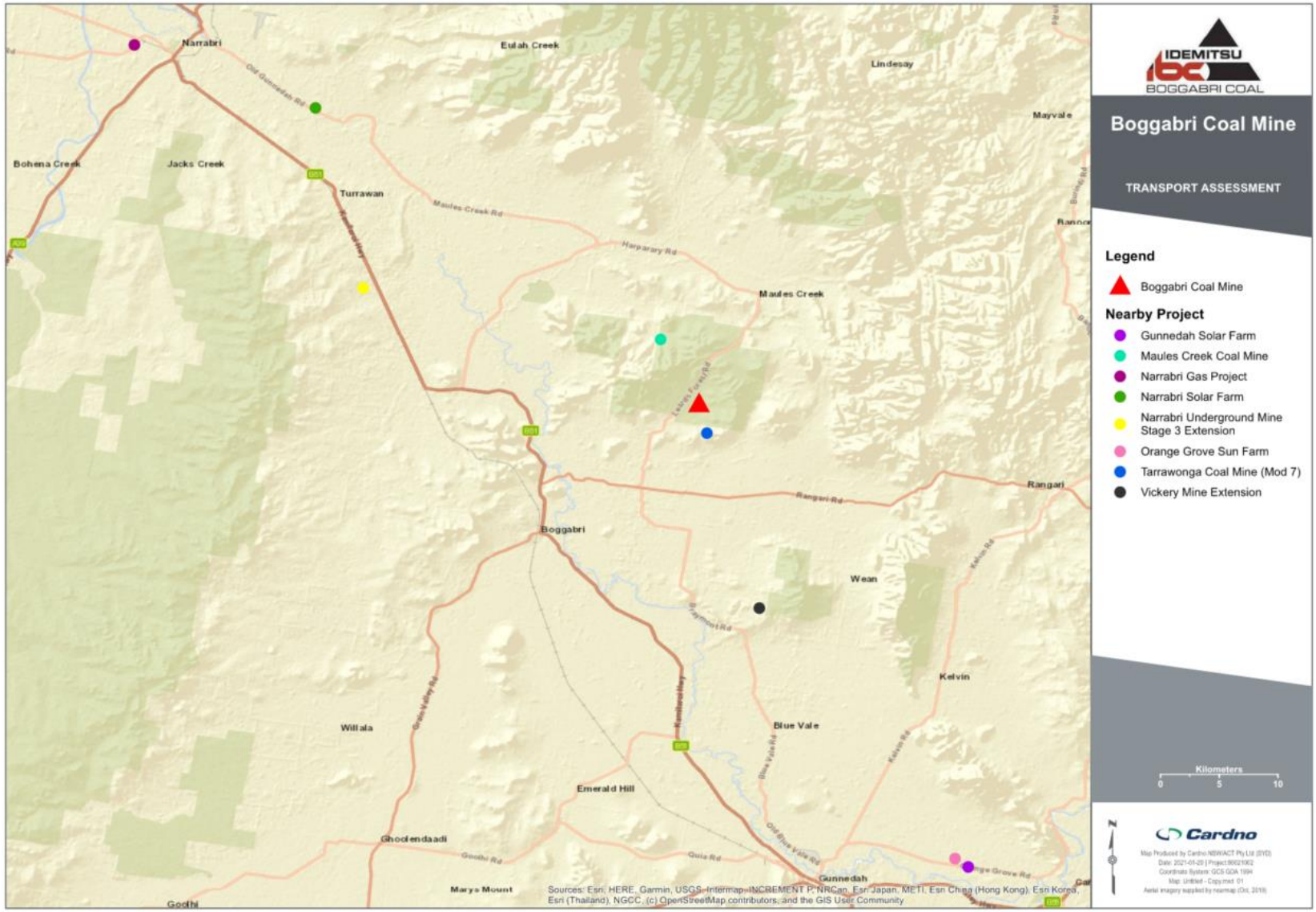

Figure 7-1 Relevant Projects Location

7.7 Cumulative Traffic Impact

The cumulative traffic in the AM and PM peak due to MOD 8 and other approved projects is the assessed road network is summarised in **Table 7-14** and **Table 7-15**

Table 7-14 Cumulative Traffic AM Peak

Road Section	2025 baseline	MOD 8 AM Peak	Maules Creek Coal Mine AM Peak	Tarrawonga Coal Mine (MOD 7) AM Peak	Narrabri Underground Mine Stage 3 Extension AM Peak	Vickery Mine Extension AM Peak	Total 2025 AM Peak
Boggabri Coal Mine access Road 1	117	57					174
Boggabri Coal Mine access Road 2	25	12					37
Kamilaroi Highway (North of Rangari Road)	109	32	8		10	3	162
Kamilaroi Highway (South of Rangari Road	205	32	78		10	5	329
Leard Forest Road (North of Goonbri Road)	20	17					37
Rangari Road (Between Leard Forest Road and Blue	114	14		6			134

Table 7-15 Cumulative Traffic PM Peak

Road Section	2025 baseline	MOD 8 PM Peak	Maules Creek Coal Mine PM Peak	Tarrawonga Coal Mine (MOD 7) PM Peak	Narrabri Underground Mine Stage 3 Extension PM Peak	Vickery Mine Extension PM Peak	Total Cumulative 2025 PM Peak
Boggabri Coal Mine access Road 1	16	55					71
Boggabri Coal Mine access Road 2	83	11					94
Kamilaroi Highway (North of Rangari	117	30	5		10	2	164
Kamilaroi Highway (South of Rangari	157	30	48		10	2	248
Leard Forest Road (North of Goonbri Road)	67	21					88
Rangari Road (Between Leard Forest	114	16		6			137

7.8 Forecast Network Performance

Based on the network performance criteria from Austroads as detailed previously, the resulting cumulative performance is summarised in **Table 7-16**.

Table 7-16 Forecast Cumulative Network Performance

Road	Cumulative Forecast 2025 AM Peak (Both Direction)	2025 AM Peak LoS	Total 2025 PM Peak (Both Direction)	2025 PM Peak LoS
Boggabri Coal Mine access Road 1	174	A	71	A
Boggabri Coal Mine access Road 2	37	A	94	A
Kamilaroi Highway (North of Rangari Road)	162	A	164	A
Kamilaroi Highway (South of Rangari Road	329	A	248	A
Leard Forest Road (North of Goonbri Road)	37	A	88	A
Rangari Road (Between Leard Forest Road and Blue Vale Road)	134	A	137	A

The cumulative 2025 forecast volumes along the assessed roads appear to be within acceptable LoS A indicating the MOD 8 application has little to no impact on the road network performance when considering other projects in the region.
The peak hour volume of traffic increase across the road network is unlikely to result in detrimental impacts to the intersection performance of Kamilaroi Highway / BCM Access Road (1 and 2) or Rangari Road / Leard Forest Road. The volumes presented in **Table 7-16** are sufficiently low that traffic modelling is not justified.

7.9 Road Safety

The review of the history of crashes in **Section 3.6** did not highlight any particular crash causation factors on the key roadways. The additional traffic assessed under the MOD 8 application is unlikely to have a tangible nexus in detrimentally impacting the crash rate surrounding the site.

8 Mitigation Measures

8.1 Operational

The foregoing assessment has identified that the additional traffic generated by MOD 8 would have a negligible impact on the operation of the road network and that there are no specific safety concerns with the existing road transport environment that would be exacerbated by the MOD 8. As a result, there is no specific road or intersection upgrade measures warranted to address the potential adverse impacts of the MOD 8.

Nevertheless, as the site will also generate heavy vehicle traffic/vehicle types along with a large portion of private vehicles, it is appropriate that controls/measures on driver code of conduct and fatigue management be implemented. The current BCM TMP, 2017 highlights the mitigation measures which remain valid and applicable for MOD 8 operational traffic management:

Fatigue Management

- The risk from fatigue is managed through the implementation of the management measures outlined in the BCM Fitness to Work Standard. The BCM Fitness to Work Standard also manages the risk of fatigue, by establishing the maximum work roster period, maximum consecutive work roster days, and minimum days off. Any proposed changes from the roster standards require a risk assessment process to incorporate additional fatigue control measures and are to be approved by the appropriate BCM Manager. The standard also prescribes a minimum break from work before commencing the next shift and specifies the work hours after which a break is required.

Code of Conduct for Heavy Vehicle Drivers

- The Conduct for Heavy Vehicle Drivers will apply to all heavy vehicle delivery drivers engaged by BCM, while they are using the approved access road.

8.2 Construction

A Construction Traffic Management Plan (CTMP) will be prepared by suitably qualified professionals to manage and mitigation potential traffic impacts during the construction program for the fauna movement crossing. It should be noted that there is no construction activities required as part of step down in mining.

The CTMP provide specific details on the construction program, once know, and include the following:

- temporary traffic controls, including detours and signage;
- notifying the local community about construction-related traffic impacts;
- minimising potential conflict between construction-related traffic and:
  - Public transport and School buses
- implementing measures to minimise construction-related traffic on the public road network outside of standard construction hours;
- ensuring construction-related traffic does not track dirt onto the public road network;
- ensuring loaded vehicles entering or leaving the site have their loads covered or contained;
- providing sufficient parking on site for all construction-related traffic;
- responding to any emergency repair requirements or maintenance during construction;
- a traffic management system for managing over-dimensional vehicles;
- fatigue management includes a driver's code of conduct that addresses:
  - travelling speeds;
  - procedures to ensure that drivers to and from the site adhere to the designated over-dimensional and heavy vehicle routes; and
  - procedures to ensure that drivers to and from the site implement safe driving practices; and
- Include a detailed program to monitor and report on the effectiveness of these measures and the code of conduct.

9 Conclusion

Based on the analysis and discussions presented within this report, the following has been determined:

This study has examined the likely road transport implications of MOD 8 and found the following:

- The current SIMP identifies in June 2020 a workforce of approximately 750 personnel (including employees and contract workers) supported the BCM. The proposed MOD 8 workforce will be an average of 620 FTEs from 2022 to 2039, with a peak number of 770 FTE in the Year 2025. Therefore, an additional 20 FTEs to what is currently on site will be required. The actual impacts to traffic conditions will be negligible given the proposed minor increase to employees currently on site.
- The Boggabri EA in 2010 was based on 500 FTE staff however did not account for contractors employed for short term or shutdowns or persons accessing the site for very short periods of time, which are now captured by contemporary industry reporting using the FTE value recording system.
- This Traffic and Transport Assessment considers the implications of up to 270 staff. This is considered conservative with the understanding there will be very little changes to current manning at BCM (additional 20 FTEs).
- Due to the increase in staff detailed under the MOD 8 application, an additional 404 daily trips are forecast to be generated by operational staff (considering the increase from 500 staff to 770 staff). However, when considering the increase of employees under MOD 8 compared to what has historically been operating on the site, the assessment of additional trips is more reflective of 28.1 to 84.4% of the 404 daily trips.
- The peak hour assessment shows that there is likely to be 102-103 trips associated with staff movements during shift changeover periods. When dispersed across the network, the increase in traffic at various locations is as follows:
  - BCM Access Road 1 (southern access to Kamilaroi Highway) – 55 to 57 trips
  - BCM Access Road 2 (northern access to Kamilaroi Highway) – 11 to 12 trips
  - Kamilaroi Highway towards Rangari Road – 30 to 32 trips
  - Leard Forest Road – 17 to 21 trips
  - Rangari Road – 14 to 16 trips
- The daily movements associated with other fuel and ancillary delivery is forecast to increase to 53 movements per day which is considered to be conservative. This is an increase from the current 37 movements per day.
- The construction workforce for the fauna crossings is anticipated to be relatively low in comparison to the operation of the site. Also, it should be noted that no construction is required for step down. The estimated construction workforce for the fauna crossings is anticipated to generate some 38 trips during the day.
- This assessment has also considered the approved projects in the vicinity and their road-based traffic generation as part of the cumulative impact assessment. Key projects and their additional traffic generation accounted for within this assessment include Maules Creek Coal Mine, Tarrawonga Coal Mine, Narrabri Underground Mine, and Vickery Mine Extension. There were a number of solar farm projects in the area that were reviewed but found to have negligible impacts on the existing traffic volumes around BCM. Also, the Narrabri Gas Project was found to have negligible impacts on the existing traffic volumes around BCM.
- The 2025 forecast volumes due to the MOD 8 application and the cumulative impacts of other projects appear to be within acceptable LoS A.
- The review of the history of crashes on the road network did not highlight any particular crash causation factors on the key roadways. The additional traffic assessed under the MOD 8 application is unlikely to have a tangible nexus in detrimentally impacting the crash rate surrounding the site
- The assessment has identified that additional traffic generated by MOD 8 would have a negligible impact on the operation of the road network and that there are no specific safety concerns with the existing road transport environment that would be exacerbated by the MOD 8. As a result, there is no specific road or intersection upgrade measures warranted to address the potential adverse impacts of the MOD 8. It

should be noted that the BCM TMP, 2017 highlights the mitigation measures which are also valid and applicable for MOD 8 operational traffic management including BCM driver code of conduct and fatigue management however consistent review and updating of these documents is recommended.

- It should be noted that construction only relates to the fauna movement crossing and no construction is required for the step down in mining depth. It is recommended that a CTMP be prepared for the fauna movement construction to ensure minimal impacts on the BCM (and other mines) traffic occurs as well as other transport modes and uses in the region.

It is concluded that the impacts of the MOD 8 application on the road transport environment in the vicinity of the BCM would be very minor and that no additional controls and measures would be required to mitigate the inclusion of MOD 8. Whilst FTE figures have increased since the 2010 EA, the reporting of FTE has changed and as such the MOD 8 assessment identifies the forecast peak of 770 staff by Year 2025 has negligible impact on the surrounding road network. The current TMP is adequate to address the traffic and transport volumes forecast under MOD 8 whilst a separate CTMP is to be prepared for the fauna movement crossing construction only, as there is no construction required for the step down in mining.