SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

Chapter 14
Transport

BHP

Contents

Saraji East Mining Lease Project

14 Transport

14.1 Introduction

This chapter provides a description of the existing traffic and transport conditions within the vicinity of the Project Site. It also identifies potential traffic impacts from the Project and mitigation measures proposed to minimise any adverse impacts.

The underpinning traffic and transport impact assessment study is presented in **Appendix J-1 Transport Technical Report**.

14.2 Legislation and policy

14.2.1 Transport Infrastructure Act 1994

The *Transport Infrastructure Act 1994* (TI Act) allows the Queensland Government to have a strategic overview of transport infrastructure in Queensland. The Department of Transport and Main Roads (DTMR) is responsible for the construction, maintenance and operation of the state-controlled roads (SCR) Network. The objectives of the *Transport Infrastructure Act 1994* (Qld) (TI Act) include the promotion of safety, the efficiency of the road network and the reduction of environmental impacts.

Section 49 of the TI Act specifies requirements for impact assessments to be carried out for developments that may cause impacts to the SCR network. After the assessment, DTMR may give directions about the use of the roads to lessen the impacts or require the proponent to carry out works to lessen the impacts.

14.2.2 Transport Operations (Road Use Management) Act 1995

The *Transport Operations (Road Use Management) Act 1995* (Transport Operations Act) aims to provide a regulatory framework with the overall objective to provide for the effective and efficient management of the use of Queensland SCR network. The Transport Operations Act provides a scheme which promotes the effective movement of goods and people, improves road safety and contributes to the strategic management of the road network in ways consistent with the TI Act.

14.2.3 Local Government Act 2009

The *Local Government Act 2009* (LG Act) gives power to local governments to control all roads in its Local Government Area (LGA). This includes:

- making local laws to regulate the use of roads and the movement of traffic
- imposing obligations on the owners of land that adjoins local roads.

Section 72 of the LG Act specifies requirements for impact assessments to be carried out for development that may cause impacts to the local road network. After the assessment, the local government may give directions about the use of the roads to lessen the impacts or require the proponent to carry out works to lessen the impacts.

14.2.4 Guide to Traffic Impact Assessment

The *Guide to Traffic Impact Assessment* (GTIA) (DTMR, 2017a) (previously known as the *Guidelines for Assessment of Road Impacts of Development)* provides guidance for development proponents on how to assess the traffic impacts of a proposed development on the SCR network.

The GTIA outlines the principles and the framework for undertaking a traffic impact assessment and provides advice on mitigation strategies to address traffic impacts. The guide provides advice for both development proposals assessable under the *Planning Act 2016*, as well as for major development assessed under other assessment frameworks (usually subject to an environmental impact statement (EIS), or a notifiable road use).

14.2.5 Australian Level Crossing Assessment Model

The Australian Level Crossing Assessment Model (ALCAM) is the Australian and New Zealand standard for assessing level crossings. ALCAM is an assessment tool designed to prioritise level crossing safety improvement works as well as assisting in the determination of the most effective treatment at each of the potentially affected level crossings.

All public level crossings on the Government supported non-commercial rail network in Queensland have been risk assessed using ALCAM.

When assessing level crossings for required upgrades, ALCAM looks at many factors at the crossing such as road geometry, road/rail traffic volume and speed, visibility and existing protection measures at the crossing. The outcomes of the ALCAM assessment are then used to identify priority level crossings for safety upgrades.

A railway safety assessment incorporating comparative ALCAM assessments is likely to be undertaken for the impacted railway level crossings, with and without the Project. Where necessary BMA will arrange for ALCAM assessments to be undertaken by the railway manager (Aurizon). The outcomes of the ALCAM assessments would identify any potential railway safety issues and inform the development of appropriate mitigation measures.

14.3 Methodology

Based on the expected construction and operational timeframes and estimated development traffic, the assessment years of Financial Year (FY) 2021, FY 2023 and FY 2040 were selected as being years in which the maximum development traffic is anticipated. These dates are indicative only as the timing for commencement, the rate of development and scale of future production have not been determined and are subject to the owner's approvals.

BMA had included an operational accommodation village within the scope of the Project at the commencement of the EIS. However, following consideration of Social Impact Assessment (SIA) related consultation with the Office of Coordinator General (OCG) and Isaac Regional Council (IRC) after the completion of this section of the EIS, it became evident to BMA that these key stakeholders did not agree that the proposed operational village was warranted. As a result, BMA is no longer pursuing approval of the operational village as part of the EIS process.

The traffic and transport impact assessment study and this chapter of the EIS considered the operational workforce to be accommodated offsite.

14.3.1 Road

To inform the assessment, an initial inspection of the existing road network was undertaken in February 2011 and a second inspection undertaken in 2018. In addition to these inspections, data pertaining to the existing condition of various roads were sourced from DTMR and IRC. This included data relating to existing traffic volumes, the existing pavement condition, school bus routes, historic crashes, and information related to planned future road works. To supplement the information received from the road authorities, traffic counts were also independently undertaken at a number of intersections in April 2018.

The adopted methodology centred on established a background 'without development' traffic scenario and comparing this with a scenario including the Project generated traffic, i.e. the 'with development' scenario.

This process allows for the assessment of the traffic impacts of the Project in terms of access, intersections, link capacity, pavement and road safety.

Access

As the majority of the SCRs have a primary function of catering for through-traffic, vehicular management is a key consideration for ensuring the SCR network maintains this function. Therefore, accesses to the SCR network should be minimised where safe and efficient alternative access points can be provided through the local government road network.

The location and configuration of access points from adjacent development or its roads can affect the safety and efficiency of SCRs by providing another location where turning vehicle movements conflict with through vehicle movements.

Intersections

An intersection is where two or more roads cross or converge at a single location. Vehicles travelling through an intersection may be required to stop or slow down. When these manoeuvres take place, delays and queuing may occur.

Delays and queuing are undesirable outcomes. The following methods are typical ways to measure performance for intersections:

- Degree of Saturation (DoS) – the ratio of traffic volume to the capacity of an intersection approach. It is expressed as a percentage with 100 per cent meaning that demand has reached the approach capacity and no further traffic will be able to progress through the intersection.
- Level of Service (LoS) – a qualitative measure of intersection performance. LoS is measured from A (less than 10 second delay) to F (more than 50 second delay).
- Queuing and delay – delay is the difference between interrupted and uninterrupted travel times at an intersection. Delay, measured in seconds, is the sum of geometry delay and queuing delay. Geometry delay is the delay caused by vehicles negotiating or manoeuvring corner radius. Queuing delay is the delay caused by gap acceptance at priority intersections or red time at signalised intersections.

For the purpose of this assessment, Signalised and unsignalised Intersection Design and Research Aid (SIDRA) (Ausroads 2017) was used to analyse intersection performance.

Highway link capacity

A highway link is a connection between an origin and a destination. There are several ways to measure performance including travel time, speed, delay and safety. As stated in the latest GTIA, the assessment of road link capacity impacts is based on the incremental worsening of LoS. It further states, road operation capacity impacts are only considered for major developments and link capacity assessments are not required unless new State-Controlled Road (SCR) road links are needed to be constructed to service the development. However, for the purpose of this assessment, volume / capacity (v/c) ratios have been used to assess the performance of the highway links with and without the traffic generated by the Project.

Pavements

Road pavements are designed to carry vehicle loads over an expected life. Heavy vehicles contribute to the deterioration of the pavement and shorten the pavement life expectancy. A preliminary desktop pavement impact assessment (PIA) was undertaken to determine the potential impacts to the pavement caused by heavy vehicles used by the Project. Standard Axle Repetition (SAR) has been used to calculate background and development loads on granular pavement. It is a unit measurement which converts the wheel loads of traffic to an equivalent number of standard loads which is usually expressed in terms of the equivalent number of 80 kilo-Newtons (kN) single axle load.

The completion of the PIA is based on a DTMR approved methodology. It states that developments should ensure no worsening to the SCR pavements as a result of the increased traffic from developments.

Safety

Road safety risks associated with the traffic generated by the Project were evaluated. Risks were classified and ranked as low, medium, high or intolerable based on the risk matrix taken from Ausroad's *Guide to Road Safety Part 6: Road Safety Audit* (2009). Road safety risk was evaluated based on frequency and severity of accidents. The frequency describes how likely it is for an accident to occur. The severity describes how serious the consequences of the accident are, including personal injury and property damage.

14.3.2 Rail, port and air

The methodology adopted for assessments of other transport modes included desktop reviews of the existing infrastructure and services including port facilities, aircraft capacity, train movements and rail infrastructure. It identified level of demands of the transport modes, potential impacts, safety issues and mitigation measures.

14.4 Existing conditions

14.4.1 Road network

The regional road network for the assessment is provided in Figure 14-1. For purposes of the assessment, parts of Dysart-Moranbah Road, Peak Downs Mine Road, Peak Downs Highway and Lake Vermont Road as highlighted in Figure 14-1 and Figure 14-2 have been identified as the Traffic Impact Assessment Area.

The assessment of highway link efficiency was undertaken at specific points shown on Figure 14.2 and are listed below:

- Highway Link 1 — Dysart-Moranbah Road south of Lake Vermont Road
- Highway Link 2 — Dysart-Moranbah Road between Lake Vermont Road and Intersection A
- Highway Link 3 — Peak Downs Mine Road south of Peak Downs Highway
- Highway Link 4 — Peak Downs Highway east of Goonyella Road.

The selection of road links was based on estimated trip distribution. As the location of the development is adjacent to the existing Saraji Mine on Dysart-Moranbah Road, Dysart, it is anticipated that the above road links would be utilised for transporting materials and equipment and movement for workers to and from the site during construction and operation stages. As stated in the GTIA, the study area should include all road links where the development traffic exceeded 5% of the base traffic in either direction on the link's annual average daily traffic in the year of opening of each stage.

Key intersections expected to be utilised by Project traffic are shown in Figure 14-2 and are listed below

- Intersection 1 — Dysart-Moranbah Road / Lake Vermont Road
- Intersection 2 — Dysart-Moranbah Road / Existing Saraji Mine Entrance
- Intersection 3 — Dysart-Moranbah Road / Peak Downs Mine Road / Existing Peak Downs Mine Entrance
- Intersection 4 — Peak Downs Highway / Peak Downs Mine Road
- Intersection 5 — Peak Downs Highway / Goonyella Road
- Proposed Intersection A — Dysart-Moranbah Road / Proposed access to the Project
- Proposed Intersection B — Lake Vermont Road / Proposed access to accommodation village

There are three level crossings within the Traffic Impact Assessment Area that may be impacted by Project traffic, which are shown in Figure 14-3 and are listed below:

- Level Crossing 1 — Lake Vermont Road / Norwich Park Branch Line
- Level Crossing 2 — Peak Downs Mine Road / Norwich Park Branch Line
- Proposed Level Crossing A — Proposed access to the Project / Norwich Park Branch Line.

LEGEND

- Moranbah Airport
- **Workers Accommodation**
  - 1. Dysart Bma Spv
  - 2. Buffel Park Village
  - 3. Stayover in Dysart
- Locality
- Drainage
- Project Site
- Highway
- Major Road
- Regional Road Network Assessment Area
- Traffic Impact Assessment Study Area

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Figure 14-1
Regional Road Network

Environmental Impact Statement
Saraji East Mining Lease Project

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Scale: 1:1,000,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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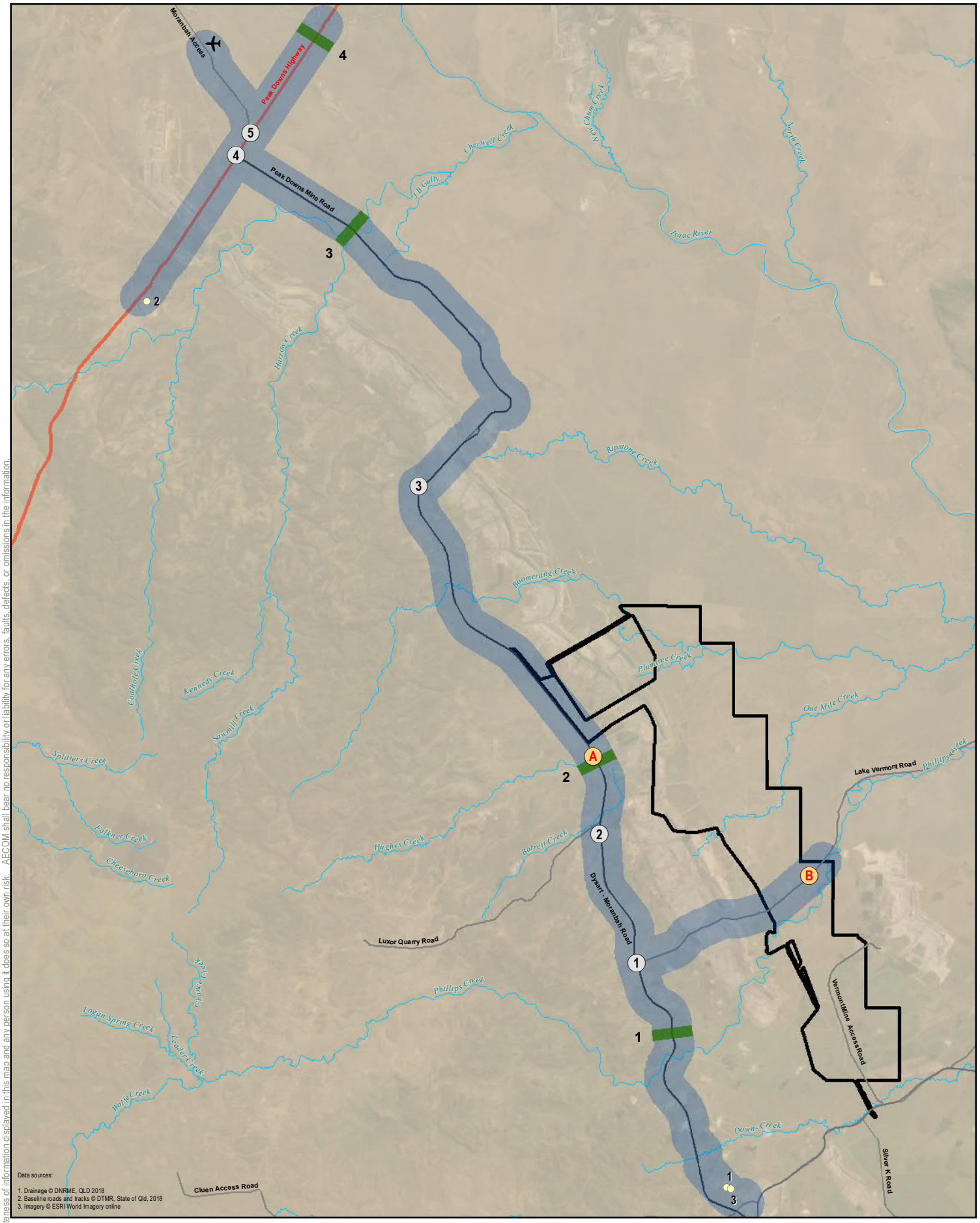

LEGEND

- Moranbah Airport
- **Workers Accommodation**
  - 1. Dysart Bma Spv
  - 2. Buffel Park Village
  - 3. Stayover in Dysart
- Watercourse
- Project Site
- Existing Intersection
- Proposed intersection
- Identified Highway Link
- Traffic Impact Assessment Study Area
- Highway
- Major Road
- Other Road

Figure 14-2
Road Network Study Area

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:250,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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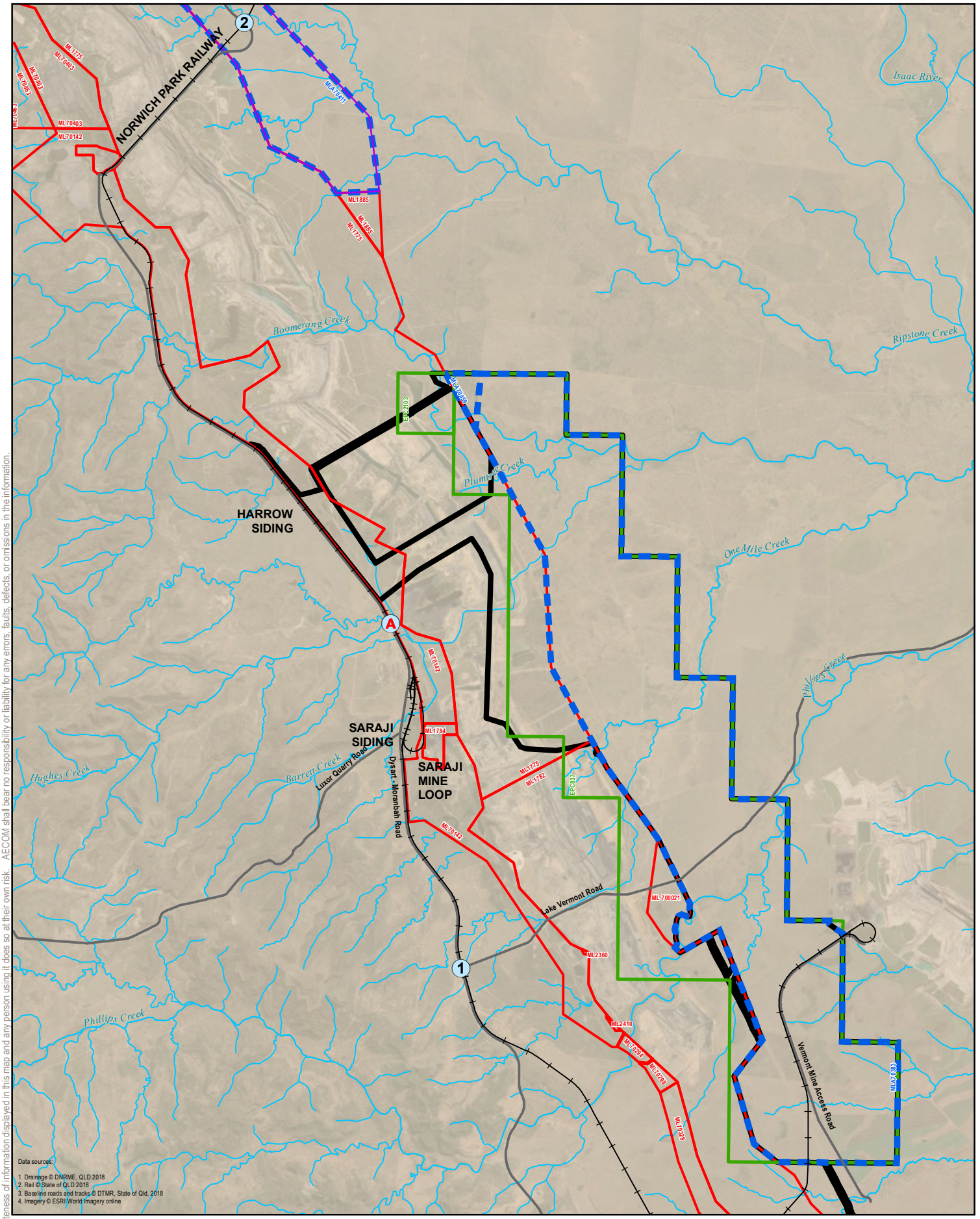

LEGEND

- Project Site
- Watercourse
- Existing Railway
- Public Road
- 1 Level Crossing
- A Proposed Level Crossing
- Exploration Permit Coal (EPC)
- Mineral Development Licence
- Mining Lease (ML)
- Mining Lease Application (MLA)

Figure 14-3
Railway Level Crossings

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:150,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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A description of the key characteristics of the roads expected to be primarily utilised by traffic associated with the construction and operation of the Project are provided in the sections below.

Dysart-Moranbah Road (519)

Dysart-Moranbah Road is a sealed local road of regional significance that provides connection between the Peak Downs Highway and other mines further south as well as to the town of Dysart. The road is also known as Peak Downs Mine Road, Winchester Road, Saraji Road, Saraji-Dysart Road (south of Peak Downs Mine) and Dysart-Middlemount Road (south of Dysart). It will be referred to as Dysart-Moranbah Road in this chapter. It is a two-way, two-lane rural road in rolling terrain, with speed limits between 80 kilometres per hour (km/h) and 100 km/h.

Its main designation is to provide access to the mining industry in the region and it therefore carries a high percentage of heavy vehicles.

Peak Downs Mine Road

Peak Downs Mine Road is a single carriageway, two-lane two-way sealed road providing a connection between Peak Downs Mine and Peak Downs Highway. The road is approximately 7m to 8m wide and the speed limit is generally 100 km/h. The road link between Peak Downs Mine and Peak Downs Highway is a local government road managed by IRC.

Peak Downs Highway (33A)

Peak Downs Highway is an SCR, linking Mackay on the Whitsunday coast and Clermont in the central west region of Queensland. It is a single carriageway two-lane two-way sealed road. It functions as a major link within the IRC area, providing the primary road connection between a number of townships and mines within Central Queensland and the regional hub of Mackay.

Lake Vermont Road

Lake Vermont Road is a partly sealed local access road that runs from Dysart-Moranbah Road to the existing Saraji Mine. It is a two-way, undivided two-lane road that is sealed in certain sections and provides the access to Saraji Mine for minor activities such as exploration and site investigations. Existing traffic volumes on this road are very low and are either associated with a small number of rural residences or exploration activities for the existing Saraji Mine. An accommodation village for the construction workforce is proposed to be constructed on a new access road off Lake Vermont Road. Therefore, Lake Vermont Road will be utilised for transporting workers between the Project Site and the villages.

Proposed intersections

One new access intersection (Intersection A) will be constructed on Dysart-Moranbah Road. Design of the intersection will be undertaken during the detailed design stage. However, it is proposed that it will include the following design elements:

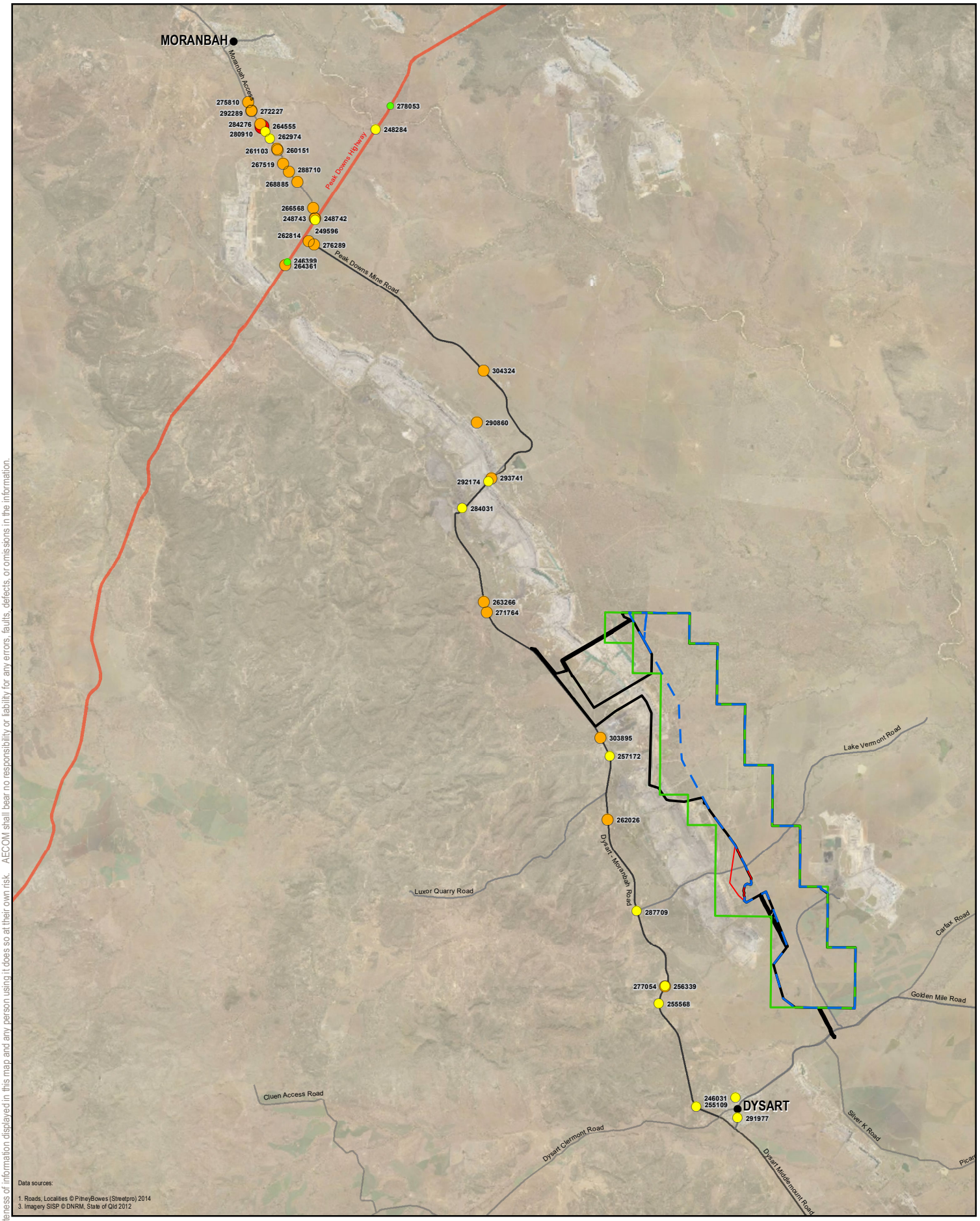
- channelised Right-turn Lane (CHR) on Dysart-Moranbah Road
- auxiliary Left-turn Treatment (AUL) on Dysart-Moranbah Road
- active level crossing with boom gates and flashing lights control on Norwich Park Branch rail line.

A new intersection (Intersection B) on Lake Vermont Road is also proposed for transporting workers between the accommodation villages and the Project. Design of this intersection will be undertaken in the detailed design stage of the Project and will trigger the requirement to proceed with the accommodation village(s).

These proposed intersections are shown in Figure 14-2

14.4.2 Road crash history

A review of the latest available crash data in the Traffic Impact Assessment Area showed a total of 39 crashes recorded in the five years between June 2012 and June 2017. Figure 14-4 shows the accident locations and severity of the crash data.



LEGEND

- Project Site
- Locality
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Highway
- Major Road
- Other Road
- Fatal
- Hospitalisation
- Medical treatment
- Minor injury

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Figure 14-4
Crash Data

Environmental Impact Statement
Saraji East Mining Lease Project

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Projection: Map Grid of Australia - Zone 55 (GDA94)

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14.4.3 Scheduled road improvement projects

Queensland Transport and Roads Investment Program (QTRIP) 2017-18 to 2020-21 (DTMR, 2017b) sets out the current and planned investments in transport and road infrastructure for the next four years. A review of QTRIP was undertaken to identify any planned upgrades to sections of the road network expected to be used by traffic associated with the Project.

Table 14.1 summarises the three planned improvements in the vicinity of the Project Site that are listed in QTRIP 2017-18 to 2020-21.

Table 14.1 Relevant planned road improvements in the vicinity of the Project Site

Investment name / location	Location description	Work description
Peak Downs Highway (Clermont - Nebo)	Wuthung Road - Caval Ridge	Widen pavement
Moranbah Access Road (Goonyella Road)	Chainage 3.50 – Chainage. 11.00km	Asphalt resurfacing
Saraji Road (Dysart-Moranbah Road to the south of Peak Downs Mine)	Chainage 5.00 – Chainage 33.00km	Asphalt overlay

14.4.4 School bus routes

School bus routes currently use the Peak Downs Highway and Moranbah Access Road to service schools in Moranbah and Dysart-Moranbah Road to service schools in Dysart. School bus routes typically operate outside of shift start and end times for mine workers and are therefore not anticipated to be affected.

14.4.5 Background traffic

Existing traffic volumes

Existing traffic volume estimates were obtained from intersection movement counts undertaken by Austraffic in 2018. The background traffic counts at highway links and intersections are provided in Table 14.2 and Table 14.3.

Table 14.2 Background traffic (2018) – highway links

Highway link	Location	Direction	Traffic flow (vehicles per hour)	
			AM peak hour	PM peak hour
(1) Dysart-Moranbah Road	South of Lake Vermont Road	Northbound	390	161
		Southbound	67	229
(2) Dysart-Moranbah Road	Intersection A	Northbound	148	91
		Southbound	42	104
(3) Peak Downs Mine Road	South of Peak Downs Highway	Northbound	25	136
		Southbound	247	125
(4) Peak Downs Highway	East of Goonyella Road	Eastbound	172	118
		Westbound	84	195

Table 14.3 Background traffic (2018) – intersections

Intersection	Location	Number of vehicles	
		2018 AM (5am – 6am)	2018 PM (5pm – 6pm)
1	Dysart-Moranbah Road / Lake Vermont Road	460	403
2	Dysart-Moranbah Road / Existing Saraji Mine Entrance	513	462
3	Dysart-Moranbah Road / Peak Downs Mine Road / Existing Peak Downs Mine Entrance	390	388
4	Peak Downs Highway / Peak Downs Mine Road	495	483
5	Peak Downs Highway / Goonyella Road	646	674
A	Dysart-Moranbah Road / Proposed access to the Project	190	195

Forecast traffic volumes

A review of the 2016 annual average daily traffic (AADT) segment reports for the Peak Downs Highway and Dysart-Moranbah Road showed a general trend of continuous decline in traffic volumes for the one-year period, five-year period and ten-year period as shown in the following table.

Table 14.4 Growth rates in 1, 5 & 10 years

Road	Direction	1 year	5 years	10 years
Peak Downs Highway	Eastbound	-1.22%	-5.93%	0.09%
	Westbound	-1.81%	-6.15%	-0.13%
	Average	-1.51%	-6.04%	-0.02%
Peak Downs – Dysart Road	Eastbound	0.74%	-9.74%	-6.45%
	Westbound	3.20%	-8.79%	-6.06%
	Average	1.97%	-9.27%	-6.26%

Whilst the results show a continuous decline, this assessment adopted a positive growth rate of one per cent per annum as a conservative approach to estimate future background traffic volumes.

The adopted growth rate of one per cent per annum was applied to the 2018 background traffic to estimate future background traffic in the nominated assessment years. Table 14.5 and Table 14.6 summarise the future background traffic for the identified highway links and intersections respectively.

Table 14.5 Future background traffic – highway links

Background traffic			Traffic flow (number of vehicles)					
Highway link	Location	Direction	FY 2021		FY 2023		FY 2040	
			AM	PM	AM	PM	AM	PM
			5am – 6am	5pm – 6pm	5am – 6am	5pm – 6pm	5am – 6am	5pm – 6pm
(1) Dysart-Moranbah Road	South of Lake Vermont Road	Northbound	406	168	414	171	490	202
		Southbound	70	238	71	243	84	288
(2) Dysart-Moranbah Road	Intersection A	Northbound	154	95	157	97	186	114
		Southbound	44	108	45	110	53	131
(3) Peak Downs Mine Road	South of Peak Downs Highway	Northbound	26	142	27	144	31	171
		Southbound	257	130	262	133	311	157
(4) Peak Downs Highway	East of Goonyella Road	Eastbound	179	123	183	125	216	148
		Westbound	87	203	89	207	106	245

Table 14.6 Future background traffic – intersections

Background traffic		Traffic flow (number of vehicles)					
Intersection	Location	FY 2021		FY 2023		FY 2040	
		AM	PM	AM	PM	AM	PM
		5am – 6am	5pm – 6pm	5am – 6am	5pm – 6pm	5am – 6am	5pm – 6pm
1	Dysart-Moranbah Road / Lake Vermont Road	479	419	488	428	578	507
2	Dysart-Moranbah Road / Existing Saraji Mine Entrance	534	481	545	490	645	581
3	Dysart-Moranbah Road / Peak Downs Mine Road / Existing Peak Downs Mine Entrance	406	404	414	412	490	488
4	Peak Downs Highway / Peak Downs Mine Road	3515	503	525	513	622	607
5	Peak Downs Highway / Goonyella Road	672	701	686	715	812	847
A	Dysart-Moranbah Road / Proposed access to the Project	198	203	202	207	239	245

14.4.6 Rail networks

The existing Goonyella rail system (specifically the Norwich Park Branch Line), which is owned and operated by Aurizon, runs adjacent to the existing Saraji Mine. The Goonyella rail system consists of 477 kilometre (km) of track length which services the coal mining area in the Bowen Basin, carrying coal to a number of port locations, including Hay Point Coal Terminal and Abbot Point Coal Terminal.

The product coal will be transported approximately 250 km (via rail) to ship loading facilities at the Hay Point Coal Terminal or approximately 400 km to the Abbot Point Coal Terminal. The total amount of coal railed will be up to 110 million tonnes (Mt) over the life of the Project, with an annual average of 6.2 million tonnes per annum (Mtpa), equating to an additional two trains per day. The maximum coal production is eight Mtpa, equating to an additional three trains per day.

Figure 14-5 shows the existing railway network that will be utilised for the Project.

14.4.7 Port infrastructure

Product coal from the Project will be exported via either:

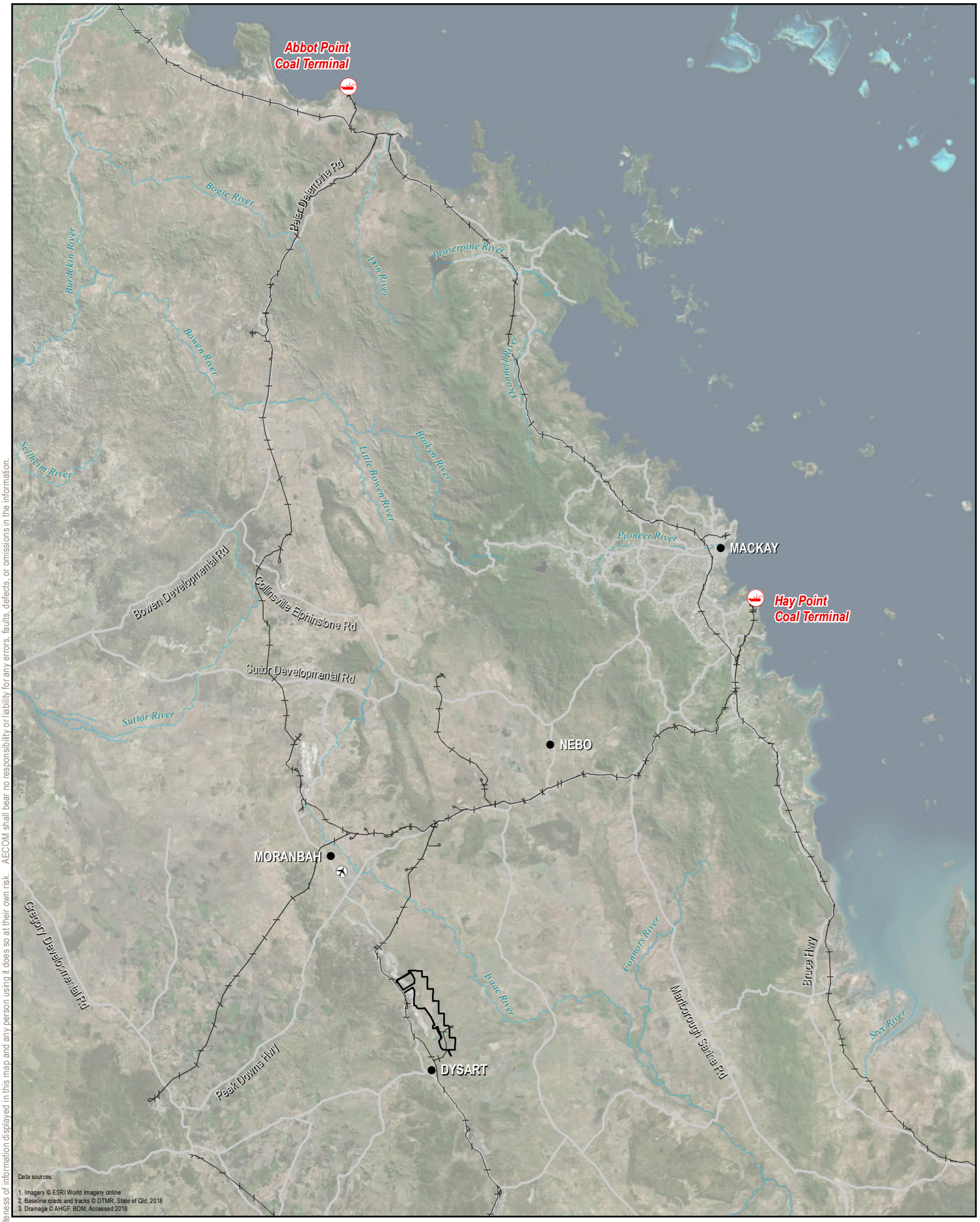
- Hay Point Coal Terminal: located approximately 40 km south of Mackay and 155 km north-east of the Project Site. The terminal is owned and operated by BMA.
- Abbot Point Coal Terminal: located approximately 266 km north of the Project Site and 25 km north of Bowen on the Central Queensland coast.

Figure 14-5 shows these two ports in relation to the Project Site.

The average shipping size through the Hay Point Coal Terminal and Abbot Point Coal Terminal is 93,000 tonnes (t). This equates to an annual average of 67 additional ships per year of operation and up to 88 ships in peak production. The product coal shipped via these ports will be within the approved port and shipping capacity and throughput limits.

14.4.8 Air transport

The closest major commercial airport to the Project Site is the Moranbah Airport, which is located 35 km north (refer Figure 14-5). Moranbah Airport is currently served by QantasLink with direct flights between Brisbane and Moranbah. The airport averages 36 QantasLink flights each week, most of these being Dash-8 (or equivalent) aircraft. The aircraft has capacity for approximately 60 passengers. The airport is operated by BMA and has one runway 1,524 metres (m) long.



LEGEND

- Project Site
- Drainage
- Locality
- Mornabah Airport
- BMA Coal Terminal
- Rail Network
- Major Road

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Figure 14-5
Port, Rail and Air Infrastructure

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

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Projection: Map Grid of Australia - Zone 55 (GDA94)

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14.5 Traffic generation

14.5.1 Construction phase

This section outlines the predicted construction traffic as a result of the Project. Conservative assumptions were made, leading to a likely over-estimation of traffic volumes. The assessed traffic generation of the construction phase is based an assumption of ten per cent of the workforce being sourced locally, and 90 per cent assumed to be fly-in, fly-out (FIFO) (considered worst-case scenario), in which the FIFO workers will reside in the proposed accommodation village. Workers will typically be working 12-hour shifts, generally operating on a one week on/one week off roster. A peak of 1,000 construction workers may be required. It is anticipated that at the start and end of rostered periods, the FIFO workforce will transit through Moranbah Airport.

Personnel will be transported between the accommodation village and Project Site by bus at the start and end of each shift.

Construction workers

The construction workers traffic is expected to range from 30 to 60 vehicles per hour and 60 to 120 vehicles per day (Table 14.7).

Table 14.7 Construction workers traffic

Construction workers traffic		Number of vehicles (buses and cars)					
Year	Workers	AM (5am – 6am)		PM (5pm – 6pm)		Average daily	
		IN	OUT	IN	OUT	IN	OUT
FY 2021	500	30	30	30	30	60	60
FY 2022	1,000	60	60	60	60	120	120
FY 2023	1,000	60	60	60	60	120	120

Construction materials and equipment

A major component of the transport task for the construction phase will be heavy vehicle traffic for the delivery of construction materials, the removal of waste and the delivery of equipment. The vehicle fleet anticipated for the construction phase of the Project was assessed, along with the material quantities and estimated heavy vehicle movements across the construction period. It is anticipated that 39 heavy vehicles per hour and 102 heavy vehicles per day will likely be required as summarised in Table 14.8.

Table 14.8 Construction materials and equipment traffic

Construction materials and equipment traffic	Number of heavy vehicles					
Year	AM (5am – 6am)		PM (5pm – 6pm)		Average daily	
	IN	OUT	IN	OUT	IN	OUT
FY 2021	39	39	39	39	102	102
FY 2022	39	39	39	39	102	102
FY 2023	39	39	39	39	102	102

It is anticipated that delivery vehicles will originate from local areas such as Moranbah (north) and Dysart (south) as well as from regional centres such as Rockhampton (south-west) and Mackay (north-east). Vehicles will either travel to/from the east using Peak Downs Highway or to/from the south along Dysart-Middlemount, Fitzroy Development Road and the Capricorn Highway. For the purpose of the assessment, an equal distribution between these routes was applied – 50 per cent of delivery vehicles are expected to use Peak Downs Highway and 50 per cent are expected to use Dysart-Moranbah Road to travel to and from destinations to the south of the Project.

Summary of construction traffic

The predicted total construction traffic ranges from 69 to 99 vehicles per hour and 162 to 222 vehicles per day (Table 14.9).

Table 14.9 Construction traffic summary

Construction traffic	Number of vehicles (buses, heavy vehicles and cars)					
Year	AM (5am – 6am)		PM (5pm – 6pm)		Average daily	
	IN	OUT	IN	OUT	IN	OUT
FY 2021	69	69	69	69	162	162
FY 2022	99	99	99	99	222	222
FY 2023	99	99	99	99	222	222

14.5.2 Operation phase

Operation workers

The operation workers traffic is expected to range from 37 to 70 vehicles per hour and 111 to 210 vehicles per day (Table 14.10). The assumption of 90 per cent FIFO workers was also taken into account for the operation phase.

Table 14.10 Operation workers traffic

Operation traffic		Number of vehicles (buses and cars)					
Year	Number of workers	AM (5am – 6am)		PM (5pm – 6pm)		Average daily	
		IN	OUT	IN	OUT	IN	OUT
FY 2023 to 2024	260	37	37	37	37	111	111
FY 2025 to 2040	500	70	70	70	70	210	210
FY 2041 to 2042	260	37	37	37	37	111	111

Operation materials and equipment

Estimated vehicle movements associated with operation phase materials and equipment include delivery of consumables are shown in Table 14.11.

Table 14.11 Quantities for operation materials & equipment

Materials	Approximate quantities (tonnes per annum)	Vehicle type	Annual deliveries (number of heavy vehicles)	Peak period (number of heavy vehicles)
Magnetite	8,000,000	B-doubles	202	1
Flocculant	1,000,000	Trucks	214	1
Coagulant	1,000,000	Trucks	225	1
Diesel	720,000	Road Trains	16	1
MIBC	360,000	Semi-trailers	18	1
Fuel & additives	32,000	Road Trains	642	1

Materials and equipment will be transported by heavy vehicles to and from the Project and their source of origins. It is anticipated that six heavy vehicles per hour will likely represent a conservative estimate of peak hour traffic during the operation stage as summarised in Table 14.12. The operation materials and equipment traffic are estimated to be six heavy vehicles per hour and 12 heavy vehicles per day.

Table 14.12 Operation materials and equipment traffic

Operation materials and equipment traffic	Number of vehicles (buses and cars)					
Year	AM (5am – 6am)		PM (5pm – 6pm)		Average daily	
	IN	OUT	IN	OUT	IN	OUT
FY 2023 to 2042	6	6	6	6	12	12

Summary of operation traffic

The total operation traffic is expected to range from 43 to 76 vehicles per hour and 123 to 222 vehicles per day (Table 14.13).

Table 14.13 Operation traffic

Construction traffic		Number of vehicles (buses, heavy vehicles and cars)					
Year	Number of workers	AM (5am – 6am)		PM (5pm – 6pm)		Average daily	
		IN	OUT	IN	OUT	IN	OUT
FY 2023 to 2024	260	43	43	43	43	123	123
FY 2025 to 2040	500	76	76	76	76	222	222
FY 2041 to 2042	260	43	43	43	43	123	123

14.6 Potential impacts

Potential impacts to transport infrastructure were assessed for each mode of transport, including road, air, rail and sea.

14.6.1 Road transport

Impacts to road transport are considered as per the requirements of GTIA 2017, including:

- intersections and access
- highway link capacity
- level crossing vehicle queues
- pavements
- safety.

The assessed peak hour traffic volumes are based on the traffic generation identified in Section 14.5 for the construction and operation phases.

Intersections

For all intersections during each assessment year (FY 2021, FY 2023 and FY 2040), the incremental LoS is considered insignificant. The results show the impact of the development traffic is anticipated to be insignificant with minimal changes in queuing and delay when comparing the background traffic analysis to the total traffic analysis.

The average delays for each intersection in FY 2021, FY 2023 and FY 2040 are shown in Table 14.14. All intersections are anticipated to operate within capacity without significant impacts to vehicle delay and queuing.

Table 14.14 FY 2021 average delays

Intersection	Location	Average delay (Worst affected approach)		
		FY 2021	FY 2023	FY 2040
1	Lake Vermont Road	12 seconds	14 seconds	10 seconds
2	Saraji Mine entrance	7 seconds	7 seconds	7 seconds
3	Peak Downs Mine entrance	8 seconds	8 seconds	8 seconds
4	Peak Downs Mine Road	11 seconds	12 seconds	11 seconds
5	Goonyella Road	10 seconds	13 seconds	13 seconds
A	Saraji East Mine entrance	7 seconds	9 seconds	7 seconds

The SIDRA results identified that the proposed Intersection A is expected to operate within capacity. The longest delay is anticipated to apply to vehicles exiting site using the Saraji East Mine Entrance with an average delay of approximately seven seconds in the FY 2040 AM and PM peaks.

Full SIDRA analysis of intersections is provided in **Appendix J-1 Transport Technical Report**.

Highway links

The assessment of percentage of development traffic over the background traffic is shown in Table 14.15. Except for Peak Downs Highway east of Goonyella Road in 2040, the development traffic is anticipated to exceed 5% of the background in all other road links.

Table 14.15 Highest percentage of development traffic over background traffic

Background traffic		Traffic flow (number of vehicles)					
Road	Direction	FY 2021		FY 2023		FY 2040	
		AM	PM	AM	PM	AM	PM
		5am – 6am	5pm – 6pm	5am – 6am	5pm – 6pm	5am – 6am	5pm – 6pm
(1) Dysart-Moranbah Road, south of Lake Vermont Road	Northbound	8%	16%	14%	28%	7%	16%
	Southbound	32%	12%	49%	22%	32%	12%
(2) Dysart-Moranbah Road, at Intersection A	Northbound	20%	29%	33%	44%	17%	25%
	Southbound	47%	26%	63%	41%	43%	23%
(3) Peak Downs Mine Road, south of Peak Downs Highway	Northbound	59%	21%	74%	35%	56%	19%
	Southbound	13%	22%	23%	37%	11%	20%
(4) Peak Downs Highway, east of Goonyella Road	Eastbound	10%	13%	11%	15%	1%	2%
	Westbound	18%	9%	20%	10%	3%	1%

Even though most of the road links have exceeded the 5% threshold, given the low background traffic in the network, it is anticipated that delay or congestion on the road links are unlikely to occur and the road links would be operating within acceptable Level of Service.

As stated in GTIA, road operation capacity impacts are only considered for major developments and link capacity assessments are not required unless new State-Controlled Road (SCR) road links are needed to be constructed to service the development.

It is confirmed that the proposed Saraji East Mining Lease Project will not require new State-Controlled Road (SCR) road links to be constructed to service the development. Therefore, additional road operation capacity assessment will not be necessary in this assessment.

14.6.2 Level crossings

It is anticipated that the level crossings within the vicinity of the Project Site will be impacted due to an increase in vehicle and/or train volumes associated with the Project. The assessment made a conservative assumption that one train will arrive at the level crossing during the AM and PM peak hour periods.

Level crossing 1 on Lake Vermont Road is close to the intersection of Dysart-Moranbah Road / Lake Vermont Road. The available queue distance between the level crossing and the road intersection is 34 m. The queue length results identified that the maximum queue length (10 m) at the level crossing does not exceed the available space of 34 m. Therefore, no adverse impact on queuing is expected as a result of the Project traffic.

The proposed new level crossing (Level crossing A) on the access road into the Project will be close to the adjacent intersections with Dysart-Moranbah Road. The available queue distance between the level crossing and the road intersection is estimated to be approximately 30 m. The queue length identified that the queue at the level crossing in FY 2023 (45 m to 104 m) is expected to exceed the available space of 30 m. This may result in vehicles waiting in the auxiliary lanes on Dysart-Moranbah Road while the level crossing is activated. While this situation is not ideal, it is only anticipated to occur for a relatively short period of time. This assessment conservatively assumed that one train will cross during the peak traffic hour, which is not expected to occur every day. The operations phase vehicle queues are expected to be able to be safely contained in the available space between the Dysart-Moranbah Road intersection and the level crossing.

Insufficient queuing length on the proposed Project access roads may overflow the vehicle queue onto Dysart-Moranbah Road. Therefore, the risk of vehicle collisions may exist.

14.6.3 Regional road network

Traffic associated with the delivery of materials and equipment during the construction and operation stages are proposed to use the regional road network of Peak Downs Highway (to Mackay) and Dysart-Middlemount Road (to the Capricorn Highway).

An assessment of the regional road network of Peak Downs Highway and Dysart-Middlemount Road shows that the development traffic is anticipated to exceed five per cent of the background traffic. However, the v/c ratios show the road network will operate within capacities and travel time and vehicle travelling speed will not be affected. Therefore, it is concluded that the impact of the Project on the operation of the regional road network is minimal.

As Dysart-Middlemount Road is managed by IRC, consultation with the Council is considered necessary and will be undertaken ahead of the construction phase of the Project.

14.6.4 Road safety

Safety issues that are likely to be introduced or exaggerated by the Project include:

- Unsealed Lake Vermont Road for approximately 11 km from Dysart-Moranbah Road – unsealed surfaces are a contributing factor to vehicular accidents.
- No intersection lighting at Intersection 1 (Lake Vermont Road / Dysart-Moranbah Road) – lack of lighting on rural roads during night-time travel is one of the contributing factors to accidents.
- Proposed Intersection A on Dysart-Moranbah Road – the design and configuration are required to meet the traffic demand and safety for heavy construction and operational vehicles.
- No intersection lighting at Intersection 3 (Peak Downs Mine Access / Peak Downs Mine Road) – lack of lighting on rural roads during night-time travel is one of the contributing factors to accidents.

14.6.5 Preliminary pavement impact assessment

The preliminary desktop PIA shows the SAR generated by the Project traffic are substantial when compared to the background traffic as summarised in Table 14.16 and Table 14.17 below for heavy vehicle traveling directions when they are loaded and unloaded.

The SAR for the background heavy vehicle component was calculated based on an average 3.2 Equivalent Standard Axle per heavy vehicle (which is based on a DTMR-approved PIA calculation tool). Where the number of SAR of the additional Project generated traffic equals or exceeds five per cent of the background SAR, the pavement is considered to be impacted based on the requirements of GTIA.

Table 14.16 Preliminary pavement impact assessment results – (Loaded direction)

Standard Axle Repetition (SAR)							%		
Road and location	Background traffic			Development traffic			Development traffic / Background traffic		
	FY 2021	FY 2023	FY 2040	FY 2021	FY 2023	FY 2040	FY 2021	FY 2023	FY 2040
Peak Downs Highway, east of Goonyella Road for 10km	393,344	401,250	475,203	113,853	117,712	3,860	28.94%	29.34%	0.81%
Peak Downs Highway, between Goonyella Rodd and Dysart-Moranbah Road	533,975	544,708	645,100	116,947	131,345	17,820	21.90%	24.11%	2.76%
Peak Downs Mine Road, between Peak Downs Highway and Peak Downs Mine	171,100	174,539	206,708	116,947	131,345	17,820	68.35%	75.25%	8.62%
Dysart-Moranbah Road, between Peak Downs Mine and Intersection A	171,100	174,539	206,708	116,947	131,345	17,820	68.35%	75.25%	8.62%
Dysart-Moranbah Road, between Intersection A and Lake Vermont Road	180,523	184,151	218,091	132,478	160,551	15,035	73.39%	**87.18%**	6.89%
Dysart-Moranbah Road, south of Vermont Road for 10km	180,523	184,151	218,091	113,853	117,712	3,860	63.07%	63.92%	1.77%

Table 14.17 Preliminary pavement impact assessment results – development traffic (Unloaded direction)

Standard Axle Repetition (SAR)							%		
Road and location	Background traffic			Development traffic			Development traffic / Background traffic		
	FY 2021	FY 2023	FY 2040	FY 2021	FY 2023	FY 2040	FY 2021	FY 2023	FY 2040
Peak Downs Highway, east of Goonyella Road for 10km	393,344	401,250	475,203	9,869	10,227	358	2.51%	2.55%	0.08%
Peak Downs Highway, between Goonyella Rodd and Dysart-Moranbah Road	533,975	544,708	645,100	10,430	12,696	2,886	1.95%	2.33%	0.45%
Peak Downs Mine Road, between Peak Downs Highway and Peak Downs Mine	171,100	174,539	206,708	10,430	12,696	2,886	6.10%	7.27%	1.40%
Dysart-Moranbah Road, between Peak Downs Mine and Intersection A	171,100	174,539	206,708	10,430	12,696	2,886	6.10%	7.27%	1.40%
Dysart-Moranbah Road, between Intersection A and Lake Vermont Road	180,523	184,151	218,091	13,243	17,986	2,382	7.34%	9.77%	1.09%
Dysart-Moranbah Road, south of Vermont Road for 10km	180,523	184,151	218,091	9,869	10,227	358	5.47%	5.55%	0.16%

The SAR resulting from development traffic are approximately one per cent to 88 per cent of the background traffic when the Project's heavy vehicles are fully loaded. A comprehensive PIA is warranted based on the increase in development traffic to assess potential contributions and identify feasible and appropriate pavement improvement works to mitigate the expected impacts. BMA will undertake a PIA during the detailed design phase in consultation with the Department of Transport and Main Roads (DTMR).

The PIA would be informed by additional road usage data and specific details of the heavy vehicles that will be used in the Project. BMA will undertake consultation with DTMR and finalise the PIA six months before commencement of construction. The conclusion of the PIA will inform the level of contribution and/or pavement improvement works required.

14.6.6 Emergency services operations

Emergency services in Queensland consist of Queensland Fire and Emergency Services (QFES), Queensland Police Service (QPS), State Emergency Service (SES) and Queensland Ambulance Service (QAS). Fire stations, police stations and medical facilities are located in Moranbah and Dysart.

The assessment concluded that the volume of the Project traffic will be low during the construction and operation phases of the Project with minimal delays. Heavy vehicles during the construction and operation stages are typically road trains, articulated vehicles and trucks. In addition, the fleet is not expecting Over-Size-Over-Mass (OSOM) vehicles. Therefore, it is anticipated that manoeuvring by Project vehicles should not be restricted at intersections and road structures. Emergency vehicles should therefore be able to overtake the Project vehicles without obstructing traffic movement. Therefore, it is concluded that the Project will not impede emergency services operations.

14.6.7 Rail

It is not expected that rail transport will be utilised during the construction stage.

For operations, it is intended than 100 per cent of product coal mined will be transported to port facilities along the existing Goonyella Rail system to a port facility for export. Aurizon owns the Norwich Park Branch rail line which runs parallel to Dysart-Moranbah Road near the Project Site and links to the overall Goonyella Rail system. The Project proposes to construct a new balloon loop and train load out facility to connect to the existing rail system. All coal will then be transported by rail to Abbot Point and/or Hay Point Terminals. This corresponds to transport using the rail network over distances of 400 km to Abbot Point and 250 km to Hay Point.

The new balloon loop and train load out facility will be located north of the existing level crossings at the Saraji Mine access. Trains will travel north from the new balloon loop to the port facilities. Therefore, trains generated by the Project are not expected to increase at Level Crossing 1 on Lake Vermont Road. The additional trains associated with the Project will increase daily train numbers at the level crossing on Peak Downs Mine Road (Level Crossing 2).

The maximum production of the Project is estimated to be eight Mtpa of product coal for an export market over a 20-year production schedule. The average train length is approximately 100 wagons with a total payload of approximately 8,500 tonnes. Therefore, when operating at peak production, the Project is anticipated to generate up to three additional trains per day on the Norwich Park Branch rail line. The annual average of coal production is 6.2 Mtpa, equating to up to two additional trains per day.

It has been confirmed by BMA that the rail network has available capacity to support the additional demand required by the Project. The volume of coal to be transported via the network will be within Aurizon's existing approval limits. As such, no additional impacts above those already approved are expected.

14.6.8 Sea

The Project is expected to produce a maximum of eight Mtpa of product coal for export and will require approximately 88 ships per year to transport this product to market. Annual average production is 6.2 Mtpa of product coal, which correlates to 67 ships per year. The existing port facilities are able to service a range of ships including Handymax, Panamax, Small Cape, and Large Cape vessels with corresponding sizes of 50,000 dead weight tons (dwt), 80,000 dwt, 150,000 dwt, and 220,000 dwt respectively. It is anticipated that the nominated ports will continue using these types of vessels across the Project's production schedule.

The product coal shipped via these ports will be within the approved port and shipping capacity and throughput limits, as such no additional impacts to the surrounding environment are expected as a result. Based on the maximum throughput of eight Mtpa product coal, the coal produced by the Project corresponds to approximately eight per cent of the combined terminal capacities of 105 Mtpa. It is considered that the impact to the combined terminal capacity is minimal.

14.6.9 Air transport

The existing Moranbah Airport will be utilised for the transportation of the Project workforce. It is anticipated that the demand for air travel for workers will increase during the construction and operation stages of the Project. During operation, the Project will result in up to 15 additional round trips per week. This increase can be accommodated within the existing capacity of the Moranbah airport.

14.7 Mitigation measures

14.7.1 Road

The assessment concluded most of the road links have exceeded the five per cent threshold, however given the low background traffic in the network, it is anticipated that delay or congestion on the road links are unlikely to occur. Therefore, immediate road links mitigations are not required.

Even though no immediate mitigations are required, it is recommended to continue to undertake traffic survey on the road links to monitor and assess traffic conditions. In the event that traffic conditions have worsened, a new traffic impact assessment is recommended to identify appropriate mitigations.

Based on road safety, the following mitigation measures are proposed to address the issues identified in this assessment:

- upgrade Lake Vermont Road for approximately 11km from Dysart-Moranbah Road (if required for the proposed accommodation village), which would include sealing of the road, assessment of the existing corrugated iron tunnel currently in place under the Norwich Park Branch rail line to determine the structural integrity and tunnel dimensions required for the Project and potential upgrade of the existing tunnel
- provide intersection lighting at Intersection 1 (Lake Vermont Road / Dysart-Moranbah Road) to improve visibility in low light conditions
- construct proposed Intersection A on Dysart-Moranbah Road, which would include deceleration lanes on the north and south approaches to the intersection on Dysart-Moranbah Road, and active devices such as boom barriers and flashing lights in addition to road lighting at the intersection
- provide intersection lighting at Intersection 3 (Peak Downs Mine Access / Peak Downs Mine Road / Dysart-Moranbah Road) to improve visibility in low light conditions.

The investments committed by DTMR and listed in QTRIP 2017-18 to 2020-21 (DTMR, 2017b) were taken into account in developing the mitigation measures proposed.

It is expected that the above mitigations will be provided within a Road Use Management Plan, to be prepared in the detailed design phase. The objective of the Plan is to demonstrate how road impacts of the Project traffic, particularly for heavy vehicles, will be managed during the construction and operation stages with an emphasis on avoiding or managing impacts through low or no-cost strategies. It should be prepared in accordance with consultation and engagement with DTMR. During the detailed design, BMA will also undertake a PIA in consultation with DTMR.

BMA will work with road authorities during the detailed design phase to confirm the extent of predicted impact and finalise mitigation measures that are likely to be in the form of compensation contributions.

A Traffic Management Plan will be prepared prior to construction considering the requirement for escorts and/or public notices during the transportation of oversize vehicles on public roads.

14.7.2 Rail and level crossings

It is expected that all coal produced by the Project will be transported by rail along the existing Norwich Park Branch rail line. This assessment concluded that the new level crossing (Level Crossings A) may not have sufficient queue length to contain the long vehicles expected.

This issue is expected to arise for a short time period during peak hours in FY 2023 when the construction phase and operation phase overlap. The following mitigation measures would be considered during the detailed design phase to address the queue length issue:

- design auxiliary turn lanes on Dysart-Moranbah Road to include appropriate storage lengths considering the potential overflow queue from the level crossing
- where practical stagger shift changeover times to occur at different hours of the day to reduce the number of vehicles using the crossing during peak hour periods
- provide safety education for heavy vehicle drivers in relation to the use of the level crossings during site induction procedures.

During the detailed design stage of the Project, ALCAM assessments may be required by the rail authority. If required, these assessments will be conducted on all level crossings substantially affected by the Project in order to finalise the required treatment options.

14.7.3 Air

The assessment concluded that a peak of 1,059 workers will be travelling to Moranbah Airport on the shift changing day. Even though these estimates are considered conservative and the airport has sufficient capacity, this assessment recommends the optimisation of workers' rosters to minimise air travel peak demands.

14.7.4 Sea

The export of coal product using the identified coal export terminal is covered by existing approvals held by the ports. The preferred port(s) will be determined through commercial discussions between BMA and the relevant port authorities.

14.8 Residual impacts

With the proposed mitigation measures in place, there are not anticipated to be any significant residual impacts.

14.9 Summary and conclusions

Based on the assessment undertaken, it is expected that the Project will have minimal impacts on shipping and airport movements, and that increases can be accommodated within the existing capacity.

For rail, at peak coal production, the Project is anticipated to generate up to three additional trains per day (or an average of two additional trains per day) on the existing Norwich Park Branch rail line. The annual average of coal production equates to up to two additional trains per day. Prior to the commencement of Project activities, agreements will be reached with Aurizon which will highlight all agreed upon mitigation measures by both parties.

This assessment concluded that the new level crossing (proposed Level Crossing A) may not have sufficient queue length. This issue is expected to arise for a short time period during peak hours in FY 2023 when the construction phase and operation phase overlap.

Road

The assessment has identified that between 162 to 222 additional vehicles per day are required in the construction phase (FY 2021-2023), and between 123 to 222additional vehicles per day in the operational phase (FY 2023-2042).

For all intersections, the incremental LoS is considered insignificant. The results show the impact of the development traffic is anticipated to be insignificant with minimal changes in queuing and delay when comparing the background traffic analysis to the total traffic analysis. The assessment of volume/capacity (v/c) ratios concluded that the highway links are anticipated to operate within capacity during construction and operation of the Project.

Regional road network

An assessment of the regional road network of Peak Downs Highway and Dysart-Middlemount Road shows that the development traffic is anticipated to exceed five per cent of the background traffic. However, the v/c ratios show the road network will operate within capacities, and travel time and vehicle travelling speed will not be affected. Therefore, it is concluded that the impact of the Project on the operation of the regional road network is minimal.

Safety

Safety issues that are likely to be introduced or exaggerated by the Project were identified and the following measures are proposed:

- upgrade Lake Vermont Road for approximately 11 km from Dysart-Moranbah Road
- provide intersection lighting at Intersection 1 (Lake Vermont Road / Dysart-Moranbah Road)
- construct proposed Intersection A on Dysart-Moranbah Road
- provide intersection lighting at Intersection 3 (Peak Downs Mine Access / Peak Downs Mine Road).