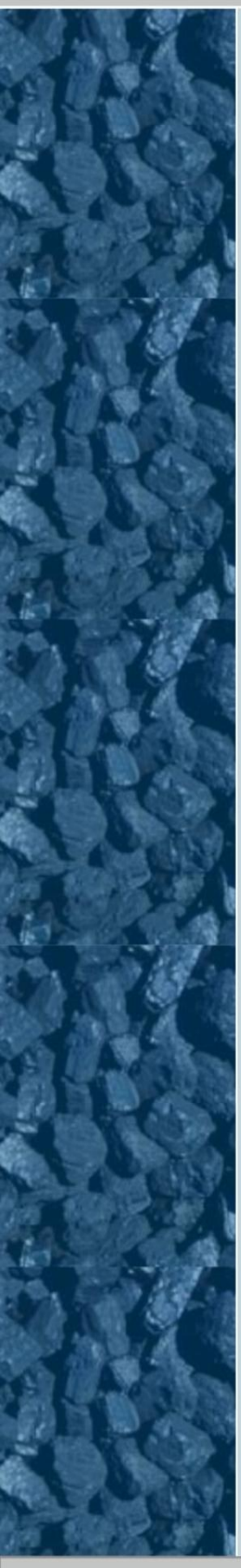
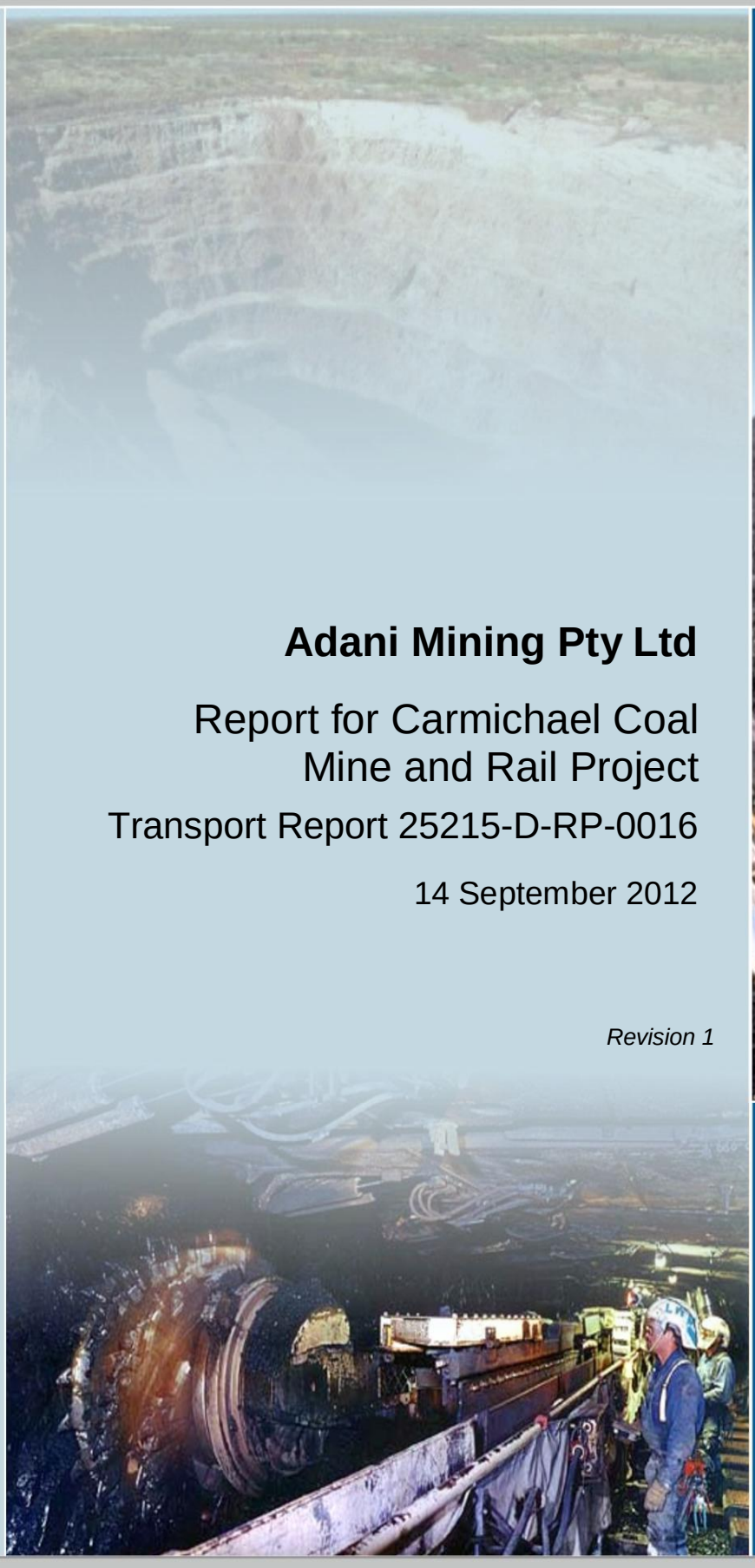
Adani Mining Pty Ltd





# Adani Mining Pty Ltd

## Report for Carmichael Coal Mine and Rail Project

Transport Report 25215-D-RP-0016

14 September 2012

*Revision 1*

*This Carmichael Coal Mine and Rail Project: Rail Transport Report ("the Report") has been prepared by GHD Pty Ltd ("GHD") on behalf of and for Adani Mining Pty Ltd ("Adani") in accordance with an agreement between GHD and Adani.*

*The Report may only be used and relied on by Adani for the purpose of informing environmental assessments and planning approvals for the proposed Carmichael Coal Mine and Rail Project (Purpose)and may not be used by, or relied on by any person other than Adani.*

*The services undertaken by GHD in connection with preparing the Report were limited to those specifically detailed in Section 1 of the Report.*

*The Report is based on conditions encountered and information reviewed, including assumptions made by GHD, at the time of preparing the Report. Assumptions made by GHD are listed within Section 2.5 of the Report and contained through the Report.*

*To the maximum extent permitted by law GHD expressly disclaims responsibility for or liability arising from:*

- *any error in, or omission in connection with assumptions, or*
- *reliance on the Report by a third party, or use of this Report other than for the Purpose.*

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## Appendices

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# Abbreviations and Glossary

| Project Specific Terminology | |
|---|---|
| **Abbreviation/ Term** | **Definition** |
| the Proponent | Adani Mining Pty Ltd |
| the Project (Mine) | Carmichael Coal Mine and Rail Project: Mine Component |
| the Project (Rail) | Carmichael Coal Mine and Rail Project: Rail Component |

| Generic Terminology | |
|---|---|
| **Abbreviation/ Term** | **Definition** |
| AADT | Annual Average Daily Traffic (expressed as number of vehicles) |
| Adani | Adani Mining Pty Ltd |
| Adani APT | Adani Abbot Point Terminal Pty Ltd |
| APCT 1 | Abbot Point Coal Terminal 1 |
| BMA | BHP Billiton Mitsubishi Alliance |
| DBCT | Dalrymple Bay Coal Terminal |
| DERM | Former Department of Environment and Resource Management |
| DNRM | Department of Natural Resources and Mines |
| DTMR | Department of Transport and Main Roads |
| EIS | Environmental Impact Statement |
| EPBC Act | *Environmental Protection and Biodiversity Conservation Act 1999* |
| EPC | Exploration Permit for Coal |
| FIFO | Fly-in-fly-out |
| GAPE | Goonyella to Abbot Point Expansion |
| GARID | Guidelines for Assessment of Road Impacts of Development |
| Goonyella rail system | QR National Goonyella Coal Rail System |
| HPCT | Hay Point Coal Terminal |

| | |
|---|---|
| IRC | Isaac Regional Council |
| LOS | Level of Service |
| MCF | [Abbot Point] Multi-Cargo Facility |
| Mtpa | million tonne (product) per annum |
| NQBP | North Queensland Bulk Ports Corporation Limited |

# Executive Summary

Adani Mining Pty Ltd (Adani) is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the north Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. All coal will be railed via a privately owned rail line connecting to the existing QR National rail infrastructure at Moranbah, and shipped through coal terminal facilities at the Port of Abbot Point and the Port of Hay Point (Dudgeon Point expansion). The Carmichael Coal Mine and Rail Project (the Project) will have an operating life of approximately 90 years.

The Project comprises of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and part of EPC1080, which includes both open cut and underground mining, on site mine infrastructure and associated mine processing facilities (the Mine) and offsite infrastructure.
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella rail system to facilitate the export of coal via the Port of Abbot Point and/or the Port of Hay Point (Dudgeon Point expansion).

The Project has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* and as such, an Environmental Impact Statement is required for the Project. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Carmichael Coal Mine and Rail Project Environmental Impact Statement has been developed with the objective to ensure that all potential environmental, social and economic impacts from the Project are identified, assessed and managed.

Construction of the Project (Rail) is expected to occur over a period of approximately two years, between 2013 and 2015. Construction dates are indicative for the purposes of undertaking transport modelling studies and therefore should be considered in the context of the timeframes of the project, for example 2013 referring to Year 1. Actual commencement dates are subject to Approvals Processes. The volume and intensity of truck movements will vary over the construction period. The worst case construction period was identified to occur between August to November 2013 generating approximately 50,910 trips per month or 1,697 daily trips.

The analysis of the estimated traffic generated by the Project will exceed the Department of Transport and Main Roads 'Guidelines for Assessment of Road Impacts of Development' threshold of a five per cent increase in the Annual Average Daily Traffic along the majority of the proposed haulage roads. However, the analysis undertaken for this study indicates that the expected increase in traffic associated with the construction of the Project (Rail) is based on the worst case scenario and would only occur over a period of approximately 18 months. In addition, the increase in traffic associated with the construction of the Project (Rail) would not impact on midblock level of service performance of these roads.

The delivery of materials and equipment are spread over the two year construction period and will be managed in order to minimise impact on the local community. Special consideration will be given to traffic levels on the eastern end of Peak Downs Highway during peak periods.

Construction of level crossings and grade separated crossings will be planned and managed to minimise delays and will ensure that adequate warning is available to motorists.

Traffic management issues will be addressed through the preparation and implementation of a Construction Traffic Management Plan, which will be developed during the detailed design phase. The plan will be developed in consultation with the relevant Department of Transport and Main Roads Regional offices, Isaac Regional Council, police and local authorities.

The Construction Traffic Management Plan will address key safety and logistical issues that may arise from the construction of the Project (Rail) and focus on:

- Vehicle crossings at major and minor road intersections
- Safety risks brought about by increased heavy vehicle traffic
- Lane closures and the use of single-lane local access roads

Mitigation measures will be identified in the Construction Traffic Management Plan to address each of the above issues. If necessary, separate site-specific (local) traffic management plans will be prepared.

A number of mitigating measures have been identified to ensure that transport and traffic impacts associated with the construction and operation of the Project (Rail) are minimised. These measures will be incorporated into the management plans. An important mitigation measure relating to construction traffic impacts is the implementation of a community information and awareness program. This program will need to be initiated prior to construction commencing and continue throughout the entire construction period to ensure that local residents are fully aware of the construction activities, with particular regard to construction traffic issues. The awareness program will identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction-related matters.

Other initiatives that will be undertaken as part of traffic management planning include:

- Continuing consultation with the Department of Transport and Main Roads to identify mitigation measures to address increases in traffic levels of over five per cent on Gregory Developmental Road and the Peak Downs Highway during the construction period
- Continuing consultation with Department of Transport and Main Roads to ensure that general signposting of construction access roads are appropriate and provide adequate warning of heavy vehicle and construction activity
- Review signposted and non-signposted speed restrictions along the road network and where necessary, provide additional signposting of speed limitations
- Distribute construction activity warning notices to advise local road users of scheduled construction activities
- Provide advance notice of road/lane closures and advice on alternative routes
- Install appropriate traffic control and warning signs for areas identified to have existing potential safety risks
- Manage the transportation of construction materials to maximise vehicle loads and minimise vehicle movements

- Manage the transportation of construction materials, using the Queensland Police Services and Pilots to maximise vehicle loads in order to minimise vehicle movements
- Whenever practical, promote the use of internal and haulage access roads rather than public roads by construction vehicles
- Project induction training for truck and vehicle operators.

Key off-site traffic issues mainly relate to:

- Use of identified road segments on the road network for access by heavy vehicles for the delivery of plant and material
- Disruption to traffic due to road/lane closures brought about by construction activities at road crossings
- Increase in travel time to existing road users due to road works and increase in heavy vehicle movement.

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# 1. Introduction

## 1.1 Project Overview

Adani Mining Pty Ltd (Adani) is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the north Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. All coal will be railed via a privately owned rail line connecting to the existing QR National rail infrastructure, and shipped through coal terminal facilities at the Port of Abbot Point and the Port of Hay Point (Dudgeon Point expansion). The Carmichael Coal Mine and Rail Project (the Project) will have an operating life of approximately 90 years.

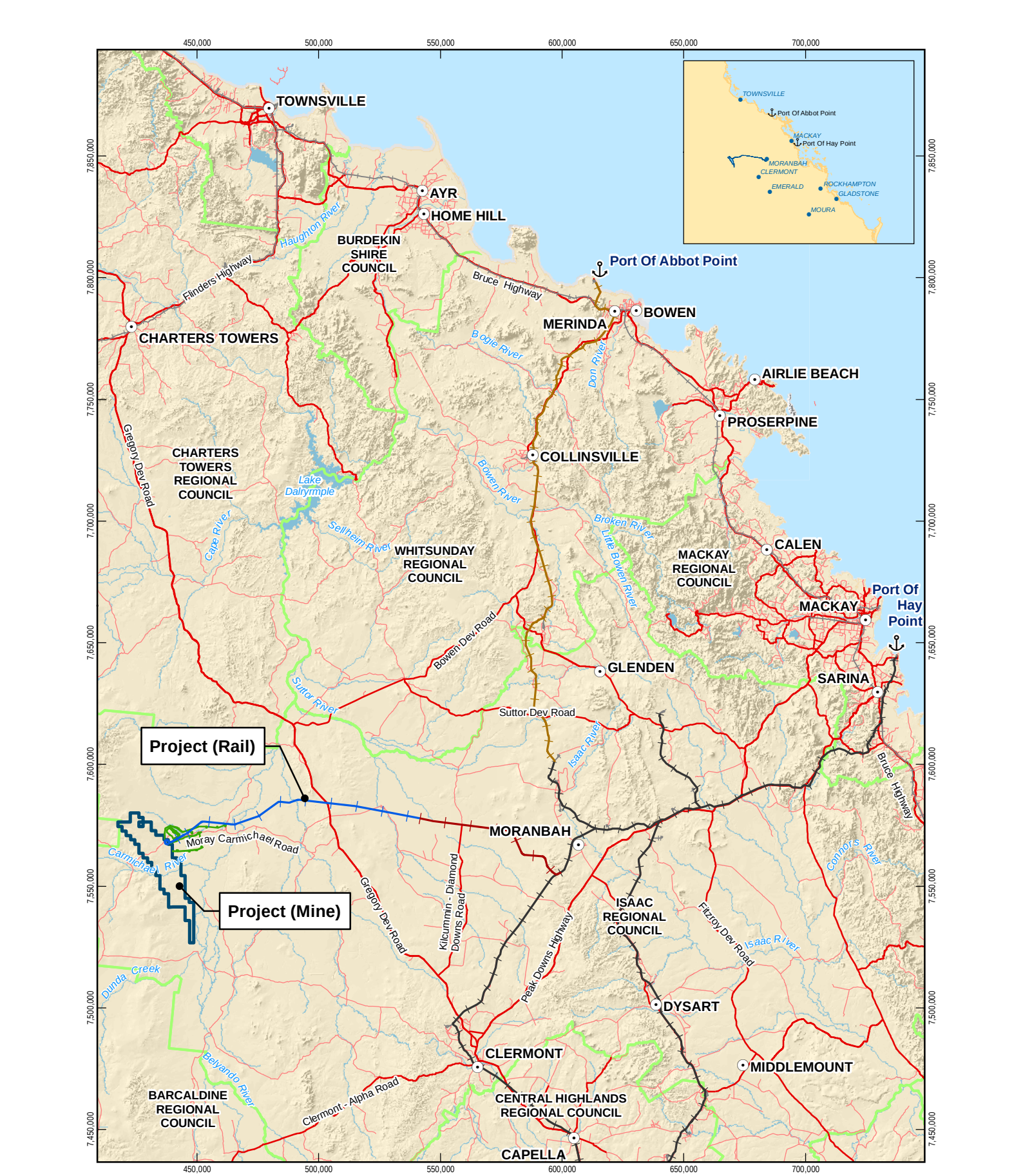
The Project comprises of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and the eastern portion of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including:
  - A workers accommodation village and associated facilities
  - A permanent airport site
  - Water supply infrastructure
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively; including:
  - Rail (west): a 120 km dual gauge portion from the Mine site running west to east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah

The Project has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971*and as such, an Environmental Impact Statement (EIS) is required for the Project. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project EIS has been developed with the objective of avoiding or mitigating all potential adverse impacts to environmental, social and economic values and enhancing positive impacts. Detailed descriptions of the Project are provided in Volume 2 Section 2 Project Description (Mine) and Volume 3 Section 2 Project Description (Rail).

Figure 1-1 shows the Project location and the surrounding regions of Charters Towers, Barcaldine, Isaac and Whitsunday.




LEGEND

- Town
- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- State Road
- Local Road
- Watercourse
- Local Government Area
- Project (Rail)
- Rail (West)
- Rail (East)
- Project (Mine)
- Mine (Offsite)



1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

**Adani Mining Pty Ltd**

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision L
Date 28-08-2012

Project Location

Figure: 1-1

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses (2007); DERM: LGA, (2011), Hillshade (2009); DMR: State Roads (2008); Gassman/Hyder: Mine (Offsite) (2012); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012). Created by: BW, JVC

## 1.2 Study Area

For the purposes of this report, the Study Area is defined as the Project (Rail) alignment and existing road and rail network expected to be utilised and impacted by the construction and operation of the Project (Rail). The Project (Rail) alignment is located within a nominally 95 m wide corridor that runs from the terminal facilities within the boundary of the Mine approximately 189 km eastwards to connect with the Wotonga-Blair Athol Branch Line of the existing QR National Goonyella system, approximately 8 km south of Moranbah.

This report also includes all road crossings along the Project (Rail) corridor and roads that are potentially impacted by traffic movements generated by the construction and operation of the Project (Rail).

Figure 1-1 shows the location of the Mine and the Project (Rail) corridor in relation to the urban centres, road network, the existing rail network and ports at Abbot Point and Hay Point (Dudgeon Point expansion).

## 1.3 Legislative Framework

This traffic and transport assessment has been undertaken with reference to the Department of Transport and Main Roads (DTMR) '*Guidelines for Assessment of Road Impacts of Development'* (GARID) (DTMR 2006), which states that:

*"DTMR will not approve development unless any road impacts of the development can be managed to maintain a safe and efficient road system for all road users, as required by the Transport Infrastructure Act 1994. This approach is supported by the legislative powers of both the Integrated Planning Act 1997* [Sustainable Planning Act 2009] *and the State Development and Public Works Organisation Act 1974 which enable DTMR to impose conditions to mitigate the road impacts of proposed developments as part of the development planning process".*

## 1.4 Report Scope

This report provides an assessment of traffic impacts during the construction and operational stages of the Project (Rail) rail line only and identifies mitigating measures to address identified impacts. It focuses on the traffic implications from road and rail interfaces (crossings), haulage of material required by the Project (Rail) along the road network, and the transporting of plant, equipment and vehicular traffic generated by construction employees. The report focuses on the worst case scenario during this period and the overall effect on the higher order road network (i.e. state-controlled road network).

This report addresses Section 3.9 of the Project Terms of Reference, which are summarised in Table 1-1 and detailed in Appendix A.

**Table 1-1 Cross Reference with Terms of Reference**

| Terms of Reference Requirement/Section Number | Section of this report |
|---|---|
| Section 3.9.1 Existing infrastructure | Section 1.1 |
| Provide background to the Project with regard to existing infrastructure at a local and regional level. | Section 3 |
| Include baseline data and a description of current conditions of the affected network(s) | |
| A map of the State controlled road network | Figure 3-1 |
| Section 3.9.2 Transport tasks and routes | |
| For all phases of the Project describe: | Section 0 |
| ◗ Expected volumes of project inputs and outputs | Section 0 |
| ◗ How project inputs and outputs will be moved | Section 4.1.3 |
| ◗ Traffic to be generated by workforce | Section 4.3.5 |
| ◗ Likely heavy and oversize loads | Section 4.1.3 |
| Section 3.9.3 Potential Impacts | Section 2, 6, 7 |
| ◗ Details on adopted methodology | Section 2.4 |
| ◗ Description of input data and assumptions | Section 2.3, 2.5 |
| ◗ Summary of consultation | Section 2.2 |
| ◗ Impact on transport operations | Section 6.7 |
| ◗ Any other rail projects in the vicinity of subject proposal | Section 7.3.1 |
| ◗ Impact of construction on existing road network | Section 6.4 |
| ◗ Road safety/efficiency and location of rail crossings | Section 6.4 |
| ◗ Impact on natural environment | Volume 4 Appendix AA Rail Ecology Report |
| ◗ Nature and likelihood of product spill during transport if relevant | |
| ◗ Driver fatigue for workers travelling to and from regional centres | Section 6.4.5 |
| ◗ Impact on public transport | Volume 4 Appendix AA Rail Ecology Report |
| ◗ Direct and indirect impacts to listed species | |
| Section 3.9.4 Infrastructure alterations | |
| Detail infrastructure alterations: | Section 0 |
| ◗ Proposed alterations or new transport-related infrastructure and services | Section 0, 1.1, 1.2, Figure 1-1 |
| ◗ Construction of project-related plant and utilities impacting upon the jurisdiction of any transport authority | |
| ◗ Requirements to upgrade and existing level crossings | Section 6.4.1, Table 3-1 |

| Terms of Reference Requirement/Section Number | Section of this report |
|---|---|
| | None impacted. |
| Section 3.9.5 Transport management and mitigation strategies<br>◗ Discuss recommended mitigation and management strategies for identified impacts<br>◗ Develop transport management plan | Section 6.4.6 |

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# 2. Scope and Methodology

## 2.1 Overview

This section outlines the methodology and evaluation criteria used in the assessment of the Project (Rail).

## 2.2 Consultation

This study has included and taken into consideration consultation with the following stakeholders:

- DTMR
- Isaac Regional Council
- Queensland Police Services

## 2.3 Data Sources

The investigation of impacts was undertaken as part of a desktop assessment. The desktop assessment included the collection and review of the following data sets:

- A review of aerial photography and other mapping information
- Existing traffic count data for state-controlled roads obtained from DTMR
- Traffic data for local roads in the Study Area provided by the IRC
- DTMR crash data for state and local authority controlled roads in the Study Area

## 2.4 Methodology

This report addresses the Terms of Reference mentioned in Table 1-1 using GARID and other network relevant evaluating criteria.

The traffic impact assessment has been undertaken with reference to DTMR's GARID. While not mandatory, the guideline suggests a process and methodology to undertake the TIA. The traffic operation assessment process outlined in the guidelines stipulates that the operating characteristics need to be compared with agreed performance criteria.

Access routes within the Study Area generally have flat terrain and are two-lane two-way rural roads (one lane per direction), with the exception of the road sections on the state highways that lead into the major urban centres. The AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity* (1988) defines level of service (LOS) as a qualitative measure describing operational conditions within a traffic stream. LOS and its characteristics for rural roads is defined in Table 2-1.

The main performance criteria adopted as part of GARID for the assessment of projects of this type are detailed in Table 2-2.

**Table 2-1 Level of Service for Rural Roads**

| Level of Service | Description | Description |
|---|---|---|
| A | Free, unrestricted flow | Satisfactory |
| B | Mostly free flow, few disruptions | |
| C | Stable flow | |
| D | Mostly stable flow, some delays | Consideration of safety implications required |
| E | Congested flow, delays common | Unsatisfactory |
| F | Forced flow | |

Source: *AUSTROADS (1988) Guide to Traffic Engineering Practice Part 2: Roadway Capacity*

**Table 2-2 Performance Criteria (GARID) – Assessment**

| Performance Measure | Criteria Adopted |
|---|---|
| Level of Service | LOS C can be considered the minimum standard in a rural context, although LOS D may be considered satisfactory where weekend peaks are the defining event and occur on recreational occasions.<br>LOS E should be considered the limit of acceptable urban area operation and remedial works would be needed if LOS F would otherwise result. |
| Per cent increase in daily traffic on the state-controlled road network | An increase within five per cent is generally considered acceptable |
| Per cent increase in pavements loadings (equivalent standard axles) | An increase within five per cent is generally considered acceptable |

The volume and composition of traffic on a given road determines the level of interaction between vehicles and is a performance measure known as a LOS. For a particular roadway capacity, the LOS deteriorates with increasing traffic volumes. GARID states that LOS A, LOS B and LOS C in a rural context are all satisfactory. LOS D may also be considered satisfactory where weekend peaks are the defining event and occur on recreational routes.

In cases where traffic, terrain or geometric data may not be precisely known, the AUSTROADS Guide (1988) provides planning guidance on maximum Annual Average Daily Traffic (AADT) (represented as number of vehicles) values that two-lane, two-way rural roads can accommodate under various terrain conditions. Table 2-3 shows the performance range values for a two-lane two-way rural road with level terrain under varying peak hour volume to AADT ratios.

**Table 2-3 Performance Criteria for Rural Roads with Level Terrain**

| Design Hour Volume to AADT Ratio | Level of Service and Daily Traffic Flows | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| 0.10 | 2,400 | 4,800 | 7,900 | 13,500 | 22,900 |
| 0.11 | 2,200 | 4,400 | 7,200 | 12,200 | 20,800 |
| 0.12 | 2,000 | 4,000 | 6,600 | 11,200 | 19,000 |
| 0.13 | 1,900 | 3,700 | 6,100 | 10,400 | 17,600 |
| 0.14 | 1,700 | 3,400 | 5,700 | 9,600 | 16,300 |
| 0.15 | 1,600 | 3,200 | 5,300 | 9,000 | 15,200 |

Source: *AUSTROADS (1988) Guide to Traffic Engineering Practice, Part 2: Roadway Capacity*, Table 3.9, from TRB Highway Capacity Manual (1985) Table 8.10.

For a LOS C, the maximum AADT values range from 5,300 to 7,900 depending on the peak hour design hour volume to AADT ratio. The above performance value ranges will be used to evaluate network performance deficiencies associated with construction vehicle access to the Project (Rail) corridor.

## 2.5 Assumptions and Limitations

The traffic impact assessment for this report has been limited by the following:

- The availability of traffic flow data for roads surrounding the Project (Rail) corridor, as traffic data is not routinely collected for all local roads within the Study Area
- The availability of crash data for roads surrounding the Project (Rail) corridor, as crash data is not routinely collected for all local roads within the Study Area.

Naming conventions for roads within the Project (Rail) Study Area are not consistent between datasets. Further, local roads are often unnamed or have a local name not presented in datasets. While care has been taken to maintain consistency and use of specific names it is likely that some discrepancies may occur.

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# 3. Description of Existing Situation

## 3.1 Existing Road Network

### 3.1.1 Classification of Roads

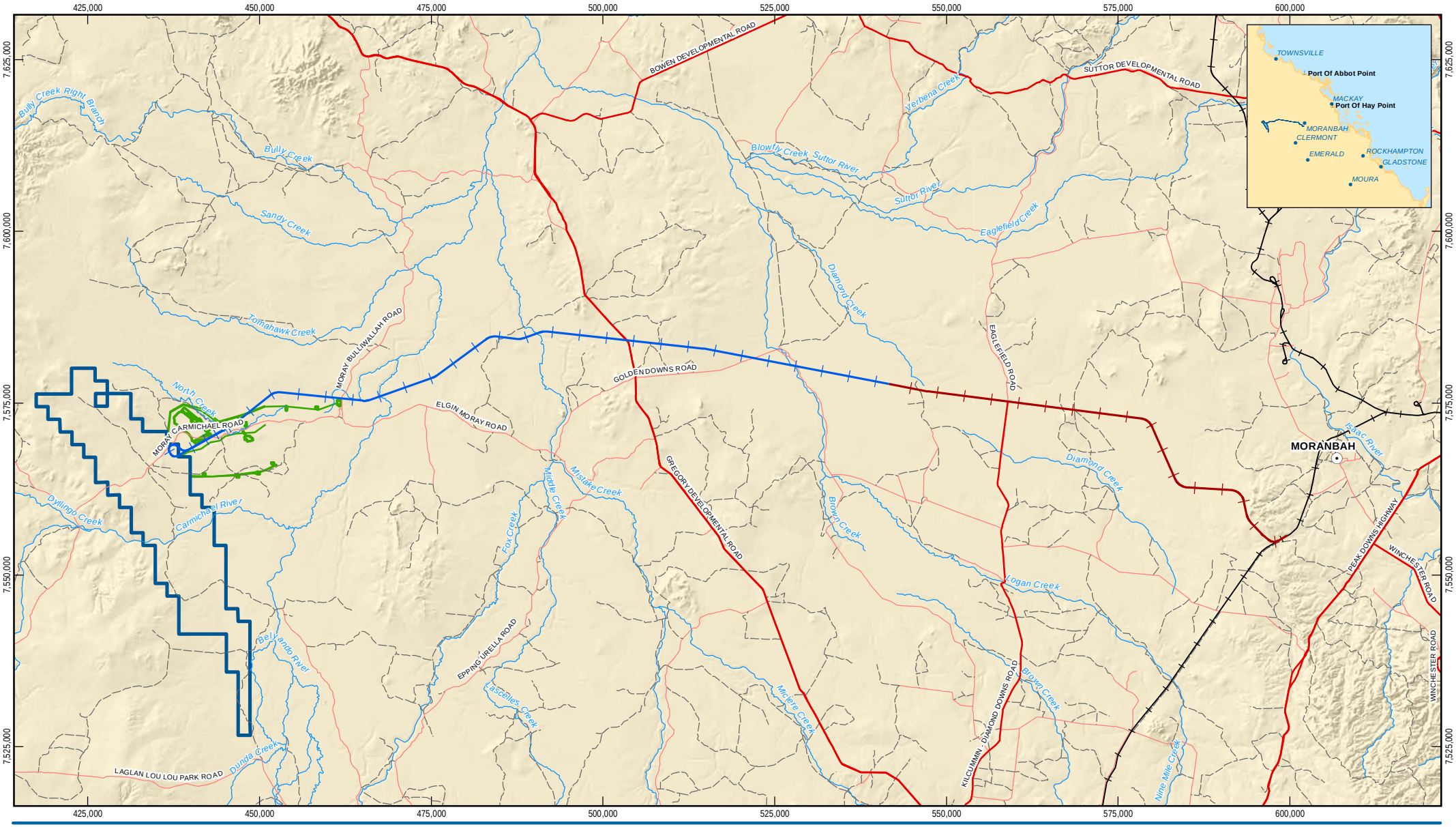
The classification of roads along the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic it should appropriately carry and its ability to accommodate Project (Rail) related traffic. DTMR has jurisdiction over roads of State or regional significance and has four administrative classifications in its hierarchy of roads. These are:

- National Highway
- State Strategic Road
- Regional Road
- District Road

For the purposes of this study, all of the above will be referred to as state-controlled roads and will be referred against the evaluation criteria shown in Table 2-3.

The Project (Rail) corridor will traverse one state-controlled road, namely the Gregory Developmental Road, and a number of other public local roads, governed by the Isaac Regional Council.

Figure 1-1 and Figure 3-1 provide a more detailed understanding of the Project (Rail) corridor and interfaces with the existing State and local road networks. The Study Area encompasses several transport corridors of national, state, regional, district and local significance. These types of roads are either under the management and control of DTMR (the State road authority) or in the case of local roads, IRC. Table 3-1 provides the classification of each road within the Study Area and identifies the authority that manages each road.

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Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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LEGEND

- Town
- State Road
- Local Road
- Track
- Other Rail Network
- Watercourse
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

**Adani Mining Pty Ltd**

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision A
Date 04-09-2012

Project (Rail) Road Networks

Figure: 3-1

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Data source: DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007); Adani: Alignment Opt9 Rev3 (SP1&2) (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

**Table 3-1 State and Local Controlled Roads in the Study Area**

| Road Name | Road Authority | Classification | Heavy Vehicle Designation* |
|---|---|---|---|
| Flinders Highway (Charters Towers to Townsville) | DTMR | State Strategic Road | Road Train |
| Gregory Developmental Road (Charters Towers to Clermont) | DTMR | State Strategic Road | Road Train |
| Bowen Developmental Road (Bowen-Collinsville) | DTMR | District Road | Road Train |
| Bowen Developmental Road (Collinsville – Belyando Crossing) | DTMR | District Road | Road Train |
| Suttor Developmental Road (Nebo-Mount Coolon) | DTMR | Regional Road | Road Train |
| Peak Downs Highway (Clermont – Nebo) | DTMR | State Strategic Road | Road Train |
| Peak Downs Highway (Nebo – Walkerston) | DTMR | State Strategic Road | Road Train |
| Peak Downs Highway (Walkerston – Bruce Highway) | DTMR | State Strategic Road | Road Train |
| Kilcummin Diamond Downs Road | DTMR | District Road | Road Train |
| Oxford Downs – Sarina Road | DTMR | District Road | Road Train |
| Marlborough – Sarina Road | DTMR | District Road | |
| Diamond-Downs/Eaglefield Road | IRC | Local Road | |
| Amaroo Road | IRC | Local Road | |
| Moray Bulliwallah Road | IRC | Local Road | |
| Elgin Moray Road | IRC | Local Road | |
| Golden Downs Avon Road | IRC | Local Road | |
| Moray Carmichael Boundary Road (Doongmabullah Rd) | IRC | Local Road | |

*Note: Heavy vehicle designation is referenced from *http://www.tmr.qld.gov.au/Business-industry/Heavy-vehicles/Multi-combination-vehicles/Maps/Map-of-south-Queensland/Section-10-maps.aspx*

### 3.1.2 Description of Existing Road Conditions

**Flinders Highway**

Flinders Highway road runs in an approximate east-west direction and is approximately 760 km in length. The road connects Townsville to the east with Cloncurry in the west. Flinders Highway intersects with Gregory Developmental Road at a priority controlled T-intersection immediately south of the township of Charters Towers. Flinders Highway has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic and functioning as a haulage route
- Two-way two-lane road

Flinders Highway provides connection to the following road links:

- Bruce Highway
- University Road
- Southwood Road
- Woodstock-Giru Road
- Burdekin Falls Dam Road
- Hervey Street
- Dr George Ellis Drive
- Millchester Road
- Bluff Road
- Gregory Developmental Road

Flinders Highway runs through the following townships:

- Charters Towers
- Queenton
- Breddan
- Dotswood
- Reid River
- Calcium
- Woodstock
- Toonpan
- Oak Valley
- Stuart

### Gregory Developmental Road

Gregory Developmental Road runs in an approximate north-south direction and is approximately 360 km in length. The road links Charters Towers to the north with Clermont to the south. Gregory Developmental Road intersects with Bowen Developmental Road at a priority controlled T-intersection immediately south-east of Mount Douglas, and ends at a priority controlled T-intersection with Peak Downs Highway north of Clermont. Gregory Developmental Road has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic and functioning as a haulage route

Gregory Developmental Road provides connection to the following road links:

- Flinders Highway
- Rocky Creek Road
- Harvest Home Road
- Bundabaroo Scartwater Road
- Yarrowmere Road
- Bowen Developmental Road
- Elgin Road
- Frankfield Road
- Kilcummin-Diamond Downs Road
- Ken Logan Road
- Peak Downs Highway

### Bowen Developmental Road

Bowen Developmental Road is a district road under the jurisdiction of the DTMR. It intersects with the Bruce Highway at a T-intersection in the township of Bowen and then proceeds in a south western direction passing Bogie, Mount Coolon and the town of Collinsville and ends at T-intersection with Gregory Developmental Road. Bowen Developmental Road has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic and functioning as a haulage route

The Bowen Developmental Road corridor provides connection to the following road links:

- Rutherford Road
- Strathalbyn Road
- Strathmore Road
- Mt. Wyatt Road
- Power House Road (local)

- Corduroy Creek Road (local)
- Collinsville Elphinstone Road
- Cerito Road
- Ilamatha Road
- Suttor Developmental Road
- Upper Don River Road

Bowen Developmental Road runs through the following townships:

- Bowen
- Mount Coolon
- Collinsville
- Almoola
- Briaba
- Binbee
- Armuna

**Suttor Developmental Road**

Suttor Developmental Road is a partly sealed road and connects Mount Coolon to the west to Nebo to the east. Suttor Developmental Road currently carries an average of 50 to 70 vehicles per day and is therefore considered to be lightly trafficked. It stretches from Mount Coolon at a T-intersection with Bowen Developmental Road to Collinsville Elphinstone Road. The Suttor Developmental Road route provides connection to the following road links:

- Stratford Road (local)
- Ellensfield Road (local)
- Collinsville Elphinstone Road (State)
- Hail Creek Road (local)
- Kemmis Creek Road (local)
- Turrawilla Road (local)
- Leggets Road (local)

**Peak Downs Highway**

Peak Downs Highway links Moranbah and Goonyella to Mackay. The Peak Downs Highway alignment travels through undulating terrain for a distance of approximately 265 km with over 1.2 km of its length travelling across vertical grades that are steeper than five per cent. Peak Downs Highway has the following general characteristics:

- Sealed pavement in good condition
- Heavy vehicle traffic characteristics indicating that this is currently used as a haulage route

Peak Downs Highway provides connection to the following road links:

- Annandale Road (local)
- Blue Mountain Road
- Bruce Highway (national highway)
- Eton - Homebush Road
- Fitzroy Developmental Road
- Gregory Developmental Road
- Gregory Highway (state)
- Mackay - Eungella Road
- Marian - Eton Road
- Moranbah Access Road
- North Eaton Road
- Oxford Downs - Sarina Road
- Suttor Developmental Road
- Winchester Road

Traffic travelling along the Peak Downs Highway corridor can access the following townships:

- Eton
- Drapers
- Walkerston
- Alexandra

**Kilcummin-Diamond Downs Road**

Kilcummin-Diamond Downs Road runs in an approximate north-south alignment. The Kilcummin Diamond Downs Road is a state-controlled road which turns into an IRC local controlled road in the vicinity of the Project (Rail), namely Eaglefield Road. Continuing south from the intersection with Eaglefield Road, the Kilcummin-Diamond Downs Road intersects with Gregory Developmental Road at a priority controlled T-intersection located to the north of Miclere.

Kilcummin-Diamond Downs Road provides connection to the following road links:

- Gregory Developmental Road
- Mount McLaren Road
- Diamond Downs Eaglefield Road
- Suttor Developmental Road

**Moray Bulliwallh Road**

Moray Bulliwallh Road is an IRC local controlled road running north from the intersection of the Elgin Moray and Moray Carmichael Roads. This road provides connection to the following road links:

- Gregory Developmental Road
- Bowen Developmental Road
- Elgin Moray Road
- Moray Carmichael Road

**Moray Carmichael Boundary Road**

Moray Carmichael Boundary Road (or Moray Carmichael Road) is a local road under the jurisdiction of the IRC. The road runs in an approximate east-west alignment and is approximately 115 km in length. The road forms a priority controlled T-intersection with Moray Bulliwallah Road at its eastern end and forms a priority controlled T-intersection with Ulcanbah Road at its western end. Moray Carmichael Road traverses the Project (Mine).

Moray Carmichael Boundary Road provides connection to the following road links:

- Ulcanbah Road
- Bulliwallah Road
- Shuttleworth Carmichael Road
- Doongmabulla Road

**Elgin Moray Road**

Elgin Moray Road is a local road under the jurisdiction of the IRC. The road runs in an approximate north-south alignment. The road intersects Eppin Elgin Road via a priority controlled T-intersection at its southern end and forms a priority controlled T-intersection with Moray Carmichael Boundary Road at its northern end. Moray Carmichael Boundary Road provides connection to the following road links:

- Elgin Road
- Epping Elgin Road
- Moray Carmichael Boundary Road

**Golden Downs Avon Road**

Golden Downs Avon Road is a local road under the jurisdiction of the IRC. The road runs in an approximate north-south alignment and intersects Kilcummin-Diamond Downs Road via a priority controlled T-intersection at its southern end. Avon Road provides connection to the following road links:

- Gregory Developmental Road
- Elgin Moray Road
- Amaroo Road

**Diamond Downs Eaglefield Road**

Eaglefield Road runs north from the junction with Kilcummin-Diamond Downs Road. The road forms a priority controlled T-intersection with Suttor Developmental Road to the south-east of Mount Coolon. Eaglefield Road is an IRC local controlled road. Kilcummin-Diamond Downs Road and Eaglefield Road also comprise part of the State's stock route network (stock route M399BELY03). Eaglefield Road provides connection to the following road links:

- Kilcummin-Diamond Downs Road
- Gregory Developmental Road
- Suttor Developmental Road

**Amaroo Road**

Amaroo Road is an IRC local controlled road leading south from Golden Downs Avon Road. Amaroo Road is also part of the State's stock route network (stock route U402BELY03).

### 3.1.3 Existing Traffic Volumes on State-Controlled Roads

Figure 1-1 and Figure 3-1 show the location of existing state-controlled roads within the Study Area. Existing traffic count data was obtained from the DTMR and is presented in Table 3-2. The data is presented in the form of AADT flows and percentage of traffic comprising of heavy vehicles along state-controlled roads. Where available, the traffic count data identified the highest and lowest daily traffic volumes, which was obtained from recordings at multiple count sites.

The highest daily counts are typically associated with locations in close proximity to either the Bruce Highway and/or an urban centre and lower daily counts are generally situated some distance from other state-controlled roads or urban centres. Based on the trends presented in Table 3-2 it is apparent that state-controlled roads are utilised as existing haulage routes.

**Table 3-2 Existing AADT Volumes on State-Controlled Roads**

| Road Name | AADT | % Heavy Vehicles |
|---|---|---|
| Flinders Highway (Charters Towers to Townsville) | | |
| Low | 1,032 | 40.7 |
| High | 4,894 | 20.2 |
| Peak Downs Highway (Clermont to Nebo) | | |
| Low | 612 | 20 |
| High | 3,435 | 13.6 |
| Peak Downs Highway (Nebo to Walkerston) | | |
| Low | 3,893 | 15 |
| High | 6,006 | 11 |
| Peak Downs Highway (Walkerston to Bruce Hwy) | | |
| Low | 10,051 | 8 |
| High | 15,990 | 10 |
| Suttor Developmental Rd (Nebo to Mt Coolon) | | |
| Low | 39 | 12.8 |
| High | 1,047 | 21.8 |

| Road Name | AADT | % Heavy Vehicles |
|---|---|---|
| Bowen Developmental Road (Collinsville to Belyando Crossing)<br>Low<br>High | <br>32<br>915 | <br>18.8<br>5 |
| Gregory Developmental Road (Clermont to Belyando Crossing)<br>Low<br>High | <br>334<br>412 | <br>29<br>28 |
| Kilcummin Diamond Downs Road | 52 | 23 |
| Oxford Downs – Sarina Road | 452 | 11.8 |
| Marlborough – Sarina Road<br>Low<br>High | <br>101<br>5,157 | <br>11.9<br>5.1 |

### 3.1.4 Existing Traffic Volumes on Local Council Roads

The IRC provided traffic volume data for some of the local roads impacted by the Project (Rail). This data includes the AADT and the percentage of traffic comprising of heavy vehicles and is presented in Table 3-3.

It should be noted that no traffic data was available for the following local roads that are impacted by the Project (Rail):

- Amaroo Road
- Moray Carmichael Boundary Road
- Moray Bulliwallah Road

All of the above roads are understood to carry relatively low traffic volumes. Traffic on the Eaglefield Road can be expected to be similar to that on the Kilcummin-Diamond Downs Road, namely 52 AADT of which 23 per cent is heavy vehicles.

**Table 3-3 Existing AADT Volumes on Local Roads**

| Road Name | AADT | % Heavy Vehicles |
|---|---|---|
| Elgin Moray Road | 350 - 2000 | 40 |
| Golden Downs Avon Road | 40 | 30 |

### 3.1.5 Roadway Capacity for Two-Lane Two-Way Rural Roads

The road network performance evaluation criteria for roads impacted by the Project (Rail) are shown in Table 2-3.

Table 3-4 shows the current performance as a LOS, for each state-controlled road impacted by the Project (Rail). Table 3-4 indicates that all state-controlled roads act as haulage routes and operate satisfactorily and have some spare road capacity to accommodate additional traffic.

The exception is the Peak Downs Highway between Walkerston and the Bruce Highway, which is currently operating at LOS E in the peak periods. Consideration needs to be given to this during the operational planning.

**Table 3-4 Existing Road Network Capacity Assessment**

| Road Name | AADT | Flow Volume* | Flow Capacity# | Volume/Capacity | LOS |
|---|---|---|---|---|---|
| Flinders Highway (Charters Towers to Townsville) | | | | | |
| Site 92192 | 1,032 | 103 | 2800 | 0.04 | A |
| Site 90060 | 4,894 | 489 | 2800 | 0.17 | C |
| Gregory Developmental Road (Clermont to Belyando Crossing) | | | | | |
| Site 150016 | 334 | 33 | 2800 | 0.01 | A |
| Site 159538 | 412 | 41 | 2800 | 0.01 | A |
| Bowen Developmental Road (Bowen –Collinsville) | | | | | |
| Site 90019 | 758 | 76 | 2800 | 0.03 | A |
| Site 91421 | 2,985 | 299 | 2800 | 0.11 | B |
| Bowen Developmental Road (Collinsville – Belyando Crossing) | | | | | |
| Site 90069 | 38 | 4 | 2800 | 0.001 | A |
| Site 91545 | 754 | 75 | 2800 | 0.03 | A |
| Suttor Developmental Road (Nebo-Mount Coolon) | | | | | |
| Site 82801 | 38 | 4 | 2800 | 0.001 | A |
| Site 82701 | 876 | 88 | 2800 | 0.03 | A |
| Peak Downs Highway (Clermont–Nebo) | | | | | |
| Site 150013 | 612 | 6 | 2800 | 0.001 | A |
| Site 80193 | 3,435 | 344 | 2800 | 0.12 | B |
| Peak Downs Highway (Nebo-Walkerston) | | | | | |
| Site 80009 | 3,893 | 389 | 2800 | 0.14 | A |
| Site 80020 | 6,006 | 601 | 2800 | 0.21 | C |
| Peak Downs Highway (Walkerston- Bruce Hwy) | | | | | |
| Site 82777 | 10,051 | 1,005 | 2800 | 0.36 | D |
| Site 82778 | 15,990 | 1,599 | 2800 | 0.57 | E |
| Kilcummin Diamond Downs Road | | | | | |
| Site 159539 | 52 | 5 | 2800 | 0.001 | A |
| Oxford Downs – Sarina Road | | | | | |
| Site 82782 | 452 | 45 | 2800 | 0.02 | A |

| Road Name | AADT | Flow Volume* | Flow Capacity# | Volume/Capacity | LOS |
|---|---|---|---|---|---|
| Marlborough – Sarina Road | | | | | |
| Site 80011 | 101 | 10 | 2800 | 0.004 | A |
| Site 82823 | 5,157 | 516 | 2800 | 0.18 | C |

Note: *Peak hour, Two-way # Two-way

### 3.1.6 Crash History

The following section summarises historical crash data obtained from the DTMR for roads impacted by the Project (Rail). It should be noted that data across the road network is limited and as a result crash data was only assessed for the following roads:

- Flinders Highway
- Gregory Developmental Road
- Bowen Developmental Road
- Suttor Developmental Road
- Peak Downs Highway
- Marlborough – Sarina Road
- Bruce Highway (Sarina to Mackay)

**Flinders Highway**

A review of crash data was undertaken for a five year period from 2005 to 2009 for the section of Flinders Highway situated between Queenton and Wulguru which is approximately 126 km in length. A summary of the crash data is presented at Table 3-5.

**Table 3-5 Crash History – Flinders Highway (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 9 | 7 | 2 | 18 |
| **2006** | 5 | 16 | 2 | 23 |
| **2007** | 5 | 16 | 0 | 21 |
| **2008** | 6 | 11 | 0 | 17 |
| **2009** | 8 | 10 | 2 | 20 |
| **Total** | 33 | 60 | 6 | 99 |

The crash data reveals:

- In total 99 crashes occurred along the surveyed section of Flinders Highway (126 km in length) over a five year period, which is an average of 0.05 crashes per day or 19.8 per year.
- Six per cent of crashes included a fatality, 61 per cent of the crashes resulted in an injury and 33 per cent in a non-casualty
- Sixty-five per cent were single vehicle crashes, 29 per cent were multi-vehicle crashes, and 20 per cent of crashes occurred at intersections
- Seventy-one per cent of crashes occurred on a weekday, and fatigue was recorded as a contributing factor in 19 per cent of all crashes
- Ninety-four per cent of crashes occurred in dry clear conditions and 59 per cent in daylight

**Gregory Developmental Road**

A review of crash data was undertaken for a five year period from 2005 to 2009 for the section of Gregory Developmental Road situated between Peak Downs Highway and Flinders Highway, approximately 370 km in length. A summary of the crash data is presented at Table 3-6.

**Table 3-6 Crash History – Gregory Developmental Road (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 6 | 6 | 0 | 12 |
| **2006** | 3 | 5 | 0 | 8 |
| **2007** | 2 | 7 | 1 | 10 |
| **2008** | 8 | 8 | 2 | 18 |
| **2009** | 7 | 10 | 0 | 17 |
| **Total** | 26 | 36 | 3 | 65 |

The crash data reveals:

- In total 65 crashes occurred along the surveyed section of Gregory Developmental Road (approximately 370 km in length) over a five year period, which is an average of 0.04 per day or 13 per year.
- Five per cent of crashes included a fatality, 55 per cent of the crashes resulted in an injury and 40 per cent in a non-casualty
- Eighty-three per cent were single vehicle crashes, and 11 per cent were multi-vehicle crashes.
- Forty-eight per cent of crashes hit an object or animal, and fatigue was recorded as a contributing factor in 26 per cent of the crashes

- Seventy-four per cent occurred on a weekday and only five per cent of crashes occurred at intersections
- Ninety-one per cent occurred in dry clear conditions and 80 per cent in daylight

**Bowen Developmental Road**

A review of crash data was undertaken for a five year period from 2005 to 2009 for the section of Bowen Developmental Road situated between Gregory Developmental Road and Bruce Highway, approximately 260 km in length. A summary of the crash data is presented at Table 3-7.

**Table 3-7 Crash History – Bowen Developmental Road (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 2 | 10 | 0 | 12 |
| **2006** | 0 | 10 | 2 | 12 |
| **2007** | 2 | 6 | 0 | 8 |
| **2008** | 5 | 7 | 0 | 12 |
| **2009** | 4 | 15 | 1 | 20 |
| **Total** | 13 | 48 | 3 | 64 |

The crash data reveals:

- In total 64 crashes occurred along the surveyed section of Bowen Developmental Road (approximately 260 km in length) over a five year period, which is an average of 0.04 per day or 13 per year.
- Five per cent of crashes included a fatality, 75 per cent of the crashes resulted in an injury and 20 per cent in a non-casualty
- Seventy-two per cent were single vehicle crashes, and 22 per cent were multi-vehicle crashes
- Forty-five per cent of crashes hit an object or animal, and fatigue was recorded as a contributing factor in 27 per cent of the crashes
- Sixty-nine per cent occurred on a weekday and 11 per cent of crashes occurred at intersections
- Ninety-one per cent occurred in dry clear conditions and 61 per cent in daylight

**Suttor Developmental Road**

A review of crash data over a five year period from 2005 to 2009 was undertaken for the section of Suttor Developmental Road situated between Bowen Developmental Road and Peak Downs Highway, approximately 160 km in length. A summary of the crash data is presented at Table 3-8.

**Table 3-8 Crash History – Suttor Developmental Road (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 0 | 5 | 0 | 5 |
| **2006** | 3 | 2 | 0 | 5 |
| **2007** | 1 | 4 | 0 | 5 |
| **2008** | 1 | 4 | 0 | 5 |
| **2009** | 0 | 1 | 0 | 1 |
| **Total** | 5 | 16 | 0 | 21 |

The crash data reveals:

- In total 21 crashes occurred along the surveyed section of Suttor Developmental Road (approximately 160 km in length) over a five year period, which is an average of 0.01 per day or 4.2 per year.
- Seventy-six per cent of the crashes resulted in an injury and 24 per cent in a non-casualty
- Seventy-six per cent were single vehicle crashes, and 19 per cent were multi-vehicle crashes
- Forty-eight per cent of crashes hit an object or animal, and fatigue was recorded as a contributing factor in 29 per cent of the crashes
- Seventy-one per cent occurred on a weekday and 19 per cent of crashes occurred at intersections
- All crashes occurred in dry clear conditions and 71 per cent in daylight

**Peak Downs Highway**

A review of crash data was undertaken for a five year period from 2005 to 2009 for the section of Peak Downs Highway situated between Gregory Developmental Road and Bruce Highway, approximately 270 km in length. A summary of the crash data is presented at Table 3-9.

**Table 3-9 Crash History – Peak Downs Highway - between Gregory Developmental Road and Bruce Highway (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 27 | 34 | 2 | 63 |
| **2006** | 22 | 32 | 3 | 57 |
| **2007** | 24 | 25 | 2 | 51 |
| **2008** | 28 | 40 | 2 | 70 |
| **2009** | 23 | 37 | 4 | 64 |
| **Total** | 124 | 168 | 13 | 305 |

The crash data reveals:

- In total 305 crashes occurred along the surveyed section of Peak Downs Highway between Clermont and Mackay (approximately 270 km in length) over a five year period, which is an average of 0.17 per day or 61 per year.
- Four per cent of the crashes resulted in a fatality, 55 per cent of the crashes resulted in an injury and 41 per cent in a non-casualty
- Fifty per cent were single vehicle crashes and 44 per cent were multi-vehicle crashes. Two per cent involved pedestrians
- Seventy-eight per cent occurred on a weekday, 84 per cent occurred in dry clear conditions and 66 per cent in daylight
- Fatigue was a contributing factor in 21 per cent of the crashes

**Marlborough – Sarina Road**

A review of crash data was undertaken for a five year period from 2005 to 2009 for the section of Marlborough – Sarina Road situated between Oxford Downs Sarina Road and Sarina, approximately 55 km in length. A summary of the crash data is presented at Table 3-10.

**Table 3-10 Crash History – Bruce Highway – Sarina to Mackay (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 5 | 4 | 0 | 9 |
| **2006** | 1 | 4 | 0 | 5 |
| **2007** | 7 | 3 | 0 | 10 |
| **2008** | 4 | 5 | 1 | 10 |
| **2009** | 4 | 11 | 0 | 15 |
| **Total** | 21 | 27 | 1 | 49 |

The crash data reveals:

- In total 49 crashes occurred along the surveyed section of Marlborough – Sarina Road between Oxford Downs Sarina Road and Sarina (approximately 55 km in length) over a five year period, which is an average of 0.03 per day or 10 per year.
- Two per cent of the crashes resulted in a fatality, 55 per cent of the crashes resulted in an injury and 43 per cent in a non-casualty
- Thirty-nine per cent were multi-vehicle crashes and 55 per cent were single vehicle. Two per cent involved pedestrians
- Fifty-three per cent occurred on a weekday, 84 per cent occurred in dry clear conditions and 74 per cent in daylight

**Bruce Highway (Sarina to Mackay)**

A review of crash data was undertaken for a five year period from 2005 to 2009 for the section of Bruce Highway situated between Sarina and Mackay, approximately 35 km length. A summary of the crash data is presented in Table 3-11.

**Table 3-11 Crash History – Bruce Highway – Sarina to Mackay (2005-2009)**

| Year | Non-Injury | Injury | Fatal | Total |
|---|---|---|---|---|
| **2005** | 39 | 38 | 3 | 80 |
| **2006** | 27 | 39 | 0 | 66 |
| **2007** | 35 | 41 | 0 | 76 |
| **2008** | 24 | 47 | 2 | 73 |
| **2009** | 35 | 41 | 0 | 76 |
| **Total** | 160 | 206 | 5 | 371 |

The crash data reveals:

- In total 371 crashes occurred along the surveyed section of Bruce Highway between Sarina and Mackay (approximately 35 km length) over a five year period, which is an average of 0.20 per day or 74 per year.
- One per cent of the crashes resulted in a fatality, 56 per cent of the crashes resulted in an injury and 43 per cent in a non-casualty
- Seventy-one per cent were multi-vehicle crashes and 25 per cent were single vehicle; two per cent involved pedestrians
- Seventy-six per cent occurred on a weekday, and 85 per cent occurred in dry clear conditions and 70 per cent in daylight

**Summary of Crash History**

The key trends identified from the review of road corridors impacted by the Project (Rail) are:

- Most roads are over 30 km in length, are high speed travel environments and have at least one recorded fatality
- Single vehicle crashes are a significant contributing crash trend along with crashes involving animals and fatigue

### 3.1.7 Asset Condition

The Project (Rail) will cross dedicated public road reserves, private (farm) trails within private property and stock crossings. A number of these roads which would intersect the Project (Rail) are currently unsealed. These unsealed road conditions may be impacted if used as a haulage route during the construction of the Project (Rail) from the deterioration of road condition under heavy and repetitive loadings, particularly in wet conditions.

Narrow carriageways and/or undulating road alignments along some of these routes could also create safety or operation issues for some large construction vehicles accessing the Project (Rail).

### 3.1.8 Urban Areas

Table 3-12 provides a summary of townships located along the potential haulage routes, which may be impacted during the construction of the Project (Rail). Most of the haulage routes avoid key regional centres, and routes to the port are planned to utilise designated heavy vehicle routes to minimise impact on towns.

**Table 3-12 Townships Potentially Impacted During Construction**

| Township Name | Township Type | Population Size |
|---|---|---|
| Townsville | Regional Centre | 145,000 |
| Charters Towers | Local Centre | 8,000 |
| Bowen | Local Centre | 15,000 |
| Collinsville | Local Centre | 2,000 |
| Mount Coolon | Local Centre | 200 |
| Mackay | Regional Centre | 85,000 |
| Sarina | Local Centre | 3,500 |
| Nebo | Local Centre | 7,000 |
| Moranbah | Local Centre | 7,000 |
| Clermont | Local Centre | 2,000 |

## 3.2 Existing Rail Network

### 3.2.1 Overview

The Project (Rail) will provide a connection between the Mine and the existing Goonyella rail system. The planned junction with the existing Goonyella rail system is anticipated to be located approximately 8 km south of Moranbah.

Coal from the Mine will be transported to ports at Hay Point (Dudgeon Point expansion) and Abbot Point. Figure 3-2 shows the following:

- Existing rail network, including the Goonyella to Abbot Point Expansion (GAPE) connecting the Goonyella and Newlands rail systems north of Moranbah
- Location of the Project (Rail) connection to the Goonyella rail system


LEGEND

- Town
- Major Port
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

Other Rail Networks

- Finch Hatton Branch
- Goonyella System
- Great Northern Line
- Newlands System
- North Coast Line
- Townsville Mount Isa



1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

**Adani Mining Pty Ltd**

Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision D
Date 04-09-2012

Existing Rail Network

Figure: 3-2

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Data Source: © Commonwealth of Australia (Geoscience Australia): Towns, Railways (2007); DERM: LGA (2011); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (SP1 & 2) (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, JVC, MS

### 3.2.2 Goonyella Rail System

The Goonyella rail system is owned and operated by QR National and comprises of approximately 925 km of narrow gauge rail line servicing 30 coal mines in the Bowen Basin. The Goonyella rail system is fully electrified, with the overhead line equipment operating at 25,000 volts, 50 Hertz alternating supply, and the predominant train type is three electric locomotives hauling 120 wagons. The track is a bi-directional duplicated track between Dalrymple Junction, near Hay Point and Wotonga, near Moranbah, with the remainder being single line.

QR National has a current program of capacity upgrades which will initially increase capacity from the current 129 Mtpa to 140 Mtpa for export via the Port of Hay Point (and the proposed Dudgeon Point expansion).

The GAPE, completed in December 2011, provides a link from the existing Goonyella rail system to the Newlands rail system, therefore enabling export of coal from the northern Bowen Basin through the Port of Abbot Point. The completion of the GAPE sees the capacity of Abbot Point Coal Terminal 1 increase to 50 Mtpa.

### 3.2.3 Newlands Rail System

The Newlands rail system is owned and operated by QR National and comprises of approximately 190 km of narrow gauge single track rail line. The Newlands rail system is capable of operating with diesel trains which predominantly consist of three diesel locomotives hauling 82 wagons.

It services three coal mines in the northern Bowen Basin and is currently contracted to export 17 Mtpa. QR National is developing master plans for the expansion of the Newlands rail system to accommodate rail movement transporting 120 Mtpa of coal.

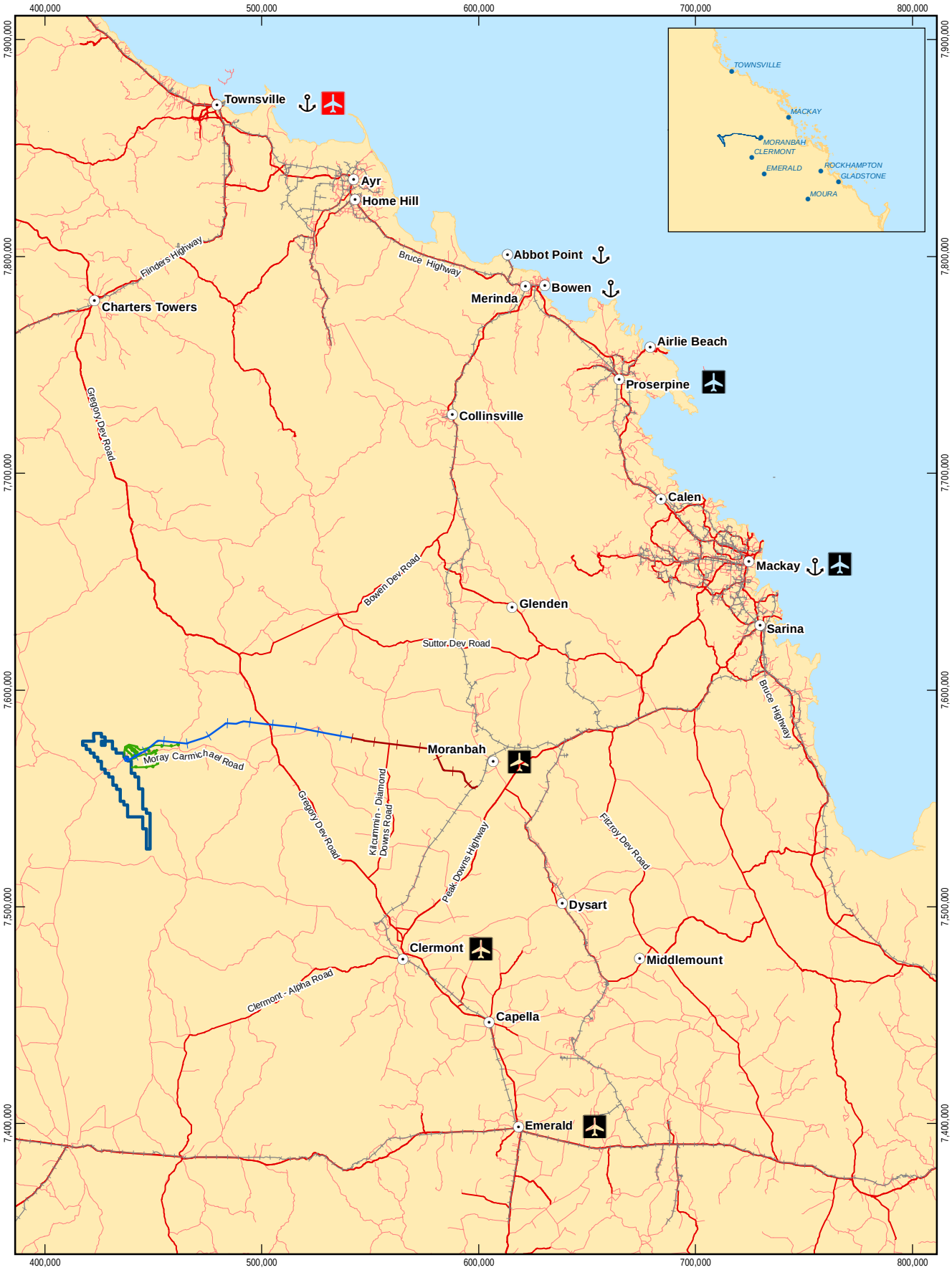
## 3.3 Existing Port Facilities

### 3.3.1 Overview

It is anticipated that the following ports could be utilised for both the transfer of supplies and equipment and the export of coal in the Project's operational phase:

- Townsville – major port with nine working berths that currently accommodates international shipping with supporting warehousing facilities
- Mackay – port with four working berths that currently accommodates international shipping and supporting warehousing facilities
- Hay Point – dedicated coal export facility
- Abbot Point – dedicated coal export facility
- Bowen – limited facilities and not currently used as an active cargo port. It mainly functions as a domestic facility and a base for tug boats that service the Abbot Point Coal Terminal

Figure 3-3 shows existing port and airport facilities within the Study Area.




LEGEND

- Town
- Major Port
- Airport International
- Airport Regional
- State Road
- Local Road
- Existing Rail Network
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)



1:2,500,000 (at A4)

0 20 40 60 80 100

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

**Adani Mining Pty Ltd**

Carmichael Coal Mine and Rail Project

## Location of Ports and Airports in the Project (Rail) Region

| | |
|---|---|
| Job Number | 41-25215 |
| Revision | E |
| Date | 04-09-2012 |

Figure: 3-3

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data Source: GA: Gazetted Names (2008) - Airports/Ports; DMR: State Roads (2008); DME:EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW,JVC.

### 3.3.2 Cargo Ports

**Townsville**

The Port of Townsville comprises nine berths catering for the import and export of a number of commodities, including:

- Fuel, oil and liquid petroleum gas
- Minerals, nickel ore, lead ingots, copper and zinc concentrates
- Containers
- Frozen beef and live cattle
- Cement
- Sugar and molasses
- Sulphuric acid and fertiliser
- Scrap metal, timber and general cargo
- Cruise ships

Commodities are supplied to the port via both rail and road. Townsville provides facilities suitable for the import of construction materials, components and pre-assembled modules for construction of the Project (Rail).

The port is operated by Port of Townsville Limited, which is currently invesitgating an expansion to develop six new berths and reclamation of approximately 100 ha.

**Mackay**

The Port of Mackay is located within Mackay harbour and is Queensland's fourth busiest multi-commodity port in terms of cargo throughput. The port is operated by North Queensland Bulk Ports Corporation Limited (NQBP). The port comprises four berths catering for the import and export of a number of commodities, including:

- Sugar and sugar products, such as molasses
- Grain
- Sulphuric acid and fertilisers
- Petroleum and ethanol
- Vehicles and machinery

Cargo is supplied to Mackay via both rail and road. Mackay provides facilities suitable for the import of construction materials, components and pre-assembled modules for construction of the Project (Rail).

### 3.3.3 Coal Export Ports

**Port of Hay Point and Associated Coal Export Terminals**

The Port of Hay Point is located approximately 40 km south of Mackay and is operated by NQBP. The port is one of the largest coal terminals in the world. The port comprises two separate coal export terminals, Dalrymple Bay Coal Terminal (DBCT), leased from the State government by DBCT Management Pty Ltd, and the Hay Point Coal Terminal (HPCT), owned and operated by BHP Billiton Mitsubishi Alliance.

Each terminal comprises rail in-loading facilities, onshore coal handling and stockpile areas, and offshore wharves. The offshore wharves are serviced by conveyor systems, supported jetties to deliver coal to the offshore facilities. The DBCT wharf is 3.8 km offshore and includes three ship-loaders. The HPCT is 1.8 km offshore with two ship-loaders.

In 2010-11, total throughput for the port was approximately 88 Mt, of which 33 Mt was through HPCT and 55 Mt through DBCT, which was supplied by the Goonyella rail system.

NQBP is currently undertaking environmental and engineering studies for the development of the Dudgeon Point expansion at the port. The expansion comprises two new terminals providing an expected 180 Mtpa additional capacity to the port. Adani and Dudgeon Point Project Management Pty Ltd were selected as preferred developers of the Dudgeon Point project in 2010. Dudgeon Point is expected to commence operations in 2015/2016.

**Port of Abbot Point and Associated Coal Export Terminals**

The Port of Abbot Point is operated by NQBP. The Port of Abbot Point is located approximately 25 km north of Bowen and is Australia's most northerly coal port. The port comprises a single coal export terminal, Abbot Point Coal Terminal 1, which is operated (under long-term 99 year lease) by Adani Abbot Point Terminal Pty Ltd, a subsidiary of the Adani Group.

Abbot Point Coal Terminal 1 comprises a rail in-loading facility, coal handling and stockpile areas, and a dual trestle jetty and conveyors connected to two berths and ship-loaders, located 2.75 km offshore, with a capacity of 50 Mtpa. Coal is supplied to the port via the Newlands rail system.

Adani Abbot Point Terminal Pty Ltd is proposing to develop a second terminal, Terminal 0, in 2013, which will provide an additional rail in-loading facility, coal handling and stockpile areas, and a second trestle jetty and conveyors connected to two additional berths and ship-loaders. This will be located east of the existing terminal and have a capacity of 35 Mtpa.

Two other terminals, Terminal 2 and Terminal 3, are also currently proposed for development in 2013-2014 each having a nominal capacity of 60 Mtpa.

## 3.4 Existing Airport Facilities

There is one international airport, two domestic airports, one regional airport and numerous additional local airstrips in the vicinity of the Study Area. A proposed personnel transport strategy for the Project (Rail) construction phase is likely to require a proportion of fly-in fly-out (FIFO) with the workforce transported by coaches for transfer between construction camps and airports. Domestic and regional airports and local airstrips that could potentially serve construction workers as part of FIFO employment contracts are located at Townsville, Mackay,

Proserpine, Emerald, Moranbah, Clermont, Bowen and Collinsville as listed in Table 3-13 and discussed below.

**Table 3-13 Existing Airport Facilities**

| Runway No. | Length (m) | Width (m) | Surface | Lighted |
|---|---|---|---|---|
| **Townsville** | | | | |
| 1 | 1,100 | 30 | Asphalt | Yes |
| 2 | 2,438 | 45 | Asphalt | Yes |
| **Mackay** | | | | |
| 1 | 1,344 | 30 | Asphalt | Yes |
| 2 | 1,981 | 45 | Asphalt | Yes |
| **Proserpine** | | | | |
| 1 | 1,100 | 30 | Asphalt (unmarked) | Yes |
| 2 | 2,073 | 45 | Asphalt | Yes |
| **Emerald** | | | | |
| 1 | 926 | 18 | Gravel | Yes |
| 2 | 1,900 | 30 | Asphalt | Yes |
| **Moranbah** | | | | |
| 1 | 1,524 | 30 | Asphalt | Yes |
| **Clermont** | | | | |
| 1 | 1,068 | 30 | Gravel | No |
| 2 | 1,311 | 30 | Asphalt | Yes |
| **Bowen** | | | | |
| 1 | 1,003 | - | Grass | No |
| 2 | 1,341 | - | Grass | No |
| **Collinsville** | | | | |
| 1 | 1,402 | - | - | No |

### 3.4.1 International Airports

Townsville International Airport is the largest and only international airport in the Central Queensland region, providing connections from capital cities with direct flights servicing Brisbane, Melbourne and Sydney to outlying Central and North Queensland. The airport is situated approximately five km to the north of Townsville City centre.

The airport has two runways, of which the longest is 2,438 m. Townsville International Airport has four aerobridges (one international and three domestic) for aircraft up to the size of Boeing 767; and three ground level tarmac departure / arrival gates for regional flights at the northern end of the terminal.

Passenger airlines operating from Townsville International Airport include Qantas, Virgin Australia, Jetstar, Skytrans and American Airlines.

A number of mining charter flights also currently operate from Townsville International Airport to Cannington Mine, Century Mine, Phosphate Hill Mine, Mount Isa, Osbourne Mine, Mount Dore, Selwyn Mine and Emerald. The airlines which provide these chartered flights include Alliance Airlines and Brindabella Airlines.

### 3.4.2 Domestic Airports

#### Mackay

Mackay Airport is a domestic airport that operates flights to Brisbane, Sydney, Melbourne, Gladstone, Rockhampton, Townsville and Cairns. Airlines operating from Mackay Airport include Jetstar, Pel-Air (cargo), Qantas, Tiger Airways and Virgin Australia.

Mackay Airport has two asphalt surfaced runways, of which the longest is 1,981 m. This places a limitation on the type of aircraft it can handle.

#### Proserpine

Proserpine Airport is a domestic airport located approximately 10 km south of Proserpine. It has two runways, of which the longest is 2,073 m. Jetstar and Virgin Australia currently operate daily flights between Proserpine and Brisbane.

### 3.4.3 Regional Airports

Emerald Airport is a regional airport located approximately six km from the town of Emerald. It has two runways, of which the longest is 1,900 m. Australian Air Express, Sunstate Airlines and Virgin Australia currently operate flights between Emerald and Brisbane.

### 3.4.4 Local Airports

Table 3-14 gives the approximate distance from airports to Bowen, Collinsville, Glenden and Moranbah, which are situated in the vicinity of the Study Area. Each of the above townships also have their own airstrips as identified below. It should be noted that the eastern end of the Project (Rail) is in close proximity to Moranbah airport.

**Table 3-14 Distances (km) of Townships to Airports**

| | Bowen | Collinsville | Glenden | Moranbah |
|---|---|---|---|---|
| Clermont | 440 | 348 | 272 | 113 |
| Mackay | 192 | 273 | 165 | 194 |
| Proserpine | 68 | 149 | 258 | 287 |
| Townsville | 203 | 277 | 386 | 549 |

**Moranbah**

Moranbah Airport is located off Goonyella Road, approximately six km south of Moranbah. The airport has one runway which is 1,524 m long.

Works at the airport (completed mid-2011) included resurfacing the airport runway, improving safety and enabling the airport to be used by larger capacity Q400 aircraft.

The airlines currently operating from Moranbah Airport include QantasLink and Skytrans, with flights operating between Moranbah and Brisbane, Cairns, Townsville and Sunshine Coast.

**Clermont**

Clermont Airport has two runways, of which the longest is 1,311 m. It is situated just off the Peak Downs Highway near Clermont. Clermont Airport is operated by the IRC and caters to FIFO workforces of nearby mines.

**Bowen**

Bowen Airport has two runways, of which the longest is 1,341 m.

**Collinsville**

Collinsville Airport has one runway which is 1,402 m long.

## 3.5 School and Public Transport Services

No public transport or school bus services have been identified in close proximity to the Project (Rail). Services are assumed to occur in the wider region.

School bus routes in and around Clermont and Moranbah utilise sections of the Peak Downs Highway between Moranbah and Clermont.

## 3.6 Summary of Key Findings

The assessment of the existing traffic and transport conditions in the vicinity of the Project (Rail) has identified:

- The majority of state-controlled roads could potentially be utilised as haulage routes to the Project (Rail) sites and have available capacity to accommodate additional traffic.
- Crash data (for the period 2005 to 2009) obtained from DTMR highlights that the potential haulage route between the Project (Rail) and Townsville, via Flinders Highway and Gregory Developmental Road, has a lower crash rate compared to the other haulage route alternatives.

- Flinders Highway, Gregory Developmental Road and Peak Downs Highway are designated Road Train routes and the Bruce Highway is a designated B-Double route.
- The shortest potential haulage route to the western end of the proposed rail line using the least amount of unsealed roads is to Townsville, via Flinders Highway and Gregory Developmental Road.
- The shortest potential haulage route to the eastern end of the proposed rail line using the least amount of unsealed roads is to Mackay via the Bruce Highway and Peak Downs Highway.
- Peak Downs Highway has a LOS D and LOS E during peak periods at its eastern end.
- Moranbah Airport has an asphalt running surface and lighting and is capable of accommodating regional air services.
- The majority of ports assessed have the capabilities to accommodate construction material imports.

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# 4. Proposed Construction Arrangement

## 4.1 Construction Activities

### 4.1.1 Overview

The Project (Rail) will be constructed over a period of approximately two years, commencing in late 2013. The Mine will be developed in stages over a longer time period with the first stages opening on completion of the Project (Rail).

Logistics planning for the Project indicates that traffic volumes generated by the construction of the Project (Rail) will vary and depend on the construction timetable. The logistics plan for construction of the Project (Rail) has been categorised as follows:

- Temporary construction camps – there are proposed to be four construction camps to facilitate the construction of the Project (Rail).
- Earthworks and civil activities – the civil component materials and associated machinery for bridges, drainage structures and earthworks.
- Track-laying activities - the materials, plant and associated machinery required for the construction of the railway tracks, including ballast, rail and sleepers.
- Maintenance yard – materials required for the construction of the maintenance yard.

Refer to Section 4.1.4 and Table 4-4 for a further understanding of construction stage relationships with truck movements.

### 4.1.2 Construction Hours

For the purposes of this study, it has been assumed that the standard hours of construction for the total duration of the construction period would be 12 hours per day (including two hours for travel and 10 hours working), seven days a week. Construction workers are assumed to work 13 days in a fortnight with one week rostered off every three weeks.

It has been assumed that the haulage of materials and plant would operate seven days a week, although this would not be continuous throughout the construction period. Material deliveries would most likely come from Townsville or Mackay and there may also be some night time haulage to the site.

### 4.1.3 Construction Traffic (Vehicles and Equipment)

Various types of machinery will be used for the construction of the railway. The different types of heavy vehicles that are required are three-, five- and seven-axle trucks, flatbed semitrailers, extendable trailers and B-doubles to transport plant and material to the site.

The tipper and standard truck sizes are expected to be mostly utilised for the transporting of material and equipment along haulage routes and the internal road corridor which will be constructed as part of the Project (Rail). Vehicles, crane, excavator, bulldozer, drilling and boring machinery will be brought to site in most cases on standard sized trucks and then

transferred between construction zones. In some cases oversized vehicles may be required to transport large equipment.

### 4.1.4 Construction Staging

The construction of the Project (Rail) is anticipated to commence in 2013 and continue for a period of two years. Table 4-1 presents the likely staging of the works, with an indication of the expected duration. The information provided in Table 4-1 has been used to estimate the worst case traffic volumes on the surrounding road network and is detailed in Section 4.1.5.

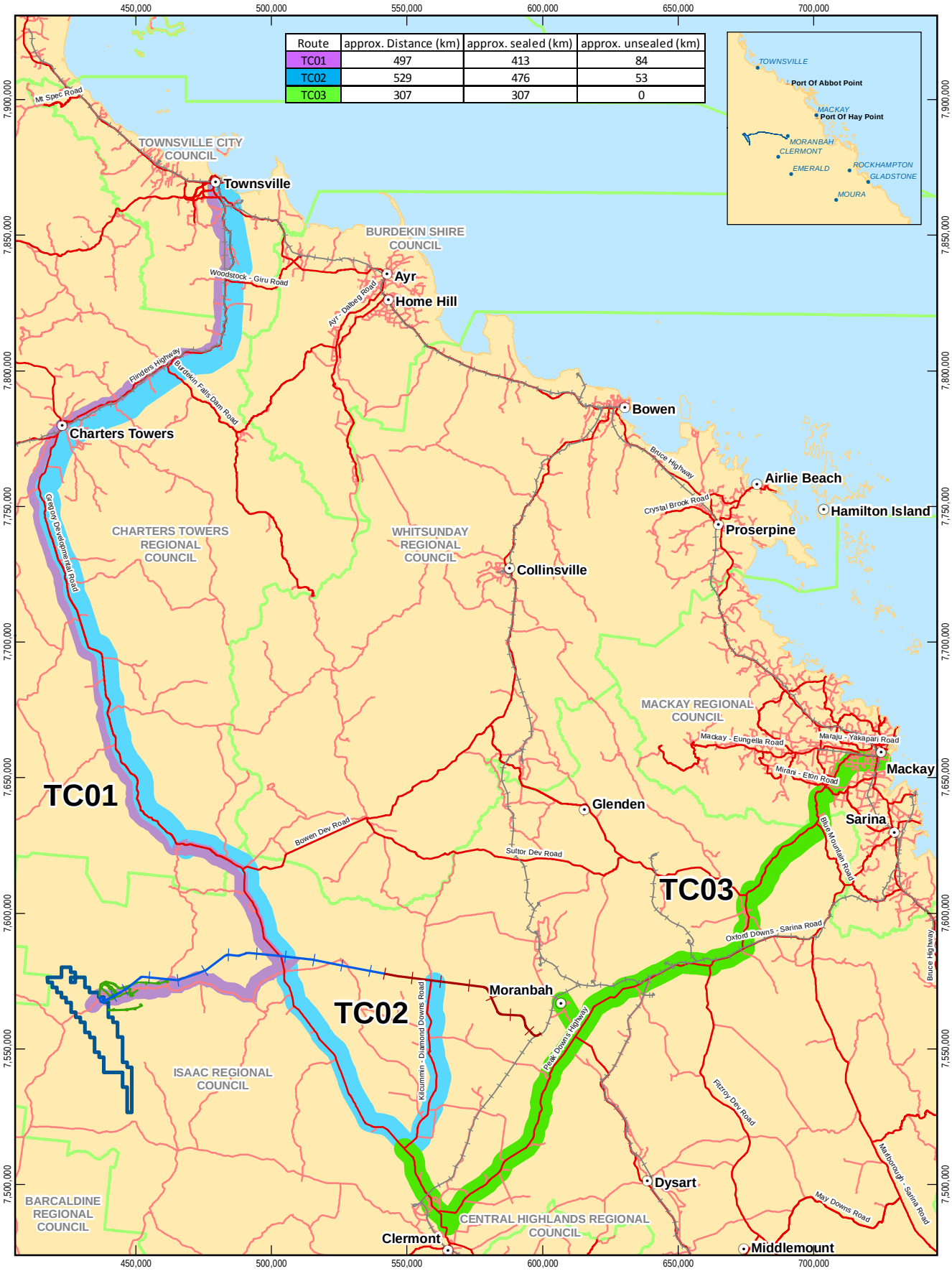
**Table 4-1 Staging of Construction Components**

| Activity | Duration |
|---|---|
| Track-laying Activities | 11 months |
| Maintenance Yard | 8 months |
| Workers Camps | 13 months |
| Earthworks and Civil Activities | 16 months |

### 4.1.5 Transport Routes for Construction Vehicles

Direct construction access is proposed to be provided adjacent to all rail works within the Project (Rail) corridor, and will be sized to allow free flow and unhindered access for all construction and support traffic vehicles. Designated access points will be utilised for the transport of water, personnel, fuel and materials for maintenance purposes. Construction access would be provided adjacent to the rail works and typically be located on the northern side within the Project (Rail) corridor. The intersections of the construction access road with the primary access roads will be designed and constructed during the site preparation/mobilisation period.

Transport corridors have been identified for the purposes of assessing the impact of construction traffic on the surrounding road network. These corridors comprise both state and local controlled roads and will be used as the primary routes during the construction phase for transporting of equipment and materials. These routes are identified in Figure 4-1 and Table 4-2. The selection of routes will be based on the location of works along the Project (Rail) corridor (east or west) and findings presented in Section 3.6.




LEGEND

- Town
- Major Port
- Other Rail Network
- State Road
- Local Road
- Rail (West)
- Rail (East)
- Mine (Onsite)
- Mine (Offsite)
- Local Government Area



1:2,000,000 (at A4)
0 10 20 30 40 50
Kilometres
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

**Adani Mining Pty Ltd**
Carmichael Coal Mine and Rail Project

Project (Rail)
Indicative Haulage Routes

Job Number 41-25215
Revision G
Date 13-09-2012

Figure: 4-1

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com


Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses, Roads (2007); DME: EPBC1690 (2010), EPC1080 (2011); GHD: Rail Options, Major Ports (2010), Adani: Alignment Opt9 Rev3 (SP1&2) (2012); Gassman/Hyder: Mine (Offsite) (2012), DERM: Local Government Boundaries (2012). Created by: BW, AJ

**Table 4-2 Indicative Transport Corridors**

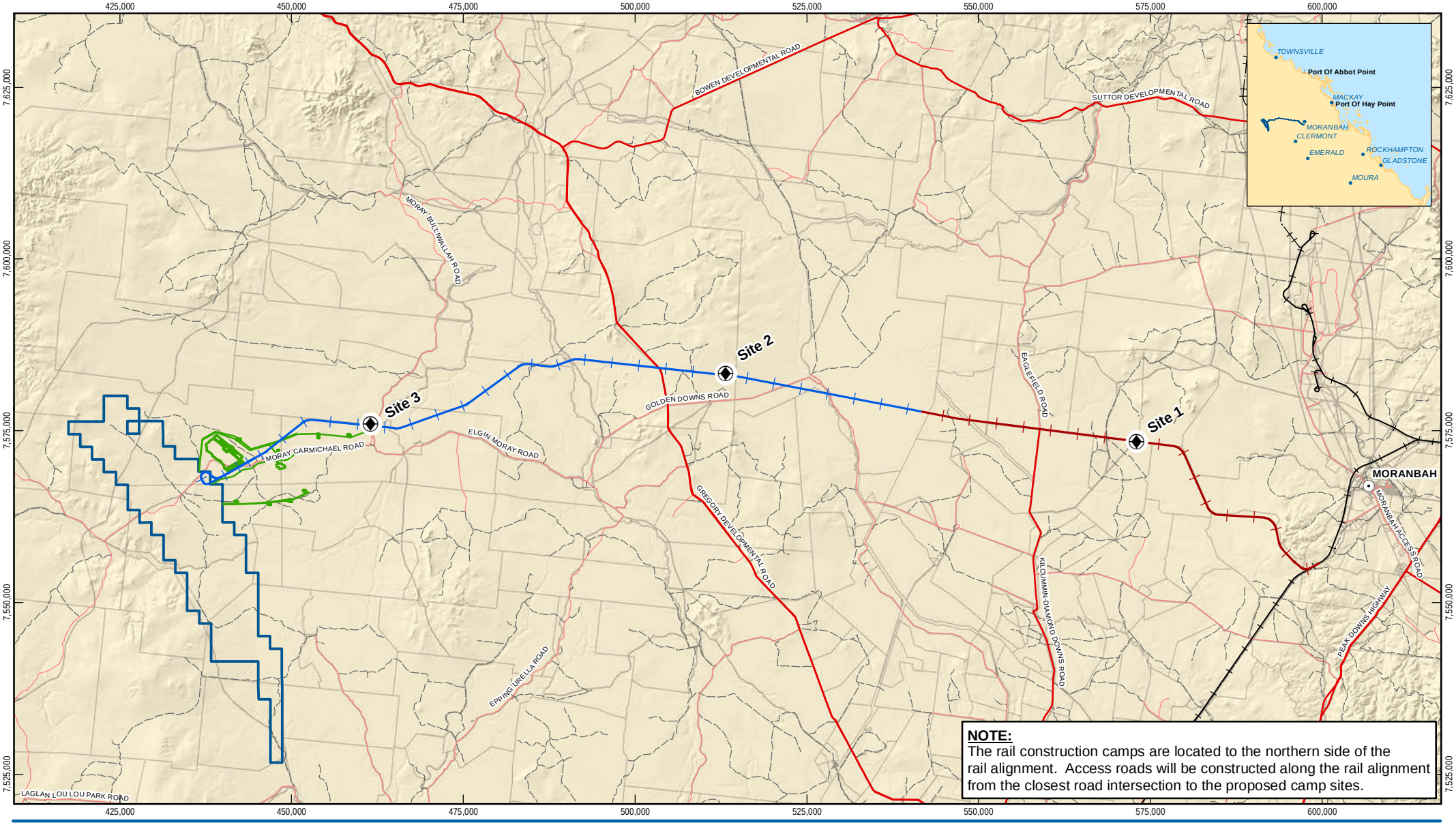
| Transport Corridor | State Road | Local Road | Comments |
|---|---|---|---|
| TC01 | Gregory Developmental Road | | Access from Townsville to west end of the rail line |
| | Flinders Highway | Moray Carmichael Road | Covers 497 km of which 84 km is unsealed. |
| | Gregory Developmental Road | Elgin Moray Road | |
| | | Moray Bulliwallah Road | |
| TC02 | Flinders Highway | | Access from Townsville to Kilcummin Diamond Downs Road on the eastern side of Project (Rail). |
| | Gregory Developmental Road | | Covers 529 km with 53 km unsealed. |
| | | Kilcummin Diamond Downs Road | |
| TC03 | Peak Downs Highway | Goonyella Road | Access from Mackay to the construction depot near Gregory Development Road |
| | Bruce Hwy | | Covers 193 km of sealed road. |
| | | Hay Point Road | |

## 4.2 Temporary Construction Camps

Four evenly spaced temporary construction camps (with a spacing of less than 60 km between each camp) are proposed along the Project (Rail). One of the camps is proposed to coincide with the Project (Mine) workers accommodation village. Figure 4-2 shows the proposed construction camps' locations.

Workers will be transported from camps to work sites by four wheel drive vehicles or buses. The maximum allowed speed on internal haul routes in the transport corridor will be limited to 40 km/h. This will result in a maximum travel time to the furthest work site of approximately 35 minutes.

Camp locations are where possible (and subject to landowner negotiations) located in close proximity to existing access roads. Access between camps and work areas will as far as possible be provided via the construction haul road within the Project (Rail) corridor.




**NOTE:**
The rail construction camps are located to the northern side of the rail alignment. Access roads will be constructed along the rail alignment from the closest road intersection to the proposed camp sites.

1:750,000 (at A4)
0 5 10 15 20 25
Kilometres
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND
- Town
- Construction Camp
- Existing Railway
- State Road
- Local Road
- Track
- Rail (West)
- Rail (East)
- Mine (Onsite)
- Mine (Offsite)
- Cadastral Parcel

**Adani Mining Pty Ltd**
Carmichael Coal Mine and Rail Project

Project (Rail)
Location of Construction Camps

Job Number 41-25215
Revision D
Date 04-09-2012

Figure 4-2

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Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007); Adani: Alignment Opt9 Rev3 (SP1&2) (2012), Construction Camps (2011); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

## 4.3 Construction Traffic Generation

### 4.3.1 Overview

The peak traffic generated during the construction phase is likely to be associated with the transporting of plant, equipment and material deliveries. An indication of these activities is listed in Table 4-3.

**Table 4-3 Construction Plant and Material**

| Construction Activity | Plant and material required |
|---|---|
| Track Laying Activities | Trucks, flatbed trailers, track excavator, sleep gantry, portal cranes and rollers, loaders and excavators, wagons, ballast hoppers and engines.<br>Ballast, sleepers, short rail lengths, fencing to be transported by road. |
| Maintenance Yard | Trucks and flatbed trailers, bridge cranes.<br>Wash bay, service sheds, storage areas, storage tanks, fencing. |
| Construction Camps | Trucks, flatbed trailers<br>Accommodation, portable water, storage tanks, electricity. Fuel supply, bridge structures, drainage. |
| Imported Fill | Fill material (sourced externally from site) |
| Bulk Earthworks | Dozers, excavators, trucks, scrapers, watercarts, graders, compaction equipment.<br>Clearing, grubbing, topsoil stripping, haul road construction. |
| General Cut | Dozers, scrapers, watercarts, excavators, trucks, compactors, grader, roller.<br>General cut, excavate and haul. |
| Drainage | Excavators, backhoes, watercart, compaction equipment. |
| Drainage Rock Protection Head Walls | Excavators, rock hauling truck. |

### 4.3.2 Total Construction Truck Movement

Table 4-4 provides the estimated truck movements associated with the construction of the Project (Rail). This estimate is based on the Project's Logistics Study (GHD, 2012). It is noted that traffic movements provided in Table 4-4 are trips to and from site (two-way trips) and have been estimated on the basis of an inbound and outbound movement per delivery. Project (Rail) construction truck movements provided in Table 4-4 have been used to estimate peak daily heavy vehicle generation along each transport corridor.

**Table 4-4 Summary of Estimated Rail Line Construction Truck Movements by Category**

| Category | Estimate of Rail Line Construction Truck Movements (two-way) |
|---|---|
| Track-laying Activities | 48,430 |
| Maintenance Yard | 2,150 |
| Construction Camps | 3,220 |
| Earthworks and Civil Activities | 540,900 |
| Total | 594,700 |

Peak traffic volumes are associated with earthworks and civil works (91 per cent of truck movements) over the first year of construction.

Table 4-5 provides an understanding of the expected heavy vehicle traffic profile over the duration of the Project (Rail), which was extracted from data presented in the logistic planning for the Project.

### 4.3.3 Traffic Distribution

The following principles have been considered in the development of traffic distribution for proposed transport corridors:

- The majority of materials associated with earthworks and track laying (ballasting) activities would be sourced from local quarry and borrow locations, where suitable material is available, and would utilise the rail corridor access track in addition to the following roads:
  - Gregory Developmental Road
  - Moray Carmichael Road
  - Kilcummin Diamond Downs Road
  - Suttor Developmental Road
- All remaining construction traffic travelling to the western end of the Project (Rail), including the construction camp situated at the Mine, will utilise the Gregory Developmental Road for the movement of construction site material and equipment to/from Townsville.
- Construction traffic travelling to the eastern end of the Project (Rail), including construction camps, will utilise Peak Downs Highway for the movement of site materials and equipment to/from Mackay.
- It is assumed that construction of the Project (Rail) will progress from the construction depot near Gregory Developmental Road. The track would first be laid from the construction depot towards the mine and thereafter from the construction depot towards Moranbah. The track works will require all bridges, drainage structures and formation capping layers to be completed ahead of rail infrastructure and trade installations.

Traffic distributions for each proposed transport corridor have been established on the basis of assumptions and information as presented in the logistics planning for the Project. Table 4-5 estimates the number of heavy vehicle construction movements for each transport corridor using activity proportions as presented in the Logistics Study (GHD, 2012).

**Table 4-5 Estimated Average Heavy Vehicle Traffic Generation**

| Category | Number of Heavy Vehicle Construction Movements (two way) | | |
|---|---|---|---|
| | TC01 (Camps 3 and 4) | TC02 (Camp 2) | TC03 (Camp 1) |
| Track-laying Activities | - | - | 48,430 |
| Maintenance Yards | 2,150 | - | - |
| Construction Camps | 1,620 | 810 | 810 |
| Earthworks and Civil Activities | 180,300 | 180,300 | 180,300 |
| Total | 184,070 | 181,110 | 229,540 |
| Proportion | 31% | 30% | 39% |

A summary of the estimated average daily construction vehicle movements along each transport corridor is provided below:

- TC01 - western end of Project (Rail), Gregory Developmental Road and construction camps 3 and 4 = 31 per cent
- TC02 - Kilcummin Diamond Downs Road and construction camp 2 = 30 per cent
- TC03 - Moranbah (eastern end of rail line) Peak Downs Highway and construction camp 1 = 39 per cent

### 4.3.4 Heavy Vehicle Movement

The average heavy vehicle generation is the total number of truck movements generated over the construction duration of the Project (Rail) rail line divided by the number of months (24) and days (30 days per month) respectively as presented in Table 4-6.

It should be noted that the figures provided in Table 4-6 represent trips to and from site and are estimated on the basis of two truck movements per delivery.

**Table 4-6 Estimated Average Heavy Vehicle Generation (two way)**

| Transport Corridor ID | Monthly Heavy Vehicle Traffic | Daily Vehicle Traffic | State Controlled Roads to be Impacted |
|---|---|---|---|
| TC01 | 7,700 | 260 | Gregory Developmental Road/Flinders Highway |
| TC02 | 7,580 | 250 | Kilcummin Diamond Downs Road/Gregory Developmental Road/Flinders Highway |
| TC03 | 9,600 | 320 | Peak Downs Highway |

Table 4-7 provides a summary of the worst case construction heavy vehicle movements along the state-controlled roads. The worst case peak heavy vehicle generation is based on the month of September 2013. The Project (Rail) construction related movements, which attracts peak construction movement of approximately 50,910 vehicle trips per month. It is noted that traffic movement provided in Table 4-7 is a two-way trip by a truck. The worst case traffic generation has been used in the traffic impact assessment detailed in Section 6.4.

**Table 4-7 Estimated Worst Case Heavy Vehicle Traffic Generation (two way)**

| Transport Corridor ID | Monthly Heavy Vehicle Traffic | Daily Vehicle Traffic | State Controlled Roads to be Impacted |
|---|---|---|---|
| TC01 | 15,760 | 525 | Gregory Developmental Road/Flinders Highway |
| TC02 | 15,510 | 517 | Kilcummin Diamond Downs Rd/Gregory Developmental Road/Flinders Highway |
| TC03 | 19,640 | 655 | Peak Downs Highway |

### 4.3.5 Construction Workforce Movements

It is understood that there would be up to 400 people at each temporary construction camp at any given time. Construction workers will operate on a FIFO basis to airports in the vicinity of the Project (Rail). Personnel would then be transferred to the construction camps via buses.

The workforce is expected to leave the temporary construction camp between the hours of 5:00 and 7:00 a.m. and return between 5:00 pm and 7:00 pm. Staff will be situated in the vicinity of the Project (Rail) and utilise as far as possible the Project (Rail) construction access road, and as a result will have minimal impact on the external road network.

The proposed access routes to the temporary construction camps are detailed in Table 4-8.

**Table 4-8 Details of Temporary Construction Camps and Proposed Coach Routes**

| Camp | Location | Peak Occupancy | Peak External Movements Per Week | Proposed FIFO Airport | Proposed Coach Route |
|---|---|---|---|---|---|
| 1 | Rail (East) | 400 | 10 | Moranbah | Moranbah to Moranbah Camp Site |
| 2 | Kilcummin Diamond Downs / Eagle Field Road | 400 | 10 | Moranbah/Clermont | Moranbah to Camp 2 via Peak Downs Highway, Wuthing Road (if suitable)and Kilcummin Diamond Downs Road |

| Camp | Location | Peak Occupancy | Peak External Movements Per Week | Proposed FIFO Airport | Proposed Coach Route |
|---|---|---|---|---|---|
| | | | | | Clermont to Camp 2 via Gregory Developmental Road and Golden Downs Road |
| 3 | Gregory Developmental Road | 400 | 10 | Moranbah/Clermont | Moranbah to Camp 3 via Peak Downs Highway, and Gregory Developmental Road<br>Clermont to Camp 3 via Gregory Developmental Road, Golden Downs Road and Elgin Moray Road |
| 4 | Project (Mine) workers accommodation village | 400 (rail workforce) | 10 | Moranbah/Clermont | Moranbah to Camp 4 via Peak Downs Highway, and Gregory Developmental Road<br>Clermont to Camp 4 via Gregory Developmental Road, Golden Downs Road, Elgin Moray Road and Moray Carmichael Road |

The estimated peak movements per week for personnel transport are assumed to be spread over a working week with one flight per construction camp in a day or eight flights in total and ten bus loads from each campsite to Moranbah and/or Clermont airstrip per week. The maximum daily two way movement is likely to be between six and ten coaches.

### 4.3.6 Other Light Vehicle Traffic Generation

Additional vehicle movements will also be generated by service vehicles supplying the construction camps. This would typically include services such as food transport, linen laundering, fuel supplies, waste management contractors and maintenance servicemen.

For the purposes of this assessment, it has been assumed that there would be approximately 20 service vehicle (light vehicle) movements per week at each construction camp.

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# 5. Rail Operations

## 5.1 Overview

This section of the report provides an outline of the proposed operations for the Project (Rail). The Project (Rail) will connect the Mine in the west to the existing Wotonga- Blair Athol Branch line in the east and include a mine rail loop at its western end. The junction on the existing Wotonga-Blair Athol Branch line is anticipated to be located approximately eight km south of Moranbah. All coal produced by the Mine will be transported to Ports at Hay Point (Dudgeon Point expansion) and Abbot Point.

Volume 3 Section 2 Rail Project Description provides further detail on Project (Rail) operations. A summary is presented below.

## 5.2 Proposed Rail Frequency

The number of trains operating within the rail system reflecting the production of coal from the Project (Mine) and potential third party users comprises:

- Ten trains per day each way to transport up to 30 Mtpa product, consisting of three locomotives and 120 narrow gauge wagons
- Twelve trains per day each way to transport up to 60 Mtpa product, consisting of four locomotives and 164 narrow gauge wagons
- Eighteen trains per day each way, including standard gauge wagons, to transport up to 100 Mtpa product

Trains are expected to run 24 hours per day, 320 days a year.

## 5.3 Estimated Train Length

The estimated length of trains along Project (Rail) will be in the order of 2.5km for narrow gauge consists and 4 km for standard gauge consists.

## 5.4 Proposed Train Speeds at Road Crossings

The maximum operation speed of a loaded train will be 80 km/h. Empty (unloaded) trains will travel at a maximum speed of 100 km/h. Trains will have an average traveling speed of approximately 80 km/h when crossing at level crossings. Subject to risk assessments at each crossing – for the purpose of assessments an indicative speed has been used.

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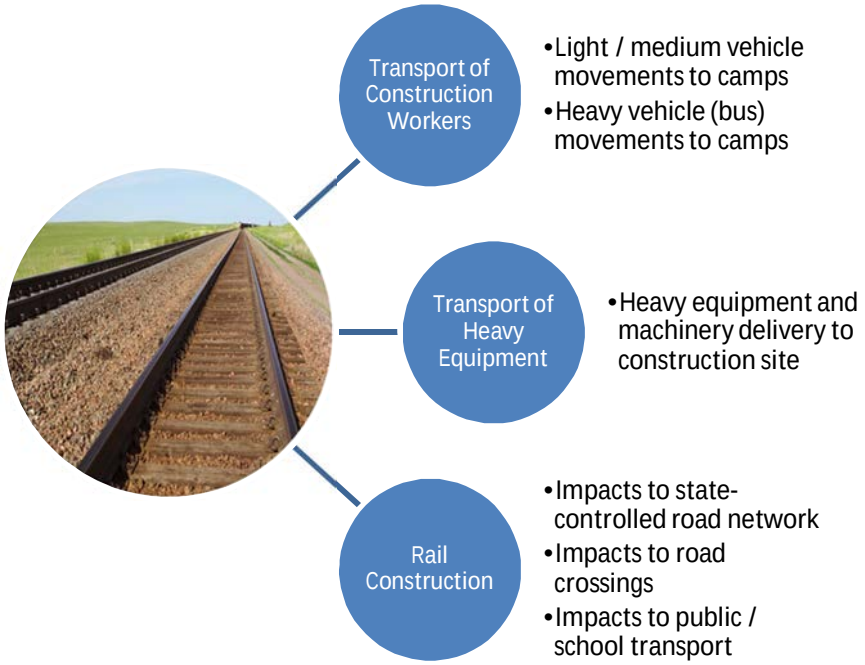
# 6. Impact Assessment and Mitigation Measures – Construction Phase

## 6.1 Overview

This Section of the report provides an assessment of the traffic and transport impacts associated with the proposed construction of the Project (Rail). Figure 6-1 provides a conceptual overview of potential impacts to transport networks associated with the Project (Rail).

**Figure 6-1 Conceptual Overview of Potential Construction Impacts**




## 6.2 Transport of Construction Workers

### 6.2.1 Light / Medium-sized Vehicles

Movements attributed to the servicing of construction camps are assumed to consist of 80 light vehicle movements each week (20 to each construction camp), which will be spread out throughout the day.

For the purposes of a worst-case scenario, it is assumed that 50 per cent of the light vehicle movements would occur during the early morning and/or late afternoon. Based on this assumption it is likely that there will be 10 vehicle movements per camp during the peak hour, or 40 in total.

### 6.2.2 Bus Movements

As detailed in Section 4.3.5, it is expected that the construction of the Project (Rail) would generate up to ten bus movements per week between the airport at Moranbah and each of the four workers camps. This number will reduce once the Project's airport is operational.

The proposed construction camps will be situated in the vicinity of the Project (Rail), and as a result trips between the camps and Project (Rail) will have minimal impact on the external road network.

## 6.3 Transport of Heavy Vehicles and Equipment

### 6.3.1 Overview

Heavy vehicle movements will comprise of the following:

- Coach movements for personnel transport from the nominated FIFO airports to the construction camps
- Heavy vehicle movements attributed to the delivery of plant and material to construction zones situated in the Project (Rail)

### 6.3.2 Labour Movement

Coach vehicle movements will comprise of ten vehicle movements per week for personnel travelling between the airport and workers camps. It is likely that the arrival of personnel will occur before the morning (am) peak hour and the departure of personnel could coincide with the evening (pm) peak hour. Based on the above assumption, it is likely that a maximum of two coach trips or four (4) coach movements would be generated during peak periods.

### 6.3.3 Deliveries and Earthworks

Heavy vehicle movements associated with the movement of earthworks and supply of plant and material have been estimated and then distributed along each transport corridor identified in Section 4.1.5. The proportion of movements occurring during the morning (am) and evening (pm) peak periods has been estimated at approximately 10 per cent, which is a worst case estimate for the movement of these types of products. Table 6-1 summarises the estimated total vehicle movements during morning and evening peaks under a worst-case scenario where it is assumed that suitable earthworks and track works (ballasting) construction materials cannot be sourced from local quarry and borrow areas in proximity to the rail corridor and have to be transported from further afield.

Table 6-2 presents the worst case estimated average daily traffic on state-controlled roads within the Study Area and includes additional construction traffic movements.

**Table 6-1 Estimated Total Vehicle Movements (Worst-case Scenario) Generated during Construction**

| Vehicle Movements | Daily (vehicles per day) | Peak Hour (vehicles per hour) |
|---|---|---|
| Light vehicle movements by service personnel | 10 | 4 |
| Heavy vehicle movements on: | | |
| Flinders Highway | 1,042 | 105 |
| Gregory Developmental Road | 1,042 | 105 |
| Peaks Down Highway | 655 | 66 |
| Kilcummin Diamond Downs Rd | 517 | 52 |

**Table 6-2 Estimated Average Daily Construction Traffic**

| Road Name | Existing | | With Project | | | |
|---|---|---|---|---|---|---|
| | Average Daily Traffic | Heavy Vehicles (%) | Light (per day) | Heavy (per day) | Average Daily Traffic | Heavy Vehicles (%) |
| Flinders Highway (14A) (Townsville to Charters Towers) | 4,894 | 20 | 2 | 1,042 | 5,938 | 34 |
| Gregory Developmental Road(98B) (Charters Towers to Belyando Crossing) | 633 | 17 | 4 | 1,042 | 1,679 | 68 |
| Gregory Developmental Road (98A) (Belyando Crossing to Clermont) | 412 | 28 | 4 | 1,042 | 1,458 | 79 |
| Peak Downs Highway (33A) (Clermont – Nebo) | 3,435 | 13 | 0 | 655 | 4,090 | 27 |
| Peak Downs Highway (33B) (Nebo – Walkerston) | 6,006 | 11 | 2 | 655 | 6,663 | 20 |
| Peak Downs Highway (33B) (Walkerston to Bruce Hwy) | 15,990 | 10 | 2 | 655 | 16,647 | 14 |
| Kilcummin Diamond Downs Road (5309)/Eaglefield Road | 53 | 23 | 2 | 517 | 572 | 93 |

## 6.4 Impact of Rail Construction

### 6.4.1 Impact of Construction on State-controlled Road Network

DTMR's GARID stipulates that the extent of impact of the Project on the state-controlled road network can be assessed on the basis of percentage increase to the existing AADT. Where the construction or operational traffic generated by the development equals or exceeds five per cent of the existing AADT on the road section then traffic operation impacts need to be considered.

Table 6-3 provides a summary of the percentage increase in traffic and the expected LOS on state-controlled roads in the Study Area and includes additional increase in traffic (based on the highest daily counts) associated with the construction of the Project (Rail).

**Table 6-3 Construction Traffic Impact on State Controlled Roads**

| Road ID | Road Name | AADT | Per cent Impact | LOS |
|---|---|---|---|---|
| 14A | Flinders Highway (Townsville to Charters Towers) | 5,938 | 21 | C |
| 98A | Gregory Developmental Road (Charters Towers to Belyando Crossing) | 1,679 | 165 | A |
| 98A | Gregory Developmental Road (Belyando Crossing to Clermont) | 1,458 | 254 | A |
| 33A | Peak Downs Highway (Clermont – Nebo) | 4,090 | 19 | B |
| 33B | Peak Downs Highway (Nebo – Walkerston) | 6,663 | 11 | C |
| 33B | Peak Downs Highway (Walkerston – Bruce Hwy) | 16,647 | 4 | E |
| 5309 | Kilcummin Diamond Downs Road | 572 | 979 | A |

Note: LOS based on Table 9

As shown in Table 6-3, the estimated traffic generated by the construction phase of the Project (Rail) will exceed the threshold of five per cent increase in AADT in most cases. The analysis undertaken for this study indicates that the expected increase in traffic associated with the construction of the Project (Rail) (based on the worst case scenario) would only occur over a period of approximately 18 months and would not impact on midblock[1] LOS Performance.

[1] Midblock assessment refers to a midblock road link assessment (i.e. assessment of a section of road rather than at an intersection)

### 6.4.2 Impact of At Grade Crossing during Construction

The Project (Rail) will cross a number of roads as described in Table 3-1 and presented in Figure 3-1.

The method for constructing level crossings is yet to be determined. Based on typical delivery profiles for the construction of level crossing it is expected that a temporary closure of one lane is likely to be required during the construction of the Project (Rail). To mitigate any impact associated with this construction, it is proposed that site specific traffic management plans be developed in consultation with the IRC and DTMR prior to construction starting. Based on the information available for roads with proposed level crossings, it is expected that there would be minimal delays to traffic during the construction of the level crossings given that in most cases daily traffic movement is low.

In some cases it is noted that there may be a need to divert traffic around the crossing on a temporary track and this will be addressed as part of developing site specific traffic management plans. This plan and any associated analysis would be undertaken and addressed in the detailed design phase of the Project (Rail).

### 6.4.3 Impact of Grade Separated Crossing during Construction

It is proposed that a grade separated (rail under road) crossing will be provided at the intersection with the Gregory Developmental Road. Grade separated (rail over road) treatments are proposed for Amaroo Road (IRC local road) and Avon Road (IRC local road). It must be noted however that final treatment options will be developed during detailed design in accordance with DTMR and IRC specifications.

It is considered that the construction of grade separated crossings along the Project (Rail) is unlikely to cause any significant traffic delays to traffic travelling across the existing road network. The delivery of bridge structures and abutments may require closing one lane along each of the above roads for a short period of time.

Any impact on the road network during the construction of the proposed grade separated crossings will be managed through the provision of site specific traffic management plans highlighting specific treatments and staged works. This will be developed in consultation with DTMR and IRC at the design stage of the Project (Rail).

### 6.4.4 Impact on School Bus Routes

Haulage routes for the Project (Rail) may overlap with school bus routes in the region. However, given the relatively low number of school bus services and townships situated along the proposed transport corridors, and the short period of time of operation within the day, it is expected that there would be a negligible impact on the safe operation of current school bus services. Any potential impacts will be addressed in detail when traffic management plans for construction and operation are prepared. Communication and promoting awareness to the community of the proposed rail operations and construction activity will be critical to managing impacts on school bus services during both construction and operation of the rail line. Bus operators will be made aware of construction schedules.

### 6.4.5 Impact on Public Transport Routes

The potential impact of the construction traffic on public transport operations will be addressed as part of developing a construction traffic management plan. Site specific traffic management plans will be prepared to mitigate any potential impact on public transport operations.

### 6.4.6 Mitigation Measures

Table 6-3 shows that the expected increase in traffic associated with the construction of the Project (Rail) can be accommodated on most state-controlled roads that provide access to the site. However, a number of mitigating measures have been identified to ensure that transport and traffic impacts arising from the construction are minimised. These measures will be incorporated through the development of the construction traffic management plan.

An important measure relating to construction traffic impacts is the implementation of a community information awareness program. This program will be initiated prior to construction commencing and throughout the entire construction period to ensure that local residents are aware of the construction activities, with particular regard to construction traffic issues.

Other initiatives that will be undertaken as part of the construction traffic management plan include:

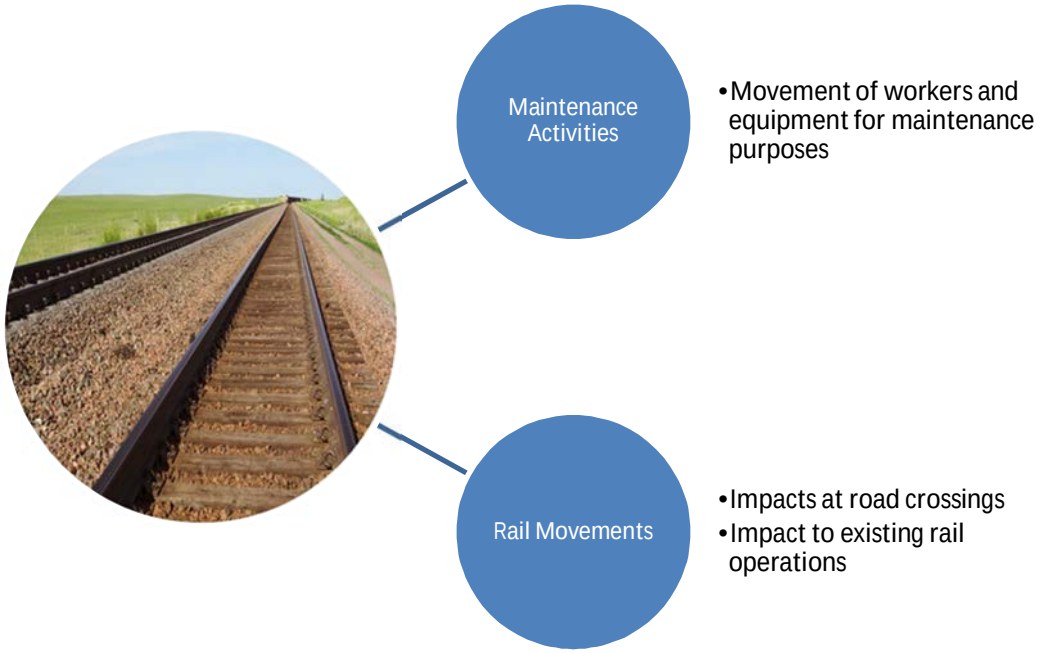
- Consultation with DTMR, IRC and the Queensland Police Services
- Reviewing speed restrictions along transport corridors
- Install specific warning signs at access roads to the construction corridor to warn road users of entering and exiting traffic
- Provide advance notice of road/lane closures and advice on alternative routes
- Provide appropriate traffic control and warning signs for areas identified where potential safety risk issues exist
- Managing the transportation of construction materials to maximise vehicle loads in order to minimise vehicle movements
- Manage the transportation of construction materials, using the Queensland Police Services and Pilots to maximise vehicle loads in order to minimise vehicle movements.

# 7. Impact Assessment and Mitigation Measures– Operation Phase

## 7.1 Impact Overview

The assessment has indicated that the operation of the Project (Rail) is likely to generate minimal road traffic and is discussed further in the following section. Figure 7-1 provides a conceptual overview of potential impacts to transport networks associated with the Project (Rail).

**Figure 7-1 Conceptual Overview of Potential Impacts – Operation**




## 7.2 Maintenance Activities

It is expected that there would be a limited number of trips to the Project (Rail) for maintenance work and periodic inspections. This is unlikely to occur on a daily basis and as a result its impact would be negligible. Maintenance activities will be facilitated by the provision of a maintenance access track

Maintenance works at rail/road crossings may be required on a periodic basis and would result in the short term closure of traffic lanes for safety reasons. In this instance, a site specific traffic management plan will be prepared in consultation with DTMR and/or IRC.

## 7.3 Rail Movements

### 7.3.1 Impact to Existing Rail Operations

It is expected that the Project (Rail) will connect to the current Goonyella rail system, approximately eight km to the south of Moranbah. The 924 km Goonyella rail system in Central Queensland currently services 30 coal mines in the northern Bowen Basin. Coal is transported by rail from these mines to the Port of Hay Point, where it is exported through the HPCT by the BHP Billiton Mitsubishi Alliance and the DBCT operated by DBCT Management Pty Ltd.

QR National is currently investing to expand and upgrade the Goonyella rail system. The initial rail expansion projects for the Goonyella System would increase the haulage capacity from 129 Mtpa to 140 Mtpa. The projects approved in the initial works program include:

- Track duplication south of Hay Point to service both coal terminals. This would improve operations and provide additional train holding capacity.
- Replacing the existing track sectioning cabin at Wotonga near Moranbah with a feeder station, and construct new track sectioning cabins in Carborough Downs and Grosvenor. This would provide improved power system reliability and result in more efficient train operations.

Further upgrading and expanding options for rail infrastructure on the Goonyella rail system across the Isaac and Mackay regions are also being considered by QR National.

The number of trains operating along the Project (Rail) will increase as the Mine is developed (between 2015 and 2025). Up to 18 trains per day each way will operate along the Project (Rail) by 2025. It is understood that the additional trains associated with the Mine's production can be accommodated on the existing rail network or on other rail lines proposed for development within the Galilee Basin. Any impact will be managed through the scheduling of trains which will be undertaken in consultation with QR National and third party operators.

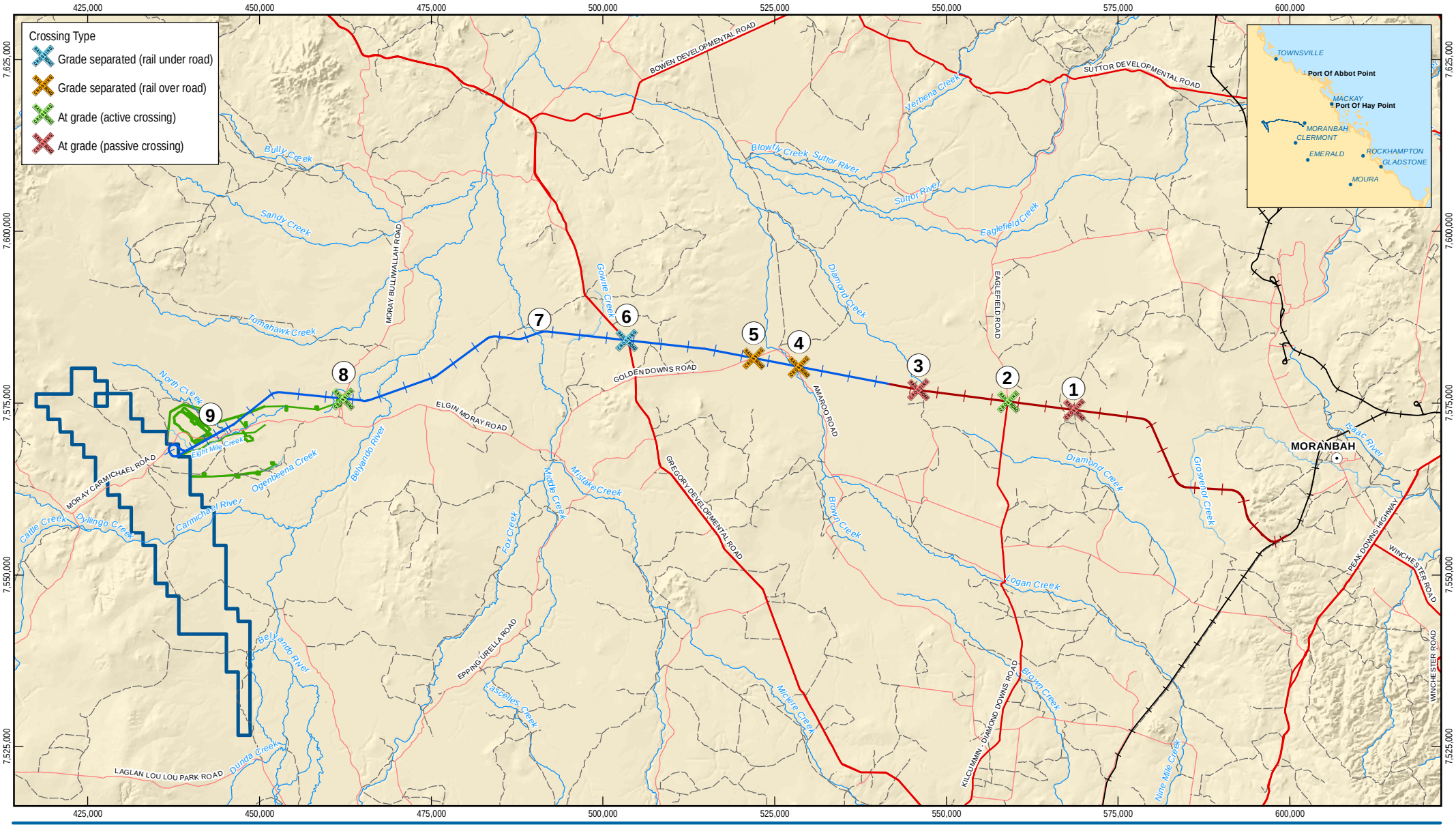
### 7.3.2 Impact at Road Crossings During Railway Operation

A number of existing crossings will be impacted by the operation of the Project (Rail). Table 7-1 and Figure 7-2 provide an overview of these crossings together with the proposed crossing treatments.

**Table 7-1 Roads Intersecting the Project (Rail) and Proposed Crossing Treatments**

| ID | Road/Crossing Name | Chainage | Proposed Treatment Type* | | Description |
|---|---|---|---|---|---|
| 1 | Unnamed Road | Ch. 41.4 | At grade (passive crossing) | | Registered road |
| 2 | Eaglefield Road / Kilcummin Diamond Downs Road | Ch. 51.2 | A<br><br>B | At grade active crossing<br><br>Stock crossing separately by culvert | IRC local controlled road<br><br>State Controlled Road (south of the Project (Rail))<br><br>Stock route (M399BELY03) |

| ID | Road/Crossing Name | Chainage | Proposed Treatment Type* | | Description |
|---|---|---|---|---|---|
| 3 | Unnamed Road | Ch. 61.3 | At grade (passive crossing) | | Registered road (adjacent to Diamond Creek) |
| 4 | Amaroo Road | Ch. 82.1 | C | Grade separated (rail over road) | IRC local controlled road<br>Stock route (U402BELY03) |
| | | | D | Stock route along road | |
| 5 | Avon Road | Ch. 88.7 | Grade separated (rail over road) | | IRC local controlled road |
| 6 | Gregory Developmental Road | Ch. 107.4 | Grade separated (rail under road) | | State controlled road |
| 7 | Mistake Creek Crossing | Ch. 120.4 | Provide sufficient clearance for stock under the waterway bridge over creek | | Stock route (Y401BELY02) |
| 8 | Moray Bulliwallah Road | Ch. 151.6 | At grade active crossing | | IRC local controlled road |
| 9 | Moray Carmichael Road | Ch. 173.1 | Realigned to run parallel on the southern side of the Project (Rail). No crossing treatment required. | | IRC local controlled road |




1:750,000 (at A4)

0 5 10 15 20 25

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Town
- Other Rail Network
- Watercourse
- State Road
- Local Road
- Track
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

**Adani Mining Pty Ltd**

Carmichael Coal Mine and Rail Project

Project (Rail) Road Crossings and Proposed Treatments

| | |
|---|---|
| Job Number | 41-25215 |
| Revision | G |
| Date | 07-09-2012 |

Figure: 7-2

G:\41\25215\GIS\Maps\MXD\100_Planning\41-25215_140_rev_g.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GHD: Crossing Types (2011); DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007); Adani: Alignment Opt9 Rev3 (SP1&2) (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

Adani is currently proposing to divert Moray Carmichael Road (Ch. 172.8 km) to run parallel to the Project (Rail) corridor and avoid any road crossings. This new alignment will run south of the Project (Rail) corridor and will provide access to the new rolling stock maintenance yard.

Grade separated crossings are proposed for the State-controlled Gregory Developmental Road and IRC local roads, Amaroo Road and Avon Road. There would be no impact to vehicles travelling along roads where grade separated crossings are provided across the Project (Rail).

As detailed in Figure 7-2, a number of at-grade crossings are proposed to be provided on local roads, which are intersected by the Project (Rail). Each of these roads has been identified to have minor road function and carry relatively low daily traffic volumes.

The following attributes have been used to consider the impact at level crossings during Project (Rail) operation. These include:

- IRC has provided an average daily traffic estimate of 10-30 vehicles per day along local roads impacted by the Project (Rail), which consist of 20 per cent heavy vehicles.
- The design of level crossings and their control treatments will take into account the required sight line distances to ensure that safety and visibility is maximised.
- Trains are estimated to have a travel speed of approximatel y80 km/h when crossing all local roads with train lengths of approximately 2.5 km and 4 km, for narrow and standard gauge consists, respectively.
- Estimated train frequency will ramp up as follows:
  - Ten trains per day each way to transport up to 30 Mtpa product, consisting of three locomotives and 120 narrow gauge wagons
  - Twelve trains per day each way to transport up to 60 Mtpa product, consisting of four locomotives and 164 narrow gauge wagons
  - Eighteen trains per day each way, including standard gauge wagons, to transport up to 100 Mtpa product
- At maximum operational capacity train frequency equates to approximately two trips or four train movements per hour over a 24 hour period.

Based on the above assumptions, assuming a 2.5 km long train travelling at 80 km/h, it would take in the order of one minute and 52 seconds for a train to pass each level crossing (). Allowing an additional minute before the train arrives and after the train departs the crossing, there would be a maximum required wait time of three minutes and 52 seconds at the crossing. Assuming three trains per hour, this would equate to a wait time of 11 minutes and 40 seconds out of each hour.

For a train travelling at 80km/h that is 4.0 km in length, it would take in the order of 3 minutes for a train to pass each level crossing. Allowing an additional minute before the train arrives and after the train departs the crossing, there would be a maximum required wait time of five minutes.

Assuming there would be a maximum 200 vehicles per day on each local road, with 20 trips (10 per cent of daily trips) occurring during the peak hour, a maximum of four vehicles (for a 2.5 km long train) or five vehicles (for a 4.0 km long train) would be impacted by train movement during the peak hour at at-grade crossings. These vehicles would be required to wait for a

maximum of three minutes and 52 seconds (2.5 km train) or five minutes (4.0 km train).The Moray Carmichael Road is to be realigned such that the Project (Rail) does not traverse it. Adani has undertaken an agreement with the IRC to upgrade and maintain the Moray Carmichael Road. Access through the Mine Site via the Moray Carmichael Road will be maintained.

### 7.3.3 Impact at Stock Routes

The Project (Rail) alignment crosses three stock routes. The stock routes and associated proposed crossing treatment are as follows:

- Kilcummin Diamond Downs Road is a stock crossing (Stock route (M399BELY03) and it is proposed that the crossing treatment will comprise a large culvert.
- Amaroo Road (stock route U402BELY03) is proposed to be grade separated with stock passing under the proposed rail bridge structure (ie rail over road) (to be confirmed through detailed design).
- Mistake Creek is also a stock crossing (stock route (Y401BELY02). Mistake Creek crossing is proposed to be grade separated with stock passing under the proposed rail bridge structure necessary for crossing the watercourse.

At grade stock movement treatments across the Project (Rail) between properties and across private accesses will be discussed and agreed between Adani and the relevant landholders (refer Volume 4 Appendix Z Rail Land Use Report).

# 8. Conclusion

Construction of the Project (Rail) is expected to occur over a period of approximately two years commencing in 2013. The volume and intensity of truck movements will vary over the construction period. The worst case construction period was identified to generate approximately 50,910 trips per month or 1,697 daily trips. The analysis of the road network during this period indicates that the expected increase in traffic associated with the construction of the Project (Rail) can be adequately accommodated and does not impact the operating performance of the road network. It is also recognised that this impact is short term and occurs within a two year construction period.

The analysis of the estimated traffic generated by the Project (Rail) will exceed the threshold of a five per cent increase in average daily traffic along the majority of the proposed haulage roads. However, the analysis undertaken for this study indicates that the expected increase in traffic associated with the construction of the Project (Rail) is based on the worst case scenario and would only occur over a period of approximately 18 months. In addition, the increase in traffic associated with the construction of the Project (Rail) would not impact on midblock LOS performance of these roads.

The delivery of materials and equipment are spread over the two year construction period and will be managed in order to minimise impact on the local community. Special consideration will be given to traffic levels on the eastern end of Peak Downs Highway during peak periods. Construction of level crossings and grade separated crossings will be planned and managed to minimise delays and will ensure that adequate warning is available to motorists.

Traffic management issues would be addressed through the preparation and implementation of a construction traffic management plan, which will be developed during the detailed design phase. This plan will be developed in consultation with the relevant DTMR Regional offices, IRC, police and local authorities.

Traffic management will address key safety and logistical issues that may arise from the construction of the Project (Rail) and focus on:

- Vehicle crossings at major and minor road intersections
- Safety risks brought about by increased heavy vehicle traffic and movement of stock
- Lane closures and the use of single-lane local access roads

Mitigation measures will be identified in the traffic management plan to address each of the above issues. If necessary, separate site-specific (local) traffic management plans will be prepared.

A number of mitigating measures have been identified to ensure that transport and traffic impacts associated with the construction and operation of the Project (Rail) are minimised. These measures will be incorporated into traffic management plans for the Project (Rail). An important mitigation measure relating to construction traffic impacts is the implementation of a community information and awareness program. This program will be initiated prior to construction commencing and continue throughout the entire construction period to ensure that local residents are fully aware of the construction activities, with particular regard to construction

traffic issues. The awareness program will identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction-related matters.

Other initiatives that will be undertaken as part of traffic management planning include:

- Ongoing consultation with the DTMR and IRC to identify mitigation measures to address increases in traffic levels of over five per cent on Gregory Developmental Road and Peak Downs Highway, during the construction period
- Ongoing consultation with DTMR and IRC to ensure that general signposting of construction access roads are appropriate and provide adequate warning of heavy vehicle and construction activity
- Review signposted and non-signposted speed restrictions along the road network and where necessary, provide additional signposting of speed limitations
- Distribute construction activity warning notices to advise local road users of scheduled construction activities
- Provide advance notice of road/lane closures and advice on alternative routes
- Install appropriate traffic control and warning signs for areas identified to have existing potential safety risks
- Manage the transportation of construction materials to maximise vehicle loads and minimise vehicle movements in consultation with DTMR, IRC and the Queensland Police Services
- Consult with the Queensland Police Service to mitigate impacts of heavy (multi-dimensional) vehicles on the roads
- Use logistics technology to plan heavy vehicle movements and the loading of equipment on these vehicles to address the appropriate Queensland Police Service and pilot support when delivering equipment
- Whenever practical, promote the use of internal and haulage access roads rather than public roads by construction vehicles
- Project induction training for truck and vehicle operators.

Key off-site traffic issues mainly relate to:

- Use of identified road segments on the road network for access by heavy vehicles for the delivery of plant and material
- Disruption to traffic due to road/lane closures brought about by construction activities at road crossings
- Increase in travel time to existing road users due to road works and increase in heavy vehicle movement.

# 9. References


Aarvee, 2011, Carmichael Rail Line Concept Design: Stage A – Report Volume 1 of 2.

Austroads, 1988, Guide to traffic engineering practice. Part 2, Roadway capacity.

Department of Transport and Regional Services, June 2007, 'Brisbane – Cairns Corridor Strategy: Building Our National Transport Future'

GHD Pty Ltd, 2012, Logistics Study, January 2012, report for Proposed Carmichael Coal Mine

Queensland Government Department of Transport and Main Roads, April 2006, 'Guidelines for Assessment of Road Impacts of Development'

Queensland Department of Employment, Economic Development and Innovation. August 2007, 'Northern Economic Triangle – Infrastructure Plan 2007-2012'

Synergies Economic Consulting for Regional Economic Development Corporation, July 2008, 'Freight Transport Study – Stage 1'

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Appendix A

# Terms of Reference Cross-reference

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| Terms of Reference Requirement/Section Number | Section of this report |
|---|---|
| 3.9 Transport | |
| 3.9.1 Existing infrastructure | |
| Present the transport assessment in separate reports for each project-affected mode (road, rail, air and sea) as appropriate. These assessment reports should provide sufficient information to allow an independent assessment of how existing transport infrastructure will be affected by project transport at the local and regional level.<br>They should also include all base data assumptions, including current condition of the affected network and its performance. | Single report has been prepared across all modes as this is considered appropriate for the project<br>Sections 2 and 3.1 to 3.1.7 |
| An overview map of the state-controlled road (SCR) network showing other major inventory features (e.g. bridges) should be included to enable the site to be fully understood in context of this network. The map should include the location of construction activities, access locations (existing and proposed) to the SCR network (if applicable), and potential crossings of the SCR network associated with the proposed rail line, as well as any construction camps likely to be used. | Figure 1-1,<br>Figure 3-1,<br>Figure 3-2 and<br>Figure 4-2 |
| Section 3.9.2 Transport tasks and routes | |
| For all phases of the project, describe the following (for example traffic data should be presented as average annual daily traffic and percentage of vehicle by class— including light vehicles, heavy vehicles etc): | |
| ◗ expected volumes of project inputs and outputs of transported raw materials, wastes, hazardous goods, finished products | Sections 4.1.3, 4.1.4 and 4.1.5 |
| ◗ how identified project inputs and outputs will be moved through the transport network (volume, composition, trip timing, routes and haulage of materials) | Sections 4.1.3, 4.1.4 and 4.1.5 |
| ◗ traffic generated by construction and operational workforce personnel including visitors (volume, composition, timing and routes) and likely accommodation facilities including possible bussing strategies to manage peak hour travel from major accommodation centres | Sections 4.2, 6.2 and 7.2 |
| ◗ likely heavy and oversize/indivisible loads (volume, composition, timing and routes) highlighting any vulnerable bridges and structures along proposed routes | Sections 4.1.5 and 6.3 |
| Section 3.9.3 Potential Impacts | |
| Impact assessment reports should include: | |
| ◗ details of the adopted assessment methodology (for impacts on roads, the road impact assessment report in general accordance with the Guidelines for Assessment of Road Impacts of Development) | Section 2 |
| ◗ description of input data and assumptions | Section 2 |
| ◗ a summary of consultation undertaken with transport authorities and Queensland Police Service (QPS) regarding scope of impact | Section 2.2 |

| Terms of Reference Requirement/Section Number | Section of this report |
|---|---|
| assessment and methodology | |
| Assess project impacts on: | |
| ◗ capacity, safety, efficiency and condition of transport operations, services and assets (from either transport or project operations) | Sections 6.2, 6.3, 6.4, 7.2 and 7.3 |
| ◗ any other proposed rail projects in the vicinity of the subject proposal | Sections 6.3 and 7.3<br>Volume 1 Section 2 Description of the Project |
| ◗ possible interruptions to transport operations | Sections 6.4, 7.2 and 7.3 |
| ◗ possible impacts on the existing road network from building the proposed rail infrastructure (e.g. haulage of construction inputs) | Sections 6.4.1, 6.4.2 and 6.3 |
| ◗ road safety and efficiency due to where and how rail crossings will be built | Sections 6.4.2, 6.4.3, 7.3.2 and Table 7-1 |
| ◗ the natural environment within the jurisdiction of an affected transport authority (e.g. road and rail corridors) | Section 3 |
| ◗ the nature and likelihood of product-spill during transport if relevant | Sections 4.1 and 5.1 |
| ◗ driver fatigue for workers travelling to and from regional centres and key destinations | Section 6.2 |
| ◗ Any existing or proposed strategies for public passenger transport and active transport and address, where relevant, requirements of Part 2A of the Transport Planning and Coordination Act 1994 | n/a |
| ◗ access to transport for people with a disability | Section 6.4.5 |
| Detail any proposed new rail infrastructure to be constructed and operated. | Sections 0 and 5<br>Volume 3 Section 2 Project Description |
| For listed species with the potential to occur within or near the proposed site, provide an analysis of all direct and indirect impacts of the each railway option, including; habitat lost, edge effects, incursion of vertebrate pests, noise and disturbance, habitat fragmentation, as a direct source of mortality and cumulative impacts as a result of the presence of other linear infrastructure (eg where habitat becomes isolated between the proposed railway and other linear infrastructure). | Volume 1 Section 1 |
| This section must discuss the uncertainties in information provided and risks to the viability of listed species populations locally, regionally and nationally. | Volume 1 Section 1 |
| Section 3.9.4 Detail infrastructure alterations | |
| Detail: | |
| ◗ any proposed alterations or new transport-related infrastructure and services required by the project (as distinct from impact mitigation works) | Sections 6.4 and 7.3<br>Volume 3 Section 2 |

| Terms of Reference Requirement/Section Number | Section of this report |
|---|---|
| | Project Description |
| ◗ construction of any project-related plant and utilities, within or impacting on the jurisdiction of any transport authority | Sections 0 and 5 |
| ◗ requirements to upgrade existing level crossings due to increased project traffic during both the construction and operations phases of the project including community indirect costs and benefits and later staged upgrading requirements over the life of the mine | Sections 6.4 and 7.3 |
| Section 3.9.5 Management and mitigation | |
| Discuss and recommend how identified impacts will be mitigated so as to maintain safety, efficiency and condition of each mode. | Sections 6.4 and 7.3 |
| Prepare these mitigation strategies in close consultation with relevant transport authorities and QPS, considering each authority's works program and forward planning. | Noted. |
| Use the findings of studies and transport infrastructure impact assessments to prepare a transport management plan. | Sections 6.4, 7.3 and 8 |

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**Document Status**

| Rev No. | Author | Reviewer | | Approved for Issue | | |
|---|---|---|---|---|---|---|
| | | Name | Signature | Name | Signature | Date |
| 0 | K McNatty<br>O Peel | G Squires | On file | J Scott | On file | 20/02/2012 |
| 1 | K McNatty<br>O Peel | G Squires |  | J Keane |  | 14/09/2012 |