SECTION 10

Section 10

TRANSPORT

10. Transport

This Section describes the existing road network and rail infrastructure surrounding the Project and identifies the possible effects the Project may have on traffic and transport during each phase of the Project. Road infrastructure impacts are described and assessed according to DMR's *Guidelines for Assessment of Road Impacts of Development Projects* (April, 2006) and mitigation strategies identified for any road realignments and increase in traffic on local and regional road networks. This Section also addresses potential coal/freight haulage impacts and mitigation measures.

10.1 Methodology

10.1.1 Approach

The methodology included:

- A site visit to conduct preliminary pavement condition assessment, a review of site access, and to identify potential crossings and appropriate controls;
- Data acquisition of vehicle traffic counts, school bus routes and accident history of the regional and local road network surrounding the Project;
- Analysis of material volumes, tonnage and composition of construction inputs for the generation of traffic routes and trip estimates;
- Determination of crossing points, possible treatments and concept designs for road, occupation and stock route crossings;
- Traffic Operation Assessment to predict changes in traffic volumes during construction of the Project; and
- A series of meetings with Council, DMR and QT officers to receive guidance on road design standards of various road elements and confirmation of design criteria to be applied to the Project (refer to Table 10-2 in Section 10.3.1) plus verification of proposed traffic solutions.

10.1.2 Road Traffic

Traffic counts were received from the Department of Main Roads (DMR), Dalby Regional Council and Banana Shire Council. The information was requested at meetings with DMR in April 2008. The DMR counts generally cover the state highways (e.g. Leichhardt Highway) and the local councils provided data of most public roads under their jurisdiction. The traffic volumes are presented in annual average daily traffic (AADT) with the percentage of heavy vehicle (HV).

The traffic volumes provided were adjusted to the base year by applying a global growth rate. DMR required a 3% per annum compound growth rate be used for all future traffic growth assumptions. This rate was adopted.

The 3% per annum compound growth rate was also applied to produce a baseline traffic forecast to assess the impact of construction traffic on the road network. The maximum number of construction vehicular trips per day was then superimposed on to the baseline traffic volume. A link capacity analysis was carried out for the various road links to identify if any major delays occur during construction. The key indicators include volume to capacity ratio and level of service.

Similar methodology was used in modelling future traffic flows during the operation of the railway. The difference will be that generated haulage vehicle trips are incorporated in the total traffic volumes rather than construction vehicle trip.

10.1.3 Rail Traffic

Train performance calculations were undertaken to provide estimates of the performance of the proposed rolling stock on the preferred alignment.

Rail capacity estimates of the Project were developed using an operations model and used to:

- Provide estimates of maximum throughput;
- Show the relationship between number and position of passing loops and achievable throughput; and
- Show the relationship between train length and throughput.

A simulation model was used to estimate the achievable throughput for the Project under a number of alternative passing loop infrastructure scenarios. The modelled track infrastructure for the Project includes representation of tonnage profiles outlined in Section 2.5 and integrated with a rail simulation model of the remainder of the southern Bowen Basin rail operations (Moura Rail System).

10.2 Existing Road Network

The existing road network in the Wandoan/Banana area is shown in Figure 10-1 and Map 27 – Local Road Network in the Map Folio. The existing roads that are likely to be directly impacted by the Project are outlined below.

10.2.1 Regional Road Network

The Dawson Highway, which extends from Gladstone to Springsure, is a State controlled road under the control of the DMR Central District Office. The road functions as a regional highway linking the hinterland through Banana and Biloela to Gladstone via a two lane, two way carriageway. The Dawson Highway will serve as the Project's primary transport route for road haulage to and from Gladstone.

The Leichhardt Highway is a State controlled road under the control of the DMR Darling Downs Regional Office at the Wandoan end and the DMR Fitzroy Regional Office at the Banana end. It runs northward from Goondiwindi, through Wandoan, Taroom, Theodore, Banana to the Capricorn Highway near Westwood, approximately 30 km west of Rockhampton. At the town of Banana, the Leichhardt Highway connects to the Dawson Highway. The Leichhardt Highway is a two lane, two way carriageway and will be used as a major construction route between Banana and Wandoan servicing the major work fronts and construction camps. Roadworks have recently upgraded the highway between Taroom and Banana. The past five years of safety records for this section of road (Queensland Transport, 2008) show there have been 15 accidents, all recorded as single-vehicle incidents, most commonly due to the vehicle loosing control or running off the road. For area surrounding the Project, the Leichhardt Highway has the highest accident record (15 out of 23 between 2001 and 2006).

The Warrego Highway is also State controlled and generally two-lane two-way rural standard road except east of Toowoomba where the road becomes 4-lane divided. The Warrego Highway provides a transport route from Brisbane and Toowoomba and will provide an important route for the delivery of construction materials, equipment and personnel to site.

Figure 10-1: Regional Highways

10.2.2 Local Road Network

The Project itself crosses a number of local roads that will also be used for access to support the construction of the Project, most notably:

- Castle Creek Road (sealed);
- Defence Road (sealed);
- Eidsvold-Theodore Road (sealed);
- Carmody's Road (unsealed);
- Nathan Gorge Road (unsealed);
- Nathan Road – North (Red Range Rd to Nathan Gorge Road) (unsealed);

- Nathan Road – South (sealed);
- Cracow Road (unsealed);
- Deearne Road (unsealed);
- Bowlings Road (unsealed);
- Bungaban-Twelve Mile Road (unsealed);
- Walsh's Road (unsealed);
- Jackson-Wandoan Road (sealed).

Bungaban-Twelve Mile and Walsh's roads are controlled by the Dalby Regional Council. Jackson-Wandoan and Eidsvold-Theodore roads are controlled by the DMR Darling Downs Regional Office and the DMR Fitzroy Regional office respectively. The remaining roads listed are under the control of the Banana Shire Council.

A number of these roads are used as school bus routes as shown in Map 27 – Local Road Network in the Map Folio. These include:

- Leichhardt Highway (Banana to Wandoan);
- Uncle Toms Road;
- Geneva Road;
- Defence Road;
- Castle Creek Road;
- Eidsvold–Theodore Road;
- Nathan Road; and
- Jackson–Wandoan Road.

Accident rates are low for these local roads with only one incident recorded between 2001 and 2006 (Queensland Transport, 2008).

10.2.3 *Existing Traffic Volumes*

Table 10-1 is a summary of the annual average daily traffic volumes for highway sections and indicative local roads that are relevant to the Project. The data shows very low traffic volumes on local roads with approximately 10% heavy vehicles, Eidsvold-Theodore and Jackson-Wandoan Roads experience slightly higher volumes and approximately 20% HV and the Leichhardt Highway receives an average of 650 vehicles per day, of which approximately 30% are HV.

Table 10-1: Current Traffic Volumes (2007)

Location	Description	AADT (veh/hr)	Proportion of Heavy Vehicle
Dawson Highway	1 km east of Banana	1,384	16.9%
Leichhardt Highway	Banana-Theodore	664	29.4%
Leichhardt Highway	Taroom-Wandoan	654	28.9%
Leichhardt Highway	Wandoan-Miles	638	31.9%

Location	Description	AADT (veh/hr)	Proportion of Heavy Vehicle
Warrego Highway	Miles-Columboola	1,846	23.2%
Castle Creek Road	East of Leichhardt Hwy	72	17.8%
Eidsvold-Theodore Road	South of Boam Creek	170	20.6%
Carmody's Road	East of Theodore-Eidsvold Road	23	9.5%
Nathan Gorge Road	East of 14th Avenue	39	9.3%
Jackson-Wandoan Road	West of Wandoan	132	20.6%

10.3 Construction Methods and Routes

10.3.1 General

A construction traffic operation assessment has been undertaken with respect to the movement of equipment and materials to and from the study area during the construction phase. This assessment has been conducted in accordance with DMR's *Guideline for Assessment of Road Impacts of Development* (DMR, 2006). It is largely anticipated that the extent of traffic impacts arising from the construction phase will be more noticeable than the longer-term impacts resulting from the operation of the railway.

Throughout the EIS process, a series of meetings have been held with Council, DMR and QT Officers to ensure the potential impacts on traffic and transport are appropriately managed. This consultation ensures the Project meets the relevant DMR standards and is compatible with the current Road Implementation Program for the area. Table 10-2 provides a summary of these consultation activities.

Table 10-2: Meetings with Council, DMR and QT Officers

Organisation	Contacts	Contact Date
DMR (Rockhampton)	• Chris Hewitt (Manager, Corridor Management and Operations) • Ray Ford (Principal Advisor, Regional & Corridor Planning) • Chris Murphy (Senior Civil Engineer)	8 April 2008
DMR (Roma)	• Mark Longhurst (Principal Engineer)	10 April 2008
Banana Shire Council, Biloela	• Anthony Lipsys (Acting Director, Engineering Services) • John Walker (Manager, Technical Services)	8 April 2008
Dalby Regional Council, Dalby	• Graeme Preston (Director Engineering Services) • Graham Cook	10 April 2008; (9 April 2008 – Teleconference)
Dalby Regional Council, Miles	• Michael Coutts (Engineer)	9 April 2008
Banana Shire Council, Taroom	• Mark Pomerenke (Works Engineer)	4 April 2008 (Phone contact)

Organisation	Contacts	Contact Date
Queensland Transport, Roma	• Sarah Batterham (Operations Officer – Passenger Transport)	1 May 2008 (Phone contact)
Queensland Transport, Rockhampton	• Gerard Bom	2 May 2008 (Phone contact)

The following sections provide a description of the transport methods and routes for all aspects of the transport task associated with the construction of the Project. Specifically it contains details with respect to construction tonnages and workforce, origin, destination, travel assumptions and routes. For the purpose of estimating the number of trips generated from construction activities and the potential impacts on the road network the following assumptions were used.

10.3.2 Assumptions

Construction Camp Establishment

Three construction camps are planned as described in Section 2.7.3. Each camp will comprise approximately 76 accommodation units transported from Brisbane via Toowoomba. The construction of each camp is anticipated to generate approximately 300 return trips (600 two-way) plus a number of shorter distance trips. On this basis, camp establishment will involve approximately 70 trips/day in peak operations along the Warrego and Leichhardt Highways and approximately 660 total trips (50 trips/day) along Nathan Road. A further 750 return trips are estimated for camp demobilisation which will use similar routes and expect similar traffic impacts.

Construction Work Fronts

As stated in Section 2.4.2 work is planned at four work fronts (sections) consecutively. The relationship between the work fronts and the construction camp locations are summarised in Table 10-3.

Table 10-3: Construction Camp and Work Front Arrangement

Work Section	Chainage	Construction Camp Number	Camp Approx. Chainage
1	0-18 km	3	35 km
2	18-75 km	3	35 km
3	75-120 km	1	165 km
4	120-214 km	1	165 km
Downfall Creek Bridge	N/A	2	75 km

Construction Traffic

The following assumptions were applied:

- Construction vehicles will range in size and type depending on the particular purpose. It is reasonable to assume that most trucks will be equivalent to B-double size;
- An access track will be constructed along the length of the alignment within the rail corridor to facilitate movement of construction vehicles. It is anticipated that bulk earthworks will use this access track thereby avoiding the need to use external roads;

- The average daily truck volumes were determined on a 24 month construction period with 250 working days per year;
- Sleepers for track works will be brought in by truck from Austrack in Rockhampton;
- Steel trusses for Downfall Creek bridge and pre-cast girders for other bridge structures will be fabricated off-site and transported by road. Trips involving bridge girders will typically involve over-dimension (long) loads;
- Rock for scour protection at bridges and culverts will be hauled on public roads not along the alignment;
- Downfall Creek precinct could impede movement of construction vehicles along the corridor for most of the construction period requiring trucks to use a bypass track or Nathan Gorge Road;
- Trips from the northern to the southern section of the alignment will generally access the construction site via Leichhardt Highway followed by Taroom-Cracow Road or Cockatoo Road;
- For the purpose of trip generation analysis, the main trip origins are referenced as (A) Rockhampton; (B) Gladstone, (C) Maryborough/Bundaberg, (D) Brisbane/Toowoomba, (E) Blackwater/Emerald; and
- The construction destinations are separated into seven sections with approximate chainage as shown in Table 10-4.

Table 10-4: Construction Related Traffic Destinations

Destination Number	Reference Location	Approx. chainage
1	Banana	214 km
2	Construction Camp 1	165 km
3	Cracow	125 km
4	Downfall Creek	90 km
5	Construction Camp 2	75 km
6	Construction Camp 3	35 km
7	Wandoan	0 km

Workforce Traffic and Service Vehicles

Each camp has a maximum capacity of 450 workers. The peak number of trips will occur at the start and end of the working week with workers arriving and departing camp. It is assumed this would account for approximately 300 trips assuming an occupancy rate of 1.5 persons per vehicle. Arrival and departure times may be staggered in account of some workers arriving and departing on non-work days to avoid driver fatigue. Daily trips are assumed to involve camp staff (probably from the local community) and vehicles delivering camp supplies (assumed five per day). Some workers are anticipated to travel to nearby towns for entertainment; it has been assumed no more than ten trips (one way) per day in account of the recreational facilities that will be provided at each camp.

The majority of the construction workforce will be transported daily via bus to and from each construction site. This will generate approximately 45 return daily trips (assuming 20 passengers per bus and lunch delivered to site). During the early stages of construction, these trips are assumed to partially use the local road network and partially use the access track within the rail corridor (refer to Section 10.4.4).

10.3.3 Construction Materials

Table 10-5 shows quantity estimates for the key construction materials that require road haulage with an indication of their likely origin. This includes the bulk volumes relating to earthworks, structures, rail drainage, roadworks, fencing and trackworks. Temporary infrastructure including the construction of accommodation units have also been included. The unit value is presented as either tonnes, metres or total number of truck movements required (where a volume unit is not appropriate). Miscellaneous items such as mechanical workshops, concrete batch plant, road furniture and slope protection, etc., will also require transportation. These lower volume items have been accounted for in the trip analysis shown in Section 10.3.5.

Table 10-5: Construction Material Quantities and Point of Origin

Material	Quantity (estimate)	Origin
Sleepers	100,960 t	Rockhampton/Gladstone
Structures (bridge beams, scaffolding & reinforcement	2098 (truck movements)	Brisbane/Toowoomba (for south of Cracow) Rockhampton (for Banana & Camp 1)
Rock – scour protection	593,693 t	Rockhampton/Gladstone
Fencing	470,800 m	Brisbane/Tooowoomba (for south of Cracow) Maryborough/Bundaberg or Gladstone (for north of Cracow)
Box culverts	347 (number)	Rockhampton & Brisbane/Toowoomba
Concrete (quarry materials, cement, admixtures) (for drainage)	85,564 t	Brisbane/Toowoomba
Construction camp mobilisation	307 (truck movements)	Brisbane/Toowoomba
Construction camp demobilisation	250 (truck movements)	Brisbane/Toowoomba

10.3.4 Proposed Transport Routes

Both State controlled and local roads will be used as haul roads for construction materials, plant and equipment. The likely routes are shown on Map 27 – Local Road Network in the Map Folio. During the initial early works phase (mid 2009 to late 2009) (refer to Section 2) construction vehicles will rely on the existing regional and local road network for access and trips until an access track is completed the length of the preferred alignment within the rail corridor. Once completed, much of the bulk earthworks will utilise this private access track to reduce necessary trips on local roads during the main construction period (early 2010 to 2012). Significant volumes of traffic and heavy vehicles will still rely on the public road network throughout construction, therefore during this peak construction period, it is anticipated the greatest impact on the road network will be experienced by the following key routes:

- Leichhardt Highway;
- Nathan Road;
- Cracow Road;
- Nathan Gorge Road;

- Eidsvold-Theodore Road;
- Defence Road;
- Dawson Highway; and
- Warrego Highway.

The composition of construction vehicles using public roads is likely to include:

- Fuel tankers;
- Cement trucks;
- Water trucks;
- B double trucks;
- Site passenger vehicles;
- Waste collection trucks; and
- Buses/vans to transport staff between the camp and construction sites.

10.3.5 Trip Generation Analysis

The daily trip generation and total trip estimations from various construction activities are summarised in Table 10-6 and Table 10-7. The number of trips shown in the matrices below are one-way (from origin to destination only). The actual trips experienced by roads will be doubled when accounting for return journeys.

Table 10-6: Daily Construction Trip Generation Estimates

		Destination							Sub-Total
		Banana	Camp 1	Cracow	Downfall Creek	Camp 2	Camp 3	Wandoan	
Origin	Rockhampton	9	8	6	4	7	1	1	37
	Gladstone	1	2	2	0	0	1	1	8
	Maryborough/ Bundaberg	0	0	0	1	1	0	0	2
	Brisbane/ Toowoomba	1	3	2	4	8	8	2	27
	Blackwater/ Emerald	0	0	0	0	0	1	0	1
Sub-Total		**11**	**13**	**11**	**9**	**15**	**11**	**4**	**75**

Table 10-7: Total Construction Trip Generation Estimates

		Destination							Sub-Total
		Banana	Camp 1	Cracow	Downfall Creek	Camp 2	Camp 3	Wandoan	
Origin	Rockhampton	4,618	3,869	3,177	2,000	3,346	729	677	18,416
	Gladstone	477	1,156	1,166	23	23	491	491	3,827
	Maryborough/ Bundaberg	23	23	23	334	422	23	23	872
	Brisbane/ Toowoomba	355	1,492	1,124	2,243	3,754	3,840	895	13,704
	Blackwater/ Emerald	28	148	23	42	24	438	23	727
Sub-Total		**5,501**	**6,688**	**5,514**	**4,642**	**7,570**	**5,522**	**2,110**	**37,546**

The number of trips required for Downfall Creek Bridge is fewer in comparison to other work fronts. This is largely because the bulk of the trips required are for the transport of bridge beams which will be fabricated off site and transported from either Toowoomba (for access to the southern side) or Rockhampton (for access from the northern side). Other truck movements to Downfall Creek bridge will supply reinforcement, concrete, scour protection and drainage structures.

The potential impact of the trips is discussed in Section 10.7.

10.3.6 Proposed Traffic Volumes

As the bulk of the construction traffic is anticipated in 2010, this is the reference year for which the traffic operation assessment has been conducted. Table 10-8 presents the estimated traffic volumes generated by the Project and a comparison between what could be expected without the project, taking into account underlying projected growth rates, and the percentage increase the Project will have on existing traffic levels.

Table 10-8: Estimated Traffic Volume for 2010

Location	2010 AADT (vpd)	Construction Traffic (vpd)	Total (vpd)	% Increase
Cockatoo Road	40*	30	70	75
Cracow Road (east of Taroom)	40*	20	60	50
Dawson Highway (east of Banana)	1,920	15	1,935	1
Defence Road (north)	70*	30	100	43
Eidsvold-Theodore Road (east of Cracow)	110	5	115	5
Eidsvold-Theodore Road (west of Cracow)	190	20	210	11
Leichhardt Highway (north of Banana)	700	70	770	10

Location	2010 AADT (vpd)	Construction Traffic (vpd)	Total (vpd)	% Increase
Leichhardt Highway (south of Banana)	730	95	825	13
Leichhardt Highway (south of Theodore)	540	45	585	8
Leichhardt Highway at Wandoan	700	55	755	8
Nathan Gorge Road	45	20	65	44
Nathan Road	70	40	110	57
Warrego Highway (east of Miles)	2,020	55	2,075	3

* Volume estimated

Under the *Guidelines for Assessment of Road Impacts of Development* (DMR, 2006), traffic impacts need to be considered where traffic due to a development equals or exceeds 5% of the existing traffic levels.

The results in Table 10-8 show the traffic is expected to exceed this threshold on most roads affected by the Project, with the exception of Warrego and Dawson Highways. The traffic volumes shown in Table 10-8 are conservative as the assessment methodology aggregates trips and does not allow for spreading and diversion along alternative access routes. However, the potential impacts on traffic volumes during construction are considered significant when compared to the very low existing traffic volumes. Despite the significantly higher usage rates of these roads, the volumes are still well below their operating capacity. For example, the Leichhardt Highway, as a two-way rural highway, has a capacity of 220 vehicles per hour for Level of Service A (the optimal traffic condition). Taking into account the conservative traffic estimates for the Project, the maximum daily traffic volume for the Leichhardt Highway is 825 vehicles (albeit with a high heavy vehicle component). This volume converts to 70 vehicles per hour by referencing the proportion of peak hour traffic as 8% on the Leichhardt Highway.

The increase in traffic volumes will be most noticeable on the unsealed (gravel) roads which are constructed to a lower design standard. This means that sight distances and opportunities to overtake may be limited. Even so, the predicted volumes are considered to be within the acceptable operating capacity of the roads to be used.

10.4 Road Infrastructure Alterations

The preferred alignment requires a total of 140 crossings. These are made up of three state-controlled road crossings (Eidsvold-Theodore Road near Cracow, the Leichhardt Highway just north of Wandoan and the Jackson-Wandoan Road at Wandoan), 23 council road crossings and 114 occupation (private) crossings. Minor public road crossings (11 No.) and private road crossings (62 No.) will be at rail level. Other public road crossings and Stock Route crossings, as declared under regulation, and private stock crossings will be under or over the railway (where practicable). Forty of the 62 private road crossings have been included as an allowance for machinery crossings, internal maintenance access crossings and additional property access. The number of occupation crossings within private property is subject to on-going consultation with landowners.

10.4.1 Road Crossings (Public)

A summary of the road crossings is provided in Table 10-9 with a recommended treatment and structure, where appropriate. Map 23 – Road and River Crossings in the Map Folio shows the location of each crossing referenced in the table.

10.4.2 Stock Route Crossings (Public)

Stock routes ordinarily used for travelling stock or declared under regulation to be a stock route are shown in Map 16 – Stock Routes in the Map Folio.

As outlined in Section 2.4.12, grade separated rail crossings will be provided for Stock Routes that are declared under regulation and intercepted by the preferred alignment. Figure 10-2 is indicative of a typical Stock Route (grade-separated) crossing layout.

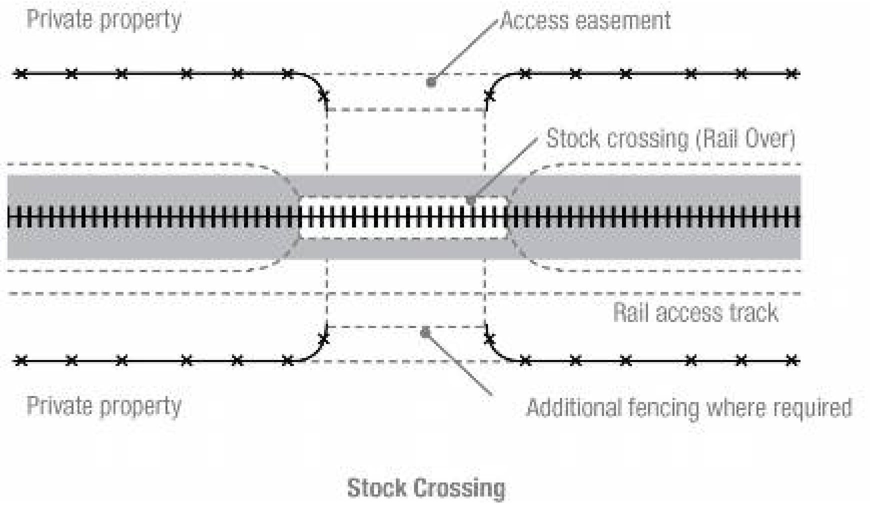

Figure 10-2: Indicative Stock Crossing Layout

Table 10-9: Road Crossings

Crossing Number	Approx Chainage	Name of Intersecting Road	Existing Road Width (m)	Existing Surface	Visibility	Traffic Volume (vpd)	%CV	Source	Remarks	Pavement Type	Structure Type	Recommended Treatment
1	2300	Local Road	4	Dirt	Good	<10		Estimated		Unsealed		Level crossing
2	5440	Jackson – Wandoan Rd	7	Sealed	Moderate-Crest	132	21%	DMR 2007	School Bus Route	Sealed	Road bridge	Road overpass[3]
3	6000	Local Road	3	Dirt	Good	<10		Estimated	Stock route/ Telecom tower access to be maintained	Unsealed	Road bridge	Road overpass
4	10400	Leichhardt Highway	9	Sealed	Moderate-undulating	654	29%	DMR 2007	Passing loop/ School bus route	Sealed	Road bridge	Road overpass
5	10800	Local Road	N/A	Unformed	Good	N/A			Stock route /Access to fishing track may be relocated	Track	Rail bridge	Rail overpass
6	20500	Walshs Road	3	Dirt	Good	<30		Estimated		Unsealed		Level crossing
8	27400	Local Road	N/A	Unformed	Good	N/A			Passing loop	Not constructed	Road bridge	Level crossing
11	34100	Bungaban 12 Miles Rd	6	Dirt	Moderate-lots of trees and slight bend	20		Estimated	Stock route	Unsealed	Road bridge	Road overpass

Crossing Number	Approx Chainage	Name of Intersecting Road	Existing Road Width (m)	Existing Surface	Visibility	Traffic Volume (vpd)	%CV	Source	Remarks	Pavement Type	Structure Type	Recommended Treatment
13	47800	Local Road	N/A	Unformed	Moderate-undulating	N/A				Track		Road diversion
14	48500	Bowlings Road	3	Dirt	Moderate-undulating	<20		Estimated		Unsealed		Level crossing
18	61000	Cockatoo Road	N/A	Unformed	Good	N/A				Not constructed		Level crossing
20	64000	Red Range Rd/Deearne Rd	6 (Deearne); 3 (Red Range)	Gravel-Deearne; Dirt-Red Range	Moderate-heavily vegetated	30-60 (Red Range); <50 (Deearne)		Estimated	Stock route /Deviate access of Red Range Rd to avoid overpass at junction	Sealed	Road bridge	Road overpass
24	79000	Sunderland Park Rd	4	Dirt	Good	<20		Estimated	Passing loop	Unsealed	Road bridge	Road overpass
25	82700	Cracow Rd. No 1	5	Gravel/ Sandy	Moderate-bends and trees	30-60		Estimated	Stock route	Unsealed	Rail bridge	Road diversion
26	86420	Cracow Rd. No 2	7	Gravel	Moderate-heavily vegetated	30-60		Estimated	Stock route	Unsealed	Road bridge	Road diversion/ Level crossing for local access to eastern side of railway
27	94730	Nathan Gorge Rd	4	Gravel	Good	38	9%	Banana 2006	Stock route	Unsealed	Rail bridge	Rail overpass

Crossing Number	Approx Chainage	Name of Intersecting Road	Existing Road Width (m)	Existing Surface	Visibility	Traffic Volume (vpd)	%CV	Source	Remarks	Pavement Type	Structure Type	Recommended Treatment
28	95000 – 101000	Nathan Gorge Rd	5	Gravel	Moderate-bends				Stock route	Unsealed		Road diversion
30	111000	Local Road	3	Dirt	Good	<10		Estimated		Not constructed		Boundary realignment
34	123200	Eidsvold Theodore Rd	7	Sealed	Good	170	21%	DMR 2007	School bus route	Sealed	Rail bridge	Rail overpass
35	123500	Services Crossing	N/A	N/A	Good	N/A			Electrical powerline	Not constructed		Occupational crossing
36	135400	Carmodys Road	6	Dirt	Good	22	10%	Banana 2006	Well-used track; some grids along	Unsealed	Rail bridge	Rail overpass
40	163600	Local Road	3	Dirt	Good	<10		Estimated		Not constructed		Level crossing
41	166200	Castle Creek Road	6	Sealed	Good	70	18%	Banana 2006	School Bus route	Sealed	Rail bridge	Rail overpass
42	170700	Defence Road	6 (Defence); 3 (Shoe-crafts)	Sealed (Defence); Gravel (Shoecrafts)	Moderate-mild uphill to south	50-100 (Defence); 9 (Shoecrafts)	3% (S)	Banana 2006	Culvert near junction/school bus route	Sealed	Rail bridge	Rail overpass
43	177500	H Elliots Road	3	Dirt	Good	<10		Estimated	Stock grid observed outside study area	Unsealed		Level crossing
44	179500	Geneva Road	5	Gravel	Good	9	19%	Banana 2006	School bus route	Unsealed		Level crossing/ boom gates

Crossing Number	Approx Chainage	Name of Intersecting Road	Existing Road Width (m)	Existing Surface	Visibility	Traffic Volume (vpd)	%CV	Source	Remarks	Pavement Type	Structure Type	Recommended Treatment
45	185550	Geneva Road	3	Dirt	Good	5	3%	Banana 2006	Low usage	Unsealed	Rail bridge	Rail overpass
46	190000	Uncle Tom Road	5	Gravel	Good	19	11%	Banana 2004	School bus route	Unsealed	Road bridge	Road overpass
50	196900	Kavanaghs Road	5	Gravel/ sandy	Good	19	9%	Banana 2004		Unsealed		Level crossing
51	200900	Norths Road	6	Gravel	Good	24	15%	Banana 2004	Land subdivisions are planned	Unsealed		Level crossing
52	206100	Local Road	4	Gravel	Good	<20		Estimated		Unsealed		Level crossing
53	209200	Services Crossing	N/A	Unformed	Good	N/A			Electrical powerline	Track		Occupational crossing

Notes

* Recommended treatments shown on this schedule are indicative and have been provided for discussion purposes only.
The treatments are considered adequate from traffic engineering point of view.
The type of control required for each crossing is determined by vehicle-train exposure, visibility and road classification.
The general principle adopted is that crossing at state roads and sealed roads of local significance will be grade separated, otherwise level crossing is recommended.
The proposed crossing treatments are subject to change to suit other constraints.

* Existing road conditions and measurements are observed from site visit and consultations with DMR and local council officers

* Horizontal and vertical clearances of road/rail structures will be designed in accordance with appropriate industry standards and guidelines.
Dimension of large machinery or trucks will also be considered in determining the clearance requirements.

10.4.3 *Occupational Crossings (Private)*

Access will be maintained for all property owners during construction and operation of the Project. The design and layout of access will be negotiated on a case by case basis, but will, as a minimum, allow access for oversize vehicles that currently access the property. In some cases more than one access point will be provided and access may be either at grade or grade separated where possible. The design of crossings will be undertaken in accordance with relevant safety standards and will incorporate elements such as minimum sight distances for both trains and vehicles. Figure 10-3 is an indicative occupation (at-grade) crossing layout. It is intended that occupation crossings are positioned in the same location as the existing access. However, where it is not safe to construct an occupation crossing in its existing location an alternative location will be negotiated.

Occupational or private stock crossings will also be provided at rail level on some properties where landscape conditions allow. The location of stock crossings for private use will be negotiated with individual landowners on a case by case basis.

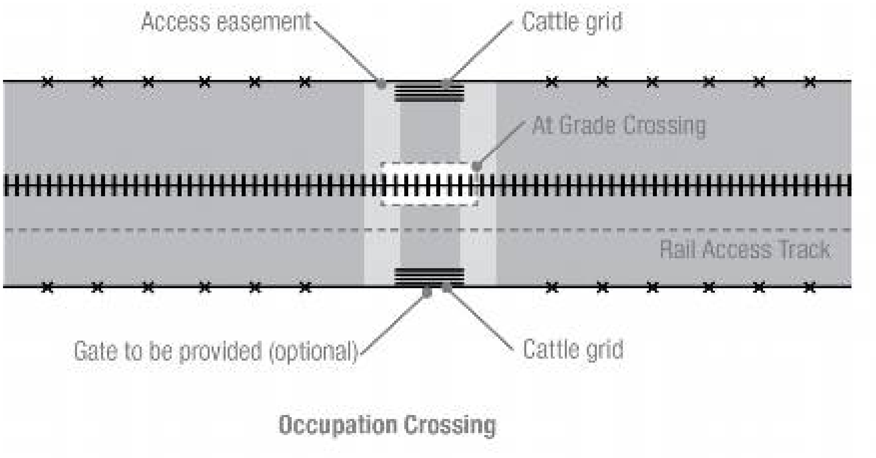

Figure 10-3: Indicative Occupation Crossing Layout

10.4.4 *Access, Maintenance and Clearance Requirements*

An access road will be constructed at natural ground level along the length of the alignment and within the multi-user corridor. This access road is to be used initially as a construction access road and then by maintenance vehicles for works on the rail infrastructure only.

Access for emergency services will be maintained at all times to the local community, personnel employed for the construction of the Project and in the case of incidents associated with the rail line during operation. Details of emergency response procedures are provided in Section 15. Clearances for rail over road will allow for over-dimension vehicles such as those used for loading houses and mine equipment. Recommendations from DMR are for 7.0 m vertical and 10.0 m horizontal clearance (measured from formation or edge of shoulder) (Figure 10-4). Recommendations from Council are for 5.5m vertical and 10.0m horizontal clearance on Council controlled roads.

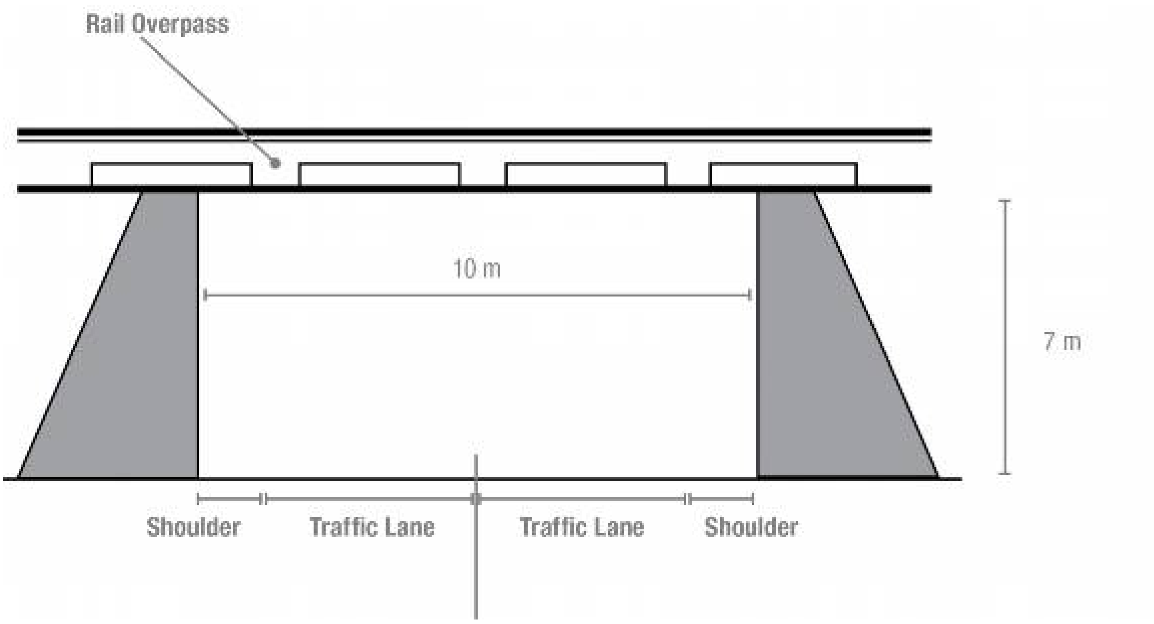

Figure 10-4: Clearance Requirements for Rail-Over-Road Overpass

10.4.5 Road Deviations, Diversions and Realignments

As shown in Table 10-9, four permanent road diversions are currently proposed. These include Cracow Road in two locations, Nathan Gorge Road and Bowlings Road. Bowlings and Cracow Road diversions have been identified as potential diversions as they will reduce the number of road crossings required. Confirmation as to whether these diversions proceed will occur as part of the detailed design process. The Nathan Gorge Road realignment is required to separate the preferred alignment from this road and to avoid multiple crossings within a confined area. Nathan Gorge Road will also be used extensively during construction and is likely to require additional upgrade works to enable this to occur.

A temporary road diversion is proposed during construction for the crossing of the Leichhardt Highway north of Wandoan.

All road diversions and potential environmental impacts have been assessed as part of this EIS and will be designed in accordance with DMR's *Road Planning and Design Manual* and signed in accordance with their *Manual of Uniform Traffic Control Devices* (DMR, 2003).

10.5 Potential Construction Impacts and Mitigation Measures

Table 10-10: Construction Potential Impacts and Mitigation Measures for Traffic and Transport

Potential Impact	Mitigation Measure
Significant increase in road traffic volumes during the main construction period (24 months from early 2010 to 2012).	Traffic operation impacts will be managed through a Traffic Management Plan (TMP), developed in consultation with DMR and the local councils, as a component of the EMP (C). The TMP will be developed during detailed design and will give consideration to: • Road deviations;
Significant increase in heavy vehicle ratio, particularly on Leichhardt Highway, Eidsvold-Theodore, Cracow, Cockatoo, Nathan and Nathan Gorge Roads during the main construction period (see previous).	

Potential Impact	Mitigation Measure
Traffic congestion, time delays and potential for safety hazard due to increased traffic movements on state and local roads as material/equipment is transported to and from the Project.	• Traffic signing; • Temporary traffic signals; • Temporary electronic message signs; • Traffic barriers and lighting; • Traffic controllers for daily operations; • Speed restrictions through construction site; • Provision for pedestrians and cyclists; • Temporary road closures and traffic detours • Maintenance of satisfactory and safe access to property; and • Maintenance of local connectivity or minimise impact. Specific traffic planning elements to be considered during detailed design will include road diversions, construction routes options and scheduling of deliveries, services and shift patterns. Opportunities to use alternative routes for deliveries avoiding school bus routes and populated areas should be explored and due consideration given to the scheduling of deliveries outside of peak traffic hours.
Road Realignment: Delay to road users, increased travel times and distances due to temporary closure and diversions of local roads and occupation crossings.	• Road diversions will be in accordance with DMR's Road Planning and Design Manual and signed in accordance with DMR's Manual of Uniform Traffic Control Devices. • Diversions will be developed and implemented through the TMP and in consultation with potentially impacted stakeholders.
Increased risk of vehicle crashes due to greater volumes of heavy vehicles, temporary truck crossings at site access and trucks turning movements at intersections.	• Safety hazards are to be addressed through the TMP. Ongoing consultation with local stakeholders should be maintained as part of the Project consultation program. • Minimum number of site accesses be allowed along Leichhardt Highway. • Access points to be located at placed with adequate sight distances and advance warning signs provided as per DMR's *Manual of Uniform Traffic Control Devices*.
Safety hazard caused by heavy vehicles travelling at slower speeds, standing and waiting to turn or cross roads for access. Agitated drivers due to additional volumes, delays and changed driving conditions. Conditions most likely to occur on heavier trafficked roads i.e. Leichhardt Highway and Eidsvold-Theodore Road.	

Potential Impact	Mitigation Measure
Disruption to school bus routes through additional volumes as described in Table 10-8 and increased risk for children boarding/alighting from school buses.	• Brief school bus operators of any pending traffic changes; • Inform construction plant operators of bus times; • Where practicable, reduce haulage operations during school bus hours to reduce the potential risk (this will be challenging for a Project of this scale); • Redirect bus routes in accordance with the TMP for any route diversions or road closures; and • Ensure bus stops are clear of construction traffic, either setting aside an area or relocating clear of the construction zone.
Damage to road pavement condition and associated safety hazard from vehicles using deteriorated road surface.	• Undertake condition assessment survey prior to construction and reinstate to agreed standards after construction is complete. DMR (and local councils) should be consulted as to agreed standards. • Establish a maintenance regime with the responsible road authorities (DMR and Councils). The maintenance agreements could be based on ESA loadings or some other form. Previous agreements between developers and road authorities provide possible models for structuring the cost sharing arrangements and responsibilities to undertake maintenance.
Movement of heavy or oversized loads, such as bridge elements on public and private roads.	• Notify the responsibly authority and obtain the necessary permits.
Disruption to existing rail services on the Western Rail System and Moura Rail System during construction of the Project connection to these lines.	• Connections to the Western and Moura Rail Systems will be undertaken in consultation with QR Ltd to minimise operational impacts to existing coal/freight operations.

10.6 Operational Coal/Freight Haulage

10.6.1 Rollingstock and Operations

The transport task of coal/freight haulage will initially be undertaken by standard Blackwater sized trains to transport coal from the surrounding mine sites. However, in the longer term, larger (1.5 times greater in size) Blackwater trains will be used. It is estimated that a maximum of approximately 42 Mtpa of coal (20 Mtpa from Wandoan mine, 15 Mtpa from South of Wandoan and 7 Mtpa from mines along the preferred alignment in the vicinity of Taroom) will be transported by the Project (see Section 2.5.1). It is likely that under normal circumstances, trains on the preferred alignment will operate 24 hours a day, 7 days a week for the majority of the calendar year (320-340 days/year). Trains will travel at a maximum speed of 80 km/h.

The transport of freight is anticipated as standard interstate single stack container configuration approximately 1,800 m in length.

10.6.2 Performance Estimation

Performance modelling, focusing on a range of parameters including travel time, average speed and average fuel consumption was completed for the three scenarios outlined here:

- Standard Blackwater Train – 1,427 m in length, configured with 4000 series diesel locomotives and 104 t coal wagons in the following arrangement: 2(4000) 44(104 t) 1(4000) 42(104 t). The assumed payload for standard Blackwater diesel trains is 7,260 t.
- 1.5 x Standard Blackwater Train – 2,200 m in length configured as 2 (4000) 44(104 t) 1(4,000) 42(104 t) 2(4000) 50(104 t). Note that this assumption requires formal confirmation with train operators. The assumed payload for 1.5 x standard Blackwater train is 11,480 t.
- Intermodal (Freight) Trains – fully loaded, doubled-stacked intermodal trains, 1,830 m in length and 6,480 gross t in weight.

Table 10-11 contains a selection of estimated performance results for the three modelled train types.

Table 10-11: Operational Coal/Freight Performance Estimation

Train Type	Direction	Travel Time (h:mm)	Average Speed (km/h)
Standard Blackwater	Northbound	3:39	59
	Southbound	2:44	78
1.5 x Standard Blackwater	Northbound	3:30	61
	Southbound	2:43	79
Intermodal Train	Northbound	2:57	73
	Southbound	3:12	67

Note: All performance estimation results presented are for uninterrupted runs in the described direction from a standing start at the beginning of the Project through to a complete stop at the end of the Project. The transit times provided in Table 10-11 are taken from the standing start until the train comes to rest at the end of the alignment in the nominated direction.

Typically, the southbound run time for coal trains (standards and 1.5 x standard Blackwater) is shorter than the northbound journey (loaded) due to the better power to weight ratio of the empty coal train. This is despite the fact that the alignment is more challenging in the southbound direction. Conversely, the intermodal trains are assumed loaded in both directions resulting in longer run times in the southbound direction.

No road pattern changes are expected directly relating to servicing the rail operations.

10.7 Potential Coal/Freight Haulage Impacts and Mitigation Measures

Once operational, the Project will result in minimal changes to the existing road traffic pattern. A small number of inspection and service vehicles will use the State-controlled and local road network. However, once vehicles are on-site, they will be mostly confined to the service road, located within the rail corridor.

In terms of the impacts of the Project on existing road network, adequate grade separation and level crossings will be provided, designed to industry standards to manage potential interruptions and maintain safety of the occupation and community users. Details of the road crossings are provided in Table 10-9.

Based on the tonnages and operational parameters assessed for the EIS, it is recognised that the operation of the Project will have a direct impact on the capacity of the Moura Railway System. The current capacity of the line is approximately 15 – 17 Mtpa. The Project will provide a connection between the Western Railway System (see Section 1.3.2) and the Moura Railway System which will result in a significant increase in rail traffic volume on the Moura Railway System, primarily because of the increase in the need for transportation of coal from the region to coal load out facilities at Gladstone. The Moura Railway System will require upgrades to accommodate the anticipated increase in rail traffic volumes. The cumulative impacts and proposed process for managing these downstream interactions is described in Section 16.

A summary of potential impacts and mitigation measures relating to the operation of the Project is provided in Table 10-12.

Table 10-12: Operation Potential Impact and Mitigation Measures for Traffic and Transport

Potential Impact	Mitigation Measure
Improved accessibility and faster delivery time of coal/freight from the Surat Basin to Port of Gladstone.	• Not applicable
Additional coal/freight services connecting into the Wandoan branch of the Western Line and the Moura Line.	• Connections to the Western and Moura Rail Systems will be undertaken in consultation with QR Ltd to minimise operational impacts to existing coal/freight operations.
Delays to road traffic and stock movement held at crossing points whilst trains to pass.	• Provision of overpasses at Leichhardt Highway and Jackson-Wandoan Road to allow traffic to continue unhindered by rail movements; • Provision of grade separated crossings where suitable landscape conditions exist and where road traffic volumes are high; and • Education of community about safe access and use of crossings.

Potential Impact	Mitigation Measure
Safety hazard for road users, train workers and members of the public due to high-speed trains operating on the Project.	• The following precautions will be followed in order to protect the safety and well-being of the community: • Level crossings will be fitted with traffic control measures such as hazard lights and warning signs in order to prevent collisions between trains and vehicles at crossings; • Speed limits will be applied to roads close to level crossings; • Maintenance crews will inspect the multi-user corridor on a regular basis to repair any damage to the line and identify any hazards; • Signage will be installed along the multi-user corridor and road side to indicate an approaching crossing; and • The multi-user corridor will be fenced in order to prevent unauthorised access of the rail corridor. • Any traffic control devices or rail safety measures will comply with the DMR Manual of Uniform Traffic Control Devices.