PART

8

TRANSPORT AND TRAFFIC

> Traffic Impact Assessment prepared by Cardno

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Adani Rail/Mining Camp

Transport Statement – Camp 2

750890

Prepared for
Adani Mining Pty Ltd

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1 Introduction

Cardno has been commissioned by Adani Mining Pty Ltd, the proponent of the Carmichael Coal Mine and Rail Project, to provide traffic and transport advice in relation to the construction accommodation camps, east of Moranbah in the Isaac Regional Council area, Queensland.

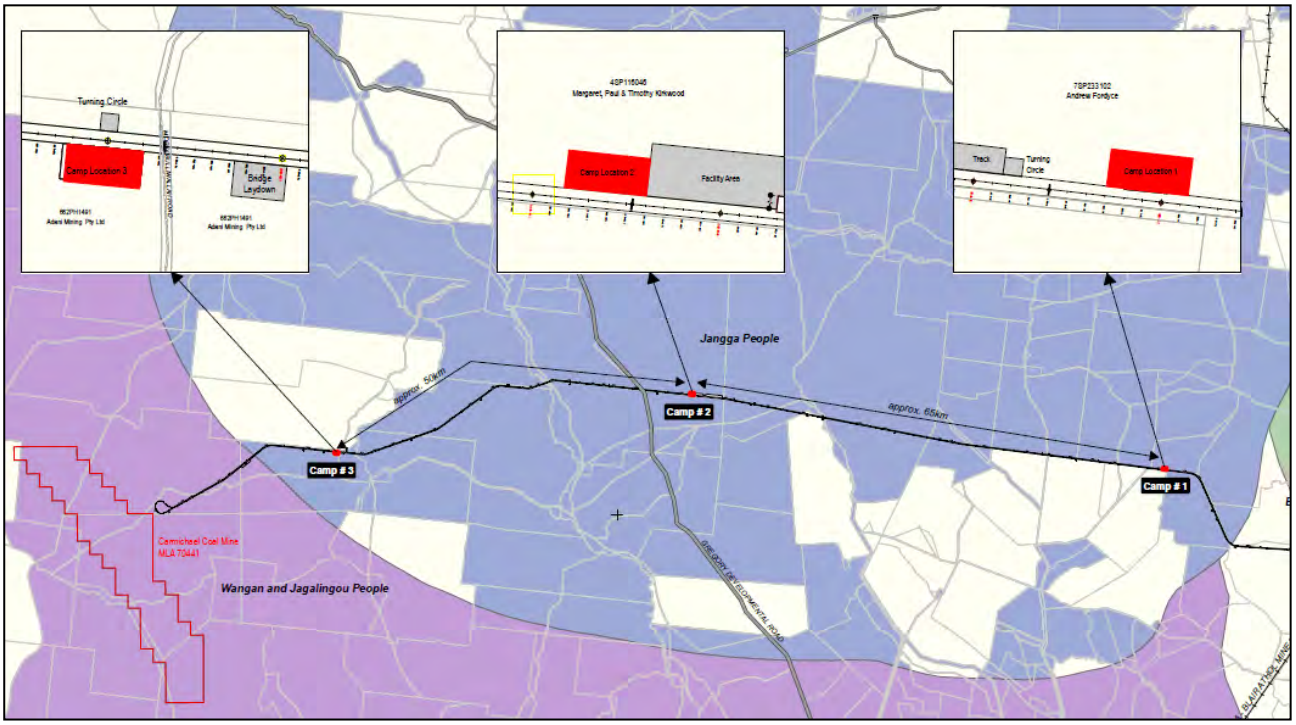
Adani proposes to develop an open cut and underground coal mine in the north Galilee Basin known as the Carmichael Coal Mine Project. The proposed mine will have a total per annum production of approximately 60 million tones and an operational lifespan of 90 years. The mine site is situated approximately 160km northwest of Clermont and is proposed to be serviced by a new 179km rail corridor along which all coal will be transported.

The construction of the proposed coal mine and rail corridor requires the employment of large volumes of workers that are separate from those that will be employed when the mine is in operation. These workers must be accommodated in locations that are within close proximity to the rail corridor and the mine site itself to reduce travel times to the required work locations. Given the remote nature of the locality and lack of accommodation infrastructure, temporary construction workers accommodation camps must be established.

The construction of the required rail infrastructure involves the establishment of a total of three temporary rail construction camps at regular intervals along the rail corridor each containing a total of 407 beds. The construction of the mine facility requires the establishment of one camp located at the mine site itself accommodating a total of 510 beds.

Figure 1-1 below provides a general illustration of the overall proposal including the three proposed rail construction camps. It is noted that the proposed mine camp is not shown on the figure below, but lies west of Camp 3 along the proposed rail line. Note that the exact locations of Camps 2 & 3 have altered slightly since this drawing was produced.

Figure 1-1 General Outline of Rail Corridor and Camp Locations (Indicative Only)



2 Existing Situation

2.1 Study Area and Subject Site

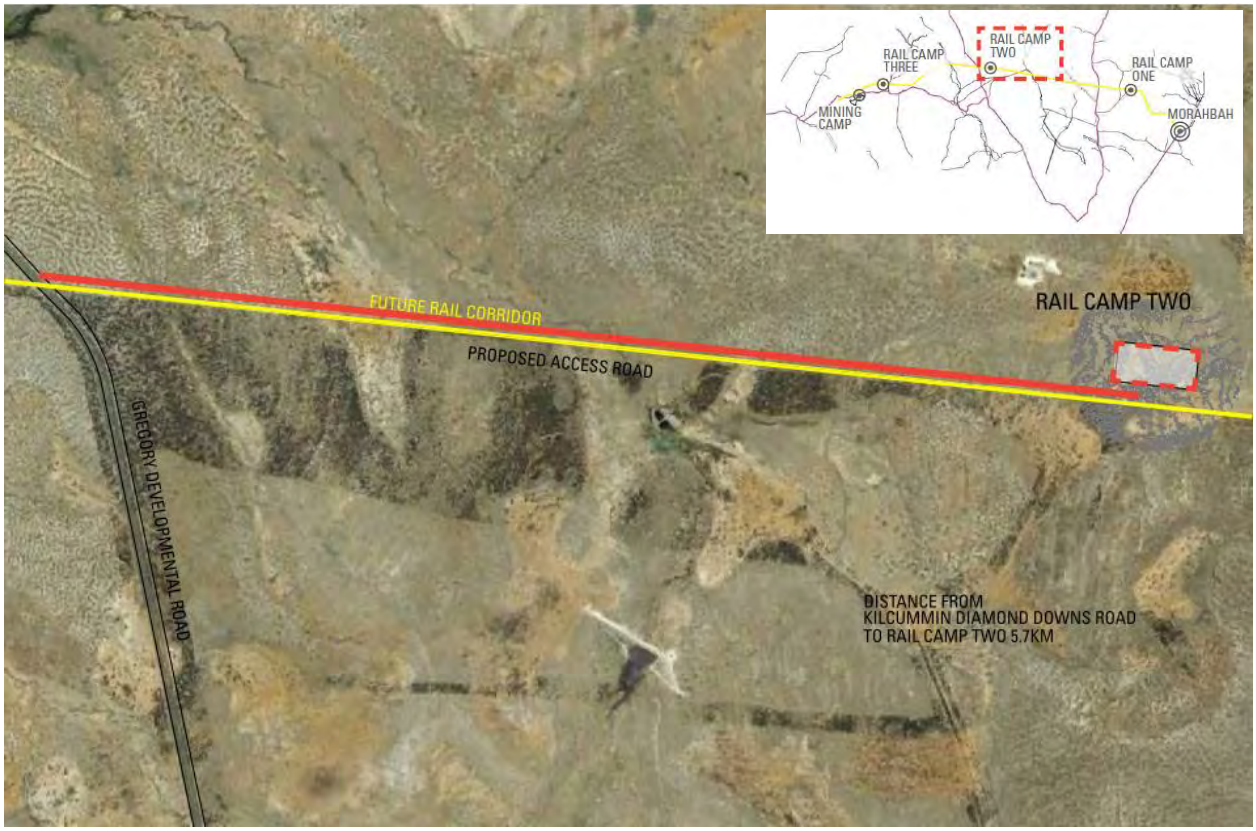
The subject area is located in Queensland's Central West region. The site is located approximately 100km west of Moranbah, and is situated within a property described as Lot 4 which has a total area of 47,600ha. The allotment is comparatively large even for this particular region and spans both sides of the Gregory Developmental Road. The region is dominated by cattle grazing and extractive industry uses.

The subject site is located on grazing lands 5.7km from the proposed access to Gregory Developmental Road, the nearest State Controlled Road (SCR) in the sites vicinity, as shown in Figure 2-1.

It is noted that the nearest Airport for fly-in/fly-out construction workers is located south of the construction camp west of Clermont, along Clermont-Alpha Road. This airport is approximately 155km from the construction camp and would entail a journey time of approximately two hours.

The next nearest airport is located south of Moranbah. Using the current road network layout, this journey would be approximately 220km in length and take approximately two and a half hours. Current information from Adani states that it is likely that Moranbah Airport would be utilised by fly-in/fly-out trips.

Figure 2-1 Rail Construction Camp 2 – Locality Plan



2.2 Gregory Developmental Road

Gregory Developmental Road is part of the Queensland State Controlled Road Network, it is designated a State Strategic Road and is managed by the Department of Transport and Main Roads (TMR). This road forms part of Gregory Highway and runs from the Gulf Developmental Road, east of Georgetown in Far North Queensland, to Dawson Highway in the Central Highlands region.

The road itself runs on an approximate north-south alignment and lies within a road reserve of approximately 60 metres in the vicinity of the site. The road is sealed for its entire length within the Isaac Regional Council area,

2.3 Traffic Volumes

Traffic volume data received from TMR indicates that Gregory Developmental Road carries approximately 370 vehicles per day (vpd), as shown in Table 2-1 below. This traffic volume is split evenly in either direction and peak hour volumes are approximately 10 percent of the daily flow. This would indicate a peak flow of 37 vehicles per hour.

Table 2-1 AADT - Gregory Developmental Road (TMR Count Site 150016)

Year	AADT	Heavy Vehicle %
2011	372	28%
2010	334	-
2009	312	-
2008	295	-

2.4 Crash Data

Cardno has requested a detailed crash history from TMR for the Gregory Developmental Road. The received information shows 25 crashes occurred along Gregory Developmental Road between Peak Downs Highway, Clermont and Bowen Developmental Road, Belyando during the accounting period 1 January 2005 to 31 August 2012. The following is noted for the crash history along this road:

- two fatal crashes occurred during the six-year period, one every three years (8% of all crashes);
- 5 crashes resulted in a hospitalisation (20%), while 7 resulted in minor injury/medical treatment (28%)
- 11 crashes resulted in property damage only (44%)
- three crashes involved multiple vehicles (12%), the rest were single vehicles
- the majority of crashes occurred on straight sections of road (80%), with the majority of these occurring on level sections of road (52% of all crashes);
- vehicle overturning was the most common crash type (52%), followed by hitting an animal/object (36%); and
- fatigue was the most common human factor (36%), followed by generic ‘other’ factors (28%), in turn followed by driver inattention (16%).

Given the relatively low daily traffic volume and the fact that most crashes occur on straight sections of road, it is not possible to comment on any road geometry issues that may be the cause. However, it is clear that driver fatigue and inattention along with hitting objects are the most common causes of crashes and not are related to the road itself. It is expected that the majority of vehicles associated with mine/rail construction activity will be heavy vehicles. These drivers would have a much greater awareness of driver fatigue over long distances than the general population, and would therefore not tend contribute to an overall percentage increase in driver fatigue related crashes.

3 Proposed Development

3.1 Development Overview

The proposed mixed use development will consist of temporary and demountable accommodation units arranged to form a fully functioning worker community. The camp is intended to be established for the entire period that is required for construction of this particular section of the railway corridor. At this point in time it is estimated that this will take approximately 2 years to complete.

The proposed mixed use development site is spread over an area of 9.38 hectares and will consist of the following land uses:

- 405 Accommodation Units
- 2 Disabled Units
- 123 Car Parking Spaces
- 2 Disabled Car Parking Spaces
- 2 Bus Parking Spaces

3.2 Internal Layout

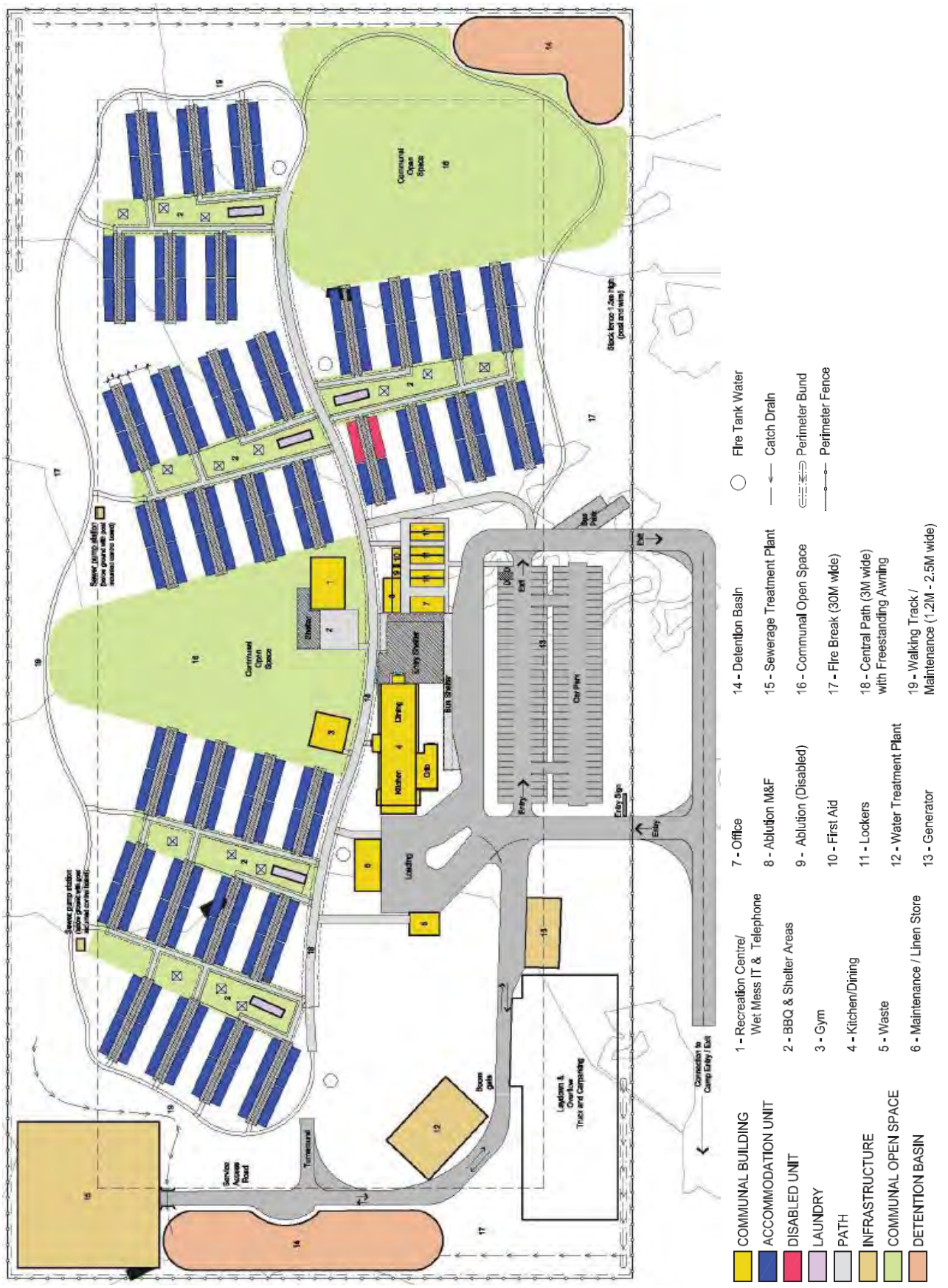
3.2.1 General Layout

The proposed site layout is shown in Figure 3-1 below. The site is bisected by a central spine road, with the workers accommodation units arranged in groups either side. Communal buildings are in the centre of the development site and will provide recreational, dining and gym facilities as well as being the collection point for transport to and from the rail construction sites.

The access road from Gregory Developmental Road and the main circulatory road within the site are proposed to be a minimum of 7.5 metres wide, allowing two heavy vehicles to pass if required.

A one-way road system is used in the pick-up/set-down area and within the car park, this will provide a legible route through the site, simplifying traffic flow and minimising accident potential.

Figure 3-1 Proposed Site Layout – Rail Construction Camp 2



3.2.2 Service Vehicles

All roads, intersections and service vehicle turning points within the site have been designed using swept path analysis, with a 19 metre articulated vehicle used as the largest expected vehicle.

The service road accessing the sewage treatment plant is proposed to be a minimum of 5.0 metres wide, and will provide access for a 19m semi-trailer. Vehicles accessing the sewage treatment plant will be required to use the turnaround area before reversing into the loading position, this will allow one-way traffic to safely utilise this facility.

The electricity generator has been positioned to be accessed from the sewage treatment plant service road, and will therefore share the turning area with the sewage treatment plant. Feasibly the overflow truck parking area could be used to turn around rather than using the full length of the service road.

General servicing required for the day-to-day operation of the construction camp will take place in a dedicated loading bay located next to the communal buildings. The loading area will be provided with a turning circle, as shown in Figure 3-1, and will accommodate all manner of vehicles, including articulated vehicles and buses should the need arise.

The location of the sewage treatment plant access road, the car park exit and the loading bay creates an intersection with five approaches in close proximity. Normally this would be of concern; however, the servicing areas will be used at most four times a day, and general traffic flow within the site is expected to be very low compared to an urban residential development.

3.2.3 Pedestrian Facilities

While no specific walking or cycling facilities will be provided beyond the boundary of the camp, all areas of the camp will be readily accessible on foot.

Footpaths within the site have been arranged adhere to pedestrian desire lines, minimising walking distances and provide maximum connectivity between the accommodation units and focal points such as the communal facilities and safe, convenient access to buses. It is noted the sheltered bus waiting area is approximately 250 metres from the furthest accommodation block, a two minute walk at a leisurely pace.

Recreational walking/cycling trails are also proposed to be provided around the perimeter of the accommodation units and within communal open spaces.

3.2.4 Public Transport Facilities

It is proposed that construction workers are transported to the construction sites by bus and/or four-wheel drive vehicles. A pick-up and set-down area will be provided within the site and will provide extensive sheltered waiting areas, protecting workers from the weather while queuing to board a bus. The waiting area is designed to be large enough to accommodate the tidal nature of workers travelling to and from the construction sites.

The bus stop is generously apportioned at over 40 metres long and will accommodate up to three standard buses or coaches, or two articulated buses. Two bus parking spaces are provided off the exit roadway while an overflow area is provided off the sewage treatment plant service road. It is also feasible that the loading area could be used to temporarily accommodate buses if required.

3.2.5 Parking Provision

Parking provision is discussed in Section 3.4 of this report.

3.3 Access Route Layout

It is proposed to access the camp along the Lot 4 property boundary, east of the Gregory Developmental Road, along the north of the proposed rail line. Access to the external road network will be taken from a priority controlled intersection with Gregory Developmental Road in the vicinity of the proposed Gregory Developmental Road overpass of the rail corridor. The alignment of the proposed access route is as highlighted in red on Figure 2-1 and is approximately 5.7km in distance from the rail camp to the intersection with the Gregory Developmental Road.

3.4 Vehicle Parking

3.4.1 Parking Requirements – Rural Zone Code

Acceptable Solution AS19.1 of the Rural Zone Code states that car parking must be provided in accordance with the requirements set out in Schedule 1, Division 2 of the scheme. This particular section of the scheme identifies car parking number requirements for defined uses. In regard to 'Residential Activities' the scheme states that one space per 'accommodation unit' must be provided for a proposed development.

The unique nature of the development means that it does not fit easily into the category of 'Residential Activities', especially given the proposed fly-in/fly-out nature of the development with bus transport being provided for residents.

The specification of one space per residential dwelling is therefore not considered to be appropriate for an isolated location where residents will be bussed to and from work. Therefore, performance criteria PC19 is applicable to the proposal. PC 19 states the following:

"Vehicle parking and service vehicle provision is adequate for the "use" and ensures safe and functional operation for motorists and pedestrians."

This performance criteria outlined in the local plan allows for a reasonable provision of parking provision to be provided based on the intended operation and use of the site.

3.4.2 Parking Provision

In consultation with Adani and in accordance with their specific requirements, it is proposed to provide a total of 123 sealed car parking spaces and two disabled spaces located opposite the communal buildings. Two dedicated bus parking spaces will also be provided as part of the proposed camp designs.

An unsealed overflow parking area is also proposed to be provided, accommodating all manner of vehicles that will be used to access and service the camp. It is noted that the overflow car park would also be accommodate excess heavy vehicles and buses in a double parked arrangement if these were required on special occasions.

The main car park will be used for parking of site management vehicles, four-wheel drives, visitor parking and other vehicles used to transfer workers to and from the construction site. These vehicles will not be used to access the external road network on a day-today basis, but will instead simply be used to get to and from the camp to the construction site on tracks running alongside the rail line.

The number of parking spaces provided on site have been specified by Adani to match the maximum operational requirement to traffic staff to and from site, and to accommodate service vehicles and buses. It is important to note that this car park is not likely to be used to accommodate workers personal vehicles.

All parking spaces within the main car park have been designed to comply with Australian Standard AS2890.1 *Off-Street Parking*. Parking spaces and aisle width have been specified for User Class 1, suitable for day-long employee and commuter parking.

Parking for disabled users has been designed to comply with AS2890.6, *Off-Street Parking for People with Disabilities*. This entails a standard space 2.4 metres wide, with a 2.4 metre wide dedicated shared area provided alongside.

Footways have been provided between the parking rows in each aisle, this will minimise pedestrian-vehicle interaction within the car park.

3.5 Traffic Generation

3.5.1 Rail Construction Camp Traffic

It is important to note from the outset that the majority of traffic movements will not impact the external road network, but will be largely confined within the camp and along tracks servicing the rail line construction sites that will run from the camp alongside the rail line as construction progresses. This has been confirmed in discussions with Adani.

Therefore the only vehicles that will typically impact the external road network are those which transfer workers to and from airports and urban centres such as Clermont and Moranbah, and those providing essential services to the camp. This has also been confirmed in discussions with Adani.

The traffic generation associated with typical day-to-day operations is therefore as specified in Table 3-1 below.

Table 3-1 Rail Construction Camp 2 - Traffic Generation

Trip Type	Mode	Weekly Volume	Daily Volume	Peak Hour Volume
Fly-in/Fly-out	Coach	10 vehicles in/out	2 in/out	2 in/out
Servicing	AV (semi-trailer)	10 vehicles in/out	4 in/out	2 in/out
Total		20 vehicles in/out	6 in/out	4 in/out

Table 3-1 indicates that on a typical day, traffic generation is expected to be minimal. The peak hour for vehicles movements will not necessarily interact with the peak flow on the external road network. The main activity will be from servicing, and tasks such as deliveries will be coordinated and will largely occur outside of times when peak construction worker trips are occurring. This is undertaken mainly as a safety precaution to minimise interaction of heavy service vehicles with camp residents as they travel to and from work; however it will also have the effect of reducing peak hour vehicle activity.

3.5.2 Rail Construction Camp Traffic Distribution

Fly-in/fly-out worker trips will arrive at the accommodation camp by coach from Moranbah Airport and therefore these vehicles will approach and leave via Gregory Developmental Road south of the site access.

Service vehicles could feasibly approach the site from Clermont, Moranbah, Charter Towers, Townsville or Mackay. It is therefore reasonable to assume that these trips would be evenly split between the north and south approaches to the site access on Gregory Developmental Road, on both a daily basis and in the peak hour.

3.5.3 External Traffic

Existing traffic volumes on Gregory Developmental Road are currently low at approximately 370 vpd and 37 vehicles in the peak hour (approximately 10% of AADT)

The Environmental Impact Statement (EIS) prepared by GHD indicates that Gregory Developmental Road will function as a transport corridor for the delivery of materials to the rail construction corridor and mine construction site. The GHD report indicates this section of Gregory Developmental Road will serve the following transport corridors:

- TC01: Townsville to Rail Camp 2, Rail Camp 3 and Mine Camp – Gregory Developmental Road/Flinders Highway. 525 vpd worst case.
- TC02: Townsville to Rail Camp 1 and Rail Camp 2 - Kilcummin Diamond Downs Road/ Gregory Developmental Road/Flinders Highway. 517 vpd worst case.

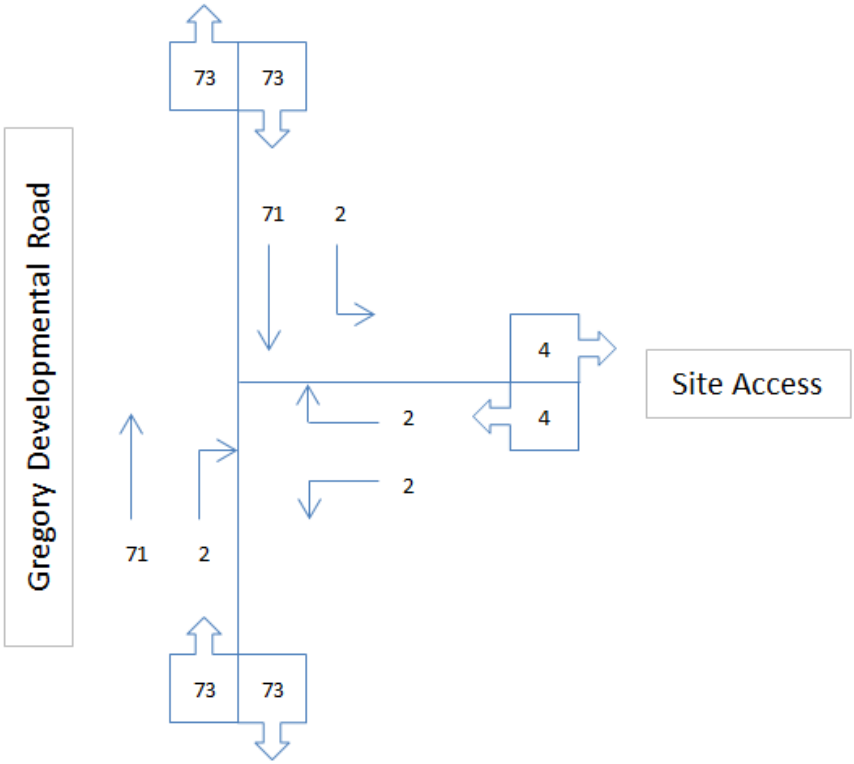
Both TC01 and TC02 pass the proposed site accommodation camp site access point. At this location the EIS estimates that the worst case traffic generation will be 1042 vpd.

In combination with the existing traffic and construction camp traffic, this indicates an overall flow of approximately 1420 vpd, and around 150 vehicles in the peak hour. It is noted that the majority of the traffic associated with transporting materials for the construction of the rail line will be heavy vehicles, that being said, the low volume of traffic is well within the traffic capacity of a sealed road.

In terms of traffic flow on Gregory Developmental Road, upon review of the EIS, traffic associated with the delivery of materials is based on a return journey, and while individual vehicles may not make the return journey in the same day, others from the previous day will, creating a balanced daily two-way flow. Therefore the directional split of construction traffic is expected to be 50/50 north/south along Gregory Developmental Road on a daily basis in the vicinity of the site access.

The EIS further indicates that the peak for deliveries would be approximately 10% of the daily total in a one hour period. Figure 3-2 shows the expected peak hour traffic flow at the camp access to the external road network.

Figure 3-2 Expected Traffic Flow at Construction Camp Access Intersection



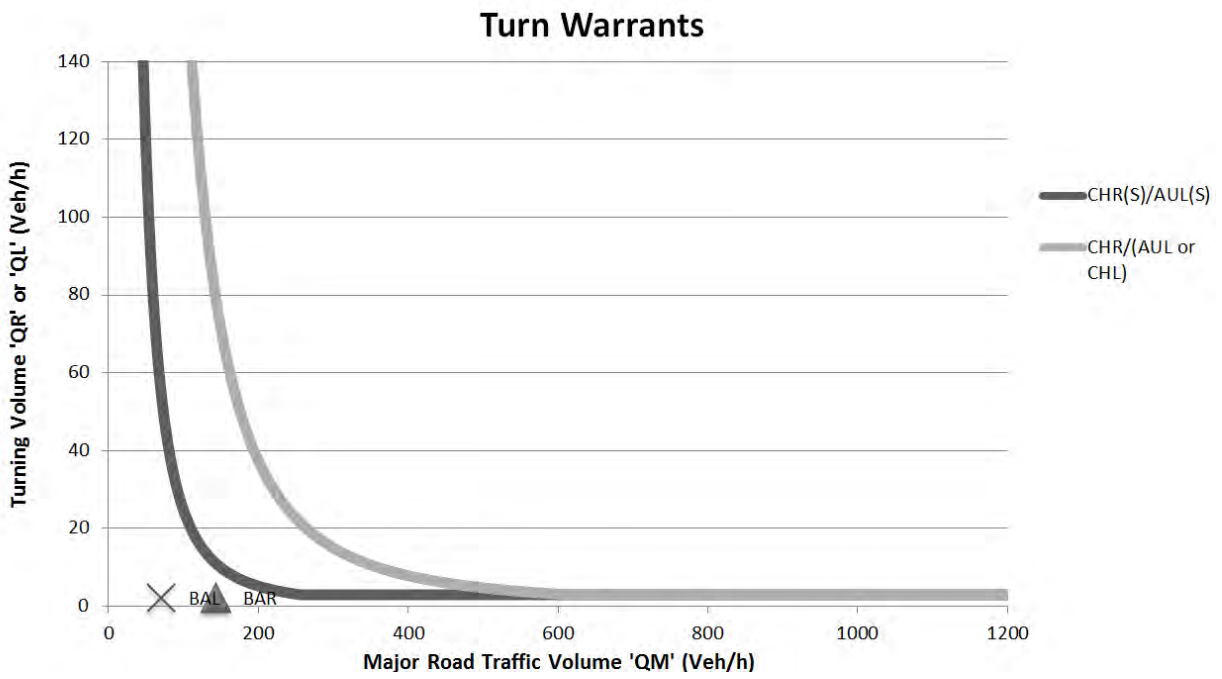
3.6 Site Access

3.6.1 Turn Warrants

A turn warrant assessment identifies when a turn treatment is required to improve road safety. Rural turn lane warrants at both key intersections have been assessed in accordance with the procedure described in Austroads Guide to Road Design, Part 4A: *Signalised and Unsignalised Intersections*.

It is also important to note that the method used measures the cost of providing an improved turning treatment compared to the cost of potential crashes occurring over a ten year period. The construction camp is likely to be in operation for only two years and therefore the usual method for turn warrant analysis is not wholly appropriate. However, in evidence of this, a turn warrant analysis at the site access has been undertaken for the peak hour using the traffic flows specified in Figure 4, the results are illustrated in Figure 3-3.

Figure 3-3 Turn Warrant Analysis



The results in Figure 3-3 indicate with access traffic totalling only eight movements (four in/out) in any given one-hour period, and given that traffic on the external road network is expected to reach only around 150 total vehicles per hour, only basic turn treatments (BAL, BAR) would technically be required in this instance.

However, to minimise accident potential, a right turning treatment should be provided at the site access for the following reasons:

> The majority of vehicles will approach the camp from the south and will therefore turn right into at the site access intersection;
> The majority of traffic on Gregory Developmental Road will be heavy vehicles
> Heavy vehicles may travel in convoys with reduced headways rather than being spread apart

Alternative rural right turn treatments are shown in Figure 3-4 and Figure 3-5 below. Figure 6 shows an Auxiliary Right turn (AUR) arrangement with localised road widening where through traffic must manoeuvre to avoid a vehicle waiting to turn right. The AUR treatment is not favoured by the Queensland Department of Main Roads due to the exposure of right-turning vehicles to rear-end collisions, and this is particularly an issue in high-speed rural situations. The AUR treatment is therefore not recommended.

Figure 3-4 Auxiliary Right Turn (AUR) Treatment

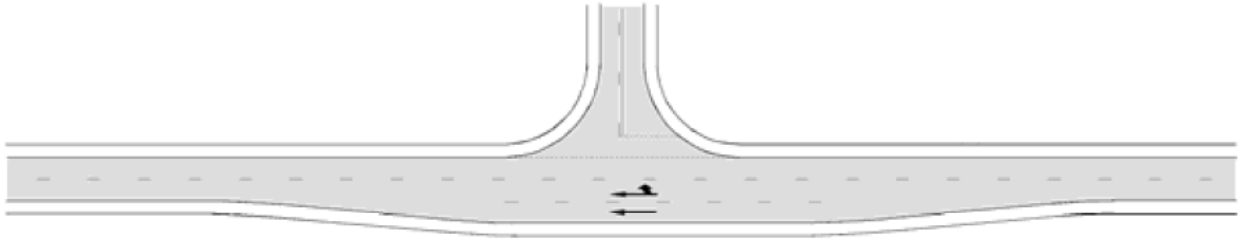
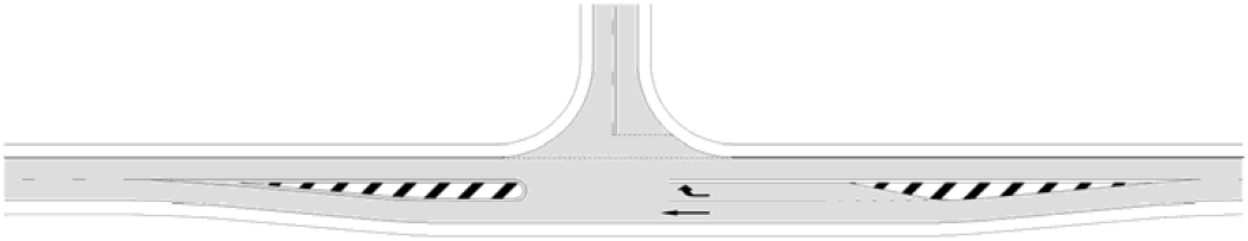


Figure 3-4 shows a Channelised Right turn (CHR) arrangement where turning vehicles would break from through traffic into a turning lane, with the majority of the deceleration taking place within the turning lane itself. This is the safest treatment for right turn protection, and is therefore the recommended treatment for access to the construction accommodation camp.

Figure 3-5 Channelised Right Turn (CHR) Treatment



3.6.2 Sight Distances

Sight distance at intersections provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle on a minor road approach moving into a collision situation (e.g. in the worst case, stalling across the traffic lanes) and to decelerate to a stop before reaching the collision point. Sight distance also allows traffic waiting in the minor road to assess gaps in the traffic in the major road traffic flow.

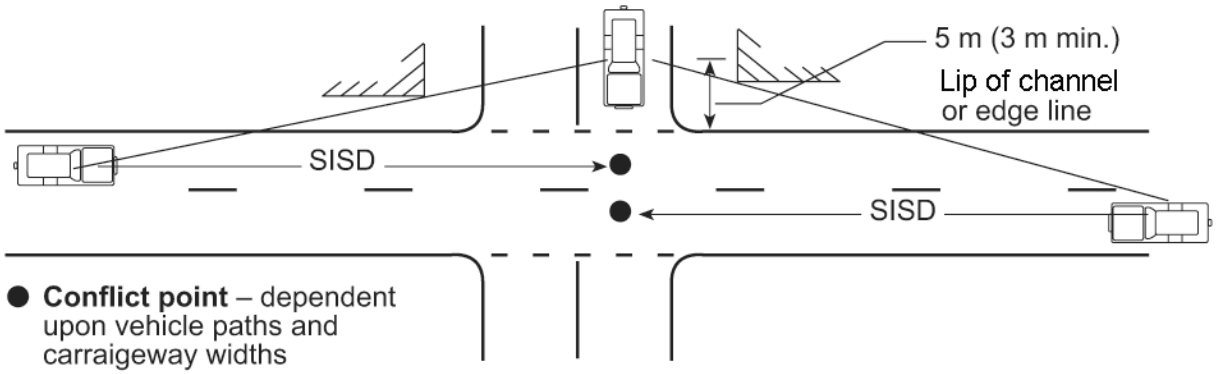
Guidance on required safe intersection sight distance (SISD) is set out in Austroads Guide to Road Design, Part 4A: *Signalised and Unsignalised Intersections*. SISD is dependent on the design speed of the road, which is approximated using the posted speed +10 km/h.

In this instance it is assumed that the maximum speed for the majority of vehicles travelling along Gregory Developmental Road is 100 km/h.

Under these circumstances the required SISD at the site access is 248 metres, and should be measured as illustrated in Figure 3-6. Given the access road is expected to be very lightly trafficked; it is considered that 248 metres SISD is sufficient at this access location.

In order to ensure that this sight distance can be met it is proposed that the area required for sight lines would be kept clear of vegetation and permanent obstructions to visibility such as signage and electric/street light poles.

Figure 3-6 Sight Distance Measurement



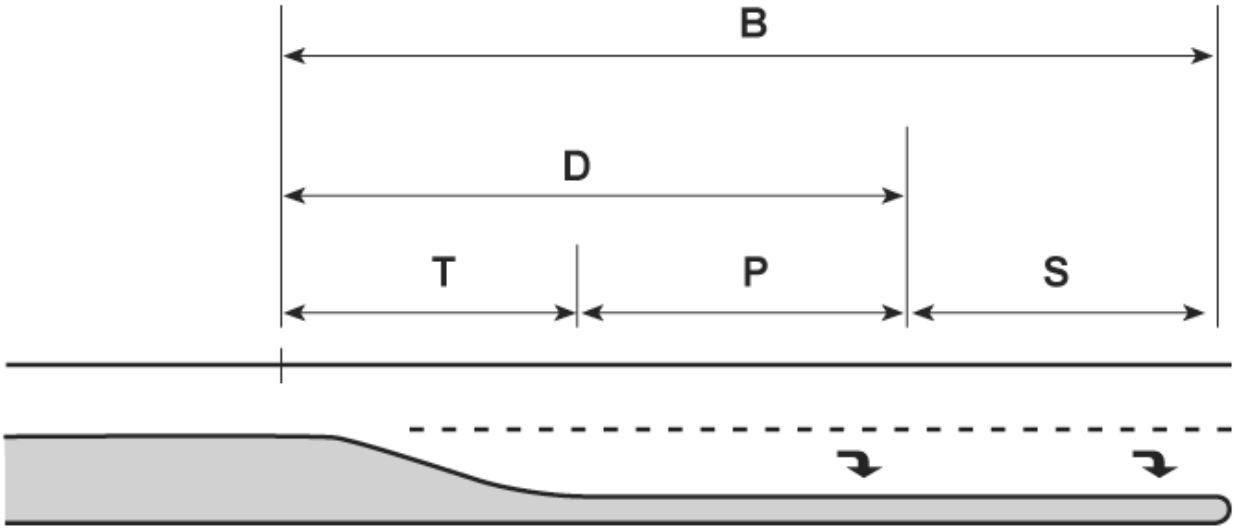
3.6.3 Geometry

The salient characteristics of the proposed CHR arrangement are specified in in Section 5 of the Austroads Guide to Road Design, Part 4A: *Signalised and Unsignalised Intersections*. These components are shown in Figure 3-7, and for a 100 km/h design speed are as follows:

- **D** - Deceleration Length:155m, consisting of
  - **T** – Physical Taper: 33m
  - **P** – Parallel: 122m
- **S** – Storage Length: Nil

It is noted the above parameters are in agreement with the TMR Road Planning and Design Manual, Chapter 13: *Intersections at Grade*.

Figure 3-7 Components of a Deceleration Lane



The remaining geometric elements at the camp access intersection are straightforward:

- The access road should have one entry and one exit lane as separate left and right turning lanes onto Gregory Developmental Road are not required due to the low flow.
- The entry and exit radii should be 15m allow heavy articulated and rigid vehicles to enter and exit easily.

4 Summary & Conclusions

This Transport Statement set out to assess the impact of the proposed rail construction accommodation camp upon the surrounding road network and has provided advice on the transport infrastructure within the development site and its connection with Gregory Developmental Road.

Construction workers will be accommodated within 407 demountable units in a temporary village. Buses will collect workers and transport them to and from the rail construction sites. These buses will use tracks running alongside the rail line as construction progresses.

External traffic movements are expected to be low but will consist largely of heavy vehicles, and when combined with the additional heavy vehicle movements expected on Gregory Developmental Road, it is recommended that a Channelised Right Turn (CHR) be provided at the priority controlled site access.

Aside from this, the impacts of the proposed construction camp on the external road network are expected to be negligible; therefore this transport statement has focused on the internal aspects of the site.

Pedestrian access within the site has been designed to facilitate pedestrian movement along desire lines between accommodation units and communal buildings, the bus stops and open space.

The bus stop is designed to accommodate up to three buses or two articulated buses; a sheltered waiting area has been provided of sufficient size to manage the tidal nature of workers travelling to and from the construction sites.

Servicing the accommodation camp will take place from a dedicated loading area and turning circle adjacent the communal buildings, as well as from a service road linking to the sewage treatment plant. It is recommended that any heavy vehicle manoeuvring and waiting areas are provided in reinforced concrete.

In conclusion, the development of these lands for temporary construction worker accommodation has been considered in detail from a transport perspective. The result will be the delivery of a safe internal layout for camp residents and a safe connection to the external road network for site traffic movements.