APPENDIX W
TRAFFIC IMPACT ASSESSMENT

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Central Eyre Iron Project

IRON ROAD LIMITED

Transport Impact Assessment

Revision 0

Client Document Number | E-F-34-RPT-0041

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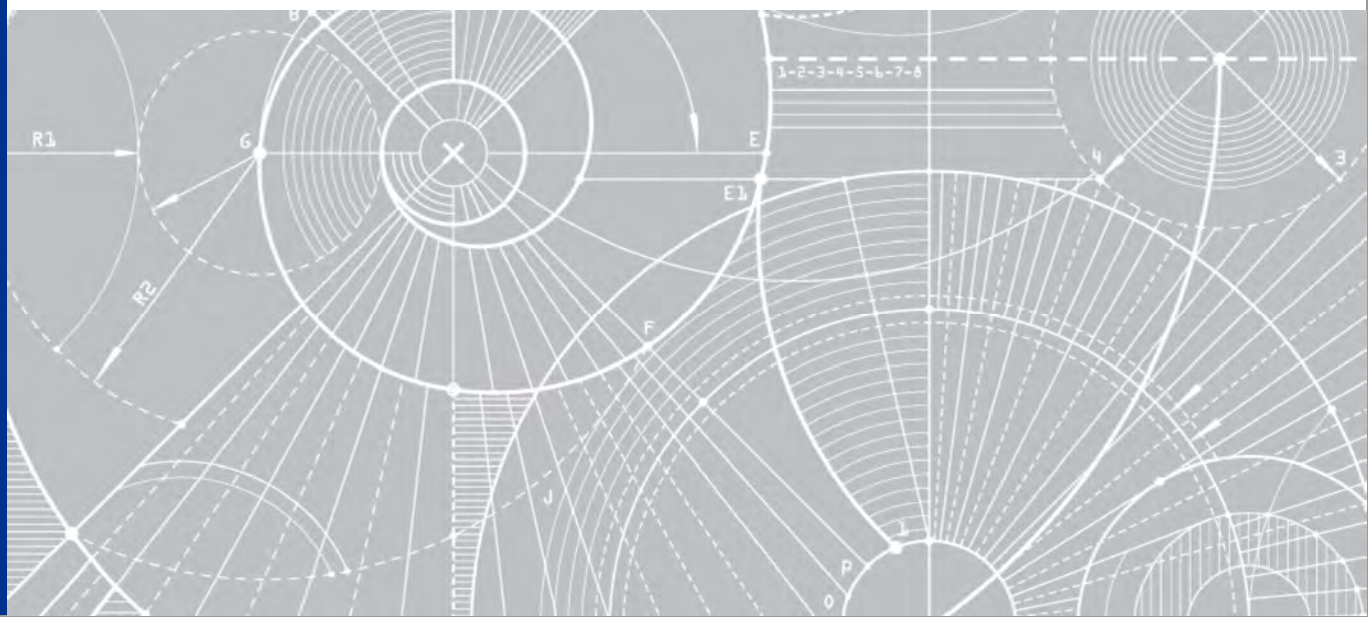

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Executive Summary

The Central Eyre Iron Project (CEIP) proposes the development of an iron ore mine and processing facility on the central Eyre Peninsula, a bulk export port facility at Cape Hardy on the east coast of the Eyre Peninsula, and an infrastructure corridor connecting the mine and port site. The CEIP is expected to produce 21.5 Mtpa of iron concentrate at full capacity, over an expected mine life of 25 years.

The construction and operation of the CEIP will generate additional traffic above existing levels which may impact the existing traffic and transport environment on the Eyre Peninsula. These impacts have been identified and assessed as part of the transport impact assessment for the CEIP, which is documented in this report. This report has been prepared to inform the Environmental Impact Statement and Mining Lease Proposal for the CEIP.

The majority of transport movements on the Eyre Peninsula, including most road and all rail movements, are for freight transport. The Eyre Peninsula has a low population density and, as such, traffic volumes, even on rural highways, are low and well below road capacity thresholds. The investigation of the increased traffic generated from the CEIP found that all planned construction and operational phase traffic impacts are comfortably within the capacity of the existing road system. Delays induced by construction traffic for the CEIP are expected to be small as appropriate road diversions will be in place where required.

Iron Road are committed to implementing a traffic management strategy and road maintenance plan for public roads used by the CEIP to ensure that transport and road maintenance impacts during the construction and operational phases are managed to an acceptable level.

1. Introduction

This report presents the findings from the transport impact assessment undertaken for the Central Eyre Iron Project (CEIP). The scope of the report is to identify the following:

- Scale and location of transport activities required to and from the proposed mine site and CEIP Infrastructure during the construction and operational phases of the mine;
- Impacts on public roads and infrastructure within the study area (Eyre Peninsula south of Whyalla) from transport activities resulting from the CEIP;
- Any public infrastructure works or upgrades required to accommodate transport impacts resulting from the CEIP.

This report is intended to satisfy the requirements of a transport impact assessment as part of the Mining Lease Proposal and CEIP Infrastructure Environmental Impact Statement.

Transport impacts from the CEIP would arise from:

- Increased traffic during construction to and from the key project activity centres – proposed port (Cape Hardy), proposed mine site (near Warramboo) and proposed infrastructure corridor from port to mine, for movements of workers, plant, equipment and building materials.
- Increased traffic during proposed mine operations from movements of workers and consumable materials to and from the proposed port site, proposed mine site, and proposed infrastructure corridor; and
- Construction impacts from unloading at port and transport to proposed mine site via road of large modules comprising major mine plant components on heavy load platforms.

1.1 Project Overview

The CEIP is designed to produce 21.5 million tonnes per annum (Mtpa) of iron concentrate at full capacity, over an expected minimum mine life of 25 years. The CEIP includes development of an iron ore mine and processing facility in the central Eyre Peninsula, a bulk export port facility at Cape Hardy on the east coast of the Eyre Peninsula, an infrastructure corridor connecting the mine and port site and village accommodation for the mine site workforce. The proposed infrastructure corridor will include a standard-gauge, heavy haul railway line, maintenance track, water supply pipeline and power transmission line.

The CEIP will consist of four key project components:

1. **Proposed CEIP Mine** – the mine site will include an open pit excavation, on-site processing plant and integrated landform. The processing plant will include metallurgical facilities, crushing, grinding and milling facilities, tailings handling and retention. Additional onsite infrastructure will include a small desalination plant for potable water supply, temporary and permanent camps for accommodation, workshops, warehouses, security, emergency services and rail infrastructure including a rail loop and train loading facility. Production of 21.5 Mtpa of iron concentrate is proposed with sufficient resource for a mine life of at least 25 years.

2. **Proposed Long Term Employee Village** – long term accommodation for the mine site workforce is proposed to be located adjacent to Wudinna, approximately 27 kilometres (km) north-east of the mine site.

3. **Proposed Infrastructure Corridor** – the infrastructure corridor will connect the mine site with a port facility at Cape Hardy and is approximately 130 km in length[1]. Spanning the length of the infrastructure corridor will be a standard gauge heavy railway line to transport iron concentrate from the mine to the

[1] Measured from the boundary of the mining lease to the boundary of the port site

port. Running parallel to the railway line in the northern section of the infrastructure corridor will be a water supply pipeline, which will connect to the proposed borefield near Kielpa. An electricity transmission line will also be included along part of the corridor. The corridor will incorporate ancillary infrastructure such as a service road and pump stations to support the railway line, transmission line and water pipeline.

4. **Proposed Port Site** – the port is proposed at a greenfield site, approximately 7 km south of Port Neill[2] in an area known as Cape Hardy. The site provides a natural deep water location with no dredging required. The port has been designed to have capacity to export 70 Mtpa, of which 21.5 Mtpa will be used by Iron Road. The port will support Panamax and Capesize vessels, with a 1.3 km jetty structure that incorporates a tug harbor, module off loading facility and wharf. Onshore, the port facility will incorporate material handling facilities, car parking and internal access roads, stormwater management and ancillary facilities including an administration building, emergency services building, control room(s), warehouse, maintenance workshop, ablutions facility and crib room and fuel storage. Temporary construction workforce accommodation will also be located at the port site during construction of the port and infrastructure corridor.

Iron Road intends to use modular construction methods for large scale infrastructure and buildings at the mine site and port site. This method will involve performing the majority of the construction work at an off-shore pre-assembly yard and shipping the substantially completed assemblies to the proposed module offloading facility at the port site. The large modules will be transported from the port site to the proposed mining lease using public roads during the construction phase of the CEIP. This pathway is called the module delivery route for the purposes of this report.

[2] Measured from the approximate centre of Port Neill to the centre of the proposed port facility

2 Transport Assessment Method

Traffic and transport impacts due to construction and operation of the CEIP were assessed through both desktop analysis and a site inspection by Jacobs (see below). The assessment was undertaken following consultation with officers of the Heavy Vehicle Access Section, the Department of Planning, Transport and Infrastructure (DPTI) to confirm the scope of assessment. A site inspection was undertaken by the Jacobs transport team on 16-18 December 2013. The inspection included visits to the port site, mine site, infrastructure corridor and intended haul routes.

In order to compare construction and operation impacts to existing conditions, baseline traffic and transport conditions for the study area were determined as follows:

- Existing roadway level of service was calculated using the Highway Capacity Manual (HCM) volume 2, chapter 15 methods for analysis of two lane highways (TRB 2010).
- Existing road safety was assessed by calculation of crash rates from historical crash records and site inspection.
- Existing roadway asset conditions and transport accessibility was assessed by site inspection and information provided by DPTI.

Construction stage activities impacting the road network were quantified as follows:

- Materials and equipment delivery loads were calculated based on quantity estimates developed as part of the engineering design for the CEIP Definitive Feasibility Study (DFS). The load assumptions regarding vehicle type and origin / destination were based on Jacobs experience in developing remote area facilities such as mines in Western Australia and Papua New Guinea.
- Oversized module delivery load information and the proposed delivery route were provided by Iron Road.
- Workforce traffic was calculated based on manning schedules provided by Iron Road, planned construction camp locations and estimated workforce draw from surrounding Eyre Peninsula towns.

Operations stage activities impacting the road network were quantified as follows:

- Consumables delivery loads were calculated based on operational details provided by Iron Road.
- Workforce traffic was quantified based on manning schedules provided by Iron Road, planned construction camp locations and estimated workforce draw from surrounding Eyre Peninsula towns.
- The duration and frequency of railway level crossing closures was calculated using information made available in the rail operations report, developed as part of the engineering design for the DFS.

Having determined both the baseline and project case conditions, the severity of impacts to the study area road network due to the proposed development were assessed as follows:

- Level of service degradation due to project traffic generation was calculated according to the US Highway Capacity Manual (HCM) methodology for two lane highways (as referenced in Austroads Guide to Traffic Management).
- Delay due to train movements at level crossings was estimated by comparison of probable vehicle arrival volume and calculated train crossing closure time.
- Delay due to slow moving module loads was estimated by simulating module travel and vehicle arrivals along the delivery route (refer to Section 2.3 below).
- Any potential road safety and accessibility concerns were identified by assessing likely traffic generation volumes of different vehicle types against the observed existing road geometry and condition data (sight distances, pavement condition, road widths).

Where required, to reduce the severity of impacts to an acceptable level, control measures were developed. These include road/intersection upgrades, traffic management procedures and signing strategies, which are described in Chapter 6.

2.1 Study Area

Figure 2-1 shows the extent of the transport study area. This was discussed and agreed with DPTI officers during initial consultation. Port Augusta was determined as the eastern extent of the study area, as vehicles travelling from Adelaide or further east would be required to pass through Port Augusta. Wudinna was determined as the western extent of the study area as materials being delivered to any of the mine construction sites from the east, west or north would have to pass through Wudinna. Port Lincoln was determined as the southern extent of the study area as there would be items being delivered to site from Port Lincoln, but not beyond. The relative impact of the project generated traffic would fall below 1% of traffic on the arterial roads outside of the study area, which is below the threshold for impact analysis in the Austroads Guide to Traffic Management.

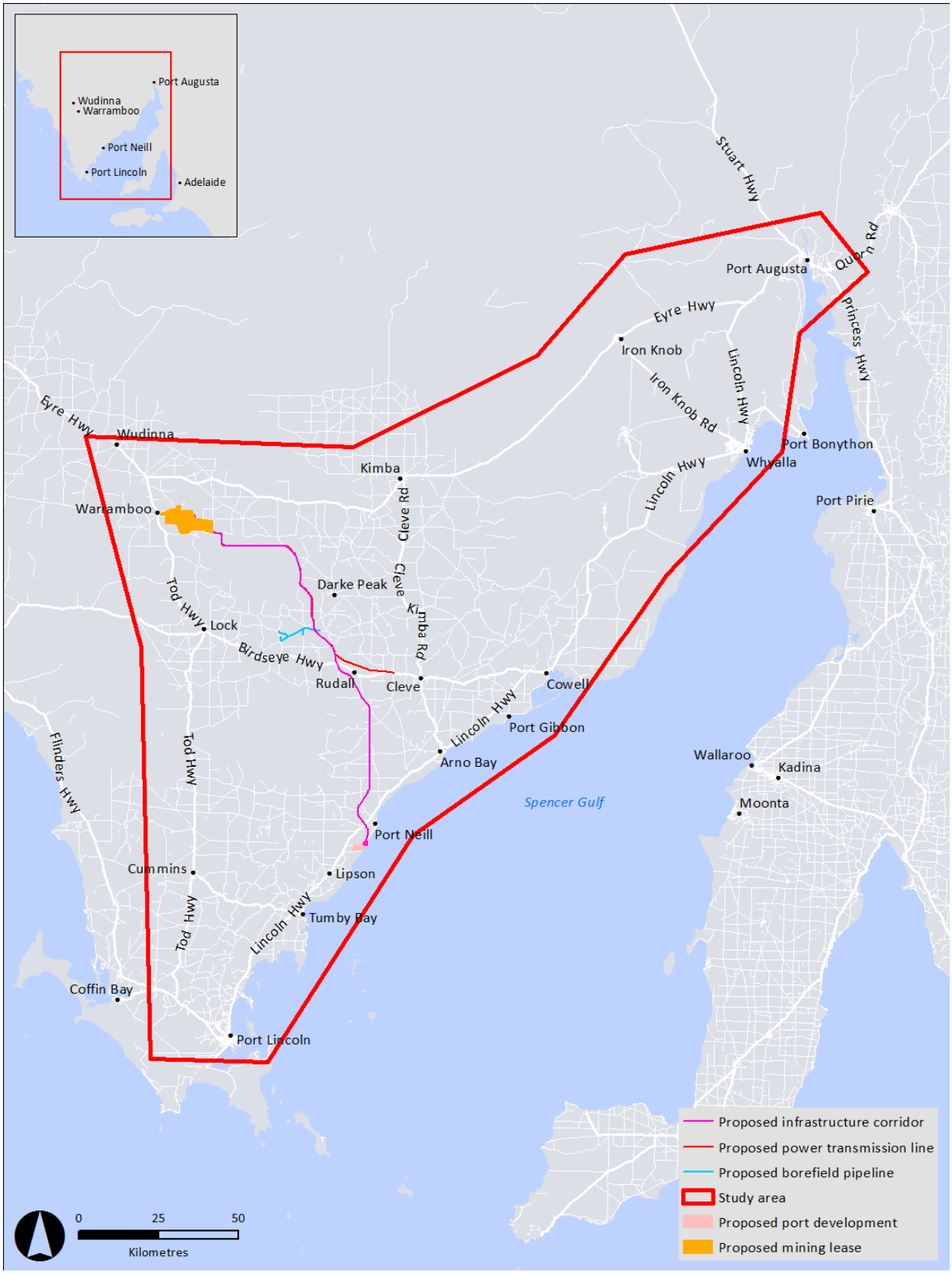


Figure 2-1 Study area

2.2 Data Inputs

Data inputs from numerous sources were required to be able to carry out this transport study. A list of the different types of information required and their sources are shown in the tables below.

Existing condition data was collected to form a base case of the existing transport network. Existing condition data included traffic volumes, crash history, gazette heavy vehicle routes and existing road conditions. The existing condition data sources are summarized in Table 2-1.

Table 2-1: Existing condition data

Input	Source
Traffic volume	Annual Average Daily Traffic Estimates – 24 hours two-way flows – Map RT1 (DPTI, 2013).
Crash history	• Detailed crash reports from DPTI Road Crash Register (5 year history) for the following locations: • Eyre Highway between Port Augusta and Kyancutta • Tod Highway between Kyancutta and Lock • Birdseye Highway between Lock and Cowell • Balumbah-Kinnard Road running North/South from Rudall to Verran and continuing on to the Lincoln Highway just north of Port Neill • Lincoln Highway between Port Augusta and Port Lincoln
Gazetted heavy vehicle routes	DPTI RAVNet service (accessed November 2013)
Existing road condition	Site inspection; verification of details (e.g. sign location) via Google Maps

Construction data was collected to quantify vehicle loads and movements around the Eyre Peninsula. This included information about the proposed mine infrastructure design, proposed infrastructure corridor design, proposed port infrastructure design, construction programme, construction materials schedule, modularised load schedule and construction workforce and accommodation. The project construction data sources are summarized in Table 2-2.

Table 2-2: Construction data

Input	Source
Mine infrastructure design	Iron Road Definitive Feasibility Study (DFS)
Infrastructure corridor design	DFS
Port infrastructure design	DFS
Construction programme	Project implementation schedule provided by Iron Road
Construction materials schedule	Vendor submission responses
Modularised load schedule	Advice from Iron Road
Construction workforce & accommodation	DFS

Operational data was collected to quantify vehicle loads, movements and impacts on Eyre Peninsula roads. Operational data included information about operational consumables, operational workforce and proposed long term employee village and railway operations timetable. The operational data sources are summarized in Table 2-3.

Table 2-3: Operational Data

Input	Source
Operational consumables	Comparison to a security project with an 800 person camp on a remote location managed by the Australian Government.
Operational workforce & accommodation	Advice from Iron Road.
Railway operations timetable	DFS

2.3 Traffic module simulation model

To estimate the likely traffic impact arising from delivery of oversized modularised loads, a high level traffic simulation model was developed using Microsoft Excel. Traffic impact was measured in terms of total and average motorist travel time delay.

Model Structure

The model provides an estimate of vehicle delay through numerical simulation of vehicle arrival and travel along the module delivery route during delivery of a modularised load.

The modelled delivery route is divided into segments which are individually analysed. Each route segment is representative of the start and end of a traffic control block with each also having a diversion route which would take motorists around the modularised load (refer to Figure 5-1).

Vehicle arrivals at each end of a segment are simulated by sampling a negative exponential distribution to calculate the headway time between consecutive vehicle arrivals. The formula used to calculate individual headways is the following:

$$t = \frac{-1}{x}\ln(u)$$

Where:

t = headway (seconds)

x = traffic flow (vehicles per second)

u = random number between 0 and 1

Due to the very low daily vehicle volumes along the module delivery route, this random sampling process for calculating headways was considered more appropriate than simply adopting the mean headway. At low volumes, the variance in headways between successive vehicles can be very large, a phenomenon which exponential method is able to replicate reasonably well. Additionally, when run over numerous iterations, upper and lower confidence bounds can be estimated, providing information on the likely range of delay.

Traffic flow input into the headway calculation is determined based on an estimated AADT for the route segment and an hourly factor dependant of the time of day the simulation has reached. For each segment, 24 factors (one for each hour of the day) have been estimated based on daily traffic count data provided by DPTI.

Once a vehicle has arrived and enters the simulation, its movement is modelled as follows:

1) Vehicles travelling in the same direction as the module are released into the segment and travel at the posted travel speed until they reach the position of the module, at which point, they travel at the same speed as the module.

2) Vehicles travelling in the opposite direction queue at the end of the segment until the module arrives.

Modelled vehicle behaviour is simplified. Acceleration, deceleration, queue and speed/flow relationships are not considered. However, for the purpose of estimating delay and given the lightly trafficked road network, this approach is considered reasonable.

For each segment, the simulation runs until the module reaches the end of the segment. At completion, delay for each modelled vehicle is calculated as follows:

$$Delay = (modelled\ travel\ time) - (expected\ free\ flow\ travel\ time)$$

Where:

$$expected\ travel\ time = \frac{segment\ distance}{posted\ travel\ speed}$$

For comparison, delay due to taking a segment diversion route is also calculated. In this case, *modelled travel time* is replaced with the expected travel time for the longer diversion route.

3 Existing Transport Environment

The existing transport network on the Eyre Peninsula is shown in Figure 3-1. People movements around the Eyre Peninsula are generally limited to road or air. An isolated rail network exists on the Eyre Peninsula which is used seasonally for the haulage of grain at harvest to Port Lincoln from inland Eyre Peninsula. No passenger rail services operate in the Eyre Peninsula, however there are passenger bus services connecting from Adelaide to Port Lincoln and from Cenduna to Adelaide. The bulk of rural movements on the Eyre Peninsula, including most road and all rail movements, are for freight transport. The Eyre Peninsula has a low population density and, as such, traffic volumes, even on rural highways in the study area, are low, and well below road capacity thresholds.

The below subsections provide information on the State road network, local road network, rail network and bus transport within the study area.

Figure 3-1 Overview map of road network

3.1 State Road Network

3.1.1 Existing State Roads in Study Area

The characteristics of key State roads which form major accesses to the proposed port or mine site, including for construction haul routes, and which are therefore relevant to the CEIP, are detailed in Table 3-1.

Table 3-1: State road access network summary

Road Name	Sealed	Overtaking Lanes	Single Carriageway	Austroads road class	Lanes	Carriageway width	Pavement Type
Eyre Highway (A1)	✓	X	✓	1	2	7-7.5 m	Spray Seal
Lincoln Highway (B100)	✓	X	✓	2	2	7 m	Spray Seal
Tod Highway (B90)	✓	X	✓	3	2	7.4 m	Spray Seal
Birdseye Highway (B91)	✓	X	✓	3	2	6.8 m	Spray Seal
Iron Knob-Whyalla Road	✓	X	✓	3	2	6m	Spray Seal
Balumbah-Kinnard Road	50% sealed 50% unsealed	X	✓	4	2	10 m (unsealed width) 7 m (seal width edge to edge)	50% Spray Seal/ 50% Unsealed
Port Neill Access Road	✓	X	✓	4	2	6 m	Spray Seal

The Eyre Highway is the only Austroads Class 1 road in the study area. Class 1 roads form the principal avenue for movements between major regions of Australia, including direct connections between capital cities (Austroads, 1989). The Lincoln Highway is an Austroads Class 2 Road, which are generally the principal avenue for movements between a capital city and key towns or between key towns. The Tod Highway, Birdseye Highway and Iron Knob-Whyalla Road are also arterial roads and are Austroads Class 3. These roads form an avenue for movements between important centres or between Class 1 and Class 2 roads. The other roads are Austroads Class 4 which are local roads whose main function is to provide access to abutting property (including property within a town in a rural area).

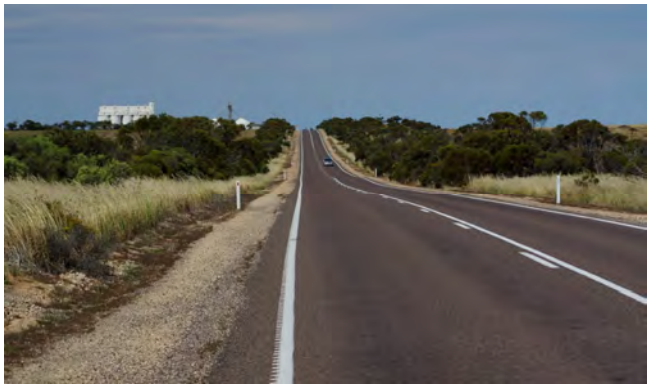
3.1.2 Eyre Peninsula State Highway Network

There are four State highways across the Eyre Peninsula that would be travelled on by either personnel commuting to and from work or materials being delivered to site. They are:

- Lincoln Highway (Port Augusta-Port Lincoln)
- Tod Highway (Kyancutta-Flinders Highway intersection west of Port Lincoln)
- Birdseye Highway (Lock-Cowell)
- Eyre Highway (Port Augusta-Western Australia border)

The Lincoln Highway is located approximately 2.5 km west of the proposed port site. The Tod Highway is approximately 17.5 km from the northern extent of the proposed infrastructure corridor where it enters the proposed mine site. Details of each of the four highways are provided in Table 3-2.

Table 3-2 Eyre Peninsula highway network

Name	Class	Description	Photo
Eyre Highway	A1	The Eyre Highway forms part of the Australian National Highway Network, linking Adelaide to Perth. Within the Eyre Peninsula, it provides connectivity between Port Augusta and a number of smaller towns, including Kimba, Kyancutta and Wudinna. It consists of a sealed single carriageway with one lane in each direction.	
Lincoln Highway	B100	The Lincoln Highway is the major Eyre Peninsula highway, serving as the primary route from Port Lincoln to Whyalla and providing connectivity to numerous towns along the way. It consists of a sealed single carriageway with one lane in each direction.	
Tod Highway	B90	The Tod Highway provides north -south connectivity through the centre of the Eyre Peninsula, from Kyancutta to the Flinders Highway approximately halfway between Coffin Bay and Port Lincoln. It consists of a sealed single carriageway with one lane in each direction.	

Name	Class	Description	Photo
Birdseye Highway	B91	The Birdseye Highway provides east-west connectivity across the Eyre Peninsula, linking Cowell to Elliston. It is a sealed, single carriageway road with one lane in each direction.	

3.1.3 Existing State Road Traffic

The Annual Average Daily Traffic (AADT) of each of the highways varies over segments between towns and major intersections. Table 3-3 details the varying AADT and percentage of heavy vehicles values by road segment. Maps displaying these AADTs and percentage of heavy vehicles (HV) are located in Appendix A. Table 3-3 also contains a projection of likely future traffic volumes anticipated during the construction period to 2017 (see section 3.1.6 for a discussion on predicted traffic volumes).

Table 3-3 Existing AADT and percentage of heavy vehicles

Road name	Segment	AADT (2013)	%HV	Projected AADT (2017)
Eyre Highway (A1)	Stuart Highway -> Lincoln Highway	2700	22	2700
	Lincoln Highway -> Iron Knob Whyalla Road	650	35.5	650
	Iron Knob Whyalla Road -> Kimba-Cleve Road	750	32	750
	Kimba-Cleve Road -> Tod Hwy	800	35	800
	Tod Hwy -> Wudinna	1000	31	1000
Lincoln Highway (B100)	Eyre Highway -> Whyalla	2000	16	2240
	Whyalla -> Kimba-Whyalla Road	1100	17	1232
	Kimba-Whyalla Road -> Ash Road	1100	27.5	1232
	Ash Road -> Cowell	950	18	1064
	Cowell -> Birdseye Highway	800	17.5	896
	Birdseye Highway -> Arno Bay	550	18	616
	Arno Bay -> Tumby Bay	700	17	784
	Tumby Bay -> Louth Bay	1200	17.5	1344
	Louth Bay -> North Shields	1800	13.5	2016
	North Shields -> Port Lincoln	3000	9.5	3360
Tod Highway (B90)	Kyancutta -> Lock	220	17.5	220
Birdseye Highway (B91)	Lincoln Highway -> Cleve	240	17	240
	Cleve -> Rudall	350	10.5	350
	Rudall -> Lock	130	13	130

3.1.4 Existing Restricted Access Vehicle Network

The four highways, as well as many other roads across the Eyre Peninsula, are gazetted for a variety of restricted access vehicles. The gazetted vehicles for each of the Highways in the study are detailed in Table 3-4 and network maps are included in Appendix B.

Table 3-4 Existing Restricted Access Vehicle Network - Highways

	Gazetted vehicle type	Eyre Highway	Lincoln Highway	Birdseye Highway (between Lock and Cowell)	Tod Highway
GML Routes	23m B Double (GML)	✓	✓	✓	✓
	26m B Double (GML)	✓	✓	✓	✓
	32m Road Train (GML)	✓	✓	✓	✓
	36.5m Road Train (GML)	✓	✓	✓	✓
	53.5m Road Train (GML)				
	Road Train Converter Dolly (GML)	✓	✓	✓	✓
	23m Vehicle Carrier (GML)	✓	✓	✓	✓
	25m Vehicle Carrier (GML)	✓	✓	✓	✓
	35.0m B-Triple	✓	✓	✓	✓
	Rigid Truck and Dog (23m) (GML)	✓	✓	✓	✓
HML	23m B Double (HML)	✓	✓	✓	✓

	Gazetted vehicle type	Eyre Highway	Lincoln Highway	Birdseye Highway (between Lock and Cowell)	Tod Highway
Routes	26m B Double (HML)	✓	✓	✓	✓
	32m Road Train (HML)	✓	✓	✓	✓
	36.5m Road Train (HML)	✓	✓	✓	✓
	53.5m Road Train (HML)				
	Road Train Converter Dolly (HML)	✓	✓	✓	✓
	23m Vehicle Carrier (HML)	✓	✓	✓	✓
	25m Vehicle Carrier (HML)	✓	✓	✓	✓
	19m Network (HML)	✓	✓	✓	✓
OSM Routes	23m 42.5t Low Loader 24 Hr	✓	✓	✓	✓
	23m 42.5t Low Loader Day Only	✓	✓	✓	✓
	25m 49.5t Low Loader	✓	✓	✓	✓
	25m 59.5t Low Loader	✓	✓	✓	✓
	Controlled Access Bus up to 14.5m	✓	✓	✓	✓
	3 Axle Crane Network	✓	✓	✓	✓
	4 Axle Crane Network	✓	✓	✓	✓
	5 Axle Crane Network	✓	✓	✓	✓
	5 Axle Crane Night Travel	✓	✓		✓
	6 Axle Crane - Day Travel	✓	✓	✓	✓
PBS Routes	Level 1A	✓	✓	✓	✓
	Level 2A	✓	✓	✓	✓
	Level 2B	✓	✓	✓	✓
	Level 3A	✓	✓	✓	✓
	Level 3B				
	Level 4A				
Commodity Routes - B Double	Grain (B Double GML)	✓	✓	✓	✓
	Fertilizer (B Double GML)	✓	✓	✓	✓
	Hay & Bulk Stock Feed (B Double GML)	✓	✓	✓	✓
	Dairy Milk (B Double GML)	✓	✓	✓	✓
	Livestock (B Double GML)	✓	✓	✓	✓
	Logging & Timber (B Double GML)	✓	✓	✓	✓
	Wine (B Double GML)	✓	✓	✓	✓
	Wool (B Double GML)	✓	✓	✓	✓
	Fruit & Veg (B Double GML)	✓	✓	✓	✓
Commodity Routes - Road Train	Grain (Road Train GML)	✓	✓	✓	✓
	Fertilizer (Road Train GML)	✓	✓	✓	✓
	Hay & Bulk Stock Feed (Road Train GML)	✓	✓	✓	✓
	Dairy Milk (Road Train GML)	✓	✓	✓	✓
	Livestock (Road Train GML)	✓	✓	✓	✓

	Gazetted vehicle type	Eyre Highway	Lincoln Highway	Birdseye Highway (between Lock and Cowell)	Tod Highway
	Logging & Timber (Road Train GML)	✓	✓	✓	✓
	Wine (Road Train GML)	✓	✓	✓	✓
	Wool (Road Train GML)	✓	✓	✓	✓
	Fruit & Veg (Road Train GML)	✓	✓	✓	✓

3.1.5 State Road Seasonal Variation of Vehicle Movements

An assessment was carried out on traffic count data from 12 locations across the Eyre Peninsula. This assessment involved looking at yearly traffic data to see if there was any season variation in traffic volumes. Of the 12 locations, five of them only had a week long traffic count data (which doesn't indicate any seasonal variations) and therefore were discarded. Of the remaining seven, for any traffic count locations which were situated above Goyder's Line there was no obvious seasonal variation. Above Goyder's Line crops generally don't grow, therefore there would be no seasonal variation in vehicle trips due to grain carting. Below Goyder's Line however there were increased vehicle trips in November and December. This increase in vehicle trips can be attributed to crop harvesting. Therefore there would be an increased number of commercial vehicles on the roads below Goyder's Line during November and December as farmers cart grain to silos in nearby towns. A map giving an indication of where Goyder's Line passes through South Australia (as there is no definitive location and it is very slowly moving further south) is given in Figure 3-2.

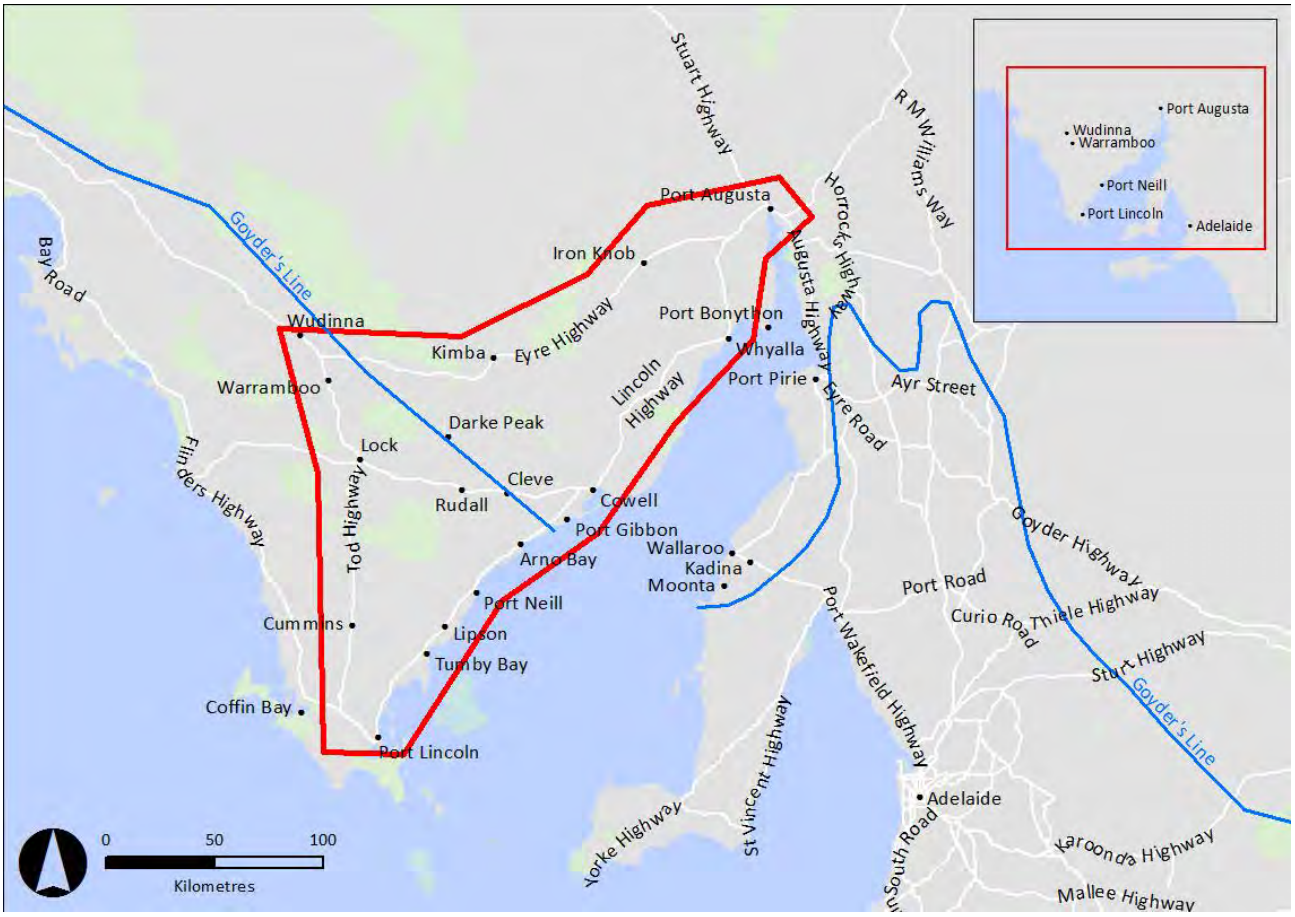


Figure 3-2 Goyder's Line

3.1.6 Predicted Traffic Growth Without Project

The pattern of population, employment and consequently traffic growth in the Eyre Peninsula is highly variable across the region. In locations where population is growing, such as in Port Lincoln, traffic growth of up to 3% per annum is occurring on approach roads. Conversely, in rural areas where there is no change to existing industries, and a declining trend in population, traffic growth is expected to be zero or even negative. From assessment of AADT data for the major highways on the Eyre Peninsula in the study area there has been negligible to no growth in daily traffic on most State roads in the past 20 years. The population of the Cleve, Franklin Harbour and Kimba Local Government Authorities (LGAs) all fell slightly between the 2006 and 2011 ABS censes. In the environs of Warramboo, Rudall and Port Neill, there is no evidence of any significant growth pattern in population or traffic in recent years. It is assumed that base (no project) traffic volumes on the approach roads to the proposed mine site would remain constant over the assessment period.

An exception is the Lincoln Highway on which traffic has almost doubled in 20 years. This increase in traffic could be attributed to the increase in population of Port Lincoln. Whyalla also experienced a slight population increase up to the 2011 census. Traffic growth on the Lincoln Highway is assumed to continue at 3% per annum. This would equate to growth of approximately 12% during the construction period to 2017. The resulting projected traffic volumes are shown in Table 3-3.

3.1.7 State Road Asset Condition

Data on existing pavement asset condition was requested from DPTI but detailed data was not available externally when requested. The State roads in the study area were observed to be in reasonable condition relative to their traffic volume in terms of surface roughness and rutting when inspected. An exception was the Iron Knob to Whyalla Road, which had high roughness.

3.1.8 State Road Safety

Crash data obtained from DPTI was mapped and compared with traffic volumes to determine the number of crashes per vehicle kilometre travelled. Data on the following roads was requested and plotted:

- Birdseye Highway between Lock and Cowell
- Eyre Highway between Port Augusta and Kyancutta
- Lincoln Highway between Port Augusta and Port Lincoln
- Tod Highway between Kyancutta and Flinders Highway
- Flinders Highway between Tod Highway intersection and Western Approach Road near Port Lincoln
- Western Approach Road, Port Lincoln
- Balumbah-Kinnard Road south of Rudall to Lincoln Highway
- Iron Knob to Whyalla Road

Figure 3-3 shows the crash rate per 100 million vehicle kilometres travelled.

Figure 3-3 Crash rate per 100 million vehicle kilometres travelled

Roads with a crash rate under 50 crashes per 100 million vehicle kilometres travelled are considered to have an average or better crash history. As can be seen in Figure 3-3 the highest crash rates per 100 million vehicle kilometres travelled occurred between:

- Kyancutta and Warramboo
- Whyalla and Iron Knob
- Lipson and Tumby Bay
- Lock and Yeelanna
- Cleve and Cowell

Crash data is notoriously variable and this can distort analysis of crash rates on low volume roads. The higher crash rates per vehicle kilometre between some of these towns can be attributed to the short distances between the towns. This may skew the data to give a worse indication than it actually is. Lipson to Tumby Bay is a fairly smooth road approximately 11 km long, and Kyancutta to Warramboo is another fairly smooth road approximately 12 km long.

The only roads with a higher than average crash rate that will be used by significant volumes of project traffic are the Birdseye Highway between Cleve and Cowell and Whyalla to Iron Knob Road. Birdseye Highway between Cleve and Cowell, is approximately 42 km long and winds through rolling terrain. The majority of construction deliveries for the CEIP will be delivered to the proposed port site or the proposed mine site. However in the second and third years of construction it is assumed there would be deliveries to the infrastructure corridor approaching from Adelaide which will use the Cleve to Cowell road. Whyalla to Iron Knob Road is approximately 52 km long and is predominantly straight on relatively flat terrain. Deliveries to the proposed mine site along this road would only occur during the construction phase.

Table 3-5 shows the sections of road within the study area which have higher crash rates and will have CEIP generated traffic travelling along them. A traffic management strategy will be required for the Kyancutta to Warramboo section of the Tod Highway, the Cleve to Cowell section of the Birdseye Highway and Iron Knob to Whyalla Road. However due to the very low volume of CEIP traffic that will be generated along the Lincoln Highway from Port Lincoln to the proposed port site, and between Port Lincoln and Lock on the Flinders Highway and Tod Highway, a traffic management strategy is not considered to be necessary for these sections of road.

Table 3-5 Sections of State road with higher crash rates within study area

Road segment	Crash rate >50 per 100 million vehicle kilometres travelled	CEIP generated traffic
Tod Highway (Kyancutta – Warramboo)	Yes	Yes (construction and operation phases)
Birdseye Highway (Cleve – Cowell)	Yes	Yes (construction phase only)
Lincoln Highway (Lipson – Tumby Bay)	Yes	Yes (negligible amount in construction phase only)
Eyre Highway (Iron Knob – Lincoln Hwy intersection)	Yes	Yes (construction and operation phases)
Iron Knob to Whyalla Road	Yes	Yes (construction phase only)
Tod Highway (Lock – Yeelanna)	Yes	Yes (negligible amount in construction phase only)

3.2 Local Road Network

This section provides information for the local road network in the study area.

3.2.1 Wudinna Local Road Network

The Wudinna local road network consists of sealed, single carriageway roads. The roads in the township of Wudinna are laid out in a grid formation (refer to Figure 3-4).

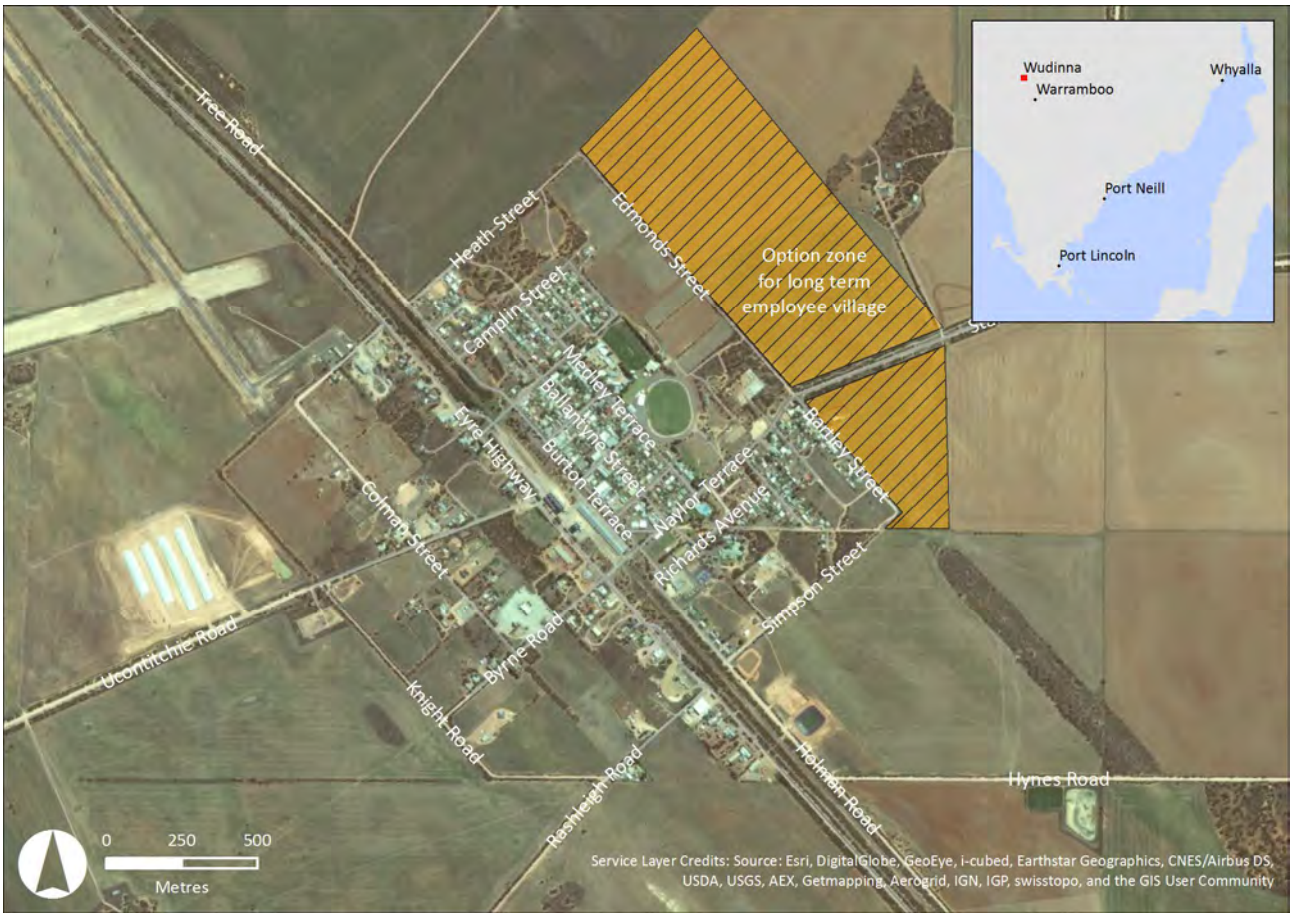


Figure 3-4 Wudinna local road network

3.2.2 Warramboo and Proposed Mine Site Local Road Network

The local road network surrounding the proposed mine site and the proposed mine site to Warramboo generally consists of unsealed, one lane each way roads. The local road network is shown on Figure 3-5 and details of the key mine site access roads are given in Table 3-6.

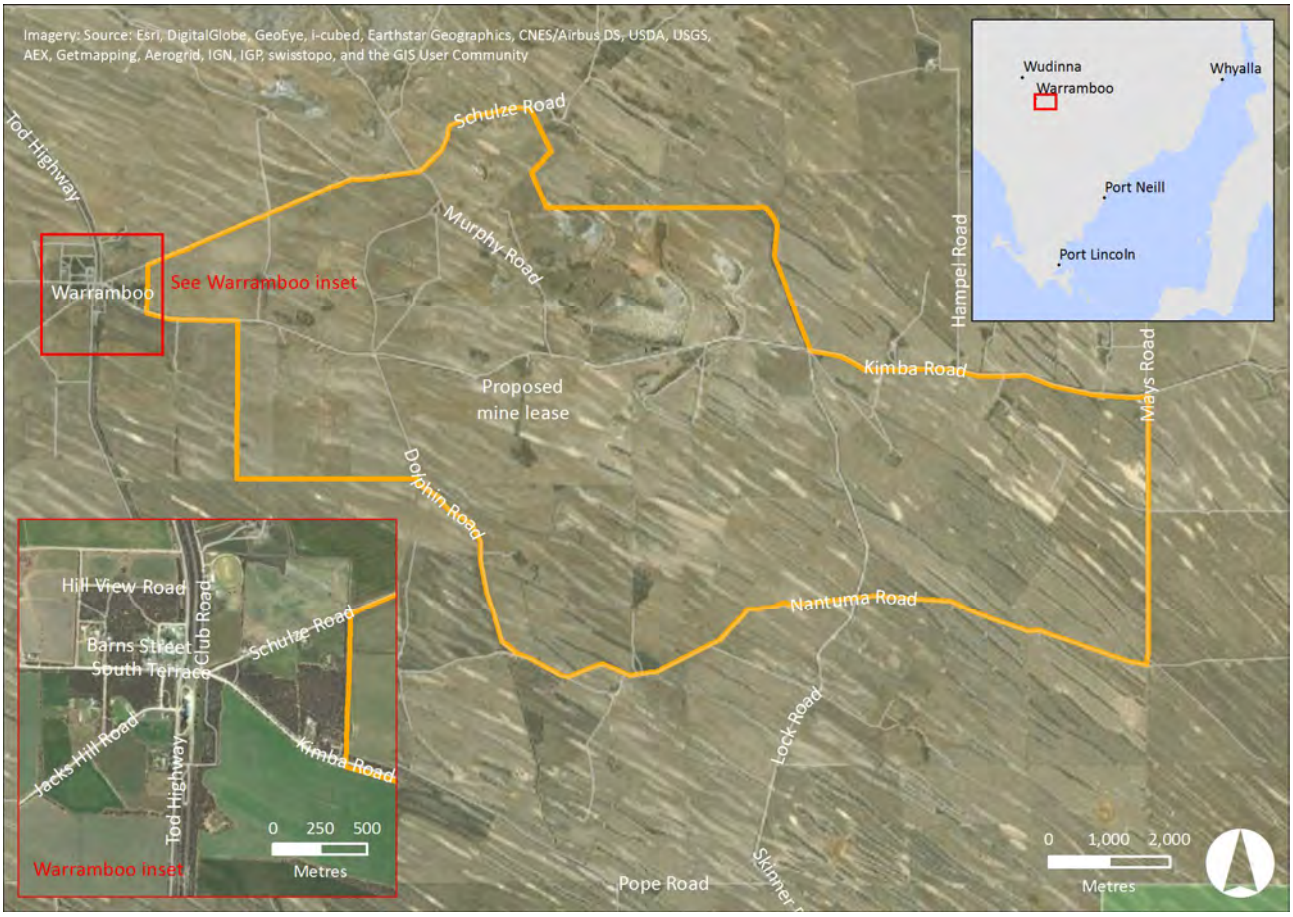


Figure 3-5 Warramboo local road network

Table 3-6 proposed mine site local road network

Road Name	Description	Photo
Kimba Road	Kimba Road is a single carriageway two way unsealed road which links Warramboo to the proposed mine site. It is maintained by Wudinna District Council and is approximately 8.5 m in width. It consists of good strength material, well graded, well compacted with some corrigations and large windrows, however it is noted that feedback from the community has advised that some sections of the road are rough. There is no excessive erosion or fines and some drainage turnouts. Currently it provides access to a small number of farm properties.	

Road Name	Description	Photo
Schulze Road	Schulze Road is a single carriageway two way unsealed road which links Warramboo to the proposed mine site. Currently it provides access to a small number of farm properties.	
Nantuma Road	Nantuma Road is a single carriageway two way unsealed road which would link the proposed mine site to the Tod Highway during the operation phase of the mine. Currently it provides access to a small number of farm properties.	

3.2.3 Infrastructure Corridor Local Road Network (proposed mine site to Lincoln Highway)

The proposed infrastructure corridor crosses approximately 30 roads between the proposed port site and the proposed mine site, including the Lincoln Highway and the Birdseye Highway. The proposed infrastructure corridor would be constructed for the railway line, pipeline and transmission line. A plan of the proposed infrastructure corridor is shown in Figure 3-6.

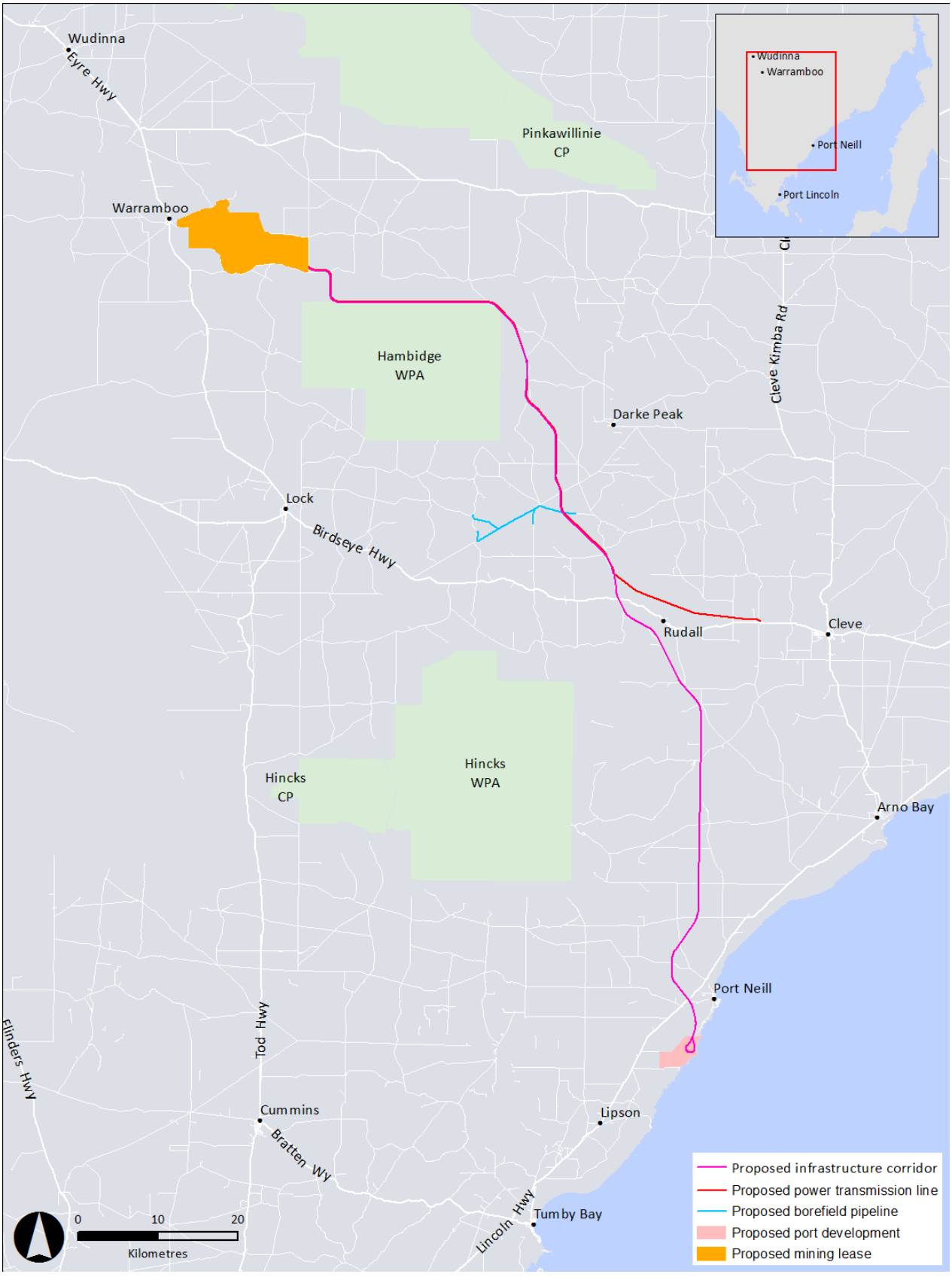


Figure 3-6 Plan of proposed infrastructure corridor

3.2.4 Module Route Local Road Network

During construction of the proposed mine site, modules of the mine plant arriving at the module offloading facility would travel to the proposed mine site via the haul route. The haul route consists of the following roads:

- North Coast Road
- Port Neill Access Road
- Lincoln Highway (Port Neill Access Road to Balumbah-Kinnard Road)
- Balumbah-Kinnard Road
- Birdseye Highway (Rudall to Lock)
- Tod Highway (Lock to Warramboo)
- Kimba Road (Warramboo to proposed mine site)

As transport of the modules along the haul route will be at low speeds (between 1 km/h and 40 km/hr depending on the size of the module), traffic will be detoured on to local surrounding roads which are generally unsealed, one lane each way roads.

A map showing the proposed module delivery route is shown in Figure 3-7.

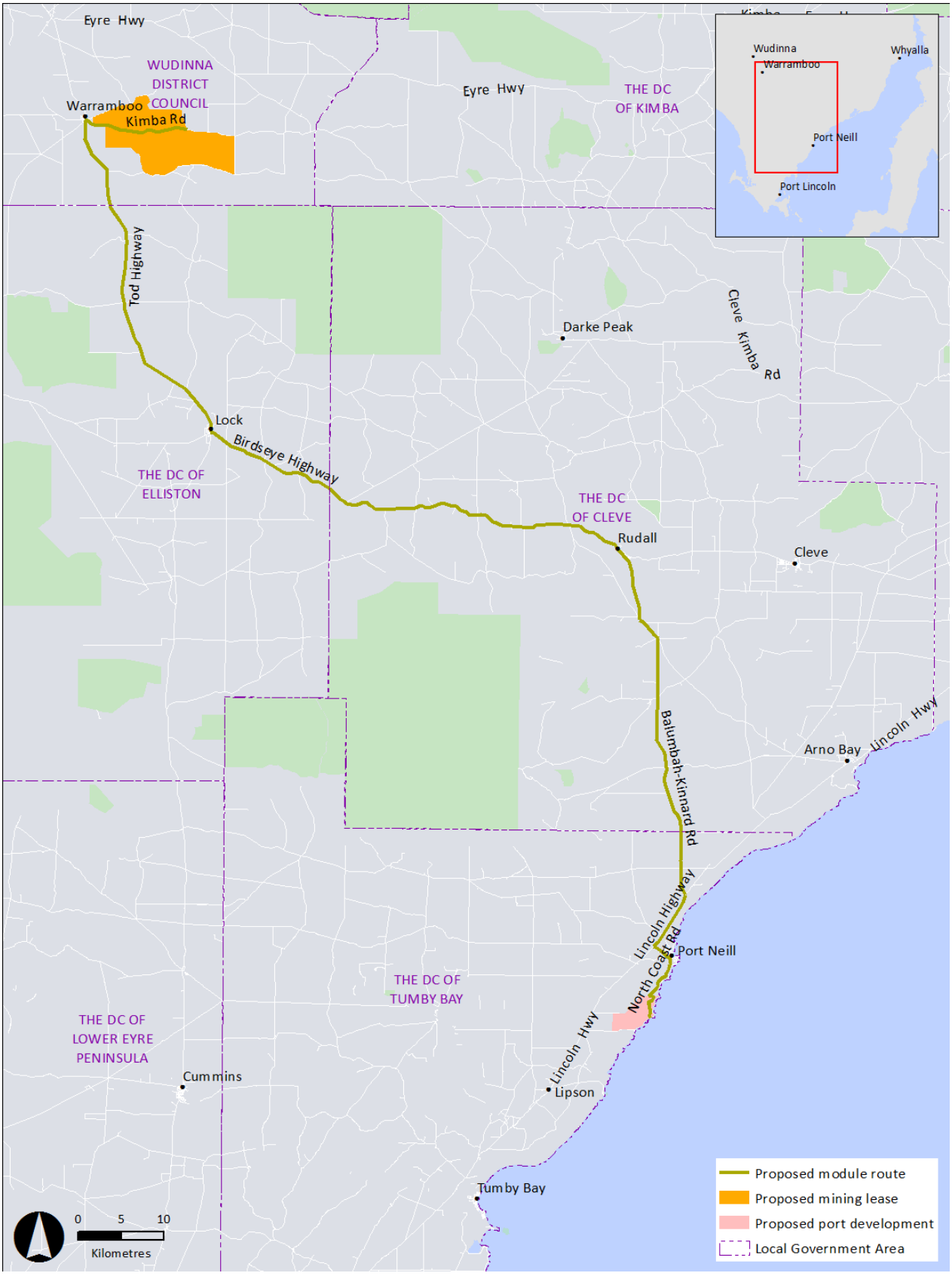


Figure 3-7 Plan of module delivery route

3.2.5 Proposed Port Site Local Road Network

The proposed port site would be accessed via the Lincoln Highway. Vehicles accessing the proposed port site would turn off the Lincoln Highway on to Port Neill Access Road, and then travel along Coast Road to the proposed port site entrance. North Coast Road traverses through the middle of the proposed port site from north to south. Brayfield Road crosses the proposed port site from the west before ending in a T intersection with Coast Road. A third local road, Kiandra Road is located at the southern boundary of the proposed port site. Details of these roads are given in Table 3-7.

Table 3-7 Proposed port site local road network

Road Name	Description	Photo
North Coast Road	North Coast Road is a single carriageway two way mostly unsealed road. It runs parallel to the Lincoln Highway from Port Neill to Kiandra Road. It is maintained by Tumby Bay Council and is approximately 7.5 m in width.	
Kiandra Road	Kiandra Road is a single carriageway two way unsealed road running parallel with Brayfield Road and perpendicular to the Lincoln Highway.	
Brayfield Road	Brayfield Road is an Austroads class 4 road running perpendicular to the Lincoln Highway to the proposed port site. It is maintained by Tumby Bay Council and is a single carriageway two way unsealed pavement of approximate width 8 m.	

Road Name	Description	Photo
Port Neill Access Road	Port Neill Access Road is a two way sealed road and serves as a link from the Lincoln Highway to Port Neill. Port Neill Access Road is approximately 6 m wide.	

3.2.6 Local Road Traffic Volumes

Local roads are not controlled by DPTI or the subject of their traffic surveys. They are generally not surveyed for traffic volume by the controlling Council either, and so there is a lack of traffic data for these roads in the study area. In practice, it can be seen from surveys of traffic volume data on intersecting major roads that traffic volumes on local roads must be the same or less than the traffic volumes at these intersection points. This means that in all cases relevant to the project, the intersecting local roads have very low traffic volumes, typically from 100 to 300 vehicles per day or less. In all cases, this means that they currently operate at Level of Service A (LOS A) in traffic capacity terms. That is, they have no current traffic capacity issues.

3.2.7 Predicted Local Road Traffic Growth Without Project

There is no available time series data on traffic growth on local roads in the study area. Similar to the conclusions for major roads, it is presumed that apart from local roads near Port Lincoln, there is no traffic growth occurring on local roads in the study area, due to stable or slightly declining local population.

3.2.8 Local Road Asset Condition

Local roads in the study area are generally unsealed and in good condition. Photos of their condition are given in Table 3-6 and Table 3-7.

3.2.9 Local Road Safety

No road crash data is available for local roads in the study area. Given the very low traffic volumes on the roads concerned, and the random nature of road crashes, it is considered unlikely that any statistically significant pattern in road crashes could be detected.

3.3 Rail Network

3.3.1 Existing Rail Lines

There is an existing isolated rail network across the Eyre Peninsula which is seasonally used for carting grain. The main track connects the Port of Thevenard on the west coast of the Eyre Peninsula to Port Lincoln. A branch of this network also links Cummins to Buckleboo. Figure 3-8 shows the existing railway lines.

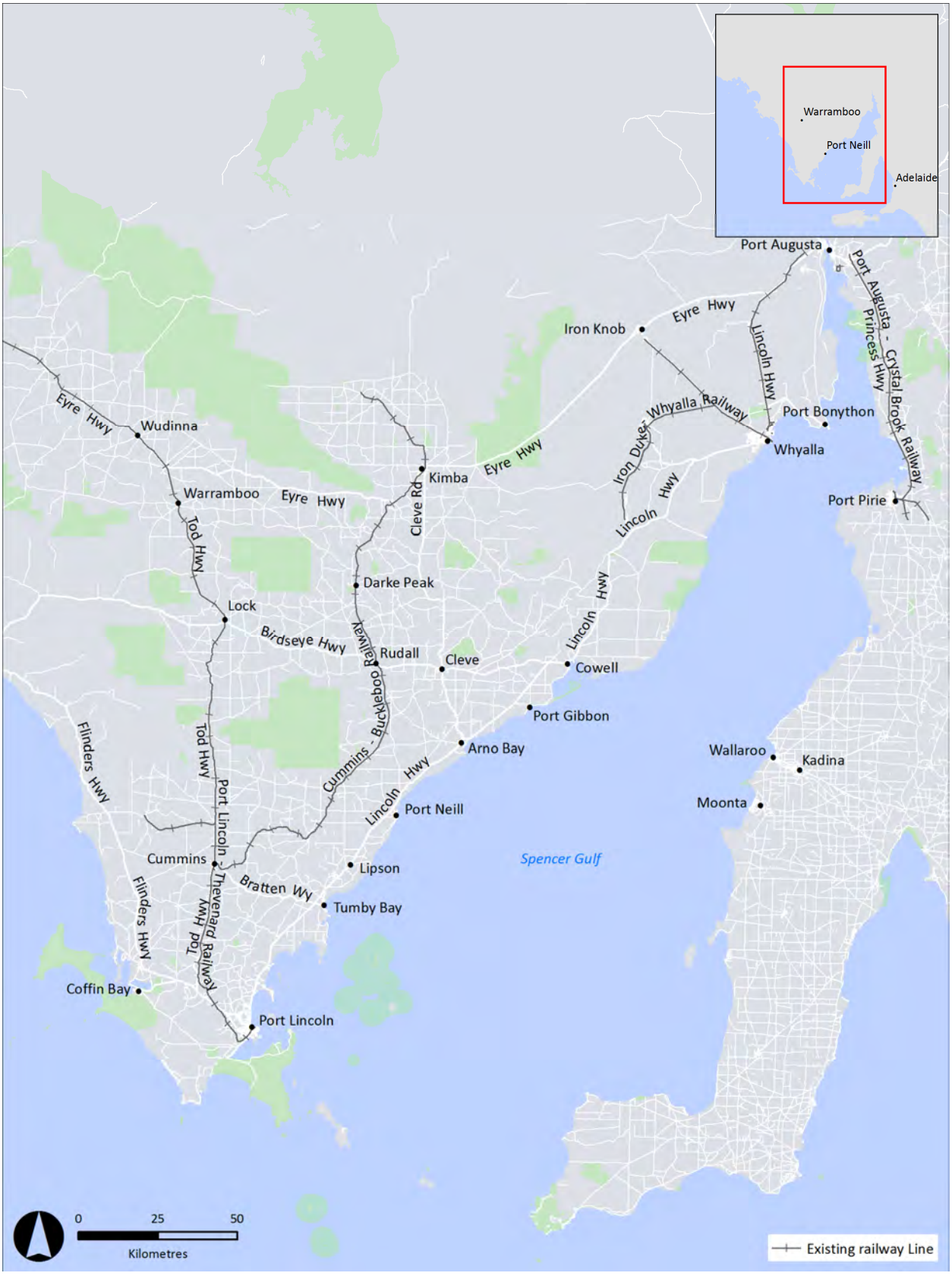


Figure 3-8 Existing railway lines on the Eyre Peninsula

The Port Lincoln-Thevenard railway line passes through the following towns in the study area:

- Port Lincoln
- Wanilla
- Edillilie
- Cummins
- Yeelanna
- Lock
- Warramboo
- Kyancutta
- Wudinna

The Cummins-Buckleboo railway line passes through the following towns in the study area:

- Cummins
- Rudall
- Darke Peak
- Kimba

3.3.2 Module Route Crossings of Existing Rail Lines

The module route will cross the Port Lincoln-Thevenard railway line at existing crossings at Lock on the Birdseye Highway and at Warramboo on Kimba Road. Details of these crossings and the crossing across the Cummins-Buckleboo railway line are provided in Table 3-8. The module route would cross the Cummins-Buckleboo railway line at Balumbah-Kinnard Road (see Table 3-8). Details of these existing crossings are provided in Table 3-8.

Table 3-8 Existing crossings on module delivery route

DPTI Reference Crossing Number	Location	Type	Control	Photo
RLX1292	Balumbah-Kinnard Rd, Rudall	Passive	Give way sign	
RLX1434	Birdseye Hwy, Lock	Passive	Stop sign	

DPTI Reference Crossing Number	Location	Type	Control	Photo
RLX1452	Kimba Rd, Warramboo	Passive	Stop sign	

All of the existing level crossings on the module route have adequate sight distance and traffic control for the traffic and train volumes currently using them.

3.4 Bus transport

Public transport on the Eyre Peninsula is limited. There are no passenger rail services. Premier Stateliner runs regular bus services between Adelaide and regional centres (Premier Stateliner 2014) including:

- A service between Port Lincoln and Adelaide with six buses each way a week, buses leave Adelaide Monday to Saturday and Port Lincoln Sunday to Friday.
- A service between Ceduna and Adelaide with two buses each way a week, buses leave Adelaide Monday and Thursday mornings and Ceduna Tuesday and Friday mornings.
- A service between Adelaide and Whyalla which runs four times a day each way Monday to Friday and less frequently on weekends.

School buses are operated by the schools within the study area including Wudinna Area School, Cleve Area School and Tumby Bay Area School. The school bus routes are generally revised annually depending on the requirements of the school population.

4 CEIP Generated Traffic

The construction and operation of the CEIP would generate additional traffic above existing levels. This chapter documents the estimated number of traffic movements associated with the CEIP during the construction and operational phases. Both the proposed mine and the proposed port site generate traffic movements over a wide area, and traffic impacts of each should not be considered in a discrete fashion. Overall generated traffic movements for each component and phase of the project have been calculated, assigned to their most logical approach route and then combined for impacts to be calculated on a route by route basis. This section documents the combined traffic generation of each phase of the various CEIP project components.

4.1 Construction Phase

4.1.1 Construction Traffic Generation Methodology

Additional traffic generated during the construction period would include a wide range of vehicle types, depending on the type of load to be carried. This includes delivery of construction materials, workers transportation, plant modules and heavy machinery transport to the site. The traffic generation from the construction phase of the project was estimated by using anticipated quantities and vehicle load sizes for materials, size of workforce and vehicle occupancy for workers, and number of loads required to transport modules and equipment to the site. These traffic generation types are each analysed separately.

The trip generation estimates only account for external movements (i.e. vehicles travelling on public roads to and from site), and do not include internal movements within the proposed mine, proposed port site or proposed infrastructure corridor. For example, movements of water carts used on site for dust suppression have been excluded as they would not be moving outside of the site area. The water carts would fill up at designated water points in the proposed infrastructure corridor and then be trucked along the proposed infrastructure corridor for dust suppression use.

4.1.2 Construction Traffic Timing

To show a more accurate representation of the variation in vehicle movements over the construction phase, the construction period has been split into three separate years and transport tasks have been assigned to each, according to their timing in construction (i.e. start, middle or end).

4.1.3 Vehicle Types

Load deliveries to the site for large volumes are assumed to occur in the most economic vehicle type legally permitted to undertake the journey on the relevant road. For most deliveries this will be on 19 metre semi-trailers. Where the daily quantity to be transported is much smaller than the load capacity of a semi-trailer, smaller rigid body trucks, either light commercial vehicles (LCV) or rigid body trucks will be used. For large scale delivery of specialist cargoes, such as fuel, approval will be sought to use specialist delivery vehicles, including those approved under Performance Based Standards.

Road restrictions are currently in place on roads on the Eyre Peninsula for certain vehicles. A-triple road trains are not currently allowed on Eyre Peninsula roads, however Performance Based Standards (PBS) vehicles are allowed which could carry the same amount of load as the A-triple road trains. This means that fuel delivery will have to be from a PBS vehicle (refer to Section 3.1.4).

4.1.4 Workforce Commute

Construction camps are to be located on site at both the port and mine, with personnel working along the proposed infrastructure corridor to be split between the port and mine construction camps.

4.1.5 Consumables Delivery

The number of vehicle loads of consumables per week for the proposed port site and proposed mine construction camps were estimated by comparing the number of personnel assumed to be working on site during the construction period to a comparable sized remote construction project. The ratio of people to shipping container was then interpolated to provide an estimate for the number of shipping container loads per week for the construction staff at the port and mine. The estimate of consumable delivery loads to the proposed mine site during construction is 34 shipping container loads per week and consumable delivery loads to the proposed port site is 12 shipping container loads per week.

4.1.6 Traffic Distribution

For the different vehicle trip types discussed in Section 4.1.1, each of the materials were designated origins and destinations to determine the distribution of vehicle trips. The origin of each material to be delivered to site, was based on the location of the construction office (or closest main office if lacking a construction office) of each vendor response used for quantities. The office location was used as the origin for materials when information about a definitive origin was not specified. Once all of the origins and destinations were collated, the trips were then distributed between the key origins and destinations in the study area. The estimated total two-way traffic generated movements in the construction period are summarised in Table 4-1.

Table 4-1 Total two-way traffic movements generated over 3 year construction period

Destination / Origin[1]	Port Site	Long Term Employee Village	Mine Site	Infrastructure Corridor
Port Augusta	8440	640	32270	8888
Wudinna	594	0	2250	5436
Whyalla	5858	0	57084	0
Port Lincoln	24	0	58	272
Port site	0	0	144	2728

[1]For vehicles travelling from outside the study area, the origin is the closest town or city to the vehicles entry point to the study area i.e. vehicles travelling from the Stuart and Princess Highways north and east of the study area were assigned to Port Augusta as the origin point

It should be noted that items being transported to site by road from Western Australia have been included in the table as coming from Wudinna due to the vehicles having to pass through Wudinna to get to the site. Items being transported from locations further east or north of Port Augusta have been included in the table as coming from Port Augusta, due to the vehicles having to pass through Port Augusta to get to the site. The impacts of project deliveries on highways beyond the study area have not been calculated as the project traffic would fall below 1% of traffic on these roads, which is below the threshold for impact analysis in the Austroads Guide to Traffic Management.

4.1.7 Traffic Route Assignment

The generated trips shown in Table 4-1 were assigned to individual segments of the quickest road routes between the origin and destination. By looking at the construction schedule (see appendix C) they were also assigned to a year of construction to give a clear view on the number of vehicles travelling on each individual road segment in each year. Figure 4-1 displays the movements broken down by road segment and construction year.

From Figure 4-1, it can be seen that the first year of construction would be the peak year of construction traffic impact. The heaviest road impacts would be on the Eyre Highway between Port Augusta and Kyancutta, and the Tod Highway between Kyancutta and the proposed mine site turnoff in Warramboo. The high number of vehicle trips generated on those roads is due to pavement material being carted from Whyalla and fuel delivery from Adelaide. For the peak year of construction (the first year) the number of vehicle movements for each of the port, mine and proposed infrastructure corridor by road segment are as shown in Figure 4-3 to Figure 4-5. As the

proposed long term employee village is not due to be constructed until the third year of construction, vehicle movements resulting from its construction are shown in Figure 4-6.

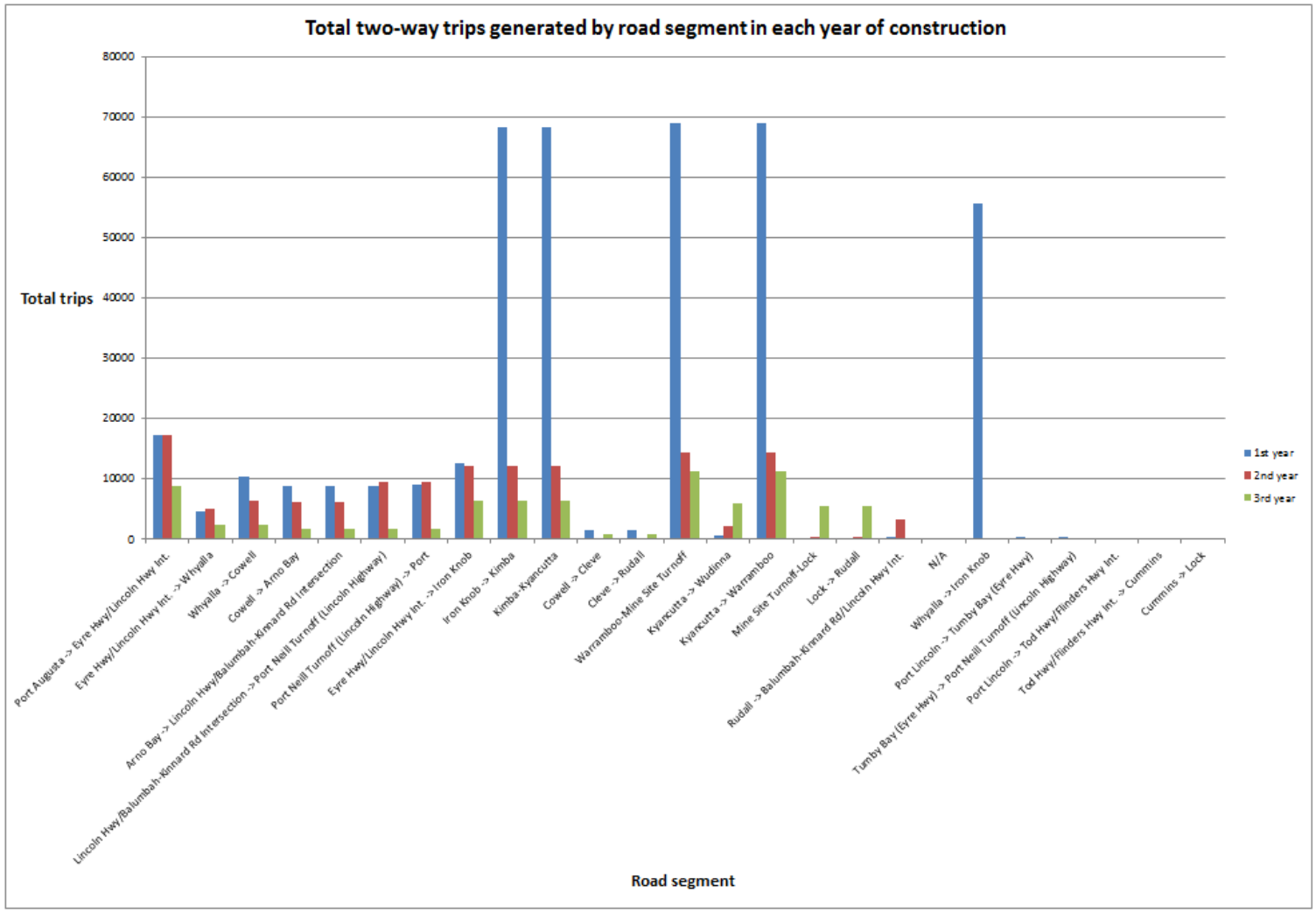


Figure 4-1 Total two-way trips generated by road segment in each year of construction

Two way vehicle movements by each road - Construction	Stage 1 - 1st Year	
	Total	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	8798	25
Cleve to Rudall	1592	5
Cowell to Arno Bay	8798	25
Cowell to Cleve	1592	5
Cummins to Lock	58	1
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	12694	35
Eyre Hwy/Lincoln Hwy Int. to Whyalla	4532	13
Iron Knob to Kimba	69776	192
Kimba to Kyancutta	69776	192
Kyancutta to Warramboo	70332	193
Kyancutta to Wudinna	556	2
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	8908	25
Lock to Rudall	110	1
Mine Site Turnoff to Lock	168	1
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	17226	48
Port Lincoln to Tod Hwy/Flinders Hwy Int.	58	1
Port Lincoln to Tumby Bay	296	1
Port Neill Turnoff (Lincoln Highway) to Port	8932	25
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	382	2
Tod Hwy/Flinders Hwy Int. to Cummins	58	1
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	296	1
Warramboo to Mine Site Turnoff	70332	193
Whyalla to Cowell	10390	29
Whyalla to Iron Knob	57082	157

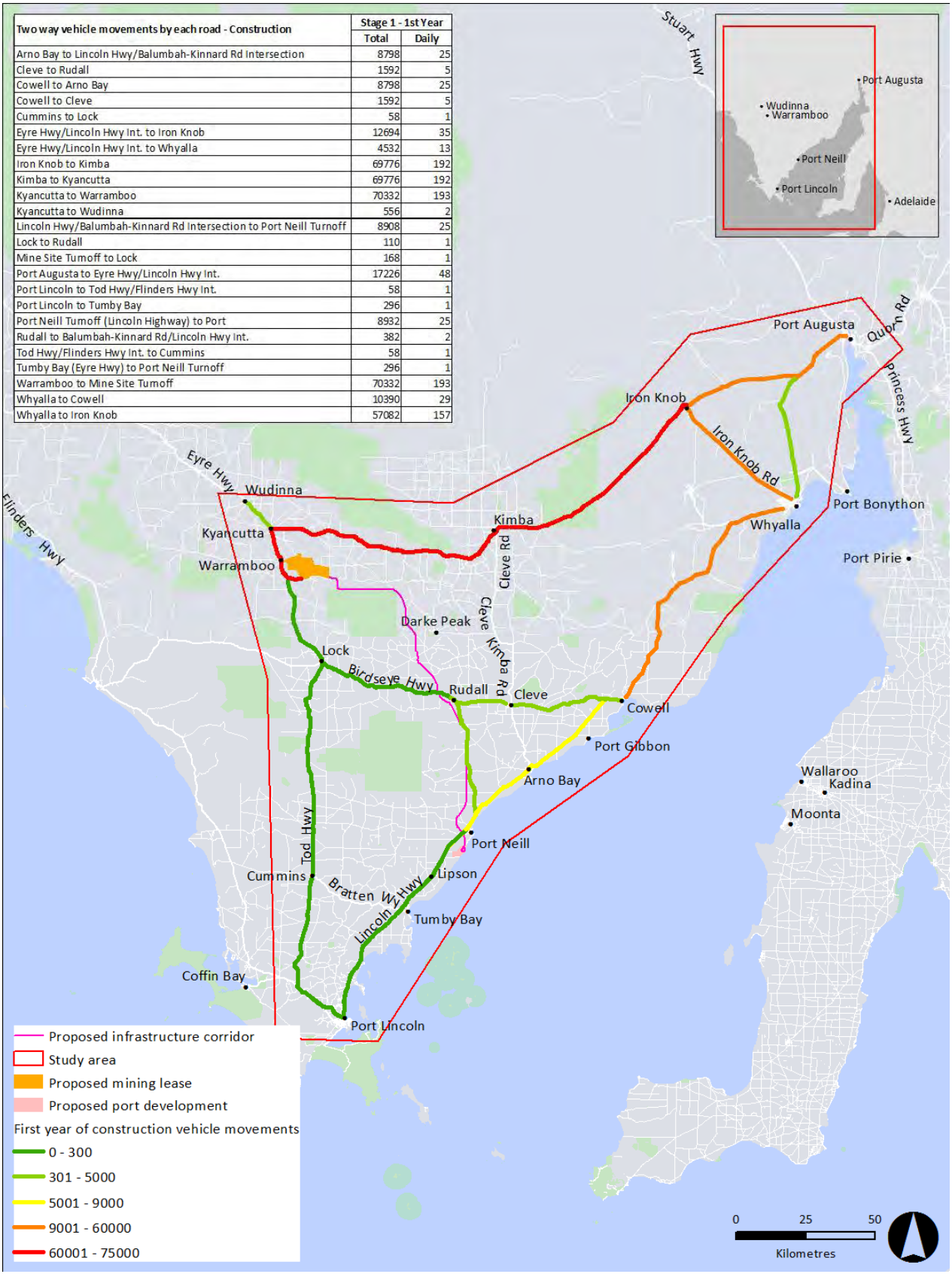


Figure 4-2 Total two way vehicle movements for first year construction

Two way vehicle movements by each road - Construction - Port	Stage 1 - 1st Year	
	Total	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	8798	25
Cleve to Rudall	0	0
Cowell to Arno Bay	8798	25
Cowell to Cleve	0	0
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	0	0
Eyre Hwy/Lincoln Hwy Int. to Whyalla	2940	9
Iron Knob to Kimba	0	0
Kimba to Kyancutta	0	0
Kyancutta to Warramboo	110	1
Kyancutta to Wudinna	110	1
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	8908	25
Lock to Rudall	110	1
Mine Site Turnoff to Lock	110	1
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	2940	9
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	24	1
Port Neill Turnoff (Lincoln Highway) to Port	8932	25
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	110	1
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	24	1
Warramboo to Mine Site Turnoff	110	1
Whyalla to Cowell	8798	25
Whyalla to Iron Knob	0	0

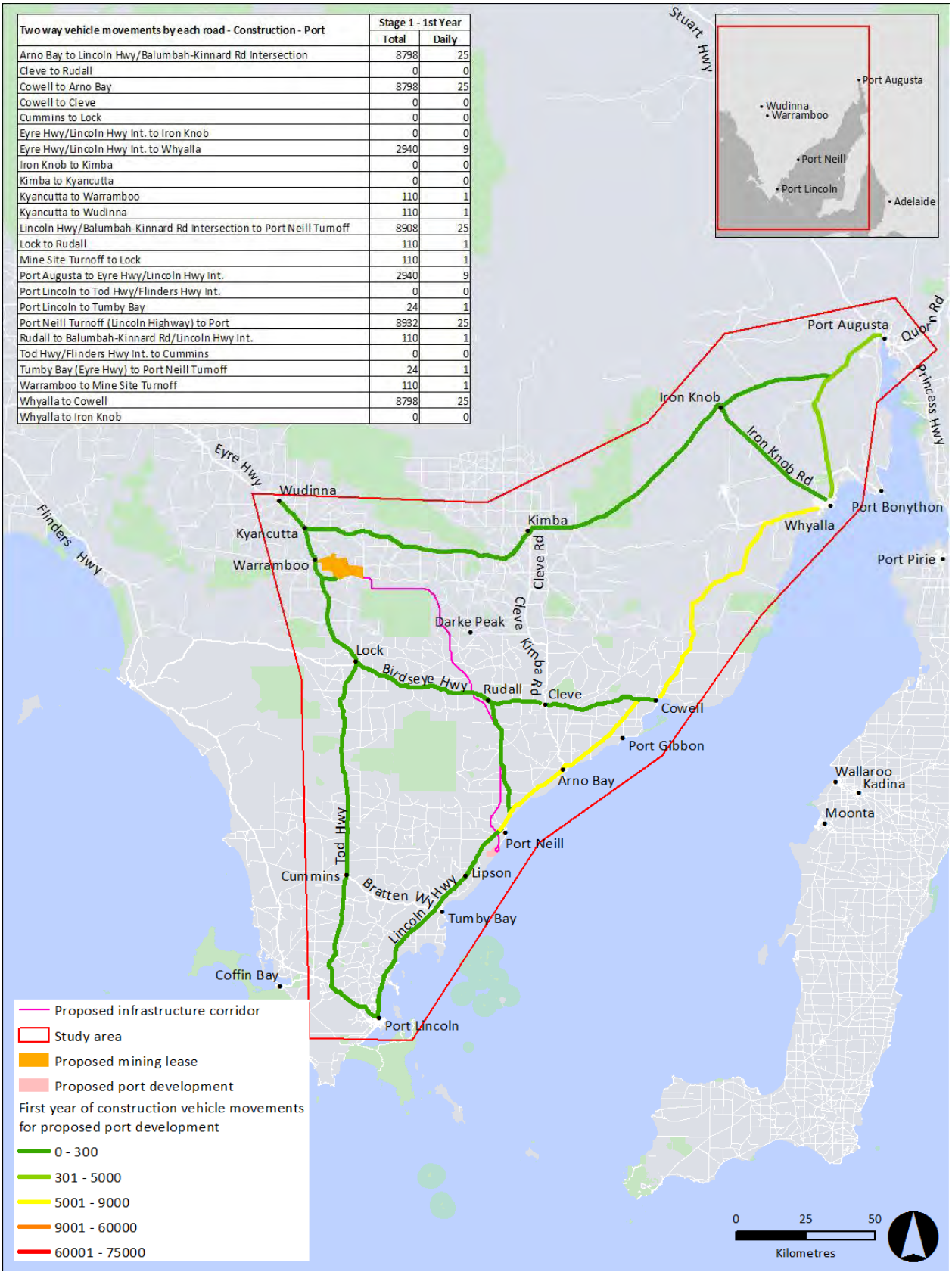


Figure 4-3 Two way vehicle movements by road segment during 1st year construction for the proposed port site

Two way vehicle movements by each road - Construction - Mine	Stage 1 - 1st Year	
	Total	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	0	0
Cleve to Rudall	0	0
Cowell to Arno Bay	0	0
Cowell to Cleve	0	0
Cummins to Lock	58	1
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	12694	35
Eyre Hwy/Lincoln Hwy Int. to Whyalla	0	0
Iron Knob to Kimba	69776	192
Kimba to Kyancutta	69776	192
Kyancutta to Warramboo	70222	193
Kyancutta to Wudinna	446	2
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	0	0
Lock to Rudall	0	0
Mine Site Turnoff to Lock	58	1
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	12694	35
Port Lincoln to Tod Hwy/Flinders Hwy Int.	58	1
Port Lincoln to Tumby Bay	0	0
Port Neill Turnoff (Lincoln Highway) to Port	0	0
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. to Cummins	58	1
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	0	0
Warramboo to Mine Site Turnoff	70222	193
Whyalla to Cowell	0	0
Whyalla to Iron Knob	57082	157

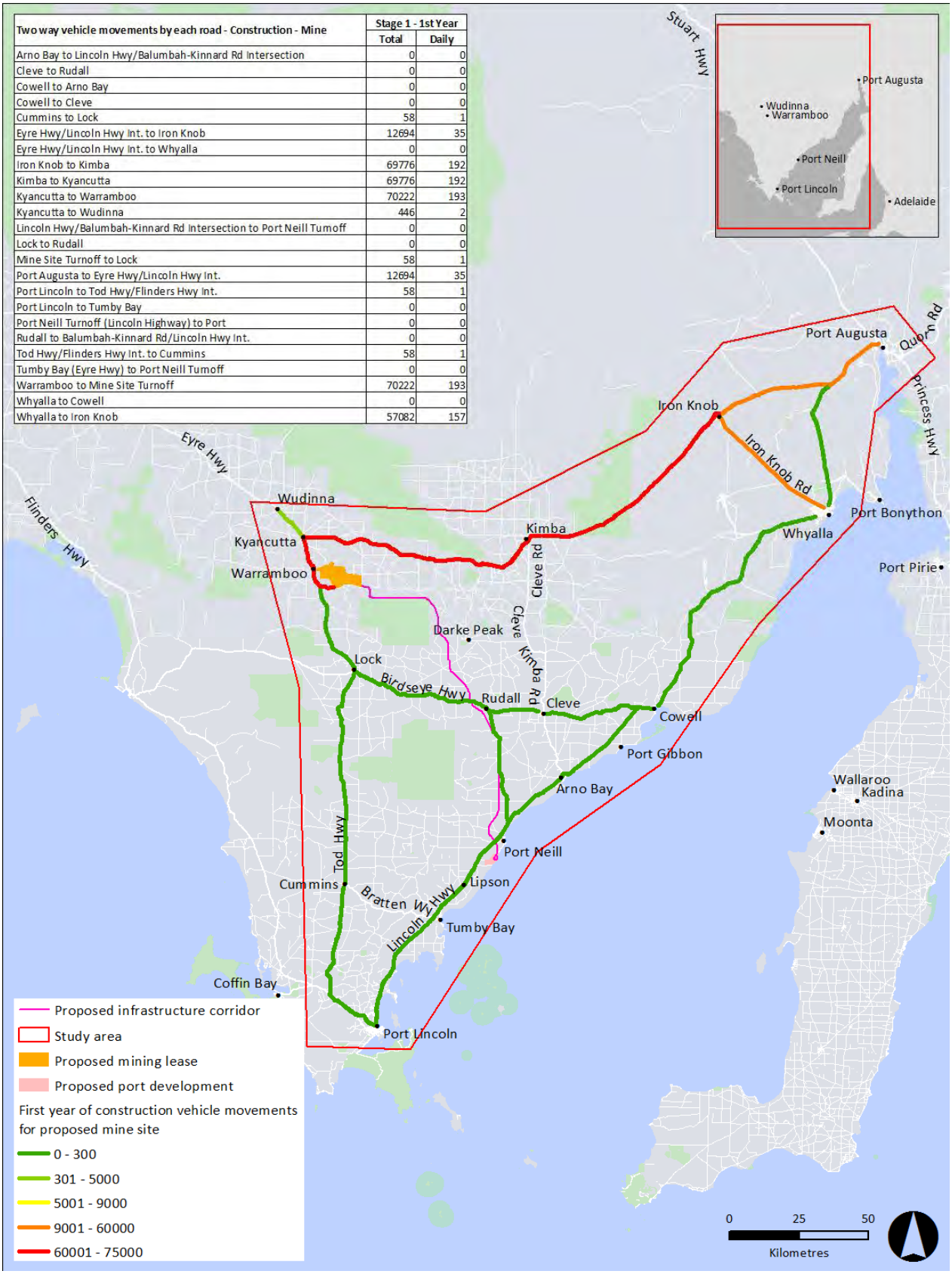


Figure 4-4 Two way vehicle movements by road segment during 1st year construction for the proposed mine site

Two way vehicle movements by each road - Construction - Infrastructure Corridor	Stage 1 - 1st Year	
	Total	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	0	0
Cleve to Rudall	1592	5
Cowell to Arno Bay	0	0
Cowell to Cleve	1592	5
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	0	0
Eyre Hwy/Lincoln Hwy Int. to Whyalla	1592	5
Iron Knob to Kimba	0	0
Kimba to Kyancutta	0	0
Kyancutta to Warramboo	0	0
Kyancutta to Wudinna	0	0
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	0	0
Lock to Rudall	0	0
Mine Site Turnoff to Lock	0	0
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	1592	5
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	272	1
Port Neill Turnoff (Lincoln Highway) to Port	0	0
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	272	1
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	272	1
Warramboo to Mine Site Turnoff	0	0
Whyalla to Cowell	1592	5
Whyalla to Iron Knob	0	0

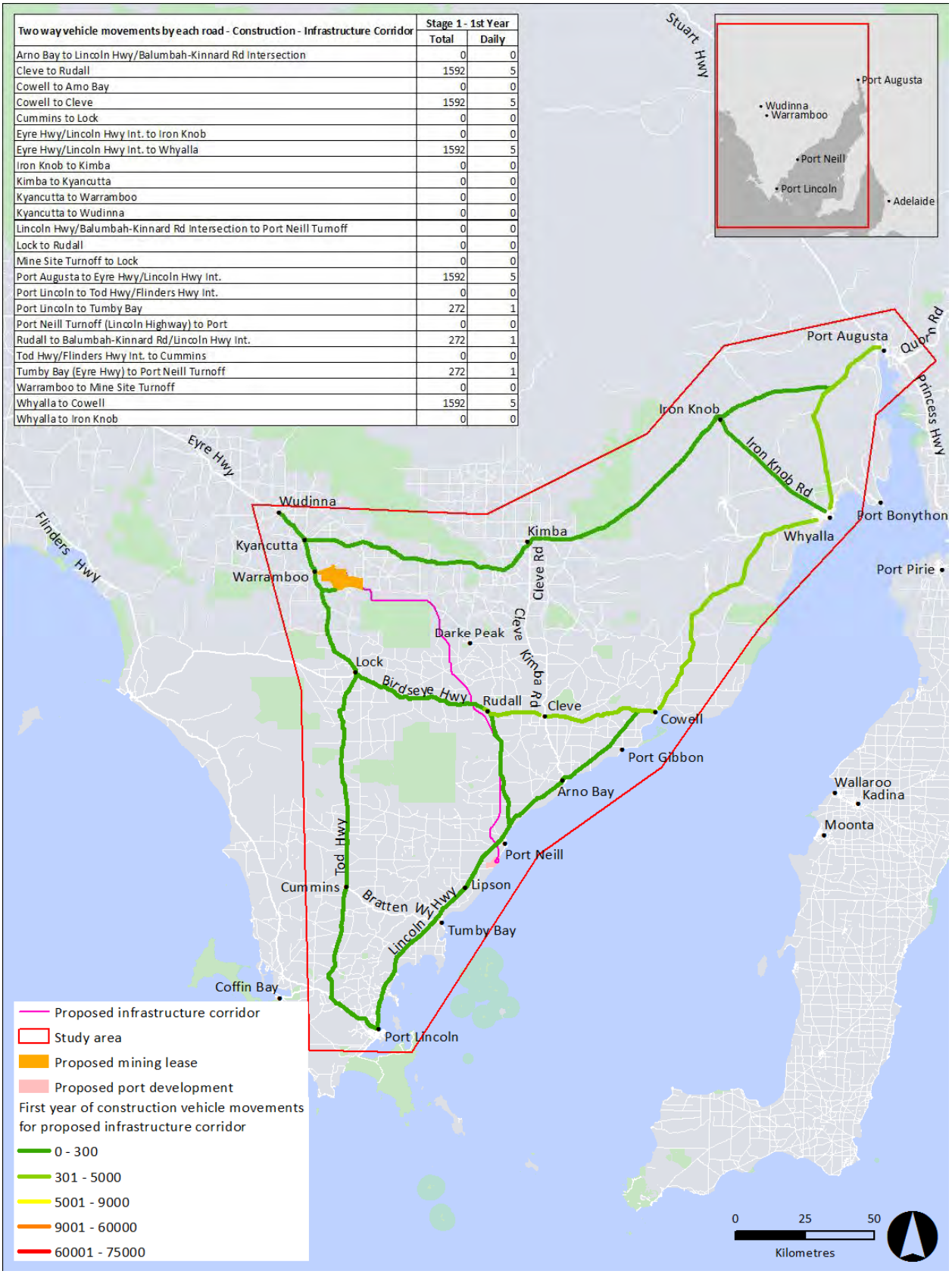


Figure 4-5 Two way vehicle movements by road segment during 1st year construction for the proposed infrastructure corridor

Two way vehicle movements by each road - Construction - Employee Village	Stage 3 - 3rd Year	
	Total	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	0	0
Cleve to Rudall	0	0
Cowell to Arno Bay	0	0
Cowell to Cleve	0	0
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	640	2
Eyre Hwy/Lincoln Hwy Int. to Whyalla	0	0
Iron Knob to Kimba	640	2
Kimba to Kyancutta	640	2
Kyancutta to Warramboo	0	0
Kyancutta to Wudinna	640	2
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	0	0
Lock to Rudall	0	0
Mine Site Turnoff to Lock	0	0
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	640	2
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	0	0
Port Neill Turnoff (Lincoln Highway) to Port	0	0
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	0	0
Warramboo to Mine Site Turnoff	0	0
Whyalla to Cowell	0	0
Whyalla to Iron Knob	0	0

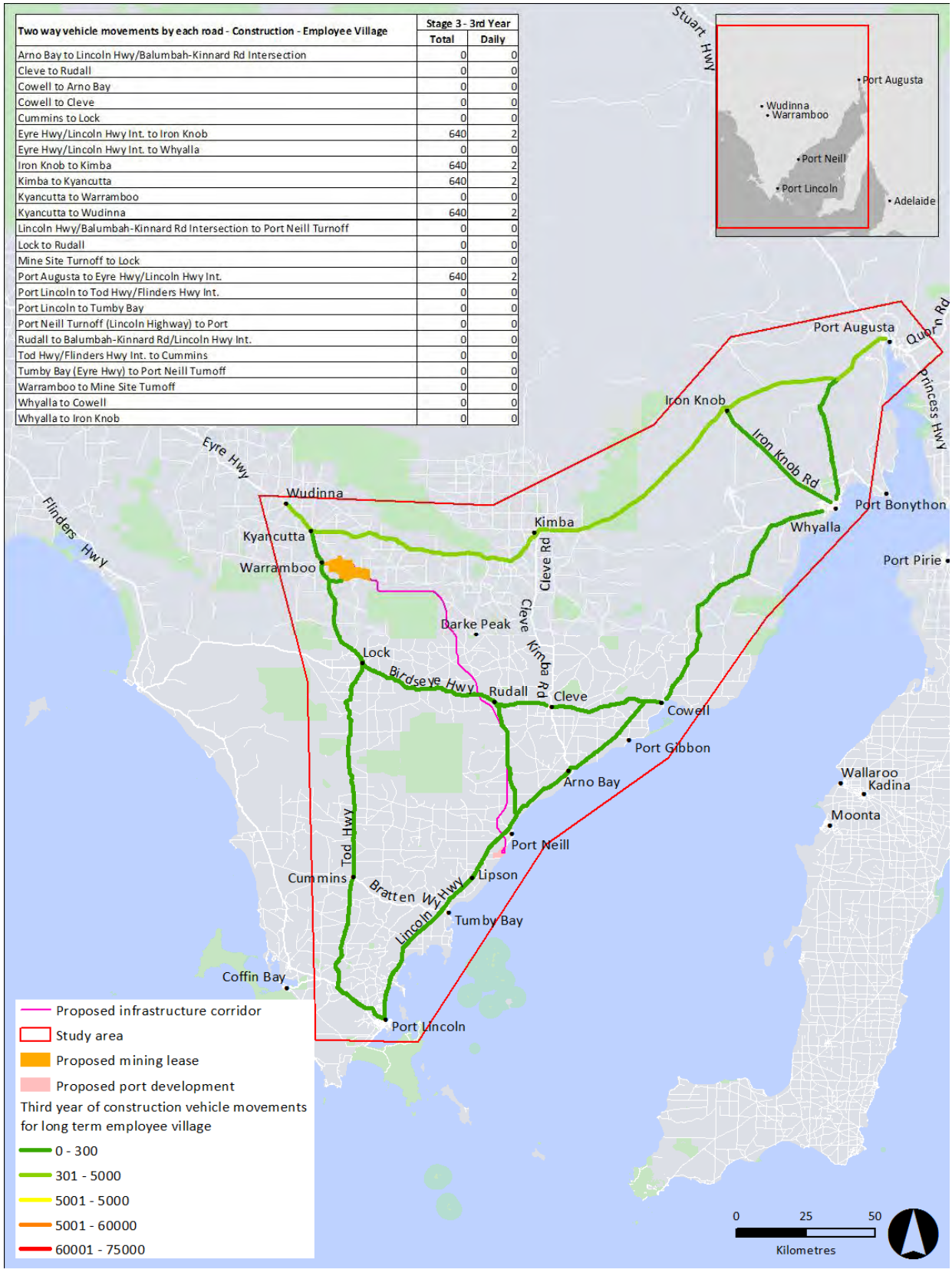


Figure 4-6 Two way vehicle movements by road segment during 3rd year construction for the proposed long term employee village

The assigned traffic volumes per road segment per year (stages 1-3) were further divided into heavy vehicles and light vehicles. These vehicle numbers were then added to the existing AADT values to determine whether there would be a significant increase in the number and proportion of heavy vehicles travelling on the impacted State roads. A summary of the average number of heavy vehicles per hour on impacted State roads in the construction period is shown in Table 4-2.

Table 4-2 Heavy vehicles per hour on impacted State roads over 3 year construction period

Road	Current- HV per hour (%HV)	Stage 1- HV per hour (%HV)	Stage 2- HV per hour (%HV)	Stage 3- HV per hour (%HV)
Port Augusta → Eyre Hwy/Lincoln Hwy Int.	24 (22%)	27 (24%)	25 (23%)	25 (23%)
Eyre Hwy/Lincoln Hwy Int. → Whyalla	13 (16%)	14 (17%)	14 (16%)	14 (16%)
Whyalla →Kimba-Whyalla Int.	10 (17%)	11 (19%)	10(17%)	10 (17%)
Kimba-Whyalla Rd Int. → Ash Rd	12. (28%)	14 (30%)	13 (29%)	13 (28%)
Ash Rd → Cowell	8 (18%)	9 (21%)	8 (19%)	8 (19%)
Cowell → Arno Bay	5 (18%)	6 (22%)	5 (19%)	5 (19%)
Arno Bay → Lincoln Hwy/Balumbah Kinnard Rd Int.	6 (17%)	7 (20%)	6 (18%)	6 (17%)
Lincoln Hwy/Balumbah Kinnard Rd Int → Port Neill Turnoff (Lincoln Highway)	6 (17%)	7 (20%)	6 (18%)	6 (17%)
Eyre Hwy/Lincoln Hwy Int. → Iron Knob	10 (36%)	12 (41%)	11 (38%)	11 (38%)
Iron Knob → Kimba	9 (32%)	18 (48%)	10 (34%)	10 (34%)
Kimba → Kyancutta	10 (35%)	19 (50%)	12 (38%)	11 (37%)
Cowell → Cleve	2 (17%)	2 (18%)	3 (26%)	2 (18%)
Cleve → Rudall	2 (11%)	2 (12%)	3(11%)	2 (11%)
Kyancutta → Wudinna	13 (31%)	14 (32%)	15 (34%)	14 (32%)
Kyancutta → Warramboo (Mine site turnoff)	2 (17%)	11 (54%)	2 (19%)	3 (26%)
Warramboo (Minesite turnoff) → Lock	2 (14%)	2 (14%)	2 (13%)	2 (19%)
Lock → Rudall	2 (13%)	2 (13%)	4 (20%)	3 (16%)
Whyalla → Iron Knob	1 (9%)	7 (52%)	1 (9%)	1 (9%)
Tumby Bay (Eyre Hwy) → Port Neill Turnoff (Lincoln Highway)	6 (17%)	6 (17%)	6 (17%)	6 (17%)
Port Lincoln → Tod Hwy/Flinders Hwy Int.	120 (8%)	120 (8%)	120 (8%)	120 (8%)
Tod Hwy/Flinders Hwy Int.	50 (9%)	50 (9%)	50 (9%)	50 (9%)
Cummins → Lock	43 (23%)	43 (23%)	43 (23%)	43 (23%)

As can be seen from Table 4-2 there is a significant increase in the percentage of heavy vehicles travelling on the Whyalla to Iron Knob, Iron Knob to Kimba, Kimba to Kyancutta and Kyancutta to Warramboo (Mine site

turnoff) in the first two years of construction (maximum increase of approximately 43%). This can be attributed to the delivery of pavement material to the proposed mine site. There is also a noticeable increase in the percentage of heavy vehicle trips travelling on the Eyre Highway between Eyre Highway/Lincoln Highway Intersection and Iron Knob, and on the Tod Highway between Kyancutta and Warramboo in the first year of construction. This can be attributed to materials being delivered to the proposed mine site from suppliers east of Port Augusta.

There would also be some construction and operational traffic added to the Port Neill Access Road and the North Coast Road, both near Port Neill. No existing traffic volumes are available for either of these roads. This would be primarily light vehicles, with some fuel trucks. As indicated in Figure 4-1, generated traffic would average under 100 trips per day.

4.1.8 Modularised Load Delivery

Large plant items required at the proposed mine and the proposed port site would be modularised and delivered via the proposed port site. From the proposed port site, if the modules are required to be transported to the proposed mine site they would be loaded on module transporters and driven up the haul route by a specialised operator in a highly organised and planned operation. It is estimated that 144 modules would be delivered to the proposed mine site in this manner. Items of plant being modularised include:

- Stackers
- Reclaimers
- Train Loading System
- Processing Plant

These modules are due to arrive in a concentrated 3 to 4 month window, starting around month 18 of the construction period. They would travel along the haul route at different speeds, varying between 1km/h and 40km/h taking between one and fourteen days to reach the proposed mine (assuming 12 hour driving shifts). This would require pullover sites approximately every 12 km along the module delivery route clear of the public road carriageway. These pullover sites would need to be at least 12 m wide, allow for access for largest size module (53 m long x 13 m wide x 45 m tall) and would be required to be paved to take the modules weights (up to 3000 tonnes).

The exact locations of module pullover sites will be discussed and agreed with DPTI and the relevant District Council prior to construction.

4.1.9 Modularisation vs Stickbuild Construction Traffic

The proposed modularised construction method will result in a reduced volume of traffic generated during construction compared to if these components were built on site (a 'sickbuild' construction method). To quantify this reduction, a comparison has been made between the traffic predicted to be generated by modularised transport and the traffic prediction for stickbuild construction, which is shown in Figure 4-7. This comparison was based on the following assumptions:

- The construction of all the modularised items if they were purely being constructed on site was expected to take a combined total of 1,259,000 hours of labour. Assuming eight hour work days over a two year period (approximately 600 working days), this equates to 262 people being on site for two years.
- The construction of the modularised items would occur over the 2nd and 3rd years of construction.
- The additional construction staff are accommodated at the construction camps at the port or the mine. Therefore additional accommodation and consumables would be required. Using the same method described in Section 4.1.5, 260 truckloads of consumables each year (5 per week) would be required. An additional 88 three-person dongas would also be required. Total two way trips for consumables would be

520 per year (10 per week) in the 2nd and 3rd year of construction. Total two way trips for donga delivery would be 176 trips in the second year of construction.

- To estimate the number of trips required for the construction material to arrive at the mine site, the tonnage and number of modules given in Table 5-1 was divided by 40 T as an average load per truck. This resulted in an additional 18,230 truck trips (two way movements).

In total an extra 9,723 trips (19,446 two way trips) would be generated if the proposed modularised construction method was not used.

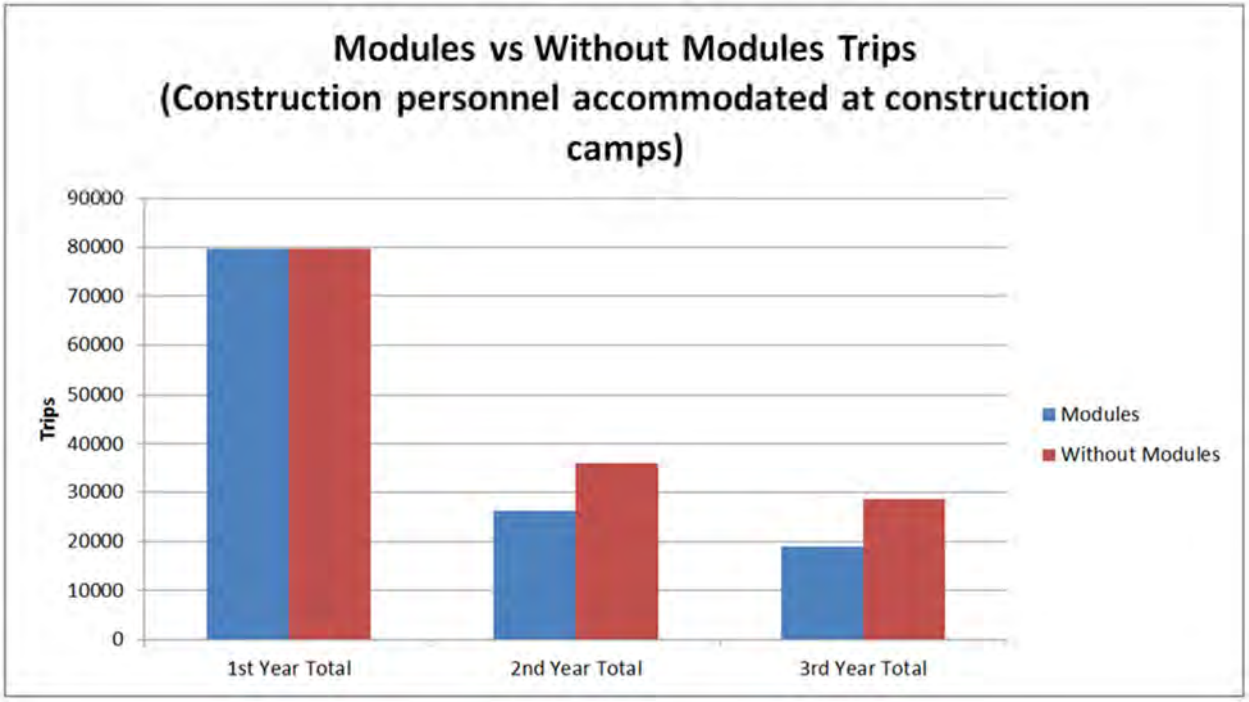


Figure 4-7 Module vs without module comparison (construction personnel accommodated at construction camp)

4.2 Operations Phase

The operations phase of the life of the mine consists of the time from when construction is completed to when the mine life ends. The components of operations phase traffic have been analysed as per day, per week or per month movements, then extrapolated out to a per year basis, or total vehicle movements over the life of the project where needed in analysis.

4.2.1 Site Access

The same public road accesses used during the construction phase are to be used in the operational phase for the proposed port site. Access to the proposed mine site would change from the construction phase via Kimba Road to the operational phase where access would be via Nantuma Road.

4.2.2 Traffic Generation

Operations phase traffic has been estimated for the port and mine sites of the CEIP. There will be negligible external CEIP vehicle trips generated to the infrastructure corridor during the operations phase, as the iron concentrate will be transported along the railway line.

The estimated average volumes of traffic that would enter the proposed port site during operation of the facility are shown in Table 4-3 for each activity stream.

Table 4-3 Port operational traffic

Vehicle Movement Type	Quantity
Day Shift Start (light vehicles)	8/day
Shift personnel changeover - Bus	2/day
Night shift change over	8/day
Nightshift personnel changeover - Bus	2/day
A-Double (PBS Level 2 vehicle) - Fuel	1.5/week
A-Double (PBS Level 2 vehicle) – Supplies	1/week
Maintenance Personnel	1/day
Maintenance Deliveries (light vehicles)	1/day
Maintenance Deliveries (trucks)	1/week
Cranes & maintenance equipment (truck)	1/month
Cranes & maintenance equipment (other)	1/month
Customs Officers	2/day
Frana (site based crane)	1/day
Visitors	1/day
Emergency vehicles (maximum)	1/week
Waste disposal	2/week

The estimated average volume of traffic that would enter the proposed mine site during operation of the facility is shown in Table 4-4 for each activity stream.

Table 4-4 Mine operational traffic

Vehicle Movement Type	Quantity
Day Shift Start (light vehicles)	110/day
Day Shift personnel changeover - Bus	3/day
Night shift change over	110/day
Night shift personnel changeover - Bus	3/day
A-Double - fuel	2/day
A-Double – Supplies	1/week
Maintenance Personnel	6/day
Maintenance Deliveries (light vehicles)	1/day
Maintenance Deliveries (trucks)	1/week
Cranes & maintenance equipment (truck)	4/month
Cranes & maintenance equipment (other)	2/month
Frana (site based crane)	1/day
Visitors	1/day
Emergency vehicles (maximum)	1/week
Waste disposal	6/week

4.2.3 Workforce Commute

The operational workforce for the mine would be accommodated at the long term employee village at Wudinna or in the mine site camp. This would require daily movement of personnel between Wudinna and the proposed mine site. These movements would consist of both bus and light vehicle movements which are assumed to enter the proposed mine site from Nantuma Road.

The operational workforce for the proposed port site is expected to live in local towns such as Port Neill, Tumby Bay and Port Lincoln with personnel moving to and from site along North Coast Road (from Port Neill) and Brayfield Road (workers commuting from Tumby Bay and Port Lincoln). These movements would consist of both bus and light vehicle movements.

4.2.4 Consumables Delivery

The number of vehicle loads of consumables per week for the proposed port site, proposed mine and proposed long term employee village was estimated using the same method used for estimating consumables delivery in the construction phase. The estimate of consumable delivery loads for the accommodation camp in Wudinna is 13 shipping container loads per week.

4.2.5 Traffic Assignment

Table 4-5 shows the breakdown of estimated vehicle loads per year and vehicle type assigned to each impacted State road. These estimates include the carting of consumables, fuel, explosives, transportation of personnel to and from site and crane movements.

Table 4-5 Yearly two-way CEIP traffic assigned to each State road in operation phase

	Light Vehicles	Rigid Truck	19 m Articulated	Double Road Train	PBS Level 2 Vehicle	Bus	Crane	Daily Average
Port Augusta → Eyre Hwy/Lincoln Hwy Intersection	1460	4380	3124	208	1616	0	0	30
Eyre Hwy/Lincoln Hwy Intersection → Whyalla	730	0	104	104	156	0	0	3
Whyalla → Cowell	730	0	104	104	156	0	0	3
Cowell → Arno Bay	730	0	104	104	156	0	0	3
Arno Bay → Balumbah Kinnard Road/Lincoln Hwy Intersection	730	0	104	104	156	0	0	3
Balumbah-Kinnard Road/Lincoln Hwy Intersection → Port Neill Turnoff (Lincoln Hwy)	730	0	104	104	156	0	0	3
Port Neill Turnoff (Lincoln Hwy) → Port	14182	336	104	104	156	2920	754	51
Eyre Hwy/Lincoln Hwy Intersection → Iron Knob	730	4380	3020	104	1460	0	0	27
Iron Knob → Kimba	730	4380	3020	104	1460	0	0	27
Kimba → Kyancutta	730	4380	3020	104	1460	0	0	27
Cowell → Cleve	0	0	0	0	0	0	0	0
Cleve → Rudall	0	0	0	0	0	0	0	0
Warramboo → proposed mine site Turnoff	166544	8960	1460	104	1460	4380	778	503
Kyancutta → Wudinna	165814	4580	1560	0	0	4380	778	485
Kyancutta → Warramboo	166544	8960	1460	104	1460	4380	778	503
Mine Site Turnoff → Lock	0	0	0	0	0	0	0	0
Lock → Rudall	0	0	0	0	0	0	0	0
Rudall → Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0	0	0	0	0	0	0
Whyalla → Iron Knob	0	0	0	0	0	0	0	0
Port Lincoln → Tumby Bay (Eyre Hwy)	0	0	0	0	0	0	0	0
Tumby Bay (Eyre Hwy) → Port Neill Turnoff (Lincoln Hwy)	0	0	0	0	0	0	0	0
Port Lincoln →Tod Hwy/Flinders Hwy Intersection	0	0	0	0	0	0	0	0
Tod Hwy/Flinders Hwy Intersection → Cummins	0	0	0	0	0	0	0	0
Cummins → Lock	0	0	0	0	0	0	0	0

From Table 4-5 it can be seen that the roads with the highest volumes of traffic on them are the roads that are being used to transport personnel from their accommodation to either the port or the mine. These roads are from Wudinna where the proposed long term employee village is to the proposed mine site (Wudinna-Kyancutta, Kyancutta-Warramboo, Warramboo-Mine Site), and the Port Neill Access Road/Coast Road.

The traffic distributions for the individual proposed port, mine and long term employee village are given in Table 4-6 to Table 4-8. In the proposed infrastructure corridor there are no designated trips assigned to it across the operational life of the mine. It would be expected however that there would be occasional maintenance vehicles which would travel along the proposed infrastructure corridor at times throughout the operational life of the mine, but not enough to make any significant impact on the corridor or surrounding local roads.

Table 4-6 Yearly two-way CEIP traffic generated per road in operation phase for the proposed port site

	Light Vehicles	Rigid Truck	19 m Articulated	Double Road Train	PBS Level 2 Vehicle	Bus	Crane	Daily Average
Port Augusta → Eyre Hwy/Lincoln Hwy Intersection	730	0	104	104	156	0	0	3
Eyre Hwy/Lincoln Hwy Intersection → Whyalla	730	0	104	104	156	0	0	3
Whyalla → Cowell	730	0	104	104	156	0	0	3
Cowell → Arno Bay	730	0	104	104	156	0	0	3
Arno Bay → Balumbah Kinnard Road/Lincoln Hwy Intersection	730	0	104	104	156	0	0	3
Balumbah-Kinnard Road/Lincoln Hwy Intersection → Port Neill Turnoff (Lincoln Hwy)	730	0	104	104	156	0	0	3
Port Neill Turnoff (Lincoln Hwy) → Port	14182	336	104	104	156	2920	754	51
Eyre Hwy/Lincoln Hwy Intersection → Iron Knob	0	0	0	0	0	0	0	0
Iron Knob→Kimba	0	0	0	0	0	0	0	0
Kimba → Kyancutta	0	0	0	0	0	0	0	0
Cowell → Cleve	0	0	0	0	0	0	0	0
Cleve → Rudall	0	0	0	0	0	0	0	0
Warramboo → proposed mine site Turnoff	0	0	0	0	0	0	0	0
Kyancutta →Wudinna	0	0	0	0	0	0	0	0
Kyancutta → Warramboo	0	0	0	0	0	0	0	0
Mine Site Turnoff → Lock	0	0	0	0	0	0	0	0
Lock → Rudall	0	0	0	0	0	0	0	0
Rudall → Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0	0	0	0	0	0	0
Whyalla → Iron Knob	0	0	0	0	0	0	0	0
Port Lincoln → Tumby Bay (Eyre Hwy)	0	0	0	0	0	0	0	0
Tumby Bay (Eyre Hwy) → Port Neill Turnoff (Lincoln Hwy)	0	0	0	0	0	0	0	0
Port Lincoln → Tod Hwy/Flinders Hwy Intersection	0	0	0	0	0	0	0	0
Tod Hwy/Flinders Hwy Intersection →Cummins	0	0	0	0	0	0	0	0
Cummins -> Lock	0	0	0	0	0	0	0	0

Table 4-7 Yearly two-way CEIP traffic generated per road in operation phase for the proposed mine site

	Light Vehicles	Rigid Truck	19 m Articulated	Double Road Train	PBS Level 2 Vehicle	Bus	Crane	Daily Average
Port Augusta → Eyre Hwy/Lincoln Hwy Intersection	730	4380	1460	104	1460	0	0	22
Eyre Hwy/Lincoln Hwy Intersection → Whyalla	0	0	0	0	0	0	0	0
Whyalla → Cowell	0	0	0	0	0	0	0	0
Cowell → Arno Bay	0	0	0	0	0	0	0	0
Arno Bay → Balumbah Kinnard Road/Lincoln Hwy Intersection	0	0	0	0	0	0	0	0
Balumbah-Kinnard Road/Lincoln Hwy Intersection → Port Neill Turnoff (Lincoln Hwy)	0	0	0	0	0	0	0	0
Port Neill Turnoff (Lincoln Hwy) → Port	0	0	0	0	0	0	0	0
Eyre Hwy/Lincoln Hwy Intersection → Iron Knob	730	4380	1460	104	1460	0	0	22
Iron Knob→Kimba	730	4380	1460	104	1460	0	0	22
Kimba → Kyancutta	730	4380	1460	104	1460	0	0	22
Cowell → Cleve	0	0	0	0	0	0	0	0
Cleve → Rudall	0	0	0	0	0	0	0	0
Warramboo → proposed mine site Turnoff	166544	8960	1460	104	1460	4380	778	503
Kyancutta →Wudinna	165814	4580	0	0	0	4380	778	481
Kyancutta → Warramboo	166544	8960	1460	104	1460	4380	778	503
Mine Site Turnoff → Lock	0	0	0	0	0	0	0	0
Lock → Rudall	0	0	0	0	0	0	0	0
Rudall → Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0	0	0	0	0	0	0
Whyalla → Iron Knob	0	0	0	0	0	0	0	0
Port Lincoln → Tumby Bay (Eyre Hwy)	0	0	0	0	0	0	0	0
Tumby Bay (Eyre Hwy) → Port Neill Turnoff (Lincoln Hwy)	0	0	0	0	0	0	0	0
Port Lincoln → Tod Hwy/Flinders Hwy Intersection	0	0	0	0	0	0	0	0
Tod Hwy/Flinders Hwy Intersection →Cummins	0	0	0	0	0	0	0	0
Cummins → Lock	0	0	0	0	0	0	0	0

Table 4-8 Yearly two-way CEIP traffic generated per road in operation phase for the proposed employee village

	Light Vehicles	Rigid Truck	19 m Articulated	Double Road Train	PBS Level 2 Vehicle	Bus	Crane	Daily Average
Port Augusta → Eyre Hwy/Lincoln Hwy Intersection	0	0	1560	0	0	0	0	4
Eyre Hwy/Lincoln Hwy Intersection → Whyalla	0	0	0	0	0	0	0	0
Whyalla → Cowell	0	0	0	0	0	0	0	0
Cowell → Arno Bay	0	0	0	0	0	0	0	0
Arno Bay → Balumbah Kinnard Road/Lincoln Hwy Intersection	0	0	0	0	0	0	0	0
Balumbah-Kinnard Road/Lincoln Hwy Intersection → Port Neill Turnoff (Lincoln Hwy)	0	0	0	0	0	0	0	0
Port Neill Turnoff (Lincoln Hwy) → Port	0	0	0	0	0	0	0	0
Eyre Hwy/Lincoln Hwy Intersection → Iron Knob	0	0	1560	0	0	0	0	4
Iron Knob→Kimba	0	0	1560	0	0	0	0	4
Kimba → Kyancutta	0	0	1560	0	0	0	0	4
Cowell → Cleve	0	0	0	0	0	0	0	0
Cleve → Rudall	0	0	0	0	0	0	0	0
Warramboo → proposed mine site Turnoff	0	0	0	0	0	0	0	0
Kyancutta →Wudinna	0	0	1560	0	0	0	0	4
Kyancutta → Warramboo	0	0	0	0	0	0	0	0
Mine Site Turnoff → Lock	0	0	0	0	0	0	0	0
Lock → Rudall	0	0	0	0	0	0	0	0
Rudall → Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0	0	0	0	0	0	0
Whyalla → Iron Knob	0	0	0	0	0	0	0	0
Port Lincoln → Tumby Bay (Eyre Hwy)	0	0	0	0	0	0	0	0
Tumby Bay (Eyre Hwy) → Port Neill Turnoff (Lincoln Hwy)	0	0	0	0	0	0	0	0
Port Lincoln → Tod Hwy/Flinders Hwy Intersection	0	0	0	0	0	0	0	0
Tod Hwy/Flinders Hwy Intersection →Cummins	0	0	0	0	0	0	0	0
Cummins -> Lock	0	0	0	0	0	0	0	0

These movements are also shown on maps in Figure 4-8 to Figure 4-11 for total traffic movement across the port, mine proposed infrastructure corridor and proposed long term employee village, and then individually for each of the mine, proposed long term employee village and port.

Two way vehicle movements by each road - Operation	Per year	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	1094	3
Cleve to Rudall	0	0
Cowell to Arno Bay	1094	3
Cowell to Cleve	0	0
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	7723	22
Eyre Hwy/Lincoln Hwy Int. to Whyalla	1094	3
Iron Knob to Kimba	7723	22
Kimba to Kyancutta	7723	22
Kyancutta to Warramboo	179306	492
Kyancutta to Wudinna	177112	486
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	1094	3
Lock to Rudall	0	0
Mine Site Turnoff to Lock	0	0
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	8817	25
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	0	0
Port Neill Turnoff (Lincoln Highway) to Port	18556	51
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	0	0
Warramboo to Mine Site Turnoff	179306	492
Whyalla to Cowell	1094	3
Whyalla to Iron Knob	0	0

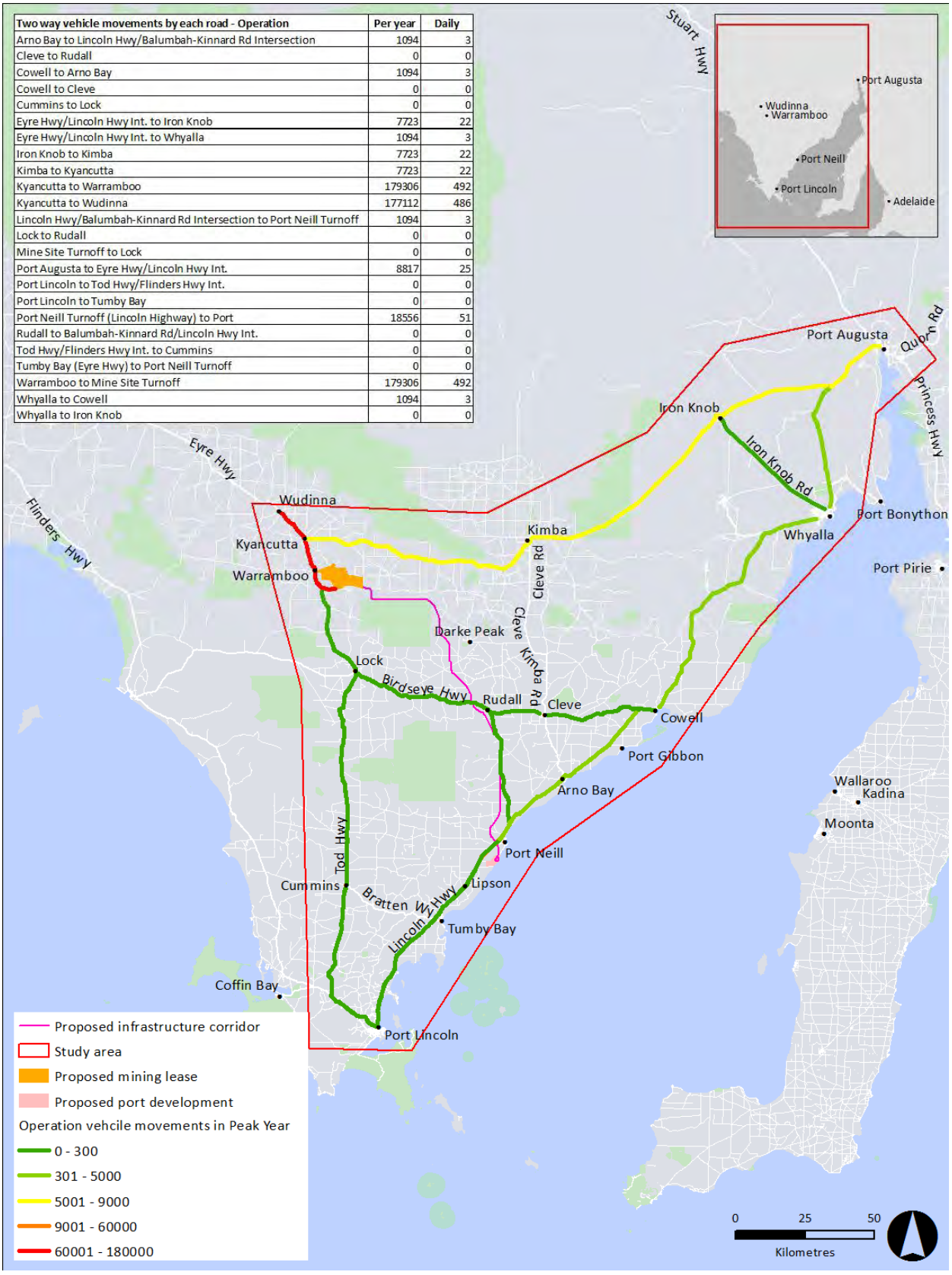


Figure 4-8 Total two-way vehicle trips per year per segment of road during operational period

Two way vehicle movements by each road - Operation - Mine	Per year	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	0	0
Cleve to Rudall	0	0
Cowell to Arno Bay	0	0
Cowell to Cleve	0	0
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	6163	17
Eyre Hwy/Lincoln Hwy Int. to Whyalla	0	0
Iron Knob to Kimba	6163	17
Kimba to Kyancutta	6163	17
Kyancutta to Warramboo	179306	492
Kyancutta to Wudinna	173143	475
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	0	0
Lock to Rudall	0	0
Mine Site Turnoff to Lock	0	0
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	6163	17
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	0	0
Port Neill Turnoff (Lincoln Highway) to Port	0	0
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	0	0
Warramboo to Mine Site Turnoff	179306	492
Whyalla to Cowell	0	0
Whyalla to Iron Knob	0	0

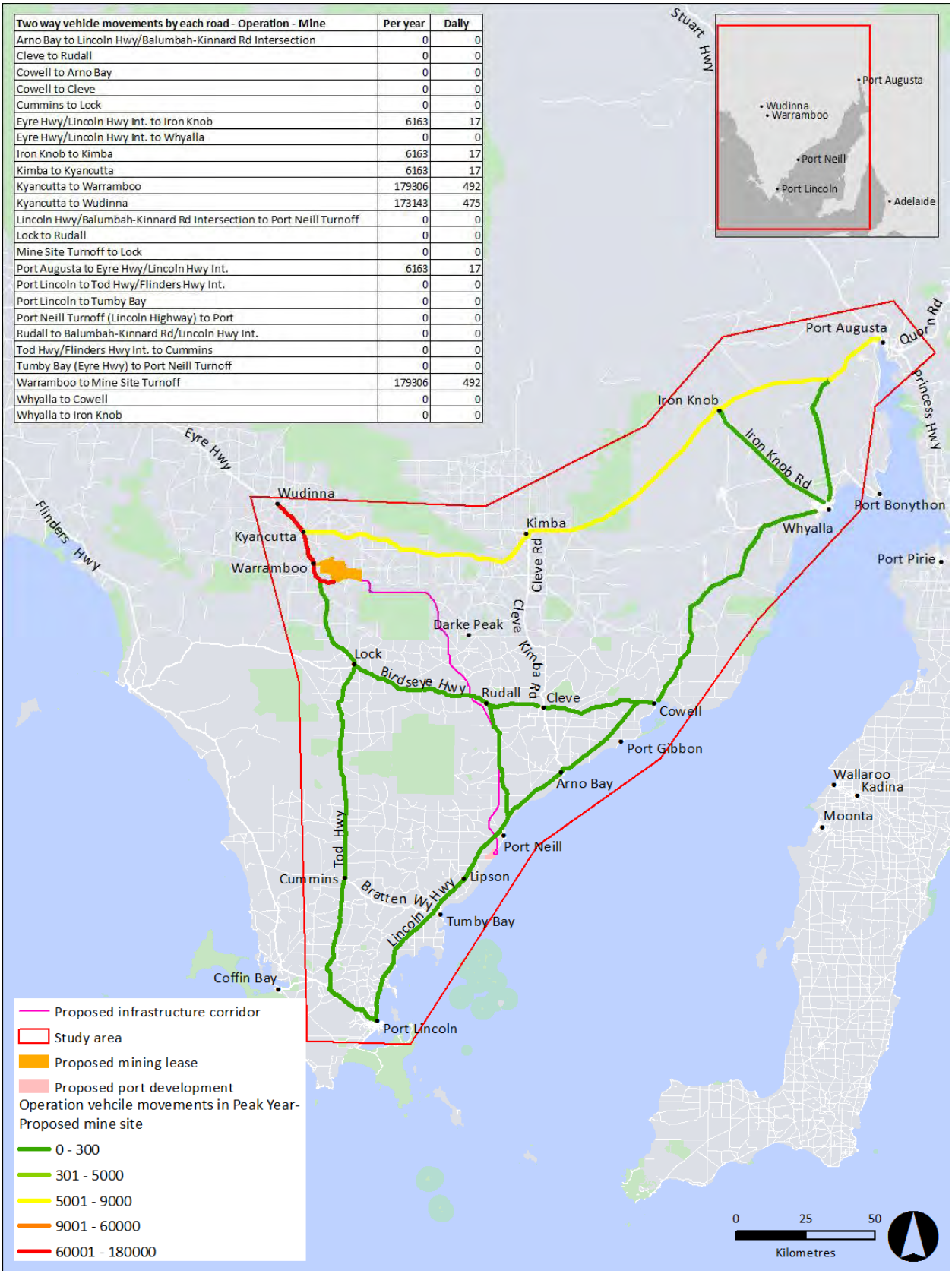


Figure 4-9 Two-way vehicle trips per year per segment of road during operational period – proposed mine site

Two way vehicle movements by each road - Operation - Employee Village	Per year	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	0	0
Cleve to Rudall	0	0
Cowell to Arno Bay	0	0
Cowell to Cleve	0	0
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	1560	5
Eyre Hwy/Lincoln Hwy Int. to Whyalla	0	0
Iron Knob to Kimba	1560	5
Kimba to Kyancutta	1560	5
Kyancutta to Warramboo	0	0
Kyancutta to Wudinna	1560	5
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	0	0
Lock to Rudall	0	0
Mine Site Turnoff to Lock	0	0
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	1560	5
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	0	0
Port Neill Turnoff (Lincoln Highway) to Port	0	0
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	0	0
Warramboo to Mine Site Turnoff	0	0
Whyalla to Cowell	0	0
Whyalla to Iron Knob	0	0

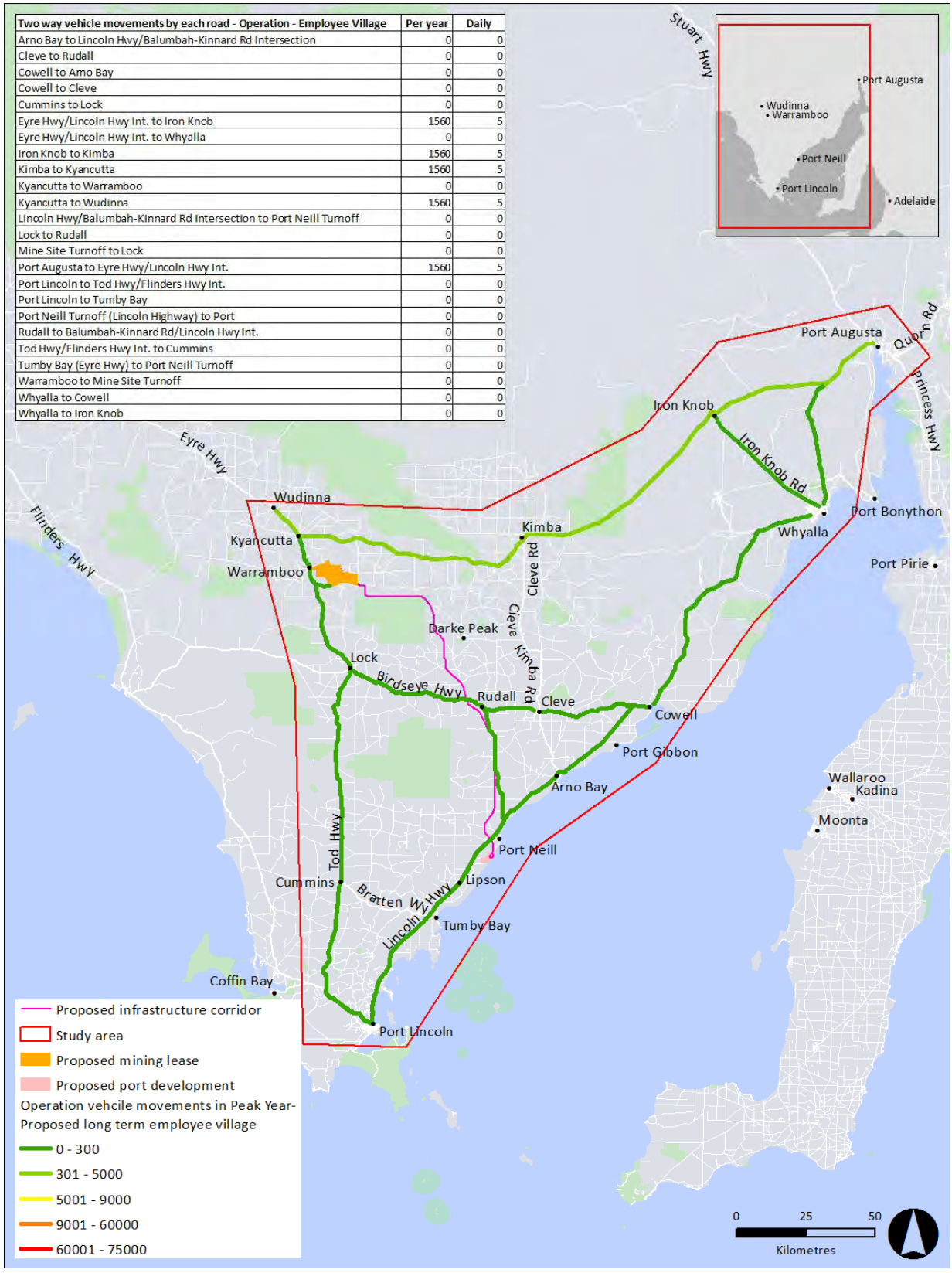


Figure 4-10 Two-way vehicle trips per year per segment of road during operational period - proposed long term employee village

Two way vehicle movements by each road - Operation - Port	Per year	Daily
Arno Bay to Lincoln Hwy/Balumbah-Kinnard Rd Intersection	1094	3
Cleve to Rudall	0	0
Cowell to Arno Bay	1094	3
Cowell to Cleve	0	0
Cummins to Lock	0	0
Eyre Hwy/Lincoln Hwy Int. to Iron Knob	0	0
Eyre Hwy/Lincoln Hwy Int. to Whyalla	1094	3
Iron Knob to Kimba	0	0
Kimba to Kyancutta	0	0
Kyancutta to Warramboo	0	0
Kyancutta to Wudinna	0	0
Lincoln Hwy/Balumbah-Kinnard Rd Intersection to Port Neill Turnoff	1094	3
Lock to Rudall	0	0
Mine Site Turnoff to Lock	0	0
Port Augusta to Eyre Hwy/Lincoln Hwy Int.	1094	3
Port Lincoln to Tod Hwy/Flinders Hwy Int.	0	0
Port Lincoln to Tumby Bay	0	0
Port Neill Turnoff (Lincoln Highway) to Port	18556	51
Rudall to Balumbah-Kinnard Rd/Lincoln Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. to Cummins	0	0
Tumby Bay (Eyre Hwy) to Port Neill Turnoff	0	0
Warramboo to Mine Site Turnoff	0	0
Whyalla to Cowell	1094	3
Whyalla to Iron Knob	0	0

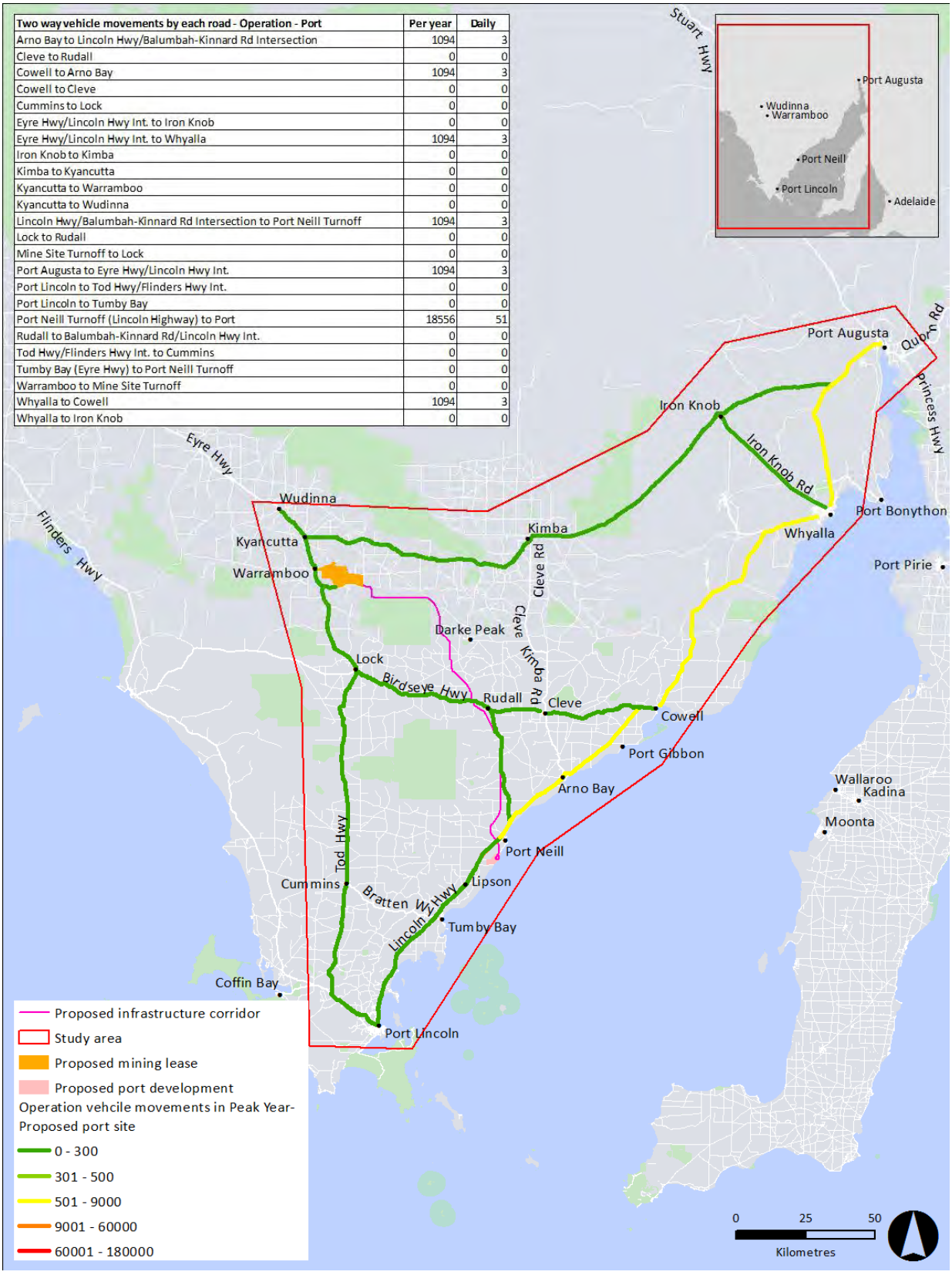


Figure 4-11 Total two-way vehicle trips per year per segment of road during operational period – proposed port site

5 Impact Assessment

Impacts on the road network have been assessed in the construction phase and in the operational phase individually for the proposed port site, mine site, infrastructure corridor and module delivery route.

5.1 Construction Phase

Construction stage transport impacts are different in scale and location to operational stage transport impacts due to the need to transport large volumes of plant and equipment to the site(s). As such the main traffic and transport impacts anticipated during the construction stage of the CEIP relate to the module delivery route and include travel time delay and road safety. Broader impacts to the transport network from construction traffic in terms of level of service and intersection capacity are also considered, as is the impact on the existing Cummins-Buckleboo Railway line.

5.1.1 Travel Time Delay from Module Transport

The most significant traffic impact during the construction period will be from delays caused by traffic waiting for large, slow modular loads (modules) being delivered to the site from the port. The extent of the impact will be dependent on the size and speed of the module, with a range of types intended and differing travel speeds for each. The range of module load sizes under consideration is shown in Table 5-2.

Table 5-1 Module Sizes for transport (Port to Mine and Port only)

Module Size	Max. Load	Quantity	Haul Mode	Haul Speed
Large (Port to Mine) – 13m x 53m x 45m	2200 tonnes	22	SPMT	1 km/hr
Medium (Port to Mine) – 13m x 53m x 45m	800 tonnes	123	SPT	40 km/hr
Large (Port only) – 20m x 53m x 50m	2200 tonnes	99	SPMT	1 km/hr

SPT = Self-Propelled Transporter

SPMT = Self-Propelled Modular Transporter

Other large loads will be transported on conventional wide load vehicles under permit. The port modules are very large but will be moved only within the port site, and will not impact on any external roads.

The primary impact from the modules will be the delay to other vehicles caused by the slow moving modules hauled by SPMT (Self-Propelled Modular Transporter). The traffic delay from the module transport rises linearly as the travel speed reduces.

Traffic impact has been measured in terms of total and average motorist travel time delay. As discussed in Section 2.3 a high level traffic simulation model was developed to estimate the likely travel time delay from delivery of the oversized modularised loads. The modelled delivery route is divided into segments which are representative of the start and end of a traffic control block with each also having a diversion route which would take motorists around the modularised load (refer to Figure 5-1)

Based on observed traffic volumes for the Lincoln Highway (see Figure 5-2) almost all daily traffic on roads along the module delivery route occurs between 5am and 8pm. It is assumed that all module driving shifts will be carried out overnight, however, depending on the start time, a driving shift may intersect with either the PM peak or the AM peak on the following day. As such, a range of start times for the 12 hour driving shift have been tested to measure the relative impact of different start time. These were 4am – 4pm, 6pm – 6am and 8pm – 8am. For each of these start times module travel speeds of 1km/hr, 2 km/hr, 3 km/hr, 4 km/hr and 40km/hr were considered.

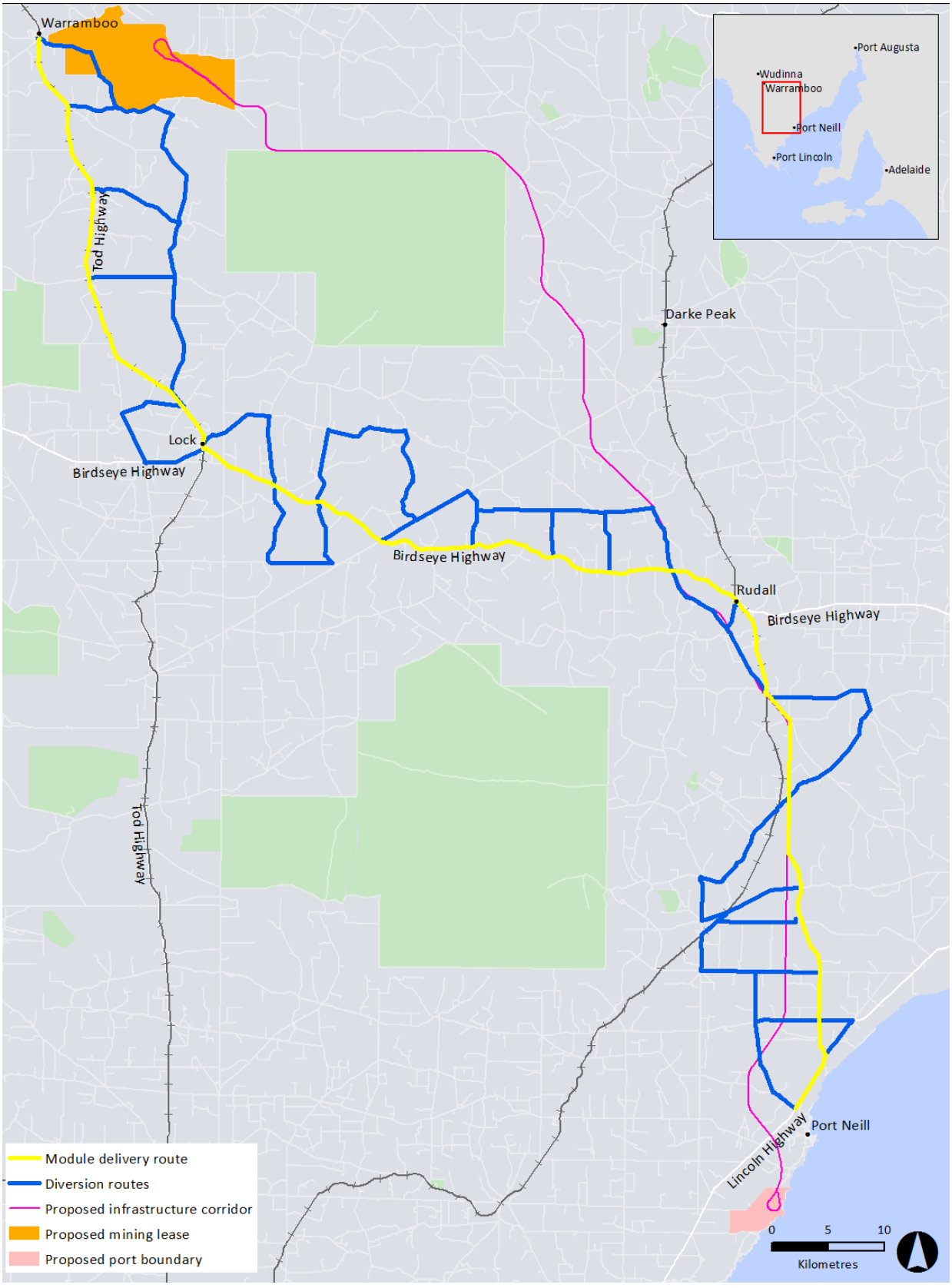


Figure 5-1 Proposed module delivery and diversion routes

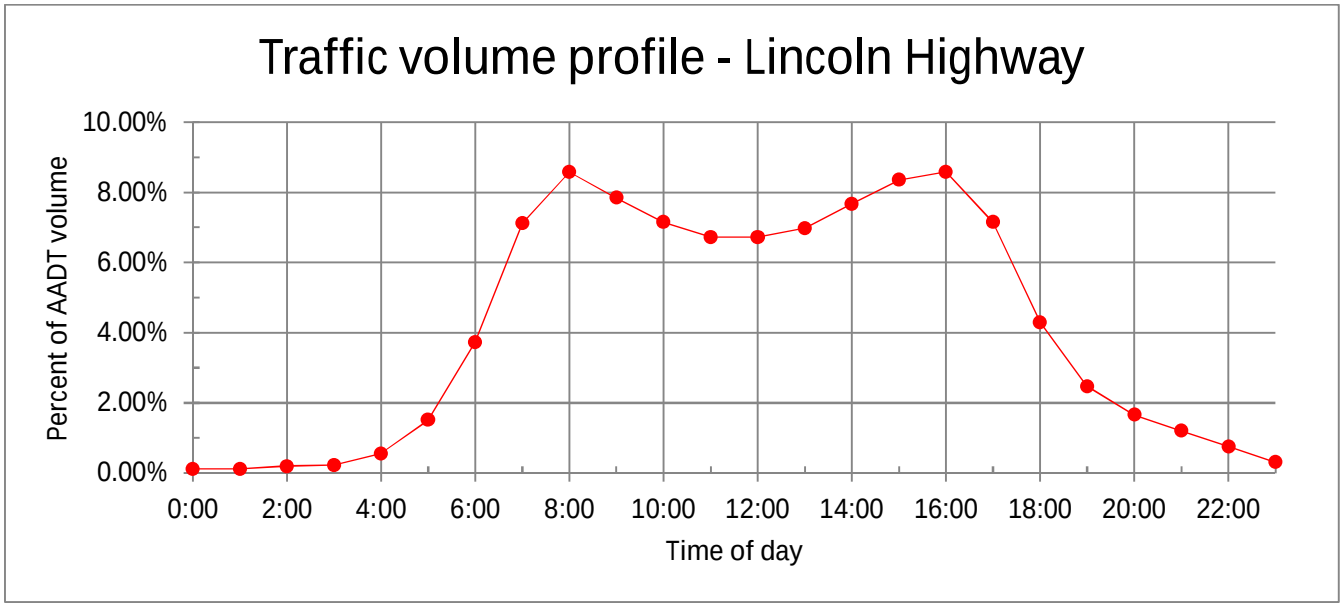


Figure 5-2 Lincoln Highway traffic profile

Summarised results for each scenario simulated are presented in Table 5-2 and Figure 5-3 which shows the collective delay to all vehicles caused from one module travelling from the port site to the mine site.

Table 5-2: Total motorist delay due to delivery of one module (hours, 95% confidence bounds)

Module Traffic Speed	**Route Taken**	**Time Period**		
		4pm – 4am	6pm – 6am	8pm – 8am
1 km/hr	Primary	896.19 (+-26.97)	484.55 (+-22.45)	340.93 (+-21.72)
	Diversion	45.1 (+-1.14)	22.15 (+-0.92)	13.98 (+-0.78)
2 km/hr	Primary	302.56 (+-10.33)	164.27 (+-8.63)	113.67 (+-7.88)
	Diversion	34.09 (+-0.84)	15.78 (+-0.66)	9.43 (+-0.55)
3 km/hr	Primary	137.18 (+-5.48)	75.76 (+-4.54)	58.04 (+-4.61)
	Diversion	24.2 (+-0.65)	11.19 (+-0.44)	6.09 (+-0.4)
4 km/hr	Primary	86.21 (+-4.19)	49.76 (+-3.39)	33.79 (+-3.02)
	Diversion	19.47 (+-0.63)	9.47 (+-0.44)	5.03 (+-0.38)
40 km/hr	Primary	1.51 (+-0.2)	1.02 (+-0.17)	0.64 (+-0.13)
	Diversion	2.32 (+-0.25)	1.25 (+-0.19)	0.46 (+-0.1)

From the simulation results it can be seen that traffic delay is sensitive not only to module travel speed, but also the driving shift start time. In all cases, starting the driving shift at 8pm gives the lowest overall delay time. This can be attributed to later starting shifts avoiding the Lincoln Highway afternoon peak period, which is by far the busiest stretch of road along the module route. The simulation also shows that the diversion routes will be an effective strategy to mitigate traffic impact, as they reduce total delay by between 80% and 90%. However, when speed of the module is around 40km/hr, following behind the module and then passing it at the end of the section (or when the module temporarily pulls over at a laydown pad) provides less delay than driving the diverted route.

5.1.2 Delay to Individual Motorists from Module Transportation

The average delay per motorist was also modelled along the haul route for modules travelling at different speeds and different driving shift start times. The average delay calculations assume motorists are only delayed for a single segment, i.e. the motorist either turns off the module route at the segment end as part of their journey or are able to go around the module at the segment end. Summarised results are shown with and without diversion in Table 5-3 and Figure 5-4. With diversion to parallel routes, delays may occur of up to ten minutes per vehicle.

Table 5-3: Average individual motorist delay due to module delivery (hours, 95% confidence bounds)

Module Traffic Speed	**Route Taken**	**Time Period**		
		4pm – 4am	6pm – 6am	8pm – 8am
1 km/hr	Primary	3.68 (+-0.06)	3.56 (+-0.09)	3.7 (+-0.11)
	Diversion	0.18 (+-0.001)	0.16 (+-0.003)	0.16 (+-0.003)
2 km/hr	Primary	1.66 (+-0.03)	1.71 (+-0.05)	1.69 (+-0.07)
	Diversion	0.19 (+-0.001)	0.17 (+-0.003)	0.15 (+-0.003)
3 km/hr	Primary	0.99 (+-0.02)	1.02 (+-0.03)	1.19 (+-0.05)
	Diversion	0.18 (+-0.001)	0.16 (+-0.002)	0.14 (+-0.003)
4 km/hr	Primary	0.74 (+-0.02)	0.76 (+-0.03)	0.75 (+-0.04)
	Diversion	0.18 (+-0.001)	0.16 (+-0.002)	0.13 (+-0.003)
40 km/hr	Primary	0.05 (+-0.01)	0.05 (+-0.01)	0.05 (+-0)
	Diversion	0.11 (+-0.003)	0.08 (+-0.005)	0.05 (+-0.005)

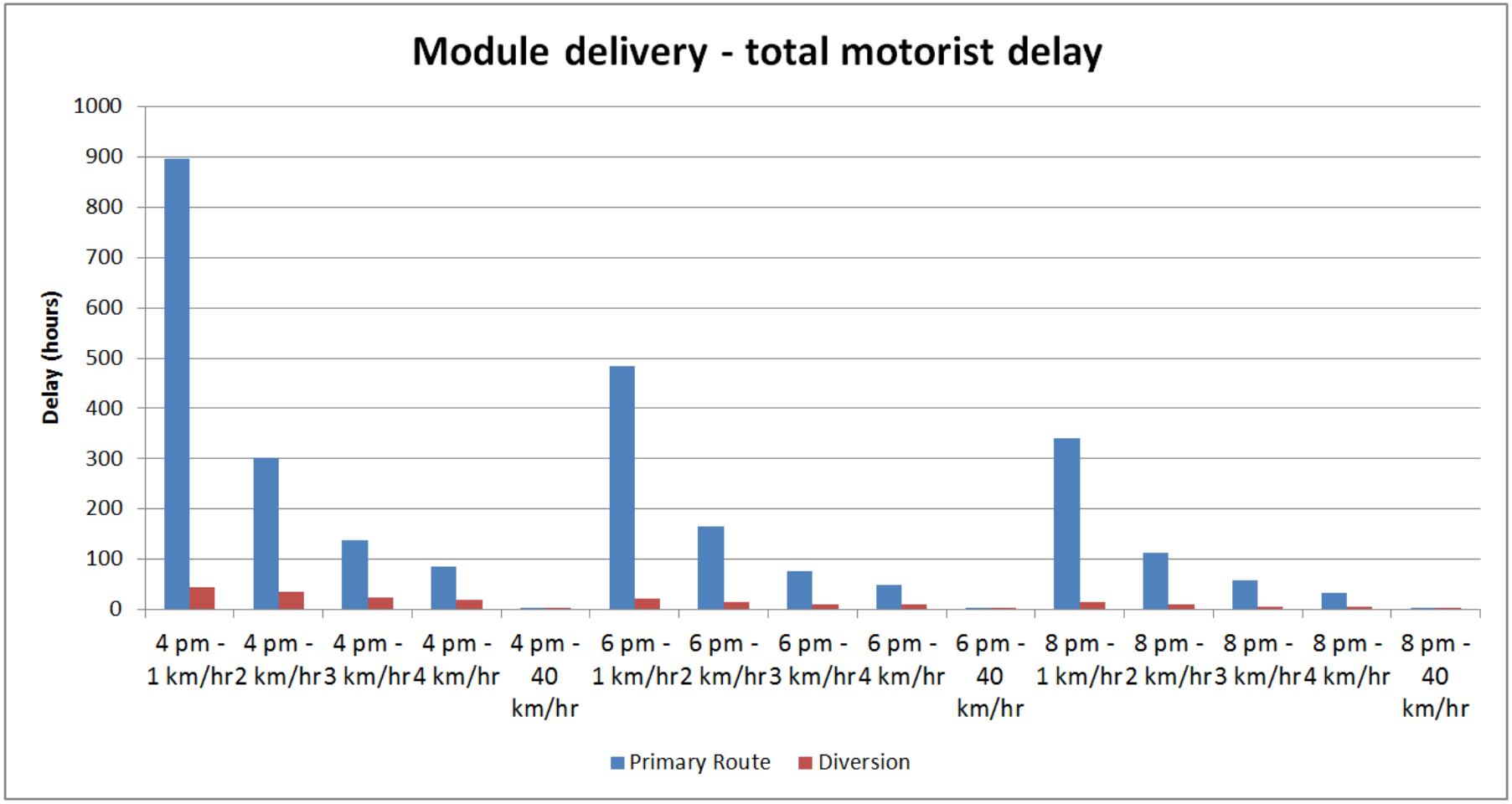


Figure 5-3 Total motorist delay due to delivery of one module (from port site to mine site)

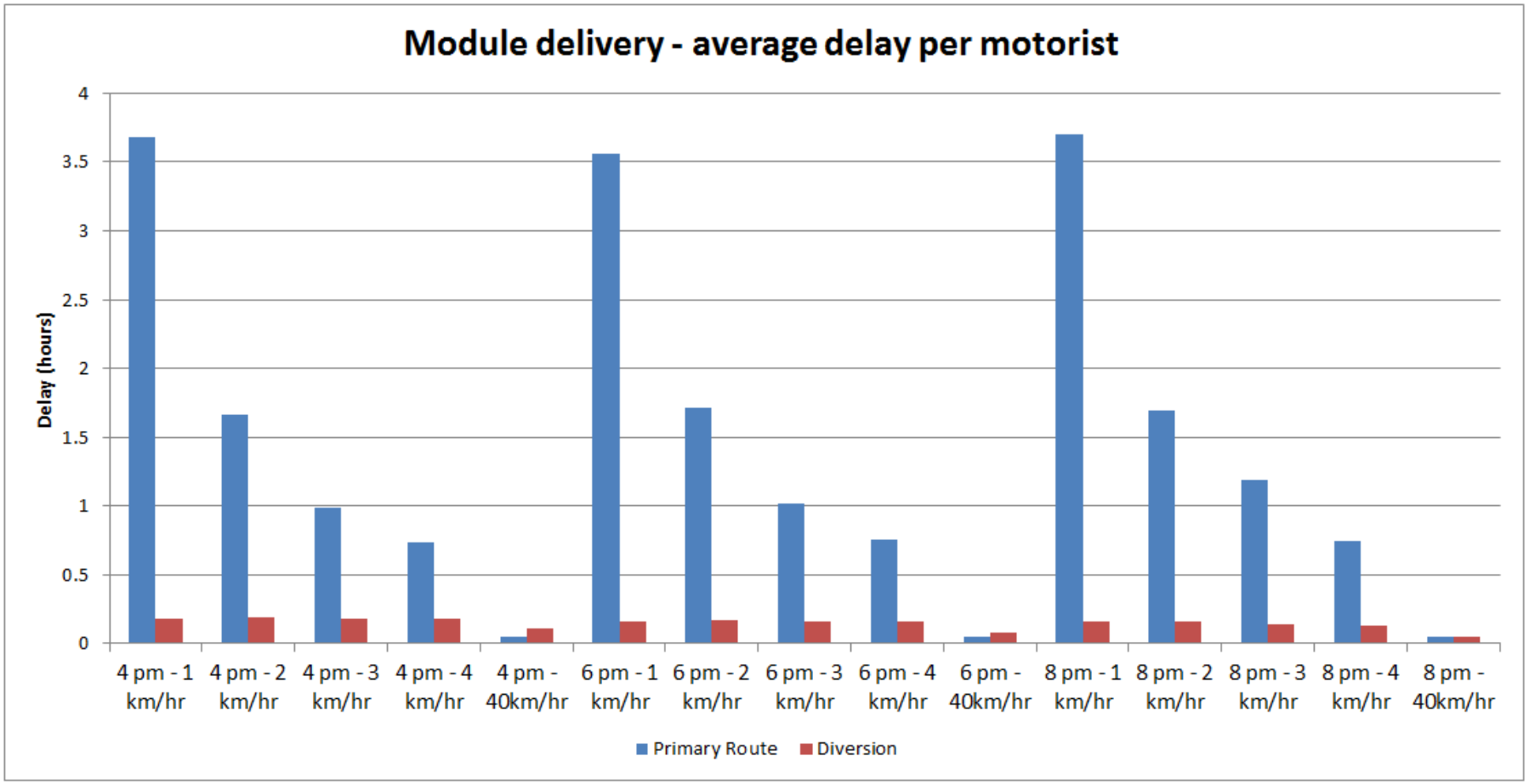


Figure 5-4 Average delay per motorist (hours)

As can be seen in Figure 5-4, unlike total delay, average delay is largely unaffected by the shift start and end times. This is intuitively expected as the modules are still travelling at the same speed and distance, regardless of when they start their trip. The diversion routes provide a reduction in average delay of between 75% and 95% dependant on module speed. When speed of the module is around 40km/hr, following behind the module and then passing it at the end of the section (or when the module temporarily pulls over at a laydown pad) provides less delay than driving the diversion route.

5.1.3 Module Delivery Route Safety

A desktop investigation was carried out to assess the module delivery route, primarily for the transport of infrastructure modules from the proposed port site to the proposed mine site. The lengths of road segments on the haul route are given in Table 5-4. The safety assessment considered intersection upgrades and service relocations along the length of the module route.

Table 5-4 Lengths of road segments on haul route

Road name	Travel direction	Length (km)
North Coast Road/Wallis Road	N-E	5.5
Port Neill Access Road	N-W	2.2
Lincoln Hwy	N-N-E	7.0
Balumbah-Kinnard Road	N	43.5
Railway Terrace	N-W	0.6
Birdseye Highway	W-N-W	51.6
Tod Highway	N-N-W	54.2
Kimba Road	S-E	1.0
Total		165.7

Intersection upgrades would be required to allow the required turning circle room for a 12 m wide x 52 m long module transporter as shown in Figure 5-5. The intersections that would require upgrading would be the North Coast Road/Port Neill Access Road intersection, Port Neill Access Road/Lincoln Highway, Lincoln Highway/Balumbah-Kinnard Rd, Birdseye Highway/Tod Highway and Tod Highway/Kimba Road. The turning circle movements for the module transporter at these intersections are shown in Figure 5-6 to Figure 5-10.

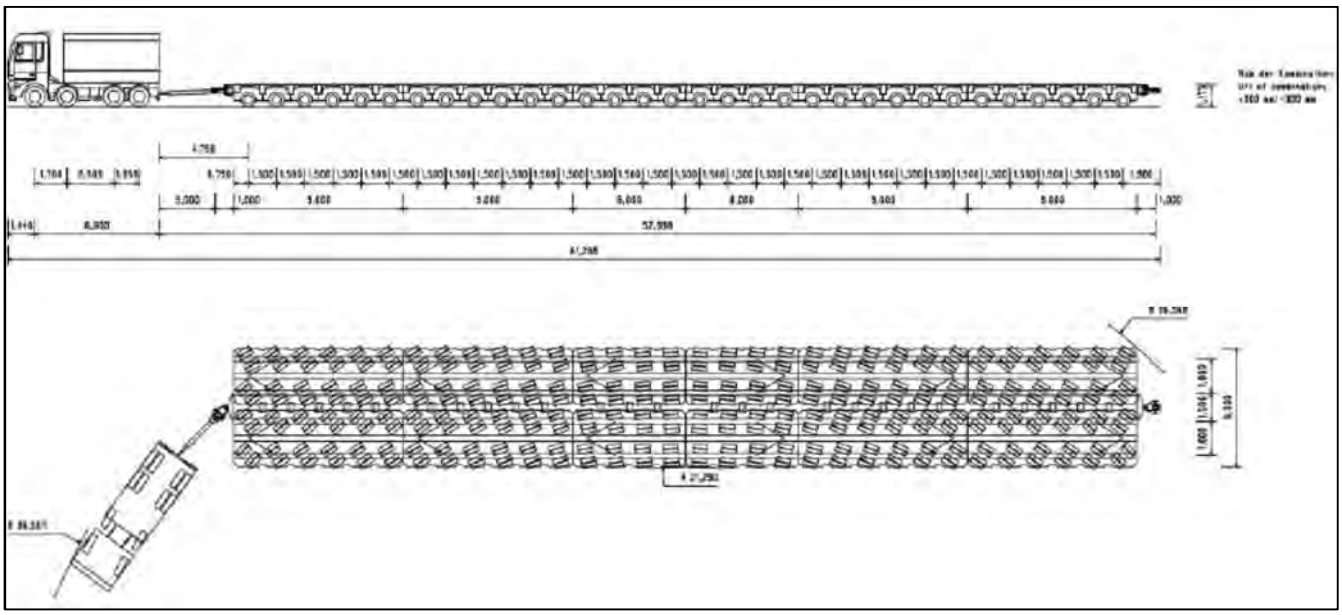


Figure 5-5 Module transporter

Figure 5-6 North Coast Road/Port Neill Access Road

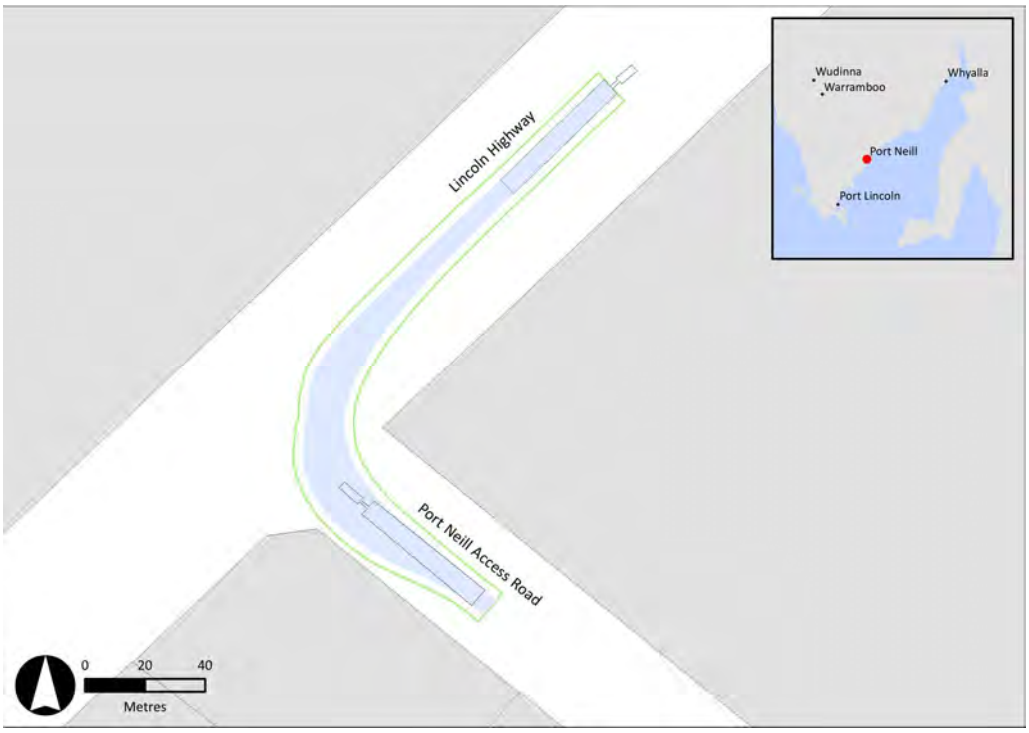


Figure 5-7 Port Neill Access Road / Lincoln Highway

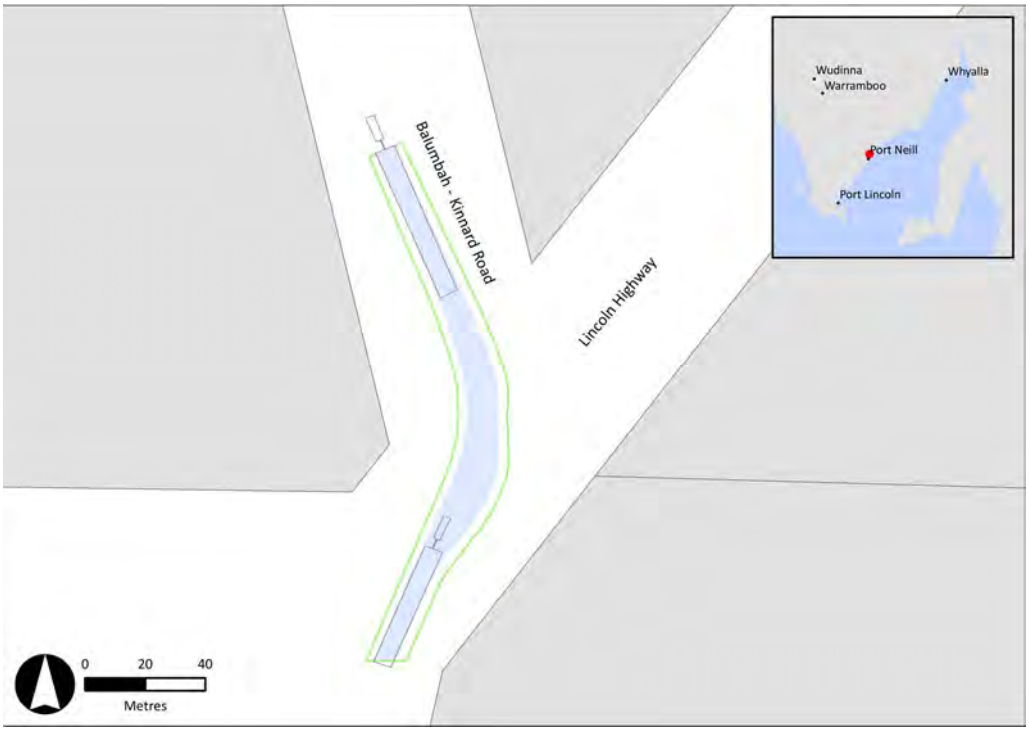


Figure 5-8 Lincoln Highway / Balumbah-Kinnard Road

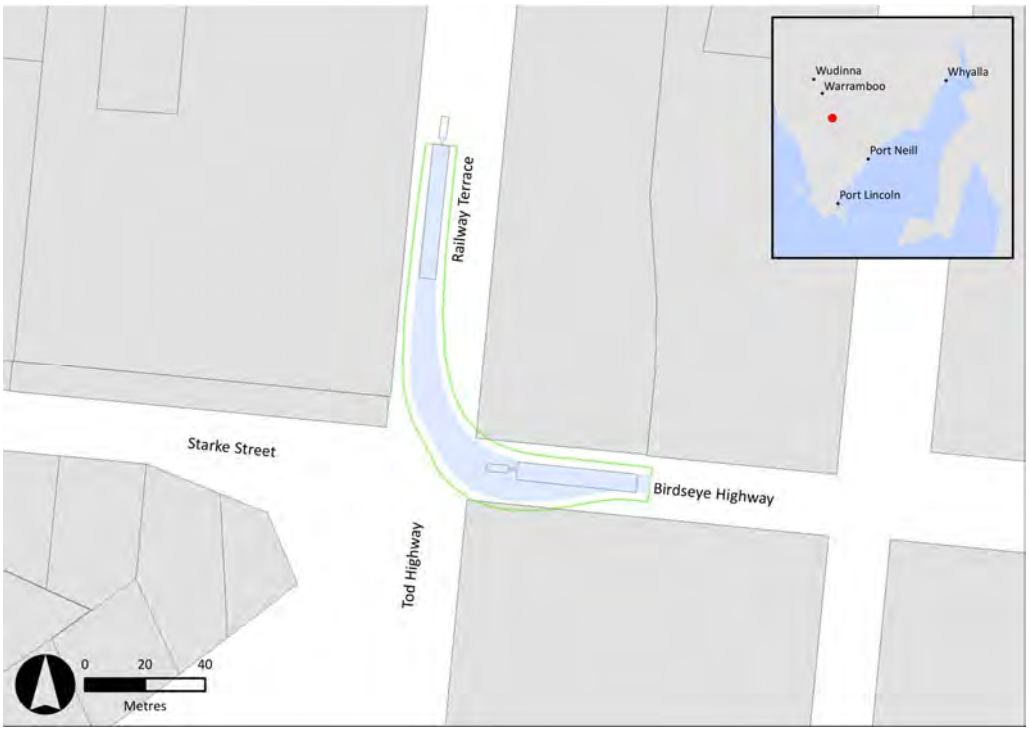


Figure 5-9 Birdseye Highway / Tod Highway

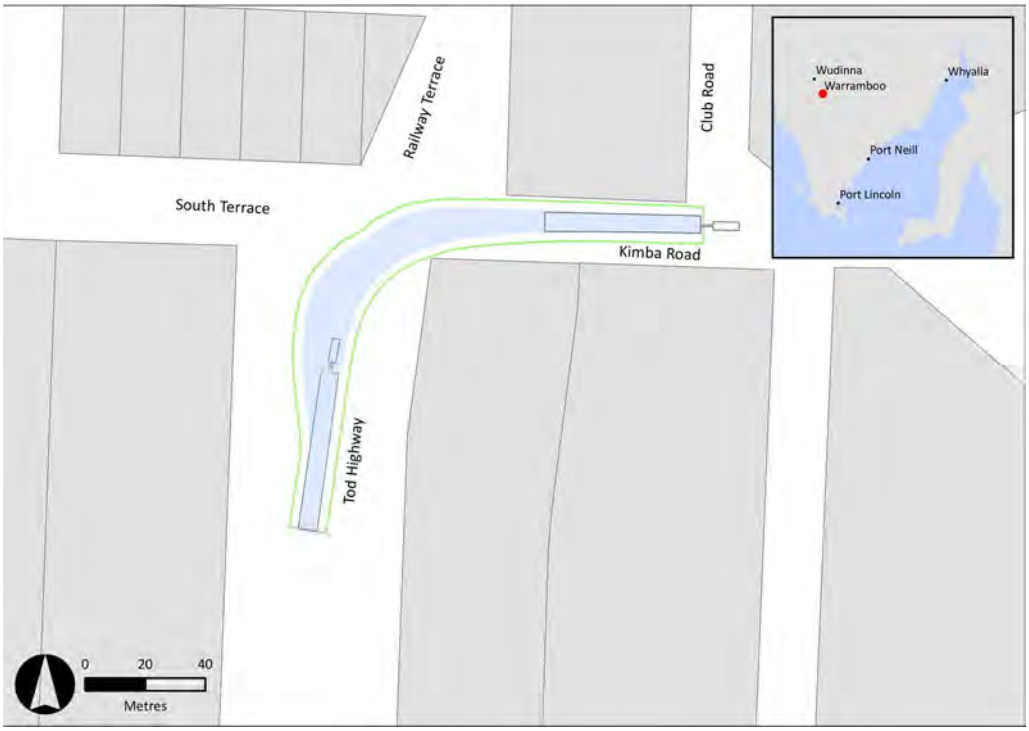


Figure 5-10 Tod Highway / Kimba Road

Modules travelling to the proposed mine site are expected to have maximum dimensions of 13 m wide by 53 m long and 45 m tall. Due to the module sizes, the relocation of some services such as power lines and road signage will be required in some locations along the module route to provide sufficient clearances to enable the modules to be transported safely.

In total, there are 36 power line crossings along the length of the module route. These power lines would need to be either raised to allow for the module size envelope or buried underground to cross the road. Additionally, sufficient clearance between the modules and power lines running parallel to the haul route will be required to allow safe passage of the modules. Example photos of power lines crossing the haul route are shown in Plate 5-1 and an example of a power line parallel to the road is shown in Plate 5-2.

Left: Power line crossing Birdseye Highway/Railway Terrace, Rudall Right: Power line crossing over Balumbah-Kinnard Road

Plate 5-1 Example photos of power lines crossing haul route

Plate 5-2 Power line parallel to haul road (North Coast Road, Port Neill)

As previously discussed in Section 3.3.2 the haul route crosses three rail crossings. For modules to be able to traverse the level crossings, signage surrounding the rail crossing would have to be removed and replaced as

each module passes along the haul route. An example of the existing signage at the Balumbah-Kinnard Road rail crossing is shown on Plate 5-3. Similarly, signage located close to the road such as on entry to Rudall (refer to Plate 5-4) would have to be removed and replaced when each of the modules pass through or be installed as fold down signage.

Plate 5-3 Rail crossing on Balumbah-Kinnard Road

Plate 5-4 Signage close to road on Balumbah-Kinnard Road on entry to Rudall

Existing culverts and pipelines along the haul route may need to be widened in some locations to allow for the module width of 12 m. For example, the culvert length under an unsealed section of Balumbah-Kinnard Road is approximately 9 m (refer to Plate 5-5).

Left: Culvert on Birdseye Highway

Right: Culvert on Balumbah-Kinnard Rd

Plate 5-5 Example photos of culverts on module delivery route

5.1.4 Impacts on Road Capacity during Construction Period

Traffic capacity can be measured using level of service (LOS) which is represented by a letter ranging from A (uncongested and free flowing) to F (failed). Level of service over the construction period of the CEIP was calculated to determine if any road segment would be affected by the additional traffic generated by the CEIP. Each level of service was calculated using the methods presented in the Highway Capacity Manual (HCM) volume 2 (TRB 2010). This required data inputs of:

- highway class
- lane width
- shoulder width
- access point densities (number of access points to the road per kilometre)
- terrain type
- percentage no-passing zone in both directions
- speed limit
- hourly automobile volume
- peak hour factor
- directional split
- heavy vehicle percentage

The results generated from these calculations gave a level of service for each road by Average Travel Speed (ATS) and Percentage Time-Spent Following (PTSF). Results of these calculations are shown in Table 5-5.

Table 5-5 Level of service on Eyre Peninsula roads during construction period of the CEIP

Road Name	Direction	Base Case (No project vehicles)		Construction Year 1		Construction Year 2		Construction Year 3	
		ATS	PTS F	ATS	PTS F	ATS	PTS F	ATS	PTS F
Eyre Highway (Wudinna-Kyancutta)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Eyre Highway (Kyancutta – Kimba)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Eyre Highway (Kimba – Iron Knob)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Eyre Highway (Iron Knob – Lincoln Highway Intersection)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Eyre Highway (Lincoln Highway Intersection – Port Augusta Bridge)	Eastbound	A	B	A	B	A	B	A	B
	Westbound	A	B	A	B	A	B	A	B
Lincoln Highway (Tumby Bay – Port Neill Turnoff)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Lincoln Highway (Port Neill Turnoff – Balumbah-Kinnard Road)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Lincoln Road (Balumbah-Kinnard Road – Arno Bay)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Lincoln Hwy (Arno Bay – Cowell)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Lincoln Hwy (Cowell – Ash Rd)	Eastbound	A	B	A	B	A	B	A	B
	Westbound	A	A	A	A	A	A	A	A
Lincoln Hwy (Ash Rd – Kimba-Whyalla Rd)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Lincoln Hwy (Kimba-Whyalla Rd - Whyalla)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Lincoln Hwy (Whyalla – Eyre Hwy)	Northbound	A	A	A	A	A	A	A	A
	Southbound	A	A	A	A	A	A	A	A
Tod Highway (Eyre Hwy – Warramboo)	Northbound	A	A	A	A	A	A	A	A
	Southbound	A	A	A	A	A	A	A	A
Tod Highway (Warramboo – Lock)	Northbound	A	A	A	A	A	A	A	A
	Southbound	A	A	A	A	A	A	A	A
Birdseye Highway (Lock – Rudall)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Birdseye Highway (Rudall – Cleve)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Birdseye Highway (Cleve – Cowell)	Eastbound	A	A	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A	A	A
Whyalla – Iron Knob Road	Northbound	A	A	A	A	A	A	A	A
	Southbound	A	A	A	A	A	A	A	A

As can be seen in Table 5-5, no change is predicted to the level of service from the base case (current level of service prior to construction) during the construction period. All of the segments of road analysed returned a LOS of A (uncongested and free flowing), except for three road segments which returned a LOS of B (uncongested and reasonably free flowing). The three road segments were the Eyre Highway (Lincoln Highway Intersection – Port Augusta Bridge) eastbound and westbound directions, and the Lincoln Highway (Cowell – Ash Road) eastbound direction.

This indicates that even with the additional traffic generated, there would be enough capacity on each of the roads to operate effectively. It should be noted that there is no data for Port Neill Access Road and North Coast Road. Both of those roads are assumed to have lower AADTs than the Lincoln Highway nearby (which has an AADT of 700) and therefore would also have a LOS of A for all scenarios shown in Table 5-5.

5.1.5 Sensitivity Tests for Traffic Capacity Impacts

A sensitivity test has been undertaken to determine how much spare traffic capacity is in the current road system, and to what extent the CEIP construction traffic impact would need to increase before it became an issue for capacity of the local road network.

The analysis in Table 5-4 demonstrated that with CEIP construction traffic added, most roads in the study area remain operating at Level of Service (LOS) A, with a few at LOS B. Under the US HCM capacity methodology used, the limit of daily capacity is approximately 3000 vehicles per day on roads of this class for LOS A, and 6500 vehicles per day for LOS B. Actual current daily traffic volumes vary from 300 to 850 vehicles per day. Mine traffic impacts during the construction phase range from 10 vehicles per day to a maximum of 120 vehicles per day. It can be shown in all cases that mine generated traffic would need to be an order of magnitude higher (+2100 to +3000 vehicles per day) before any capacity threshold were crossed. Even then, mine traffic would only change the road LOS from A to B, or B to C, not exceeding traffic capacity (normally taken as LOS C on rural roads). In other words, there is ample spare traffic capacity at all affected intersections during construction, regardless of whether construction occurs primarily onsite or offsite. This is the case for both low volume/local roads (AADT 350 to 850 vehicles per day) and medium volume roads/State highways (AADT up to 3400 vehicles per day). The capacity thresholds and demands are shown in Table 5-6.

Table 5-6 Level of service thresholds

Road Category	Level of Service (LOS)	Capacity Limit for LOS (veh/day)	Current Traffic (veh/day)	Mine Impact (veh/day)	Spare Capacity to next LOS
Local/ Low Volume	A	3000	350 to 850	10 to 50	+2100 veh/day
State Highway/ Medium Volume	B	6500	2700 to 3400	50 to 120	+2980 veh/day

Similar conclusions may be reached for the mine operational phase, where mine generated traffic will be less than during the peak of the construction phase.

5.1.6 Pavement condition and wear

Pavement impacts are determined by the number of equivalent standard axles (ESAs) applied to a road. The estimated number of ESAs generated by the CEIP for each segment of road impacted by the CEIP was calculated as an indication of the likely wear and tear on the road network from construction traffic. The project generated ESAs are given in Table 5-7.

Table 5-7 Equivalent Standard Axles generated by CEIP in the construction period

Road segment	Construction – Totals for 3 construction years	
	Loaded	Unloaded
Port Augusta -> Eyre Hwy/Lincoln Hwy Int.	187422	1733
Eyre Hwy/Lincoln Hwy Int. -> Whyalla	37779	350
Whyalla -> Cowell	56319	521
Cowell -> Arno Bay	45117	418
Arno Bay -> Lincoln Hwy/Balumbah-Kinnard Rd Intersection	45117	418
Lincoln Hwy/Balumbah-Kinnard Rd Intersection -> Port Neill Turnoff (Lincoln Hwy)	56866	526
Port Neill Turnoff (Lincoln Hwy) -> Port	56947	527
Eyre Hwy/Lincoln Hwy Int. -> Iron Knob	149643	1383
Iron Knob -> Kimba	275437	2545
Kimba -> Kyancutta	275437	2545
Cowell -> Cleve	11202	103
Cleve -> Rudall	11202	103
Warramboo -> Mine Site Turnoff	317790	2936
Kyancutta -> Wudinna	46185	427
Kyancutta -> Warramboo	317790	2936
Mine Site Turnoff -> Lock	23672	219
Birdseye Highway (Lock – Rudall)	23446	217
Rudall -> Balumbah Kinnard Rd/Lincoln Hwy Int.	12812	118
Whyalla -> Iron Knob	125794	1162
Port Lincoln -> Tumby Bay	1143	11
Tumby Bay -> Port Neill Turnoff (Lincoln Hwy)	1143	11
Port Lincoln -> Tod Hwy/Flinders Hwy Int.	227	2
Tod Hwy/Flinders Hwy Int. -> Cummins	227	2
Cummins -> Lock	227	2

The extent by which the CEIP will increase average daily traffic during the construction period varies from negligible to a 54% increase. These increases are on a very small base and the quantum of daily traffic increase would not be more than 150 vehicles per day. The estimated increase in daily axle loadings (Equivalent Standard Axles or ESAs) from heavy commercial vehicles (HCVs) on the haul road pavements varies from negligible (0%) to considerable (1866%, but again from a very small base) over the same period. The impact of this additional loading on pavement condition is unknown and will depend on the existing condition and remaining life of the pavement. Iron Road will undertake pavement deflection (strength) testing on haul route pavements before and after the construction period to determine whether any remedial pavement rehabilitation treatment is required as the result of the CEIP construction.

5.1.7 Impacts on Intersection Capacity during Construction Period

Intersections across the Eyre Peninsula which material delivery or construction staff would pass through were analysed to see how many additional vehicles per hour would pass through the intersections. The intersections analysed were:

- Eyre Highway/Lincoln Highway
- Whyalla-Iron Knob/Lincoln Highway

- Eyre Highway/Mine Site Turnoff
- Eyre Highway/Tod Highway
- Tod Highway/Kimba Road
- Tod Highway/Birdseye Highway
- Balumbah-Kinnard Road/Lincoln Highway
- Lincoln Highway/Port Neill Access Road
- Birdseye Highway/Lincoln Highway

To determine the hourly number of construciton vehicles passing through intersections in each direction, the yearly number of vehicles was divided by 365 to obtain daily values. This assumed that vehicles would only be delivering items in a twelve hour period each day (daytime). The assessment found that the maximum number of construction vehicles per hour passing through an intersection was eight in the first year, three in the second year and two in the third year. These values include origin – destination trips only (one-way). This leads to the conclusion that there would be negligible impact on intersection capacity created by the extra turning movements generated in the construction phase.

5.1.8 Impact on existing Cummins-Buckleboo Railway Line Operations

The proposed railway line would be constructed over the existing Cummins-Buckleboo railway line, to allow the existing railway line to maintain functionality. Impacts to train movements on the Cummins-Buckleboo railway line during construction of the proposed infrastructure corridor would be reduced through the proposed construction technique of using a corrugated steel arch for the existing rail line to pass through. The plated steel arch would be assembled off the alignment and then craned into position. A diagram of the arch is shown in Figure 5-11.

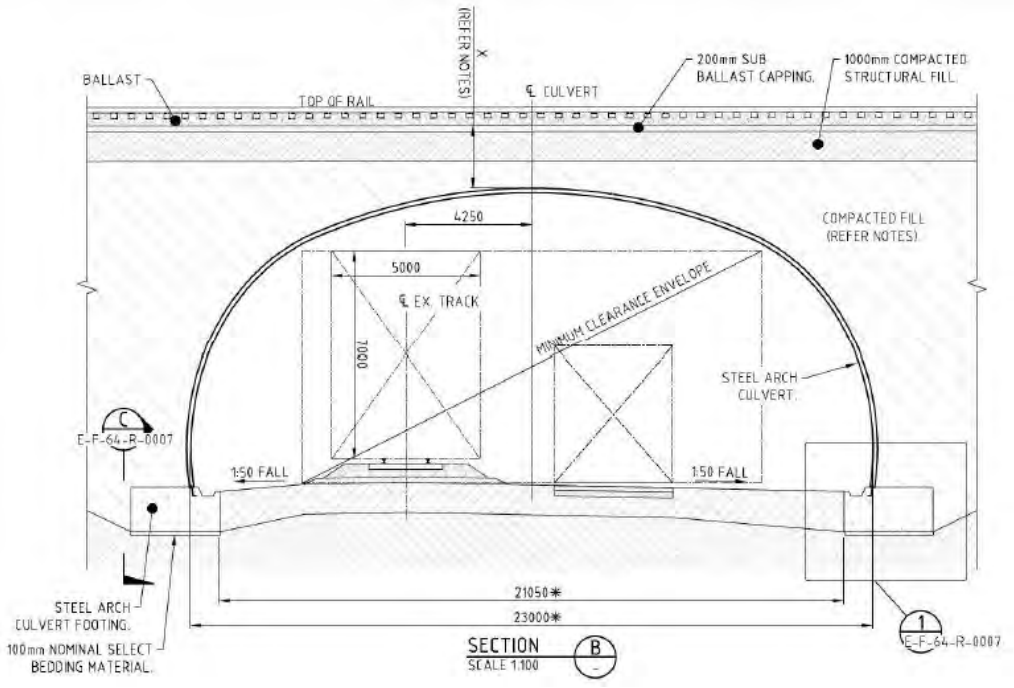


Figure 5-11 Cummins-Buckleboo Railway Line grade separation arch cross section

5.2 Operation Phase

Outside of the infrastructure corridor, it has already been established in Section 4.2 that traffic volumes in the Operational Phase are in all cases lower than the CEIP generated traffic during the peak of the construction phase. Therefore it is concluded that traffic capacity impacts to the transport network from the operation phase will be less than for the construction phase. Further analysis of the impact on traffic capacity during the operation phase has not been undertaken.

The primary operations phase transport impacts will be on road pavement condition and wear from the movements of the mine workforce and consumable deliveries to and from the mine site and delays at rail level crossings for roads traversing the infrastructure corridor. Other minor impacts will occur from road closures and diversions and increased traffic through intersections. These impacts are analysed in this section.

5.2.1 Rail Movements and Traffic Delay at Level Crossings

The proposed rail operations involve six return train trips per 24 hours in order to meet tonnage requirements. Three trains will run on the railway line at any one time, taking 12 hours to complete one cycle of loading at the mine, travelling to port, unloading at the port and travelling back to mine. Each train will be staggered to be four hours apart in the cycle behind the train in front of them. An illustration of this is shown in Figure 5-12. On average there will be a train passing through each level crossing every two hours.

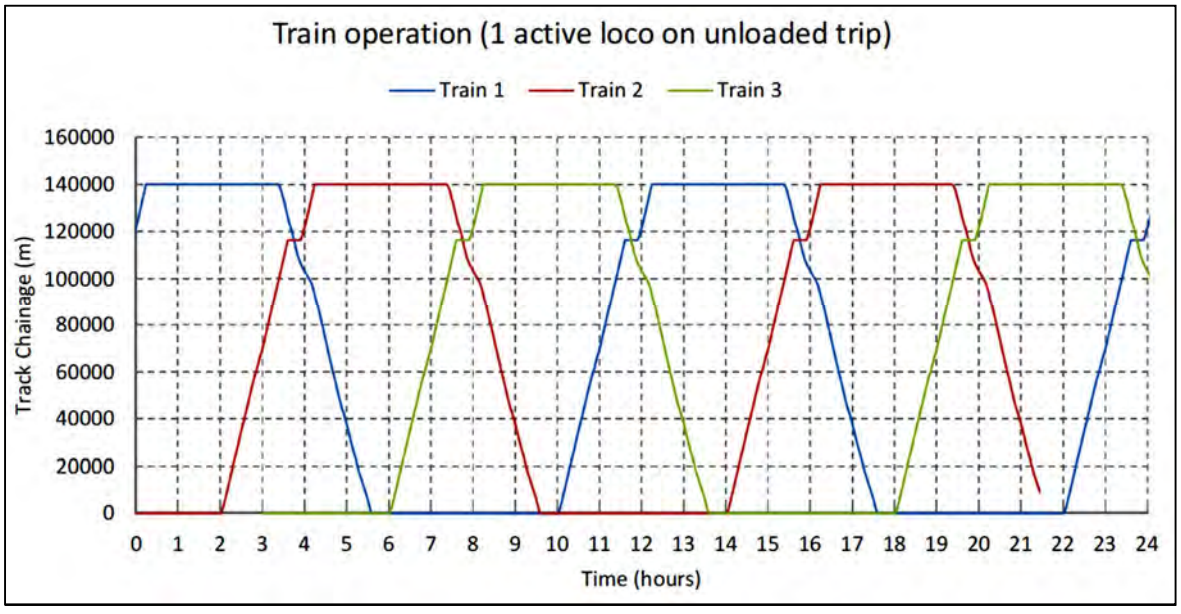


Figure 5-12 Train operations diagram (DFS Chapter 4 - Infrastructure - Rail)

Level crossings will need to be installed at intersections with roads along the proposed railway line. The number of level at grade crossings is rationalised to reduce the number of road and rail conflict points.

Where possible, the proposed design avoids the need for a level crossing through proposed road closures or realignments or by grade separating the crossing. A total of 22 public road crossings are proposed which include:

- 17 ‘at grade’ road crossings (some to include slight road realignments)
- 5 culvert/grade separation crossings (either road over rail or rail over road)

Figure 5-13 shows the path of the proposed infrastructure corridor and locations of new level crossings, while Figure 5-14 shows the proposed level crossings on roads that are gazetted for restricted vehicles.

Table 5-8 provides information regarding the control measures at each of these level crossings. These crossings consist of sealed and unsealed roads. Private road crossings are being discussed with individual land owners and will be in addition to the public crossings.

During detailed design each of the proposed level crossings will be designed in accordance with AS1742.7, which defines the sighting required for level crossings in order to provide clear visibility of warning signage for an approaching motorist as well as between a road vehicle and an oncoming train. In addition the proposed level crossings along roads that are currently gazetted for restricted vehicles will also be designed in conjunction with DPTI Operational Instruction 7.9.

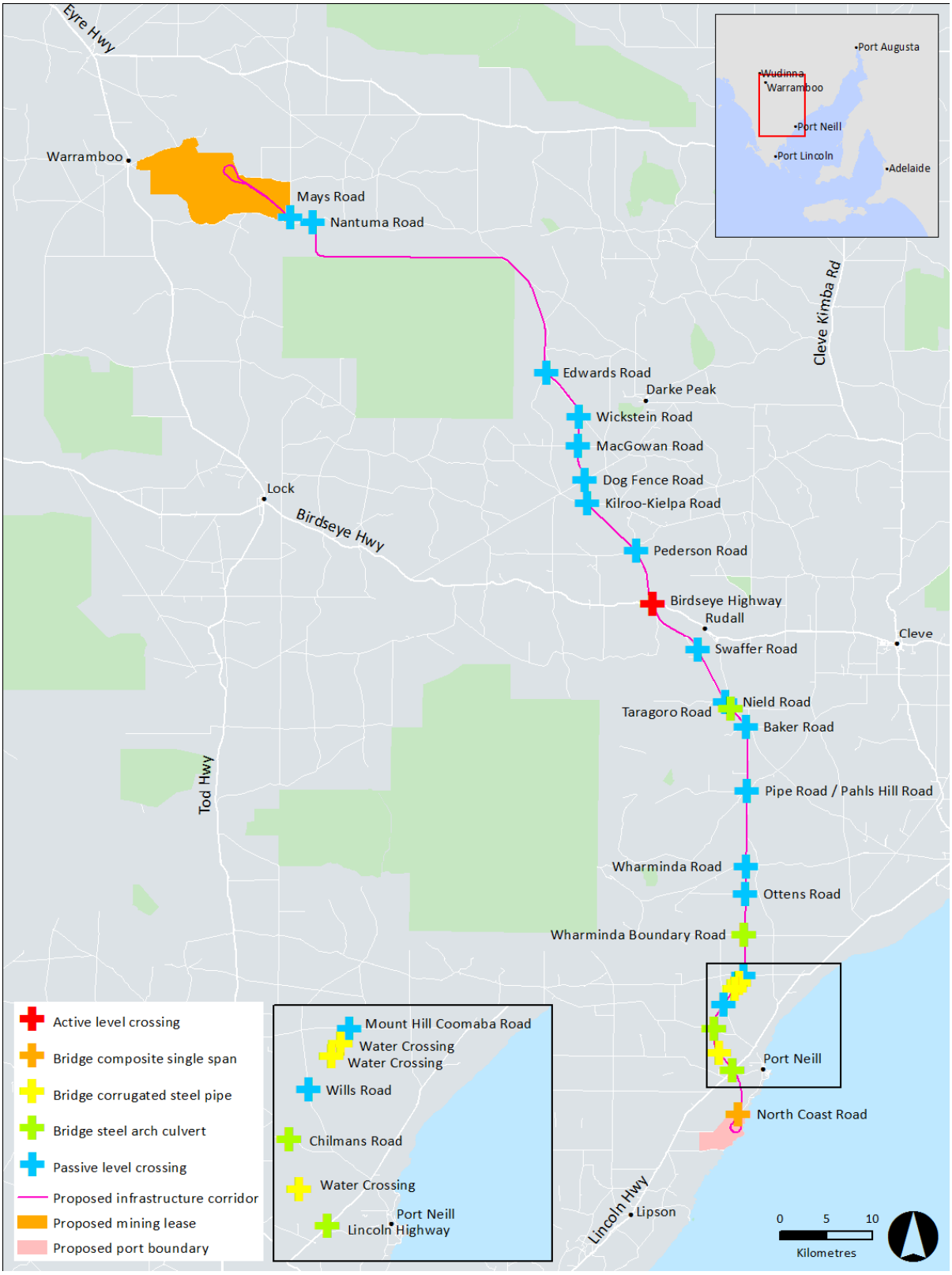


Figure 5-13 Proposed infrastructure corridor and level crossing locations

Level Crossing Location	Gazetted Description
Birdseye Highway	**GML and HML** - B-Double, 32m and 36.5m Road Train, Road Train Converter Dolly, 23m and 25m Vehicle Carrier, 35m B-Triple, Rigid Truck and Dog, **HML** - 19m Network (HML), **OSM** - Low Loader, Controlled Access Bus up to 14.5m, 3 Axle Crane Network, 4 Axle Crane Network, 5 Axle Crane Network, 6 Axle Crane (day travel), **PBS** - Level 1A, 2A, 2B, 3A, **Commodity Routes** - B-Double, Road Train
Dog Fence Road	**HML** - 19m network (HML), Commodity Route - B-Double (GML) - Grain, fertilizer, hay and bulk stock feed, livestock, wool
Edwards Road	**HML** - 19m network (HML), Commodity Route - B-Double (GML) - Grain, fertilizer, hay and bulk stock feed, livestock, wool
Kilroo-Kielpa Road	**HML** - 19m network (HML), **Commodity Route** - B-Double (GML) - Grain, fertilizer, hay and bulk stock feed, livestock, wool
Mays Road	**Commodity Route** - B-Double and Road Train (GML) - Grain, fertilizer, hay & bulk stock feed, dairy milk, livestock, logging and timber, wine, wool
Pipe Road / Pahls Hill Road	**Commodity Route** - B-Double and Road Train (GML) - Grain, fertilizer, hay & bulk stock feed, livestock, wool
Swaffer Road	**Commodity Route** - B-Double and Road Train (GML) - Grain, fertilizer, hay & bulk stock feed, livestock, wool
Wharminda Road	**HML** - 19m network (HML), **Commodity Route** - B-Double and Road Train (GML) - Grain, fertilizer, hay & bulk stock feed, livestock, wool

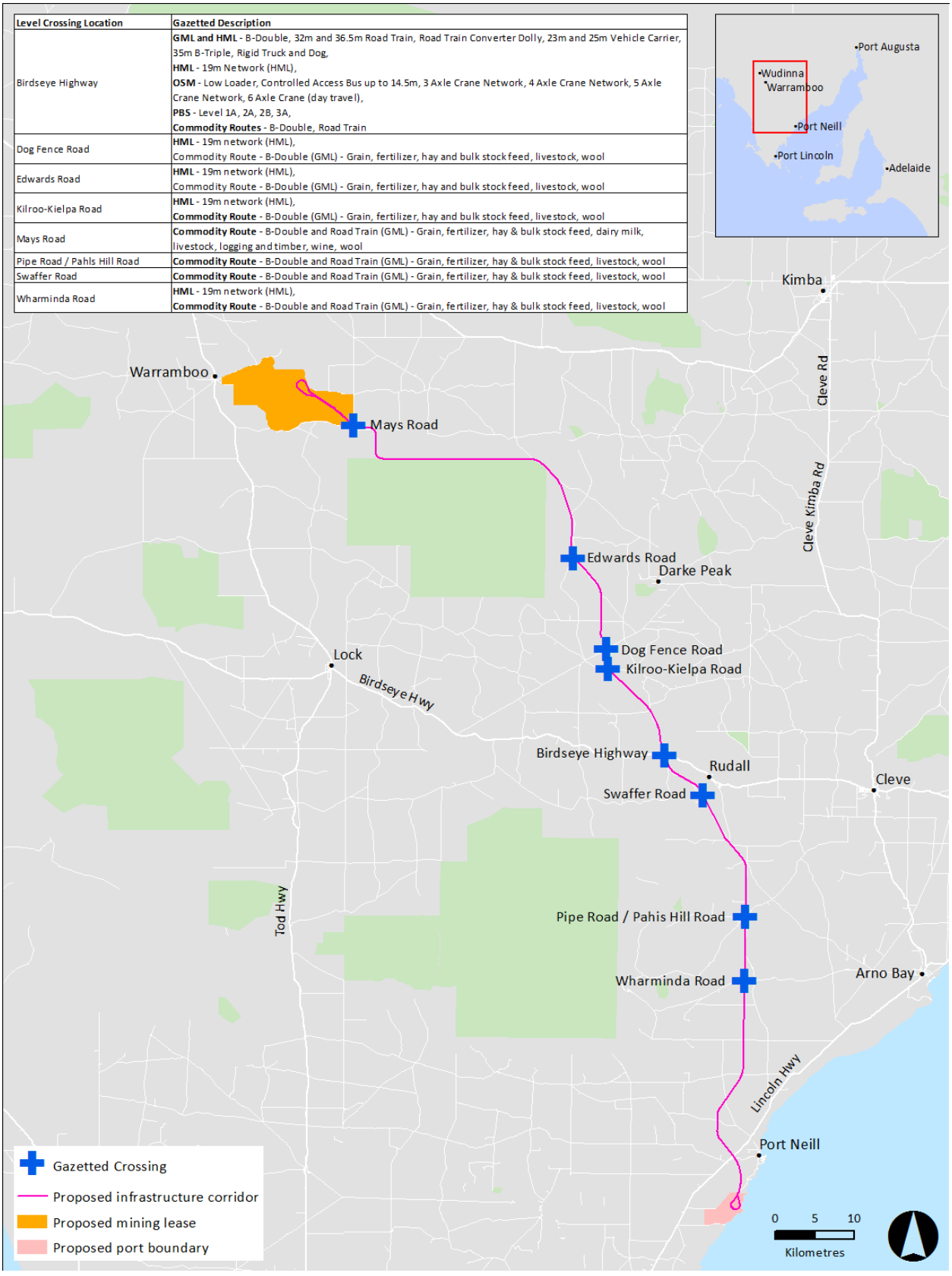


Figure 5-14 Proposed level crossing locations and gazetted roads

Table 5-8 Summary of proposed infrastructure corridor level crossings and control measures

Road Type/Name	Approximate Design Chainage	Comments
North Coast Road	CH5.070	Bridge – steel girder and concrete deck (road over rail) Road realignment to suit geometry for bridge for stage 1
Chalmers road	CH9.700	No crossing – proposed road closure, diversion back to Lincoln Hway (east side)
Lincoln Highway	CH10.065	Bridge – multi-plate steel archway (road over rail)
Water crossing	CH12.400	Bridge – corrugated steel pipe
Chilmans Road	CH15.200	Bridge – steel arch culvert (road over rail)
Wills Road	CH18.022	Passive level crossing
Mount Hill Coomba Road	CH21.875	Passive level crossing
Wharminda Boundary Road	CH26.175	Bridge – steel arch culvert (rail over road)
Ottens Road	CH30.595	Passive level crossing
Wharminda Boundary Road (B)	CH33.580	Passive level crossing
Pipe Road / Pahls Hill Road	CH41.655	Passive level crossing
Baker Road	CH48.690	Passive level crossing
G&W railway	CH51.452	Bridge – steel arch culvert (rail over road)
Nield Road	CH52.205	Passive level crossing
Phelps Road diversion (to avoid crossing)	CH52.200 – CH53.900	No crossing – Phelps Road extended to intersect with Nield Rd
Swaffer Road	CH58.600	Passive level crossing
Birdseye Highway	CH65.785	Active level crossing
Pedersen Road	CH67.900	No crossing – proposed road realignment to run parallel to west side of rail line
Pedersen Road	CH68.500	No crossing – proposed road realignment to run parallel to west side of rail line
Pederson Road	CH71.735	Passive level crossing
Kilroo-Kielpa Road	CH79.225	Passive level crossing
Dog Fence Road	CH81.760	Passive level crossing
MacGowan Road	CH85.525	Passive level crossing
Wickstein Road	CH88.685	Passive level crossing
Edwards Road (Rangeview Road?)	CH94.770	Passive level crossing
Property access off Wudinna-Darke Peak Road	CH105.170	See below: Farm crossing added at CH 105.20
Wudinna-Darke Peak Road realignment	CH104.90 - CH109.00	Road realignment (north side) to run parallel with rail line Farm crossing added at CH 105.20
Nantuma Road	CH132.330	Passive level crossing
Mays Road	CH134.850	Passive level crossing

In most cases, the local roads will be realigned slightly at the level crossing points to achieve Austroads requirements for sight distances.

The anticipated delay for the active (signalised) and passive (unsignalised) level crossings are shown in Table 5-9. Each of the trains will comprise two locomotives and 138 wagons. The trains are approximately 1.3 km long and will travel at approximately 80 km/h. This means that the maximum delay caused by trains will be 60 seconds at passive (unsignalised) crossings, and about 100 seconds at active (signalised) crossings where additional time is required for closing of the crossing prior with boom gates prior to the train passing through.

One active crossing is proposed along the railway line which is at the Birdseye Highway. From DPTI AADT data the Birdseye Highway has approximately 130 vehicles on average per day. Taking a worst case assumption that all of these trips are completed during a 12 hour period, 11 trips would be made on the road per hour, which equates to one vehicle every five to six minutes on average.

The local roads which will have passive level crossings for the proposed railway are generally only used for local access by farmers. To calculate vehicle delay at the passive level crossings, a conservatively high assumption of 130 vehicles per day was made. This assessment found that there is a low probability of vehicles being delayed by train movements (around 1%, with an average delay between 2.7 and 4.5 seconds).

Table 5-9 Delay at rail crossings

Crossing Type	AADT (vehicles per day on road)	Train Crossings per day	Time for train to pass/ maximum delay (seconds)	Probability of being delayed	Vehicles passing through crossing in two hours (assuming vehicles travelling in 12 hour daytime period)	Average delay per vehicle (seconds)
Active (signalised)	130 (Birdseye Hwy between Lock and Rudall)	12	100	1.39%	22	4.5
Passive (unsignalised)	130 (assumed)	12	60	0.83%	22	2.7

5.2.2 Impacts on Haul Road Capacity and Condition during Operational Period

Traffic capacity and level of service were calculated as per the method described in section 5.1.4 . The results generated from these calculations gave a level of service for each road by Average Travel Speed (ATS) and Percentage Time-Spent Following (PTSF). Results of these calculations are shown in Table 5-10.

Table 5-10 Level of service on Eyre Peninsula roads over the operational phase of the CEIP

Road Name	Direction	Base Case (No project vehicles)		Operational	
		ATS	PTSF	ATS	PTSF
Eyre Highway (Wudinna-Kyancutta)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Eyre Highway (Kyancutta – Kimba)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Eyre Highway (Kimba – Iron Knob)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Eyre Highway (Iron Knob – Lincoln Highway Intersection)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Eyre Highway (Lincoln Highway Intersection – Port Augusta Bridge)	Eastbound	A	B	A	B
	Westbound	A	B	A	B
Lincoln Highway (Tumby Bay – Port Neill Turnoff)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Lincoln Highway (Port Neill Turnoff – Balumbah-Kinnard Road)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Lincoln Road (Balumbah-Kinnard Road – Arno Bay)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Lincoln Hwy (Arno Bay – Cowell)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Lincoln Hwy (Cowell – Ash Rd)	Eastbound	A	B	A	B
	Westbound	A	A	A	A
Lincoln Hwy (Ash Rd – Kimba-Whyalla Rd)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Lincoln Hwy (Kimba-Whyalla Rd - Whyalla)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Lincoln Hwy (Whyalla – Eyre Hwy)	Northbound	A	A	A	A
	Southbound	A	A	A	A
Tod Highway (Eyre Hwy – Warramboo)	Northbound	A	A	A	A
	Southbound	A	A	A	A
Tod Highway (Warramboo – Lock)	Northbound	A	A	A	A
	Southbound	A	A	A	A
Birdseye Highway (Lock – Rudall)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Birdseye Highway (Rudall – Cleve)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Birdseye Highway (Cleve – Cowell)	Eastbound	A	A	A	A
	Westbound	A	A	A	A
Whyalla – Iron Knob Road	Northbound	A	A	A	A
	Southbound	A	A	A	A

As can be seen in Table 5-10, all segments of road analysed returned a LOS of A, except for three road segments which returned a LOS of B. The three road segments were the Eyre Highway (Lincoln Highway

Intersection – Port Augusta Bridge) eastbound and westbound directions, and the Lincoln Highway (Cowell – Ash Road) eastbound direction. Over the operational period there is no change in level of service from the base case (current level of service prior to construction).

This indicates that even with the additional traffic generated across the operational period of the CEIP, there would be enough capacity on each of the roads to be able to handle excess traffic. It should be noted that there is no data for Port Neill Access Road and Coast Road. Both of those roads would be assumed to have lower AADTs than the Lincoln Highway nearby (which has an AADT of 700) and it would expected that they would have a LOS of A for all scenarios shown in Table 5-10.

5.2.3 Pavement condition and wear

The estimated number of ESAs generated by the CEIP for each segment of road impacted by the CEIP was calculated as an indication of the likely wear and tear on the road network from operational traffic. These ESAs are given in Table 5-11.

Table 5-11 Equivalent Standard Axles generated by CEIP in the operational period

Road segment	Operation – Totals for 25 year operation life of mine	
	Loaded	Unloaded
Port Augusta -> Eyre Hwy/Lincoln Hwy Int.	594536	5941
Eyre Hwy/Lincoln Hwy Int. -> Whyalla	40137	371
Whyalla -> Cowell	40137	371
Cowell -> Arno Bay	40137	371
Arno Bay -> Lincoln Hwy/Balumbah-Kinnard Rd Intersection	40137	371
Lincoln Hwy/Balumbah-Kinnard Rd Intersection -> Port Neill Turnoff (Lincoln Hwy)	40137	371
Port Neill Turnoff (Lincoln Hwy) -> Port	801922	748473
Eyre Hwy/Lincoln Hwy Int. -> Iron Knob	554399	5120
Iron Knob -> Kimba	554399	5120
Kimba -> Kyancutta	554399	5120
Cowell -> Cleve	0	0
Cleve -> Rudall	0	0
Warramboo -> Mine Site Turnoff	1482718	834020
Kyancutta -> Wudinna	1104130	830524
Kyancutta -> Warramboo	1482718	834020
Mine Site Turnoff -> Lock	0	0
Birdseye Highway (Lock – Rudall)	0	0
Rudall -> Balumbah Kinnard Rd/Lincoln Hwy Int.	0	0
Whyalla -> Iron Knob	0	0
Port Lincoln -> Tumby Bay	0	0
Tumby Bay -> Port Neill Turnoff (Lincoln Hwy)	0	0
Port Lincoln -> Tod Hwy/Flinders Hwy Int.	0	0
Tod Hwy/Flinders Hwy Int. -> Cummins	0	0
Cummins -> Lock	0	0

The amount the CEIP will increase average daily traffic on the road network during the operational period varies from negligible to more than double on some roads. These increases are on a very small base and the quantum of daily traffic increase is never predicted to be more than 300 vehicles per day. The estimated increase in daily axle loadings (Equivalent Standard Axles or ESAs) from heavy commercial vehicles (HCVs) on the roads will be negligible (range from 0% to 1%) over this period. The impact of this additional loading on pavement condition is likely to be very slight and should not significantly affect the condition and remaining life of the pavement. As a result remedial pavement rehabilitation treatment is unlikely to be required as the result of the operation of the project.

5.2.4 Impacts on Intersection Capacity during Operational Period

Intersections across the Eyre Peninsula which material delivery or operational staff would pass through were analysed to determine potential effects on intersection capacity. The intersections analysed were:

- Eyre Highway/Lincoln Highway
- Whyalla-Iron Knob/Lincoln Highway
- Eyre Highway/Mine Site Turnoff
- Eyre Highway/Tod Highway
- Tod Highway/Kimba Road
- Tod Highway/Birdseye Highway
- Balumbah-Kinnard Road/Lincoln Highway
- Lincoln Highway/Port Neill Access Road
- Birdseye Highway/Lincoln Highway

To determine the hourly number of vehicles passing through intersections in each direction, the yearly number of vehicles was divided by 365 to obtain daily values, then all except the operational staff vehicles travelling between Wudinna (proposed long term employee village) and the proposed mine site were divided again by 12. This assumed that vehicles would only be delivering items in a twelve hour period each day (daytime). For the vehicles travelling between Wudinna (proposed long term employee village) and the proposed mine site the daily rate was divided by two. This allows the two peak hour volumes (shift change at the mine) to be seen.

From analysis of all of the listed above intersections the maximum number of vehicles per hour passing through an intersection making the same turn was 1 in each year of operation with the exclusion of operational traffic travelling between Wudinna (proposed long term employee village) and the proposed mine site turn off at Warramboo. The peak hour operational traffic between the proposed long term employee village and the proposed mine site was estimated at 117 vehicles. These values include origin – destination trips only (one-way). This leads to the conclusion that there will be negligible impact as a result of the extra turning movements created in the operational phase. The number of additional turning movements that would be sufficient to require capacity upgrade works to intersections would be in the order of 400 to 1000 additional turning movements in a peak hour (depending on the turning movement added to the intersection). This is significantly more than the maximum 117 additional trips expected to generated by the CEIP in a given hour at analysed locations. Therefore the CEIP trip generation would need to increase by 342% before a capacity threshold was exceeded.

5.2.5 Local road closures, diversions and upgrades

Several road closures, diversions and upgrades are proposed in the vicinity of the proposed mining lease, infrastructure corridor and port site as part of the CEIP.

At the port site these are:

- Construction of new bridge over rail for the existing North Coast Road at the northern port site boundary realignment of the existing North Coast Road around the Port Main Sub Station
- Closure of Brayfield Road on the eastern side of North Coast Road
- Upgrade of Brayfield Road between North Coast Road and Lincoln Highway
- Minor realignment, slight lengthening and improvement of the physical standard of sections of the existing Port Neill Access Road

The sections of existing public roads that fall within the proposed mining lease will be closed, this includes sections of:

- Dolphin Road
- Murphy Road
- Kimba Road
- Lock Road

Two road diversions are also proposed along the infrastructure corridor in order to avoid level crossings at Phelps Road and Wudinna-Darke Peak Road (refer to Figure 5-15).

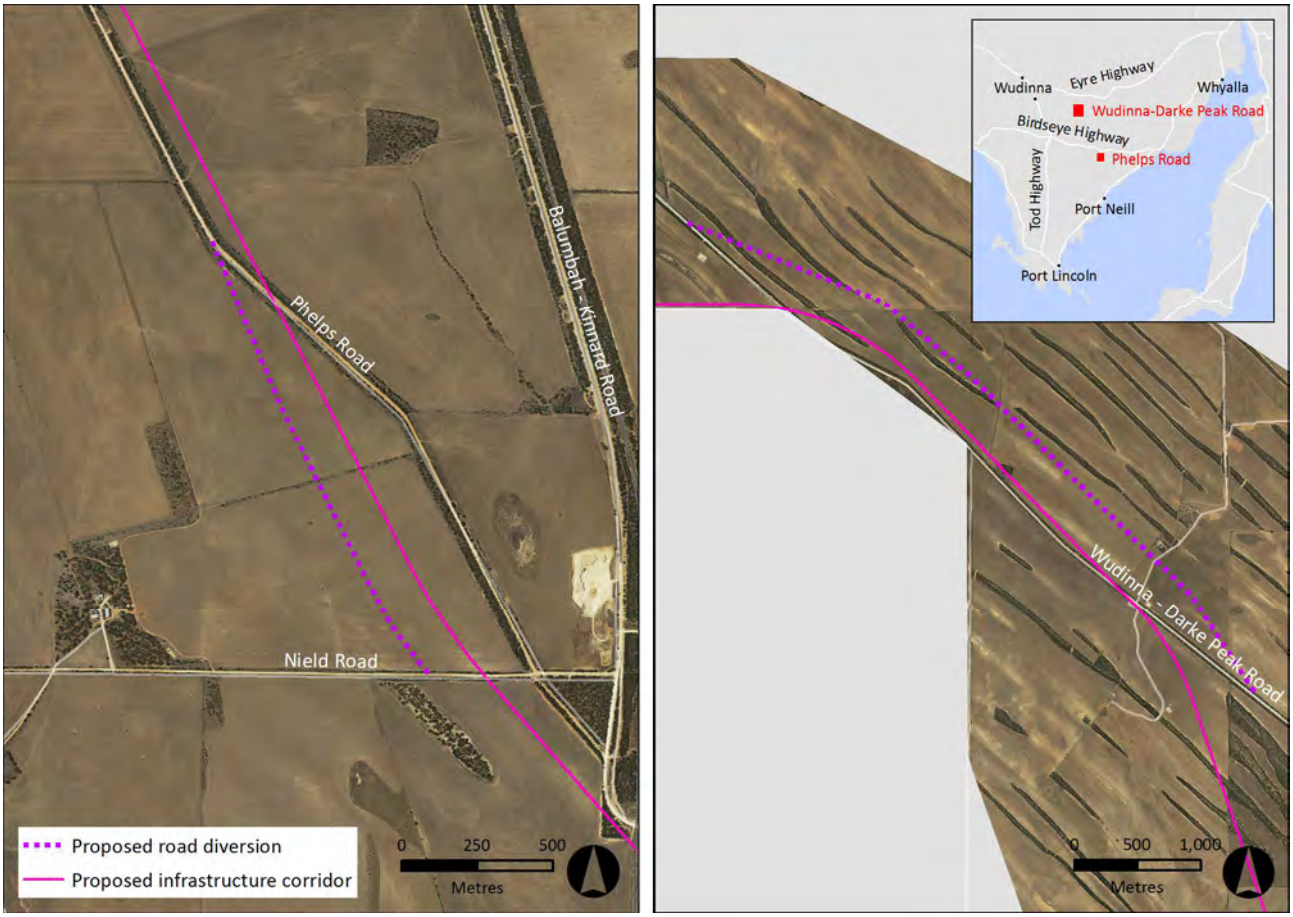


Figure 5-15 Proposed road diversions at Phelps Road and Wudinna-Darke Peak Road

The proposed road closures and alignments will be reviewed and confirmed in consultation with the District Council of Tumby Bay, District Council of Cleve and Wudinna District Council as detailed design progresses. The net effect on travel time and distance as a result of the proposed changes to the public road system around the port site will be negligible, with the increase in travel time being less than one minute for most trips and a shorter travel time for some journeys. The road closures within the proposed mining lease will increase travel times in the local area. For example, a motorist travelling east from Waramboo may use Nantuma Road as a replacement for the closed section of Kimba Road. This would increase travel time by approximately seven to eight minutes.

6 Impact Management

The transport impact assessment in Section 5 has demonstrated that the construction and operational phase impacts of the CEIP on road capacity and safety are acceptable. However, Iron Road will implement a traffic management strategy and road maintenance plan for public roads used by the CEIP to ensure that:

- Transport operations are consistent with the assumptions made in this report and hence traffic impacts in practice are as predicted and acceptable;
- Maintenance impacts during both the construction and operational phases are managed so that there is no project-related deterioration in the condition of the public roads used.

The project involves placing a large workforce, most of whom will be unfamiliar with the terrain, in a remote area. While the transport operations and infrastructure have been designed to meet relevant safety standards, there is also an important human element to safe operations. Iron Road will proactively encourage all workers associated with the project (internal or sub-contractors) to drive safely and to the road conditions, with an aim to achieve a safe driving culture. Measures intended to achieve this will include driver education and training, fatigue management, and scheduling of trips to minimise risk.

6.1 Construction Phase Traffic Management

In order to minimise the impact on the transport network during construction, Iron Road will develop a traffic management strategy in consultation with DPTI, local councils and communities. The management approaches in Table 6-1 will be incorporated into the Construction Environmental Management Plan.

6.2 Construction Phase Pavement Management

The large heavy vehicles proposed for use during the construction phase may result in incidental damage to the road pavement and/or road furniture. Iron Road will develop a construction phase pavement management plan to manage these impacts. This will identify different types of possible road and pavement damage, inspection frequencies, intervention levels and required treatments. As part of the management plan, Iron Road will undertake pavement deflection (strength) testing on haul route pavements before and after the mine construction period to determine whether any remedial pavement rehabilitation treatment is required as the result of the mine construction.

Table 6-1 Construction traffic management issues

IMPACT	MANAGEMENT
Module deliveries could potentially conflict with peak traffic periods and harvest season	Schedule module deliveries to arrive outside peak hours and potential conflict times with harvest season (November-December)
Delivery of materials during peak hours may cause slight delay to existing traffic travelling on the roads (although level of service would remain the same)	Manage construction programme to reduce peak traffic generation and/or avoid peak traffic periods to minimise traffic delay to the public if required.
Traffic generated by project and road closures may alter or delay school bus routes	Liaise with local schools to discuss any impacts to bus routes due to road closures or traffic movements. Where possible construction traffic will be timed to avoid school bus services.
Deterioration of pavement due to vehicle movements generated by project	Develop a pavement monitoring and management plan with inspections when and where pavement damage is most likely to occur (e.g. module delivery). The plan will include identification of any rutting, corrugations, potholing and significant cracking.
Motorists encounter the slow moving modules (modules travels at 3 km/h) on open roads with no prior warning until module is in sight.	Progressive temporary road closures during module and heavy materials and equipment deliveries, with alternative routes clearly signed. Accredited traffic controllers will also be engaged to manage intersections at start and finish of the closed road sections to prevent movements onto closed sections. Modules will be delivered outside of peak traffic periods at night.
Increased risk of vehicle accidents due to high crash rates on segments of road which CEIP generated traffic would travel on	Traffic management strategies such as the use of pilot vehicles and temporary speed restrictions will be required for the segments of road with high crash rates (Warramboo to Kyancutta on the Tod Highway; Cleve to Cowell on the Birdseye Highway; Iron Knob to Whyalla Road; and Iron Knob to Lincoln Highway intersection on the Eyre Highway).
A-Triple vehicles not permitted on Eyre Peninsula Roads	Fuel supply vehicles to be PBS Level 2 vehicle
Sufficient module clearance will require relocation of some services and upgrade of some intersections	Upgrade of 5 intersections along module delivery route to allow for module transport vehicle to be able to complete cornering Undergrounding of power lines which cross module route roads. Check of clearance for power lines parallel and close to module route roads. Widening of culverts and road formations to at least 12 m to allow module transporter to pass over required for all culverts on module route prior to modules transport. Grading of cuttings which have insufficient width for the module transporter to pass between (12 m wide). Installation of foldable signs along module delivery route

6.3 Operational Phase Traffic Management

During the operational phase of the proposed development, a number of management measures would be incorporated into the Operation Environmental Management Plan. These are shown in Table 6-2.

Table 6-2 Operational traffic management issues

Impact	Management
Shift changeover traffic could be detrimental to the non-mine peak hour traffic if shift changeover coincides with current peak hour times (currently around 9am and 5pm)	Schedule shift changeovers away from current peak hours.
Potential use of heavy vehicles such as A-Triple vehicles that are not permitted on Eyre Peninsula Roads	Designated delivery transport routes for heavy vehicle and light vehicles accessing the port site and mine site. Fuel supply vehicles to be PBS Level 2 vehicle

6.4 Operational Phase Pavement Management

During the operational phase passenger and truck movements to the site will be much less than in the construction phase, and will all be by vehicles operating as of right or under permit. No additional pavement management measures are expected to be required.

7 Findings and Conclusion

Following investigation of the increased traffic generated from the CEIP and its relative impact, the following conclusions are reached:

- All planned construction and operational phase traffic impacts are comfortably within the capacity of the existing road system (Level of Service A). There is ample spare capacity at all affected intersections during the mine construction phase. Mine generated traffic volumes would need to be an order of magnitude higher before any capacity threshold was crossed (+2000 to +3000 vehicles per day compared to CEIP impacts of +30 to +150 vehicles per day).
- Delays induced by CEIP construction traffic will be small. Traffic will be diverted around modules. Delays from this may occur of up to ten minutes per module encountered, depending on the length of diversion.
- All proposed CEIP transport operations on public roads should be safe provided they are undertaken in a manner consistent with the assumptions in this analysis.
- CEIP will generate construction traffic onto some local roads with existing crash rates that are above average. Traffic management strategies such as the use of pilot vehicles and temporary speed restrictions will be required for those segments of road with high crash rates (Warramboo to Kyancutta on the Tod Highway; Cleve to Cowell on the Birdseye Highway; Iron Knob to Whyalla Road; and Iron Knob to Lincoln Highway intersection on the Eyre Highway).
- The project involves placing a large workforce, most of whom will be unfamiliar with the terrain, in a remote area. Iron Road will proactively encourage all workers associated with the project (internal or sub-contractors) to drive safely and to the road conditions, with an aim to achieve a safe driving culture. Measures intended to achieve this will include driver education and training, fatigue management, and scheduling of trips to minimise risk

8 References

Austroads (2009), Austroads Guide To Traffic Management Part 12 Traffic Impacts of Development, Austroads, Sydney.

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RAVnet - Department of Planning, Transport and Infrastructure 2011, viewed 6 November 2013, <http://www.dpti.sa.gov.au/ravnet>

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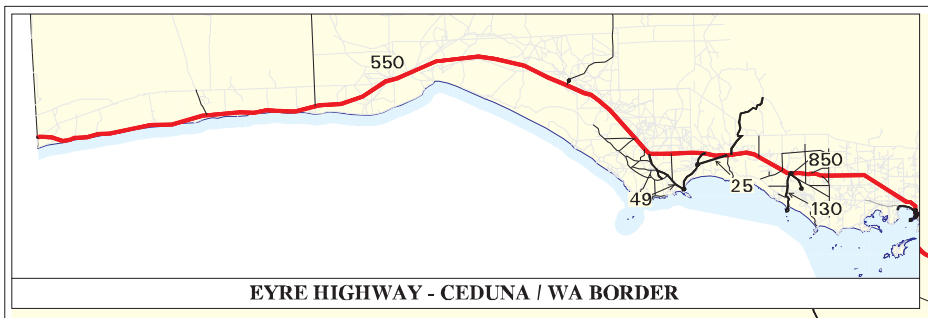
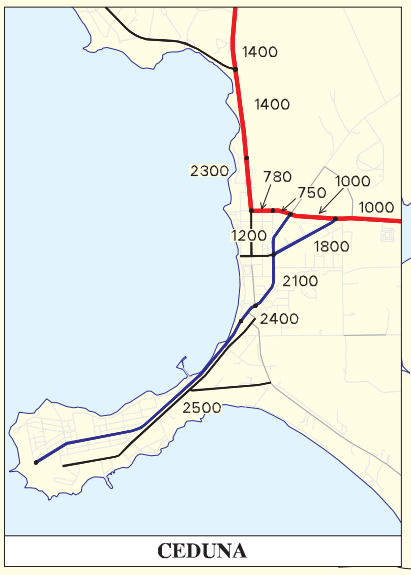
9 Glossary and abbreviations

AADT	Annual average daily traffic
CEIP	Central Eyre Iron Project
DFS	Definitive Feasibility Study
DPTI	Department of Planning, Transport and Infrastructure
HCM	Highway Capacity Manual
HV	Heavy vehicle
LGA	Local Government Authority
LOS	Level of service
MOF	Module offloading facility
Mtpa	Million tonnes per annum
PBS	Performance Based Standards
VKT	Vehicle kilometres travelled

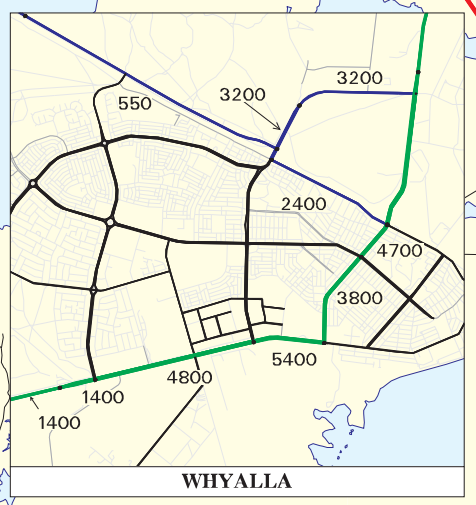
Appendix A. AADT and percentage of heavy vehicle maps of Eyre Peninsula



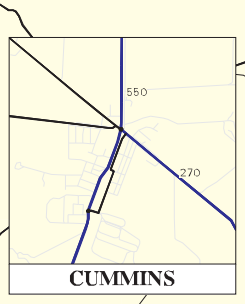
EYRE HIGHWAY - CEDUNA / WA BORDER



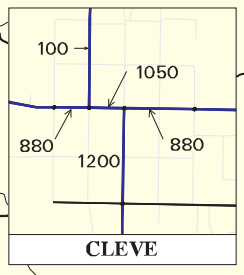
CEDUNA



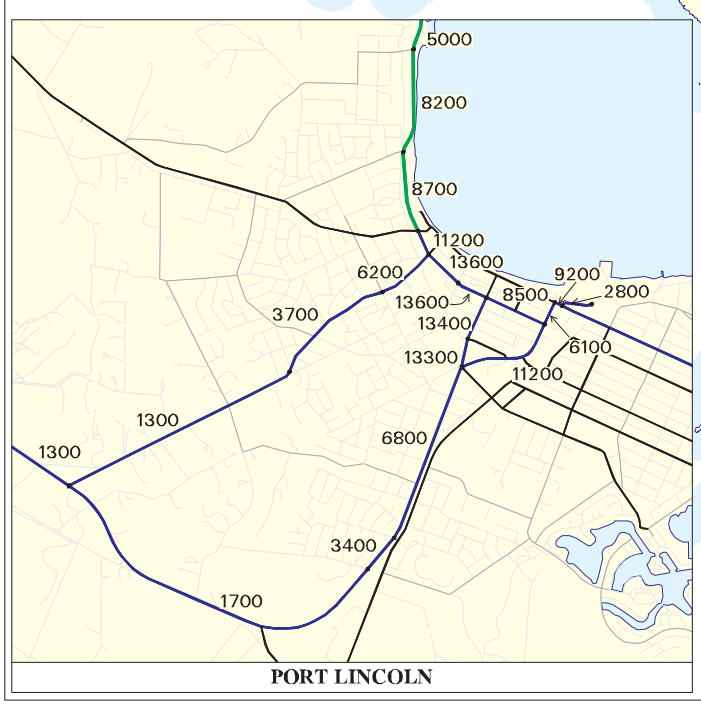
WHYALLA



CUMMINS



CLEVE



PORT LINCOLN

Annual Average Daily Traffic Estimates
24 hour two-way flows

Please note that this information has been collected for internal use by DPTI and is provided herein as an information resource only. It is not a substitute for independent professional advice and users should exercise their own skill, care and judgement with respect to the use of the material. Whilst all reasonable care has been taken in the preparation, the State of South Australia does not guarantee, and accepts no legal liability arising from or connected to, the accuracy, reliability, currency, suitability, or completeness of this material.

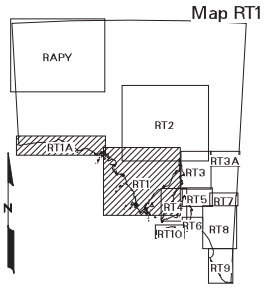
The estimates shown are weighted averages for designated road sections. Since counts may be influenced by various factors, these counts should be used as a guide only. For more detailed information phone (08)8343 2810.

AUSTROADS
Road Class

- 1
- 2
- 3
- 4
- 5

- Section start
- Section end

Map RT1



Government of South Australia
Department of Planning, Transport and Infrastructure

Produced by Road Asset Management Section - 03 November 2013

Heavy Vehicle Traffic Estimates
24 hour two-way flows and (Percentages of AADT)

Please note that this information has been collected for internal use by DPTI and is provided herein as an information resource only. It is not a substitute for independent professional advice and users should exercise their own skill, care and judgement with respect to the use of the material. Whilst all reasonable care has been taken in the preparation, the State of South Australia does not guarantee, and accepts no legal liability arising from or connected to, the accuracy, reliability, currency, suitability, or completeness of this material.

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AUSTROADS
Road Class

- 1
- 2
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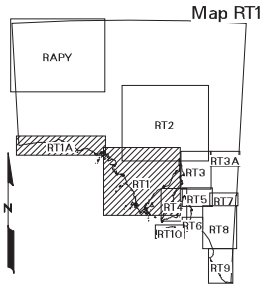
- Section start
- Section end

Map RT1



Government of South Australia
Department of Planning, Transport and Infrastructure

Produced by Road Asset Management Section - 03 November 2013

Appendix B. Restricted Access Vehicle Network

Roads gazetted for restricted access vehicles within the study area are detailed in Table B.1and the restricted access vehicle maps for Eyre Peninsula are included below.

Table B.1 Restricted Access Vehicle Gazetted Roads

		GML Routes										HML Routes									Commodity Routes - Road Train									
		23m B Double (GML)	26m B Double (GML)	32m Road Train (GML)	36.5m Road Train (GML)	53.5m Road Train (GML)	Road Train Converter Dolly (GML)	23m Vehicle Carrier (GML)	25m Vehicle Carrier (GML)	35.0m B-Triple	Rigid Truck and Dog (23m) (GML)	23m B Double (HML)	26m B Double (HML)	32m Road Train (HML)	36.5m Road Train (HML)	53.5m Road Train (HML)	Road Train Converter Dolly (HML)	23m Vehicle Carrier (HML)	25m Vehicle Carrier (HML)	19m Network (HML)	Grain (Road Train GML)	Fertilizer (Road Train GML)	Hay & Bulk Stock Feed (Road Train GML)	Dairy Milk (Road Train GML)	Livestock (Road Train GML)	Logging & Timber (Road Train GML)	Wine (Road Train GML)	Wool (Road Train GML)	Fruit & Veg (Road Train GML)
Road	Eyre Highway	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lincoln Highway	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Birdseye Highway (between Lock and Cowell)	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tod Highway	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Port Neill Access Road	✓	✓	✓	✓		✓			✓											✓	✓	✓	✓	✓	✓	✓	✓	✓
	North Coast Road	NOT CURRENTLY GAZETTED										NOT CURRENTLY GAZETTED									NOT CURRENTLY GAZETTED								
	Brayfield Road	NOT CURRENTLY GAZETTED										NOT CURRENTLY GAZETTED									NOT CURRENTLY GAZETTED								
	Balumbah-Kinnard Road			80% ✓	80% ✓		80% ✓							80% ✓	80% ✓		80% ✓			✓	✓	✓	✓	80% ✓	✓	80% ✓	80% ✓	✓	80% ✓
	Kimba Road																				✓	✓	✓	✓	✓	✓	✓	✓	
	Nantuma Road																				✓	✓	✓	✓	✓	✓	✓	✓	
	Iron Knob-Whyalla Road																			✓									

		OSM Routes										PBS Routes						Commodity Routes-B Double								
		23m 42.5t Low Loader 24 Hr	23m 42.5t Low Loader Day Only	25m 49.5t Low Loader	25m 59.5t Low Loader	Controlled Access Bus up to 14.5m	3 Axle Crane Network	4 Axle Crane Network	5 Axle Crane Network	5 Axle Crane Night Travel	6 Axle Crane - Day Travel	Level 1A	Level 2A	Level 2B	Level 3A	Level 3B	Level 4A	Grain (B Double GML)	Fertilizer (B Double GML)	Hay & Bulk Stock Feed (B Double GML)	Dairy Milk (B Double GML)	Livestock (B Double GML)	Logging & Timber (B Double GML)	Wine (B Double GML)	Wool (B Double GML)	Fruit & Veg (B Double GML)
Road	Eyre Highway	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lincoln Highway	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Birdseye Highway (between Lock and Cowell)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tod Highway	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Port Neill Access Road	✓	✓															✓	✓	✓	✓	✓	✓	✓	✓	✓
	North Coast Road	NOT CURRENTLY GAZETTED										NOT CURRENTLY GAZETTED						NOT CURRENTLY GAZETTED								
	Brayfield Road	NOT CURRENTLY GAZETTED										NOT CURRENTLY GAZETTED						NOT CURRENTLY GAZETTED								
	Balumbah-Kinnard Road																	✓	✓	✓		✓			✓	
	Kimba Road																	✓	✓	✓	✓	✓	✓	✓	✓	
	Nantuma Road																	✓	✓	✓	✓	✓	✓	✓	✓	
	Iron Knob-Whyalla Road		✓	✓	✓		✓	✓	✓		✓	✓														

RAVNet Map for 23m 42.5t Low Loader 24hr

Legend

- 23m 42.5t Low Loader 24hr
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

Restrictions

Ref	Restriction Information
24190	Access to the Kimba Bunker site via Tola Rd is only permitted when the gate is closed across the Buckleboo rail line south of Tola Rd
31	Left turn not permitted from Wallaroo-Moonta rd into Kadina-Moonta Rd
52	No travel on Stevenson St between Matthew Pl and St Andrews Tce between 8:15am and 8:45am or 3:15pm and 3:45pm weekdays
51	Travel restricted on Gawler Tce between the hours of 8:00am and 5:00pm, Monday to Friday
53	No left or right turn into Main St from Fifth St

RAVNet Map for 25m 59.5t Low Loader

Legend

- 25m 59.5t Low Loader
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

RAVNet Map for 26m B Double (HML)

Legend

- 26m B Double (HML)
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

Restrictions

Ref	Restriction Information
21630	Carriewerloo Rd maximum speed 60kph
21631	Myall Creek Rd from Carriewerloo Rd maximum speed 40kph
24190	Access to the Kimba Bunker site via Tola Rd is only permitted when the gate is closed across the Buckleboo rail line south of Tola Rd
21639	No left turn from Chatfield Tce into Abraham Rydberg Dr. No right turn from Abraham Rydberg Dr into Chatfield Tce
21632	Myall Creek Rd maximum speed 40kph
21634	Carriewerloo Rd maximum speed 60kph
810	Right turn from Primes Rd onto Port Wakefield Rd prohibited
2425	Right turn into crossover point heading South. Right turn out of crossover point heading North only permitted
31	Left turn not permitted from Wallaroo-Moonta rd into Kadina-Moonta Rd
52	No travel on Stevenson St between Matthew Pl and St Andrews Tce between 8:15am and 8:45am or 3:15pm and 3:45pm weekdays
51	Travel restricted on Gawler Tce between the hours of 8:00am and 5:00pm, Monday to Friday
53	No left or right turn into Main St from Fifth St
6265	No right turn from Kulpara Rd into Agery Rd and no left turn from Agery Rd into Kulpara Rd allowed
6266	No right turn from Maitland Rd into Ardrossan Rd and no left turn from Ardrossan Rd into Maitland Rd allowed
6267	No left turn from Kulpara Rd into Clinton Rd and no right turn from Clinton Rd into Kulpara Rd allowed
6268	No left turn from Moonta Rd into Robert St allowed
811	Access by all vehicles on Flinders Tce is restricted to between 7am and 7pm every day
18114	Access by all vehicles on Flinders Tce is restricted to between 7am and 7pm every day
18119	No right turn from Spencer Hwy onto Pt Broughton Rd
3385	Maximum speed 80kph on sealed section of road, 70kph on unsealed section of road outside town limits
92	Primes Rd to Waste Management Facility Only
6905	No left turn into Caroona Rd Allowed

RAVNet Map for 36.5m Road Train (GML)

Legend

- 36.5m Road Train (GML)
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

Restrictions

Ref	Restriction Information
13633	Road Train speed limit of 40kph applies in all 50 or 60kph limit zones within Port Augusta
21630	Carriewerloo Rd maximum speed 60kph
21631	Myall Creek Rd from Carriewerloo Rd maximum speed 40kph
24190	Access to the Kimba Bunker site via Tola Rd is only permitted when the gate is closed across the Buckleboo rail line south of Tola Rd
21632	Myall Creek Rd maximum speed 40kph
21634	Carriewerloo Rd maximum speed 60kph
73	Shell Meteor Roadhouse Left turn into eastern entrance. Left turn exit from the western entrance onto National Highway 1. Vehicles are permitted to drop both trailers at a roadhouse if the facilities on the opposite side of the road are to be used, i.e., travel bobtail.
142	Maximun length over Dublin St bridge limited to 32.0m
143	Max length vehicle of 30m ONLY permitted along Caroona Rd
810	Right turn from Primes Rd onto Port Wakefield Rd prohibited
2425	Right turn into crossover point heading South. Right turn out of crossover point heading North only permitted
5307	No left turn from Cook Street into Stevenson Street.
2108	No right turn from Kimba-Whyalla Road onto Lincoln Highway and no left turn from Lincoln Highway into Kimba-Whyalla Road allowed
13635	Road Train speed limit of 40kph applies in all 50 or 60kph limit zones within Whyalla
13634	Road Train speed limit of 40kph applies in all 50 or 60kph limit zones within Port Pirie
17788	General Freight - Restricted speed on Taragoro Rd and Balumbah-Kinnaird Rd to 80 kph at all times. Speed to reduce to 25kph when school bus present. Route only approved up to 30 June 2014
53	No left or right turn into Main St from Fifth St
20359	No left turn onto Augusta Hwy from Warnertown Rd
5945	No right turn from Lucky Bay Rd into Wilton Rd, and no left turn from Wilton Rd into Lucky Bay Rd allowed
153	Access to silos Only
138	Vehicles must enter the weighbridge at Stirling North when the weightbridge is open and/or as directed by an Inspector or Police Officer.
2105	General Freight - Maximum speed limit 60kph applicable to 500m either side of Verran township
5308	No left turn from London Street into Stevenson Street. No right turn from Stevenson Street into London Street
74	BP Roadhouse Left turn into Ritma Rd and then into the roadhouse. Left turn exit onto Ritma Rd and then left turn into National Highway 1. Vehicles are permitted to drop both trailers at a roadhouse if the facilities on the opposite side of the road are to be used, i.e., travel bobtail.
3385	Maximum speed 80kph on sealed section of road, 70kph on unsealed section of road outside town limits
92	Primes Rd to Waste Management Facility Only
135	Access to Wheare Depot Only
134	Pine Haven Road Train Depot
141	Whyalla One Steel Access
87	BP Bungama Service Station. Southbound access only, left turn in and out.
75	Mobil Pt Augusta Truck Stop, west bound, left turn into eastern entrance. East bound, National Highway 1 right turn into Power Station Rd left turn into Mobil Pt Augusta Truck Stop. Exit from Mobil Pt Augusta Truck Stop is right turn into Power Station Rd then left or right into National Highway 1.
89	Redhill Food and Gas Stop. Southbound access only, left turn in and out.
91	Lochiel Marshelling Yard, entry in only, from the right turn lane on National Hwy 1 to the northern access and from the left turn lane on National Hwy 1 into the southern access. Exit only, left turn via the northern access using the acceleration lane. Right turn from either access is not permitted.
86	Georges Corner Mobil Service Station. Southbound access only, left turn in and out
6905	No left turn into Caroona Rd Allowed
88	Mobil Country Gardens Service Station. Southbound access only, left turn in and out
90	Mobil Snowtown Service Station. Nothbound access only, left turn in and out

RAVNet Map for 53.5m Road Train (GML)

Legend

- 53.5m Road Train (GML)
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

RAVNet Map for 26m B Double (HML)

Legend

- 26m B Double (HML)
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

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810	Right turn from Primes Rd onto Port Wakefield Rd prohibited
2425	Right turn into crossover point heading South. Right turn out of crossover point heading North only permitted
31	Left turn not permitted from Wallaroo-Moonta rd into Kadina-Moonta Rd
52	No travel on Stevenson St between Matthew Pl and St Andrews Tce between 8:15am and 8:45am or 3:15pm and 3:45pm weekdays
51	Travel restricted on Gawler Tce between the hours of 8:00am and 5:00pm, Monday to Friday
53	No left or right turn into Main St from Fifth St
6265	No right turn from Kulpara Rd into Agery Rd and no left turn from Agery Rd into Kulpara Rd allowed
6266	No right turn from Maitland Rd into Ardrossan Rd and no left turn from Ardrossan Rd into Maitland Rd allowed
6267	No left turn from Kulpara Rd into Clinton Rd and no right turn from Clinton Rd into Kulpara Rd allowed
6268	No left turn from Moonta Rd into Robert St allowed
811	Access by all vehicles on Flinders Tce is restricted to between 7am and 7pm every day
18114	Access by all vehicles on Flinders Tce is restricted to between 7am and 7pm every day
18119	No right turn from Spencer Hwy onto Pt Broughton Rd
3385	Maximum speed 80kph on sealed section of road, 70kph on unsealed section of road outside town limits
92	Primes Rd to Waste Management Facility Only
6905	No left turn into Caroona Rd Allowed

RAVNet Map for 36.5m Road Train (HML)

Legend

- 36.5m Road Train (HML)
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

Restrictions

Ref	Restriction Information
13633	Road Train speed limit of 40kph applies in all 50 or 60kph limit zones within Port Augusta
21630	Carriewerloo Rd maximum speed 60kph
21631	Myall Creek Rd from Carriewerloo Rd maximum speed 40kph
24190	Access to the Kimba Bunker site via Tola Rd is only permitted when the gate is closed across the Buckleboo rail line south of Tola Rd
21632	Myall Creek Rd maximum speed 40kph
21634	Carriewerloo Rd maximum speed 60kph
73	Shell Meteor Roadhouse Left turn into eastern entrance. Left turn exit from the western entrance onto National Highway 1. Vehicles are permitted to drop both trailers at a roadhouse if the facilities on the opposite side of the road are to be used, i.e., travel bobtail.
142	Maximun length over Dublin St bridge limited to 32.0m
143	Max length vehicle of 30m ONLY permitted along Caroona Rd
810	Right turn from Primes Rd onto Port Wakefield Rd prohibited
2425	Right turn into crossover point heading South. Right turn out of crossover point heading North only permitted
5307	No left turn from Cook Street into Stevenson Street.
2108	No right turn from Kimba-Whyalla Road onto Lincoln Highway and no left turn from Lincoln Highway into Kimba-Whyalla Road allowed
13635	Road Train speed limit of 40kph applies in all 50 or 60kph limit zones within Whyalla
13634	Road Train speed limit of 40kph applies in all 50 or 60kph limit zones within Port Pirie
17788	General Freight - Restricted speed on Taragoro Rd and Balumbah-Kinnaird Rd to 80 kph at all times. Speed to reduce to 25kph when school bus present. Route only approved up to 30 June 2014
53	No left or right turn into Main St from Fifth St
20359	No left turn onto Augusta Hwy from Warnertown Rd
138	Vehicles must enter the weighbridge at Stirling North when the weightbridge is open and/or as directed by an Inspector or Police Officer.
2105	General Freight - Maximum speed limit 60kph applicable to 500m either side of Verran township
5308	No left turn from London Street into Stevenson Street. No right turn from Stevenson Street into London Street
74	BP Roadhouse Left turn into Ritma Rd and then into the roadhouse. Left turn exit onto Ritma Rd and then left turn into National Highway 1. Vehicles are permitted to drop both trailers at a roadhouse if the facilities on the opposite side of the road are to be used, i.e., travel bobtail.
3385	Maximum speed 80kph on sealed section of road, 70kph on unsealed section of road outside town limits
92	Primes Rd to Waste Management Facility Only
135	Access to Wheare Depot Only
134	Pine Haven Road Train Depot
141	Whyalla One Steel Access
87	BP Bungama Service Station. Southbound access only, left turn in and out.
75	Mobil Pt Augusta Truck Stop, west bound, left turn into eastern entrance. East bound, National Highway 1 right turn into Power Station Rd left turn into Mobil Pt Augusta Truck Stop. Exit from Mobil Pt Augusta Truck Stop is right turn into Power Station Rd then left or right into National Highway 1.
89	Redhill Food and Gas Stop. Southbound access only, left turn in and out.
91	Lochiel Marshelling Yard, entry in only, from the right turn lane on National Hwy 1 to the northern access and from the left turn lane on National Hwy 1 into the southern access. Exit only, left turn via the northern access using the acceleration lane. Right turn from either access is not permitted.
86	Georges Corner Mobil Service Station. Southbound access only, left turn in and out
6905	No left turn into Caroona Rd Allowed
88	Mobil Country Gardens Service Station. Southbound access only, left turn in and out
90	Mobil Snowtown Service Station. Nothbound access only, left turn in and out

RAVNet Map for 53.5m Road Train (HML)

Legend

- 53.5m Road Train (HML)
- Restriction
- Star Restriction
- LGA with Restrictions
- DPTI Safe T Cam Site

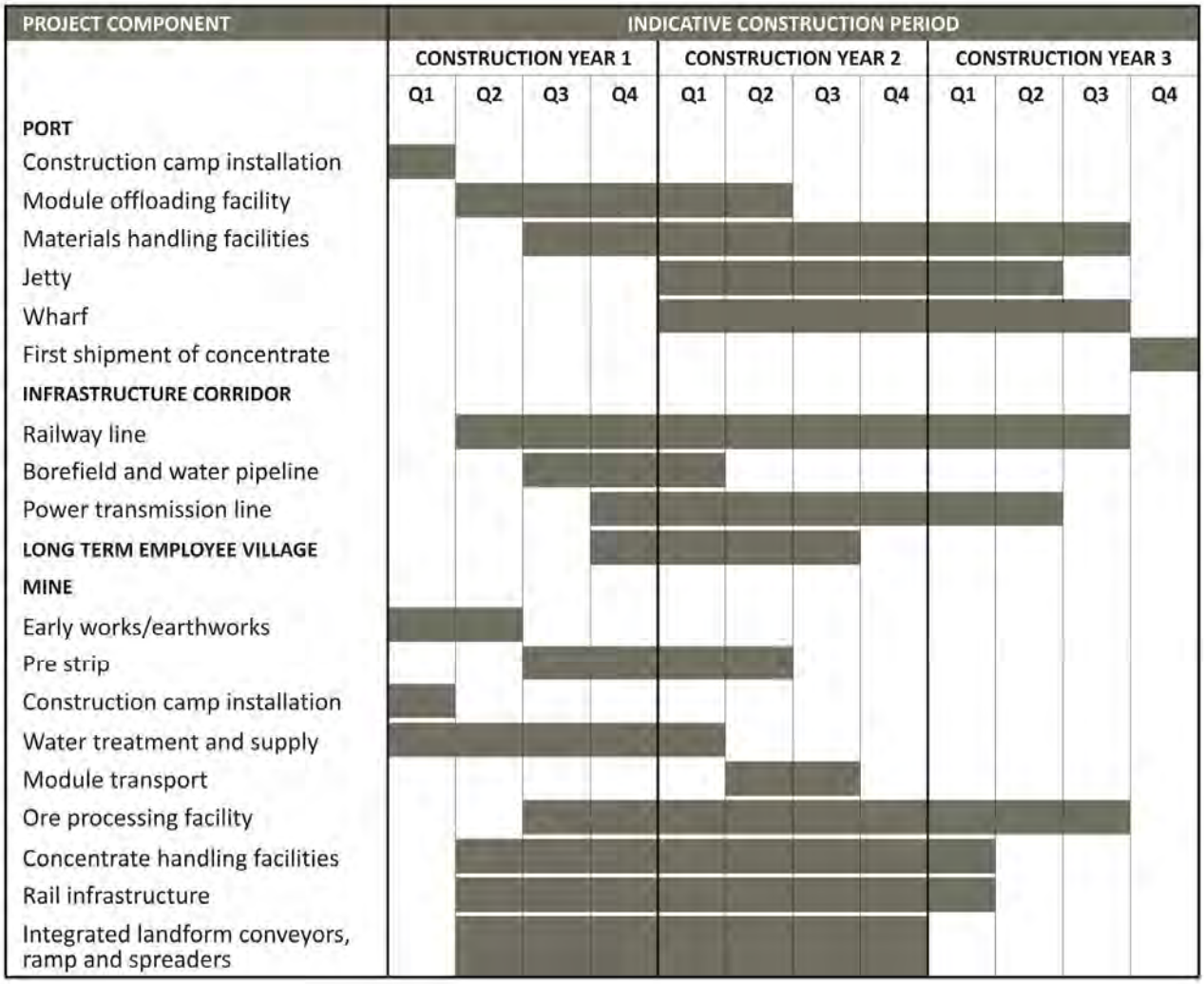
N

25km

Scale- 1:2,311,162 (at A4 print size)

Government of South Australia
Department of Planning, Transport and Infrastructure

Appendix C. Indicative Construction Schedule



Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is a transport impact assessment in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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