

Chapter 25
Traffic and transport

ESMERALDA GRAPHITE PROJECT

aarc ENVIRONMENTAL SOLUTIONS
APEM Group

GRAPHINEX

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Glossary, acronyms and abbreviations

Acronym or Abbreviation	Meaning
CBD	Central Business District
DIDO	Drive-In Drive-Out
DTMR	Department of Transport and Main Roads
EIS	Environmental Impact Statement
FIFO	Fly-In Fly-Out
GTIA	Guide to Traffic Impact Assessment
GTRD	Guide to Road Design
MLA	Mining Lease Application
NWMP	North-West Minerals Province
OSOM	Oversize and/or overmass
QR	Queensland Rail
ROM	Run-of-Mine
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SISD	Safe Intersection Sight Distance
TMR	Transport and Main Roads
TOR	Terms of Reference

25 Traffic and transport

25.1 Environmental objectives

This chapter has been prepared for the Esmeralda Graphite Project (the Project) to address the requirements of the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

To identify and assess the existing traffic and transport environment, potential impacts of the Project with respect to traffic and transport and determining avoidance and mitigation measures to minimise adverse impacts, a Transport Impact Assessment has been undertaken by Burchills Engineering Solutions (2026, Appendix N). This chapter summarises the findings of this assessment.

As per the Terms of Reference for the Project, the construction and operation of the Project should aim to:

- maintain the safety and efficiency of all affected transport modes for the Project workforce and other transport system users;
- avoid and mitigate impacts on the condition of transport infrastructure; and
- ensure any required works are compatible with existing infrastructure and future transport corridors.

25.2 Total transport task

The total transport task for the Project includes the:

- transport of materials and equipment by road between estimated origin in Queensland (e.g. Townsville, Mount Isa, or Brisbane) and the Project site;
- transport of personnel by road between local towns and the Project site;
- transport of personnel by road between the mine accommodation camp on site and a hometown or airport;
- transport of personnel by air through private charter to site; and
- transport of graphite concentrate from the Mineral Processing Plant on MLA100431 by road haulage to the Port of Townsville for export to overseas customers.

25.2.1 Workforce

Approximately 100 personnel will be required during construction, increasing to approximately 192 for mining and processing at peak operations, and 50 for decommissioning and rehabilitation. The anticipated traffic generated by the Project (i.e. the inputs and outputs of the Project) during construction and operation are detailed in Section 25.3. Workers will be accommodated on site at the workers accommodation village. Under normal conditions and at peak operation, the workers accommodation village will be occupied by approximately 192 people.

Additional information on the Project workforce, accommodation, and construction are presented in Chapter 4 (Project Description).

25.2.2 Inputs and outputs

Up to 3.5 Mtpa ROM ore is to be extracted by the Project during peak operations. Overburden containing ore will be transported from the mining area to an onsite mineral processing plant. The plant will produce up to 100 ktpa of graphite concentrate during the first three years, before increasing to 200 ktpa of graphite concentrate at peak operation. The concentrate will be transported off site to Townsville for export. The transport process from the mining area to the Port of Townsville including refinery is shown in Figure 25-1.

The transport and haulage route has been selected to ensure transport efficiency and to minimise impacts on existing users and the community.

The anticipated Project workforce transport required for the Project will be predominantly Fly-In Fly-Out (FIFO). Workers travelling to and from the mine site will consist of 95% travelling FIFO via the on-site gravel airstrip, whilst 5% travelling to and from the mine sit via private vehicles (Drive-In Drive-Out, DIDO). It is additionally likely that workers travelling DIDO will carpool where possible, reducing the quantity of single passenger vehicle trips. The majority of staff are expected to travel to/from the east (Townsville, Richmond, Hughenden) with a small proportion from the west (Mt Isa, Cloncurry). The total workforce will be expected to reside in the on-site accommodation village for the duration of their roster, reducing daily transport needs on external roads.

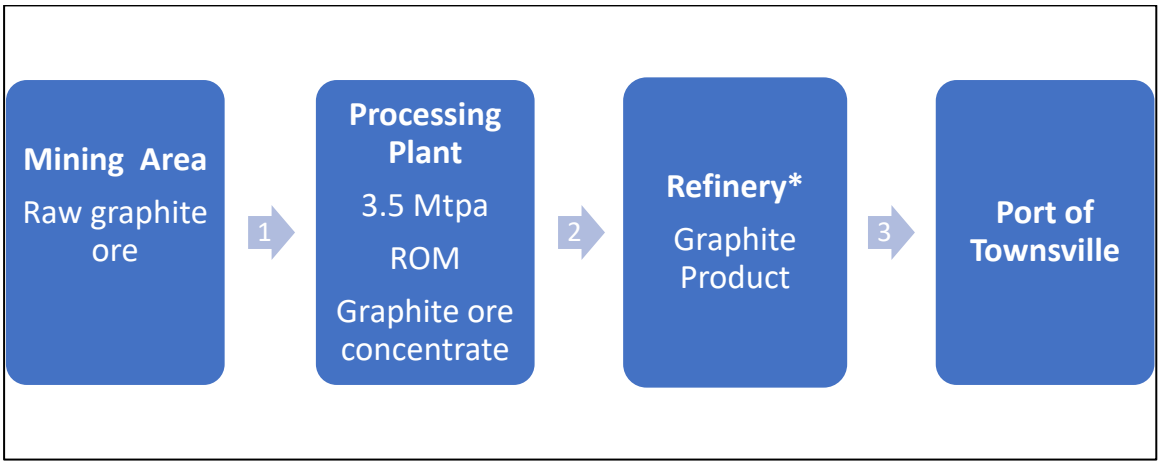


Figure 25-1: Transport from Project site to Port of Townsville

*Note: A demonstration plant exists, with insufficient capacity for the production from the Project. A significant upgrade or new facility would be required. Until this time, export of the product concentrate is proposed.

25.3 Road transport

25.3.1 Existing infrastructure and values

A Transport Impact Assessment for the Project has been undertaken by Burchills Engineering Solutions (2026) and is provided in Appendix N. The assessment was prepared in accordance with the 'Guide to Traffic Impact Assessment' (DTMR, 2018).

The following subsections provide:

- a description of the existing road transport infrastructure;
- an assessment of the road transport impacts of the Project on the local and regional road network; and
- the mitigation and management measures for road transport.

25.3.1.1 Road network

The scope of the assessment undertaken by Burchills Engineering Solutions (Appendix N) was focused on the roads used by the traffic that would be generated by the proposed Project. Burchills conducted an inspection of the key road network from the 22nd to the 24th of September 2025. The tasks conducted as part of the inspection included:

- visual review of the general road condition, including pavement type and noted pavement deficiencies;
- visual review of road formation, including carriageway configuration;
- visual review of road alignment, including bends and crests which could post safety risks; and
- visual review of existing roadside infrastructure, including warning signage.

Furthermore, it is noted that to supplement the site visit information, Burchills commissioned traffic counts on the key surrounding roads. Traffic counts are discussed further in Section 25.3.1.3.

Seven key roads were assessed and are described in detail in Appendix N, Transport Impact Assessment, and are depicted in Figure 25-3. Existing conditions are summarised in Table 25-1.

Flinders Highway is in Northern Queensland extending from Townsville in the East to Cloncurry in the West and including the town of Richmond (Figure 25-2). The road is generally a two-lane two-way sealed formation, with typically flat topography and gradual bends. The regulatory speed limit of 110 km/h along the majority of the road with reductions to 80 km/h and 60 km/h speed limits through towns.

Flinders Highway connects to via Richmond Road and Richmond-Woolgar Road, connecting to Esmeralda Prospect Road via an unnamed road section, then via a private mine road.

Flinders Highway extends from Townsville to Cloncurry, passing through multiple towns located within northern Queensland, including the town of Richmond. The road is generally a two-lane two-way sealed formation, with typically flat topography, and gradual bends. The speed limit is 110 km/h along the majority of the road, with reductions in speed limits to 80 km/h and 60 km/h through the towns.

Larsen Street, Richmond provides a connection between the Finders Highway A6, Goldring Street and Hillier Street in Richmond. The road is a two-lane, two-way sealed formation, with flat topography. The speed limit is 60km/h along the entirety of the road length.

Crawford Street provides a connection between the Finders Highway A6 and Richmond-Croydon Road in Richmond. The road is a two-lane, two-way sealed formation, with flat topography. The speed limit is 50 km/h along majority of the road, with reductions in speed limits to 40 km/h through the school zones. Crawford Street is classified as a B-Double route, for vehicles up to 25 m/26 m in length

Goldring Street provides a connection between the Flinders Highway A6, Larsen Street and Richmond-Croydon Road in Richmond. The road is a two-lane, two-way sealed formation, with typically flat topography. The speed limit is 60 km/h along the entirety of the road length.

Richmond Road provides a connection between Goldring Street, Richmond-Woolgar Road and Esmeralda Prospect Road. The road is typically configured with a two-lane, two-way with a combination of seal and gravel formation, with typically flat topography. The speed limit varies between 80 km/h and 100 km/h along the road extent. The carriageway width varies between narrow 4 m and 7 m for sealed sections and 8 m to 10 m for gravel road sections. It is noted that this road is identified as Richmond Road when within the Croydon Shire Council boundary and is also unnamed directly south of the Esmeralda Prospect Road / Richmond Road intersection.

The sealed width is typically 22.5 m, separated by a 7 m wide median to accommodate on-street parking for general vehicles and trucks / caravans. In the road segments where on-street parking is accommodated along one verge of the road the total sealed width is typically 27 m. Furthermore, in the road segments where on-street parking is accommodated along both verges of the road, the total sealed width is typically 32 m

Esmeralda Prospect Road provides a connection between Richmond-Croydon Road and the proposed Mine Access. The road is a two-lane, two-way gravel formation, with typically flat topography. The speed limit is a typical rural road default 100 km/h limit (unsigned) along the road extent. The gravel road width varies between 6 m to 8 m, with wide gravel shoulders provided along the entirety of the road length.

The proposed Mine Access provides a connection between Esmeralda Prospect Road and the mine site. The road is a two-lane, two-way gravel formation, with typically flat topography. The speed limit is a typical rural road default 100 km/h limit (unsigned) along the road extent. The gravel road width is approximately 3 m to 8 m, with wide gravel shoulders provided along the entirety of the road length.

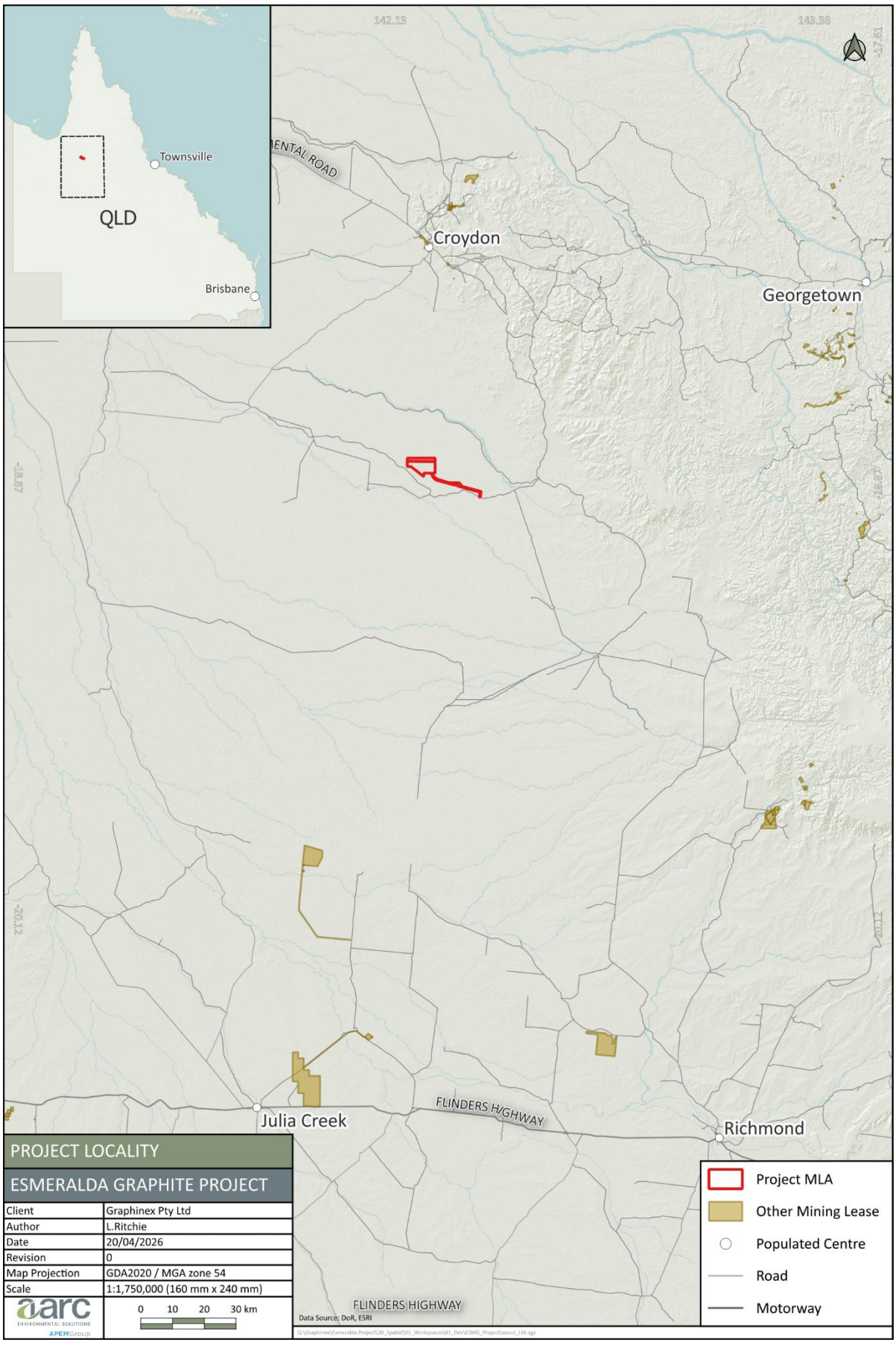


Figure 25-2: Site location

Table 25-1: Existing road conditions

Road	Road Condition	Formation	Speed Limit	Average Annual Daily Traffic[1]	% Heavy Vehicle
Flinders Highway – Townsville	Sealed	2-lane 2-way	80 km/h – 100 km/h	7226	30
Flinders Highway – Charters Towers (3)	Sealed	2-lane 2-way	80 km/h – 100 km/h	2584	22
Flinders Highway – Charters Towers (2)	Sealed	2-lane 2-way	80 km/h – 100 km/h	2982	20
Flinders Highway – Charters Towers (1)	Sealed	2-lane 2-way	80 km/h – 100 km/h	3300	23
Flidners Highway – East of Charters Towers	Sealed	2-lane 2-way	80 km/h – 100 km/h	1204	30
Flinders Highway – Far West of Charters Towers	Sealed	2-lane 2-way	80 km/h – 100 km/h	775	33
Flinders Highway – Fart East of Hughenden	Sealed	2-lane 2-way	80 km/h – 100 km/h	583	39
Flinders Highway - Hughenden	Sealed	2-lane 2-way	80 km/h – 100 km/h	714	41
Flinders Highway A6	Sealed	2-lane 2-way	60 km/h – 110 km/h	423	43
Larsen Street	Sealed	2-lane 2-way	60 km/h	423	43
Goldring Street	Sealed	2-lane 2-way	60 km/h	870	9
Crawford Street	Sealed	2-lane 2-way	50 km/h	870	35
Richmond-Woolgar Road	Sealed	2-lane 2-way	80 km/h – 100 km/h	155	22
Richmond–Croydon Road	Sealed	2-lane 2-way	80 km/h – 100 km/h	155	22
Esmeralda Prospect Road	Gravel	1-lane 2-way	100 km/h	< 50	52
Proposed Mine Access	Gravel	1-lane 2-way	100 km/h	< 50	50

[1]It is noted that AADT for Crawford Street, Esmeralda Prospect Road, and the Proposed Mine Access are estimates only. This has been based on the traffic survey data obtained (AADT = Sum of AM and PM Peak Movements (in both directions) x 10). All other roads are based on TMR census data.

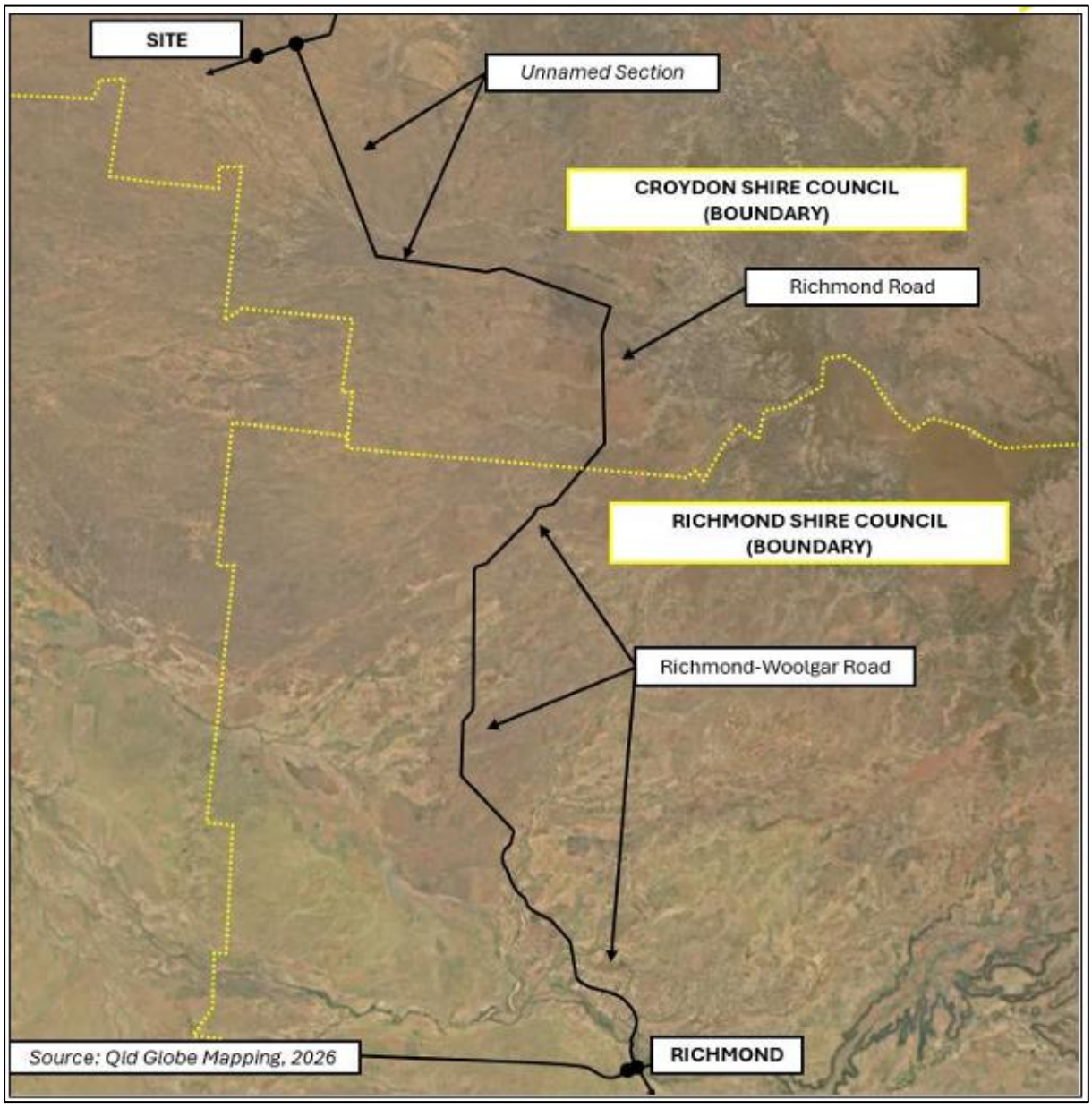


Figure 25-3: Road links assessed in traffic assessment

25.3.1.2 Product transport

The Project proposes mining of the Esmeralda Granite Unit and on-site concentration of graphite ore. Key activities relevant to road transport associated with the Project include;

- construction, operation and rehabilitation of an open cut graphite mine within Mining Lease Application (MLA) 100431 and MLA 100430;
- mineral processing of ore to produce a graphite concentrate, within MLA 100431;
- haul road construction and transport of concentrate to the Esmeralda Prosect Road, within MLA 100431; and
- transport of concentrated ore to refinery located approximately 70 km from Croydon.

The Project proposes a staged process of mining, concentrating and refining graphite ore to produce concentrated graphite product. The stages will include transportation of graphite ore from mining areas to the

onsite processing plant, then transport of graphite concentrate from the processing plant via B-double trucks on a dedicated haul road within MLA 100431. The haul road will connect to the Esmeralda Prospect Road, south-east of the mine. B-double trucks will transport graphite concentrate from the Project to a separate facility near Townsville for further refinement or export to overseas markets.

Concentrated graphite product will be generated across the 53-year operational life, at up to 100 ktpa for the first three years, before increasing to 200 ktpa for the remainder.

25.3.1.3 Existing road traffic volumes

Burchills contracted Austraffic to undertake traffic surveys during the typical AM and PM peak hour periods on 28 October 2025 at Flinders Highway A6/Larsen Street/Goldring Street intersection and Richmond-Croydon Road/Richmond Woolgar Road Intersection (Figure 25-4).

The traffic count information is presented in Appendix N, Transport Impact Assessment, and the survey results indicate the existing traffic volumes are low.

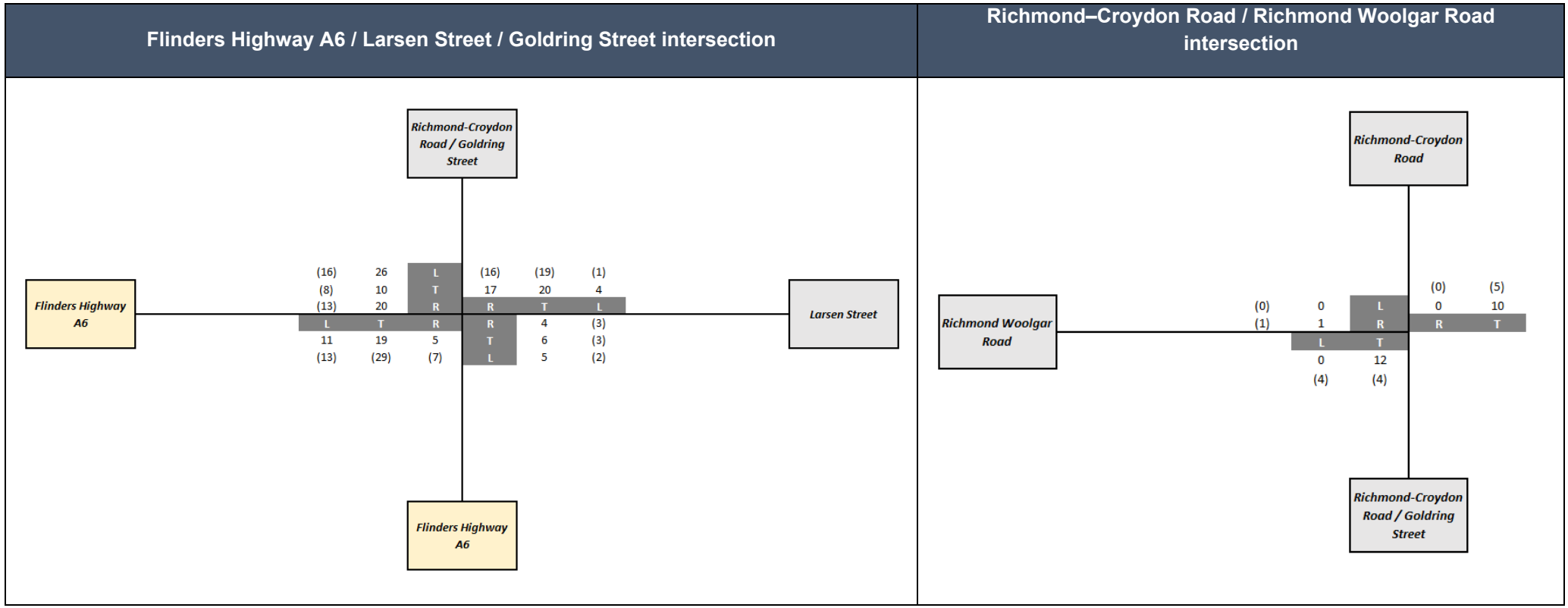


Figure 25-4: Surveyed traffic volumes (AM and PM)

25.3.1.4 Road capacity

The road link capacity of the roads impacted by the proposed Esmeralda Graphite Project haulage traffic has been assessed according to the DTMR GTIA. Level of service is a qualitative measure that describes operational conditions encountered by traffic which considers:

- speed;
- travel time;
- interruptions;
- interference;
- freedom to overtake;
- ability to manoeuvre;
- safety;
- comfort;
- convenience; and
- vehicle operating costs.

The traffic assessment considered these parameters and reviewed the TMR annual segment reports for the surrounding road network located in close proximity of the development site to inform the background traffic conditions. A linear growth rate of 1.0% was adopted for the assessment.

25.3.1.5 Road safety and conditions

Crash history for intersections and links associated with the Project were reviewed to determine baseline conditions. No crashes were recorded within the last 5-year period for the following intersections or road segments;

- Flinders Highway A6 / Larsen Street / Goldring Street intersection
- Flinders Highway A6 / Crawford Street intersection
- RichmondRoad / Esmeralda Prospect Road intersection
- Esmeralda Prospect Road / Proposed Mine Access intersection.
- Flinders Highway A6
- Larsen Street
- Esmeralda Prospect Road
- Proposed Mine Access

Two single vehicle incidents were recorded for Goldring street. One resulted in medical treatment while the other resulted in hospitalisation.

Two incidents were also recorded on Richmond Road; one multi-vehicle crash resulting in hospitalisation, and one single vehicle crash resulting in hospitalisation.

25.3.2 Potential impacts

Potential impact of the Project on the seven key road sections, traffic generation, road capacity, safety and road conditions are assessed in Appendix N, Transport Impact Assessment and summarised below.

25.3.2.1 Traffic Generation

It is estimated that up to approximately up to 100 personnel will be required during peak construction, 192 during operation and 50 for rehabilitation and closure. There is not expected to be an overlap between construction and operations. Workers will be divided into 2 rosters that will be rotated every 5 days. Workforce numbers are summarised in Table 25-2.

Table 25-2: Daily workforce peak numbers

Project Phase	Year	Total Number of Staff	Number of Rosters	Number of Staff per Workforce		Total Number of Staff per Roster
				Surface Infrastructure	Mine construction / operations/ Decommissioning	
Construction	2027 – 2028	200	2	-	100	100
Operation	From 2028	384	2	62	130	192
Decommissioning	From 2076	100	2	-	50	50

It is anticipated that 95% of the workforce will be Fly-In, Fly-Out via the onsite gravel airport and staying at the workers accommodation while on site. Approximately 5% are expected to be Drive-In, Drive-Out predominantly from the eastern centres of Townsville, Richmond and Hughenden with a small proportion from Mt Isa and Cloncurry area.

The workforce transportation modes and rosters describe above have been used to develop the peak daily workforce distribution and consequent traffic generation for the assessment.

Table 25-3: Workforce Transportation Distributions per shift

Workforce Transportation Mode	Construction Stage Year 2027	Operation Stage Year 2028	Decommissioning Stage Year 2076
	Daily workforce	Daily workforce	Daily workforce
Fly-In Fly-Out (via on-site airport) and bussed to site	95	182	48
Drive-In Drive-Out via private vehicles	5	10	2
Total	100	192	50

The FIFO workforce for all phases of the Project will be via the onsite gravel airport. Therefore, all FIFO and shuttle bus trips will not be generated along the external road network. DIDO transport has been conservatively assessed as only 1 person will occupy each light vehicle (i.e. no carpooling). On this basis, the number of vehicle trips likely to be generated by the Project along external road network is depicted in Table 25-4.

Table 25-4: Workforce Project trips

Workforce Trips	Construction Stage Year 2027	Operation Stage Year 2028	Decommissioning Stage Year 2076
	Shift-change day Trips	Shift change day Trips	Shift change day Trips
FIFO and Shuttle Bus	0	0	0
Private vehicles	10	20	4

Workforce rosters will operate over a 12-hour shift per roster, for 5 days on and 2 days off roster (5:2 roster). For the purposes of this assessment a conservative shift change in both the AM and PM peak hours has been used. Staff travelling via FIFO and shuttle bus will not generate any vehicle trips on the external road network, as the staff will land within the mine site.

The inbound and outbound vehicle trips for the construction, operation and decommissioning phases, and trips associated with the shift change days, are outlined in Table 25-5.

Table 25-5: Project Inbound and outbound trips – vehicles per hour (vph)

Workforce Trips	Construction Stage (Year 2027)		Operation Stage (Year 2028)		Decommissioning Stage (Year 2076)	
	AM In / Out (vph)	PM In / Out (vph)	AM In / Out (vph)	PM In / Out (vph)	AM In / Out (vph)	PM In / Out (vph)
FIFO and Shuttle Bus	0	0	0	0	0	0
Private vehicles	10	10	20	20	4	4
Heavy Vehicles	5	5	3	3	3	3
Total	15	15	23	23	7	7

In addition to workforce trip generation, the Project is also anticipated to generate heavy vehicle movements for each phase. Heavy vehicle movements for each phase are summarised in Table 25-6 .

Table 25-6: Heavy vehicle movements for the Project

Vehicle type	**Quantity per Day**
Heavy vehicles during construction	
Concrete Mixer	8
Class 3 truck	12
Low Loader	2
Class 9 AV	4
Class 10 B-Double	26
Total Construction	**52**
Heavy vehicles during operation Stage 1 (inbound and outbound)	

Vehicle type	Quantity per Day
Concrete Mixer	0
Class 3 truck	0
Low Loader	0
Class 9 AV	0
Class 10 B-Double (Graphite haulage)	11
Class 10 B-Double (Diesel, flocculent, MIBC, grinding media)	4
Total Stage 1	**15**
Heavy Vehicles During Operation Stage 2 (inbound and outbound)	
Concrete Mixer	0
Class 3 truck	0
Low Loader	0
Class 9 AV	0
Class 10 B-Double (graphite haulage)	22
Class 10 B-Double (Diesel, flocculant, MIBC, grinding media)	4
Total Stage 2	**26**
Heavy Vehicles During Decommissioning	
Concrete Mixer	4
Class 3 truck	6
Low Loader	1
Class 9 AV	2
Class 10 B-Double	13
Total	**26**

25.3.2.2 Road capacity

A fit for use assessment was undertaken for Richmond Road (including Richmond-Woolgar Road) and Esmeralda Prospect Road (Appendix N). The assessment was based on three key criteria below. A road is identified as unfit if any of the three criteria are not adequately met.

- suitable road condition – the existing road is in a generally good condition for vehicular travel, based on site observations;
- sufficient road capacity – the existing road form is sufficient to accommodate baseline plus development traffic volumes according to the Austroads road link capacities; and
- adequate road safety – the road configuration provides for adequately safe travel for users, based on site observations.

Based on the findings of the fit for use assessment, Richmond Road is considered to be unfit for use in its current configuration. A summary of the assessment and proposed mitigation are provided in Table 25-7.

Table 25-7: Fit for use assessment Richmond Road

Road	Suitable Road Condition	Sufficient Road Capacity	Adequate Road Safety	Potential Mitigation
Richmond Road Richmond-Woolgar Road	No	Yes	No	• The subject section of road is to be widened to a 9.2m formation with 6.2m wide carriageway in accordance with Austroads GTRD Part 3. • Regular road maintenance should be provided. • Upgrade narrow road sections to double width (refer to additional detail below). • Mitigation measures such as traffic signage including guideposts and advance warning signages should be installed to warn drivers of road conditions and hazards.
Esmeralda Prospect Road	No	Yes	No	• The subject section of road is to be widened to between 8.7m and 9.2m formation in accordance with Austroads GTRD Part 3. • Regular road maintenance should be provided. • Upgrade narrow road sections at the intersection with Richmond Croydon Road to double width • Mitigation measures such as traffic signage including guideposts and advance warning signages should be installed to warn drivers of road conditions and hazards.

25.3.2.3 Road intersection performance

Traffic generation associated with the Project has the potential to increase delays at intersections along key roads used by-product haulage trucks, delivery trucks, workforce and visitors.

The Transport Impact Assessment (Appendix N) includes an assessment of the potential impact of the Project on the performance of key intersections. The intersection assessment was conducted in accordance with the 'Guide to Traffic Impact Assessment' (DTMR 2018) and includes assessment of intersections that have the potential to be impacted by the traffic generated by the Project and the existing road network.

A road safety assessment was conducted to in accordance with TMR's GTIA which states;

> *Development should ensure that a road's safety is not significantly worsened as a result of development and that any pre-existing or development-introduced unacceptable safety risk is addressed. 'Significantly worsened' is defined in terms of the change in the safety risk rating (for example, from low to medium or from medium to high).*

The intersection capacity has been assessed at each intersection and turn warrant assessments have been undertaken to ensure adequate protection is proposed for turning vehicles for the additional traffic generated by the Project. The assessment considered road safety at;

- All intersections where the development traffic exceeds 5% of the base traffic for any movement in the design peak periods in the year of opening of each stage; and
- All road links where the development traffic exceeds 5% of the base traffic in either direction on the link in the design peak periods in the year of opening of each stage

The assessment considered that the proposed transport routes already accommodate heavy vehicles include haulage vehicles. Potential impacts to safety are described in the following section.

The assessment identified the following current road risks;

- Increase to turning movements at the existing Flinders Highway / Crawford Street intersection;
- Increase to turning and through movements at the existing Flinders Highway / Goldring Street intersection;
- Increases in traffic volumes on Flinders Highway, Richmond Road and Esmeralda Prospect Road;
- An increase in OSOM vehicles on road links and at intersections;
- All intersections currently accommodate heavy vehicles including haulage traffic; and
- Risk of incidents due to driver fatigue.

25.3.2.4 Access and Egress to mine site

Vehicle ingress and egress to the mine site as assessed according to Austroads Guide to Road Design Part 4A. The Austroads Guide to Road Design Part 4A includes the following assessment guidelines:

- Safe Intersection Sight Distance (SISD) assessment;
- Acceleration assessment; and
- Turn Warrant Assessment.

The Transport Impact Assessment (Appendix N) concluded that intersections within the study area will all operate well within industry standard performance thresholds to the end of the Project life. From a safety perspective, the provision of turn treatments was deemed adequate to cater for both baseline and traffic generated by the Project to the end of life.

It is noted that that Austroads Guide to Road Design Part 3 Geometric Design has been considered for the purpose of the assessment given Richmond Road and Esmeralda Prospect Road are under the jurisdiction of Croydon Shire Council. The supplement published by DTMR is typically applicable to state-controlled roads, however subject to the discretion of Council.

25.3.2.5 Road safety and efficiency

No obvious trends were identified in the crash data that was reviewed as part of the Traffic Assessment, which could potentially be exacerbated by the increase in traffic generated by the Project (Appendix N, Transport Impact Assessment). Notwithstanding, mitigation measures will be provided for the Project through road use management and driver management procedures. The Project is not anticipated to have a significant impact on the safety and efficiency of the road network.

25.3.2.6 Road condition

Traffic generation associated with the Project has the potential to impact the road pavement used by-product haulage trucks, workforce and deliveries.

The Proponent has an established relationship with the various authorities responsible for the road network including the Croydon Shire Council, Richmond Shire Council, and DTMR. Engagement with the Council occurs typically on an as needed basis to address specific matters.

Potential impacts on the road network are proposed to be mitigated during the life of the Project and will be negotiated with the relevant road authorities.

25.3.3 Mitigation and management measures

To mitigate and manage potential impacts on traffic and transport, the Proponent will engage with relevant authorities to maintain the road network under appropriate agreements. This may include roadworks required

prior to Project commencement. This is expected to be undertaken through an infrastructure agreement with the relevant local or state governing bodies that would be entered into to address the ongoing use of road infrastructure and any upgrades required for the Project

In addition, targeted mitigation measures for impacts of traffic generated by the Project include:

- monitoring and enforcement of appropriate:
  - workforce hours;
  - driver behaviours;
- implementing standard operating procedures;
- limit transit during and immediately following wet weather;
- assess the condition of the route prior to commencement of permit vehicles;
- use of vehicles on public roads to consider vehicle noise and movement at night;
- wide loads to have pilot and escort vehicles;
- traffic control at property entrances when load is in transit along the route; and
- selective tree and vegetation management to provide load clearance.

25.4 Rail transport

No direct rail transport runs directly to the Graphinex Project site. The Project is located about 70km south of Croydon, an area where Queensland Rail (QR) owns and manages the nearest major rail infrastructure.

25.4.1 Existing infrastructure and values

The closest rail line is the Gulflander, which runs between Croydon and Normanton, and is part of the Queensland Rail (QR) Network.

The nearest rail facility with direct utility to the Project is Richmond Railway Stations located south of Goldring Street on the Mount Isa line which is located between latitude 19°21’ S and 21° 53’ S and longitude 139°29’ E and 146°50’ E. This line is referred to as the Inlander and runs between the urban centres of Mount Isa in the west and Townsville in the East (refer Figure 25-5).

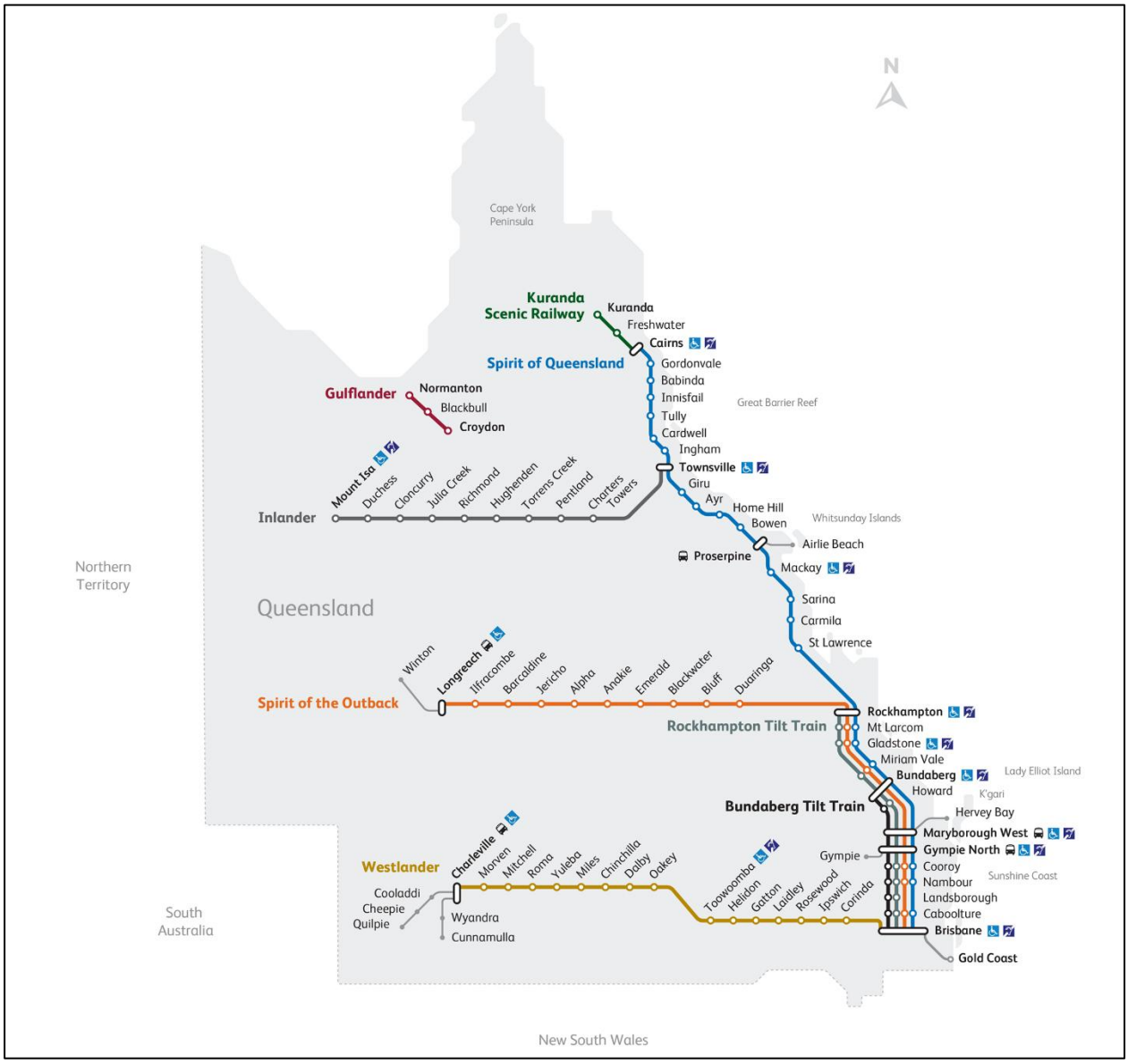


Figure 25-5: Queensland Rail Network Map - Mount Isa to Townsville Inlander rail line

The network is owned and operated by QR and services several communities along the line for both freight and passenger services. The conveyance of general freight and passenger services provide a critical link for several remote communities including Cloncurry, Julia Creek, Richmond, Hughenden and Charters Towers, to the larger urban centre of Townsville connecting into the National passenger rail network.

The Mt Isa Line also connects the North-West Minerals Province (NWMP) to the Port of Townsville for bulk exports. The NWMP is one of the world richest mineral producing regions, located in north-west Qld and centred around Mt Isa and Cloncurry. The region is a major contributor to the Qld economy noted for its vast deposits of copper, zinc, lead, silver and emerging 'new economy' minerals as described by Qld Department of State development (https://www.statedevelopment.qld.gov.au/regions/regional-priorities/a-strong-and-prosperous-north-west-queensland)

Several rail crossing points intersected by the Flinders Highway and route, including rail overpasses, underpasses and level crossings, have been identified and are shown in Figure 25-6.



Figure 25-6: Existing Flinders Highway / Railway intersections points (purple)

25.4.2 Potential impacts

The transport route from Richmond to Townsville will include five rail level crossing points intersecting the Flinders Highway between Richmond and Townsville shown in Figure 25-7. Potential impacts at these intersections are summarised in Table 25-8.

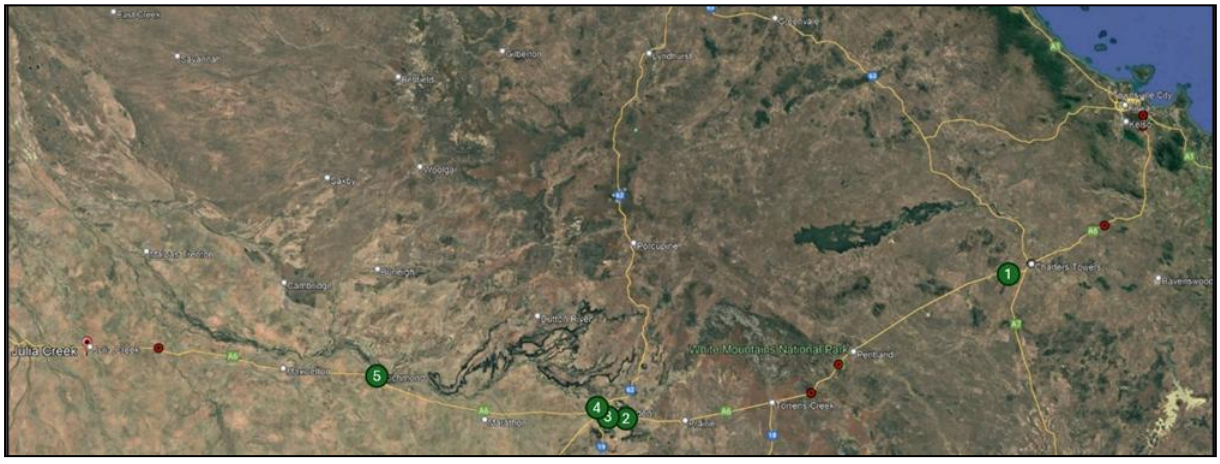


Figure 25-7: Existing flinders Highway Railway level crossing points

Table 25-8: Rail level crossings on intersections with Flinders Highway (Richmond to Townsville)

ID	Location	Crossing Type	Safety Features	Short Stacking Impacts
1	12km west of Charters Towns on Flinders Highway	At-grade level crossing	Active Control - safety features including flashing lights and static signage	Not applicable as level crossing is on Flinders Highway.
2	16km east of Hughenden on Flinders Highway	At-grade level crossing	Active Control - safety features including flashing lights and static signage	Not applicable as level crossing is on Flinders Highway.

ID	Location	Crossing Type	Safety Features	Short Stacking Impacts
3	2km east of Hughenden on Flinders Highway	At-grade level crossing	Active Control - safety features including flashing lights and static signage	Not applicable as level crossing is on Flinders Highway.
4	Hughenden CBD on Flinders Highway	At-grade level crossing	Active Control - safety features including flashing lights and static signage	Not applicable as level crossing is on Flinders Highway.
5	Richmond CBD	At-grade level crossing	Active Control - safety features including flashing lights and static signage	Not applicable as level crossing is on Flinders Highway.

25.4.3 Mitigation and management measures

No specific rail transport mitigation measures are proposed to be implemented for the Project.

25.5 Air transport

25.5.1 Existing infrastructure and values

The nearest airports to the Project site are the Richmond Airport and the Georgetown Airport, which are located to the south-east and north-east of the site respectively.

Cloncurry Airport is located approximately 140 km west of the Julia Creek township. Qantas Airlines operation passenger service to/from Cloncurry to/from Townsville, Brisbane and Mount Isa. Alliance Airlines operates a FIFO charter service for local mines and also a regular passenger transport service is to/from Cloncurry, Townsville and Brisbane.

Mount Isa Airport is approximately 272 km west of Julia Creek and is served by airlines such as Virgin Australia and Qantas. These airlines offer flights from Mount Isa to major cities including Cairns, Townsville, Brisbane, Sydney, Melbourne, and Perth.

25.5.2 Potential impacts

The Project will construct a gravel airstrip on-site during the construction stage of the Project. It is proposed that 95% of the workforce during both the construction, operation and decommissioning phases of the Project will be Fly In / Fly Out (FIFO) workers via the on-site airport.

As such, it is not anticipated that surrounding airports (i.e. Mt Isa, Cloncurry, Richmond or Georgetown) will be impacted or that any facilities would require expansion or alteration to support the Project.

It is anticipated that the origin airports include Mount Isa, Townsville and Brisbane, however this will be confirmed via the operater as part of future planning stages. Brisbane Airport is the nearest major city airport and is operated by Brisbane Airport Corporation. Commercial flights to Townsville would be utilised for the small proportion of employees and contractors that will travel to site from Brisbane.

25.5.3 Mitigation and management measures

No specific airport facilities mitigation measures are proposed for regional airports. The Project proposes a private gravel airstrip within the mining lease which will directly mitigate any impacts of regional airport facilities.

25.6 Sea transport and Port Facilities

25.6.1 Existing infrastructure and values

The Port of Townsville is a government-owned Corporation and seaport in Townville operating since 1864. The Port is one of Qld four major Government owned Corporations under the Transport and Infrastructure Act 1994 and the Government Owned Corporations Act 1993. It is the third-largest seaport in Queensland and services a large area that includes the mining community at Mount Isa and the Greenvale nickel refinery.

The port has eight (8) working berths accommodating international shipping, mining and warehouse facilities that service the NWMP, one of the richest mining areas in the world. It also services the Greenvale Nickel refinery, historically a major importer / exporter via Townsville and the broader North and North-West Queensland industries including agriculture mineral and manufacturing.

Imports received at the Townsville Port include refined fuel, nickel ore, motor vehicles and general cargo.

25.6.2 Potential impacts

It is anticipated that capacity at the Port of Townsville would be utilised for the transfer of equipment from overseas during the construction phase. No amendments to existing port facilities are anticipated for the Project.

It is to be noted that mine products will be hauled via road to the Port of Townsville and exported overseas.

25.6.3 Mitigation and management measures

No specific sea transport mitigation measures are proposed to be implemented for the Project.

25.7 Other known projects

25.7.1 Existing infrastructure and values

The Graphinex Project is located within the North-West Minerals Province is an extensive mineral rich region hosting major projects across minerals, renewables and enabling infrastructure. The Department of State development lists multiple projects in the NWMP projects pipeline. These are listed in Table 25-9.

Table 25-9: Project Pipeline – Northwest Minerals Province

Project name	Proponent	Project status	Indicative start	Sector	Local government area
Etta Plains Agricultural Development	Gulf Cotton	Construction underway	2021	Agriculture	McKinlay
CopperString 2032 Project	Powerlink	Construction underway	2023 -> 2031	Infrastructure	Mount Isa to Townsville

Project name	Proponent	Project status	Indicative start	Sector	Local government area
Mount James Wind Farm	Iberdrola Australia	Financial investment decision	2026	Infrastructure	Flinders
North Queensland Super Hub - Stage 1 (Prairie Wind Farm & Wongalee Project)	Windlab	Detailed design	2026	Infrastructure	Flinders
Sybella Creek Solar Farm	APA Group	Bankable or Full-feasibility	2025	Infrastructure	Mount Isa
Greater Duchess Copper Gold Project	Carnaby Resources	Pre-feasibility	2025	Resource	Cloncurry
Knapdale Range Wind Project - Dugald River Windfarm	MMG Limited	Pre-construction	2028	Infrastructure	Cloncurry
Eva Copper Project	Eva Copper Mine Pty Ltd	Financial investment decision Detailed design	2024	Resource	Cloncurry
Saint Elmo Vanadium and High Purity Alumina Mine and Refinery	Multicom Resources Pty Ltd	Construction underway	2023	Resource	McKinlay
Jericho Copper Mine development	AIC Mines	Construction underway	2024	Resource	Cloncurry
Paradise North, Paradise South & Barr Creek Phosphate Projects - Stage 1 Paradise South	Northwest Phosphate	Construction underway	2024	Resource	Mount Isa
PhosOne Project	Northwest Phosphate / Sibanye-Stillwater JV	Detailed design	2026	Resource	Burke Carpentaria
Croydon Gold Project	Jubilee Metals	Financial investment decision	2026	Resource	Croydon
Richmond-Julia Creek Vanadium Project	Richmond Vanadium Technology Pty Ltd	Bankable or Full-feasibility	2027	Resource	Richmond

Project name	Proponent	Project status	Indicative start	Sector	Local government area
Vecco Critical Minerals Project	Vecco Group	Bankable or Full-feasibility	2026	Resource	McKinlay
North Queensland Vanadium Project	Velox Energy Materials	Pre-feasibility	2027	Resource	McKinlay Richmond
Julia Creek Vanadium and Energy Project	QEM Limited	Bankable or full-feasibility	2028	Resource	McKinlay

25.7.2 Potential impacts

The Project is anticipated to generate the following potential traffic on the transport network that will be in addition to the above listed projects in the region;

- a total of fifty-two heavy vehicle movements per day will be generated by the mine during the construction phase;
- a total of thirty heavy vehicle movements per day will be generated by the mine during stage 1 of the operations phase;
- a total of eighty heavy vehicle movements per day will be generated by the mine during Stage 2 of the operations phase;
- a total of twenty-six heavy vehicle movements per day will be generated by the mine during the decommissioning phase;
- the construction and operation workforce operators and staff will be accommodated in the on-site worker's camp village;
- the workforce will operate over a 12-hour shift per roster, for five (5) days on and two (2) days off. Roster changeover will occur every 14 days; and
- the construction / decommissioning workforce is divided into two (2) crews which will be rotated every five (5) days.

This traffic movements using the traffic network and interacting in the community will be compatible with that of other projects in the region.

25.7.3 Mitigation and management measures

Graphinex has an existing operation in proximity with the proposed Project and engages with relevant authorities and communities to identify and address priorities as a result of this engagement. Project planning and development will include ongoing engagement to apply this process to the Project.

25.8 TOR Reconciliation table

Terms of reference - Content requirements of the EIS		EIS Section
Section 25 - Traffic and transport		
25.1	The following guidance is relevant for the assessment of traffic and transport: (a) Queensland Government, Transport – EIS information guideline, ESR/2020/5310 (b) Queensland Government, Guide to Traffic Impact Assessment, 2018 (c) Queensland Government, Assessable development under the Planning Act, available at www.tmr.qld.gov.au/Community-and-environment/Planning-and-development/Planning-and-development-assessment-under-the-Planning-Act/Assessable-development (d) Queensland Government, Technical publications (website), available at www.tmr.qld.gov.au/business-industry/Technical-standards-publications.	Section 25.1
Traffic and transport - Existing environment		
25.2	Describe the existing and future (as planned by state or local government) transport network and corridors including detailed maps to appropriate scales showing relevant:	
	(a) construction laydown areas and workers accommodation areas	Section 25.2.1
	(b) locations where Project components cross or are located in proximity to or located within existing and planned:	Section 25.2.2
	(i) State or local government road corridors and road infrastructure	Section 25.3.1
	(ii) railway corridors and rail infrastructure	Section 25.4.1
	(iii) airports and airstrips	Section 25.5.1
	(iv) sea ports	Section 25.6.1
	(v) other relevant approved or known projects.	Section 25.7.1
Traffic and transport - Impact assessment		
25.3	Describe the total transport activities associated with each Project phase. The information should include, but not be limited to:	Section 25.3
	(a) background traffic growth and existing traffic data that is expected via the state-controlled road network and via local government roads	Section 25.3.1
	(b) expected annual volumes, weights and origins/destinations of materials, products, hazardous goods, and wastes	Section 25.3.2
	(c) details concerning road transportation for each major transport task (e.g. fuel, plant and equipment, consumables, wastes) including heavy vehicle classification, load size (highlighting over-mass and over-sized loads) (swept paths to be provided), number of trips, service frequency, likely timing and duration, and maps of routes highlighting any vulnerable bridges or other structures along the proposed routes	Section 25.3.2
	(d) potential impacts to time sensitive agricultural freight (e.g. exports, horticulture, livestock)	Section 25.3.2
	(e) traffic generated by workforce personnel and service providers during each phase of the Project	Section 25.3.2

Terms of reference - Content requirements of the EIS		EIS Section
	(f) a multi-criteria analysis and/or a cost benefit analysis of the economic, social, and environmental impacts for logistics management alternatives being considered, including shared use of common user infrastructure	Chapter 21, Economics
	(g) detail appropriate choices for modes of transport to ensure efficiency and minimise impacts on the community.	Section 25.3.2.5
25.4	Identify and map the main access to the Project (include latitude and longitude coordinates). Include an assessment of the suitability for the proposed use and any required upgrades in accordance with relevant local and/or state policies, standards, and manuals.	Section 25.3.1
25.5	Prepare a transport impact assessment in accordance with Transport – EIS information guideline. Present the transport assessment in separate sections for each project-affected mode (road, rail, air services and port) as appropriate for each phase of the Project, including the proposed transportation and delivery of pre-assembled modules or components to site. The assessment must be completed by a Registered Professional Engineer of Queensland and include:	Section 25
	(a) how the existing and future safety, condition, and performance of transport infrastructure (local and state) will be impacted by each phase of the Project	Section 25.3.2, Section 25.4.2, Section 24.5.2, Section 25.6.2, Section 25.7.2
	(b) details of the adopted assessment methodology for impacts on roads within the road impact assessment report in accordance with Guide to Traffic Impact Assessment (GTIA) for state-controlled roads and the local government impact assessment methodologies for local government roads	Section 25.3.1
	(c) for state-controlled roads, all impact types, such as road safety, access and frontage, intersection delay, road link capacity, pavement, and transport infrastructure (including bridges, culverts, and grids), as detailed in the GTIA are considered and mitigated. Particular emphasis is to also be placed on the following sections of the GTIA:	Section 25.3.1
	(i) section 8.4.2 Heavy Vehicle Routes	Section 25.3.1
	(ii) section 9 Road Safety	Section 25.3.1
	(iii) section 13 Pavement	Section 25.3.1
25.6	Provide a detailed assessment for the Project's impacts on local government roads in accordance with the relevant local government's impact assessment methodology.	Section 25.3.1
Traffic and transport - Mitigation measures		
25.7	Demonstrate that any necessary transport impact mitigation works will not compromise existing and future transport infrastructure corridors planning and works, with reference to the latest version of the Department of Transport and Main Roads (DTMR's) Queensland Transport and Roads Investment Program and the Development Assessment Mapping System.	Section 25.3.3,
25.8	Demonstrate how Project impacts for each transportation mode will be mitigated to maintain the safety, efficiency and operational integrity of all affected transport modes for the Project workforce and other transport systems. Mitigation measures are to be prepared in consultation with relevant transport authorities (e.g. local governments, DTMR, Civil Aviation Safety Authority, relevant port authorities, Maritime Safety Queensland, Queensland Rail and Queensland Police Service) and must consider the transport authorities' works programs and forward planning, and be in accordance with the relevant methodologies, guidelines, and design manuals.	Section 25.3.3, Section 25.4.3, Section 25.5.3, Section 25.6.3, Section 25.7.3