Graphinex – Esmeralda Graphite Project Environmental Impact Statement

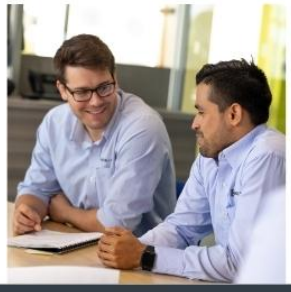
Appendix N – Transport Impact Assessment

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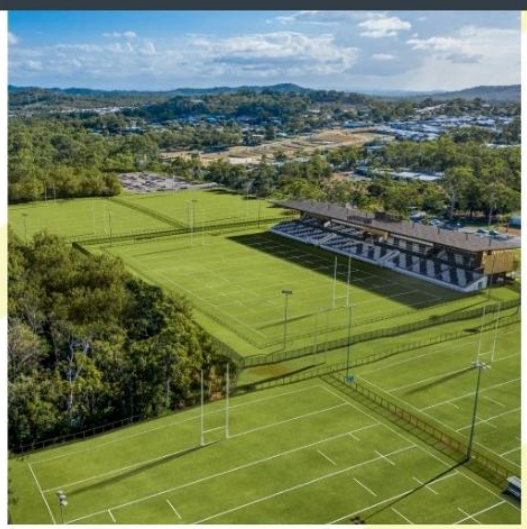
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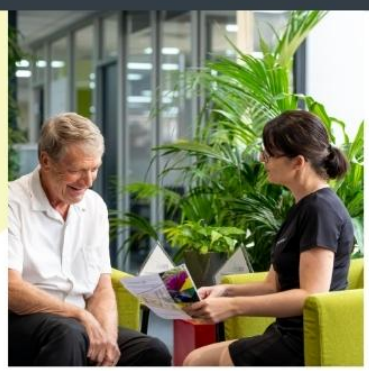




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Esmeralda Graphite Project
Environment Impact Statement Transport Assessment (EISTA)

Client:	Qld Aus Graphite Pty Ltd
Project Number:	BE250115
Document Number:	BE250115-RP-EISTA-03
Date of Issue:	9 June 2026

Document Control Record

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Version No.	Description	Date	Prepared	Approved
01	Draft for review and comment	30/01/2026	GR	AW
02	Final for Submission	01/04/2026	GR	AW
02	Final for Submission – Minor Updates	9/06/26	KC	AW

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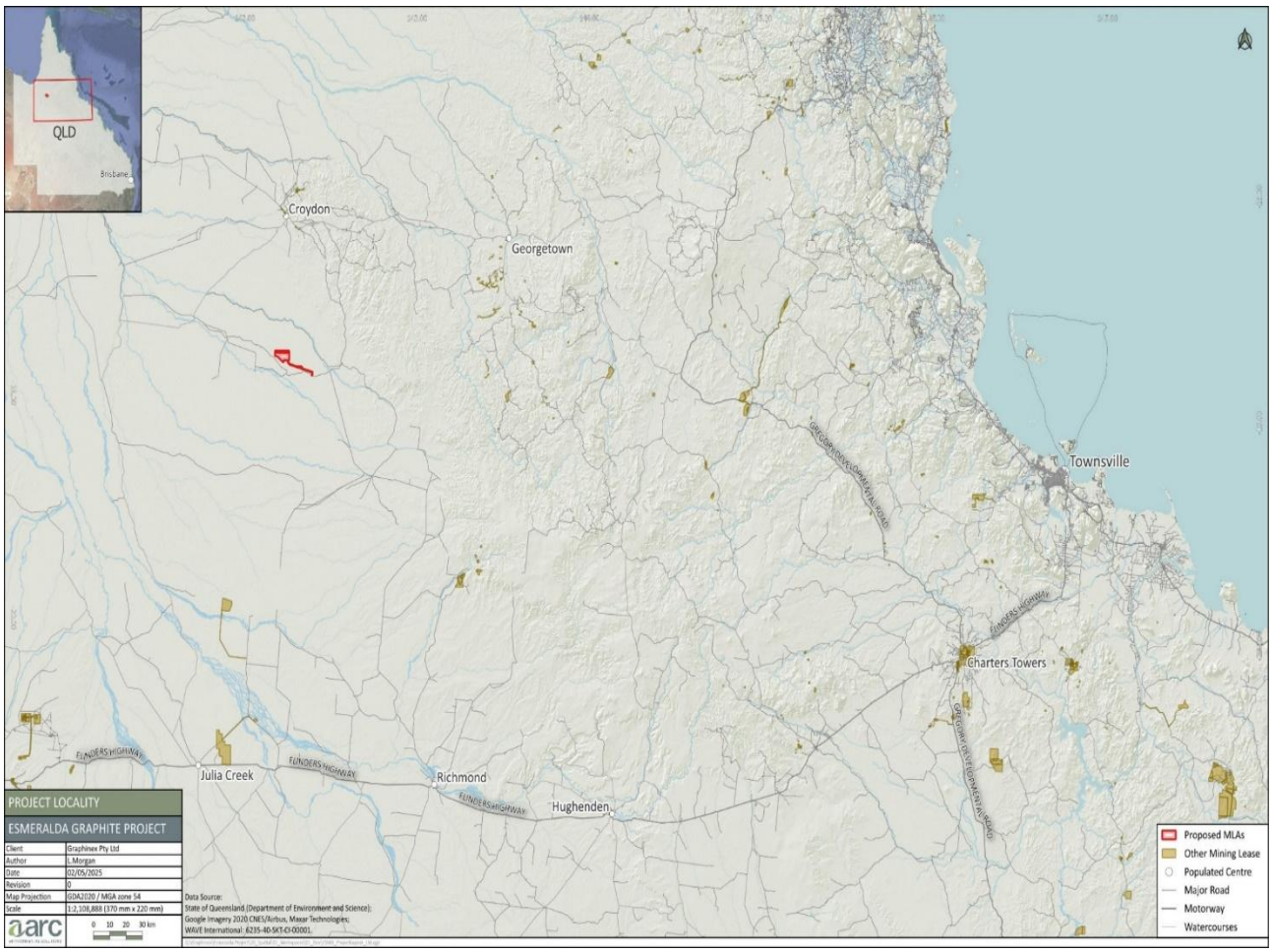
1. Introduction

1.1 Project Overview

Burchills Engineering Solutions (Burchills) has been commissioned by Qld Aus Graphite Pty Ltd to produce an Environmental Impact Statement Transport Assessment (EISTA) for the Esmeralda Graphite Project located in Esmeralda, Queensland. The site is located within the Croydon Shire Council (CSC) local government area.

The proposed Esmeralda Graphite Project will be assessed under the State Development and Public Works Organisation Act 1971 (SDPWO Act).

The Esmeralda Graphite Project is a proposed open cut graphite mine, located approximately 70 km south of Croydon, Queensland, Australia. The site location is illustrated in Figure 1.1 below.



Source: AARC Environmental Solutions Pty Ltd

Figure 1.1 Site Location

The Project proposes mining of the Esmeralda Granite Unit and on-site concentration of graphite ore.

The proposed life-of-mine (LOM) is approximately 65 years, including construction (18-24 months), operation (53 years), and decommissioning and rehabilitation (10 years).

1.2 Objectives

The objective of this report is to address the transport and infrastructure requirements associated with the construction, operation and decommissioning of the Project. During construction, operation and decommissioning of the Project aims to meet the following key objectives:

The construction, operation and decommissioning stages of the Project should aim to:

- Avoid, minimise and/or mitigate adverse impacts to the condition and operation of existing and planned transport infrastructure;
- Maintain the safety, efficiency and operational integrity of all affected transport modes for the project workforce and other transport system; and
- Ensure impact mitigation works are compatible with transport infrastructure planning.

As outlined in the DTMR GTIA, the typical traffic impact assessment process for EIS development is as follows:

- Prepare an initial advice statement and review terms of reference;
- Authorities provides the proponent with the traffic information for the EIS;
- Establish base characteristics;
- Determine development traffic characteristics;
- Impact assessment and mitigation analysis: consideration of measures to avoid, manage and then mitigate impacts;
- Discuss and agree on impact mitigation measures;
- Revise and finalise documentation;
- Submit TIA documentation;
- EIS Traffic Assessment submitted;
- Review of EIS Traffic Assessment;
- Preparation of supplementary EIS/updated EIS Traffic Assessment;
- Review of supplementary EIS/updated EIS Traffic Assessment and recommends conditions;
- Decision on EIS conditions; and
- Prepare and finalise EIS Traffic Assessment. and road-use management plan/infrastructure agreement if applicable (prior to project commencement).

1.3 Scope

The report investigates the transport aspects associated with the Project. The scope of the transport aspects investigated includes:

- Determine the likely traffic volumes and traffic distribution from the project;
- Determine the likely traffic impact of the Project on the local road network;
- Determine the road upgrades to be provided to mitigate the impact of the project on the local road network (if any);
- Assess the access configuration to provide efficient and safe manoeuvring between the site and the local road network; and
- Undertake an impact assessment for transport methods including sea, rail and air transport.

1.4 Report Structure

The reporting structure adopted as part of this assessment is outlined in Table 1.1 below.

Table 1.1 Report Structure

Section Number	Section	Description
1	Introduction	Introduces the Environmental Impact Statement Transport Assessment report.
2	Project Description	An introduction and description of the proposed development.
3	Assessment Scope	Description of the scope of the assessment, and approach taken to determine the impact of the development.
4	Existing Conditions	Description of the existing road network and intersections.
5	Traffic Considerations	Description of the Project traffic demands.
6	Traffic Assessment Criteria	Description of the assessment criteria for the Project.
7	Operational Assessment	Displays the results from the SIDRA Intersection assessment and Turn Warrant assessment, including any potential impacts on the existing road network.
8	Mitigation Strategies	Proposes strategies to mitigate potential impacts of the Project, including any infrastructure upgrades or management strategies.
9	Transport Infrastructure Assessment	An assessment of transport infrastructure in accordance with TMR's GTIA.
10	Road Safety Assessment	An Assessment road safety impacts in accordance with TMR's GTIA.

1.5 References

The following documents have been used in the preparation of this report:

- Croydon Shire Council (CSC) Planning Scheme;
- Richmond Shire Council (RSC) Planning Scheme;
- Department of Transport and Main Roads (DTMR) Guide to Traffic Impact Assessment (GTIA0;
- Austroads Guide to Road Design Part 4A;
- Austroads Guide to Traffic Management Part 6;
- Road Planning and Design Manual (RPDM) and relevant DTMR Supplements to Austroads Guidance above; and
- Coordinator General's Terms of Reference.

1.6 Limitations

Burchills has completed this transport impact assessment report in accordance with the usual care and thoroughness of the consulting profession. To inform the Project operations, conditions, workforce numbers and delivery stage durations, Burchills has largely utilised the assumptions provided by Graphinex when undertaking this assessment.

The assessment is based on accepted traffic engineering practises and standards applicable at the time of undertaking the assessment. The assessment was completed in January 2026 and is based on the conditions encountered and Project information available at the time. Burchills disclaims responsibility for any changes to Project planning or road conditions that may occur after the completion of the assessment.

2. Esmeralda Graphite Project

2.1 Project Overview

The Esmeralda Graphite Project is a proposed open cut graphite mine, located approximately 70 km south of Croydon, Queensland.

The Project proposes mining of the Esmeralda Granite Unit and on-site concentration of graphite ore. Key activities within the scope of 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; and
- Haul road construction and transport of concentrate to the Esmeralda Prosect Road, within MLA 100431.

The proposed open cut mining operation will mine up to 3.5 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) ore. A total of approximately 170 Mt graphite ore will be mined over the operational life of the Project.

The proposed life-of-mine (LOM) is approximately 65 years, including construction (18-24 months), operation (53 years), and decommissioning and rehabilitation (10 years). The resource base consists of a granite hosted ore body of approximately 150 meters thickness, located beneath approximately 70 meters of weathered sedimentary overburden. Ore will be mined to an approximate maximum depth of 250 m below ground level. Extracted Run-of Mine (ROM) ore will be hauled to the mineral processing plant for stockpiling and processing via conventional floatation methods.

Low-grade ore will be stockpiled separately for processing later in the mine life, as ore reserves begin to deplete in the in the pit. Processing of low-grade stockpiles will continue post-mining, economically supporting the backfilling and rehabilitation of the mining void.

Graphite concentrate from the processing plant will be trucked via road train on a dedicated haul road within MLA 100431. The haul road will connect to the Esmeralda Prospect Road, south-east of the mine. Road trains will then transport concentrate from the Project to a separate facility near Townsville for further refinement and/or distribution to local and overseas market.

2.2 Project Staging

The Project on-site construction and operation process will be delivered in stages. Following approvals, construction is expected to commence at the end of 2027 and be followed by an operational life of approximately 53 years. The key delivery stages are outlined below in Table 2.1.

Table 2.1 Esmeralda Graphinex Project Stages

Approximate Timeframe	Project Phase
Year -2 to Year -1	**Construction (2027)** Project site works commence and is expected to occur over a period of approximately 2 years. This includes pre-strip, topsoil stockpiling, development of on-site accommodation, mine infrastructure area and mine-access road, and waste/overburden removal in Year -1.
Year 1	**Operation (2028)** Mining production commences.
Year 3	Ramping up to full production of 3.5 Mtpa plant feed.
Year 25	In-pit waste backfill commences on small scale
	Ex-pit tailings will be progressively reclaimed to fill the large pit void

Year 35	All waste and ore are depleted within pit; mid-grade stockpile is reclaimed to feed plant between years 36 and 48.
Year 46	In-pit waste backfill ramped up.
Year 48	Mining operations progressively cease. Plan and vehicle movements continue, associated with use of any remaining stockpile through to year 53.
Year 54 – Year 63	**Decommissioning and Rehabilitation** Decommissioning and removal of infrastructure, final rehabilitation and ongoing environmental monitoring and maintenance works.

2.3 Workforce

To determine the traffic generation associated with Esmeralda Graphite Project, Burchills has assessed the proposed workforce numbers associated with the construction and operation phases of each of the delivery stages.

The anticipated total workforce schedule for the construction and operation phase is outlined in Table 2.2 below. It is noted these workforce numbers specify the anticipated number of workers and operators during each calendar year.

Table 2.2 Esmeralda Graphinex Project Expected Total Workforce Number

Project Stage	Year	Workforce	No. of Shifts
Construction	2027	100	2 (12 hours per shift)
Operations	2028	192	2 (12 hours per shift)
Decommissioning & Rehabilitation	2082	50	2 (12 hours per shift)

The construction and decommissioning workforce will be divided into 2 crew which then will work in 12 hour shifts 5 days a week.

2.4 Workforce Accommodation

As a part of the Project, during the construction, operation and decommissioning phases, all workers will be accommodated in the on-site worker's village.

3. Assessment Scope

3.1 Road Network

The scope of this assessment is limited to the roads used by the traffic generated by the proposed Project. The judgement of whether a road carries a significant amount of traffic is based on DTMR GTIA. The guidelines state that a road carries a significant proportion of project traffic when levels reach 5% of existing traffic volumes.

The roads and intersections outlined in Table 3.1 and Table 3.2 below have been assessed to determine if the traffic generated by the proposed Project exceeds the 5% threshold and are classified as a significant impact.

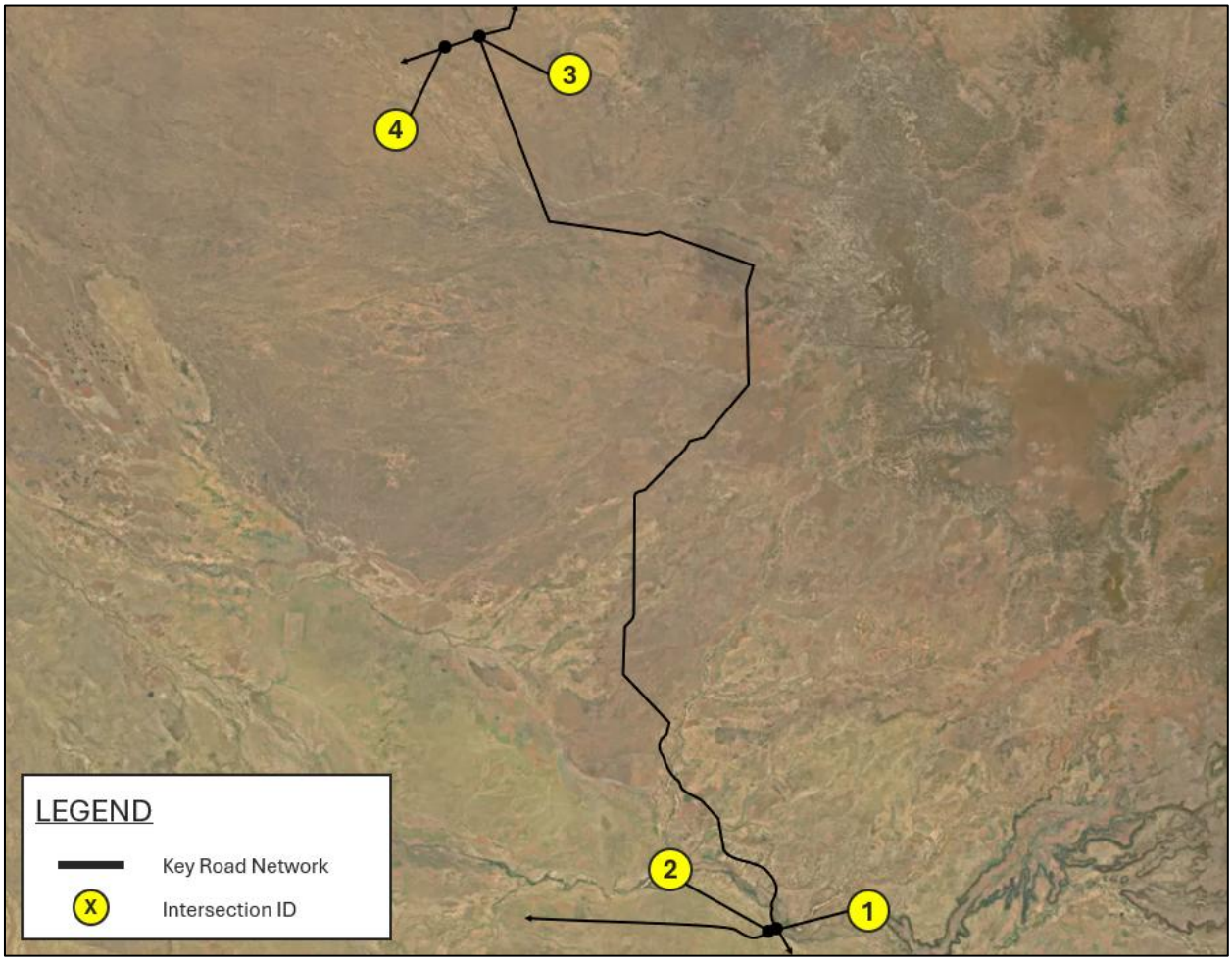
Table 3.1 Road Links

Road Link	Authority
Flinders Highway - Townsville	DTMR
Flinders Highway - Charters Towers	DTMR
Flinders Highway - East of Charters Towers	DTMR
Flinders Highway - Far West of Charters Towers	DTMR
Flinders Highway - Far East of Hughenden	DTMR
Flinders Highway - Hughenden	DTMR
Flinders Highway A6 - Richmond	DTMR
Goldring Street	DTMR
Larsen Street	RSC
Crawford Street	RSC
Richmond-Woolgar Road	RSC
Richmond Road	CSC
Esmeralda Prospect Road	CSC
Proposed Mine Access	CSC

Table 3.2 Intersections

Intersection ID	Intersection	Authority
1	Flinders Highway A6 / Larsen Street / Goldring Street Intersection	DTMR
2	Flinders Highway A6 / Crawford Street Intersection	DTMR
3	Richmond Road / Esmeralda Prospect Road Intersection	CSC
4	Esmeralda Prospect Road / Proposed Mine Access Intersection	CSC

The study roads and intersections are illustrated in Figure 3.1. We note this figure illustrates the key intersections from the DTMR road network to the site access (via gazetted heavy vehicle routes). Additional maps displaying the entire haul route have been provided in Appendix E.



Source: Metro Map

Figure 3.1 Road Links and Intersections

3.2 Access and Egress to Mine Site

Vehicle ingress and egress to the mine site will be assessed according to Austroads Guide to Road Design Part 4A and *DTMR's Supplement 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 guideline assessments ensure that adequate protection is proposed for turning vehicles entering and exiting the proposed Project site. It is noted that the SISD assessment is the highest measure of sight distance, where SISD compliance will result in compliance with Approach Sight Distance (ASD), Minimum Gap Sight Distance (MGSD) and Stopping Sight Distance (SSD).

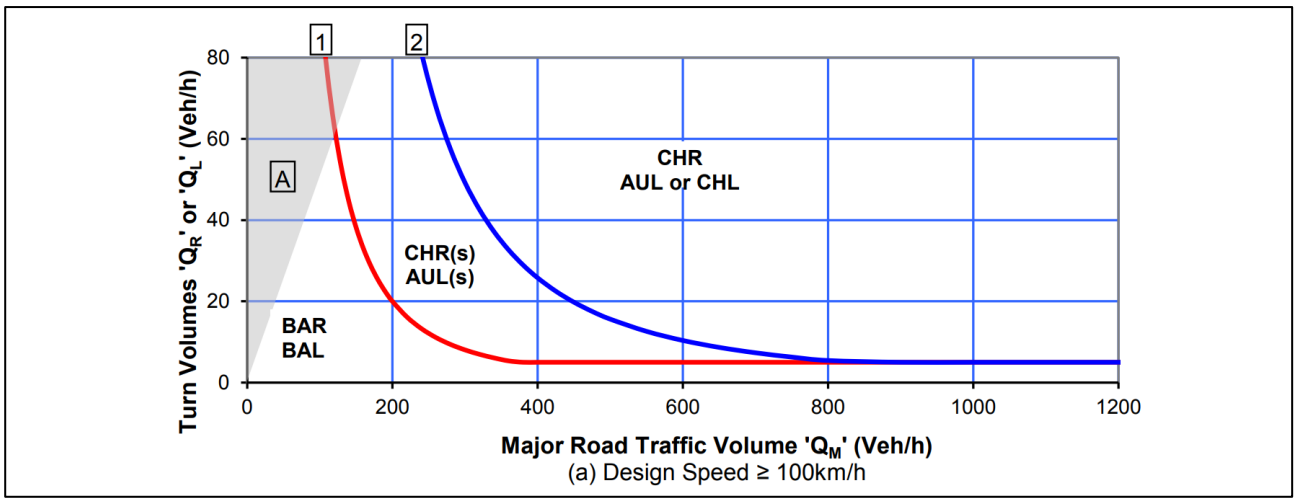
3.3 Intersection Safety Criteria

3.3.1 Warrants for Turn Treatments

The Austroads warrants for turn treatments provide an indication of which turn treatments will be required to provide an appropriate level of safety for all vehicle types entering and exiting the site.

The warrants for turn treatment provide guidance on where deceleration lanes and turning lanes should be provided based on traffic volumes. The warrants were developed by Arndt, Troutbeck, Handley & Slattery (2006) and are referenced in the DTMR Road Planning and Design Manual (RPDM). The warrants were determined by identifying the location at which the benefits of providing a higher-level treatment (the reduction in estimated crash costs) are equal to additional construction costs associated with the treatment.

The warrants for turn treatments for rural areas and with speeds greater than or equal to 100 kilometres per hour (km/h) are outlined in Figure 3.2 below.



Source: Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings

Figure 3.2 Warrants for Turn Treatments – High Speed Rural Roads

3.4 Link Capacity Criteria

The road link capacity of the roads impacted by the proposed Esmeralda Graphite Project haulage traffic has been assessed according to the DTMR GTIA. The impact assessment area is defined as the following:

- All road links where the development traffic exceeds 5% of the base in either direction on the links annual average daily traffic (AADT) in the year of opening of each stage.

3.5 Road Safety Criteria

The road safety criteria of the roads and intersections impacted by the proposed Esmeralda Graphite Project haulage traffic has been assessed according to the GTIA. The impact assessment area is defined as the following:

- 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 the opening of each stage.

3.6 Transport Infrastructure

The transport infrastructure criteria of road links impacted by the proposed Esmeralda Graphite Project haulage traffic has been assessed according to the GTIA. The impact assessment area is defined as the following:

- All road links where the development traffic exceeds 5% of the base traffic in either direction on the link's AADT in the year of opening of each stage, or where Transport and Main Roads identifies prevailing structural integrity issues of transport infrastructure (for example, bridges or culverts).

4. Existing Conditions

4.1 Road Links

Burchills has conducted an inspection of the key road network from the 22nd to the 24th of September 2025. The tasks conducted on the inspection include the following:

- 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 pose safety risks; and
- Visual review of existing roadside infrastructure, including warning signage.

Furthermore, it is noted that to supplement the site visit information, Burchills has commissioned traffic counts on the key surrounding roads. The findings from the traffic counts have been outlined within **Section 5.1** of this report.

Table 4.1 summarises the existing conditions of key road network and the total vehicles per day (vpd) obtained from the peak period traffic counts[1] and TMR census data. A detailed map illustrating the below roads is included in Appendix E.

Table 4.1 Existing Road Conditions

Road	Road Condition	Formation	Speed Limit	AADT	HV%
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%
Flinders 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 - Far 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 - Richmond	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%

[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.*

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 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%

The detailed characteristics of the key roads located in the vicinity of the subject site are provided in the following sections of this report.

4.1.1 Flinders Highway A6

The Flinders Highway extends from Townsville to Cloncurry, crossing through the 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 110km/h along the majority of the road, with reductions in speed limits to 80km/h and 60km/h through the towns.

The sealed width is typically 7m to 8m, with 1m sealed shoulders provided along the majority of the road length.

The existing conditions of the Flinders Highway A6 are illustrated in Figure 4.1 below.

Eastbound	Westbound
	

Source: Site Visit

Figure 4.1 Existing Road Conditions - Flinders Highway A6

4.1.2 Larsen Street, Richmond

Larsen Street 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.

The sealed road width is approximately 22.0m, to accommodate on-street parking along both verges of Larsen Street. Furthermore, it provides a central lane of approximately 3.5m in width to accommodate vehicle parking.

The existing conditions of Larsen Street are illustrated in Figure 4.2 below.

Eastbound	Westbound
	

Source: MetroMap

Figure 4.2 Existing Road Conditions – Larsen Street

4.1.3 Crawford Street, Richmond

Crawford Street provides a connection between the Finders Highway A6 and Richmond-Woolgar Road in Richmond. The road is a two-lane, two-way sealed formation, with flat topography. The speed limit is 50km/h along majority of the road, with reductions in speed limits to 40km/h through the school zones.

The sealed road width is approximately 30.0m, to accommodate on-street parking along both verges and the centre of Crawford Street. Furthermore, it is noted that Crawford Street is classified as a B-Double route, for vehicles up to 25m/26m in length.

The existing conditions of Crawford Street are illustrated in Figure 4.3 below.

Northbound	Southbound
	

Source: MetroMap

Figure 4.3 Existing Road Conditions – Crawford Street

4.1.4 Goldring Street, Richmond

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

The sealed width is typically 22.5m, separated by a 7.0m 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 27.0m. Furthermore, in the road segments where on-street parking is accommodated along both verges of the road, the total sealed width is typically 32.0m

The existing conditions of Goldring Street are illustrated in Figure 4.4 below.

North-Westbound	South-Eastbound
	

Source: Site Visit and MetroMap

Figure 4.4 Existing Road Conditions – Goldring Street

4.1.5 Richmond Road and Richmond-Woolgar Road

Richmond Road and Richmond-Woolgar Road provide a connection between Richmond Woolgar Road and Esmeralda Prospect Road intersection. 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 80km/h and 100km/h along the road extent.

The carriageway width varies between narrow 4m and 7m for sealed sections and 8m to 10m for gravel road sections.

The existing conditions of Richmond Road and Richmond-Woolgar Road are illustrated in Figure 4.5 below.

Northbound	Southbound
	

Source: Site Visit

Figure 4.5 Existing Road Conditions – Richmond Road and Richmond-Woolgar Road

We note, this road is identified as Richmond Road when within the CSC boundary and is also unnamed directly south of the Esmeralda Prospect Road / Richmond Road intersection as per Queensland Globe mapping. Refer to the illustration in Figure 4.6 below. As outlined in the above sections, the condition of the road through each local government authority is generally the same.

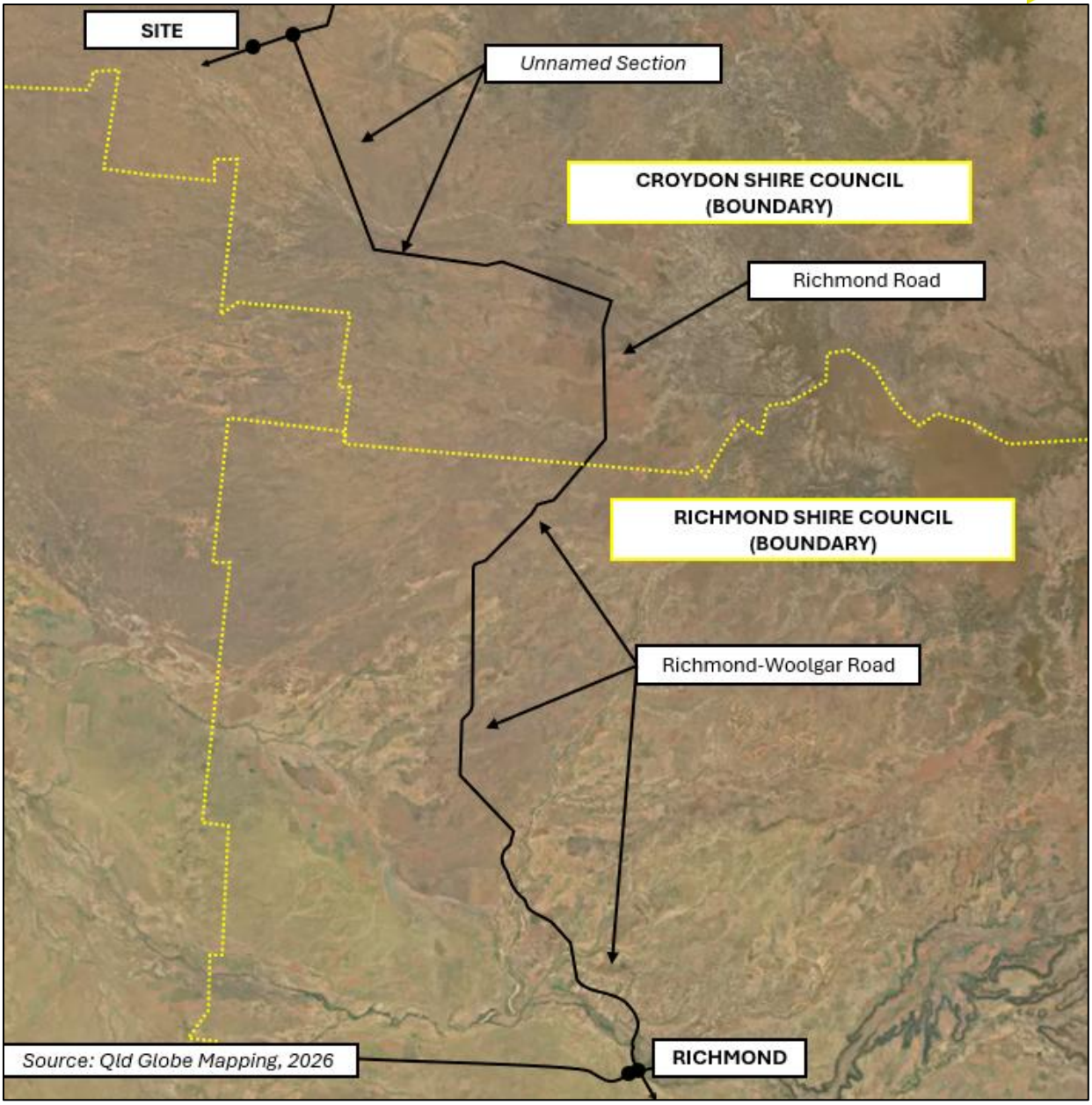


Figure 4.6 Richmond Road Context – Queensland Globe Mapping

4.1.6 Esmeralda Prospect Road

Esmeralda Prospect Road provides a connection between Richmond 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 100km/h limit (unsigned) along the road extent.

The gravel road width varies between 6m to 8m, with wide gravel shoulders provided along the entirety of the road length.

The existing conditions of Esmeralda Prospect Road are illustrated in Figure 4.7 below.

Westbound


Source: Site Visit

Figure 4.7 Existing Road Conditions – Esmeralda Prospect Road

4.1.7 Proposed Mine Access Road

The proposed Mine Access provides a connection between Esmeralda Prospect Road and the Graphite 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 100km/h limit (unsigned) along the road extent.

The gravel road width is approximately 3m to 8m, with wide gravel shoulders provided along the entirety of the road length.

The existing conditions of the Proposed Mine Access Road are illustrated in Figure 4.8 below.

Northbound	Southbound
	

Source: Site Visit

Figure 4.8 Existing Road Conditions – Proposed Mine Access

4.2 Key Intersections

4.2.1 Flinders Highway A6 / Larsen Street / Goldring Street Intersection

The Flinders Highway A6 / Larsen Street / Goldring Street intersection is a sealed four-way, priority-controlled intersection with a posted speed limit of 60 km/h along each road. Each road provides wide sealed shoulders to accommodate on-street parking. The Flinders Highway A6 (southern leg) is divided by a 10m wide combined solid and hatched median. Furthermore, Goldring Street is generally divided by a 12m wide median which provides on-street parking for general vehicles and trucks / caravans.

The pavement and line marking of the intersection are in good condition and the intersection is well illuminated.

The Flinders Highway A6 / Larsen Street / Goldring Street intersection will be utilised by some heavy vehicles to gain access to the wider road network (towards Townsville) to and from the Project area for staff and operators during both the construction and operation phases.

Figure 4.9 below provides an aerial view of the Flinders Highway A6 / Larsen Street / Goldring Street intersection.



Source: Queensland Globe

Figure 4.9 Aerial View - Flinders Highway A6 / Larsen Street / Goldring Street Intersection

Table 4.2 below summarises the lane widths in the vicinity of the intersection.

Table 4.2 Flinders Highway A6 / Larsen Street / Goldring Street Intersection

Lane Description	Direction of Traffic	Lane Width
Flinders Highway A6 (southern leg)	Northbound	3.6m
Flinders Highway A6 (southern leg)	Southbound	3.4m
Flinders Highway A6 (western leg)	Eastbound	3.5m
Flinders Highway A6 (western leg)	Westbound	4.6m
Larsen Street	Eastbound	4.5m
Larsen Street	Westbound	4.0m
Goldring Street	Northbound	6.7m
Goldring Street	Southbound	6.7m

Burchills has conducted a Safe Intersection Sight Distance (SISD) review at the existing Flinders Highway A6 / Larsen Street / Goldring Street intersection in accordance with the Austroads Guide to Road Design Part 4A for a posted speed limit of 60 km/r (design speed of 70 km/r). The sight distance achievements at the intersection were determined during the site visit conducted by Burchills and outlined in Table 4.3 below.

Table 4.3 SISD Achievements - Flinders Highway A6 / Larsen Street / Goldring Street Intersection

Direction	SISD Requirement (Design Speed 70 Km/h)	SISD
Left out of Larsen Street	151m	> 151m
Right out of Larsen Street	151m	> 151m
Left out of Flinders Highway A6 (western leg)	151m	> 151m
Right out of Flinders Highway A6 (western leg)	151m	> 151m

Source: Site Visit

We note, as per DTMR's Supplement to Austroads Guide to Road Design Part 4A, acceptance for heavy vehicles greater than 19m semi-trailers (with respect to SISD time gaps) will need to confirmed/accepted by DTMR.

4.2.2 Flinders Highway A6 (Goldring Street) / Crawford Street Intersection

The Flinders Highway A6 / Crawford Street intersection is a sealed four-way, priority-controlled intersection with a posted speed limit of 40km/h to 60 km/h. Each road provides wide sealed shoulders to accommodate on-street parking.

The pavement and line marking of the intersection are in good condition and the intersection is illuminated.

The Flinders Highway A6 / Crawford Street intersection may be utilised by heavy vehicles to gain access to the wider road network (towards Mount Isa) to and from the Project area for staff and operators during both the construction, operation and decommissioning phases.

Figure 4.10 below provides an aerial view of the Flinders Highway A6 / Crawford Street intersection.



Source: Queensland Globe

Figure 4.10 Aerial View - Flinders Highway A6 / Crawford Street Intersection

Table 4.4 below summarises the lane widths in the vicinity of the intersection.

Table 4.4 Flinders Highway A6 / Crawford Street Intersection

Lane Description	Direction of Traffic	Lane Width
Flinders Highway A6	Eastbound	3.6m
Flinders Highway A6	Westbound	3.5m
Crawford Street	Northbound	9.7m
Crawford Street	Southbound	8.6m

Burchills has conducted a Safe Intersection Sight Distance (SISD) review at the existing Flinders Highway A6 / Crawford Street intersection in accordance with the Austroads Guide to Road Design Part 4A for a posted speed limit of 60 km/r (design speed of 70 km/r). The sight distance achievements at the intersection were determined during the site visit conducted by Burchills and outlined in Table 4.5 below.

Table 4.5 SISD Achievements - Flinders Highway A6 / Crawford Street Intersection

Direction	SISD Requirement (Design Speed 70 Km/h)	SISD
Left out of Crawford Street (northern leg)	151m	> 151m
Right out of Crawford Street (northern leg)	151m	> 151m
Left out of Crawford Street (southern leg)	151m	> 151m
Right out of Crawford Street (southern leg)	151m	> 151m

Source: Site Visit

We note, as per DTMR's Supplement to Austroads Guide to Road Design Part 4A, acceptance for heavy vehicles greater than 19m semi-trailers (with respect to SISD time gaps) will need to confirmed/accepted by DTMR.

4.2.3 Richmond Road / Esmeralda Prospect Road Intersection

The Richmond Road / Esmeralda Prospect Road intersection is a sealed and gravel three-way priority-controlled intersection with a speed limit of 100 km/h (unsigned) along each road. Wide gravel shoulders are provided along each road of the intersection.

The pavement at the intersection is in good condition, however no line marking has been provided to direct vehicle movements at the approach.

As per the previous intersection, the Richmond Road / Esmeralda Prospect Road intersection will be sole access route to the mine site.

Figure 4.11 below provides an aerial view of the Richmond Road / Esmeralda Prospect Road intersection.



Source: Queensland Globe

Figure 4.11 Aerial View – Richmond Road / Esmeralda Prospect Road Intersection

Note, as per Queensland Globe, the southern leg of this intersection is currently unnamed, but is identified as Richmond Road as per Google Mapping.

Table 4.6 below summarises the lane widths in the vicinity of the intersection.

Table 4.6 Richmond Road / Esmeralda Prospect Road Intersection

Lane Description	Direction of Traffic	Lane Width
Richmond Road	Northbound	4.0m
Richmond Road	Southbound	4.0m
Esmerald Prospect Road	Eastbound	3.0m – 4.0m
Esmerald Prospect Road	Westbound	3.0m – 4.0m

Burchills has conducted a Safe Intersection Sight Distance (SISD) review at the existing Richmond Road / Esmeralda Prospect Road intersection in accordance with the Austroads Guide to Road Design Part 4A for a posted speed limit of 100 km/r (design speed of 110 km/r). The sight distance achievements at the intersection were determined during the site visit conducted by Burchills and outlined in Table 4.7 below.

Table 4.7 SISD Achievements - Richmond Road / Esmeralda Prospect Road Intersection

Direction	SISD Requirement (Design Speed 110 Km/h)	SISD
Left out of Esmerald Prospect Road	285m	> 285m
Right out of Esmerald Prospect Road	285m	> 285m

Source: Site Visit

We note, as per DTMR's Supplement to Austroads Guide to Road Design Part 4A, acceptance for heavy vehicles greater than 19m semi-trailers (with respect to SISD time gaps) will need to confirmed/accepted by DTMR.

4.2.4 Esmeralda Prospect Road / Proposed Mine Access Intersection

The Esmeralda Prospect Road / Proposed Mine Access intersection is a gravel three-way priority-controlled intersection with a speed limit of 100 km/h (unsigned) along each road. Wide gravel shoulders are provided along each road of the intersection.

The pavement at the intersection is in reasonable condition, however no line marking has been provided to direct vehicle movements at the approach due to the nature of the gravel road formation.

Figure 4.12 below provides an aerial view of the Esmeralda Prospect Road / Proposed Mine Access intersection.



Source: Metro Map

Figure 4.12 Aerial View - Esmeralda Prospect Road / Proposed Mine Access Intersection

Table 4.8 below summarises the lane widths in the vicinity of the intersection.

Table 4.8 Esmeralda Prospect Road / Proposed Mine Access Intersection

Lane Description	Direction of Traffic	Lane Width
Esmerald Prospect Road	Eastbound	3.0m – 4.0m
Esmerald Prospect Road	Westbound	3.0m – 4.0m
Proposed Mine Access	Northbound	3.0m – 4.0m
Proposed Mine Access	Southbound	3.0m – 4.0m

Burchills has conducted a Safe Intersection Sight Distance (SISD) review at the existing Esmeralda Prospect Road / Proposed Mine Access intersection in accordance with the Austroads Guide to Road Design Part 4A for a posted speed limit of 100 km/r (design speed of 110 km/r). The sight distance achievements at the intersection were determined during the site visit conducted by Burchills and outlined in Table 4.9 below.

Table 4.9 SISD Achievements - Esmeralda Prospect Road / Proposed Mine Access Intersection

Direction	SISD Requirement (Design Speed 110 Km/h)	SISD
Left out of Proposed Mine Access	285m	> 285m
Right out of Proposed Mine Access	285m	> 285m

Source: Site Visit

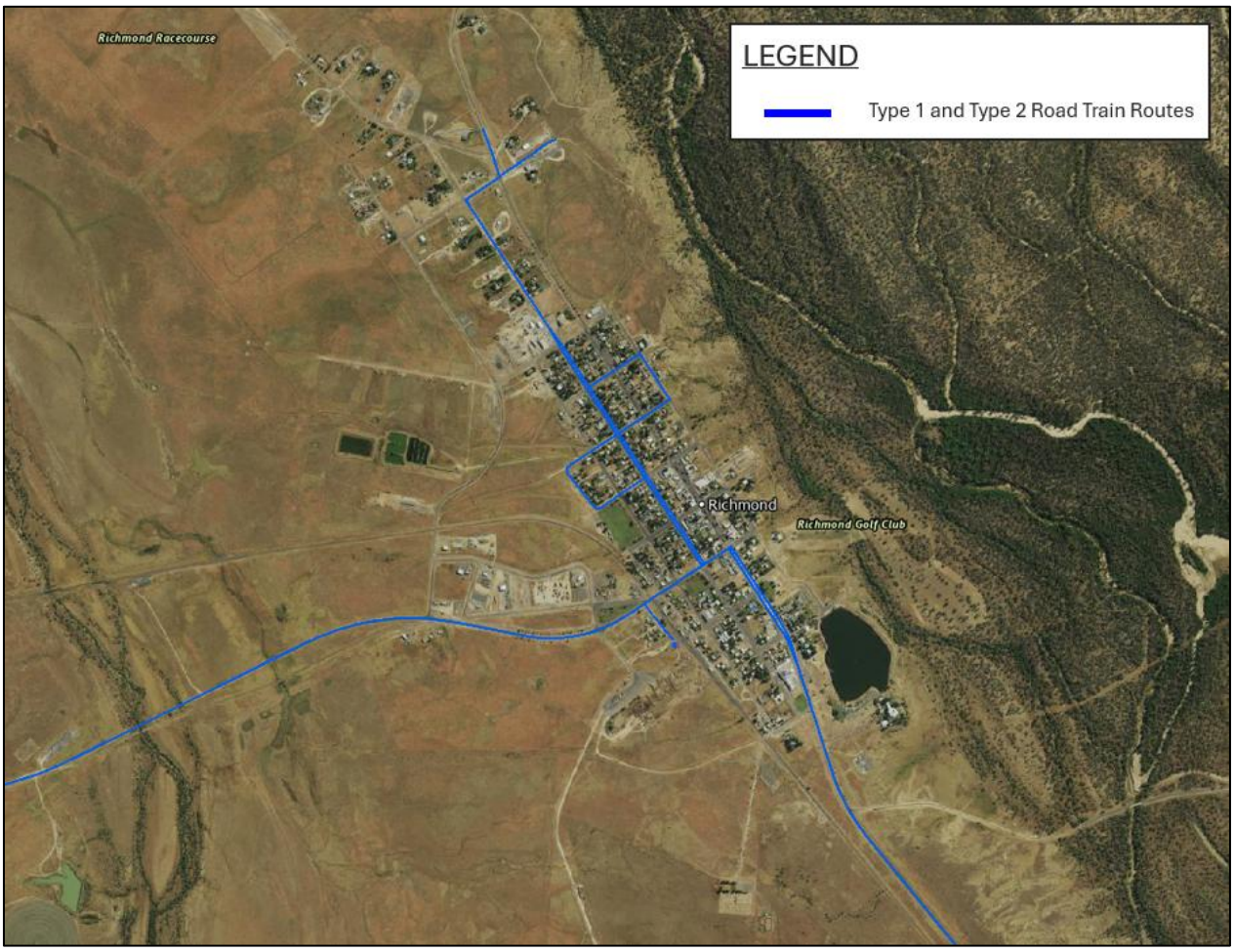
We note, as per DTMR's Supplement to Austroads Guide to Road Design Part 4A, acceptance for heavy vehicles greater than 19m semi-trailers (with respect to SISD time gaps) will need to confirmed/accepted by DTMR.

4.3 Surrounding Heavy Vehicle Routes and Restrictions

The Flinders Highway A6, Goldring Street, Crawford Street and Richmond-Woolgar Road are gazetted Type 1 and Type 2 Road Train (PBS Level 3A and 4A) routes which authorise the use of Road Trains (up to 36.5m and 53.5m in length respectively) on these roads without restriction. It is noted that the gazetted route terminates along Richmond-Woolgar Road (north of the township) but is also approved north of Boree Park Road.

Furthermore, it is noted that Goldring Street is only partially classified a gazetted Type 1 and Type 2 Road Train routes. This indicates that heavy vehicle movements to and from the Flinders Highway A6 and Goldring Street (south) will be required to divert via Crawford Street.

The Type 1 and Type 2 Road Train routes are shown in Figure 4.12 below.



Source: QLD Globe

Figure 4.13 Heavy Vehicle Routes – Type 1 and Type 2 Road Train Routes

4.4 Heavy Vehicle Haulage Routes

Table 4.10 outlines the anticipated heavy vehicle route for construction and operational traffic associated with the site. Note, these routes are indicative only and have been based on existing gazetted networks for Type 1 and Type 2 Road trains as discussed in Section 4.3. Furthermore, the route terminates at the Port of Townsville, however this may be subject to change once future operational details are confirmed. For all roads that are not on a gazetted heavy vehicle network, a road access permit will need to be obtained by the site or transport operator at a later date (subject to local government, port authority and DTMR consent where applicable).

Table 4.10 Proposed Heavy Vehicle Haulage Routes

Haulage Route (Both directions)	Road Manager	LGA Boundary	Heavy Vehicle Network
Proposed Mine Access	CSC	**Croydon Shire Council (CSC)**	Type 1 & 2 Road Train
Esmeralda Prospect Road	CSC		Type 1 & 2 Road Train
Richmond Road	CSC		Type 1 & 2 Road Train
Richmond-Woolgar Road	RSC	**Richmond Shire Council (RSC)**	Type 1 & 2 Road Train
Richmond Woolgar Road	RSC		Nil (North of Richmond)
McLeod Street	RSC		Type 1 & 2 Road Train
Crawford Street	RSC		Type 1 & 2 Road Train
Larsen Street	DTMR		Type 1 & 2 Road Train
Goldring Street	DTMR		Type 1 & 2 Road Train
Flinders Highway	DTMR		Type 1 & 2 Road Train
Flinders Highway	DTMR	**Flinders Shire Council (FSC)**	Type 1 & 2 Road Train
Richmond Hill Drive	DTMR		Type 1 & 2 Road Train
Gray Street	DTMR		Type 1 & 2 Road Train
Flinders Highway	DTMR		Type 1 & 2 Road Train
Flinders Highway	DTMR	**Charters Towers Regional Council (CTRC)**	Type 1 & 2 Road Train
York Street	DTMR		Type 1 & 2 Road Train
Norman Dungavell Drive	DTMR		Type 1 & 2 Road Train
New Queen Road	DTMR		Type 1 & 2 Road Train
Flinders Highway	DTMR		Type 1 & 2 Road Train
Flinders Highway	DTMR	**Townsville City Council (TCC)**	Type 1 & 2 Road Train
Ron McLean Drive	DTMR		Type 1 & 2 Road Train
Southern Port Road	DTMR	**Port of Townsville (POT)**	Type 1 Road Train
Archer Street	POT		Type 1 Road Train
Hubert Street	POT		Type 1 Road Train
Benwell Road	POT		Type 1 Road Train

[1]Local Government Authority (LGA) council boundary

Figure 4.14 illustrates the proposed haulage route summarised in Table 4.10. A detailed version of this map is provided in Appendix E.

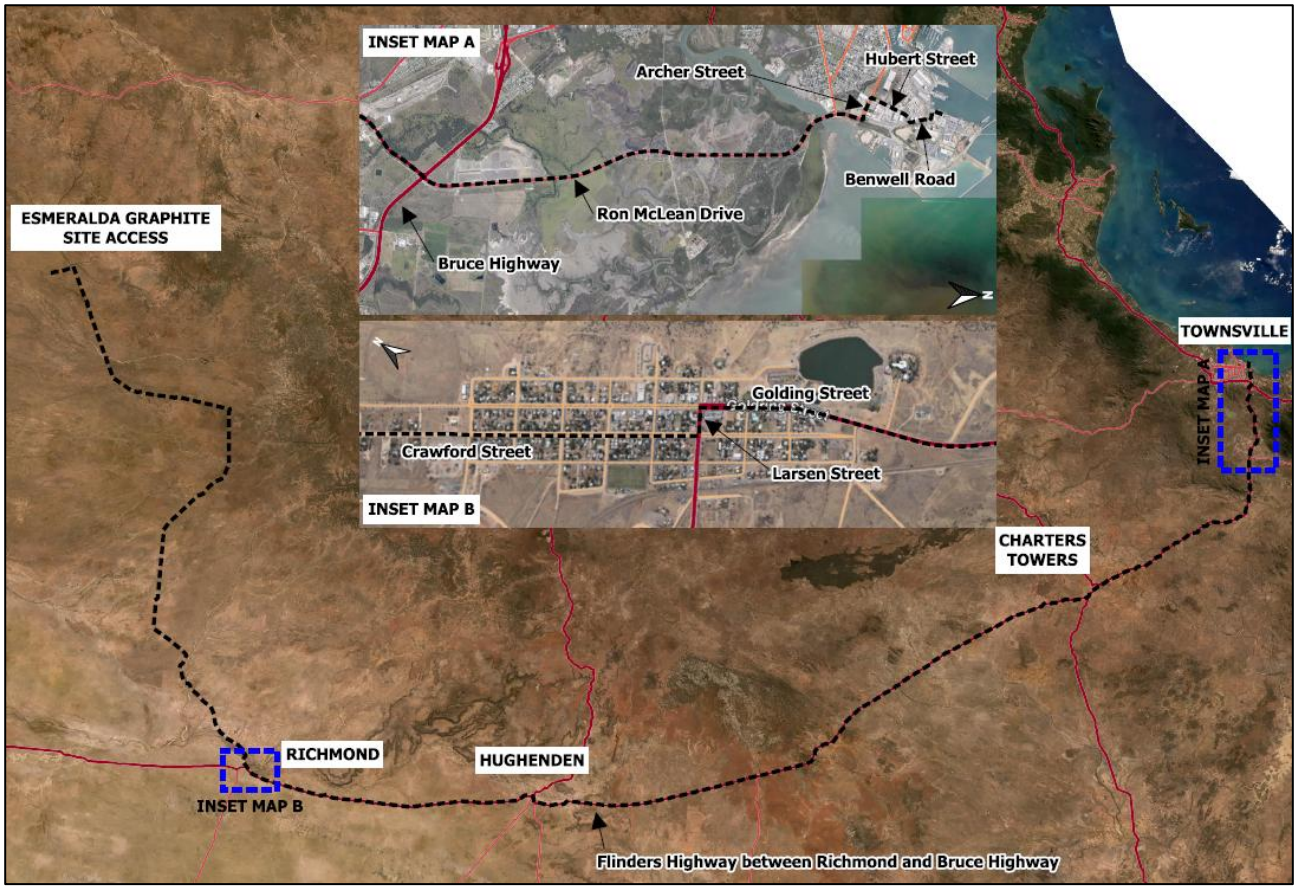
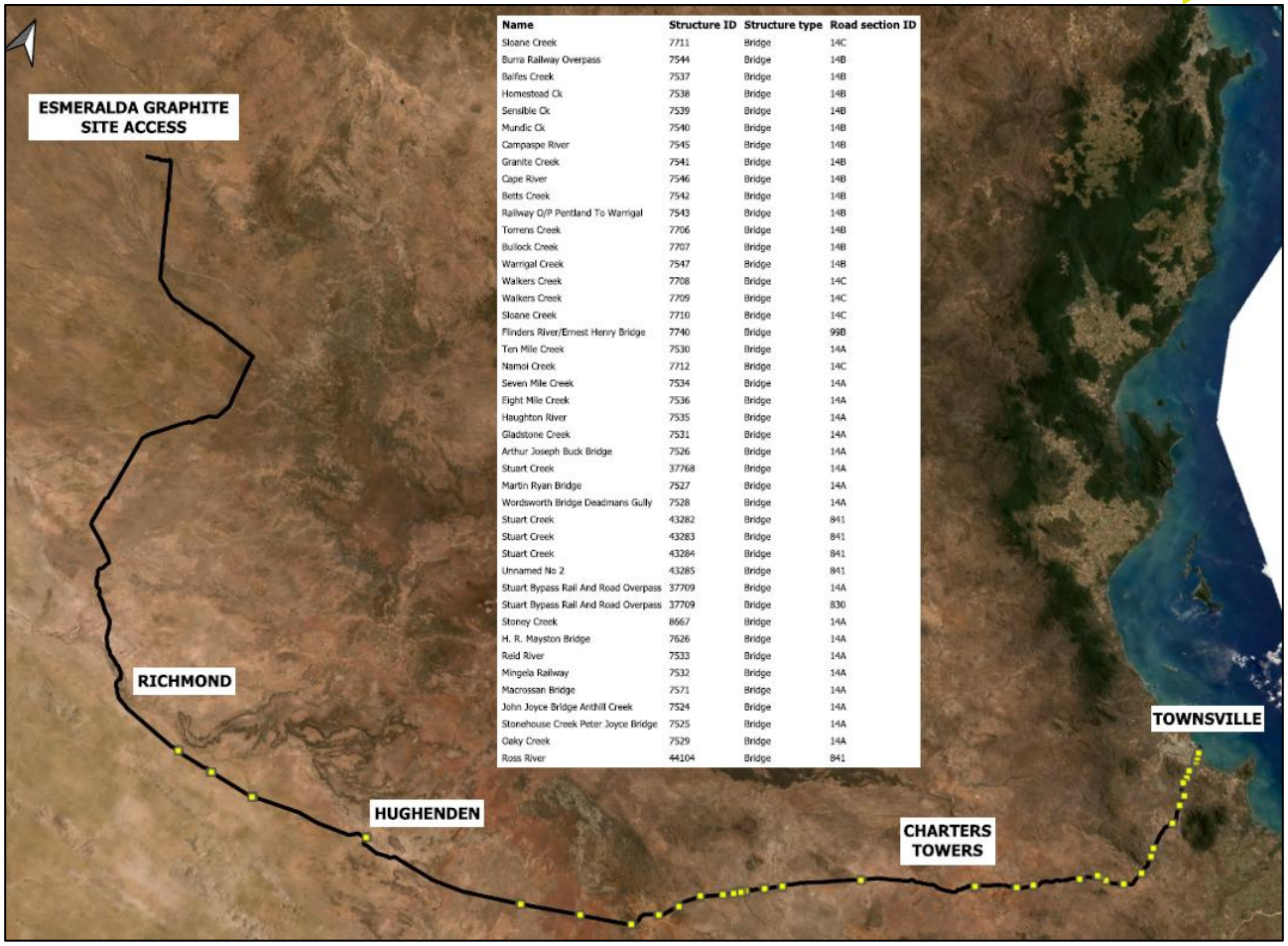


Figure 4.14 Proposed Heavy Vehicle Haulage Route

4.5 Existing Infrastructure

Figure 4.18 illustrates the existing infrastructure (over waterways) along the proposed haulage route. We note that the haulage traffic associated with the proposed development is not expected to affect existing infrastructure. Any load limited or restricted structures are to be specified in road access permits or as a condition of travel by the road owner (LGA, DTMR and port authorities), which will be determined at future stages of the project. A detailed version of this map is provided in Appendix E.



Name	Structure ID	Structure type	Road section ID
Sloane Creek	7711	Bridge	14C
Burra Railway Overpass	7544	Bridge	14B
Belfes Creek	7537	Bridge	14B
Homestead Ck	7538	Bridge	14B
Sensible Ck	7539	Bridge	14B
Mundic Ck	7540	Bridge	14B
Campaspe River	7545	Bridge	14B
Granite Creek	7541	Bridge	14B
Cape River	7546	Bridge	14B
Betts Creek	7542	Bridge	14B
Railway O/P Pentland To Warrigal	7543	Bridge	14B
Torrens Creek	7706	Bridge	14B
Bullock Creek	7707	Bridge	14B
Warrigal Creek	7547	Bridge	14B
Walkers Creek	7708	Bridge	14C
Walkers Creek	7709	Bridge	14C
Sloane Creek	7710	Bridge	14C
Flinders River/Ernest Henry Bridge	7740	Bridge	99B
Ten Mile Creek	7530	Bridge	14A
Namoi Creek	7712	Bridge	14C
Seven Mile Creek	7534	Bridge	14A
Eight Mile Creek	7536	Bridge	14A
Haughton River	7535	Bridge	14A
Gladstone Creek	7531	Bridge	14A
Arthur Joseph Buck Bridge	7526	Bridge	14A
Stuart Creek	37768	Bridge	14A
Martin Ryan Bridge	7527	Bridge	14A
Wordsworth Bridge Deadmans Gully	7528	Bridge	14A
Stuart Creek	43282	Bridge	841
Stuart Creek	43283	Bridge	841
Stuart Creek	43284	Bridge	841
Unnamed No 2	43285	Bridge	841
Stuart Bypass Rail And Road Overpass	37709	Bridge	14A
Stuart Bypass Rail And Road Overpass	37709	Bridge	830
Stoney Creek	8667	Bridge	14A
H. R. Mayston Bridge	7626	Bridge	14A
Reid River	7533	Bridge	14A
Mingela Railway	7532	Bridge	14A
Macrossan Bridge	7571	Bridge	14A
John Joyce Bridge Anthill Creek	7524	Bridge	14A
Stonehouse Creek Peter Joyce Bridge	7525	Bridge	14A
Oaky Creek	7529	Bridge	14A
Ross River	44104	Bridge	841

Figure 4.15 Existing Infrastructure (Source: Qld Globe, 2026)

4.6 Crash History for Intersections and Links

4.6.1 Study Intersections

Burchills has reviewed the incident history data at the key intersections. The incident history data has been obtained from the Queensland Government Open Data Portal for the year 2019 to 2024.

The reported incidents at the key intersections have been summarised in Table 4.11 below.

Table 4.11 Incident History – Key Intersections

Crash ID	Severity	Type	Description	DCA Code	Month/Year	Traffic Controls	Conditions
Flinders Highway A6 / Larsen Street / Goldring Street intersection							
No crashes recorded within the last 5-year period.							
Flinders Highway A6 / Crawford Street intersection							
No crashes recorded within the last 5-year period.							
Richmond Road / Esmeralda Prospect Road intersection							
No crashes recorded within the last 5-year period.							

Crash ID	Severity	Type	Description	DCA Code	Month/Year	Traffic Controls	Conditions
Flinders Highway A6 / Larsen Street / Goldring Street intersection							
Esmeralda Prospect Road / Proposed Mine Access intersection							
No crashes recorded within the last 5-year period.							

The incident data indicates that no vehicle crashes have been recorded within the last 5-year period at the key intersections.

4.6.2 Road Segments

Burchills has reviewed the incident history data along the key road network. Provided that the Flinders Highway A6 extends for approximately 775km, Burchills has assessed the road segment between the Flinders Highway A6 / Villadale Road intersection to Goldring Street. Furthermore, Burchills has assessed the Richmond Road segment from Goldring Street to approximately 7.5km east of the Richmond Road / Esmerald Prospect Road intersection. However, all other key roads have been assessed considering the entire road extent.

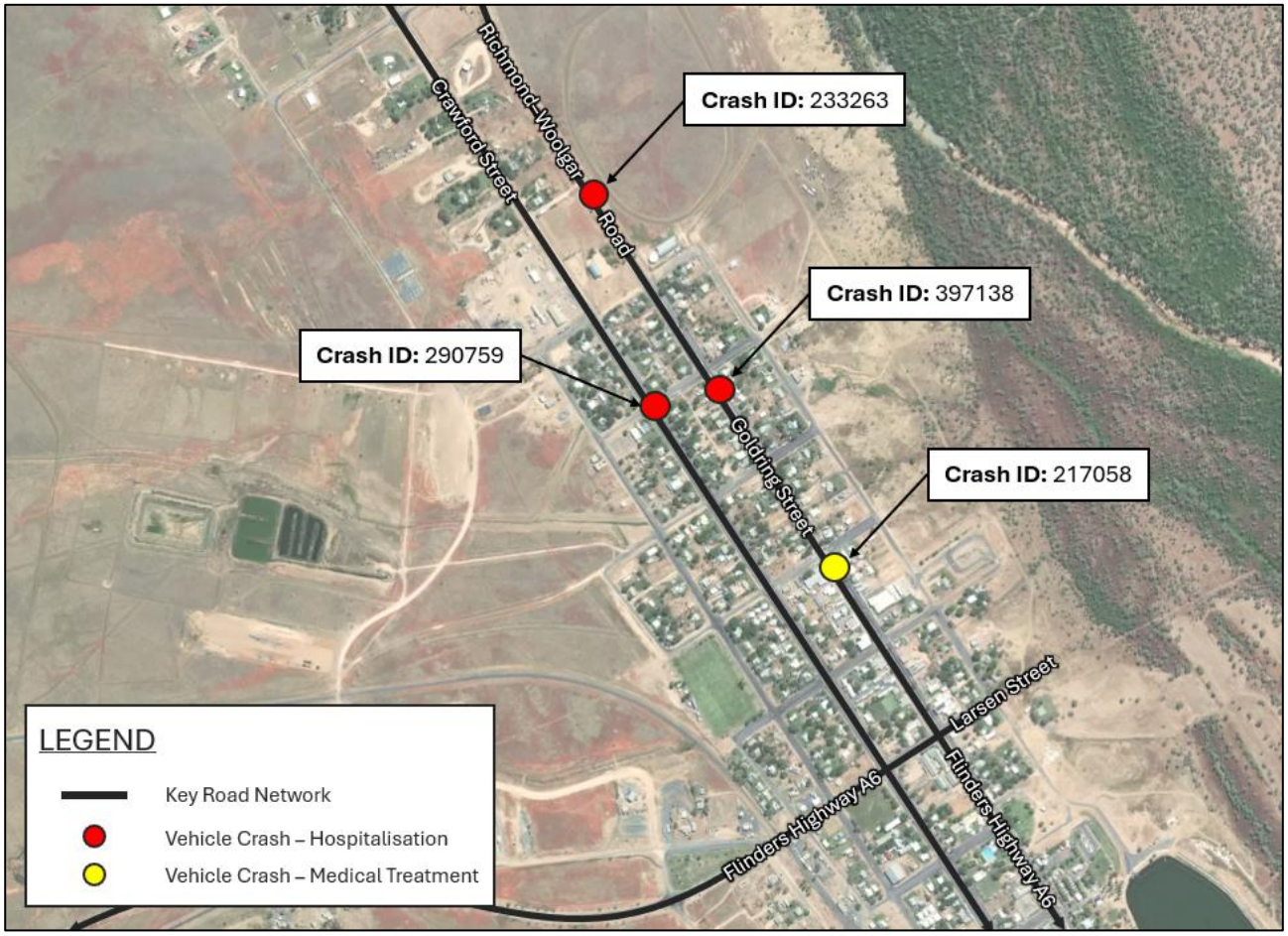
The incident history data has been obtained from the Queensland Government Open Data Portal for the year 2018 to 2024. The data revealed that within the last 5 years of recorded data, a total of four (4) vehicle crashes have occurred along the key road network.

The reported incidents along the key roads have been summarised in Table 4.12 and the vehicle crash locations have been illustrated Figure 4.16 below.

Table 4.12 Incident History – Road Segments

Crash ID	Severity	Type	Description	DCA Code	Month/Year	Traffic Controls	Conditions
Flinders Highway A6							
No crashes recorded within the last 5-year period.							
Larsen Street							
No crashes recorded within the last 5-year period.							
Goldring Street							
397138	Hospitalisation	Single Vehicle	Off Path-Straight: Mounts Traffic Island	708	February 2021	No traffic control	Clear, darkness – not lighted
217058	Medical Treatment	Single Vehicle	Off Path-Straight: Out of Control on Cway	705	May 2024	Give way sign	Clear, darkness – lighted
Crawford Street							
290759	Hospitalisation	Multi-Vehicle	Vehs Adjacent Approach: Thur-Thru	101	February 2021	Give way sign	Clear, daylight
Richmond-Woolgar Road							
233263	Hospitalisation	Single Vehicle	Off Path-Curve: Off Cway Right Bend	801	November 2019	No traffic control	Clear, darkness – not lighted

Crash ID	Severity	Type	Description	DCA Code	Month/Year	Traffic Controls	Conditions
Esmeralda Prospect Road							
No crashes recorded within the last 5-year period.							
Proposed Mine Access							
No crashes recorded within the last 5-year period.							



Source: MetroMap

Figure 4.16 Incident Location – Road Segments

4.7 Rail Facilities

The nearest rail facility to the project is Richmond Railway Station situated south of Goldring Street. The Richmond Railway Station is 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. The railway line runs between Mount Isa and Townsville.

The rail line services a number of communities along the line through passenger transport and the conveyance of general freight which is a critical link from the North West Minerals Province to the Port of Townsville, where the majority of bulk products are exported.

The Mount Isa Line is of particular national interest as it runs along some of the world's largest deposits of copper, lead, zinc, silver and phosphate rock.

It is noted that a number of rail crossing points are located on the Flinders Highway including rail overpasses, rail underpasses and level crossings. The crossing points are shown in Figure 4.17.

We note that an ALCAM assessment will be undertaken in the next stage of assessment for the development.



Source: Google Maps

Figure 4.17 Existing Flinders Highway intersect Points with Railway

As shown above, the Flinders Highway includes a number of intersections with the railway line between Townsville and Richmond including railway overpasses, underpasses and level crossing points. A summary of the level crossing points between Townsville and Richmond is shown in Figure 4.18.



Source: Google Maps

Figure 4.18 Existing Flinders Highway Railway Level Crossing Points

Further detail regarding the crossing points is provided in Table 4.13.

Table 4.13 Flinders Highway Level Crossings (Townsville to Richmond)

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.
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.

4.8 Port Facilities

The Port of Townsville is a government-owned Corporation and seaport in Townville. 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.

It is anticipated that capacity at the Port of Townsville will 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 (export) will be hauled via road to the Port of Townsville.

4.9 Airport Facilities

The nearest airports to the Project site are the Richmond Airport and the Georgetown Airport, which are located to the south and north 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 Airline 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 roughly 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.

However, it is understood that a new gravel airstrip will be constructed on-site with all FIFO workers arriving and departing via the on-site gravel airstrip.

We note the frequency and operational capacity of air services will be determined and assessed between the operator and Graphinex at a later stage. It is anticipated that the origin airports include Mount Isa, Townsville and Brisbane, however this will also be confirmed via the operate as part of future planning stages.

4.10 Future Infrastructure Upgrades

A review of Queensland Transport and Roads Investment Program (QTRIP) 2025-26 to 2028-29 identified four (4) future infrastructure upgrades along the state-controlled corridor between Richmond and Charters Towers, as summarised in Table 4.14 below.

Table 4.14 Future Infrastructure Upgrades – QTRIP 2025-6 2028-29

District	Investment ID	Project Title	Investment Status (as at 1 July 2025)	Planning	Construction Start
Statewide	QR1992	Mount Isa Line, resilience improvements	Planned	Underway	Underway
North West	2340159	Flinders Highway (Hughenden - Richmond), various locations, improve pavement and culverts	Planned	Underway	2026-27
North West	1904899	Hughenden - Muttaburra Road, construct to a sealed standard	Contractually Committed	-	-
Northern	3492923	Flinders Highway (Charters Towers - Hughenden), Homestead West, construct heavy vehicles rest area	Planned	Underway	Mid 2026

4.11 Active Transport Networks

Figure 4.19 illustrates the proposed active transports routes along the proposed haulage route. A detailed version of this map is provided in Appendix E. We note that the development traffic associated with the proposed Is not expected to impact the safety and efficiency of these routes.

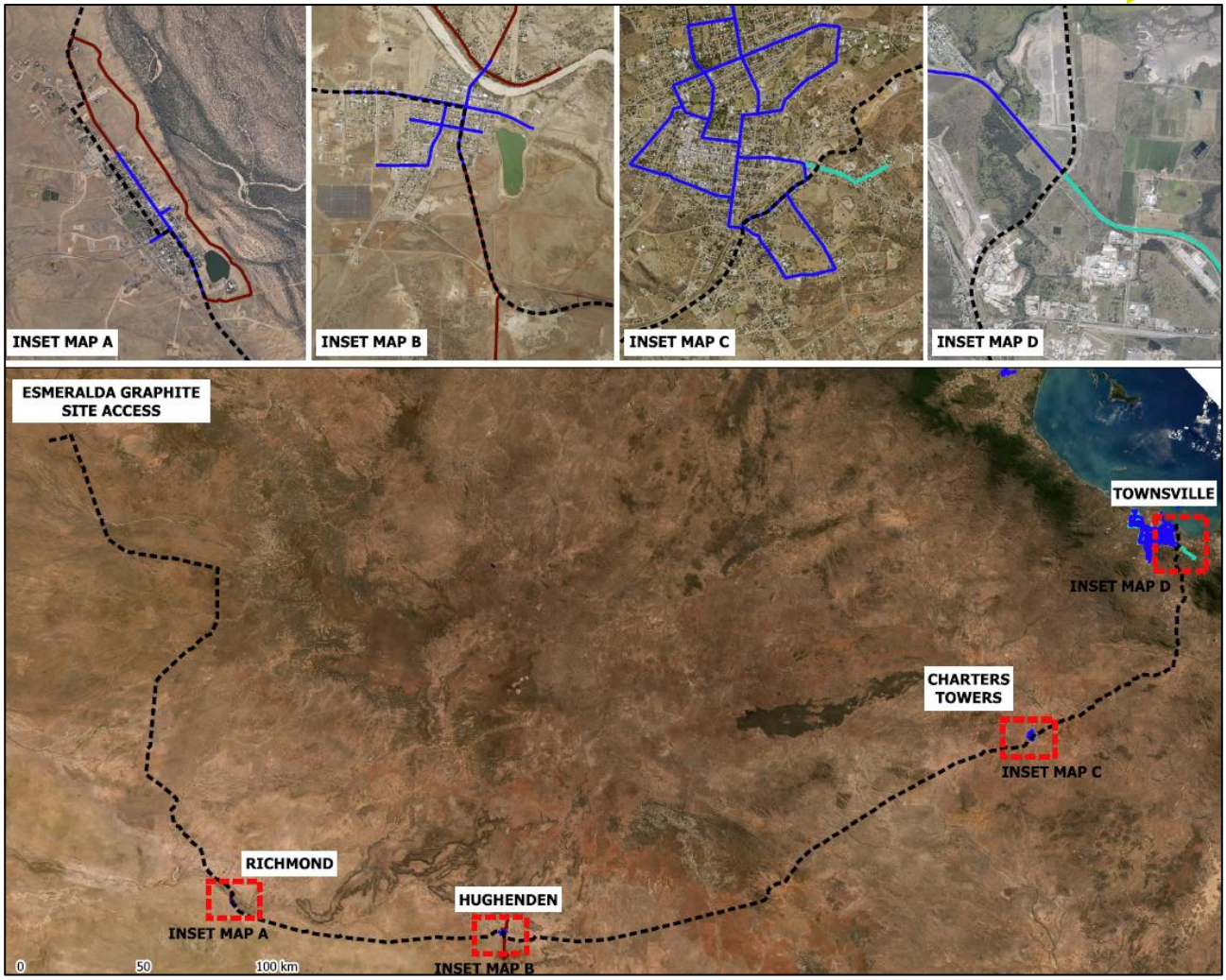


Figure 4.19 Active Transport Routes (Source: Qld Globe, 2026)

4.12 Livestock Routes

Figure 4.20 illustrate the proposed stock routes along the proposed haulage route. We note that the development traffic associated with the proposed Is not expected to impact the safety and efficiency of these routes. A detailed version of this map is provided in Appendix E.

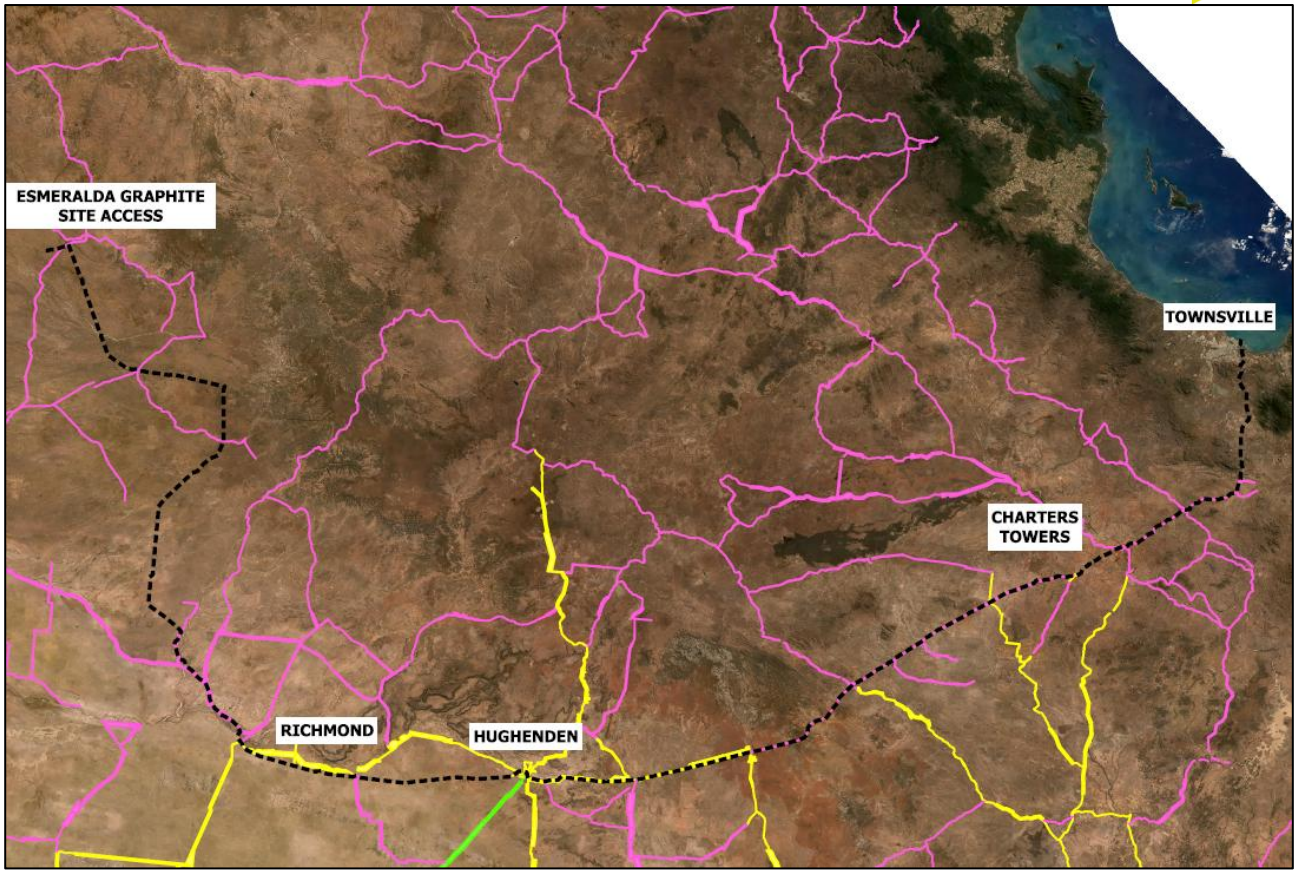


Figure 4.20 Stock Routes (Source: Qld Globe, 2026)

5. Traffic Considerations

5.1 Traffic Survey Data

To understand the existing traffic conditions along the external road network, traffic surveys were undertaken by Austraffic during the typical AM and PM peak hour periods on Tuesday the 28th of October 2025 at the following intersections:

- Flinders Highway A6 / Larsen Street / Goldring Street intersection; and
- Boree Park Road / Richmond Woolgar Road intersection

The surveyed and adopted peak hour periods have been summarised in Table 5.1 below.

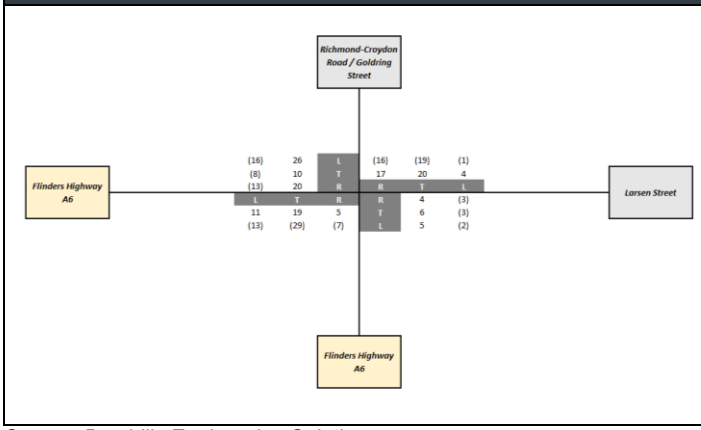
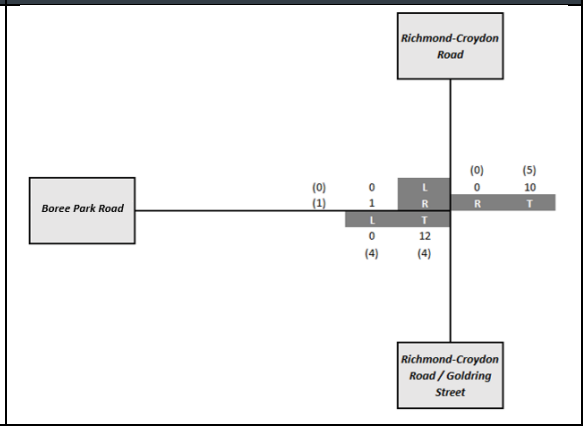
Table 5.1 Assessment Peak Periods

Survey Details	Peak Period	
	AM	PM
Surveyed Periods	06:00AM – 06:00PM	
Adopted Hourly Peak Periods	07:30AM – 08:30AM	03:30PM – 04:30PM

A copy of the traffic surveys data has been provided at **Appendix B**.

5.2 Background Traffic Volumes

Based on the traffic survey data, the AM and PM peak hour traffic volumes at each intersection are outlined in Figure 5.1 below.

Flinders Highway A6 / Larsen Street / Goldring Street intersection	Boree Park Road / Richmond Woolgar Road intersection
	

Source: Burchills Engineering Solutions

Figure 5.1 Surveyed Traffic Volumes (AM and PM)

The background survey volumes at each intersection are included within the Network Flow Diagram provided at **Appendix C**.

5.3 Traffic Growth

Burchills has 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. The adopted TMR annual segment reports relevant for this assessment are outlined below:

- FLINDERS HIGHWAY (TMR Segment Site 100148);
- FLINDERS HIGHWAY (TMR Segment Site 100049); and
- FLINDERS HIGHWAY (TMR Segment Site 100019).

The growth rate was calculated as the average of the annual growth rate at the TMR segment sites over the previous 10-year period. Based on the traffic volumes over the last 10 years, the resultant average linear growth rate of -1.9% was obtained. Therefore, Burchills has adopted a linear growth rate of 1.0% for the assessment for the study intersections, to complete a conservative assessment.

5.4 Traffic Generation

5.4.1 Workforce Numbers

To determine the traffic generation associated with the Project, Burchills has assessed the supplied workforce numbers associated with the construction and operation phases of each delivery stage.

The anticipated workforce schedule for the construction and operation phase is reproduced in Table 5.2 below.

Table 5.2 Daily Workforce Number (Peak)

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 2082	100	2	-	50	**50**

It is noted that the construction / decommissioning workforce is divided into two (2) crews which will be rotated every five (5) days. It is also to be noted that there will be no overlap between the construction stage and the operation stage.

As previously noted, all workers will be accommodated within the worker's camp village.

5.5 Workforce Transportation Modes Split

It is anticipated that on the day of shift change, travel to and from the mine area will occur via the on-site airport as well as private vehicle transportation for both construction, operation and decommissioning phases.

The workforce transportation mode splits are outlined below for both the construction and operation phases:

- 95% of the workforce will be travelling to and from the mine site via the on-site gravel airport (Fly-In Fly-Out).
- 5% of the workforce travelling to and from the mine site via private vehicles (Drive-In Drive-Out) Carpooling with other staff. 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).

Therefore, the workforce transportation mode split for the construction, operation and decommissioning workforce in the years 2027 and 2028 are outlined in Table 5.3 below.

Table 5.3 Workforce Transportation Distributions Per Shift

Workforce Transportation Mode	Construction Stage Year 2027	Operation Stage Year 2028	Decommissioning Stage Year 2082
	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**

It is noted that the staff travelling via private vehicles will solely travel to and from the mine site on the day of roster change. All staff will be accommodated in the on-site workers camp during the shift.

5.6 Workforce Vehicle Trips

It has been advised that the FIFO workforce for both the construction, operational and decommissioning phase of the mine will land within the mine site. Therefore, all FIFO and Shuttle Bus trips will not be generated along the external road network. Furthermore, it has been assumed that each private vehicle trip will solely be occupied by one (1) driver (i.e. no carpooling).

On this basis, the number of vehicle trips likely to be generated by the mine along the external road network is summarised in Table 5.4 below.

Table 5.4 Emeralda Graphite Project Trips

Workforce Trips	Construction Stage Year 2027	Operation Stage Year 2028	Decommissioning Stage Year 2082
	Shift-change day Trips	Shift change day Trips	Shift change day Trips
FIFO and Shuttle Bus	0	0	0
Private vehicles	10	20	4

It is noted that the total vehicle trips for the construction, operation and decommissioning phases are inclusive of inbound and outbound vehicle movements.

5.7 Workforce Rosters

Burchills has been advised that the construction, operation and decommissioning phases will operate with two (2) daily workforce rosters. The workforce will operate over a 12-hour shift per roster, for five (5) days on and two (2) days off. It is understood that roster changeover will occur every 14 days.

The timing of shift change is unknown at this time. However, for the purpose of this assessment, a full shift change has been assessed in both the AM and PM peak hours to complete a conservative assessment (on the high side).

In line with **Section 5.6** of this report, staff travelling FIFO and via 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 5.5 below.

Table 5.5 Esmeralda Graphite Project Inbound and Outbound Trips

Workforce Trips	Construction Stage (Year 2027)		Operation Stage (Year 2028)		Decommissioning Stage (Year 2082)	
	AM In / Out	PM In / Out	AM In / Out	PM In / Out	AM In / Out	PM In / Out
FIFO and Shuttle Bus	0 vph	0 vph	0 vph	0 vph	0 vph	0 vph
Private vehicles	10 vph	10 vph	20 vph	20 vph	4 vph	4 vph
Heavy Vehicles	5 vph	5 vph	3 vph	3 vph	3vph	3 vph
Total	**15 vph**	**15 vph**	**23 vph**	**23 vph**	**7 vph**	**7 vph**

vph – vehicles per hour

The network flow diagrams outlining the AM and PM inbound and outbound vehicle trips for the construction and operations phases are provided at **Appendix C**.

5.8 Heavy Vehicle Movements

In addition to the workforce trip generation for the Project, Burchills has also assessed the heavy vehicle movements for construction, operation and decommissioning[2]. A summary of the heavy vehicle movements per stage is shown in Table 5.6 to Table 5.10 below.

Table 5.6 Heavy Vehicles During Construction (Inbound and Outbound)

Vehicle Type	Quantity per Day
Concrete Mixer	8 trips
Class 3 truck	12 trips
Low Loader	2 trips
Class 9 AV	4 trips
Class 10 B-Double	26 trips
Total	**52 trips**

[2] For the purposes of this assessment, it has been assumed that decommissioning heavy vehicle trips will be in the order of 50% of construction generated heavy vehicle trips.

Table 5.7 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 trips
Class 10 B-Double (Diesel, Flocculant, MIBC, Grinding Media)	4 trips
Total	**15 trips**

Table 5.8 Heavy Vehicles During Operation Stage 2 (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)	22 trips
Class 10 B-Double (Diesel, Flocculant, MIBC, Grinding Media)	4 trips
Total	**26 trips**

Table 5.9 Heavy Vehicles During Decommissioning (Inbound and Outbound)

Vehicle Type	Quantity per Day
Concrete Mixer	4 trips
Class 3 truck	6 trips
Low Loader	1 trips
Class 9 AV	2 trips
Class 10 B-Double	13 trips
Total	**26 trips**

Heavy vehicle impacts during the decommissioning stage are considered to be relatively low when compared to the heavy vehicle trips generated during construction and operations. As such, the following traffic impacts assessment has focused on construction and decommissioning impacts.

5.8.1 Heavy Vehicle Load Types

It is understood that the material coming into the project site will be hauled using Class 10 B-doubles, or oversized vehicles (low loaders) where not feasible. The mineral processing plant will be brought into the site from the Port of Townsville as indivisible (semi-constructed) items. Furthermore, for all dangerous goods transport, these will be transported in accordance with the Australian Dangerous Goods Code (ADG) and relevant Heavy Vehicle National Law (HVNL) requirements via B-doubles. Further detail regarding expect

material, product and waste movements will be provided as part of subsequent assessment stage (i.e. waste reports).

5.9 Directional Trip Distribution

For robust traffic assessment, the directional distribution has been estimated based on the worst-case scenario. A split of 50% In and 50% Out is used for both AM and PM peak trip distribution.

5.10 Traffic Distribution

The surrounding road network and attractors have been analysed to determine the external distributions for the mining traffic.

It is anticipated that the majority of private vehicle trips will originate in the east (i.e. Hughenden, Charters Towers, Richmond etc), while a smaller proportion will originate from the west (i.e. Julia Creek, Cloncurry and Mount Isa). For the purposes of this assessment, it has been assumed that 100% of traffic will travel to / from the east via the study intersections. While some site generated traffic may travel to/from the west, it is anticipated that this trips to travel via other local roads and will generate minimal impact on the surround road network.

It is expected that 90% to 100% of heavy vehicles used for deliveries proposed during the construction and operation stages will be travelling to and from Charters Towers or Townsville.

For the purpose of this assessment, the external distribution of the Project is summarised in Table 5.9 below.

Table 5.10 External Traffic Distribution

Transportation Mode	Construction Stage Year 2027		Operation Stage Year 2028	
	Flinders Hwy West via study intersections	Flinders Hwy East via study intersections	Flinders Hwy West via study intersections	Flinders Hwy East via study intersections
Light vehicles	0%	100%	0%	100%
Heavy vehicles	0%	100%	0%	100%

While it is noted that a small proportion of trips may travel to the west (i.e. Mt Isa, Cloncurry) for the purposes of this assessment the majority of heavy vehicle and private trips are anticipated to travel to/from the east. Any trips heading to the west are likely to detour via the local road network in Richmond including Pattel Drive and Crawford Street (B-doubles). The impacts of these trips are anticipated to be minor and as such have not been assessed.

5.11 Railway Facilities Impact

In order to determine the impacts likely to be generated by the project on existing level crossings, a review of existing AADT, future AADT and project generated traffic volumes has been undertaken using TMR Census data for the Flinders Highway as summarized below:

- Flinders Highway Section 14C (Chainage 0.76 – 114.449): 423vpd (43% HV) in 2024; and
- Flinders Highway Section 14D (Chainage 0.0 – 149.31): 329vpd (43% HV) in 2024

While TMR's data indicates a negative growth rate, a 1% growth rate has been adopted to be conservative. It is understood that operations will incrementally increase production on-site. As such, the highest trip estimates for operations have been used for this assessment (Operations Stage 2).

A summary of the railway level crossing impacts is summarised in Table 5.11 and Table 5.12 below.

It is noted that Table 5.10 below has adopted a 100% eastbound split of development generated volumes to be conservative on the high side.

Table 5.11 External Traffic Distribution to the East

Year	Base Case Volume		Project Volume		Post Development Volume	
	Two-way AADT	Vehicle Types	Two-way AADT	Vehicle Types	Two-way AADT	Vehicle Types
2027 Opening of Construction	436vpd 43% HV	248 LV 188 HV	62vpd	10 LV 52 HV	498vpd	258 LV 240 HV
2028 Opening of Operation	440vpd 43% HV	251 LV 189 HV	46vpd	20 LV 26 HV	486vpd	271 LV 215 HV
2038 Year 10 of Operation	482vpd 43% HV	275 LV 207 HV	46vpd	20 LV 26 HV	528vpd	295 LV 233 HV
2082 Year of Decommissioning	643vpd 43% HV	366 LV 276 HV	34vpd	8 LV 26 HV	677vpd	374 LV 302 HV

While westbound traffic has been used in the following assessment, the proportion of development generated traffic to/from the west is anticipated to be low. However, for this assessment, it has been assumed that two (2) light vehicles and up to 10 heavy vehicles travel to/from the west each day.

Table 5.12 External Traffic Distribution to the West

Year	Base Case Volume		Project Volume		Post Development Volume	
	Two-way AADT	Vehicle Types	Two-way AADT	Vehicle Types	Two-way AADT	Vehicle Types
2027 Opening of Construction	339vpd 43% HV	193 LV 146 HV	12vpd	2 LV 10 HV	351vpd	195 LV 156 HV
2028 Opening of Operation	342vpd 43% HV	195 LV 147 HV	12vpd	2 LV 10 HV	354vpd	197 LV 157 HV
2038 Year 10 of Operation	375vpd 43% HV	214 LV 161 HV	12vpd	2 LV 10 HV	387vpd	216 LV 171 HV
2082 Year of Decommissioning	500vpd 43% HV	285 LV 215 HV	12vpd	2 LV 10 HV	512vpd	287 LV 225 HV

We note the above estimates provided in this section can be used to inform the future ALCAM assessment.

5.12 Port Facilities Impact

It is anticipated that capacity at the Port of Townsville will be utilised for the transfer of equipment from overseas during the construction phase and the import of materials during this phase. No amendments to existing port facilities are anticipated for the project.

5.13 Airport Facilities Impact

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's not anticipated that surrounding airports (i.e. Mt Isa, Cloncurry, Richmond or Georgetown) will be impact or be required to expand existing facilities. to accommodate the demand from FIFO workers associated with the Project.

We note the frequency and operational capacity of air services will be determined and assessed between the operator and Graphinex at a later stage. It is anticipated that the origin airports include Mount Isa, Townsville and Brisbane, however this will also be confirmed via the operate as part of future planning stages.

6. Traffic Assessment Criteria

6.1 Assessment Scenarios

For the purpose of this traffic assessment, Burchills has assessed the development impacts on the external road network for the year of opening for both construction and operational phases. It has been advised that construction will commence in 2027 and operations in 2027 – 2028.

It is noted that the Flinders Highway A6 / Crawford Street intersection (Intersection 2) has not been modelled as part of this assessment as the proposed construction and operations phases of the mine site will solely generate Heavy Vehicle trips at the intersection. The Heavy Vehicle trips generated during the AM and PM peak hours are very low and therefore are not anticipated to adversely impact the operations and safety of the Flinders Highway A6 / Crawford Street intersection.

Heavy vehicle impacts during the decommissioning stage are considered to be relatively low when compared to the heavy vehicle trips generated during construction and operations. As such, the following traffic impacts assessment has focused on construction and operations impacts.

Table 6.1 summarises the impact assessment scenarios.

Table 6.1 Assessment Scenarios

Phase	Assessment Scenario	Intersections
Construction	2027 BG	Intersection 1, 3 and 4
	2027 BG + Construction	Intersection 1, 3 and 4
Operations	2028 BG	Intersection 1, 3 and 4
	2028 BG + Operations	Intersection 1, 3 and 4

The inbound and outbound trips for the AM and PM peak hour periods for the assessment years are outlined in Table 6.2 below. It is important to note that the volumes below will solely occur on shift change-over days and do not represent typical AM and PM traffic generation characteristics for the site as the typical volumes are anticipated to be significantly lower. In addition, peak hour heavy vehicle trips have been assumed to be 10% of the daily trip generation estimates for each stage.

Table 6.2 Esmeralda Graphite Project Inbound and Outbound Trips

Trips (Inbound & Outbound)	Construction Stage Year 2027		Operation Stage Year 2028	
	AM	**PM**	**AM**	**PM**
Workforce Trips				
Shuttle Buses	Nil	Nil	Nil	Nil
Private vehicles	10 trips	10 trips	20 trips	20 trips
Subtotal	**10 trips**	**10 trips**	**20 trips**	**20 trips**
Heavy Vehicle Trips				
Subtotal	**5 trips**	**5 trips**	**3 trips**	**3 trips**
Total	**15 trips**	**15 trips**	**23 trips**	**23 trips**

In line with **Section 5.6** of this document, it has been advised that the FIFO workforce for both the construction, operational and decommissioning phases of the mine will land within the mine site. Therefore, Shuttle Bus trips will be generated within the site and will not access the external road network.

On this basis, the Shuttle Bus trips have not been considered within the operational assessment of the key intersections outline in the following section of the document.

7. Operational Assessment

7.1 SIDRA Intersection Assessment

7.1.1 INT 1: Flinders Highway A6 / Larsen Street / Goldring Street Intersection

The Flinders Highway A6 / Larsen Street / Goldring Street intersection is a four-way, priority-controlled intersection where the Flinders Highway A6 is the major road. The existing intersection configuration and adopted SIDRA layout is illustrated in Figure 7.1 below.



Figure 7.1 Aerial and SIDRA Layout – Flinders Highway A6 / Larsen Street / Goldring Street

The results of the SIDRA assessment are summarised in Table 7.1 below. The SIDRA layouts and detailed results have been provided at **Appendix D**.

Table 7.1 SIDRA Results - Flinders Highway A6 / Larsen Street / Goldring Street

Scenarios	AM Peak Period			PM Peak Period		
	DOS	Critical Mvmt Delay	95th %ile Queue	DOS	Critical Mvmt Delay	95th %ile Queue
Construction Phase						
2027 BG	0.053	6.8 sec	1.6m	0.033	6.1 sec	0.9m
2027 BG + DEV	0.058	6.9 sec	1.8m	0.036	6.1 sec	1.0m
Operations Phase						
2028 BG	0.055	6.8 sec	1.7m	0.033	6.1 sec	0.9m
2028 BG + DEV	0.057	6.9 sec	1.8m	0.035	6.2 sec	1.0m

As shown in Table 7.1, the Flinders Highway A6 / Larsen Street / Goldring Street intersection performs within the acceptable thresholds (DOS <0.80 for priority-controlled and delay <42 seconds) in all scenarios.

As such, the Flinders Highway A6 / Larsen Street / Goldring Street intersection is anticipated to operate satisfactorily following the construction, operation and decommissioning of the development.

7.1.2 INT 3: Richmond Road / Esmeralda Prospect Road Intersection

The Richmond Road / Esmeralda Prospect Road intersection is a three-way, priority-controlled intersection where Richmond Road is the major road. The existing intersection configuration and adopted SIDRA layout is illustrated in Figure 7.2 below.

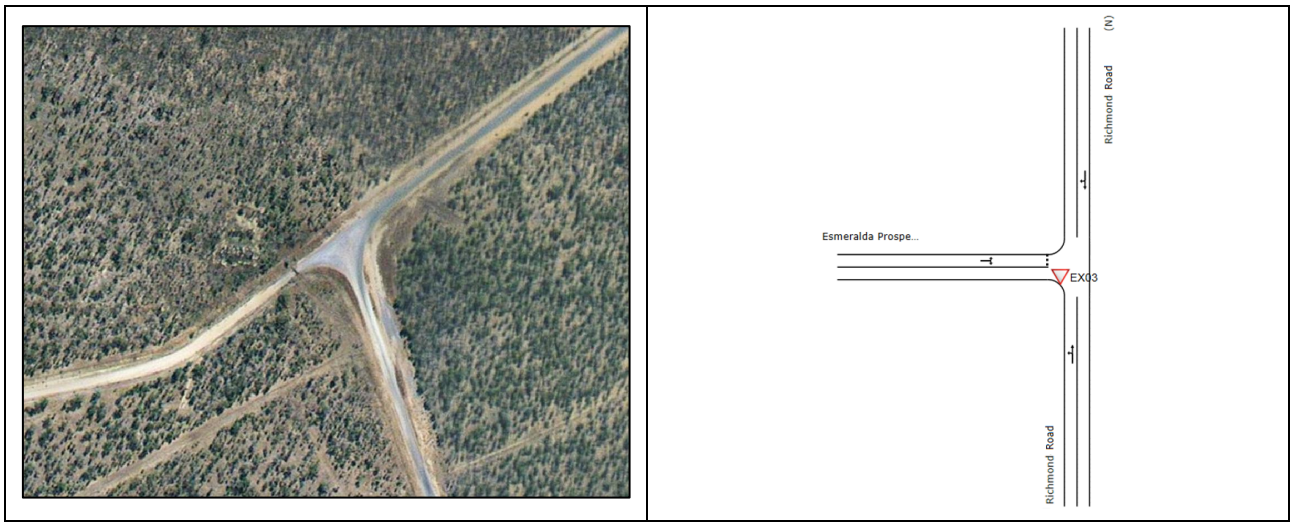


Figure 7.2 Aerial and SIDRA Layout - Richmond Road / Esmeralda Prospect Road

The results of the SIDRA assessment are summarised in Table 8.2 below. The SIDRA layouts and detailed results have been provided at **Appendix D**.

Table 7.2 SIDRA Results - Richmond Road / Esmeralda Prospect Road

Scenarios	AM Peak Period			PM Peak Period		
	DOS	Critical Mvmt Delay	95th %ile Queue	DOS	Critical Mvmt Delay	95th %ile Queue
Construction Phase						
2027 BG	0.008	7.9 sec	0.0m	0.004	7.8 sec	0.0m
2027 BG + DEV	0.014	9.5 sec	0.3m	0.008	9.4 sec	0.3m
Operations Phase						
2028 BG	0.008	7.9 sec	0.0m	0.004	7.8 sec	0.0m
2028 BG + DEV	0.015	8.9 sec	0.3m	0.011	8.9 sec	0.3m

As shown in Table 8.2, the Richmond Road / Esmeralda Prospect Road intersection performs within the acceptable thresholds (DOS <0.80 for priority-controlled and delay <42 seconds) in all scenarios.

As such, the Richmond Road / Esmeralda Prospect Road intersection is anticipated to operate satisfactorily following the construction, operation and decommissioning of the development.

7.1.3 INT 4: Esmeralda Prospect Road / Proposed Mine Access Intersection

The Esmeralda Prospect Road / Proposed Mine Access intersection is a three-way, priority-controlled intersection where Esmeralda Prospect Road is the major road. The existing intersection configuration and adopted SIDRA layout is illustrated in Figure 7.3 below.



Figure 7.3 Aerial and SIDRA Layout – Esmeralda Prospect Road / Proposed Mine Access

The results of the SIDRA assessment are summarised in Table 7.3 below. The SIDRA layouts and detailed results have been provided at **Appendix D**.

Table 7.3 SIDRA Results – Esmeralda Prospect Road / Proposed Mine Access

Scenarios	AM Peak Period			PM Peak Period		
	DOS	Critical Mvmt Delay	95th %ile Queue	DOS	Critical Mvmt Delay	95th %ile Queue
Construction Phase						
2027 BG	0.001	7.8 sec	0.0m	0.001	7.8 sec	0.0m
2027 BG + DEV	0.008	9.5 sec	0.3m	0.008	9.5 sec	0.3m
Operations Phase						
2028 BG	0.001	7.8 sec	0.0m	0.001	7.8 sec	0.0m
2028 BG + DEV	0.009	8.9 sec	0.4m	0.009	8.9 sec	0.4m

As shown in Table 7.3, the Esmeralda Prospect Road / Proposed Mine Access intersection performs within the acceptable thresholds (DOS <0.80 for priority-controlled and delay <42 seconds) in all scenarios.

As such, the Esmeralda Prospect Road / Proposed Mine Access intersection is anticipated to operate satisfactorily following the construction, operation and decommissioning of the development.

7.2 Turn Warrant Assessment

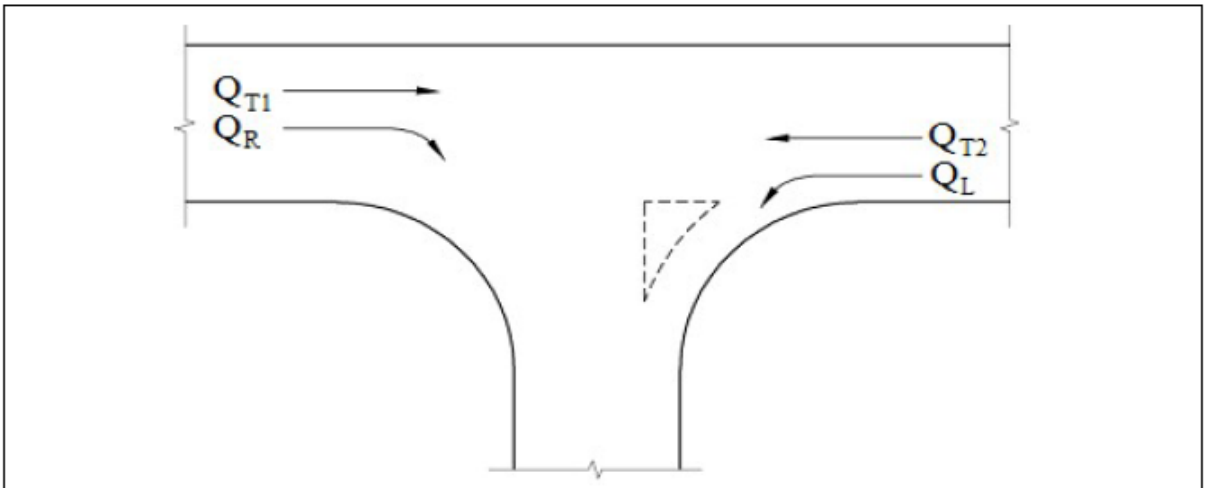
7.2.1 Turn Warrant Assessment Outcomes

Burchills has conducted a turn warrant assessment to confirm the required turn treatments most suitable for each key intersection. The turn warrant assessment has been undertaken in accordance with Department of Transport and Main Roads (DTMR) Road Planning and Design Manual Edition 2: Volume 3, supplement to the Austroads Guide to Traffic Management Part 6.

It is noted that the turn warrant assessment has been undertaken for the operational phase of the mine, as the resultant vehicle trips generated by the workforce and heavy vehicles are higher. The operational phase of the mine is anticipated to commence in 2028 and therefore a design horizon year 2038 has been utilised for this assessment.

A summary of the traffic movement parameters considered is outlined in Figure 7.4 below.

Figure 4A-2 - Calculation of the major road traffic volume parameter 'Q_M'



Road Type	Turn Type	Splitter Island	Q_M (veh/h)
2 Lane 2 Way	Right	No	= Q_{T1} + Q_{T2} + Q_L
		Yes	= Q_{T1} + Q_{T2}
	Left	Yes/No	= Q_{T2}
4 Lane 2 Way	Right	No	= 50% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 50% x Q_{T1} + Q_{T2}
	Left	Yes/No	= 50% x Q_{T2}

Figure 7.4 Turn Warrants Qm Traffic Flow Calculation

The turn warrant assessment has been undertaken for the following intersections:

- **INT 1:** Flinders Highway A6 / Larsen Street / Goldring Street intersection;
- **INT 2:** Richmond Road / Esmeralda Prospect Road intersection; and
- **INT 3:** Esmeralda Prospect Road / Proposed Mine Access intersection.

A summary of turn treatment requirements for each intersection is provided in Table 7.4 below.

Table 7.4 Turn Treatment Requirements

ID	Intersection	AM Peak		PM Peak		Upgrades Required
		Left Turn Treatment	Right Turn Treatment	Left Turn Treatment	Right Turn Treatment	
1	Flinders Highway A6 (S) / Larsen Street / Goldring Street	BAL	BAR	BAL	BAR	**No**
1	Flinders Highway A6 (S & W) / Goldring Street	BAL	BAR	BAL	BAR	**No**
2	Richmond Road / Esmeralda Prospect Road	BAL	BAR	BAL	BAR	**No**
3	Esmeralda Prospect Road / Proposed Mine Access	BAL	BAR	BAL	BAR	**No**

The detailed turn warrant assessment for each intersection is provided in the following sections of this report.

7.2.2 Flinders Highway A6 / Larsen Street / Goldring Street Intersection

The adopted volumes for the turn warrant assessment of the Flinders Highway A6 / Larsen Street / Goldring Street intersection are outlined in Table 7.5 with the turn warrant diagrams illustrated in Figure 7.5 and Figure 7.6 below.

The turn warrant assessment has been conducted for the following conditions:

- Year 2040 Background Traffic + Proposed Development Traffic (Year of Opening);
- Posted speed limit of 60km/hr along the Flinders Highway A6 and Goldring Street (design speed of 70km/hr); and
- With splitter island (north and south approach).

Table 7.5 Peak Hour Trips – Flinders Highway A6 / Larsen Street / Goldring Street Intersection

Traffic Volume	Larsen Street		Flinders Highway A6 (W)	
	AM peak hour	PM peak hour	AM peak hour	PM peak hour
QT1	28	39	29	28
QT2	29	28	39	39
QL	4	1	15	15
QR	5	7	18	16
QM Left	29	28	39	39
QM Right	57	68	68	82

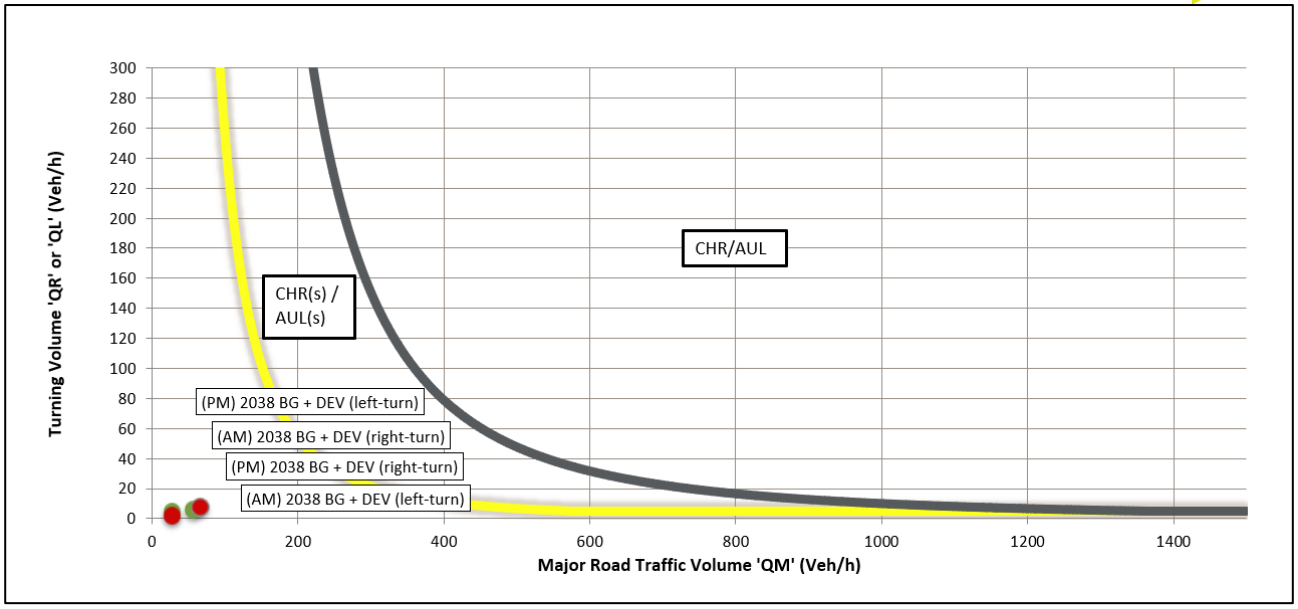


Figure 7.5 Turn Warrant Assessment – Flinders Highway A6 (S) / Larsen Street / Goldring Street Intersection

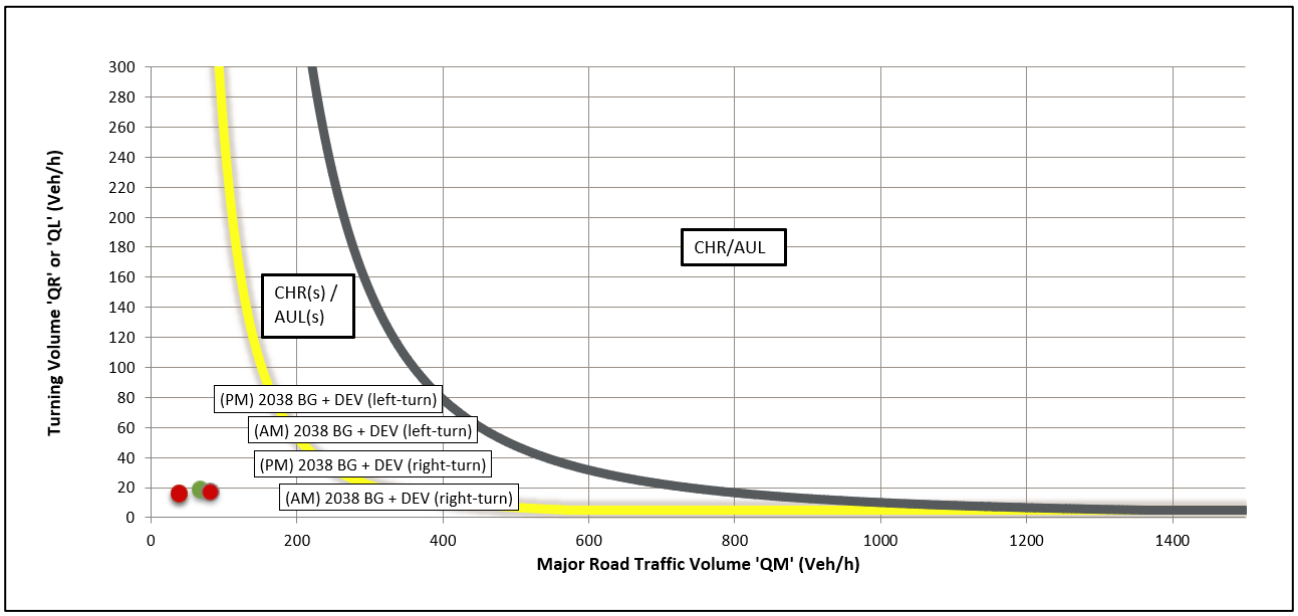


Figure 7.6 Turn Warrant Assessment – Flinders Highway A6 (S and W) / Goldring Street Intersection

Therefore, the turn warrant assessment determined that a Basic Left (BAL) and Basic Right (BAR) turn treatment are required at the Flinders Highway A6 / Larsen Street / Goldring Street intersection.

7.2.3 Richmond Road / Esmeralda Prospect Road Intersection

The adopted volumes for the turn warrant assessment of the Richmond Road / Esmeralda Prospect Road intersection are outlined in Table 7.6 with the turn warrant diagram illustrated in Figure 7.7 below.

Table 7.6 Peak Hour Trips – Richmond Road / Esmeralda Prospect Road Intersection

Traffic Volume	AM peak hour	PM peak hour
QT1	10	5
QT2	12	4
QL	10	10
QR	1	1
QM Left	12	4
QM Right	32	19

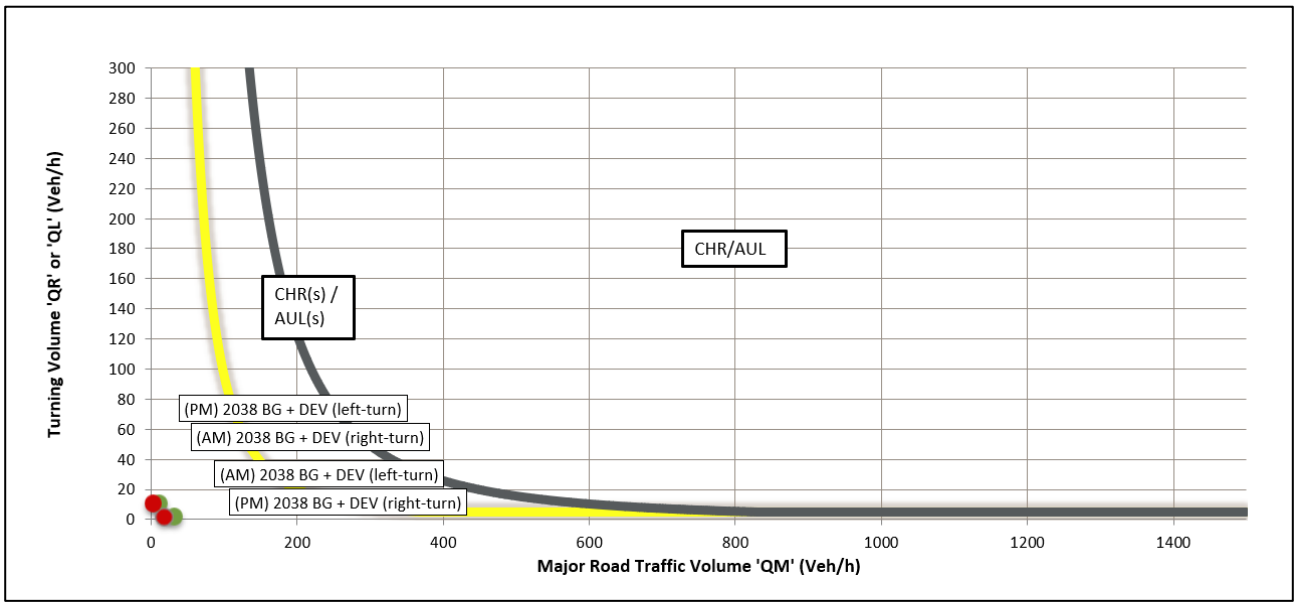


Figure 7.7 Turn Warrant Assessment – Richmond Road / Esmeralda Prospect Road Intersection

Therefore, the turn warrant assessment determined that a Basic Left (BAL) and Basic Right (BAR) turn treatment are required at the Richmond Road / Esmeralda Prospect Road intersection.

7.2.4 Esmeralda Prospect Road / Proposed Mine Access Intersection

The adopted volumes for the turn warrant assessment of the Esmeralda Prospect Road / Proposed Mine Access intersection are outlined in Table 7.7 with the turn warrant diagram illustrated in Figure 7.8 below.

Table 7.7 Peak Hour Trips – Esmeralda Prospect Road / Proposed Mine Access Intersection

Traffic Volume	AM peak hour	PM peak hour
QT1	1	1
QT2	1	1
QL	1	1
QR	11	11
QM Left	1	1
QM Right	3	3

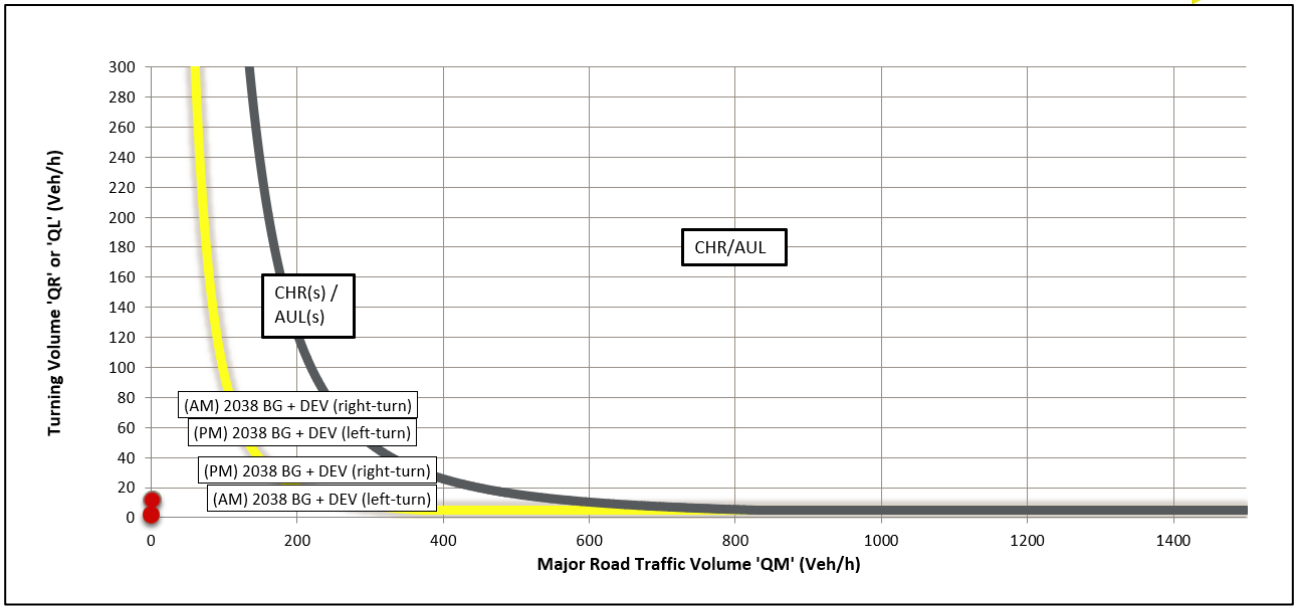


Figure 7.8 Turn Warrant Assessment – Esmeralda Prospect Road / Proposed Mine Access Intersection

Therefore, the turn warrant assessment determined that a Basic Left (BAL) and Basic Right (BAR) turn treatment are required at the Esmeralda Prospect Road / Proposed Mine Access intersection.

8. Mitigation Strategies

8.1 Sight Distance

Reference to Austroads Guide to Road Design indicates that the site access is required to provide a Safe Intersection Sight Distance (SISD) of 285m adopting a 110km/hr design speed and a driver reaction time of 2 seconds.

The site access intersection with Esmeralda Prospect Road has been designed to maximize the achievable sight distances, the following SISD are provided:

8.1.1 Access:

- 300m+ to the North; and
- 300m+ to the South.

Based on the above, the sight distance provisions at the site access points are considered to be satisfactory from a traffic engineering perspective. However as stated previously, as per DTMR's Supplement to Austroads Guide to Road Design Part 4A, acceptance for heavy vehicles greater than 19m semi-trailers (with respect to SISD time gaps) will need to confirmed/accepted by DTMR.

It is recommended that maintenance of the Esmeralda Prospect Road verge and vegetation be monitored to ensure that adequate sight distance is retained during the life of the project.

8.2 Cross-Section Fit for Use Assessment

The Average Annual Daily Traffic (AADT) for rural roads form the fit for use criteria. Desirable traffic lanes and shoulder widths are adopted to optimise safety and environmental impacts in regard to daily traffic volumes. Performance of single carriageway rural roads are detailed in Austroads *Guide to Road Design Part 3 Geometric Design.* Table 8.1 identifies desirable cross-sectional characteristics for varying design ADDT volumes.

Table 8.1 Single Carriageway Rural Road Width

Element	Design AADT				
	1-150	**150-500**	**500-1,000**	**1,000-3,000**	**>3,000**
Traffic Lanes (m)	3.7 (1 x 3.7)	6.2 (2 x 3.1)	6.2-7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Total Shoulder (m)	2.5	1.5	1.5	2.0	2.5
Minimum Shoulder Seal (m)	0	0.5	0.5	1.0	1.5
Total Carriageway (m)	8.7	9.2	9.2-10.0	11.0	12.0

Source: Austroads: Guide to Road Design Part 3 Geometric Design - 2016

The Austroads *Guide to Road Design Part 3 Geometric Design* identifies the desirable lane width for rural roads to be 3.5m to allow large vehicles to pass without either vehicle veering towards the outer edge of the lane. Project timing of project road use will dictate the validity of potential carriageway widening works.

We note that the above table from Austroads *Guide to Road Design Part 3 Geometric Design* has been considered for the purpose of this assessment given Richmond Road and Esmeralda Prospect Road are under the jurisdiction of CSC. The supplement published by DTMR is typically applicable to state-controlled roads, however subject to the discretion of Council.

8.2.1 Fit For Use Assessment

A fit for use assessment has been undertaken for Richmond Road/Richmond-Woolgar Road and Esmeralda Prospect Road based on three criteria:

- 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.

A road can be identified as unfit if any of the above three (3) criteria are not adequately met. For such cases, potential mitigation items should be identified to ameliorate the issues.

Based on the findings of the fit for use assessment, Richmond Road/Richmond-Woolgar Road is considered to be unfit for use in its current configuration. The potential mitigations have been recommended in the Table 8.2.

Table 8.2 Fit for use Assessment Richmond/Richmond-Woolgar 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 Richmond 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 Richmond 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 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.

Richmond Road and Richmond-Woolgar Road incorporates a range of physical features along its length including but not limited to:

- multiple single-width cattle grids;
- horizontal bends;
- single-width floodway bridges; and
- damaged road surface in some sections of the road.

To mitigate above mentioned issues, the following measures should be considered:

- Localised road widening to allow vehicles to pass each other simultaneously along the full length of road;
- Advanced warning signs to be installed before any crests and horizontal bends on both approaches;
- Give Way signage to be installed at narrow bridges and floodway crossings;
- Repair road surfaces with significant damage;
- Guideposts to be installed on each culvert; and
- Undertake regular maintenance.

In addition to the above mitigations, it is expected that an infrastructure agreement with the relevant local or state governing bodies would be entered into to address the ongoing use of road infrastructure and any future upgrades required for the Project.

Esmeralda Prospect Road has some narrow sections and an uneven road surface in some areas. To mitigate above mentioned issues, the following measures should be considered:

- Localised road widening to allow vehicles to pass each other simultaneously along the full length of road;
- Advanced warning signs to be placed to identify the location of the site access intersection;
- Give Way signage to be installed at any narrow points which are to be retained;
- Repair and maintain any damaged road surfaces;
- Guideposts to be installed on each culvert; and
- Undertake regular maintenance.

Furthermore, Burchills undertook a site visit (in 2025) along each of the subject roads to record and observe existing route constraints. The route constraints identified during this site visit are provided in Appendix F. We note these findings identify key design issues which will need to also be addressed and acknowledged as part of any future road upgrades while considering heavy vehicle suitability (I.e. B-doubles).

8.3 Impacts on Other Uses (Agriculture Freight)

The road network infrastructure surrounding the project is rural and mainly agriculture/stock land uses. The proposed project site would be connected to the public road network via Esmeralda Prospect Road, Richmond /Richmond-Woolgar Road and the Flinders Highway. The regional and local road networks relevant to the proposed project are identified in this EIS and it is considered that major stock routes are not affected.

The EIS Road Impact Assessment for the subject road network was undertaken in accordance with TMR's guidelines for the assessment of Road Impacts of Development. The road impacts included those affecting the operation of external intersection operation and road safety. Traffic operational impact was assessed on a worst-case scenario which indicates that the development is not anticipated to generate a significant impact on the external road network during construction or operation.

Based on the above, it is anticipated that the impact of the project on the time-sensitive agriculture freights on the adjacent road network will be very minimal during all stages of the project.

It is also can be anticipated that project operations at the Port of Townsville can be easily accommodated within the Ports of Townsville existing infrastructure.

8.4 Common User Infrastructure

There does not appear to be any current operational mines or other relevant project infrastructure in close proximity to the proposed Esmeralda Graphite Project, which could be shared to reduce the environmental

impacts. The existing logistic management to deliver freight is via road, which are established and are considered to be the current optimum solution to serve the Project.

8.5 Future Considerations

As part of future stages of the development, a Pavement Impact Assessment (PIA) will be undertaken in accordance with DTMR's GTIA and associated guidance documents. The PIA will assess the impacts of both construction and operational traffic on the surrounding road network and determine any applicable road contribution requirements (inclusive of a scoping assessment).

In addition, a Road Safety Audit (RSA) is proposed to be undertaken within the Richmond township for key intersections and haulage routes. The scope, extent and timing of the RSA will be confirmed during future stages of the project development and in consultation with relevant stakeholders.

A Road Use Management Plan (RMP) will also be completed in accordance with DTMR's GTIA. The RMP will outline the operational and administrative measures to manage construction and operational traffic impact on the road network (including mitigation measures). The scope will include the approved haulage routes and key intersections within the Richmond township. The timing of the RMP will also be confirmed during future stages of the project in consultation with relevant stakeholders.

Furthermore, we understand (at the time of preparing this report) that Graphinex are having on-going discussions with CSC and RSC regarding the extent and configuration of road upgrades. These matters will be discussed further as part of subsequent design and project development stages.

9. Transport Infrastructure Assessment

The transport infrastructure criteria of road links impacted by the Esmeralda Graphite Project traffic has been assessed according to the Guide to Traffic Impact Assessments (GTIA). The GTIA defines the impact assessment area as:

- All road links where the development traffic exceeds 5% of the base traffic in either direction on the link's AADT in the year of opening of each stage, or where Transport and Main Roads identifies prevailing structural integrity issues of transport infrastructure (for example, bridges or culverts.

Noting that the level of development generated impact will be highest during the construction period, a transport infrastructure scoping assessment has been undertaken for the worst-case scenario.

9.1 Scoping Assessment

Transport Infrastructure has been assessed using the average daily development volumes for the site using heavy vehicle estimates only noting that 95% of the staff are expected to arrive via the on-site airstrip The analysis has been performed in accordance with TMR's GTIA. We note that assessment has been undertaken based on the likely haulage route from the site via Richmond, Charters Towers and the Port of Townville via the state-controlled network, as described Section 4.4 and Table 4.10. The AADT volumes have been based on DTMR open-source data for each segment. The results of this analysis are shown in Table 9.1, noting that the AADT and Impacts are based on the DTMR

Table 9.1 Link Performance with Baseline AADT Traffic Volumes (Construction)

Road	Section	2027		
		AADT (2027)	Development Volume	Impact
Flinders Highway	East of Goldring Road	436	62vpd	14%
Flinders Highway	West of Golding Road	339	12vpd	3.5%
Flinders Highway	Hughenden (Site: 100055)	735	62vpd	8.4%
Flinders Highway	Far East of Hughenden (Site: 100107)	600	62vpd	10.3%
Flinders Highway	Far West of Charters Towers (Site: 90009)	798	62vpd	7.8%
Flinders Highway	East of Charters Towers (Site: 91324)	1240	62vpd	5.0%
Flinders Highway	Charters Towers (Site: 91299)	3399	62vpd	1.8%
Flinders Highway	Charters Towers (Site: 91329)	3071	62vpd	2.0%
Flinders Highway	Charters Towers (Site: 91328)	2662	62vpd	2.3%
Flinders Highway	Townsville	2647	62vpd	2.3%
Flinders Highway	Townsville	7958	62vpd	0.8%

A summary of the link performance during the operational phase is summarised in Table 9.2

Table 9.2 Link Performance with Baseline Traffic Volumes (Operation Only)

Road	Section	2028		
		AADT (2028)	Development Volume	Impact
Flinders Highway	East of Goldring Road	440	46vpd	11%
Flinders Highway	West of Golding Road	342	12vpd	3.5%
Flinders Highway	Hughenden (Site: 100055)	743	46vpd	6.2%
Flinders Highway	Far East of Hughenden (Site: 100107)	606	46vpd	7.6%
Flinders Highway	Far West of Charters Towers (Site: 90009)	806	46vpd	5.7%
Flinders Highway	East of Charters Towers (Site: 91324)	1252	46vpd	3.7%
Flinders Highway	Charters Towers (Site: 91299)	3432	46vpd	1.3%
Flinders Highway	Charters Towers (Site: 91329)	3101	46vpd	1.5%
Flinders Highway	Charters Towers (Site: 91328)	2688	46vpd	1.7%
Flinders Highway	Townsville	2673	46vpd	1.7%
Flinders Highway	Townsville	8035	46vpd	0.6%

While the proposed development does exceed 5% of background volumes in some locations, this is due to the low levels of traffic on the Flinders Highway west of Charters Towers. We note the AADT from Charters Towers towards the east is generally higher given the proximity to Townville and connections to the north and south of regions on Queensland. As such, the traffic generated by the proposed development does not exceed the 5% threshold outlined in TMR's GTIA, to the east of Charters Towers for construction or operation.

It is noted that the impacts of road haulage and deliveries on the Flinders Highway will be addressed via pavement contributions made by the Esmeralda Graphite Project to TMR. In addition, Flinders Highway is a gazetted Type 2 Road Train (53.5m road trains up to A-triple's) haulage route. As such, no additional assessment of the transport infrastructure on the Flinders Highway has been undertaken.

On the basis of the above, no further transport infrastructure assessment is considered to be necessary on subject roads.

10. Road Safety Assessment

Reference to TMRs GTIA indicates that road safety is to be considered 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.

For the purposes of this assessment a road safety assessment was undertaken. In terms of road safety, TMR's GTIA 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)."

Table 10.1 below are details of the required safety risk score matrix outlined in the GTIA.

Table 10.1 Risk Safety Matrix

		Potential consequence				
		Property only (1)	Minor injury (2)	Medical treatment (3)	Hospitalisation (4)	Fatality (5)
Potential likelihood	Almost certain (5)	M	M	H	H	H
	Likely (4)	M	M	M	H	H
	Moderate (3)	L	M	M	M	H
	Unlikely (2)	L	L	M	M	M
	Rare (1)	L	L	L	M	M

A summary of the identified risks is provided in the following sections.

10.1 Identified Risks

In identifying risks, it's important to note that the route currently accommodates heavy vehicles including haulage vehicles. The following road safety risks have been identified.

- 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/Richmond-Woolgar 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.

10.2 Risk Assessment

The Road Safety Assessment has documented its findings by numbered issues referenced to locations within the study area. Recommendations for potential remedial treatments have been identified and each issue is allocated with a priority, as shown in Table 10.2.

Table 10.2 Specific Issues and Recommendations

	Issue Description	Without Development			With Development			Recommendation	Residual Risk		
		L	C	Risk	L	C	Risk		L	C	Risk
1	> Minor increase to turning movements at the existing intersections. > Flinders Highway/Goldring Street, Flinders Highway/Crawford Street, Richmond Road/ Esmeralda Prospect Road, Esmeralda Prospect Road/Site Access intersections. > This may result in minor increases in the potential for incidents.	2	3	M	3	3	M	> Measures to mitigate the identified risks will include monitoring workforce hours, monitoring of driver behaviours, and implementing standard operating procedures. > Drivers will also strictly adhere to existing speed limits and road rules. > Driver standard operating procedures to include details on flora and fauna impacts. > No transit permitted during and immediately following wet weather. No standing water to be present on gravel road surfaces before heavy vehicle movements commence. > Condition assessment of the route prior to commencement of permit vehicles.	2	3	M

	Issue Description	Without Development			With Development			Recommendation	Residual Risk		
		L	C	Risk	L	C	Risk		L	C	Risk
2	> Minor increase to turning movements at existing road links > Flinders Highway, Esmeralda Prospect Road, Richmond Road/Richmond-Woolgar Road, Goldring Street. > This may increase the potential for incidents on these road links > Noise Impacts outside project area > Impact of other road users, Stock vehicles and school buses.	2	3	M	3	3	M	> Measures to mitigate the identified risks will include monitoring workforce hours, monitoring of driver behaviors, and implementing standard operating procedures. > Drivers will also strictly adhere to existing speed limits and road rules. > Driver standard operating procedures to include details on flora and fauna impacts. > No transit will be permitted during and immediately following wet weather. No standing water to be present on gravel road surfaces before heavy vehicle movements commence (included in a Road Use Management Plan) > Condition assessment of the route prior to commencement of permit vehicles. > In order to minimise vehicle noise, vehicle movements will be curtailed during the hours of darkness and will be part of the Road Use Management Plan. > Road Use Management Plan to include driver interaction with other road users such as other road users, bus and stock vehicles, where priority is given to other vehicles or slower speeds are adopted. Development vehicles to not overtake buses	2	3	M
3	> Increase in OSOM vehicles on road links and key intersections where OSOM vehicles require access to the site.	1	3	M	3	3	M	> All OSOM vehicles will operate under a Traffic Management Plan. > All wide loads to have pilot and escort vehicles. > Signage for Radio / mobile call up points at either end of the route for advice to other road users of transport movements and delays. > Traffic control at property entrances when load is in transit along the route. > Selective tree and vegetation trimming and management to provide load clearance	2	3	M

	Issue Description	Without Development			With Development			Recommendation	Residual Risk		
		L	C	Risk	L	C	Risk		L	C	Risk
4	> Risk of incidents due to driver fatigue.	2	4	M	2	4	M	> Measures to mitigate the identified risks will include monitoring workforce hours, monitoring of driver behaviors, and implementing standard operating procedures. > Driver fatigue to be managed and overseen by the heavy vehicle operators with a Road Use Management Plan > Road Use Management Plan to include mitigation on flora and fauna impacts.	2	4	M

In addition to the above assessment, it is important to note that:

- Flinders Highway is classified as a gazette B-double, Road Train Type 1 and Road Train Type 2 network;
- The intersections are currently existing heavy vehicle routes;
- Sight distances at the intersections accord with Austroads Guide to Road Design;
- Richmond Road/Richmond-Woolgar Road is currently used as a heavy vehicle and freight route;
- No incident trends have been identified at the intersections during the last five years; and
- The increase in traffic volumes associated with the haulage is not anticipated to increase the risk rating as identified in Table 10.2. As such, no additional mitigation measures are required in accordance with the GTIA.

On the basis of the above, the proposed application is considered to be satisfactory from a road safety perspective.

11. Summary and Conclusions

Burchills Engineering Solutions (Burchills) has been commissioned by Qld Aus Graphite Pty Ltd to produce an Environmental Impact Statement Transport Assessment (EISTA) for the Esmeralda Graphite Project located in Esmeralda, Queensland. The site is located within the Croydon Shire Council (CSC) local government area.

The proposed Esmeralda Graphite Project will be assessed under the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

The Esmeralda Graphite Project is a proposed open cut graphite mine, located approximately 70 km south of Croydon, Queensland, Australia. The Project proposes mining of the Esmeralda Granite Unit and on-site concentration of graphite ore.

In light of the above, the following concluding statements are made:

Background Information:

- The key road network assessed as park of this Project includes four (4) intersections;
- The SISD achievements at all intersections meet the minimum sight distance requirements of the Austroads Guide to Road Desing Part 4A;
- The crash analysis determined that no vehicle crashes have occurred within the last 5-year period at each study intersection;
- The crash analysis determined that within the last 5-year period of recorded data, a total of four (4) vehicle crashes have occurred along the key road network;
- The nearest rail facility to the project is Richmond Railway Station situated south of Goldring Street;
- The nearest port facility to the project is the Port of Townsville, which is located to the east of the site respectively; and
- The nearest airports to the Project site are the Richmond Airport and the Georgetown Airport, which are located to the south and north of the site respectively.

Proposed Operations:

- It is anticipated that a total of 52 heavy vehicle movements per day will be generated by the mine during the construction phase;
- It is anticipated that a total of 15 heavy vehicle movements per day will be generated by the mine during stage 1 of the operations phase;
- It is anticipated that a total of 26 heavy vehicle movements per day will be generated by the mine during Stage 2 of the operations phase;
- It is anticipated that a total of 26 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;
- A peak of 192 staff members will be on-site at any one time during the operations phase of the mine;
- The construction phase will generate a peak of 100 staff members, and it has been assumed that the decommissioning phase will generate a peak of 50 staff members, on-site at any one time;
- The workforce will operate over a 12-hour shift per roster, for five (5) days on and two (2) days off. It is understood that roster changeover will occur every 14 days;
- The construction / decommissioning workforce is divided into two (2) crews which will be rotated every five (5) days;
- 95% of the workforce for all phases of the mine are anticipated to travel to site via Fly-in / Fly-out (FIFO) and then bussed to site; and

- 5% of the workforce for all phases of the mine are anticipated to travel to site via drive-in / drive-out (DIDO) via private vehicles.

Transport Assessment:

- Traffic surveys were undertaken during the typical AM and PM peak hour periods at a total of two (2) intersections;
- The peak hour vehicle trips have been determined utilising the anticipated workforce numbers within each phase, as well as the accommodation and transportation mode distributions;
- It is anticipated that a total of 10 private vehicle trips and 5 heavy vehicle trips will be generated in the AM and PM peak hours during the construction phase of the mine;
- It is anticipated that a total of 20 private vehicle trips and 3 heavy vehicle trips will be generated in the AM and PM peak hours during the operations phase of the mine;
- It is anticipated that a total of 5 private vehicle trips and 3 heavy vehicle trips will be generated in the AM and PM peak hours during the decommissioning phase of the mine;
- It is noted that 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;
- It is anticipated that the proposed Project will not adversely impact the operations of the surrounding port and airport facilities;
- The SIDRA Assessment indicated that no upgrades will be required at each assessed intersection; and
- The turn Warrant Assessment indicated that no upgrades will be required at each assessed intersection.

In addition to the above, the following recommendations and/or other considerations have been made:

- It is recommended that maintenance of the Esmeralda Prospect Road verge and vegetation be monitored to ensure that adequate sight distance is retained during the life of the project;
- Mitigation measures have been provided to ensure that Richmond Road/Richmond-Woolgar Road will be fit for use, including Esmeralda Prospect Road; and
- A number of safety mitigation measures have been identified to ensure that vehicle trips generated by the Project are able to safely travel on the key road network assessed.

12. References

Department of Transport and Main Roads (DTMR) 2021, Road Planning and Design Manual: Supplement to Austroads Guide to Road Design Part 4A: *Unsignalised and Signalised Intersections*.

Austroads Guide to Traffic Management Part 6: *Intersections, Interchanges and Crossings Management.*

Austroads Guide to Road Design Part 3: *Geometric Design.*

Department of Transport and Main Roads (DTMR) *Road Planning and Design Manual (RPDM) Edition 2: Volume 3.*

Department of Main Roads 2018, *Guide to Traffic Impact Assessment (GTIA)*.

Graphinex and WAVE International Operations Management: *Esmeralda Graphite Project Pre-Feasibility Study.*

Department of Main Roads 2006, *Guidelines for Assessment of Road Impacts of Development*, Queensland Government, Brisbane.

Appendix A – Concept Site Layout

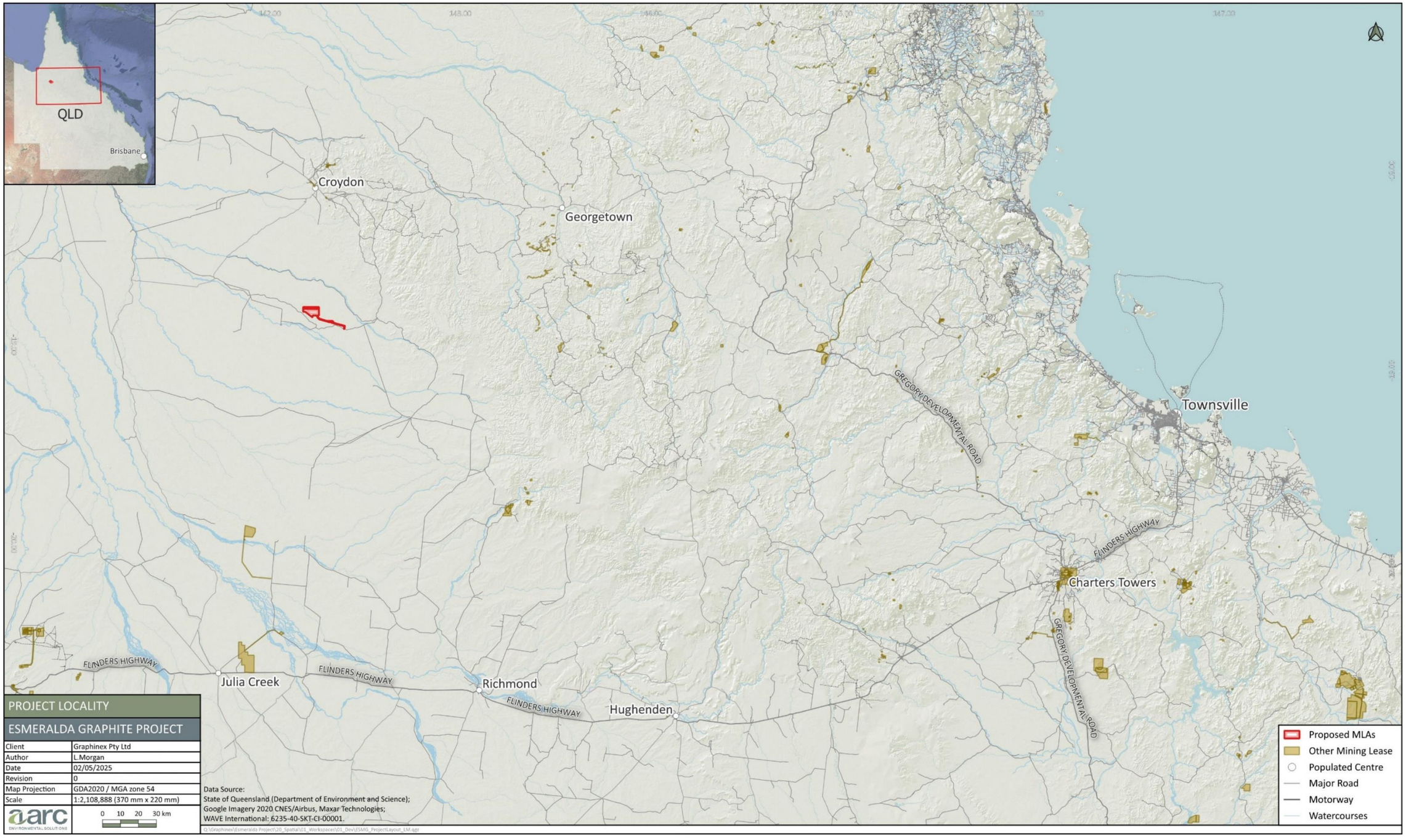


Figure 1: Project location

Appendix B – Traffic Survey Data

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 1 **Weather:** Fine

Location: Flinders Highway (Goldring Street)/Larsen Street, Richmond

Day/Date: Tuesday, 28 October 2025

Summary: 12 Hour Volumes : *6:00 AM to 6:00 PM*

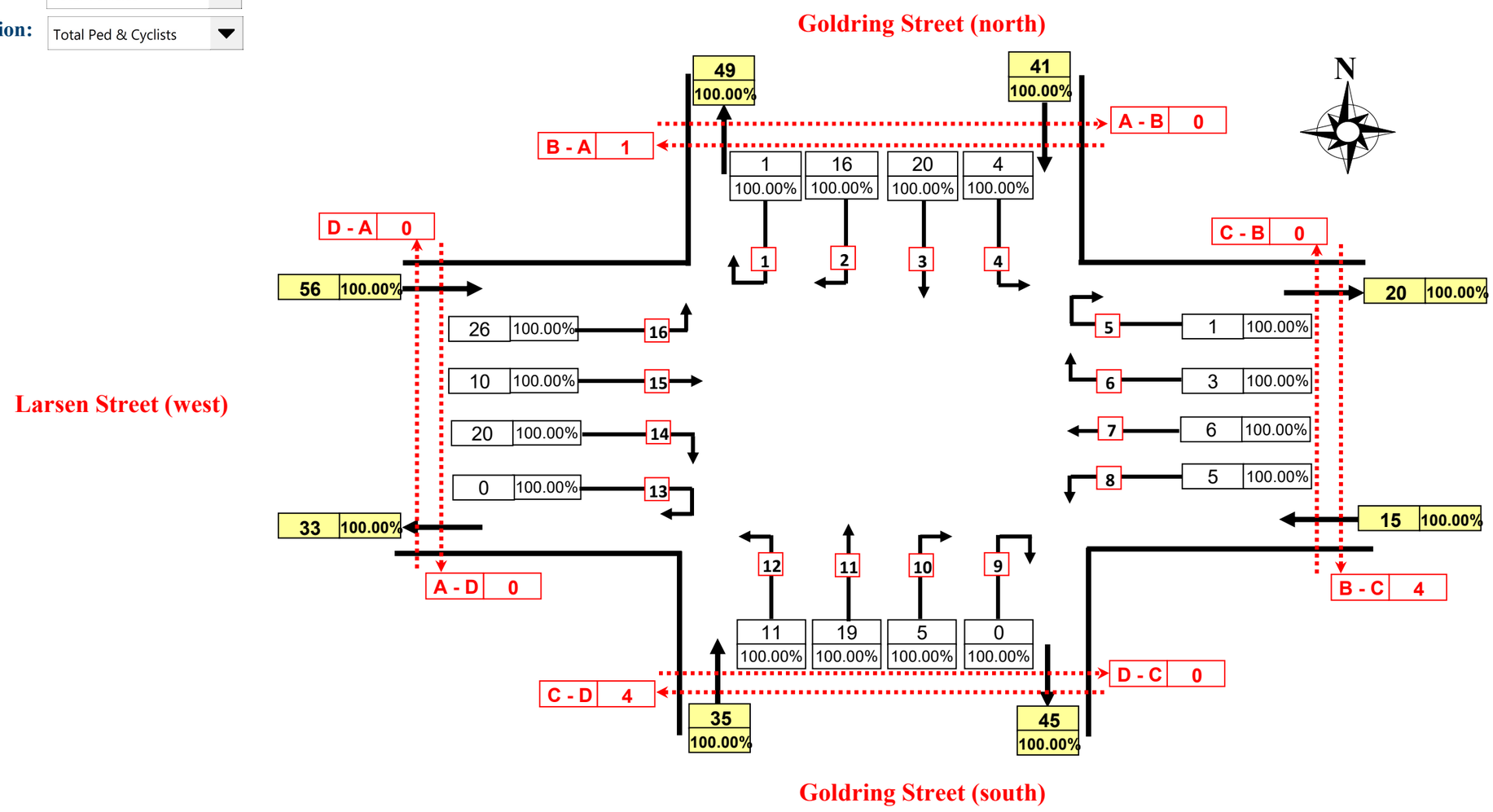
AM Peak : *Hour ending - 8:30 AM*

PM Peak : *Hour ending - 4:30 PM*

Hour Ending: 8:30 AM

On-road classification: Total Vehicles

Off-road classification: Total Ped & Cyclists



Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 1 **Weather:** Fine

Location: Flinders Highway (Goldring Street)/Larsen Street, Richmond

Day/Date: Tuesday, 28 October 2025

Summary: 12 Hour Volumes : *6:00 AM to 6:00 PM*

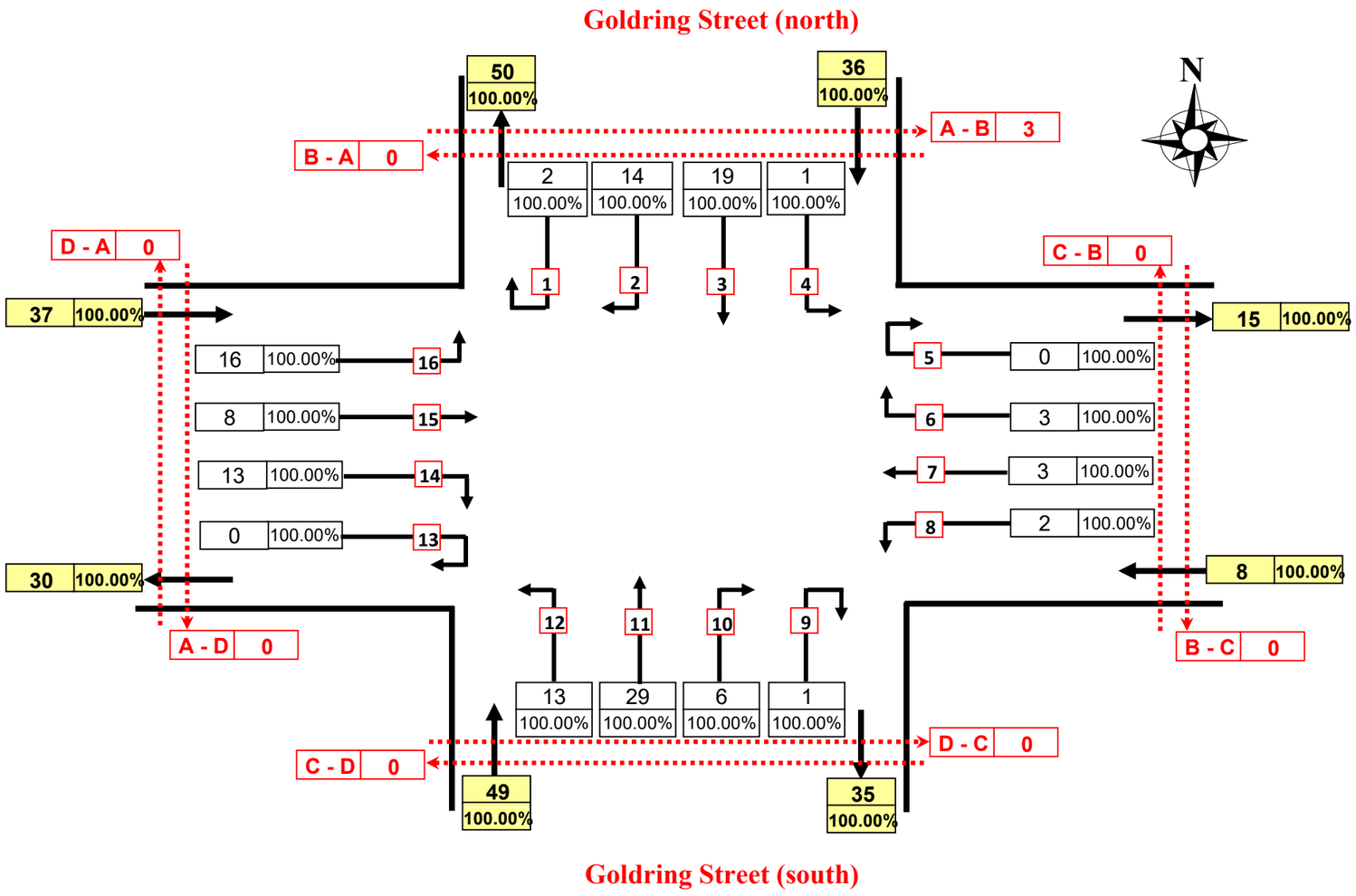
AM Peak : *Hour ending - 8:30 AM*

PM Peak : *Hour ending - 4:30 PM*

Hour Ending: 4:30 PM

On-road classification: Total Vehicles

Off-road classification: Total Ped & Cyclists



Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 2 **Weather:** Fine

Location: Croydon Road/Aerodrome Road, Richmond

Day/Date: Tuesday, 28 October 2025

Summary: 12 Hour Volumes : *6:00 AM to 6:00 PM*

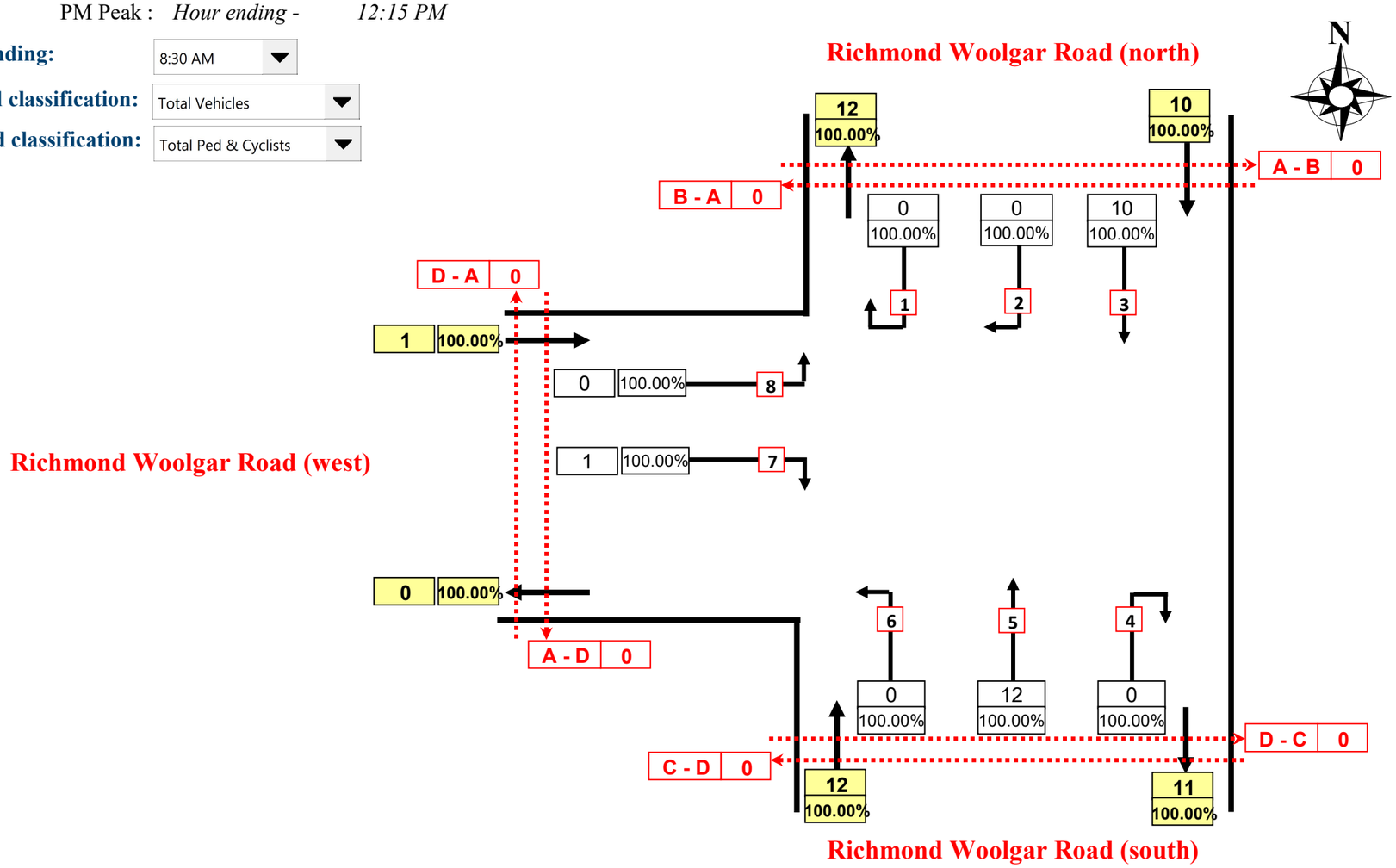
AM Peak : *Hour ending - 12:00 PM*

PM Peak : *Hour ending - 12:15 PM*

Hour Ending: 8:30 AM

On-road classification: Total Vehicles

Off-road classification: Total Ped & Cyclists



Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

AUSTRAFFIC VIDEO INTERSECTION COUNT

Site No.: 2 **Weather:** Fine

Location: Croydon Road/Aerodrome Road, Richmond

Day/Date: Tuesday, 28 October 2025

Summary: 12 Hour Volumes : *6:00 AM to 6:00 PM*

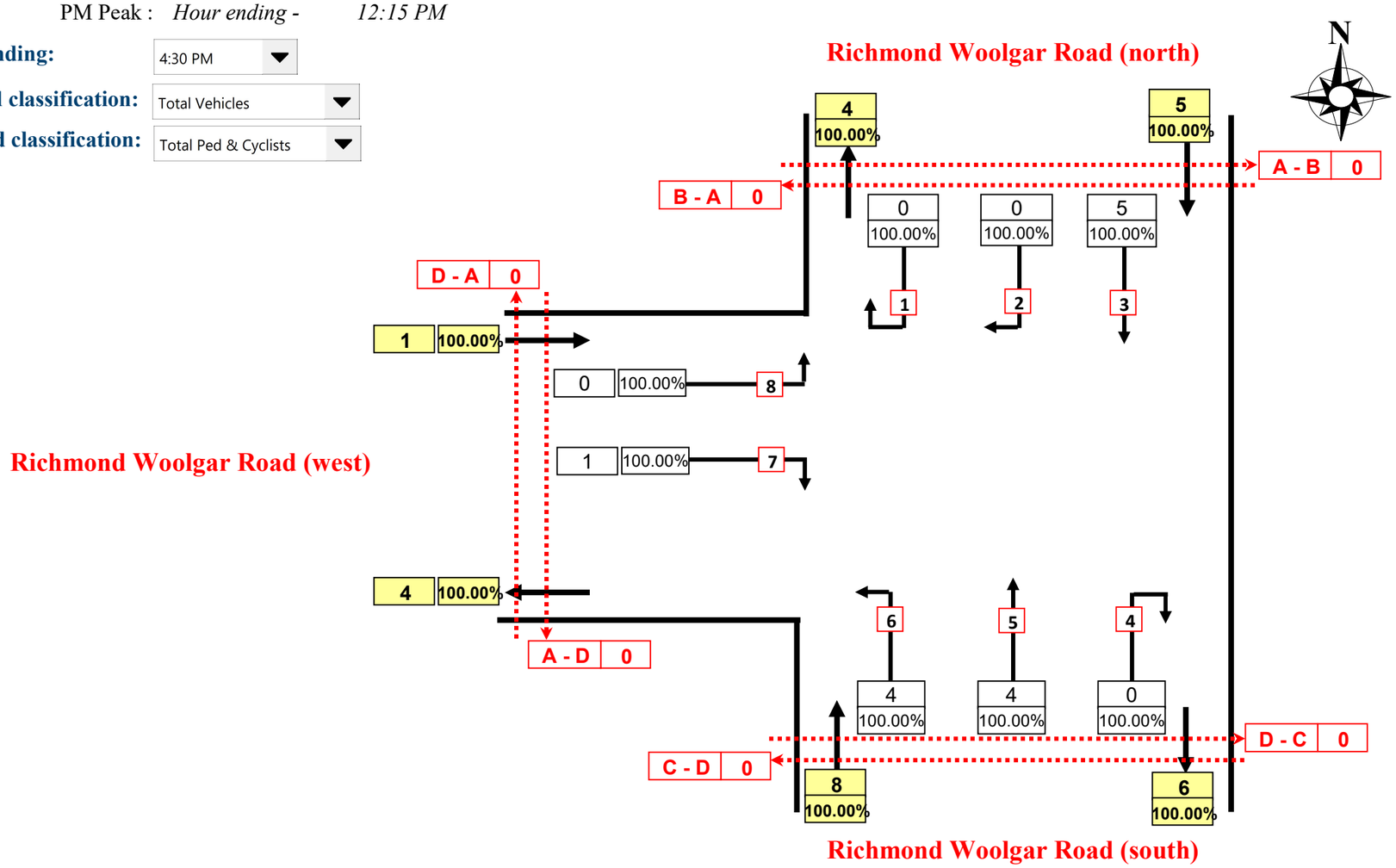
AM Peak : *Hour ending - 12:00 PM*

PM Peak : *Hour ending - 12:15 PM*

Hour Ending: 4:30 PM

On-road classification: Total Vehicles

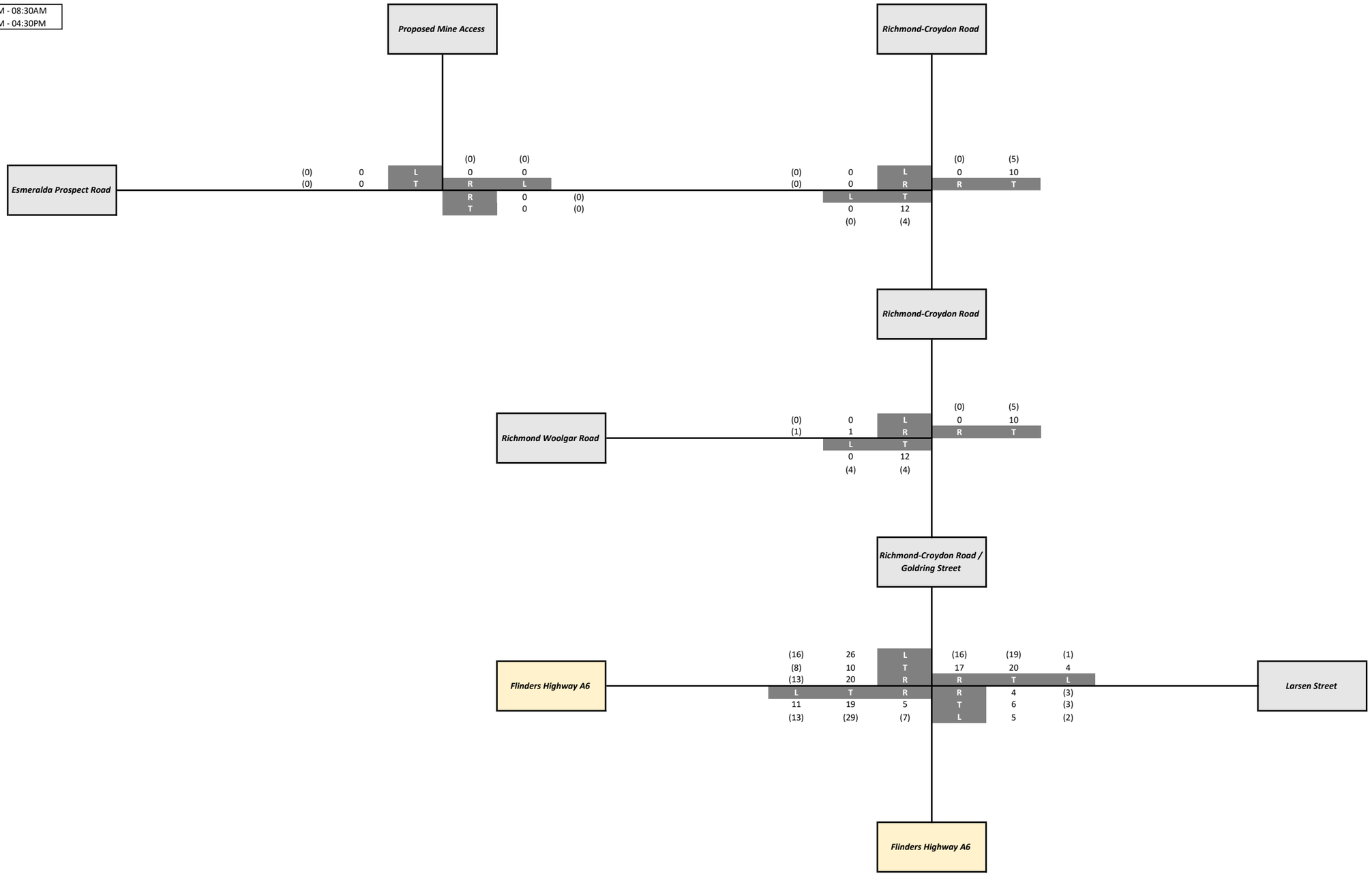
Off-road classification: Total Ped & Cyclists



Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

Appendix C – Traffic Flow Diagram

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



BURCHILLS ENGINEERING SOLUTIONS

2025 Background Traffic Volumes

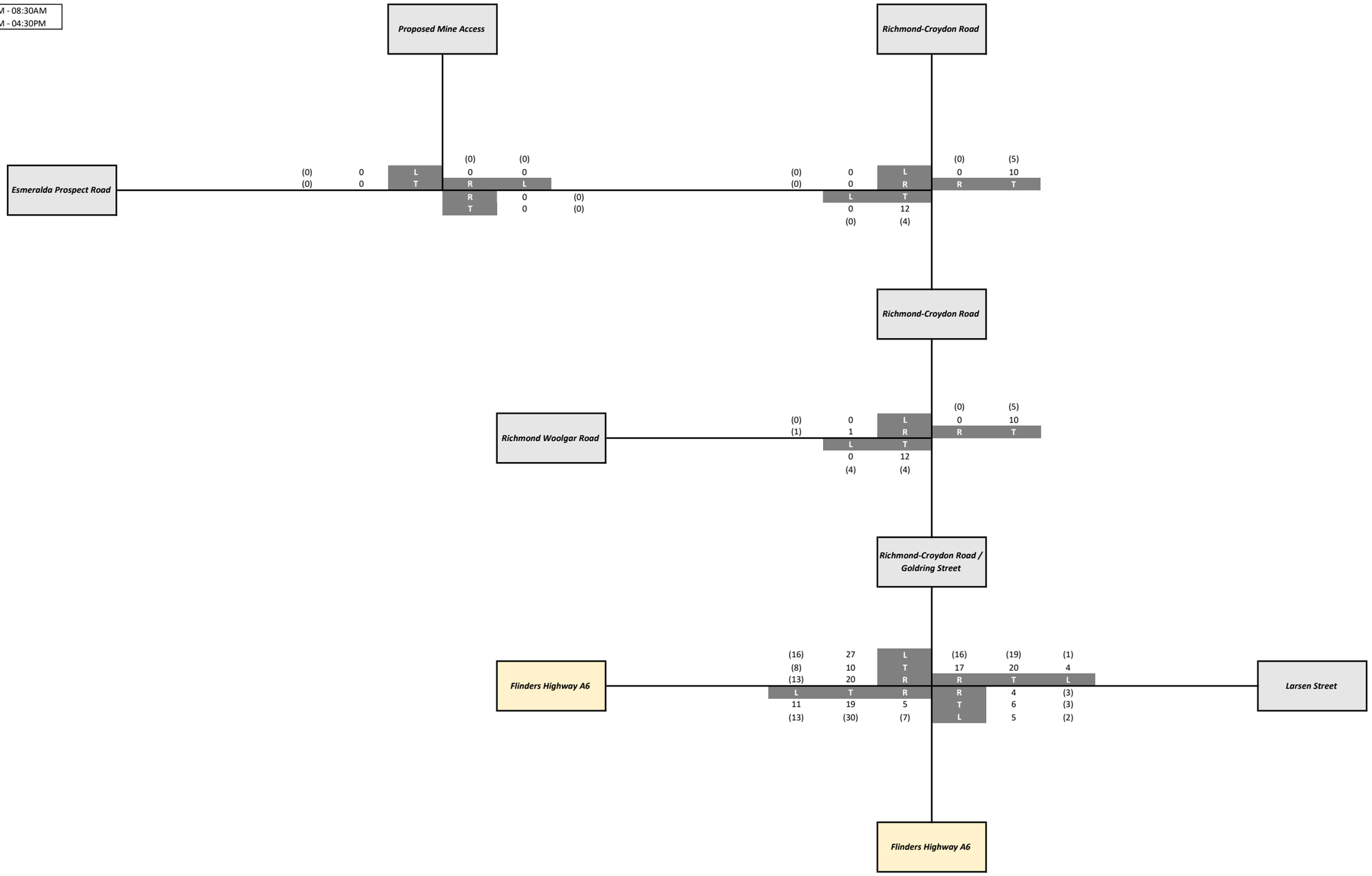
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



BURCHILLS ENGINEERING SOLUTIONS

2027 Background Traffic Volumes

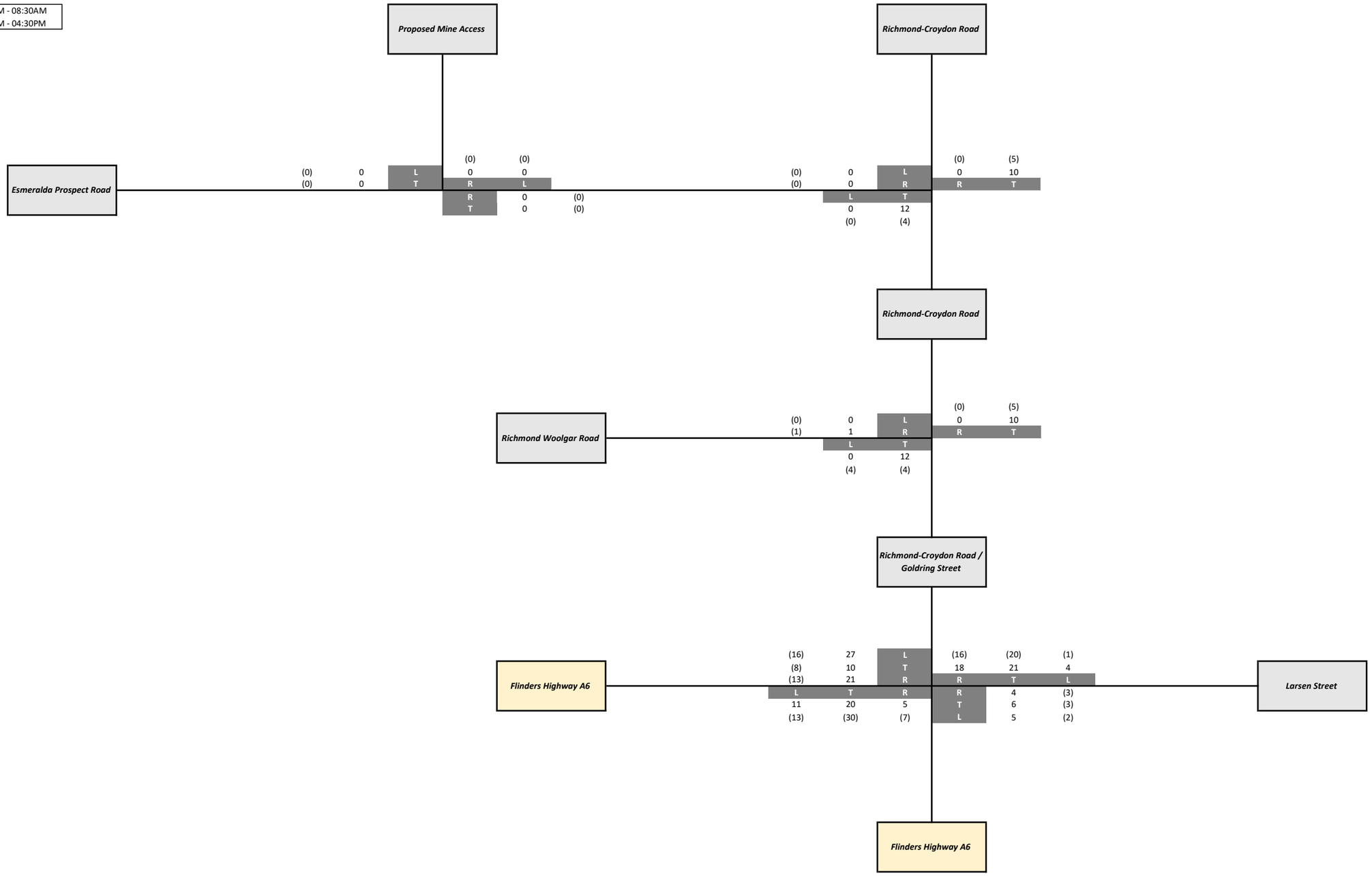
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



BURCHILLS ENGINEERING SOLUTIONS

2028 Background Traffic Volumes

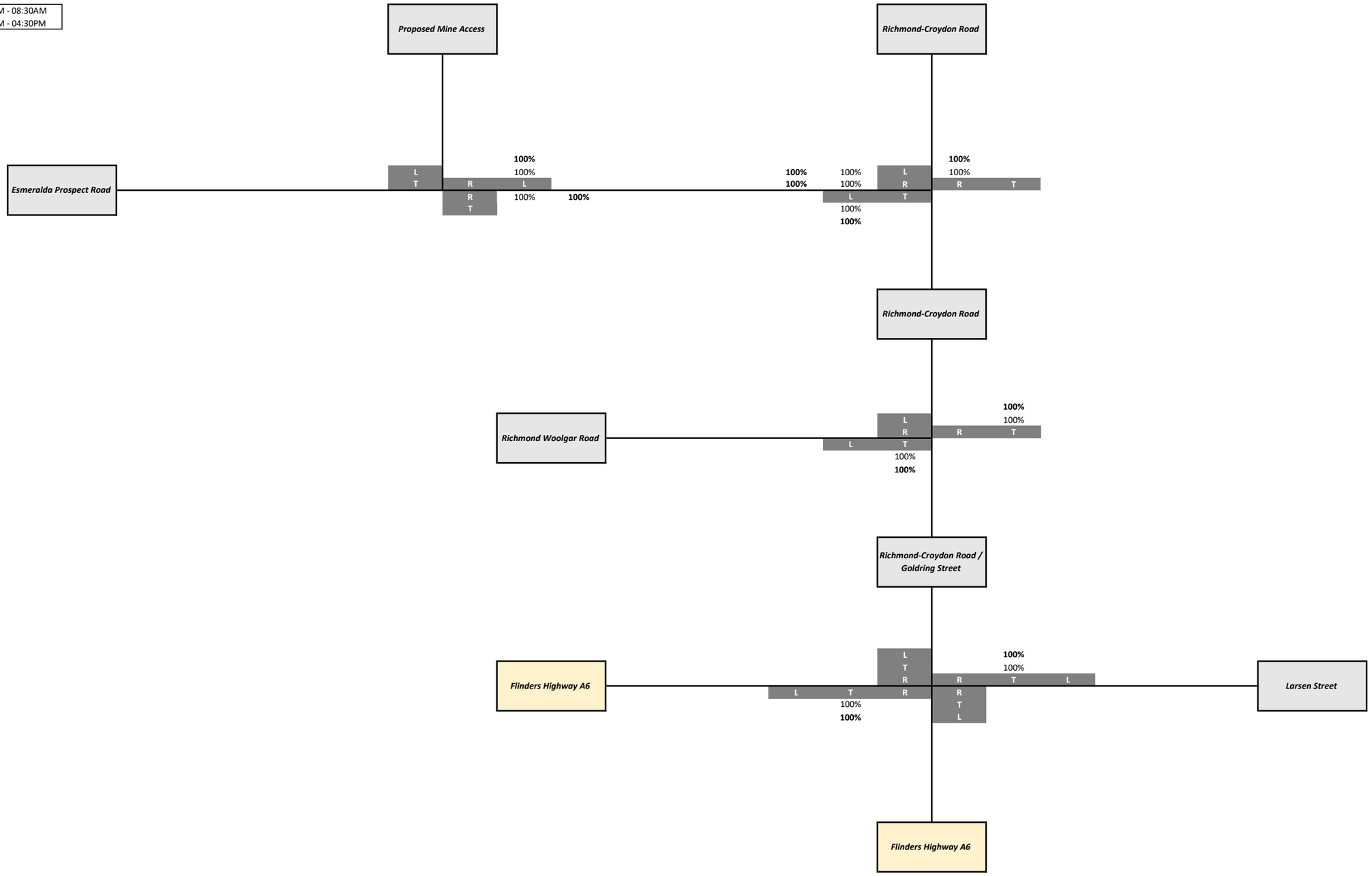
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



BURCHILLS ENGINEERING SOLUTIONS

Traffic Distribution for Private Vehicles

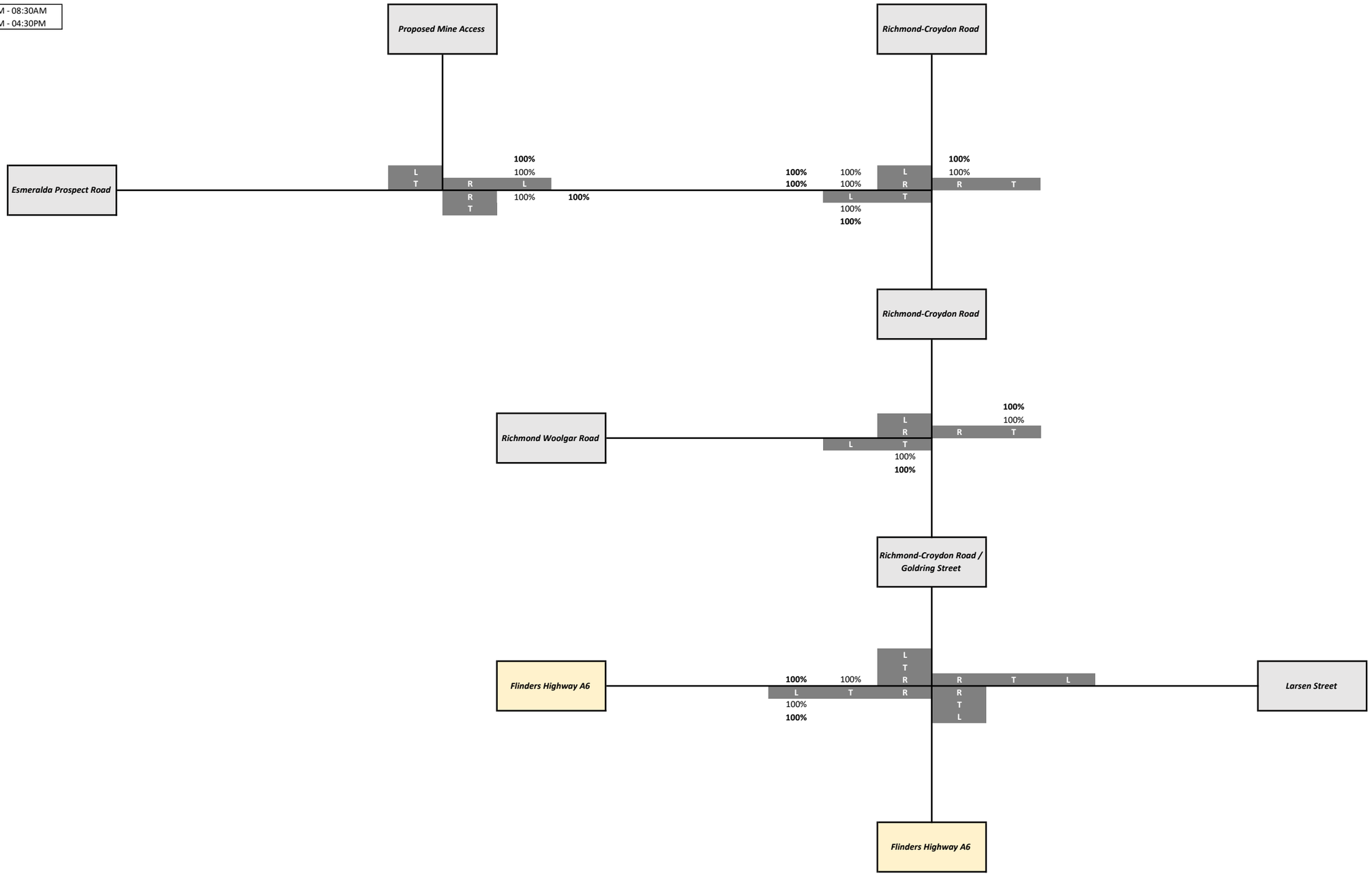
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



BURCHILLS ENGINEERING SOLUTIONS

Traffic Distribution for Heavy Vehicles

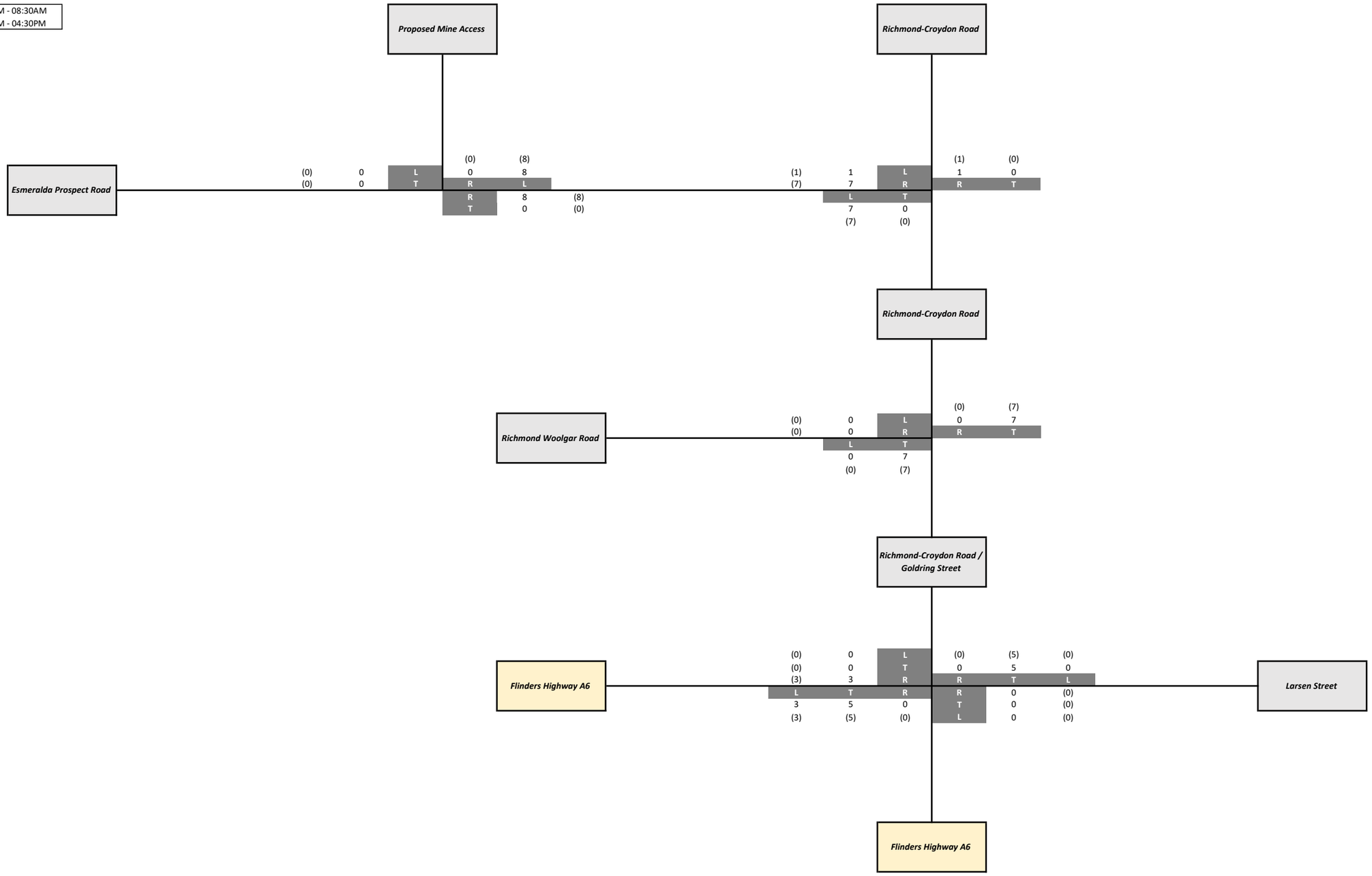
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



Development Traffic - Construction

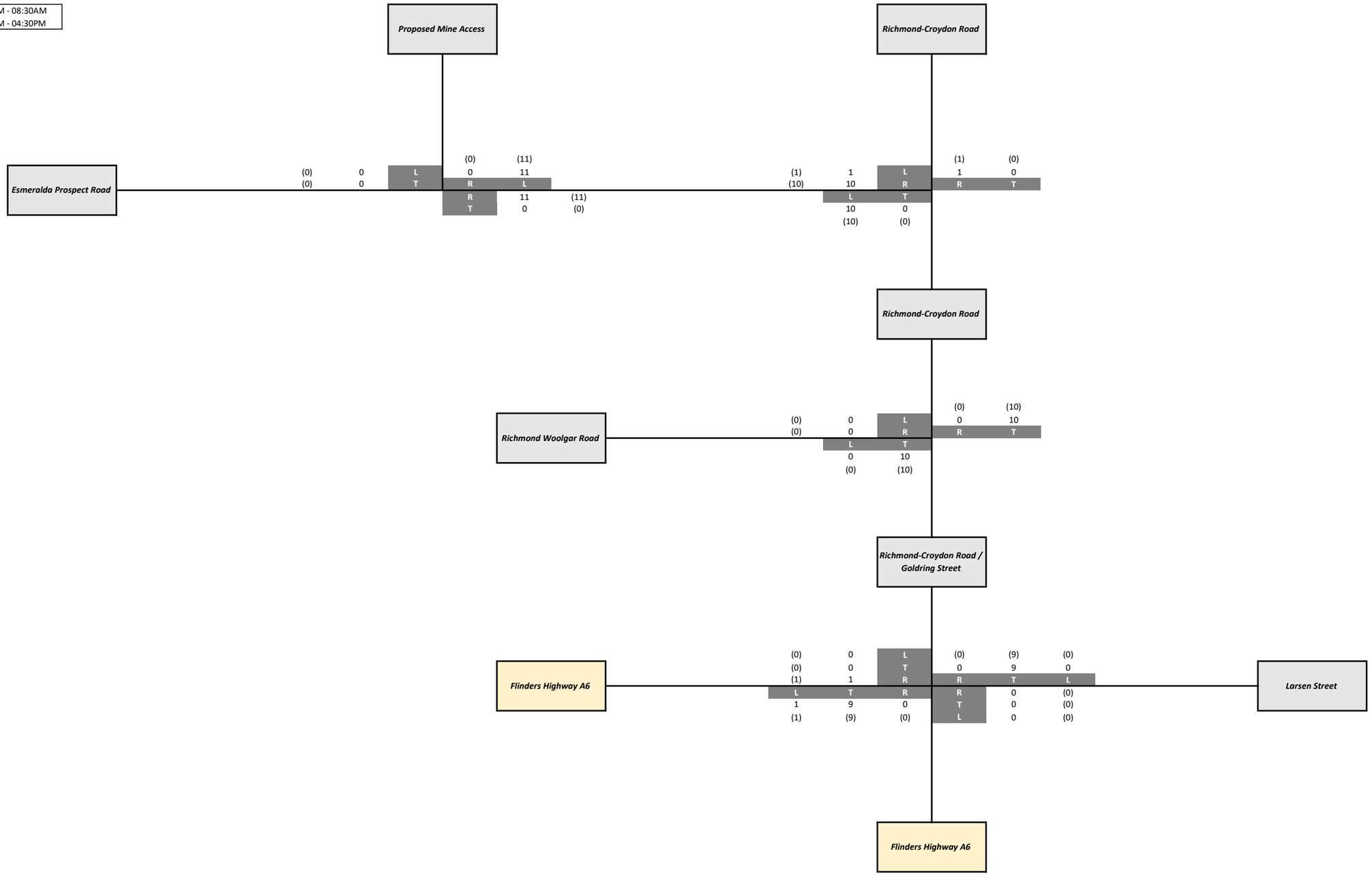
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



BURCHILLS ENGINEERING SOLUTIONS

Development Traffic - Operations

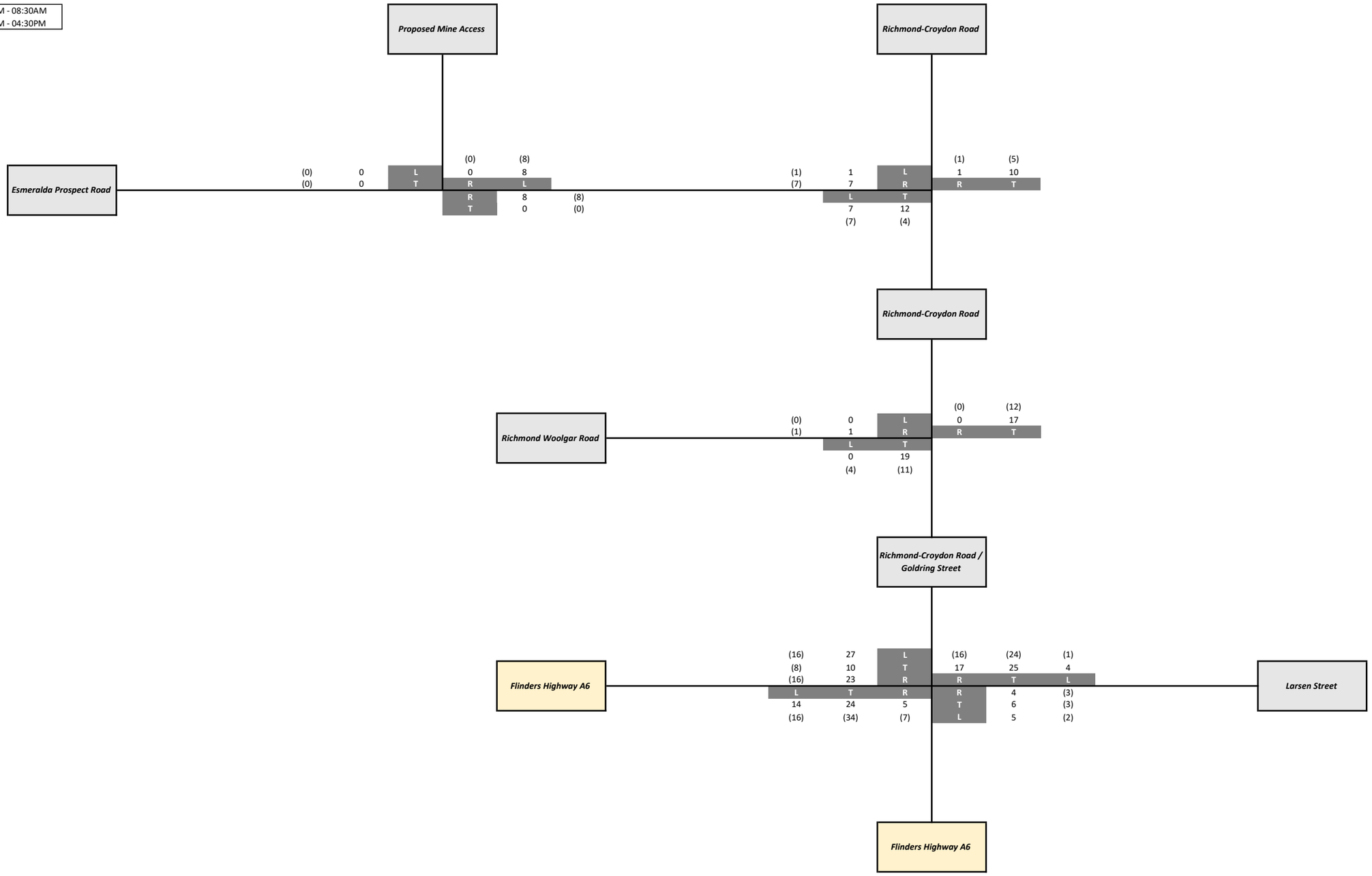
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



2027 Background Traffic Volumes + Construction Traffic

BURCHILLS ENGINEERING SOLUTIONS

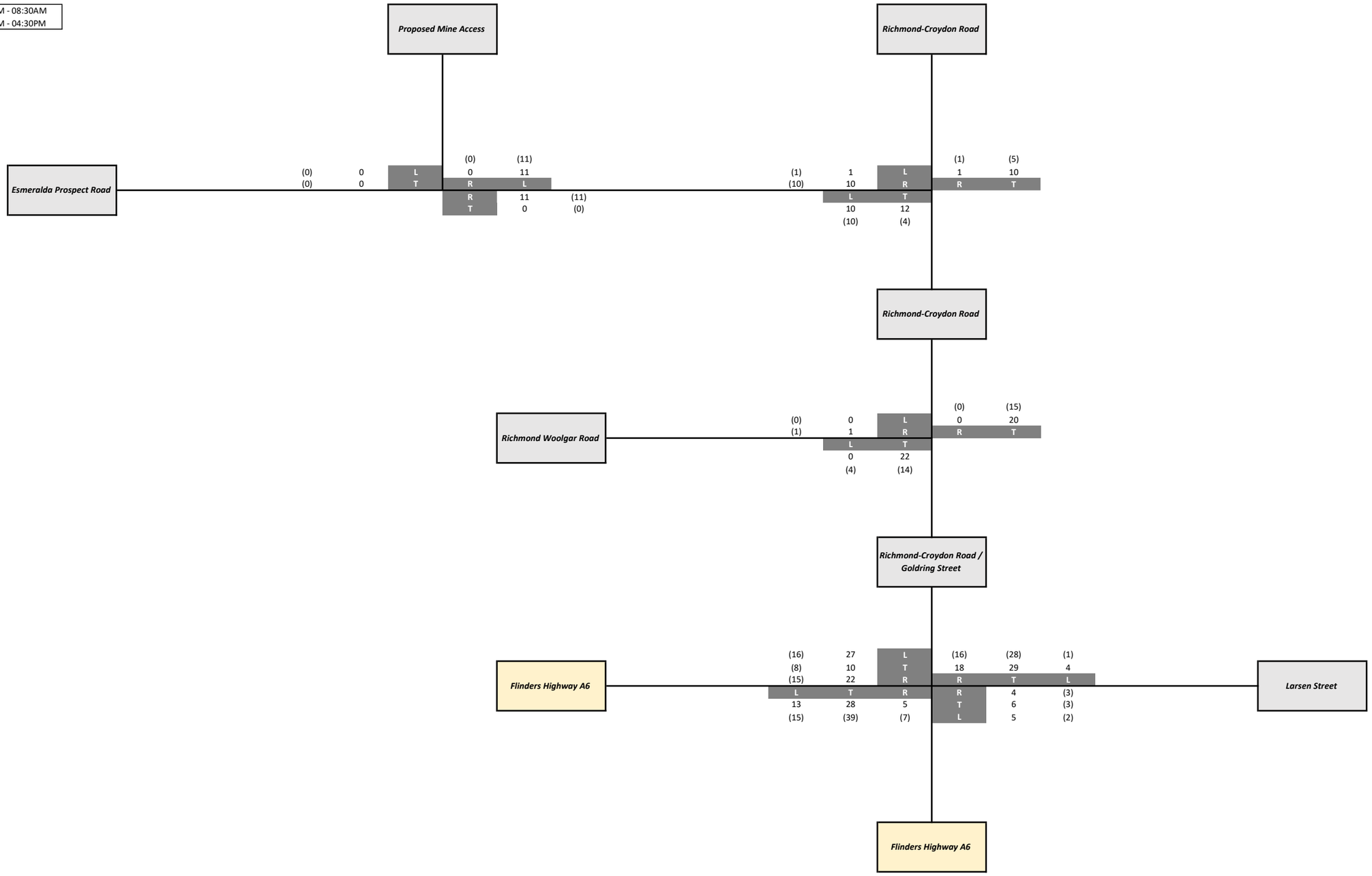
Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

AM PEAK	07:30AM - 08:30AM
PM PEAK	03:30PM - 04:30PM



2028 Background Traffic Volumes + Operations Traffic

Project No.: BE250115
Project Name: Esmeralda Graphite Project

Prepared by: Giada Rendina
Reviewed by: Angela Wood

Legend

L	Left turn
T	Through
R	Right turn
U	U-turn
00	AM Peak Volume
(00)	PM Peak Volume

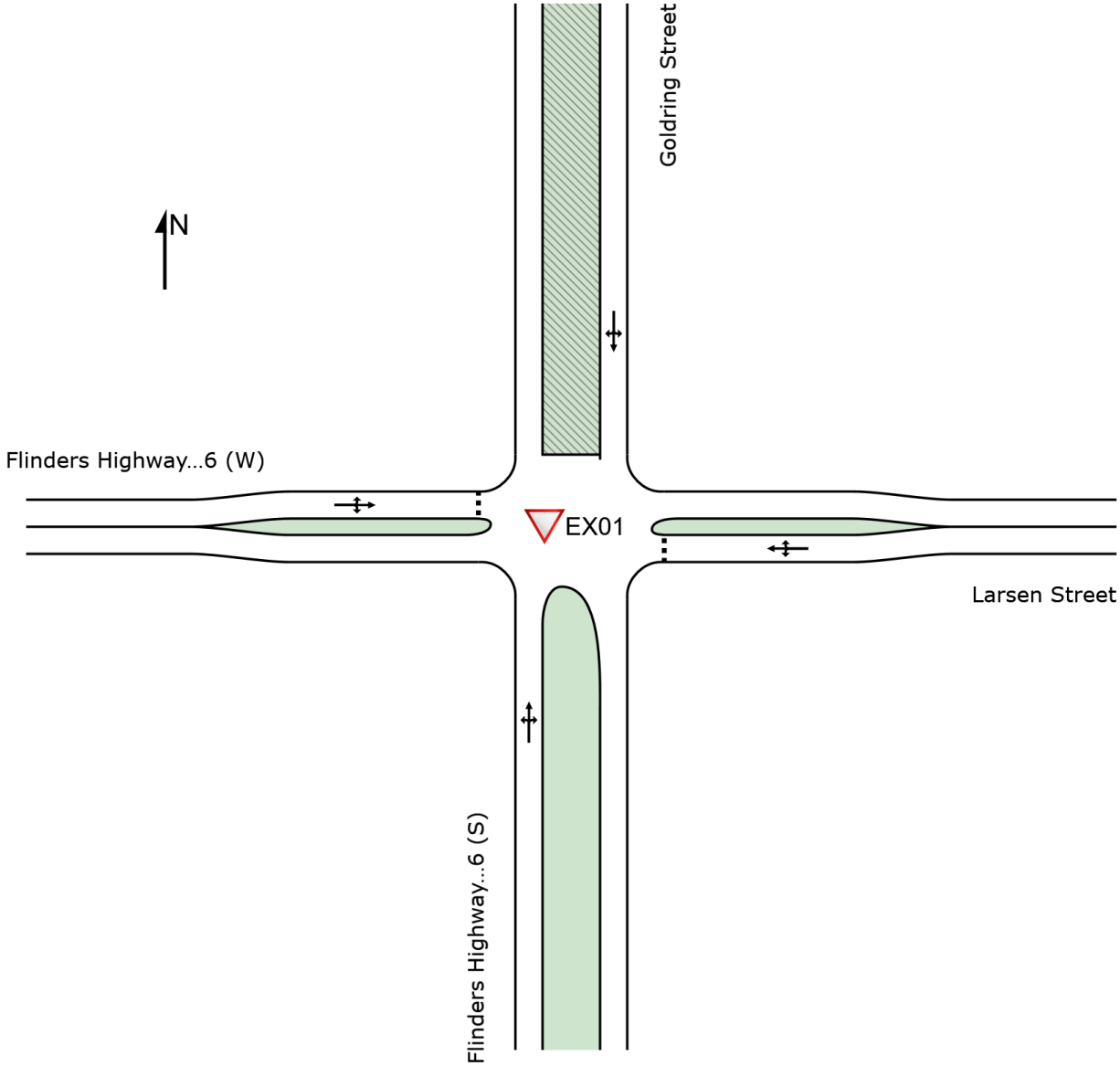
Appendix D – SIDRA Output

SITE LAYOUT

Site: EX01 [INT 1 (AM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2027 BG)]

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: EX01 [INT 1 (AM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2027 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	12	54.6	12	54.6	0.023	6.2	LOS A	0.0	0.3	0.03	0.26	0.03	53.1
2	T1	All MCs	20	15.8	20	15.8	0.023	0.0	LOS A	0.0	0.3	0.03	0.26	0.03	57.7
3	R2	All MCs	5	0.0	5	0.0	0.023	5.6	LOS A	0.0	0.3	0.03	0.26	0.03	53.4
Approach			37	25.7	37	25.7	0.023	2.7	NA	0.0	0.3	0.03	0.26	0.03	55.6
East: Larsen Street															
4	L2	All MCs	5	0.0	5	0.0	0.013	5.6	LOS A	0.0	0.3	0.12	0.52	0.12	49.4
5	T1	All MCs	6	0.0	6	0.0	0.013	5.0	LOS A	0.0	0.3	0.12	0.52	0.12	49.9
6	R2	All MCs	4	0.0	4	0.0	0.013	6.0	LOS A	0.0	0.3	0.12	0.52	0.12	48.6
Approach			16	0.0	16	0.0	0.013	5.5	LOS A	0.0	0.3	0.12	0.52	0.12	49.4
North: Goldring Street															
7	L2	All MCs	4	0.0	4	0.0	0.024	5.6	LOS A	0.1	0.7	0.09	0.29	0.09	51.3
8	T1	All MCs	21	5.0	21	5.0	0.024	0.1	LOS A	0.1	0.7	0.09	0.29	0.09	56.7
9	R2	All MCs	18	0.0	18	0.0	0.024	5.7	LOS A	0.1	0.7	0.09	0.29	0.09	54.5
Approach			43	2.4	43	2.4	0.024	2.9	NA	0.1	0.7	0.09	0.29	0.09	55.4
West: Flinders Highway A6 (W)															
10	L2	All MCs	28	7.7	28	7.7	0.053	5.7	LOS A	0.2	1.6	0.11	0.53	0.11	51.9
11	T1	All MCs	11	10.0	11	10.0	0.053	5.1	LOS A	0.2	1.6	0.11	0.53	0.11	49.1
12	R2	All MCs	21	50.0	21	50.0	0.053	6.8	LOS A	0.2	1.6	0.11	0.53	0.11	50.8
Approach			60	22.9	60	22.9	0.053	6.0	LOS A	0.2	1.6	0.11	0.53	0.11	51.1
All Vehicles			156	15.6	156	15.6	0.053	4.3	NA	0.2	1.6	0.09	0.40	0.09	53.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (PM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2027 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	14	15.4	14	15.4	0.029	5.7	LOS A	0.1	0.4	0.03	0.23	0.03	54.9
2	T1	All MCs	32	0.0	32	0.0	0.029	0.0	LOS A	0.1	0.4	0.03	0.23	0.03	57.8
3	R2	All MCs	7	0.0	7	0.0	0.029	5.6	LOS A	0.1	0.4	0.03	0.23	0.03	53.4
Approach			53	4.0	53	4.0	0.029	2.3	NA	0.1	0.4	0.03	0.23	0.03	56.5
East: Larsen Street															
4	L2	All MCs	2	0.0	2	0.0	0.007	5.6	LOS A	0.0	0.2	0.13	0.51	0.13	49.3
5	T1	All MCs	3	0.0	3	0.0	0.007	5.0	LOS A	0.0	0.2	0.13	0.51	0.13	49.9
6	R2	All MCs	3	0.0	3	0.0	0.007	6.0	LOS A	0.0	0.2	0.13	0.51	0.13	48.5
Approach			8	0.0	8	0.0	0.007	5.5	LOS A	0.0	0.2	0.13	0.51	0.13	49.3
North: Goldring Street															
7	L2	All MCs	1	0.0	1	0.0	0.021	5.7	LOS A	0.1	0.6	0.10	0.27	0.10	51.5
8	T1	All MCs	20	5.3	20	5.3	0.021	0.1	LOS A	0.1	0.6	0.10	0.27	0.10	56.9
9	R2	All MCs	17	0.0	17	0.0	0.021	5.7	LOS A	0.1	0.6	0.10	0.27	0.10	54.6
Approach			38	2.8	38	2.8	0.021	2.7	NA	0.1	0.6	0.10	0.27	0.10	55.7
West: Flinders Highway A6 (W)															
10	L2	All MCs	17	6.3	17	6.3	0.033	5.7	LOS A	0.1	0.9	0.13	0.53	0.13	51.9
11	T1	All MCs	8	25.0	8	25.0	0.033	5.4	LOS A	0.1	0.9	0.13	0.53	0.13	48.1
12	R2	All MCs	14	7.7	14	7.7	0.033	6.1	LOS A	0.1	0.9	0.13	0.53	0.13	52.4
Approach			39	10.8	39	10.8	0.033	5.8	LOS A	0.1	0.9	0.13	0.53	0.13	51.5
All Vehicles			138	5.3	138	5.3	0.033	3.6	NA	0.1	0.9	0.09	0.34	0.09	54.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (AM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2027 BG + CONSTRUCTION DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	15	54.6	15	54.6	0.028	6.2	LOS A	0.0	0.3	0.03	0.25	0.03	53.2
2	T1	All MCs	25	15.8	25	15.8	0.028	0.0	LOS A	0.0	0.3	0.03	0.25	0.03	57.9
3	R2	All MCs	5	0.0	5	0.0	0.028	5.6	LOS A	0.0	0.3	0.03	0.25	0.03	53.6
Approach			45	26.6	45	26.6	0.028	2.7	NA	0.0	0.3	0.03	0.25	0.03	55.8
East: Larsen Street															
4	L2	All MCs	5	0.0	5	0.0	0.013	5.6	LOS A	0.0	0.3	0.13	0.51	0.13	49.3
5	T1	All MCs	6	0.0	6	0.0	0.013	5.0	LOS A	0.0	0.3	0.13	0.51	0.13	49.9
6	R2	All MCs	4	0.0	4	0.0	0.013	6.1	LOS A	0.0	0.3	0.13	0.51	0.13	48.5
Approach			16	0.0	16	0.0	0.013	5.5	LOS A	0.0	0.3	0.13	0.51	0.13	49.3
North: Goldring Street															
7	L2	All MCs	4	0.0	4	0.0	0.027	5.7	LOS A	0.1	0.7	0.10	0.26	0.10	51.7
8	T1	All MCs	26	5.0	26	5.0	0.027	0.1	LOS A	0.1	0.7	0.10	0.26	0.10	57.0
9	R2	All MCs	18	0.0	18	0.0	0.027	5.7	LOS A	0.1	0.7	0.10	0.26	0.10	54.7
Approach			48	2.7	48	2.7	0.027	2.6	NA	0.1	0.7	0.10	0.26	0.10	55.8
West: Flinders Highway A6 (W)															
10	L2	All MCs	28	7.7	28	7.7	0.058	5.7	LOS A	0.2	1.8	0.13	0.53	0.13	51.9
11	T1	All MCs	11	10.0	11	10.0	0.058	5.2	LOS A	0.2	1.8	0.13	0.53	0.13	49.1
12	R2	All MCs	24	50.0	24	50.0	0.058	6.9	LOS A	0.2	1.8	0.13	0.53	0.13	50.7
Approach			63	24.3	63	24.3	0.058	6.1	LOS A	0.2	1.8	0.13	0.53	0.13	51.0
All Vehicles			173	16.6	173	16.6	0.058	4.2	NA	0.2	1.8	0.10	0.38	0.10	53.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (PM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2027 BG + CONSTRUCTION DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	17	15.4	17	15.4	0.033	5.7	LOS A	0.1	0.4	0.03	0.23	0.03	54.8
2	T1	All MCs	36	0.0	36	0.0	0.033	0.0	LOS A	0.1	0.4	0.03	0.23	0.03	57.8
3	R2	All MCs	7	0.0	7	0.0	0.033	5.6	LOS A	0.1	0.4	0.03	0.23	0.03	53.4
Approach			60	4.3	60	4.3	0.033	2.3	NA	0.1	0.4	0.03	0.23	0.03	56.5
East: Larsen Street															
4	L2	All MCs	2	0.0	2	0.0	0.007	5.6	LOS A	0.0	0.2	0.14	0.51	0.14	49.2
5	T1	All MCs	3	0.0	3	0.0	0.007	5.1	LOS A	0.0	0.2	0.14	0.51	0.14	49.8
6	R2	All MCs	3	0.0	3	0.0	0.007	6.0	LOS A	0.0	0.2	0.14	0.51	0.14	48.5
Approach			8	0.0	8	0.0	0.007	5.6	LOS A	0.0	0.2	0.14	0.51	0.14	49.2
North: Goldring Street															
7	L2	All MCs	1	0.0	1	0.0	0.024	5.7	LOS A	0.1	0.6	0.11	0.24	0.11	51.9
8	T1	All MCs	25	5.3	25	5.3	0.024	0.1	LOS A	0.1	0.6	0.11	0.24	0.11	57.2
9	R2	All MCs	17	0.0	17	0.0	0.024	5.7	LOS A	0.1	0.6	0.11	0.24	0.11	54.9
Approach			43	3.1	43	3.1	0.024	2.4	NA	0.1	0.6	0.11	0.24	0.11	56.2
West: Flinders Highway A6 (W)															
10	L2	All MCs	17	6.3	17	6.3	0.036	5.7	LOS A	0.1	1.0	0.14	0.53	0.14	51.9
11	T1	All MCs	8	25.0	8	25.0	0.036	5.4	LOS A	0.1	1.0	0.14	0.53	0.14	48.0
12	R2	All MCs	17	7.7	17	7.7	0.036	6.1	LOS A	0.1	1.0	0.14	0.53	0.14	52.3
Approach			42	10.6	42	10.6	0.036	5.8	LOS A	0.1	1.0	0.14	0.53	0.14	51.5
All Vehicles			154	5.4	154	5.4	0.036	3.5	NA	0.1	1.0	0.09	0.33	0.09	54.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (AM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2028 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	12	54.6	12	54.6	0.023	6.2	LOS A	0.0	0.3	0.03	0.25	0.03	53.1
2	T1	All MCs	21	15.8	21	15.8	0.023	0.0	LOS A	0.0	0.3	0.03	0.25	0.03	57.8
3	R2	All MCs	5	0.0	5	0.0	0.023	5.6	LOS A	0.0	0.3	0.03	0.25	0.03	53.5
Approach			38	25.4	38	25.4	0.023	2.7	NA	0.0	0.3	0.03	0.25	0.03	55.7
East: Larsen Street															
4	L2	All MCs	5	0.0	5	0.0	0.013	5.6	LOS A	0.0	0.3	0.12	0.51	0.12	49.3
5	T1	All MCs	6	0.0	6	0.0	0.013	5.0	LOS A	0.0	0.3	0.12	0.51	0.12	49.9
6	R2	All MCs	4	0.0	4	0.0	0.013	6.0	LOS A	0.0	0.3	0.12	0.51	0.12	48.6
Approach			16	0.0	16	0.0	0.013	5.5	LOS A	0.0	0.3	0.12	0.51	0.12	49.4
North: Goldring Street															
7	L2	All MCs	4	0.0	4	0.0	0.025	5.6	LOS A	0.1	0.7	0.09	0.29	0.09	51.3
8	T1	All MCs	22	5.0	22	5.0	0.025	0.1	LOS A	0.1	0.7	0.09	0.29	0.09	56.7
9	R2	All MCs	19	0.0	19	0.0	0.025	5.7	LOS A	0.1	0.7	0.09	0.29	0.09	54.5
Approach			45	2.4	45	2.4	0.025	2.9	NA	0.1	0.7	0.09	0.29	0.09	55.4
West: Flinders Highway A6 (W)															
10	L2	All MCs	28	7.7	28	7.7	0.055	5.7	LOS A	0.2	1.7	0.12	0.53	0.12	51.9
11	T1	All MCs	11	10.0	11	10.0	0.055	5.2	LOS A	0.2	1.7	0.12	0.53	0.12	49.1
12	R2	All MCs	22	50.0	22	50.0	0.055	6.8	LOS A	0.2	1.7	0.12	0.53	0.12	50.8
Approach			61	23.4	61	23.4	0.055	6.0	LOS A	0.2	1.7	0.12	0.53	0.12	51.1
All Vehicles			160	15.6	160	15.6	0.055	4.3	NA	0.2	1.7	0.09	0.39	0.09	53.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (PM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2028 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	14	15.4	14	15.4	0.029	5.7	LOS A	0.1	0.4	0.03	0.23	0.03	54.9
2	T1	All MCs	32	0.0	32	0.0	0.029	0.0	LOS A	0.1	0.4	0.03	0.23	0.03	57.8
3	R2	All MCs	7	0.0	7	0.0	0.029	5.6	LOS A	0.1	0.4	0.03	0.23	0.03	53.4
Approach			53	4.0	53	4.0	0.029	2.3	NA	0.1	0.4	0.03	0.23	0.03	56.5
East: Larsen Street															
4	L2	All MCs	2	0.0	2	0.0	0.007	5.6	LOS A	0.0	0.2	0.13	0.51	0.13	49.3
5	T1	All MCs	3	0.0	3	0.0	0.007	5.0	LOS A	0.0	0.2	0.13	0.51	0.13	49.9
6	R2	All MCs	3	0.0	3	0.0	0.007	6.0	LOS A	0.0	0.2	0.13	0.51	0.13	48.5
Approach			8	0.0	8	0.0	0.007	5.5	LOS A	0.0	0.2	0.13	0.51	0.13	49.2
North: Goldring Street															
7	L2	All MCs	1	0.0	1	0.0	0.022	5.7	LOS A	0.1	0.6	0.10	0.27	0.10	51.6
8	T1	All MCs	21	5.3	21	5.3	0.022	0.1	LOS A	0.1	0.6	0.10	0.27	0.10	56.9
9	R2	All MCs	17	0.0	17	0.0	0.022	5.7	LOS A	0.1	0.6	0.10	0.27	0.10	54.7
Approach			39	2.8	39	2.8	0.022	2.7	NA	0.1	0.6	0.10	0.27	0.10	55.8
West: Flinders Highway A6 (W)															
10	L2	All MCs	17	6.3	17	6.3	0.033	5.7	LOS A	0.1	0.9	0.13	0.53	0.13	51.9
11	T1	All MCs	8	25.0	8	25.0	0.033	5.4	LOS A	0.1	0.9	0.13	0.53	0.13	48.1
12	R2	All MCs	14	7.7	14	7.7	0.033	6.1	LOS A	0.1	0.9	0.13	0.53	0.13	52.4
Approach			39	10.8	39	10.8	0.033	5.8	LOS A	0.1	0.9	0.13	0.53	0.13	51.5
All Vehicles			139	5.3	139	5.3	0.033	3.6	NA	0.1	0.9	0.09	0.34	0.09	54.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (AM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2028 BG + OPERATIONAL DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	14	54.6	14	54.6	0.030	6.2	LOS A	0.0	0.3	0.03	0.22	0.03	53.4
2	T1	All MCs	29	15.8	29	15.8	0.030	0.0	LOS A	0.0	0.3	0.03	0.22	0.03	58.1
3	R2	All MCs	5	0.0	5	0.0	0.030	5.6	LOS A	0.0	0.3	0.03	0.22	0.03	53.8
Approach			48	25.0	48	25.0	0.030	2.4	NA	0.0	0.3	0.03	0.22	0.03	56.2
East: Larsen Street															
4	L2	All MCs	5	0.0	5	0.0	0.013	5.6	LOS A	0.0	0.3	0.14	0.51	0.14	49.3
5	T1	All MCs	6	0.0	6	0.0	0.013	5.1	LOS A	0.0	0.3	0.14	0.51	0.14	49.8
6	R2	All MCs	4	0.0	4	0.0	0.013	6.1	LOS A	0.0	0.3	0.14	0.51	0.14	48.5
Approach			16	0.0	16	0.0	0.013	5.5	LOS A	0.0	0.3	0.14	0.51	0.14	49.3
North: Goldring Street															
7	L2	All MCs	4	0.0	4	0.0	0.030	5.7	LOS A	0.1	0.7	0.10	0.25	0.10	51.8
8	T1	All MCs	31	5.0	31	5.0	0.030	0.1	LOS A	0.1	0.7	0.10	0.25	0.10	57.1
9	R2	All MCs	19	0.0	19	0.0	0.030	5.7	LOS A	0.1	0.7	0.10	0.25	0.10	54.8
Approach			54	2.8	54	2.8	0.030	2.5	NA	0.1	0.7	0.10	0.25	0.10	56.0
West: Flinders Highway A6 (W)															
10	L2	All MCs	28	7.7	28	7.7	0.057	5.7	LOS A	0.2	1.8	0.14	0.53	0.14	51.8
11	T1	All MCs	11	10.0	11	10.0	0.057	5.2	LOS A	0.2	1.8	0.14	0.53	0.14	49.0
12	R2	All MCs	23	50.0	23	50.0	0.057	6.9	LOS A	0.2	1.8	0.14	0.53	0.14	50.7
Approach			62	23.9	62	23.9	0.057	6.1	LOS A	0.2	1.8	0.14	0.53	0.14	51.0
All Vehicles			180	15.8	180	15.8	0.057	4.0	NA	0.2	1.8	0.10	0.36	0.10	53.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX01 [INT 1 (PM): Flinders Highway A6 / Larsen Street / Goldring Street (Site Folder: 2028 BG + OPERATIONAL DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Flinders Highway A6 / Larsen Street / Goldring Street intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Flinders Highway A6 (S)															
1	L2	All MCs	16	15.4	16	15.4	0.035	5.7	LOS A	0.1	0.4	0.03	0.21	0.03	55.0
2	T1	All MCs	41	0.0	41	0.0	0.035	0.0	LOS A	0.1	0.4	0.03	0.21	0.03	58.0
3	R2	All MCs	7	0.0	7	0.0	0.035	5.6	LOS A	0.1	0.4	0.03	0.21	0.03	53.7
Approach			64	3.8	64	3.8	0.035	2.1	NA	0.1	0.4	0.03	0.21	0.03	56.8
East: Larsen Street															
4	L2	All MCs	2	0.0	2	0.0	0.007	5.6	LOS A	0.0	0.2	0.15	0.51	0.15	49.2
5	T1	All MCs	3	0.0	3	0.0	0.007	5.1	LOS A	0.0	0.2	0.15	0.51	0.15	49.8
6	R2	All MCs	3	0.0	3	0.0	0.007	6.1	LOS A	0.0	0.2	0.15	0.51	0.15	48.4
Approach			8	0.0	8	0.0	0.007	5.6	LOS A	0.0	0.2	0.15	0.51	0.15	49.1
North: Goldring Street															
7	L2	All MCs	1	0.0	1	0.0	0.026	5.7	LOS A	0.1	0.6	0.10	0.23	0.10	52.2
8	T1	All MCs	29	5.3	29	5.3	0.026	0.1	LOS A	0.1	0.6	0.10	0.23	0.10	57.4
9	R2	All MCs	17	0.0	17	0.0	0.026	5.7	LOS A	0.1	0.6	0.10	0.23	0.10	55.1
Approach			47	3.3	47	3.3	0.026	2.2	NA	0.1	0.6	0.10	0.23	0.10	56.4
West: Flinders Highway A6 (W)															
10	L2	All MCs	17	6.3	17	6.3	0.035	5.7	LOS A	0.1	1.0	0.15	0.53	0.15	51.8
11	T1	All MCs	8	25.0	8	25.0	0.035	5.5	LOS A	0.1	1.0	0.15	0.53	0.15	48.0
12	R2	All MCs	16	7.7	16	7.7	0.035	6.2	LOS A	0.1	1.0	0.15	0.53	0.15	52.3
Approach			41	10.7	41	10.7	0.035	5.9	LOS A	0.1	1.0	0.15	0.53	0.15	51.4
All Vehicles			161	5.2	161	5.2	0.035	3.3	NA	0.1	1.0	0.09	0.31	0.09	54.9

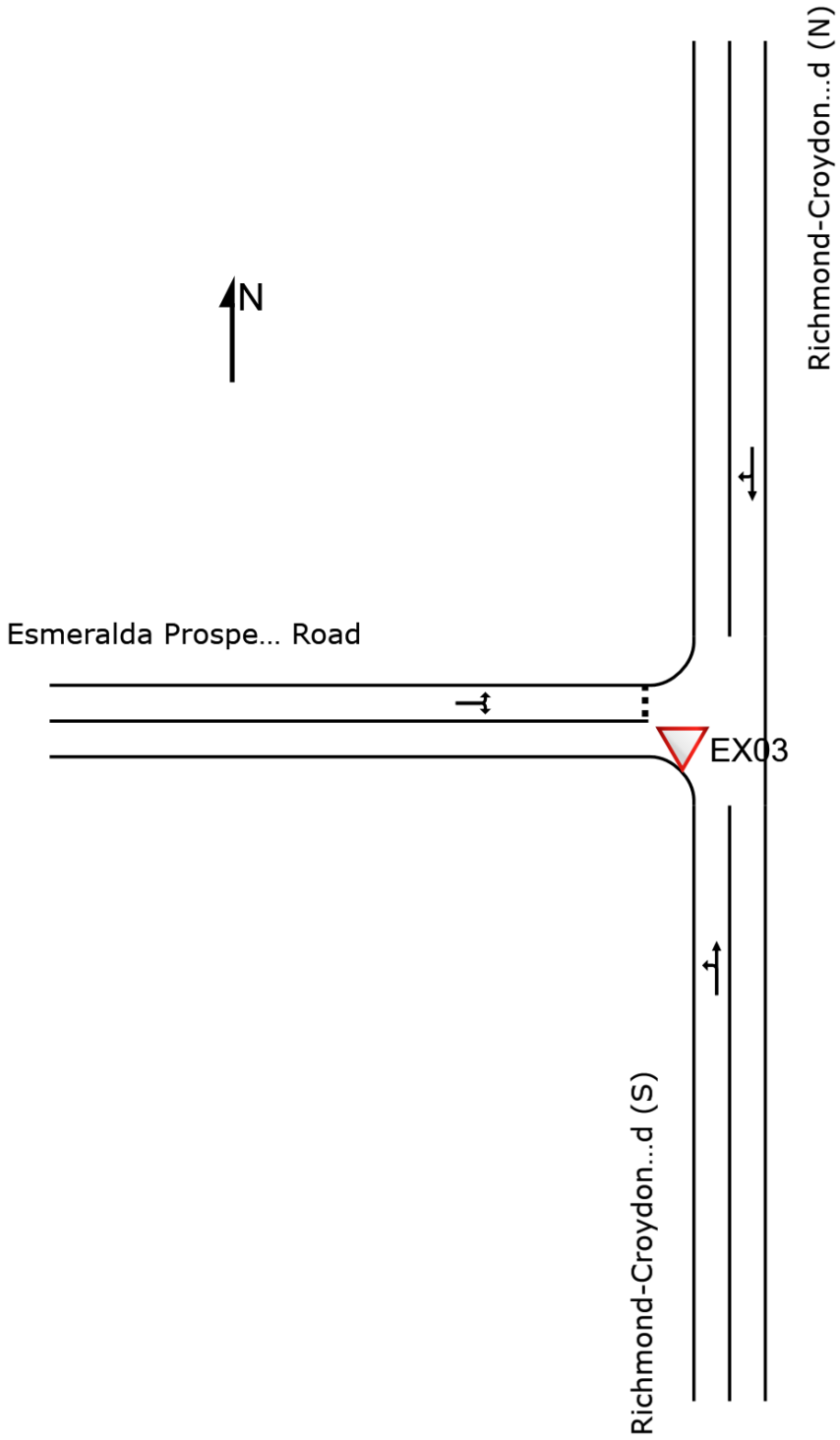
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

Site: EX03 [INT 3 (AM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2027 BG)]

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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MOVEMENT SUMMARY

Site: EX03 [INT 3 (AM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2027 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	1	0.0	1	0.0	0.008	7.8	LOS A	0.0	0.0	0.00	0.05	0.00	85.6
2	T1	All MCs	13	33.3	13	33.3	0.008	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	97.7
Approach			14	30.8	14	30.8	0.008	0.6	NA	0.0	0.0	0.00	0.05	0.00	96.6
North: Richmond-Croydon Road (N)															
8	T1	All MCs	11	10.0	11	10.0	0.006	0.0	LOS A	0.0	0.0	0.01	0.06	0.01	97.8
9	R2	All MCs	1	0.0	1	0.0	0.006	7.4	LOS A	0.0	0.0	0.01	0.06	0.01	85.7
Approach			12	9.1	12	9.1	0.006	0.7	NA	0.0	0.0	0.01	0.06	0.01	96.6
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.9	LOS A	0.0	0.0	0.07	0.63	0.07	74.3
12	R2	All MCs	1	0.0	1	0.0	0.001	7.5	LOS A	0.0	0.0	0.07	0.63	0.07	74.1
Approach			2	0.0	2	0.0	0.001	7.7	LOS A	0.0	0.0	0.07	0.63	0.07	74.2
All Vehicles			27	19.2	27	19.2	0.008	1.2	NA	0.0	0.0	0.01	0.10	0.01	94.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX03 [INT 3 (PM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2027 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	1	0.0	1	0.0	0.003	7.8	LOS A	0.0	0.0	0.00	0.14	0.00	85.3
2	T1	All MCs	4	0.0	4	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	95.9
Approach			5	0.0	5	0.0	0.003	1.6	NA	0.0	0.0	0.00	0.14	0.00	93.5
North: Richmond-Croydon Road (N)															
8	T1	All MCs	5	20.0	5	20.0	0.004	0.0	LOS A	0.0	0.0	0.01	0.11	0.01	95.9
9	R2	All MCs	1	0.0	1	0.0	0.004	7.4	LOS A	0.0	0.0	0.01	0.11	0.01	84.2
Approach			6	16.7	6	16.7	0.004	1.2	NA	0.0	0.0	0.01	0.11	0.01	93.8
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.03	0.65	0.03	74.5
12	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.03	0.65	0.03	74.3
Approach			2	0.0	2	0.0	0.001	7.6	LOS A	0.0	0.0	0.03	0.65	0.03	74.4
All Vehicles			14	7.7	14	7.7	0.004	2.3	NA	0.0	0.0	0.01	0.20	0.01	90.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: EX03 [INT 3 (AM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2027 BG + CONSTRUCTION DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	7	62.0	7	62.0	0.014	9.5	LOS A	0.0	0.0	0.00	0.25	0.00	61.6
2	T1	All MCs	13	33.3	13	33.3	0.014	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	94.9
Approach			20	43.9	20	43.9	0.014	3.5	NA	0.0	0.0	0.00	0.25	0.00	79.1
North: Richmond-Croydon Road (N)															
8	T1	All MCs	11	10.0	11	10.0	0.006	0.0	LOS A	0.0	0.0	0.02	0.06	0.02	97.8
9	R2	All MCs	1	0.0	1	0.0	0.006	7.4	LOS A	0.0	0.0	0.02	0.06	0.02	85.7
Approach			12	9.1	12	9.1	0.006	0.7	NA	0.0	0.0	0.02	0.06	0.02	96.5
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.008	7.9	LOS A	0.0	0.3	0.09	0.65	0.09	73.6
12	R2	All MCs	7	62.0	7	62.0	0.008	9.3	LOS A	0.0	0.3	0.09	0.65	0.09	55.1
Approach			8	54.3	8	54.3	0.008	9.1	LOS A	0.0	0.3	0.09	0.65	0.09	56.9
All Vehicles			40	36.0	40	36.0	0.014	3.9	NA	0.0	0.3	0.02	0.28	0.02	76.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX03 [INT 3 (PM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2027 BG + CONSTRUCTION DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	7	62.0	7	62.0	0.008	9.4	LOS A	0.0	0.0	0.00	0.43	0.00	60.4
2	T1	All MCs	4	0.0	4	0.0	0.008	0.0	LOS A	0.0	0.0	0.00	0.43	0.00	92.1
Approach			12	39.5	12	39.5	0.008	6.0	NA	0.0	0.0	0.00	0.43	0.00	69.0
North: Richmond-Croydon Road (N)															
8	T1	All MCs	5	20.0	5	20.0	0.004	0.0	LOS A	0.0	0.0	0.02	0.11	0.02	95.8
9	R2	All MCs	1	0.0	1	0.0	0.004	7.4	LOS A	0.0	0.0	0.02	0.11	0.02	84.2
Approach			6	16.7	6	16.7	0.004	1.2	NA	0.0	0.0	0.02	0.11	0.02	93.7
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.008	7.8	LOS A	0.0	0.3	0.05	0.66	0.05	73.8
12	R2	All MCs	7	62.0	7	62.0	0.008	9.2	LOS A	0.0	0.3	0.05	0.66	0.05	55.2
Approach			8	54.3	8	54.3	0.008	9.0	LOS A	0.0	0.3	0.05	0.66	0.05	57.0
All Vehicles			26	38.7	26	38.7	0.008	5.8	NA	0.0	0.3	0.02	0.43	0.02	68.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: EX03 [INT 3 (AM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2028 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	1	0.0	1	0.0	0.008	7.8	LOS A	0.0	0.0	0.00	0.05	0.00	85.6
2	T1	All MCs	13	33.3	13	33.3	0.008	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	97.7
Approach			14	30.8	14	30.8	0.008	0.6	NA	0.0	0.0	0.00	0.05	0.00	96.6
North: Richmond-Croydon Road (N)															
8	T1	All MCs	11	10.0	11	10.0	0.006	0.0	LOS A	0.0	0.0	0.01	0.06	0.01	97.8
9	R2	All MCs	1	0.0	1	0.0	0.006	7.4	LOS A	0.0	0.0	0.01	0.06	0.01	85.7
Approach			12	9.1	12	9.1	0.006	0.7	NA	0.0	0.0	0.01	0.06	0.01	96.6
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.9	LOS A	0.0	0.0	0.07	0.63	0.07	74.3
12	R2	All MCs	1	0.0	1	0.0	0.001	7.5	LOS A	0.0	0.0	0.07	0.63	0.07	74.1
Approach			2	0.0	2	0.0	0.001	7.7	LOS A	0.0	0.0	0.07	0.63	0.07	74.2
All Vehicles			27	19.2	27	19.2	0.008	1.2	NA	0.0	0.0	0.01	0.10	0.01	94.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: EX03 [INT 3 (PM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2028 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	1	0.0	1	0.0	0.003	7.8	LOS A	0.0	0.0	0.00	0.14	0.00	85.3
2	T1	All MCs	4	0.0	4	0.0	0.003	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	95.9
Approach			5	0.0	5	0.0	0.003	1.6	NA	0.0	0.0	0.00	0.14	0.00	93.5
North: Richmond-Croydon Road (N)															
8	T1	All MCs	5	20.0	5	20.0	0.004	0.0	LOS A	0.0	0.0	0.01	0.11	0.01	95.9
9	R2	All MCs	1	0.0	1	0.0	0.004	7.4	LOS A	0.0	0.0	0.01	0.11	0.01	84.2
Approach			6	16.7	6	16.7	0.004	1.2	NA	0.0	0.0	0.01	0.11	0.01	93.8
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.03	0.65	0.03	74.5
12	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.03	0.65	0.03	74.3
Approach			2	0.0	2	0.0	0.001	7.6	LOS A	0.0	0.0	0.03	0.65	0.03	74.4
All Vehicles			14	7.7	14	7.7	0.004	2.3	NA	0.0	0.0	0.01	0.20	0.01	90.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: EX03 [INT 3 (AM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2028 BG + OPERATIONAL DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	11	42.0	11	42.0	0.015	8.9	LOS A	0.0	0.0	0.00	0.31	0.00	65.7
2	T1	All MCs	13	33.3	13	33.3	0.015	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	91.7
Approach			23	37.3	23	37.3	0.015	4.1	NA	0.0	0.0	0.00	0.31	0.00	77.7
North: Richmond-Croydon Road (N)															
8	T1	All MCs	11	10.0	11	10.0	0.006	0.0	LOS A	0.0	0.0	0.02	0.06	0.02	97.8
9	R2	All MCs	1	0.0	1	0.0	0.006	7.4	LOS A	0.0	0.0	0.02	0.06	0.02	85.6
Approach			12	9.1	12	9.1	0.006	0.7	NA	0.0	0.0	0.02	0.06	0.02	96.5
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.011	7.9	LOS A	0.0	0.3	0.09	0.64	0.09	73.6
12	R2	All MCs	11	42.0	11	42.0	0.011	8.7	LOS A	0.0	0.3	0.09	0.64	0.09	60.0
Approach			12	38.2	12	38.2	0.011	8.6	LOS A	0.0	0.3	0.09	0.64	0.09	61.0
All Vehicles			46	30.5	46	30.5	0.015	4.4	NA	0.0	0.3	0.03	0.33	0.03	76.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX03 [INT 3 (PM): Richmond-Croydon Road / Esmeralda Prospect Road (Site Folder: 2028 BG + OPERATIONAL DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Richmond-Croydon Road / Esmeralda Prospect Road intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Richmond-Croydon Road (S)															
1	L2	All MCs	11	42.0	11	42.0	0.010	8.9	LOS A	0.0	0.0	0.00	0.48	0.00	64.1
2	T1	All MCs	4	0.0	4	0.0	0.010	0.0	LOS A	0.0	0.0	0.00	0.48	0.00	88.7
Approach			15	30.0	15	30.0	0.010	6.4	NA	0.0	0.0	0.00	0.48	0.00	69.6
North: Richmond-Croydon Road (N)															
8	T1	All MCs	5	20.0	5	20.0	0.004	0.0	LOS A	0.0	0.0	0.02	0.11	0.02	95.8
9	R2	All MCs	1	0.0	1	0.0	0.004	7.4	LOS A	0.0	0.0	0.02	0.11	0.02	84.1
Approach			6	16.7	6	16.7	0.004	1.2	NA	0.0	0.0	0.02	0.11	0.02	93.6
West: Esmeralda Prospect Road															
10	L2	All MCs	1	0.0	1	0.0	0.011	7.8	LOS A	0.0	0.3	0.06	0.66	0.06	73.8
12	R2	All MCs	11	42.0	11	42.0	0.011	8.6	LOS A	0.0	0.3	0.06	0.66	0.06	60.1
Approach			12	38.2	12	38.2	0.011	8.5	LOS A	0.0	0.3	0.06	0.66	0.06	61.2
All Vehicles			33	30.3	33	30.3	0.011	6.1	NA	0.0	0.3	0.02	0.47	0.02	69.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

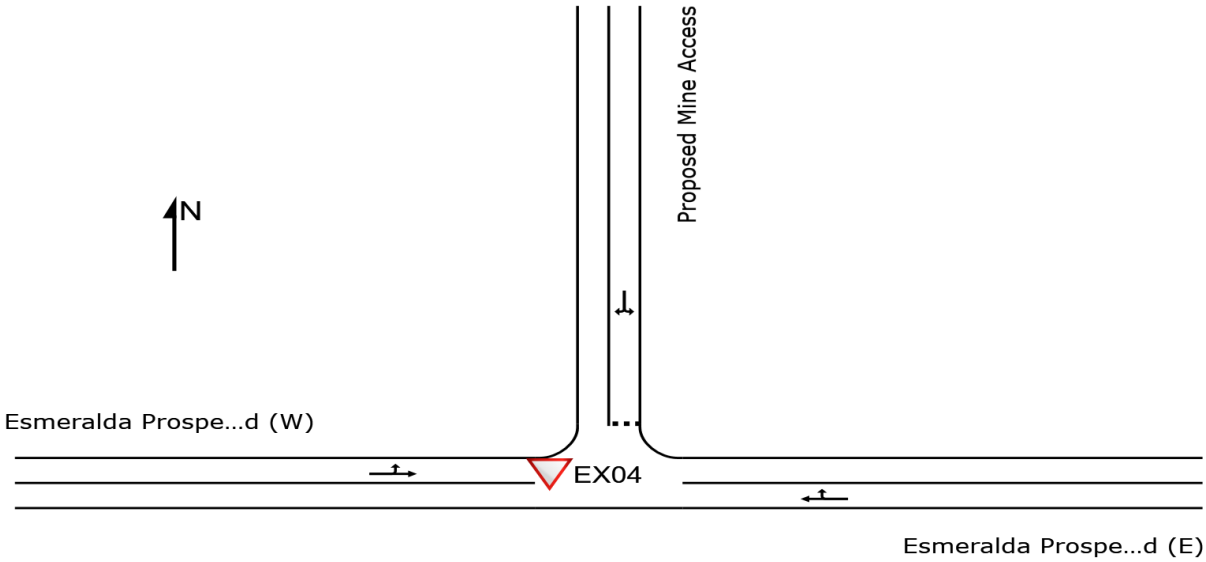
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SITE LAYOUT

Site: EX04 [INT 4 (AM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2027 BG)]

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: EX04 [INT 4 (AM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2027 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.34	0.02	90.6
6	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.02	0.34	0.02	80.8
Approach			2	0.0	2	0.0	0.001	3.7	NA	0.0	0.0	0.02	0.34	0.02	85.4
North: Proposed Mine Access															
7	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.01	0.66	0.01	74.6
9	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.01	0.66	0.01	74.4
Approach			2	0.0	2	0.0	0.001	7.6	LOS A	0.0	0.0	0.01	0.66	0.01	74.5
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			6	0.0	6	0.0	0.001	5.1	NA	0.0	0.0	0.01	0.44	0.01	81.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX04 [INT 4 (PM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2027 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.34	0.02	90.6
6	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.02	0.34	0.02	80.8
Approach			2	0.0	2	0.0	0.001	3.7	NA	0.0	0.0	0.02	0.34	0.02	85.4
North: Proposed Mine Access															
7	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.01	0.66	0.01	74.6
9	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.01	0.66	0.01	74.4
Approach			2	0.0	2	0.0	0.001	7.6	LOS A	0.0	0.0	0.01	0.66	0.01	74.5
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			6	0.0	6	0.0	0.001	5.1	NA	0.0	0.0	0.01	0.44	0.01	81.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX04 [INT 4 (AM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2027 BG + CONSTRUCTION DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.007	0.0	LOS A	0.0	0.3	0.02	0.61	0.02	86.5
6	R2	All MCs	8	62.0	8	62.0	0.007	9.1	LOS A	0.0	0.3	0.02	0.61	0.02	57.0
Approach			9	55.1	9	55.1	0.007	8.1	NA	0.0	0.3	0.02	0.61	0.02	59.2
North: Proposed Mine Access															
7	L2	All MCs	8	62.0	8	62.0	0.008	9.5	LOS A	0.0	0.3	0.01	0.66	0.01	56.1
9	R2	All MCs	1	0.0	1	0.0	0.008	7.4	LOS A	0.0	0.3	0.01	0.66	0.01	73.7
Approach			9	55.1	9	55.1	0.008	9.2	LOS A	0.0	0.3	0.01	0.66	0.01	57.6
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			21	49.6	21	49.6	0.008	8.2	NA	0.0	0.3	0.02	0.60	0.02	60.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX04 [INT 4 (PM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2027 BG + CONSTRUCTION DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.007	0.0	LOS A	0.0	0.3	0.02	0.61	0.02	86.5
6	R2	All MCs	8	62.0	8	62.0	0.007	9.1	LOS A	0.0	0.3	0.02	0.61	0.02	57.0
Approach			9	55.1	9	55.1	0.007	8.1	NA	0.0	0.3	0.02	0.61	0.02	59.2
North: Proposed Mine Access															
7	L2	All MCs	8	62.0	8	62.0	0.008	9.5	LOS A	0.0	0.3	0.01	0.66	0.01	56.1
9	R2	All MCs	1	0.0	1	0.0	0.008	7.4	LOS A	0.0	0.3	0.01	0.66	0.01	73.7
Approach			9	55.1	9	55.1	0.008	9.2	LOS A	0.0	0.3	0.01	0.66	0.01	57.6
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			21	49.6	21	49.6	0.008	8.2	NA	0.0	0.3	0.02	0.60	0.02	60.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX04 [INT 4 (AM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2028 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.34	0.02	90.6
6	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.02	0.34	0.02	80.8
Approach			2	0.0	2	0.0	0.001	3.7	NA	0.0	0.0	0.02	0.34	0.02	85.4
North: Proposed Mine Access															
7	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.01	0.66	0.01	74.6
9	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.01	0.66	0.01	74.4
Approach			2	0.0	2	0.0	0.001	7.6	LOS A	0.0	0.0	0.01	0.66	0.01	74.5
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			6	0.0	6	0.0	0.001	5.1	NA	0.0	0.0	0.01	0.44	0.01	81.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: EX04 [INT 4 (PM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2028 BG)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.34	0.02	90.6
6	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.02	0.34	0.02	80.8
Approach			2	0.0	2	0.0	0.001	3.7	NA	0.0	0.0	0.02	0.34	0.02	85.4
North: Proposed Mine Access															
7	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.01	0.66	0.01	74.6
9	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOS A	0.0	0.0	0.01	0.66	0.01	74.4
Approach			2	0.0	2	0.0	0.001	7.6	LOS A	0.0	0.0	0.01	0.66	0.01	74.5
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			6	0.0	6	0.0	0.001	5.1	NA	0.0	0.0	0.01	0.44	0.01	81.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX04 [INT 4 (AM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2028 BG + OPERATIONAL DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.009	0.0	LOS A	0.0	0.4	0.02	0.62	0.02	84.9
6	R2	All MCs	12	42.0	12	42.0	0.009	8.6	LOS A	0.0	0.4	0.02	0.62	0.02	61.3
Approach			13	38.5	13	38.5	0.009	7.8	NA	0.0	0.4	0.02	0.62	0.02	62.8
North: Proposed Mine Access															
7	L2	All MCs	12	42.0	12	42.0	0.009	8.9	LOS A	0.0	0.3	0.01	0.65	0.01	60.8
9	R2	All MCs	1	0.0	1	0.0	0.009	7.4	LOS A	0.0	0.3	0.01	0.65	0.01	73.6
Approach			13	38.5	13	38.5	0.009	8.8	LOS A	0.0	0.3	0.01	0.65	0.01	61.7
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			27	35.5	27	35.5	0.009	8.0	NA	0.0	0.4	0.02	0.61	0.02	63.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: EX04 [INT 4 (PM): Esmeralda Prospect Road / Proposed Mine Access (Site Folder: 2028 BG + OPERATIONAL DEV)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Esmeralda Prospect Road / Proposed Mine Access intersection
AM PEAK:
PM PEAK:
Site Category: Existing Design
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Esmeralda Prospect Road (E)															
5	T1	All MCs	1	0.0	1	0.0	0.009	0.0	LOS A	0.0	0.4	0.02	0.62	0.02	84.9
6	R2	All MCs	12	42.0	12	42.0	0.009	8.6	LOS A	0.0	0.4	0.02	0.62	0.02	61.3
Approach			13	38.5	13	38.5	0.009	7.8	NA	0.0	0.4	0.02	0.62	0.02	62.8
North: Proposed Mine Access															
7	L2	All MCs	12	42.0	12	42.0	0.009	8.9	LOS A	0.0	0.3	0.01	0.65	0.01	60.8
9	R2	All MCs	1	0.0	1	0.0	0.009	7.4	LOS A	0.0	0.3	0.01	0.65	0.01	73.6
Approach			13	38.5	13	38.5	0.009	8.8	LOS A	0.0	0.3	0.01	0.65	0.01	61.7
West: Esmeralda Prospect Road (W)															
10	L2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.00	0.34	0.00	80.8
11	T1	All MCs	1	0.0	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.00	0.34	0.00	90.3
Approach			2	0.0	2	0.0	0.001	3.9	NA	0.0	0.0	0.00	0.34	0.00	85.3
All Vehicles			27	35.5	27	35.5	0.009	8.0	NA	0.0	0.4	0.02	0.61	0.02	63.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix E – Route Maps and Overlays

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Esmeralda Graphite Project

Route Overview with 2024 Traffic Volumes (Both Directions)

ESMERALDA GRAPHITE SITE ACCESS

Traffic Year	Site ID	Description	Travel Direction	Total AADT	Percentage HV (%)
2024	92192	500m West Bruce Highway Intersection	Both Directions	2570	30.38
2024	90060	200m Sth of Mt. Stuart Road	Both Directions	7226	30.37
2024	91328	400m from Inter with 98C (New Queen Rd)	Both Directions	2584	22.47
2024	91329	14A 300m East of Rainbow Rd	Both Directions	2982	19.76
2024	91299	350M Ch. Towers side of DSC depot	Both Directions	3300	23.17
2024	91324	500m West of Greg Dev Rd 98B	Both Directions	1204	29.47
2024	90009	Homestead 74km West of Charters Twrs	Both Directions	775	32.64
2024	100107	14B Ch 153.867 - East Torrens Creek Bdge	Both Directions	583	38.55
2024	100055	14B Ch 237.24 - 10km east of Hughenden	Both Directions	714	40.93
2024	100148	14C Ch 17.22 - West Hughenden	Both Directions	423	42.96

RICHMOND

HUGHENDEN

CHARTERS TOWERS

TOWNSVILLE

Site: 100055
2024 AADT: 714 vpd
HV%: 40.93

Site: 100148
2024 AADT: 423 vpd
HV%: 42.96

Site: 90009
2024 AADT: 775 vpd
HV%: 32.64

Site: 91328
2024 AADT: 2584 vpd
HV%: 22.47

Site: 91329
2024 AADT: 2982 vpd
HV%: 19.76

Site: 92192
2024 AADT: 2570 vpd
HV%: 30.38

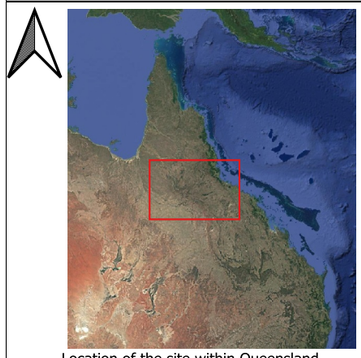
Site: 90060
2024 AADT: 7226 vpd
HV%: 30.37

Site: 91299
2024 AADT: 3300 vpd
HV%: 23.17

Site: 91324
2024 AADT: 1204 vpd
HV%: 29.47

Site: 100107
2024 AADT: 583 vpd
HV%: 38.55

0 50 100 km



Location of the site within Queensland

Legend

- Proposed Haul Route
- 2024 Traffic Count Locations

Project: BE250115

Date: 05/06/2026

Scale: 1:1,200,000 at A3

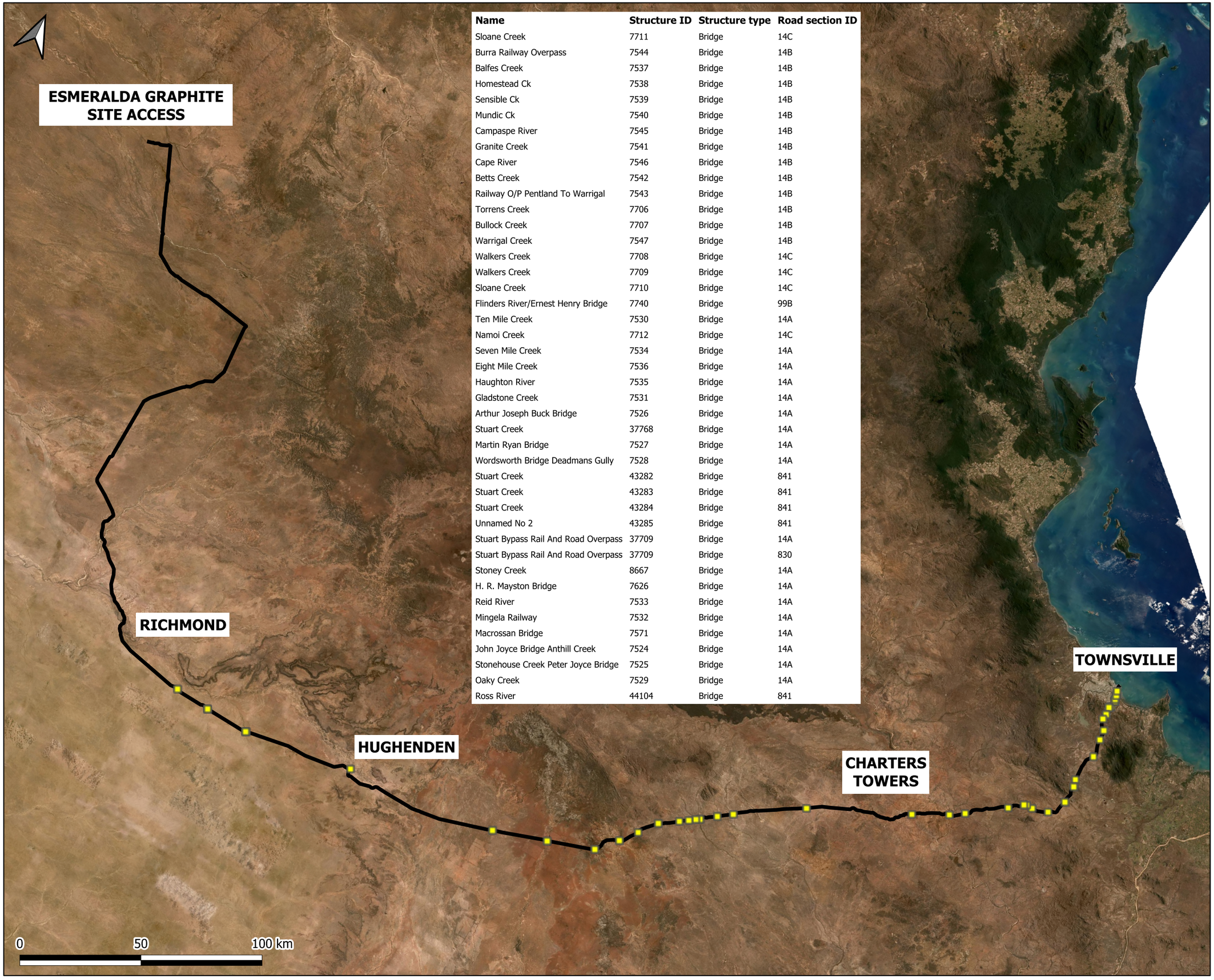
Projection:EPSG:4326

Data Sources: Queensland Globe

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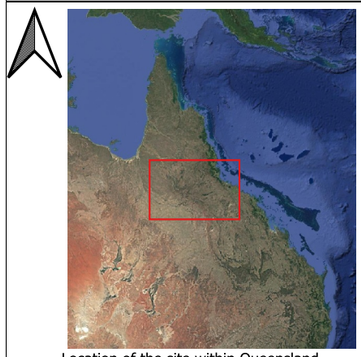
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Name	Structure ID	Structure type	Road section ID
Sloane Creek	7711	Bridge	14C
Burra Railway Overpass	7544	Bridge	14B
Balfes Creek	7537	Bridge	14B
Homestead Ck	7538	Bridge	14B
Sensible Ck	7539	Bridge	14B
Mundic Ck	7540	Bridge	14B
Campaspe River	7545	Bridge	14B
Granite Creek	7541	Bridge	14B
Cape River	7546	Bridge	14B
Betts Creek	7542	Bridge	14B
Railway O/P Pentland To Warrigal	7543	Bridge	14B
Torrens Creek	7706	Bridge	14B
Bullock Creek	7707	Bridge	14B
Warrigal Creek	7547	Bridge	14B
Walkers Creek	7708	Bridge	14C
Walkers Creek	7709	Bridge	14C
Sloane Creek	7710	Bridge	14C
Flinders River/Ernest Henry Bridge	7740	Bridge	99B
Ten Mile Creek	7530	Bridge	14A
Namoi Creek	7712	Bridge	14C
Seven Mile Creek	7534	Bridge	14A
Eight Mile Creek	7536	Bridge	14A
Haughton River	7535	Bridge	14A
Gladstone Creek	7531	Bridge	14A
Arthur Joseph Buck Bridge	7526	Bridge	14A
Stuart Creek	37768	Bridge	14A
Martin Ryan Bridge	7527	Bridge	14A
Wordsworth Bridge Deadmans Gully	7528	Bridge	14A
Stuart Creek	43282	Bridge	841
Stuart Creek	43283	Bridge	841
Stuart Creek	43284	Bridge	841
Unnamed No 2	43285	Bridge	841
Stuart Bypass Rail And Road Overpass	37709	Bridge	14A
Stuart Bypass Rail And Road Overpass	37709	Bridge	830
Stoney Creek	8667	Bridge	14A
H. R. Mayston Bridge	7626	Bridge	14A
Reid River	7533	Bridge	14A
Mingela Railway	7532	Bridge	14A
Macrossan Bridge	7571	Bridge	14A
John Joyce Bridge Anthill Creek	7524	Bridge	14A
Stonehouse Creek Peter Joyce Bridge	7525	Bridge	14A
Oaky Creek	7529	Bridge	14A
Ross River	44104	Bridge	841

Esmeralda Graphite Project

Route Overview with Existing Waterway Crossings



Location of the site within Queensland

Legend

- Proposed Haul Route
- State Controlled Bridges

Project: BE250115

Date: 03/06/2026

Scale: 1:1,200,000 at A3

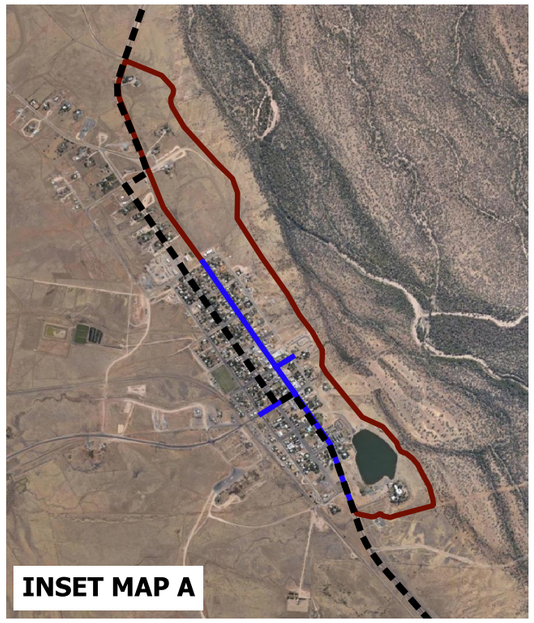
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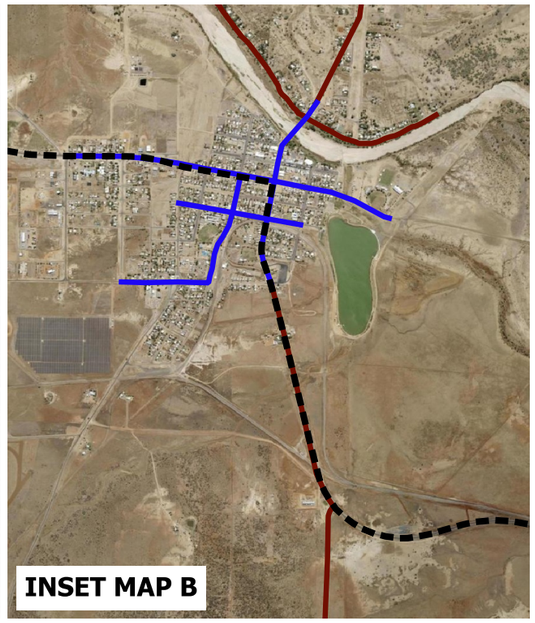
Data Sources: Queensland Globe

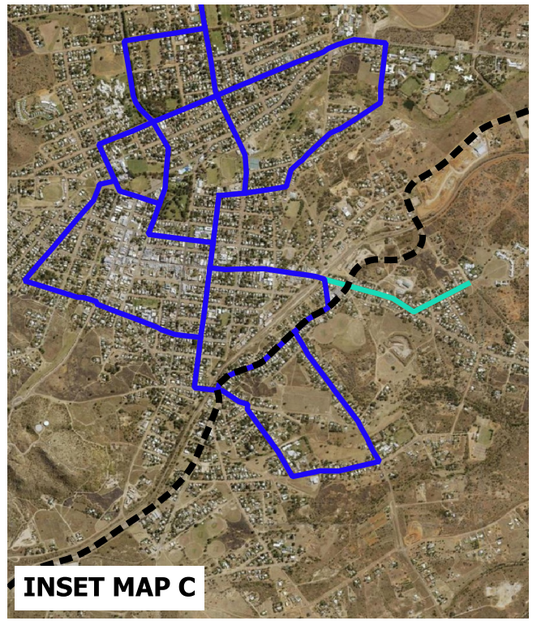
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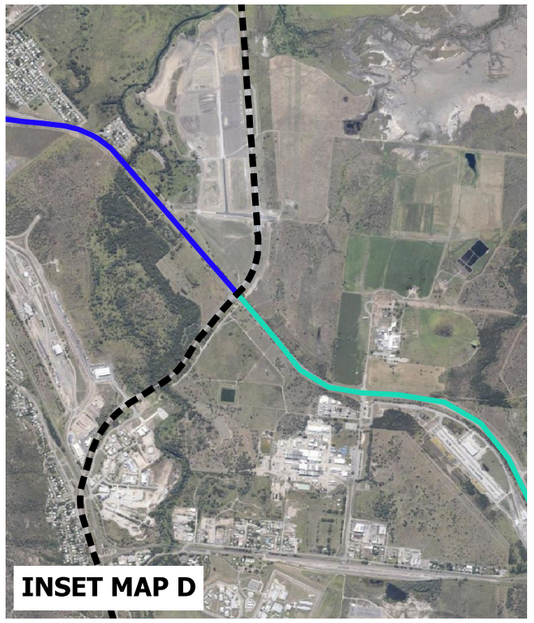
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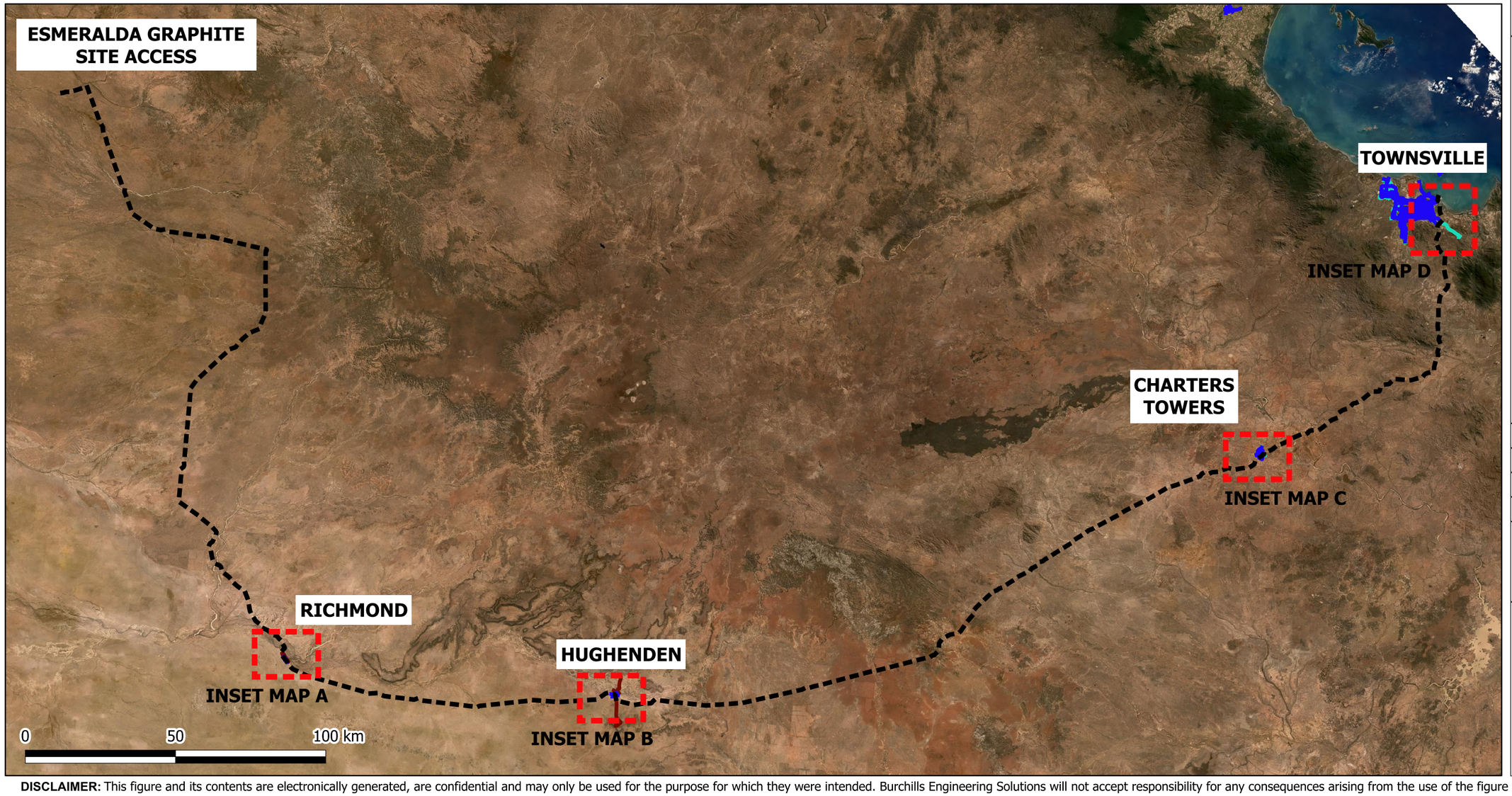
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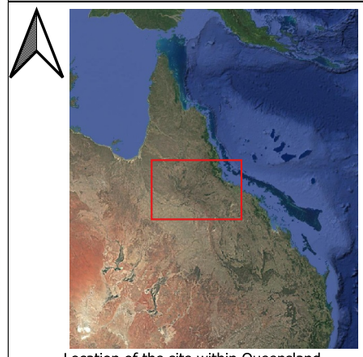






Esmeralda Graphite Project

Route Overview with Principal Cycle Network



Location of the site within Queensland

Legend

Principal Cycle Network

- Future
- Principal
- Tourism
- Proposed Haul Route

Project: BE250115

Date: 03/06/2026

Scale: 1:1,200,000 (Main) at A3

Projection:EPSG:4326

Data Sources: Queensland Globe

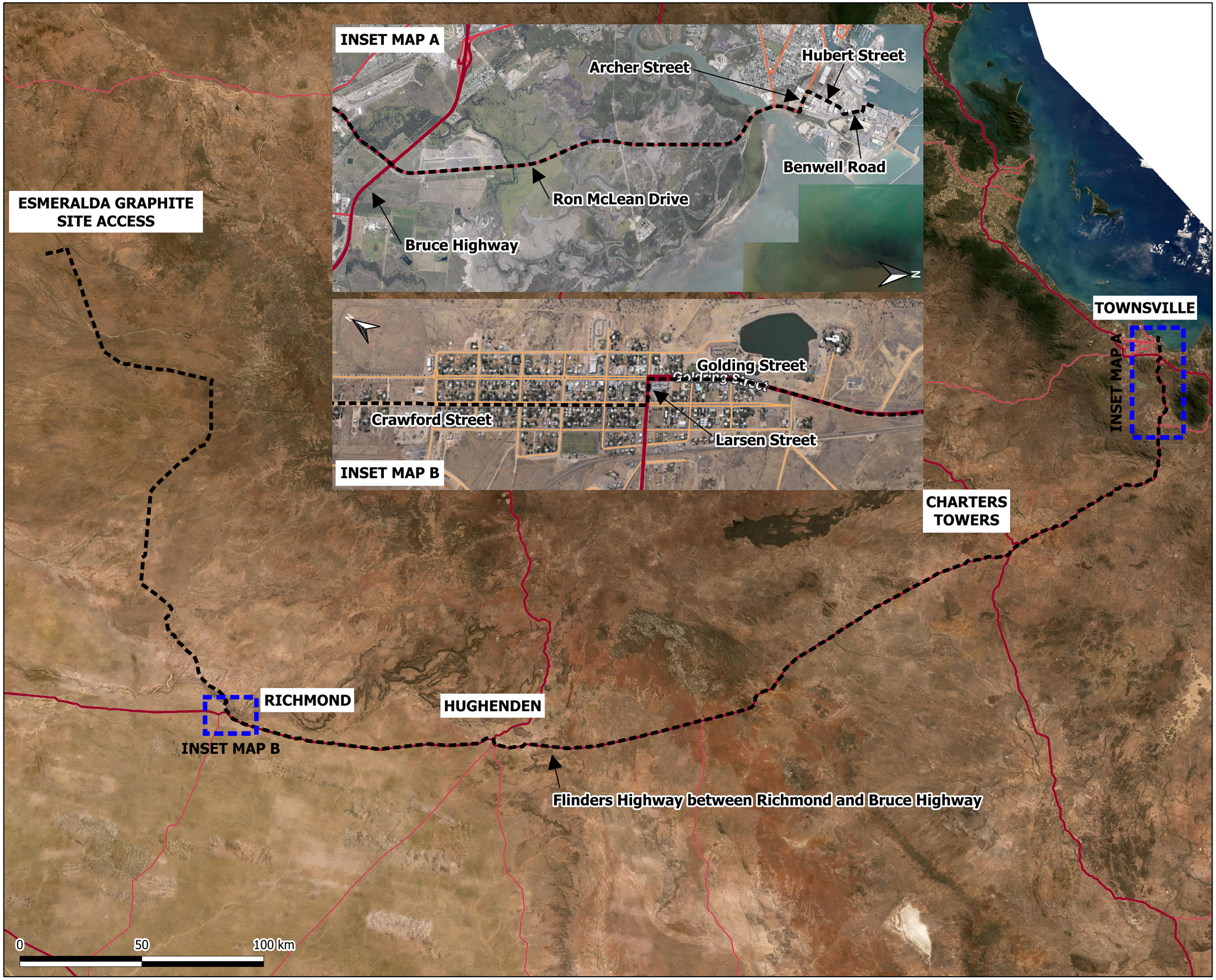
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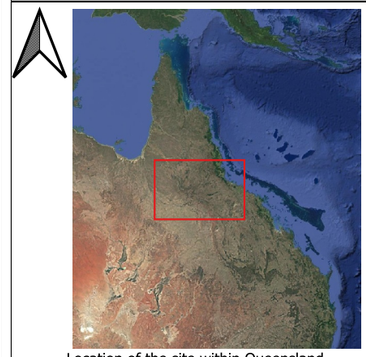
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Esmeralda Graphite Project

Route Overview with Existing Road Classification





Location of the site within Queensland

Legend

- Proposed Haul Route

QLD Roads and tracks

- Motorway
- Highway
- Secondary
- Connector
- Local

Project: BE250115
Date: 03/06/2026
Scale: 1:1,200,000 (Main) at A3
Projection:EPSG:4326
Data Sources: Queensland Globe

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ESMERALDA GRAPHITE SITE ACCESS

TOWNSVILLE

CHARTERS TOWERS

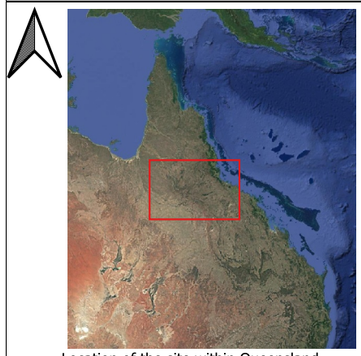
RICHMOND

HUGHENDEN

0 50 100 km

Esmeralda Graphite Project

Route Overview with Existing Stock Routes



Location of the site within Queensland

Legend

QLD Stock Routes

- Primary
- Secondary
- Tertiary
- Proposed Haul Route

Project: BE250115

Date: 03/06/2026

Scale: 1:1,200,000 at A3

Projection:EPSG:4326

Data Sources: Queensland Globe

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Appendix F – Route Constraints (Site Visit)

Richmond-Woolgar Road (within RSC Boundary)

Chainage 0.0 is taken as Goldring Street / Flinders Highway intersection.

Table 3.2 Richmond-Woolgar Road Key Access Constraints

Item No.	Chainage	Constraint	Imagery
1	4.0	Flinders River Crossing Narrow two-way bridge	
2	5.3	Little Sandy Creek Narrow two-way culvert	
3	6.1	Low level, narrow culvert crossing	

Item No.	Chainage	Constraint	Imagery
4	6.4	Narrow overland flow path	
4	9.9	Narrow overland flow path	
5	10.9	Narrow one-way culvert. Good visibility on approach	
6	12.3	Single width grid	

Item No.	Chainage	Constraint	Imagery
7	13.8	Narrow overland flow path	
8	15.8	Double Barrel Creek. Wide enough for two vehicles.	
9	17.9	Two consecutive narrow floodways.	

Item No.	Chainage	Constraint	Imagery
10	19	Narrow floodway on a bend in the road alignment.	
11	20.6	Narrow culvert	
12	21	Narrow carriageway in poor condition, on crest	

Item No.	Chainage	Constraint	Imagery
13	21.3	Two-way grid	
14	22.6	Carriageway narrows to one-way width	
15	25.3	Double Grid and narrow culvert crossing	

Item No.	Chainage	Constraint	Imagery
16	27.6	Damaged bridge infrastructure (Temporary sidetrack in place)	
17	27.6 – 28.8	Hazelwood Channels – series of narrow floodways and culverts	
18	29.6	Two-way grid on bend in road alignment	
19	30.1	Ram Creek overland floodway	

Item No.	Chainage	Constraint	Imagery
20	34.2	Two-way grid	
21	35.7	Two-way grid	
22	39.5	Two-Mile Channels	

Item No.	Chainage	Constraint	Imagery
23	43.6	Two-way grid	
24	43.9	Low level river crossing Stawell River Cambridge Crossing	 

Item No.	Chainage	Constraint	Imagery
25	45	Two-way grid	
26	48.7	Two-way floodway	
27	49.7	Two-way grid	
28	49.9	Two-way floodway	

Item No.	Chainage	Constraint	Imagery
29	50.8	Two-way floodway	
30	53	Two-way grid on bend	
31	56.7	Two-way floodway	

Item No.	Chainage	Constraint	Imagery
32	58.9 and 64.5	Two-way grid	
33	67.8	Two-way grid	
34	73.4	Narrow culvert crossing	

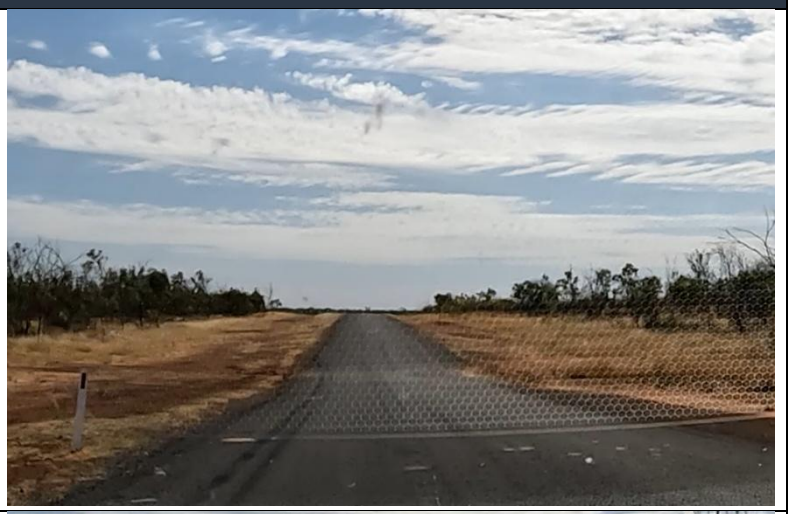
Item No.	Chainage	Constraint	Imagery
35	77.9	Narrow floodway	
36	83.3	Two-way grid	
37	85.5	Two-way floodway	

Item No.	Chainage	Constraint	Imagery
38	86.0 and 86.6	Dip and narrow overland flow path	
39	87	Express Creek narrow creek crossing	
40	90.4	Two-way grid	
41	95.4	Two-way grid	

Item No.	Chainage	Constraint	Imagery
42	96.5 and 97.0	Plum Tree Creek – narrow culvert crossing	
43	99.9	Two-way grid	
44	100.4	Red Mile Creek crossing – Narrow crossing. With Give-way for southbound traffic.	
45	105.2	Serpentine Creek crossing – narrow crossing	

Item No.	Chainage	Constraint	Imagery
46	108.1	Two-way grid – grid undermined by water wash out	No photo
47	110.3	Limestone Creek. Narrow dip in carriageway	
48	115	Two-way grid	
49	129.8	Two-way grid	

Item No.	Chainage	Constraint	Imagery
50	132	Low level, narrow floodway	
51	133	Two-way grid	
52	135	Two-way grid	

Item No.	Chainage	Constraint	Imagery
53	136.3	Two-way floodway	
54	136.9	Two-way floodway	
55	140	Two-way floodway	

Item No.	Chainage	Constraint	Imagery
56	141.5	Two-way grid	
57	145.8	Transition from seal to gravel. Gravel for 10.4km	

Richmond Road (within CSC Boundary)

Continued from Richmond-Woolgar Road in the section above

Table 3.2 Richmond Road Key Access Constraints

Item No.	Chainage	Constraint	Imagery
58	151.2	Two-way grid	
59	151.4	Norman River crossing	
60	156.2	Gravel to seal.	

Item No.	Chainage	Constraint	Imagery
61	170.6	Two-way grid	
62	182	Two-way grid	
63	193.9	Two-way grid	

Item No.	Chainage	Constraint	Imagery
64	194.6	Seal to gravel.	
65	195.7	Narrow culvert	
66	202.5	Gravel to seal transition	
67	208	Two-way grid.	

Item No.	Chainage	Constraint	Imagery
68	209.0	Narrow dip in carriageway	
69	211.3	Narrow dip in carriageway	
70	211.7	Two-way grid.	

Item No.	Chainage	Constraint	Imagery
71	212.6	Narrow floodway and poor surface	
72	219.7	Narrow floodway	
73	220.6	Narrow floodway	

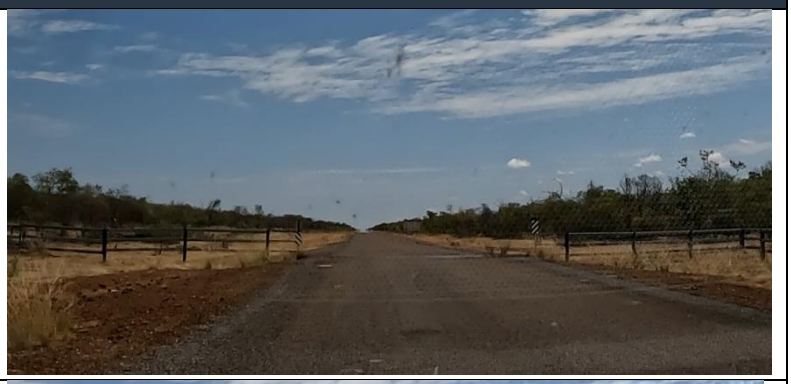
Item No.	Chainage	Constraint	Imagery
74	223.1	Two-way Grid	
75	228.7	Narrow floodway	
76	229.2	Two-way grid	

Item No.	Chainage	Constraint	Imagery
77	229.8	Clara River crossing – Narrow carriageway	
78	238..6	Dip in carriageway	
79	241.3	Two-way grid	

Item No.	Chainage	Constraint	Imagery
80	242.2	Narrow overland flow path on bend.	
81	247.1	Gravel to seal transition	
82	247.4	Significant damage to seal on southbound side of carriageway for 300m in length.	

Item No.	Chainage	Constraint	Imagery
83	248.7	Narrow overland flow path.	
84	249.9	Narrow overland crossing. Road in disrepair.	
85	252.7	Narrow overland crossing. Debris on seal	

Item No.	Chainage	Constraint	Imagery
86	253.1	Debris on carriageway. Overland flow path	
87	255.3	Debris on carriageway. Overland flow path	
88	256.6	Narrow overland flow path	

Item No.	Chainage	Constraint	Imagery
89	258.3	Two-way grid	
90	263	Narrow overland flow path	

Esmeralda Prospect Road

Chainage 0.0 is taken at the Richmond Road / Esmeralda Prospect Road intersection

Table 3.3 Esmeralda Prospect Road Constraints

Item No.	Chainage	Constraint	Imagery
1	0.0.	Single width grid	
2	0.1	Narrow carriageway for 100m	

Esmeralda Prospect Road varies in width beyond this point but is approximately 6-8m wide and is suitable for two-way traffic.

Private Site Access Road

Chainage 0.0 is taken at the Esmeralda Prospect Road / Private Access Road intersection.

Table 3.4: Private Road Constraints

Item No.	Chainage	Constraint	Imagery
1	0.5	Carriageway narrows to single width. Gravel is overgrown. But fit for use.	
2	2.4	Gravel needs regrading to accommodate two-way traffic.	
3	3.3	Narrow carriageway on bend. Usable carriageway width narrows.	
4	8.8	Carriageway narrows with drop off.	

Item No.	Chainage	Constraint	Imagery
5	10.8	Carriageway narrows. Unfit for use for 500m	 
6	12.6	Narrow carriageway	

Item No.	Chainage	Constraint	Imagery
7	14.3	Narrow carriageway	
8	17.3	Narrow gate	
9	17.6	Narrow carriageway. Soft surface	