APPENDIX U

INLAND RAIL

Traffic Impact Assessment

Part 1 of 2

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

IR_1381

ARTC

Inland Rail Helidon to Calvert EIS

Appendix U - Traffic Impact Assessment

Australian Rail Track Corporation

Reference: 3300

Document Number:
2-0001-330-EAP-10-RP-0220

Contents

Appendices

Appendix I

Precast Concrete Construction Traffic Routes

Appendix J

Quarry Construction Traffic Routes

Appendix K

Sleeper Construction Traffic Routes

Appendix L

Water Construction Traffic Routes

Appendix M

Workforce Construction Traffic Routes

Appendix N

Tunnel Spoil Construction Traffic Routes

Appendix O

Multi-Combination Heavy Vehicle Routes

Appendix P

Detailed Link Analysis

Appendix Q

Gaul Street Technical Memo

Appendix R

Public Transport and Principle Cycle Network Plan Maps

Appendix S

Peak construction traffic by road segment

Figures

Tables

Abbreviations

Abbreviation	Definition
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
ALCAM	Australian Level Crossing Assessment Model
ARTC	Australian Rail Track Corporation
AUL	Auxiliary left turn
BAL	Basic left turn
C2K	Calvert to Kagaru
CEMP	Construction Environmental Management Plan
CHR	Channelised right turn
COAG	Council of Australian Governments
CVC	Clarence Valley Council
d	Delay
DCA	Definition for Coding Accidents
DNRME	Department of Natural Resources, Mines and Energy
DTMR	Queensland Department of Transport Main Roads
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
FAMLIT	Freight Axle Mass Limits Investigation Tool
FTE	Full Time Equivalent
GTIA	Guidelines to Traffic Impact Assessment
H2C	Helidon to Calvert
HV	Heavy vehicle
ICC	Ipswich City Council
m	metre
km	kilometre
kN	Kilo-Newtons
Land Act	*Land Act 1994* (Qld)
LCC	Logan City Council
LGA	Local government area
LGR	Local Government Roads
Local Government Act	*Local Government Act 2009* (Qld)
LOS	Level of Service
LRDS	Local road deterioration study
LVRC	Lockyer Valley Regional Council
LWR	Long welded rail
MUTCD	Manual of Uniform Traffic Control Devices
NHVR	National Heavy Vehicle Regulator
NRLCSS	National Railway Level Crossing Safety Strategy
NSW	New South Wales
ONRSR	Office of the National Rail Safety Regulator

Abbreviation	Definition
OSOM	Oversize, over-mass vehicles
PCNP	Principal Cycle Network Plans
QAS	Queensland Ambulance Services
QFES	Queensland Fire and Emergency Services
QLCSS	Queensland Level Crossing Safety Strategy
QLD	Queensland
QPS	Queensland Police Services
QR	Queensland Rail
RAAF	Royal Australian Air Force
RAMR	Rail Maintenance Access Road
RAV	Restricted Access Vehicles
RFI	Request for Information
RMS	Roads and Maritime Services
RSNL Act	*Rail Safety National Law Act 2017* (Qld)
RTA	Roads and Traffic Authority
RUMP	Road Use Management Plan
SAR	Standard Axle Repetitions
SAR/HV	Standard Axle Repetition per Heavy Vehicle
SCR	State-controlled roads
SDA	State Development Area
SDAP	State development assessment provisions
SEQ	South East Queensland
SRRC	Scenic Rim Regional Council
TAL	Tonne Axle Load
TCP	Traffic Control Plans
TDM	Travel Demand Management
TI Act	*Transport Infrastructure Act 1994* (Qld)
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
ToR	Terms of Reference
TPC Act	*Transport Planning and Coordination Act 1994* (Qld)
TRC	Toowoomba Regional Council
VMS	Variable Message Signs
WIM	Weigh-in-motion

1 Introduction and approach

1.1 Project overview

ARTC proposes to construct and operate the Helidon to Calvert (H2C) section of Inland Rail (the Project). The Project is located in South East Queensland (SEQ) and consists of approximately 47 kilometres (km) of new dual gauge track. The Project is proposed to connect Helidon (east of Toowoomba) with Calvert (near Ipswich), via Placid Hills, Gatton, Forest Hill, Laidley and Grandchester. It crosses the two local government areas (LGAs) of Lockyer Valley and Ipswich City. This 47 km section will include a new 850 metre (m) tunnel to create an efficient route through the steep terrain of the Little Liverpool Range. The Traffic Impact Assessment (TIA) partly addresses the Project specific transport matters outlined in Part B, Section 11 of the final Terms of Reference (ToR).

1.2 Scope and context of report

This TIA addressed potential traffic, transport and access impacts of the construction and operation of the Project on the surrounding transport infrastructure and road users. The report also summarises the potential road impacts from the movement of materials, workforce and equipment during the construction and operational phases of the Project on the surrounding road network. The assessments were undertaken for public New South Wales (NSW) State Roads and Queensland (QLD) State-controlled roads (together referred to as SCR) and Local Government Roads (LGR).

This assessment follows the construction methodology adopted for the Project whereby a supplier has been assumed for all key materials. Generally, suppliers local to the Project within QLD have been assumed. However, due to specific Project requirements, the provision of dual-gauge sleepers was assumed to be provided from a facility in Grafton, NSW, resulting in the inclusion of NSW impacts within this TIA.

The transport of materials, workforce and equipment during construction is expected to primarily utilise the existing road and rail transport networks. While some materials and workforce will utilise port and airport facilities, the expected impact from the Project these facilities is not considered to be significant during either the construction or operational phases. Impacts from the Project on the operation and throughputs at ports (containers) has not been assessed in this report as it is considered to be out of scope.

The construction routes assumed as a part of this assessment are routes which the construction contractor may use to transport materials from the assumed suppliers to the Project laydown areas. However, the determination of the final construction and heavy vehicle (HV) routes will be subject to consultation between Department of Transport and Main Roads (DTMR), the local government authority and the construction contractor during the next phase of the Project. This is consistent with Section 7.5 of DTMR's Guidelines to Traffic Impact Assessment (GTIA) (2017) which states that the TIA 'may be finalised when project contractors are appointed, and final traffic generation is clearer.' Consistent with this, Registered Professional Engineer of QLD certification of the Project TIA will be undertaken as per the requirement of the GTIA at a time when a construction contractor is engaged and final traffic volumes, turning movements, routes and vehicle types are known and, if required, DTMR have completed their final review of such information. Until such time as DTMR have completed their final review of such information provided by the construction contractor and provided confirmation of their satisfaction of such, this information will be deemed incomplete and should not be solely relied upon.

The TIA focuses on the Project's impact on the existing road and rail transport infrastructure and users, and includes the following tasks:

- Provides an overview of existing transport network conditions, including existing road, active transport and rail traffic
- A description of the Project

- Provides an overview of baseline operations associated with intersections, road links, pavements, existing road-rail interface locations and existing road safety
- Provides a summary of construction tasks, routes and resulting traffic generated by the Project
- Summarises rail operational traffic and maintenance processes, as an input to the impact assessment
- Conducts a TIA associated with intersections, road links, road-rail interface locations, pavements, road safety and access and frontage based on the Project construction routes assumed as a part of the design
- Describes potential impacts associated with the Project and assumed construction routes, and identifies measures to be undertaken to mitigate the identified impacts for the Project and any future design development
- Provides a summary of potential traffic impact risks identified along the route
- Takes into consideration the cumulative impacts of the Project alongside other proximate committed major projects.

The Terms of Reference (ToR) describe the matters the proponent must address in the EIS for the Project. The matters relating to traffic, transport and access are contained in ToR 11.109 through ToR 11.117. These are provided in Table 1.1.

Table 1.1 Terms of Reference requirements – Traffic, transport and access

Terms of Reference requirements	Addressed in chapter
Transport	
11.109. Describe and map the existing transport infrastructure and corridors. Provide data on existing road, active transport and rail traffic in the project area	Section 2 Chapter 19, Section 19.7
11.110. Describe and map where the project's preferred alignment differs from the State's strategic rail corridor and the reasons for any such deviation	Chapter 19, Section 19.5 and Figure 19.1
11.111. Describe how the project complies with the *Queensland Level Crossing Safety Strategy 2012-2021* for new road/rail interfaces and the impacts on existing road/rail interfaces	Section 1.3, 1.5.2.2 and 9.5 Chapter 19, Sections 19.4, 19.6.3 and 19.7
11.112. Assess the impacts of the project on individual road/rail crossings and any cumulative impacts on the wider transport network in the context of the Queensland level crossing safety strategy	Section 11 Chapter 19, Sections 19.8, 19.9 and 19.11
11.113. The EIS should include a clear summary of the total transport task for the project, including workforce, haulage routes, inputs and outputs during the construction and operational phases	Sections 3, 5, 6, and 12 as well as Appendix G to O Chapter 19, Sections 19.5 and 19.8
11.114. Present the transport assessment in separate sections for each project affected mode (road, active transport and rail) as appropriate for each phase of the project	Section 6 Chapter 19, Section 19.7
11.115. Provide sufficient information to allow an independent assessment of how existing and proposed transport infrastructure will be affected by project transport at the local and regional level (for example, local roads and state-controlled roads). Discussion should also refer to emergency service access	Section 6 Chapter 19, Sections 19.7, 19.8 and 19.9
11.116. Include details of the adopted assessment methodology for impacts on roads within the road impact assessment report in accordance with the Department of Transport and Main Roads' *Guide to Traffic Impact Assessment*	Section 1.5 Chapter 19, Section 19.6
11.117. Discuss and recommend how identified impacts will be mitigated. Mitigation strategies are to be prepared in close consultation with relevant transport authorities (including Local Government)	Section 9 Chapter 19, Section 19.10

1.3 Relevant legislation, policy and guidelines

Table 1.1 identifies the relevance of any legislative or policy level objectives and standards that exist to protect or manage the transport infrastructures in the context of the Project.

Table 1.2 Summary of legislation, standards, policies and guidelines

Legislation, policy/ standard or guideline	Relevance to the Project
Legislation	
Transport Planning and Coordination Act 1994 (Qld) (TPC Act)	The overall objective of the TPC Act is to encourage effective integrated planning and efficient management of transport infrastructure. This is achieved through the DTMR's Transport Coordination Plan for Queensland 2017-2027.
Transport Infrastructure Act 1994 (Qld) (TI Act)	The overall objective of the TI Act is to provide a regime that allows for and encourages effective integrated planning and efficient management of a system of transport infrastructure. This is consistent with the objectives of the TPC Act. Any crossings of existing rail lines or works within existing rail corridor will trigger s255-*Interfering with railway* and will require the approval of the railway manager. Any works within SCRs or access to SCRs (during construction) will trigger s50-*Ancillary works and encroachments & s33-Prohibition on roadworks etc. on State controlled roads* & s62-*Management of access between individual properties and State controlled roads section* 66-*Road access works within State controlled road*.
Land Act 1994 (Qld) (Land Act)	The Land Act prescribes the framework for the allocation of non-freehold land tenure and its subsequent management. Under Chapter 4, Part 4 of the Land Act, permits are required for the occupation of unallocated state land, a reserve or a road. A permit to occupy will also be required for any underground infrastructure that is proposed beneath land governed by State held tenure. Chapter 3, Part 2, Division 2 of the Land Act contains the provisions relating to the temporary or permanent closure of a road, including SCR and LGRs, and declared stock routes.
Rail Safety National Law Act 2017 (Qld) (RSNL Act)	The purpose of the RSNL Act is to provide for safe railway operations in Australia. One objective of the RSNL Act is to establish the Office of the National Rail Safety Regulator (ONRSR) as the rail safety regulator in QLD. The RSNL Act was created following an agreement of the Council of Australian Governments (COAG) to deliver a consistent approach to rail safety policy and regulations (and to remove the inconsistencies) between the previous state and territory rail safety regimes. The RSNL Act governs the safe operation of the rail system in QLD. The ongoing operation of the Project will need to comply with all areas of the RSNL Act, covering rail industry work practices and protocols for safe working in rail corridors and associated accreditation, signalling and control, the ongoing management of structures and civil works, interfaces with public roads and highways and other activities impacting on rail safety.
Local Government Act 2009 (Qld) (Local Government Act)	The Local Government Act sets out the responsibilities of local government authorities with regard to the construction, improvement, control and management of traffic on local roads (excluding SCRs). A local government authority may temporarily or permanently close a local road to traffic in accordance with the Local Government Act. An adjoining landowner must apply under the Land Act to temporarily or permanently close a local road.
Stock Route Management Act 2002	The QLD stock route network is a network of stock routes and reserves for travelling stock in the State. The *Stock Route Management Act 2002* (Qld) provides for managing the stock route network, recognising that the network has multiple uses with the primary purpose being for travelling stock (refer Section 98 (2) (a)). All stock routes are classified as roads under the Land Act.
Transport Administration Act 1988 (NSW)	The objectives of the *Transport Administration Act 1988* (NSW) relate to administering the transport services provided to the people of NSW and include: ■ Providing an efficient and accountable framework for the governance of the delivery of transport services ■ Promoting the integration of the transport system ■ Enabling effective planning and delivery of transport infrastructure and services ■ Facilitating the mobilisation and prioritisation of key resources across the transport sector ■ Coordinating the activities of those engaged in the delivery of transport services

Legislation, policy/ standard or guideline	Relevance to the Project
	▪ Maintaining independent regulatory arrangements for securing the safety of transport services. This Act is relevant to the movement of construction materials on NSW roads within the Project.
Road Transport Act of 2013 (NSW)	The elements of the *Road Transport Act of 2013* (NSW) relevant to the Project are to govern the application of traffic control devices, electrical equipment or other facilities on roads or road shoulders, footpaths, structures under or over the Project and control of vehicles (other than vehicles used on the railway itself) and animals along construction routes within NSW.
Local government plans/strategies	
Draft Lockyer Valley Regional Planning Scheme	The Project is located within the Lockyer Valley local government area (LGA). The planning schemes currently in force and effect within the Lockyer Valley LGA (LGA) are those of the former Gatton and Laidley Shires which were in place when these shires were amalgamated in 2008, as well as the Grantham Reconstruction Area Development Scheme. These planning schemes continue to apply until the new Lockyer Valley Planning Scheme has been adopted. As of August 2019, the Lockyer Valley Planning Scheme is in draft and has not yet been released for public consultation.
Draft Lockyer Valley Planning Scheme – Priority Infrastructure Plan	LVRC has developed a Draft Priority Infrastructure Plan. This Plan identifies the infrastructure the Lockyer Valley will need between 2014 and 2024 to service the expected population and employment growth over the road network, as well as for community facilities, water supply and sewerage.
Gatton Shire Planning Scheme 2007 (Gatton Shire Council 2007)	The Gatton Shire Planning Scheme is the primary planning document for land located within the former Gatton Shire (with the exception of land that is subject to the Grantham Reconstruction Area). This area now forms part of the Lockyer Valley LGA. This planning scheme was prepared under the repealed Integrated Planning Act 1997. LVRC administers all development and land use planning for this area. The Gatton Shire Planning Scheme outlines the level of assessment and requirements for undertaking development in the former Gatton Shire. The Project is located within the former Gatton Shire, now Lockyer Valley LGA. In accordance with Schedule 6, Part 5, Section 26(2) of the Planning Regulation 2017, development for the construction of transport infrastructure, where the infrastructure is government supported transport infrastructure, is exempt from assessment under the relevant local categorising instruments. As such, the provisions of the Gatton Planning Scheme do not apply to the Project. Notwithstanding this, the zoning intent for these areas as determined by the planning scheme has been taken into consideration when determining impacts of the Project on future land uses in the area.
Laidley Shire Planning Scheme 2003 (Lockyer Valley Regional Council 2003)	The Laidley Shire Planning Scheme is the primary planning document for land located within the former Laidley Shire. This area now forms part of the Lockyer Valley LGA. The planning scheme was prepared under the repealed *Integrated Planning Act 1997*. LVRC administers all development and land use planning for this area. The Laidley Shire Planning Scheme outlines the level of assessment and requirements for undertaking development in the former Laidley Shire. The Project is located within the former Laidley Shire, now Lockyer Valley LGA. In accordance with Schedule 6, Part 5, Section 26(2) of the Planning Regulation 2017, development for the construction of transport infrastructure, where the infrastructure is government supported transport infrastructure, is exempt from assessment under the relevant local categorising instruments. As such, the provisions of the provisions of the Lockyer Valley Shire Planning Scheme do not apply to the Project. Notwithstanding this, the zoning intent for these areas as determined by the planning scheme has been taken into consideration when determining impacts of the Project on future land uses in the area.
Ipswich City Planning Scheme 2006 (Ipswich City Council 2006)	The purpose of the Ipswich City Planning Scheme is to act as a framework for managing development in a way that advances previous planning documents for Ipswich City Council (ICC). It will identify assessable and self-assessable development and identify anticipated outcomes in the LGA as the context for assessing development. Part of this Scheme includes the Local Government Infrastructure Plan which provides desired standards of service for the transport network, plans for trunk infrastructure and a schedule of works for planned infrastructure in Ipswich City. The Project passes through the Ipswich LGA.

Legislation, policy/ standard or guideline	Relevance to the Project
	In accordance with Schedule 6, Part 5, Section 26(2) of the Planning Regulation, provisions of this planning scheme do not apply to the Project. Notwithstanding this, the zoning intent for these areas as determined by the planning scheme has been taken into consideration when determining impacts of the Project on future land uses in the area.
City of Ipswich Transport Plan 2016 (Ipswich City Council 2016)	The City of Ipswich Transport Plan outlines the Council's high-level aspirations to advance the transport system in Ipswich by identifying current key transport challenges, setting a vision and objective for the transport system and identifying appropriate policy focuses and actions.
Guidelines	
Queensland Level Crossing Safety Strategy 2012-2021 (QLCSS) (DTMR 2012a)	This strategy complements the National Railway Level Crossing Safety Strategy (NRLCSS) (2010-2020), which was released by the Australian Transport Council in 2009 to promote national consistency in addressing level crossing safety. (Note: the NRLCSS has subsequently been superseded by the NRLCSS (2017-2020. However, the QLCSS refers to the 2010-2020 version). A reliable state transport network is vital for connecting people, places, goods and services. It is in everyone's interests that road and rail users work together to make this network as safe and efficient as possible. The strategy focuses on all users of level crossings, including train crew and passengers, road vehicle drivers, riders, passengers and pedestrians. These crossings, including any which may be accessible to the public, are considered to be a workplace health and safety matter and are managed under separate arrangements. This strategy will be used with its associated key performance indicators in order to ensure that mitigation measures determined for all public road-rail interface locations (level crossings) through the analysis process focus on safety, risk and operational efficiency.
Guideline to Traffic Impact Assessment, September 2017 (Qld) (DTMR 2017)	The GTIA has been used as a point of reference for the traffic and transport assessment, as it relates to roads and intersections affected by the construction and operation of the Project. GTIA provides information about the processes involved to assess road impacts triggered by a proposed development. While it is not mandatory, the GTIA provides a basis for the assessment of road impacts and has been adopted for the preliminary assessment on traffic and pavement impacts by the Project. Although the Guidelines only apply to the SCRs, Local Government Authorities may choose to adopt or use this as a reference. In general, DTMR will consider a development's road impacts to be 'insignificant' if the development generates an increase in traffic on SCRs of less than 5 per cent (%) over existing levels, either measured in terms of annual average daily traffic (AADT) or Standard Axle Repetitions (SARs). Inputs to the GTIA process typically include the existing traffic levels, the Project construction timeframe, and that of other projects, volume of construction materials, haul vehicles and their capacities, and therefore the number of new or additional Project-related trips likely to use the network. The use of the assessment process recommended in the GTIA will provide the Project with clarification on likely traffic impacts on nominated haulage routes, intersections and other affected roads. It is noted that an updated version of the GTIA was released in December 2018, after the ToR for the Project were released. This assessment has been undertaken consistent with the 2017 GTIA consistent with the ToR, which is also generally in accordance with the 2018 GTIA (and with no material implications to assessment outcomes).
Roads and Traffic Authority Guide to Traffic Generating Developments (Transport Planning Section New South Wales 2002)	The RTA Guide to Traffic Generating Developments Version 2.2 (2002) (NSW) (the guide) outlines all aspects of traffic generation considerations relating to developments. The guide provides information regarding traffic issues for those submitting Development Applications, and for those involved in the assessment of these applications. The overall objective is all parties impacted have access to common information relevant to the development approval process. The information provided gives background into the likely impacts of traffic from various types of developments and associated mitigation measures, thereby illustrating the importance of accurate development assessment. The guide is used to provide guidance on the assessment approach for mid-block capacity assessments. The GTIA manual is used as overarching guideline document for NSW roads, as agreed with Roads and Maritime Services (RMS).

Legislation, policy/ standard or guideline	Relevance to the Project
Manual of Uniform Traffic Control Devices (MUTCD) Part 3: Traffic Control for Works on Roads (DTMR 2019a)	The Queensland MUTCD and its supplements, within the meaning of the *Transport Operations (Road Use Management) Act 1995*, contains the design of, and the methods, standards and procedures in relation to every sign, signal, marking, light or device, installed on a road. The use of signs, markings and other devices at railway level crossings and affected roads, based on uniform standards and practices, is essential in the interests of safety for both rail traffic and road users. This part of the MUTCD sets out the principles of signing at roadworks, describes the signs and devices used to effect traffic guidance and provides typical layout diagrams for deployment of signs and devices for various work site configurations.
Manual of Uniform Traffic Control Devices (MUTCD) Part 7: Railway Crossings (DTMR 2019b)	The Queensland MUTCD and its supplements, within the meaning of the *Transport Operations (Road Use Management) Act 1995*, contains the design of, and the methods, standards and procedures in relation to every sign, signal, marking, light or device, installed on a road. The use of signs, markings and other devices at railway level crossings and affected roads, based on uniform standards and practices, is essential in the interests of safety for both rail traffic and road users. This part of the MUTCD sets out the various controls used at railway level crossings and describes the devices and assemblies, their use and location to achieve these controls.
DTMR Guide to Development in a Transport Environment: Rail Transport and Main Roads (DTMR 2015)	The DTMR Guide to Development in a Transport Environment: Rail provides important information for the planning, design or delivery of development in the vicinity of railways in QLD. It is intended for use as a technical reference document. The guide provides specific technical guidance to assist development proponents to achieve compliance with the performance outcomes and acceptable outcomes in the QLD State Development Assessment Provisions (SDAP) in relation to managing impacts of development on railway safety, structural integrity and operation. The guide also provides useful information in relation to the operational constraints and requirements when undertaking construction work within the railway environment.
Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings (2019a)	This Guide is concerned with traffic management at all types of intersections where road users must join or cross another stream of traffic. Part 6 describes the appropriate use of, and design of, the various intersection types and the techniques that need to be applied if efficient and safe intersections are to be provided to the road user.
Austroads Guide to Traffic Management Part 12: Traffic Impact of Developments (2019b)	This Guide helps traffic and transport practitioners identify and manage the impacts on the road arising from land use developments. The impacts being considered are those directly affecting road users of all classes, from large freight vehicles and buses to cyclists and pedestrians. It is a useful supplement to the NSW Guide and QLD GTIA publications discussed earlier.
Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012)	This Guide provides advice on the structural design of sealed road pavements. It covers detailed discussion of subgrade evaluation, pavement materials evaluation, analysis of traffic loading and structural design in addition to other factors relevant to pavement design.
Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis (2017a)	In the context of the Austroads Guide, Part 3: Traffic Studies and Analysis outlines the importance of traffic data and its analysis for traffic management and traffic control within a network. It serves to ensure some degree of consistency in conducting traffic studies and surveys. It provides guidance on the different types of traffic studies and surveys that can be undertaken, their use and application, and methods for traffic data collection and analysis.
Austroads Guide to Traffic Engineering Practice Part 2: Roadway Capacity (1988)	The guide provides information regarding roadway capacity for various road types. The guide is used to provide guidance on the assessment approach for mid-block capacity assessments.
Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2017b)	The guide provides road designers and other practitioners with guidance on the detailed geometric design of all at-grade intersections. It provides information regarding intersection design requirements to be used in occasions where permanent intersection upgrades may be required to accommodate Project related construction or operational traffic.

Legislation, policy/ standard or guideline	Relevance to the Project
Cycling Aspects of Austroads Guides (Austroads 2017c)	This guideline contains information that relates to the planning, design and traffic management of cycling facilities. The guideline provides: ■ An overview of planning and traffic management considerations and cross-references to other Austroads Guides and texts for further detailed information ■ A summary of design guidance and criteria relating to on-road and off-road cycle facilities together with a high level of cross-referencing to the relevant Austroads Guides for further information ■ Information and cross-references on the provision for cyclists at structures, traffic control devices, construction and maintenance considerations and end-of-trip facilities.
Australian Level Crossing Assessment Model (ALCAM) (2016)	ALCAM is an assessment tool used to identify key potential risks at level crossings and to assist in the prioritisation of crossings for upgrades. The risk model is used to support a decision-making process regarding both road and pedestrian level crossings and to help determine cost effective treatments.

1.4 Transport, traffic and access study area

The transport, traffic and access study area (herein referred to as the transport study area) defined for the TIA consists of the:

- Extent of the proposed rail corridor, including public roads intersecting the rail corridor (road-rail interface locations), shown in Figure 1.2
- Road network envisaged for the transport of workforce, materials and equipment during the construction and operational phases of the Project, shown in Figure 1.3.

The transport study area was the focus area for assessing impacts and determining and mitigation measures for the Project.

The TIA does not include the consideration of impacts to private roads. Any impacts to private roads are addressed directly with the impacted landowners as part of the Project's wider consultation process. The use of any private roads during construction will require a specific agreement between the delivery contractor with the private road owner.

1.4.1 Project rail corridor

The proposed rail corridor for the Project starts approximately 2.5 km north-west of Helidon along the existing West Moreton System rail corridor and heads in an easterly direction for approximately 1 km before deviating into a new alignment. It then continues east for approximately 9 km before re-joining the West Moreton System rail corridor in the vicinity of Placid Hills. The West Moreton System rail corridor is followed for approximately 18 km through Gatton and Forest Hill before again deviating into a new alignment to the north of Laidley. The alignment continues south-east for approximately 12 km before again joining the West Moreton System rail corridor in the vicinity of Calvert, then continuing along it for approximately 6 km in an easterly direction. The proposed Project is illustrated in Figure 1.1.

The proposed road-rail interface locations that form part of the transport study area are shown in Figure 1.2. These road-rail interface locations consist of public formed roads only. The road-rail interface locations included in the transport study area are all public road crossings which are envisaged to intersect with the proposed Project alignment. The road-rail interface locations are described in more detail within Section 3.2. The figure depicting the public road-rail interface locations is also provided in Appendix A.

1.4.2 Primary construction transport routes

The proposed primary road-based construction transport routes that form part of the transport study area are provided in Figure 1.3, with specific material transport routes provided in Appendix C to Appendix P. The construction routes proposed as a part of this assessment are routes which the construction contractor may use. However, the determination of the final construction and heavy vehicle routes will be subject to consultation between DTMR, the local government authorities and the construction contractor.

The primary road-based construction routes comprise of the existing road network (both SCR and LGRs) and will be used to transport materials, equipment and workforce for the construction of the Project.

Although other roads might also be used for the transport of construction activities, these roads would not be the primary construction routes and will have significantly less construction traffic volumes. The impact on these roads is expected to be insignificant and are therefore not evaluated.

It is assumed that rail will be supplied by a single source and will be distributed from the closest existing Queensland Rail (QR) and ARTC rail network to various points along the Project and hauled within the temporary construction disturbance footprint. It is assumed that no road-based construction routes are required to transport rail for this Project.

The primary construction routes for the Project are described in more detail in Section 5.6. The proposed primary construction route map for all road-based transport materials is also provided in Appendix B.

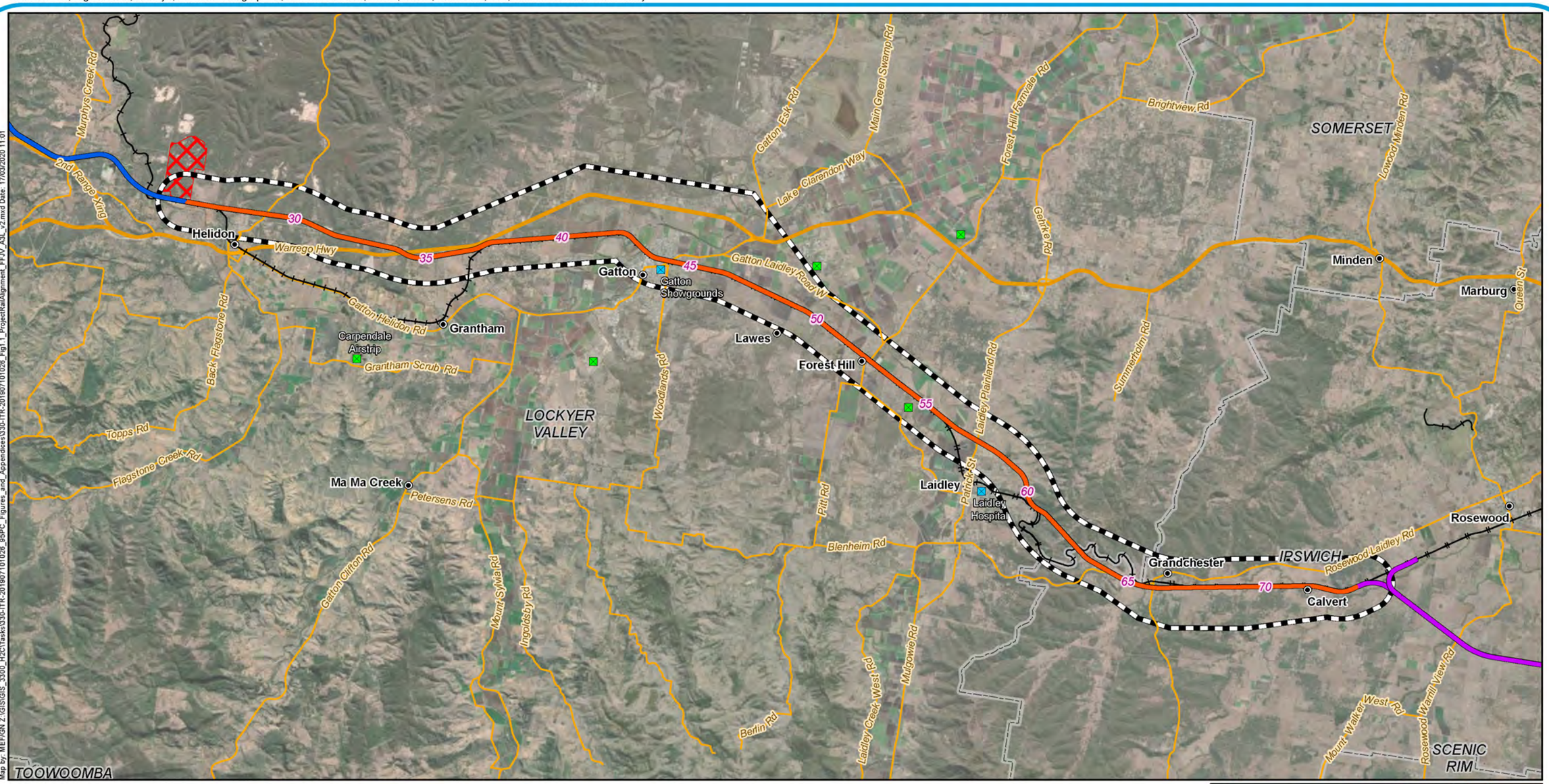
1.4.3 Operational transport routes

The major transport tasks during the operational phase of the Project are expected to be rail maintenance workforce movements and the delivery of maintenance materials. It is anticipated that operational traffic will be irregular and insignificant due to the expected nature of maintenance tasks (low vehicle movements to/from depots, transportation of maintenance material within the rail corridor).

While the Project may encourage the construction of intermodal freight facilities or industrial developments each of these developments will be subject to a separate development application (and associated TIA) and are not relevant to this assessment.

Similarly, this TIA does not consider changes to the network operations resulting from modal shift, such as the improvement to highway operations resulting from the shift of freight movements from heavy vehicles to trains.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: MEF/GN Z:\GIS\GIS_3300_H2C\Tasks\3330-ITR-20190710102B_95PC_Figures_and_Appendices\3330-ITR-20190710102B_Fig1.1_ProjectRailAlignment_FFJV_A3L_v2.mxd Date: 17/03/2020 11:01

Legend

- Heliport
- Landing ground
- 5 Chainage (km)
- Localities
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Existing rail
- Major roads
- Minor roads
- EIS investigation corridor
- Local Government Areas
- Reserve for explosives magazine

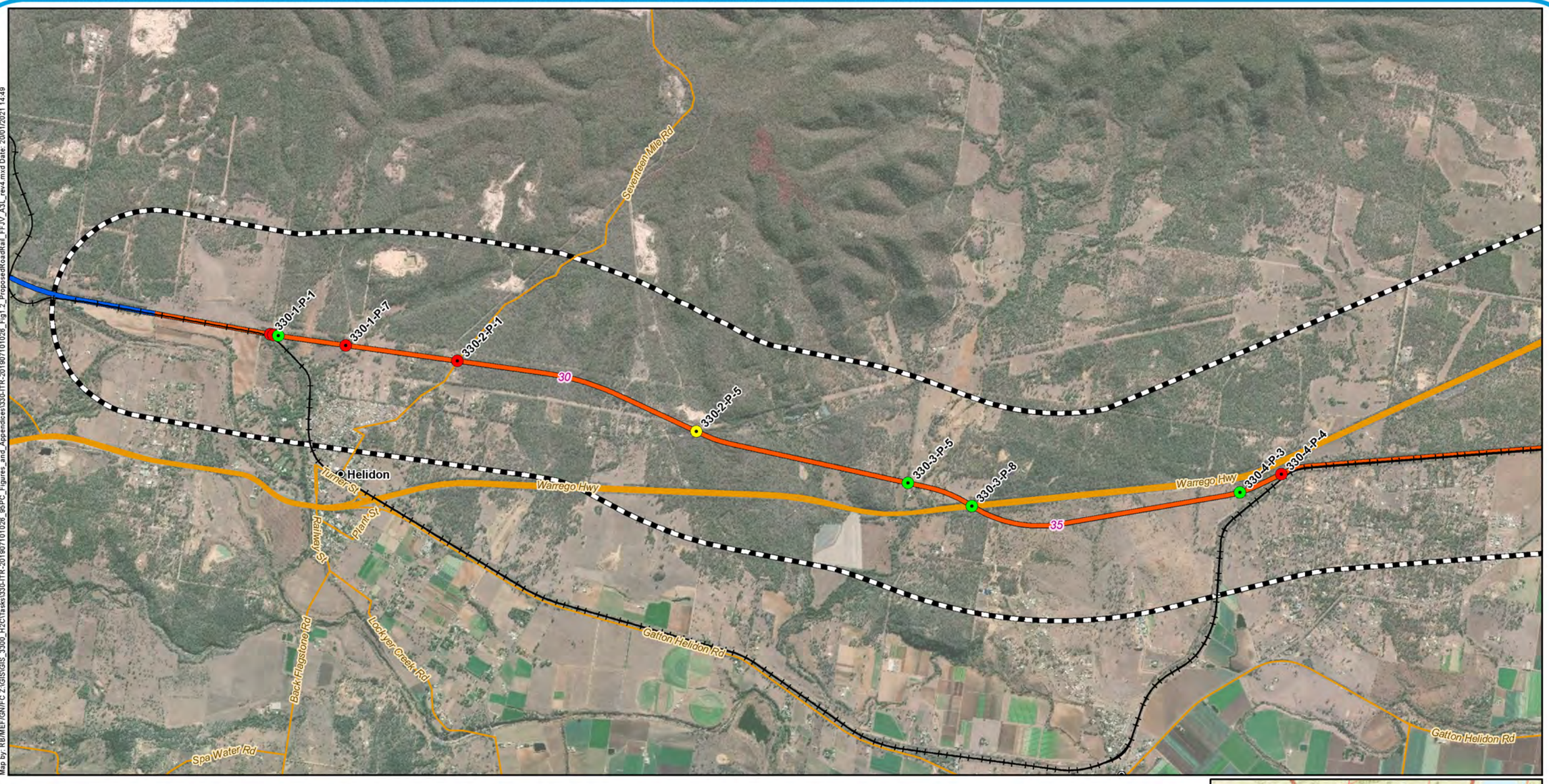
A3 scale: 1:150,000

0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 17/03/2020 Version: 2
Coordinate System: GDA 1994 MGA Zone 56

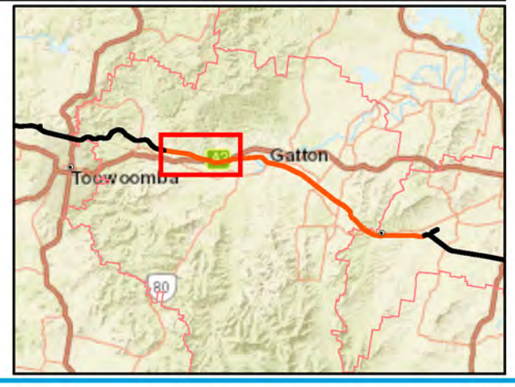
Helidon to Calvert
Figure 1.1: Project rail alignment



Map by: RB/MEF/GN/FC Z:\GIS\GIS_3300_H2C\Tasks\330-ITR-20190710102 8_95PC_Figures_and_Appendices\330-ITR-20190710102 8_Fig1.2_ProposedRoadRail_FFJV_A3L_rev4.mxd Date: 20/01/2021 14:49

Legend

- Localities
- Existing rail
- Major roads
- Minor roads
- G2H project alignment
- H2C project alignment
- EIS investigation corridor
- Active Level Crossing
- At Grade Level Crossing
- Grade Separation
- No Crossing Provided



A3 scale: 1:40,000

0 0.5 1 1.5 2 2.5km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 20/01/2021 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

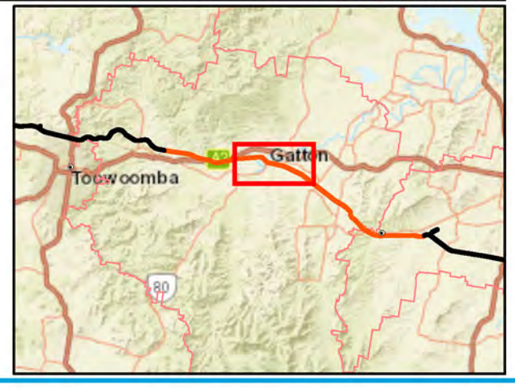
Helidon to Calvert
Figure 1.2a:
Proposed road-rail interface locations

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Warrego Hwy
330-4-P-4
330-6-E-1
40
Spencer St
Gatton
Eastern Dr
45
Gatton Laidley Rd W
Western Dr
Railway St
Gatton Helidon Rd
Gatton Clifton Rd
McLucas Rd
Woodlands Rd
50
Lawes
330-9-P-0
330-9-E-1a
330-9-P-1
Forest Hill
330-6-E-2
330-6-E-3
330-6-E-4
330-6-E-4a
330-6-E-4b
330-6-E-5
330-6-E-5a
330-7-E-1
km

Legend

- Localities
- Existing rail
- Major roads
- Minor roads
- H2C project alignment
- EIS investigation corridor
- Active Level Crossing
- At Grade Level Crossing
- Grade Separation
- No Crossing Provided



A3 scale: 1:40,000
0 0.5 1 1.5 2 2.5km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 20/01/2021 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 1.2b:
Proposed road-rail interface locations

Lawes
Forest Hill
Laidley
Gatton Laidley Rd W
Forest Hill Fernvale Rd
Victoria St
Whiteway Rd
Gatton Laidley Rd E
Forest Hill Blenheim Rd
Pitt Rd
Whites Rd
Patrick St
Laidley Plainland Rd
Summerholm Rd
50
55
60
330-9-P-0
330-9-E-1a
330-9-P-1
330-10-P-3
330-11-P-4
330-11-P-6
330-11-P-7
330-11-P-8

Legend

- Localities
- Existing rail
- Minor roads
- H2C project alignment
- EIS investigation corridor
- Active Level Crossing
- At Grade Level Crossing
- Grade Separation
- No Crossing Provided

A3 scale: 1:40,000
0 0.5 1 1.5 2 2.5km

Future Freight
Integrating Community, Environment and Engineering

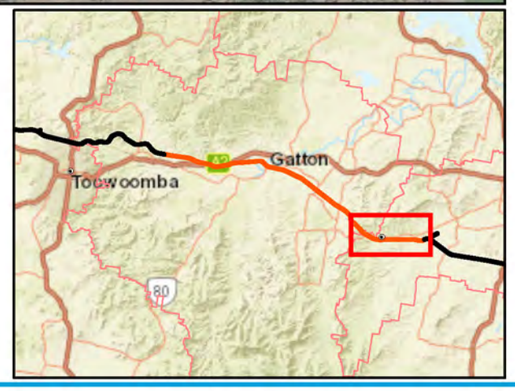
Issue date: 20/01/2021 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 1.2c:
Proposed road-rail interface locations

60
330-12-P-1a
330-12-P-1b
330-12-P-1c
330-13-P-2c
330-13-P-2f
65
Rosewood Laidley Rd
Grandchester
330-14-P-2
Grandchester Mount North Rd
Rosewood Laidley Rd
330-15-E-4
70
Calvert

Legend

- Localities
- Existing rail
- Minor roads
- H2C project alignment
- C2K project alignment
- EIS investigation corridor
- Active Level Crossing
- At Grade Level Crossing
- Grade Separation
- No Crossing Provided



A3 scale: 1:40,000
0 0.5 1 1.5 2 2.5km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 20/01/2021 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 1.2d:
Proposed road-rail interface locations

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

MORETON BAY
SOMERSET
BRISBANE
REDLAND
WESTERN DOWNS
TOOWOOMBA
LOCKYER VALLEY
IPSWICH
LOGAN
GOLD COAST
SCENIC RIM
Gold Coast
Warwick
GOONDIWINDI
SOUTHERN DOWNS
TWEED
KYOGLE
BYRON
LISMORE
BALLINA
TENTERFIELD
RICHMOND VALLEY
CLARENCE VALLEY
MOREE PLAINS
INVERELL
GWYDIR
GLEN INNES SEVERN
NARRABRI

Legend

- Construction Routes
- N2NS project alignment
- NS2B project alignment
- B2G project alignment
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Local Government Areas

A3 scale: 1:1,500,000

0 10 20 30 40 50km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 17/03/2020 Version: 2
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 1.3:
Proposed primary construction transport routes for H2C

1.5 Methodology

This section outlines the methodology that was adopted for the TIA for the construction and operational phases of the Project. The Project ToR requires the TIA be undertaken in accordance with the DTMR GTIA 2017. The methodology followed within this TIA is consistent with the methodology outlined in the GTIA and consists of:

- Desktop studies to establish the baseline conditions for the transport infrastructure within the transport study area
- Determining the traffic generation related to the construction and operation of the Project
- Identifying the potential impacts on the transport infrastructure and users
- Developing measures to avoid, manage and mitigate impacts
- Undertaking a risk assessment of potential traffic impacts
- Undertaking a cumulative assessment of other committed projects of significance.

It is noted that an updated version of the GTIA was released in December 2018, after the ToR for the Project were released. This assessment has been undertaken consistent with the 2017 GTIA consistent with the ToR. However, as per the GTIA, the TIA will need to be finalised when project contractors are appointed, and the final traffic generation is clearer. It is proposed that any future TIA be prepared consistent with the December 2018 version of the GTIA.

An initial high-level summary of the expected transport task by mode was undertaken for the existing road, rail, port and airport facilities to establish the assessment requirements during the construction and operational phases of the Project. Table 1.2 summarises the expected Project transport tasks by mode. As shown, the transportation of materials and equipment will typically make use of the existing road and rail network. Therefore, the majority of impacts were considered to be road and rail network based.

Table 1.3 Summary of transport tasks by mode

Project phase	Road	Rail	Port and airport	Active transport
Construction	Transport of construction material, plant and equipment. The transport of workforce to and from the site.	Transport of construction material (i.e. rail)	No impact expected	No impact expected
	Impact of road closures and realignments on surrounding road network and road-rail interface locations			
	Impact of rail crossings on vehicle queues and nearby intersections.			
Operation	Rail maintenance workforce movements.	Operations and maintenance	No impact expected	No impact expected
	Impact of permanent road closures and realignments on surrounding road network and road-rail interface locations			
	Rail maintenance workforce movements.			
	Impact of rail crossings on vehicle queues along adjacent State-controlled and local council roads, and impacts on nearby intersections			

A brief overview of the methodology adopted to identify the background and Project related traffic volumes is summarised in Figure 1.4. This centred on establishing a background, 'without Project' traffic scenario for the identified transport study area and comparing this to the scenario including the Project generated traffic, i.e. the 'with Project' scenario. The process allowed for the assessment of the traffic impacts of the Project in terms of road safety, access and frontage, intersections, road links, pavement, road-rail interfaces, active travel, stock routes and school routes.

Following the impact assessment, if required, potential mitigation and management measures were formulated to address the potential traffic impacts caused by the proposed Project.

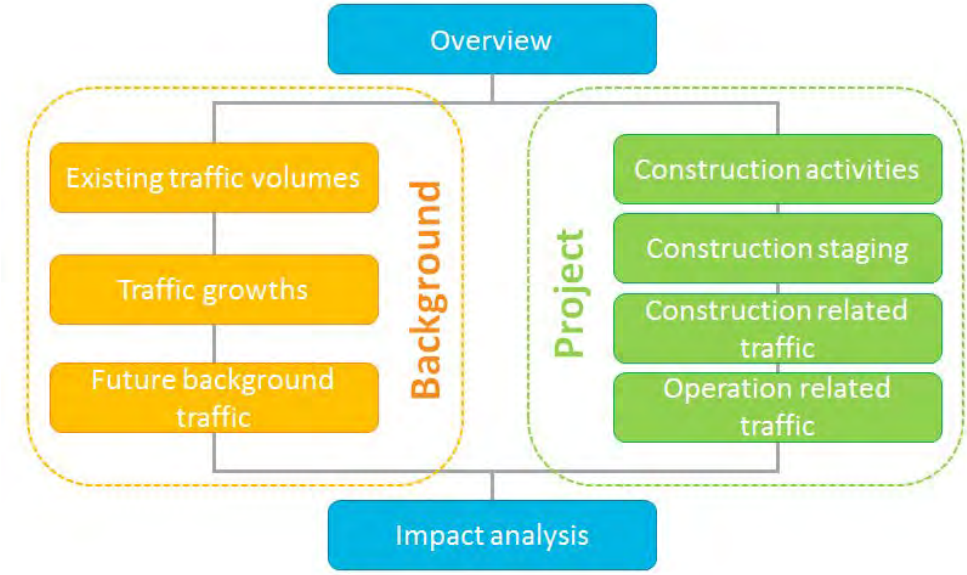


Figure 1.4 Background and Project traffic volumes

1.5.1 Desktop review and data collection

The key data and information inputs required to undertake the TIA are provided in the following list. Inputs required from road controlling authorities were requested by a formal request for information (RFI):

- Local government/state policies and strategies potentially influencing the TIA for the Project
- Road configurations and access policies (existing and proposed)
- Road network and hierarchy maps
- Road link capacity thresholds
- Road classification details, including typical cross sections
- Existing traffic data
- Traffic growth
- Programmed road works and upgrades
- Future planned road network
- Approved and future development plans
- Road use management plans
- Designated freight and seasonal traffic routes
- Dangerous goods vehicle routes
- Bus and school bus routes
- Stock routes
- Multi-combination routes and zones
- Standard axle loads and existing pavement condition
- Prevailing structural integrity issues (i.e. vulnerable structures)
- Structural capacity/life of structures
- Crash data.

Assumptions were made in instances where requested data was not available. These have been documented in the TIA as appropriate.

The following section describes the approach for obtaining background and Project traffic volumes used in the impact assessment.

- Background traffic:
  - Existing traffic volumes

    Existing traffic volumes (link and intersections) in the first instance was obtained from road controlling authorities. Where this data was not available, traffic surveys were commissioned. Refer to the section below for further details on the proposed approach for identifying locations where traffic surveys were undertaken.

    In instances where traffic data was not available from road controlling authorities or traffic surveys conducted, traffic volumes were estimated based on the guidance provided by Austroads Part 2 – Guide to Traffic Engineering Practice: Roadway Capacity which provided base AADT by road type, respective Level of Service (LOS) and K-value. The K-value represents the ratio between the 30th highest hourly peak volume and AADT. The proposed assumed volumes were subsequently provided to the relevant road controlling authorities for review.
  - Traffic growth rates

    Traffic growth rates on SCR were derived based on historic permanent census traffic data where available. An evaluation of the traffic growth rates within this traffic data revealed an overall annual average AADT growth rate of 2 per cent. The proportion of this growth, which was heavy vehicles varied by link, but was generally consistent with the AADT growth and has been assumed as such. This is considered reasonable for the current design stage. Traffic growth rates were requested from all asset owners impacted by construction traffic. However, in the absence of available historical count data or forecast models, the 2 per cent growth rate calculated from the SCR was adopted in the analyses for all SCR and LGRs for all vehicle types. This is considered reasonable for the current design stage given the observed growth on roads evaluated. The data and evaluation are provided in Appendix C for DTMR roads and Appendix D for RMS.
  - Future background traffic

    Traffic growth was applied to existing traffic volumes to estimate the future background traffic. This was done by means of a compound traffic growth estimation procedure which is:

    $$AADTx = AADTy1 \times (1 + GR)^{(x-y1)}$$

    Where:

    - AADTy1 = AADT in the first year of evaluation
    - AADTx = AADT in year x
    - GR = growth rate
    - y1 = first year (1)
    - x = year of calculation
- Project traffic:
  - Construction activities

    The major construction activities consist of: transportation of quarry materials (ballast, capping materials), other bulk materials, pre-cast concrete, ready-mix concrete, rail, consolidated sleepers, earthworks materials, workforce, spoil removal, delivery of water, delivery/collection of plant, tools and other materials.

- Construction staging

  Staging will relate to construction start and end dates of all construction related activities within the envisaged construction period. The start and end dates of all associated construction was taken into account in order to determine the peak period for the Project along each construction route road segment. The construction schedule with anticipated road segment based peak loads/volumes are described in more detail in Section 5.

- Construction related traffic

  The number of trips generated by each construction activity was estimated for light vehicle and heavy vehicle trips based on the transport of material quantities and associated construction schedules, including workforce trips. The traffic loads/trips were assigned to the corresponding transport route for each construction activity. This allowed for the estimation of peak construction traffic for each construction route and also for separate road sections.

- Operational traffic

  The major transport tasks during the operational phase of the Project are expected to be rail maintenance workforce movements and the delivery of maintenance materials. It is anticipated that operational traffic will consist of low vehicle movements to/from depots and the transportation of maintenance material within the rail corridor. These movements are expected to be irregular and add an insignificant amount of traffic to the background road network and are not expected to impact on the operations of the road network.

- Cumulative Impacts:

  - Construction schedules

    Construction schedules relating to other Inland Rail projects and major developments in the region were reviewed in order to establish schedule overlaps (i.e. where primary construction routes are used for several Inland Rail Projects during the peak period). This process was used as part of a cumulative impact assessment process. The timing and scale of other developments and projects within the transport study area was also considered as part of the cumulative impact assessment process. The cumulative impacts were assessed with the results included in Section 11.

A gap analysis of received data/information was undertaken to identify additional data requirements from other sources, such as traffic surveys, to determine existing traffic volumes along primary construction routes for use in the impact assessment. The following approach was proposed to aid in the selection of road segments within the transport study area where data was to be obtained from traffic surveys:

- Assign road details to each road segment within the transport study area: number of lanes, posted speed limited, road surface
- Identify the duration each road segment will be used for construction transport. Durations were estimated with nominated assumed periods (i.e. short: <6 months; moderate 6-12 months; long: >12 months)
- Determine the road segments where traffic surveys were recommended, taking into consideration the increase in traffic volumes due to the Project and the duration of construction (refer to Table 1.3).

Table 1.4 Proposed selection criteria for traffic survey locations

Increase in traffic due to Project	Long duration	Moderate duration	Short duration
High increase	Traffic survey recommended	Traffic survey recommended	No traffic survey recommended
Moderate increase	Traffic survey recommended	No traffic survey recommended	No traffic survey recommended
Low increase	No traffic survey recommended	No traffic survey recommended	No traffic survey recommended

Traffic data provided by road controlling authorities on road links that were considered appropriate for use in the impact assessment did not require traffic surveys. The following approach was proposed to aid in the selection of intersections within the transport study area where data was obtained from traffic surveys:

- Utilising the 5 per cent comparison analysis undertaken for road segments, identify intersections where construction traffic is required to undertake turn manoeuvres and where the increase in traffic is either moderate or high
- Referring to the intersections identified above, it was recommended that traffic surveys be undertaken based on the selection criteria presented in Table 1.3.

Regardless of duration and increase in traffic, it has been assumed that traffic surveys for local roads will not be undertaken. The use of local roads for construction traffic is not preferred as these roads are not generally designed for regular heavy vehicle use. The use of these roads has been avoided unless no practicable alternative route was available. Traffic data provided by road controlling authorities was used at locations where available.

Data for road links which were expected to be impacted by primary construction routes and did not have available background traffic information either sourced or collected by means of traffic surveys were assumed. In these situations, the local government authority was consulted. The flow volumes were assumed by adopting the following process:

- Classify each road segment within the transport study area based on the following assumed classification:
  - Urban Local Road
  - Urban Collector Road
  - Urban Arterial Road
  - Rural Local Road
  - Rural Collector Road
  - Rural Arterial Road
- Flow rates were estimated based on the following:
  - Urban Local Road: Volumes derived by assuming LOS A with associated AADT of 2000 vehicles as depicted in RTA Guide to Traffic Generating Developments, 2002 as adopted from the Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity, 1988
  - Urban Collector Road: Volumes derived by assuming LOS B with associated AADT of 3800 vehicles as depicted in RTA Guide to Traffic Generating Developments, 2002 as adopted from the Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity, 1988
  - Urban Arterial Road: Volumes derived by assuming LOS B with K-value of 0.12 with associated AADT of 2000 vehicles as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity, 1988
  - Rural Local Road: Volumes derived by assuming 400 AADT based on a review of proximate rural local roads
  - Rural Collector Road: Volumes derived by assuming LOS A with K-value of 0.12 with associated AADT of 2000 vehicles as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity, 1988
  - Rural Arterial Road: Volumes derived by assuming LOS A with K-value of 0.15 with associated AADT of 1600 vehicles as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity, 1988
- Peak hour flow rates obtained from the various sources will be converted to Average Daily Traffic Volumes (ADT) by adopting industry suited conversion factors.

1.5.2 Impact assessment and mitigation

1.5.2.1 Road network impact assessment

The operational performance of the road network in the transport study area was assessed to develop an understanding on the potential traffic impacts from the Project. The transport study area comprised impacted roads located in QLD; however, it also extends to some parts of NSW due to the transport of sleepers that are located in Grafton. This report provides a summary of the findings from the analysis and will identify potential mitigation measures and transport management strategies.

Consistent with GTIA, the process as indicated in Figure 1.5 will be used for the purpose of the TIA and Environmental Impact Statement (EIS). This process is for the impact assessment of development on the SCR network and this has been extended to the LGR network (subject to further discussion with local governments). It does not apply to private roads. While use of the guideline is not mandatory, it provides a basis for assessing potential impacts from the construction and operational phases on the local and regional transport network. Where relevant to NSW, the use of the GTIA manual has been agreed with and accepted by RMS to be used as the TIA guideline document (RMS email dated 20 September 2018). All road sections within this TIA follow the same assessment process.

As outlined in Figure 1.5, this TIA will likely be subject to the preparation of a supplementary EIS following DTMR review.

The extent of the impacts of Project traffic on other users and on infrastructure can range from being localised to quite disperse. An analysis boundary has been defined within which to assess a reasonable level of impact of the additional Project traffic. This boundary is the transport study area. The transport study area would aim to define where impacts would most likely occur at intersections and on links in the network surrounding the Project. GTIA indicates the conditions for determining the transport study area which is provided in Table 1.4 (updated to also reference RMS).

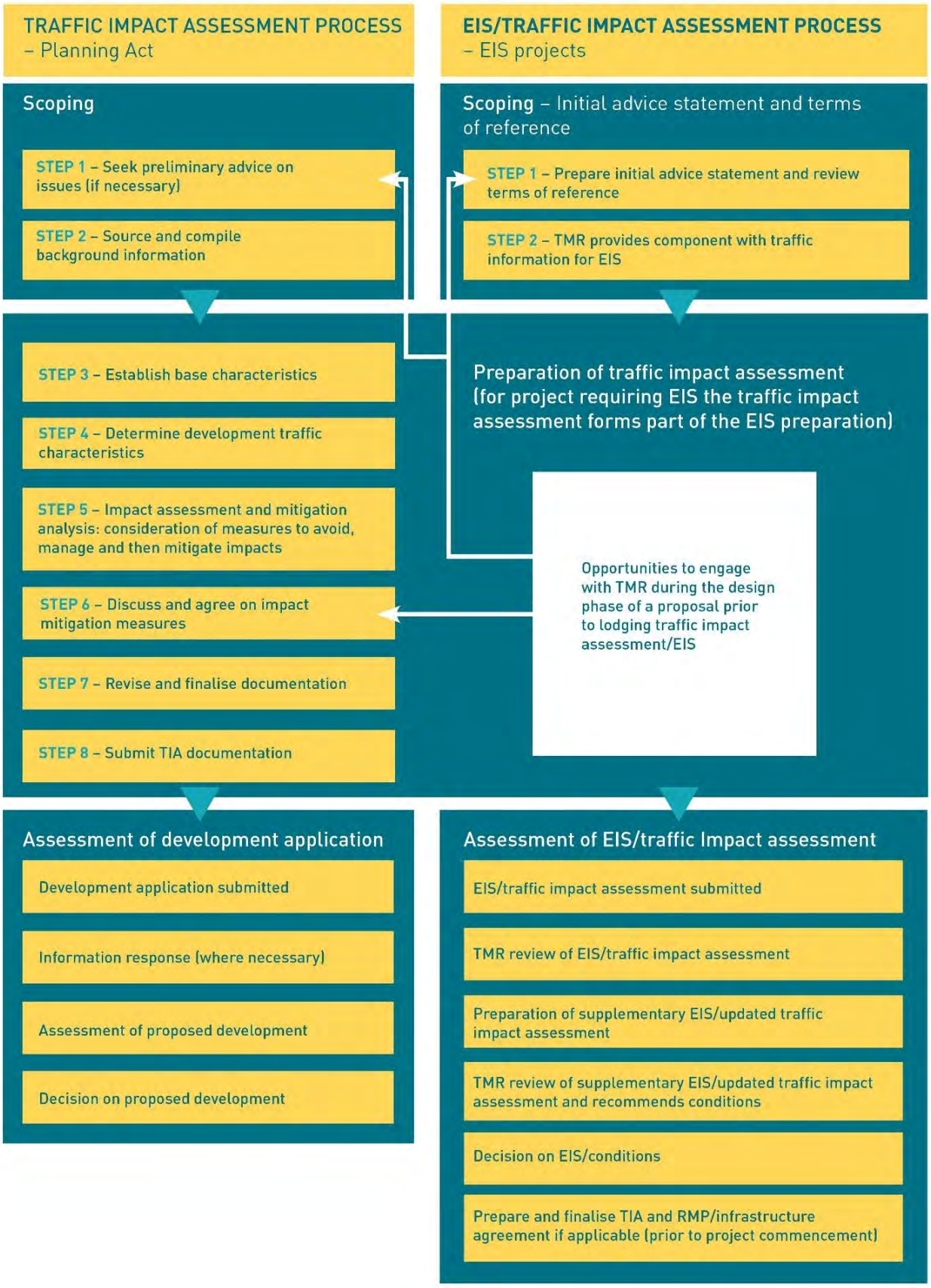


Figure 1.5 **Traffic impact assessment process**

Source: DTMR 2017

Table 1.5 Impact assessment area by impact type

Impact type	Transport study area
Road safety	All intersections where the Project traffic exceeds 5% of the base traffic for any movement in the design peak periods in the year of opening of each stage. All road links where the Project 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.
Access and Frontage	Potential construction accesses/ lay down areas on Limited Access Roads in the DTMR and RMS network.
Intersection Delay	All intersections where the Project traffic exceeds 5% of the base traffic for any movement in the design peak periods in the year of opening of each stage.
Road Link Capacity	All road links where the Project traffic exceeds 5% of the base traffic in either direction on the link's AADT in the year of opening of each stage.
Pavement	All road links where the Project SAR exceeds 5% of the base traffic in either direction on the link's SAR in the year of opening of each stage.
Transport Infrastructure	All road links where the Project 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 DTMR or RMS identifies prevailing structural integrity issues of transport infrastructure (for example, bridges or culverts).

Source: Guide to Traffic Impact Assessment (DTMR 2017)

Table 1.5 outlines the performance criteria for assessment of traffic and transport impact. The LOS criteria are as defined in the Austroads Guide to Traffic Management: Part 3 Traffic Studies and Analysis (2017a).

Table 1.6 Performance criteria

Assessment type	Performance criteria
Traffic impact assessment	Construction and operational traffic generated by the Project equals or exceeds 5% of the existing AADT on the road section.
	LOS C can be considered the minimum standard on rural roads. However, LOS D may be accepted in case of event traffic.
	LOS E should be considered the limit of acceptable for urban area operation and remedial works would be needed if LOS F would otherwise result.
Pavement impact assessment	Construction and operational traffic generated by the Project equals or exceeds 5% of the existing SAR on the road section.

Source: DTMR 2017

The impact assessment year is the year at which the impacts of the Project are assessed. The impact assessment year varies by impact type because the effects of development can be quite different on infrastructure than they are on other users. The impact years which are to be assessed were adopted from GTIA and summarised in Table 1.6.

Table 1.7 Impact assessment years

Impact type	Impact assessment years
Road safety	Each year of construction + year of opening of each stage including the final stage
Access and frontage	Each year of construction + year of opening of each stage including the final stage and 10 years after the year of opening of the final stage for access intersections (includes both new and amended accesses)
Intersection delay	Each year of construction + year of opening of each stage including the final stage
Road link capacity	Each year of construction + year of opening of each stage including the final stage
Pavement	Each year of construction + year of opening of each stage including the final stage over a 20-year design period
Transport infrastructure	Each year of construction + year of opening of each stage including the final stage.

Source: DTMR 2017

The impact assessment and mitigation process contained in GTIA was adopted to determine appropriate mitigation measures on road impacts. The mitigation framework is provided in Figure 1.6.

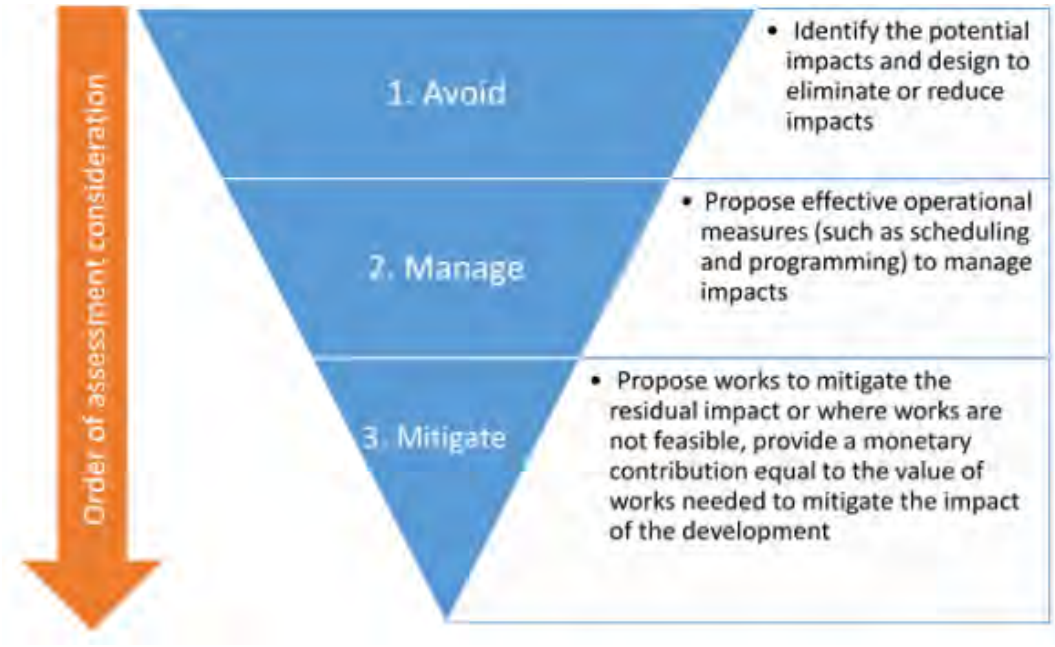


Figure 1.6 Mitigation framework

Source: DTMR 2017

1.5.2.2 Rail crossing impact assessment

The rail crossing impact assessment describes how the Project complies with the QLCSS (DTMR 2012a). Hereafter, the assessment focuses on vehicle delay and queueing analysis, demonstrating how the Project-generated traffic impacts on vehicle delays and queuing issues at the public rail crossing and at nearby closely spaced intersections. This analysis was undertaken for the Project at proposed public rail crossings only as there are no existing operational rail crossings within the transport study area.

Should road realignments, diversions and/or closures have a significant impact, assessments of the increased travel time and wider network impacts are considered.

1.5.2.3 Rail network impact assessment

Almost half of the Project is to be constructed next to the QR West Moreton System rail corridor. Generally, scope exists within the disturbance footprint to erect safety barriers and construct the Project parallel to sections of existing operational railway without impacting operations. However, some works will likely require rail possessions and speed restrictions. It is expected that these possessions can occur during routine maintenance periods. These requirements will need to be planned and agreed with QR during the next phase to quantify and minimise impact to operations. Therefore, the operational performance of the existing rail network in the transport study area is not anticipated to be significantly impacted as a result of the Project construction.

1.5.2.4 Port and airports impact assessment

During the construction and operational phases, the expected impact from the Project on ports and airports is not considered to be significant as the transport of materials, workforce and equipment is expected to primarily utilise the road and rail transport networks.

Whilst the Inland Rail Program (Inland Rail) proposes to utilise the existing freight line from Acacia Ridge to the Port of Brisbane, this particular Project is located over 60 km from the Port. As the Project is not located within close proximity, the Project will not impact on the safety or efficient operation of any strategic ports. Impacts from the Project on the operation and throughputs at ports (freight containers) is not in the scope of this report and has not been assessed.

The Project is not located within close proximity to strategic airports or aviation facilities. The closest facility is the Royal Australian Air Force (RAAF) Base Amberley located in excess of 14 km to the east of the transport study area.

1.5.2.5 Road safety impact assessment

The road safety impact assessment has been undertaken as per the framework laid out in Part C of the GTIA. This framework relies on the principle that a road's safety is not significantly worsened as a result of the Project, and that any pre-existing or Project-introduced unacceptable safety risk is addressed. This process has been utilised to determine safety risks along the Project construction traffic routes and project road rail interface locations.

1.5.2.6 Cumulative impact assessment

To enable stakeholders to make informed decisions, consideration needs to be given to the potential impacts of other major projects in the area to ensure that the combined impacts of the Projects are accounted for. The traffic generation estimations from other major developments will be considered as part of a cumulative assessment process. The cumulative impact evaluation is provided in Section 11. This includes adjacent Inland Rail projects as well as other committed major projects of significance.

1.5.3 Stakeholder consultation

Consultation has been undertaken with stakeholders throughout the development of the TIA report. Formal RFI, meetings and correspondence have been used to consult with impacted public road controlling authorities on the following issues:

- To gain an understanding of the existing road assets
- To outline the proposed TIA process
- To outline the adopted manuals and procedures
- To inform the road controlling authorities of the impacted assets
- To outline the adopted assumptions (such as traffic growth rates, assumed base volumes)
- To outline the proposed mitigation.

The consulted stakeholders are listed in Table 1.7.

Table 1.8 Consulted stakeholders

Stakeholder	Consultation methods
RMS (NSW)	RFI, Telephone, Email
DTMR (QLD)	RFI, Meetings, Email
ICC	RFI, Meetings
LVRC	RFI, Meetings
Toowoomba Regional Council (TRC)	RFI, Meetings
Clarence Valley Council (CVC)	RFI

2 Existing conditions

2.1 Existing land use

Existing land uses along the Project alignment are discussed and mapped as part of the existing conditions assessment and requirements of GTIA. The existing land uses which occur along the Project alignment are shown in Figure 2.1, with detailed land use maps provided in Appendix E.

Figure 2.1 shows that land use in proximity to the Project is predominantly grazing land, combined with other agricultural land uses including irrigated seasonal horticulture and cropping. Other land uses include residential, services, and other minimal use (consisting of areas of land that are largely unused, for example, residual native cover). The Project also traverses infrastructure, including highways, main roads, local roads, gas pipelines and other utilities. Of particular relevance to the traffic impact assessment is the Helidon Magazine Reserve located within the study area to the northwest of Helidon (shown in Figure 1.1). The Helidon Magazine Reserve is a highly specialised land use with significant buffering requirements from incompatible land uses, with security risks associated with the queuing of vehicles transporting explosives.

The predominantly rural nature of these surrounding land uses indicates that the surrounding road network would generally consist of low traffic volumes, with potential seasonal variations during harvesting seasons. The Project alignment passes through residential and services areas through the towns of Gatton, Helidon, Forest Hill, Laidley and Grandchester. Traffic volumes on the surrounding network are likely higher through these areas.

2.2 Existing road network

The transport study area encompasses several SCR and LGRs that serve as main transport routes for the Project. These roads are further described in the following sections. The ARTC guide was used to determine the road classifications for the roads which are envisaged to be used as primary construction routes.

This section does not identify roads which are to be used during the operational phase of the Project, as the operational phase traffic would only account for irregular maintenance and emergency service vehicles. The operational traffic is envisaged to make use of the existing road system and account for low volume traffic with no impact on existing operations.

2.2.1 State-controlled roads

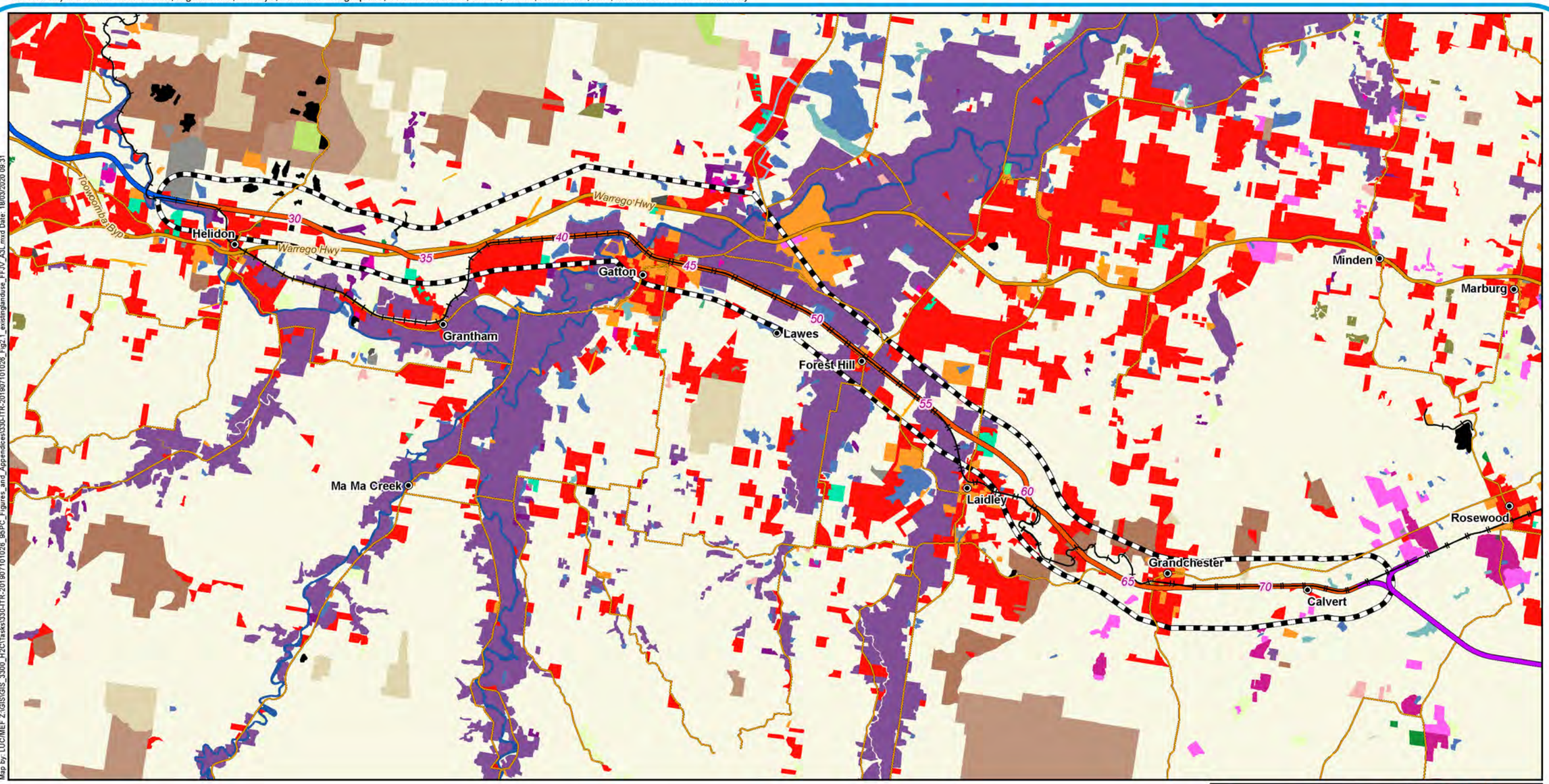
Five SCR intersect with the Project. These SCR are detailed in Table 2.1.

Table 2.1 State-controlled roads: intersecting Project rail corridor

Interface ID	Road name
SCR: DTMR	
330-3-P-8	Warrego Highway
330-7-E-1	Eastern Drive
330-9-E-2/330-9-P-1	Hunt Street and Glenore Grove Road
330-11-P-5	Laidley Plainland Road
330-13-P-2d	Rosewood Laidley Road

There are several SCR which are proposed to be used to transport construction materials, equipment and workforce during construction of the Project. These are summarised in Table 2.2.

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- Localities
- Existing rail
- Major roads
- Minor roads
- G2H project alignment
- H2C project alignment
- C2K project alignment
- EIS investigation corridor

Land Use

- Nature conservation
- Managed resource protection
- Other minimal use
- Grazing native vegetation
- Production forestry
- Plantation forestry
- Grazing modified pastures
- Cropping
- Perennial horticulture
- Seasonal horticulture
- Land in transition
- Irrigated modified pastures
- Irrigated cropping
- Irrigated perennial horticulture
- Irrigated seasonal horticulture
- Irrigated land in transition
- Intensive horticulture
- Intensive animal husbandry
- Manufacturing and industrial
- Residential
- Services
- Utilities
- Transport and communication
- Mining
- Waste treatment and disposal
- Reservoir/dam
- River
- Channel/aquedeuct
- Marsh/wetland

A3 scale: 1:150,000

0 1 2 3 4 5km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 17/03/2020 Version: 2
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 2.1: Existing land uses

Table 2.2 State-controlled roads: Project primary construction routes

Road name	Road ID - road section
SCR: DTMR	
Cunningham Highway	17B - Between River Road and Redbank Plains Road
	17B - Between Redbank Plains Road and Ripley Road
	17B - Between Ripley Road and Ipswich Boonah Road
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road
	314 - Between Gatton Clifton Road and Railway Street
	314 - Between Railway Street and Hickey Street
	314 - Between Hickey Street and Gatton Laidley Road W
	314 - Between Gatton Laidley Road W and Warrego Highway
	314 - Between Warrego Highway and William Street
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road
	312 - Between Whiteway Road and Railway Street
	312 - Between Railway Street and Hall Road
	312 - Between Hall Road and Forest Hill Fernvale Road
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road
	304 - Between Rosewood Warrill View Road and Karrabin Rosewood Road
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road
	311 - Between Old Laidley Forest Hill Road and Railway Street
	311 - Between Railway Street and Whites Road
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway
New England Highway	22A - Between Griffiths Street and Munro Street
	22A - Between North Street and James Street
Pacific Motorway	Between Logan Motorway and NSW/QLD Border
Pine Mountain Road	302 - Between Warrego Highway and Lowry Street
River Road	309 - Between Warrego Highway and Cunningham Highway
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road
	308 - Between Mulgowie Road and Crown Street
	308 - Between Crown Street and Rosewood Marburg Road
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway
	Between New England Highway and Toowoomba Connection Road

Road name	Road ID - road section
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road
	315 - Between Toowoomba-Athol Road and New England Highway
	315 - Between New England Highway and James Street
	315 - Between James Street and Tourist Road
	315 - Between Tourist Road and Roches Road
	315 - Between Roches Road and Murphys Creek Road
	315 - Between Murphys Creek Road and Toowoomba Second Range Crossing
Warrego Highway	18A - Between Toowoomba Second Range Crossing and Gatton Helidon Road
	18A - Between Gatton Helidon Road and Gatton Esk Road
	18A - Between Gatton Esk Road and Laidley Plainland Road
	18A - Between Laidley Plainland Road and Haigslea Amberley Road
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway
	18A - Between Brisbane Valley Highway and Mount Crosby Road
	18A - Between Mount Crosby Road and Cunningham Highway
Road name	**Road ID - Road Section**
SCR: RMS	
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway
Summerland Way	Between Trenayr Road and Turf Street

2.2.2 Local government roads

There are several LGRs which intersect directly with the Project rail corridor. These roads fall are summarised in Table 2.3.

Table 2.3 Local government roads: intersecting Project rail corridor

Authority and Interface ID	Road name
LVRC	
330-1-P-1	Airforce Road
330-1-P-2	Warrigal Road
330-1-P-2a	Airforce Road
330-1-P-7	Wrights Road
330-2-P-1	Seventeen Mile Road
330-2-P-5	Connors Road
330-3-P-5	Sandy Creek Road
330-4-P-3	Philps Road
330-4-P-4	Brooks Road
330-6-E-1	Jamiesons Road
330-6-E-2	Burgess Road
330-6-E-3	Off Beavan Street
330-6-E-4	Old College Road
330-6-E-4a	Pedestrian Interface
330-6-E-4b	Pedestrian Interface

Authority and Interface ID	Road name
330-6-E-5	Gaul Street
330-6-E-5a	Pedestrian Interface
330-9-P-0	Pedestrian Interface
330-9-E-1	Dodt Road
330-9-E-1a	Pedestrian Interface
330-10-P-3	Old Laidley Forest Hill Road
330-11-P-4	Old Laidley Forest Hill Road
330-11-P-6	Francis Road
330-11-P-7	Luck Road
330-11-P-8	Paroz Road
330-12-P-1a	Railway Street
330-12-P-1b	Kessling Drive
330-12-P-1c	Kessling Drive
ICC	
330-13-P-2c	Unnamed Road
330-13-P-2f	Doonans Road
330-14-P-2	Grand Chester Mount Mort Road
330-14-P-2a	Pedestrian Interface
330-15-E-4	Calvert Station Road

There are several LGRs which are proposed to be used to transport construction materials, equipment and workforce during construction of the Project as indicated in Table 2.4.

Table 2.4 Local government roads: Project primary construction routes

Authority and Road name	Road section
CVC	
Bent Street	Between Craig Street and Gwydir Highway
Charles Street	Between Bent Street and Pacific Highway
Clark Road	Full extent
Craig Street	Between Villiers Street and Bent Street
Dobie Street	Between Villiers Street and Summerland Way
Trenayr Road	Between Summerland Way and Clark Road
Villiers Street	Between Craig Street and Dobie Street
ICC	
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street
Fairbank Place	Full extent
Grandchester Mount Mort Road	Between Rosewood Laidley Road and School Road
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road
Hiddenvale Road	Between Gipps Street and Neumann Road
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry
	Between Thagoona Haigslea Road and Mount Marrow Quarry
Neumann Road	Full extent
Newhill Drive	Full extent
Noblevale Way	Full extent

Authority and Road name	Road section
Rafters Road	Between School Road and Railway Line
Redbank Plains Road	Between Cunningham Highway and Newhill Drive
Rob Roy Way	Full extent
School Road	Between Grandchester Mount Mort Road and Rafters Road
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road
	Between Schumanns Road and Mount Marrow Quarry Road
LVRC	
Airforce Road	Between Airforce Road and Railway Line
Arthur Street	Between Bowen Street and Station Street
	Between Station Street and Mary McKillop Street
	Between Mary McKillop Street and Georges Street
Boundary Road	Between Laidley Plainland Road and Francis Road
Bowtells Road	Full extent
Boxmoor Street	Between Victor Street and Philps Road
Burgess Road	Between Old Toowoomba Road and Smithfield Road
Connors Road	Between Seventeen Mile Road and Sandy Creek Road
	Between Airforce Road and Wrights Road
Crescent Street	Between William Street and East Street
Crown Street	Full extent
George Street	Between Seventeen Mile Road and Arthur Street
	Between Arthur Street and Lawlers Road
Hall Road	Full extent
Hickey Street	Between Old College Road and Buaraba Street
Laidley Street	Between Station Street and Seventeen Mile Road
	Between Seventeen Mile Road and George Street
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road
Lawlers Road	Between Victor Street and George Street
	Between George Street and Warrego Highway
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon
Mary McKillop Street	Between Turner Street and Arthur Street
Old College Road	Between East Street and Gatton Laidley Road
Old Laidley Forest Hill Road	Between Forest Hill Fernvale and Laidley Plainland
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road
Paroz Road	Between Summer Street and 200 East of Summer Street
Philipps Road	Between Boxmoor Street and Warrego Highway
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line
Railway Road	Between Gatton Laidley Road and Greyfriars Road
Railway Street	Between Kessling Drive and Summer Street
	Between Summer Street and Laidley Plainland Road
Saleyard Road	Between Tenthill Creek Road and Warrego Highway
Sandy Creek Road	Between Connors Road and Warrego Highway
	Between Warrego Highway and Bowtells Road

Authority and Road name	Road section
Seventeen Mile Road	Between Airforce Road and Laidley Street
Station Street	Between Arthur Street and Laidley Street
Summer Street	Between Paroz Street and Railway Street
Tenthill Creek Road	Between Warrego Highway and Saleyard Road
Turner Street	Between Warrego Highway and Mary McKillop Street
Victor Street	Between William Street and Boxmoor Street
Western Drive	Between Warrego Highway and Tenthill Creek Road
William Street	Between Hickey Street and Cochrane Street
William Street	Between Bowen Street and Laidley Street
William Street	Between Gatton Helidon Street and Victor Street
Wrights Road	Between Connors Road and Andersons Road
TRC	
Dent Street	Between Margaret Street and Herries Street
Griffiths Street	Between Mort Street and New England Highway
Herries Street	Between Dent Street and Water Street North
Larcombe Street	Between North Street and Railway Line
Mort Street	Between Hermitage Road and North Street
Munro Street	Between New England Highway and Harlaxton Quarry
North Street	Between Mort Street and New England Highway
O'Mara's Road	Between Toowoomba Connection Road and Witmack Road
Station Street	Between Margaret Street and Russel Street
Water Street North	Between Herries Street and Toowoomba Connection Road
Witmack Road	Between O'Mara's Road and Witmack Industry Park

2.2.3 Public transport networks

Existing public transport routes within QLD and NSW that may be impacted by construction traffic and/or proposed and existing road rail interface locations have been identified using data sourced from Transport for NSW and TransLink in QLD. Identified routes that may be impacted are provided in Table 2.5.

It should be noted that there may be additional routes that are not publicly available and have therefore not been captured in Table 2.5. Consultation with relevant local authorities will be undertaken prior to the construction stage of the Project once construction routes have been finalised to ensure that all public transport routes that may be impacted by construction traffic have been accounted for.

Table 2.5 Impacted public transport networks

Services	Weekday frequency	Impacted roads	Impacted road rail interface
QLD public transport routes			
1	11/day	North Street	-
2	10/day	New England Highway	-
4	11/day	Toowoomba Connection Road (formerly Warrego Highway)	-
5	10/day	Hume Street	-
300	4/day	New England Highway	-
301	5/day	New England Highway	-
314	3/day	New England Highway	-

Services	Weekday frequency	Impacted roads	Impacted road rail interface
315	3/day	New England Highway	-
539	11/ day	Ipswich Rosewood Road Rosewood Laidley Road Gatton Helidon Road Forest Hill Fernvale Road Gatton Helidon Road Crescent Street William Street Turner Street	330-9-P-1 Glenore Grove Road (Forest Hill Fernvale)
515	3/ hr on peak 2/ hr off peak	Ipswich Rosewood Road Cunningham Highway Pine Mountain Road	-
514	1/ hr	Pine Mountain Road	-
500	2/ hr 1/ hr off peak	River Road	-
529	3/ day	Warrego Highway Pine Mountain Road	-
901	2/ hr on peak 1/ hr off peak	Toowoomba Connection Road (formerly Warrego Highway) Herries Street New England Highway Griffiths Street	-
902	1/ hr	Toowoomba Connection Road (formerly Warrego Highway) Herries Street New England Highway	-
905	1/ hr on peak 1/ 2hrs off peak	Toowoomba Connection Road (formerly Warrego Highway) New England Highway	-
906	1/ hr	Toowoomba Connection Road (formerly Warrego Highway) New England Highway	-
907	2/ hr on peak 1/ hr off peak	Toowoomba Connection Road (formerly Warrego Highway) Herries Street	-
950	1/hr	New England Highway	-
Kan-go	1/hr	New England Highway Herries Street	-
Route 3	2/day	New England Highway Herries Street	-
Route KGT	1/hr	New England Highway Toowoomba Connection Road (formerly Warrego Highway)	-
NSW Public transport routes			
372	2/ hr on peak 1/ 2hr off peak	Craig Street Bent Street	-
373	1/ hr	Craig Street Bent Street	-
374	2/ hr on peak 1/ hr off peak	Craig Street Bent Street	-

Services	Weekday frequency	Impacted roads	Impacted road rail interface
375A	1/ hr on peak 1/ 2 hrs off peak	Summerland Way, Grafton	-
375C (Private Bus Service)	1/ hr	Dobie Street, Grafton	-
376 (Private Bus Service)	1/ hr	Summerland Way, Grafton	-
377 (Private Bus Service)	1/ 2hrs	Summerland Way, Grafton	-
695	2/ day	Craig Street Bent Street Pacific Motorway, Grafton to Woodburn	-

Source: TransLink 2019 and TfNSW 2019

Given the low frequency of public bus services it is expected that public transport services would not be substantially impacted from an operational and service reliability perspective as a result of the Project generated traffic during the Project construction. Impacts on routes which intersect the Project are discussed in Section 6.

Public transport maps are provided in Appendix T.

2.2.4 School bus routes

Existing school bus routes that are likely to be impacted by construction traffic and/or proposed and existing road rail crossings has been identified using data sourced from Transport for NSW and the QLD Government. Identified routes that may be impacted are provided in Table 2.6.

It should be noted that there may be additional school bus routes that are not publicly available and have therefore not been captured in Table 2.6. Consultation with relevant local authorities and TransLink will be undertaken prior to the construction stage of the Project once construction routes have been finalised to ensure that all public transport routes that may be impacted by construction traffic have been accounted for.

Table 2.6 Impacted school bus routes

Services	Weekday frequency	Impacted roads	Road rail crossings
QLD school bus routes			
Route 90	1 AM, 1 PM	Munro Street	-
Route 94A Route 94P	1 AM, 1 PM	Griffiths Street	-
P1751 AM and PM Iredale-Postmans Ridge to Helidon State School	1 AM, 1 PM	Warrego Highway	-
P1451 AM and PM Forest Hill Area	1 AM, 1 PM	Gatton Laidley Road Forest Hill Fernvale Road Old Laidley Forest Hill Road	330-9-P-1 Glenore Grove Road
P1551 Am and PM Plainland Area, Laidley District SS	1 AM, 1 PM	Laidley Plainland Road	-
P1508 AM and PM Laidley Area, Laidley District SS	1 AM, 1 PM	Laidley Plainland Road Gatton Laidley Road	-
S787 AM and PM Laidley Range Area, Laidley SHS	1 AM, 1 PM	Railway Street Summer Street Paroz Street	-

Services	Weekday frequency	Impacted roads	Road rail crossings
S849 AM – PM Townson, Townson Area	1 AM, 1 PM	Laidley Plainland Road Gatton Laidley Road	-
S848 AM and PM Grandchester, Laidley SHS	1 AM, 1 PM	Rosewood Laidley Road School Road	330-14-P-2 Grandchester Mount Mort Road
P552 AM and PM Mount Mort Area, Grandchester SS	1 AM, 1 PM	School Road	-
S187 AM and PM Calvert, Ashwell Area, Ashwell SS and Rosewood SHS	1 AM, 1 PM	Rosewood Laidley Road Calvert Station Road	330-15-E-4 Calvert Station Road
S175 AM – PM Rosevale, Mt Walker Areas, Rosewood SHS	1 AM, 1 PM	Rosewood Laidley Road Ipswich Rosewood Road	-
S743 AM and PM Lower Mt Walker Area, Rosewood SHS	1 AM, 1 PM	Rosewood Laidley Road Ipswich Rosewood Road	-
S646 AM and PM Mt Forbes Area, Rosewood SHS	1 AM, 1 PM	Rosewood Laidley Road Ipswich Rosewood Road	-
IP1503 AM and PM Hatton Vale/Marburg Area to Ipswich Special Schools	1 AM, 1 PM	Warrego Highway	-
IP1502 AM and PM Hatton Vale, Lowood, Fernvale, Ironbark Area to Ipswich Special Schools	1 AM, 1 PM	Warrego Highway	-
P623 AM and PM Summerholm Area, Hatton Vale SS	1 AM, 1 PM	Warrego Highway	-
P1732 AM and PM Hatton Vale Area, Hatton Vale SS	1 AM, 1 PM	Warrego Highway	-
IP1701 SWD AM Run – Boonah to Ipswich	1 AM, 1 PM	Cunningham Highway	-
P1388 AM and PM Kholo Area, Brassall State School	1 AM, 1 PM	Pine Mountain Road	-
5210	1/ day	Ipswich Motorway	-
5212	1/ day	Warrego Highway Redbank Plains Road	-
5217	1/ day	Cunningham Highway	-
5218	1/ day	Cunningham Highway	-
5226	1/ day	Redbank Plains Road	-
6210	1/ day	River Road	-
6215	1/ day	Cunningham Highway	-
6219	1/day	Pine Mountain Road Downs Street	-
6226	1/ day	Redbank Plains Road	-
6247	1/ day	Pine Mountain Road Downs Street	-

Services	Weekday frequency	Impacted roads	Road rail crossings
NSW school bus routes			
AM/PM services travelling to/from Grafton High School, Grafton Public School, South Grafton High School, South, South Grafton Public School, St Mary's Primary School, St Joseph's Primary School, Clarence Valley Anglican School, Westlawn Public School	AM and PM services as per school requirements	Bent Street, Grafton	-

Source: QLD Government 2019 and TfNSW 2019

Given the low frequency, it is expected that school bus services would not be substantially impacted from an operational and service reliability perspective as a result of the Project generated traffic during the Project construction. Nonetheless, bus operators will be consulted as part of the Project and made aware of the various construction activities. Further details regarding mitigation measures are provided within subsequent sections of the report.

2.2.5 Long distance services

Existing long-distance coach services that are likely to be impacted by construction traffic and/or proposed and existing road rail crossings have been identified using data sourced from Transport for NSW and the QLD Government. Identified routes that may be impacted are provided in Table 2.7.

Table 2.7 Impacted long-distance coach services

Services	Weekday frequency	Impacted roads	Road rail crossings
QLD routes			
Brisbane City to Grafton	-	Pacific Motorway	-
Brisbane City to Mount Isa	1/day 7 days/Week	Ipswich Motorway Cunningham Highway Warrego Highway Toowoomba Connection Road Laidley Plainland Road Gatton Helidon Road William Street New England Highway Station Street	-
Brisbane City to Charleville	1/day 7 days/Week	Ipswich Motorway Cunningham Highway Warrego Highway Toowoomba Connection Road Laidley Plainland Road Gatton Helidon Road William Street New England Highway Station Street	-
NSW routes			
Brisbane City to Grafton	-	Pacific Motorway Summerland Way Villiers Street Dobie Street	-

Source: DTMR 2019d

Given the low frequency of long-distance coach services it is expected that long distance buses would not be significantly impacted as a result of the construction of the Project.

2.2.6 Stock routes

There is only one stock route identified which is impacted by the potential construction routes. This stock route is located along Ipswich Rosewood Road (outside of the Project EIS Investigation Corridor, but within the adopted transport study area). Information about this stock route is found in Table 2.8.

Table 2.8 Stock routes within the Project transport study area

Crossing Site ID	MBIR Chainage	Stock Route ID	LGA	Nearest public road crossing	Description of site and impact
N/A	N/A	Armstrong Park	ICC	Ipswich Rosewood Road	Armstrong Park stock route is currently classified as being a minor and unused stock route.

Source: QLD Government 2019

Appropriate management measures will be implemented when construction traffic is travelling within vicinity of this area.

2.2.7 State strategic touring routes

The following State Strategic Touring Routes and Tourist Routes exist proximate to the Project and are proposed to be used or intersected by primary construction routes:

- Adventure Way, along Warrego Highway and Toowoomba Connection Road
- Warrego Way, along Warrego Highway and Toowoomba Connection Road
- Pacific Coast Way, along Pacific Highway.

The increase in construction traffic and, particularly heavy vehicles, has the potential to impact these strategic touring routes. The impact of this will be considered in conjunction with the construction traffic link analysis within this TIA.

2.2.8 Emergency services

During construction and operations, response times for emergency services may be delayed if encountering significant roadworks or passing trains at level crossings. ARTC will work with emergency services to develop protocols and joint working arrangements to address potential impacts on emergency services and service response times during construction and operation and ensure that access is retained as required.

The emergency services in QLD will be consulted prior to construction of emergency access points to identify possible solutions to minimise the potential impacts.

2.3 Existing rail facilities

QR owns and manages QLD's regional freight network and operates both suburban and long-distance passenger services for the QLD Government. QR's regional freight network comprises seven different systems in the state. Products hauled on the QR Regional Network is primarily thermo-coal originating from and hauled on the West Moreton System rail corridor, while grain is the primary product on the South Western System.

The Project rail corridor uses the existing rail corridor and the DTMR Gowrie to Grandchester future public passenger transport corridor (protected under the TPC Act), with possible refinements being considered.

2.3.1 West Moreton System rail corridor – Rosewood to Toowoomba

Rosewood is the boundary between the Western and the Metropolitan Systems and is the termination station for QR's electrified network The track structure is 41 kilograms per metre (kg/m) long welded rail (LWR) on timber sleepers with some 60/50 kg/m rail on concrete sleepers, with a with a maximum allowable Tonne Axle Load (tal) of 15.75 tal The line has a maximum allowable gross tonnage of 7.0 m per annum The maximum allowable speed on this line is 80 kilometres per hour (km/hr), while the slowest speed is 15 km/hr through some of the tunnel sections. This line is 105.1 km in length with the number of tracks varying from single to dual. There are 45 level crossings along this line, comprising public, occupation, flood lights and boom gate control types.

2.4 Existing active transport networks

2.4.1 Cycling and pedestrian network

A review of the PCNP was undertaken in order to identify any existing on-road cycle paths that may coincide with proposed construction traffic routes within QLD. The PCNP shows core routes that are required to increase cycling amongst the population and is used to guide future planning.

This review showed that cycle routes on the following roads within the PCNP coincide with proposed construction traffic routes:

- **DTMR:**
  - Cunningham Highway
  - Gatton Helidon Road
  - Gatton Laidley Road
  - Laidley Plainland Road
  - New England Highway
  - Pine Mountain Road
  - Rosewood Laidley Road
  - Toowoomba Connection Road
  - Warrego Highway
- **TRC:**
  - Herries Street
  - Dent Street
  - Station Street
  - North Street
  - Mort Street
- **LVRC:**
  - Hickey Street
  - Railway Street
  - Tenthill Creek Road
  - William Street

- **ICC:**
  - Redbank Plains Road.

Relevant up to date PCNP maps are available online on the DTMR website.

Similarly, a review of cycle networks within NSW was undertaken using the online 'Cycleway Finder' tool provided by RMS in order to identify any existing on-road cycle paths that may coincide with proposed construction routes. This review showed that the following cycle routes may be impacted by construction traffic:

- **RMS:**
  - Summerland Way
- **CVC:**
  - Craig Street

It should be noted that a number of the proposed construction routes traverse through areas of moderate to high pedestrian activity through the city centres of Toowoomba, Gatton, Helidon, Laidley and North Ipswich. It should be noted that while increased heavy vehicle movements through these locations may adversely impact pedestrian movements, the majority of these routes currently facilitate a high proportion of heavy vehicle movements regardless. Haulage contractors will be made aware of these areas of high pedestrian activity as a part of the Traffic Management Plan (TMP), discussed in Section 9.

Table 2.9 shows the existing pedestrian interfaces with the Project and the proposed treatments at these locations.

Table 2.9 Pedestrian interfaces with proposed Project alignment

ID reference	Road name	Owner	Proposed treatment
LVRC			
330-6-E-4a	Pedestrian Interface (Gatton Station)	LVRC	Grade separation - pedestrian over
330-6-E-4b	Pedestrian Interface (Gaul Street, west)	LVRC	No crossing provided - consolidate
330-6-E-5a	Pedestrian Interface (Gaul Street, east)	LVRC	At grade level crossing
330-9-P-0	Pedestrian Interface (Dodt Road)	LVRC	At grade level crossing
330-9-E-1a	Pedestrian Interface (Hunt Street)	LVRC	At grade level crossing
ICC			
330-14-P-2a	Pedestrian Interface (Grandchester Mount Mort Road)	ICC	At grade level crossing

Relevant PCNP maps are provided in Appendix T.

Suitable consultation with central cycling organisations will be conducted as required during the detailed design phase of the Project in order to ensure specific needs are considered and addressed during the construction of the Project.

3 Proposed works

3.1 Project rail alignment

As mentioned in Section 1.1, the proposed Project rail corridor is one of 13 projects that complete Inland Rail. This section of Inland Rail involves the design and construction of approximately 47 km of single track dual gauge railway with four crossing loops to accommodate double stack container freight trains up to 1,800 m long.

This 47 km section will also include a new 850 m tunnel to create an efficient route through the steep terrain of the Little Liverpool Range. The proposed Project is classed as both greenfield and brownfield development as approximately 50 per cent of the alignment runs parallel to existing rail corridors.

The Project will take into consideration the downstream impacts of the existing networks in evaluating the infrastructure options required for this Project. The Inland Rail Service Offering Requirements are:

- Train Length: up to 1,800 m, 6.5 m high (maximum)
- Maximum design speed: 80 to 115 km/hr, dependant on axle loads
- Double stacking: Clearances for double stack operation at 6.5 m high
- Interoperability: rail link between Melbourne and Brisbane that is interoperable with train operations to Perth, Adelaide, and other locations on the standard gauge rail network to serve future rail freight demand and to stimulate growth for inter-capital and regional/bulk rail freight.

It is estimated that the operation of the Project will involve an annual average of about 32 train services per day in both directions (northbound and southbound) in 2026. This is likely to increase to up to 47 train services per day in both directions in 2040 with current proposed infrastructure.

3.2 Road-rail interface locations

The Project rail corridor intersects SCR and LGRs at several locations. The proposed treatments/level of protection at road-rail interfaces are based on the outcome of the assessment undertaken by ARTC using ALCAM (2016) which considers factors such as future road traffic numbers, vehicle types, train numbers, speeds and sighting distances. This ALCAM assessment is carried out separate to this TIA and any identified changes to road-rail interfaces subsequent to what has been identified in this report will be incorporated through an updated TIA in the next design stage. Assessment of road-rail crossings on private roads is not in scope for the TIA.

To maintain suitable separation distance between the proposed railway alignment and the existing road network and minimise the potential for new level crossings, there may be a need to realign sections of the existing road network. Road network alterations such as road closures, deviations, realignments were taken into account for the purpose of the TIA.

3.2.1 Existing road-rail interface locations

Table 3.1 tabulates the existing public road-rail interface locations and road closures associated with the Project rail corridor.

Table 3.1 Existing road-rail interface locations and road closure locations

Interface ID	Road name	Proposed treatment
DTMR		
330-7-E-1	Eastern Drive	Grade separation - road over
330-9-E-2	Hunt Street	No crossing provided - relocate

Interface ID	Road name	Proposed treatment
LVRC		
330-6-E-1	Jamiesons Road	Active level crossing
330-6-E-2	Burgess Road	No crossing provided - consolidate
330-6-E-3	Off Beavan Street	Grade separation - rail over
330-6-E-4	Old College Road	Grade separation - rail over
330-6-E-4a	Pedestrian Interface	Grade separation - pedestrian over
330-6-E-4b	Pedestrian Interface	No crossing provided - consolidate
330-6-E-5	Gaul Street	No crossing provided - consolidate
330-6-E-5a	Pedestrian Interface	At grade level crossing
330-9-E-1	Dodt Road	Active level crossing
330-9-E-1a	Pedestrian Interface	At grade level crossing
ICC		
330-15-E-4	Calvert Station Road	Active level crossing

3.2.2 Proposed road-rail interface locations

Table 3.2 tabulates the proposed public road-rail interface locations and road closures associated with the Project rail corridor.

Table 3.2 Proposed public road-rail interface and road closure locations

Interface ID	Road name	Proposed treatment
DTMR		
330-3-P-8	Warrego Highway	Grade separation - rail over
330-9-P-1	Glenore Grove Road	Active level crossing
330-11-P-5	Laidley Plainland Road	Grade separation - rail over
330-13-P-2d	Rosewood Laidley Road	Grade separation - rail over
330-13-P-2e	Rosewood Laidley Road	No crossing provided - road divert/re-align
LVRC		
330-1-P-1	Airforce Road	No crossing provided - road divert/re-align
330-1-P-2	Warrigal Road	No crossing provided - road divert/re-align
330-1-P-2a	Airforce Road[1]	Grade separation - road over
330-1-P-7	Wrights Road	No crossing provided - road divert/re-align
330-2-P-1	Seventeen Mile Road	No crossing provided - consolidate
330-2-P-5	Connors Road	Active level crossing
330-3-P-5	Sandy Creek Road	Grade separation - rail over
330-4-P-3	Philps Road	Grade separation - rail over
330-4-P-4	Brooks Road	No crossing provided - road divert/re-align
330-9-P-0	Pedestrian Interface	At grade level crossing
330-10-P-3	Old Laidley Forest Hill Road	Grade separation - rail over
330-11-P-4	Old Laidley Forest Hill Road	No crossing provided - road divert/re-align
330-11-P-6	Francis Road	Grade separation - rail over
330-11-P-7	Luck Road	Grade separation - rail over
330-11-P-8	Paroz Road	Grade separation - rail over
330-12-P-1a	Railway Street	No crossing provided - consolidate

Interface ID	Road name	Proposed treatment
330-12-P-1b	Kessling Drive	No crossing provided - consolidate
330-12-P-1c	Kessling Drive	No crossing provided - consolidate
ICC		
330-13-P-2c	Unnamed Road	Grade separation - rail over
330-13-P-2f	Doonans Road	No crossing provided - road divert/re-align
330-14-P-2	Grand Chester Mount Mort Road	Active level crossing
330-14-P-2a	Pedestrian Interface	At grade level crossing

Table note:

1 Potential permanent and temporary impacts to Airforce Road have been considered for the Project as the road is utilised by haulage vehicles in transporting explosive goods to and from the Helidon Explosives Reserve. Grade separation is proposed at this road/rail interface point to alleviate any security risks associated with queued explosives vehicles at rail crossings and public risk of emergency situations involving explosives transport vehicles.

3.3 Construction activities

The major construction activities for the Project consist of: transportation of quarry materials (ballast, capping materials), pre-cast concrete, in-situ concrete, consolidated sleepers, earthworks materials, workforce, delivery of water, delivery/collection of plant, tools and other materials. Further details on construction activities and traffic are provided in Section 5.

3.4 Workforce accommodation camps

It has been determined that there is no need for a provision for construction worker camps to be made for the Project given the extent of significant population centres in close proximity to the alignment. Further details on workforce generated traffic are provided in Section 5.

3.5 Road alterations

This section discusses potential alterations to the local road network during the construction and operational phases of the Project. These proposed alterations may include both temporary and permanent alterations to the road network to facilitate the construction of the Project and road closures and diversions along the Project rail corridor (i.e. in the vicinity of road-rail interface locations).

3.5.1 Road realignments, diversions and closures

The proposed public road alterations as part of the Project are summarised in Table 3.3.

Table 3.3 Proposed road realignments, diversions and closures

Interface ID	Road name	Proposed treatment
DTMR		
330-9-E-2	Hunt Street	No crossing provided - relocate
330-13-P-2e	Rosewood Laidley Road	No crossing provided - road divert/re-align
LVRC		
330-1-P-1	Airforce Road	No crossing provided - road divert/re-align
330-1-P-2	Warrigal Road	No crossing provided - road divert/re-align
330-1-P-7	Wrights Road	No crossing provided - road divert/re-align
330-2-P-1	Seventeen Mile Road	No crossing provided - consolidate
330-4-P-4	Brooks Road	No crossing provided - road divert/re-align

Interface ID	Road name	Proposed treatment
330-6-E-2	Burgess Road	No crossing provided - consolidate
330-6-E-4b	Pedestrian Interface	No crossing provided - consolidate
330-6-E-5	Gaul Street	No crossing provided - consolidate
330-11-P-4	Old Laidley Forest Hill Road	No crossing provided - road divert/re-align
330-12-P-1a	Railway Street	No crossing provided - consolidate
330-12-P-1b	Kessling Drive	No crossing provided - consolidate
330-12-P-1c	Kessling Drive	No crossing provided - consolidate
ICC		
330-13-P-2f	Doonans Road	No crossing provided - road divert/re-align

While these alterations to the external public road network will create permanent diversions, these are not expected to create a significant change to existing traffic patterns and distributions. The alterations to the public road network are not expected to be significant at most of these sites as:

- The proposed road network alterations mainly consist of road realignments whereby existing traffic patterns will be maintained
- Existing geometric lane configurations can be maintained within the newly proposed road realignments.

As a result, detailed operational capacity assessments were only envisaged to be required at the Gaul Street (330-6-E-5) site. This operational capacity assessment assessed network effects of closing and retaining the existing level crossing, and resulted in the following conclusions:

- Closure of the existing Gaul Street level crossing is proposed based on existing queue storage capacity constraints. The potential vehicle queue spill back from the William Street/Crescent Street intersection across the existing Gaul Street level crossing is considered a significant safety risk.
- The closure of the level crossing would mitigate the significant safety issues relating to the queuing of traffic on the level crossing
- The traffic from the closure of the Gaul Street level crossing is anticipated to divert via Old College Road and pass under the existing and proposed rail overbridges. These overbridges will be upgraded with sufficient vertical clearance to accommodate the proposed traffic.
- Traffic capacity of the road links and intersections along the proposed diversion route assessed as being adequate to receive the additional traffic without significant negative impacts.

Detailed analysis of the Gaul Street (330-6-E-5) site has been provided in Appendix S.

4 Baseline operations

This section discusses the existing operational conditions for the impacted SCR and LGR.

4.1 Existing road links

4.1.1 Level of service definition

Level of service is a qualitative measure describing the operational conditions within a traffic flow. This will be determined for both the existing road links as well as during the various construction stages where the Project's construction activities could potentially have an impact on the operational performance of the surrounding road network. The findings from the analysis will lead to the formulation of potential mitigation measures to address the identified impacts.

LOS is defined in terms of service measures such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience. The practical application of LOS to different road environments takes into account factors such as road hierarchy, volume/capacity ratios, terrain types, proportion of heavy vehicles and road gradients. The methodology and LOS criteria has been obtained from the Guide to Traffic Management Part 3: Traffic Studies and Analysis (2017a) and Highway Capacity Manual (Transportation Research Board 2016).

Each of the six LOS represents a range of operating conditions and the driver's perception of those conditions, and can generally be described as:

- **LOS A**: Level of Service A is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
- **LOS B:** Level of Service B is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with LOS A
- **LOS C:** Level of Service C is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
- **LOS D**: Level of Service D is close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
- **LOS E**: Level of Service E occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select their desired speeds and to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause flow breakdown.
- **LOS F:** Level of Service F is in the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

Road authorities generally prefer to design new rural road projects for LOS A or B at opening and LOS C to D in the design year. However, some rural projects and most urban projects will have practical and financial limits on the extent of work that can be achieved and consequently the performance criteria will have to be negotiated throughout the traffic analysis process. In this regard, an analysis of the existing level of service on the road network provides a useful benchmark by which to assess changes as a result of the Project. The colours adopted to represent the various LOS are as shown in Table 4.1.

Table 4.1 Level of service

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

4.1.2 Two-lane two-way analysis criteria

The LOS criteria are based on the design hour volume to AADT ratio with respective saturation flows per terrain type as obtained from Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity (1988) and is provided in Table 4.2 and Table 4.3. The LOS criteria adopted are for the purpose of identifying any changes to the network performance in the future scenarios by comparing the scenarios with and without the additional traffic generated by the Project.

Table 4.2 Saturation flow rate – uninterrupted two-lane two-way rural roads (vehicles per day)

Design hour volume to AADT ratio (K-value)	Level of service (LOS)				
	A	B	C	D	E
Level terrain					
0.1	2,400	4,800	7,900	13,500	22,900
0.11	2,200	4,400	7,200	12,200	20,800
0.12	2,000	4,000	6,600	11,200	19,000
0.13	1,900	3,700	6,100	10,400	17,600
0.14	1,700	3,400	5,700	9,600	16,300
0.15	1,600	3,200	5,300	9,000	15,200
Rolling terrain					
0.1	1,100	2,800	5,200	8,000	14,800
0.11	1,000	2,500	4,700	7,200	13,500
0.12	900	2,300	4,400	6,600	12,300
0.13	900	2,100	4,000	6,100	11,400
0.14	800	2,000	3,700	5,700	10,600
0.15	700	1,800	3,500	5,300	9,900
Mountainous terrain					
0.1	500	1,300	2,400	3,700	8,100
0.11	400	1,200	2,200	3,400	7,300
0.12	400	1,100	2,000	3,100	6,700
0.13	400	1,000	1,800	2,900	6,200
0.14	300	900	1,700	2,700	5,800
0.15	300	900	1,600	2,500	5,400

Source: Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity 1988

Table 4.3 Saturation flow rate – uninterrupted two-lane-two-way rural roads (pc/h/ln)

Design hour volume to AADT ratio (K-value)	Level of service (LOS)				
	A	B	C	D	E
Level terrain					
0.1	250	500	800	1,350	2,300
0.11	250	500	800	1,350	2,300
0.12	250	500	800	1,350	2,300
0.13	250	500	800	1,350	2,300
0.14	250	500	800	1,350	2,300
0.15	250	500	800	1,350	2,300
Rolling terrain					
0.1	50	300	500	800	1,500
0.11	50	300	500	800	1,500
0.12	50	300	500	800	1,500
0.13	50	300	500	800	1,500
0.14	50	300	500	800	1,500
0.15	50	300	500	800	1,500
Mountainous terrain					
0.1	50	150	250	350	800
0.11	50	150	250	350	800
0.12	50	150	250	350	800
0.13	50	150	250	350	800
0.14	50	150	250	350	800
0.15	50	150	250	350	800

Table note:

Values rounded to the nearest 50.

Source: Austroads 1988.

4.1.3 Baseline traffic volumes

Baseline traffic volumes (AADT) and heavy vehicle percentages by direction have been tabulated for each road section along the Project construction traffic routes. These tables also provide the road hierarchy and data source for each of these road segments. The data sources used in the assessment have been provided in Table 4.4.

Table 4.4 Traffic data sources

Source ID	Traffic data source
A	Volumes obtained from DTMR detailed segment and weekly reports
B	Volumes adopted from adjacent DTMR road segment
C	Volumes obtained from RMS opensource Traffic Viewer. Adjacent road link volumes were adopted on links where traffic information is not available.
D	Urban Local Road - Volumes derived by assuming LOS A with associated AADT of 2000 veh as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity (1988)
	Urban Collector Road - Volumes derived by assuming LOS B with associated AADT of 3800 veh as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity (1988)
	Rural Local Road - Volumes derived by assuming 400 AADT according to ARTC Road Classification for Victoria, NSW and QLD Guide
E	Rural Arterial Road - Volumes derived by assuming LOS A with K-value of 0.15 with associated AADT of 1600 veh as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity (1988)
	Urban Arterial Road - Volumes derived by assuming LOS B with K-value of 0.12 with associated AADT of 2000 veh as depicted in Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity (1988)
F	Volumes obtained through 7-day 24-hour traffic surveys
G	Volumes adopted from adjacent surveyed link road or adjacent DTMR detailed segment and weekly reports
H	Volumes obtained from QLD Globe
I	Volumes obtained from relevant authority

4.1.4 Existing construction route traffic volumes

The existing baseline traffic volumes for roads located in QLD are provided in Table 4.5. The traffic volumes represent both SCR and LGR associated volumes traversing along construction route link roads. The volumes were used for the purpose of all capacity and pavement impact assessments. The traffic volumes account for all SCR census-based traffic volumes, surveyed traffic volumes as well as assumed traffic volumes where information was not available.

The traffic volumes provide information relating to AADT, ADT and percent heavy vehicles for both directions of travel. Baseline year 2017 traffic volumes along SCRs were adjusted for by means of a compound growth equation as mentioned in Section 1.5.1, to determine base year 2018 traffic volumes for analyses. Both assumed and surveyed traffic volumes account for base year 2018 traffic volumes.

Table 4.5 Existing baseline construction route traffic volumes

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
SCR:DTMR								
Cunningham Highway	17B - Between River Road and Redbank Plains Road	Urban motorway	A	2017	22117	17	20050	16
	17B - Between Redbank Plains Road and Ripley Road	Urban motorway	A	2017	17027	13	17927	15
	17B - Between Ripley Road and Ipswich Boonah Road	Urban arterial	A	2017	9896	14	10214	19
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	Rural motorway	A	2017	10301	13	10520	12
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	Rural arterial	H	2017	543	9	543	9
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	Rural local	H	2017	2184	16	2184	16
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	Rural local	A	2017	2619	13	2441	13
	314 - Between Gatton Clifton Road and Railway Street	Rural arterial	A	2017	3248	12	2938	10
	314 - Between Railway Street and Hickey Street	Urban collector	A	2017	4996	13	4982	13
	314 - Between Hickey Street and Gatton Laidley Road W	Urban collector	A	2017	6184	10	6094	12
	314 - Between Gatton Laidley Road W and Warrego Highway	Urban arterial	A	2017	2613	16	2623	4
	314 - Between Warrego Highway and William Street	Rural arterial	A	2017	2619	13	2441	13
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	Rural arterial	A	2017	1197	8	1176	8
	312 - Between Whiteway Road and Railway Street	Rural arterial	A	2017	1197	8	1176	8
	312 - Between Railway Street and Hall Road	Urban collector	A	2017	1197	8	1176	8
	312 - Between Hall Road and Forest Hill Fernvale Road	Urban local	A	2017	1197	8	1176	8
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	Rural arterial	A	2017	1197	8	1176	8
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	Rural arterial	A	2017	2712	15	2232	18
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	Rural arterial	A	2017	54594	5	54247	3

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	Urban motorway	A	2017	3891	17	3820	15
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	Rural motorway	A	2017	1541	15	1563	11
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	Rural arterial	A	2017	1541	15	1563	11
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	Urban collector	A	2017	2103	11	1933	12
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	Rural arterial	A	2017	2613	16	2623	4
	311 - Between Old Laidley Forest Hill Road and Railway Street	Rural arterial	A	2017	3204	7	3192	6
	311 - Between Railway Street and Whites Road	Rural arterial	A	2017	3204	7	3192	6
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	Rural arterial	G	2017	54594	5	54247	5
New England Highway	22A - Between Griffiths Street and Munro Street	Urban motorway	A	2017	8961	8	8574	9
	22A - Between North Street and James Street	Urban arterial	A	2017	6528	6	7178	6
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	Urban arterial	A	2017	78160	8	78858	8
Pine Mountain Road	Between Warrego Highway and Lowry Street	Urban arterial	H	2017	7169	4	7169	4
River Road	309 - Between Warrego Highway and Cunningham Highway	Urban motorway	H	2017	3437	12	3437	12
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	Urban collector	A	2017	906	7	895	14
	308 - Between Mulgowie Road and Crown Street	Rural arterial	A	2017	1608	14	1510	12
	308 - Between Crown Street and Rosewood Marburg Road	Rural arterial	A	2017	1608	14	1510	12
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	Rural arterial	I	2018	1459	46	1459	46
	Between New England Highway and Toowoomba Connection Road	Rural arterial	I	2018	1459	46	1459	46

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	Rural motorway	A	2017	6319	17	6283	17
	315 - Between Toowoomba-Athol Road and New England Highway	Urban arterial	A	2017	11086	10	10819	16
	315 - Between New England Highway and James Street	Urban arterial	A	2017	8707	22	8931	19
	315 - Between James Street and Tourist Road	Urban arterial	A	2017	7867	27	8946	20
	315 - Between Tourist Road and Roches Road	Urban arterial	A	2017	12499	19	12106	17
	315 - Between Roches Road and Murphys Creek Road	Rural arterial	A	2017	12499	19	12106	17
	315 - Between Murphys Creek Road and Toowoomba Second Range Crossing	Rural motorway	A	2017	10238	17	9821	18
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	Rural motorway	A	2017	7239	19	8402	21
	18A - Between Gatton Helidon Road and Gatton Esk Road	Rural motorway	A	2017	7239	19	8402	21
	18A - Between Gatton Esk Road and Laidley Plainland Road	Rural motorway	A	2017	11410	19	11297	20
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	Rural motorway	A	2017	11410	21	11297	18
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	Rural motorway	A	2017	17087	15	15819	15
	18A - Between Brisbane Valley Highway and Mount Crosby Road	Rural motorway	A	2017	23696	14	21327	17
	18A - Between Mount Crosby Road and Cunningham Highway	Urban motorway	A	2017	29392	14	28468	15
SCR: RMS								
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway	Urban motorway	C	2017	7242	24	8982	23
Summerland Way	Between Trenayr Road and Turf Street	Rural arterial	C	2017	12553	5	12529	5

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
LGR: CVC								
Bent Street	Between Craig Street and Gwydir Highway	Urban arterial	E	2018	2000	-	2000	-
Charles Street	Between Bent Street and Pacific Highway	Urban arterial	E	2018	2000	-	2000	-
Clark Road	Full extent	Rural local	D	2018	400	-	400	-
Craig Street	Between Villiers Street and Bent Street	Urban collector	D	2018	3800	-	3800	-
Dobie Street	Between Villiers Street and Summerland Way	Urban collector	D	2018	3800	-	3800	-
Trenayr Road	Between Summerland Way and Clark Road	Rural collector	D	2018	2000	-	2000	-
Villiers Street	Between Craig Street and Dobie Street	Urban collector	D	2018	3800	-	3800	-
LGR: ICC								
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	Rural local	F	2018	219	7	221	8
Fairbank Place	Full extent	Urban local	D	2019	148	33	127	25
Grandchester Mount Mort Road	Between Rosewood Laidley Road and School Road	Rural collector	F	2018	381	15	385	14
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	Rural collector	G	2018	202	47	205	44
Hiddenvale Road	Between Gipps Street and Neumann Road	Rural local	D	2018	219	7	221	8
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	Rural collector	F	2018	202	52	205	49
	Between Thagoona Haigslea Road and Mount Marrow Quarry	Rural collector	F	2018	202	52	205	49
Neumann Road	Full extent	Rural local	D	2018	50	15	50	15
Newhill Drive	Full extent	Urban collector	D	2019	606	45	659	36
Noblevale Way	Full extent	Urban local	I	2019	223	35	229	39
Rafters Road	Between School Road and Railway Line	Rural local	D	2018	381	15	385	14
Redbank Plains Road	Between Cunningham Highway and Newhill Drive	Urban arterial	I	2010	7856	12	7856	12

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
Rob Roy Way	Full extent	Urban local	D	2019	430	44	411	37
School Road	Between Grandchester Mount Mort Road and Rafters Road	Rural local	G	2018	381	15	385	14
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	Rural collector	I	2010	159	15	159	15
	Between Schumanns Road and Mount Marrow Quarry Road	Rural collector	I	2010	159	15	159	15
LGR: LVRC								
Airforce Road	Between Airforce Road and Railway Line	Rural collector	F	2018	567	9	200	13
Arthur Street	Between Bowen Street and Station Street	Urban local	D	2018	2000	15	2000	15
	Between Station Street and Mary McKillop Street	Urban local	D	2018	2000	15	2000	15
	Between Mary McKillop Street and Georges Street	Urban local	D	2018	2000	15	2000	15
Boundary Road	Between Laidley Plainland Road and Francis Road	Rural local	D	2018	400	15	400	15
Bowtells Road	Full extent	Rural local	D	2018	400	15	400	15
Boxmoor Street	Between Victor Street and Philps Road	Rural collector	D	2018	2000	15	2000	15
Burgess Road	Between Old Toowoomba Road and Smithfield Road	Rural collector	F	2018	766	12	780	7
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	Rural collector	F	2018	37	10	42	13
	Between Airforce Road and Wrights Road	Rural collector	F	2018	37	10	42	13
Crescent Street	Between William Street and East Street	Urban local	F	2018	960	4	1530	5
Crown Street	Full extent	Rural local	D	2018	400	15	400	15
George Street	Between Seventeen Mile Road and Arthur Street	Rural collector	G	2015	269	13	272	20
	Between Arthur Street and Lawlers Road	Rural collector	G	2015	269	13	272	20
Hall Road	Full extent	Urban local	D	2018	2000	15	2000	15
Hickey Street	Between Old College Road and Buaraba Street	Urban collector	F	2018	2120	0	1090	7
Laidley Street	Between Station Street and Seventeen Mile Road	Urban local	D	2018	2000	15	2000	15
Laidley Street	Between Seventeen Mile Road and George Street	Urban local	D	2018	2000	15	2000	15

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	Rural local	D	2018	400	15	400	15
Lawlers Road	Between Victor Street and George Street	Rural collector	G	2015	269	13	272	20
	Between George Street and Warrego Highway	Rural collector	G	2015	269	13	272	20
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	Rural local	D	2018	400	15	400	15
Mary McKillop Street	Between Turner Street and Arthur Street	Rural local	D	2018	400	15	400	15
Old College Road	Between East Street and Gatton Laidley Road	Urban collector	F	2018	370	0	430	2
Old Laidley Forest Hill Road	Between Forest Hill Fernvale Road and Laidley Plainland Road	Urban collector	I	2016	695	6	695	4
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	Rural collector	D	2018	2000	15	2000	15
Paroz Road	Between Summer Street and 200 East of Summer Street	Rural local	I	2012	230	9	232	3
Philipps Road	Between Boxmoor Street and Warrego Highway	Rural collector	D	2018	2000	15	2000	15
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	Rural local	D	2018	400	15	400	15
Railway Road	Between Gatton Laidley Road and Greyfriars Road	Urban local	D	2018	2000	15	2000	15
Railway Street	Between Kessling Drive and Summer Street	Rural local	I	2012	8	0	8	1
	Between Summer Street and Laidley Plainland Road	Rural local	I	2012	8	0	8	1
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	Urban local	D	2018	2000	15	2000	15
Sandy Creek Road	Between Connors Road and Warrego Highway	Rural collector	F	2018	556	39	556	46
	Between Warrego Highway and Bowtells Road	Rural local	F	2018	556	39	556	46
Seventeen Mile Road	Between Airforce Road and Laidley Street	Rural collector	F	2018	109	24	111	23
Station Street	Between Arthur Street and Laidley Street	Urban local	D	2018	2000	15	2000	15

Road name	Road section	Road hierarchy	Data source	Traffic volume base year	Gazettal/ northbound/ eastbound		Anti-gazettal/ southbound/ westbound	
					AADT	% Heavy vehicles	AADT	% Heavy vehicles
Summer Street	Between Paroz Street and Railway Street	Rural local	F	2018	368	12	367	16
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	Urban local	D	2018	2000	15	2000	15
Turner Street	Between Warrego Highway and Mary McKillop Street	Rural collector	D	2018	2000	15	2000	15
Victor Street	Between William Street and Boxmoor Street	Rural collector	D	2018	2000	15	2000	15
Western Drive	Between Warrego Highway and Tenthill Creek Road	Urban local	D	2018	2000	15	2000	15
WIlliam Street	Between Hickey Street and Cochrane Street	Urban collector	F	2018	1948	10	2127	11
	Between Bowen Street and Laidley Street	Urban local	D	2018	2000	15	2000	15
	Between Gatton Helidon Street and Victor Street	Rural collector	D	2018	2000	15	2000	15
Wrights Road	Between Connors Road and Andersons Road	Rural local	F	2018	27	30	27	34
LGR: TRC								
Dent Street	Between Margaret Street and Herries Street	Urban local	I	2016	1915	5	1915	5
Griffiths Street	Between Mort Street and New England Highway	Urban collector	I	2014	3751	8	3751	8
Herries Street	Between Dent Street and Water Street North	Urban arterial	I	2014	9319	6	9319	6
Larcombe Street	Between North Street and Railway Line	Urban local	D	2018	2000	15	2000	15
Mort Street	Between Hermitage Road and North Street	Urban collector	I	2013	93	16	93	16
Munro Street	Between New England Highway and Harlaxton Quarry	Urban local	I	2016	199	25	199	25
North Street	Between Mort Street and New England Highway	Urban collector	I	2014	4568	10	4568	10
O'Mara's Road	Between Toowoomba Connection Road and Witmack Road	Rural local	I	2018	1695	25	1695	25
Station Street	Between Margaret Street and Russel Street	Urban local	I	2016	379	7	379	7
Water Street North	Between Herries Street and Toowoomba Connection Road	Urban local	I	2016	773	6	773	6
Witmack Road	Between O'Mara's Road and Witmack Industry Park	Rural local	G	2018	1695	25	1695	25

4.2 Existing intersection performance

4.2.1 Delay based intersection analysis criteria

An increase in vehicles through an intersection as a result of the Project will likely increase traffic delays. Increases in delays potentially have an economic and social impact on the community through increased travel times, driver impatience (leading to possible crashes) and the associated economic cost of these delays to private and commercial/heavy vehicle trips according to the GTIA. The following input types are required as a basis to evaluate existing intersection performance:

- Existing intersection geometry and lane configuration data
- Existing traffic signal phasing and sequence data where required
- Vehicle movement data
- Peak hour traffic volume data.

The delay-based analyses criteria adopted for the purposes of the TIA are provided in Table 4.6. The table indicates the LOS per intersection control type associated with a respective delay per vehicle measured in seconds.

Table 4.6 Level of service definitions based on vehicle delay in seconds

Control delay per vehicle in seconds (d)			
Level of service	**Signals**	**Roundabout**	**Sign control**
A	d ≤ 10	d ≤ 10	d ≤ 10
B	10 d ≤ 20	10 d ≤ 20	10 d ≤ 15
C	20 d ≤ 35	20 d ≤ 35	15 d ≤ 25
D	35 d ≤ 55	35 d ≤ 50	25 d ≤ 35
E	55 d ≤ 80	50 d ≤ 70	35 d ≤ 50
F	d < 80	d < 70	d < 50

Source: SIDRA Intersection 8 User Guide (2018)

4.3 Existing pavement load (standard axle repetitions)

A preliminary desktop pavement impact assessment has been undertaken based on the existing background traffic data available for SCRs impacted by proposed construction traffic. These traffic volumes have been converted into SARs based on the heavy vehicle classes provided by relevant road controlling authorities. A SAR is a unit measurement which converts the wheel loads of traffic to an equivalent number of standard loads and is usually expressed in terms of the equivalent number of 80 kilo-Newtons (kN) single axle load.

4.3.1 Equivalent axle load per heavy vehicle type: Queensland

Detailed road segment reports with 12-bin vehicle breakdown details were used to calculate SAR/HV along SCRs on the DTMR road network. The SAR/HV was calculated by means of the methodologies set out in Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012) (as referenced in the GTIA. It is noted that a more recent version of this guide is available which will be used for pavement design).

The SAR/HV along the SCR primary construction routes are provided in Table 4.7.

Table 4.7 **Standard Axle Repetitions per heavy vehicles on primary construction routes along State-controlled roads**

Road name	Road ID - road section	Source	SAR/HV	
			Gazettal	Anti-Gazettal
Cunningham Highway	17B - Between River Road and Redbank Plains Road	Calculated	2.34	2.37
	17B - Between Redbank Plains Road and Ripley Road	Calculated	2.47	2.37
	17B - Between Ripley Road and Ipswich Boonah Road	Calculated	2.56	2.40
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	Calculated	2.47	2.44
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	Assumed	1.89	1.88
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	Assumed	1.89	1.88
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	Calculated	2.12	2.07
	314 - Between Gatton Clifton Road and Railway Street	Calculated	2.14	2.02
	314 - Between Railway Street and Hickey Street	Calculated	2.08	2.04
	314 - Between Hickey Street and Gatton Laidley Road W	Calculated	2.13	2.04
	314 - Between Gatton Laidley Road W and Warrego Highway	Calculated	1.87	1.99
	314 - Between Warrego Highway and William Street	Calculated	2.12	2.07
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	Calculated	1.89	1.88
	312 - Between Whiteway Road and Railway Street	Calculated	1.89	1.88
	312 - Between Railway Street and Hall Road	Calculated	1.89	1.88
	312 - Between Hall Road and Forest Hill Fernvale Road	Calculated	1.89	1.88
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	Calculated	1.94	1.92
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	Calculated	1.96	1.93
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	Calculated	2.27	3.06
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	Calculated	2.11	2.09
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	Calculated	2.03	2.02
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	Calculated	2.03	2.02
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	Calculated	2.02	2.03
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	Calculated	1.87	1.99
	311 - Between Old Laidley Forest Hill Road and Railway Street	Calculated	1.93	1.94
	311 - Between Railway Street and Whites Road	Calculated	1.93	1.94

Road name	Road ID - road section	Source	SAR/HV	
			Gazettal	Anti-Gazettal
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	Adopted	2.27	3.06
New England Highway	22A - Between Griffiths Street and Munro Street	Calculated	1.94	1.93
	22A - Between North Street and James Street	Calculated	1.97	1.93
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	Adopted	2.27	3.06
Pine Mountain Road	302 - Between Warrego Highway and Lowry Street	Adopted	2.34	2.37
River Road	309 - Between Warrego Highway and Cunningham Highway	Adopted	2.34	2.37
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	Calculated	1.89	1.92
	308 - Between Mulgowie Road and Crown Street	Calculated	1.94	1.99
	308 - Between Crown Street and Rosewood Marburg Road	Calculated	1.94	1.99
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	Adopted	2.56	2.64
	Between New England Highway and Toowoomba Connection Road	Adopted	2.56	2.64
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	Adopted	2.24	2.84
	315 - Between Toowoomba-Athol Road and New England Highway	Calculated	2.24	2.84
	315 - Between New England Highway and James Street	Calculated	2.56	2.64
	18A - Between James Street and Tourist Road	Calculated	2.47	2.48
	18A - Between Tourist Road and Roches Road	Calculated	2.52	2.52
	18A - Between Roches Road and Murphys Creek Road	Calculated	2.52	2.52
	18A - Between Murphys Creek Road and Toowoomba Second Range Crossing	Calculated	2.57	2.51
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	Calculated	2.44	2.49
	18A - Between Gatton Helidon Road and Gatton Esk Road	Calculated	2.44	2.49
	18A - Between Gatton Esk Road and Laidley Plainland Road	Calculated	2.53	2.50
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	Calculated	2.53	2.50
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	Calculated	2.44	2.54
	18A - Between Brisbane Valley Highway and Mount Crosby Road	Calculated	2.38	2.38
	18A - Between Mount Crosby Road and Cunningham Highway	Calculated	2.30	2.29

4.3.2 Equivalent axle load per heavy vehicle type: New South Wales

SAR/HV values were also used as part of the pavement impact analyses for the primary construction routes along RMS SCRs. SARs were also determined for the primary construction routes along RMS SCRs. As annual 12-bin vehicle breakdown information was not available for RMS roads, SAR/HV information provided within Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012) was used based on Weigh-In-Motion (WIM) sites across NSW. As not all roads were represented in the guide, SAR/HV values were assumed based on similar, proximate roads.

Table 4.8 outlines the road name and the assumed WIM site(s) used for the purpose of the analysis.

Table 4.8 Standard Axle Repetitions per heavy vehicles on representative Weigh-in-motion sites across NSW

Project road assessed	WIM site road name	WIM ID	Location	%HV	SAR/HVAG	SAR/HV
Pacific Highway	Pacific Highway	283	Brunswick Heads	14.2	0.807	2.30
Summerland Way	New England Highway	700	Branxton	14.4	0.803	2.19
	New England Highway	AR	Armidale	18.7	0.714	1.97
	Average:			16.6	0.759	2.08

4.3.3 Existing standard axle repetitions over 20-year design life

SARs for the background heavy vehicle component were calculated based on the heavy vehicle splits for the relevant road sections. It must be noted that all base pavement loading SAR's were calculated as granular pavement with thin bituminous surfacing with a load damage unit equivalent to SAR4 (a SAR with a load damage exponent 4), irrespective of pavements containing one or more boundary layers for both DTMR and RMS roads. This is because raw road asset data from DTMR does not capture loaded and unloaded heavy vehicle movements which do not make it feasible to calculate SAR5s and SAR12s (load damage units applicable to pavements with one or more boundary layers. This was completed in accordance with the following process:

- The existing AADT for the relevant road sections, where available, were obtained from DTMR and RMS
- Relevant SAR rates were applied to existing heavy vehicle proportions for each direction of travel
- Determine the existing SAR4s for each construction route road section on all affected SCRs in accordance with Section 6.4 of the GTIA Manual
- A 2 per cent heavy vehicle compound growth rate was used and applied to determine future projected yearly SAR over a 20-year design life
- Existing SAR4s and associated capacities was graphically represented for each link over a 20-year design life.

Detailed findings of existing SAR across a 20-year design life are provided in Appendix F.

4.4 Rail crossings

4.4.1 Existing rail crossings

Table 4.9 shows the existing rail crossings along the Project alignment.

Table 4.9 Existing at-grade rail crossings (public formed roads only)

Interface ID	Road name	Proposed treatment
DTMR		
330-7-E-1	Eastern Drive	Grade Separation - Road over
330-9-E-2	Hunt Street	No crossing provided - relocate

Interface ID	Road name	Proposed treatment
LVRC		
330-6-E-1	Jamiesons Road	Active level crossing
330-6-E-2	Burgess Road	No crossing provided – consolidate
330-6-E-3	Off Beavan Street	Grade Separation - Rail over
330-6-E-4	Old College Road	Grade Separation - Rail over
330-6-E-4a	Pedestrian Interface	Grade Separation - Pedestrian over
330-6-E-4b	Pedestrian Interface	No crossing provided - consolidate
330-6-E-5	Gaul Street	No crossing provided - consolidate
330-6-E-5a	Pedestrian Interface	At grade level crossing
330-9-E-1	Dodt Road	Active level crossing
330-9-E-1a	Pedestrian Interface	At grade level crossing
ICC		
330-15-E-4	Calvert Station Road	Active level crossing

4.4.2 Road-rail interface traffic volumes

Base year 2018 traffic volumes at existing and proposed public road rail interface sites along formed roads are provided in Table 4.10.

Table 4.10 Existing traffic volumes at proposed road-rail interface locations

Road/ rail Interface ID	AM peak volume		PM peak volume		Peak day volume		% Heavy vehicles (average weekday)	
	North-bound/ East-bound	South-bound/ West-bound	North-bound/ East-bound	South-bound/ West-bound	North-bound/ East-bound	South-bound/ West-bound	North-bound/ East-bound	South-bound/ West-bound
330-1-P-7	3	3	3	3	34	35	34	39
330-2-P-1	27	11	10	20	135	133	28	26
330-2-P-5	3	5	6	4	46	54	11	15
330-6-E-1	89	44	68	100	895	906	12	7
330-6-E-3	117	55	78	117	978	974	9	16
330-6-E-5	130	197	227	218	2231	2462	10	11
330-9-E-1	1	1	1	1	12	11	17	50
330-9-E-2	205	131	180	190	2046	2021	7	9
330-11-P-7	26	46	41	27	413	407	12	16
330-13-P-2d	2	2	2	4	30	31	10	2
330-14-P-2	38	35	41	47	425	436	16	15
330-15-E-4	24	11	15	25	267	279	8	8

These volumes were taken into consideration as part of the vehicle queueing and delay capacity assessments during the operational years of the proposed level crossings. These volumes are provided for the locations with traffic volumes that were assumed to exceed 10 vehicles per day. Details of the analysis are provided in Section 6.4.3. It is evident from Table 4.10 that existing traffic volumes are typically low during both AM and PM peak hours for the majority of these sites.

4.5 Existing road safety issues (crash data)

Crash data for the transport study area was obtained for the most recent and available five-year time period from DTMR and RMS. As a result, the analysis has considered the following time periods:

- RMS: 01/07/2012 to 30/06/2017
- DTMR: 01/11/2012 to 31/10/2017.

It should be noted that DTMR and RMS apply different categorisations for crash severity. As a result, crash data has been summarised separately for each of these regions. Additionally, DTMR does not report on non-injury (i.e. uncategorised) crashes as of 2010, therefore, non-injury crashes have been removed from the RMS dataset in this analysis. The crashes are classified using DCA Code Groups, with Table 4.11 demonstrating the DCA Code Group descriptions. These codes have been used to determine the type of crash that occurs most frequently (highest prevalence out of total accidents by magnitude based on the data provided).

Table 4.11 Definition for Coding Accidents code group descriptions

DCA code group	DCA code group description
Multiple vehicle crashes	
1	From adjacent approaches
2	Head on
3	Opposing vehicle turning
4	Rear end
5	Lane change
6	Parallel lanes, turning
7	U-turn
8	Entering roadway
9	Overtaking, same direction
10	Hit parked vehicle
11	Hit railway train
Single vehicle crashes	
12	Pedestrian
13	Obstruction on carriageway
14	Hit animal
15	Off carriageway on straight
16	Off carriageway on straight, hit object
17	Out of control on straight
18	Off carriageway on curve
19	Off carriageway on curve, hit object
20	Out of control on curve
Exceptions	
21	Exceptions (i.e. crashes which are unlikely to be attributable to and road environment factor)

Source: Austroads Guide to Road Safety Part 8, 2015

4.5.1 Crash analysis – construction routes

Based on the provided DTMR and RMS data, a breakdown of reported incidents by crash severity within the transport study area has been provided in Table 4.12. Maps showing the location of the reported crashes as road sections along which construction traffic travels are provided in Appendix G.

Table 4.12 Construction traffic route crash data summary

Road name	Length (km)	Background volume (AADT)	Peak construction volume (ADT)	Total 5 year crashes	Total 5-year crashes				Most frequent DCA group	
					Fatal	Hospitalisation	Medical treatment	Minor injury	DCA code group	DCA %
SCR: DTMR										
Cunningham Highway	17.1	9907-42167	4	103	1	58	32	12	4	18
Forest Hill Fernvale Road	No crashes									
Gatton Esk Road	No crashes									
Gatton Helidon Road	20.8	5060-12278	161	11	1	5	5	0	1	27
Gatton Laidley Road	15	2373	87	11	1	6	4	0	19	27
Gatton Laidley Road West	No crashes									
Haigslea Amberley Road	3.4	4944	77	8	0	1	4	3	4	38
Ipswich Motorway	8.2	108841	53	93	0	39	40	14	5	31
Ipswich Rosewood Road	12.7	3104-7711	2	2	0	1	1	0	4	50
Karrabin Rosewood Road	8.2	4036	137	12	0	5	4	3	1	25
Laidley Plainland Road	8.6	5236-6396	258	5	1	1	2	1	4	40
Logan Motorway (managed by Transurban)	30.2	108841	53	207	2	79	107	19	4	35
New England Highway	1.7	13706-17535	67	72	0	25	38	9	4	36
Pacific Motorway	66	157018	53	910	10	323	464	113	4	56
Pine Mountain Road	3.2	14337	153	5	0	2	3	0	4	60
River Road	1	6873	4	5	0	2	2	1	16	60
Rosewood Laidley Road	23.6	1801-3118	173	23	3	12	7	1	19	30
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	No crashes – new road									
Warrego Highway / Toowoomba Second Range Crossing	96	12602-57860	245	523	12	205	246	60	4	26

Road name	Length (km)	Background volume (AADT)	Peak construction volume (ADT)	Total 5 year crashes	Total 5-year crashes				Most frequent DCA group	
					Fatal	Hospitalisation	Medical treatment	Minor injury	DCA code group	DCA %
SCR: RMS										
Pacific Motorway	216	16224	53	445	25	163	183	74	16	21
Summerland Way	4.8	12529	53	14	0	4	8	2	1	50
LGR: CVC										
Bent Street	1.5	4000	53	11	0	2	8	1	4	27
Charles Street	No crash data available									
Clark Road	No crash data available									
Craig Street	0.1	7600	53	6	0	2	4	0	4	33
Dobie Street	1.7	7600	53	4	0	0	4	0	1	100
Trenayr Road	No crash data available									
Villiers Street	1.3	7600	53	8	0	2	4	2	1	63
LGR: TRC										
Dent Street	0.4	3829	111	1	0	0	0	1	7	100
Griffiths Street	1.4	7502	67	6	0	4	1	1	4	67
Herries Street	No crashes									
Larcombe Street	No crashes									
Mort Street	1.5	185	67	2	0	1	1	0	1	100
Munro Street	No crashes									
North Street	0.8	9136	6	2	0	1	1	0	4	50
O'Mara's Road	No crashes									
Station Street	No crashes									
Water Street North	No crashes									
Witmack Road	0.6	3390	0	1	0		1	0	15	100

Road name	Length (km)	Background volume (AADT)	Peak construction volume (ADT)	Total 5 year crashes	Total 5-year crashes				Most frequent DCA group	
					Fatal	Hospitalisation	Medical treatment	Minor injury	DCA code group	DCA %
LGR: LVRC										
Airforce Road	No crashes									
Arthur Street	No crashes									
Boundary Road	No crashes									
Bowtells Road	No crashes									
Boxmoor Street	No crashes									
Burgess Road	No crashes									
Connors Road	No crashes									
Crescent Street	0.4	2490	10	1	0	0	1	0	8	100
Crown Street	No crashes									
George Street	No crashes									
Hall Road	No crashes									
Hickey Street	No crashes									
Laidley Street	No crashes									
Lake Clarendon Way	No crashes									
Lawlers Road	8	541	149	1	0	1	0	0	19	100
Main Green Swamp Road	No crashes									
Mary McKillop Street	No crashes									
Old College Road	1.4	800	1	2	0	2	0	0	1	100
Old Laidley Forest Hill Road	5.5	1390	30	6	2	3	0	1	2	33
Old Toowoomba Road	4.9	4000	12	1	1	0	0	0	16	100
Paroz Road	No crashes									
Philipps Road	No crashes									
Outer Ring Road Extension (new road)	No crashes									
Railway Road	No crashes									

Road name	Length (km)	Background volume (AADT)	Peak construction volume (ADT)	Total 5 year crashes	Total 5-year crashes				Most frequent DCA group	
					Fatal	Hospitalisation	Medical treatment	Minor injury	DCA code group	DCA %
Railway Street	3.1	16	153	1	0	1	0	0	17	100
Saleyard Road	0.4	4000	15	1	0	0	1	0	1	100
Sandy Creek Road	No crashes									
Seventeen Mile Road	No crashes									
Station Street	No crashes									
Summer Street	No crashes									
Tenthill Creek Road	No crashes									
Turner Street	No crashes									
Victor Street	No crashes									
Western Drive	No crashes									
WIlliam Street	0.7	4000-4075	91	3	0	1	1	1	12	67
Wrights Road	No crashes									
LGR: ICC										
Calvert Station Road	No crashes									
Fairbank Place	No crashes									
Grandchester Mort Road	No crashes									
Haigslea Malabar Road	No crashes									
Hiddenvale Road	No crashes									
Mount Marrow Quarry Road	2.8	407	149	1	0	1	0	0	3	100
Neumann Road	No crashes									
Newhill Drive	No crashes									
Noblevale Way	No crashes									
Rafters Road	No crashes									

Road name	Length (km)	Background volume (AADT)	Peak construction volume (ADT)	Total 5 year crashes	Total 5-year crashes				Most frequent DCA group	
					Fatal	Hospitalisation	Medical treatment	Minor injury	DCA code group	DCA %
Redbank Plains Road	1.2	15711	5	5	0	2	3	0	4	40
Rob Roy Way	No crashes									
School Road	No crashes									
Thagoona Haigslea Road	No crashes									

Table note:

* No DCA Code Group identified as being most commonly occurring

4.5.2 Crash analysis – road-rail interface

Crashes by crash severity and type which have occurred within a 200 m radius from existing and proposed public road-rail interface locations have been evaluated. A summary of these findings has been provided in Table 4.13, and a figure showing the proposed road rail interface and 200 m buffer has been provided in Appendix H.

Table 4.13 Crash analysis – Proposed public road-rail interface (within 200 m radius)

Interface ID	Road name	Proposed treatment	Recorded crashes (200 m buffer)
DTMR			
330-3-P-8	Warrego Highway	Grade Separation - Rail over	No crashes were recorded
330-7-E-1	Eastern Drive	Grade Separation - Road over	No crashes were recorded
330-9-P-1	Glenore Grove Road	Active level crossing	One crash was recorded (crash intensity- medical treatment)
330-9-E-2	Hunt Street	No crossing provided - relocate	One crash was recorded (crash intensity- medical treatment)
330-11-P-5	Laidley Plainland Road	Grade Separation - Rail over	Two crashes were recorded (crash intensity- medical treatment and minor injury)
330-13-P-2d	Rosewood Laidley Road	Grade Separation - Rail over	No crashes were recorded
330-13-P-2e	Rosewood Laidley Road	No Crossing Provided – Road divert/re-align	No crashes were recorded
LVRC			
330-1-P-1	Airforce Road	No Crossing Provided - Road divert/re-align	No crashes were recorded
330-1-P-2	Warrigal Road	No Crossing Provided - Road divert/re-align	No crashes were recorded
330-1-P-2a	Airforce Road	Grade Separation - Road over	No crashes were recorded
330-1-P-7	Wrights Road	No Crossing Provided - Road divert/re-align	No crashes were recorded
330-2-P-1	Seventeen Mile Road	No crossing provided - consolidate	No crashes were recorded
330-2-P-5	Connors Road	Active level crossing	No crashes were recorded
330-3-P-5	Sandy Creek Road	Grade Separation - Rail over	No crashes were recorded
330-4-P-3	Philps Road	Grade Separation - Rail over	No crashes were recorded
330-4-P-4	Brooks Road	No Crossing Provided - Road divert/re-align	No crashes were recorded
330-6-E-1	Jamiesons Road	Active level crossing	No crashes were recorded
330-6-E-2	Burgess Road	No crossing provided - consolidate	No crashes were recorded
330-6-E-3	Off Beavan Street	Grade Separation - Rail over	No crashes were recorded
330-6-E-4	Old College Road	Grade Separation - Rail over	No crashes were recorded
330-6-E-4a	Pedestrian Interface	Grade Separation - Pedestrian over	No pedestrian incidents recorded
330-6-E-4b	Pedestrian Interface	No crossing provided - consolidate	No pedestrian incidents recorded
330-6-E-5	Gaul Street	No crossing provided - consolidate	Two crashes were recorded (crash intensity- medical treatment and minor injury)
330-6-E-5a	Pedestrian Interface	At grade level crossing	No pedestrian incidents recorded
330-9-P-0	Pedestrian Interface	At grade level crossing	No pedestrian incidents recorded
330-9-E-1	Dodt Road	Active level crossing	No crashes were recorded

Interface ID	Road name	Proposed treatment	Recorded crashes (200 m buffer)
330-9-E-1a	Pedestrian Interface	At grade level crossing	No pedestrian incidents recorded
330-10-P-3	Old Laidley Forest Hill Road	Grade Separation - Rail over	No crashes were recorded
330-11-P-4	Old Laidley Forest Hill Road	No Crossing Provided - Road divert/re-align	Two crashes were recorded (crash intensity- medical treatment and minor injury)
330-11-P-6	Francis Road	Grade Separation - Rail over	No crashes were recorded
330-11-P-7	Luck Road	Grade Separation - Rail over	No crashes were recorded
330-11-P-8	Paroz Road	Grade Separation - Rail over	No crashes were recorded
330-12-P-1a	Railway Street	No crossing provided - consolidate	No crashes were recorded
330-12-P-1b	Kessling Drive	No crossing provided - consolidate	No crashes were recorded
330-12-P-1c	Kessling Drive	No crossing provided - consolidate	No crashes were recorded
ICC			
330-13-P-2c	Unnamed Road	Grade Separation - Rail over	No crashes were recorded
330-13-P-2f	Doonans Road	No Crossing Provided - Road divert/re-align	No crashes were recorded
330-14-P-2	Grand Chester Mount Mort Road	Active level crossing	One crash was recorded (crash intensity- hospitalisation)
330-14-P-2a	Pedestrian Interface	At grade level crossing	No pedestrian incidents recorded
330-15-E-4	Calvert Station Road	Active level crossing	One crash was recorded (crash intensity- hospitalisation)

Source: Data Analysis, Engineering and Technology, Infrastructure Management and Delivery (2018)

No fatalities were recorded at any of the proposed road rail interface locations. Crashes resulting in hospitalisations were recorded at the following locations:

- 330-14-P-2: Grandchester Mount Mort Road
- 330-15-E-4: Calvert Station Road.

It should be noted that active level crossings have been provided at these locations as opposed to passive level crossings.

The following locations had more than one reported crash within a 200m of the proposed road rail interface:

- 330-11-P-5: Laidley Plainland Road
- 330-6-E-5: Gaul Street
- 330-11-P-4: Old Laidley Forest Hill Road.

No at-grade crossings are proposed at these locations. It is proposed that these crossings with more than one reported crash will either be closed, roads diverted/realigned, or grade separations provided.

Road safety audits will be undertaken at all proposed road rail interface locations during detailed design, pre-construction and post-construction to ensure they are designed with safety in mind.

4.6 Other proposed developments

Construction schedules from other major developments will be considered as part of a cumulative assessment process. The cumulative impact evaluation is provided in Section 11. This will include other Inland Rail projects as well as other committed major projects of significance.

5 Construction traffic generation and assignment

5.1 Construction transport modes

The construction TIA contained within this report has been undertaken based on the construction task, material sources, quantities, modes, routes and durations identified in the Project constructability review outlined within this section. However, the determination of the final material sources, suppliers, locations, quantities and construction and heavy vehicle routes will be subject to detailed design and consultation between DTMR, the local government authority and the construction contractor.

Construction transport will primarily be by road, other than rail sections which will be transported by existing rail corridors as well as roads. Table 5.1 lists the major construction activities and related transport modes for the traffic generated by the respective activities.

Table 5.1 Construction activities contributing to traffic generation and transport mode

Material	Delivery method	Quantity/volume	Start date*	End date*
General fill	Road/haul routes	2,034,419 bcm (excluding any contingency)	22/02/2022	11/08/2023
Structural fill	Road/haul routes	338,308 m^3	22/02/2022	11/08/2023
Capping	Road	449,236 t	6/07/2023	10/01/2025
Top ballast	Road	56,242 t	06/05/2025	03/06/2025
Bottom ballast	Road	112,484 t	13/01/2025	04/04/2025
Sleepers	Road	90,903 number	28/01/2025	17/02/2025
Rail	Rail	10,123 t	N/A	N/A
Precast concrete – bridge	Road	Girders (at various length and size)	18/10/2022	7/03/2025
In situ Concrete – bridge and culverts	Road	60,718 m^3	27/07/2022	07/03/2025
Precast concrete - culverts	Road	Culverts at various sizes	06/09/2022	16/01/2024
Workforce	Road	410 FTE (peak)	01/01/2022	01/12/2025
Spoil	Road	1,349,885 m^3	01/03/2022	25/09/2023

Table notes:

m^3 = cubic metres
t = tonnes
bcm = Bank Cubic Metres
* Start and end dates indicative only

5.2 Construction staging

Staging relates to construction start and end dates of all construction related activities within the envisaged construction period. The start and end dates of all associated construction are taken into account in order to determine the peak period for the Project. Although some materials might be delivered prior to construction start and end dates, it was conservatively assumed that delivery and construction start and end dates would occur during the same time. Fluctuations may occur on site due to the early delivery of materials. However, the design does not require the design and detailing of the construction activities to be programmed to the day or to the hour, therefore, this information is currently unavailable. This will be assessed as a part of the detailed design for the Project when a construction contractor is appointed.

Construction schedules relating to other committed projects of significance have been considered in the Cumulative Assessment in Section 11.

5.3 Estimated material requirements

The construction TIA has been undertaken based on the assumed material sources, quantities and durations identified as part of the design. The final sources, quantities and durations of construction materials and activities may differ from what is presented here. Alternative material sources have been identified and detailed in the TIA. Should further alternative sources be identified, these may be assessed during the detailed design phase of the Project using the process documented in this report and, if required, mitigations applied as defined in Section 9.

5.3.1 Borrow material

The Project alignment does not require borrow materials for general fill from outside of the nominated disturbance footprint. It is anticipated that sufficient cut material is available for general fill. It is anticipated that structural fill will be either processed from the Project excavated material out of the cuttings or sourced from existing quarries and that capping material to be sourced from nearby existing quarries.

5.3.2 Quarry material

The expected volumes of capping and rail ballast for the Project alignment are shown in Table 5.2. Total amounts for ballast are based on the following:

- Bottom Ballast: 2 tonnes per metre of alignment
- Top Ballast: 1 tonne per metre of alignment.

The ballast estimate has been calculated using the inputs below.

Table 5.2 Quarry materials

Material type	Quarry site	Supply chainage		Quantity (t)	Laydown	Comment
		From (km)	To (km)			
Top Ballast	Harlaxton Quarry	26,000	32,100	12,200	H2C-LDN028.8	
	Harlaxton Quarry	32,100	37,300	14,700	H2C-LDN032.8	Including passing loop
	Mount Marrow Blue Metal Quarry	37,300	41,900	9,200	H2C-LDN039.1	
	Mount Marrow Blue Metal Quarry	41,900	49,600	19,900	H2C-LDN044.6	Including passing loop
	Mount Marrow Blue Metal Quarry	49,600	56,900	19,000	H2C-LDN054.6	Including passing loop
	Mount Marrow Blue Metal Quarry	56,900	61,800	9,400	H2C-LDN059.2	
	Mount Marrow Blue Metal Quarry	62,700	67,200	11,200	H2C-LDN064.0	
	Mount Marrow Blue Metal Quarry	67,200	73,442	16,884	H2C-LDN070.4	Including passing loop
Bottom Ballast	Harlaxton Quarry	26,000	32,100	6,100	H2C-LDN028.8	
	Harlaxton Quarry	32,100	37,300	7,350	H2C-LDN032.8	Including passing loop
	Mount Marrow Blue Metal Quarry	37,300	41,900	4,600	H2C-LDN039.1	
	Mount Marrow Blue Metal Quarry	41,900	49,600	9,950	H2C-LDN044.6	Including passing loop
	Mount Marrow Blue Metal Quarry	49,600	56,900	9,500	H2C-LDN054.6	Including passing loop
	Mount Marrow Blue Metal Quarry	56,900	61,800	4,700	H2C-LDN059.2	
	Mount Marrow Blue Metal Quarry	62,700	67,200	5,600	H2C-LDN064.0	

Material type	Quarry site	Supply chainage		Quantity (t)	Laydown	Comment
		From (km)	To (km)			
	Mount Marrow Blue Metal Quarry	67,200	73,442	8,442	H2C-LDN070.4	Including passing loop
Capping	Harlaxton Quarry	26,000	32,100	73,902	H2C-LDN028.8	
	Harlaxton Quarry	32,100	37,300	38,808	H2C-LDN032.8	Including passing loop
	Mount Marrow Blue Metal Quarry	37,300	41,900	48,708	H2C-LDN039.1	
	Mount Marrow Blue Metal Quarry	41,900	49,600	83,686	H2C-LDN044.6	Including passing loop
	Mount Marrow Blue Metal Quarry	49,600	56,900	64,533	H2C-LDN054.6	Including passing loop
	Mount Marrow Blue Metal Quarry	56,900	61,800	43,162	H2C-LDN059.2	
	Mount Marrow Blue Metal Quarry	62,700	67,200	35,286	H2C-LDN064.0	
	Mount Marrow Blue Metal Quarry	67,200	73,442	66,022	H2C-LDN070.4	Including passing loop

Potential quarry sites in the vicinity of Project are shown in Table 5.3 and Figure 5.1. The quarry operators have been approached for information regarding the products that are produced and rates of production that can be sustained.

Table 5.3 Project schedule of quarries

Quarry name	Location
Quarry Products Harlaxton	Harlaxton Qld 4350
Mt Sylvia Basalt Quarry	Junction View Qld 4343
Mount Marrow Blue Metal Quarry	Mount Marrow Qld 4306
Boral Quarry Purga	Purga Qld 4306
Withcott Quarry Materials Pty. Ltd.	Withcott Qld 4352

5.3.3 Precast and bulk concrete

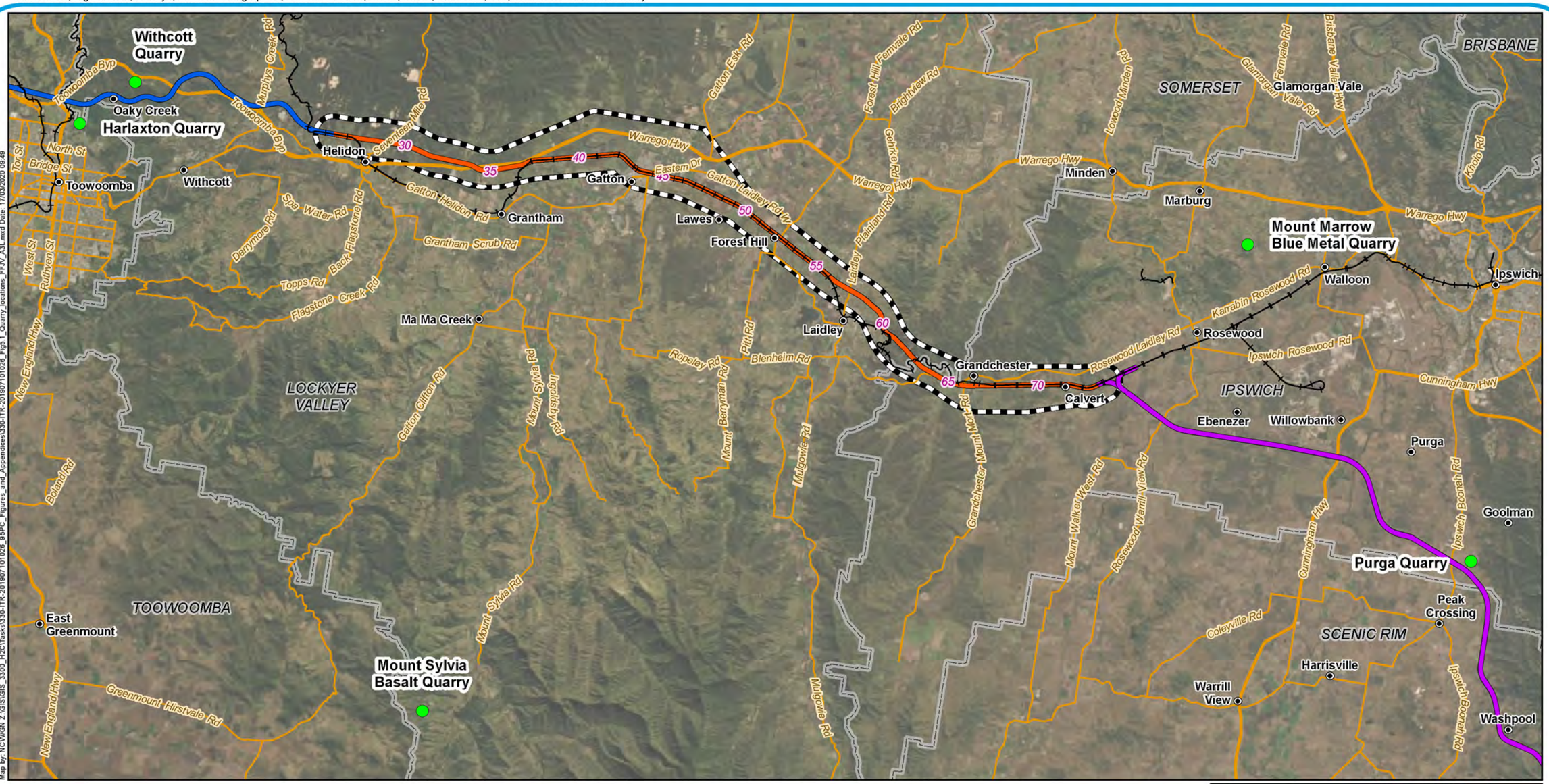
Precast elements and bulk concrete will be required to be delivered to laydown areas along the alignment for the construction of bridges and culverts. It is assumed that all precast material for the Project will be supplied from Ipswich or Toowoomba. Figure 5.2 shows the location of potential precast and bulk concrete facilities near the Project alignment.

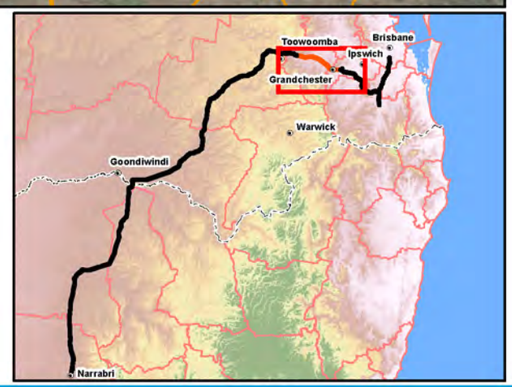
Two locations have been identified as potential concrete batch plant sites for the Project and are shown in Table 5.4. These locations are within the vicinity of the EIS investigation corridor. The Tunnel Portal West The Tunnel Portal West location is specifically to provide concrete products for tunnel construction and the potential site adjacent to the Warrego Highway provides good access to a central location of the alignment.

Table 5.4 Potential concrete batch plants

ID	Adjoining road	Chainage	Description
H2C-LDN035.4	Warrego Highway	Ch 35.4 km	Good access to proposed site
H2C- LDN061.2	Dedicated access to tunnel site	Ch 61.2 km	Support tunnel construction works

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





Legend

- Quarries
- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- Major roads
- Minor roads
- EIS investigation corridor
- Local Government Areas

A3 scale: 1:230,000

0 5 10 15km

Future Freight
Integrating Community, Environment and Engineering

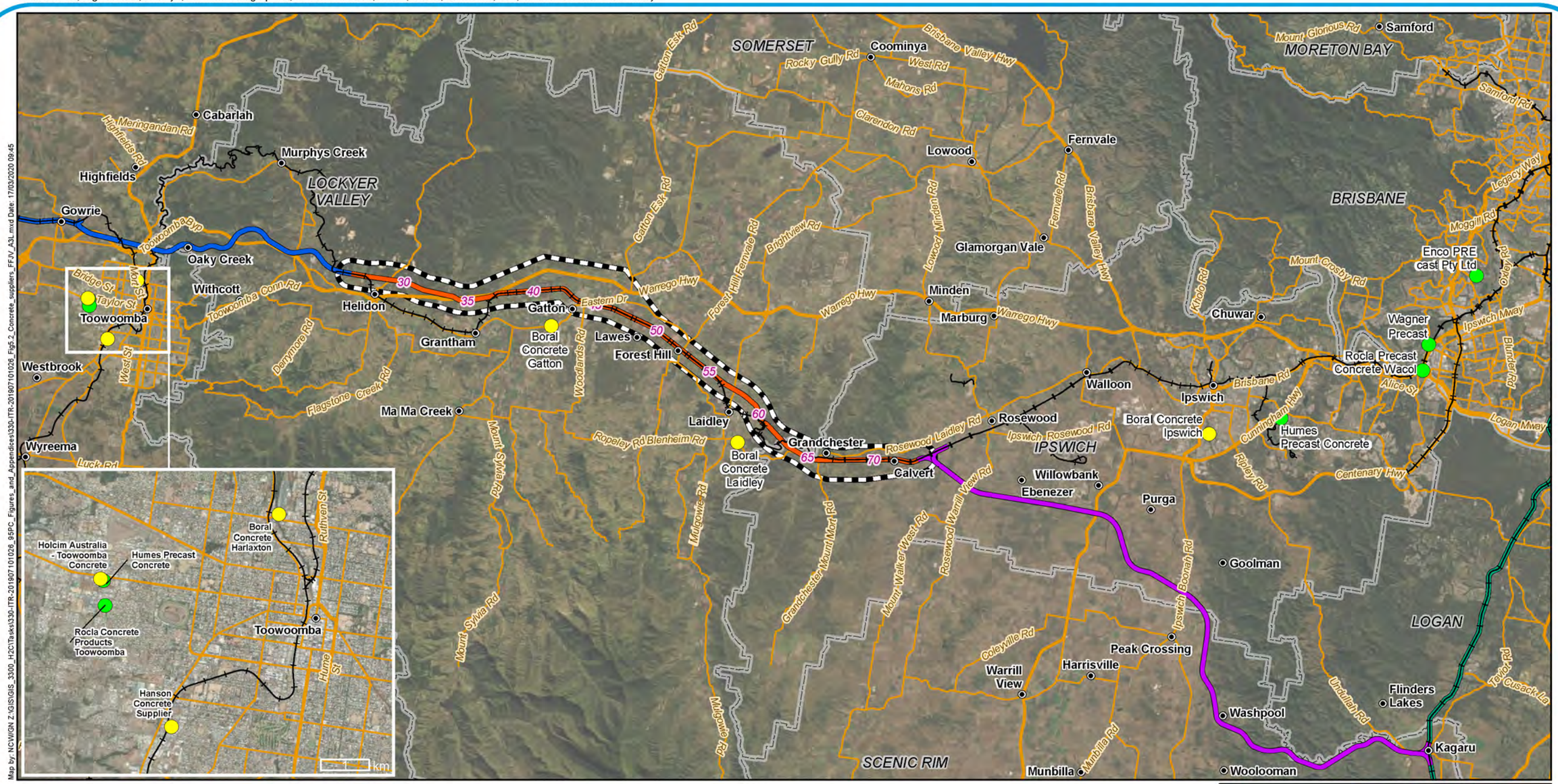
Issue date: 17/03/2020 Version: 0
Coordinate System: GDA 1994 MGA Zone 56

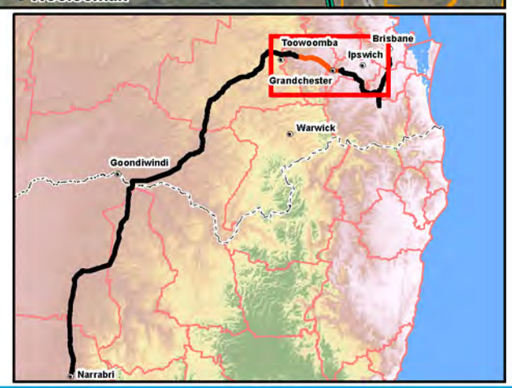
Helidon to Calvert

Figure 5.1:
Quarry locations in the vicinity of the project

Map by: NCW/GN Z:\GIS\GIS_3300_H2C\Tasks\3330-ITR-20190710102\6_95PC_Figures_and_Appendices\3330-ITR-20190710102\6_Fig5.1_Quarry_locations_FF.IV_A3L.mxd Date: 17/03/2020 09:49

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





Legend

- H2C Concrete Batch Plants
- H2C Precast Concrete Suppliers
- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Major roads
- Minor roads
- EIS investigation corridor
- Local Government Areas

A3 scale: 1:310,000

0 5 10 15km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 17/03/2020 Version: 0
Coordinate System: GDA 1994 MGA Zone 56

Map by: NCW/GN Z:\GIS\GIS_3300_H2C\Tasks\3300-ITR-20190710102 6_95PC_Figures_and_Appendices\3300-ITR-20190710102 6_Fig5.2_Concrete_suppliers_FFJV_A3L.mxd Date: 17/03/2020 09:45

Helidon to Calvert
Figure 5.2: Project concrete suppliers

5.3.4 Construction water requirements

Overall, an allowance of 190 l/m^3 of earthworks has been made in building up the estimated water demand requirements. This is a conservative estimate based upon actual requirements recorded on the Toowoomba Second Range Crossing project during 2018.

The main construction elements requiring water including quantity, quality and flow rate are detailed in Table 5.4.

Table 5.5 Construction water requirements

Construction activity/ process/ phase	Uses/requirement	Quantity	Quality	Flow rate	Supply
Earthworks	Material conditioning and general dust suppression	High	Low	High	River, dam or bore
Concrete (by concrete supplier)	Bridge and culvert locations	Medium	High	Low	Town mains due to quality requirements
Trackworks	Ballast dust suppression during ballasting and regulating activities	Medium	Low	Low	River, dam or bore
Tunnel Construction	Dust Suppression, grouting	Low	Low (dust), High (Grouting)	Low	Town mains and extracted groundwater (dust suppression)

5.3.4.1 Earthworks

The greatest water demand on the Project will be for the earthworks, which includes conditioning of material, haul road and laydown maintenance and dust suppression. Generally, earthworks operations require low quality water from sources such as dams and watercourses, and ideally high-quality water sources should be avoided for these construction activities.

Material conditioning will consume approximately 100 L of water per m^3 of fill, however this is variable, dependent upon material properties and should be assessed as more information becomes available. The water demand for conditioning of the earthworks material on the H2C project is approximately 244 ML of water in total.

General dust suppression across the site will be a constant activity. An allowance of approximately 50L of water per m^3 of fill has been made which equates to 121 ML of water in total.

Haul Road and laydown area maintenance will also require water. An allowance of 40 L of water per m^3 of fill has been made which equates to 98 ML of water.

The total construction water requirements along the alignment (ML vs Chainage) are provided in Figure 5.3 and over time in Figure 5.4. The calculations for the expected water demand are:

- 100 L of water per m^3 allowed for the compaction of embankment. (5.5& by weight)
- An additional 50 L of water per m^3 was allowed for dust suppression (3% by weight), and
- An additional 40 L of water per m^3 for haul road maintenance.

Therefore, as an overall allowance, 190 litres per cubic metre (L/m^3) has been allowed for earthworks. This equates to 10.5% by weight and is considered appropriate at this stage of design.

An allowance of 190 L/m^3 has also been included for all earthworks associated with new roads and road re-alignments.

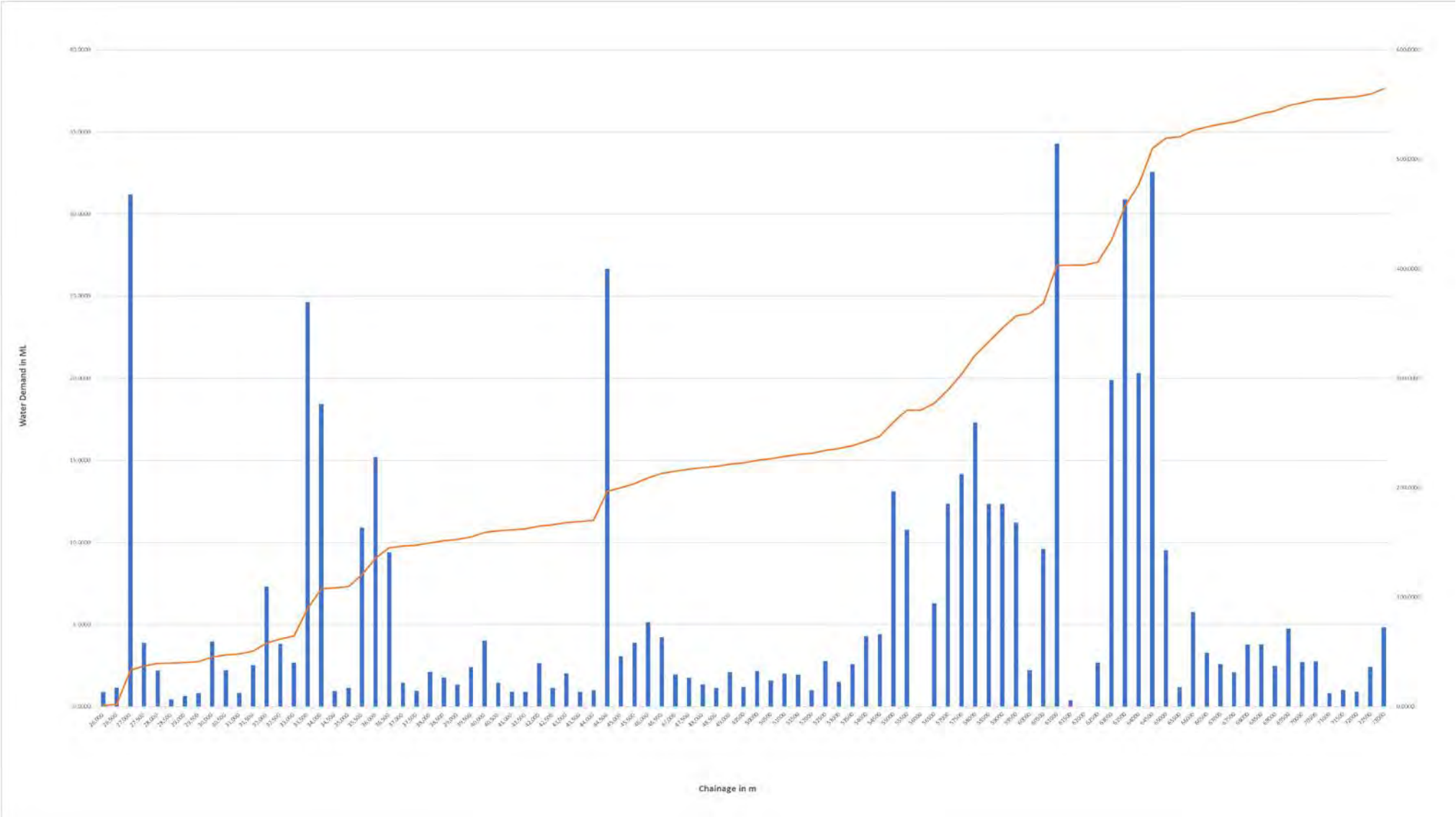


Figure 5.3 **Project water demand**

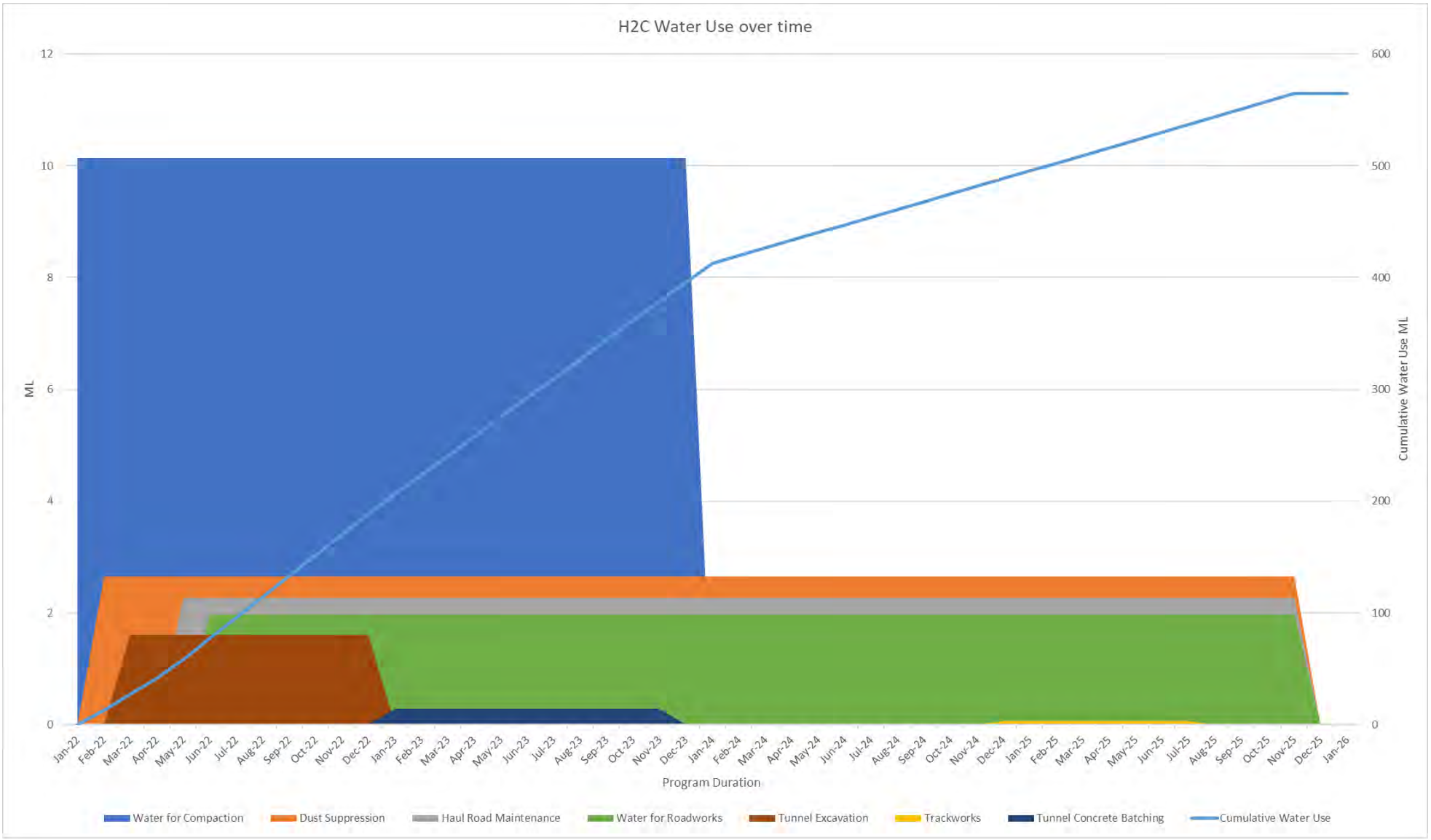


Figure 5.4 **Project water use over time**

5.3.4.2 Concrete

Any water supply associated with concrete works will be required to be in accordance with AS1379 “Specification and Supply of Concrete”. There are several established concrete batch plants within supply distance to the H2C project and these will be the primary source of concrete. These established plants are connected into mains water supply and the quality and uninterrupted supply of water is not considered an issue. If the project establishes and uses the proposed site batch plants, then a dedicated water supply, sourced from mains water will be required. If this option is progressed, then water storage tanks will form part of the batch plants designed and be filled by water trucks drawing water from mains connections in local towns. This volume of water for general concrete requirements has not been quantified in this report.

An allowance for water supply to the tunnel batch plant has been made and allowed in this analysis.

5.3.4.3 Trackworks

The predominant use of construction water during trackworks is for dust suppression relating to ballasting works, in particular ballast dropping and ballast regulating works during track tamping activities. An approximate allowance of 10L per track metre have been considered for ballast dropping, tamping and regulating activities, by adopting this allowance the trackworks activity will consume approximately 480 kL of water.

5.3.4.4 Tunnel

Water requirements during the construction of the tunnel include water for dust suppression/sprays on the roadheader, dust suppression on roadways/stockpiles, and water for drilling. An allowance of 40m^3/day over the duration of the tunnel excavation has been included in the below water estimates. The total water allocated to tunnel excavation is 16 ML.

An additional allowance of 200 l/m^3 of concrete has been made for bulk concrete batched at the proposed site batch plant at the western tunnel portal. This water is allocated to concrete used for the construction of the tunnel only (primary shotcrete, invert, permanent lining). Concrete batching at the western portal will consume approximately 3 ML of water.

5.4 Workforce

A preliminary estimate of the workforce required to undertake the works to the nominated program is shown below. Workforce on site for H2C is estimated to peak at 410 full time equivalents between weeks 56 and 57. The average number of full-time equivalent workforce on site across the full construction period is 193 people. The estimated workforce over the construction period has been provided in Figure 5.5.

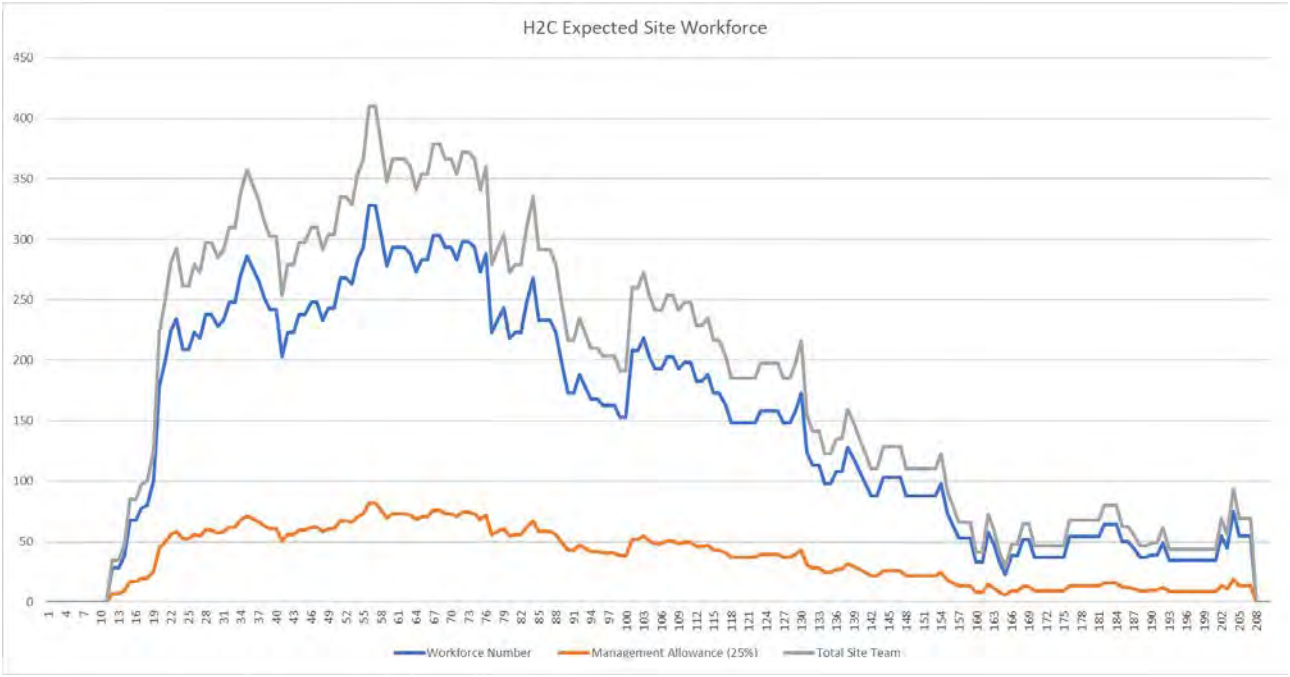


Figure 5.5 Estimated site workforce

Despite this number of people on site, an accommodation camp is not considered necessary due to the reasonably close proximity to population centres that will offer both workforce and accommodation options.

It is envisaged that the majority of workforce will originate from the following populations centres such as Brisbane, Ipswich, Logan, Jimboomba, Beaudesert, Gatton and Toowoomba that are proximate to the Project alignment. It has therefore been determined that there is no need for a provision for construction worker camps to be made for the Project given the extent of significant population centres in close proximity to the alignment, as shown in Table 5.5 and Figure 5.6.

Table 5.6 Available accommodation

Town/city	Population	No. of hotels/ motels[1]	No of available rentals (as of January 2018)[2]
Brisbane	2,054,000	850	1,500
Ipswich	200,000	30	500
Logan	303,390	20	1,400
Jimboomba	13,201	0	20
Beaudesert	6,395	10	50
Gatton	6,870	5	50
Toowoomba	100,000	100	500

Table notes:

1 Based on available, published data. Rounded estimates
2 Rounded estimates

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: NCW/GN Z:\GIS\GIS_3300_H2C\Task\3330-ITR-20190710102\6_95PC_Figures_and_Appendices\3330-ITR-20190710102\6_Fig5.6_Proximity_major_pop_centres_FFJV_A3L.mxd Date: 17/03/2020 10:58

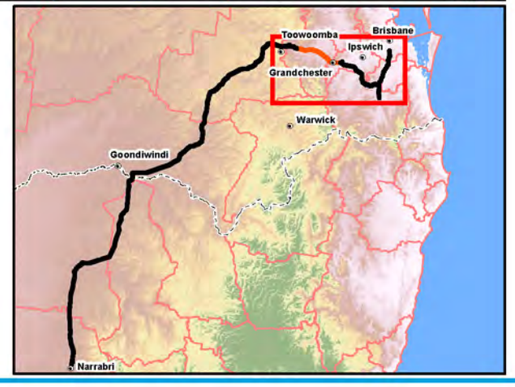
Highfields
Murphys Creek
Gowrie
Toowoomba Bypass
New England Hwy
Oaky Creek
Toowoomba
Withcott
Helidon
Grantham
Gatton
Eastern Dr
Lawes
Forest Hill
Laidley
Ma Ma Creek
LOCKYER VALLEY
Warrego Hwy
Lowood
Fernvale
SOMERSET
Glamorgan Vale
Brisbane Valley Hwy
Minden
Marburg
IPSWICH
Walloon
Rosewood
Grandchester
Calvert
Ebenezer
Willowbank
Purga
Goolman
Peak Crossing
Harrisville
Warrill View
Washpool
Munbilla
Woolooman
SCENIC RIM
Kalbar
Aratula
Boonah
Dugandan
Chuwar
Brisbane Rd
Ipswich
Cunningham Hwy
Centenary Hwy
Ipswich Mway
Legacy Way
Brisbane
Gateway Mway
Capalaba
Ipswich Rd
Pacific Mway
REDLAND
Logan
Logan Mway
Mount Lindesay Hwy
Beaudesert Rd
LOGAN
Logan Village
Jimboomba
GOLD COAST
Flinders Lakes
Kagaru
Tamborine
Beaudesert
Canungra
Greenmount
East Greenmount
TOOWOOMBA
Nobby
Pilton
Clifton
SOUTHERN DOWNS

Legend

- Major Population Centres
- 5 Chainage (km)
- Localities
- Existing rail
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Major roads
- Minor roads
- EIS investigation corridor
- Local Government Areas

A3 scale: 1:350,000

0 5 10 15km



Future Freight
Integrating Community, Environment and Engineering

Issue date: 17/03/2020 Version: 0
Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert
Figure 5.6:
Proximity to major population centres

5.5 Working hours

The construction schedule will be based on the following worksite hours:

- General construction activities:
  - Monday to Friday – 6.30 am to 6.00 pm (and up to 10.00 pm if the construction works comply with the performance requirements in approved environmental management plans)
  - Saturday – 6.30 am to 1.00 pm (and up to 5.00 pm if the construction works comply with the performance requirements in approved environmental management plans)
  - No work planned on Sundays or public holiday
- Track possessions and tunnelling activities will proceed on a 7day/24hr hours per day (and in accordance with the hours of work prescribed by the rail infrastructure manager)
- Spoil haulage – 7 days per week, 24 hours per day.

Note: Works will occur outside of these hours, as described below.

QR and ARTC track possessions will generally be allocated over weekend periods, with extended track possessions occurring over holiday or non-seasonal periods (i.e. outside of grain movement periods).

Extended working hours would be considered permissible where there are no nearby sensitive receptors or impacts to receivers can be appropriately managed. Any changes to working hours would be supported by assessing impacts to sensitive receptors. Works outside of standard construction hours may occur throughout the duration of the construction program and will involve:

- Delivery of concrete, steel, and other construction materials delivered to site by heavy vehicles
- Movements of heavy plant and materials
- Transport, assembly or decommissioning of oversized plant, equipment, components or structures
- Delivery of ‘in time’ materials such as concrete, hazardous materials, large components and machinery
- Arrival and departure of construction staff during shift change-overs
- Roadworks to arterial roads
- Traffic control crews, including large truck mounted crash attenuator vehicles, medium rigid vehicles, and lighting towers
- Incident response including tow-trucks for light, medium, and heavy vehicles
- Alternative construction rosters to suit delivery and industrial relations issues may be investigated by the construction contractor.

The construction program utilises a five-day week at full productivity. The 0.5 day (on the Saturday) is to account for maintenance and cycle time calculations that the contractor will carry out. This level of conservatism is deemed appropriate at this stage of design and program development.

Despite delivery of some construction materials continuing outside of standard construction hours, the traffic impact analysis has conservatively assumed a 12-hour delivery period coinciding with the standard construction hours.

5.6 Construction schedule

A preliminary construction program has been developed to inform the EIS. This construction program is based upon:

- Five geographic areas of bulk earthworks with varying cut to fill volumes
- Utilises four bridge structures teams
- Utilises up to six separate drainage crews to install the required volume of storm water drainage

- Assumes tunnel construction progresses from the west to the east
- Assumes a single work front carrying out capping and track-works. This area will contain opportunity if the Program is to be delivered earlier than currently shown or by using alternative construction methods.

It is acknowledged that there are multiple options available for dividing the works into suitable work front.

5.7 Construction transport routes

For the purposes of the TIA, it has been assumed that all construction material deliveries are being made to laydown area delivery points along the rail corridor alignment. Primary construction routes determined for the Project are used for the purposes of the TIA. Proposed construction transport routes are identified in Section 2.2. Appendix I to Appendix O illustrate the various primary construction routes.

5.7.1 Delivery of water

Water will be required for dust control, site compaction and reinstatement during construction. A number of potential water sources have been investigated, including extraction of groundwater or surface water, private bores and watercourses. This will be further explored prior to construction in consultation with local councils and landowners. Where water is not available, it will be transported to the site via tanker truck and stored in temporary storage tanks. Potable water for human consumption may be supplied via bottled water or potable water tanks.

- If water is to be sourced from local town supplies, then agreement will have to be made with the local councils on supply conditions
- If water is to be drawn from creeks and rivers crossing the alignment then approvals will be required from the Department of Regional Development, Manufacturing and Water (formerly Department of Natural Resources, Mines and Energy (DNRME))
- In order to draw from ground water bores then further approvals will also be required from the DNRME and relevant land owners
- Drawing water from local dams and reservoirs will provide construction water and discussions will be progressed with the asset owner.

It is likely that water supply for the Project will be made up of a combination of the above supply options. For the purpose of this assessment it has been assumed that water will be sourced from Lake Clarendon and Lake Dyer. This is subject to availability and agreement during the detailed design and construction phase of the Project. Changes to water sources in subsequent design phases will require this TIA to be updated accordingly.

Activities during the construction phase with the highest water demand are:

- Soil conditioning and compaction
- General dust suppression
- Dust suppression and maintenance of laydown areas and haul roads
- Construction offices and amenities.

The tunnel construction is expected to produce a constant volume of wastewater that will either have to be treated or disposed of according to further testing. Although, the handling of this water has not been finalised, the transport of volumes of waste water has not been considered significant and has therefore not been included in this assessment.

5.7.2 Spoil routes

The Project is anticipated to generate approximately 3,638,000 m^3 of cut material (other than rock) from tunnelling and rail works during construction. Approximately two-thirds of the excavated material will be reused within the Project as fill, leaving an excess of approximately just over a million cubic metres of spoil that will need to be managed.

A number of opportunities existing for the reuse of this material. Table 5.7 details options for management of spoil generated by the Project and how this TIA has considered the transport of this material along the road network. The options are presented in order of preference.

Table 5.7 Spoil management hierarchy

Rank	Options	Example of options	Consideration in TIA
1	Avoid and reduce spoil generation	Reduce the amount of spoil being generated through design and construction methodology	The quantity of spoil generated is proposed to be reduced by: ■ Refining the horizontal and vertical design and alignments to minimise the quantity of off-site fill required ■ Consideration of the shape and size of batters to encourage cut and fill balancing ■ Completing an assessment of the availability, quality and volume of materials which are readily accessible and can be used within the Project ■ Reuse topsoil where possible and identify ways to reuse materials normally considered unsuitable for use.
2	Reuse within the Project	Reuse in the Project to fill embankments for rail line and drainage. Reuse of topsoil for rehabilitation on site.	Approximately 2,034,000 m^3 of cut material will be used as general fill and 255,000 m^3 as structural fill. The majority of the spoil is proposed to be reused as embankment fill and some for the rehabilitation of the disturbance footprint subject to being deemed suitable for reuse. Further details are provided in EIS Chapter 21: Water and resource management. It is proposed that the majority of this material be transported within the Project alignment along Rail Access Maintenance Roads (RMAR). Some of this material is proposed to be transported via the external road network between Helidon and Grandchester.
3	Reuse on other development projects	Reuse as an embankment fill for other Inland Rail projects Calvert to Kagaru (C2K) and Gowrie to Helidon (G2H) or other development projects.	Spoil excess of approximately just over a million cubic metres is proposed to be used as fill material for the development of the Gatton West Industrial Zone and will be transported via the road network from laydown areas along the alignment to this location.
4	Reuse for land restoration if above is not viable	Reuse for land reclamation or remediation works for quarries	Not considered in the TIA
5	Reuse for landfill management if reuse on other development project is not viable	Reuse as a daily cover for the landfills	Not considered in the TIA
6	Treat	Treatment of any identified acid sulfate soils or contaminated soil or geotechnically unsuitable material to render it suitable for other applications	Not considered in the TIA
7	Dispose offsite as construction waste	Disposal of excess spoil as waste at an approved facility, licenced to receive the material	Not considered in the TIA

As shown in Table 5.7, the majority of spoil is expected to be reused as embankment fill for other Inland Rail projects. It is proposed that this material be transported along RMAR and not along the wider transport state and local government road networks.

The remaining spoil excess of approximately just over a million cubic meters that is proposed to be used as fill material for the development of the Gatton West Industrial Zone is expected to be transported along state and local government road networks. These proposed routes have been provided in Appendix G. The vehicular traffic that is expected to be generated through the transport of this material along the public road network has been included in Section 5.9. The impact that this traffic is expected to have on the public road network has been included in the traffic analysis undertaken in Section 6. The pavement impact analysis undertaken in Section 7 also includes these expected spoil movements.

5.7.3 Pre-cast concrete routes

For the purposes of the TIA, it has been assumed that precast concrete for the Project alignment will be delivered from Toowoomba and Ipswich. Routes are based on roads most likely to be used for the transportation of precast concrete taking into account input from the National Heavy Vehicle Regulator (NHVR) journey planner which provides guidance in identifying suitable roads for heavy vehicles. For the transportation of some of the larger precast concrete girders, it is expected that police escort will be required. Further discussion on the use of OSOM (oversize and over-mass) vehicles for the delivery of precast concrete girders is provided in Section 5.7.10.

5.7.4 Quarry routes

Quarry routes for the Project alignment are currently based on quarries located in Mount Marrow and Harlaxton. These are the closest quarries to the alignment likely to be able to provide the required ballast and capping. For the purposes of the TIA it has been assumed that all ballast and capping deliveries will be made by road. Routes are based on roads most likely to be used for the transportation of quarry materials, taking into account distance and where possible staying on arterial roads and outside town centres.

5.7.5 Ready mix concrete routes

For the purposes of this assessment, it has been assumed that existing concrete suppliers along the vicinity of the construction corridor will be utilised to provide all ready-mix concrete. For the Project, the closest existing concrete suppliers are in Toowoomba, Gatton and Laidley.

Concrete truck routes were based on the location of the concrete supplier and roads most likely to be used for the transportation of concrete based on distance and where possible staying on arterial routes and out of town centres.

5.7.6 Sleeper routes

For the purposes of this assessment, it has been assumed that ARTC will supply all the concrete sleepers. The concrete sleepers are assumed to originate from NSW and be distributed via the road network to various laydown areas.

Sleeper routes were formulated using the NHVR journey planner which provided guidance in identifying suitable roads for heavy vehicles. The sleeper routes were then consolidated where feasible to minimise the number of roads affected. This was achieved by selecting the same roads where possible in circumstances where the alternate route did not increase the route distance significantly.

5.7.7 Rail routes

For the purposes of this assessment, it has been assumed that rail will be supplied by a single source and will be distributed from the closest existing QR and ARTC rail network to various points along the alignment where possible. Where further transportation is required to distribute rail to designated areas along the alignment, road networks may be required to achieve this. This requirement will be confirmed during the detailed design phase of the Project.

5.7.8 Delivery and collection of plant, tools, materials

It is envisaged that the delivery and collection of plant, tools and materials to the construction areas will be cascaded across the road network and occur irregularly. It is considered that the spreading of the trips of this construction activity across the external road network would have a minimal impact and be of an irregular pattern to model. It has therefore been conservatively assumed that these activities would follow the same proposed routes as the workforce discussed in Section 5.3.4.3.

5.7.9 Laydown areas

Several laydown areas have been highlighted through the alignment to support the following activities:

- Material laydown
  - Situated next to the corridor to facilitate direct access to/from the laydown to the alignment
  - Laydown areas will act as a centralised point for all material storage
  - Some laydowns will also consist of fuel storage areas and site office compounds.
- Bridge laydown/work areas
  - Each bridge location along the alignment will have a dedicated laydown/work area
  - Bridge laydown areas primarily for the bridge works
  - Larger areas have been provided for locations requiring the storage of other materials that are not associated with the construction of the bridge
- Tunnel laydown/ work areas.

5.7.10 Road network and restrictions on vehicle size

The transport corridors identified have taken into consideration the restrictions on vehicle sizes through the NHVR Journey Planner Tool. However, if required and necessary for the Project, all RAV (restricted access vehicles) and OSOM vehicles required to transport special equipment will apply for the necessary permits from DTMR and other relevant authorities as well as the Heavy Vehicle (Mass, Dimension and Loading) National Regulation 2013 (the Regulation) including all applicable legislative requirements from RMS. At this stage, oversize vehicles are only assumed to be required the transportation of 29 metre Super-T precast concrete girders. This requirement may change during detailed design phase. The relevant routes for these trips are shown in Appendix K, with the potentially impacted links listed below:

- DTMR
  - Cunningham Highway - Between Ipswich Boonah Road and Ipswich Rosewood Road
  - Cunningham Highway - Between Redbanks Plains Road and Ripley Road
  - Cunningham Highway - Between Ripley Road and Ipswich Boonah Road
  - Cunningham Highway - Between River Road and Redbank Plains Road
  - Forest Hill Fernvale Road - Between Gatton Laidley Road and Warrego Highway
  - Gatton Helidon Road - Between Gatton Laidley Road W and Warrego Highway

- Gatton Helidon Road - Between Hickey Street and Gatton Laidley Road W
- Gatton Laidley Road - Between Hall Road and Forest Hill Fernvale Road
- Gatton Laidley Road - Between Railway Street and Hall Road
- Gatton Laidley Road West - Between Forest Hill Fernvale Road and Gatton Helidon Road
- Ipswich Rosewood Road - Between Cunningham Highway and Haiglsea Amberley Road
- Ipswich Rosewood Road - Between Haigslea Amberley Road and Rosewood Warrill View Road
- Ipswich Rosewood Road - Between Rosewood Warril View Road and Karrabin Rosewood Road
- Laidley Plainland Road - Between Old Laidley Forest Hill Road and Railway Street
- Laidley Plainland Road - Between Warrego Highway and Old Laidley Forest Hill Road
- River Road - Between Warrego Highway and Cunningham Highway
- Rosewood Laidley Road - Between Crown Street and Rosewood Marburg Road
- Warrego Highway - Between Brisbane Valley Highway and Mount Crosby Road
- Warrego Highway - Between Gatton Esk Road and Laidley Plainland Road
- Warrego Highway - Between Gatton Helidon Road and Gatton Esk Road
- Warrego Highway - Between Haigslea Amberley Road and Brisbane Valley Highway
- Warrego Highway - Between Laidley Plainland Road and Haigslea Amberley Road
- Warrego Highway - Between Mount Crosby Road and Cunningham Highway

- LVRC
  - Airforce Road - Between Airforce Road and Railway Line
  - Arthur Street - Between Bowen Street and Station Street
  - Arthur Street - Between Mary McKillop Street and Georges Street
  - Arthur Street - Between Station Street and Mary McKillop Street
  - Boundary Road - Between Carrington Road and Williams Road
  - George Street - Between Arthur Street and Lawlers Road
  - Hall Road - Full extent
  - Hickey Street - Between Old College Road and Buaraba Street
  - Lawlers Road - Between George Street and Warrego Highway
  - Old College Road - Between East Street and Gatton Laidley Road
  - Old Laidley Forest Hill Road - Between Forest Hill Fernvale Road and Laidley Plainland Road
  - Paroz Road - Between Summer Street and 200 East of Summer Street
  - Quiet Ring Road Extension (new road) - Between Gatton Laidley Road West and Railway Line
  - Railway Road - Between Gatton Laidley Road and Greyfriars Road
  - Railway Street - Between Summer Street and Laidley Plainland Road
  - Summer Street - Between Paroz Street and Railway Street
  - William Street - Between Bowen Street and Laidley Street

- ICC
  - Calvert Station Road - Between Rosewood Laidley Road and Gipps Street
  - Fairbank Place - Full extent
  - Grandchester Mort Road - Between Rosewood Laidley Road and School Road
  - Newhill Drive - Full extent
  - Noblevale Way - Full extent
  - Redbank Plains Road - Between Cunningham Highway and Newhill Drive
  - Rob Roy Way - Full extent.

Obtaining vehicle permits is beyond the scope of this TIA and will be undertaken by the appointed construction contractor once delivery materials and routes are determined. While vehicle tracking has been considered in the development of construction routes, the development of final construction routes will include an assessment of above and underground services that may be affected by OSOM vehicles. Maps highlighting precast concrete routes are provided in Appendix K. Maps indicating the multi-combination heavy vehicle routes are provided in Appendix Q.

5.7.11 Load restricted bridges

Table 5.6 lists bridges and their respective load restrictions that are within the Lockyer Valley Council Region that may potentially be used by construction traffic routes. No detailed assessment has currently been undertaken with regards to these bridges and should heavy vehicles be required to use them, an assessment will need to be undertaken and further investigation and inspections will need to take place – the outcomes of which may lead to upgrading these bridges for construction and operational purposes. It must be noted that there are several other bridges that may require load limiting but have not been assessed and may need to be if heavy vehicles are to use them.

Table 5.8 **Load limits for Lockyer Valley Regional Council bridges within the H2C alignment**

Name of bridge	Location	Owner	Load limit	Description
McGarrigal Bridge	McGarrigal Road, Mulgowie	LVRC	42.5	Concrete Bridge
Peter's Bridge	Peter's Road, Thornton	LVRC	42.5	Concrete Bridge
Steinke's Bridge	Lake Clarendon Road, Lake Clarendon	LVRC	23.0	Concrete Bridge
Frankie Steinhardt's Bridge	Lower Tenthill Road, Lower Tenthill	LVRC	42.5	Concrete Bridge
Hoger Bridge	Hogers Road, Ropeley	LVRC	42.5	Concrete Bridge
Sheep Station Bridge	Turner Street, Helidon	LVRC	35.0	Concrete Bridge
Mahon Bridge	Carpendale Road, Carpendale	LVRC	35.0	Concrete Bridge
Cran Bridge	Stockyard Creek Road, Flagstone Creek	LVRC	24.0	Timber Bridge
Kirsop Bridge	McCormack Drive, Murphys Creek	LVRC	42.5	Concrete Bridge
Connole Bridge	Postman's Ridge Road, Postman's Ridge	LVRC	42.5	Timber Bridge
Middleton's Bridge	Lockrose Road North, Lockrose	LVRC	42.5	Timber Bridge

5.7.12 Access tracks and haul routes

Several access tracks, outlined in Figure 1.3, have to be developed to facilitate access to the laydown and construction sites located along the length of the alignment. These access tracks must be developed with a proposed pavement treatment suitable for the material type to be stored at the locations and vehicle type required to access the location.

Haul routes should be developed considering several factors such as separation requirements, one-way or two-way vehicle movements, overtaking requirements and vehicle weights to use the road. Haul routes will firstly look to adopt the future Rail Maintenance Access Road (RMAR) footprint or the formation prior to creating new tracks that will require future restoration once the construction work has been completed.

When planning for the exact location of access tracks and haul routes, an assessment should be made of above and underground services that may be affected by oversized loads or weights. This assessment should also consider the asset owners maintenance access requirements. The finalisation of access tracks will be undertaken once the construction contractor is appointed. It is required that these access points be negotiated and approved by the relevant asset owner prior to the construction period.

Table 5.9 Project temporary access tracks

ID	Adjoining road	Chainage (km)	Length (m)	Note
H2C-TRK029.9	Seventeen Mile Road (access track)	29.88	1100	Existing access track to be regraded and widened if necessary
H2C-TRK031.0	Connors Road (North access track)	31.00	390	Interface with transmission line easement Utilising future RMAR
H2C-TRK031.4	Connors Road (South access track)	31.40	930	Bridge access utilising future RMAR
H2C-TRK032.8	Connors Road (South access track)	32.80	770	Bridge access utilising future RMAR
H2C-TRK033.5	Sandy Creek Road	33.50	980	Cut to Fill Track
H2C-TRK034.1	Risson Road	34.10	1400	Bridge access utilising future RMAR
H2C-TRK036.8	Philips Road	36.80	2500	Bridge Access utilising future RMAR
H2C-TRK039.1	Warrego Hwy Truck Stop (access track)	39.10	320	Access road to be constructed from Warrego Hwy truck stop to laydown area
H2C-TRK044.9	Eastern Drive	44.90	360	Access via Eastern Drive
H2C-TRK049.5	Gatton-Laidley Road	49.50	850	Bridge/Laydown Access
H2C-TRK050.2	Greyfriars Road	50.20	950	Dirt track access available from Gatton/Laidley Road, may need grading
H2C-TRK052.0	Railway Street	52.00	630	Extension of Railway Street
H2C-TRK054.5	Railway Street	54.50	840	Existing Dirt track and access to houses, may need grading
H2C-TRK061.0	Tunnel Portal Access Track	61.00	1000	Utilising future RMAR
H2C-TRK063.0	Tunnel Portal Access Track	63.00	1500	Utilising future RMAR
H2C-TRK065.0	Doonans Road	65.00	430	Bridge/Laydown access
H2C-TRK065.8	Grandchester Mount Mort Road	65.80	110	Bridge access utilising future RMAR
H2C-TRK067.0	Rafters Road	67.00	410	Bridge access utilising future RMAR
H2C-TRK067.8	H2C-TRK068.8	67.80	1000	utilising future RMAR
H2C-TRK068.8	Rosewood Laidley Road	68.80	1000	Bridge and Laydown access
H2C-TRK070.0	Neumann's Road	70.00	550	Laydown access using proposed Neumann Road re-alignment
H2C-TRK071.3	Hiddenvale Road	71.30	85	Bridge access utilising future RMAR
H2C-TRK073.1	Waters Road	73.10	150	Project alignment access

Where a track is noted as On RMAR then it is within the alignment and utilising the footprint of the future RMAR. New alignments are required to get access to the construction sites.

5.7.13 Access constraints

5.7.13.1 Warrego Highway laydown access

It is proposed that two laydown areas be accessed directly from Warrego Highway, with these access points ensuring the most direct logistical route for proposed construction traffic. It is required that these access points be negotiated and approved by DTMR prior to the construction period. These access points will require:

- Appropriate site distances in both the vertical and horizontal geometry
- Deceleration lanes for heavy vehicles to slow down in
- Acceleration lanes for existing vehicles
- Appropriate signage and line marking.

5.7.13.2 Laidley laydown access

Access to one of the proposed laydowns is through the township of Laidley. There exists a possible additional access that would allow all deliveries coming via the Warrego Highway to bypass the town. This access road will fit within the currently identified temporary construction disturbance footprint. The primary access through Laidley has been included within the traffic assessment.

5.8 Fire ant zones

The Project passes through Fire ant zone 2 from chainage (Ch) 48.05 km to Ch 73.44 km (end). Under the *Biosecurity Act 2014*, all Queenslanders have a general biosecurity obligation to manage biosecurity risks and threats that are under their control, they know about or they are expected to know about. In terms of fire ants and weeds, a biosecurity risk exists when dealing with materials that are relevant to the Project that the pests and weeds can be carried in, including:

- Soil
- Turf
- Mulch
- Baled hay or straw
- Mining or quarry products.

Individuals and organisations moving or storing fire ant carriers can fulfil their general biosecurity obligation by:

- Understanding what fire ants look like and what materials they might be moved in
- Being aware if you are working in a fire ant biosecurity zone
- Being aware of movement controls relevant to the fire ant carrier you intend to move
- Cleaning down machinery and equipment used when dealing with fire ant carriers before moving the equipment off site
- Conducting inspections of material that can carry fire ants for any ant activity
- Reporting suspect ants online or by calling Biosecurity Queensland on 13 25 23.

Similarly, the spread of noxious weeds during the import and export of these materials to the Project needs to be tightly controlled by the construction contractor. Appropriate checks and controls will have to put in place including, but not limited to, identification of weed risk areas, surveillance and audit compliance and vehicle wash downs.

5.8.1 Managing fire ant carriers

The Biosecurity Regulation 2016 prescribes procedures that must follow when moving or storing a fire ant carrier.

5.8.2 Checking for fire ants

To be able to successfully check for fire ants a person must be suitably trained. Biosecurity Queensland provides free fire ant training sessions to assist with the identification of fire ants.

Common areas to look include:

- The perimeter of the site
- Garden and lawn areas
- Waste material storage areas
- Storage areas for equipment used for dealing with fire ant carriers
- Around buildings
- In and around unused equipment.

Before excavating or disturbing the ground, thorough visual check will be completed for any signs of fire ants. In the event that fire ants are identified, or any suspect ants will be reported to Biosecurity Queensland within 24 hours.

5.8.3 Removing the top one metre of soil

A fire ant colony in soil is usually found within the top 1 m of soil. By removing this top metre of soil from ground level, the soil below can be assessed and safely moved off-site. The top layer of soil can be removed from site to a disposal facility without a biosecurity instrument permit. This top layer of soil not be mixed with other soil layers that are being moved.

For soil movement within the fire ant biosecurity zones, the below outlines certain conditions that must be met before moving fire ant carriers. In particular, there are different levels of controls for moving soil.

Table 5.10 Fire ant zone restrictions

Fire ant carrier	Fire ant biosecurity zone 1	Fire ant biosecurity zone 2	Fire ant biosecurity zone 3
Soil (includes fill, clay, scrapings, and any material removed from the ground at a site where earthworks are being carried out)	To move soil from a property within biosecurity zone 1, you must have a biosecurity instrument permit, unless: ■ The soil remains within zone 1 or ■ The soil is moved to a waste facility within zone 1 or zone 2	To move soil from a property within biosecurity zone 2, you must have a biosecurity instrument permit, unless: ■ The soil remains within zone 2 or is moved to zone 1 or ■ The soil is moved to a waste facility within zone 1 or 2	To move soil from a property within biosecurity zone 3, you must have a biosecurity instrument permit, unless: ■ The soil remains within zone 3* or ■ The soil is moved to a waste facility within zone 3

To haul material from Fire Ant Zone 2 to no fire ant areas, remove the upper topsoil layers to mitigate the risk of finding fire ants in the underlying material is greatly reduced and highly unlikely. It would need to be confirmed with Biosecurity Queensland. The biosecurity instrument permit request can be obtained from a Biosecurity Queensland inspector or online (https://www.daf.qld.gov.au/business-priorities/biosecurity/about-biosecurity/apply-for-a-biosecurity-instrument-permit)

5.9 Traffic generation by activity

This section presents the traffic generated based on the quantities of construction materials, workforce and equipment as per the above sections.

In order to take into account additional trips generated by factors such as quality compliance and breakages during construction, buffer factors have been applied to each construction activity. These also cater for potential minor changes to material volumes resulting from design and Project alignment updates (horizontal or vertical). The proposed buffers are considered conservative. It is also envisaged that these factors would cover any peak delivery times. The adjustment/buffer factors are provided in Table 5.11.

Table 5.11 Estimated buffers

Material	Delivery method	Estimated buffer for traffic assessment (%)
General fill	Road	10 (there is no import of general fill)
Structural fill	Road	10
Capping	Road	10
Top ballast	Road	7.5
Bottom ballast	Road	7.5
Sleepers	Road	2.5
Rail	Rail	2.5
Precast concrete – bridge	Road	2.5 (to allow for a few broken beams)
Concrete – bridge and culverts	Road	5 (excess excavation, wastage)
Culverts	Road	2.5 (quality compliance)
Water (earthworks)	Road	10
Water (dust suppression)	Road	10
Water (haul road and laydown maintenance	Road	10

Total trips by construction activity for each road section have been estimated using material requirements and delivery schedule provided in the above sections. These total trips have been summarised in Table 5.12 by activity and year of construction for the Project.

Table 5.12 Total trips estimated by activity per year

Material	2022	2023	2024	2025
Workers/plants and tool delivery	69714	69714	69714	63904
In situ concrete	882	5447	4279	17
Pre-cast concrete	155	820	366	13
Quarry	0	16422	17399	7954
Spoil	32886	23981	0	0
Sleepers	0	0	0	1171
Water	12204	14039	3587	1227
Cut-to-fill	15979	13502	0	0

The total trips are distributed along the construction routes, resulting in the total trips by road section as shown in Table 5.13.

Table 5.13 Total trips estimated by road section per year

Road name	Road ID - road section	Year of construction			
		2022	2023	2024	2025
SCR: DTMR					
Cunningham Highway	17B - Between River Road and Redbank Plains Road	99	532	259	5
	17B - Between Redbank Plains Road and Ripley Road	57	255	107	8
	17B - Between Ripley Road and Ipswich Boonah Road	57	255	107	8
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	57	255	107	8
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	10001	15569	9921	10350
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	4511	5344	1668	852
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	8734	8919	9519	7850
	314 - Between Gatton Clifton Road and Railway Street	6309	7284	7162	5612
	314 - Between Railway Street and Hickey Street	6139	6928	6207	5612
	314 - Between Hickey Street and Gatton Laidley Road W	3592	4032	9740	3971
	314 - Between Gatton Laidley Road W and Warrego Highway	3592	4006	9696	3971
	314 - Between Warrego Highway and William Street	11006	11078	11961	10088
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	7693	8695	1920	375
	312 - Between Whiteway Road and Railway Street	1235	1361	253	28
	312 - Between Railway Street and Hall Road	1325	1449	1353	1136
	312 - Between Hall Road and Forest Hill Fernvale Road	10001	15569	9917	10242
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	7325	7338	7373	6822
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	17128	17128	17128	15974
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	0	0	0	1171
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	57	255	107	8
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	57	255	107	8
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	57	255	107	8
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	17128	25088	17128	17592
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	52771	32986	13625	12965
	311 - Between Old Laidley Forest Hill Road and Railway Street	44352	26434	6968	5115
	311 - Between Railway Street and Whites Road	27381	18184	2126	4
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	0	0	0	1171

Road name	Road ID - road section	Year of construction			
		2022	2023	2024	2025
SCR: DTMR					
New England Highway	22A - Between Griffiths Street and Munro Street	0	0	7380	3025
	22A - Between North Street and James Street	259	907	441	0
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	0	0	0	1171
Pine Mountain Road	Between Warrego Highway and Lowry Street	40378	40378	40378	37013
River Road	309 - Between Warrego Highway and Cunningham Highway	99	532	259	5
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	22613	17499	3792	351
	308 - Between Mulgowie Road and Crown Street	22613	17499	3792	351
	308 - Between Crown Street and Rosewood Marburg Road	39884	41868	19574	17959
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	0	34	0	0
	Between New England Highway and Toowoomba Connection Road	0	34	7380	3025
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	0	34	0	0
	315 - Between Toowoomba-Athol Road and New England Highway	29336	29336	29336	26891
	315 - Between New England Highway and James Street	29595	30243	29777	26891
	315 - Between James Street and Tourist Road	29595	30243	29777	26891
	315 - Between Tourist Road and Roches Road	29595	30243	29777	26891
	315 - Between Roches Road and Murphys Creek Road	29595	30243	29777	26891
	315 - Between Murphys Creek Road and Toowoomba Second Range Crossing	29595	30277	37157	29916
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	47866	25969	12455	7161
	18A - Between Gatton Helidon Road and Gatton Esk Road	47866	25969	12455	7161
	18A - Between Gatton Esk Road and Laidley Plainland Road	49174	31275	19904	12561
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	23349	32244	33529	25526
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	40477	40910	40637	38188
	18A - Between Brisbane Valley Highway and Mount Crosby Road	40477	40910	40637	38188
	18A - Between Mount Crosby Road and Cunningham Highway	99	532	259	1175
SCR: RMS					
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway	0	0	0	1171
Summerland Way	Between Trenayr Road and Turf Street	0	0	0	1171
LGR: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0	0	0	1171

Road name	Road ID - road section	Year of construction			
		2022	2023	2024	2025
SCR: DTMR					
Charles Street	Between Bent Street and Pacific Highway	0	0	0	1171
Clark Road	Full extent	0	0	0	1171
Craig Street	Between Villiers Street and Bent Street	0	0	0	1171
Dobie Street	Between Villiers Street and Summerland Way	0	0	0	1171
Trenayr Road	Between Summerland Way and Clark Road	0	0	0	1171
Villiers Street	Between Craig Street and Dobie Street	0	0	0	1171
LGR: ICC					
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	19669	17370	932	4739
Fairbank Place	Full extent	155	787	366	13
Grandchester Mount Mort Road	Between Rosewood Laidley Road and School Road	0	464	439	3443
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	0	8462	10020	3311
Hiddenvale Road	Between Gipps Street and Neumann Road	3686	9356	930	3595
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	0	8462	10020	3311
	Between Thagoona Haigslea Road and Mount Marrow Quarry	0	7960	0	1617
Neumann Road	Full extent	3677	9303	877	3582
Newhill Drive	Full extent	155	787	366	13
Noblevale Way	Full extent	155	787	366	13
Rafters Road	Between School Road and Railway Line	0	0	0	1136
Redbank Plains Road	Between Cunningham Highway and Newhill Drive	155	787	366	13
Rob Roy Way	Full extent	155	787	366	13
School Road	Between Grandchester Mount Mort Road and Rafters Road	0	0	0	1136
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	0	7960	0	1617
	Between Schumanns Road and Mount Marrow Quarry Road	0	7960	0	1617
LGR: LVRC					
Airforce Road	Between Airforce Road and Railway Line	9568	8058	974	4541
Arthur Street	Between Bowen Street and Station Street	9568	8058	974	4541
	Between Station Street and Mary McKillop Street	10255	17057	6307	14567
	Between Mary McKillop Street and Georges Street	9568	16016	19	199
Boundary Road	Between Laidley Plainland Road and Francis Road	0	0	32	2238
Bowtells Road	Full extent	0	5512	0	0
Boxmoor Street	Between Victor Street and Philps Road	9568	15962	0	2238
Burgess Road	Between Old Toowoomba Road and Smithfield Road	170	283	0	2238
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	15979	16054	0	6849
	Between Airforce Road and Wrights Road	9568	7973	0	0
Crescent Street	Between William Street and East Street	0	43	0	2238

Road name	Road ID - road section	Year of construction			
		2022	2023	2024	2025
SCR: DTMR					
Crown Street	Full extent	262	1203	673	13
George Street	Between Seventeen Mile Road and Arthur Street	15979	7990	0	0
	Between Arthur Street and Lawlers Road	25547	24006	19	199
Hall Road	Full extent	1347	6917	253	2420
Hickey Street	Between Old College Road and Buaraba Street	25	731	0	3374
Laidley Street	Between Station Street and Seventeen Mile Road	687	8998	5333	10026
	Between Seventeen Mile Road and George Street	15979	7990	0	0
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	4511	5344	1668	852
Lawlers Road	Between Victor Street and George Street	9568	15962	0	0
	Between George Street and Warrego Highway	26234	24940	513	570
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	4511	5344	1668	852
Mary McKillop Street	Between Turner Street and Arthur Street	687	1040	6288	14368
Old College Road	Between East Street and Gatton Laidley Road	25	56	0	0
Old Laidley Forest Hill	Between Forest Hill Fernvale and Laidley Plainland	166	2199	2051	3374
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	170	283	0	2238
Paroz Road	Between Summer Street and 200 East of Summer Street	11247	11486	60	643
Philipps Road	Between Boxmoor Street and Warrego Highway	9568	15962	0	2238
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	0	13	23	4584
Railway Road	Between Gatton Laidley Road and Greyfriars Road	86	210	114	1136
Railway Street	Between Kessling Drive and Summer Street	12106	40	0	2238
	Between Summer Street and Laidley Plainland Road	23353	11526	60	5119
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	187	1161	1040	0
Sandy Creek Road	Between Connors Road and Warrego Highway	0	0	0	2238
	Between Warrego Highway and Bowtells Road	0	5512	0	0
Seventeen Mile Road	Between Airforce Road and Laidley Street	16667	16988	5333	10026
Station Street	Between Arthur Street and Laidley Street	687	8998	5333	10026
Summer Street	Between Paroz Street and Railway Street	11247	11486	60	2881
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	187	1161	1040	0
Turner Street	Between Warrego Highway and Mary McKillop Street	687	1040	6288	14368
Victor Street	Between William Street and Boxmoor Street	9568	15962	0	2238
Western Drive	Between Warrego Highway and Tenthill Creek Road	187	1161	1040	0
William Street	Between Hickey Street and Cochrane Street	0	718	0	5612
	Between Bowen Street and Laidley Street	9568	8058	974	4541
	Between Gatton Helidon Street and Victor Street	0	0	0	2238

Road name	Road ID - road section	Year of construction			
		2022	2023	2024	2025
SCR: DTMR					
Wrights Road	Between Connors Road and Andersons Road	9568	7973	0	0
LGR: TRC					
Dent Street	Between Margaret Street and Herries Street	0	0	0	26891
Griffiths Street	Between Mort Street and New England Highway	0	0	7380	3025
Herries Street	Between Dent Street and Water Street North	0	0	0	26891
Larcombe Street	Between North Street and Railway Line	259	907	441	0
Mort Street	Between Hermitage Road and North Street	0	0	7380	3025
Munro Street	Between New England Highway and Harlaxton Quarry	0	0	7380	3025
North Street	Between Mort Street and New England Highway	259	907	441	0
O'Mara's Road	Between Toowoomba Connection Road and Witmack Road	0	34	0	0
Station Street	Between Margaret Street and Russel Street	0	0	0	26891
Water Street North	Between Herries Street and Toowoomba Connection Road	0	0	0	26891
Witmack Road	Between O'Mara's Road and Witmack Industry Park	0	34	0	0

Peak daily trips along each road segment have been calculated from the total trips by construction activity using the following key assumptions:

- A total of 261 working days per year, resulting in an average of 22 working days per month. This is a conservative assumption as it does not take into account potential deliveries occurring on Sundays.
- Equal distribution of loads throughout the delivery period
  - Buffer factors provided in Table 5.11 are to cover any potential 'peak' delivery times within this period
  - Peak delivery movements for different construction activities will likely not coincide with each other as the start date of construction activities are typically reliant on the end date of others.

While buffer factors have been included in the analysis to cover potential 'peak' delivery times, fluctuations may occur on site to coincide with the appointed contractor's delivery schedule. The current design stage does not require the detail of the construction activities to be programmed to the day or to the hour. Potential fluctuations in peak deliveries will therefore be assessed as a part of the detailed design for the Project when a construction contractor is appointed. This assessment will inform the TMP discussed in Section 9 which will ensure that the transport task is managed to reduce overlapping peak periods and impacts on the wider road network, such as peak school hours.

Table 5.14 summarises the peak daily traffic volumes which would occur along each road segment of the proposed primary construction routes for each year of construction. It also identifies the peak month of construction where these are currently scheduled to occur. Plots of the full construction impact by month on the links are provided in Appendix U.

Table 5.14 Peak daily trips estimated per road section

Road name	Road ID - road section	Year of construction				Peak construction months
		2022	2023	2024	2025	
SCR: DTMR						
Cunningham Highway	17B - Between River Road and Redbank Plains Road	2	4	2	0	Aug-23
	17B - Between Redbank Plains Road and Ripley Road	1	2	1	0	Mar-23
	17B - Between Ripley Road and Ipswich Boonah Road	1	2	1	0	Mar-23
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	1	2	1	0	Mar-23
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	41	87	38	60	Aug-23 to Sep-23
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	20	20	20	4	Aug-23 to Feb-24
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	35	35	47	32	May-24 to Jul-24
	314 - Between Gatton Clifton Road and Railway Street	26	29	38	23	May-24 to Jun-24
	314 - Between Railway Street and Hickey Street	23	29	24	23	Oct-23
	314 - Between Hickey Street and Gatton Laidley Road W	16	17	161	29	Jun-24
	314 - Between Gatton Laidley Road W and Warrego Highway	16	16	161	29	Jun-24 to Jul-24
	314 - Between Warrego Highway and William Street	42	42	56	42	May-24 to Jul-24
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	32	33	33	2	Aug-23 to Feb-24
	312 - Between Whiteway Road and Railway Street	5	5	5	0	Aug-23 to Feb-24
	312 - Between Railway Street and Hall Road	6	6	5	5	Nov-22 to Oct-22
	312 - Between Hall Road and Forest Hill Fernvale Road	41	87	38	56	Aug-23 to Sep-23
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	28	28	28	33	Feb-25
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	65	65	65	77	Feb-25
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	0	0	0	53	Feb-25
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	1	2	1	0	Mar-23
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	1	2	1	0	Mar-23
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	1	2	1	0	Mar-23
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	65	137	65	94	Aug-23 to Dec-23
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	258	197	52	61	Oct-22 to Sep-22

Road name	Road ID - road section	Year of construction				Peak construction months
		2022	2023	2024	2025	
	311 - Between Old Laidley Forest Hill Road and Railway Street	228	172	34	28	Nov-22 to Oct-22
	311 - Between Railway Street and Whites Road	149	154	15	0	Feb-23 to May-23
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	0	0	0	53	Feb-25
New England Highway	22A - Between Griffiths Street and Munro Street	0	0	67	67	Aug-24 to Jan-25
	22A - Between North Street and James Street	2	6	3	0	Jul-23 to Sep-23
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	0	0	0	53	Feb-25
Pine Mountain Road	302 - Between Warrego Highway and Lowry Street	153	153	153	153	Jan-22 to Dec-24
River Road	309 - Between Warrego Highway and Cunningham Highway	2	4	2	0	Aug-23
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	103	109	43	2	Feb-23 to May-23
	308 - Between Mulgowie Road and Crown Street	103	109	43	2	Feb-23 to May-23
	308 - Between Crown Street and Rosewood Marburg Road	169	173	99	95	Aug-23 to Sep-23
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	0	0	0	0	Jun-23 to Nov-23
	Between New England Highway and Toowoomba Connection Road	0	0	67	67	Aug-24 to Jan-25
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	0	0	0	0	Jun-23 to Nov-23
	315 - Between Toowoomba-Athol Road and New England Highway	111	111	111	111	Jan-22 to Dec-24
	315 - Between New England Highway and James Street	113	117	114	111	Jul-23 to Sep-23
	18A - Between James Street and Tourist Road	113	117	114	111	Jul-23 to Sep-23
	18A - Between Tourist Road and Roches Road	113	117	114	111	Jul-23 to Sep-23
	18A - Between Roches Road and Murphys Creek Road	113	117	114	111	Jul-23 to Sep-23
	18A - Between Murphys Creek Road and Toowoomba Second Range Crossing	113	117	178	178	Aug-24 to Jan-25
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	243	181	76	52	Nov-22 to Oct-22
	18A - Between Gatton Helidon Road and Gatton Esk Road	243	181	76	52	Nov-22 to Oct-22
	18A - Between Gatton Esk Road and Laidley Plainland Road	245	184	187	102	Nov-22 to Oct-22
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	90	169	240	162	Jul-24

Road name	Road ID - road section	Year of construction				Peak construction months
		2022	2023	2024	2025	
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	155	157	155	206	Feb-25
	18A - Between Brisbane Valley Highway and Mount Crosby Road	155	157	155	206	Feb-25
	18A - Between Mount Crosby Road and Cunningham Highway	2	4	2	53	Feb-25
SCR: RMS						
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway	0	0	0	53	Feb-25
Summerland Way	Between Trenayr Road and Turf Street	0	0	0	53	Feb-25
LGR: CVC						
Bent Street	Between Craig Street and Gwydir Highway	0	0	0	53	Feb-25
Charles Street	Between Bent Street and Pacific Highway	0	0	0	53	Feb-25
Clark Road	Full extent	0	0	0	53	Feb-25
Craig Street	Between Villiers Street and Bent Street	0	0	0	53	Feb-25
Dobie Street	Between Villiers Street and Summerland Way	0	0	0	53	Feb-25
Trenayr Road	Between Summerland Way and Clark Road	0	0	0	53	Feb-25
Villiers Street	Between Craig Street and Dobie Street	0	0	0	53	Feb-25
LGR: ICC						
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	102	102	30	32	Nov-22 to Apr-23
Fairbank Place	Full extent	4	5	2	0	Aug-23
Grandchester Mount Mort Road	Between Rosewood Laidley Road and School Road	14	18	19	17	Feb-24 to Apr-24
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	0	77	149	50	Jun-24 to Jul-24
Hiddenvale Road	Between Gipps Street and Neumann Road	25	72	25	27	Aug-23 to Dec-23
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	0	77	149	50	Jun-24 to Jul-24
	Between Thagoona Haigslea Road and Mount Marrow Quarry	0	72	0	25	Aug-23 to Dec-23
Neumann Road	Full extent	25	72	25	27	Aug-23 to Dec-23
Newhill Drive	Full extent	4	5	2	0	Aug-23
Noblevale Way	Full extent	4	5	2	0	Aug-23
Rafters Road	Between School Road and Railway Line	5	5	5	5	Jan-22 to Dec-24

Road name	Road ID - road section	Year of construction				Peak construction months
		2022	2023	2024	2025	
Redbank Plains Road	Between Cunningham Highway and Newhill Drive	4	5	2	0	Aug-23
Rob Roy Way	Full extent	4	5	2	0	Aug-23
School Road	Between Grandchester Mount Mort Road and Rafters Road	5	5	5	5	Jan-22 to Dec-24
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	0	72	0	25	Aug-23 to Dec-23
	Between Schumanns Road and Mount Marrow Quarry Road	0	72	0	25	Aug-23 to Dec-23
LGR: LVRC						
Airforce Road	Between Airforce Road and Railway Line	91	91	34	21	Jul-22 to Dec-22
Arthur Street	Between Bowen Street and Station Street	91	91	34	21	Jul-22 to Dec-22
	Between Station Street and Mary McKillop Street	127	146	96	96	Aug-23 to Sep-23
	Between Mary McKillop Street and Georges Street	72	91	1	9	Jun-23 to Sep-23
Boundary Road	Between Laidley Plainland Road and Francis Road	9	9	10	9	Sep-24
Bowtells Road	Full extent	0	84	0	0	Jun-23 to Aug-23
Boxmoor Street	Between Victor Street and Philps Road	82	100	9	9	Jun-23 to Sep-23
Burgess Road	Between Old Toowoomba Road and Smithfield Road	12	12	9	9	Oct-22 to Mar-23
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	100	119	28	34	Jun-23 to Sep-23
	Between Airforce Road and Wrights Road	72	72	0	0	Jul-22 to Dec-22
Crescent Street	Between William Street and East Street	9	10	9	9	Apr-23 to Jun-23
Crown Street	Full extent	3	7	6	0	Aug-23 to Sep-23
George Street	Between Seventeen Mile Road and Arthur Street	73	73	0	0	Mar-22 to Aug-22
	Between Arthur Street and Lawlers Road	145	145	1	9	Jul-22 to Dec-22
Hall Road	Full extent	12	58	10	23	Aug-23 to Sep-23
Hickey Street	Between Old College Road and Buaraba Street	15	19	14	14	Aug-23
Laidley Street	Between Station Street and Seventeen Mile Road	36	127	78	78	Aug-23 to Sep-23
	Between Seventeen Mile Road and George Street	73	73	0	0	Mar-22 to Aug-22
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	20	20	20	4	Aug-23 to Feb-24

Road name	Road ID - road section	Year of construction				Peak construction months
		2022	2023	2024	2025	
Lawlers Road	Between Victor Street and George Street	72	91	0	0	Jun-23 to Sep-23
	Between George Street and Warrego Highway	149	149	4	11	Jul-22 to Dec-22
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	20	20	20	4	Aug-23 to Feb-24
Mary McKillop Street	Between Turner Street and Arthur Street	54	55	96	96	Aug-24 to Jan-25
Old College Road	Between East Street and Gatton Laidley Road	1	1	0	0	Dec-22
Old Laidley Forest Hill	Between Forest Hill Fernvale and Laidley Plainland	17	30	30	14	Dec-23 to Mar-24
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	12	12	9	9	Oct-22 to Mar-23
Paroz Road	Between Summer Street and 200 East of Summer Street	73	73	0	10	Oct-22 to Mar-23
Philipps Road	Between Boxmoor Street and Warrego Highway	82	100	9	9	Jun-23 to Sep-23
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	18	19	19	23	Feb-25
Railway Road	Between Gatton Laidley Road and Greyfriars Road	6	6	5	5	Nov-22 to Oct-22
Railway Street	Between Kessling Drive and Summer Street	71	9	9	9	Oct-22 to Sep-22
	Between Summer Street and Laidley Plainland Road	153	92	19	28	Oct-22 to Sep-22
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	3	6	15	0	May-24 to Jun-24
Sandy Creek Road	Between Connors Road and Warrego Highway	9	9	9	9	Jan-22 to Dec-24
	Between Warrego Highway and Bowtells Road	0	84	0	0	Jun-23 to Aug-23
Seventeen Mile Road	Between Airforce Road and Laidley Street	109	127	78	78	Aug-23 to Sep-23
Station Street	Between Arthur Street and Laidley Street	36	127	78	78	Aug-23 to Sep-23
Summer Street	Between Paroz Street and Railway Street	82	82	10	19	Oct-22 to Mar-23
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	3	6	15	0	May-24 to Jun-24
Turner Street	Between Warrego Highway and Mary McKillop Street	54	55	96	96	Aug-24 to Jan-25
Victor Street	Between William Street and Boxmoor Street	82	100	9	9	Jun-23 to Sep-23
Western Drive	Between Warrego Highway and Tenthill Creek Road	3	6	15	0	May-24 to Jun-24
William Street	Between Hickey Street and Cochrane Street	23	28	23	23	Jun-23
	Between Bowen Street and Laidley Street	91	91	34	21	Jul-22 to Dec-22

Road name	Road ID - road section	Year of construction				Peak construction months
		2022	2023	2024	2025	
	Between Gatton Helidon Street and Victor Street	9	9	9	9	Jan-22 to Dec-24
Wrights Road	Between Connors Road and Andersons Road	72	72	0	0	Jul-22 to Dec-22
LGR: TRC						
Dent Street	Between Margaret Street and Herries Street	111	111	111	111	Jan-22 to Dec-24
Griffiths Street	Between Mort Street and New England Highway	0	0	67	67	Aug-24 to Jan-25
Herries Street	Between Dent Street and Water Street North	111	111	111	111	Jan-22 to Dec-24
Larcombe Street	Between North Street and Railway Line	2	6	3	0	Jul-23 to Sep-23
Mort Street	Between Hermitage Road and North Street	0	0	67	67	Aug-24 to Jan-25
Munro Street	Between New England Highway and Harlaxton Quarry	0	0	67	67	Aug-24 to Jan-25
North Street	Between Mort Street and New England Highway	2	6	3	0	Jul-23 to Sep-23
O'Mara's Road	Between Toowoomba Connection Road and Witmack Road	0	0	0	0	Jun-23 to Nov-23
Station Street	Between Margaret Street and Russel Street	111	111	111	111	Jan-22 to Dec-24
Water Street North	Between Herries Street and Toowoomba Connection Road	111	111	111	111	Jan-22 to Dec-24
Witmack Road	Between O'Mara's Road and Witmack Industry Park	0	0	0	0	Jun-23 to Nov-23

6 Traffic impact assessment

6.1 Traffic analysis

This section examines the impact of the Project on the road network. The Project related traffic consists of traffic generated by both construction and operational activities. However, it is anticipated that the impacts would primarily be during the construction phase of the Project. Throughout the operational phase, the impacts from the Project are expected to be low given the expected nature of operations (i.e. low vehicle movements to/from depots, transportation of maintenance material within the rail corridor). Therefore, the associated Project traffic volumes are not expected to trigger the 5 per cent threshold outlined in GTIA (refer Table 1.4).

6.1.1 Traffic growth rates

Traffic growth rates on SCRs were derived based on historic permanent census traffic data where available. An evaluation of the traffic growth rates within this traffic data revealed an overall AADT growth rate of 2 per cent. The proportion of this growth, which was heavy vehicles varied by link, but was generally consistent with the AADT growth and has been assumed as such. This is considered reasonable for the current design stage. Traffic growth rates were requested from all asset owners impacted by construction traffic. However, in the absence of available historical count data or forecast models, the 2 per cent growth rate calculated from the SCRs was adopted in the analyses for all SCRs and LGRs for all vehicle types. This is considered reasonable for the current design stage given the observed growth on roads evaluated. The data and evaluation are provided in Appendix C for DTMR roads and Appendix D for RMS.

6.1.2 Seasonal variation

Based on the dominant rural/agricultural land uses of the transport study area, traffic volumes on the road network are likely to increase during harvesting season. Key crops include vegetables, wheat, barley, oats and cereal rye. During this season, heavy vehicle usage on local and main roads increases as trucks transport grain and tractors and harvesters move between properties. Farming machinery is generally much larger and slower than other vehicles using the roads and may result in localised delays. The impact of seasonal variation was taken into account as part of the analyses especially at road-rail interface locations, where the analysis outcomes provide input into the design. The impact of seasonality was taken into consideration by means of the following:

- Road-Rail interface analysis: It was considered to adopt 95th percentile output results from SIDRA modelling results instead of industry standard 85th percentile outputs. This is considered conservative as it accounts for additional vehicle queue and delay which might be induced through higher traffic volumes and slower moving vehicles.
- The LOS thresholds and associated K-values used within the analyses per road type as derived from the Austroads Part 2 – Guide to Traffic Engineering Practice: Roadway Capacity (1988) already accounts for the 30th highest hour traffic volumes of similar road types. This provides for upper LOS threshold limits which accounts for any micro fluctuations and peaks in traffic throughout the year.

6.2 Construction phase

This section examines the impact of the Project related traffic on the existing road network operation. The following traffic analysis was performed on identified primary construction routes:

- Comparison of the Project traffic to the existing traffic to determine if the 5 per cent threshold is breached (road links and intersections)

- LOS analysis
- Intersection performance analysis.

6.2.1 Five per cent traffic comparison on links

According to GTIA, for the 5 per cent traffic comparison, the percentage traffic impact is calculated by expressing the traffic generated by the Project (future design years) as a percentage of the background traffic. A summary of the 5 per cent traffic comparison analysis is provided in Table 6.2 and Table 6.3 which highlights the road sections in the transport corridor where the Project related traffic exceeds 5 per cent and also where it exceeds 10 per cent of the existing daily background traffic. This is provided for both directions of travel. Table 6.1 indicates the parameters adopted for the percentage comparison.

Table 6.1 Percentage impact parameter

Percentage impact range	Colour highlighted
Less than 5%	Green
Greater than or equal to 5% and less than 10%	Orange
Greater than or equal to 10%	Red

Table 6.2 5 per cent comparison summary (gazettal/northbound/eastbound directions)

Road name	Road ID - road section	Year of construction (%)			
		2022	2023	2024	2025
SCR: DTMR					
Cunningham Highway	17B - Between River Road and Redbank Plains Road	0.0	0.0	0.0	0.0
	17B - Between Redbank Plains Road and Ripley Road	0.0	0.0	0.0	0.0
	17B - Between Ripley Road and Ipswich Boonah Road	0.0	0.0	0.0	0.0
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	0.0	0.0	0.0	0.0
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	6.8	14.2	6.1	9.5
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	0.8	0.8	0.8	0.1
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	1.2	1.2	1.6	1.1
	314 - Between Gatton Clifton Road and Railway Street	0.7	0.8	1.0	0.6
	314 - Between Railway Street and Hickey Street	0.4	0.5	0.4	0.4
	314 - Between Hickey Street and Gatton Laidley Road W	0.2	0.2	2.3	0.4
	314 - Between Gatton Laidley Road W and Warrego Highway	0.6	0.5	5.4	1.0
	314 - Between Warrego Highway and William Street	1.4	1.4	1.9	1.4
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	2.5	2.4	2.4	0.1
	312 - Between Whiteway Road and Railway Street	0.4	0.4	0.4	0.0
	312 - Between Railway Street and Hall Road	0.4	0.4	0.4	0.3
	312 - Between Hall Road and Forest Hill Fernvale Road	3.1	6.4	2.7	4.0
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	2.1	2.1	2.0	2.3
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	2.2	2.1	2.1	2.4
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	0.0	0.0	0.0	0.1

Road name	Road ID - road section	Year of construction (%)			
		2022	2023	2024	2025
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	0.0	0.0	0.0	0.0
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	0.1	0.1	0.1	0.0
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	0.1	0.1	0.1	0.0
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	2.8	5.8	2.7	3.8
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	8.9	6.7	1.7	2.0
	311 - Between Old Laidley Forest Hill Road and Railway Street	6.4	4.8	0.9	0.8
	311 - Between Railway Street and Whites Road	4.2	4.3	0.4	0.0
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	0.0	0.0	0.0	0.1
New England Highway	22A - Between Griffiths Street and Munro Street	0.0	0.0	0.7	0.6
	22A - Between North Street and James Street	0.0	0.1	0.0	0.0
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	0.0	0.0	0.0	0.1
Pine Mountain Road	302 - Between Warrego Highway and Lowry Street	1.9	1.9	1.9	1.8
River Road	309 - Between Warrego Highway and Cunningham Highway	0.1	0.1	0.1	0.0
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	10.3	10.7	4.2	0.2
	308 - Between Mulgowie Road and Crown Street	5.8	6.0	2.3	0.1
	308 - Between Crown Street and Rosewood Marburg Road	9.5	9.6	5.4	5.1
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	0.0	0.0	0.0	0.0
	Between New England Highway and Toowoomba Connection Road	0.0	0.0	4.1	4.0
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	0.0	0.0	0.0	0.0
	315 - Between Toowoomba-Athol Road and New England Highway	0.9	0.9	0.9	0.9
	315 - Between New England Highway and James Street	1.2	1.2	1.1	1.1
	315 - Between James Street and Tourist Road	1.3	1.3	1.3	1.2
	315 - Between Tourist Road and Roches Road	0.8	0.8	0.8	0.8
	315 - Between Roches Road and Murphys Creek Road	0.8	0.8	0.8	0.8
	315 - Between Murphys Creek Road and Toowoomba Second Range Crossing	1.0	1.0	1.5	1.5
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	3.0	2.2	0.9	0.6
	18A - Between Gatton Helidon Road and Gatton Esk Road	3.0	2.2	0.9	0.6
	18A - Between Gatton Esk Road and Laidley Plainland Road	1.9	1.4	1.4	0.8
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	0.7	1.3	1.8	1.2

Road name	Road ID - road section	Year of construction (%)			
		2022	2023	2024	2025
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	0.8	0.8	0.8	1.0
	18A - Between Brisbane Valley Highway and Mount Crosby Road	0.6	0.6	0.6	0.7
	18A - Between Mount Crosby Road and Cunningham Highway	0.0	0.0	0.0	0.2
SCR: RMS					
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway	0.0	0.0	0.0	0.6
Summerland Way	Between Trenayr Road and Turf Street	0.0	0.0	0.0	0.4
LGR: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0.0	0.0	0.0	2.3
Charles Street	Between Bent Street and Pacific Highway	0.0	0.0	0.0	2.3
Clark Road	Full extent	0.0	0.0	0.0	11.6
Craig Street	Between Villiers Street and Bent Street	0.0	0.0	0.0	1.2
Dobie Street	Between Villiers Street and Summerland Way	0.0	0.0	0.0	1.2
Trenayr Road	Between Summerland Way and Clark Road	0.0	0.0	0.0	2.3
Villiers Street	Between Craig Street and Dobie Street	0.0	0.0	0.0	1.2
LGR: ICC					
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	43.2	42.4	12.1	12.8
Fairbank Place	Full extent	2.3	3.3	1.5	0.2
Grandchester Mount Mort Road	Between Rosewood Laidley Road and School Road	3.4	4.3	4.5	3.9
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	0.0	34.5	65.7	21.6
Hiddenvale Road	Between Gipps Street and Neumann Road	10.6	29.9	10.2	10.9
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	0.0	34.5	65.7	21.6
	Between Thagoona Haigslea Road and Mount Marrow Quarry	0.0	32.4	0.0	10.6
Neumann Road	Full extent	45.9	130.4	44.1	47.5
Newhill Drive	Full extent	0.6	0.8	0.4	0.1
Noblevale Way	Full extent	1.5	2.2	1.0	0.1
Rafters Road	Between School Road and Railway Line	1.1	1.1	1.1	1.1
Redbank Plains Road	Between Cunningham Highway and Newhill Drive	0.0	0.1	0.0	0.0
Rob Roy Way	Full extent	0.8	1.1	0.5	0.1
School Road	Between Grandchester Mount Mort Road and Rafters Road	1.1	1.1	1.1	1.1
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	0.0	35.2	0.0	11.5
	Between Schumanns Road and Mount Marrow Quarry Road	0.0	35.2	0.0	11.5
LGR: LVRC					
Airforce Road	Between Airforce Road and Railway Line	14.8	14.5	5.3	3.3
Arthur Street	Between Bowen Street and Station Street	4.2	4.1	1.5	0.9
	Between Station Street and Mary McKillop Street	5.9	6.6	4.3	4.2

Road name	Road ID - road section	Year of construction (%)			
		2022	2023	2024	2025
	Between Mary McKillop Street and Georges Street	3.3	4.1	0.0	0.4
Boundary Road	Between Laidley Plainland Road and Francis Road	2.1	2.1	2.2	2.0
Bowtells Road	Full extent	0.0	18.9	0.0	0.0
Boxmoor Street	Between Victor Street and Philps Road	3.8	4.5	0.4	0.4
Burgess Road	Between Old Toowoomba Road and Smithfield Road	1.4	1.4	1.1	1.1
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	250.6	291.5	66.6	79.6
	Between Airforce Road and Wrights Road	181.0	177.4	0.0	0.0
Crescent Street	Between William Street and East Street	0.9	0.9	0.9	0.8
Crown Street	Full extent	0.7	1.6	1.2	0.0
George Street	Between Seventeen Mile Road and Arthur Street	23.5	23.0	0.0	0.0
	Between Arthur Street and Lawlers Road	47.0	46.0	0.3	2.8
Hall Road	Full extent	0.6	2.6	0.4	1.0
Hickey Street	Between Old College Road and Buaraba Street	0.7	0.8	0.6	0.6
Laidley Street	Between Station Street and Seventeen Mile Road	1.7	5.8	3.5	3.4
	Between Seventeen Mile Road and George Street	3.4	3.3	0.0	0.0
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	4.7	4.6	4.5	0.8
Lawlers Road	Between Victor Street and George Street	23.5	28.8	0.0	0.0
	Between George Street and Warrego Highway	48.1	47.2	1.1	3.2
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	4.7	4.6	4.5	0.8
Mary McKillop Street	Between Turner Street and Arthur Street	12.6	12.5	21.4	21.0
Old College Road	Between East Street and Gatton Laidley Road	0.3	0.2	0.0	0.0
Old Laidley Forest Hill	Between Forest Hill Fernvale and Laidley Plainland	2.1	3.8	3.7	1.7
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	0.5	0.5	0.4	0.4
Paroz Road	Between Summer Street and 200 East of Summer Street	26.1	25.6	0.1	3.2
Philipps Road	Between Boxmoor Street and Warrego Highway	3.8	4.5	0.4	0.4
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	4.3	4.3	4.2	5.1
Railway Road	Between Gatton Laidley Road and Greyfriars Road	0.3	0.3	0.2	0.2
Railway Street	Between Kessling Drive and Summer Street	723.2	95.0	91.2	89.4
	Between Summer Street and Laidley Plainland Road	1568.8	924.1	186.3	272.1
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	0.1	0.3	0.7	0.0
Sandy Creek Road	Between Connors Road and Warrego Highway	1.5	1.5	1.5	1.4
	Between Warrego Highway and Bowtells Road	0.0	13.6	0.0	0.0
Seventeen Mile Road	Between Airforce Road and Laidley Street	92.1	105.8	63.5	62.3
Station Street	Between Arthur Street and Laidley Street	1.7	5.8	3.5	3.4
Summer Street	Between Paroz Street and Railway Street	20.7	20.3	2.3	4.5
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	0.1	0.3	0.7	0.0

Road name	Road ID - road section	Year of construction (%)			
		2022	2023	2024	2025
Turner Street	Between Warrego Highway and Mary McKillop Street	2.5	2.5	4.3	4.2
Victor Street	Between William Street and Boxmoor Street	3.8	4.5	0.4	0.4
Western Drive	Between Warrego Highway and Tenthill Creek Road	0.1	0.3	0.7	0.0
WIlliam Street	Between Hickey Street and Cochrane Street	1.1	1.3	1.1	1.0
William Street	Between Bowen Street and Laidley Street	4.2	4.1	1.5	0.9
William Street	Between Gatton Helidon Street and Victor Street	0.4	0.4	0.4	0.4
Wrights Road	Between Connors Road and Andersons Road	248.0	243.1	0.0	0.0
LGR: TRC					
Dent Street	Between Margaret Street and Herries Street	5.2	5.1	5.0	4.9
Griffiths Street	Between Mort Street and New England Highway	0.0	0.0	1.5	1.4
Herries Street	Between Dent Street and Water Street North	1.0	1.0	1.0	1.0
Larcombe Street	Between North Street and Railway Line	0.1	0.3	0.1	0.0
Mort Street	Between Hermitage Road and North Street	0.0	0.0	58.3	57.2
Munro Street	Between New England Highway and Harlaxton Quarry	0.0	0.0	28.8	28.2
North Street	Between Mort Street and New England Highway	0.0	0.1	0.1	0.0
O'Mara's Road	Between Toowoomba Connection Road and Witmack Road	0.0	0.0	0.0	0.0
Station Street	Between Margaret Street and Russel Street	26.1	25.6	25.1	24.6
Water Street North	Between Herries Street and Toowoomba Connection Road	12.8	12.5	12.3	12.0
Witmack Road	Between O'Mara's Road and Witmack Industry Park	0.0	0.0	0.0	0.0

Table 6.3 5 per cent comparison summary (anti-gazettal/southbound/westbound directions)

Road name	Road ID - Road section	Year of construction (%)			
		2022	2023	2024	2025
SCR: DTMR					
Cunningham Highway	17B - Between River Road and Redbank Plains Road	0.0	0.0	0.0	0.0
	17B - Between Redbank Plains Road and Ripley Road	0.0	0.0	0.0	0.0
	17B - Between Ripley Road and Ipswich Boonah Road	0.0	0.0	0.0	0.0
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	0.0	0.0	0.0	0.0
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	6.8	14.2	6.1	9.5
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	0.8	0.8	0.8	0.1
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	1.3	1.3	1.7	1.1
	314 - Between Gatton Clifton Road and Railway Street	0.8	0.9	1.1	0.7
	314 - Between Railway Street and Hickey Street	0.4	0.5	0.4	0.4
	314 - Between Hickey Street and Gatton Laidley Road W	0.2	0.2	2.3	0.4
	314 - Between Gatton Laidley Road W and Warrego Highway	0.5	0.5	5.3	1.0
	314 - Between Warrego Highway and William Street	1.5	1.5	2.0	1.5

Road name	Road ID - Road section	Year of construction (%)			
		2022	2023	2024	2025
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	2.5	2.5	2.4	0.1
	312 - Between Whiteway Road and Railway Street	0.4	0.4	0.4	0.0
	312 - Between Railway Street and Hall Road	0.4	0.4	0.4	0.3
	312 - Between Hall Road and Forest Hill Fernvale Road	3.1	6.5	2.8	4.0
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	2.1	2.1	2.1	2.4
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	2.6	2.6	2.5	3.0
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	0.0	0.0	0.0	0.1
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	0.0	0.0	0.0	0.0
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	0.1	0.1	0.1	0.0
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	0.1	0.1	0.1	0.0
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	3.0	6.3	2.9	4.1
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	8.9	6.7	1.7	2.0
	311 - Between Old Laidley Forest Hill Road and Railway Street	6.5	4.8	0.9	0.8
	311 - Between Railway Street and Whites Road	4.2	4.3	0.4	0.0
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	0.0	0.0	0.0	0.1
New England Highway	22A - Between Griffiths Street and Munro Street	0.0	0.0	0.7	0.7
	22A - Between North Street and James Street	0.0	0.1	0.0	0.0
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	0.0	0.0	0.0	0.1
Pine Mountain Road	302 - Between Warrego Highway and Lowry Street	1.9	1.9	1.9	1.8
River Road	309 - Between Warrego Highway and Cunningham Highway	0.1	0.1	0.1	0.0
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	10.4	10.8	4.2	0.2
	308 - Between Mulgowie Road and Crown Street	6.2	6.4	2.5	0.1
	308 - Between Crown Street and Rosewood Marburg Road	10.2	10.2	5.7	5.4
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	0.0	0.0	0.0	0.0
	Between New England Highway and Toowoomba Connection Road	0.0	0.0	4.1	4.0
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	0.0	0.0	0.0	0.0
	315 - Between Toowoomba-Athol Road and New England Highway	0.9	0.9	0.9	0.9
	315 - Between New England Highway and James Street	1.2	1.2	1.1	1.1
	18A - Between James Street and Tourist Road	1.1	1.2	1.1	1.1
	18A - Between Tourist Road and Roches Road	0.8	0.9	0.8	0.8
	18A - Between Roches Road and Murphys Creek Road	0.8	0.9	0.8	0.8

Road name	Road ID - Road section	Year of construction (%)			
		2022	2023	2024	2025
	18A - Between Murphys Creek Road and Toowoomba Second Range Crossing	1.0	1.1	1.6	1.5
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	2.6	1.9	0.8	0.5
	18A - Between Gatton Helidon Road and Gatton Esk Road	2.6	1.9	0.8	0.5
	18A - Between Gatton Esk Road and Laidley Plainland Road	2.0	1.4	1.4	0.8
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	0.7	1.3	1.8	1.2
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	0.9	0.9	0.9	1.1
	18A - Between Brisbane Valley Highway and Mount Crosby Road	0.7	0.7	0.6	0.8
	18A - Between Mount Crosby Road and Cunningham Highway	0.0	0.0	0.0	0.2
SCR: RMS					
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway	0.0	0.0	0.0	0.5
Summerland Way	Between Trenayr Road and Turf Street	0.0	0.0	0.0	0.4
LGR: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0.0	0.0	0.0	2.3
Charles Street	Between Bent Street and Pacific Highway	0.0	0.0	0.0	2.3
Clark Road	Full extent	0.0	0.0	0.0	11.6
Craig Street	Between Villiers Street and Bent Street	0.0	0.0	0.0	1.2
Dobie Street	Between Villiers Street and Summerland Way	0.0	0.0	0.0	1.2
Trenayr Road	Between Summerland Way and Clark Road	0.0	0.0	0.0	2.3
Villiers Street	Between Craig Street and Dobie Street	0.0	0.0	0.0	1.2
LGR: ICC					
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	42.8	42.0	12.0	12.7
Fairbank Place	Full extent	2.6	3.9	1.7	0.3
Grandchester Mount Mort Road	Between Rosewood Laidley Road and School Road	3.3	4.3	4.4	3.9
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	0.0	34.0	64.7	21.3
Hiddenvale Road	Between Gipps Street and Neumann Road	10.5	29.6	10.1	10.8
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	0.0	34.0	64.7	21.3
	Between Thagoona Haigslea Road and Mount Marrow Quarry	0.0	32.0	0.0	10.4
Neumann Road	Full extent	45.9	130.4	44.1	47.5
Newhill Drive	Full extent	0.5	0.8	0.3	0.1
Noblevale Way	Full extent	1.5	2.2	1.0	0.1
Rafters Road	Between School Road and Railway Line	1.1	1.1	1.1	1.1
Redbank Plains Road	Between Cunningham Highway and Newhill Drive	0.0	0.1	0.0	0.0
Rob Roy Way	Full extent	0.8	1.2	0.5	0.1

Road name	Road ID - Road section	Year of construction (%)			
		2022	2023	2024	2025
School Road	Between Grandchester Mount Mort Road and Rafters Road	1.1	1.1	1.1	1.1
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	0.0	35.2	0.0	11.5
	Between Schumanns Road and Mount Marrow Quarry Road	0.0	35.2	0.0	11.5
LGR: LVRC					
Airforce Road	Between Airforce Road and Railway Line	42.0	41.2	15.0	9.3
Arthur Street	Between Bowen Street and Station Street	4.2	4.1	1.5	0.9
	Between Station Street and Mary McKillop Street	5.9	6.6	4.3	4.2
	Between Mary McKillop Street and Georges Street	3.3	4.1	0.0	0.4
Boundary Road	Between Laidley Plainland Road and Francis Road	2.1	2.1	2.2	2.0
Bowtells Road	Full extent	0.0	18.9	0.0	0.0
Boxmoor Street	Between Victor Street and Philps Road	3.8	4.5	0.4	0.4
Burgess Road	Between Old Toowoomba Road and Smithfield Road	1.4	1.4	1.1	1.0
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	220.8	256.8	58.7	70.2
	Between Airforce Road and Wrights Road	159.4	156.3	0.0	0.0
Crescent Street	Between William Street and East Street	0.6	0.6	0.5	0.5
Crown Street	Full extent	0.7	1.6	1.2	0.0
George Street	Between Seventeen Mile Road and Arthur Street	23.3	22.8	0.0	0.0
	Between Arthur Street and Lawlers Road	46.5	45.6	0.3	2.7
Hall Road	Full extent	0.6	2.6	0.4	1.0
Hickey Street	Between Old College Road and Buaraba Street	1.3	1.6	1.1	1.1
Laidley Street	Between Station Street and Seventeen Mile Road	1.7	5.8	3.5	3.4
	Between Seventeen Mile Road and George Street	3.4	3.3	0.0	0.0
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	4.7	4.6	4.5	0.8
Lawlers Road	Between Victor Street and George Street	23.2	28.5	0.0	0.0
	Between George Street and Warrego Highway	47.6	46.7	1.1	3.2
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	4.7	4.6	4.5	0.8
Mary McKillop Street	Between Turner Street and Arthur Street	12.6	12.5	21.4	21.0
Old College Road	Between East Street and Gatton Laidley Road	0.2	0.2	0.0	0.0
Old Laidley Forest Hill	Between Forest Hill Fernvale and Laidley Plainland	2.1	3.8	3.7	1.7
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	0.5	0.5	0.4	0.4
Paroz Road	Between Summer Street and 200 East of Summer Street	25.9	25.4	0.1	3.2
Philipps Road	Between Boxmoor Street and Warrego Highway	3.8	4.5	0.4	0.4
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	4.3	4.3	4.2	5.1
Railway Road	Between Gatton Laidley Road and Greyfriars Road	0.3	0.3	0.2	0.2
Railway Street	Between Kessling Drive and Summer Street	723.2	95.0	91.2	89.4
	Between Summer Street and Laidley Plainland Road	1568.8	924.1	186.3	272.1

Road name	Road ID - Road section	Year of construction (%)			
		2022	2023	2024	2025
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	0.1	0.3	0.7	0.0
Sandy Creek Road	Between Connors Road and Warrego Highway	1.5	1.5	1.5	1.4
	Between Warrego Highway and Bowtells Road	0.0	13.6	0.0	0.0
Seventeen Mile Road	Between Airforce Road and Laidley Street	90.4	103.9	62.4	61.1
Station Street	Between Arthur Street and Laidley Street	1.7	5.8	3.5	3.4
Summer Street	Between Paroz Street and Railway Street	20.8	20.4	2.3	4.5
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	0.1	0.3	0.7	0.0
Turner Street	Between Warrego Highway and Mary McKillop Street	2.5	2.5	4.3	4.2
Victor Street	Between William Street and Boxmoor Street	3.8	4.5	0.4	0.4
Western Drive	Between Warrego Highway and Tenthill Creek Road	0.1	0.3	0.7	0.0
WIlliam Street	Between Hickey Street and Cochrane Street	1.0	1.2	1.0	0.9
William Street	Between Bowen Street and Laidley Street	4.2	4.1	1.5	0.9
William Street	Between Gatton Helidon Street and Victor Street	0.4	0.4	0.4	0.4
Wrights Road	Between Connors Road and Andersons Road	248.0	243.1	0.0	0.0
LGR: TRC					
Dent Street	Between Margaret Street and Herries Street	5.2	5.1	5.0	4.9
Griffiths Street	Between Mort Street and New England Highway	0.0	0.0	1.5	1.4
Herries Street	Between Dent Street and Water Street North	1.0	1.0	1.0	1.0
Larcombe Street	Between North Street and Railway Line	0.1	0.3	0.1	0.0
Mort Street	Between Hermitage Road and North Street	0.0	0.0	58.3	57.2
Munro Street	Between New England Highway and Harlaxton Quarry	0.0	0.0	28.8	28.2
North Street	Between Mort Street and New England Highway	0.0	0.1	0.1	0.0
O'Mara's Road	Between Toowoomba Connection Road and Witmack Road	0.0	0.0	0.0	0.0
Station Street	Between Margaret Street and Russel Street	26.1	25.6	25.1	24.6
Water Street North	Between Herries Street and Toowoomba Connection Road	12.8	12.5	12.3	12.0
Witmack Road	Between O'Mara's Road and Witmack Industry Park	0.0	0.0	0.0	0.0

From the results presented in Table 6.2 and Table 6.3, it can be seen that Years 2022 and 2023 of the construction phase are likely to generate the highest construction related traffic volumes on the surrounding road network. During these years, some routes contain sections that are exceeding 5 per cent or 10 per cent of the background traffic. It was noted that some of the sections exceeded 10 per cent of the background traffic by significant margins; however, this is primarily due to the low background traffic volumes along these sections.

A summary of the number of roads with construction traffic that exceeds 5 per cent of base AADT has been provided for each road authority in Table 6.4. For these routes, certain sections will generate construction related traffic volumes in excess of 5 per cent or 10 per cent of the background traffic during the construction phase.

The percentage comparison by itself does not provide an accurate overview of the Project's impact on the surrounding road network as it does not reflect the magnitude of the Project related traffic volumes on the operational performance of the road network. Further comparisons to identify the magnitude of the Project related traffic against the background traffic are further discussed and the results are presented in Section 6.2.2.

The impacts identified due to various construction activities are expected to be short term and only for the duration of the specific activities. Generally, the level of impacts identified would only be for limited periods which can be mitigated through adequate traffic management measures.

Table 6.4 Number of roads exceeding 5 per cent base annual average daily traffic by road owner

Road authority	Number of roads	
	5 to 10 of Base AADT	> 10 Base AADT
DTMR	4	2
RMS	0	0
CVC	0	1
ICC	0	6
LVRC	3	13
TRC	1	3

6.2.2 Level of service comparison on links

The primary aim of the LOS analysis is to determine the level of impact the Project generated traffic has on the road network by determining the change in LOS in the peak hour for each road section. The following section provides a summary of the performance analysis carried out to determine the 'without' and 'with Project' traffic LOS for various construction route road sections during the year construction is expected.

Peak hour traffic volumes were derived from peak daily volumes using the following key assumptions:

- Material delivery movements will be evenly distributed across the standard 12 hours of construction
- It has been assumed that two shifts will occur per day with 50 per cent of total staff working each shift. Staff shift changeovers have been conservatively assumed to occur simultaneously with the background traffic peak hour.

As per the GTIA, LOS C is considered to be the minimum standard on rural roads, although a LOS D may be acceptable during events such as construction. Therefore, all road sections currently operating above LOS D are considered to be operating above the acceptable standard. The LOS analysis was undertaken for the construction route sections which exceeds the 5 per cent threshold. For the purpose of comparing the expected LOS for each affected road section, the performance 'with' and 'without' the Project related traffic has been summarised in Table 6.5 and Table 6.6.

The results of the LOS comparison indicate that the Project construction traffic may cause a change to LOS along the following construction traffic routes in each direction unless otherwise specified:

- DTMR
  - Karrabin Rosewood Road, between Rosewood Marburg Road and Haigslea Amberley Road (LOS A to LOS B)
  - Rosewood Laidley Road, between Crown Street and Rosewood Marburg Road (LOS A to LOS B, - gazettal direction only)
- TRC
  - Water Street North, Between Herries Street and Toowoomba Connection Road (LOS A to LOS B).

Although there is a change in operational LOS for the road sections above, the expected operational LOS B (worst case) is considered acceptable given the construction activities are expected to be less than a year. Therefore, during the construction phase, apart from the identified road sections and the explanations provided above; the operational LOS of the overall road network will be no worse as a result of the Project.

Based on the LOS comparison, it is not expected that the Project would generate the need to upgrade the road network for these temporary construction actives. Regardless, as per the earlier assessments, it is important that the routes are reviewed in the preparation of a TMP from a physical and safety perspective prior to the commencement of construction activities to ensure that they are suitable. This will include joint visual inspection of all routes by the design and construction contractor, the asset owner and an accredited road safety auditor to agree on routes and any works require to ensure the routes are suitable for the level of construction activity proposed. This requirement is discussed further in Section 9. Detailed road link outputs have been provided in Appendix R.

Table 6.5 Primary construction routes level of service results gazettal direction/northbound/eastbound

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
SCR: DTMR										
Forest Hill Fernvale Road	Between Gatton Laidley Road and Warrego Highway	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Gatton Helidon Road	Between Gatton Laidley Road W and Warrego Highway	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Gatton Laidley Road	Between Hall Road and Forest Hill Fernvale Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Karrabin Rosewood Road	Between Rosewood Marburg Road and Haigslea Amberley Road	Two-Way Two-Lane Highway	A	B	B	B	B	B	B	B
Laidley Plainland Road	Between Warrego Highway and Old Laidley Forest Hill Road	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Laidley Plainland Road	Between Old Laidley Forest Hill Road and Railway Street	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Rosewood Laidley Road	Between Whites Road and Mulgowie Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Rosewood Laidley Road	Between Mulgowie Road and Crown Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Rosewood Laidley Road	Between Crown Street and Rosewood Marburg Road	Two-Way Two-Lane Highway	A	A	A	A	B	B	B	B
LGR: CVC										
Clark Road	Full extent	Mid-Block Analysis	A	A	A	A	A	A	A	A
LGR: ICC										
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Hiddenvale Road	Between Gipps Street and Neumann Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mount Marrow Quarry Road	Between Thagoona Haigslea Road and Mount Marrow Quarry	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Neumann Road	Full extent	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
Thagoona Haigslea Road	Between Schumanns Road and Mount Marrow Quarry Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
LGR: LVRC										
Airforce Road	Between Airforce Road and Railway Line	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Arthur Street	Between Station Street and Mary McKillop Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Bowtells Road	Full extent	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Connors Road	Between Airforce Road and Wrights Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
George Street	Between Seventeen Mile Road and Arthur Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
George Street	Between Arthur Street and Lawlers Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Laidley Street	Between Station Street and Seventeen Mile Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Lawlers Road	Between Victor Street and George Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Lawlers Road	Between George Street and Warrego Highway	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mary McKillop Street	Between Turner Street and Arthur Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
Paroz Road	Between Summer Street and 200 East of Summer Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Railway Street	Between Summer Street and Laidley Plainland Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Railway Street	Between Kessling Drive and Summer Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Sandy Creek Road	Between Warrego Highway and Bowtells Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Seventeen Mile Road	Between Airforce Road and Laidley Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Station Street	Between Arthur Street and Laidley Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Summer Street	Between Paroz Street and Railway Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Wrights Road	Between Connors Road and Andersons Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
LGR: TRC										
Dent Street	Between Margaret Street and Herries Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Mort Street	Between Hermitage Riad and North Street	Mid-Block Analysis	A	A	A	A	A	A	A	A

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
Munro Street	Between New England Highway and Harlaxton Quarry	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Station Street	Between Margaret Street and Russel Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
Water Street North	Between Herries Street and Toowoomba Connection Road	Mid-Block Analysis	A	A	A	A	B	B	B	B

Table 6.6 Primary construction routes level of service results anti-gazettal direction/southbound/westbound

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
SCR: DTMR										
Forest Hill Fernvale Road	Between Gatton Laidley Road and Warrego Highway	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Gatton Helidon Road	Between Gatton Laidley Road W and Warrego Highway	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Gatton Laidley Road	Between Hall Road and Forest Hill Fernvale Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Karrabin Rosewood Road	Between Rosewood Marburg Road and Haigslea Amberley Road	Two-Way Two-Lane Highway	A	A	A	A	B	B	B	B
Laidley Plainland Road	Between Warrego Highway and Old Laidley Forest Hill Road	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Laidley Plainland Road	Between Old Laidley Forest Hill Road and Railway Street	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Rosewood Laidley Road	Between Whites Road and Mulgowie Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Rosewood Laidley Road	Between Mulgowie Road and Crown Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Rosewood Laidley Road	Between Crown Street and Rosewood Marburg Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
LGR: CVC										
Clark Road	Full extent	Mid-Block Analysis	A	A	A	A	A	A	A	A
LGR: ICC										
Calvert Station Road	Between Rosewood Laidley Road and Gipps Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Haigslea Malabar Road	Between Warrego Highway and Mount Marrow Quarry Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Hiddenvale Road	Between Gipps Street and Neumann Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
Mount Marrow Quarry Road	Between Haigslea Malabar Road and Mount Marrow Quarry	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mount Marrow Quarry Road	Between Thagoona Haigslea Road and Mount Marrow Quarry	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Neumann Road	Full extent	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Thagoona Haigslea Road	Between Karrabin Rosewood Road and Schumanns Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Thagoona Haigslea Road	Between Schumanns Road and Mount Marrow Quarry Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
LGR: LVRC										
Airforce Road	Between Airforce Road and Railway Line	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Arthur Street	Between Station Street and Mary McKillop Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Bowtells Road	Full extent	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Connors Road	Between Seventeen Mile Road and Sandy Creek Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Connors Road	Between Airforce Road and Wrights Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
George Street	Between Seventeen Mile Road and Arthur Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
George Street	Between Arthur Street and Lawlers Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Laidley Street	Between Station Street and Seventeen Mile Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Lawlers Road	Between Victor Street and George Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Lawlers Road	Between George Street and Warrego Highway	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mary McKillop Street	Between Turner Street and Arthur Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
Paroz Road	Between Summer Street and 200 East of Summer Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Railway Street	Between Summer Street and Laidley Plainland Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Railway Street	Between Kessling Drive and Summer Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Sandy Creek Road	Between Warrego Highway and Bowtells Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Seventeen Mile Road	Between Airforce Road and Laidley Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
Station Street	Between Arthur Street and Laidley Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Summer Street	Between Paroz Street and Railway Street	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Wrights Road	Between Connors Road and Andersons Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
LGR: TRC										
Dent Street	Between Margaret Street and Herries Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Munro Street	Between New England Highway and Harlaxton Quarry	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Station Street	Between Margaret Street and Russel Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
Water Street North	Between Herries Street and Toowoomba Connection Road	Mid-Block Analysis	A	A	A	A	B	B	B	B

6.2.3 Level of service comparison on links with assumed base traffic volumes

LOS analysis was also undertaken along links where base traffic volumes were required to be assumed due to insufficient data. Peak hour volumes were calculated using the same assumptions in Section 6.2.3.

Table 6.7 and Table 6.8 summarises the LOS results of the 'without' and 'with' Project traffic LOS.

The results of the LOS comparison indicate that the Project construction traffic may cause a change to LOS along the following construction traffic routes in each direction unless otherwise specified:

- LVRC:
  - Turner Street between Warrego Highway and Mary MacKillop Street (LOS B to LOS C)

Despite increases to traffic due to Project construction activities, LOS along these links is estimated to be LOS C or better in the peak hour and that the expected increase in level of service is only expected to temporarily occur for the duration of construction. Further, as the level of service assessment is a cumulative assessment of the background traffic and the proposed Project traffic, this is considered a conservative assessment of the LOS.

Regardless, as per the earlier assessments, it is important that the routes are reviewed in the preparation of a TMP from a physical and safety perspective prior to the commencement of construction activities to ensure that they are suitable. This will include joint visual inspection of all routes by the design and construction contractor, the asset owner and an accredited road safety auditor to agree on routes and any works require to ensure the routes are suitable for the level of construction activity proposed. This requirement is discussed further in Section 9. Detailed road link outputs have been provided in Appendix R.

Table 6.7 Primary construction routes level of service results gazettal direction/northbound/eastbound – assumed base traffic volumes

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
LGR: CVC										
Bent Street	Between Craig Street and Gwydir Highway	Mid-Block Analysis	B	B	B	B	B	B	B	B
Charles Street	Between Bent Street and Pacific Highway	Mid-Block Analysis	B	B	B	B	B	B	B	B
Clark Road	Full Extent	Mid-Block Analysis	A	A	A	A	A	A	A	A
Craig Street	Between Villiers Street and Bent Street	Mid-Block Analysis	C	C	C	C	C	C	C	C
Dobie Street	Between Villers Street and Summerland Way	Mid-Block Analysis	C	C	C	C	C	C	C	C
Trenayr Road	Between Summerland Way and Clark Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Villers Street	Between Craig Street and Dobie Street	Mid-Block Analysis	C	C	C	C	C	C	C	C
LGR: LVRC										
Arthur Street	Between Bowen Street and Station Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Arthur Street	Between Station Street and Mary McKillop Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Arthur Street	Between Mary McKillop Street and Georges Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Boundary Road	Between Carrington Road and Williams Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Bowtells Road	Full Extent	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Boxmoor Street	Between Victor Street and Philps Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Crown Street	Full extent	Mid-Block Analysis	A	A	A	A	A	A	A	A
Hall Road	Full Extent	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Laidley Street	Between Station Street and Seventeen Mile Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Laidley Street	Between Seventeen Mile Road and George Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mary McKillop Street	Between Turner Street and Arthur Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Philipps Road	Between Boxmoor Street and Warrego Highway	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Railway Road	Between Gatton Laidley Road and Greyfriars Road	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	Mid-Block Analysis	B	B	B	B	B	B	B	B
Station Street	Between Arthur Street and Laidley Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Turner Street	Between Warrego Highway and Mary MacKillop Street	Mid-Block Analysis	B	B	B	B	C	C	C	C
Victor Street	Between William Street and Boxmoor Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Western Drive	Between Warrego Highway and Tenthill Creek Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
William Street	Between Bowen Street and Laidley Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
William Street	Between Gatton Helidon Street and Victor Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
LGR: TRC										
Larcombe Street	Between North Street and Railway Line	Mid-Block Analysis	B	B	B	B	B	B	B	B

Table 6.8 Primary construction routes level of service results anti-gazettal direction/southbound/westbound – assumed base traffic volumes

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
LGR: CVC										
Bent Street	Between Craig Street and Gwydir Highway	Mid-Block Analysis	B	B	B	B	B	B	B	B
Charles Street	Between Bent Street and Pacific Highway	Mid-Block Analysis	B	B	B	B	B	B	B	B
Craig Street	Between Villiers Street and Bent Street	Mid-Block Analysis	C	C	C	C	C	C	C	C
Dobie Street	Between Villers Street and Summerland Way	Mid-Block Analysis	C	C	C	C	C	C	C	C
Trenayr Road	Between Summerland Way and Clark Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Villers Street	Between Craig Street and Dobie Street	Mid-Block Analysis	C	C	C	C	C	C	C	C
LGR: LVRC										
Arthur Street	Between Bowen Street and Station Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Arthur Street	Between Station Street and Mary McKillop Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Arthur Street	Between Mary McKillop Street and Georges Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Boundary Road	Between Carrington Road and Williams Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Bowtells Road	Full Extent	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Boxmoor Street	Between Victor Street and Philps Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Crown Street	Full extent	Mid-Block Analysis	A	A	A	A	A	A	A	A
Hall Road	Full Extent	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Laidley Street	Between Station Street and Seventeen Mile Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Laidley Street	Between Seventeen Mile Road and George Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Lake Clarendon Way	Between Gatton Esk Road and Main Green Swamp Road	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Main Green Swamp Road	Between Lake Clarendon Way and Lake Clarendon	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A
Mary McKillop Street	Between Turner Street and Arthur Street	Mid-Block Analysis	A	A	A	A	A	A	A	A
Old Toowoomba Road	Between Gatton Helidon Road and Burgess Road	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Outer Ring Road Extension (new road)	Between Gatton Laidley Road West and Railway Line	Two-Way Two-Lane Highway	A	A	A	A	A	A	A	A

Road name	Road ID - road section	Analysis type	Without Project traffic				With Project traffic			
			2022	2023	2024	2025	2022	2023	2024	2025
Philipps Road	Between Boxmoor Street and Warrego Highway	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Railway Road	Between Gatton Laidley Road and Greyfriars Road	Two-Way Two-Lane Highway	B	B	B	B	B	B	B	B
Saleyard Road	Between Tenthill Creek Road and Warrego Highway	Mid-Block Analysis	B	B	B	B	B	B	B	B
Station Street	Between Arthur Street and Laidley Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Tenthill Creek Road	Between Warrego Highway and Saleyard Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
Turner Street	Between Warrego Highway and Mary MacKillop Street	Mid-Block Analysis	B	B	B	B	C	C	C	C
Victor Street	Between William Street and Boxmoor Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
Western Drive	Between Warrego Highway and Tenthill Creek Road	Mid-Block Analysis	B	B	B	B	B	B	B	B
William Street	Between Bowen Street and Laidley Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
William Street	Between Gatton Helidon Street and Victor Street	Mid-Block Analysis	B	B	B	B	B	B	B	B
LGR: TRC										
Larcombe Street	Between North Street and Railway Line	Mid-Block Analysis	B	B	B	B	B	B	B	B

6.2.4 Traffic management strategies on links

Traffic management strategies to be introduced in order to mitigate impacts along link roads will include:

- Travel demand management (TDM) campaign to inform the public on works and its effect on network operations
- TMP to be prepared and approved by the construction contractor, DTMR, Council and an accredited road safety auditor. TMP will address managing hours of work and deliveries, staff transport and staff parking, with the provision of on-site tool storage where practicable.
- Ongoing consultation with relevant local councils, state authorities, police, emergency services and affected property owners/occupiers
- Directional signage and line marking around construction sites and the surrounding network, including using Variable Message Signs (VMS)
- All OSOM and RAV vehicles will comply with relevant guidelines as set out by DTMR and the NHVR in terms of transport safety.
- Specific traffic management plans for special events developed in conjunction with the relevant stakeholders
- Relevant emergency services will be notified in advance prior to before the movement of all hazardous/dangerous or oversize construction material and equipment
- Secondary alternative construction route activities will be determined as part of the TMP, in the event of the primary route is blocked off by an emergency.

Detailed mitigation measures are provided in Section 9.

6.3 Construction intersection analysis

For the transportation of materials, workforce, as well as equipment, key transport routes have been identified. From the analysis of these transport corridors, key intersections have been identified which are expected to be cater for the movement of construction related activities during the various construction stages. The intersections where turning movements along primary construction routes would occur are provided in Table 6.9.

Table 6.9 Intersection with construction traffic turn movements

Name	Joint ownership
DTMR	
Cunningham Highway/Ipswich Rosewood Road	-
Forest Hill Fernvale Road/Old Laidley Forest Hill Road	LVRC
Gatton Esk Road/Lake Clarendon Road	LVRC
Gatton Helidon Road/Gatton Laidley Road	LVRC
Gatton Helidon Road/Old College Road	LVRC
Gatton Helidon Road/Old Toowoomba Road	LVRC
Gatton Helidon Road/Spencer Street	LVRC
Gatton Helidon Road/Tenthill Creek Road	LVRC
Gatton Helidon Road/Western Drive	LVRC
Gatton Helidon Road/William Street	LVRC
Gatton Helidon Road/William Street	LVRC
Gatton Laidley Road/Forest Hill Fernvale Road	LVRC
Gatton Laidley Road/Hall Road	LVRC

Name	Joint ownership
Gatton Laidley Road/Lake Dyer Access Road	LVRC
Gatton Laidley Road/Outer Ring Road Extension	LVRC
Gatton Laidley Road/Railway Street	LVRC
Ipswich Rosewood Road/Rosewood Warrill View Road	-
Karrabin Rosewood Road/Haigslea Amberley Road	ICC
Karrabin Rosewood Road/Thagoona Haigslea Road	ICC
Laidley Plainlands Road/Boundary Road	LVRC
Laidley Plainlands Road/Gatton Laidley Road	-
Laidley Plainlands Road/Old Laidley Forest Hill Road	LVRC
Laidley Plainlands Road/Railway Street	LVRC
New England Highway/Munro Street	TRC
Rosewood Laidley Road/Calvert Station Road	ICC
Rosewood Laidley Road/Crown Street	LVRC
Rosewood Laidley Road/Grandchester Mt Mort Road	ICC
Rosewood Laidley Road/Ipswich Rosewood Road	ICC
Rosewood Laidley Road/Rosewood Laidley Road	LVRC
Warrego Highway/Thagoona Haigslea Road	ICC
RMS	
Pacific Highway/Gwydir Highway	-
Summerland Way/Dobie Street	CVC
Summerland Way/Trenayr Road	CVC
CVC	
Trenayr Road/Clark Road	-
Villiers Street/Craig Street	-
Villiers Street/Dobie Street	-
ICC	
Grandchester Mt Mort Road/School Road	-
Haigslea Malabar Road/Mount Morrow Road	-
Haigslea Malabar Road/Thagoona Haigslea Road	-
Hiddenvale Road/Neumann Road	-
Newhill Drive/Rob Roy Way	-
Noblevale Way/Fairbank Place	-
Rob Roy Way/Noblevale Way	-
School Road/Rafters Road	-
Thagoona Haigslea Road/Mt Marrow Quarry Road	-
Thagoona Haigslea Road/Thagoona Haigslea Road	-
Logan City Council	
Airforce Road/Connors Road	-
Arthur Street/Mary McKillop Street	-
Arthur Street/Station Street	-
Boxmoor Street/Philps Road	-
Connors Road/Phillips Road	-

Name	Joint ownership
Connors Road/Wrights Road	-
Crescent Street/Hickey Street	-
George Street/Arthur Street	-
Old Toowoomba Road/Burgess Road	-
Laidley Street/Seventeen Mile Road	-
Laidley Street/Station Street	-
Main Green Swamp Road/Lake Clarendon Access Road	-
Railway Street/Summer Street	-
Sandy Creek Road/Bowtells Road	-
Sandy Creek Road/Connors Road	-
Seventeen Mile Road/Connors Road	-
Tenthill Creek Road/Saleyards Road	-
Tenthill Creek Road/Western Drive	-
Turner Street/Mary McKillop Street	-
Victor Street/William Street	-
Victors Street/Lawlers Road	-
Warrego Highway/Forest Hill Fernvale Road	-
Warrego Highway/Laidley Plainlands Road	-
William Street/Hickey Street	-
TRC	
Herries Street/Water Street	-
North Street/Larcombe Street	-
Toowoomba Connection Road/Water Street	-

As outlined in Section 1.5.1, traffic survey considerations were based on intersections where construction traffic was envisaged to undertake turn manoeuvres and the combination of expected increase in traffic and associated construction duration. Traffic surveys were conducted at locations where the expected construction traffic experience a high increase with associated long and moderate duration, or a moderate increase with associated long construction duration. However, at the time traffic survey locations were determined, specific details regarding the construction traffic schedules of each construction activity were not available.

Table 6.9 highlights the intersections which are expected to experience any number of turning movements during construction. The absence of traffic counts at these intersections prohibits the 5 per cent comparison at these intersections, or the SIDRA analysis of those exceeding 5 per cent increases. It is proposed that this assessment be undertaken once the construction traffic routes are finalised by the construction contractor.

In order to assist in in quantifying the number of intersections which may experience potential operational impacts, an assessment has been undertaken to highlight intersections which are more likely to experience impacts. This assessment compares base traffic flows and construction flows to determine intersections which may require upgraded turning treatments to accommodate construction traffic flows consistent with the warrants outlined in Austroads Guide to Traffic Management Part 6 (2019a). Given the rural nature of a number of the roads, warrants for intersections with design speeds greater than 100 km/h warrants have been assumed.

This assessment compares assumed base traffic flows and turning movements from available data with construction flows to determine intersections which are expected to require upgraded turning treatments to accommodate construction traffic flows consistent with the warrants outlined in Austroads Guide to Traffic Management Part 6 (2019a). The assumptions used are discussed below. As these turning movements are assumed, this analysis will be updated once the construction traffic routes are finalised by the construction contractor. Figure 6.1 indicates the left turn volume (Q_L) and right turn volume (Q_R), as well as the values used to calculate the major road traffic volume parameter (Q_M). The value of Q_M is calculated as outlined in Table 6.10.

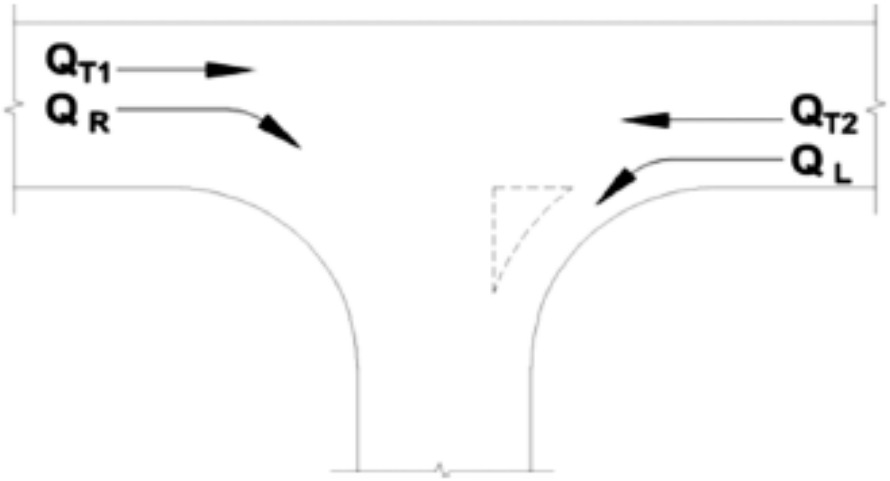


Figure 6.1 **Calculation of the major road traffic volume (Q_M)**

Source: Austroads 2019a

Table 6.10 **Calculation of the major road traffic volume (Q_M)**

Road type	Turn type	Splitter island	Q_M (vehicles per hour)
Two-lane two-way	Right	No	= $Q_{T1} + Q_{T2} + Q_L$
		Yes	= $Q_{T1} + Q_{T2}$
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50 x $Q_{T1} + Q_{T2} + Q_L$
		Yes	= 50 x $Q_{T1} + Q_{T2}$
	Left	Yes or no	= 50 x Q_{T2}
Six-lane two-way	Right	No	= 33 x $Q_{T1} + Q_{T2} + Q_L$
		Yes	= 33 x $Q_{T1} + Q_{T2}$
	Left	Yes or no	= 33 x Q_{T2}

Source: Austroads 2019a

These upgraded turning treatments outlined in this methodology are warranted only temporarily for construction traffic. Therefore, discussions will be required with DTMR and local councils during the Project design phase to determine the permanence of such upgrades. Given the typical duration of construction activities generally being less than a year, traffic management strategies may be introduced in order to mitigate construction related traffic impacts at intersections.

The intersections determined to require temporary intersection treatments are summarised in Table 6.11 with detailed assessment results outlined in the sections below this table.

Table 6.11 Intersections with potential operational impacts

Name	Joint ownership
DTMR	
Gatton Laidley Road/Hall Road	LVRC
Karrabin Rosewood Road/Thagoona Haigslea Road	ICC
New England Highway/Munro Street	TRC
Toowoomba Connection Road/Water Street	TRC
Forest Hill Fernvale Road/Old Laidley Forest Hill Road	LVRC
Gatton Helidon Road/Old Toowoomba Road	LVRC
Gatton Laidley/Outer Ring Road	LVRC
Laidley Plainlands Road/Boundary Road	LVRC
Laidley Plainlands Road/Gatton Laidley Road	-
Laidley Plainlands Road/Old Laidley Forest Hill Road	LVRC
Laidley Plainlands Road/Railway Street	LVRC
LVRC	
Arthur Street/Mary McKillop Street	-
Arthur Street/Station Street	-
Boxmoor Street/Philps Road	-
Laidley Street/Seventeen Mile Road	-
Laidley Street/Station Street	-
Turner Street/Mary McKillop Street	-
Old Toowoomba Road/Burgess Road	-
William Street/Hickey Street	-

6.3.1 Forest Hill Fernvale Road/Old Laidley Forest Hill Road, Forest Hill

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting in-situ concrete, sleepers, quarry materials and workers are expected to travel to these laydown areas via Forest Hill by turning right from Forest Fernvale Road into Old Laidley Forest Hill Road. Currently, there are moderate flows along Old Laidley Forest Hill Road (i.e. 1,390 vehicles per day, two-way). It is conservatively assumed that this equates to 104 vehicles turning into Old Laidley Forest Hill Road from Forest Fernvale Road during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.2.

Figure 6.2 **Forest Hill Fernvale Road/Old Laidley Forest Hill Road existing layout**

The Project traffic assessment demonstrates that the turning movements into Old Laidley Forest Hill Road are expected to peak in 2023, with up to 5 vehicles per hour expected to turn into Old Laidley Forest Hill Road from Forest Hill Fernvale Road. These turning volumes, along with the through movement volumes on Forest Hill Fernvale Road, are summarised in Table 6.12. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.3.

Table 6.12 **Forest Hill Fernvale Road/Old Laidley Forest Hill Road turning treatment volumes**

Scenario	Forest Hill Fernvale Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Old Laidley Forest Hill Road (Q_R)
Existing volumes	163	104
Forecast volumes without Project (2023)	183	120
Project traffic	26	5
Volumes for treatment assessment	209	125

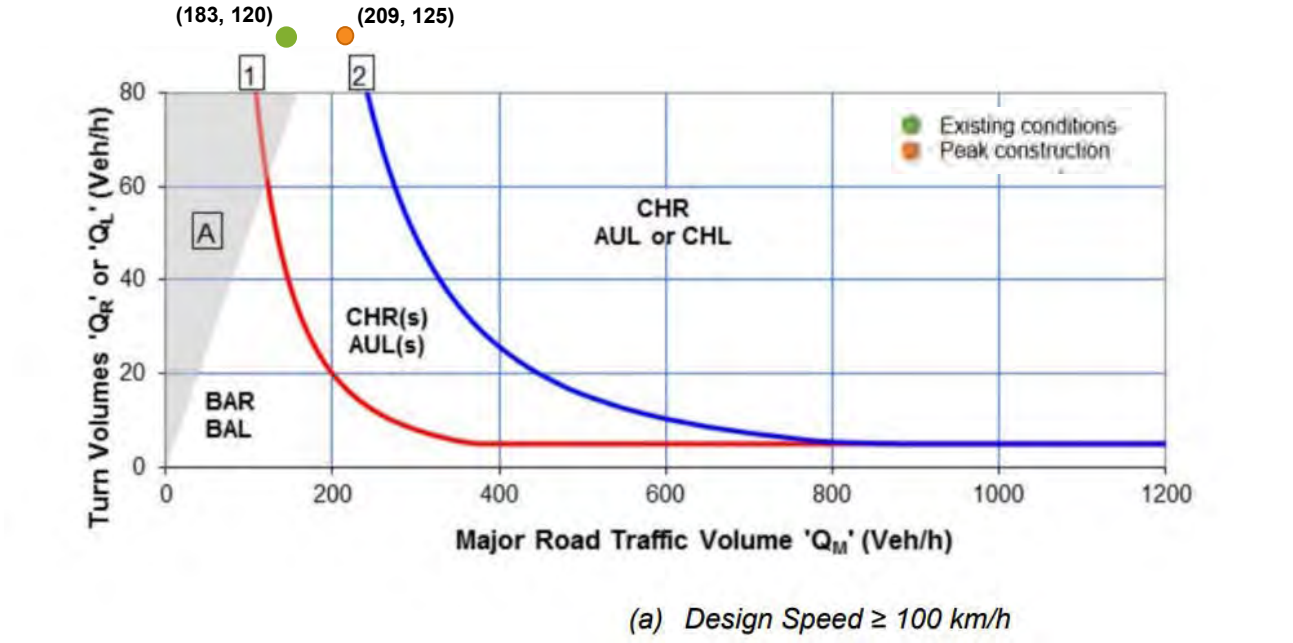


Figure 6.3 **Forest Hill Fernvale Road/Old Laidley Forest Hill Road turning treatment assessment**

Source: DTMR 2014

Figure 6.3 demonstrates that as a minimum, a CHR(s) treatment is required to accommodate the turning volumes at the Forest Hill Fernvale Road / Old Laidley Forest Hill Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.2 Gatton Helidon Road/Old Toowoomba Road, Placid Hills

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting in-situ concrete and workers are expected to travel to these laydown areas via Placid Hills by turning left and right from Gatton Helidon Road into Old Toowoomba Road.

In the absence of traffic data, it has been assumed that the two-way flow along Old Toowoomba Road would be 4,000 vehicles per day. It is conservatively assumed that this equates to 300 vehicles turning into Old Toowoomba Road from Gatton Helidon Road during the peak hour. An AUL and AUR treatment is currently provided at this intersection, as shown in Figure 6.4.

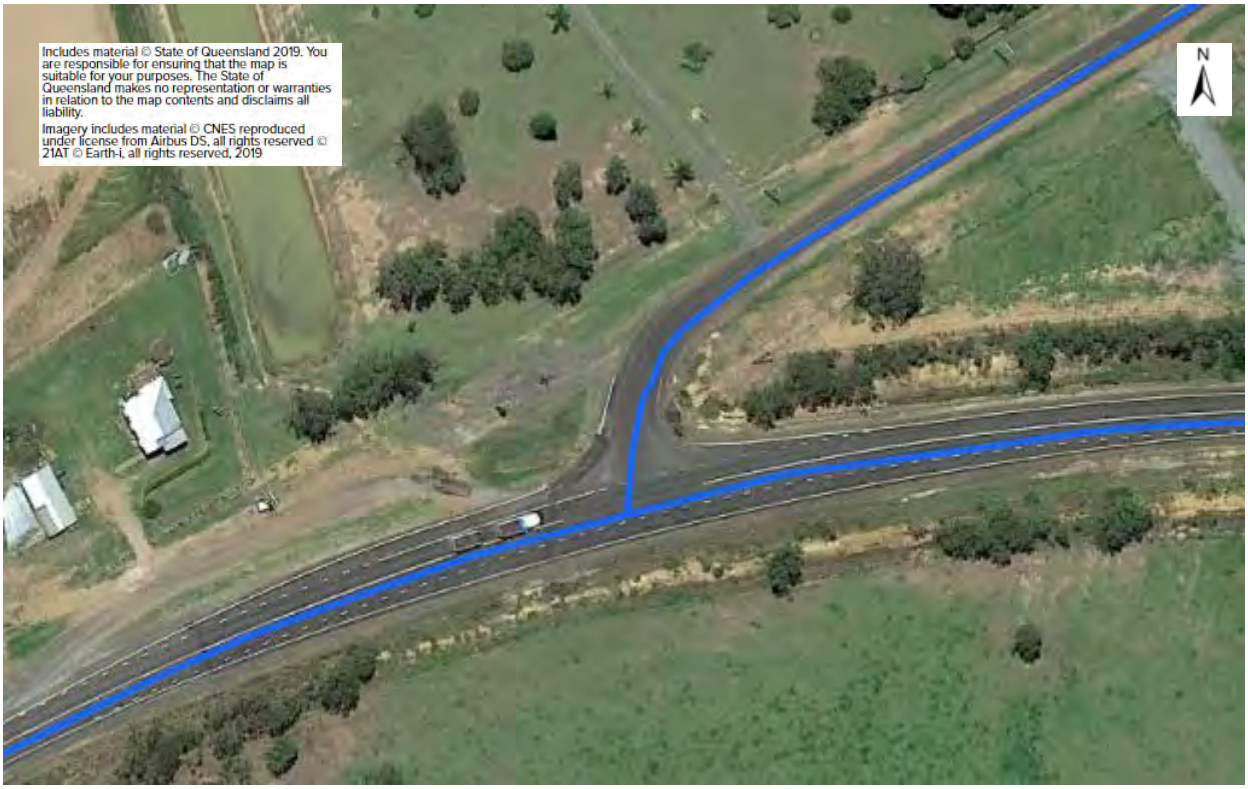


Figure 6.4 Gatton Helidon Road/Old Toowoomba Road existing layout

The Project traffic assessment demonstrates that the turning movements into Old Toowoomba Road are expected to peak in 2022, with up to 3 vehicles per hour expected to turn into Old Toowoomba Road from Gatton Helidon Road. These turning volumes, along with the through movement volumes on Gatton Helidon Road, are summarised in Table 6.13 and Table 6.14. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.5.

Table 6.13 Gatton Helidon Road/Old Toowoomba Road left turning treatment volumes

Scenario	Gatton Helidon Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Old Toowoomba Road (Q_L)
Existing volumes	380	300
Forecast volumes without Project (2022)	419	325
Project traffic	9	3
Volumes for treatment assessment	428	328

Table 6.14 Gatton Helidon Road/Old Toowoomba Road right turning treatment volumes

Scenario	Gatton Helidon Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Old Toowoomba Road (Q_R)
Existing volumes	759	300
Forecast volumes without Project (2022)	838	325
Project traffic	18	3
Volumes for treatment assessment	856	328

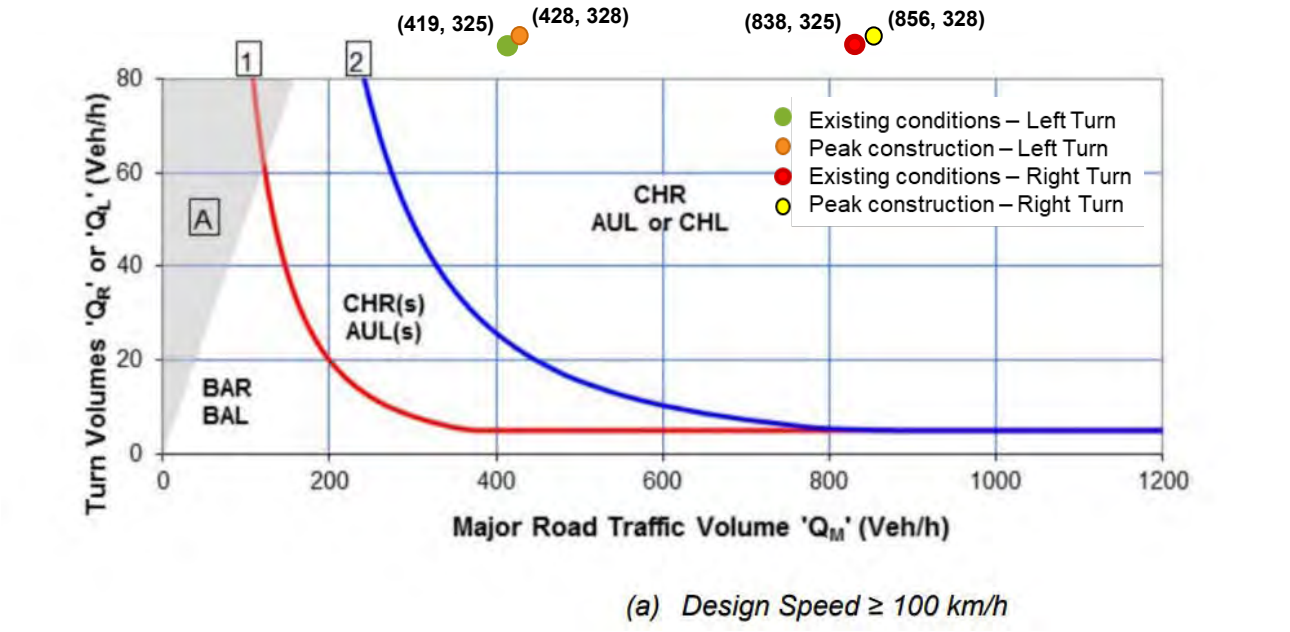


Figure 6.5 Gatton Helidon Road/Old Toowoomba Road turning treatment assessment

Source: DTMR 2014

Figure 6.5 demonstrates that as a minimum, an AUL and CHR treatment are required to accommodate the turning volumes at the Gatton Helidon Road / Old Toowoomba Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.3 Gatton Laidley Road/Hall Road, Forest Hill

The Project construction methodology proposes to include laydown area adjacent to Hall Road approximately 2 km south-east of the Gatton Laidley Road/Hall Road intersection. Construction vehicles transporting pre-cast concrete, in-situ concrete, sleepers, quarry materials, water and workers are expected to access this laydown area via Forest Hill by turning left from Gatton Laidley Road into Hall Road.

In the absence of traffic data, it has been assumed that the two-way flow along Hall Road would be 4,000 vehicles per day. It is conservatively assumed that this equates to 300 vehicles turning into Hall Road from Gatton Laidley Road during the peak hour. A BAL treatment is currently provided at this intersection, as shown in Figure 6.6.

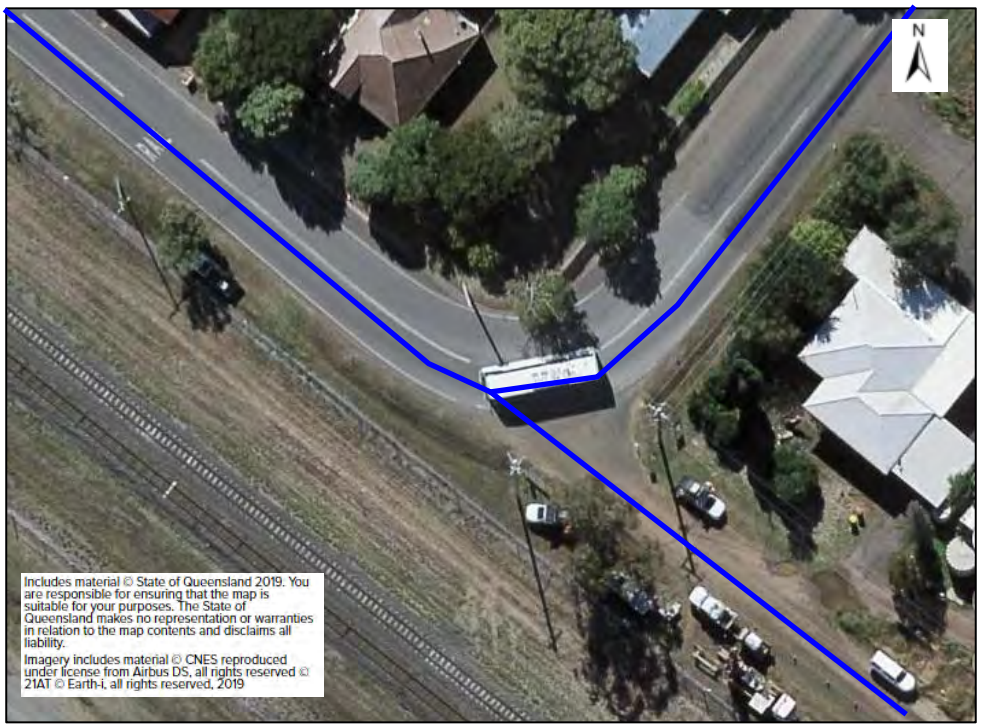


Figure 6.6 Gatton Laidley Road/Hall Road existing layout

The Project traffic assessment demonstrates that the turning movements into Hall Road are expected to peak in 2023, with up to 4 vehicles per hour expected to turn into Hall Road from Gatton Laidley Road. These turning volumes, along with the through movement volumes on Gatton Laidley Road are summarised in Table 6.15. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.7.

Table 6.15 Gatton Laidley Road/Hall Road turning treatment volumes

Scenario	Gatton Laidley Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Hall Road (Q_L)
Existing Volumes	178	300
Forecast Volumes without Project (2023)	200	331
Project Traffic	13	4
Volumes for Treatment Assessment	213	335

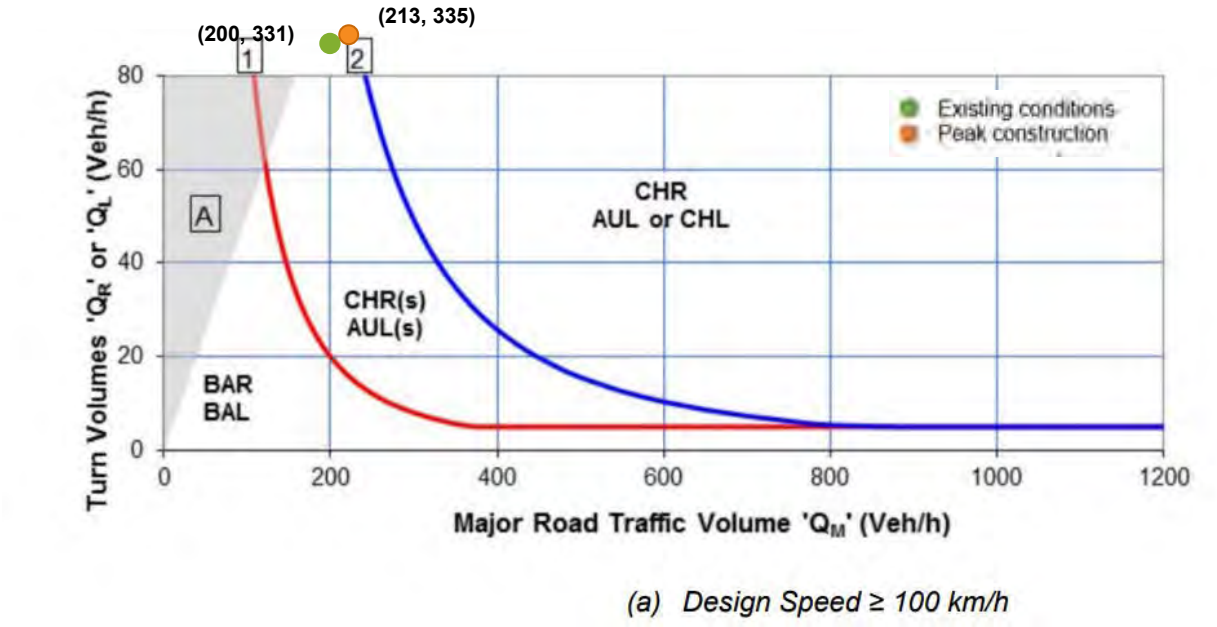


Figure 6.7 **Gatton Laidley Road/Hall Road turning treatment assessment**

Source: DTMR 2014

Figure 6.7 demonstrates that as a minimum, an AUL(s) treatment is required to accommodate the turning volumes at the Gatton Laidley Road/Hall Road intersection during construction. This however is an existing requirement at this intersection, based on the assumed traffic flows.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.4 Gatton Laidley Road/Outer Ring Road, Lawes

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting in-situ concrete, sleepers and workers are expected to travel to these laydown areas via Lawes by turning left from Gatton Laidley Road into Outer Ring Road.

In the absence of traffic data, it has been assumed that the two-way flow along Outer Ring Road would be 800 vehicles per day. It is conservatively assumed that this equates to 60 vehicles turning into Outer Ring Road from Gatton Laidley Road during the peak hour. A BAL treatment is currently provided at this intersection, as shown in Figure 6.8.

Figure 6.8 **Gatton Laidley Road/Outer Ring Road existing layout**

The Project traffic assessment demonstrates that the turning movements into Outer Ring Road are expected to peak in 2025, with up to 6 vehicles per hour expected to turn into Outer Ring Road from Gatton Laidley Road. These turning volumes, along with the through movement volumes on Gatton Laidley Road, are summarised in Table 6.16. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.9.

Table 6.16 **Gatton Laidley Road/Outer Ring Road turning treatment volumes**

Scenario	Gatton Laidley Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Outer Ring Road (Q_L)
Existing volumes	178	60
Forecast volumes without Project (2025)	209	69
Project traffic	13	6
Volumes for treatment assessment	222	75

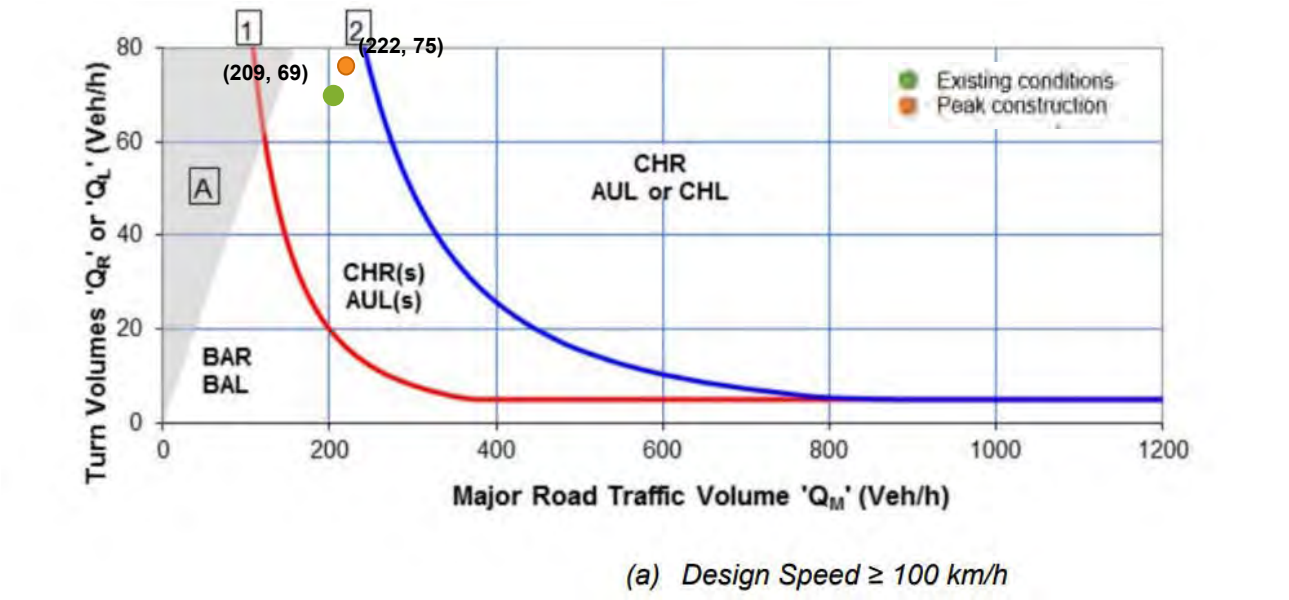


Figure 6.9 **Gatton Laidley Road/Outer Ring Road turning treatment assessment**

Source: DTMR 2014

Figure 6.9 demonstrates that as a minimum, an AUL(s) treatment is required to accommodate the turning volumes at the Gatton Laidley Road/Outer Ring Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.5 Karrabin Rosewood Road/Thagoona Haigslea Road, Mount Marrow

The Project construction methodology proposes to source quarry materials from the Mount Marrow Quarry located off Mount Marrow Quarry Road in Mount Marrow. Construction vehicles are expected to travel to/from this quarry to two laydown areas along the alignment by turning right onto Karrabin Rosewood Road and left from the Karrabin Rosewood Road.

Currently, there are moderate flows along Thagoona Haigslea Road (i.e. 318 vehicles per day, two-way). It is conservatively assumed that this equates to 24 vehicles turning into Thagoona Haigslea Road from Karrabin Rosewood Road during the peak hour. A BAL treatment is currently provided at this intersection, as shown in Figure 6.10.

Figure 6.10 Karrabin Rosewood Road/Thagoona Haigslea Road existing layout

The Project traffic assessment demonstrates that the turning movements into Thagoona Haigslea Street are expected to peak in 2023, with up to 3 vehicles per hour expected to turn into Thagoona Haigslea Road from Karrabin Rosewood Road. These turning volumes, along with the through movement volumes on Karrabin Rosewood Road are summarised in Table 6.17. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.11.

Table 6.17 Karrabin Rosewood Road/Thagoona Haigslea Road turning treatment volumes

Scenario	Karrabin Rosewood Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Thagoona Haigslea Road (Q_L)
Existing volumes	303	24
Forecast volumes without Project (2023)	341	31
Project traffic	22	3
Volumes for treatment assessment	363	34

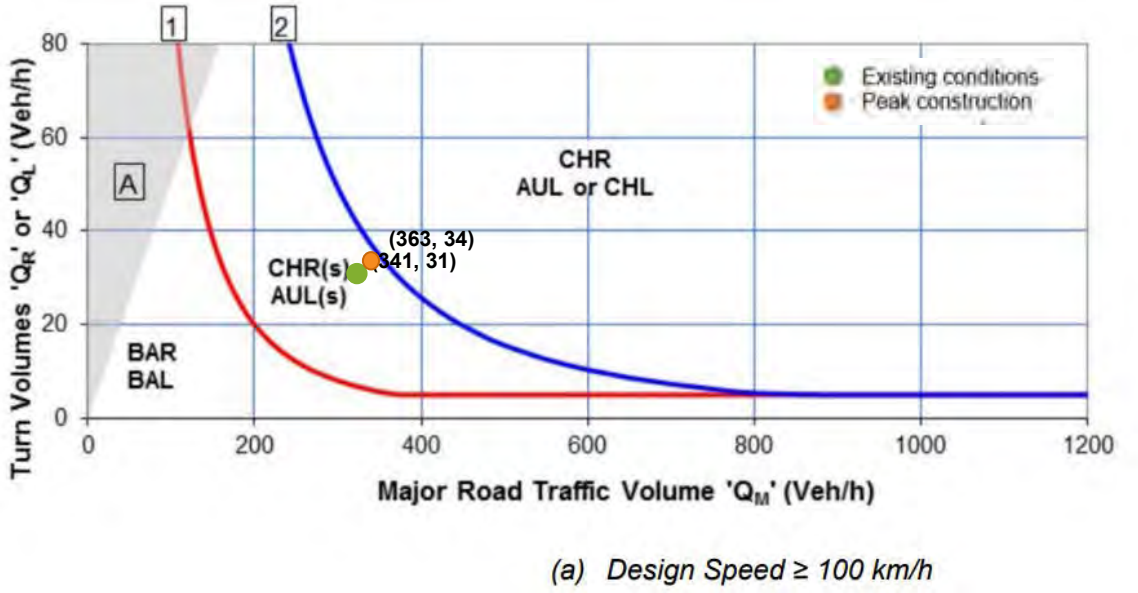


Figure 6.11 Karrabin Rosewood Road/Thagoona Haigslea Road turning treatment assessment

Source: DTMR 2014

Figure 6.11 demonstrates that as a minimum, an AUL (s) turning treatment is required to accommodate the turning volumes at the Karrabin Rosewood Road/Thagoona Haigslea Road intersection during construction. This however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.6 Laidley Plainlands Road/Boundary Road, Laidley North

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting pre-cast concrete, in-situ concrete, sleepers, quarry materials, and workers are expected to travel to these laydown areas via Laidley North by turning left and right from Laidley Plainlands Road into Boundary Road.

In the absence of traffic data, it has been assumed that the two-way flow along Boundary Road would be 800 vehicles per day. It is conservatively assumed that this equates to 60 vehicles turning into Boundary Road from Laidley Plainlands Road during the peak hour. A BAL and BAR treatment is currently provided at this intersection, as shown in Figure 6.12.

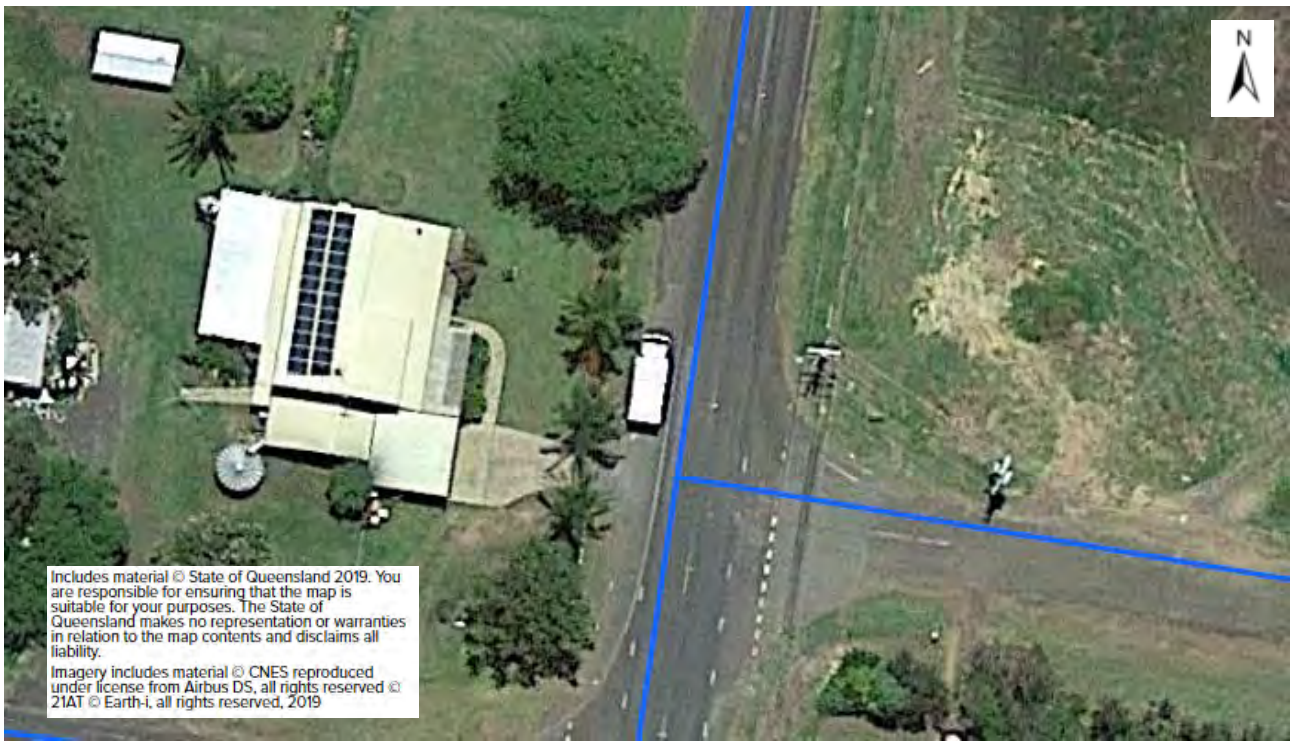


Figure 6.12 Laidley Plainlands Road/Boundary Road existing layout

The Project traffic assessment demonstrates that the turning movements into Boundary Road are expected to peak in 2024, with up to 3 vehicles per hour expected to turn into Boundary Road from Laidley Plainlands Road. These turning volumes, along with the through movement volumes on Laidley Plainlands Road, are summarised in Table 6.18 and Table 6.19. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.13.

Table 6.18 Laidley Plainlands Road/Boundary Road left turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Boundary Road (Q_L)
Existing volumes	393	60
Forecast volumes without Project (2024)	451	68
Project traffic	23	3
Volumes for treatment assessment	475	71

Table 6.19 Laidley Plainlands Road/Boundary Road right turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Boundary Road (Q_R)
Existing volumes	785	60
Forecast volumes without Project (2024)	902	68
Project traffic	47	3
Volumes for treatment assessment	949	71

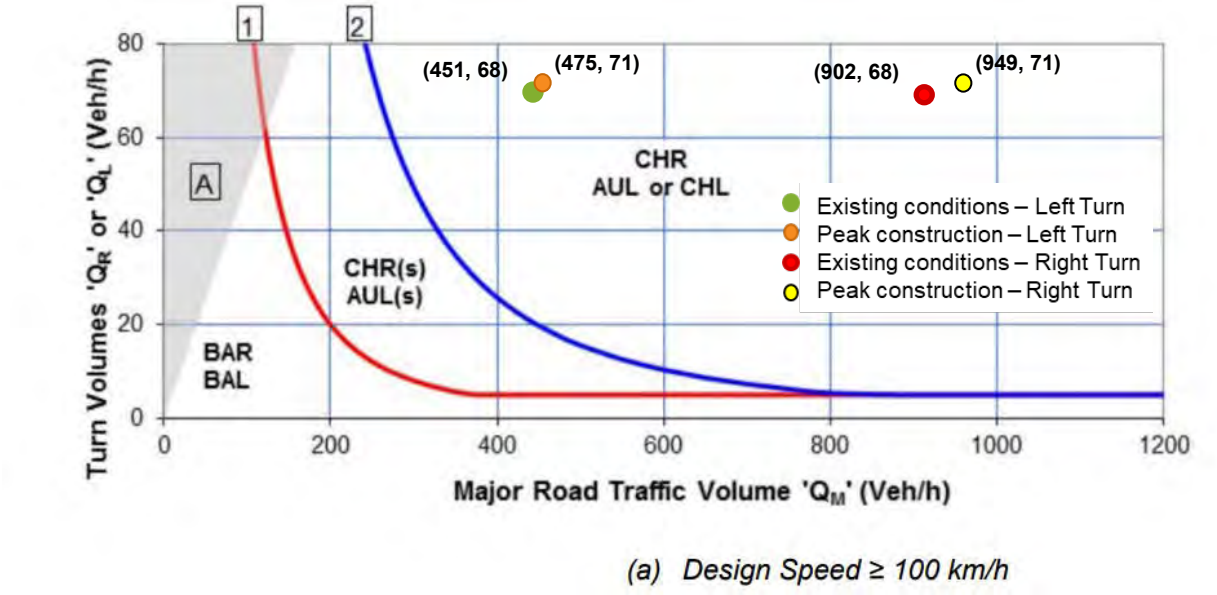


Figure 6.13 Laidley Plainlands Road/Boundary Road turning treatment assessment

Source: DTMR 2014

Figure 6.13 demonstrates that as a minimum, an AUL and CHR treatment is required to accommodate the turning volumes at the Laidley Plainlands Road/Boundary Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.7 Laidley Plainlands Road/Gatton Laidley Road, Laidley

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting pre-cast concrete, in-situ concrete, sleepers, quarry materials, and workers are expected to travel to these laydown areas via Laidley by turning left and right from Laidley Plainlands Road into Gatton Laidley Road.

Currently, there are moderate flows along Gatton Laidley Road (i.e. 2373 vehicles per day, two-way). It is conservatively assumed that this equates to 178 vehicles turning into Gatton Laidley Road from Laidley Plainlands Road during the peak hour. A BAL and BAR treatment is currently provided at this intersection, as shown in Figure 6.14.

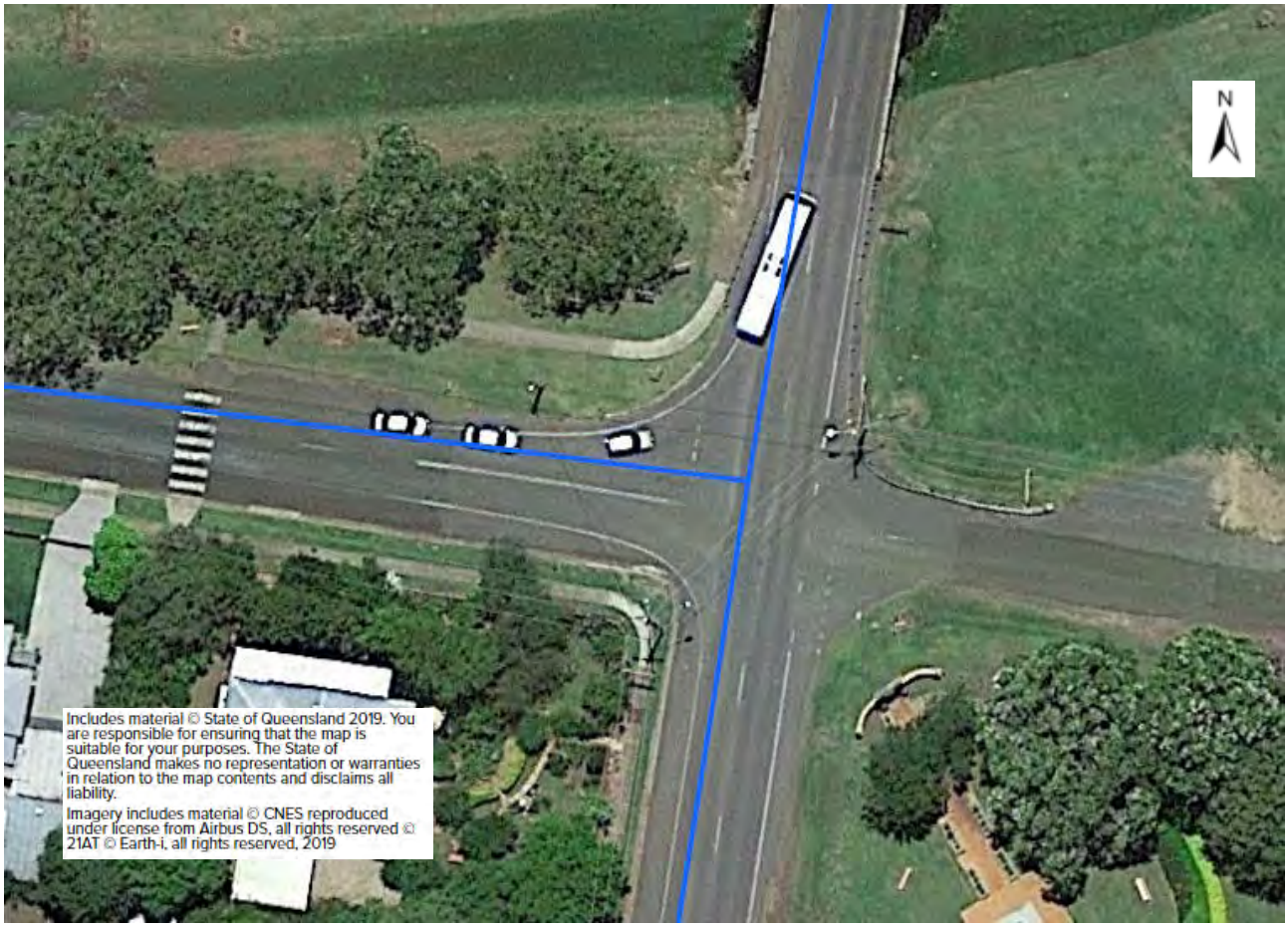


Figure 6.14 Laidley Plainlands Road/Gatton Laidley Road existing layout

The Project traffic assessment demonstrates that the turning movements into Gatton Laidley Road are expected to peak in 2023, with up to 13 vehicles per hour expected to turn into Gatton Laidley Road from Laidley Plainlands Road. These turning volumes, along with the through movement volumes on Laidley Plainlands Road, are summarised in Table 6.20 and Table 6.21. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.15.

Table 6.20 Laidley Plainlands Road/Gatton Laidley Road left turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Gatton Laidley Road (Q_L)
Existing volumes	393	178
Forecast volumes without Project (2023)	442	200
Project traffic	23	13
Volumes for treatment assessment	465	213

Table 6.21 Laidley Plainlands Road/Gatton Laidley Road right turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Gatton Laidley Road (Q_R)
Existing volumes	785	178
Forecast volumes without Project (2023)	884	200
Project traffic	47	13
Volumes for treatment assessment	931	213

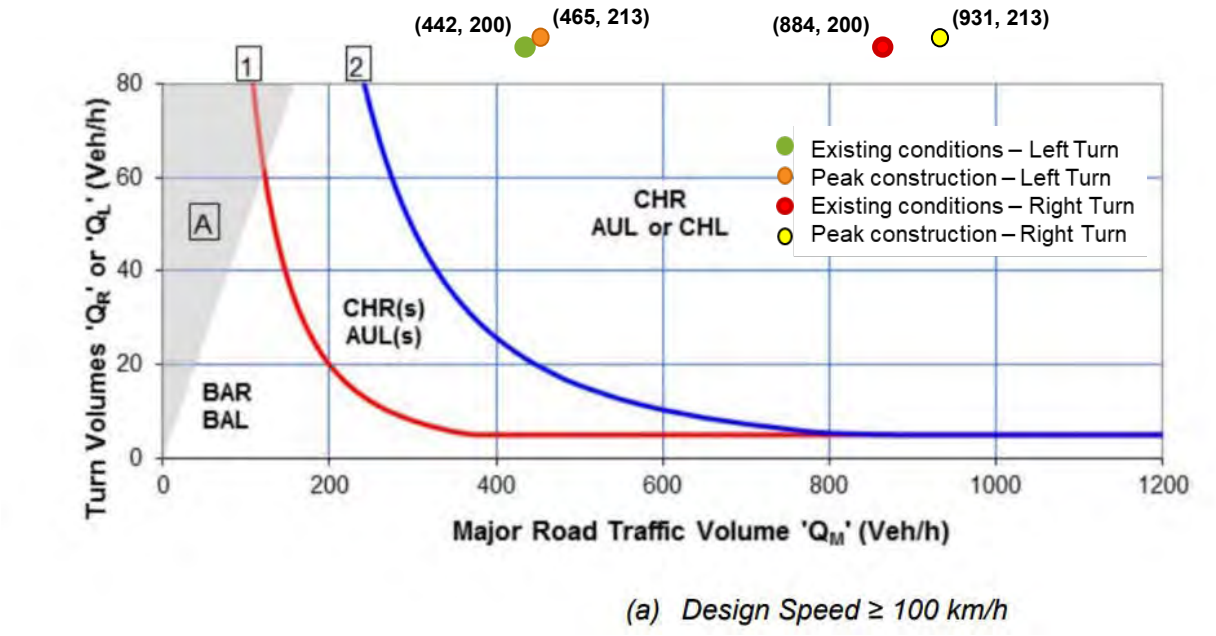


Figure 6.15 **Laidley Plainlands Road/Gatton Laidley Road turning treatment assessment**

Source: DTMR 2014

Figure 6.15 demonstrates that as a minimum, an AUL and CHR treatment are required to accommodate the turning volumes at the Laidley Plainlands Road/Gatton Laidley Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.8 Laidley Plainlands Road/Old Laidley Forest Hill Road, Laidley North

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting in-situ concrete, water and mass haul are expected to travel to these laydown areas via Laidley North by turning left and right from Laidley Plainlands Road into Old Laidley Forest Hill Road.

Currently, there are moderate flows along Old Laidley Forest Hill Road (i.e. 1390 vehicles per day, two-way). It is conservatively assumed that this equates to 104 vehicles turning into Old Laidley Forest Hill Road from Laidley Plainlands Road during the peak hour. A Bal and BAR treatment is currently provided at this intersection, as shown in Figure 6.16.

Figure 6.16 Laidley Plainlands Road/Old Laidley Forest Hill Road existing layout

The Project traffic assessment demonstrates that the turning movements into Old Laidley Forest Hill Road are expected to peak in 2023, with up to 5 vehicles per hour expected to turn into Old Laidley Forest Hill Road from Laidley Plainlands Road. These turning volumes, along with the through movement volumes on Laidley Plainlands Road, are summarised in Table 6.22 and Table 6.23. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.17.

Table 6.22 Laidley Plainlands Road/Old Laidley Forest Hill Road left turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Old Laidley Forest Hill Road (Q_L)
Existing volumes	393	104
Forecast volumes without Project (2023)	442	120
Project traffic	23	5
Volumes for treatment assessment	466	125

Table 6.23 Laidley Plainlands Road/Old Laidley Forest Hill Road right turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Old Laidley Forest Hill Road (Q_R)
Existing volumes	785	104
Forecast volumes without Project (2022)	884	120
Project traffic	47	5
Volumes for treatment assessment	931	125

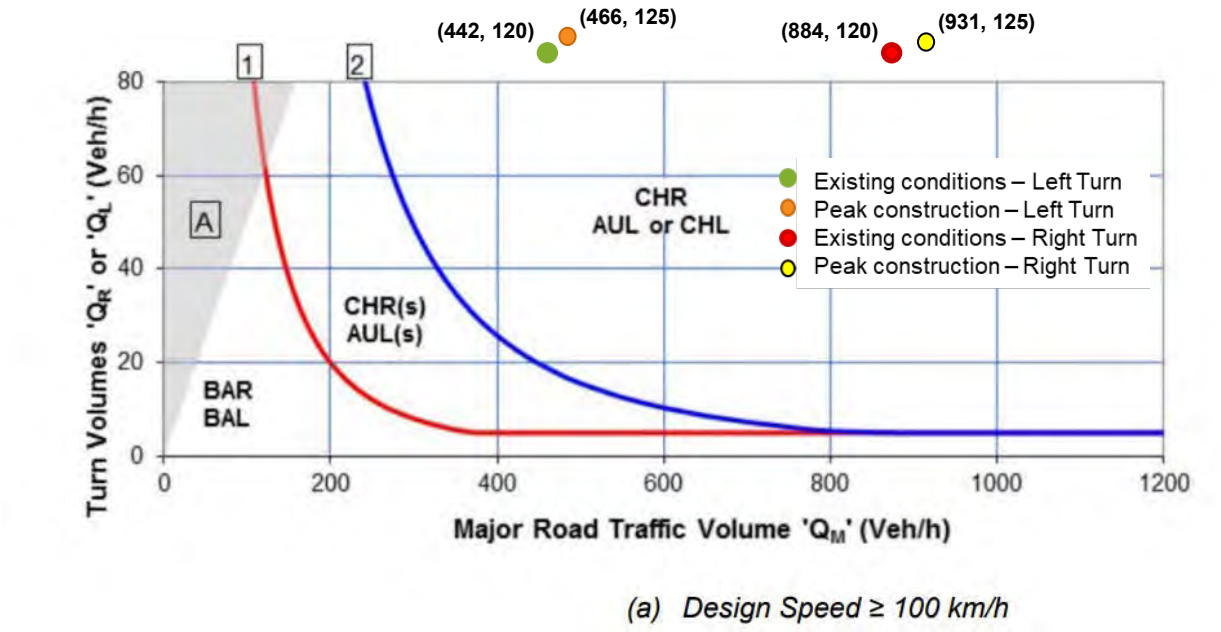


Figure 6.17 Laidley Plainlands Road/Old Laidley Forest Hill Road turning treatment assessment

Source: DTMR 2014

Figure 6.17 demonstrates that as a minimum, an AUL and CHR treatment are required to accommodate the turning volumes at the Laidley Plainlands Road/Old Laidley Forest Hill Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.9 Laidley Plainlands Road/Railway Street, Laidley

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting pre-cast concrete, in-situ concrete, sleepers, quarry materials, water, workers, tunnel spoil and mass haul are expected to travel to these laydown areas via Laidley by turning left and right from Laidley Plainlands Road into Railway Street.

Currently, there are moderate flows along Railway Street (i.e. 16 vehicles per day, two-way). It is conservatively assumed that this equates to 1 vehicle turning into Railway Street Road from Laidley Plainlands Road during the peak hour. A BAL and BAR treatment is currently provided at this intersection, as shown in Figure 6.18.

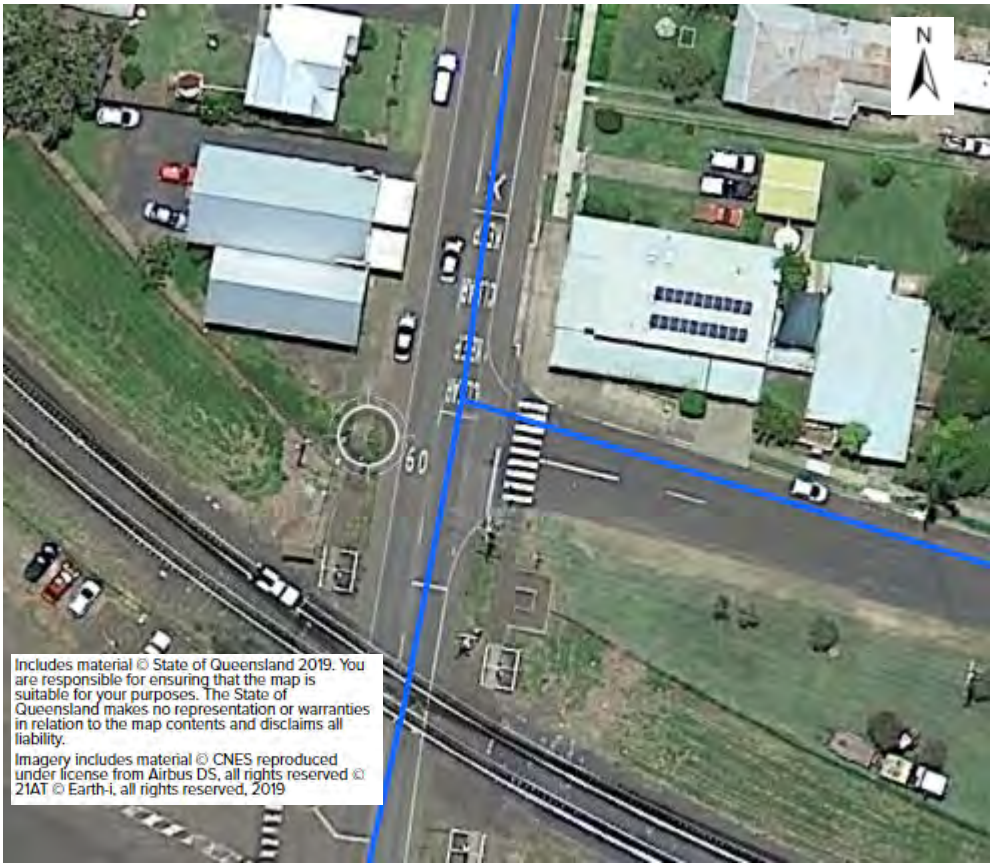


Figure 6.18 Laidley Plainlands Road/Railway Street existing layout

The Project traffic assessment demonstrates that the turning movements into Railway Street are expected to peak in 2022, with up to 11 vehicles per hour expected to turn into Railway Street from Laidley Plainlands Road. These turning volumes, along with the through movement volumes on Laidley Plainlands Road, are summarised in Table 6.24 and Table 6.25. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.19.

Table 6.24 Laidley Plainlands Road/Railway Street left turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour left turn volume into Railway Street (Q_L)
Existing volumes	393	1
Forecast volumes without Project (2022)	434	1
Project traffic	23	11
Volumes for treatment assessment	457	12

Table 6.25 Laidley Plainlands Road/Railway Street right turning treatment volumes

Scenario	Laidley Plainlands Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Railway Street (Q_R)
Existing volumes	785	1
Forecast volumes without Project (2022)	867	1
Project traffic	47	11
Volumes for treatment assessment	914	12

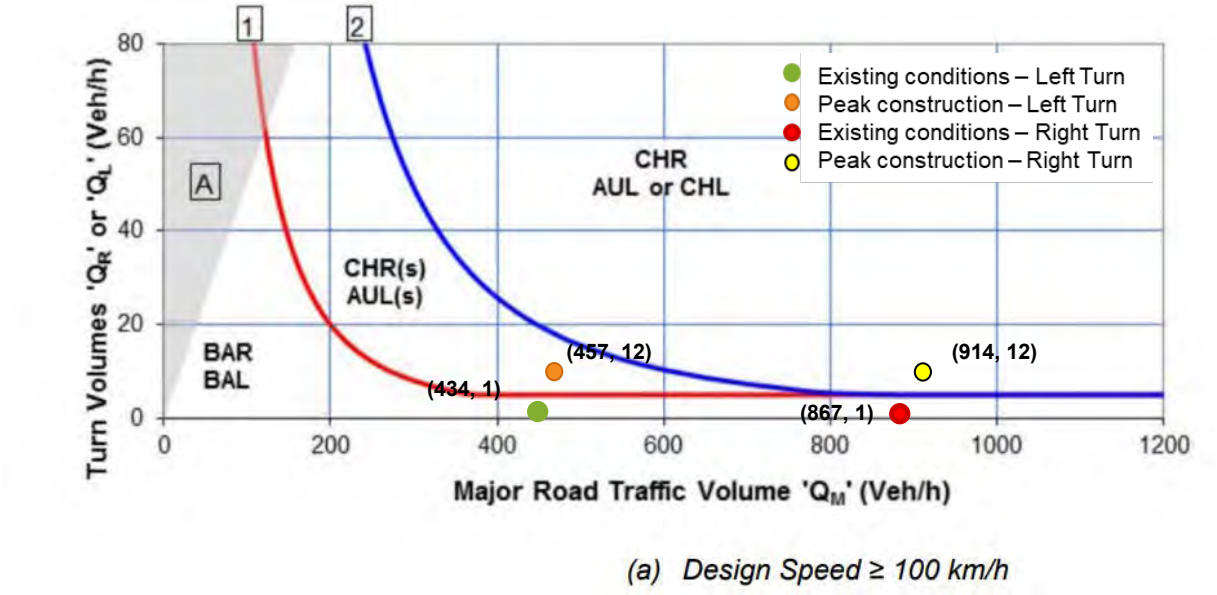


Figure 6.19 **Laidley Plainlands Road/Railway Street turning treatment assessment**

Source: DTMR 2014

Figure 6.19 demonstrates that as a minimum, an AUL(s) and CHR treatment are required to accommodate the turning volumes at the Laidley Plainlands Road/Railway Street intersection during construction.

This should be designed consistent with the requirements of Austroads Guide to Road Design Part 4A and accommodate sufficient storage for the largest proposed construction vehicle (to be confirmed with the construction contractor). It is noted that this treatment is only required during construction, with the requirement no longer necessary post-construction and as such may be agreed to be managed through temporary traffic measures rather than permanent upgrades, as to be agreed between the design and construction contractor and the asset owner.

Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.10 New England Highway/Munro Street, Toowoomba

The Project construction methodology proposes to source quarry materials from the Harlaxton Quarry located off Munro Street in Toowoomba. Construction vehicles are expected to travel to/from this quarry to laydown areas along the alignment by turning right onto the New England Highway and left from the New England Highway.

Currently, there are moderate flows along Munro Street (i.e. 398 vehicles per day, two-way). It is conservatively assumed that this equates to 30 vehicles turning into Munro Street from the New England Highway during the peak hour. A BAL treatment is currently provided at this intersection, as shown in Figure 6.20.

Figure 6.20 **New England Highway/Munro Street existing layout**

The Project traffic assessment demonstrates that the turning movements into Munro Street are expected to peak in 2024, with up to 3 vehicles per hour expected to turn into Munro Street from the New England Highway. These turning volumes, along with the through movement volumes on the New England Highway are summarised in Table 6.26. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.21.

Table 6.26 **New England Highway/Munro Street turning treatment volumes**

Scenario	New England Highway peak hour volume (Q_M, two-way)	Peak hour left turn volume into Munro Street (Q_L)
Existing volumes	1315	30
Forecast volumes without Project (2024)	1511	35
Project traffic	3	3
Volumes for treatment assessment	1513	38

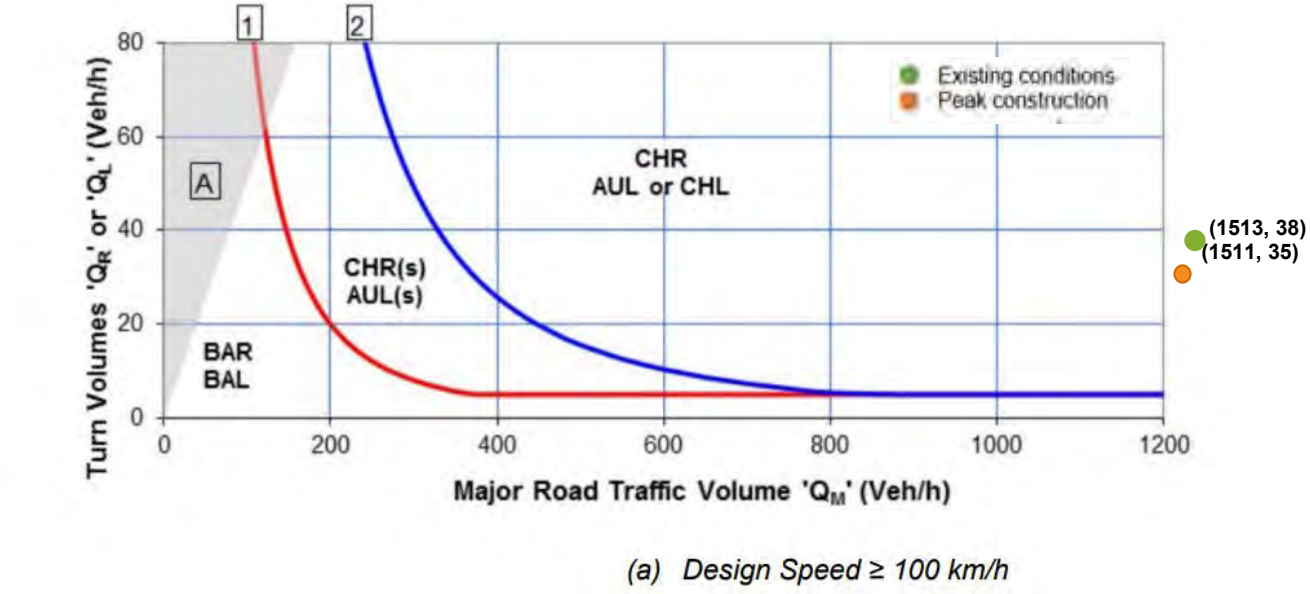


Figure 6.21 **New England Highway/Munro Street turning treatment assessment**

Source: DTMR 2014

Figure 6.21 demonstrates that as a minimum, an AUL turning treatment is required to accommodate the turning volumes at the New England Highway/Munro Street intersection during construction. This treatment however is an existing requirement at this intersection.

This will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.11 Arthur Street/Mary McKillop Street, Helidon

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting pre-cast concrete, in-situ concrete, sleepers, quarry materials, water and workers are expected to travel from these laydown areas via Helidon by turning right from Arthur Street into Mary McKillop Street.

In the absence of traffic data, it has been assumed that the two-way flow along Mary McKillop Street would be 800 vehicles per day. It is conservatively assumed that this equates to 60 vehicles turning into Mary McKillop Street from the Arthur Street during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.22.

Figure 6.22 Arthur Street/Mary McKillop Street existing layout

The Project traffic assessment demonstrates that the turning movements into Mary McKillop Street are expected to peak in 2024, with up to 17 vehicles per hour expected to turn into Mary McKillop Street from Arthur Street. These turning volumes, along with the through movement volumes on Arthur Street, are summarised in Table 6.27. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.23.

Table 6.27 Arthur Street/Mary McKillop Street turning treatment volumes

Scenario	Arthur Street peak hour volume (Q_M, two-way)	Peak hour right turn volume into Mary McKillop Street (Q_R)
Existing volumes	600	60
Forecast volumes without Project (2024)	676	68
Project traffic	38	17
Volumes for treatment assessment	714	85

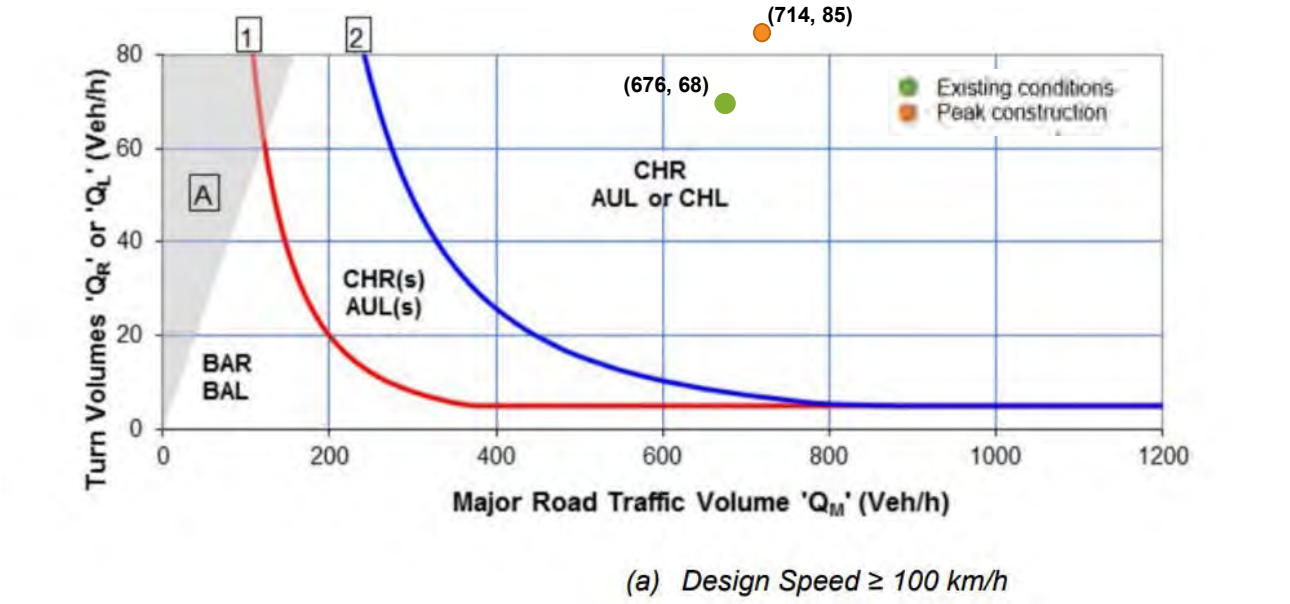


Figure 6.23 Arthur Street/Mary McKillop Street turning treatment assessment

Source: DTMR 2014

Figure 6.23 demonstrates that as a minimum, a CHR treatment is required to accommodate the turning volumes at the Arthur Street/Mary McKillop Street intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.12 Arthur Street/Station Street, Helidon

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting pre-cast concrete, in-situ concrete, sleepers, quarry materials, water and workers are expected to travel to these laydown areas via Helidon by turning right from Arthur Street into Station Street.

In the absence of traffic data, it has been assumed that the two-way flow along Station Street would be 4,000 vehicles per day. It is conservatively assumed that this equates to 300 vehicles turning into Station Street from Arthur Street during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.24.

Figure 6.24 Arthur Street/Station Street existing layout

The Project traffic assessment demonstrates that the turning movements into Station Street are expected to peak in 2023, with up to 13 vehicles per hour expected to turn into Station Street from Arthur Street. These turning volumes, along with the through movement volumes on Arthur Street, are summarised in Table 6.28. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.25.

Table 6.28 Arthur Street/Station Street turning treatment volumes

Scenario	Arthur Street peak hour volume (Q_M, two-way)	Peak hour right turn volume into Station Street (Q_R)
Existing volumes	600	300
Forecast volumes without Project (2022)	662	331
Project traffic	38	13
Volumes for treatment assessment	700	344

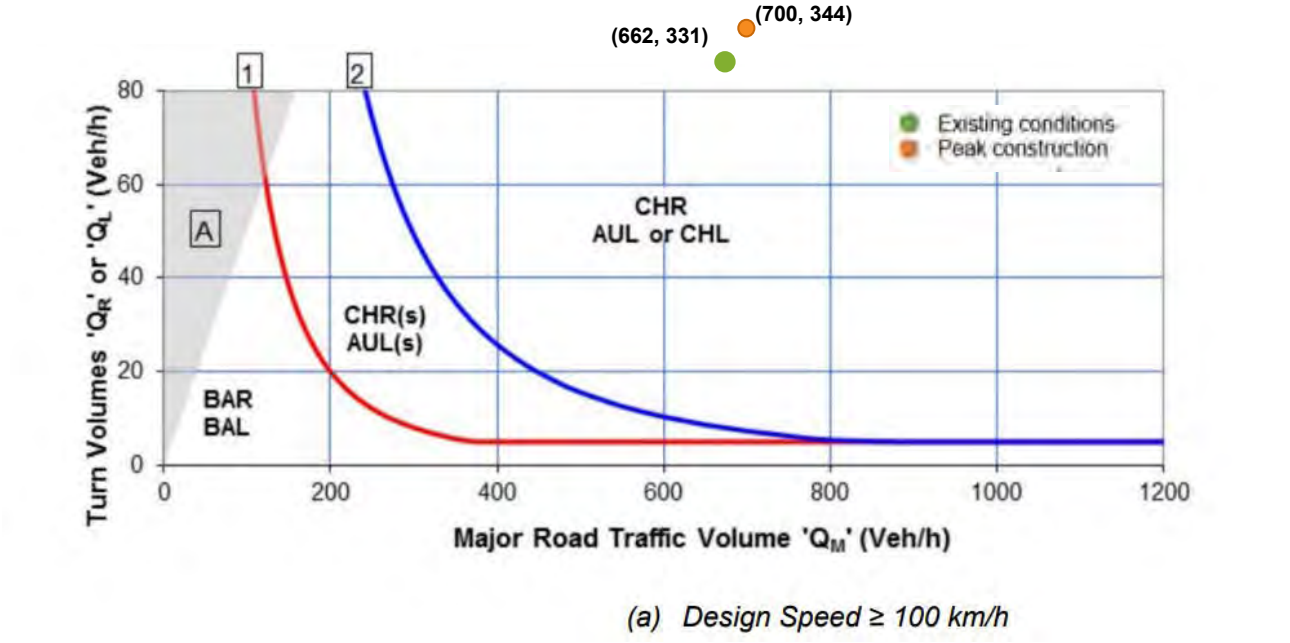


Figure 6.25 Arthur Street/Station Street turning treatment assessment

Source: DTMR 2014

Figure 6.25 demonstrates that as a minimum, a CHR treatment is required to accommodate the turning volumes at the Arthur Street/Station Street intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.13 Boxmoor Street/Philps Road, Grantham

The Project construction methodology proposes to include a laydown area adjacent to Connors Road. Construction vehicles transporting spoil and workers are expected to travel to this laydown areas via Grantham by turning right from Boxmoor Street into Philps Road.

In the absence of traffic data, it has been assumed that the two-way flow along Philps Road would be 4,000 vehicles per day. It is conservatively assumed that this equates to 300 vehicles turning into Philps Road from Boxmoor Street during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.26.

Figure 6.26 Boxmoor Street/Philps Road existing layout

The Project traffic assessment demonstrates that the turning movements into Philps Road are expected to peak in 2023, with up to 6 vehicles per hour expected to turn into Philps Road from Boxmoor Street. These turning volumes, along with the through movement volumes on Boxmoor Street, are summarised in Table 6.29. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.27.

Table 6.29 Boxmoor Street/Philps Road turning treatment volumes

Scenario	Boxmoor Street peak hour volume (Q_M, two-way)	Peak hour right turn volume into Philps Road (Q_R)
Existing volumes	600	300
Forecast volumes without Project (2023)	662	331
Project traffic	13	6
Volumes for treatment assessment	675	337

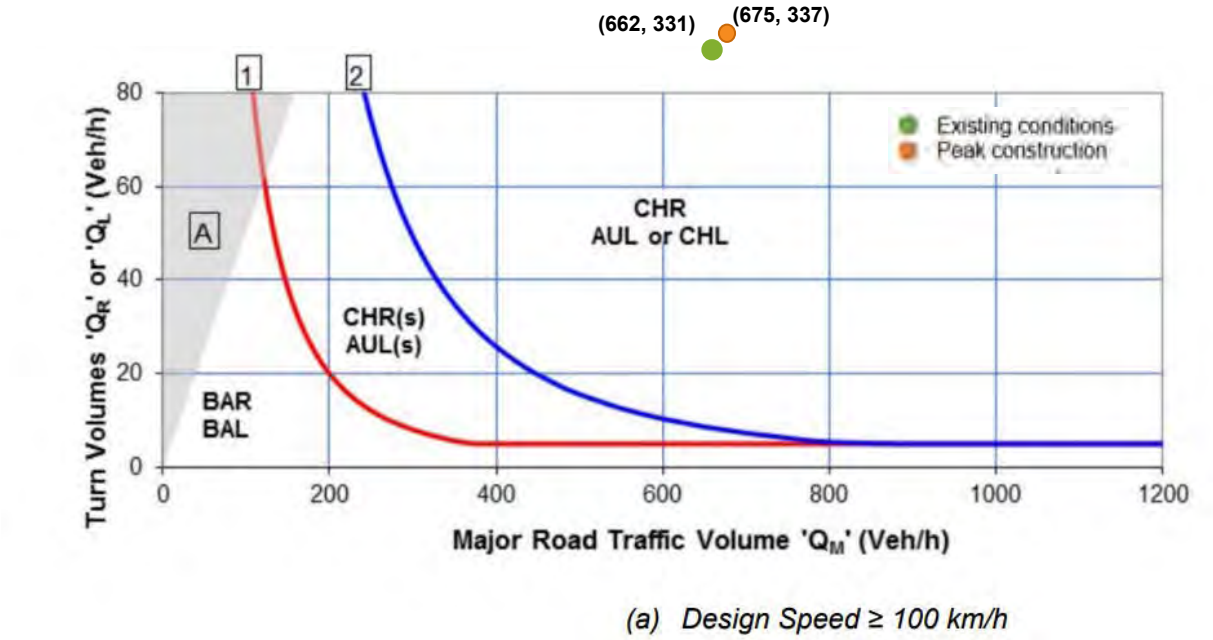


Figure 6.27 Boxmoor Street/Philps Road turning treatment assessment

Source: DTMR 2014

Figure 6.27 demonstrates that as a minimum, a CHR treatment is required to accommodate the turning volumes at the Boxmoor Street/Philps Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.14 Laidley Street/Seventeen Mile Road, Helidon

The Project construction methodology proposes to include laydown areas adjacent to Seventeen Mile Road and Connors Road. Construction vehicles transporting sleepers, quarry materials, pre-cast concrete, in-situ concrete, water, spoil and workers are expected to travel to these laydown areas via Helidon by turning left from Laidley Street into Seventeen Mile Road.

Currently, there are moderate flows along Seventeen Mile Road (i.e. 220 vehicles per day, two-way). It is conservatively assumed that this equates to 17 vehicles turning into Seventeen Mile Road from Laidley Street during the peak hour. A BAL treatment is currently provided at this intersection, as shown in Figure 6.28.

Figure 6.28 Laidley Street/Seventeen Mile Road existing layout

The Project traffic assessment demonstrates that the turning movements into Seventeen Mile Road are expected to peak in 2023, with up to 13 vehicles per hour expected to turn into Seventeen Mile Road from Laidley Street. These turning volumes, along with the through movement volumes on Laidley Street, are summarised in Table 6.30. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.29.

Table 6.30 Laidley Street/Seventeen Mile Road turning treatment volumes

Scenario	Laidley Street peak hour volume (Q_M, two-way)	Peak hour left turn volume into Seventeen Mile Road (Q_L)
Existing volumes	300	17
Forecast volumes without Project (2023)	331	18
Project traffic	13	13
Volumes for treatment assessment	345	32

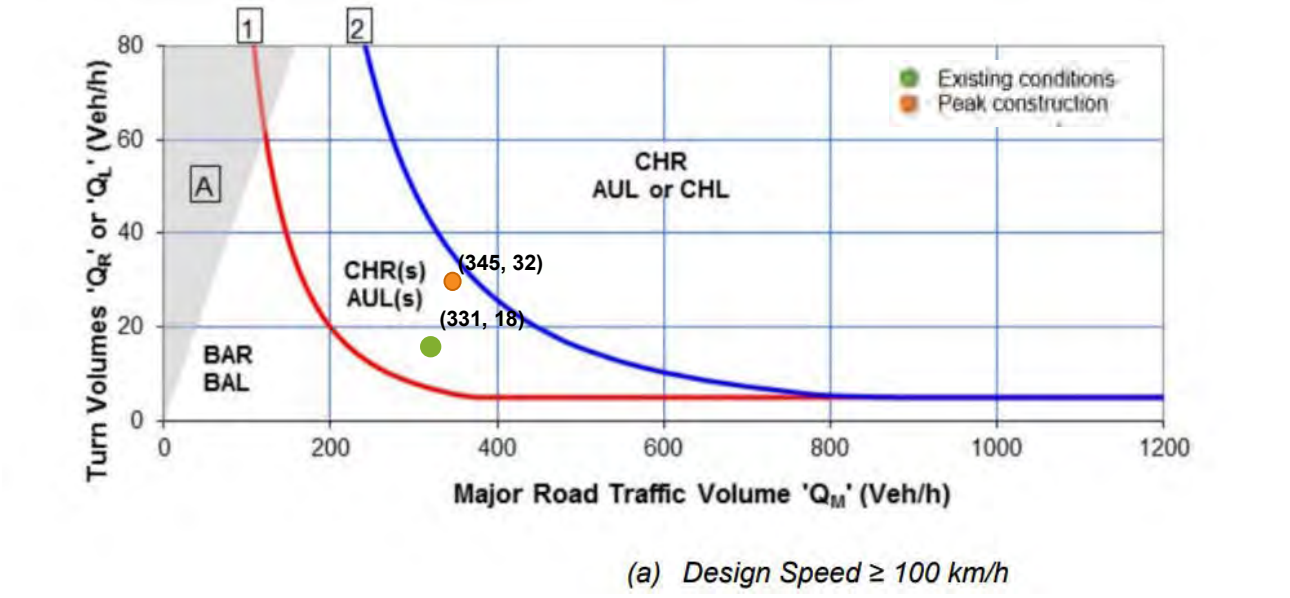


Figure 6.29 Laidley Street/Seventeen Mile Road turning treatment assessment

Source: DTMR 2014

Figure 6.29 demonstrates that as a minimum, an AUL(s) treatment is required to accommodate the turning volumes at the Laidley Street/Seventeen Mile Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.15 Laidley Street/Station Street, Helidon

The Project construction methodology proposes to include a laydown area adjacent to Station Street and Connors Road. Construction vehicles transporting sleepers, quarry materials, pre-cast concrete, in-situ concrete, water, spoil and workers are expected to travel from these laydown areas via Helidon by turning left from Laidley Street into Station Street.

In the absence of traffic data, it has been conservatively assumed that two-way flows along Station Street are 4,000 vehicles per day. It is assumed that this equates to 300 vehicles turning into Station Street from Laidley Street during the peak hour. A BAL treatment is currently provided at this intersection, as shown in Figure 6.30.

Figure 6.30 Laidley Street/Station Street existing layout

The Project traffic assessment demonstrates that the turning movements into Station Street are expected to peak in 2023, with up to 13 vehicles per hour expected to turn into Station Street from Laidley Street. These turning volumes, along with the through movement volumes on Laidley Street, are summarised in Table 6.31. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.31.

Table 6.31 Laidley Street/Station Street turning treatment volumes

Scenario	Laidley Street peak hour volume (Q_M, two-way)	Peak hour left turn volume into Station Street (Q_L)
Existing volumes	300	300
Forecast volumes without Project (2023)	331	331
Project traffic	13	13
Volumes for treatment assessment	345	345

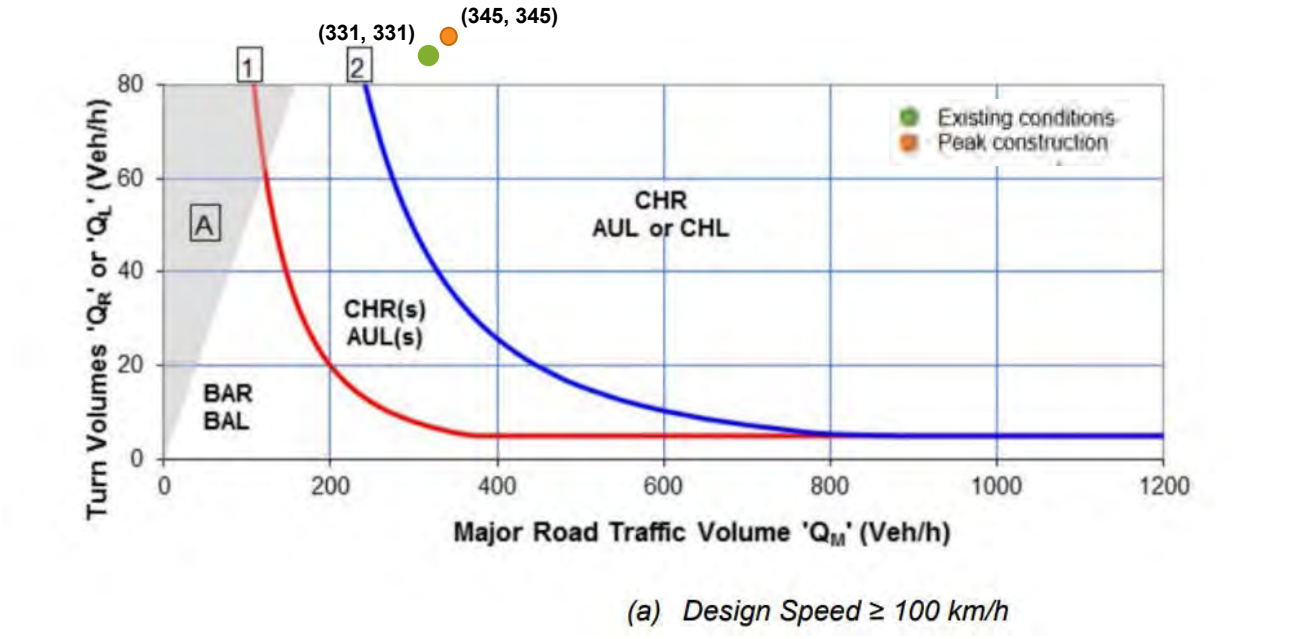


Figure 6.31 Laidley Street/Station Street turning treatment assessment

Source: DTMR 2014

Figure 6.31 demonstrates that as a minimum, an AUL treatment is required to accommodate the turning volumes at the Laidley Street/Station Street intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.16 Jamiesons Road/Burgess Road, Gatton

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting in-situ concrete and workers are expected to travel to these laydown areas via Gatton by turning right from Jamiesons Road into Burgess Road.

Currently, there are moderate flows along Burgess Road (i.e. 1546 vehicles per day, two-way). It is conservatively assumed that this equates to 116 vehicles turning into Burgess Road from Jamiesons Road during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.32.

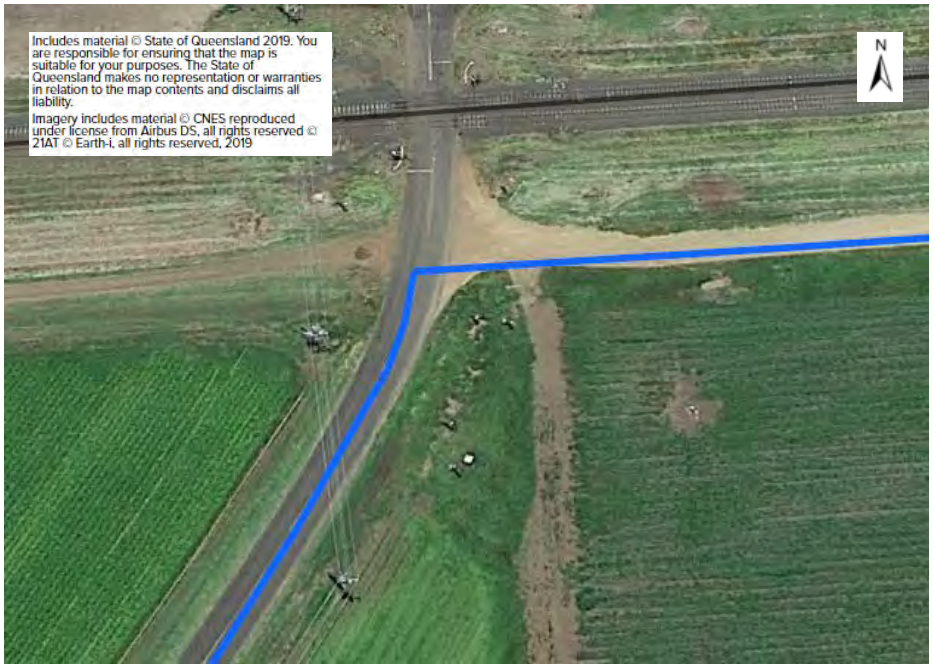


Figure 6.32 Jamiesons Road/Burgess Road existing layout

The Project traffic assessment demonstrates that the turning movements into Burgess Road are expected to peak in 2022, with up to 3 vehicles per hour expected to turn into Burgess Road from Jamiesons Road. These turning volumes, along with the through movement volumes on Jamiesons Road, are summarised in Table 6.32. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.33.

Table 6.32 Jamiesons Road/Burgess Road turning treatment volumes

Scenario	Jamiesons Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Burgess Road (Q_R)
Existing volumes	600	116
Forecast volumes without Project (2022)	649	126
Project traffic	6	3
Volumes for treatment assessment	655	128

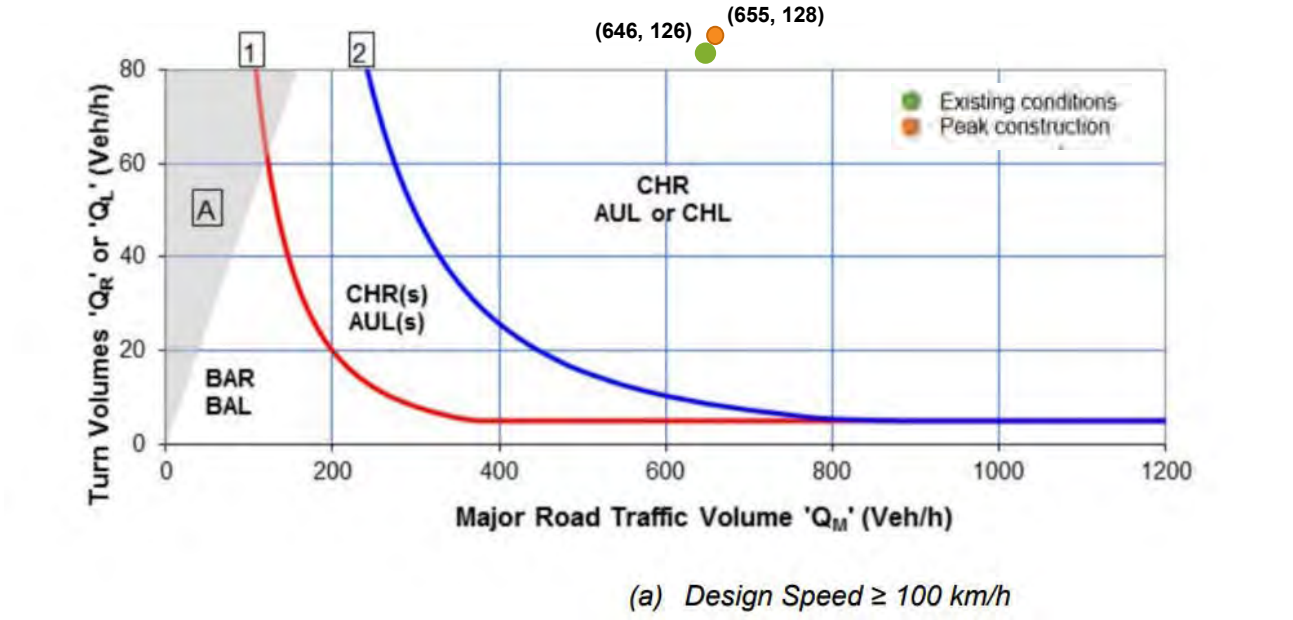


Figure 6.33 Jamiesons Road/Burgess Road turning treatment assessment

Source: DTMR 2014

Figure 6.33 demonstrates that as a minimum, an CHR treatment is required to accommodate the turning volumes at the Jamiesons Road/Burgess Road intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.17 Turner Street/Mary McKillop Street, Helidon

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting sleepers, quarry materials, pre-cast concrete, in-situ concrete, water, spoil and workers are expected to travel to these laydown areas via Helidon by turning right from Turner Street into Mary McKillop Street.

In the absence of traffic data, it has been conservatively assumed that two-way flows along Mary McKillop Street are 800 vehicles per day. It is assumed that this equates to 60 vehicles turning into Mary McKillop Street from Turner Street during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.34.

Figure 6.34 Turner Street/Mary McKillop Street existing layout

The Project traffic assessment demonstrates that the turning movements into Mary McKillop Street are expected to peak in 2024, with up to 17 vehicles per hour expected to turn into Mary McKillop Street from Turner Street. These turning volumes, along with the through movement volumes on Turner Street, are summarised in Table 6.33. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.35.

Table 6.33 Turner Street/Mary McKillop Street turning treatment volumes

Scenario	Turner Street peak hour volume (Q_M, two-way)	Peak hour right turn volume into Mary McKillop Street (Q_R)
Existing volumes	600	60
Forecast volumes without Project (2024)	676	68
Project traffic	34	17
Volumes for treatment assessment	710	85

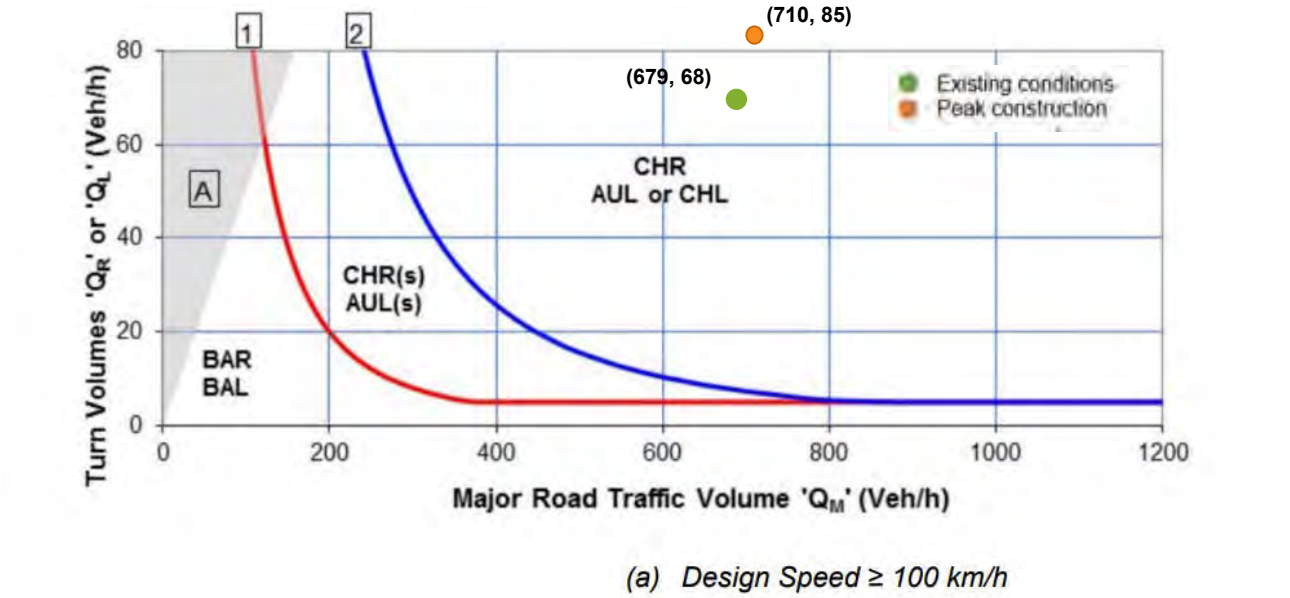


Figure 6.35 Turner Street/Mary McKillop Street turning treatment assessment

Source: DTMR 2014

Figure 6.35 demonstrates that as a minimum, an CHR treatment is required to accommodate the turning volumes at the Turner Street/Mary McKillop Street intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.18 William Street/Hickey Street, Grantham

The Project construction methodology proposes to include laydown areas adjacent to Airforce Road, Seventeen Mile Road and Connors Road. Construction vehicles transporting in-situ concrete and workers are expected to travel to these laydown areas via Grantham by turning left and right from William Street into Hickey Street.

Currently, there are moderate flows along Hickey Street (i.e. 3210 vehicles per day, two-way). It is conservatively assumed that this equates to 241 vehicles turning into Hickey Street Road from William Street during the peak hour. A BAL and BAR treatment is currently provided at this intersection, as shown in Figure 6.36.

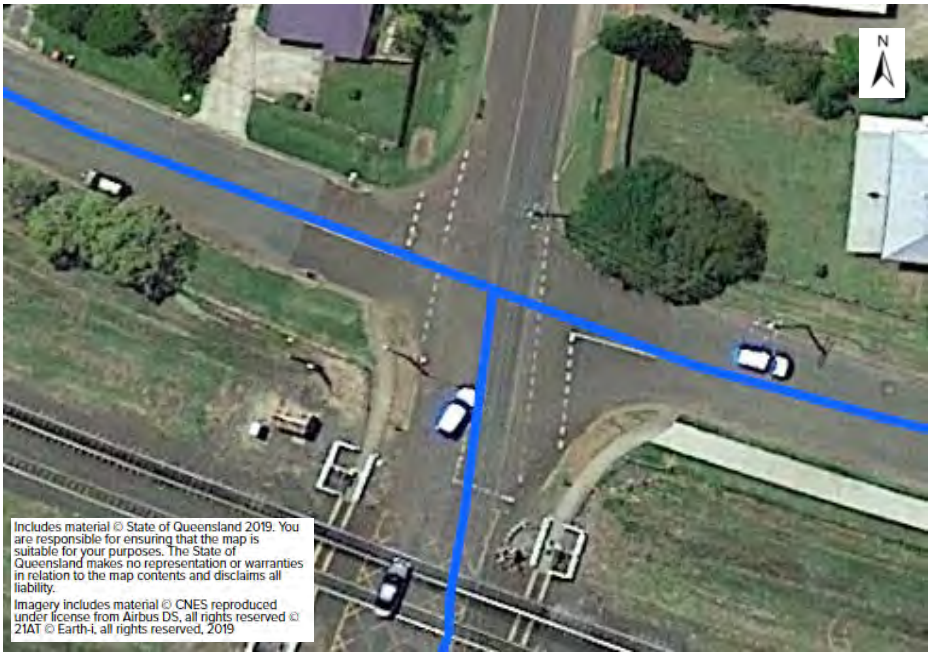


Figure 6.36 William Street/Hickey Street existing layout

The Project traffic assessment demonstrates that the turning movements into Hickey Street are expected to peak in 2023, with up to 4 vehicles per hour expected to turn into Hickey Street from William Street. These turning volumes, along with the through movement volumes on William Street, are summarised in Table 6.34 and Table 6.35. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.37.

Table 6.34 William Street/Hickey Street left turning treatment volumes

Scenario	William Street peak hour volume (Q_M, two-way)	Peak hour left turn volume into Hickey Street (Q_L)
Existing volumes	306	241
Forecast volumes without Project (2023)	337	266
Project traffic	7	4
Volumes for treatment assessment	344	270

Table 6.35 William Street/Hickey Street right turning treatment volumes

Scenario	William Street peak hour volume (Q_M, two-way)	Peak hour right turn volume into Hickey Street (Q_R)
Existing volumes	611	241
Forecast volumes without Project (2023)	675	266
Project traffic	14	4
Volumes for treatment assessment	689	270

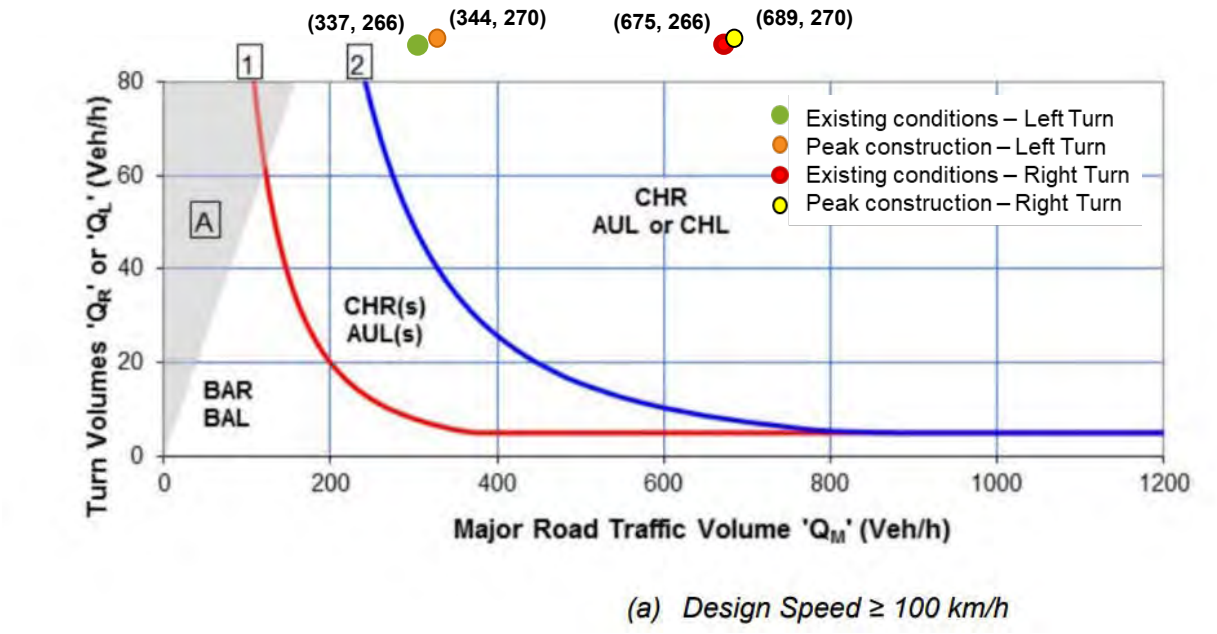


Figure 6.37 William Street/Hickey Street turning treatment assessment

Source: DTMR 2014

Figure 6.37 demonstrates that as a minimum, an AUL and CHR treatment are required to accommodate the turning volumes at the William Street/Hickey Street intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.19 Toowoomba Connection Road/Water Street, Toowoomba

The Project construction methodology currently assumes workers will travel to/from laydown areas along the alignment from Toowoomba City Centre via the Toowoomba Connection Road/Water Street intersection. These vehicles are expected to travel to lay down areas by turning left out of Water Street and travel from the laydown areas by turning right from Toowoomba Connection Road onto Water Street.

Currently, there are moderate flows along Water Street (i.e. 1,545 vehicles per day, two-way). It is conservatively assumed that this equates to 116 vehicles turning into Water Street from Toowoomba Connection Road during the peak hour. A BAR treatment is currently provided at this intersection, as shown in Figure 6.38.

Figure 6.38 Toowoomba Connection Road/Water Street existing layout

The Project traffic assessment demonstrates that the turning movements into Water Street are expected to be constant over the construction period, with up to 32 vehicles per hour expected to turn into Water Street from Toowoomba Connection Road. These turning volumes, along with the through movement volumes on Toowoomba Connection Road, are summarised in Table 6.36. To determine if a turning treatment is required at the intersection, a turning treatment assessment consistent with the requirements of Austroads Guide to Traffic Management Part 6 (2019a) is demonstrated in Figure 6.39.

Table 6.36 Toowoomba Connection Road/Water Street turning treatment volumes

Scenario	Toowoomba Connection Road peak hour volume (Q_M, two-way)	Peak hour right turn volume into Water Street (Q_R)
Existing volumes	3286	116
Forecast volumes without Project (2022)	3628	130
Project traffic	94	32
Volumes for treatment assessment	3722	162

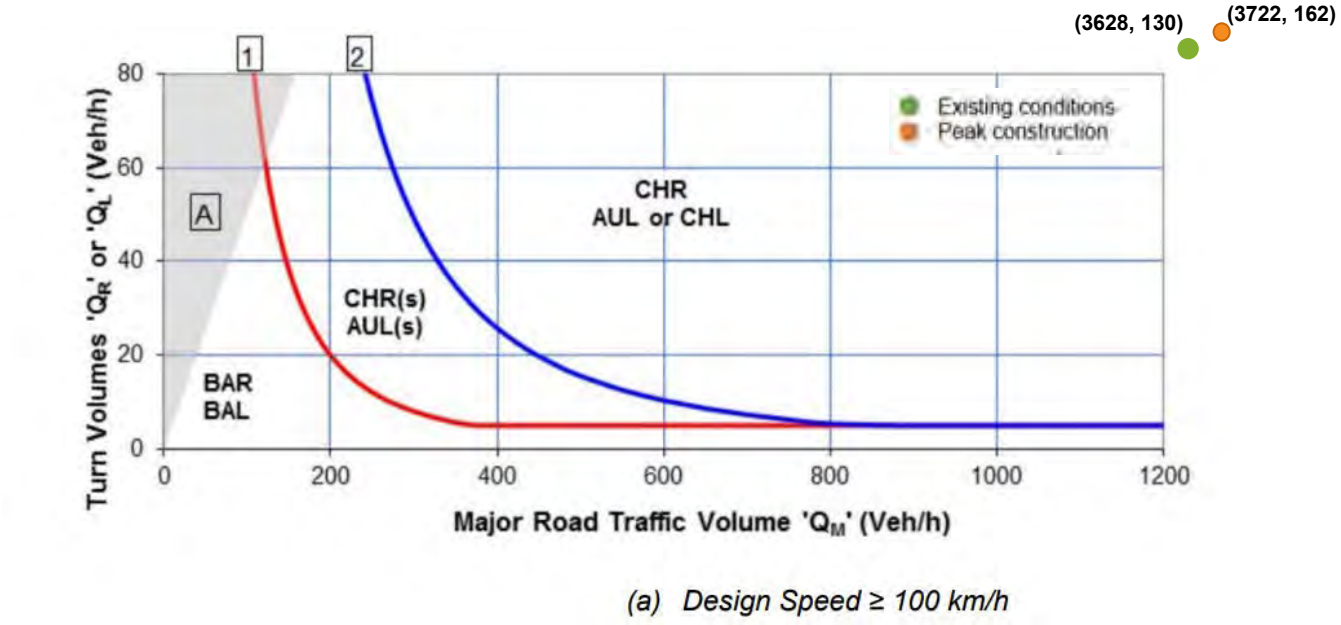


Figure 6.39 Toowoomba Connection Road/Water Street turning treatment assessment

Source: DTMR 2014

Figure 6.39 demonstrates that as a minimum, a CHR treatment is required to accommodate the turning volumes at the Toowoomba Connection Road/Water Street intersection during construction. This treatment however is an existing requirement at this intersection.

If required, this will be designed consistent with the requirements of Austroads Guide to Road Design Part 4A (2017b) and accommodate sufficient storage for the largest proposed construction vehicle.

It is noted that these treatments are warranted under existing conditions given the existing traffic flows through the intersection. Any potential intersection upgrades will be developed in consultation with DTMR and relevant local councils. This discussion will be undertaken during the development of the TMP once construction routes are finalised and agreed with the relevant asset owners.

6.3.20 Traffic management strategies at intersections

Traffic management strategies to be introduced in order to mitigate impacts along intersections will include:

- TMPs will be prepared prior to construction in accordance with the latest edition of the Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads (DTMR 2019a) and Technical Standard MRTS02 - Provision for traffic (DTMR 2019c) prior to the commencement of construction. Road safety measures will take into consideration speed restrictions, driver fatigue, in-vehicle communications, signage, demarcations, maintenance, safety checks, and interaction with public transport, transport of hazardous and dangerous goods and emergency response and disaster management.
- Temporary road works, including diversion and signage, will be in accordance with the Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads (DTMR 2019a) and the Traffic and Road Use Management Manual: Volume 7 Road Works (DTMR 2012b).
- Fatigue management measures will be introduced and enforced for all workers
- Any required works to be identified in ongoing Road Use Management Plans (RUMPs) prepared to support the Project
- All OSOM and RAV vehicles will comply with relevant guidelines as set out by DTMR and the NHVR with regard to transport safety.

There are no operational traffic mitigations proposed as Project traffic would only relate to construction traffic.

6.4 Operational phase

6.4.1 Workforce

Workforce during operational stages is assumed to reside within local surrounding towns along the Project and make up for local resident employees. It is assumed that no new trips will be generated as existing trips would be accounted for and the dispersed nature of these trips across the road network would have a minimal impact on road network operational performance. Therefore, a detailed analysis was not considered necessary as part of the TIA.

6.4.2 Maintenance

During the operational phase of the Project, it is anticipated that occasional access to and from the corridor will be required to conduct routine inspection and maintenance works. Maintenance vehicles will utilise the access track that will be constructed for the majority of the inspection and maintenance activities. However, these activities are likely to be infrequent and the related traffic volumes are likely to be minimal with no envisaged impact to operational conditions of the surrounding road network. These traffic volumes are envisaged not to exceed 5 per cent of base conditions. Therefore, a detailed analysis was not considered necessary as part of the TIA.

6.4.3 Rail crossings

The operational performance of proposed public level rail crossings in the transport study area was assessed to provide an understanding of the impacts on performance during operation stages, also taking into account any potential impact of diverted traffic created by road closures. The rail crossing impact assessment focuses on vehicle delay and queueing analysis, demonstrating how the Project generated traffic impacts on vehicle delays and queuing issues at the rail crossing, and at nearby closely spaced intersections.

The following scenarios were evaluated:

- Future Year 2026 and 2036 AM and PM peak hour analysis of proposed crossings: Operational Railway Traffic with background road traffic + operational traffic + traffic diversions if any (only at locations where short stacking might be of impact).

6.4.3.1 Analysis assumptions

Analysis of the level crossings was conducted based on the following inputs:

- The design vehicle (train) considered for the analysis account for a length of 1,800 m in future year 2026 and 1,800 m in year 2036
- Vehicle wait time at passive crossings were calculated by means of using the Australian Standard 1742.7, MUTCD – Railway crossings. The estimated wait time is considered a function of:
  - The distance of the train from the crossing at the point where a driver approaching the rail crossing sights a train, judges a stop is needed, decelerates and stops at a giveaway line
  - The time it takes the train to drive along the distance from where the vehicle sees the train and decides to decelerate
  - The time it takes the train to cross the level crossing
  - Design vehicle consisting of a B-double for input parameters.

The following points describe the assumptions relating to the operation and sequence of operations at active level crossings, vehicle wait times at active level crossings and SIDRA analysis methodology used to determine the traffic impacts of level crossings for the Project.

- Operation of the active level crossings are described as follows:
  - Active level crossings utilise warning devices to warn road users of the approach of a train. The warning devices operate when the approaching train is at a minimum warning time from entering the road-rail interface. The level crossing warning time is defined as the minimum time of operation of the warning equipment for the fastest train from the initiation of the warning sequence until the front of the train reaches the road-rail intersection.
  - For Inland Rail, the minimum warning device protection is defined in the basis of design as being an active level crossing controlled by flashing lights and half boom barriers. The minimum signage, line marking and assembly for this crossings' type is defined in AS 1742.7 and is a RX-5 flashing light assembly and half boom barriers. (Note, the standard the term RX-5 is synonymous with the term Type F Highway signal).
  - Operation of this type of crossing requires the warning devices to be initiated and maintained automatically by the detection of a train, using crossing control devices that operate on the approach side of the level crossing. This ensures the correct minimum warning time is obtained.
- Typical active level crossing sequence of operations which were adopted in the assessment are as follows:
  - If no train is approaching the level crossing then the Type F highway signals are extinguished, the half-boom barriers are a fully raised position and no audible warning can be heard

- As a train approaches the level crossing then, at the minimum warning time point (t=0), the crossing control devices trigger the Type F highway signals to commence and they continue to flash alternately. At the same time warning bells are also triggered to commence and continue to sound. The minimum warning time in QLD is 25 seconds for Type F lights and boom barrier installations.
- After 11 seconds (t=11) time interval the half-boom barriers commence to lower and after an additional 11 to 13 seconds (t=22-25) they shall reach the fully lowered position and one of the warning bells is silenced. Where there are large articulated vehicles (B triples or Road trains), the delay before the booms commence lowering can be increased by a further 5 seconds to 16 seconds. In this instance the minimum warning time would be increased accordingly.
- After the minimum approach time has expired (t=25-30) the front of the approaching train will reach the level crossing
- When the train has cleared the crossing, the booms commence to rise to the upright position and the remaining warning bell will be silenced. Unless a second train is approaching the level crossing, in the holding section, as the rear of the first train passes clear of the level crossing and there is insufficient time for the half-boom barriers to rise and remain in the fully raised position there set time interval before commencing to lower for the second train, then the boom barriers remain lowered until the rear of the second train has also passed clear of the level crossing.
- After the last train has cleared the level crossing, the booms commence to rise to the upright position and the remaining warning bell will be silenced. The half-boom barriers reach the fully raised position within 10 seconds and the Type F highway signals become extinguished.

- Train speed and train clearance times (s) calculations and assumptions (as obtained from Road-Rail Interface) for the level crossing are as follows:
  - Train clearance times were calculated based on an assumed maximum design train speed of 115 km/h
  - Calculation of the freight train acceleration rate
  - Distance of the level crossing from crossing loops
  - Distance required to accelerate to maximum crossing loop speed (50 km/h)
  - Distance travelled while at constant maximum crossing loop speed
  - Distance required to accelerate to maximum speed after whole train has passed the crossing loop
  - Total distance required to reach maximum speed for train starting from the crossing loop
  - Total vehicle wait time with train length of 1,800 m were estimated to be 104 seconds (including boom closure times).
- Active level crossings were modelled in SIDRA as follows:
  - The railway crossing was represented by a straight road with two phases. A Dummy Movement is specified to represent the train movement in Phase B when vehicle movements are stopped.
  - Phase times have been calculated assuming two trains cross within the peak hour
  - The Minimum Green Time for the Dummy Movement is specified as input so that the road closure time for the train is Minimum Green Time plus the Yellow and All-Red Times for Phase B. The remaining time which is allocated to Phase A which allows vehicles to cross the level crossing.
  - Calculated vehicle wait times for each crossing are provided in Table 6.23.
- For the purpose of the analysis it was assumed that there will be two trains per peak hour i.e. two barrier closures in the peak hour for both existing and with Project traffic scenarios. Although there are three parallel rail lines in some locations (inclusive of the existing QR West Moreton System rail corridor), the assumption of two closures is considered adequate.

- Train volumes are expected to average 32 services per day in 2026 increasing to an average of 47 train services per day in 2040
- Three level crossings have an adjacent QR West Moreton System rail corridor (refer Table 6.23). It is anticipated that wait times as a result of the QR trains crossing at these locations will be less than when an ARTC train crosses.

6.4.3.2 Site analysis

To determine the impact of the level crossing operations on the road networks, SIDRA modelling was undertaken at active and passive level crossing locations along the route for the 'with Project' scenarios. SIDRA analysis was not undertaken for the 'without Project' scenario as the 'with Project' scenario is indicative of the worst-case scenario when compared to the existing crossing operations. Additionally, SIDRA analysis was not undertaken at sites which only served low levels of local/occupational volumes. Table 6.22 provides a summary of the active level crossings and passive level crossings along the Project route, and whether SIDRA modelling were deemed necessary.

Table 6.37 Active/passive level crossing sites (public and formed roads only)

Interface ID	Road name	Proposed treatment	SIDRA analysis?
DTMR			
330-9-P-1	Glenore Grove Road	Active level crossing	Yes
LVRC			
330-2-P-5	Connors Road	Active level crossing	Yes
330-6-E-1	Jamiesons Road	Active level crossing	Yes
330-6-E-5	Gaul Street	Close - Consolidate	Yes – detailed analysis included in Appendix Q
330-9-E-1	Dodt Road	Active level crossing	Yes
ICC			
330-14-P-2	Grand Chester Mount Mort Road	Active level crossing	Yes
330-15-E-4	Calvert Station Road	Active level crossing	Yes

6.4.3.3 Analysis results

Based on the assumptions outlined in the above sections, the rail crossing wait times shown in Table 6.23 were calculated.

Table 6.38 Vehicle wait times

Road rail interface ID	Adjacent QR line?	Crossing type	Total wait time per closure (seconds)
330-2-P-5	-	Public	213
330-6-E-1	Yes	Public	106
330-9-E-1	Yes	Public	98
330-9-P-1	Yes	Public	114
330-14-P-2	-	Public	128
330-15-E-4	-	Public	147

As shown in Table 6.23, three of the active level crossings have an adjacent QR line. It is not anticipated that QR trains will cross concurrently at these crossings with ARTC trains. Additionally, this analysis conservatively assumes two ARTC trains crossing concurrently, which will likely close these crossings for a longer period than QR trains would. Therefore, wait times for QR trains have not been included in this analysis.

The SIDRA analysis results, which take into account this wait time, have been provided in Table 6.24. The results show the queue and delay associated with the proposed level crossing for the two future year scenarios.

Table 6.39 Proposed level rail crossings – analysis results

Road Rail Interface Location			Year 2026 (1,800m train length)				Year 2036 (1,800m train length)			
			With Project				With Project			
			Volume * (veh/h)	Queue (m)	Delay * (s)	LOS	Volume * (veh/h)	Queue (m)	Delay ** (s)	LOS
330-2-P-5: Connors Road										
AM	Connors Road (E)	T	6	Negligible***	13.5	A	8	6.0	13.5	A
	Connors Road (W)	T	4	Negligible***	13.5	A	5	Negligible***	13.5	A
PM	Connors Road (E)	T	5	Negligible***	13.5	A	6	Negligible***	13.5	A
	Connors Road (W)	T	7	Negligible***	13.5	A	9	7.0	13.5	A
330-6-E-1: Jamiesons Road										
AM	Jamiesons Road (S)	T	110	46.3	3.7	A	134	57.2	3.8	A
	Jamiesons Road (N)	T	54	21.3	3.6	A	66	26.1	3.6	A
PM	Jamiesons Road (S)	T	84	34.8	3.7	A	102	42.9	3.7	A
	Jamiesons Road (N)	T	123	50.3	3.8	A	150	62.3	3.8	A
330-9-E-1: Dodt Road										
AM	Dodt Road (S)	T	1	Negligible***	3.0	A	2	Negligible***	3.0	A
	Dodt Road (N)	T	1	Negligible***	3.0	A	2	Negligible***	3.0	A
PM	Dodt Road (S)	T	1	Negligible***	3.0	A	2	Negligible***	3.0	A
	Dodt Road (N)	T	1	Negligible***	3.0	A	2	Negligible***	3.0	A
330-9-P-1: Glenore Grove Road**										
AM	Glenore Grove Road (N)	T	162	73.4	4.4	A	197	91.4	4.5	A
	Glenore Grove Road (S)	T	254	120.0	4.7	A	310	151.6	4.9	A
PM	Glenore Grove Road (N)	T	234	111.3	4.6	A	286	140.2	4.8	A
	Glenore Grove Road (S)	T	222	102.8	4.6	A	271	129.2	4.7	A
330-14-P-2: Grandchester Mount Mort Road										
AM	Grandchester Mt Road (S)	T	47	23.5	5.2	A	57	28.8	5.2	A
	Grandchester Mt Road (N)	T	43	21.4	5.2	A	53	26.3	5.2	A
PM	Grandchester Mt Road (S)	T	51	24.0	5.2	A	62	29.5	5.2	A
	Grandchester Mt Road (N)	T	58	27.2	5.2	A	71	33.4	5.2	A
330-15-E-4: Calvert Station Road										
AM	Calvert Station Road (S)	T	30	15.7	6.7	A	36	19.3	6.7	A
	Calvert Station Road (N)	T	14	7.1	6.6	A	17	8.7	6.6	A
PM	Calvert Station Road (S)	T	18	9.8	6.6	A	23	11.9	6.6	A
	Calvert Station Road (N)	T	31	16.4	6.7	A	38	20.1	6.7	A

Table notes:

Veh/hr = vehicles per hour

* SIDRA modelled volumes may differ slightly from inputs due to rounding

** Average weighted delay for all vehicles approaching the level crossing in the hour. The minimum delay to a single vehicle would be 0s, and the maximum delay would be the sum of the vehicle wait time specified in Table 6.38 as well as any additional time for queues to clear
*** Queue length less than one car length (6m)
**** Traffic volumes from Hunt Street applied

6.4.3.4 Connors Road (330-2-P-5)

The results of the analysis indicate that the proposed level crossing along Connors Road (330-2-P-5) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the east approach would be 6.0 m in the 2036 AM peak, with maximum queue length along the west approach being 7.0 m in the year 2036 PM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections.

6.4.3.5 Jamiesons Road (330-6-E-1)

The results of the SIDRA analysis indicate that the existing level crossing along Jamiesons Road (330-6-E-1) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. The Jamiesons Road level crossing is located approximately 65 m south of the proposed Jamiesons Road/Smithfield Road intersection, providing sufficient queuing space to achieve the ARTC short stacking requirement of 31 m (26 m B-double design vehicle + 5 m safety factor). The calculated 95th percentile queue length on the north approach of the crossing is expected to be 62 m in the year 2036 PM peak, and as a result, is not expected to have significant impacts on the operations of the level crossing or the proposed Jamiesons Road/Smithfield Road intersection.

Currently, the Jamiesons Road level crossing is located 20 m north of the existing Jamiesons Road/Burgess Road/Karraschs Road intersection, and approximately 95 m north of the proposed upgraded intersection. The proposed spacing provides sufficient distance to accommodate the calculated 2036 AM peak 95th percentile queue south of the level crossing (i.e. 57 m queue) and to achieve the short stacking requirement (i.e. 31 m).

6.4.3.6 Dodt Road (330-9-E-1)

The results of the analysis indicate that the existing level crossing along Dodt Road (330-9-E-1) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that there would be negligible queues along the north and south approaches for the year 2026 and 2036 AM and PM peaks.

Currently, the Dodt Road level crossing is located 26 m north of the existing Dodt Road T-intersection, and approximately 40 m north of the proposed realigned Dodt Road intersection. The realigned intersection will provide sufficient distance to achieve the short stacking requirement (i.e. 31 m) for a design vehicle turning right at this intersection.

Additionally, the Dodt Road level crossing is currently located 20 m south of the existing Dodt Road/Greyfriars Road/Railway Street intersection, providing insufficient short stacking for vehicles after crossing the level crossing northbound. It is proposed for the give-way rule be allocated on the Greyfriars Road and Railway Street approaches to allow for priority along the Dodt Road intersection, thereby alleviating the existing short stacking concern at this location.

6.4.3.7 Glenore Grove Road (330-9-P-1)

The results of the analysis indicate that the proposed level crossing along Glenore Grove Road (330-9-P-1) would operate at LOS A in the AM and PM peak in the year 2026 and 2036. SIDRA analysis indicates that the maximum queue length along the north approach of the crossing would be 140 m in the year 2036 PM peak, impacting the proposed Glenore Grove Road Avenue/Railway Street intersection located approximately 20 m north of the site when queuing is present. This impact is not considered significant. As

only 20 m of stacking is achievable between the level crossing and Railway Street, it is proposed for the right turn to be restricted into Railway Street from the south.

Modelled queue lengths along the south approach are 152 m in the year 2036 AM peak. This queue length may impact the eastern section of Gordon Street when queuing is present. No short stacking issues arise in this location as the southbound movements have priority on Gordon Street to the east and west. This impact is not considered significant. The next closest intersection is the Victoria Street/William Street intersection located approximately 220 m to the west of the site. The queuing is not expected to impact on this intersection.

It should be noted that the Glenore Grove Road (330-9-P-1) site is a proposed level crossing which is the result of closing the existing Hunt Street level crossing (330-9-E-2) in favour of realigning Glenore Grove Road to connect to Gordon Street. If the existing level crossing at Hunt Street (330-9-E-2) were to be retained, it is expected that queues on the south approach in the year 2036 AM peak would extend through the Victoria Street/William Street intersection and the Victoria Street/Robert Street intersection. It is therefore expected that the proposed level crossing at Glenore Grove Road would improve traffic operations for the surrounding network.

6.4.3.8 Grandchester Mount Mort Road (330-14-P-2)

The results of the analysis indicate that the proposed level crossing along Grandchester Mount Mort Road (330-14-P-2) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the north approach of the crossing would be 33 m in the year 2036 PM peak, with maximum queue length along the south approach being 30 m in the year 2036 PM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections with the closest intersection being the Grand Chester Mount Mort Road/School Road intersection located approximately 100 m south of the site.

6.4.3.9 Calvert Station Road (330-15-E-4)

The results of the analysis indicate that the existing level crossing along Calvert Station Road (330-15-E-4) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the north approach of the crossing would be 20m in the year 2036 PM peak, with maximum queue length along the south approach being 19 m in the year 2036 AM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections, with the closest intersection being the Hiddenvale Road/Gipps Street intersection located approximately 50 m south of the site.

6.4.4 Traffic management strategies at level crossings

- Any required works to be identified in the TMP and the draft Outline Environmental Management Plan (draft Outline EMP) prepared to support the Project
- Level crossings will be designed in order to provide for safe design standards where sufficient stacking and sight distances prevail
- Grade separation of the rail line at road crossings:
  - Delays to road vehicles would be removed entirely, and the safety risks associated with train/vehicle conflict avoided
  - This will require a significant variation to the proposal, and would have additional impacts in terms of the temporary construction disturbance footprint, costs and environmental issues
  - Due to the low volume of vehicles that are envisaged to cross the rail line, grade separation is not likely to be feasible at most level crossing locations

- During construction, options for impact mitigation will depend on the specific activity being undertaken, and the location where it is occurring. It will be up to the construction contractor to select and implement appropriate controls.

Additional details on traffic management strategies at level crossings are provided in Section 9.4 and Section 9.5.

6.5 Active transport impacts

6.5.1 Pedestrian and cycle network

A number of existing cycle networks have been identified to be coincident with proposed construction traffic routes. These impacted cycle networks have been provided in Section 2.4.1. A number of the proposed construction routes currently traverse through areas of moderate to high pedestrian activity through the city centres of Toowoomba, Gatton, Helidon, Laidley and North Ipswich. It should be noted that while increased heavy vehicle movements through these locations may adversely impact pedestrian movements, the majority of these routes currently facilitate a high proportion of heavy vehicle movements regardless.

There are five pedestrian interfaces with the Project alignment: Gatton Station (330-6-E-4a), Gaul Street east (330-6-E-5a), Dodt Road (330-9-P-0), Hunt Street (330-9-E-1a) and Grandchester Mount Mort Road 330-14-P-2a). For Gatton Station (330-6-E-4a), the existing pedestrian footbridge crosses will be replaced. This will be a grade separated crossing both QR lines and providing a link between the southern side and the northern side of Gatton.

It is proposed that each pedestrian crossings is designed to allow for accessibility for all users.

6.6 Other road impacts

As part of the TIA, Project impacts other than those affecting the existing road network were considered. These other impacts include impacts on stock routes, cycling and pedestrian networks, public transport networks, accesses and operation of emergency services.

6.6.1 Impacts on emergency services

During construction and operations, response times for emergency services may be delayed if encountering significant roadworks or passing trains at level crossings. ARTC will work with emergency services to develop protocols and joint working arrangements to address potential impacts on emergency services and service response times during construction and operation and ensure that access is retained as required.

The operational workforce will not create any significant population increase and is therefore unlikely to result in any other significant increased demand for services or infrastructure.

The emergency services agencies will be consulted prior to construction of emergency access points to identify possible solutions to minimise the potential impacts.

6.6.2 Impacts on stock routes

Currently, there are no stock routes that cross the Project alignment.

6.6.3 Public transport impacts

Given the evaluation of existing public transport services (provided in Section 2.2), it is considered that there would be minimal impacts to existing public transport services as a result of construction of the proposed rail corridor, except for the Route 539 which currently travels across the existing 330-9-E-2 Hunt Street level crossing. It is proposed that this crossing is relocated to the east, and that a proposed level crossing is provided at Glenore Grove Road (330-9-P-1) instead. This relocation will still allow for the bus route to effectively cross the rail line without significant detour delays, however, the route may be adversely affected due to higher wait times at the crossing when it is closed.

It is envisaged that the existing Hunt Street level crossing remain operational during the construction phase of the Project, thereby allowing the bus route to cross the rail line during this period.

6.6.4 School bus service impacts

The increase in construction traffic and in particular, heavy vehicle traffic has the potential to impact school bus routes. The school bus services discussed in the following sections are likely to be impacted by the Project alignment.

6.6.4.1 P1451 Forest Hill Area

The P1451 school bus service currently travels across the existing 330-9-E-2 Hunt Street level crossing. It is proposed that this crossing is relocated to the east, and that a proposed level crossing is provided at Glenore Grove Road (330-9-P-1) instead. This relocation will still allow for the bus route to effectively cross the rail line without significant detour delays, however, the route may be adversely affected due to higher wait times at the crossing when it is closed.

It is envisaged that the existing Hunt Street level crossing remain operational during the construction phase of the Project, thereby allowing the bus route to cross the rail line during this period. During the construction phase of the Project, bus operators will be consulted as part of the Project and made aware of the various construction activities. The contractors will also be made aware of the presence of school bus routes and their operational hours as part of the Project induction process.

6.6.4.2 S848 AM and PM Grandchester, Laidley State High School

The S848 school bus service currently travels along Grand Chester Mount Mort Road. It is proposed that an active level crossing is implemented along this road (330-14-P-2), which may result in delays to the bus service if it is required to wait at the crossing for a train to pass. Bus operators will be consulted as part of the Project to be made aware of impacts to bus services as a result of the proposed active level crossing at this location.

Prior to the construction phase of the Project, a suitable detour route for this service will be identified. Both prior to and during the construction phase of the Project, bus operators will be consulted as part of the Project and made aware of the various construction activities. The contractors will also be made aware of the presence of school bus routes and their operational hours as part of the Project induction process.

6.6.4.3 S187 AM and PM Calvert, Ashwell Area, Ashwell State School and Rosewood State High School

The S187 school bus service currently travels along Calvert Station Road and crosses the existing level crossing at 330-15-E-4. Although bus services may already be required to wait at the crossing for a train to pass, delays at this crossing may be increased as a result of the Project. Bus operators will be consulted as part of the Project to be made aware of impacts to bus services as a result of the proposed active level crossing at this location.

Both prior to and during the construction phase of the Project, bus operators will be consulted as part of the Project and made aware of the various construction activities. The contractors will also be made aware of the presence of school bus routes and their operational hours as part of the Project induction process.

6.6.5 State strategic touring routes

Given the evaluation of construction traffic on the road network, it is considered that although some strategic touring routes are coincident with proposed primary construction routes, including but not limited to the Bicentennial National Trail, the short-term nature of the construction phase would result in only temporary impacts to these routes.

6.6.6 Access and egress

Construction vehicle access would be via the existing road network and proposed access tracks. These access points must be chosen such that adequate sight distance and a safe access/egress path are available. Further investigation of access locations will be required once additional detail around the planned construction methodology is known. This is expected to become available during the detailed design stages. In particular, the proposed access points off the Warrego Highway will be investigated in further detail and approved by DTMR prior to the construction phase. Further details have been provided in Section 5.7.13.

All construction access points will be designed in accordance with Australian Standards with adequate sight lines to ensure they operate in a safe and efficient manner. In addition, where possible, access will be provided from secondary roads to minimise the potential disruptions to the nearby arterial road network.

Where the proposed rail line is in close proximity to the arterials with limited alternative access routes, specific traffic management will be put in place reflecting the prevailing conditions. Where possible, access will be along the rail corridor from a nearby secondary road. Encroachment of construction works into existing road reserves is not anticipated.

A RMAR is required to facilitate maintenance for critical infrastructure (e.g. crossing loops), and to provide access for emergency recovery. Formation level access has been proposed for all crossing loop locations, and, where reasonably practical, for the Full extent of crossing loops. Operational maintenance activities will use the existing road network to travel to the rail corridor. Once in the rail corridor, the RMAR incorporated into the design of the Project will be used in preference to the existing road network for project maintenance activities.

7 Pavement impact assessment

A preliminary desktop pavement impact assessment was undertaken on all envisaged affected DTMR and RMS SCRs based on the existing background traffic data available for the relevant road sections. The heavy vehicle component of the AADT was calculated for the construction period by adopting the background heavy vehicle percentages from the traffic data.

All base pavement loading SAR were calculated as granular pavement with thin bituminous surfacing with a load damage unit equivalent to ESA/SAR4 and load damage exponent 4, irrespective of pavements containing one or more bound layers for both DTMR and RMS roads. This is because raw road asset data from DTMR does not capture loaded and unloaded heavy vehicle movements which do not make it feasible to calculate SAR5 and SAR12 (load damage units applicable to pavements with one or more boundary layers). For Project purposes all generated traffic pavement loading also accounts for SAR4 irrespective of pavement type.

The SAR for the background heavy vehicle component was calculated based on the heavy vehicle splits for the relevant road sections. Where the number of SAR of the additional Project related traffic equals or exceeds the existing pavement life, the pavement is considered to be impacted and further assessment (detail design) separate to the TIA is required. Where the number of Project generated SARs does not exceed the remaining pavement life, a marginal cost per additional SAR-km will be calculated.

Pavement impact assessments were not conducted for affected LGR as the GTIA apply to SCR. Alternative mitigation measures will be developed such as road visual condition assessments prior, during and post construction and returning the road to original condition once construction is finished. Such mitigation will be developed through consultation with Local Governments prior to the construction phase.

The pavement impact assessment is for use in this report only and is not proposed to be used for pavement design.

It is noted that an updated version of the GTIA was released in December 2018, after the ToR for the Project were released. An accompanying practice note (GTIA Practice Note: Pavement Impact Assessment (DTMR 2018)) was also released at this time. This assessment has been undertaken consistent with the 2017 GTIA consistent with the ToR. However, as per the GTIA, the TIA will need to be finalised when project contractors are appointed, and the final traffic generation is clearer. It is proposed that the updated TIA be prepared consistent with the December 2018 version of the GTIA, and the associated Pavement Impact Assessment Practice Note.

7.1 Methodology

The pavement assessment as part of the TIA process will be undertaken for SCR road links where the Project generated traffic SAR exceed 5 per cent of the base traffic SAR in either direction on the link in the year of analysis. The impacts on pavements will be identified and measures implemented to avoid, reduce or mitigate the effects on pavement life from Project traffic. Construction activities are likely to involve intensive, short-term haulage and the pavement impacts of this haulage over the construction period were also assessed. The following section provides a brief summary of the approach and methodology adopted for the preliminary desktop pavement impact assessment for envisaged affected SCRs:

- Determine the number and types of vehicles that will be generated by the Project in both construction and operational phases, and determine the sections of the network where pavement assessment is most likely required for each year of implementation
- The Project traffic volumes were converted into SAR based on the assumed number of SAR per vehicle
- Conduct a 5 per cent comparison of the background traffic SAR (as calculated in Section 4.3) and Project generated SAR for each link identified to be most likely impacted by the proposed Project.

The construction routes assumed as a part of this assessment are routes which the construction contractor may use. However, ultimately, the determination of the final construction and heavy vehicle routes will be subject to consultation between DTMR, the local councils and the construction contractor. The below analysis will be undertaken as a part of the design and construction phase when the final construction routes are finalised by the construction contractor:

- Determine if the Project-generated SAR pavement loading will consume the remaining design life pavement capacity during the impact mitigation period on any section of the road network. Project generated SAR will be applied to base SAR and compared to existing allowable SAR capacities. This will graphically be represented for each link over a 20-year design life.
- If the remaining SAR capacity is consumed, then according to the GTIA manual a pavement design for that section of pavement to return the pavement to its pre-Project SAR capacity at the end of the impact mitigation period will be done. The pavement design is separate to a TIA and considered to be dealt with as part of the detailed design and construction phase. The TIA will indicate whether the remaining SAR capacity will be consumed and if a pavement design will be required.
- For marginal SAR impacts, defined as cases where the remaining pavement SAR capacity will not be consumed during the impact mitigation period, the relevant marginal cost rate per SAR-km from DTMR's marginal cost database (as detailed following) for each SCR section in the transport study area will be identified. As per the GTIA, the contribution required to offset pavement impacts is calculated using the following formula:

$$\text{Pavement Contribution} = \sum_{i=1}^{n} ((\text{C} + \text{O})\text{i x MCi x Li})$$

Where:

- I is each road segment triggered
- C is construction period SARs
- O is operational period SARS for the impact mitigation period
- MC is the relevant marginal cost (per SAR-km) prescribed in the department's database for each road segment
- L is the length of road section in km
- N is the number of road segments triggered in the transport study area.

DTMR has determined marginal cost values for road-wear due to increased axle loads for the entire SCR network (with the exception of concrete pavements). For sealed roads, these marginal costs are calculated by using the Freight Axle Mass Limits Investigation Tool (FAMLIT) and will be obtained from DTMR.

The FAMLIT assessment methodology does not cater for unsealed roads. DTMR has adopted the Australian Local Road Deterioration Study (LRDS) gravel loss model to calculate marginal cost estimates per vehicle pass for various combinations of network and traffic parameters, and grading frequency. These cost rates will be obtained from DTMR in the event that gravel road are to be assessed.

7.2 Assumptions

Table 7.1 shows the Austroads vehicle types by construction activity that have been adopted for the assessment.

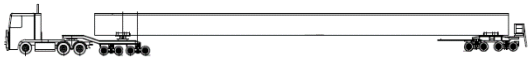
Table 7.1 Vehicle types by construction activity

Construction activity	Austroads vehicle class
Sleepers	Class 10
Quarry	Class 10
Precast Concrete - culverts	Class 9

Construction activity	Austroads vehicle class
Precast Concrete – bridges	OSOM vehicle
Insitu Concrete	Class 5
Water	Class 7
Tunnel Spoil	Class 10
Spoil	Class 10
Workers	Class 1

The SAR parameters used for the construction vehicles are provided in Table 7.2. To ensure no underestimation of SARs in any direction, fully loaded vehicles have been assumed in both directions. This is considered a conservative assumption and will be confirmed by the future delivery contractor.

Table 7.2 Project traffic Standard Axle Repetition parameters (Standard Axle Repetitions per heavy vehicle)

Vehicle classes	Total fully loaded SAR/HV
Class 5 4 Axle Rigid Truck (27.5 tonne) 	4.09
Class 7 4 Axle Semitrailer (31.5 tonnes) 	5.02
Class 9 6 Axle Semitrailer (42.5 tonne) 	4.93
Class 10 7 Axle B-Double (55.5 tonne) 	7.72
OSOM for Precast concrete bridges Unloaded Class 3 Rigid Truck with 4 Axle Dolly and 4 Axle Jinker (70t payload) 	12.21

The SAR4/HV values in Table 7.2 were sourced from DTMR's GTIA Practice Note: Pavement Impact Assessment. The SAR4/HV for the OSOM vehicle to transport the 29 metre Super-T precast concrete bridge elements was calculated consistent with Austroads Guide to Pavement Technology Part 2: Pavement Structural Design.

7.3 Analysis and findings

The pavement analysis provides a 5 per cent comparison of the background traffic SAR and Project generated SAR for each SCR link identified to impacted by the proposed Project. The results are summarised in Table 7.3.

Table 7.3 5 per cent Standard Axle Repetitions comparison

Road name	Road ID - road section	Year of construction %			
		2022	2023	2024	2025
SCR: DTMR					
Cunningham Highway	17B - Between River Road and Redbank Plains Road	0.0	0.2	0.1	0.0
	17B - Between Redbank Plains Road and Ripley Road	0.0	0.1	0.1	0.0
	17B - Between Ripley Road and Ipswich Boonah Road	0.1	0.4	0.2	0.0
	17B - Between Ipswich Boonah Road and Ipswich Rosewood Road	0.1	0.2	0.1	0.0
Forest Hill Fernvale Road	412 - Between Gatton Laidley Road and Warrego Highway	3.0	109.0	1.3	25.6
Gatton Esk Road	4144 - Between Warrego Highway and Lake Clarendon Way	8.7	10.1	3.1	1.6
Gatton Helidon Road	314 - Between William Street and Gatton Clifton Road	0.3	0.5	1.4	0.0
	314 - Between Gatton Clifton Road and Railway Street	0.3	1.6	1.4	0.0
	314 - Between Railway Street and Hickey Street	0.0	0.6	0.1	0.0
	314 - Between Hickey Street and Gatton Laidley Road W	1.1	1.5	9.4	2.1
	314 - Between Gatton Laidley Road W and Warrego Highway	2.9	3.9	25.1	5.5
	314 - Between Warrego Highway and William Street	0.0	0.1	1.4	0.0
Gatton Laidley Road	312 - Between Laidley Plainland Road and Whiteway Road	53.1	58.8	12.7	2.4
	312 - Between Whiteway Road and Railway Street	8.5	9.2	1.7	0.2
	312 - Between Railway Street and Hall Road	0.7	1.8	0.6	0.0
	312 - Between Hall Road and Forest Hill Fernvale Road	1.6	58.0	0.6	12.6
Gatton Laidley Road West	312 - Between Forest Hill Fernvale Road and Gatton Helidon Road	0.0	0.1	0.3	1.1
Haigslea Amberley Road	3041 - Between Karrabin Rosewood and Warrego Highway	0.0	0.0	0.0	0.6
Ipswich Motorway	17A - Between Cunningham Highway and Logan Motorway	0.0	0.0	0.0	0.4
Ipswich Rosewood Road	304 - Between Cunningham Highway and Haigslea Amberley Road	0.1	0.6	0.2	0.0
	304 - Between Haigslea Amberley Road and Rosewood Warrill View Road	0.4	1.8	0.8	0.1
	304 - Between Rosewood Warril View Road and Karrabin Rosewood Road	0.4	1.8	0.8	0.1
Karrabin Rosewood Road	3002 - Between Rosewood Marburg Road and Haigslea Amberley Road	0.0	31.3	0.0	7.1
Laidley Plainland Road	311 - Between Warrego Highway and Old Laidley Forest Hill Road	146.9	71.8	1.0	2.3
	311 - Between Old Laidley Forest Hill Road and Railway Street	183.9	94.2	5.0	2.8
	311 - Between Railway Street and Whites Road	127.4	78.5	5.0	0.0
Logan Motorway (managed by Transurban)	Between Ipswich Motorway and Pacific Motorway	0.0	0.0	0.0	0.3
New England Highway	22A - Between Griffiths Street and Munro Street	0.0	0.0	9.7	3.9
	22A - Between North Street and James Street	0.3	1.1	0.5	0.0
Pacific Motorway	Between Logan Motorway and NSW/QLD Border	0.0	0.0	0.0	0.1

Road name	Road ID - road section	Year of construction %			
		2022	2023	2024	2025
Pine Mountain Road	302 - Between Warrego Highway and Lowry Street	0.0	0.0	0.0	0.0
River Road	309 - Between Warrego Highway and Cunningham Highway	0.3	1.6	0.8	0.0
Rosewood Laidley Road	308 - Between Whites Road and Mulgowie Road	218.9	147.3	22.9	2.3
	308 - Between Mulgowie Road and Crown Street	95.7	64.4	10.0	1.0
	308 - Between Crown Street and Rosewood Marburg Road	96.3	100.7	7.3	9.5
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Between Toowoomba Connection Road and New England Highway	0.0	0.1	0.0	0.0
	Between New England Highway and Toowoomba Connection Road	0.0	0.1	7.8	3.1
Toowoomba Connection Road (formerly Warrego Highway)	315 - Between Toowoomba Second Range Crossing and O'Mara's Road	0.0	0.0	0.0	0.0
	315 - Between Toowoomba-Athol Road and New England Highway	0.0	0.0	0.0	0.0
	315 - Between New England Highway and James Street	0.1	0.2	0.1	0.0
	18A - Between James Street and Tourist Road	0.1	0.2	0.1	0.0
	18A - Between Tourist Road and Roches Road	0.0	0.2	0.1	0.0
	18A - Between Roches Road and Murphys Creek Road	0.0	0.2	0.1	0.0
	18A - Between Murphys Creek Road and Toowoomba Second Range Crossing	0.1	0.2	3.1	1.2
Warrego Highway	18A – Between Toowoomba Second Range Crossing and Gatton Helidon Road	20.5	9.4	3.3	1.2
	18A - Between Gatton Helidon Road and Gatton Esk Road	20.5	9.4	3.3	1.2
	18A - Between Gatton Esk Road and Laidley Plainland Road	13.9	7.5	3.4	1.2
	18A - Between Laidley Plainland Road and Haigslea Amberley Road	0.1	3.1	3.5	1.4
	18A - Between Haigslea Amberley Road and Brisbane Valley Highway	0.0	0.3	0.1	0.4
	18A - Between Brisbane Valley Highway and Mount Crosby Road	0.0	0.2	0.1	0.3
	18A - Between Mount Crosby Road and Cunningham Highway	0.0	0.2	0.1	0.2
SCR: RMS					
Pacific Motorway	Between QLD/ NSW border and Gwydir Highway	0.0	0.0	0.0	0.5
Summerland Way	Between Trenayr Road and Turf Street	0.0	0.0	0.0	1.6

The analysis indicates that the majority of SCR road segments would have a minimal pavement impact given the duration of construction activities and pavement loading. It was found that the road segments that are likely to exceed the 5 per cent threshold consists of:

- Forest Hill Fernvale Road - Between Gatton Laidley Road and Warrego Highway
- Gatton Esk Road - Between Warrego Highway and Lake Clarendon Way
- Gatton Helidon Road - Between Hickey Street and Gatton Laidley Road W
- Gatton Helidon Road - Between Gatton Laidley Road W and Warrego Highway
- Gatton Laidley Road - Between Laidley Plainland Road and Whiteway Road

- Gatton Laidley Road - Between Whiteway Road and Railway Street
- Gatton Laidley Road - Between Hall Road and Forest Hill Fernvale Road
- Karrabin Rosewood Road - Between Rosewood Marburg Road and Haigslea Amberley Road
- Laidley Plainland Road - Between Warrego Highway and Old Laidley Forest Hill Road
- Laidley Plainland Road - Between Old Laidley Forest Hill Road and Railway Street
- Laidley Plainland Road - Between Railway Street and Whites Road
- New England Highway - Between Griffiths Street and Munro Street
- Rosewood Laidley Road - Between Whites Road and Mulgowie Road
- Rosewood Laidley Road - Between Mulgowie Road and Crown Street
- Rosewood Laidley Road - Between Crown Street and Rosewood Marburg Road
- Toowoomba Second Range Crossing - Between New England Highway and Toowoomba Connection Road
- Warrego Highway – Between Toowoomba Second Range Crossing and Gatton Helidon Road
- Warrego Highway - Between Gatton Helidon Road and Gatton Esk Road
- Warrego Highway - Between Gatton Esk Road and Laidley Plainland Road.

Detailed SAR analysis outputs and results are provided in Appendix F. This analysis indicates that the SCR road segments located in QLD would have a minimal pavement impact over the pavement life given the duration of the construction activities and pavement loading.

It is proposed that a more detailed pavement impact assessment will be carried out prior to construction and in consultation with DTMR once specific construction routes are agreed. This will form part of the draft Outline EMP and subsequent EMPs to be developed prior to construction. This will assist further discussions with DTMR to identify if contributions may be required towards the maintenance costs for the affected road sections as a result of additional pavement loading.

7.3.1 Traffic management strategies for pavement impacts

The following impact mitigation strategy is proposed in order to mitigate the envisaged additional pavement loading resulting from the generation of short-term construction related traffic.

- Undertake a pavement impact assessment consistent with the process detailed in the GTIA and identify measures to avoid, reduce or mitigate effects on the pavement life of the SCR. Typical measures include:
  - Provide a payment contribution for future pavement works (for marginal SAR impacts)
  - Provide extra pavement width (for example, to prevent edge degradation)
  - Provide additional pavement thickness
  - Seal an unsealed pavement
  - Provide maintenance during construction
  - Undertake pavement rehabilitation
- Undertake a pavement condition assessment prior to and post construction activities as well as at ongoing intervals during construction
- Install wheel washers on all Project vehicles and/or equipment that exit onto sealed roads from unpaved roads
- Install shaker grids or rumble pads at site exit points from construction activities.

Detailed mitigation measures are provided in Section 9.

8 Safety assessment

8.1 Methodology

The road safety impact assessment has been undertaken as per the framework laid out in Part C of the GTIA. This framework relies on the principle that a road's safety is not significantly worsened as a result of the Project, and that any pre-existing or Project-introduced unacceptable safety risk is addressed. The GTIA acknowledges that safety is not readily quantifiable and may require scoring based on expert opinion on the changes to likelihood and/or consequence of a risk being realised.

With this in mind, the road safety assessment process undertaken in the following sections includes:

- Establishing the existing safety risks relevant to the Project transport study area. It is proposed that existing safety issues will be obtained from consultation with the road controlling authorities and a desktop review of relevant available data and information including published crash histories.
- Identifying the likely new risks or modified risks resulting from the Project
- Completing a risk assessment of the likelihood and consequence of safety risks being increased as a consequence of Project traffic and at Project access points
- Recommending management and mitigation works to ensure the existing safety risk rating for the road is not worsened as a result of the Project and that any unacceptable safety risk is addressed.

This process has been utilised to determine safety risks along the Project construction traffic routes and Project road rail interface locations.

8.2 Existing safety issues

The existing safety issues along construction traffic routes and road rail interface locations has been assessed and provided in Section 4.5.1 and 4.5.2. These existing safety issues, namely the number of reported crashes and crash severities for each construction traffic route and road rail interface location have been used to inform the consequence classifications provided in the sections below.

8.3 Risk assessment

A safety risk assessment based on existing crash history has been undertaken along the Project construction traffic routes and road rail interface locations for the following scenarios:

- Without Project
- With Project
- With Project and with mitigation measures *(required only if the score in the 'with Project' situation is higher than in the 'without Project' situation, or if the 'without Project' score is in the 'high' category).*

As per Part C of the GTIA, road safety risk is considered in terms of changes in:

- Likelihood: how often an event or situation is expected to take place, and
- Consequence: the effect, result, or outcome of something occurring.

Classifications for likelihood and consequence that have been used in this risk assessment have been provided in Table 8.1 and Table 8.2 respectively. The resulting risk ratings have been provided in Table 8.3. These risk ratings are reflective of those provided in Figure 9.3.2(a) of the GTIA.

Table 8.1 Consequence classification – based on five-year reported crash data

Consequence	Safety risk classification
Extreme	One or more reported fatalities
Major	One or more reported crashes resulting in hospitalisation
Moderate	One or more reported crashes resulting in medical treatment
Minor	One or more reported crashes resulting in minor injuries treatment
Not significant	No crashes

Table 8.2 Risk likelihood description

Likelihood	Description
Almost certain	Crash severity occurs more than ten times per year
Likely	Crash severity occurs or would potentially occur about five times or more per year
Possible	Crash severity occurs or is likely to occur about once per year
Unlikely	Crash severity occurs or is likely to occur about once every five years
Rare	Crash severity occurs or is likely to occur less frequently than once every five years

Table 8.3 Risk rating

Likelihood	Consequence				
	Not significant	Minor	Moderate	Major	Extreme
Almost certain	Medium	Medium	High	High	High
Likely	Medium	Medium	Medium	High	High
Possible	Low	Medium	Medium	Medium	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Medium	Medium

8.3.1 Risk assessment results

8.3.1.1 Construction traffic

The resulting identified risks for the 'with' and 'without Project' scenarios associated with construction traffic have been provided in Table 8.4. The consequence for the 'without Project' scenario has been based on the highest reported crash severity for each construction traffic route, and the likelihood has been based on the frequency at which this crash severity occurred over the five-year period.

The consequence in the 'with Project' scenario has been taken to be the same as in the 'without Project', and the likelihood of occurrence has been determined based on the likely changes to road safety as a result of construction related traffic.

Table 8.4 identifies that the following construction traffic routes may require safety mitigation measures based on the assumed construction traffic routes:

- Cunningham Highway (DTMR)
- Gatton Helidon Road (DTMR)
- Gatton Laidley Road (DTMR)
- Haigslea Amberley Road (DTMR)
- Ipswich Motorway (DTMR)
- Laidley Plainland Road (DTMR)

- Logan Motorway (Transurban)
- New England Highway (DTMR)
- Pacific Motorway (DTMR and RMS)
- Rosewood Laidley Road (DTMR)
- Toowoomba Connection Road (DTMR)
- Warrego Highway (DTMR)
- Dent Street (TRC)
- Old Laidley Forest Hill Road (LVRC)
- Old Toowoomba Road (LVRC).

Table 8.5 provides the 'with Project' and 'with Project mitigation measures' safety risk assessment for the routes that have been identified to require safety mitigation. This table shows that following the provision of appropriate mitigation measures, all risk scores are either returned to 'without Project' levels or below the 'high' level.

Table 8.4 Safety risk assessment: Project primary construction routes (without and with Project)

Road name	Without Project			With Project			Mitigation required?
	Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating	
SCR: DTMR							
Cunningham Highway	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Forest Hill Fernvale Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Gatton Esk Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Gatton Helidon Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Gatton Laidley Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Gatton Laidley Road West	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Haigslea Amberley Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Ipswich Motorway	Major	Likely	High	Major	Likely	High	Required
Ipswich Rosewood Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Karrabin Rosewood Road	Major	Possible	Medium	Major	Possible	Medium	-
Laidley Plainland Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Logan Motorway (managed by Transurban)	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
New England Highway	Major	Likely	High	Major	Likely	High	Required
Pacific Motorway	Extreme	Possible	High	Extreme	Possible	High	Required
Pine Mountain Road	Major	Unlikely	Medium	Major	Possible	Medium	-
River Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Rosewood Laidley Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Toowoomba Second Range Crossing (Warrego Highway, managed by Nexus)	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Toowoomba Connection Road	Extreme	Possible	High	Extreme	Possible	High	Required
Warrego Highway	Extreme	Possible	High	Extreme	Possible	High	Required
SCR: RMS							
Pacific Arterial	Extreme	Likely	High	Extreme	Likely	High	Required
Summerland Way	Major	Possible	Medium	Major	Possible	Medium	-

Road name	Without Project			With Project			Mitigation required?
	Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating	
LGR: CVC							
Bent Street	Major	Unlikely	Medium	Major	Possible	Medium	-
Charles Street	*No crash data available*						-
Clark Road	*No crash data available*						-
Craig Street	Major	Unlikely	Medium	Major	Possible	Medium	-
Dobie Street	Moderate	Possible	Medium	Major	Possible	Medium	-
Trenayr Road	*No crash data available*						-
Villiers Street	Major	Unlikely	Medium	Major	Possible	Medium	-
LGR: TRC							
Dent Street	Minor	Unlikely	Low	Minor	Possible	Medium	Required
Griffiths Street	Major	Possible	Medium	Major	Possible	Medium	-
Herries Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Larcombe Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Mort Street	Major	Unlikely	Medium	Major	Possible	Medium	-
Munro Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
North Street	Major	Unlikely	Medium	Major	Possible	Medium	-
O'Mara's Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Water Street North	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Witmack Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
LGR: LVRC							
Airforce Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Arthur Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Boundary Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Bowtells Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Boxmoor Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Burgess Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-

Road name	Without Project			With Project			Mitigation required?
	Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating	
Connors Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Crescent Street	Moderate	Unlikely	Medium	Moderate	Possible	Medium	-
Crown Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
George Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Hall Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Hickey Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Laidley Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Lake Clarendon Way	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Lawlers Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Main Green Swamp Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Mary McKillop Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Old College Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Old Laidley Forest Hill Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Old Toowoomba Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Paroz Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Philipps Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Outer Ring Road Extension	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Railway Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Railway Street	Major	Unlikely	Medium	Major	Possible	Medium	-
Saleyard Road	Moderate	Unlikely	Medium	Moderate	Possible	Medium	-
Sandy Creek Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Seventeen Mile Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Station Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Summer Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Tenthill Creek Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Turner Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-

Road name	Without Project			With Project			Mitigation required?
	Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating	
Victor Street	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Western Drive	Not Significant	Rare	Low	Not Significant	Possible	Low	-
WIlliam Street	Major	Unlikely	Medium	Major	Possible	Medium	-
Wrights Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
LGR: ICC							
Calvert Station Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Fairbank Place	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Grandchester Mort Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Haigslea Malabar Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Hiddenvale Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Mount Marrow Quarry Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Neumann Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Newhill Drive	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Noblevale Way	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Rafters Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Redbank Plains Road	Major	Unlikely	Medium	Major	Possible	Medium	-
Rob Roy Way	Not Significant	Rare	Low	Not Significant	Possible	Low	-
School Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-
Thagoona Haigslea Road	Not Significant	Rare	Low	Not Significant	Possible	Low	-

Table 8.5 Safety risk assessment: Project primary construction routes (with Project and with mitigation measures)

Road name	With Project			Proposed mitigation measures	With Project – with mitigation		
	Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
SCR: DTMR							
Cunningham Highway	Extreme	Possible	High	Mitigation measures include: ■ Fatigue management measures will be introduced and enforced for all workers. ■ Pre and post construction inspections of routes to ensure suitability, including a Road Safety Analysis ■ ARTC contractor to identify any damage to road from construction traffic. Any damage or decreased asset life resulting from construction traffic to be addressed through consultation process with the road authority. ■ Heavy vehicles may be associated with the construction activities and therefore use of school bus routes will be avoided if possible, or carefully managed to avoid conflicts. ■ Consideration will be given to limiting construction traffic on school bus routes during pick-up and set-down times on school days, alternatively appropriate school bus infrastructure could be installed. ■ Workers will be made aware of school bus routes as well as typical pick-up and drop-off times in the vicinity of the Project ■ Temporary traffic management to be implemented, for example road signs stipulating reduced speed limits. ■ Road closures (if required) to be performed by police escorts (should it be required) with closure times aimed at periods of 15 minutes or less. ■ All OSOM and RAV vehicles will comply with all relevant safety regulations and guidelines set out by DTMR and the NHVR.	Extreme	Unlikely	Medium
Gatton Helidon Road	Extreme	Possible	High		Extreme	Unlikely	Medium
Gatton Laidley Road	Extreme	Possible	High		Extreme	Unlikely	Medium
Ipswich Motorway	Major	Likely	High		Major	Possible	Medium
Laidley Plainland Road	Extreme	Possible	High		Extreme	Unlikely	Medium
Logan Motorway (managed by Transurban)	Extreme	Possible	High		Extreme	Unlikely	Medium
New England Highway	Major	Likely	High		Major	Possible	Medium
Pacific Motorway	Extreme	Possible	High		Extreme	Unlikely	Medium
Rosewood Laidley Road	Extreme	Possible	High		Extreme	Unlikely	Medium
Toowoomba Connection Road (formerly Warrego Highway)	Extreme	Possible	High		Extreme	Unlikely	Medium
Warrego Highway	Extreme	Possible	High		Extreme	Unlikely	Medium
SCR: RMS							
Pacific Arterial	Extreme	Likely	High	*As per DTMR Roads, above*	Major	Possible	Medium
TRC							
Dent Street	Minor	Possible	Medium	*As per DTMR Roads, above*	Minor	Unlikely	Low

Road name	With Project			Proposed mitigation measures	With Project – with mitigation		
	Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
LVRC							
Old Laidley Forest Hill Road	Extreme	Possible	High	*As per DTMR Roads, above*	Extreme	Unlikely	Medium
Old Toowoomba Road	Extreme	Possible	High		Extreme	Unlikely	Medium

It should be noted that the construction routes assumed as a part of this assessment are routes which the construction contractor may use. However, the determination of the final construction and heavy vehicle routes will be subject to consultation between DTMR, the local council and the construction contractor. The above analysis will be undertaken again as a part of the design and construction phase when the final construction routes are finalised by the construction contractor. Additionally, the safety assessment of the intersections used by construction traffic will be undertaken when the construction routes are finalised.

8.3.1.2 Road rail interface

Identified safety risks for the 'with' and 'without Project' scenarios associated with road rail interface locations have been provided in Table 8.6. The 'without Project' risk assessment was completed by analysing crashes within a 200 m radius from the proposed crossing. The consequence for the 'without Project' scenario has been based on the highest reported crash severity for each buffer zone, and the likelihood has been based on the frequency at which this crash severity occurred over the five-year period.

The 'with Project' scenario has been assigned a consequence of 'extreme' in the safety assessment as any incident at a road rail crossing is likely to be of a high consequence. Without appropriate mitigation measures, it is reasonable to expect that such an event may occur a few times a year. As a result, the likelihood has been assigned as 'likely' resulting in all road rail interface locations being 'high' and requiring safety mitigation measures.

Table 8.7 provides the 'with Project' and 'with Project mitigation measures' safety risk assessment. This table shows that following the provision of appropriate mitigation measures, the likelihood of an extreme incident has been rated as being 'unlikely' resulting in all risk scores being below the 'high' level.

Table 8.6 Safety risk assessment: Road rail interface (without and with Project)

Interface ID	Road name	Proposed treatment	Without Project			With Project		
			Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating
DTMR								
330-9-P-1	Glenore Grove Road	Active level crossing	Proposed crossing			Extreme	Likely	High
ICC								
330-14-P-2	Grandchester Mount Mort Road	Active level crossing	Proposed crossing			Extreme	Likely	High
330-15-E-4	Calvert Station Road	Active level crossing	Extreme	Rare	Medium	Extreme	Likely	High
LVRC								
330-2-P-5	Connors Road	Active level crossing	Proposed crossing			Extreme	Likely	High
330-6-E-1	Jamiesons Road	Active level crossing	Extreme	Rare	Medium	Extreme	Likely	High
330-9-E-1	Dodt Road	Active level crossing	Extreme	Rare	Medium	Extreme	Likely	High

Table 8.7 Safety risk assessment: Road rail interface (with Project and with mitigation measures)

Interface ID	With Project			Proposed mitigation measures	With Project – with mitigation		
	Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
330-9-P-1	Extreme	Likely	High	▪ Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national and ARTC standards ▪ Level crossings will be designed in order to provide for safe design standards where sufficient stacking and, sight distances, lane marking, and signage prevail for a design vehicle consisting of a low loader ▪ Threshold and ALCAM assessment to be undertaken to determine the appropriate protection type for the proposed crossing ▪ Road safety audits will be undertaken at the level crossings during design, pre and post opening in accordance with the Austroads guidelines. Level crossings will be reviewed to confirm: – That the level of protection continues to be appropriate – That the infrastructure is appropriate for the traffic conditions – That the crossing is designed to provide suitable stacking and sight distance.	Extreme	Unlikely	Medium
330-2-P-5	Extreme	Likely	High		Extreme	Unlikely	Medium
330-6-E-1	Extreme	Likely	High		Extreme	Unlikely	Medium
330-9-E-1	Extreme	Likely	High		Extreme	Unlikely	Medium
330-11-P-9	Extreme	Likely	High		Extreme	Unlikely	Medium
330-14-P-2	Extreme	Likely	High		Extreme	Unlikely	Medium
330-15-E-4	Extreme	Likely	High		Extreme	Unlikely	Medium

9 Mitigation and management

9.1 Preliminary road use management during construction

9.1.1 Preliminary road use management plan

As stated in the DTMR's GTIA, 'the Road Use Management Plan (RUMP) is a plan specifically for managing road related issues and is based on negotiation with industry to best manage current and future increases in district road use/access by specific freight commodities and specific types of heavy vehicles to alleviate and manage adverse traffic management risks and road impacts'.

The purpose of this TIA is to support the delivery and assessment of the Project. The construction routes assumed as a part of this assessment are routes which the construction contractor may use. However, the determination of the final construction and heavy vehicle routes will be subject to construction contractor consultation with DTMR and the relevant local council.

Therefore, it is proposed that a RUMP be developed for the Project before construction commences, based on the outcomes of the updated TIA. The purpose of developing the RUMP for the Project is to identify, where required, appropriate traffic and transport management strategies for the use of the SCRs and LGRs for each of the construction stages. The RUMP will also minimise the impact on the efficiency of road networks as well as the operational safety of the Project related vehicles accessing the construction sites.

The RUMP will:

- Summarise updated Project traffic information on which the updated road impact assessment and proposed mitigation strategies are based
- List roles and responsibilities for implementation
- Detail finalised impact mitigation strategies, focusing on controls-based and road-use management strategies, including:
  - Use of variable message signs
  - Travel demand management
  - Options for shuttle buses to transport workers
  - Avoiding peak hour traffic, especially near schools/bus routes
  - Fatigue management strategies.

Where road realignments or closures are required, traffic management associated with these works will be included in the RUMP. This will need to include the requirements for obtaining necessary approvals and permits from relevant authorities as well as notifying the community on any changes to traffic conditions..

A fatigue management plan will be developed as part of the wider RUMP and all heavy vehicle operators will be required to adhere to the restrictions set out in the plan. The purpose of the plan is to define restrictions on travel times and durations for drivers transporting materials or equipment to the Project site. As trip schedules and work rosters are key factors in managing driver fatigue, the fatigue management plan will apply to all heavy vehicle operators working on the Project (including suppliers and contractors).

The RUMP will be developed in consultation with DTMR, emergency services and local councils to develop appropriate strategies to minimise the effects of the Project's transport activities during the construction phase, on the existing and future road corridors.

9.1.2 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) will be prepared prior to construction commencing as discussed in the Traffic Transport and Access Sub-plan of the draft Outline EMP (refer Chapter 23: Draft Outline Environmental Management Plan). The CEMP will include a TMP which will outline:

- Traffic demand
- Routing
- Controls
- Special vehicle requirements
- Integrating Project activities into the operation of the road network
- Identification and consideration of foreseeable risks.

The TMP will be developed in consultation with DTMR, local councils and an accredited road safety auditor. This plan will identify the impacts that construction traffic is likely to have on the transport infrastructure and detail ameliorative measures required to mitigate all identified impacts of the Project. This may include potential temporary or permanent intersection works.

The TMP will detail measures to:

- Safely manage traffic when undertaking works in a road reserve
- Minimise traffic delays resulting from the development/construction
- Manage construction vehicles accessing and leaving the site
- Maintain satisfactory property access.
- Minimise disruption to adjacent properties
- Minimise disturbance to the environment
- Meet the requirements of legislation and codes of practice regarding traffic management
- Cater for special events.

The TMP will take into consideration:

- Final construction routes
- Approaches to seasonality and stock routes
- Areas of significant pedestrian and cyclist activity
- Standard hours of work and deliveries
- Specific hours of deliveries impacted by local land uses (e.g. school zones)
- Bus service operators (e.g. public transport, school buses, long distance services)
- Emergency services
- Staff transport
- Staff parking, with the provision of on-site tool storage where practicable.

The TMP will detail the most effective methods for heavy vehicle movements to and from the site to ensure efficiency, safety and limited disruption to all road users. It will be prepared prior to construction in accordance with the latest edition of the *Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads* (DTMR 2019a) and *Technical Standard MRTS02 - Provision for traffic* (DTMR 2019c) prior to the commencement of construction

Works identified within the TMP may require the preparation of Traffic Control Plans (TCPs), also referred to as Traffic Guidance Schemes. TCPs detail the traffic control signs, devices and measures to be applied at work sites to warn traffic and guide it through, or past, a work area or temporary hazard. This includes plan/diagram that illustrates the arrangement of signage and devices used to manage traffic. Highlighting the temporary signage, markings, speed zones, barriers and works aims to:

- Warn drivers of the changes to the usual conditions
- Inform drivers about the changing conditions
- Guide drivers through the work sties
- Ensure safety of works and external road users.

Specific TCPs are required for each separate element of the TMP identified works. Should any SCRS Regulatory Traffic Signs/Devices be required, a Form M994 will be completed and signed by a certified Level 3 Traffic Management Operator.

Temporary road works, including diversion and signage, will be in accordance with the *Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads* (DTMR 2019a) and the *Traffic and Road Use Management Manual: Volume 7 Road Works* (DTMR 2012b).

9.2 Road link mitigation measures

Relevant mitigation measures based on the LOS analysis are provided. The assessment provided in Section 6.2.1 indicated that there were several roads that exceeded the 5 per cent background traffic threshold with the additional construction traffic. For roads links with less than the 5 per cent background traffic threshold, no impact is expected.

Out of these roads, a number of roads were determined to exhibit a decrease in the LOS experienced by road users. These roads are summarised in Table 9.1.

Table 9.1 Road segments with change in level of service

Road name	Road section	Change of LOS
DTMR		
Karrabin Rosewood Road	Between Rosewood Marburg Road and Haigslea Amberley Road	LOS A to LOS B
Rosewood Laidley Road	Between Crown Street and Rosewood Marburg Road	LOS A to LOS B
TRC		
Water Street North	Between Herries Street and Toowoomba Connection Road	LOS A to LOS B

Table note:

* Based on assumed volumes

Although these are the only roads currently identified as decreasing LOS, road segments impacted may be refined during detailed design – once final construction and heavy vehicle routes are known. The following mitigation measures are applicable to SCRs and LGRs which are impacted by Project construction traffic, irrespective of whether they have demonstrated a decrease in the LOS.

Table 9.2 Road link mitigation measures

Phase	Mitigation	Mitigation outcome
Construction	Travel demand management (TDM) campaign to inform the public on works and its effect on network operations	Relieve congestion by encouraging travel outside of peaks or mode shift by the public, and increase awareness of construction works
	TMP developed by the proponent in consultation with DTMR, local councils and an accredited road safety auditor. This plan will identify the impacts that construction traffic is likely to have on the transport infrastructure and detail ameliorative measures required to mitigate all identified impacts of the Project. The TMP will include condition assessment of the road pavement for all construction traffic routes. This will be required to occur before the commencement of any operations and ongoing throughout construction at intervals agreed in writing between the contractor and the asset owner.	Limit impact to the public and asset owners by managing construction movements and deliveries during peak hours, and minimising construction staff traffic by the use of shuttles and public transport
	The plans will take into account: ■ Final construction routes ■ Approaches to seasonality and stock routes ■ Areas of significant pedestrian and cyclist activity ■ Standard hours of work and deliveries ■ Specific hours of deliveries impacted by local land uses (e.g. school zones) ■ Bus service operators (e.g. public transport, school buses, long distance services) ■ Emergency services ■ Staff transport ■ Staff parking, with the provision of on-site tool storage where practicable.	
	Ongoing consultation with relevant local councils, DTMR, emergency services and affected property owners/occupiers to inform of Project status and likely disruptions.	Minimise traffic and transport impacts during construction
	Directional signage and line marking around construction sites and the surrounding network, including using VMS (if appropriate).	Direct and guide drivers and pedestrians past construction sites, and advice of potential delays, traffic diversions, speed restrictions or alternate routes.
	Specific TMPs for special events developed in conjunction with the relevant stakeholders.	Targeted plans to provide safe and efficient pedestrian, cycle, public transport and traffic flows during occasional events to minimise disruption to the community throughout construction.
	Relevant emergency services will be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment.	Discussions will identify any pre-identified emergency response routes which may be impacted by the transport corridors as well as possible solutions to minimise any potential impacts.
	Secondary alternative construction route activities will be determined as part of the TMPs, in the event of the primary route is blocked off by an emergency/accident.	Secondary construction routes will facilitate the continued construction activities and thus managing costs and schedule.
Operational	Develop a protocol between ARTC and emergency service providers, defining appropriate and co-ordinated responses and communication in the event of emergencies during operations, (e.g. access to real time information about crossing times and access to alternate crossing points).	Protocol will minimise any impact to emergency services due to potential changes to the road network and Project operation.

9.3 Intersection mitigation measures

The results in Section 6.3 highlighted intersections where temporary treatments may be required during construction, including:

- Forest Hill Fernvale Road/Old Laidley Forest Hill road
- Gatton Helidon Road/Old Toowoomba Road
- Gatton Laidley Road/Hall Road
- Gatton Laidley Road/Outer Ring Road
- Karrabin Rosewood Road/Thagoona Haigslea Road
- Laidley Plainlands Road/Boundary Road
- Laidley Plainlands Road/Gatton Laidley Road
- Laidley Plainlands Road/Old Laidley Forest Hill Road
- Laidley Plainlands Road/Railway Street
- New England Highway/Munro Street
- Toowoomba Connection Road/Water Street
- Arthur Street/Mary McKillop Street
- Arthur Street/Station Street
- Boxmoor Street/Philps Road
- Laidley Street/Seventeen Mile Road
- Laidley Street/Station Street
- Jamiesons Road/Burgess Road
- Turner Street/Mary McKillop Street
- William Street/Hickey Street.

At this stage, the Project is not expected to generate the need to upgrade the road network to accommodate short term construction traffic loading. However, this will be confirmed once final construction traffic routes have been confirmed. Notwithstanding, TCPs will be implemented alongside the TMP and CEMP associated with the road link mitigation strategies. These plans will ensure that intersection geometry and capacity is taken into account when selecting and agreeing construction traffic routes. The accredited road safety auditor present during the visual inspections of the construction routes will verify, and identify additional potential, safety issues for relevant intersections.

Where required, the introduction of traffic control devices will be used to:

- Warn drivers of changes to the usual road conditions
- Inform drivers about changing conditions
- Guide drivers through the work site
- Ensure the safety of works and external road users.

Each intersections identified in Table 6.9 will be considered in the TMP.

The TMP, each TCPs and any temporary road works including diversion and signage will all be prepared prior to construction in accordance with the latest edition of the *Traffic control at work sites: Technical Manual* (RMS, 2018)and AS 1742.3-2019, *Manual of uniform traffic control devices Part 3 - Traffic control for works on roads*. The TMP will consider construction activity delivery timeframes which (where possible) avoid peak hour travel conditions.

Any and all road safety measures will take into consideration items including, but not necessarily limited to, the following: speed restrictions; driver fatigue; in-vehicle communications; signage; demarcations; maintenance; and safety checks. Interaction with public transport, transport of hazardous and dangerous goods and emergency response and disaster management will also be important considerations.

9.4 Road safety mitigation measures

Relevant mitigation measures based on the safety analysis findings are provided. The following mitigation measures are proposed:

- Fatigue management measures will be introduced and enforced for all workers
- Any required works to be identified in ongoing RUMPS prepared to support the Project
- RUMPS to address the possibility of physical works required at critical intersections, high pedestrian activity zones and around high impact construction zones
- Heavy vehicles will be associated with the construction activities and therefore use of school bus routes will be avoided if possible, or carefully managed to avoid conflicts
- Consideration will be given to limiting construction traffic on school bus routes during pick-up and set-down times on school days, alternatively appropriate school bus infrastructure could be installed
- Temporary traffic management to be implemented, for example road signs stipulating reduced speed limits
- Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national standards (refer Section 1.3)
- Fencing will be provided along the rail corridor (as necessary) to ensure people and stock do not cross the Project.

9.5 Road-rail interface mitigation measures

Relevant mitigation measures for road-rail interface locations are provided within this section of the TIA. Table 9.3 outlines the potential impact and mitigation measures.

Table 9.3 Road-rail interface mitigation measures

Phase	Mitigation	Mitigation outcome
Construction	Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national and ARTC standards in accordance with TMP and RUMP procedures. Options for impact mitigation will depend on the specific activity being undertaken, and the location where it is occurring. It will be up to the construction contractor to select and implement appropriate controls. Road safety audits will be undertaken at the level crossings post construction in accordance with the Austroads guidelines. Level crossings will be reviewed to confirm the: ■ Level of protection continues to be appropriate ■ Infrastructure is appropriate for the traffic conditions.	Direct and guide active mode users at road-rail interface locations, improving safety and reduces the likelihood of any significant traffic delays due to incidents.
Operational	Road safety audits will be undertaken at the level crossings post opening in accordance with the Austroads guidelines. Post commissioning, the level crossing will be managed as a part of business as usual for the relevant road and rail manager under the terms of the signed interface agreement. Level crossings will be reviewed to confirm that the: ■ Level of protection continues to be appropriate ■ Infrastructure is appropriate for the traffic conditions.	Make further enhancements to safety measures and further reduce the likelihood of delays.

Phase	Mitigation	Mitigation outcome
	Increase in traffic associated with the Project is likely to increase vehicle exposure at rail crossings. Public level crossings will be designed in order to provide for safe design standards where sufficient stacking and, sight distances, lane marking, and signage prevail for a design vehicle consisting of a low loader	To ensure safe design standards are implemented to minimise and mitigate the impact significance and likelihood of crashes which may occur at level crossings.
	Threshold and ALCAM assessment to be undertaken to determine the appropriate protection type for the proposed crossing	To ensure safe design standards are implemented to minimise and mitigate the impact significance and likelihood of crashes which may occur at level crossings.
	■ Implement key actions outlined within the QLCSS (DTMR 2012a), including: – Promoting level crossing safety through public awareness campaigns – Maintain a high standard of data collection including near miss reporting. – Maintain level crossing infrastructure in accordance with relevant Australian Standards.	Promote ongoing safety improvements at road rail interface locations.

9.6 Pavement mitigation measures

Relevant mitigation measures from a pavement impact perspective are provided. The mitigation measures provide for a robust strategic traffic and road use management strategy. These mitigation measures apply to any SCRs and/or LGRs used as primary construction routes.

Several mitigation measures were developed based on consultation with affected road authorities and councils. The consultation works will be ongoing. The proposed strategy to mitigate against the pavement and service deterioration (during the construction phase) is provided in Table 9.4.

Table 9.4 Pavement mitigation measures

Phase	Mitigation	Mitigation outcome
Construction	Install wheel washers on all Project vehicles and/or equipment that exit onto sealed roads from unpaved roads	Will prevent track-out and deterioration of the pavement surface.
	A rock bed may be installed as appropriate at vehicle/equipment site exit points	
	Install shaker grids or rumble pads at site exit points from construction activities	Reduce the potential for soil spill onto transport corridors and the deterioration of the pavement surface.
	SCR: Undertake a pavement impact assessment consistent with the process detailed in the GTIA and identify measures to avoid, reduce or mitigate effects on the pavement life. Options include providing: ■ A payment contribution for future pavement works (for marginal SAR impacts) ■ Extra pavement width (for example, to prevent edge degradation) ■ Additional pavement thickness ■ Sealant to unsealed pavement ■ Maintenance during construction ■ For pavement rehabilitation.	Mitigation measures identified and implemented to avoid, reduce or mitigate the effects of the construction traffic on the pavement life of the SCR and ensure no worsening to pavements as a result of increased vehicle traffic from the Project.

Phase	Mitigation	Mitigation outcome
	LGR Unsealed roads: Undertake a visual pavement condition assessment prior to, during and post construction activities.	A visual condition assessment is advised in order to mitigate for the construction related traffic impacts so that any returned works are consistent with pre-construction conditions.
	LGR Sealed and asphalt roads: Undertake a condition assessment (e.g. NAASRA roughness count) prior and post construction activities, as well as at ongoing intervals during construction. These intervals will be agreed with the relevant local council before construction commences.	The current condition of the pavements will be classified as per AGTPT05-11 Table 4.1. The degradation of the pavements based on NAASRA roughness count will be calculated, enabling quantification of construction traffic impacts and required restoration works (to pre-construction condition). Where the level of roughness measured prior to construction exceeds the maximum desirable level for the class of road, the road has already exceeded its design life. In these cases, the intervention required will be agreed on a case-by-case basis with the road controlling authority.
	The use of an LGR and SCR owner approved maintenance contractor to maintain impacted road for the duration of the construction period. This may include works such as crack sealing, pothole patching, edge repairs, resealing and grading (of gravel roads).	To ensure that pavement deterioration as a result of construction related traffic is mitigated during and post construction.

9.7 Additional considerations

The NHVR regulates all vehicles over 4.5 t gross vehicle mass and coordinates road access permits for these vehicles. Any new permits required for the Project will be made through the NHVR. It is a requirement for these permits to be reviewed and approved by the relevant asset owner.

Load restrictions along bridges within the Lockyer Valley Council Region that may potentially be used by construction traffic routes have been provided in Section 5.7.11. No detailed assessment has been undertaken as part of the EIS with regards to load limited bridges. If heavy vehicles are required to use any load limited bridge, an assessment will need to be undertaken and further investigation and inspections will need to take place – the outcomes of which may lead to upgrading these bridges.

10 Risk assessment summary

This section provides a brief summary of the potential traffic impacts associated from the construction phase of the Project which has been identified as the key traffic generator. This has included an assessment of the risk associated with the impacts identified. The risk assessment has considered the following:

- Magnitude of impact (or consequence) through an assessment of the traffic impact of the Project on the road sections along the Project
- Likelihood of impact or the probability of the impact occurring.

The probability analysis assesses the likelihood of impact occurring during the assessment period and the consequence analysis assesses the level of impact, or consequence, that a hazard or impact may cause. Table 10.1 and Table 10.2 shows the parameters used to determine the risk levels associated with the key impacts identified for the Project.

Table 10.1 Probability analysis

Score	Likelihood
6	Almost Certain
5	High likelihood
4	Probably
3	Possibly
2	Unlikely
1	Extremely remote

Table 10.2 Consequence analysis

Score	Consequence
6	Extreme
5	Very High
4	High
3	Moderate
2	Low
1	Very Low

Table 10.3 summarises the Risk Matrix used to identify the risks associated with the traffic impacts related to the Project.

Table 10.3 Risk matrix

Likelihood		Consequence					
		1	2	3	4	5	6
		Very Low	Low	Moderate	High	Very high	Extreme
6	Almost certain	7	8	9	10	11	12
5	High likelihood	6	7	8	9	10	11
4	Probably	5	6	7	8	9	10
3	Possibly	4	5	6	7	8	9
2	Unlikely	3	4	5	6	7	8
1	Extreme remote	2	3	4	5	6	7

Table 10.4 summarises the resulting risk level applied based on the scores in Table 10.3.

Table 10.4 Risk level matrix

Score	Risk level
11 to 12	Extreme risk
8 to 10	High Risk
4 to 7	Moderate risk
2 to 3	Low risk

Table 10.5 summarises the key traffic impacts identified with the Project and also includes the proposed mitigation measures required to reduce the level of risks and to maintain an overall high level of operational efficiency for the road network.

Table 10.5 Traffic impact risk assessment

Value/element	Description of impact				Summary of key mitigation measures	Residual risk
	Primary impacting process	Magnitude of impact	Likelihood of impact	Risk rating (before mitigation)		
Traffic impacts from construction activities						
Intersections	Safety	**Moderate** Traffic impacts at the key intersections impacting operations. Adequacy of intersection configuration to cater for haulage vehicles.	**Probably** It is reasonable to assume that traffic impacts at key intersections will occur during the construction period.	**Moderate**	In consultation with DTMR, RMS and local councils, develop cost effective solutions to alleviate additional traffic impacts from the construction related activities. These will include: ■ Traffic Management Plans prepared prior to construction in accordance with the latest edition of: – Traffic control at work sites - Technical Manual (TfNSW 2018), Australian Standard 1742.3, and Manual of uniform traffic control devices Part 3 - Traffic control for works on roads (DTMR 2019a) – Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads (DTMR 2019a) and the Traffic and Road Use Management Manual: Volume 7 Road Works (DTMR 2012b) – Roads and Maritime Supplement to Australian Standard 1742 Manual for Uniform Traffic Control Devices ■ Road safety measures at intersections will take into consideration speed restrictions, driver fatigue, in-vehicle communications, heavy vehicle turning signage, demarcations, safety checks, and interaction with public transport, transport of hazardous and dangerous goods and emergency response and disaster management. ■ TMPs will consider construction activity delivery timeframes which avoid peak hour travel conditions.	**Low**
Road links	Operational efficiency	**Moderate** Traffic impacts along primary construction routes affecting traffic operations along key routes.	**Probably** It is reasonable to assume that traffic impacts along primary construction routes will occur over the construction period.	**Moderate**	In consultation with DTMR and local councils, employ traffic management strategies in order to mitigate impacts along road links. These will include: ■ TMP according to DTMR and RMS specifications ■ Travel demand management campaigns ■ Directional signage and line marking around construction sites and the surrounding network ■ Specific traffic management plans for special events developed in conjunction with the relevant stakeholders	**Low**

Value/element	Description of impact				Summary of key mitigation measures	Residual risk
	Primary impacting process	**Magnitude of impact**	**Likelihood of impact**	**Risk rating (before mitigation)**		
					▪ Relevant emergency services will be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment ▪ Secondary alternative construction route activities will be determined as part of the TMPs, in the event of the primary route is blocked off by an emergency/accident. ▪ TDM campaign to inform the public on works and its effect on network operations.	
Pavements	Operational efficiency	**Moderate** Increased percentage of heavy vehicles along SCRs from Project construction traffic, resulting in pavement degradation.	**Probably** It is reasonable to assume that pavement degradation as a result of Project construction traffic will occur over the construction period.	**Moderate**	Mitigation measures may include but are not limited to: ▪ Undertaking visual assessments prior to, during and post construction activities, with the impacted road improved to a similar condition to the initial visual pavement condition ▪ Installation of wheel washers on all Project vehicles travelling from unsealed to sealed roads ▪ Installation of shaker grids or rumble pads at site exit points from construction activities	**Low**
Road Safety – Primary Construction Routes, including intersections	Safety	**Moderate** Decreased road safety along construction traffic routes as a result of increased traffic, changes in heavy vehicle mix, or fatigue for long distance trips.	**Possible** It is reasonable to assume that an incident involving a Project construction vehicle occurs over the construction period	**Moderate**	Mitigation measures will include: ▪ Fatigue management measures will be introduced and enforced for all workers. ▪ Any required works to be identified in ongoing RUMP prepared to support the Project. ▪ Heavy vehicles will be associated with the construction activities and therefore use of school bus routes will be avoided if possible, or carefully managed to avoid conflicts. ▪ Consideration will be given to limiting construction traffic on school bus routes during pick-up and set-down times on school days, alternatively appropriate school bus infrastructure could be installed. ▪ Temporary traffic management to be implemented, for example road signs stipulating reduced speed limits.	**Low**

Value/element	Description of impact				Summary of key mitigation measures	Residual risk
	Primary impacting process	Magnitude of impact	Likelihood of impact	Risk rating (before mitigation)		
Traffic impacts from operational activities						
Road-Rail Interface	Operational efficiency	**Moderate** Additional delay to through traffic with reduced operational efficiency as a result of construction activities	**Probably** Without appropriate mitigation strategies, the likelihood of an incident occurring at a rail crossing is probable.	**Moderate**	Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national and ARTC standards in accordance with Traffic Management Plan and Road Use Management Plan procedures to accommodate traffic and operational efficiency during construction. Direct and guide active mode users at road-rail interface locations, improving safety and reduces the likelihood of any significant traffic delays due to incidents.	**Low**
Road Safety – Road-Rail Interface	Safety	**Extreme** Introduction of open level crossings on the road network may result in high severity crashes between traffic and trains.	**Probably** Without appropriate mitigation strategies, the likelihood of an incident occurring at a rail crossing is probable.	**High**	▪ Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national and ARTC standards. ▪ Public level crossings will be designed in order to provide for safe design standards where sufficient stacking and, sight distances, lane marking, and signage prevail for a design vehicle consisting of a low loader ▪ Road safety audits will be undertaken at the level crossings during design, pre and post opening in accordance with the Austroads guidelines. Post commissioning, the level crossing will be managed as a part of business as usual for the relevant road and rail manager under the terms of the signed interface agreement. Level crossings will be reviewed to confirm: – That the level of protection continues to be appropriate – That the infrastructure is appropriate for the traffic conditions	**Low/ Moderate**

11 Cumulative impacts

11.1 Regionally significant projects overview

To enable stakeholders to make informed decisions, consideration needs to be given to the potential impacts of other major projects in the area to ensure that the combined impacts of the projects are accounted for. There are currently several other projects in the region at planning, design or construction stage.

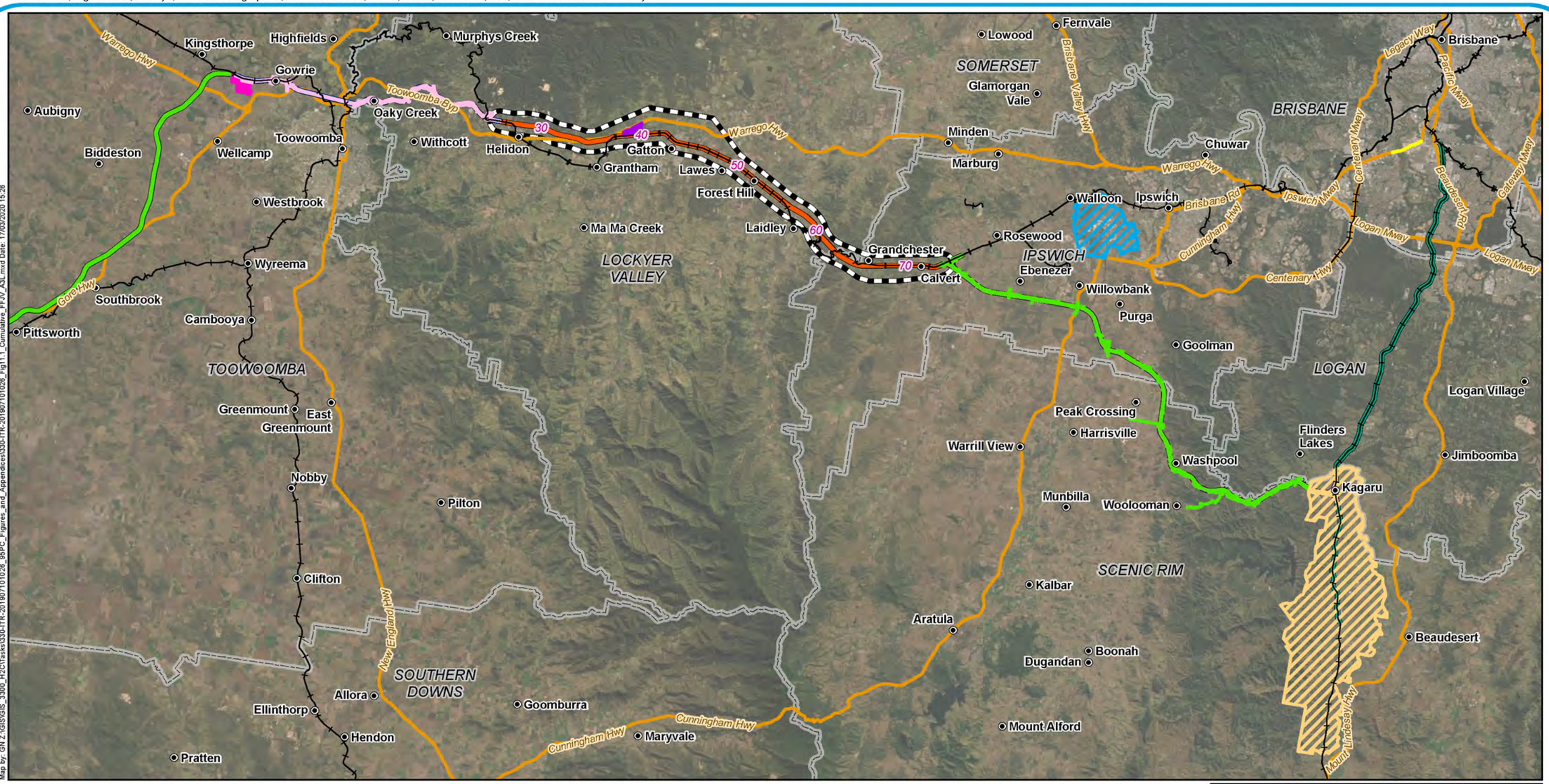
Projects which were considered as part of the TIA are provided in Table 11.1.

Table 11.1 Projects considered in cumulative assessment

Project and Proponent	Location	Description	Project status	Construction dates
Gowrie to Helidon (ARTC)	Rail alignment from Gowrie to Helidon	26 km single-track dual-gauge freight railway as part of the ARTC Inland Rail Project	Draft EIS being prepared by ARTC	2021 – 2026
Calvert to Kagaru (ARTC)	Rail alignment from Calvert to Kagaru	53 km single-track dual-gauge freight railway as part of the ARTC Inland Rail Project	Draft EIS being prepared by ARTC	2021 – 2026
Bromelton State Development Area (SDA)	Bromelton, Qld	Delivery of critical infrastructure within the Bromelton SDA will support future development and economic growth. This includes a trunk water main and the Beaudesert Town Centre Bypass. This infrastructure provides opportunities to build on the momentum of current development activities by major landowners in the SDA.	The current version of the Bromelton SDA Development Scheme was approved by Governor in Council, December 2017	2016 – 2031
Ipswich Motorway Upgrade Rocklea to Darra (Remaining sections)	Western Brisbane, Qld	Addressing of congestion and extensive delays in the Ipswich Motorway corridor by a range of road upgrades along 7 km of Ipswich Motorway between Rocklea and Darra.	Project listed on QLD Infrastructure Initiative List – Proponent to complete business case development (Stage 3 of Infrastructure Australia's Assessment Framework)	2016/17 to 2020-2021
RAAF Base Amberley future works	RAAF Base Amberley	White paper dedicated future upgrades to RAAF Base Amberley at a cost of $1 billion	N/A	2016 – 2022
Gatton West Industrial Zone (GWIZ)	3 km north west Gatton	Industrial development including a transport and logistics hub on Warrego Highway	N/A	2019 – 2024
InterlinkSQ	13 km west of Toowoomba	200ha of new transport, logistics and business hubs. Located on the narrow-gauge regional rail network and interstate network. Located at the junction of the Gore, Warrego and New England Highways.	N/A	2017 – 2037

The locations of these projects are illustrated in Figure 11.1.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



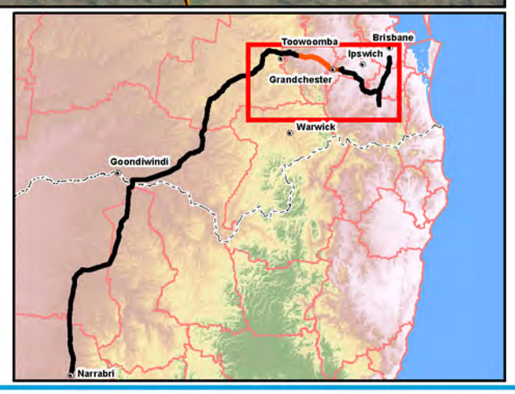
Map by: GN Z:\GIS\GIS_3300_H2C\Tasks\330-ITR-20190710102 8_95PC_Figures_and_Appendices\330-ITR-20190710102 8_Fig11.1_Cumulative_FF-JV_A3L.mxd Date: 17/03/2020 15:28

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- B2G project alignment
- G2H project alignment
- H2C project alignment
- C2K project alignment
- K2ARB project alignment
- Major roads
- Minor roads
- EIS investigation corridor
- Local Government Areas

Projects

- Bromelton State Development Area
- Calvert to Kagaru
- Gatton West Industrial Zone (GWIZ)
- Gowrie to Helidon
- Interlink SQ - Global Logistics Centre
- Ipswich Motorway Upgrade
- RAAF Amberley



A3 scale: 1:400,000

0 3 6 9 12 15km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 17/03/2020 Version: 0

Coordinate System: GDA 1994 MGA Zone 56

Helidon to Calvert

Figure 11.1:

Projects considered in cumulative assessment

11.2 Qualitative assessment

The qualitative assessment takes into account the relevance factor of the regionally significant projects as indicated in Table 11.2.

Table 11.2 Relevance factor

Aspect	Relevance factor		
	Low	Medium	High
Probability of Impact	1	2	3
Duration of Impact	1	2	3
Magnitude/Intensity of Impact	1	2	3
Sensitivity of Receiving Environment	1	2	3

The sum of the relevance factor provides a consequence based on a significance of impact which is provided in Table 11.3.

Table 11.3 Impact significance

Impact significance	Sum of relevant factors	Consequence
Low	1-6	Negative impacts need to be managed by standard environmental management practices. Special approval conditions unlikely to be necessary. Monitoring to be part of general Project monitoring program.
Medium	7-9	Mitigation measures likely to be necessary and specific management practices to be applied. Specific approval conditions are likely. Targeted monitoring program required where appropriate.
High	10-12	Alternative actions will be considered and/or mitigation measures applied to demonstrate improvement. Specific approval conditions required. Targeted monitoring program necessary where appropriate.

A qualitative cumulative impact assessment and associated results are provided in Table 11.4.

Table 11.4 Qualitative cumulative impact assessment

Project and Proponent	Sum of relevant factors	Qualitative assessment consequence	Mitigation measures
Gowrie to Helidon (ARTC)	**Medium**	An overlap of construction schedules and proposed primary construction routes might create for increase in construction traffic volumes. Mitigation measures are likely to be necessary and specific management practices to be applied. Targeted monitoring program would be required where appropriate. Specific approval conditions are likely.	Mitigation measures relating to safety, intersection impacts, link road impacts, pavement impacts, and road-rail interface impacts as described in Section 11 would suffice in order to mitigate the cumulative impacts resulting from the G2H project.
Calvert to Kagaru (ARTC)	**Medium**	An overlap of construction schedules and proposed primary construction routes might create for increase in construction traffic volumes. Mitigation measures are likely to be necessary and specific management practices to be applied. Targeted monitoring program would be required where appropriate. Specific approval conditions are likely.	Mitigation measures relating to safety, intersection impacts, link road impacts, pavement impacts, and road-rail interface impacts as described in Section 11 would suffice in order to mitigate for the cumulative impacts resulting from the C2K project.

Project and Proponent	Sum of relevant factors	Qualitative assessment consequence	Mitigation measures
Bromelton State Development Area	**Low**	The work is in progress on this project which can create an overlap of construction schedules and proposed construction routes, resulting in increase in construction traffic volumes. However, the duration of development project spans up to 15 years. Therefore, its impacts are not likely to be concentrated or significantly impact the Project. The exact construction routes for this project are unknown, therefore mitigation measures may be necessary and specific management practices to be applied. Targeted monitoring program would be required where appropriate.	No additional mitigation required
RAAF Base Amberley future works	**Medium**	The work is in progress on this project which can create an overlap of construction schedules and proposed construction routes, resulting in increase in construction traffic volumes. The exact construction routes for this project are unknown, therefore mitigation measures may be necessary and specific management practices to be applied. Targeted monitoring program would be required where appropriate.	No additional mitigation required
Gatton West Industrial Zone (GWIZ)	**Low**	This project may have small impacts due to the proximity to construction traffic routes being used during the Project construction period. Negative impacts need to be managed by standard environmental management practices. Special approval conditions unlikely to be necessary. Monitoring to be part of general project monitoring program.	No additional mitigation required
InterlinkSQ	**Low**	No impact expected as the construction area does not overlap with construction traffic routes or Project alignment. Negative impacts need to be managed by standard environmental management practices. Special approval conditions unlikely to be necessary. Monitoring to be part of general project monitoring program.	No additional mitigation required

The following projects may have overlapping construction dates with the Project, with impacts dependant on the timing and location of the works of multiple projects at that time. These projects will have cumulative impacts on traffic volumes, congestion and potentially lead to delays during the construction period:

- G2H and C2K
- Bromelton State Development Area.

It is worth nothing that, as part of the Project impact assessment of traffic and transport, a large range of mitigation measures have been proposed at local and state levels for construction and operation of the Project. To further mitigate potential cumulative impacts, the other assessable projects will also be required to implement similar mitigation measures

12 Summary of findings

As part of the overall assessments carried out for the Project, the traffic impact assessment has evaluated key issues related to potential transport infrastructure impacts during the construction and operation phase of the Project. The assessment also examines the potential traffic and pavement impacts from the movement of materials, workforce and equipment during the construction phase of the Project.

12.1 Traffic impacts – link roads

The results of the LOS comparison between the 'with' and 'without' Project scenarios indicated that the Project may potentially cause a minor change in LOS for some road sections during each year of construction. Road sections considered to have a moderate change in LOS for the duration of construction for the following road sections:

- DTMR
  - Karrabin Rosewood Road, between Rosewood Marburg Road and Haigslea Amberley Road (LOS A to LOS B)
  - Rosewood Laidley Road, between Crown Street and Rosewood Marburg Road (LOS A to LOS B, bi-gazettal direction only)
- TRC
  - Water Street North, Between Herries Street and Toowoomba Connection Road (LOS A to LOS B).
- LVRC
  - Turner Street Between Warrego Highway and Mary McKillop Street (LOS B to LOS C)

Although there is a change in operational LOS, the expected operational LOS B and LOS C is considered acceptable given the short duration of the construction activities. Therefore, during the construction phase, apart from the identified road sections and the explanations provided above; the operational LOS of the overall road network will be no worse as a result of the Project. In addition, the operational performance of the road would also return to base conditions after construction is complete.

Hence, based on the LOS comparison, it is not expected that the Project would generate the need to upgrade the road network for such a short duration of impact, but adequate traffic and road use management strategies would be required.

12.2 Traffic impacts – intersections

Intersections which may potentially experience operational impacts during the construction period have been outlined in Table 12.1.

Table 12.1 Intersections with potential operational impacts

Name	Joint ownership
DTMR	
Gatton Laidley Road/Hall Road	LVRC
Karrabin Rosewood Road/Thagoona Haigslea Road	ICC
New England Highway/Munro Street	TRC
Toowoomba Connection Road/Water Street	TRC
Forest Hill Fernvale Road/Old Laidley Forest Hill Road	LVRC
Gatton Helidon Road/Old Toowoomba Road	LVRC
Gatton Laidley/Outer Ring Road	LVRC

Name	Joint ownership
Laidley Plainlands Road/Boundary Road	LVRC
Laidley Plainlands Road/Gatton Laidley Road	-
Laidley Plainlands Road/Old Laidley Forest Hill Road	LVRC
Laidley Plainlands Road/Railway Street	LVRC
LVRC	
Arthur Street/Mary McKillop Street	-
Arthur Street/Station Street	-
Boxmoor Street/Philps Road	-
Laidley Street/Seventeen Mile Road	-
Laidley Street/Station Street	-
Turner Street/Mary McKillop Street	-
Old Toowoomba Road/Burgess Road	-
William Street/Hickey Street	-

All intersections impacted by construction traffic will be considered in the development of the TMP.

12.3 Traffic impacts – pavements

A preliminary desktop pavement impact assessment was undertaken on potentially impacted affected DTMR and RMS SCR roads based on the existing background traffic data available for the relevant road sections. The analysis included a 5 per cent comparison of the background traffic SAR (refer Section 7.3) and Project generated SAR for each link identified to be most likely impacted by the proposed Project.

The analysis indicates that the majority of SCR road segments would have a minimal pavement impact given the duration of construction activities and pavement loading. It was found that a number of SCR roads would be equal to, or exceed, the 5 per cent threshold which consists of:

- Forest Hill Fernvale Road - Between Gatton Laidley Road and Warrego Highway
- Gatton Esk Road - Between Warrego Highway and Lake Clarendon Way
- Gatton Helidon Road - Between Hickey Street and Gatton Laidley Road W
- Gatton Helidon Road - Between Gatton Laidley Road W and Warrego Highway
- Gatton Laidley Road - Between Laidley Plainland Road and Whiteway Road
- Gatton Laidley Road - Between Whiteway Road and Railway Street
- Gatton Laidley Road - Between Hall Road and Forest Hill Fernvale Road
- Karrabin Rosewood Road - Between Rosewood Marburg Road and Haigslea Amberley Road
- Laidley Plainland Road - Between Warrego Highway and Old Laidley Forest Hill Road
- Laidley Plainland Road - Between Old Laidley Forest Hill Road and Railway Street
- Laidley Plainland Road - Between Railway Street and Whites Road
- New England Highway - Between Griffiths Street and Munro Street
- Rosewood Laidley Road - Between Whites Road and Mulgowie Road
- Rosewood Laidley Road - Between Mulgowie Road and Crown Street
- Rosewood Laidley Road - Between Crown Street and Rosewood Marburg Road
- Toowoomba Second Range Crossing - Between New England Highway and Toowoomba Connection Road
- Warrego Highway – Between Toowoomba Second Range Crossing and Gatton Helidon Road

- Warrego Highway - Between Gatton Helidon Road and Gatton Esk Road
- Warrego Highway - Between Gatton Esk Road and Laidley Plainland Road.

In the absence of detailed existing pavement life information along SCRs roads, it is proposed that a more detailed pavement impact assessment will be carried out prior to construction and in consultation with the asset owners. This will form part of the RUMP to be developed prior to construction. This will also assist with ongoing consultation to identify potential contributions towards the maintenance costs for the affected road sections which will be addressed post-EIS.

A pavement impact assessment was not conducted for envisaged affected LGR as the guidelines apply to SCR. Appropriate mitigation measures were developed and provided in Section 9.6 to be applied to both SCR and LGR. Mitigations will be finalised through consultation with local councils.

12.4 Traffic impacts – road-rail interface

The operational performance of the proposed public level rail crossings in the transport study area was assessed (road-rail interfaces). The road-rail interface assessment focuses on potential vehicle delay and queueing analysis at the rail crossings, and at nearby closely spaced intersections. The following scenarios were evaluated:

- Future Year 2026 and 2036 AM and PM peak hour analysis of proposed crossings: Operational Railway Traffic with background road traffic + operational traffic + traffic diversions if any (only at locations where short stacking might be of impact).

The results indicate that acceptable LOS would prevail with minimal impact to vehicle queueing and delay should the proposed level crossings be implemented. Findings for specific level crossings are set out below.

12.4.1 Connors Road (330-2-P-5)

The results of the analysis indicate that the proposed level crossing along Connors Road (330-2-P-5) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the east approach would be 6.0 m in the 2036 AM peak, with maximum queue length along the west approach being 7.0 m in the year 2036 PM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections.

12.4.2 Jamiesons Road (330-6-E-1)

The results of the SIDRA analysis indicate that the existing level crossing along Jamiesons Road (330-6-E-1) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. The Jamiesons Road level crossing is located approximately 65 m south of the proposed Jamiesons Road/Smithfield Road intersection, providing sufficient queuing space to achieve the ARTC short stacking requirement of 31 m (26 m B-double design vehicle + 5 m safety factor). The calculated 95th percentile queue length on the north approach of the crossing is expected to be 62 m in the year 2036 PM peak, and as a result, is not expected to have impacts on the operations of the level crossing or the proposed Jamiesons Road/Smithfield Road intersection.

Currently, the Jamiesons Road level crossing is located 20 m north of the existing Jamiesons Road/Burgess Road/Karraschs Road intersection, and approximately 95 m north of the proposed upgraded intersection. The proposed spacing provides sufficient distance to accommodate the calculated 2036 AM peak 95th percentile queue south of the level crossing (i.e. 57 m queue) and to achieve the short stacking requirement (i.e. 31 m).

12.4.3 Dodt Road (330-9-E-1)

The results of the analysis indicate that the existing level crossing along Dodt Road (330-9-E-1) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that there would be negligible queues along the north and south approaches for the year 2026 and 2036 AM and PM peaks.

Currently, the Dodt Road level crossing is located 26 m north of the existing Dodt Road T-intersection, and approximately 40 m north of the proposed realigned Dodt Road intersection. The realigned intersection will provide sufficient distance to achieve the short stacking requirement (i.e. 31 m) for a design vehicle turning right at this intersection.

Additionally, the Dodt Road level crossing is currently located 20 m south of the existing Dodt Road/Greyfriars Road/Railway Street intersection, providing insufficient short stacking for vehicles after crossing the level crossing northbound. It is proposed for the give-way rule be allocated on the Greyfriars Road and Railway Street approaches to allow for priority along the Dodt Road intersection, thereby alleviating the existing short stacking concern at this location.

12.4.4 Glenore Grove Road (330-9-P-1)

The results of the analysis indicate that the proposed level crossing along Glenore Grove Road (330-9-P-1) would operate at LOS A in the AM and PM peak in the year 2026 and 2036. SIDRA analysis indicates that the maximum queue length along the north approach of the crossing would be 140 m in the year 2036 PM peak, impacting the proposed Glenore Grove Road Avenue/Railway Street intersection located approximately 20 m north of the site when queuing is present. This impact is not considered significant. As only 20 m of stacking is achievable between the level crossing and Railway Street, it is proposed for the right turn to be restricted into Railway Street from the south.

Modelled queue lengths along the south approach are 152 m in the year 2036 AM peak. This queue length may impact the eastern section of Gordon Street when queuing is present. No short stacking issues arise in this location as the southbound movements have priority on Gordon Street to the east and west. This impact is not considered significant. The next closest intersection is the Victoria Street/William Street intersection located approximately 220 m to the west of the site. The queuing is not expected to impact on this intersection.

It should be noted that the Glenore Grove Road (330-9-P-1) site is a proposed level crossing which is the result of closing the existing Hunt Street level crossing (330-9-E-2) in favour of realigning Glenore Grove Road to connect to Gordon Street. If the existing level crossing at Hunt Street (330-9-E-2) were to be retained, it is expected that queues on the south approach in the year 2036 AM peak would extend through the Victoria Street/William Street intersection and the Victoria Street/Robert Street intersection. It is therefore expected that the proposed level crossing at Glenore Grove Road would improve traffic operations for the surrounding network.

12.4.5 Grandchester Mount Mort Road (330-14-P-2)

The results of the analysis indicate that the proposed level crossing along Grandchester Mount Mort Road (330-14-P-2) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the north approach of the crossing would be 33 m in the year 2036 PM peak, with maximum queue length along the south approach being 30 m in the year 2036 PM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections with the closest intersection being the Grand Chester Mount Mort Road/School Road intersection located approximately 100 m south of the site.

12.4.6 Calvert Station Road (330-15-E-4)

The results of the analysis indicate that the existing level crossing along Calvert Station Road (330-15-E-4) would operate at LOS A in the AM and PM peak in the year 2026 and 2036 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the north approach of the crossing would be 20m in the year 2036 PM peak, with maximum queue length along the south approach being 19 m in the year 2036 AM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections, with the closest intersection being the Hiddenvale Road/Gipps Street intersection located approximately 50 m south of the site.

12.5 Traffic impacts – active travel

A number of existing cycle networks have been identified to be coincident with propose construction traffic routes. These impacted cycle networks have been provided in Section 2.4.1. A number of the proposed construction routes currently traverse through areas of moderate to high pedestrian activity through the city centres of Toowoomba, Gatton, Helidon, Laidley and North Ipswich. It should be noted that while increased heavy vehicle movements through these locations may adversely impact pedestrian movements, the majority of these routes currently facilitate a high proportion of heavy vehicle movements regardless.

There are five pedestrian interfaces with the Project alignment.

There are five pedestrian interfaces with the Project alignment: Gatton Station (330-6-E-4a), Gaul Street east (330-6-E-5a), Dodt Road (330-9-P-0), Hunt Street (330-9-E-1a) and Grandchester Mount Mort Road 330-14-P-2a). For Gatton Station (330-6-E-4a), the existing pedestrian footbridge crosses will be replaced. This will be a grade separated crossing both QR lines and providing a link between the southern side and the northern side of Gatton.

It is not expected that significant impacts to pedestrian connectivity will occur as a result of the Project alignment.

13 References

ALCAM (2016) *Australian Level Crossing Assessment Model.* National ALCAM Committee. Available: http://alcam.com.au/media/1013/alcam-in-detail-update-august-2016.pdf

Austroads (1988) *Guide to Traffic Engineering Practice Part 2: Roadway Capacity*

Austroads (2012) *Guide to Pavement Technology Part 2: Pavement Structural Design*. Available: https://austroads.com.au/publications/pavement/agpt02-12

Austroads (2015) *Guide to Road Safety Part 8: Treatment of Crash Locations*. Available: https://austroads.com.au/publications/road-safety/agrs08

Austroads (2017a). *Guide to Traffic Management Part 3: Traffic Studies and Analysis*. Available: https://austroads.com.au/publications/traffic-management/agtm03

Austroads (2017b) *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*. Available: https://austroads.com.au/publications/road-design/agrd04a

Austroads (2017c). *Cycling Aspects of Austroads Guides.* Available: https://austroads.com.au/publications/road-design/ap-g88-17

Austroads (2019a). *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings*. Available: https://austroads.com.au/publications/traffic-management/agtm06

Austroads (2019b). *Guide to Traffic Management Part 12: Traffic Impacts of Developments.* Available: https://austroads.com.au/publications/traffic-management/agtm12

Data Analysis, Engineering and Technology, Infrastructure Management and Delivery (2018). Available: https://www.tmr.qld.gov.au/-/media/Safety/Transport-and-road-statistics/statistics_data_request_form.pdf?la=en *[03 May 2018]*

Department of Transport and Main Roads (2012a). *Queensland Level Crossing Safety Strategy*. Available: https://www.tmr.qld.gov.au/-/media/Safety/railsafety/QueenslandLevelCrossingSafetyStrategy2012to2021.pdf

Department of Transport and Main Roads (2012b). *Traffic and Road Use Management Manual: Volume 7 – Road Works.* Available: http://www.aapaqtmr.org/SAR20131211/Ref_docs/08-TRUM-volume_7_complete_Nov2013.pdf

Department of Transport and Main Roads (2014) *Road Planning and Design Manual: Supplement to Austroads guide to Road Design Part 4A*. Available: http://www.tmr.qld.gov.au/~/media/busind/techstdpubs/Road20planning20and20design/Road20Planning20and20Design202nd20edition/RPDMSuppVol3Part4A.pdf

Department of Transport and Main Roads (2015). *Guide to Development in a Transport Environment: Rail.* Available: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Guide-to-development-in-a-transport-environment-rail.aspx

Department of Transport and Main Roads (2017). *Guide to Traffic Impact Assessment.* Available: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Guide-to-Traffic-Impact-Assessment

Department of Transport and Main Roads (2018). *GTIA Practice Note: Pavement Impact Assessment.* Available: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Guide-to-Traffic-Impact-Assessment

Department of Transport and Main Roads (2019a) *Queensland Manual of Uniform Traffic Control Devices Part 3: Traffic Control for Works on Roads*. Available: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Manual-of-uniform-traffic-control-devices.aspx

Department of Transport and Main Roads (2019b) *Queensland Manual of Uniform Traffic Control Devices Part 7: Railway Crossings.* Available: https://www.tmr.qld.gov.au/-/media/busind/techstdpubs/Traffic-management/Manual-of-Uniform-Traffic-Control-Devices/MUTCD-Pt-7-Railway-Crossings.pdf?la=en

Department of Transport and Main Roads (2019c) *Technical Standard MRTS02 – Provision for traffic prior to the commencement of construction.* Available: https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Specifications/1-Overarching-Specifications.aspx#MRTS02

Department of Transport and Main Roads (2019d). *Long Distance Coach Services.* Available: https://www.tmr.qld.gov.au/Travel-and-transport/Long-distance-coach-services.aspx

Gatton Shire Council (2007). *Planning Scheme*. Available: https://www.lockyervalley.qld.gov.au/our-services/strategic-planning/Documents/Planning20Schemes/gatton20planning20scheme20adopted2015-06-0720v2-120no20cover20no20maps.pdf

Ipswich City Council (2006). *Ipswich City Council Planning Scheme*. Available: https://www.ipswichplanning.com.au/planning-documents/planning-scheme

Ipswich City Council (2016). *iGO City of Ipswich Transport Plan*. Available: https://www.ipswich.qld.gov.au/about_council/corporate_publications/igo

Lockyer Valley Regional Council (2003). *Laidley Shire Council Planning Scheme*. Available: https://www.lockyervalley.qld.gov.au/our-services/strategic-planning/Documents/Planning20Schemes/Laidley20Shire20Planning20Scheme20200320-20Amendment202.pdf

Queensland Government (2019). *Open Data Portal.* Available: https://www.data.qld.gov.au/dataset

SIDRA Intersection Software (2018) *SIDRA Intersection User Guide for Version 8*

TransLink (2019). *Bus Route Timetables.* Available: https://jp.translink.com.au/plan-your-journey/timetables

Transport Planning Section New South Wales (2002). Guide to Traffic Generating Developments. Available: https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/guides-manuals/guide-to-generating-traffic-developments.pdf

Transport for New South Wales (2018). *Traffic Control at work sites – Technical Manual.* Available: https://www.rms.nsw.gov.au/business-industry/partners-suppliers/document-types/guides-manuals/traffic-control-worksites.html

Transport for New South Wales (2019). *Routes and timetables.* Available: https://transportnsw.info/routes/bus

Transportation Research Board (2016) *Highway Capacity Manual 6th edition: A guide for multimodal mobility analysis.* Washington D.C.