APPENDIX

M

Traffic Impact Assessment

PART 1 OF 2

Main Report

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Inland Rail North Star to Border EIS

Appendix M: Traffic Impact Assessment

Australian Rail Track Corporation

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Revision: 2

Future Freight
Integrating Community, Environment and Engineering

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Glossary

Abbreviation	Definition
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
ALCAM	Australian Level Crossing Assessment Model
ARTC	Australian Rail Track Corporation
AUL(S)	Auxiliary Left Turn
B2G	Border to Gowrie
BAL	Basic left turn
BAR	Basic right turn
CEMP	Construction environmental management plan
Ch	Chainage along the project (in kilometres)
CHR(S)	Channelised Right Turn
CVC	Clarence Valley Council
DCA	Definition for Coding Accidents
DIDO	Drive-in-drive-out
DTMR	Queensland Department of Transport Main Roads
EIS	Environmental Impact Statement
FFJV	Future Freight Joint Venture
FIFO	Fly-in-fly-out
GRC	Goondiwindi Regional Council
GSC	Gwydir Shire Council
GTIA	Guidelines to Traffic Impact Assessment
GVM	Gross vehicle mass
HV	Heavy Vehicle
ISC	Inverell Shire Council
km	Kilometre
LCIP	NSW Level Crossing Improvement Program
LGA	Local Government Authorities
LGR	Local Government Roads
LOS	Level of Service
m	metre
MPSC	Moree Plains Shire Council
MUTCD	Manual of Uniform Traffic Control Devices
NHVR	National Heavy Vehicle Regulator
NS2B	North Star to NSW/QLD Border
NSW	New South Wales
NTC	National Transport Commission
OSOM	Oversize, over-mass vehicles
ONRSR	Office of the National Rail Safety Regulator
PCNP	Queensland Principal Cycle Network Plans

Abbreviation	Definition
The Project	North Star to NSW/QLD Border section of Inland Rail
QLCSS	Queensland Level Crossing Safety Strategy
QLD	Queensland
QPS	Queensland Police Service
QR	Queensland Rail
RAV	Restricted access vehicles
RFI	Requests for Information
RMAR	Rail maintenance access roads
RMS	Roads and Maritime Services
RSNL	Rail Safety National Law
RSRP	Rail Safety Regulators Panel
RTA	Roads and Traffic Authority
RUMPs	Road Use Management Plans
SAR	Standard Axle Repetitions
SCR	New South Wales State Roads and Queensland State-Controlled Roads
SEARs	NSW Secretary's Environmental Assessment Requirements
SEIS	Supplementary EIS
SiD	Safety in Design
SIDRA	Signalised & Unsignalised Intersection Design and Research Aid
SFAIRP	So Far As Is Reasonably Practicable
TCPs	Traffic Control Plans
TDM	Travel demand management
TfNSW	Transport for New South Wales
TIA	Traffic Impact Assessment
TI Act	Transport Infrastructure Act 1994 (QLD)
TMSs	Traffic Management Strategies
TP&C Act	Transport Planning and Coordination Act 1994
TRC	Toowoomba Regional Council
TSR	Travelling Stock Reserves
VMS	Variable Message Signs
WIM	Weigh-In-Motion

1 Introduction and approach

1.1 Project overview

ARTC proposes to construct and operate the North Star to NSW/QLD Border ("the Project") section of Inland Rail. The Inland Rail route is approximately 1,700 km long and will provide a direct link between Melbourne and Brisbane via regional Victoria, NSW and QLD. Inland Rail has been divided into thirteen projects, seven of which are located in NSW.

The North Star to NSW/QLD Border (NS2B) section involves the design and construction of approximately 25km of new standard gauge track within the existing, non-operational Boggabilla railway line between approximately 900 metres north of North Star towards Whalan Creek (refer Figure 1.1). The Project then continues along a 5 km section of greenfield rail alignment towards the NSW/QLD border. It crosses two Local Government Areas (LGAs) of Gwydir Shire Council (GSC) and Moree Plains Shire Council (MPSC).

This Traffic Impact Assessment (TIA) addresses the requirements of the NSW Secretary's Environmental Assessment Requirements (SEARs) Section 7-1 to 7-4 as shown in Section 1.4.

1.2 Scope and context of report

This report assesses the traffic and transport impacts of the construction and operation of the Project on the surrounding transport infrastructure based on the Project feasibility design. 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 State-Controlled Roads (together referred to as SCR) and Local Government Roads (LGR).

This assessment follows the construction methodology which assumes a supplier for all key materials. Generally, suppliers local to the Project within NSW have been assumed. However, due to specific Project requirements, some suppliers are located in Queensland, resulting in the inclusion of Queensland 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 on these facilities is not considered to be significant during either the construction and operational phases. Impacts from the Project on the operation and throughputs at ports (containers) has not been assessed in this report as it is outside the requirement of the assessment.

DTMR's Guidelines to Traffic Impact Assessment (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. The DTMR GTIA 2017 has been agreed with and accepted by RMS (Roads and Maritime Services) as the TIA guideline document (RMS email dated 20 September 2018).

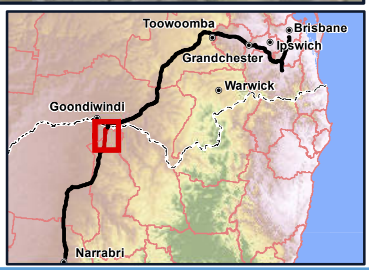
The construction routes assumed as a part of this assessment are routes which the construction contractor may use to transport materials from the assumed suppliers to the Project laydown areas. However, the determination of the final construction and heavy vehicle (HV) routes will be subject to consultation between Roads and Maritime Services (RMS), the Department of Transport and Main Roads (DTMR), LGAs and the construction contractor. This is consistent with Section 7.5 of GTIA which states that the TIA "may be finalised when Project contractors are appointed and final traffic generation is clearer." Consistent with this, a Traffic Management Plan (TMP) will be finalised by the construction contractor and when final traffic volumes, turning movements, routes and vehicle types are known and, if required, RMS and DTMR have completed their final review of such information. Until such time as RMS 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 by a third party.

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

Map by: DTH/AD/GN Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig1.1_Project_alignment_FFJV_A4P_rev2.mxd Date: 18/11/2019 16:41

Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border



A4 scale: 1:170,000

0 1 2 3 4 5km

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Date: 15/11/2019 Version: 2

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 1.1:Project alignment

The traffic and transport assessment focusses 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 transport operations associated with intersections, road links, 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 assessments
- Conducts a traffic impact assessment associated with intersections, road links, road/rail interface locations, road safety and access and frontage based on the Project construction routes assumed as a part of the feasibility 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.

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 1.1 Summary of legislation, standards, policies and guidelines

Legislation, policy/ standard or guideline	Relevance to the Project
Legislation	
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 ▪ 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 2013 (NSW)	The elements of the *Road Transport Act 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.

Legislation, policy/ standard or guideline	Relevance to the Project
Roads Act 1993 No 33 (NSW)	The objects of the *Roads Act 1993 No 33 (NSW)* relevant to the Project are: a) to set out the rights of members of the public to pass along public roads, and b) to set out the rights of persons who own land adjoining a public road to have access to the public road, and c) to establish the procedures for the opening and closing of a public road, and d) to provide for the classification of roads, and e) to provide for the declaration of RMS and other public authorities as roads authorities for both classified and unclassified roads, and f) to confer certain functions (in particular, the function of carrying out road work) on RMS and on other roads authorities, and g) to provide for the distribution of the functions conferred by this Act between RMS and other roads authorities, and h) to regulate the carrying out of various activities on public roads. Additional sections of the Act that are relevant to the Project include: Section 138 (1) A person must not: a) erect a structure or carry out a work in, on or over a public road, or b) dig up or disturb the surface of a public road, or c) remove or interfere with a structure, work or tree on a public road, or d) pump water into a public road from any land adjoining the road, or e) connect a road (whether public or private) to a classified road, f) otherwise than with the consent of the appropriate roads authority.
Construction of New Level Crossings Policy (TfNSW 2018)	The Construction of New Level Crossing Policy provides guidance and direction to transport planners and infrastructure managers in the ongoing development and management of the NSW rail network. The approach by TfNSW and rail and road agencies is to avoid building new level crossings wherever possible given the inherent risk. This policy outlines the process for opening a new level crossing and issues to be considered. The development application must take into consideration: ▪ The implications for traffic safety ▪ The feasibility of alternative means of access to the development that does not involve use of level crossings and ▪ Any comments received from the CEO of the rail authority on the Project.
Level Crossing Closures Policy (TfNSW 2018)	The purpose of the Level Crossing Closures Policy is to provide guidance and direction to transport planners and infrastructure managers in the ongoing development and management of the NSW rail network. It is the position of TfNSW that the closer of public and private level crossings in NSW is to be pursued where it is practical and cost effective to do so.
Rail Safety National Law (NSW)	The objects of this Rail Safety National Law (NSW) that are relevant to the Project are— a) to make provision for a national system of rail safety, including by providing a scheme for national accreditation of rail transport operators in respect of railway operations; and b) to provide for the effective management of safety risks associated with railway operations; and c) to provide for the safe carrying out of railway operations; and d) to provide for continuous improvement of the safe carrying out of railway operations; and e) to make special provision for the control of particular risks arising from railway operations; and f) to promote public confidence in the safety of transport of persons or freight by rail; and g) to promote the provision of advice, information, education and training for safe railway operations; and h) to promote the effective involvement of relevant stakeholders, through consultation and cooperation, in the provision of safe railway operations.
Transport Planning and Coordination Act 1994 (TP&C Act)	The overall objective of the Transport Planning and Coordination Act 1994 (Qld) (TP&C 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.

Legislation, policy/ standard or guideline	Relevance to the Project
Transport Infrastructure Act 1994 (QLD) (TI Act)	The overall objective of the *Transport Infrastructure Act 1994* 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 TP&C 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 State controlled roads or access to State controlled roads (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.
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 State controlled roads). 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.
Government plans/strategies	
Goondiwindi Regional Council Community Plan (2012)	The Goondiwindi Regional Council Community Plan forms one of Goondiwindi Regional Council's key planning documents, and is the overarching document guiding other council's plans. It sits above all other planning processes and may provide agreed priorities and strategies to guide these other plans. It also sets out the implementation strategies to deliver the desired outcomes of the plan until 2022.
Goondiwindi Regional Planning Scheme (2018)	The Goondiwindi Regional Planning Scheme is a document which sets out the controls and use of land that apply to land within the region. It is the current planning scheme used in assessing development applications. The planning scheme sets out Goondiwindi Regional Council's intention for the future development in the planning scheme until 2038 and maps out trunk infrastructure within the Town of Goondiwindi as well as designations of premises for development.
Goondiwindi Regional Council Charges Resolution (2017)	The purpose of the Goondiwindi Regional Council Charges Resolution is to assist with the implementation of the applicable local planning instruments by providing charges for trunk infrastructure networks such as water, sewerage, stormwater, transport and parks within the local government area. It also provides the method of calculation for the charge that would be levied by the local government for the development.
Gwydir Shire Council Community Strategic Plan, 2017 – 2027	The Community Strategic Plan is a high-level plan, which reflects the community's main priorities and aspirations. This plan is the basis of the other Council documents as it outlines five goals for the Council over the next ten years: ▪ A healthy and cohesive community ▪ Building the business base ▪ An environmentally responsible shire ▪ Proactive regional and local leadership. ▪ Organisation management
Gwydir Shire Council Delivery Program, 2017 – 2021	The Delivery Program takes the strategic goals outlined in the Community Strategic Plan and incorporates them into strategic actions. This document is the single point of reference for all principal activities to be taken by the Council during their term in office. The document also outlines the Council's mission and core values.
Gwydir Shire Council Transport Asset Management Plan, 2011	The Council has a suite of Integrated Planning and Reporting documents including the Transport, Sewerage and Water Supply Asset Management Plans. The Transport Asset Management Plan outlines the Council's plan to advance Gwydir's transport system. The document identifies the infrastructure needs of the Council in order to enable people to get to work, recreation, school, farm produce to markets and goods and services to shops. The document also outlines the actions required to deliver this to an agreed level of service in the most cost effective manner.
Gwydir Shire Economic Development Strategy, 2017 – 2020	The Economic Development Strategy provides the direction and framework for encouraging, supporting and facilitating economic development within Gwydir Shire. The document provides an economic snapshot of the council and the infrastructure required to meet the ambitions of the Council. The key industries within the Council are discussed with an economic lens and how the Council plans to help grow them.

Legislation, policy/ standard or guideline	Relevance to the Project
Moree Plains Shire Council Community Strategic Plan, 2017 – 2027	The Community Strategic Plan is the overarching document in the Council's Integrated Planning and Reporting Framework. It translates the priorities and aspirations of the community into long-term strategic goals: ▪ An inclusive caring community ▪ Sustainable spaces and places ▪ A vibrant regional economy ▪ A leading organisation
Moree Plains Shire Council Delivery Program 2017-2021	The Delivery Program is a statement of commitment to the community from each newly elected council. Where the community strategic plan identifies a role for Council in delivering a community strategy, the Delivery Program is designed as the single point of reference for all principal activities undertaken.
Moree Plains Shire Council Asset Management Strategy 2017	The Asset Management Strategy is prepared to assist Council in improving the way it delivers services from infrastructure including roads, bridges, paths, stormwater drainage, parks and recreation, buildings, water and sewer. The document outlines how the asset portfolio will be used to meet the service delivery needs of the Council's community into the future.
Future Transport Strategy 2056 (TfNSW, 2017)	The Future Transport Strategy is an update of NSW's Long-Term Transport Master Plan. It acknowledges the vital role transport plays in the land use, tourism, and economic development of towns and cities. It includes issue-specific and place-based supporting plans that shift the focus away from individual modes of transport, toward integrated solutions. The Strategy and Plans also focus on the role of transport in delivering movement and place outcomes that support the character of the places and communities we want for the future. The document aligns with the Greater Sydney commission, Infrastructure NSW, the Department of Premier and Cabinet and the Department of Planning, Industry and Environment. Inland Rail project will mean major infrastructure changes to rail track in regional NSW including: ▪ 37 km of new track from Illabo to Stockinbingal ▪ 107 km of upgraded track from Parkes to Narromine ▪ 307 km of new track from Narromine to Narrabri ▪ 183 km of upgraded track and 3km of new track from Narrabri to North Star ▪ 52 km of new track from North Star to the NSW/Queensland border. The Future Transport Strategy 2056 will ensure the Project optimises the movement of freight in NSW through efficient links to ports and economically sustainable freight hubs.
NSW Freight and Ports Plan 2018 – 2023 (TfNSW, 2017)	The NSW Freight and Ports Plan 2018 - 2023 (the Plan) provides industry with the continuity and certainty it needs for the State's future growth and prosperity. The Plan encourages government and industry to collaborate on clear initiatives and targets to make the NSW freight tasks more efficient and safe, and it will address key issues for the safe, efficient and sustainable movement of freight across NSW, including: ▪ Effective planning and corridor protection for future freight infrastructure and growth ▪ Balancing freight and passenger movements ▪ Improved cross-border harmonisation ▪ The facilitation and introduction of technologies to improve safety and efficiency. The Project will improve the efficiency, capacity and safety of the freight network in NSW by providing a dedicated rail corridor linking NSW to Victoria and Queensland. The Project is noted as part of an outer Sydney orbital freight corridor and key north-south freight corridor across NSW.
New England North West Regional Transport Plan (NSW)	The New England North West Regional Transport Plans provide a blueprint for the future of transport in the ten regions, including the New England North West, and set a strategic direction for the delivery of transport infrastructure and services in the State's regions over the next 20 years. Importantly, the Plans support the implementation of the NSW Long Term Transport Master Plan which sets the strategic framework to guide transport decision making in NSW. The Project will support these regional transport plans with the introduction of a new rail corridor through New England North West region.

Legislation, policy/ standard or guideline	Relevance to the Project
Level Crossing Strategy Council's Strategic Plan for NSW Level Crossings 2010 – 2020	The Level Crossing Strategy Council's Strategic Plan for NSW Level Crossings provides the framework for a consistent approach to the management of level crossings across NSW by road and rail agencies. The vision of this plan is for no fatalities at level crossings in NSW. Key guiding principles of this plan that are applicable to the Project include: ▪ Road and rail infrastructure managers are responsible for implementing risk reduction treatments based on their respective risk frameworks and priorities. ▪ Reducing safety risks at level crossings by undertaking thorough assessment of site conditions (both rail and road) and a consideration of the effectiveness of existing and potential controls. The application of low-cost treatments will be considered in the first instance. Higher cost road and rail management measures will be considered when necessary. ▪ Where the development of either the road or rail network leads to a change in a risk profile resulting in the need for an upgrade of a level crossing, the associated costs for both the road and rail components will be met by the developer
Level Crossing Improvement Program (NSW)	The Level Crossing Improvement Program (LCIP) allocates supplementary funding for level crossing upgrades and to support initiatives such as safety awareness and police enforcement campaigns. Upgrade locations funded by the LCIP are identified through a priority ranking approach using the ALCAM, a review of NSW safety incident data and consultation with relevant road managers and rail infrastructure managers.
Guidelines	
Guideline to Traffic Impact Assessment, September 2017 (Queensland)	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. The DTMR GTIA 2017 has been agreed with and accepted by RMS as the TIA guideline document (RMS email dated 20 September 2018). 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 State controlled roads, Local Government Authorities may choose to adopt or use this as a reference. In general, the Department of Transport and Main Roads (DTMR) will consider a development's road impacts to be 'insignificant' if the development generates an increase in traffic on State controlled roads 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. This was updated to include a clarification regarding the calculation of pavement contributions. Since this is not a significant update, this assessment has been undertaken consistent with the 2017 GTIA.
Roads and Traffic Authority (RTA) Guide to Traffic Generating Developments	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 GTIA manual is used as overarching guideline document for NSW roads, as agreed with Roads and Maritime Services (RMS).
Manual of Uniform Traffic Control Devices (MUTCD) Part 7: Railway Crossings (AS 1742.7: 2016)	The MUTCD series covers all mandatory road and rail related traffic control devices likely to be required for the Project. 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, cane railway and combined railway/cane railway level crossings and describes the devices and assemblies, their use and location to achieve these controls.

Legislation, policy/ standard or guideline	Relevance to the Project
Austroads Guide to Traffic Management Part 12: Traffic Impact Assessments (2016)	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 DTMR GTIA publications discussed earlier.
Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis (2017)	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 (2017)	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.
Cycling Aspects of Austroads Guides (Austroads, 2014)	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 traffic cost effective treatments.
National Rail Safety Guideline (2008)	The National Transport Commission (NTC) is an independent body established under Commonwealth legislation and an inter-governmental agreement, and funded jointly by the Commonwealth, States and Territories. In accordance with its duties, the NTC has developed a national model Rail Safety Bill 2006 and Rail Safety Regulations 2006 to achieve a nationally consistent approach to regulating rail safety in Australia. The model legislation was developed in conjunction with representatives of all jurisdictions, the rail industry and rail unions and was approved by the Australian Transport Council in 2006. The national model Bill and Regulations will receive legal effect when enacted in State and Territory law. Within each State and Territory, the rail safety regulators are responsible for administering rail safety legislation and in some jurisdictions; this responsibility extends to the preparation of rail safety guidelines. Rail safety regulators' national activities are coordinated through their collegiate body, the Rail Safety Regulators Panel (RSRP) which together with the NTC is responsible for the development of this guideline. The guideline outlines the requirements for the accreditation of rail infrastructure managers in control of new or existing railway infrastructure. Such managers must demonstrate appropriate risk management of their operations, safety management systems, demonstrated competence and capacity to mitigate risks (for example at new road/rail interfaces) and compliance with other legislative requirements, for example those contained in the NSW Road Transport Act 2013.

1.4 Secretary's Environmental Assessment Requirements

The TIA responds to the Project specific transport matters outlined in the Project Secretary's Environmental Assessment Requirements (SEARs). The transport SEARs have been reproduced in Table 1.2, alongside the relevant sections of this report where these elements have been addressed.

Table 1.2 Secretary's Environmental Assessment Requirements – transport

<table>
<tr><th colspan="2">Secretary's Environmental Assessment Requirements</th><th>Relevant section</th></tr>
<tr><td rowspan="5">1. The Proponent must assess construction transport and traffic (vehicle, pedestrian and cyclists, bus services, and train operations) impacts, including, but not necessarily limited to:</td><td>(a) A considered approach to route identification and scheduling of transport movements;</td><td>Section 5.5 and 5.7</td></tr>
<tr><td>(b) The number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements and track machines);</td><td>Section 5.6</td></tr>
<tr><td>(c) The nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements) and assessment of traffic impacts on these routes including identifying traffic management measures to mitigate any impacts;</td><td>Section 2, 4, 6.2 and 8</td></tr>
<tr><td>(d) The closure, diversion or reconfiguration of elements of the road network associated with the construction of the Project; and</td><td>Section 3.4</td></tr>
<tr><td>(e) Safe access and egress to/from the classified road network.</td><td>Section 5.5.11 and 6.3</td></tr>
<tr><td rowspan="3">2. The Proponent must assess (and model) the operational transport impacts of the Project, including:</td><td>(a) The performance of key level crossings and intersections.</td><td>Section 6.4.3 and 6.3</td></tr>
<tr><td>(b) Wider transport interactions (local and regional roads, cycling, public and freight transport and the broader NSW rail network); and</td><td>Section 2.2</td></tr>
<tr><td>(c) Identification of traffic and transport measures to mitigate any impacts.</td><td>Section 8</td></tr>
<tr><td colspan="2">3. The Proponent must assess the feasibility of level crossings (existing and proposed), and justify the safety and operational impacts and/or benefits of the proposed crossing type, taking into account the NSW Government's Construction of New Level Crossings Policy.</td><td>Section 3.3</td></tr>
<tr><td rowspan="6">4. in the assessment of level crossings, the EIS must take into account:</td><td>(a) The NSW Government's Construction of New Level Crossings Policy;</td><td>Section 3.3</td></tr>
<tr><td>(b) Level crossing ALCAM assessments for public crossings and site- specific risk assessments. The Proponent must demonstrate how they reduce risks identified So Far As Is Reasonably Practicable (SFAIRP);</td><td>Section 3.3</td></tr>
<tr><td>(c) Consistency with any Interface Agreements and related Safety Management Plans, including draft Interface Agreements and draft Safety Management Plans;</td><td>Section 3.3</td></tr>
<tr><td>(d) The practice of upgrading active public level crossings to boom gates and flashing lights adopted by the NSW Level Crossing Improvement Program (LCIP);</td><td>N/A – no existing crossings</td></tr>
<tr><td>(e) The rationalisation of private and public level crossings in line with the NSW Government's Level Crossing Closures Policy; and</td><td>N/A – no existing crossings</td></tr>
<tr><td>(f) Operation of level crossings with regard to road and rail travel speeds, vehicle types, train lengths, train numbers, road and rail traffic volumes, vehicle queuing and sight distance.</td><td>Section 6.4.3</td></tr>
</table>

1.5 Impact assessment area

The impact assessment area defined for the traffic impact assessment (TIA) consists of:

- Project, including public roads intersecting the Project (road/rail interface locations), shown in Figure 1.2
- Primary construction transport routes, the 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 impact assessment area was the focus area for assessing impacts and determining 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 land owners as part of the Project's wider consultation process, including rail interfaces with private roads. The use of any private roads during construction would require a specific agreement between the delivery contractor with the private road owner.

1.5.1 The Project

The Project starts in New South Wales where the existing Cummara Boggabilla railway line terminates just north of North Star. For the purposes of the Environmental Impact Statement (EIS) and this TIA, the Project terminates at the NSW/QLD border.

The proposed road/rail interface locations that form part of the impact assessment area are shown in Figure 1.2 (a to c). These road/rail interface locations consist of public formed roads only. The road/rail interface locations included in the TIA impact assessment area are all public road crossings which are envisaged to intersect with the Project. The road/rail interface locations are described in more detail within Section 3.2.

1.5.2 Primary construction transport routes

The proposed primary road-based construction transport routes that form part of the impact assessment area are provided in Figure 1.3, with specific material transport routes provided in Appendix E to Appendix J. The construction routes proposed as a part of this assessment may be used by workforce or in the transportation of quarry materials (ballast, capping materials), other bulk materials, pre-cast concrete, ready-mix concrete, rail, sleepers, earthworks materials, spoil, water, plant, tools and other materials. However, the determination of the final construction and heavy vehicle routes will be subject to consultation between RMS, DTMR, the local government authority and the construction contractor.

The primary road-based construction routes comprise of the existing road network (both SCRs 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, they will 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 in detail.

It has been assumed that rail will be supplied by a single source and will be distributed from the closest existing rail network to various points along the Project. It is assumed that no road-based construction routes are required to transport rail for this Project.

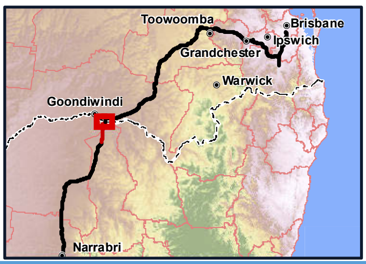
The primary construction routes for the Project are described in more detail in Section 2.2. The proposed primary construction route map for all road-based transport materials is provided in Appendix E to Appendix J.

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

Map by: DTH/AD/GN Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig1.2_Location_FFJV_A4P_rev3.mxd Date: 5/02/2020 15:28

Legend

- 5 Chainage (km)
- Localities
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border



A4 scale: 1:65,000

0 0.5 1 1.5 2 2.5 km

Future Freight
Integrating Community, Environment and Engineering

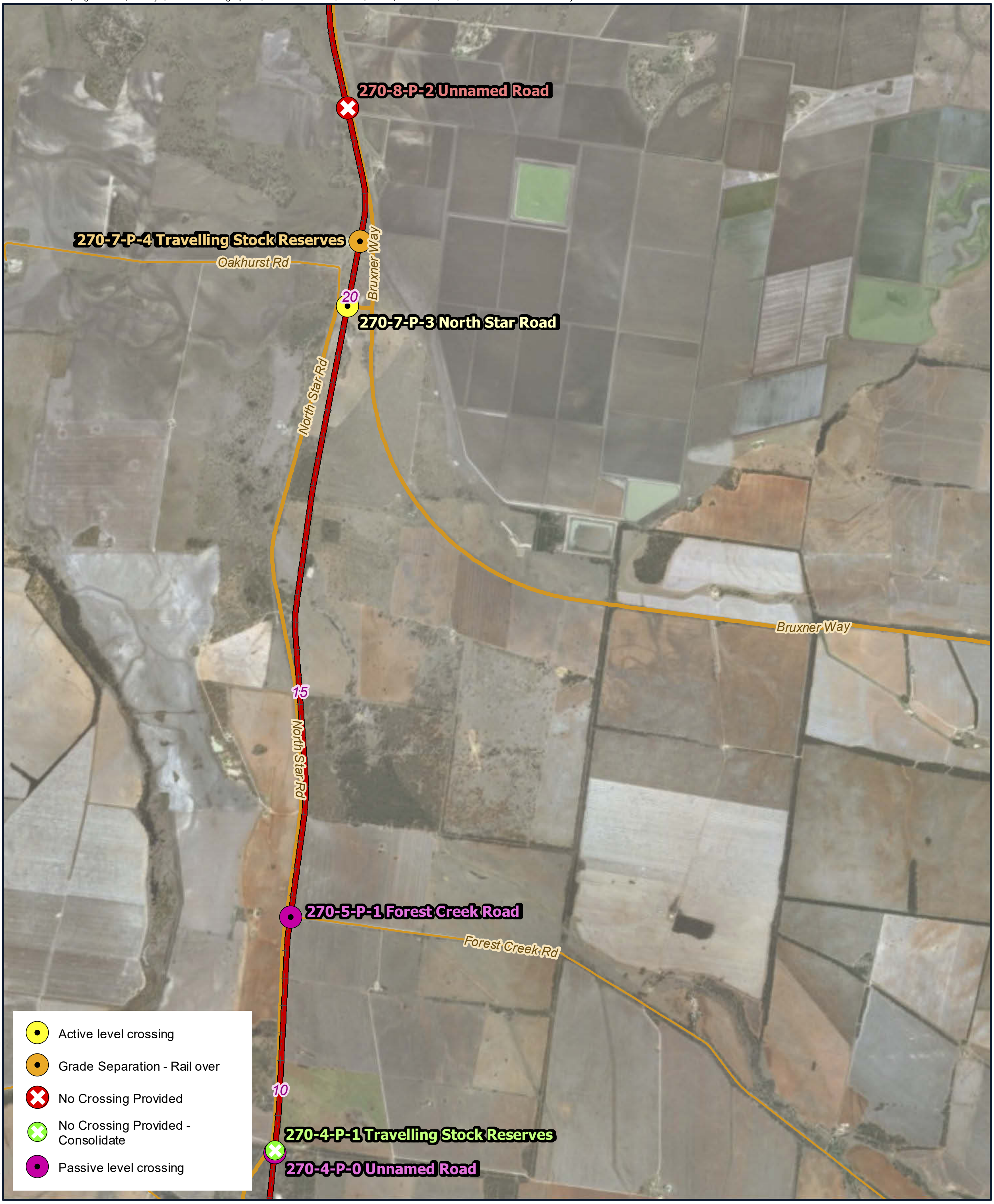
Date: 23/10/2019 Version: 0

Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 1.2a: Proposed public road/rail interface locations rail alignment

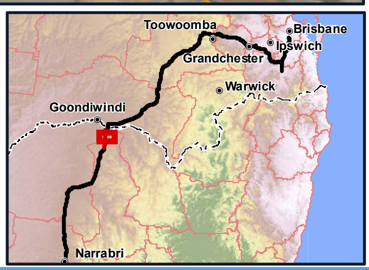
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: DTH/AD/GN Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig1.2_Location_FFJV_A4P_rev3.mxd Date: 5/02/2020 15:28

Legend

5 Chainage (km)
Existing rail (non-operational)
North Star to NSW/QLD border alignment
Major roads
Minor roads



A4 scale: 1:65,000

0 0.5 1 1.5 2 2.5 km

Future Freight
Integrating Community, Environment and Engineering

Date: 23/10/2019 Version: 0
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

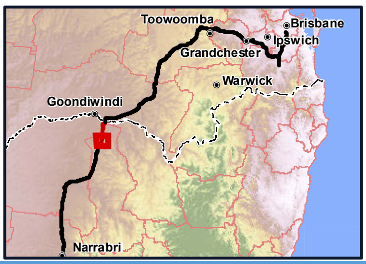
Figure 1.2b: Proposed public road/rail interface locations rail alignment

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

Map by: DTH/AD/GN Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig1.2_Location_FFJV_A4P_rev3.mxd Date: 5/02/2020 15:28

Legend

5 Chainage (km)
Localities
Existing rail (operational)
Existing rail (non-operational)
North Star to NSW/QLD border alignment
Adjoining alignments
Major roads
Minor roads



A4 scale: 1:65,000

0 0.5 1 1.5 2 2.5 km

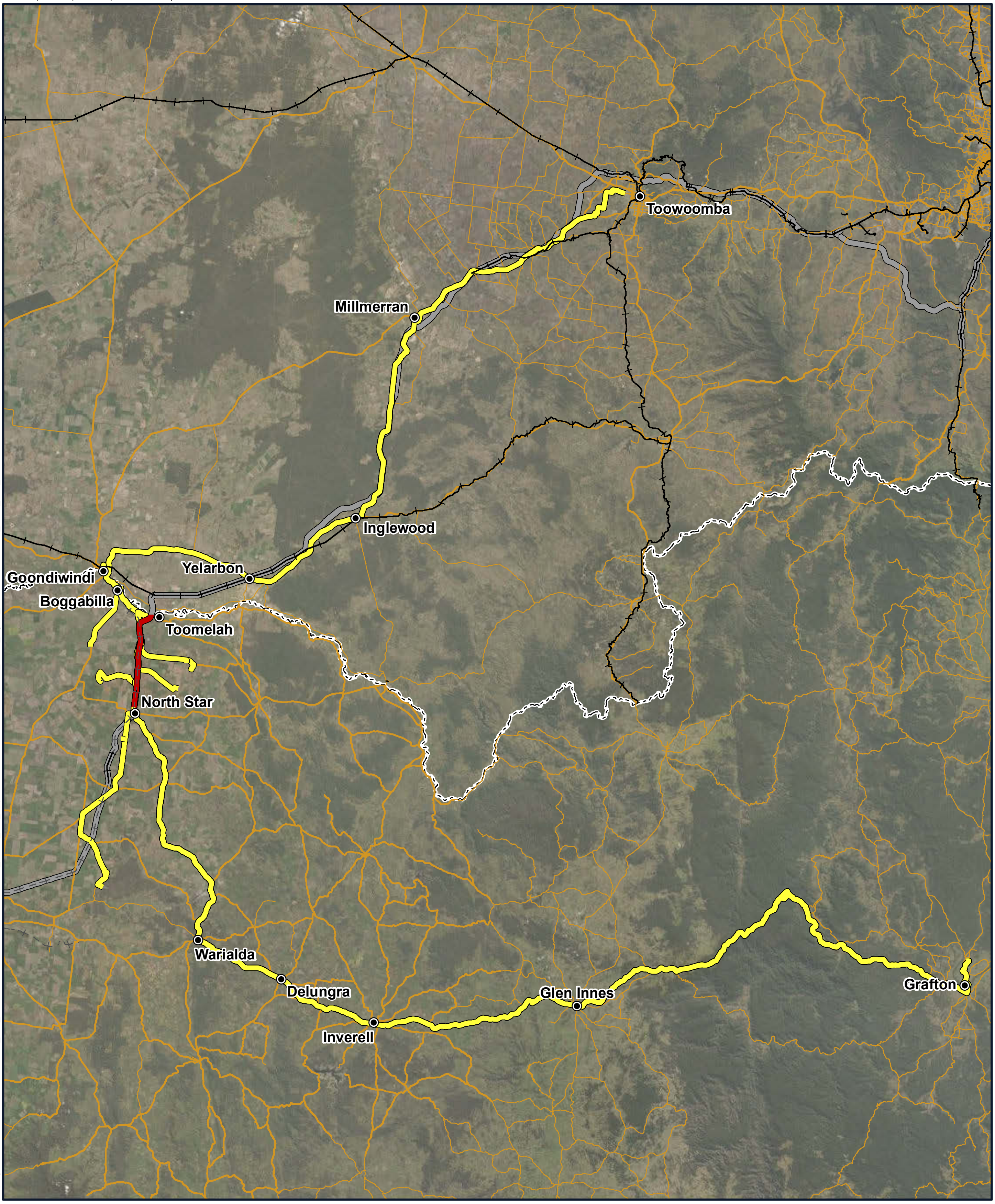
Future Freight
Integrating Community, Environment and Engineering

Date: 23/10/2019 Version: 0
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 1.2c: Proposed public road/rail interface locations rail alignment

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors



Map by: FFJV DTH/AD/GN Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig1.3_OverallConstruction_FFJV_A4P_v2.mxd Date: 18/11/2019 16:34

Legend

- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Overall construction routes
- Major roads
- NSW/QLD border

A4 scale: 1:1,550,000

0 9 18 27 36 45km

Future Freight
Integrating Community, Environment and Engineering

Date: 23/10/2019 Version: 0
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 1.3:
Overall construction transport routes

1.5.3 Project transport routes – operational phase

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 Project 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. This has previously been undertaken as part of the Project business case and has been considered across the program. Although not investigated in detail in this TIA, it can be reasonably assumed that the Project will result in modal shift from heavy vehicle trips along the surrounding network being converted to train trips, therefore resulting in a positive long term traffic benefit.

1.6 Methodology

This section outlines the methodology that was adopted for the TIA for the construction and operational phases of the Project. The SEARS for the Project does not specify a guideline that the TIA be undertaken in accordance with, however, the DTMR GTIA 2017 has been agreed with and accepted by RMS as the basis for this assessment. 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 TIA impact assessment area
- Determining the traffic generation related to the construction and operational phases 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. The update to this version is considered minor as the only change is a clarification to the payment of pavement contributions which does not impact on the assessment undertaken in this TIA. As a result, this assessment has been undertaken consistent with the 2017 version.

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. While some workforce movements may use active transport, this is not expected to be significant given the remote locations of the worksites. Table 1.3 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 significant 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 impact assessment 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, road/rail interfaces, active travel, TSRs 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.

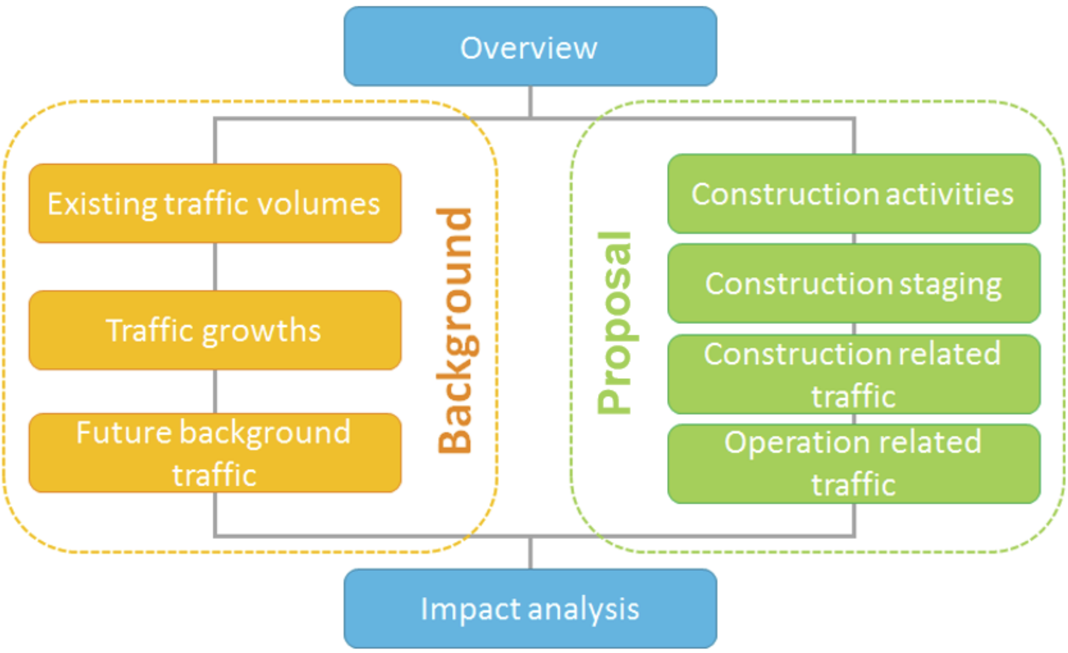


Figure 1.4 Background and Project traffic volumes

1.6.1 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
- Designated freight and seasonal traffic routes
- Dangerous goods vehicle routes
- Bus and school bus routes
- TSRs and stock routes
- Multi-combination routes and zones
- 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 Average Annual Daily Traffic Volumes (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 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 annual average AADT growth rate of 2 per cent. This rate was adopted in the analyses for all SCRs and LGRs. The data and evaluation are provided in Appendix A for DTMR roads and Appendix B 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 can be equated as:

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

  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 of this report.

  - 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 Project 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 impact assessment 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 impact assessment area where data was to be obtained from traffic surveys:

- 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 to 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 1.4).

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 impact assessment 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 1.4.

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 TIA impact assessment 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
- Where relevant, volumes along adjacent road segments with traffic counts have been adopted for road segments without traffic counts

- Peak hour flow rates obtained from the various sources will be converted to Average Daily Traffic Volumes (ADT) by adopting industry suited conversion factors.

1.6.2 Impact assessment and mitigation

1.6.2.1 Road network impact assessment

The operational performance of the road network in the impact assessment area was assessed to develop an understanding on the potential traffic impacts from the Project. 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 purposes of the TIA and EIS, noting that that the TIA also covers off all requirements outlined by the relevant Project SEARs. This process is for the impact assessment of the Project 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. All road sections within this TIA follow the same assessment process.

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 Impact Assessment Area. The Impact Assessment 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 impact assessment area which is provided in Table 1.5 (updated to also reference RMS).

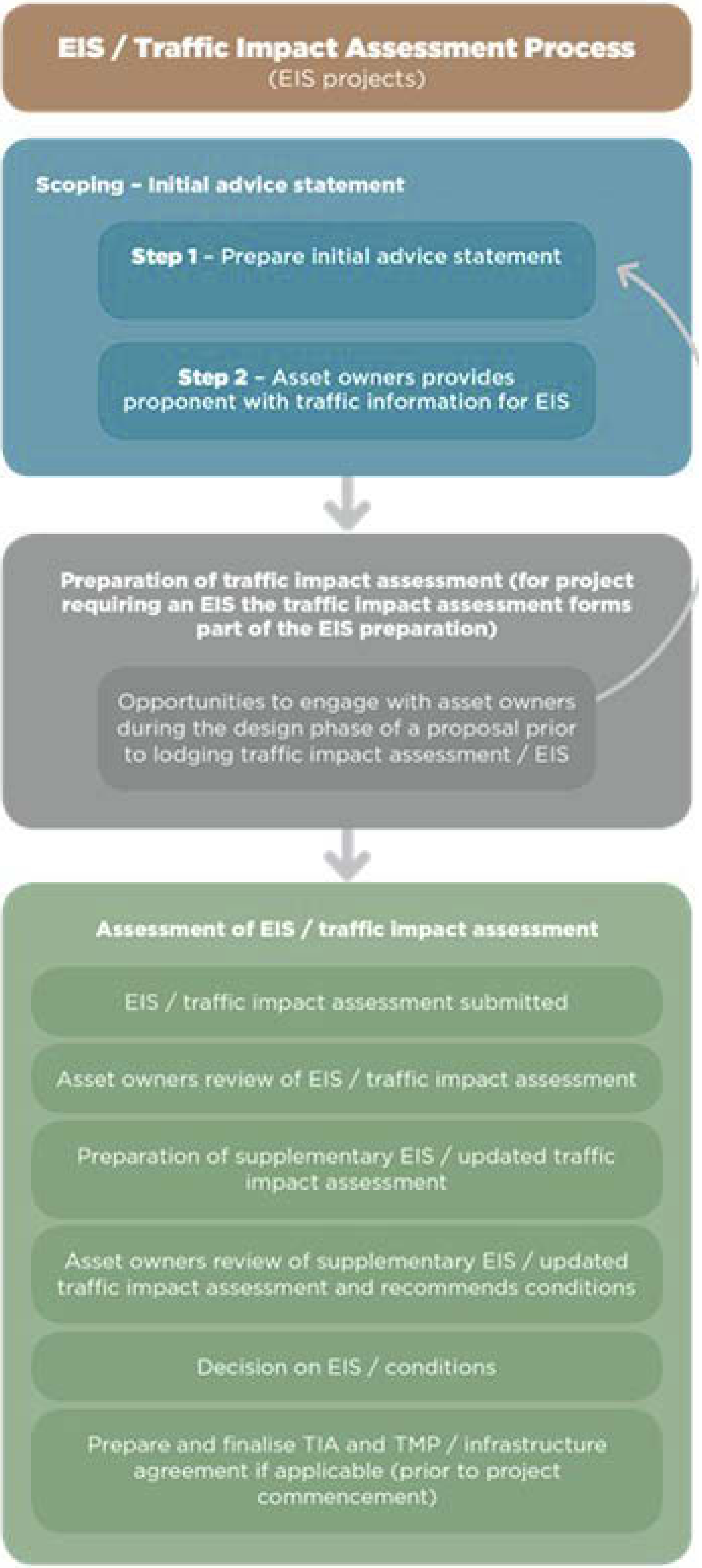


Figure 1.5 Traffic impact assessment process (adapted from GTIA)

Table 1.5 Impact assessment area by impact type

Impact type	Impact assessment area
Road safety	All intersections where the Project traffic exceeds 5 per cent 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 per cent 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 per cent 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 per cent of the base traffic in either direction on the link's annual average daily traffic (AADT) in the year of opening of each stage.
Transport infrastructure	All road links where the Project traffic exceeds 5 per cent 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).

Table 1.6 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 (2017) (AUSTROADS publications are publicly available from https://austroads.com.au/publications).

Table 1.6 Performance criteria

Assessment type	Performance criteria
Traffic impact assessment	Construction and operational traffic generated by the Project equals or exceeds 5 per cent of the existing AADT on the road section.
	Level of service (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 road operation and remedial works would be needed if LOS F would otherwise result.

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 1.7.

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. Level crossings have been assessed at year of opening as well as at Year 2040 in order to align with the EIS timelines.
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
Transport infrastructure	Each year of construction + year of opening of each stage including the final stage.

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.

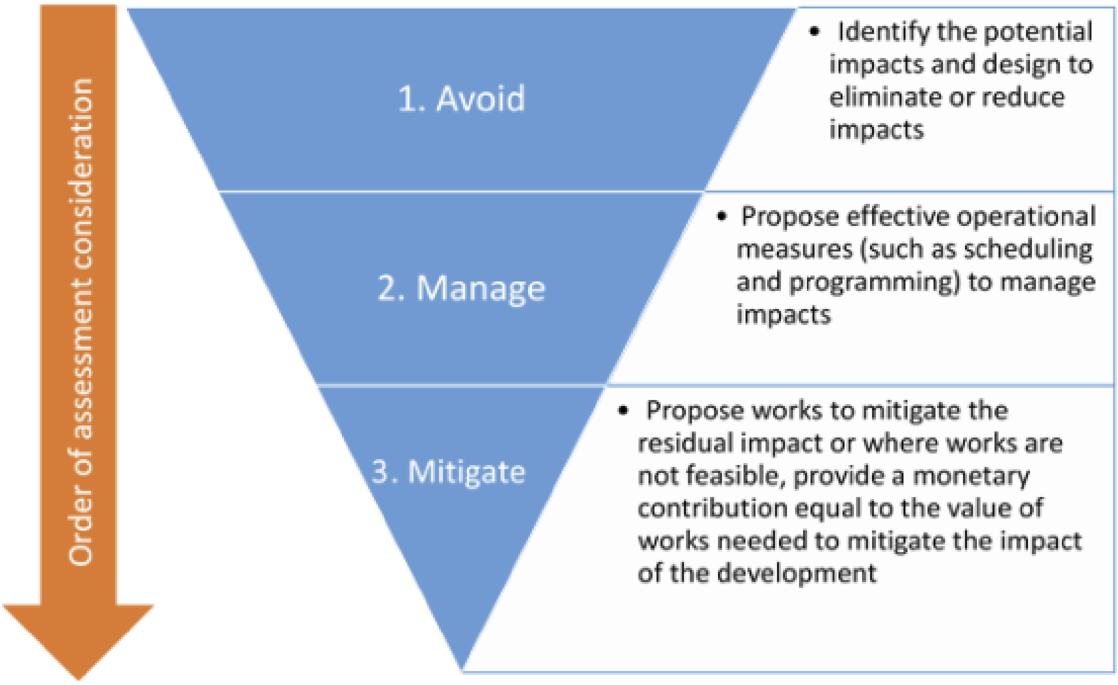


Figure 1.6 Mitigation framework

Source: Figure 1 GTIA Sept 2017

1.6.2.2 Rail crossing impact assessment

The rail crossing impact assessment within this TIA also details 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. It also looks at existing road safety at proposed level crossing locations. This analysis was undertaken for the Project at proposed public rail crossings only as there are no existing operational rail crossings within the TIA impact assessment area. This has been addressed in Section 6.4.3.

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

As per the SEARs, the assessment of proposed level crossings and the safety and road/rail operational impacts and/or benefits has been assessed taking into account:

- NSW Government's Construction of New Level Crossings Policy
- NSW Level Crossing Improvement Program (LCIP)
- NSW Government's Level Crossing Closures Policy.

This has been addressed in Section 3.3.

1.6.2.3 Rail network impact assessment

The operational performance of the existing rail network in the TIA impact assessment area is not anticipated to be significantly impacted as a result of the Project construction as:

- The majority of the Project is constructed in existing non-operational corridor
- The construction of connections will be limited to connections with adjacent Inland Rail projects.

Therefore, impacts to the existing rail network are not expected.

1.6.2.4 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 existing road and rail transport networks. 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.

1.6.2.5 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.

1.6.2.6 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 10. This will include adjacent Inland Rail sections as well as other committed major projects of significance.

1.6.3 Stakeholder consultation

Consultation has been undertaken with public road controlling authority stakeholders throughout the development of the Traffic Impact Assessment report. Formal Requests for Information (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 and adjacent land uses
- To outline the proposed traffic impact assessment 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 etc.)
- To outline the proposed mitigations.

The consulted stakeholders are listed in Table 1.8.

Table 1.8 Consulted stakeholders

Stakeholder	Consultation methods
Roads and Maritime Services (NSW)	RFI, Telephone, Email
Department of Transport and Main Roads (QLD)	RFI, Meetings, Email
Goondiwindi Regional Council	RFI, Tech. Note
Moree Plains Shire Council	RFI, Tech. Note
Gwydir Shire Council	RFI, Tech. Note
Inverell Shire Council	RFI
Clarence Valley Council	RFI

Independent of the TIA, ARTC has undertaken consultation with impacted private land owners. Discussion of this consultation and the outcomes achieved are not within the scope of this TIA.

2 Existing conditions

2.1 Existing land uses

Existing land uses along the Project corridor are discussed and mapped as part of the existing conditions assessment and requirements of GTIA. The existing land uses which occur along the Project corridor are shown in Figure 2.1.

Figure 2.1 shows that the majority of land uses surrounding the Project are considered to be grazing and cropping farming areas. The rural nature of the surrounding land uses indicates that the surrounding road network would generally consist of low traffic volumes.

2.2 Existing road network

The Impact assessment area encompasses several SCR's and LGR's that serve as main transport routes for the Project. These roads are further described in the following sections.

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: New South Wales

There are no state-controlled roads in New South Wales that intersect with the proposed rail alignment. Impacts along NSW SCR's are limited to use as primary construction routes. SCR's which are proposed to be used to transport construction materials, equipment and workforce during construction of the Project are included in Table 2.1.

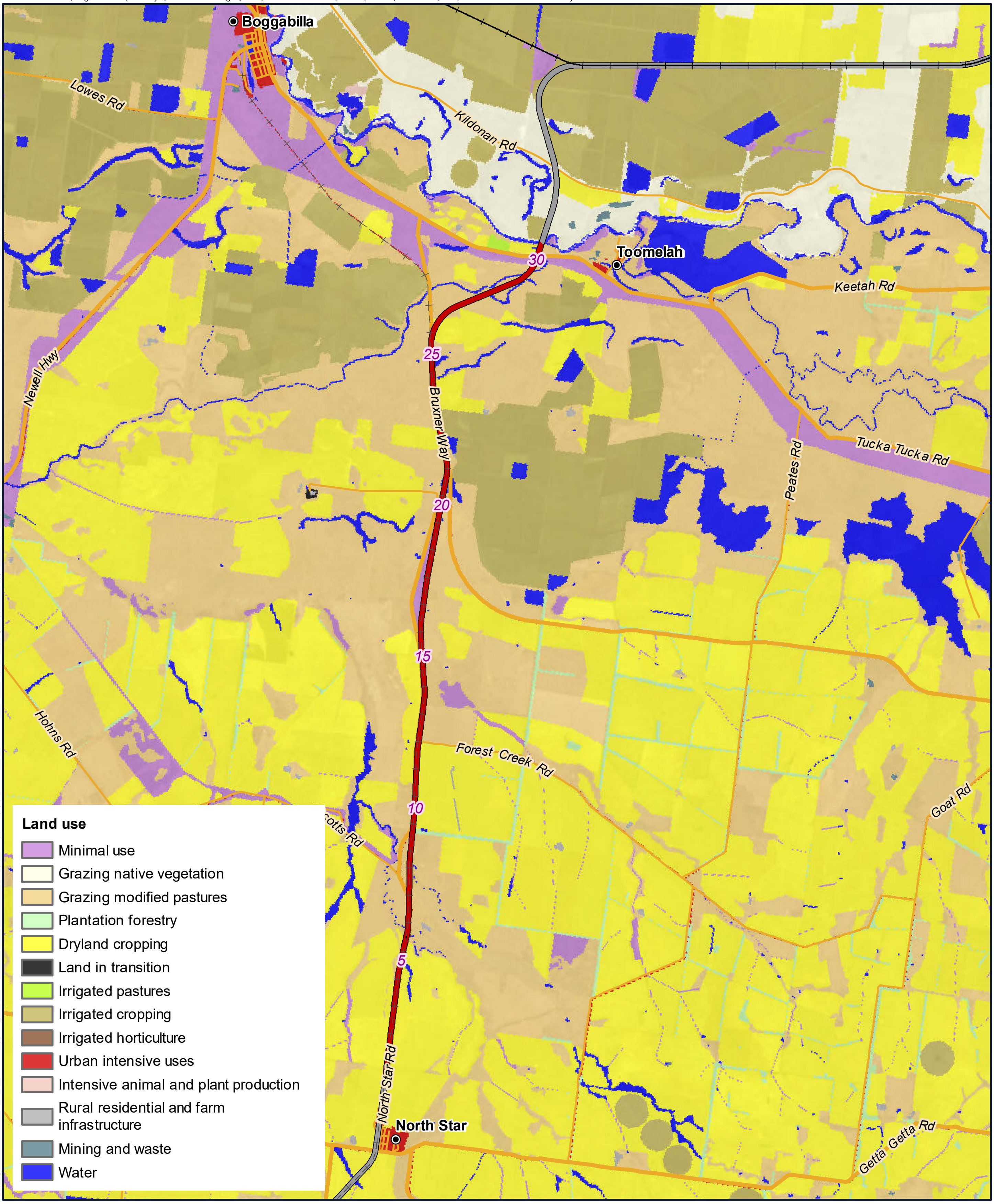
Table 2.1 New South Wales state-controlled roads: project primary construction routes

Road name	Road section
State-controlled roads: RMS	
Gwydir Highway	Between Bent Street and New England Highway
	Between New England Highway and Campbell Street
	Between Campbell Street and Stephen Street
Newell Highway	Between NSW/QLD border and Bruxner Way
	Between Bruxner Way and Letter Box Road
New England Highway	Between Gwydir Highway and Gwydir Highway
Summerland Way	Between Trenayr Road and Turf Street

2.2.2 State-controlled roads: Queensland

There are no SCR's in Queensland that intersect with the proposed rail alignment. Impacts along Queensland SCR's are limited to use as primary construction routes. While the Project is wholly contained within NSW, Queensland SCR's are proposed to be used to transport construction materials, equipment and workforce during construction of the Project. These are shown in Table 2.2.

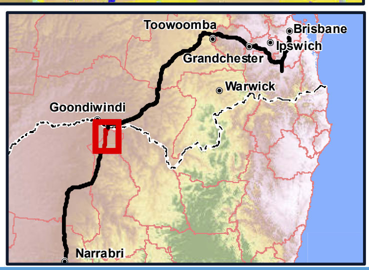
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Map by: FFJV DTH/AD/GN Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig2.1_LandUse_Location_FFJV_A4P_v3.mxd Date: 5/02/2020 10:31

Legend

- 5 Chainage (km)
- Localities
- Existing rail (operational)
- Existing rail (non-operational)
- North Star to NSW/QLD border alignment
- Adjoining alignments
- Major roads
- Minor roads
- NSW/QLD border



A4 scale: 1:170,000

0 1 2 3 4 5km

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Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 2.1:
North Star to NSW/QLD border land use

Table 2.2 Queensland state-controlled roads: project primary construction routes

Road name	Road section
State-controlled roads: DTMR	
Cunningham Highway	Between NSW/QLD Border and Leichhardt Highway
	Between Leichhardt Highway and Yelarbon-Keetah Road
	Between Yelarbon-Keetah Road and Millmerran Inglewood Road
Gore Highway	Between Millmerran Inglewood Road and Bunkers Hill School Road
Leichhardt Highway	Between Cunningham Highway and Hunt Street
Millmerran Inglewood Road	Between Cunningham Highway and Gore Highway
Toowoomba Cecil Plains Road	Between McDougall Street and Troys Road
	Between Troys Road and Hursley Road
	Between Hursley Road and Wellcamp Westbrook Road

2.2.3 Local government roads: New South Wales

Within New South Wales, five LGRs directly intersect with the Project. The Project intersects two of these LGRs twice. These roads fall within the jurisdiction of the following two local government authorities and are summarised in Table 2.3:

- MPSC
- GSC.

There are an additional seven proposed public road rail interface locations located along unformed roads. These locations are not required to be assessed as part of the TIA as these are paper roads which do not currently facilitate vehicle movements. As a result, these have not been discussed.

Proposed treatments for these interface locations have also been provided in Table 2.3. It should be noted that the proposed treatments reported in this table are tentative treatments and are subject to change following design refinements and stakeholder consultations.

Table 2.3 New South Wales local government roads intersecting the Project

ID reference	Road name	Owner	Proposed treatment
Local government roads: MPSC			
270-7-P-3	North Star Road	MPSC	Active level crossing
270-8-P-2	Unnamed Road	MPSC	No Crossing Provided
270-9-P-4	Bruxner Way	MPSC	No Crossing Provided - Road divert/re-align
270-9-P-4z	Bruxner Way	MPSC	Grade Separation
270-11-P-2	Tucka Road	MPSC	Grade Separation
Local government roads: GSC			
270-3-P-2	North Star Road	GSC	Active level crossing
270-5-P-1	Forest Creek Road	GSC	Passive level crossing

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. These fall within the jurisdiction of four local government authorities within New South Wales:

- Clarence Valley Council (CVC)
- GSC
- Inverell Shire Council (ISC)
- MPSC

Table 2.4 New South Wales local government roads: project primary construction routes

Road name	Road section
Local government roads: CVC	
Bent Street	Between Craig Street and Gwydir Highway
Clark Road	Between Clark Road and Trenayr Road
Craig Street	Between Villiers Street and Clarence Street
	Between Clarence Street and Bent Street
Dobie Street	Between Villers Street and Summerland Way
Trenayr Road	Between Summerland Way and Clark Road
Villiers Street	Between Craig Street and Dobie Street
Local government roads: GSC	
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road
Bush Access Road	Full extent
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road
Edwards Street	Between North Star Road and I B Bore Road
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access
I B Bore Road	Between Edwards Street and Croppa Creek Road
North Star Road	Between MPSC Council Boundary and Edwards Street
	Between Edwards Street and Getta Getta Road
	Between Getta Getta Road and Warialda Road
Scotts Road	Between North Star Road and Hohns Road
Stephen Street	Between Long Street and Gwydir Highway
Warialda Road	Between North Star Road and Stephen Street
Local government roads: ISC	
Campbell Street	Between Byron Street and Otho Street
Local government roads: MPSC	
Bruxner Way	Between Newell Highway and Tucka Tucka Road
	Between Tucka Tucka Road and North Star Road
Hohns Road	Between Hohns Road and Borrow Pit Site 5
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road
North Star Road	Between Bruxner Way and GSC boundary
River Road	Full Extent
Tucka Tucka Road	Between Bruxner Way to GSC Boundary

2.2.4 Local government roads: Queensland

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 2.5. Within Queensland, these fall within the jurisdiction of Goondiwindi Regional Council (GRC) and Toowoomba Regional Council (TRC).

Table 2.5 Queensland local government roads: project primary construction routes

Road name	Road section
Local government roads: GRC	
Boodle Street	Between Boodle Street and Hunt Street
Hunt Street	Between Leichhardt Highway and Boodle Street
Local government roads: TRC	
Blackwell Road	Between Bunkers Hill School Road and Macaulay Road
Bunkers Hill School Road	Between Gore Highway and Blackwell Road
Macaulay Road	Between Blackwell Road and Wellcamp Westbrook Road
Wellcamp Westbrook Road	Between Macaulay Road and Toowoomba Cecil Plains Road

2.2.5 Public transport networks: New South Wales

Existing public transport routes within New South Wales 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 New South Wales. Identified routes that may be impacted are provided in Table 2.6.

It should be noted that there may be additional routes that are not publicly available and have therefore not been captured in Table 2.6. Consultation with relevant council authorities should 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 public transport networks: New South Wales

Services	Weekday frequency	Impacted roads	Road rail crossings
Route 375C (Private Bus Service)	1 per hr	Dobie Street, Grafton	-
Route 376 (Private Bus Service)	1 per hr	Summerland Way, Grafton	-
Route 377 (Private Bus Service)	1 per 2hrs	Turf Street, Grafton	-

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 construction traffic. Mitigations for public transport routes which intersect the Project are discussed in Section 8.

Public transport maps are provided in Appendix M.

2.2.6 Public transport networks: Queensland

Following a review of Translink data, no existing public transport routes within Queensland were found to likely be impacted by construction traffic as a result of the Project.

2.2.7 School bus routes: New South Wales

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 New South Wales. Identified routes that may be impacted are provided in Table 2.7.

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 2.7. Consultation with relevant council authorities should 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 2.7 Impacted school bus routes: New South Wales

Services	Weekday frequency	Impacted roads	Road rail crossings
AM/PM services travelling to/from: ▪ Boggabilla Central School ▪ Border Rivers Christian College ▪ Clarence Valley Anglican School ▪ Delungra Public School ▪ Glen Innes Primary School ▪ Glen Inness Public School ▪ Glen Inness West Infants School ▪ Goondiwindi State High School ▪ Goondiwindi State Primary School ▪ Grafton High School ▪ Grafton Public School ▪ Holy Trinity School ▪ Inverell High School ▪ Inverell Public School ▪ North Star Public School ▪ South Grafton High School ▪ St Joseph's Primary School (Warialda) ▪ St Josephs Primary School (Glen Innes) ▪ St Marys Goondiwindi ▪ St. Joseph's Primary School ▪ St. Mary's Primary School ▪ Warialda High School ▪ Warialda Public School ▪ Westlawn Public School	AM and PM services as per school requirements	Various	-

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 should 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.

2.2.8 School bus routes: Queensland

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 the Queensland Government. Identified routes that may be impacted are provided in Table 2.8.

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 2.8. Consultation with relevant council authorities should 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 2.8 Impacted school bus routes: Queensland

Services	Weekday frequency	Impacted roads
P450 - Seven Mile to Inglewood State School	1 x AM, 1 x PM	Cunningham Highway
P451 - Yelarbon to Yelarbon State School	1 x AM, 1 x PM	Cunningham Highway
P473 - Yuraraba to Inglewood State School	1 x AM, 1 x PM	Cunningham Highway

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 construction traffic. Nonetheless, bus operators should 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.

2.2.9 Long distance coach services: New South Wales

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 New South Wales. Identified routes that may be impacted are provided in Table 2.9.

Table 2.9 Impacted long distance coach services: New South Wales

Services	Weekday frequency	Impacted roads	Road rail crossings
Brisbane to Grafton (Private Coach Service)	-	Summerland Way, Grafton	-
		Villiers Street, Grafton	-
		Dobie Street, Grafton	-
Route 141 - Grafton to Moree Town (Transport for NSW Coach Service)	1 per hr	Gwydir Highway	-
Route 142 - Moree Town to Grafton (Transport for NSW Coach Service)	1 per hr	Gwydir Highway	-

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.

2.2.10 Long distance coach services: Queensland

Existing long-distance coach services that are likely to be impacted by construction traffic and/or proposed and existing road rail crossings were identified using data sourced from the Queensland Government. Following this review, no long distances coach services within Queensland were found to likely be impacted by Project traffic.

2.2.11 Travelling Stock Reserves

The New South Wales Travelling Stock Reserves (TSR) are used for moving or grazing stock around the state. TSRs also provide a key role in landscape connectivity and biodiversity conservation across NSW and are also highly valued as important access points for other recreational activities. TSRs are managed directly by Local Land Services, pursuant to the Local Land Services (LLS) Act 2013, as well as by the NSW Department of Industry.

Within NSW, there are three TSRs that cross the proposed rail alignment. These TSRs have been provided in Table 2.10.

Table 2.10 Travelling Stock Reserves intersecting the Project: New South Wales

RRI ID	Proposed treatment	TSR ID	LGA	TSR Classification	TSR Conservation Value
270-4-P-0	Passive level crossing	Mobinbry	GSC	Category 2	Medium
270-4-P-1	No crossing provided - consolidate	Mobinbry	GSC	Category 2	Medium
270-7-P-4	Grade separation – rail over	Wearne	MPSC	Category 2	Medium
270-11-P-1	Grade separation – rail over	The Mission	MPSC	Category 2	Medium

There are also a number of TSRs within NSW that intersect with proposed construction traffic routes. It is not expected that Project construction traffic will have a significant impact on the ability of stock to move within the TSRs.

2.2.12 Tourist routes: New South Wales

The following NSW tourist routes are proposed to be intersected by primary construction routes:

- Fossickers Way
- Coast to Country.

The increase in construction traffic, in particular, 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.

2.2.13 State Strategic Touring Routes: Queensland

The following Queensland 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
- Warrego Way
- Australia's Country Way
- New England Highway
- Pacific Coast Way
- Legendary Pacific Coast Drive.

The increase in construction traffic, in particular, 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.

2.3 Existing rail facilities

The Project connects to the existing non-operational Camurra-North Star Railway at North Star in NSW. 25 km of the Project is proposed to be located within the existing, non-operational Boggabilla railway line which extends from North Star – Boggabilla.

2.4 Existing active transport networks

2.4.1 Cycling and pedestrian network: New South Wales

A review of cycle networks 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 primary construction routes. This review showed that the following cycle routes may be impacted by construction traffic:

- Gwydir Highway
- New England Highway.

Owing to the isolated location of the works and low volume of construction traffic traversing through impacted active travel networks in ISC, GSC and MPSC, pedestrian or cyclist movements are not expected to be significantly impacted by proposed construction traffic. Nonetheless, haulage contractors should be made aware of these areas of high pedestrian activity as a part of the traffic management plan (TMP), discussed in Section 8.

Relevant public transport maps are provided in Appendix M.

2.4.2 Cycling and pedestrian network: Queensland

A review of the Queensland Principal Cycle Network Plans (PCNP) was undertaken in order to identify any existing on-road cycle paths that may coincide with proposed construction traffic routes within Queensland. 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 the following cycle routes within the PCNP coincide with proposed construction traffic routes:

- Carrington Road
- Toowoomba Cecil Plains Road.

It is not expected that these cycle routes will be significantly impacted by Project construction traffic owing to the relatively short construction time frames. Nonetheless, haulage contractors should be made aware of these areas of high pedestrian activity as a part of the TMP, discussed in Section 8. Relevant PCNP and public transport maps are provided in Appendix M.

3 Proposed works

3.1 Rail alignment

As mentioned in Section 1.1, the proposed Project is one of 13 projects that complete Inland Rail. This section of Inland Rail involves the design and construction of approximately 25km of new standard gauge track within the existing, non-operational Boggabilla railway line and approximately 5km of greenfield track.

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: 1,800m with potential to upgrade to 3,600m long trains if required in the future
- Axle load/max speed: 21 tonnes @ 115km/h, 23 tonnes @ 90km/h, 25 tonnes @ 80km/h with future proofing for 30 tonnes @ 80km/h
- Double stacking: 7.1m vertical clearances for double stack operation to suit Outline F rolling stock
- Interoperability: Full interoperability with interstate connectivity to Queensland narrow gauge regional network. Connects to NSW Country Regional Network to provide for standard gauge connections to the ports of Melbourne, Port Kembla, Sydney, Newcastle, Brisbane, Adelaide and Perth.

It is currently proposed that an estimated 14 trains per day will run in 2025, increasing to an estimated 21 trains per day in 2040. The number of trains capable of running on the railway will ultimately depend on the rail operational analysis and feasible timetable, the type of trains, traffic volumes on connecting railways, and loading and unloading times.

The Project will be fenced to ensure that stock and people do not enter the track. Fencing is to be consistent with fencing used in other sections of the railway line.

3.2 Road/rail interface locations

The Project intersects SCRs 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 the Australian Level Crossing Assessment Model (ALCAM) 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. Further details on the process of determining the proposed treatments has been provided in Section 3.3. 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, some sections of the existing road network have been realigned. Proposed road network alterations such as road closures, deviations and realignments. have been addressed in this TIA.

3.2.1 Existing road/rail interface locations

Five existing non-operational public road/rail interfaces exist along the Boggabilla railway line within the Project extents. Table 3.1 tabulates the existing crossing locations that are proposed to be reinstated as part of the Project. The proposed treatments reported in this table are tentative treatments and are subject to change following design refinements and stakeholder consultations.

Table 3.1 Existing non-operational public road/rail interface and road closure locations (formed roads only)

ID reference	Road name	Owner	Proposed treatment
GSC			
270-3-P-2	North Star Road	GSC	Active level crossing
270-5-P-1	Forest Creek Road	GSC	Passive level crossing
MPSC			
270-7-P-3	North Star Road	MPSC	Active level crossing
270-8-P-2	Unnamed Road	MPSC	No crossing provided
270-9-P-4	Bruxner Way	MPSC	Road divert/re-align

3.2.2 Proposed road/rail interface locations

Table 3.2 tabulates the proposed public formed road/rail interface locations and road closures associated with the Project. The proposed treatments reported in this table are tentative treatments and are subject to change following design refinements and stakeholder consultations.

There are an additional seven proposed public road/rail interface locations along unformed roads. These locations are not required to be assessed as part of the TIA as these are paper roads which do not currently facilitate vehicle movements. As a result, these have not been discussed.

Table 3.2 Proposed public road/rail interface and road closure locations (formed roads only)

ID reference	Road name	Owner	Proposed treatment
MPSC			
270-9-P-4z	Bruxner Way	MPSC	Grade separation - rail over
270-11-P-2	Tucka Tucka Road	MPSC	Grade separation - rail over

3.3 Assessment of level crossings

The assessment of proposed level crossings and the safety and road/rail operational impacts and/or benefits of the proposed crossing has been assessed as per the SEARs requirements. This section shows how these requirements have been addressed. As per the SEARs, in the assessment of level crossings, the EIS must take into account:

a) The NSW Government's Construction of New Level Crossings Policy

The Construction of New Level Crossings Policy states that the position of TfNSW is to avoid building new level crossings wherever possible given the inherent risk attached to any level crossing. The policy states that developers and other organisations seeking to open a new level crossing should exhaust all other options prior to proposing to build a new level crossing, and that if a new level crossing is required, the organisation will need to demonstrate that they have taken these steps to consider all the possible alternatives.

This policy has been considered during the feasibility design process. This process determines the treatment of identified road rail interfaces by applying:

- Elimination, so far as is reasonably practical (SFAIRP), by not providing a crossing:
  - At an interface that is not required at this time
  - By consolidating with other interfaces
  - By relocating the interface
  - By diverting roads to avoid an interface requirement

- Grade separation in accordance with ARTC policy
- Level crossings either; passive level crossings with stop signs or active level crossings.

Where a new level crossing is necessary, the safety risks will be eliminated or minimised SFAIRP. For the design of any required level crossings SFAIRP is being achieved by:

- Utilising a risk tool developed by ARTC, which also includes ALCAM assessments
- Implementing the safety risk reduction recommendations through application of recognised ARTC standards and AS standards.

To assess the feasibility of proposed level crossings as part of the Project, a road rail interface review process was developed in line with a risk tool developed by ARTC and Safety in Design (SiD) risk management processes on the Project. The proposed road rail interface treatments were assessed on a case-by-case basis for design purposes, with consideration given to current and future usage of the existing asset, the relevant Australian Standards, the road and rail geometry at the crossing location and stakeholder feedback. As part of the assessment, ARTC used a national level crossing system called ALCAM (Australian Level Crossing Assessment Model), which considers factors such as future road traffic numbers, vehicle types, train numbers, speeds and sighting distances. The methodology adopted is consistent with National Rail Safety Law and ONRSR guidelines.

The road rail interface review process was used to investigate the rail alignment and affected properties to ascertain the potential interface locations. The review process utilised a methodical approach, including consolidation criteria to assess each identified potential interface to determine the appropriate tentative treatment and was undertaken in consultation with impacted landowners. Considerations in the review process included:

- Determining the interface location and type: *i.e. public roads, private access roads, farm tracks, pedestrian interfaces, TSRs and extension of existing rail level crossings*
- Assessing the need for the interface: *Legal and physical access to both properties and severed properties is retained, potential traffic levels, land use, nearby interfaces, adjoined properties, vertical geometry of the rail alignment (in the context of the property and access for other local connectivity)*
- Determining a crossing's treatment: *Based on need to eliminate level crossings SFAIRP by; removal, proposing alternative road diversions, consolidating, grade separation, or as a last resort providing a level crossing.*

The interface locations were then assessed to determine the best location to provide a proposed crossing, its treatment and to confirm its compliance. New or relocated level crossings are to maximise available sight distance when considering placement. The treatment options for a crossing are:

- No crossing provided -relocation: The interface has been relocated to a better position to match the alignment verticals, or sight distance considerations.
- No crossing provided – road realignment: The interface is no longer required as the road is proposed for realignment.
- Grade separation -rail over
- Grade separation -road over
- Provision of a level crossing to ARTC developed standard, either:
  - A passive level crossing with the minimum protection of stop control signage. Passive level crossings must comply with the all relevant design standards, including the local and state government requirements and that it can be constructed at each location. If a passive level crossing cannot be achieved, then an alternative treatment solution is to be proposed.
  - An active level crossing with the minimum RX-5 and half boom barriers.

(b) Level crossing ALCAM assessments for public crossings and site- specific risk assessments. The Proponent must demonstrate how they reduce risks identified So Far As Is Reasonably Practicable (SFAIRP);

Assessments have been undertaken by ARTC using the Australian Level Crossing Assessment Model (ALCAM) for public crossings. This 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. The requirement to minimise safety risks is an ongoing process that must be adhered to in future design stages.

(c) Consistency with any Interface Agreements and related Safety Management Plans, including draft Interface Agreements and draft Safety Management Plans;

Consistent with existing interface arrangements and in accordance with National and State Rail Safety Law requirements, public road crossings will be subject to an Interface Agreement with the relevant road manager in order to ensure that safety risk are identified and minimised SFAIRP during the operations phase.

The interface agreements will be prepared to cover each public road crossing location to ensure a formal written agreement between the responsible road and/or rail managers is in place consistent with the requirements of section 105 of the Rail Safety National Law, including responsibilities of parties for implementing safety measures and a process for monitoring these.

(d) The practice of upgrading active public level crossings to boom gates and flashing lights adopted by the NSW Level Crossing Improvement Program (LCIP);

As previously noted, there are six crossings that are located along the existing non-operational Boggabilla Line, however, these crossings are considered as being proposed for the purposes of the TIA. As a result, the LCIP is not relevant for this assessment.

(e) The rationalisation of private and public level crossings in line with the NSW Government's Level Crossing Closures Policy; and

The Level Crossing Closures Policy is not relevant for this assessment as all level crossings along the alignment are considered as proposed.

(f) Operation of level crossings with regard to road and rail travel speeds, vehicle types, train lengths, train numbers, road and rail traffic volumes, vehicle queuing and sight distance.

The operation of proposed level crossings has been reported in Section 6.4.3.

The treatments provided in this document are tentative treatments and are subject to change following design refinements and stakeholder consultations. Following the above assessment, three locations were determined to require active or passive level crossings, which were then corroborated by ALCAM assessments. These crossings are shown in Table 3.3. This table also includes mitigations that were investigated. Risks at these locations have been reduced SFAIRP during the feasibility design process, which have also been detailed in Section 8.2.5.

Table 3.3 Active/passive level crossing sites and mitigations

Interface ID	Road name	Proposed treatment	Mitigations investigated
GSC			
270-3-P-2	North Star Road	Active level crossing	Relocating rail or road in this location is not possible. Active level crossing is therefore the mitigation measure to the sighting distance failure.
270-5-P-1	Forest Creek Road	Passive level crossing	Mitigation for S1 is to incorporate advanced warning signage in accordance with AS1742.7.
MPSC			
270-7-P-3	North Star Road	Active level crossing	Active level crossing corroborated by ALCAM assessment

Interface ID	Road name	Proposed treatment	Mitigations investigated
State of New South Wales			
270-4-P-0	Unnamed Road *(Occupational track)*	Passive level crossing	N/A – occupational track

3.4 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 rail alignment and road closures and diversions along the Project (i.e. in the vicinity of road/rail interface locations).

3.4.1 Road realignments, diversions and closures

The proposed public road alterations within New South Wales are summarised in Table 3.4. The traffic impacts of these road alterations were evaluated as part of the TIA.

Table 3.4 Proposed road realignments, diversions and closures: New South Wales public roads

ID reference	Road name	Owner	Alteration details
Local government roads: MPSC			
270-9-P-4	Bruxner Way	MPSC	Relocation required due to improved flood immunity as well as significant closure times if the crossing was maintained at grade.

The alterations to the public road network proximate to Bruxner Way are unlikely to result in a significant change to existing traffic patterns and distributions. The proposed alteration at this location mainly consists of road realignments, with existing traffic patterns being maintained. Due to the minor nature of these alterations, no detailed capacity assessments were required.

3.5 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.

3.6 Workforce accommodation camps

It is planned that the construction workforce will be housed in temporary camp accommodation at North Star. The temporary construction camp will be designed to provide accommodation to industry standards and will comply with all relevant legislation and regulations, including the required building codes and occupational health and safety guidelines.

Details regarding FIFO (fly-in-fly-out) and DIDO (drive-in-drive-out) arrangements and staff scheduling is not available at this feasibility stage. Regardless of whether FIFO or DIDO arrangements are used, it is expected that the vast majority of employees will reside in the accommodation camp in use for the construction phase of the Project.

In order to assess the expected impact, it was assumed that all workers will travel by private car to and from the site. Specific details regarding accommodation camp location, employee numbers, working hours and envisaged assumed number of daily trips have been provided in Section 5.5.5. Daily workforce trips have been taken into account within all assessments.

4 Baseline conditions

This section discusses the existing conditions for the impacted SCR's and LGRs.

4.1 Existing road links

4.1.1 Level of service definition

Level of service (LOS) 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 and Highway Capacity Manual 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)

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 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

Source: Austroads Part 2 - Guide to Traffic Engineering Practice: Roadway Capacity,1988. Values rounded to the nearest 50.

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 Urban Collector Road - Volumes derived by assuming LOS B with associated AADT of 3800 veh Rural Local Road - Volumes derived by assuming 400 AADT Rural Collector Road – Volumes derived by assuming LOS A with associated AADT of 2000 veh
E	Rural Arterial Road - Volumes derived by assuming LOS A with K-value of 0.15 with associated AADT of 1600 veh Urban Arterial Road - Volumes derived by assuming LOS B with K-value of 0.12 with associated AADT of 2000 veh
F	Volumes obtained through 7-day 24 hour traffic surveys

Source ID	Traffic data source
G	Volumes adopted from adjacent surveyed link road or adjacent DTMR detailed segment and weekly reports
H	Volumes obtained from relevant Local Government Authority

4.1.4 Existing construction route traffic volumes: New South Wales

The existing baseline traffic volumes for roads located in New South Wales 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 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 HV 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 1.6.1, 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: New South Wales

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
State controlled roads: RMS								
Gwydir Highway	Between Bent Street and New England Highway	Rural Arterial	C	2017	739	21%	739	23%
	Between New England Highway and Campbell Street	Rural Arterial	C	2017	739	21%	739	23%
	Between Campbell Street and Stephen Street	Rural Arterial	C	2017	739	21%	739	23%
Newell Highway	Between NSW/QLD border and Bruxner Way	Rural Arterial	C	2017	2048	32%	2003	33%
	Between Bruxner Way and Letter Box Road	Rural Arterial	C	2017	2048	32%	2003	33%
New England Highway	Between Gwydir Highway and Gwydir Highway	Rural Arterial	C	2017	1061	22%	1107	25%
Summerland Way	Between Trenayr Road and Turf Street	Rural Arterial	C	2017	1677	15%	1676	16%
Local government roads: CVC								
Bent Street	Between Craig Street and Gwydir Highway	Urban Arterial	E	2018	2000	15%	2000	15%
Clark Road	Between Clark Road and Trenayr Road	Rural Local	D	2018	400	15%	400	15%
Craig Street	Between Villiers Street and Clarence Street	Urban Collector	D	2018	3800	15%	3800	15%
Craig Street	Between Clarence Street and Bent Street	Urban Collector	D	2018	3800	15%	3800	15%
Dobie Street	Between Villers Street and Summerland Way	Urban Collector	D	2018	3800	15%	3800	15%
Villers Street	Between Craig Street and Dobie Street	Urban Collector	D	2018	3800	15%	3800	15%
Trenayr Road	Between Summerland Way and Clark Road	Rural Collector	D	2018	2000	15%	2000	15%
Local government roads: GSC								
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	Rural Arterial	F	2018	231	20%	242	23%
Bush Access Road	Full extent	Rural Local	G	2018	10	38%	12	41%
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	Rural Local	G	2018	144	23%	147	27%
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	Rural Local	G	2018	144	23%	147	27%

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
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	Rural Local	G	2018	144	23%	147	27%
Edwards Street	Between North Star Road and I B Bore Road	Rural Arterial	G	2018	144	23%	147	27%
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	Rural Local	F	2018	10	38%	12	41%
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	Rural Local	G	2018	144	23%	147	27%
I B Bore Road	Between Edwards Street and Croppa Creek Road	Rural Local	G	2018	144	23%	147	27%
North Star Road	Between MPSC Council Boundary and Edwards Street	Rural Arterial	F	2018	144	23%	147	27%
	Between Edwards Street and Getta Getta Road	Rural Arterial	F	2018	144	23%	147	27%
	Between Getta Getta Road and Warialda Road	Rural Arterial	F	2018	144	23%	147	27%
Scotts Road	Between North Star Road and Hohns Road	Rural Local	G	2018	144	23%	147	27%
Stephen Street	Between Long Street and Gwydir Highway	Rural Arterial	G	2017	739	21%	739	23%
Warialda Road	Between North Star Road and Stephen Street	Rural Arterial	G	2017	739	21%	739	23%
Local government roads: ISC								
Campbell Street	Between Byron Street and Otho Street	Urban Local	G	2017	739	21%	739	23%
Local government roads: MPSC								
Bruxner Way	Between Newell Highway and Tucka Tucka Road	Rural Arterial	F	2018	231	20%	242	23%
	Between Tucka Tucka Road and North Star Road	Rural Arterial	F	2018	231	20%	242	23%
Hohns Road	Between Hohns Road and Borrow Pit Site 5	Rural Local	G	2018	144	23%	147	27%
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	Rural Local	G	2018	144	23%	147	27%
North Star Road	Between Bruxner Way and GSC boundary	Rural Arterial	F	2018	134	16%	141	21%
River Road	Full Extent	Rural Local	G	2018	10	38%	12	41%
Tucka Tucka Road	Between Bruxner Way to GSC Boundary	Rural Arterial	F	2018	150	9%	144	12%

4.1.5 Existing construction route traffic volumes: Queensland

The existing baseline traffic volumes for roads located in Queensland are provided in Table 4.6. 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 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 HV 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 1.6.1, to determine base year 2018 traffic volumes for analyses. Both assumed and surveyed traffic volumes account for base year 2018 traffic volumes.

Table 4.6 Existing baseline construction route traffic volumes: Queensland

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
State Controlled Roads: DTMR								
Cunningham Highway	Between NSW/QLD Border and Leichhardt Highway	Urban Collector	A	2017	1536	43%	1601	45%
	Between Leichhardt Highway and Yelarbon-Keetah Road	Rural Arterial	A	2017	705	47%	751	50%
	Between Yelarbon-Keetah Road and Millmerran Inglewood Road	Rural Arterial	A	2017	776	45%	820	45%
Gore Highway	Between Millmerran Inglewood Road and Bunkers Hill School Road	Rural Arterial	A	2017	1429	32%	1398	33%
Leichhardt Highway	Between Cunningham Highway and Hunt Street	Rural Arterial	A	2017	1251	45%	1400	43%
Millmerran Inglewood Road	Between Cunningham Highway and Gore Highway	Rural Arterial	A	2017	167	35%	167	32%
Toowoomba Cecil Plains Road	Between McDougall Street and Troys Road	Urban Collector	A	2017	2874	25%	2598	30%
	Between Troys Road and Hursley Road	Urban Collector	A	2017	1569	18%	1548	18%
	Between Hursley Road and Wellcamp Westbrook Road	Rural Arterial	A	2017	1569	18%	1548	18%
Local Government Roads: GRC								
Boodle Street	Between Boodle Street and Hunt Street	Rural Local	D	2018	400	15%	400	15%
Hunt Street	Between Leichhardt Highway and Boodle Street	Rural Local	D	2018	400	15%	400	15%
Local Government Roads: TRC								
Blackwell Road	Between Bunkers Hill School Road and Macaulay Road	Rural Local	H	2017	263	26%	263	26%
Bunkers Hill School Road	Between Gore Highway and Blackwell Road	Rural Local	H	2017	261	21%	261	21%
Macaulay Road	Between Blackwell Road and Wellcamp Westbrook Road	Rural Local	H	2017	292	19%	292	19%
Wellcamp Westbrook Road	Between Macaulay Road and Toowoomba Cecil Plains Road	Rural Local	H	2017	357	15%	357	15%

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 4.7. The table indicates the LOS per intersection control type associated with a respective delay per vehicle measured in seconds.

Table 4.7 LOS 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

4.3 Rail crossings

4.3.1 Road/rail interface traffic volumes

Existing year 2018 traffic volumes at road/rail interface locations are provided in Table 4.8. It should be noted that traffic volumes were only obtained at locations where deemed necessary as per Section 1.6.1.

Table 4.8 Existing traffic volumes at proposed road/rail interface locations

Road/ rail interface		AM peak volume		PM peak volume		Peak day volume		% Heavies (average weekday)	
		Northbound/ Eastbound	Southbound/ Westbound	Northbound/ Eastbound	Southbound/ Westbound	Northbound/ Eastbound	Southbound/ Westbound	Northbound/ Eastbound	Southbound/ Westbound
270-3-P-2	North Star Road	16	14	15	15	184	202	25.9%	29.9%
270-5-P-1	Forest Creek Road	2	3	2	2	13	20	37.3%	36.8%
270-7-P-3	North Star Road	16	18	20	18	180	188	22%	25%
270-9-P-4	Bruxner Way	29	30	22	22	292	317	22.5%	25.8%
270-9-P-4z	Bruxner Way	29	30	22	22	292	317	22.5%	25.8%
270-11-P-2	Tucka Tucka Road	15	12	16	17	241	190	10.1%	13.7%

These volumes were taken into consideration as part of the vehicle queueing and delay capacity assessments during the operational phase of the proposed level crossings. Details of the analysis are provided in Section 6.4.3. It is evident from Table 4.8 that existing traffic volumes are low during both AM and PM peak hours.

4.4 Existing road safety issues (crash data)

Crash data for the impact assessment 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 the Definition for Coding Accidents (DCA) Code Groups, with Table 4.9 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 4.9 DCA 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

DCA code group	DCA code group description
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)

4.4.1 Crash analysis – construction routes: New South Wales

Based on the provided RMS data, a breakdown of reported incidents by crash severity within the impact assessment has been provided in Table 4.10. Maps showing the location of the reported crashes within the impact assessment area are provided in Appendix C. The impact assessment area for this analysis has been defined as road sections along which construction traffic travels.

Table 4.10 Construction traffic route crash data summary: New South Wales

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 %
State Controlled Roads: RMS										
Gwydir Highway	316 km	739	16	121	5	37	66	13	19	25%
New England Highway	No crash data available									
Newell Highway	7.6 km	2003 – 2048	24 – 48	11	3	3	3	2	14	27%
Summerland Way	4.8 km	1676 – 1677	16	14	0	4	8	2	1	50%
Local Government Roads: CVC										
Bent Street	1.5 km	2000	16	10	0	2	7	1	4	30%
Clark Road	No crash data available									
Craig Street	0.1 km	3800	16	6	0	2	4	0	4	50%
Dobie Street	1.7 km	3800	16	4	0	0	4	0	1	100%
Trenayr Road	No crash data available									
Villiers Street	1.3 km	3800	16	8	0	2	4	2	1	63%
Local Government Roads: GSC										
Bruxner Way	20 km	231 – 242	167	3	0	0	1	2	14	33%
Bush Access Road	No crash data available									
County Boundary Road	No crash data available									
Croppa Creek Road	23 km	144 – 147	143	2	0	0	0	2	2	100%
Croppa Moree Road	12 km	144 – 147	143	2	0	0	2	0	4	50%
Edwards Street	No crash data available									
Forest Creek Road	No crash data available									
Gil Gil Creek Road	No crash data available									
I B Bore Road	No crash data available									
North Star Road	70 km	134 – 147	69 – 294	1	0	1	0	0	2	100%
Scotts Road	No crash data available									

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 %
Stephen Street	No crash data available									
Warialda Road	24 km	739	16	4	0	3	1	0	14	75%
Local Government Roads: ISC										
Campbell Street	No crashes recorded									
Local Government Roads: MPSC										
Bruxner Way	20 km	231 – 242	72 – 76	3	0	0	1	2	14	33%
County Boundary Road	No crash data available									
Hohns Road	No crash data available									
Letter Box Road	No crash data available									
North Star Road	No crash data available									
River Road	No crash data available									
Tucka Tucka Road	No crash data available									

4.4.2 Crash analysis – construction routes: Queensland

Based on the provided DTMR data, a breakdown of reported incidents by crash severity within the impact assessment area has been provided in Table 4.11. Maps showing the location of the reported crashes within the impact assessment area are provided in Appendix C. The impact assessment area for this analysis has been defined as road sections along which construction traffic travels.

Table 4.11 **Construction traffic route crash data summary: Queensland**

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 %
State controlled roads: DTMR										
Cunningham Highway	3.2 km	705 - 1601	2 – 24	28	1	14	9	4	15	18%
Gore Highway	65 km	1398 - 1429	2	42	3	18	17	4	15	19%
Leichhardt Highway	2 km	1251 - 1400	22	3	0	3	0	0	1	33%
Cunningham Highway	69 km	167	2	6	1	2	2	1	20	33%
Toowoomba Cecil Plains Road	6.2 km	1548 - 2874	2	20	1	6	10	3	1	30%
Local government roads: GRC										
Boodle Street	No crash data available									
Hunt Street	No crash data available									
Local government roads: TRC										
Blackwell Road	No crash data available									
Bunkers Hill School Road	1.5 km	261	2	1	0	1	0	0	14	100%
Macaulay Road	No crash data available									
Wellcamp Westbrook Road	No crash data available									

4.4.3 Crash analysis – road/rail interface

Crashes by crash severity and type which have occurred within a 200m radius from existing and proposed public at grade road/rail interface locations have been evaluated. A summary of these findings has been provided in Table 4.12, and a figure showing the proposed road rail interface and 200m buffer has been provided in Appendix D.

The findings show that no crashes have been reported to RMS in the five-year period within 200m of the proposed public road/rail interfaces.

Table 4.12 Crash analysis – proposed public road/rail interface (within 200m radius)

Interface ID	Road name	Proposed treatment	Existing crashes (200m buffer)
GSC			
270-3-P-2	North Star Road	Active level crossing	No recorded crashes
270-5-P-1	Forest Creek Road	Passive level crossing	No recorded crashes
MPSC			
270-7-P-3	North Star Road	Active level crossing	No recorded crashes

4.5 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 10. This will include other Inland Rail sections as well as other committed major projects of significance.

5 Construction traffic generation and assignment

5.1 Construction transport modes

Construction transport will primarily be by road, other than rail sections which will be transported by existing rail lines as well as roads. Table 5.1 lists the major construction activities and related transport modes for the traffic generated by the respective activities. It should be noted that the volumes and dates presented in this table are based on the feasibility design and are subject to change following further refinements to the design and construction schedule.

Table 5.1 Approximate construction activities contributing to traffic generation and transport mode

Material	Delivery method	Approximate quantity/volume	Start date*	End date*
General fill	Road	1,478,000 m^3 (excluding any contingency)	1/05/2021	1/07/2022
Structural fill	Road	181,000 m^3	1/02/2022	1/07/2022
Capping	Road	64,000 m^3	1/09/2023	1/12/2023
Top ballast	Road	32,000 t	1/04/2024	1/04/2024
Bottom ballast	Road	64,000 t	1/02/2024	1/02/2024
Sleepers	Road	53,000 items	1/12/2023	1/01/2024
Rail	Rail	13,000 t	1/02/2024	01/04/2024
Precast concrete – bridge	Road	200 girders (at various length and size)	1/10/2021	1/03/2023
Concrete – bridge and culverts	Road	2,300 sections (various sizes)	1/12/2021	1/11/2022
Insitu Concrete	Road	32,000 m^3	1/08/2021	1/07/2023
Water (trackworks)	Road	190 kL	17/08/2023	12/06/2024
Water (earthworks)	Road	249 ML	1/05/2021	1/07/2022
Water (haul road dust suppression)	Road	68 ML	1/05/2021	1/02/2022

Table notes:

* 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, feasibility 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.

The construction staging plan developed for the EIS indicates that the peak construction traffic time across the impacted network will likely occur in Year 2022. It should be noted that different roads within the impacted network will experience peaks at differing stages throughout the project construction phase (2021 – 2024). This will be dependent on when the construction activity that is proposed to travel along that road is scheduled to occur. Ongoing consultation with road authorities will continue throughout the life of project to ensure peak periods are communicated and captured within the projects Traffic Management Plan.

Construction schedules relating to other committed rail projects are taken into account in the cumulative assessment in Section 10.

5.3 Estimated material requirements

The construction traffic impact assessment has been undertaken based on the material sources, quantities and durations identified to construct the Feasibility Design. Should alternative sources be identified, these may be assessed using the process documented in this report and, if required, mitigations applied as defined in Section 8.

5.3.1 Borrow material

A preliminary desktop-based study of potential borrow pits was undertaken to investigate borrow pit location, supply and volumes. A selection of these borrow pits were used as the basis of this assessment. The expected volumes of General Fill and Structural Fill required along the alignment are provided in Table 5.2 and Table 5.3 respectively.

Table 5.2 General fill – demand

General fill chainage (m)	General fill demand* (m^3)
941 to 7,000	134,000
7,000 to 18,000	352,000
18,000 to 21,000	137,000
21,000 to 22,000	144,000
22,000 to 24,000	167,000
24,000 to 29,000	494,000
29,000 to 29,352	50,000
Total required	**1,478,000**

Table notes:

* Fill demand includes 50 per cent buffer for shrinkage factor, borrow pit uncertainties and other contingencies

Table 5.3 Structural fill – demand

Structural fill chainage (m)	Structural fill demand* (m^3)
941 to 7,000	39,000
7,000 to 18,000	70,000
18,000 to 21,000	19,000
21,000 to 22,000	6,000
22,000 to 24,000	13,000
24,000 to 29,000	32,000
29,000 to 29,352	2,000
Total required	**181, 000**

Table notes:

* Fill demand includes 50 per cent buffer for shrinkage factor, borrow pit uncertainties and other contingencies

The availability of General Fill and Structural Fill from identified feasible borrow pits has been provided in Table 5.4 and Table 5.5, respectively. As it is unknown which of the borrow pit sites or structural fill quarries will be used in the construction of the Project, the TIA analysis has assessed the usage of all available fill quantities rather than fill requirement. This will result in an overestimation of the impact of the Project. However, it will provide the construction contractor with additional flexibility in determining which borrow pit/quarry sites to use. As some of the borrow pits are located directly on the alignment, fill sourced from these sites will only use the Project rail maintenance access roads (RMAR) and are not expected to impact on the road network.

Table 5.4 General fill – supply

Borrow pit ID	General fill supply (m^3)
Site 4	240,000
Site 7/7B	1,200,000
Site 8	500,000
Site 9	500,000
Site 11	200,000
Site 13	100,000
Site 5	200,000
Site 26	120,000
Site 25	140,000
Total available	**3,200,000**

Table 5.5 Structural fill – supply

Borrow pit	Structural fill supply (m^3)
Site 1	240, 000
Tikitere Quarry	240, 000
Johnston Quarry	240, 000
Total available	**720,000**

The structural fill is proposed to come from three suppliers, and the resulting proposed construction traffic routes overlap along North Star Road. The total amount of structural fill along that road segment was taken to be a total of 240, 000 m^3. The total quantity of quarry materials is proposed to be delivered equally to three laydown areas along the rail alignment.

5.3.2 Quarry material

The expected volumes of capping and rail ballast for the Project alignment are shown in Table 5.6. Total amounts for top ballast, bottom ballast and capping are based on the following:

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

Table 5.6 Quarry materials requirements

Material type	Supply chainage		Quantity (t)
	From	To	
Bottom Ballast	941	11,800	22,000
	11,800	21,100	19,000
	21,100	30,500	23,000
Top Ballast	941	11,800	11,000
	11,800	21,100	9,000
	21,100	30,500	12,000
Capping	941	11,800	22,000
	11,800	21,100	19,000
	21,100	30,500	23,000

Table 5.6 highlights a total quarry requirement of approximately 160, 000 t. For the purpose of this assessment, it was conservatively assumed that the three identified quarry suppliers would each supply the total required amount of 160, 000 t. Where quarry material routes from each supplier overlapped along North Star Road, the total amount of quarry material along that road segment was taken to be 160, 000 t. The total quantity of quarry materials is proposed to be delivered equally to three laydown areas along the rail alignment.

5.3.3 Precast concrete

Precast concrete will be primarily required for a number of culvert and bridge sections. The proposed culvert and bridge culvert sections has been provided in Table 5.7 and Table 5.8 respectively.

Table 5.7 Concrete logistics for culvert construction

Chainage (m)	Type	Barrels	Diameter/width (m)	No. drainage elements
5116	RCP	2	0.9	12
5582	RCP	2	1.05	16
6083	RCP	7	2.1	56
6115	RCP	7	2.1	49
6532	RCP	6	2.1	42
6579	RCP	5	2.1	40
9000	RCP	6	1.2	30
10188	RCP	2	1.35	10
10817	RCP	3	1.8	18
11870	RCP	2	0.9	10
12431	RCP	1	1.35	6
13443	RCP	1	0.9	6
14163	RCP	2	1.2	16
15000	RCP	4	1.05	24
15668	RCP	20	1.2	120
15828	RCP	20	1.2	120
15896	RCP	20	1.2	120
15979	RCP	20	1.2	140
16080	RCP	20	1.2	140
16493	RCBC	1	3	8
16597	RCP	8	1.2	56
16827	RCP	8	1.2	56
18090	RCP	3	1.65	18
19600	RCP	4	1.2	24
21348	RCP	3	1.35	36
21967	RCP	3	1.05	27
22269	RCP	3	1.2	18
22860	RCP	10	1.2	110
23218	RCP	10	1.2	110
23703	RCP	10	1.2	110
23796	RCP	10	1.2	110
24032	RCP	8	1.05	88

Chainage (m)	Type	Barrels	Diameter/width (m)	No. drainage elements
24200	RCP	5	0.9	60
24618	RCP	12	1.35	144
24713	RCP	12	1.35	132
24849	RCP	12	1.35	156
27061	RCP	10	1.2	70

Table 5.8 Precast concrete for bridge sections

Bridge name	Approximate length (m)	Structure	Crossing type	Span length (m)	Span number	No. of precast girders/beams per span
Mobbindry Creek Rail Bridge	112	Bridge	Waterway	14	8	1
Mobbindry Floodplain Rail Bridge	182	Bridge	Waterway	14	13	1
Back Creek Rail Bridge	70	Bridge	Waterway	14	5	1
Forest Creek Rail Bridge	154	Bridge	Waterway	14	11	1
UT1 Forest Creek Rail Bridge	136	Bridge	Waterway	23	6	2
Melonenkamm Rail Bridge	160	Bridge	Waterway	23	7	2
Bruxner Way Rail Bridge	114	Bridge	Road	23	5	2
Whalan Floodplain #1 Rail Bridge	183	Bridge	Waterway	23	8	2
Whalan Floodplain #2 Rail Bridge	126	Bridge	Waterway	14	9	1
Whalan Floodplain #3 Rail Bridge	126	Bridge	Waterway	14	9	1
Macintyre River Viaduct	1150	Bridge/Road	Waterway	29	40	2
	165		Waterway	33	5	2
	435		Waterway	29	15	2

5.3.4 Construction water requirements

Construction water will be at a premium in the area, with the demand for water driven by the construction activity. Each construction activity will require different levels of quantity, quality and flow rate to achieve the planned construction productivities. The main construction elements requiring water including quantity, quality, flow rate are detailed in Table 5.9.

Table 5.9 Construction water requirements

Construction activity/ process/phase	Uses/requirement	Quantity	Quality	Flow rate
Earthworks	Material conditioning and general dust suppression	High	Low	High
Construction camp.	Drinking water, showers, toilets, washing and cooking facilities	Low	High	Low
Concrete	Bridge and culvert locations	Medium	High	Low
Trackworks	Ballast dust suppression during ballasting and regulating activities	Medium	Low	Low

The total water requirements along the alignment are provided in Figure 5.1, with each component discussed below.

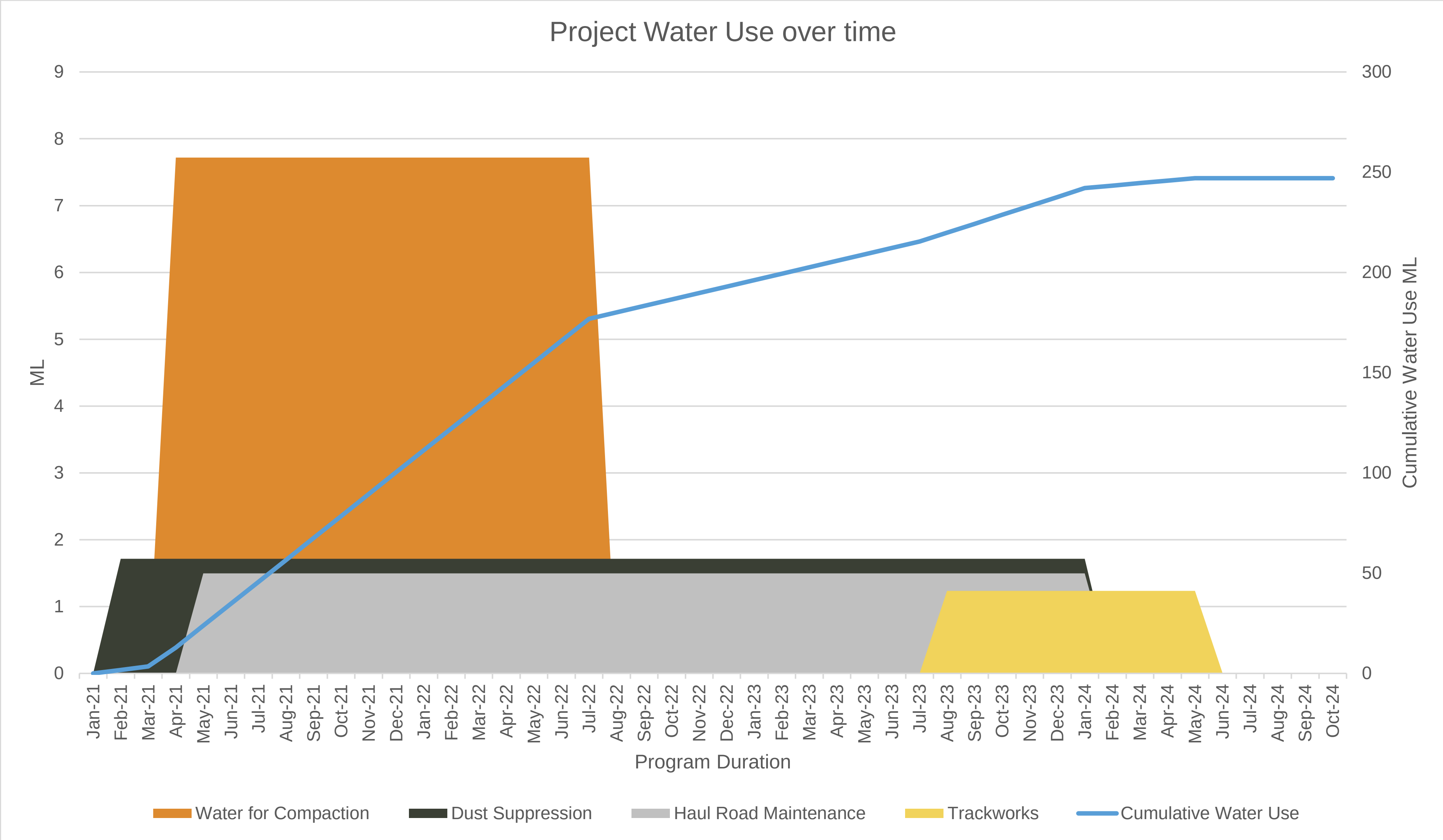


Figure 5.1 **Water use over time**

5.3.4.1 Earthworks

The greatest water demand on the Project will be for the earthworks, which predominantly 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 100L of water per m^3 of fill, however this is very variable, dependent upon material properties. The Project has approximately 1,659,000m^3 of fill, so the water demand for conditioning of the earthworks material will require approximately 166 ML of water in total.

General earthworks dust suppression across the site will be a constant activity. An allowance of approximately 50L of water per m^3 of imported fill has been made which equates to 83 ML of water in total. The use of dust control polymers and additives will also be investigated by the Construction Contractor to reduce this part of the water demand.

5.3.4.2 Haul road dust suppression

Haul road and laydown area maintenance will also require water. An allowance of 40 L of water per m^3 of imported fill has been made which equates to 68 ML of water.

An additional allowance for dust suppression during trackworks has been made.

5.3.4.3 Construction camp

It is recommended that the construction camp is established with a rainwater harvesting system to reduce the requirement on the town water supply of North Star. A greywater recycling system should also be explored to reuse water for activities such as toilet flushing. All potable water supplies on the Project should comply with the 2011 NHMRC Australian Drinking Water Guidelines.

The township of North Star currently has access to water through the Great Artesian Basin with its allocation being 40 ML per year under the current water sharing plan (ceased July 2018). It is estimated that on average the construction camp will consume approximately 1 ML of water per month of operation.

5.3.4.4 Concrete

Any water supply associated with concrete works will be required to be in accordance with AS1379 “Specification and Supply of Concrete”. There is no concrete batch plant provision for the Project due to the demand being relatively low compared to the establishment cost of such a facility.

Furthermore, there are several local concrete suppliers available in Goondiwindi with approximate journey times of 35mins (one-way) to North Star, which is the furthest point from supply for the Project.

5.3.4.5 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 6 L per track metre have been considered for ballast dropping and 3 L per track metre for tamping and regulating activities.

5.3.5 Spoil management

The Project is predominantly an import project and is not expected to generate a significant amount of spoil. However, there are several likely sources of spoil material to be handled over the life of the Project, including:

- Excess topsoil. If present, the current planning is to potentially use this to:
  - Rehabilitate borrow pits
  - Localised landscaping within the Project rail corridor or
  - Reused in embankments with geotechnical treatments
- Unsuitable material. If the volume is such that it cannot be used within the permanent works corridor then it will be disposed of in the borrow pits.
- Camp waste, both solid and wastewater. Not subject to assessment under this report
- Waste construction materials, including but not limited to: used formwork, empty containers, waste reinforcement, concrete wastage, office waste. These types of waste will be transported to the local waste disposal facilities and treated in accordance with their governing rules.

Due to the limited spoil task in the Project, no trips have been added specifically to the TIA to account for these tasks. However, these are considered within the buffer trips and return trips assessed as a part of the TIA.

5.4 Working hours

The construction schedule used to determine traffic movements has been based on the following delivery hours:

- General construction activities:
  - Monday to Friday – 6.00 am to 6.00 pm
  - Saturday - 6.00 am to 1.00 pm
  - No deliveries planned on Sundays or public holiday
- Track possessions will proceed on a 7 day/24 hour calendar basis.

Works outside of standard construction hours will 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.
- 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.

It should be noted that this is separate to the approval period the EIS is seeking which is for a 7 day week between 6:30 am to 6:00 pm. Assuming deliveries will not occur on Sundays is a conservative in terms of the traffic impact assessment.

5.5 Construction transport routes

For the purpose of the TIA, it has been assumed that all construction material deliveries are being made to laydown area delivery points along the rail alignment. Proposed construction transport routes are identified in Section 2.2. Appendix E to Appendix J illustrate the various primary construction routes.

5.5.1 Material laydowns

Several potential laydown areas have been identified throughout the length of the alignment. These laydown areas are situated next to the corridor to facilitate direct access to/from the laydown to the alignment. The 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. For the purposes of this TIA it has been assumed that all materials will travel from their identified supply point to these proposed laydown areas.

5.5.2 Pre-cast concrete routes

For the purpose of the traffic impact assessment, it has been assumed that all pre-cast concrete for the Project will be available from established yards in Toowoomba, approximately 180 km northwest of the Project alignment. Suitable precast manufacturers have not been identified in Moree or Tenterfield at this stage. All pre-cast concrete routes originate in Toowoomba and will be distributed directly to assigned bridge/culvert laydowns along the alignment. For the transportation of some of the larger precast concrete girders, it is expected that a police escort will be required. There is currently no established precast supplier in Moree or Tenterfield, but a future commercial operation may be established to support NSW projects.

Other suitable precast and bulk concrete suppliers in the wider region are shown in Table 5.10. Supply from locations outside of Toowoomba have not been taken into account in this TIA.

Table 5.10 Project schedule of concrete suppliers

Type	Name	Location
Pre-cast facilities	Wagner Precast	Wacol, Qld 4076
	Enco PRE Cast Pty Ltd	Seventeen Mile Rocks, Qld 4073
	Humes Precast Concrete Ipswich	Swanbank, Qld 4306
	Humes Precast Concrete Toowoomba	Wilsonton, Qld 4350
	Rocla Precast Concrete Toowoomba	Toowoomba, Qld 4350
	Rocla Recast Concrete Wacol	Wacol, Qld 4076
Bulk supply	Boral Concrete Goondiwindi	Goondiwindi, Qld 4390
	Holcim Australia Goondiwindi	Goondiwindi, Qld 4390
	Boral Concrete Millmerran	Millmerran, Qld 4357
	Boral Concrete Pittsworth	Pittsworth, Qld 4356
	Boral Concrete Harlaxton	Toowoomba, Qld 4350
	Holcim Australia Toowoomba	Toowoomba, Qld 4350
	Hanson Concrete Supplier	Toowoomba, Qld 4350

Haul roads that are planned to be future precast delivery routes should account for the required maximum gradients and horizontal curves to safely transport the selected precast members. It is advised that items such as bridge girders be transported in the late afternoon (between 4.00 pm and 6.00 pm) to relieve the pressure on the haul routes being used during the day by the earthworks teams.

5.5.3 Concrete routes

For the purpose of this assessment, it has been assumed that all concrete for the Project will be supplied from Goondiwindi. Concrete will be distributed directly to the discharge point along the alignment. Concrete 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 roads.

5.5.4 Sleeper routes

For the purpose of this assessment, it has been assumed that concrete sleepers would originate from Grafton and be distributed via the road network to various laydown areas along the Project alignment.

5.5.5 Workforce transport and accommodation camps

It has been assumed that one construction camp be provided in North Star. The approximate location of the proposed camp is indicated in Figure 5.2 whilst a conceptual layout is presented in Figure 5.3. The camp has the capacity to accommodate upwards of 350 people.

Figure 5.2 Construction camp location

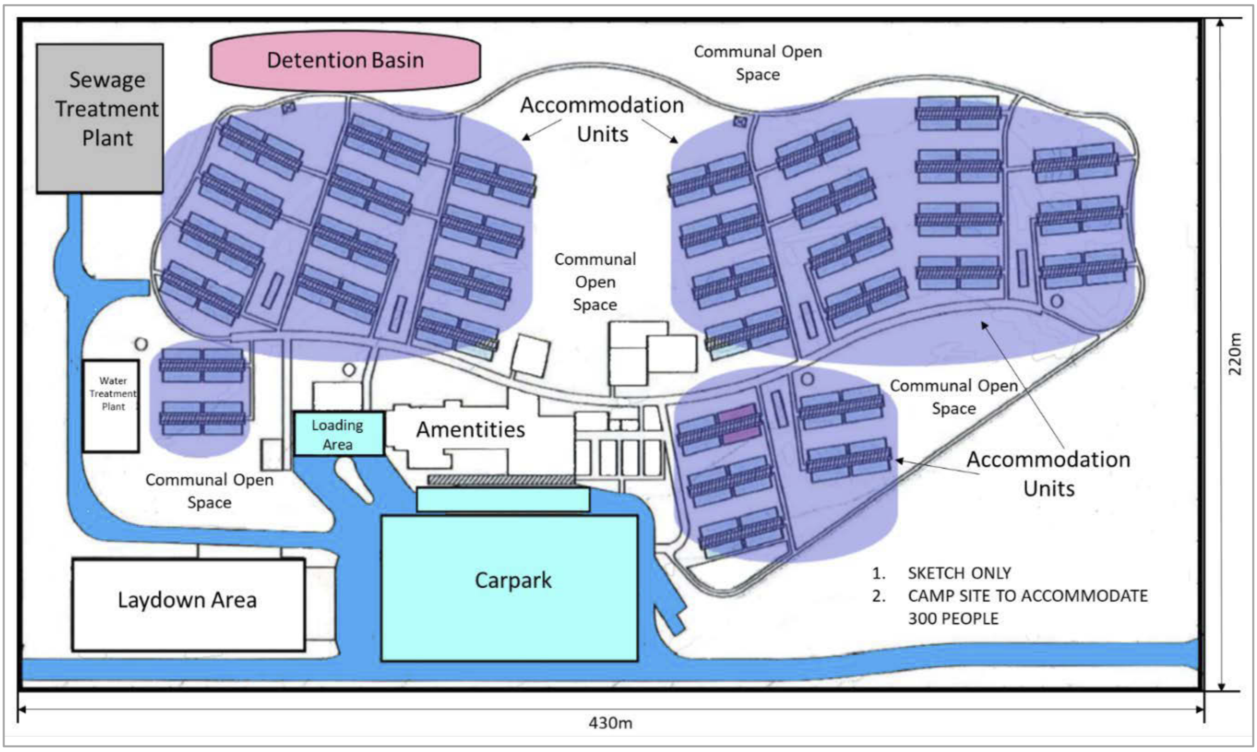


Figure 5.3 **Preliminary construction camp layout**

The preliminary site workforce information is shown in Figure 5.4 as expected workforce on site over program weeks.

This graph shows the expected full-time workforce and does not include delivery drivers for precast bridge elements or culverts, concrete deliveries or fuel deliveries. It does include delivery drivers for bulk materials including general and structural fill, capping material and ballast. The total site team is expected to peak at approximately 250 to 350 team members from week 50 through to week 80.

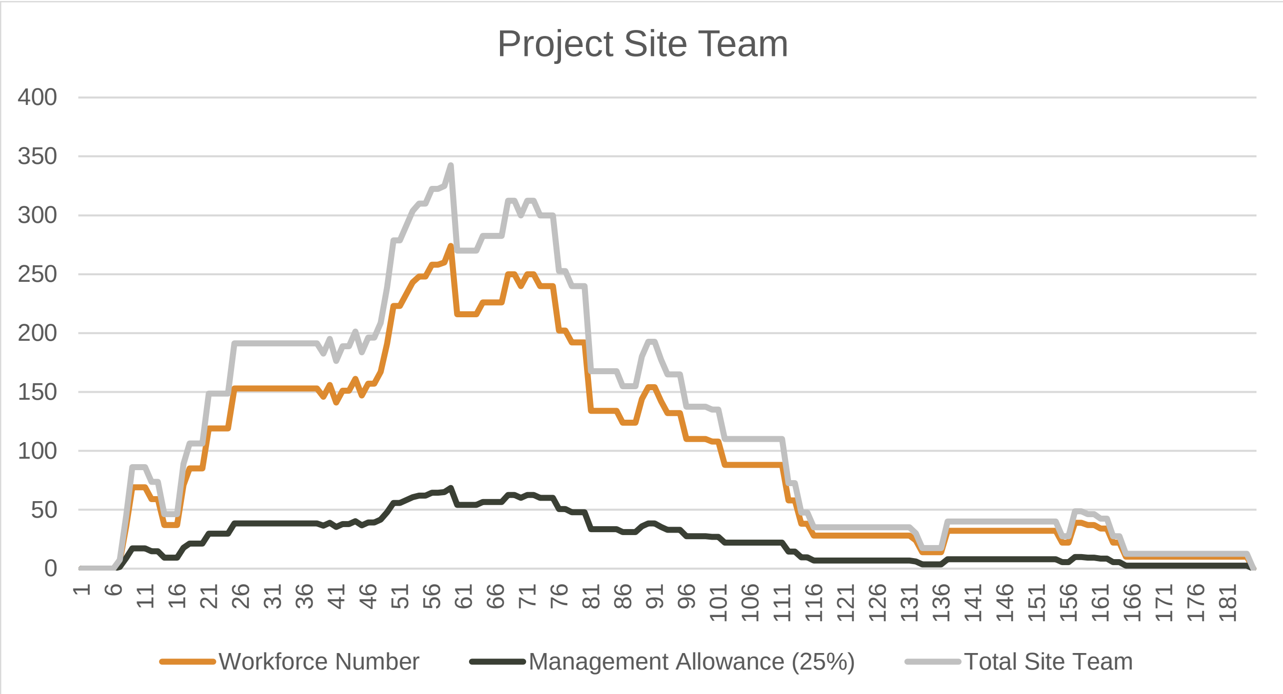


Figure 5.4 **Site workforce over time**

All workforce routes originate from the construction camp at North Star. The endpoints of the route are located at various points along the Project alignment.

5.5.6 Quarry routes

For the purpose of this TIA, it has been assumed that all quarry materials for the Project will be supplied from quarries south of North Star. These quarries are proposed to supply materials for bottom ballast, top ballast, capping and structural fill. These potential suppliers have been shown in Table 5.11.

Table 5.11 Project schedule of quarries

Quarry Name	Location
Johnstone Concrete and Quarries	Pallamallawa, NSW
Tikitere Quarry	North Star, NSW
1000 Acres borrow pit (Site 2)	North Star, NSW
Site 1 borrow pit	North Star, NSW

The TIA has undertaken a conservative assessment of quarry materials by assuming that 100 per cent of required quarry material for construction of the Project can be sourced from any one of the viable quarries. This is highly conservative as only a percentage of the total will be sourced from each quarry, most likely the quarry closest to the laydown area.

5.5.7 Delivery of water

For the purpose of this TIA, water supply is assumed to be available from the Boggabilla Weir. Water will be supplied to various points along the alignment for activities including earthworks, trackwork and dust suppression. Other potential water supplies may include rivers, dams and bores, however, these have not been assessed as part of this TIA.

5.5.8 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.

5.5.9 Borrow pits

The routes from each borrow pit largely utilises distributor roads and the RMAR. Local roads were avoided where possible; however, as some borrow pits were located away from distributor and arterial roads, local roads were necessary to connect to the distributor/arterial roads.

5.5.10 Road network and restrictions on vehicle size

The transport corridors identified have taken into consideration the restrictions on vehicle sizes. However, if required and necessary for the Project, all oversize over-mass (OSOM) vehicles and restricted access vehicles (RAV) required to transport special equipment will apply for the necessary permits from RMS, DTMR and other relevant authorities and should comply with the Guideline for Excess Dimension Vehicles in Queensland version 8, 2013, Heavy Vehicle (Mass, Dimension and Loading) National Regulation 2013 (the Regulation) and all other applicable legislative requirements from RMS. At this stage, oversize vehicles are only assumed to be required the transportation of 29 m Super-T precast concrete girders. This requirement may change during detailed design phase. The relevant routes for these trips are shown in Appendix G, with the potentially impacted links listed below:

- GSC
  - North Star Road - Between MPSC Council Boundary and Edwards Street

- MPSC
  - Bruxner Way - Between Newell Highway and Tucka Tucka Road
  - Bruxner Way - Between Tucka Tucka Road and North Star Road
  - North Star Road - Between Bruxner Way and GSC boundary
  - Tucka Tucka Road - Between Bruxner Way to Gwydir Shire Council Boundary
- TMR
  - Cunningham Highway - Between Leichhardt Highway and Yelarbon-Keetah Road
  - Cunningham Highway - Between NSW/QLD Border and Leichhardt Highway
  - Cunningham Highway - Between Yelarbon-Keetah Road and Millmerran Inglewood Road
  - Gore Highway - Between Millmerran Inglewood Road and Bunkers Hill School Road
  - Millmerran Inglewood Road - Between Cunningham Highway and Gore Highway
  - Newell Highway - Between NSW/QLD border and Bruxner Way
  - Toowoomba Cecil Plains Road - Between Hursley Road and Wellcamp Westbrook Road
  - Toowoomba Cecil Plains Road - Between McDougall Street and Troys Road
  - Toowoomba Cecil Plains Road - Between Troys Road and Hursley Road
- TRC
  - Blackwell Road - Between Bunkers Hill School Road and Macaulay Road
  - Bunkers Hill School Road - Between Gore Highway and Blackwell Road
  - Macaulay Road - Between Blackwell Road and Wellcamp Westbrook Road
  - Wellcamp Westbrook Road - Between Macaulay Road and Toowoomba Cecil Plains Road.

5.5.11 Access constraints

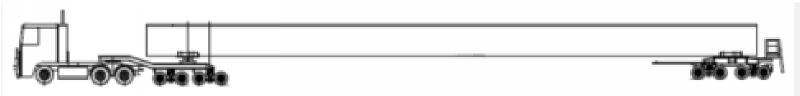
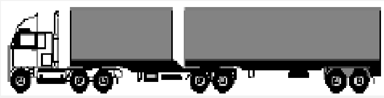
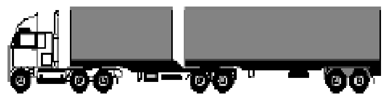
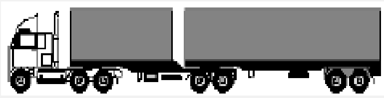
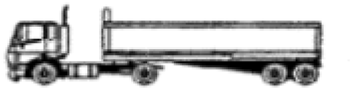
An initial review of the potential access suggests that no significant access constraints are currently anticipated within the Project corridor. The access to the permanent corridor and to the site laydown areas are required to be confirmed with asset owners during the detailed design stage.

5.5.12 Vehicle types

Proposed vehicle types by construction activity that are proposed to be used to transport construction materials for the Project have been provided in Table 5.12.

Table 5.12 Vehicles types by construction activity

Construction activity	Austroads vehicle class	Illustration (indicative)
Workers/ tools	Class 1 – 2 Short vehicle/towing	
Insitu concrete	Class 5 4 Axle Rigid Truck (27.5 tonne)	

Construction activity	Austroads vehicle class	Illustration (indicative)
Precast concrete	OSOM for Precast concrete bridges Uploaded Class 3 Rigid Truck with 4 Axle Dolly and 4 Axle Jinker (70 tonne payload)	
Quarry	Class 10 7 Axle B-Double (55.5 tonne)	
Fill	Class 10 7 Axle B-Double (55.5 tonne)	
Sleepers	Class 10 7 Axle B-Double (55.5 tonne)	
Water	Class 7 4 Axle Semitrailer (31.5 tonne)	

5.6 Traffic generation by activity

This section presents the traffic generated based on the quantities of construction materials, workforce and equipment required for the construction of the Project.

Table 5.13 shows the quantities/volumes of materials used to inform this traffic impact assessment. The general fill and structural fill volumes are conservative when compared to the amount of material that will ultimately be required to be transported (provided in Table 5.1). These differ as the TIA has conservatively assumed that 100 per cent of general fill and structural fill materials for the Project can be sourced from any one of the viable quarries and borrow pits. This is highly conservative as only a percentage of the total will be sourced from each site, most likely the quarry closest to the laydown area.

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 rail alignment updates (horizontal or vertical). is also envisaged that these factors would also cover any peak delivery times within the broad timeframes specified for each construction activity. The adjustment/buffer factors are provided in Table 5.13.

Table 5.13 Quantities/volumes used in traffic assessment

Material	Delivery method	Quantity/volume	Estimated buffer for traffic assessment
General fill	Road	3, 200, 000 m^3 (excluding any contingency)	Movement Buffer would be 10 per cent. A 50 per cent buffer has been assessed, as agreed with ARTC, to counter the risk of non-conforming material in borrows. It is deemed appropriate that will not be moved if it is non-conforming.
Structural fill	Road	240,000 m^3	10 per cent. Comment as above.
Capping	Road	64,000 m^3	10 per cent.
Top ballast	Road	32,000 t	7.5 per cent
Bottom ballast	Road	64,000 t	7.5 per cent
Sleepers	Road	53,000 items	2.5 per cent

Material	Delivery method	Quantity/volume	Estimated buffer for traffic assessment
Rail	Rail	13,000 t	2.5 per cent
Precast concrete – bridge	Road	200 girders (at various length and size)	2.5 per cent (to allow for a few broken beams)
Concrete – bridge and culverts	Road	2,300 sections (various sizes)	5 per cent (over excavation, wastage)
Culverts	Road	32,000 m^3	2.5 per cent (Quality compliance)
Water (trackworks)	Road	190 kL	10 per cent
Water (earthworks)	Road	249 ML	10 per cent
Water (haul road dust suppression)	Road	68 ML	10 per cent

Total trips by construction activity for each road section have been derived using material requirements and delivery schedules. These total trips have been summarised in Table 5.14 by activity and year of construction for the Project.

Table 5.14 Total trips by activity per year

Material	2021	2022	2023	2024
Workers	37510	40920	40920	40920
Insitu Concrete	709	3837	1051	0
Precast Concrete	93	322	15	0
Quarry	0	0	9986	14642
Fill	134097	192764	0	0
Sleepers	0	0	341	341
Water	9268	6839	4	6

The total trips are distributed along the construction routes, resulting in the total trips by road section as shown in Table 5.15 and Table 5.16 for New South Wales and Queensland, respectively.

Table 5.15 Total trips by road section per year: New South Wales

Road name	Road section	2021	2022	2023	2024
State controlled roads: RMS					
Gwydir Highway	Between Bent Street and New England Highway	0	0	341	341
	Between New England Highway and Campbell Street	0	0	341	341
	Between Campbell Street and Stephen Street	0	0	341	341
Newell Highway	Between NSW/QLD border and Bruxner Way	10070	10997	1070	6
	Between Bruxner Way and Letter Box Road	4191	3667	0	0
New England Highway	Between Gwydir Highway and Gwydir Highway	0	0	341	341
Summerland Way	Between Trenayr Road and Turf Street	0	0	341	341
Local government roads: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0	0	341	341
Clark Road	Full extent	0	0	341	341
Craig Street	Between Villiers Street and Clarence Street	0	0	341	341
	Between Clarence Street and Bent Street	0	0	341	341
Dobie Street	Between Villiers Street and Summerland Way	0	0	341	341

Road name	Road section	2021	2022	2023	2024
State controlled roads: RMS					
Trenayr Road	Between Summerland Way and Clark Road	0	0	341	341
Villiers Street	Between Craig Street and Dobie Street	0	0	341	341
Local government roads: GSC					
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	29334	25667	0	0
Bush Access Road	Full extent	0	18857	2496	3659
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	0	18857	2496	3659
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	0	18857	2496	3659
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	19360	39977	23959	25125
Edwards Street	Between North Star Road and I B Bore Road	5867	5133	0	0
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	0	18857	2496	3659
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	0	18857	2496	3659
I B Bore Road	Between Edwards Street and Croppa Creek Road	0	18857	2496	3659
North Star Road	Between MPSC Council Boundary and Edwards Street	32800	50556	23961	25127
North Star Road	Between Edwards Street and Getta Getta Road	19360	39977	21461	21461
North Star Road	Between Getta Getta Road and Warialda Road	0	18857	341	341
Scotts Road	Between North Star Road and Hohns Road	8381	7333	0	0
Stephen Street	Between Long Street and Gwydir Highway	0	0	341	341
Warialda Road	Between North Star Road and Stephen Street	0	0	341	341
Local government roads: ISC					
Campbell Street	Between Byron Street and Otho Street	0	0	341	341
Local government roads: MPSC					
Bruxner Way	Between Newell Highway and Tucka Tucka Road	14260	14664	1070	6
Bruxner Way	Between Tucka Tucka Road and North Star Road	14930	14469	4737	5027
Hohns Road	Between Hohns Road and Borrow Pit Site 5	8381	7333	0	0
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	4191	3667	0	0
North Star Road	Between Bruxner Way and GSC boundary	10278	9121	6234	7012
River Road	Full Extent	9268	6839	4	6
Tucka Tucka Road	Between Bruxner Way to GSC boundary	3687	4947	2046	1081

Table 5.16 Total trips by road section per year: Queensland

Road name	Road section	2021	2022	2023	2024
State controlled roads: DTMR					
Cunningham Highway	Between NSW/QLD Border and Leichhardt Highway	802	4158	1066	0
	Between Leichhardt Highway and Yelarbon-Keetah Road	93	322	15	0
	Between Yelarbon-Keetah Road and Millmerran Inglewood Road	93	322	15	0
Gore Highway	Between Millmerran Inglewood Road and Bunkers Hill School Road	93	322	15	0
Leichhardt Highway	Between Cunningham Highway and Hunt Street	709	3837	1051	0
Millmerran Inglewood Road	Between Cunningham Highway and Gore Highway	93	322	15	0
Toowoomba Cecil Plains Road	Between McDougall Street and Troys Road	93	322	15	0
	Between Troys Road and Hursley Road	93	322	15	0
	Between Hursley Road and Wellcamp Westbrook Road	93	322	15	0
Local government roads: GRC					
Boodle Street	Between Boodle Street and Hunt Street	709	3837	1051	0
Hunt Street	Between Leichhardt Highway and Boodle Street	709	3837	1051	0
Local government roads: TRC					
Blackwell Road	Between Bunkers Hill School Road and Macaulay Road	93	322	15	0
Bunkers Hill School Road	Between Gore Highway and Blackwell Road	93	322	15	0
Macaulay Road	Between Blackwell Road and Wellcamp Westbrook Road	93	322	15	0
Wellcamp Westbrook Road	Between Macaulay Road and Toowoomba Cecil Plains Road	93	322	15	0

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

- 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 Saturdays or Sundays.
- Equal distribution of loads throughout the delivery period
  - Buffer factors provided in Table 5.13 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.

Table 5.17 and Table 5.18 summarises the peak daily traffic volumes which would occur along each road segment of the proposed primary construction routes for each year of construction.

Table 5.17 Peak daily per road section: New South Wales

Road name	Road section	Year of construction			
		2021	2022	2023	2024
State Controlled Roads: RMS					
Gwydir Highway	Between Bent Street and New England Highway	0	0	16	16
	Between New England Highway and Campbell Street	0	0	16	16
	Between Campbell Street and Stephen Street	0	0	16	16
Newell Highway	Between NSW/QLD border and Bruxner Way	70	72	9	0
	Between Bruxner Way and Letter Box Road	24	24	0	0
New England Highway	Between Gwydir Highway and Gwydir Highway	0	0	16	16
Summerland Way	Between Trenayr Road and Turf Street	0	0	16	16
Local Government Roads: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0	0	16	16
Clark Road	Between Clark Road and Trenayr Road	0	0	16	16
Craig Street	Between Villiers Street and Clarence Street	0	0	16	16
	Between Clarence Street and Bent Street	0	0	16	16
Dobie Street	Between Villers Street and Summerland Way	0	0	16	16
Trenayr Road	Between Summerland Way and Clark Road	0	0	16	16
Villiers Street	Between Craig Street and Dobie Street	0	0	16	16
Local Government Roads: GSC					
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	167	167	0	0
Bush Access Road	Full extent	0	143	28	55
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	0	143	28	55
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	0	143	28	55
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	0	143	28	55
Edwards Street	Between North Star Road and I B Bore Road	80	223	124	151
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	33	33	0	0
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	0	143	28	55
I B Bore Road	Between Edwards Street and Croppa Creek Road	0	143	28	55
North Star Road	Between MPSC Council Boundary and Edwards Street	159	304	124	151
North Star Road	Between Edwards Street and Getta Getta Road	80	223	96	96
North Star Road	Between Getta Getta Road and Warialda Road	0	143	16	16
Scotts Road	Between North Star Road and Hohns Road	48	48	0	0
Stephen Street	Between Long Street and Gwydir Highway	0	0	16	16
Warialda Road	Between North Star Road and Stephen Street	0	0	16	16
Local Government Roads: ISC					
Campbell Street	Between Byron Street and Otho Street	0	0	16	16

Road name	Road section	Year of construction			
		2021	2022	2023	2024
Local Government Roads: MPSC					
Bruxner Way	Between Newell Highway and Tucka Tucka Road	94	96	9	0
Bruxner Way	Between Tucka Tucka Road and North Star Road	85	87	28	37
Hohns Road	Between Hohns Road and Borrow Pit Site 5	48	48	0	0
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	24	24	0	0
North Star Road	Between Bruxner Way and GSC boundary	55	57	50	69
River Road	Full Extent	55	55	0	0
Tucka Tucka Road	Between Bruxner Way to GSC boundary	27	27	10	5

Table 5.18 Peak daily per road section: Queensland

Road name	Road section	Year of construction			
		2021	2022	2023	2024
State Controlled Roads: DTMR					
Cunningham Highway	Between NSW/QLD Border and Leichhardt Highway	15	24	9	0
	Between Leichhardt Highway and Yelarbon-Keetah Road	2	2	0	0
	Between Yelarbon-Keetah Road and Millmerran Inglewood Road	2	2	0	0
Gore Highway	Between Millmerran Inglewood Road and Bunkers Hill School Road	2	2	0	0
Leichhardt Highway	Between Cunningham Highway and Hunt Street	13	22	8	0
Millmerran Inglewood Road	Between Cunningham Highway and Gore Highway	2	2	0	0
Toowoomba Cecil Plains Road	Between McDougall Street and Troys Road	2	2	0	0
	Between Troys Road and Hursley Road	2	2	0	0
	Between Hursley Road and Wellcamp Westbrook Road	2	2	0	0
Local Government Rods: GRC					
Boodle Street	Between Boodle Street and Hunt Street	13	22	8	0
Hunt Street	Between Leichhardt Hwy and Boodle Street	13	22	8	0
Local Government Rods: TRC					
Blackwell Road	Between Bunkers Hill School Road and Macaulay Road	2	2	0	0
Bunkers Hill School Road	Between Gore Highway and Blackwell Road	2	2	0	0
Macaulay Road	Between Blackwell Road and Wellcamp Westbrook Road	2	2	0	0
Wellcamp Westbrook Road	Between Macaulay Road and Toowoomba Cecil Plains Road	2	2	0	0

The transport of precast bridge girders may require the use of oversize vehicles. If any need arises for an oversize vehicle movement (excess mass or over-dimensional loads), DTMR, RMS and other relevant authorities will be notified and permissions will be obtained as required under the Transport Operations (Road Use Management) Act (Qld) 1995 and Road Transport Act (2013) (NSW). Obtaining vehicle permits is beyond the scope of this TIA.

5.7 Construction schedule

A preliminary Construction Program was developed for the purposes of the TIA:

- This Construction Program utilises three earthworks crews constructing in the following areas:
  - From approximate Ch 0.0 km to the bridge across the un-named Creek at Ch 20.8 km
  - From the northern side of the bridge at approximate Ch 20.8 km to the NSW/QLD border at Ch 30.6km
- Assumes four bridge structures teams
- Utilises six culvert construction crews
- Assumes capping and track-works progresses on one front (South to North).

The construction program has been developed sufficient to demonstrate the constructability of the Project by a competent contractor and determine a possible Project duration. Note that the preliminary construction program is for indicative purposes only and may not reflect the actual Project commencement and completion dates.

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 during the construction and operational phases of the Project. 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 Project rail corridor). Therefore, the associated Project traffic volumes are not expected to trigger the 5 per cent threshold outlined in GTIA (refer Table 1.5).

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 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 feasibility design. 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 feasibility design given the observed growth on roads evaluated. The data and evaluation are provided in Appendix A for RMS roads and Appendix B for DTMR roads.

6.1.2 Seasonal variation

Based on the dominant rural/agricultural land uses of the impact assessment area, traffic volumes on the road network are likely to increase during harvesting season. Key crops in the impact assessment area include vegetables, wheat, barley, oats and cereal rye. During this season, heavy vehicle usage on local and main roads in the impact assessment area 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 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. 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 5 per cent traffic comparison on links: New South Wales

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 per cent	Green
Greater than or equal to 5 per cent and less than 10 per cent	Orange
Greater than or equal to 10 per cent	Red

Table 6.2 5 per cent comparison summary (gazettal/northbound/eastbound directions): New South Wales

Road name	Road section	Year of construction			
		2021	2022	2023	2024
State-Controlled Roads: RMS					
Gwydir Highway	Between Bent Street and New England Highway	0.0%	0.0%	1.9%	1.8%
	Between New England Highway and Campbell Street	0.0%	0.0%	1.9%	1.8%
	Between Campbell Street and Stephen Street	0.0%	0.0%	1.9%	1.8%
Newell Highway	Between NSW/QLD border and Bruxner Way	3.2%	3.2%	0.4%	0.0%
	Between Bruxner Way and Letter Box Road	1.1%	1.1%	0.0%	0.0%
New England Highway	Between Gwydir Highway and Gwydir Highway	0.0%	0.0%	1.3%	1.3%
Summerland Way	Between Trenayr Road and Turf Street	0.0%	0.0%	0.8%	0.8%
Local Government Roads: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0.0%	0.0%	0.7%	0.7%
Clark Road	Between Clark Road and Trenayr Road	0.0%	0.0%	3.5%	3.4%
Craig Street	Between Villiers Street and Clarence Street	0.0%	0.0%	0.4%	0.4%
Craig Street	Between Clarence Street and Bent Street	0.0%	0.0%	0.4%	0.4%
Dobie Street	Between Villers Street and Summerland Way	0.0%	0.0%	0.4%	0.4%
Villers Street	Between Craig Street and Dobie Street	0.0%	0.0%	0.4%	0.4%
Trenayr Road	Between Summerland Way and Clark Road	0.0%	0.0%	0.7%	0.7%
Local Government Roads: GSC					
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	68.0%	66.7%	0.0%	0.0%
Bush Access Road	Full extent	0.0%	1319.8%	256.9%	492.5%
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	0.0%	91.7%	17.8%	34.2%
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	0.0%	91.7%	17.8%	34.2%
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	0.0%	91.7%	17.8%	34.2%
Edwards Street	Between North Star Road and I B Bore Road	52.4%	143.0%	77.9%	93.1%

Road name	Road section	Year of construction			
		2021	2022	2023	2024
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	314.1%	307.9%	0.0%	0.0%
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	0.0%	91.7%	17.8%	34.2%
I B Bore Road	Between Edwards Street and Croppa Creek Road	0.0%	91.7%	17.8%	34.2%
North Star Road	Between MPSC Council Boundary and Edwards Street	103.9%	194.8%	77.9%	93.1%
North Star Road	Between Edwards Street and Getta Getta Road	52.4%	143.0%	60.1%	58.9%
North Star Road	Between Getta Getta Road and Warialda Road	0.0%	91.7%	9.8%	9.6%
Scotts Road	Between North Star Road and Hohns Road	31.2%	30.6%	0.0%	0.0%
Stephen Street	Between Long Street and Gwydir Highway	0.0%	0.0%	1.9%	1.8%
Warialda Road	Between North Star Road and Stephen Street	0.0%	0.0%	1.9%	1.8%
Local Government Roads: ISC					
Campbell Street	Between Byron Street and Otho Street	0.0%	0.0%	1.9%	1.8%
Local Government Roads: MPSC					
Bruxner Way	Between Newell Highway and Tucka Tucka Road	38.2%	38.5%	3.4%	0.0%
Bruxner Way	Between Tucka Tucka Road and North Star Road	34.5%	34.9%	11.1%	14.3%
Hohns Road	Between Hohns Road and Borrow Pit Site 5	31.2%	30.6%	0.0%	0.0%
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	15.6%	15.3%	0.0%	0.0%
North Star Road	Between Bruxner Way and GSC boundary	38.6%	39.2%	34.1%	45.4%
River Road	Full Extent	522%	512%	0.4%	0.4%
Tucka Tucka Road	Between Bruxner Way to GSC boundary	17.0%	16.7%	6.3%	3.0%

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

Road name	Road ID - road section	Year of construction			
		2021	2022	2023	2024
State-Controlled Roads: RMS					
Gwydir Highway	Between Bent Street and New England Highway	0.0%	0.0%	1.9%	1.8%
	Between New England Highway and Campbell Street	0.0%	0.0%	1.9%	1.8%
	Between Campbell Street and Stephen Street	0.0%	0.0%	1.9%	1.8%
Newell Highway	Between NSW/QLD border and Bruxner Way	3.2%	3.3%	0.4%	0.0%
	Between Bruxner Way and Letter Box Road	1.1%	1.1%	0.0%	0.0%
New England Highway	Between Gwydir Highway and Gwydir Highway	0.0%	0.0%	1.2%	1.2%
Summerland Way	Between Trenayr Road and Turf Street	0.0%	0.0%	0.8%	0.8%
Local Government Roads: CVC					
Bent Street	Between Craig Street and Gwydir Highway	0.0%	0.0%	0.7%	0.7%
Clark Road	Between Clark Road and Trenayr Road	0.0%	0.0%	3.5%	3.4%
Craig Street	Between Villiers Street and Clarence Street	0.0%	0.0%	0.4%	0.4%
Craig Street	Between Clarence Street and Bent Street	0.0%	0.0%	0.4%	0.4%
Dobie Street	Between Villers Street and Summerland Way	0.0%	0.0%	0.4%	0.4%

Road name	Road ID - road section	Year of construction			
		2021	2022	2023	2024
Villers Street	Between Craig Street and Dobie Street	0.0%	0.0%	0.4%	0.4%
Trenayr Road	Between Summerland Way and Clark Road	0.0%	0.0%	0.7%	0.7%
Local Government Roads: GSC					
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	64.9%	63.6%	0.0%	0.0%
Bush Access Road	Full extent	0.0%	1099.8%	214.1%	410.4%
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	0.0%	89.8%	17.5%	33.5%
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	0.0%	89.8%	17.5%	33.5%
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	0.0%	89.8%	17.5%	33.5%
Edwards Street	Between North Star Road and I B Bore Road	51.3%	140.1%	76.3%	91.2%
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	261.8%	256.6%	0.0%	0.0%
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	0.0%	89.8%	17.5%	33.5%
I B Bore Road	Between Edwards Street and Croppa Creek Road	0.0%	89.8%	17.5%	33.5%
North Star Road	Between MPSC Council Boundary and Edwards Street	101.8%	190.9%	76.4%	91.2%
North Star Road	Between Edwards Street and Getta Getta Road	51.3%	140.1%	58.9%	57.7%
North Star Road	Between Getta Getta Road and Warialda Road	0.0%	89.8%	9.6%	9.4%
Scotts Road	Between North Star Road and Hohns Road	30.5%	29.9%	0.0%	0.0%
Stephen Street	Between Long Street and Gwydir Highway	0.0%	0.0%	1.9%	1.8%
Warialda Road	Between North Star Road and Stephen Street	0.0%	0.0%	1.9%	1.8%
Local Government Roads: ISC					
Campbell Street	Between Byron Street and Otho Street	0.0%	0.0%	1.9%	1.8%
Local Government Roads: MPSC					
Bruxner Way	Between Newell Highway and Tucka Tucka Road	36.5%	36.8%	3.2%	0.0%
Bruxner Way	Between Tucka Tucka Road and North Star Road	33.0%	33.3%	10.6%	13.7%
Hohns Road	Between Hohns Road and Borrow Pit Site 5	30.5%	29.9%	0.0%	0.0%
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	15.3%	15.0%	0.0%	0.0%
North Star Road	Between Bruxner Way and GSC boundary	36.6%	37.3%	32.4%	43.2%
River Road	Full Extent	435%	426%	0.4%	0.4%
Tucka Tucka Road	Between Bruxner Way to GSC boundary	17.7%	17.4%	6.5%	3.1%

From the results presented in Table 6.2 and Table 6.3, it can be seen that Years 2021 - 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 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 6.2.3.

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 AADT by road authority: New South Wales

Road authority	Number of roads	
	5 – 10% of base AADT	> 10% base AADT
RMS	0	0
CVC	0	0
GSC	0	13
ISC	0	0
MPSC	0	7

6.2.2 5 per cent traffic comparison on links: Queensland

A summary of the 5 per cent traffic comparison analysis for road sections located in Queensland is provided in Table 6.5 and Table 6.6 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 6.5 5 per cent comparison summary (gazettal/northbound/eastbound directions): Queensland

Road name	Road section	Year of construction			
		2021	2022	2023	2024
State-controlled roads: DTMR					
Cunningham Highway	Between NSW/QLD Border and Leichhardt Highway	0.9%	1.4%	0.5%	0.0%
	Between Leichhardt Highway and Yelarbon-Keetah Road	0.2%	0.2%	0.0%	0.0%
	Between Yelarbon-Keetah Road and Millmerran Inglewood Road	0.2%	0.2%	0.0%	0.0%
Gore Highway	Between Millmerran Inglewood Road and Bunkers Hill School Road	0.1%	0.1%	0.0%	0.0%
Leichhardt Highway	Between Cunningham Highway and Hunt Street	0.9%	1.6%	0.6%	0.0%
Millmerran Inglewood Road	Between Cunningham Highway and Gore Highway	1.0%	0.9%	0.1%	0.0%
Toowoomba Cecil Plains Road	Between McDougall Street and Troys Road	0.1%	0.1%	0.0%	0.0%
	Between Troys Road and Hursley Road	0.1%	0.1%	0.0%	0.0%
	Between Hursley Road and Wellcamp Westbrook Road	0.1%	0.1%	0.0%	0.0%
Local government roads: GRC					
Boodle Street	Between Boodle Street and Hunt Street	3.0%	5.1%	1.9%	0.0%
Hunt Street	Between Leichhardt Hwy and Boodle Street	3.0%	5.1%	1.9%	0.0%

Road name	Road section	Year of construction			
		2021	2022	2023	2024
Local government roads: TRC					
Blackwell Road	Between Bunkers Hill School Road and Macaulay Road	0.6%	0.6%	0.1%	0.0%
Bunkers Hill School Road	Between Gore Highway and Blackwell Road	0.6%	0.6%	0.1%	0.0%
Macaulay Road	Between Blackwell Road and Wellcamp Westbrook Road	0.6%	0.5%	0.1%	0.0%
Wellcamp Westbrook Road	Between Macaulay Road and Toowoomba Cecil Plains Road	0.5%	0.4%	0.1%	0.0%

Table 6.6 5% comparison summary (anti-gazettal/southbound/westbound directions): Queensland

Road name	Road section	Year of construction			
		2021	2022	2023	2024
State-controlled roads: DTMR					
Cunningham Highway	Between NSW/QLD Border and Leichhardt Highway	0.8%	1.3%	0.5%	0.0%
	Between Leichhardt Highway and Yelarbon-Keetah Road	0.2%	0.2%	0.0%	0.0%
	Between Yelarbon-Keetah Road and Millmerran Inglewood Road	0.2%	0.2%	0.0%	0.0%
Gore Highway	Between Millmerran Inglewood Road and Bunkers Hill School Road	0.1%	0.1%	0.0%	0.0%
Leichhardt Highway	Between Cunningham Highway and Hunt Street	0.8%	1.4%	0.5%	0.0%
Millmerran Inglewood Road	Between Cunningham Highway and Gore Highway	1.0%	0.9%	0.1%	0.0%
Toowoomba Cecil Plains Road	Between McDougall Street and Troys Road	0.1%	0.1%	0.0%	0.0%
	Between Troys Road and Hursley Road	0.1%	0.1%	0.0%	0.0%
	Between Hursley Road and Wellcamp Westbrook Road	0.1%	0.1%	0.0%	0.0%
Local government roads: GRC					
Boodle Street	Between Boodle Street and Hunt Street	3.0%	5.1%	1.9%	0.0%
Hunt Street	Between Leichhardt Hwy and Boodle Street	3.0%	5.1%	1.9%	0.0%
Local government roads: TRC					
Blackwell Road	Between Bunkers Hill School Road and Macaulay Road	0.6%	0.6%	0.1%	0.0%
Bunkers Hill School Road	Between Gore Highway and Blackwell Road	0.6%	0.6%	0.1%	0.0%
Macaulay Road	Between Blackwell Road and Wellcamp Westbrook Road	0.6%	0.5%	0.1%	0.0%
Wellcamp Westbrook Road	Between Macaulay Road and Toowoomba Cecil Plains Road	0.5%	0.4%	0.1%	0.0%

From the results presented in Table 6.5 and Table 6.6, 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 exceed 5 per cent threshold, although only by a small margin. 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 6.7.

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 6.7 Number of roads exceeding 5 per cent base AADT by road authority: Queensland

Road authority	Number of roads	
	5 – 10% of Base AADT	> 10% Base AADT
DTMR	0	0
GRC	2	0
TRC	0	0

6.2.3 Level of service comparison on links: New South Wales

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 analyses 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 6.8 and Table 6.9.

Table 6.8 Primary construction routes level of service results gazettal direction/northbound/eastbound: New South Wales

Road name	Road section	Analysis type	Without project				With project			
			2021	2022	2023	2024	2021	2022	2023	2024
Local government roads: GSC										
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Bush Access Road	Full extent	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Edwards Street	Between North Star Road and I B Bore Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
I B Bore Road	Between Edwards Street and Croppa Creek Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
North Star Road	Between MPSC Council Boundary and Edwards Street	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
North Star Road	Between Edwards Street and Getta Getta Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
North Star Road	Between Getta Getta Road and Warialda Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Scotts Road	Between North Star Road and Hohns Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Local government roads: MPSC										
Bruxner Way	Between Newell Highway and Tucka Tucka Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Bruxner Way	Between Tucka Tucka Road and North Star Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Hohns Road	Between Hohns Road and Borrow Pit Site 5	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
North Star Road	Between Bruxner Way and GSC boundary	Mid-Block Analysis	A	A	A	A	A	A	A	A
River Road	Full Extent	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Tucka Tucka Road	Between Bruxner Way to GSC boundary	Two Way Two Lane Highway	A	A	A	A	A	A	A	A

Table 6.9 Primary construction routes level of service results anti-gazettal direction/southbound/westbound: New South Wales

Road name	Road section	Analysis type	Without project				With project			
			2021	2022	2023	2024	2021	2022	2023	2024
Local government roads: GSC										
Bruxner Way	Between North Star Road and Borrow Pit Site 11 Access Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Bush Access Road	Full extent	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
County Boundary Road	Between Croppa Moree Road and Gil Gil Creek Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Croppa Creek Road	Between I B Bore Road and Croppa Moree Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Croppa Moree Road	Between Croppa Creek Road and County Boundary Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Edwards Street	Between North Star Road and I B Bore Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
Forest Creek Road	Between North Star Road and Forest Creek Road Borrow Pit	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Gil Gil Creek Road	Between County Boundary Road and Johnston Borrow Pit Access	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
I B Bore Road	Between Edwards Street and Croppa Creek Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
North Star Road	Between MPSC Council Boundary and Edwards Street	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
North Star Road	Between Edwards Street and Getta Getta Road	Mid-Block Analysis	A	A	A	A	A	A	A	A
North Star Road	Between Getta Getta Road and Warialda Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Scotts Road	Between North Star Road and Hohns Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Local government roads: MPSC										
Bruxner Way	Between Newell Highway and Tucka Tucka Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Bruxner Way	Between Tucka Tucka Road and North Star Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Hohns Road	Between Hohns Road and Borrow Pit Site 5	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Letter Box Road	Between Newell Highway and Borrow Pit Site 13 Access Road	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
North Star Road	Between Bruxner Way and GSC boundary	Mid-Block Analysis	A	A	A	A	A	A	A	A
River Road	Full Extent	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Tucka Tucka Road	Between Bruxner Way to GSC boundary	Two Way Two Lane Highway	A	A	A	A	A	A	A	A

The results of the LOS comparison indicate that the Project construction traffic will not cause a change to LOS along any of the proposed construction traffic routes.

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 should 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 8. Detailed road link analyses outputs have been provided in Appendix L.

6.2.4 Level of service comparison on links: Queensland

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 analyses 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 6.10 and Table 6.11.

Table 6.10 Primary construction routes level of service results gazettal direction/northbound/eastbound: Queensland

Road name	Road section	Analysis type	Without project				With project			
			2021	2022	2023	2024	2021	2022	2023	2024
Local Government Roads: GRC										
Boodle Street	Between Boodle Street and Hunt Street	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Hunt Street	Between Leichhardt Hwy and Boodle Street	Two Way Two Lane Highway	A	A	A	A	A	A	A	A

Table 6.11 Primary construction routes level of service results anti-gazettal direction/southbound/westbound: Queensland

Road name	Road section	Analysis type	Without project				With project			
			2021	2022	2023	2024	2021	2022	2023	2024
Local Government Roads: GRC										
Boodle Street	Between Boodle Street and Hunt Street	Two Way Two Lane Highway	A	A	A	A	A	A	A	A
Hunt Street	Between Leichhardt Hwy and Boodle Street	Two Way Two Lane Highway	A	A	A	A	A	A	A	A

The results of the LOS comparison indicate that the Project construction traffic will not cause a change to LOS along any of the proposed construction traffic routes.

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 should 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 8. Detailed road link analyses outputs have been provided in Appendix L.

6.2.5 Traffic management strategies on links

Traffic management strategies to be introduced in order to mitigate impacts along link roads should 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, RMS, road controlling authorities and an accredited road safety auditor. TMP should 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 government 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 should comply with NSW Heavy Vehicle National Law and the Guideline for Excess Dimension Vehicles in Queensland version 8, 2013 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 TMPs, in the event of the primary route is blocked off by an emergency.

Detailed mitigation measures are provided in Section 8.

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 6.12 and Table 6.13 for New South Wales and Queensland respectively.

Table 6.12 Intersection with construction traffic turn movements: New South Wales

Name	Joint ownership
Local government roads: RMS	
Bruxner Way/Newell Highway	
Newell Highway/Letter Box Road	MPSC
Newell Highway/River Road	MPSC
Gwydir Highway/Stephen Street	GSC

Name	Joint ownership
New England Highway/Gwydir Highway	
Summerland Way/Dobie Street	CVC
Summerland Way/Trenayr Road	CVC
Local government roads: CVC	
Trenayr Road/Clark Road	
Local government roads: GSC	
Bruxner Way/North Star Road	
North Star Road/Scotts Road	
Bruxner Way/Borrow Pit Site 11 Access Road	
Bruxner Way/Borrow Pit Site 9 Access Road	
I B Bore Road/Edwards Street	
I B Bore Road/Croppa Creek Road	
Croppa Creek Road/Bush Access Road	
Croppa Moree Road/Croppa Creek Road	
Croppa Moree Road/County Boundary Road	
County Boundary Road/Gil Gil Creek Road	
Gil Gil Creek Road/Gil Gil Creek Road	
Bruxner Way/Tucka Tucka Road	MPSC
North Star Road/North Star Road	
North Star Road/Forest Creek Road	
Forest Creek Road/Forest Creek Road	
North Star Road/North Star Road	
Warialda Road/North Star Road	
Local government roads: MPSC	
Letter Box Road/Borrow Pit Site 13 Access Road	
Hohns Road/Hohns Road	
River Road/River Road	
Goondiwindi Regional Council	
Hunt Street/Boodle Street	

Table 6.13 Intersection with construction traffic turn movements: Queensland

Name	Joint ownership
Local government roads: DTMR	
Toowoomba Cecil Plains Road/Wellcamp Westbrook Road	TRC
Gore Highway/Bunkers Hill School Road	TRC
Gore Highway/Millmerran Inglewood Road	
Cunningham Highway/Millmerran Inglewood Road	TRC
Gore Highway/Millmerran Inglewood Road	
Cunningham Highway/Millmerran Inglewood Road	
Cunningham Highway/Leichhardt Highway	
Leichhardt Highway/Hunt Street	GRC

Name	Joint ownership
Local government roads: TRC	
Wellcamp Westbrook Road/Macaulay Road	
Macaulay Road/Blackwell Road	
Bunkers Hill School Road/Blackwell Road	

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 6.12 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 recommended that this assessment be undertaken once the construction traffic routes are finalised by the construction contractor.

In order to assist in quantifying the number of intersections which may experience potential operational impacts, an assessment was undertaken to highlight intersections which are more likely to experience impacts. This assessment compared base traffic flows and 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. Given the rural nature of a number of the roads, warrants for intersections with design speeds greater than 100km/h warrants have been assumed.

The assumptions used in this assessment are discussed below. As these turning movements are assumed, this analysis should 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 6.14.

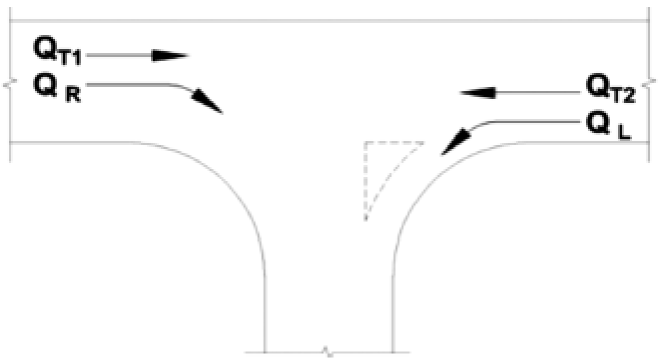


Figure 6.1 Calculation of the major road traffic volume (Q_M)

Source: Austroads 2017

Table 6.14 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	$= 50\% \times Q_{T1} + Q_{T2} + Q_L$
		Yes	$= 50\% \times Q_{T1} + Q_{T2}$
	Left	Yes or no	$= 50\% \times Q_{T2}$
Six-lane two-way	Right	No	$= 33\% \times Q_{T1} + Q_{T2} + Q_L$
		Yes	$= 33\% \times Q_{T1} + Q_{T2}$
	Left	Yes or no	$= 33\% \times Q_{T2}$

Source: Austroads 2017

Following the above assessment, it was determined that no intersections within the impact assessment area would require temporary intersection treatments due to the relatively low volumes of baseline and Project related construction traffic.

As previously noted, as these turning movements are assumed, this analysis should be updated once the construction traffic routes are finalised by the construction contractor. These upgraded turning treatments outlined in this methodology are warranted only temporarily for construction traffic. Therefore, discussions will be required with RMS, DTMR and Council's 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.

6.3.1 Traffic management strategies at intersections

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

- TMPs should be prepared prior to construction in accordance with the latest edition of AS1742.7 Manual of Uniform Traffic Control Devices: Part 3 – Traffic control devices for works on roads. Road safety measures should 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, should be in accordance with the AS1742.7 Manual of Uniform Traffic Control Devices: Part 3 - Traffic control devices for works on roads and the Traffic
- Fatigue management measures should be introduced and enforced for all workers
- Any required works to be identified in ongoing Construction Environmental Plans (CEMP) prepared to support the Project
- All OSOM and RAV vehicles should comply with the *NSW Heavy Vehicle National Law* and the Guideline for Excess Dimension Vehicles in Queensland version 8, 2013 in terms of 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 the operations phase of the Project is assumed to reside within local surrounding towns to 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 traffic operation on 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 road operational performance of proposed public level rail crossings in the impact assessment area was assessed to provide an understanding of the impacts on performance during operation phase of the Project, 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 2025 and 2040 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 1,800m in future year 2025 and 1,800m in year 2040.
- Vehicle wait time at passive crossings were calculated by means of using the Australian Standard 1742.7: 2016, 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 New South Wales is 30 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 for the level crossing are as follows:
  - Train clearance times were calculated based on an assumed maximum 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 turnout speed (50 km/h)

- Distance travelled while at constant maximum turnout speed
  - Distance required to accelerate to maximum speed after whole train has passed turnout
  - Total distance required to reach maximum speed for train starting from turnout
- 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 6.16.
- 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.
- The current anticipated number of trains is 14 trains per day in 2025 for the Project increasing to an estimated 21 trains per day in 2040.

6.4.3.2 Site analysed

To determine the impact of the level crossings on the road networks, SIDRA analyses were undertaken at active and passive level crossing locations along the route. These analyses were not undertaken at sites which only served low levels of local/occupational volumes. Table 6.15 provides a summary of the active level crossings and passive level crossings along the Project route, and whether SIDRA analyses were deemed necessary.

Table 6.15 Active/passive level crossing sites (public and formed roads only)

Interface ID	Road name	Proposed treatment	SIDRA analysis?
GSC			
270-3-P-2	North Star Road	Active level crossing	Yes
270-5-P-1	Forest Creek Road	Passive level crossing	Yes
MPSC			
270-7-P-3	North Star Road	Active level crossing	Yes
State of New South Wales			
270-4-P-0	Unnamed Road (Occupational track)	Passive level crossing	No

6.4.3.3 Analysis results

Based on the assumptions outlined in the above sections, the rail crossing wait times shown in Table 6.16 were calculated.

Table 6.16 Vehicle wait times

Road Rail Interface ID	Crossing type	Wait time per closure (seconds)
270-3-P-2	Public	102
270-5-P-1	Public	102
270-7-P-3	Public	122

The SIDRA analysis results, which take into account this wait time, have been provided in Table 6.17. The results show the queue and delay associated with the proposed level crossing for the two future year scenarios.

Table 6.17 Proposed level rail crossings - analysis results

Road rail interface location			Year 2025 (1 800m train length)				Year 2040 (1 800m train length)			
			With project				With project			
			Volume* (veh/h)	Queue (m)	Average Delay (s)	LOS	Volume* (veh/h)	Queue (m)	Average Delay (s)	LOS
270-3-P-2: North Star Road										
AM	North Star Road (S)	T	19	8.3	3.3	A	24	11.2	3.3	A
	North Star Road (N)	T	17	7.4	3.3	A	21	10.0	3.3	A
PM	North Star Road (S)	T	18	7.7	3.3	A	22	10.5	3.3	A
	North Star Road (N)	T	18	8.0	3.3	A	22	10.8	3.3	A
270-5-P-1: Forest Creek Road										
AM	Forest Creek Road (E)	T	4	*Negligible***	3.3	A	4	*Negligible***	3.3	A
	Forest Creek Road (W)	T	2	*Negligible***	3.3	A	3	*Negligible***	3.3	A
PM	Forest Creek Road (E)	T	2	*Negligible***	3.3	A	3	*Negligible***	3.3	A
	Forest Creek Road (W)	T	2	*Negligible***	3.3	A	3	*Negligible***	3.3	A
270-7-P-3: North Star Road***										
AM	North Star Road (E)	T	22	11.0	4.7	A	27	14.9	4.7	A
	North Star Road (W)	T	19	9.5	4.6	A	24	12.9	4.7	A
PM	North Star Road (E)	T	22	11.0	4.7	A	27	14.9	4.7	A
	North Star Road (W)	T	24	11.9	4.7	A	29	16.1	4.7	A

Table notes:

* SIDRA modelled volumes may differ slightly from inputs due to rounding
** Queue length less than one vehicle length (6m)
*** Tube removed during survey period as a result of resealing

The average delays reported in Table 6.17 have been calculated in SIDRA. SIDRA calculates an average delay over the hour which is weighted by the number of vehicles for that movement. Given that the 95th percentile queues are approximately 1 vehicle, if a vehicle arrived as the boom gates were being activated to lower, the maximum delay faced would be approximately equal to the closure times reported in Table 6.16.

6.4.3.4 270-3-P-2: North Star Road

The results of the analysis indicate that the proposed level crossing along North Star Road (270-3-P-2) would operate at LOS A in the AM and PM peaks in the year 2025 and 2040 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 11m in the 2040 AM peak, with maximum queue length along the south approach being 11m in the 2040 AM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections.

6.4.3.5 270-5-P-1: Forest Creek Road

The results of the analysis indicate that the proposed level crossing along Forest Creek Road (270-5-P-1) would operate at LOS A in the AM and PM peaks in the year 2025 and 2040 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that there would be negligible queues of less than one car length in each of these scenarios. The closest intersection to this site is the North Star Road/Forest Creek Road intersection located approximately 40m west of the site, therefore is not anticipated to be impacted by vehicle queueing at this proposed level crossing.

6.4.3.6 270-7-P-3: North Star Road

The results of the analysis indicate that the proposed level crossing along North Star Road (270-7-P-3) would operate at LOS A in the AM and PM peaks in the year 2025 and 2040 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the east approach of the crossing would be 15m in both the 2040 AM and PM peak, with maximum queue length along the west approach being 16m in the 2040 PM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections with the closest intersection being the North Star Road/Oakhurst Road intersection located approximately 115m west of the site.

6.4.4 Traffic management strategies at level crossings

- Any required works to be identified in the Construction Environmental Management Plan (CEMP) prepared to support the Project
- Level crossings should 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 Project, and would have additional impacts in terms of construction 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
- 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.

6.5 Active transport impacts

6.5.1 Pedestrian and cycle network

Given the evaluation of existing pedestrian and cycle networks (provided in Section 2.4), it is considered that there would be a minimal impact to existing active transport networks as a result of construction of the Project.

6.6 Other road impacts

As part of the traffic impact assessment, Project impacts other than those affecting the existing road network were considered. These other impacts include impacts on TSRs, 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 to 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 in New South Wales and Queensland should be consulted prior to construction of emergency access points to identify possible solutions to minimise the potential impacts.

6.6.2 Impacts on Travelling Stock Reserves

Within NSW, there are 4 TSRs that cross the proposed rail alignment. The impact to these have been detailed in Table 6.18.

Table 6.18 Travelling Stock Reserves intersecting the Project: New South Wales

RRI ID	Proposed treatment	Impact
270-4-P-0	Passive level crossing	Stock may have to wait prior to crossing if a train is passing.
270-4-P-1	No crossing provided - consolidate	TSR crossing consolidated with Private Access Road crossing 30m north
270-7-P-4	Grade separation – rail over	No impact
270-11-P-1	Grade separation – rail over	No impact

Where there are to be permanent disruptions to the TSR network, replacement and or upgrade of TSRs of a similar width and suitable type are to be provided to ensure for uninterrupted flow of travelling stock. Any proposed changes or disturbances to the TSR network will be required to be in agreeance with the State of New South Wales.

6.6.3 Public transport impacts

Given the evaluation of existing public transport services (provided in Section 2.2.5 and 2.2.6), it is considered that there would be minimal impacts to existing public transport services as a result of construction of the Project.

6.6.4 School bus service impacts

The increase in construction traffic and in particular, heavy vehicle traffic has the potential to impact these school bus routes. Although not assessed in detail during this phase of the Project, in order to mitigate the impacts upon school bus operations, bus operators should be consulted as part of the Project and made aware of the various construction activities. The contractors should 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, 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.

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 Project is in close proximity to 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 Project 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. turnouts), and to provide access for emergency recovery. Formation level access has been proposed for all turnout 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 Project. Once within the Project 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 Safety assessment

7.1 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 impact assessment 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.

7.2 Existing safety issues

The existing safety issues along construction traffic routes and road rail interface locations has been assessed and provided in Section 4.4.1 and 4.4.2. 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.

7.3 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 7.1 and Table 7.2 respectively. The resulting risk ratings have been provided in Table 7.3. These risk ratings are reflective of those provided in Figure 9.3.2(a) of the GTIA.

Table 7.1 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 7.2 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 7.3 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

7.3.1 Risk assessment results

7.3.1.1 Construction traffic: New South Wales

The resulting identified risks for the 'with' and 'without Project' scenarios associated with construction traffic have been provided in Table 7.4. 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 7.4 identifies that the following construction traffic routes may require safety mitigations:

- Gwydir Highway (RMS)
- Newell Highway (RMS)
- Croppa Creek Road (GSC).

Table 7.5 provides the 'with Project' and 'with Project mitigation measures' safety risk assessment for the routes that have been identified to require safety mitigations. 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 7.4 Safety risk assessment: project primary construction routes (without and with Project): New South Wales

Road name	Without project			With project			Mitigation required?
	Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating	
State controlled roads: RMS							
Gwydir Highway	Extreme	Possible	High	Extreme	Possible	High	Required
New England Highway	Not Significant	Rare	Low	Not Significant	Possible	Low	
Newell Highway	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Summerland Way	Major	Unlikely	Medium	Major	Possible	Medium	
Local government roads: CVC							
Bent Street	Major	Unlikely	Medium	Major	Possible	Medium	
Clark Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Craig Street	Major	Unlikely	Medium	Major	Possible	Medium	
Dobie Street	Moderate	Unlikely	Medium	Moderate	Possible	Medium	
Trenayr Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Villiers Street	Major	Unlikely	Medium	Major	Possible	Medium	
Local government roads: GSC							
Bruxner Way	Moderate	Unlikely	Medium	Moderate	Possible	Medium	
Bush Access Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
County Boundary Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Croppa Creek Road	Minor	Unlikely	Low	Minor	Possible	Medium	Required
Croppa Moree Road	Moderate	Unlikely	Medium	Moderate	Possible	Medium	
Edwards Street	Not Significant	Rare	Low	Not Significant	Possible	Low	
Forest Creek Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Gil Gil Creek Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
I B Bore Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
North Star Road	Major	Unlikely	Medium	Major	Possible	Medium	
Scotts Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Stephen 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	
Warialda Road	Major	Unlikely	Medium	Major	Possible	Medium	
Local government roads: ISC							
Campbell Street	Not Significant	Rare	Low	Not Significant	Possible	Low	
Local government roads: MPSC							
Bruxner Way	Moderate	Unlikely	Medium	Moderate	Possible	Medium	
County Boundary Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Hohns Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Letter Box Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
North Star Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
River Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Tucka Tucka Road	Not Significant	Rare	Low	Not Significant	Possible	Low	

Table 7.5 Safety risk assessment: project primary construction routes (with Project and with mitigation measures): New South Wales

Road name	With project			Proposed mitigation measures	With project – with mitigation		
	Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
State controlled roads: RMS							
Gwydir Highway	Extreme	Possible	High	Mitigation measures may include but are not limited to: ▪ Fatigue management measures should 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 should be avoided if possible, or carefully managed to avoid conflicts. ▪ Consideration should 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 should 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 limited to a maximum of 15 minutes. ▪ All OSOM and RAV vehicles should comply with the NSW Heavy Vehicle National Law	Extreme	Unlikely	Medium
Newell Highway	Extreme	Possible	High		Extreme	Unlikely	Medium
Local government roads: GSC							
Croppa Creek Road	Minor	Possible	Medium	As per RMS Roads, above.	Minor	Unlikely	Low

It should be noted that 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 RMS, the local government authority and the construction contractor. The above analysis should 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 should be undertaken when the construction routes are finalised.

7.3.1.2 Construction traffic: Queensland

The resulting identified risks for the 'with' and 'without Project' scenarios associated with construction traffic have been provided in Table 7.6. 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 7.6 identifies that the following construction traffic routes may require safety mitigations:

- Cunningham Highway (DTMR)
- Gore Highway (DTMR)
- Millmerran Inglewood Road (DTMR)
- Toowoomba Cecil Plains Road (DTMR).

Table 7.7 provides the 'with Project' and 'with Project mitigation measures' safety risk assessment for the routes that have been identified to require safety mitigations. 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 7.6 Safety risk assessment: project primary construction routes (without and with Project): Queensland

Road name	Without project			With project			Mitigation required?
	Consequence	Likelihood	Risk rating	Consequence	Likelihood	Risk rating	
State controlled roads: DTMR							
Cunningham Highway	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Gore Highway	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Leichhardt Highway	Major	Unlikely	Medium	Major	Possible	Medium	
Millmerran Inglewood Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Toowoomba Cecil Plains Road	Extreme	Unlikely	Medium	Extreme	Possible	High	Required
Local Government Roads: GRC							
Boodle Street	Not Significant	Rare	Low	Not Significant	Possible	Low	
Hunt Street	Not Significant	Rare	Low	Not Significant	Possible	Low	
Local Government Roads: TRC							
Blackwell Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Bunkers Hill School Road	Major	Unlikely	Medium	Major	Possible	Medium	
Macaulay Road	Not Significant	Rare	Low	Not Significant	Possible	Low	
Wellcamp Westbrook Road	Not Significant	Rare	Low	Not Significant	Possible	Low	

Table 7.7 Safety risk assessment: project primary construction routes (with Project and with mitigation measures): Queensland

Road name	With project			Proposed mitigation measures	With project – with mitigation		
	Consequence	Likelihood	Risk rating		Consequence	Likelihood	Risk rating
State Controlled Roads: Transport Main Roads							
Cunningham Highway	Extreme	Possible	High	Mitigation measures may include but are not limited to: ▪ Fatigue management measures should 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 should be avoided if possible, or carefully managed to avoid conflicts. ▪ Consideration should 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 should 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 limited to a maximum of 15 minutes. ▪ All OSOM and RAV vehicles should comply with Guideline for Excess Dimension Vehicles in Queensland version 8, 2013 in terms of transport safety.	Extreme	Unlikely	Medium
Gore Highway	Extreme	Possible	High		Extreme	Unlikely	Medium
Millmerran Inglewood Road	Extreme	Possible	High		Extreme	Unlikely	Medium
Toowoomba Cecil Plains 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, ultimately, the determination of the final construction and heavy vehicle routes will be subject to consultation between DTMR, the local government authority and the construction contractor. The above analysis should 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 should be undertaken when the construction routes are finalised.

7.3.1.3 Road rail interface

Identified safety risks for the 'with' and 'without Project' scenarios associated with road rail interface locations have been provided in Table 7.8. The 'without Project' risk assessment was completed by analysing crashes within a 200m zone 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 7.9 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 7.8 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
Local government roads: GSC								
270-3-P-2	North Star Road	Active level crossing	Proposed crossing			Extreme	Likely	High
270-5-P-1	Forest Creek Road	Passive level crossing	Proposed crossing			Extreme	Likely	High
Local government roads: MPSC								
270-7-P-3	North Star Road	Active level crossing	Proposed Crossing			Extreme	Likely	High

Table 7.9 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
270-3-P-2	Extreme	Likely	High	Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national 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 the proposed design vehicle In accordance with National and State Rail Safety Law requirements, public road crossings will be subject to an Interface Agreement with the relevant road manager in order to ensure that safety risk are identified and minimised SFAIRP during the operations phase of the Project A consistent methodology which aligns with the Office of the National Rail Safety Regulator (ONRSR) guidelines has been used to develop proposed level crossing treatments. This approach involves applying the ALCAM model to determine the 'risk score', and then undertaking cost-benefit analysis to assess whether higher levels of protection are justified (e.g. upgrade passive protection to active, active to grade separation). 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. Undertaking road safety audits at level crossings and the intervals at which these are undertaken are to be agreed at the program level. These discussions are to be driven by ARTC with the relevant parties. In accordance with Rail Safety National Law (NSW) requirements, public road crossings will be subject to an Interface Agreement with the relevant road manager to ensure safety risks are identified and minimised as SFAIRP during the operational phase of the Project	Extreme	Unlikely	Medium
270-5-P-1	Extreme	Likely	High		Extreme	Unlikely	Medium
270-7-P-3	Extreme	Likely	High		Extreme	Unlikely	Medium

8 Mitigation and management

8.1 Design considerations

Development of the feasibility design for the Project has progressed in parallel with the impact assessment process. As a consequence, design solutions for avoiding, minimising or mitigating impacts have been incorporated into the Project as appropriate and where possible.

Mitigations and controls that have been factored into the Project design are summarised in Table 8.1.

Table 8.1 Initial mitigations of relevance to traffic

Aspect	Initial mitigations
Traffic	▪ The Project has been aligned to be co-located with existing rail and road infrastructure where possible, minimising the need to develop land that has not previously been subject to disturbance for transport infrastructure purposes. ▪ The Project has been designed to minimise the potential for alterations to the public road network or create a permanent change to existing traffic patterns and distributions. ▪ The horizontal and vertical alignment has been established to optimise the earthworks required and achieve as close to a net-balance as is possible. By minimising the material deficit for construction of the Project, the volume of material required to be imported has been reduced. Less imported material equates to fewer construction phase truck movements and less vehicular emissions. ▪ Where practical, traffic will be constrained to constructed access tracks/construction footprint and been identified that provide the shortest journey time between origin and destination, thereby restricting fuel consumption and vehicular emissions. These routes have been assessed as part of the traffic impact assessment. The temporary footprint for the project has been defined to provide sufficient space for the project, including road modifications, to be safely and efficiently constructed, with a need for temporary side-tracks to be provided.
Road-rail interfaces	▪ Grade separated crossings of existing roads have been adopted instead of level crossings so far as is reasonably practicable (SFAIRP). ▪ Where interfaces were not automatically grade separated, a consistent methodology which aligns with the Office of the National Rail Safety Regulator (ONRSR) guidelines was used to develop proposed level crossing treatments. This approach involves applying the ALCAM model to determine the 'risk score', and then undertaking cost-benefit analysis to assess whether higher levels of protection are justified (e.g. upgrade passive protection to active, active to grade separation). ▪ The specific design treatment at each road-rail interface has been selected based on a combination of factors, which include: – Road/rail geometry – Sighting distances – Road and rail traffic volumes and speeds – Design vehicle types – Community and stakeholder feedback through consultation ▪ Level crossings will be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant ARTC and national standards. ▪ Consistent with the requirements of the NSW Governments Construction of New Level Crossings Policy, level crossings have been subject to safe design studies and risk assessments in accordance with Australian Level Crossing Assessment Model to identify and reduce SFAIRP the potential risks associated with these crossings. ▪ The feasibility design for the Project has, in all instances, maintained access for private properties. This has been provided through either: – The provision of a crossing point of the rail alignment in the location of the existing private access; or – The provision of an alternative means of accessing a dwelling or place of work from the public road network

Aspect	Initial mitigations
TSRs	▪ The feasibility design for the Project has, in all instances, maintained access for TSR users. This has been provided through either: – The provision of a crossing point of the rail alignment in the location of the existing TSR; or – The provision of an alternative means of moving stock.
Bridges	▪ Maintenance access to the deck level of all new bridge structures has been incorporated into the design ▪ Bridge clearances have been established in consultation with the owners of existing assets over which the bridge structures span, i.e. RMS, local governments and private landholders ▪ No public pedestrian access is provided on road-over-rail bridges.
Access	▪ The feasibility design for the Project has, in all instances, maintained connectivity across the Project footprint for public roads. The design also provides maintained access to private and State land. This has been provided through either: – The provision of a crossing point of the rail alignment in the location of the existing access; or – The provision of continued means of access, via an alternative location, with interconnectivity provided.

8.2 Proposed mitigation measures

8.2.1 Preliminary road use management during construction

8.2.1.1 Construction Environmental Management Plan (CEMP)

A Construction Environmental Management Plan (CEMP) will be prepared by the construction contractor prior to construction commencing. The CEMP will include a TMP which will outline:

- Traffic demand
- Routing
- Controls
- Special vehicle requirements
- How works to accommodate these are integrated into the operation of the road network
- Identifies and considers all foreseeable risks.

The TMP will be developed by ARTC in consultation with RMS, Council and an accredited road safety auditor. This Sub-plan will identify the potential 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
- Manage road intersections that experience increased usage due to construction vehicle movements
- 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 truck 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* prior to the commencement of construction

Works identified within the TMP may require the preparation of Traffic Control Plans (TCP's), also referred to as Traffic Guidance Schemes. TCP's 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. Highlight the temporary signage, markings, speed zones, barriers and works with the aim to:

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

Specific TCP's are required for each separate element of the works identified to be undertaken within the TMP. This should be undertaken in accordance with the RMS Traffic control at work sites Technical Manual.

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

8.2.2 Road link mitigation measures

Relevant mitigation measures based on the LOS analyses findings are provided within this section of the TIA. The analyses conducted 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.

Other roads may be identified upon determination of the final construction and heavy vehicle routes. The following mitigation measures are applicable to all NSW and Queensland SCRs and LGRs impacted by Project construction traffic.

Table 8.2 Road link mitigation measures

Phase	Mitigation	Mitigation outcome
Design/ pre-construction	Traffic management plan prepared in consultation with the construction contractor, TfNSW, 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 proposal.	Minimise traffic and transport impacts during construction

Phase	Mitigation	Mitigation outcome
Construction	Construction traffic management plan to be implemented and reviewed periodically for effectiveness by stakeholders	Minimise traffic and transport impacts during construction
	Ongoing consultation with relevant Councils, Police, emergency services, bus operators and affected property owners/occupiers to inform of proposal status and likely traffic disruptions and temporary road closures	Minimise traffic and transport impacts during construction
	Ongoing consultations with regulators and impacted Councils to inform of potential traffic impacts along routes impacted by harvest seasons.	Minimise traffic and transport impacts along routes traversed by harvest season vehicles during construction.
	Specific TMPs for special events developed in conjunction with the relevant stakeholders.	Bespoke 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 should 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 should 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 operational phase.

8.2.3 Intersection and access mitigation measures

The results in Section 6.3 indicated that no intersections were identified that may require temporary intersection treatments may be required during construction.

Given the typical construction duration of generally less than a year and associated low to moderate increase in traffic, it is not anticipated that intersection upgrades would be required during the construction period. However, Traffic Control Plans (TCPs) should 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 highlight whether safety issues may arise through the movement of construction vehicles through these intersections.

All intersections highlighted within Table 6.12 should be considered in the Project TMP.

Table 8.3 Intersection and access mitigation measures

Phase	Mitigation
Design/ pre-construction	Traffic management plans, traffic control plans and temporary road works including diversion and signage should be prepared prior to construction in accordance with the latest edition of the Traffic control at work sites: Technical Manual, 2018 and Australian Standard 1742.3, Manual of uniform traffic control devices - Traffic control for works on roads. Traffic management plans should consider construction activity delivery timeframes which avoid peak hour travel conditions.

Phase	Mitigation
Construction	Traffic management plans, traffic control plans and temporary road works to be implemented and reviewed to ensure effectiveness
	Construction traffic management plan to be implemented and reviewed periodically by stakeholders to ensure intersection operations are effective.
	The Rail Maintenance Access Road strategy to be reviewed and updated to ensure it remains effective

8.2.4 Road safety mitigation measures

Relevant mitigation measures based on the safety analyses findings are provided within this section of the TIA. Table 8.4 details the proposed road safety mitigation measures.

Table 8.4 Road safety mitigation measures

Phase	Mitigation
Design/ pre-construction	Ongoing consultation with local council/RMS and asset owners will be undertaken to ensure safety concerns and issues are assessed.
	Relevant emergency services should be notified of changes to the road network and of construction activities prior to construction commencing.
Construction	Road safety measures to be implemented taking 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
	Relevant emergency services should be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment
	Consideration should 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.
	Traffic calming devices to be installed along road segments with surrounding land uses containing vulnerable road users (e.g. schools) where deemed necessary in consultation with local road authorities and relevant stakeholders.

8.2.5 Road/rail interface mitigation measures

Relevant mitigation measures based on the analyses findings at road/rail interface locations are provided within this section of the TIA. The following table outlines the proposed mitigation measures.

Table 8.5 Road/rail interface mitigation measures

Phase	Mitigation	Mitigation outcome
Design/ pre-construction	Consult with stakeholders (level crossings) for public roads and private landowners before detailed design phase	Minimise traffic and transport impacts to stakeholders and private landowners
	Road safety audits will be undertaken pre-construction at level crossings in accordance with the Austroads guidelines to confirm: ▪ The level of protection is appropriate ▪ The infrastructure is appropriate for the traffic conditions ▪ The crossing is designed to provide suitable stacking and sight distance	Make enhancements to safety measures and further reduce the likelihood of delays SFAIRP.
Construction	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: ▪ That the level of protection is appropriate ▪ That the infrastructure is appropriate for the traffic conditions	Make enhancements to safety measures and further reduce the likelihood of delays SFAIRP.

Phase	Mitigation	Mitigation outcome
	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.	
	Ongoing consultations with regulators and impacted Councils to inform of potential traffic impacts caused by construction of level crossings during harvest seasons.	Minimise traffic and transport impacts at proposed level crossings traversed by harvest season vehicles during construction.
Operational	Road safety audits will be undertaken at the level crossings during the operational phase of the Project 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. Undertaking road safety audits at level crossings and the intervals at which these are undertaken are to be agreed at the program level. These discussions are to be driven by ARTC with the relevant parties.	Make further enhancements to safety measures and further reduce the likelihood of delays SFAIRP.
	Increase in traffic associated with the Project during operational phase is likely to increase vehicle exposure at rail crossings. Public level crossings should be designed in order to provide for safe design standards where sufficient stacking and, sight distances, lane marking and signage prevail for an appropriate design vehicle	To ensure safe design standards are implemented to minimise and mitigate the impact significance and likelihood of crashes which may occur at level crossings over its operational life.
	Ongoing consultations with regulators and impacted Councils to inform of potential traffic impacts at level crossings during harvest seasons, noting that peak hour traffic analysis at proposed level crossings show minimal delays and queueing (95^{th} percentile) for vehicles travelling over level crossings.	Minimise traffic and transport impacts at proposed level crossings traversed by harvest season vehicles.
	Threshold and ALCAM assessment to be undertaken to determine the appropriate protection type for the proposed crossing as per the Level Crossing Strategy Council's Strategic Plan for NSW Level Crossings and the NSW Level Crossing Improvement Program (LCIP).	To ensure safe design standards are implemented to minimise and mitigate the impact significance and likelihood of crashes which may occur at level crossings over its operational life.
	Preparation of interface agreements with responsible road and/or rail managers to cover each public road crossing location in accordance with National and State Rail Safety Law requirements, consistent with any existing Interface Agreements and related Safety Management Plans, including draft Interface Agreements and draft Safety Management Plans	To ensure a formal written agreement between the responsible road and/or rail managers is in place consistent with the requirements of section 105 of the Rail Safety National Law, including responsibilities of parties for implementing safety measures and a process for monitoring these.

8.2.6 Additional considerations

The National Heavy Vehicle Regulator (NHVR) regulates all vehicles over 4.5T GVM and coordinates road access permits for these vehicles. Any new permits required as part of the Project construction or operation will be made through the NHVR. It is a requirement for these permits to be reviewed and approved by the relevant asset owner.

9 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 corridor
- 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 9.1 and Table 9.2 shows the parameters used to determine the risk levels associated with the key impacts identified for the Project.

Table 9.1 Probability analysis

Score	Likelihood
6	Almost Certain
5	High likelihood
4	Probably
3	Possibly
2	Unlikely
1	Extremely remote

Table 9.2 Consequence analysis

Score	Consequence
6	Extreme
5	Very High
4	High
3	Moderate
2	Low
1	Very Low

Table 9.3 summarises the Risk Matrix used to identify the risks associated with the traffic impacts related to the Project.

Table 9.3 Risk matrix

Likelihood		Consequence					
		1 Very Low	2 Low	3 Moderate	4 High	5 Very high	6 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 9.4 summarises the resulting risk level applied based on the scores in Table 9.3.

Table 9.4 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 9.5 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 9.5 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	Operational efficiency	**Moderate** Traffic impacts at the key intersections impacting operations. Adequacy of intersection configuration to cater for haulage vehicles.	**Probably** It is reasonable to say that some traffic impacts at key intersections will probably occur during the construction period.	**Moderate**	In consultation with RMS, DTMR and Regional Councils to develop cost effective solutions to alleviate additional traffic impacts from the construction related activities. These may include but are not limited to: ▪ Traffic Management Plans should be prepared prior to construction in accordance with the latest edition of: – Traffic control at work sites - Technical Manual, 2018 and Australian Standard 1742.3, Manual of uniform traffic control devices - Traffic control for works on roads – Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads – Roads and Maritime Supplement to Australian Standard 1742 Manual for Uniform Traffic Control Devices ▪ Road safety measures at intersections should 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. ▪ Traffic Management Plans should 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 say that some traffic impacts along primary construction routes will probably occur over the construction period.	**Moderate**	In consultation with RMS, DTMR and Regional Councils, employ traffic management strategies in order to mitigate impacts along road links. These may include but are not limited to: ▪ Construction traffic management plans according to RMS and DTMR 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 ▪ Relevant emergency services should be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment	**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)		
					■ Secondary alternative construction route activities should be determined as part of the TMPs, in the event of the primary route is blocked off by an emergency/accident. ■ Travel demand management (TDM) campaign to inform the public on works and its effect on network operations	
Pavements	Operational efficiency	**Moderate** Increased percentage of heavy vehicles along SCR's from Project construction traffic, resulting in pavement degradation.	**Probably** It is reasonable to assume that some pavement degradation as a result of Project construction traffic will probably 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	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 is possible over the construction period	**Moderate**	Mitigation measures may include but are not limited to: ■ Fatigue management measures should be introduced and enforced for all workers. ■ Any required works to be identified in ongoing TMPs prepared to support the Project. ■ Heavy vehicles may be associated with the construction activities and therefore use of school bus routes should be avoided if possible, or carefully managed to avoid conflicts. ■ Consideration should 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**	**Moderate**	Level crossings should be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national and ARTC standards, Traffic Management procedures to accommodate traffic and operational efficiency during construction. Traffic modelling assessments at the proposed level crossings indicate that delays to vehicles at these locations are predicted to be minor and will not significantly impact LOS. No significant queues are expected to develop at the proposed level crossings at the year of opening (2025) or at 2040 the design horizon, assuming that traffic patterns at the proposed crossings do not significantly differ from what is currently observed. Changes in future traffic patterns may require revision of the traffic modelling assessment to ensure the level crossing continues to provide a reasonable level of operational efficiency. 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 should be provided with warning signage, line marking, and other relevant controls; in accordance with the relevant national and ARTC standards. ▪ Public level crossings should 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 ▪ 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 Undertaking road safety audits at level crossings and the intervals at which these are undertaken are to be agreed at the program level. These discussions are to be driven by ARTC with the relevant parties. ▪ In accordance with National and State Rail Safety Law requirements, public road crossings will be subject to an Interface Agreement with the relevant road manager in order to ensure that safety risk are identified and minimised SFAIRP during the operations phase of the Project	**Low/ Moderate**

10 Cumulative impacts

10.1 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 developments in the region at planning, design or construction stage. The traffic generation estimations from these developments were considered in the cumulative impact assessment.

This cumulative impact assessment has been prepared in accordance with the SEARs, which requires:

> "*An assessment of the cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed'*.

This cumulative impact assessment only deals with:

- Projects that have been approved but where construction has not commenced
- Projects that have commenced construction
- Projects that have only recently been completed
- Projects that are currently being assessed as State significant infrastructure within Gwydir, Moree Plains and Inverell local government areas, or as Coordinated Projects in Goondiwindi local government area.

Other projects which were considered as part of the TIA are provided in Table 10.1.

Table 10.1 Projects considered in cumulative assessment

Project and Proponent	Location	Description	EIS status	Construction dates
Border to Gowrie – Inland Rail (ARTC)	New South Wales/Queensland Border to Gowrie	Comprised of approximately 146km of new dual gauge track and 78km of upgraded track from the NSW/QLD border, near Yelarbon, to Gowrie Junction, north west of Toowoomba in Queensland.	Project feasibility	
Narrabri to North Star – Inland Rail (ARTC)	Narrabri (NSW) to the village of North Star in NSW	An upgrade to approximately 188km of track within the existing rail corridor and construction of approximately 1.6km of new rail corridor.	Project assessment (late 2017 – late 2018)	2020 to 2022
Moree Solar Farm	10km south of Moree, off the Newell Highway in Northern NSW	Construction of a 56MWac/70.1MWdc single axis tracking solar PV facility. Construction works currently involve the installation of the framing system which consists of the BladePiles and the NexTracker tracking systems, the JA Solar photovoltaic modules, the DC and AC wiring of the electrical equipment, the 22/66kV on-site substation and the 66kV transmission line.	Project was approved by the NSW Major Projects Office on 17 July 2011.	01/2012 to 12/2015
Newell Highway Moree Town Centre Bypass	Moree	Construction of a 4.4 km two-lane bypass of the Moree town centre	Approved by the NSW Minister for Planning on 20 July 2004. Latest modification 8 approved 7 July 2010	Unknown

Project and Proponent	Location	Description	EIS status	Construction dates
Bindaree Beef Abattoir – Rendering Plant and Bio-digester Plant	Bindaree Beef Abattoir, Inverell	The proposed project involves the installation of a wastewater treatment system (bio-digester) and new render plant facility to reduce odour and carbon emissions at its existing abattoir site. The bio-digester generates a bio-gas from waste and waste water which would then be reused at the site.	Approved by the NSW Minister for Planning on 10 December 2014	12 months construction. Start date unknown
Queensland -Hunter Gas Pipeline	Wallumbilla to Newcastle	420 km high pressure gas transmission pipeline from the Wallumbilla Gas Hub in South Central Queensland to the existing Sydney-Newcastle pipeline at Hexham in New South Wales.	Project determined under Part 3A – now transitioned to SSI	Unknown
White Rock Wind Farm	20 kilometres south-west of Glen Innes, 40 km east of Inverell NSW	Establishment of a 20 MW solar farm and associated infrastructure	Approved by the NSW Minister for Planning 14 June 2016	Late 2018 to late 2020
Sundown Solar Farm	South of Gwydir Hwy, 30 km east of Inverell (NSW)	The Project consists of a large-scale solar photovoltaic generation facility, including battery storage and associated infrastructure, with an estimated maximum capacity of up to 600 MW, enough to power over 250,000 homes.	SEARs issued by NSW Department of Planning, Industry and Environment	2019 to 2023
Bonshaw Solar Farm	Bruxner Way, 16 km south of Bonshaw and 66 km north of Inverell (NSW)	GAIA Australia is proposing to develop a large scale solar photovoltaic generation facility and associated infrastructure with a capacity of 500 MW	SEARs issued by NSW Department of Planning, Industry and Environment	Mid 2019 to 2021
Sapphire Solar Farm	Project in the Kings Plains, Wellingrove and Sapphire areas	A 200 MW hybrid solar and battery power facility	Approved by the NSW Minister for Planning on 16 August 2018	2019 to 2020
Sapphire Wind Farm	Project in the Kings Plains, Wellingrove and Sapphire areas	Construction of a 238 to 425 MW capacity wind farm (between 125 and 159 turbines)	Approved by the NSW Minister for Planning on 26 June 2013	TBA

The locations of these projects are illustrated in Figure 10.1.

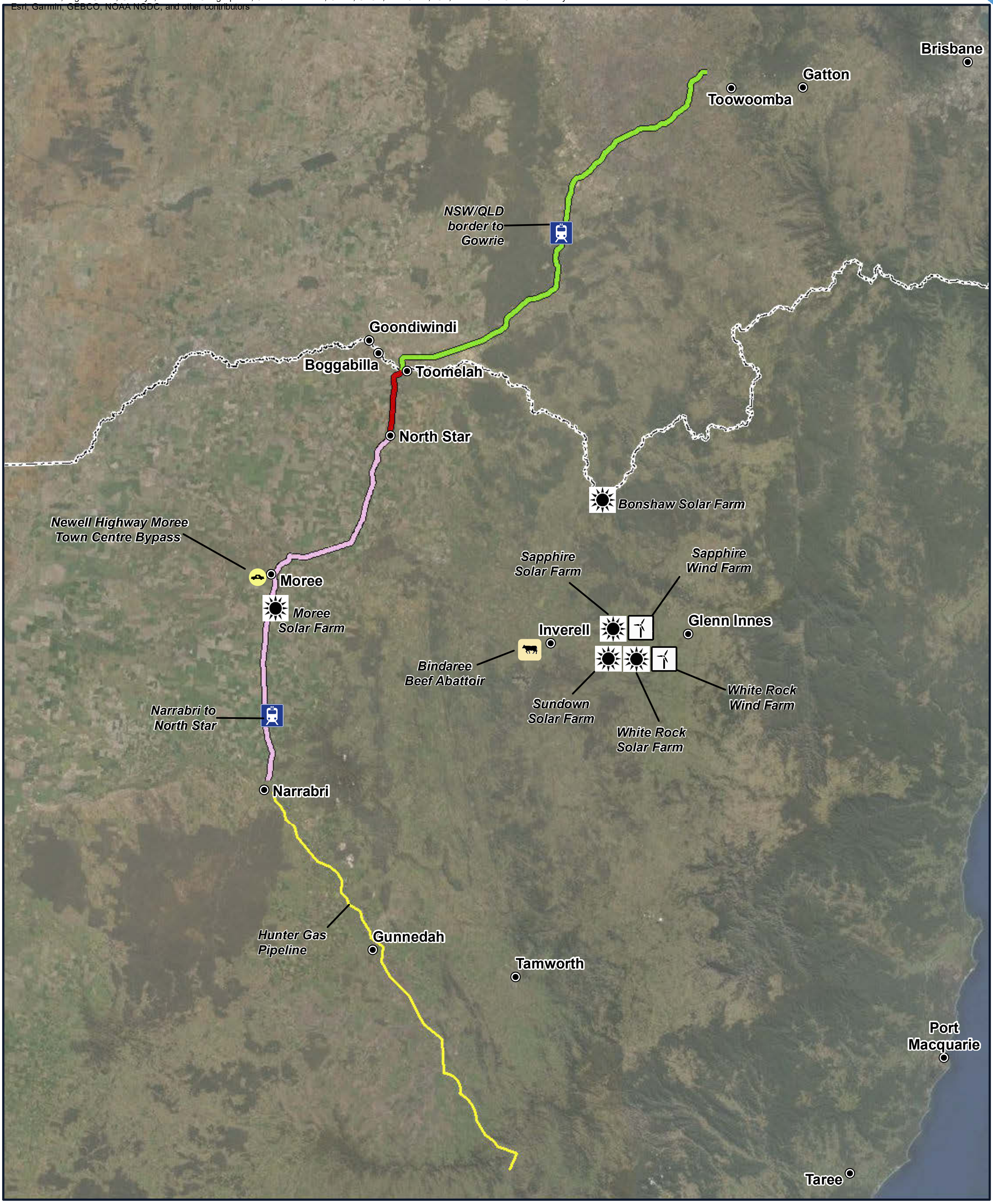
10.2 Qualitative assessment

The qualitative assessment takes into account the relevance factor of the regionally significant projects as indicated in Table 10.1.

Table 10.2 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

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors



Map by: GN/IW Z:\GIS\GIS_270_NS2B\Tasks\270-ITR-201909170806_NS2B_TIA_Appendices\270-ITR-201909170606_NS2B_Fig10.1_FFJV_A4P.mxd Date: 9/03/2020 14:23

Legend

- Localities
- North Star to NSW/QLD border alignment
- NSW/QLD border

A4 scale: 1:2,300,000

0 10 20 30 40 50 km

Future Freight
Integrating Community, Environment and Engineering

Date: 9/03/2020 Version: 3
Coordinate System: GDA 1994 MGA Zone 56

North Star to NSW/QLD border

Figure 10.1: Projects surrounding the proposal - cumulative assessment

The sum of the relevance factor provides a consequence based on a significance of impact which is provided in Table 10.3.

Table 10.3 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 should 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 10.4.

Table 10.4 Qualitative cumulative impact assessment

Project and proponent	Sum of relevant factors	Qualitative assessment consequence	Mitigation measures
Border to Gowrie (B2G) – Inland Rail (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 as a result of the Border to Gowrie (B2G) project.
Narrabri to North Star (N2NS) – Inland Rail (ARTC)	Low	No impact expected as the construction schedules do not overlap. 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 mitigations required
Moree Solar Farm	Low	No impact expected as the construction schedules do not overlap. 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 mitigations required
Newell Highway Moree Town Centre Bypass	Low	Construction dates unknown at this stage and as a result, impact of construction traffic (i.e. construction traffic routes, estimated construction traffic volumes) cannot yet be determined.	No additional mitigations required
Bindaree Beef Abattoir – Rendering Plant and Bio-digester Plant	Low	Start date of construction unknown at this stage and as a result, impact of construction traffic (i.e. construction traffic routes, estimated construction traffic volumes) cannot yet be determined.	No additional mitigations required
Queensland Hunter Gas Pipeline	Low	Construction dates unknown at this stage and as a result, impact of construction traffic (i.e. construction traffic routes, estimated construction traffic volumes) cannot yet be determined.	No additional mitigations required

Project and proponent	Sum of relevant factors	Qualitative assessment consequence	Mitigation measures
White Rock Wind Farm	Low	No impact expected as the construction schedules do not overlap. 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 mitigations required
Sundown Solar Farm	Low	Impact of construction traffic (i.e. construction traffic routes, estimated construction traffic volumes) cannot yet be determined as project is only in Preliminary Environmental Assessment stage (submitted November 2017)	No additional mitigations required
Bonshaw Solar Farm	Medium	Impact of construction traffic (i.e. construction traffic routes, estimated construction traffic volumes) cannot yet be determined as project is only in Preliminary Environmental Assessment stage (submitted July 2018). 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.	No additional mitigations required
Sapphire Solar Farm	Low	No impact expected as the construction schedules do not overlap. 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 mitigations required
Sapphire Wind Farm	Low	Construction dates unknown at this stage and as a result, impact of construction traffic (i.e. construction traffic routes, estimated construction traffic volumes) cannot yet be determined.	No additional mitigations required

11 Summary of findings

As part of the overall assessments carried out for the Project, the traffic and transport impact assessment has evaluated a comprehensive range of issues encompassing potential impacts of the construction and operation phase of the Project on the surrounding transport infrastructure. The report also examines the potential traffic and pavement impacts from the movement of materials, workforce and equipment during the construction phase of the Project on the surrounding road network.

11.1 Traffic impacts – link roads

The results of the LOS comparison between the “with” and “without” Project scenarios indicated that the Project would not likely cause a change in LOS for any of the proposed construction traffic routes.

Hence, based on the LOS comparison, it is not expected that the Project would generate the need to upgrade the road network, but adequate traffic and road use management strategies would be required.

11.2 Traffic impacts – intersections

No intersections were found to potentially experience significant operational impacts during the construction period. Nonetheless, all intersections impacted by construction traffic should be considered through the development of the TMP.

11.3 Traffic impacts – road/rail interface

The operational performance of the proposed public level rail crossings in the impact assessment area was assessed to provide an understanding of the impacts on performance during operations phase of the Project. 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 2025 and 2040 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 analyses results indicate that acceptable Levels of Service would prevail with minimal impact to vehicle queueing and delay should the proposed level crossings be implemented. Findings for specific level crossings are as follows:

11.3.1 270-3-P-2: North Star Road

The results of the analysis indicate that the proposed level crossing along North Star Road (270-3-P-2) would operate at LOS A in the AM and PM peaks in the year 2025 and 2040 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 11m in the 2040 AM peak, with maximum queue length along the south approach being 11m in the 2040 AM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections.

11.3.2 270-5-P-1: Forest Creek Road

The results of the analysis indicate that the proposed level crossing along Forest Creek Road (270-5-P-1) would operate at LOS A in the AM and PM peaks in the year 2025 and 2040 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that there would be negligible queues of less than one car length in each of these scenarios. The closest intersection to this site is the North Star Road/Forest Creek Road intersection located approximately 40m west of the site, therefore is not anticipated to be impacted by vehicle queueing at this proposed level crossing.

11.3.3 270-7-P-3: North Star Road

The results of the analysis indicate that the proposed level crossing along North Star Road (270-7-P-3) would operate at LOS A in the AM and PM peaks in the year 2025 and 2040 with minimal impacts to queueing and delays in each of these scenarios. SIDRA analysis indicates that the maximum queue length along the east approach of the crossing would be 15 m in both the 2040 AM and PM peak, with maximum queue length along the west approach being 16m in the 2040 PM peak. These modelled queue lengths do not have an impact on any existing adjacent intersections with the closest intersection being the North Star Road/Oakhurst Road intersection located approximately 115m west of the site.

11.4 Traffic impacts – active travel

A review of cycle networks in NSW was undertaken to identify any existing on-road cycle paths that may coincide with proposed primary construction routes. This review showed that the following cycle routes may be impacted by construction traffic:

- Gwydir Highway
- New England Highway.

Owing to the isolated location of the works and low volume of construction traffic traversing through impacted active travel networks in ISC, GSC and MPSC, pedestrian or cyclist movements are not expected to be significantly impacted by proposed construction traffic.

A review of the Queensland Principal Cycle Network Plans (PCNP) was undertaken in order to identify any existing on-road cycle paths that may coincide with proposed construction traffic routes within Queensland. This review showed that the following cycle routes within the PCNP coincide with proposed construction traffic routes:

- Carrington Road
- Toowoomba Cecil Plains Road.

It is not expected that these cycle routes will be significantly impacted by Project construction traffic owing to the relatively short construction time frames.