CHAPTER

24

Draft Outline Environmental Management Plan

BORDER TO GOWRIE REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT

Inland Rail is a subsidiary of
Australian Rail Track Corporation

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24.1 Introduction and purpose

This draft Outline Environmental Management Plan (draft Outline EMP) has been developed for the Inland Rail—Border to Gowrie Project (the Project) to:

- Provide an environmental management framework to enable the identified environmental and social outcomes to be achieved for the life of the Project, through the detailed design, pre-construction activities and early works, construction works and operations stages.
- Establish the process for the preparation and implementation of the Construction Environmental Management Plan (CEMP) and the Operations Environmental Management Plan (Operations EMP).
- Support the refinement and implementation of the Social Impact Management Plan (SIMP) for the Project.

This draft Outline EMP will be further developed following completion of Environment Impact Statement (EIS) process, incorporating relevant permit and approval conditions, design refinements, and detailed construction planning to inform the CEMP and Operations EMP.

The CEMP provides a structured approach to the management of environmental issues during the delivery of the Project and will be developed by the Proponent (Australian Rail Track Corporation (ARTC)). The CEMP will be endorsed by the Environmental Monitor (EM) as being consistent with the final Outline EMP, all permit and approval conditions, and applicable legislation, standards and guidelines, prior to the commencement of any relevant Project construction works.

Prior to the commencement of Project operations, an Operations EMP will be prepared consistent with the final Outline EMP, all applicable permit and approval conditions and relevant laws, and ARTC's environmental management policies.

ARTC has adopted a comprehensive and integrated approach to ensuring that all the mitigations identified within the various chapters of the revised draft EIS are implemented for each stage of the Project to which they relate, with measurable outcomes and clear timeframes as set out in this draft Outline EMP. In the event of any inconsistency between the draft Outline EMP and the revised draft EIS chapters, the draft Outline EMP will apply.

Commitments made within the revised draft EIS that extend beyond the scope of the draft Outline EMP, and are more general and related to the Project as a whole, are presented in Appendix AC: Proponent Commitments.

24.1.1 Structure of the draft Outline Environmental Management Plan

This draft Outline EMP:

- Describes the environmental management framework for the Project
- Describes monitoring, reporting, auditing, review and documentation requirements
- Includes requirements for training and awareness, community and stakeholder engagement
- Includes frameworks for the following discipline-specific matters:
  - land use and tenure
  - land resources
  - landscape and visual amenity
  - flora and fauna
  - air quality
  - surface water
  - flooding and geomorphology
  - groundwater
  - noise and vibration
  - cultural heritage
  - traffic, transport and access
  - hazard and risk
  - waste and resource management.

This draft Outline EMP provides direction for the CEMP and Operations EMP and includes the following:

- **Environmental outcomes**—environmental outcomes are mandatory and must be achieved. The environmental outcomes are derived from statutory requirements or other relevant criteria and are reflected in the criteria adopted in the revised draft EIS.
- **Performance criteria**—measurable objectives or indicators of the environmental outcome. Environmental outcomes are deemed to be achieved if the performance criteria are met. If the performance criteria are not met, mitigation measures will be implemented to achieve the environmental outcomes.
- **Mitigation measures**—measures directed at achieving the environmental outcomes. The proposed mitigation measures have been identified through the EIS process, recognising that additional or different mitigation measures may be applied through the Project development in order to achieve the environmental outcome. Additional mitigation measures may be developed in consultation with directly affected persons, relevant stakeholders and with the advice of the Environmental Monitor (EM) and Community Relations Monitor (Section 24.2).
- **Monitoring requirements**—monitoring requirements to demonstrate that the environmental outcomes have been achieved.
- **Corrective actions.**
- **Reporting.**

The Project is committed to applying best practice and innovation in addressing the impacts of the Project works. Where performance criteria indicates the Project will implement management measures that are consistent with the criteria from identified codes of practice, policies and guidelines, it is to be read that those management measures will be informed by the criteria from such codes of practice, policies and guidelines and in compliance with all applicable conditions of approval, including what is reasonably practicable in pursuing approaches of best practice that support innovation.

It is proposed that any conditions included in the Coordinator-General's evaluation report for the Project under the *State Development and Public Works Organisation Act 1972* (Qld) (SDPWO Act) and/or the Australian Minister for the Environment's controlled action decision under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) will be incorporated into the final Outline EMP. The final Outline EMP will inform the CEMP to ensure that all works are authorised and consistent with the approval conditions on the Project. Similarly, the final Outline EMP and approval conditions relevant to the operations stage will be incorporated into the Operations EMP.

As construction may progress in stages, a CEMP will be developed in advance of relevant Project construction works commencing and will be amended/updated as construction proceeds.

24.1.2 Proposed activities

The Project involves the remaining stages:

- Enabling works
- Detailed design
- Project approvals and corridor acquisition
- Pre-construction activities and early works
- Construction works
- Commissioning
- Operations
- Decommissioning.

Project works are works subject to approval under the EPBC Act by the Australian Minister for the Environment and the receipt of the Coordinator-General's evaluation report under the SDPWO Act. Project works include all the Project stages listed above, except for enabling works, detailed design, project approvals and corridor acquisition and decommissioning.

In order to provide a holistic view, this OEMP also describes the following activities which inform the Project but do not form part of the Project works:

- Enabling works
- Detailed design
- Project approvals and corridor acquisition
- Decommissioning.

24.1.2.1 Enabling works

Enabling works are works that are not defined as Project works and not subject to assessment in the revised draft EIS, including:

- Works to inform the ongoing development of the Project design and inputs to the revised draft EIS
- Works to existing utilities and rail infrastructure to be undertaken in advance of construction works.

These scope items are not included in the revised draft EIS for assessment. Where these works have been described in this draft Outline EMP, they are included to provide broader Project context.

Enabling works (existing utility and rail works) will be undertaken under a separate contract, or by the asset owner and will be required to comply with the relevant environmental or regulatory framework applicable to the works or public utility.

Enabling works include the following:

- Works to inform detailed design and revised draft EIS:
  - utility investigations and survey
  - survey and geotechnical investigations
  - baseline surveys
- Works to be undertaken in advance of construction:
  - utility treatments such as protection, relocation, and/or removal of utilities/service crossings (existing public utility/service crossings)
  - relocation or protection of Queensland Rail (QR) assets
  - site compounds and laydown areas required to support enabling works, with disturbance areas limited to what is practicably required, and subject to separate approvals processes where required.

Survey and geotechnical investigations

The construction of Project infrastructure requires the undertaking of survey and geotechnical investigations, including adherence to survey control plans and procedures to ensure spatial correctness, understanding of existing site conditions, and quality of reporting and construction. Where necessary, separate approvals will be obtained for these works.

Baseline surveys

ARTC will undertake additional baseline surveys to supplement the surveys undertaken as part of the revised draft EIS. These baseline surveys will inform such matters as cultural heritage management, water quality objectives, design and environmental and planning approvals, rehabilitation requirements and performance indicators. Further information on the proposed baseline surveys required for the Project is provided in the relevant technical chapters and reports.

Utility treatments

Utility treatments include avoiding, protecting, modifying, diverting or realigning utility services and infrastructure which will be undertaken or overseen by a third-party asset owner or manager. The anticipated methodology for the treatment of utilities is:

- Site surveys to determine as-built locations and arrangements
- Identification of utility clashes with proposed design
- Avoiding identified clashes:
  - review/amendment of designs to avoid the utility where possible
  - apply for relaxations/derogations or departures from utility authorities to relax requirements in order to leave the utility in place with no treatment
- Protect the existing utility:
  - implement controls for construction activities to protect the existing utilities
  - maintain required clearances as required by the utility authority
  - limit vibrations
  - substitute machinery, use spotters or other controls

- Install physical protective treatments:
  - concrete protection slabs
  - bridging slabs
  - concrete encasement
- Relocation of the existing utility:
  - lower, re-align or raise existing underground or overhead utilities
  - relocation of power poles to either raise or re-align overhead powerlines
  - trenching to lower and/or re-align existing underground utilities
  - directional drilling or tunnel boring/pipe jacking to lower and/or relocate existing underground utilities
- Abandonment of redundant utilities:
  - disconnection and removal of utilities no longer in service where possible and practical
  - capping and/or ground filling of utilities no longer in service and/or abandoned if removal is not possible or practical.

Approvals, including asset owner approvals, will be obtained for these works.

All utility owners have been consulted by ARTC during the revised reference design process to establish potential interface impacts and to identify initial design solutions. Details of consultation are outlined in Appendix E: Consultation Report. Consultation with utility owners will continue through the detailed design stage of the Project to further verify interface impacts and to confirm appropriate interface treatments.

Relocation or protection of Queensland Rail assets

A survey of existing QR assets within the Project footprint will be required after an interface agreement between ARTC and QR, but prior to the commencement of construction. The purpose of this survey will be to locate all existing rail infrastructure components and determine their type, size, materials and condition. QR assets include connections, signalling systems, culverts, sleepers, rail and ballast. This survey will inform Project decisions on the ability to reuse, protect, remove or relocate existing QR assets as well as the required timing of these works. The outcomes of the survey including the nature and timing of required works will be agreed with QR.

24.1.2.2 Detailed design

ARTC has progressed the design of the Project to a reference design status. While some changes could be expected as the design evolves, the general principle will be that design changes either improve the safety or performance of the Project, improve environmental outcomes, or incorporate value engineering opportunities. ARTC will be responsible for integrating any EIS conditions into the detailed design.

Measures to be implemented during detailed design have been identified in this draft Outline EMP where those measures are directed to avoid, minimise or mitigate community and environmental impacts.

24.1.2.3 Project approvals and corridor acquisition

Project approvals and corridor acquisition will commence following the EIS phase to support the Project's detailed design, construction works and operations stages. This Project stage will include preparation of secondary environmental and planning approvals, and corridor acquisition.

Environmental and planning approvals

Following approval of the Project under the SDPWO Act and EPBC Act, the Project will require additional, post-EIS secondary environmental and planning approvals, permits and licences. Approvals will be required prior to the commencement of the relevant construction or ground-disturbing activity and will be obtained, as required, throughout the Project's construction stage.

Corridor acquisition

Where possible, the Project has been intentionally aligned with existing road corridors and sections of the QR South Western Line and Millmerran Branch Line rail corridors, minimising the extent of 'new' properties to be acquired. Notwithstanding this, the acquisition of land, and interests in land, will be required for the construction and operation of the Project.

Acquisition of land will be undertaken via a combination of three methods being:

- Compulsory acquisition by Department of Transport and Main Roads (DTMR) using acquisition powers under the *Transport Planning and Coordination Act 1994* (Qld) in accordance with the process under the *Acquisition of Land Act 1967* (Qld). ARTC will request DTMR protect the Project corridor under the appropriate legislative mechanisms following the issuing of the Coordinator-General's evaluation report.
- A private sale treaty for early voluntary negotiated acquisitions (prior to compulsory acquisition) undertaken by either ARTC or DTMR.
- Applications in accordance with the *Land Act 1994* (Qld) for non-freehold tenures of unallocated State land, reserve land, roads and road reserves, perpetual leases, term leases. Certain types of State leasehold land may be able to be compulsory resumed in accordance with the *Acquisition of Land Act 1967* (Qld).

The DTMR will support ARTC with consultation with affected landowners and interest holders prior to the commencement of the statutory compulsory acquisition process. Consultation will inform requirements for access for machinery and cattle, access to water assets, fencing, accommodation works or property adjustments, and unregistered interests not recorded on property titles who may be eligible for compensation.

The specific extents of land required for the Project will be determined during detailed design.

24.1.2.4 Pre-construction and early works

Pre-construction and early works are undertaken prior to full mobilisation of the contractor. These works may be undertaken under a separate contract but will not commence until the final Outline EMP has been provided to the Coordinator-General and the Australian Minister for the Environment as applicable, and the relevant early works CEMP has been endorsed by the EM. Pre-construction activities and early works include:

- Site preparation for construction
- Establishment of access roads/tracks
- Vegetation clearing and other ground disturbance activities which will be required to comply with relevant legislative requirements, approval conditions, guidelines and plans
- Additional surveys and geotechnical investigations to inform construction works
- Relocation or protection of QR assets that were not required to be undertaken well in advance as part of enabling works
- Utility/service interfaces that were not required to be undertaken well in advance as part of enabling works
- Modification of biosecurity fencing
- Installation of boundary fencing
- Establishment of site offices and initial laydown areas including Whetstone Material Distribution Centre (MDC)
- Establishment of non-resident workforce accommodation.

Pre-construction and early works may also include works within the local road reserves, including establishing new access points and/or to facilitate the future upgrades and road closures subject to agreement between ARTC and the relevant local council.

24.1.2.5 Construction works

Construction works may commence upon the endorsement of the CEMP by the EM for the relevant Project construction works. Construction works include:

- Site set out and pegging within the Project footprint, where not completed in pre-construction activities and early works
- Establishment of laydown areas and compounds, including vehicle inspection/workshops, washdown facilities and temporary fencing, where not completed in pre-construction activities and early works
- Clearing—using dozers, chainsaws, excavators, trucks and similar equipment, where not completed in pre-construction activities and early works
- Establishment of erosion and sediment controls as per the approved Erosion and Sediment Control Plan (ESCP), where not completed in pre-construction activities and early works
- Rail corridor works, including track works turnouts and crossing loops
- Road and road-rail interface works
- Road realignments, grade separations and upgrade works
- Rail maintenance access roads
- Bridge construction
- Fencing, where not completed as pre-construction or early works

- Fauna habitat connectivity measures (fencing, crossing structures in accordance with detailed design specifications, Fauna Connectivity Strategy and subsequent Wildlife Connectivity Plan)
- Signalling and communications
- Laydown, stockpile, and storage areas, that are not for enabling works and where not completed in pre-construction activities and early works
- Ballast—supply, delivery and installation
- Concrete sleepers—supply, delivery and installation
- Utilities and services to support/service the Project (that are not for enabling works)
- Bulk earthworks—major cut-to-fill operations including the winning of suitable construction material from sections of cut along the Project alignment or from borrow pits external to the site
- Permanent and temporary drainage controls, including culverts and longitudinal drainage
- Clean-up, landscaping, site restoration and rehabilitation, and any other activities necessary to complete such works
- Demobilisation of construction sites and activities.

24.1.2.6 Commissioning

Testing and commissioning (checking) of the rail line and communication/signalling systems will be undertaken to ensure that all systems and infrastructure are designed, installed and operating according to ARTC's operational requirements.

24.1.2.7 Operations

Operations include the use of the railway for freight purposes, operation and maintenance of safety systems, signalling, and general track and infrastructure maintenance. Operational items include, but are not limited to:

- Bridge and culvert inspections and maintenance
- Sleeper replacement
- Rail replacement, welding and grinding
- Ballast replacement and cleaning
- Track tamping and reconditioning
- Vegetation management
- Signalling systems and equipment testing and maintenance
- Transportation of equipment, materials and workforce
- Other asset management in accordance with ARTC technical maintenance.

These operational maintenance programs will be regularly reviewed and updated in consultation with all affected stakeholders.

24.1.3 Corporate governance and policies

24.1.3.1 ARTC and Inland Rail corporate governance

ARTC is the proponent for Inland Rail and will operate the railway. Inland Rail Pty Ltd was established as a subsidiary of ARTC to build Inland Rail on behalf of the Australian Government.

Jointly, the ARTC and Inland Rail systema of corporate governance comprises corporate policies, core values and a range of management systems, policies and frameworks. This governance system applies across the whole of the ARTC network to guide a program-wide consistent approach to environmental management in accordance with industry best practice. In addition to various legislative compliance requirements, all works associated with the Inland Rail Program will be completed in accordance with relevant corporate policies.

This draft Outline EMP has been prepared to align with corporate governance system current at the time of preparation, including the following documents:

- ARTC Environment Policy
- ARTC Environmental Management System (EMS)
- ARTC Environmental Management Information System
- Inland Rail Environment and Sustainability Policy.

Figure 24-1 illustrates the interactions between these, and the Project's frameworks. These documents provide a guide for the development of Project environmental management plans including the CEMP, Operations EMP and SIMP and are further described in Section 24.1.4 and illustrated in Figure 24-2.

24.1.3.2 ARTC Environmental Policy

The ARTC Environmental Policy provides a framework for continual improvement of ARTC's EMS and sets out commitments for managing potential environmental risks.

24.1.3.3 ARTC Environmental Management System

ARTC maintains an EMS aligned with Australian Standard/New Zealand Standard (AS/NZS) International Organization for Standardization (ISO) 14001 that is a structured framework for the consideration, evaluation, management and regulatory compliance with, and reporting of, environmental issues associated with ARTC's business activities across all project phases.

In order to maintain alignment with ISO14001, ARTC will require the appointed principal contractor is consistent with the ARTC EMS through the Project Construction Environmental Management Plan (Section 24.1.3.4).

24.1.3.4 ARTC Environmental Management Information System

To ensure consistency with the ARTC EMS across the Inland Rail Program, ARTC has implemented an Environmental Management Information System, Horizon360, for the Project. Horizon360 is utilised as a management tool to monitor, review and manage environmental requirements and obligations. This system has been configured to support ARTC fulfil their environmental management requirements.

The contractor will be required to provide environmental data/information to enable the population of Horizon360 platform as part of their obligations in the contract. All required information will be entered directly into the system by the ARTC project management team. ARTC will remain as the proponent for ARTC approvals and will track and monitor compliance with these obligations utilising Horizon360.

ARTC will also manage an asset management system, 'Ellipse' during the operations stage that records and tracks performance and compliance of assets against environment management obligations, and schedules maintenance and monitoring requirements, as prescribed by the relevant administrative authority.

24.1.3.5 Inland Rail Environment and Sustainability Policy

ARTC have developed an *Inland Rail Environment and Sustainability Policy* (2023a) which supports the ARTC EMS, and which the Project will be required to comply with.

The sustainability measures embedded into the *Inland Rail Environment and Sustainability Policy* have guided the Project's approach to sustainability. The future sustainability opportunities identified for the Project will be investigated and implemented as appropriate, guided by the policy, which will assist in meeting the key deliverables identified in the *Inland Rail Environmental and Sustainability Strategy* (2023b).

24.1.4 Environmental Management Framework

The ARTC and Inland Rail corporate governance requirements form a Project Construction Environmental Management Framework that is to be implemented by the construction contractor through the preparation and approval of the CEMP consistent with the final Outline EMP. The Construction Environmental Management Framework will operate in conjunction with the ARTC and Contractor Agreement, Project Scope and Technical Requirements, and associated documentation to:

- Provide the contractor with the ARTC Inland Rail Program EMS requirements
- Provide supporting information for the contractor to meet the environmental management requirements for the delivery of the works
- Provide the contractor with guidance and information needed to develop the required environmental management documentation, including the CEMP and environmental assurance framework.

The final Outline EMP will include detailed mitigation measures addressing the range of identified environmental impacts for the Project and is informed by the requirements of the Coordinator-General's evaluation report for the Project (i.e. any imposed conditions) and the EPBC Act controlled action approval conditions. The mitigation measures described within the final Outline EMP will be associated with noise and vibration, air quality, traffic and other environmental values. These requirements and controls will be addressed within the Project's CEMP.

Measures required to manage the Project's social impacts and/or to maximise its community benefits are described within the Project's SIMP and its sub-plans. The Project's SIMP is a key component of the Projects environmental management framework and represents a key instrument informing the development and delivery of the Project's CEMP, as illustrated by Figure 24-1.

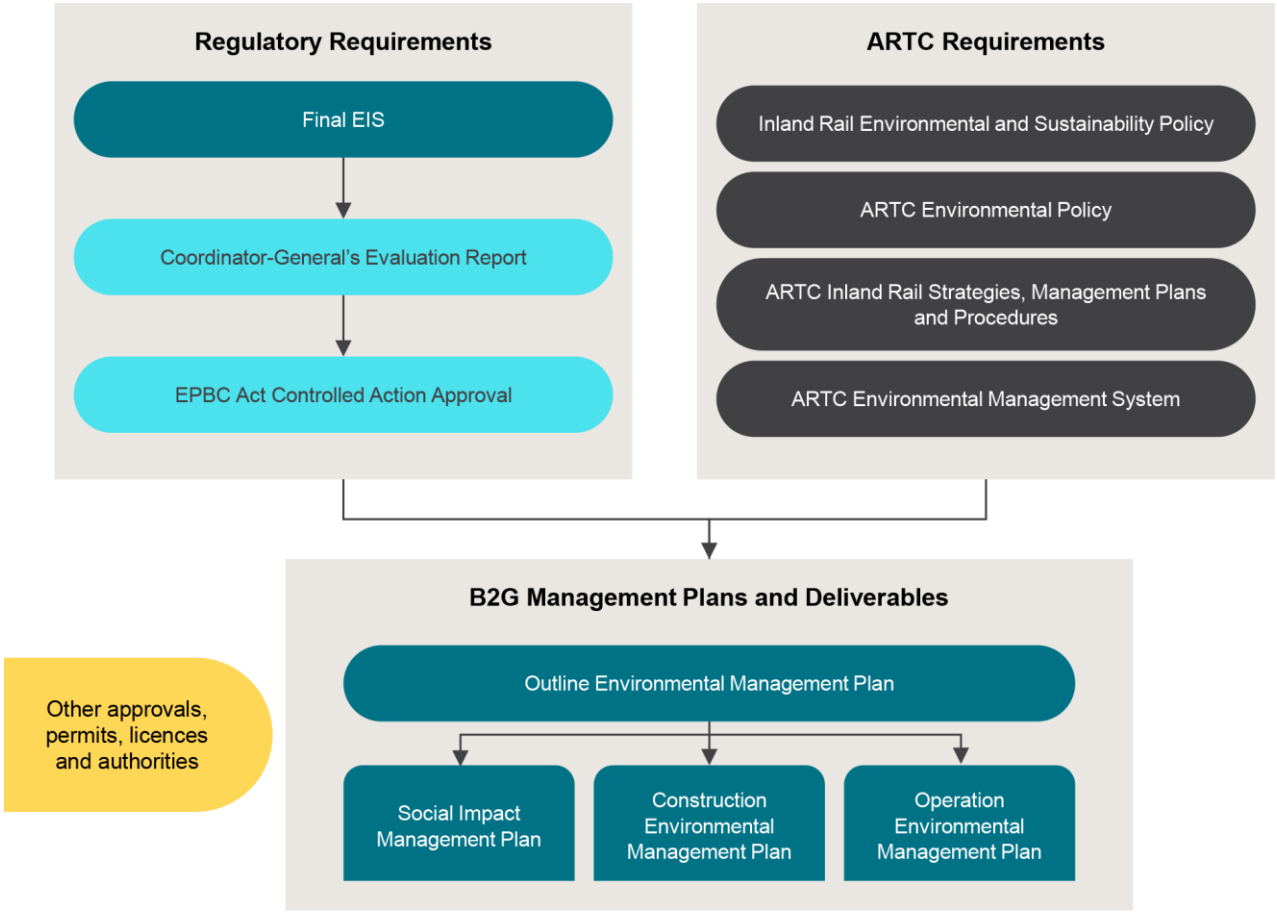

FIGURE 24-1 PROJECT ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK

24.1.5 Final Outline Environmental Management Plan

The final Outline EMP will be updated following receipt of the Coordinator-General's evaluation report and EPBC Act controlled action decision. The final Outline EMP will further develop the principles and approaches that are presented in this draft Outline EMP and provide a framework for a comprehensive approach to environmental management throughout the delivery of the Project.

The final Outline EMP will be prepared by ARTC and endorsed by the EM prior to being issued to the Coordinator-General for information. It will be developed in compliance with any relevant conditions imposed in the Coordinator-General's evaluation report and EPBC Act controlled action decision and will include:

- The environmental outcomes and performance criteria from this draft Outline EMP, except as amended by any conditions or otherwise agreed
- Include possible mitigation measures, monitoring and reporting for all environmental elements to achieve environmental outcomes
- Include an outline of the CEMP and the Operations EMP
- Include an outline of the relevant plans that are components to the CEMP or the Operations EMP.

24.1.6 Construction Environmental Management Plan

The CEMP provides a structured approach to the management of environmental issues during the delivery of the Project and will be developed by ARTC in compliance with the final Outline EMP. The CEMP will be endorsed by the EM and issued to the Coordinator-General once the CEMP has been prepared to a sufficient standard that addresses the following criteria:

- Environmental outcomes (objectives)—have to be achieved
- Performance criteria—if satisfied, will achieve the outcome
- Mitigation measures—may be implemented, may be refined based on detailed design and construction planning
- Monitoring
- Corrective actions
- Reporting

The CEMP provides the direction for the Project and the contractor on behalf of the Proponent to meet the Project's statutory requirements for construction activities. The CEMP must be endorsed by the EM as being consistent with the final Outline EMP, legislation requirements and conditions of approval prior to the commencement of any relevant Project construction works.

The CEMP will be prepared to be consistent with the final Outline EMP and will comprise a series of component plans as shown in Figure 24-2. These component plans will document the aspects, impacts, management measures and monitoring requirements for each key environmental aspect and will be required to address the scope requirements as outlined in Table 24-1. These plans will be endorsed by the EM prior to relevant construction works commencing.

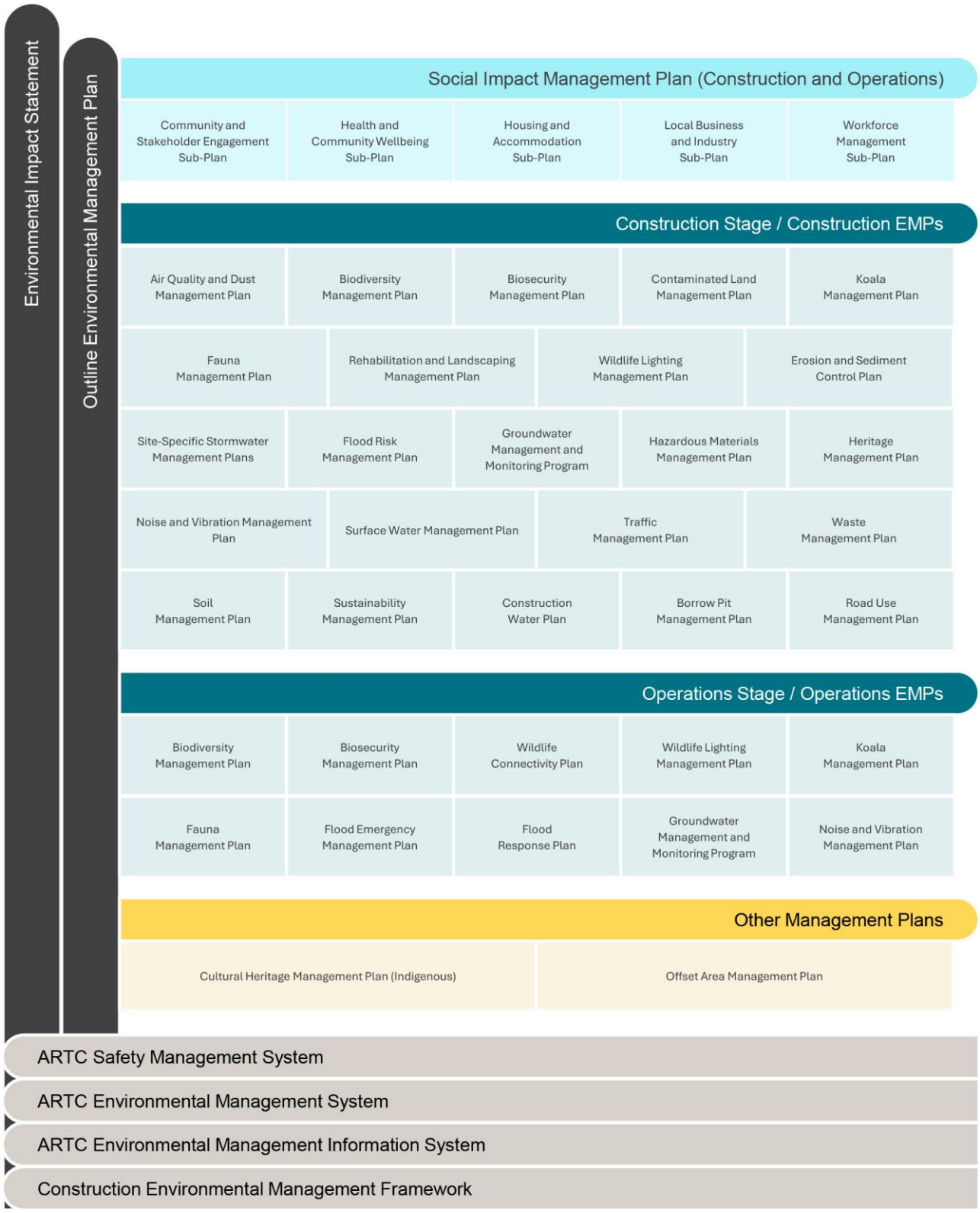

FIGURE 24-2 PROJECT ENVIRONMENTAL MANAGEMENT PLANS

TABLE 24-1 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN SCOPE

Component	Description
Objective(s) and purpose	To be established as a means of assessing environmental outcomes. Objectives will be developed consistent with all relevant approval and permit conditions and final Outline EMP requirements.
Legislation and approvals	To set out the legislative and all relevant approval and permit compliance requirements, and how compliance will be achieved.
Risk management (mitigation measures)	Mitigation measures satisfy the environmental outcomes and are endorsed by the EM in consultation with ARTC. These measures detail the applicable Project stage and the measures to be adopted to address identified environmental hazards or issues.
Compliance management (reporting)	Frequent reporting in compliance with all relevant approval and permit conditions in order to validate the impacts predicted for the Project.
Compliance management (auditing and monitoring)	Auditing and monitoring to assess compliance with the CEMP, all approval and permit conditions, and any relevant legal and other requirements (e.g. the Project contract documentation).
Compliance management (incident response)	Environmental event response actions and responsibilities that will be implemented immediately after, and in response to, an incident.

24.1.7 Operations Environmental Management Plan

The Operations EMP will form part of an overarching management approach by ARTC to the operation and maintenance of the Project within the Inland Rail and ARTC networks. ARTC will prepare the Operations EMP consistent with ARTC's EMS, safety management system and other requirements.

ARTC's Inland Rail EMS provides a structured framework for the management, compliance and reporting of environmental aspects of rail network operations. ARTC has developed the EMS in consideration of ISO14001 – Environmental Management Systems.

ARTC's network-wide existing safety management system will apply to the Project and will incorporate:

- Incident Management Plan
- Fatal and Severe Risk Program
- Existing Emergency Management Procedures
- Security and Crisis Management Procedures.

Social impacts and stakeholder concerns will be addressed through implementation of the operations SIMP. The operations SIMP will follow a pathway of continual development to address social impacts extending from the construction works stage through commissioning to Project operations.

The Operations EMP relates to operational environmental impacts identified through this EIS process, and will present a management and mitigation approach consistent with the final Outline EMP and approvals. The plans are illustrated in Figure 24-2**.**

24.1.8 Social Impact Management Plan

24.1.8.1 Overview

The SIMP outlines the objectives, outcomes and measures for mitigation of social impacts, and measures intended to enhance Project benefits and opportunities. The SIMP complements the CEMP and Operations EMP.

ARTC will review changes to the design or construction methodology that have potential to change social impacts and if a material change in impacts is foreseen, the SIMP measures will be revised to address the change in social impacts.

ARTC will develop further detail in the SIMP as part of the detailed design stage. This will include engagement with the contractor and stakeholders, as identified in the SIMP sub-plans, to review the measures outlined in the SIMP, the responsibilities of each party, implementation plans, timing and performance monitoring. This will inform the implementation of SIMP measures and ARTC's social performance program delivery including:

- Partnerships and projects to support mitigation and enhancement of benefits
- The respective responsibilities of the Project and other stakeholders
- The program for implementation
- SIMP monitoring.

ARTC will review the SIMP annually during the construction works stage, and update where necessary, based on monitoring results, including stakeholder feedback. The SIMP includes an introduction describing SIMP implementation, the five management sub-plans and description of the monitoring and reporting framework. The five SIMP sub-plans are:

- **Community and Stakeholder Engagement Management Sub-plan**: describes how the Project will communicate and engage with community members and other stakeholders throughout the Project's detailed design, pre-construction and early works, and construction works stages. It includes a monitoring and reporting framework and describes how stakeholder inputs will be incorporated in ongoing development and implementation of SIMP measures. This sub-plan will guide the development of the Community and Stakeholder Engagement Management Plan (CSEMP) for construction.
- **Workforce Management Sub-plan**: describes how the Project will implement training and employment opportunities for residents in the Goondiwindi and Toowoomba local government areas (LGAs), manage the potential for impacts on other industries, and support workforce wellbeing. This sub-plan guides the development of the Workforce Management Plan.
- **Housing and Accommodation Sub-plan**: describes the measures that ARTC will undertake to mitigate potential impacts on housing and accommodation access in the social impact assessment study area, and to support management of the Project's non-resident workforce accommodation facilities. An Accommodation Management Plan will be developed to monitor any impacts on housing or accommodation and modify accommodation management strategies if the potential for negative impacts is identified.
- **Health and Community Wellbeing Sub-plan**: addresses the potential for impacts on community facilities and services, community safety and mental health, and the potential for impacts on community wellbeing due to changes to local amenity, community cohesion or local character. This sub-plan will guide the development of the Community Wellbeing Plan.
- **Local Business and Industry Sub-plan**: addresses the potential for Project impacts on businesses including farms, agribusinesses and tourism-related businesses, and describes ARTC's approach to ensuring that local and regional businesses benefit from the Project.

ARTC will track SIMP implementation and review performance measures quarterly (where information is available), to facilitate continual improvement of strategies and practices. SIMP implementation will be reported to the Community Reference Group/s (CRG/s) at each meeting and a report against performance measures will be presented to the CRG/s, Toowoomba Regional Council (TRC) and Goondiwindi Regional Council (GRC) annually during construction.

Prior to commissioning the Project, a SIMP for the operations stage will be developed, in accordance with ARTC's established management frameworks for rail operation, including rail noise management, safety management, workforce development and stakeholder engagement. This will be informed by the social performance monitoring undertaken during the construction works stage, which includes stakeholder engagement in monitoring impacts and the effectiveness of mitigation measures. An operations CSEMP will be developed under the operations SIMP.

24.1.9 Cultural Heritage Management Plans (Indigenous)

The *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) is intended to provide effective recognition, protection and conservation of Indigenous cultural heritage in Queensland. Aboriginal cultural heritage is defined as a significant Aboriginal area in Queensland or a significant Aboriginal object or evidence, of archaeological or historic significance, of Aboriginal occupation of an area of Queensland. The ACH Act protects Indigenous cultural heritage primarily through a 'cultural heritage duty of care', which requires all persons to take reasonable and practical measures to avoid harming cultural heritage. Failure to comply with the cultural heritage duty of care is an offence. Additional offences prescribed by the ACH Act include unlawfully harming, excavating, relocating, taking away and possessing Aboriginal cultural heritage.

Relevantly, and among other things, a person who carries out an activity will be taken to have complied with the cultural heritage duty of care and will not commit any of the other offences prescribed by the ACH Act if the person is acting in compliance with, and under, an approved Cultural Heritage Management Plan (CHMP) that applies to the cultural heritage. An approved CHMP is mandatory for projects that require an EIS such as this Project.

Project works will be undertaken in accordance with a relevant approved CHMP developed with the relevant Aboriginal Party under the ACH Act. The relevant approved CHMP will cover the construction of new rail infrastructure and associated structures for the Inland Rail Program, as well as operation and maintenance of the rail corridor that will be managed by ARTC. The CHMP complements the CEMP and Operations EMP but does not form a component of those management plans.

The CHMP will not extend to activities performed by QR.

24.2 Roles and responsibilities

ARTC is the Project proponent, retaining overall responsibility for the Project and its operations. As a subsidiary of ARTC, Inland Rail Pty Ltd will operate with its own governance arrangements with responsibility for the delivery of the Project.

The roles and responsibilities of relevant entities for delivery of the Project works are set out in Table 24-2. These roles may be refined as contractual arrangements are finalised, and are subject to Commonwealth and State agency responsibilities.

TABLE 24-2 ROLES AND RESPONSIBILITIES

Role	Responsibilities
ARTC (Proponent)	▸ Proponent for the Project, retaining overall responsibility for the Project ▸ Inland Rail Pty Ltd, as a subsidiary of ARTC, will have responsibility for delivery of the Project ▸ Engagement of the contractor for the detailed design, pre-construction activities and early works and construction work ▸ Prepare and finalise the final Outline EMP and SIMP for the Project ▸ Maintain responsibility for delivery of the Project in accordance with the Coordinator-General's evaluation report (i.e., imposed conditions), the Australian Minister for the Environment EPBC Act controlled action approval conditions and secondary environmental and planning approvals ▸ Oversee the design, delivery and implementation of the Project to achieve the environmental outcomes, and comply with all laws and Project obligations ▸ Responsible for monitoring, reporting and auditing the delivery and implementation of the Project in relation to the CEMP and Operations EMP ▸ Responsible for issuing documentation to the Coordinator-General, the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and any other applicable regulatory agencies as required under the approval conditions ▸ Responsible for making environment documentation available to the Coordinator-General, DCCEEW and the community, including uploading EMPs, environmental reports and audits to the Inland Rail website as required by the approval conditions ▸ Establish and maintain a complaints management system, to receive and respond to complaints ▸ Engage the EM, for the duration of construction ▸ Engage the Community Relations Monitor for the duration of construction and facilitate the formation and activities of the CRG ▸ Report to regulators and stakeholders as required ▸ Maintain the final Outline EMP and SIMP, including delivering any updates required as an outcome of any changes to the Project ▸ Coordinate and lead ongoing engagement with the Coordinator-General, DCCEEW and other stakeholders as required by the approval conditions or nominated in the mitigation measures.
Contractor/s	▸ Prepare and finalise the CEMP for issue to ARTC and subsequently the EM for endorsement ▸ Provide proper and regular training to the construction workforce in environmental responsibilities, including cultural heritage responsibilities and codes of behaviour, in accordance with the CEMP ▸ Carry out all works in accordance with the CEMP and SIMP ▸ Maintain approvals obtained by the contractor and demonstrate compliance ▸ Comply with the conditions of all Project approvals, and all relevant legislation, policies, standards, guidelines and codes of practice.
Coordinator-General	▸ Administer the SDPWO Act ▸ Approve the EM and the Community Relations Monitor that have been nominated by ARTC ▸ Receive the final Outline EMP, SIMP, CEMP and Operations EMP following endorsement from the EM ▸ Approve the final Outline EMP in accordance with any imposed conditions ▸ Receive reporting and notification in accordance with any imposed conditions.
DCCEEW	▸ Administer the EPBC Act ▸ Approve management plans required under the EPBC Act controlled action approval ▸ Receive reporting and notification about matters of national environmental significance in accordance with EPBC Act requirements, including controlled action approval conditions

Role	Responsibilities
Environmental Monitor (EM)	▸ An independent entity to the Proponent ▸ Review and endorse the Proponent's final Outline EMP ▸ Review and endorse the Proponent's CEMP and revisions against the final Outline EMP and any approval conditions ▸ Monitor compliance with the CEMP and any approval conditions ▸ Maintain a current copy of the CEMP including any progressive revisions and records of modifications to the Project's construction or commissioning procedures ▸ Review any audit and compliance reports prepared by the contractor or ARTC ▸ Have oversight of the implementation of the environmental monitoring requirements established in the CEMP and review the results of the monitoring and verify these results if the EM considers it necessary ▸ Prepare periodic reports to ARTC, DCCEEW and the Coordinator-General, collated from the verified reporting prepared by the contractor.
Community Relations Monitor	▸ An independent entity to the Proponent, separate to the EM ▸ Prepare and provide periodic reports to the EM on community issues emerging from the construction and commissioning activities in relation to any approval conditions, the CEMP, complaints, monitoring and community relations ▸ Communicate with ARTC and the EM with regard to any imposed conditions, the CEMP, the SIMP, community consultation strategies and community concerns ▸ Review complaints procedures and the resolution of complaints and corrective action reporting to assess performance of the contractor's implementation of the SIMP and CEMP ▸ Facilitate discussions between ARTC, the contractor and affected entities about mitigation measures, as required by either ARTC or the affected entity ▸ Provide advice to the EM in relation to complaints received from the community ▸ Prepare and provide periodic reports to the EM on community issues emerging from the construction and commissioning activities in relation to any imposed conditions, the CEMP, complaints, monitoring and community relations ▸ Communicate with ARTC and the EM with regards to any approval conditions, the CEMP, the SIMP, community consultation strategies and community concerns ▸ Review complaints procedures and the resolution of complaints and corrective action reporting to assess performance of the contractor's implementation of the SIMP and CEMP ▸ Facilitate discussions between ARTC, the contractor and affected entities including the CRG, about mitigation measures, as required by either ARTC or the affected entity.
CRG	▸ Provide feedback to ARTC and the contractor in relation to construction planning, impacts and mitigation measures ▸ Receive reports on SIMP implementation at each CRG meeting, and on CEMP implementation on a six-monthly basis, for their feedback ▸ Providing feedback on the effectiveness of community and stakeholder engagement measures at each CRG meeting ▸ Receiving and providing feedback on annual SIMP reports ▸ Participation in annual SIMP reviews.

24.3 Construction and commissioning training and awareness

All Project personnel required for construction and commissioning activities will attend an induction session to inform them of their responsibilities under the CEMP.

A training register will be developed and maintained throughout construction and commissioning that identifies requirements in relation to:

- Qualifications and competencies
- Project-specific environmental training courses, refreshers and inductions relevant to different activities/groups of personnel/locations.

This register will also be used to track the relevant qualifications held by Project personnel and subsequent completion of induction/training/refreshers sessions.

Short-term visitors to site, for purposes such as deliveries, will be required to undertake a visitor's Induction and will be accompanied by inducted personnel.

All employees, contractors and subcontractors will receive an environmental induction that will include:

- CEMP requirements
- Code of Conduct and Behaviour
- Coordinator-General's evaluation report imposed conditions
- EPBC Act controlled action approval conditions
- Secondary approvals and conditions obtained for the relevant activities
- Statutory duties in regard to notifications (e.g. environmental harm, biosecurity)
- Environmental incident notification procedures
- Complaints management procedures
- Key environmental risks and issues
- Location of sensitive receptors and environmentally sensitive areas
- Cultural heritage and cultural awareness training, in consultation with the Traditional Owners
- Permissible hours of work
- Construction traffic routes
- Key environmental contacts.

Communication to all construction personnel in relation to environmental management will occur. The contractor, ARTC and other relevant responsible entities will ensure that the general intent, scope and relevance of the final Outline EMP are understood by all site personnel.

Environmental education of environmental risks and issues will be communicated as relevant (such as seasonal, work activity) by the following methods:

- Environmental induction programs and training
- Daily prestart meetings
- Weekly toolbox meetings
- Risk workshops
- Management meetings
- Noticeboards
- Environmental incident reports.

Attendance records and any training associated with the environmental education program will be recorded and maintained by the environment team. The environment team is assigned under the contractor and is responsible for undertaking reporting of attendance and associated environmental education program recording. Reporting is completed through Project database recording, with summaries of topics included within Project environmental periodic reporting. The effectiveness of these communication methods will be subjected to periodic review.

24.4 Incidents, notifications and emergencies

The *Environmental Protection Act 1994* (Qld) (EP Act) outlines the requirements for the duty to notify of environmental harm. Pollution incidents and activities that cause or threaten to cause potential serious environmental harm or potential material environmental harm will be reported within 24 hours to the Department of Environment, Tourism, Science and Innovation (DETSI) (previously known as DESI), and other stakeholders, in accordance with all other legal requirements for reporting, so that appropriate action can be taken to prevent or limit possible environmental harm.

Any incidents or non-compliance with the EPBC Act controlled action approval conditions, will be reported to DCCEEW within two business days. Details of the incident or non-compliance will be provided within 10 business days outlining any corrective action or investigation already taken or intended to be taken in the immediate future, potential impacts of the incident or non-compliance, and the method and timing of any remedial action that will be undertaken.

All staff and contractors will be required to report any environmental incidents (including complaints) or breaches of any approval conditions in accordance with the requirements and timeframes set out in the final Outline EMP, CEMP, Operations EMP, Coordinator-General's evaluation report for the Project under the SDPWO Act and the EPBC Act controlled action approval, ARTC procedures and any statutory requirements.

Project-specific Incident Management Procedures will also be developed to detail the process and resources required to respond to and manage incidents and emergencies during pre-construction activities and early works, construction works, commissioning and operations stages.

24.5 Inspections, monitoring, auditing and reporting

Inspections, monitoring and reporting will be undertaken by relevant authorities as required to document compliance with the Coordinator-General's evaluation report for the Project under the SDPWO Act and the EPBC Act controlled action approval, ARTC procedures, the final Outline EMP, CEMP and Operations EMP.

Where monitoring and reporting determines that the existing management measures are not effective, corrective and preventative measures will be developed and implemented as soon as practicable.

24.5.1 Environmental inspections

The CEMP will include requirements for inspections of construction sites to ensure compliance with approval conditions and other Project-specific plans. The Operations EMP will identify requirements for inspections of the operating Project to ensure compliance with approvals conditions and other Project-specific plans.

24.5.2 Environmental monitoring

Environmental monitoring programs will be developed for the pre-construction activities and early works, and construction works stages of the Project. These monitoring programs will be designed to assess the compliance of the Project with the CEMP and determine the effectiveness of mitigation measures. ARTC will also conduct operational monitoring to comply with requirements of the final Outline EMP, approval conditions and ARTC procedures. Consideration will be given to implementing a live tracking and monitoring system with online community disruption notification and alerts.

Monitoring activities will be conducted by a person who is suitably trained, qualified and experienced. Monitoring will be carried out in accordance with relevant guidelines, including:

- Surface water sampling:
  - *Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009* (Department of Environment and Science (DES), 2018b)
- Groundwater:
  - *Minimum Construction Requirements for Water Bores in Australia* (National Uniform Drillers Licensing Committee, 2020)
  - *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* 2009 (DES, 2018b)
  - *Groundwater Sampling and Analysis—A Field Guide* (Sundaram et al., 2009).
- Air quality:
  - AS/NZ 3580.10.1:2016— *Methods for sampling and analysis of ambient air, Method 10.1: Determination of particulate matter—Deposited matter—Gravimetric method* (Standards Australia and Standards New Zealand, 2016a)
- Noise and vibration:
  - *Transport Noise Management Code of Practice Volume 2—Construction Noise and Vibration* (DTMR, 2023a)
  - AS/NZS International Electrotechnical Commission (IEC) 61672.1-2019 *Electroacoustics – Sound level meters, Part 1: Specifications.*

All monitoring equipment will be maintained and calibrated in accordance with manufacturers' instructions, which will ensure reliability of equipment and data.

Environmental samples will be sent to a National Association of Testing Authorities accredited laboratory for analysis, unless otherwise stated in the CEMP or as approved by the EM. The results of the monitoring programs will be interpreted and reviewed regularly through Project reporting, with non-conformances investigated and resolved as per agreed timeframes.

If monitoring indicates construction or commissioning activities are not in compliance with the imposed conditions or the CEMP, necessary actions will be taken to rectify the identified issue. The CEMP will include a process for regular review, and updating of the CEMP if required, as well as a process to review, endorse and implement additional or different mitigation measures in response to monitoring results.

24.5.3 Corrective actions

A non-conformance and corrective action procedure will be developed for managing non-conformances with the final Outline EMP, approvals or legislative requirements. The procedure will be implemented after the identification of non-conformances during site inspections, environmental audits and through other mechanisms, such as the complaints register. The procedures will include:

- Classification of what constitutes non-conformance
- Investigation requirements
- Identification and implementation of corrective and preventative actions
- Assigning adequate resources and timelines for completion of corrective and preventative actions
- Reporting requirements (internally and externally)
- Process for closing out non-conformances
- Requirements for and the maintenance of a non-conformance register
- Processes for the regular review and status of non-conformances.

The non-conformances and corrective actions may trigger the requirement for a review and modification of practices onsite. These changes in onsite work practices should be reflected in amendments to the EMS and EMPs.

24.5.4 Reporting

During construction, in accordance with the agreed compliance report process, a Construction Compliance Report will be prepared, quarterly, by ARTC. Reporting is completed through Project database recording, with summaries of topics included within Project environmental periodic reporting. This will include:

- Summary of monitoring data and interpretation of the results
- Details of non-compliance events, including a description of the incident, resulting effects, corrective actions, revised practices to prevent a recurrence, responsibility and timing
- Reporting of complaints, including the number of complaints, description of issues, responses and corrective actions.

Relevant works, investigations and approvals undertaken during the pre-construction activities and early works stage of the Project, will be included in the construction compliance reporting by the contractor. These may include:

- Inspection results of installed erosion and sediment control devices, as per the ESCP
- Pre-clearance fauna spotter survey reporting
  - a qualified fauna spotter catcher will supervise and document the sequential clearing of vegetation and relocation of fauna, if required
- Status of secured secondary approvals obtained prior to works commencing
- Document control.

For the duration of construction, an Annual Construction Report will be prepared by the contractor, which will include:

- A compliance evaluation table detailing the relevant imposed conditions, whether compliance with the imposed conditions are achieved and how compliance was evaluated
- An evaluation of compliance with the CEMP
- A summary of non-compliance events during the reporting period
- A summary of non-compliance events during the previous reporting period, with details of site construction works, remediation works, corrective actions taken, or to be taken, and revised practices implemented or to be implemented (as relevant)
- Relevant trends and interpretation related to environmental outcomes and performance criteria for each environmental element (all periods to date).

The Construction Compliance Report and Annual Construction Report will be provided to the EM and ARTC. Reporting will be published on the Project website once validated.

Records that are applicable to construction and commissioning environmental management will be retained for a minimum of 15 years post construction unless otherwise specified in this draft Outline EMP or required under a condition of approval. Environmental records will include:

- Environmental audit reports
- Environmental approval documentation and associated compliance reporting
- Environmental procedures and plans
- Site inspection checklists
- Monitoring data
- Complaints and associated records of communication
- Corrective actions
- Training records
- Meeting minutes
- Regular correspondence.

24.5.5 Auditing

During construction and commissioning, environmental audits will be completed to assess compliance with all applicable environmental requirements, including approval conditions, the CEMP and all relevant laws. This will include internal audits (an internal audit plan will be developed) and if needed, requirements for third-party independent audits will be considered. Third-party independent audits will be led by a Lead Auditor who has completed Environment Lead Auditor training (ISO 14001:2015) and has an appropriate level of experience.

Third-party independent audits will be completed on an annual basis during the construction period. The audits will assess compliance with the following requirements:

- Coordinator-General's evaluation report
- EPBC Act controlled action approval conditions
- Post-EIS approval, licence and permit conditions
- The CEMP.

Audit reports will summarise the findings of the audits and include corrective actions. The audit results, corrective actions required, and conclusions will be communicated to those responsible for implementing the corrective actions. The audit reports will be made available as required.

24.6 Community and stakeholder engagement principles

ARTC is committed to ongoing engagement with the local community and key stakeholders. ARTC acknowledges that active and responsive stakeholder engagement is an ongoing process, and is committed to continuing to work with the community to maintain open and responsive communication channels regarding potential impacts and mitigation measures throughout the life of the Project.

ARTC has five key principles to guide community engagement:

1. **Considerate**: we care about how we impact people and communities. We're timely in our responses and mindful of their needs.
2. **Fair**: we listen, free of judgement and assumptions, to understand the perspectives and needs of our communities.
3. **Inclusive**: We're approachable. We build relationships with our communities and encourage meaningful participation through our engagement activities.
4. **Trustworthy**: We're transparent and honest. We're clear with our people and communities about their ability to influence an outcome.
5. **Connected**: We value our connections in the communities where we live, work and visit. We support initiatives and opportunities that build shared value.

Key elements of community and stakeholder engagement include:

- Develop and implement CSEMPs for construction and operation, which will be informed by the construction and operations SIMPs
- Establish one or more CRG/s for construction to act as a conduit between the Project and the broader community
- Appoint an independent Community Relations Monitor to oversee the community and stakeholder engagement processes for construction
- Provide a Community Relations Liaison Officer for construction, appointed by the contractor
- Ongoing consultation with directly impacted landowners, businesses, and community facilities to ensure Project construction and operation impacts are communicated and, where possible, minimised or mitigated.

24.6.1 Community and Stakeholder Engagement Management Plans

The CSEMPs will be developed under the construction and operations SIMPs to provide the framework for community and stakeholder engagement during the construction works and operations stages, in line with ARTC's engagement principles. The aim of a CSEMP is to maintain proactive and positive stakeholder engagement during construction and operation, and to minimise or mitigate disruption to the community as a result of the Project.

The CSEMPs are overarching plans that will guide individual engagement strategies and communication. The CSEMPs will inform stakeholder engagement activities, provide proactive communication strategies, monitor community feedback and manage the complaints process.

24.6.2 Community Reference Groups

Following Project approval under the SDPWO Act and EPBC Act, CRG/s will be established to engage with the community during the construction works stage. ARTC will work with the contractor to establish one or more Project CRG/s during the detailed design stage.

The CRG/s will meet regularly until the completion of construction to provide timely, open advice about the Project, enable representations of community issues to be made to ARTC, and facilitate community review of the effectiveness of the SIMP measures. The CRG/s will:

- Provide a channel to inform communities about the construction works stage of the Project
- Provide feedback to ARTC about construction plans and programs
- Receive updates on SIMP implementation, and enable feedback on mitigation and enhancement measures that need to be reconsidered or refined
- Enable CRG members to participate in monitoring the effectiveness of social and environmental management measures.

Community members and other stakeholders will have access to CRG proceedings via provision of endorsed copies of minutes and other meeting records for the public record and for display on the Project's webpage, where appropriate.

The need for a CRG for any part of the operations stage will be reviewed in cooperation with the Coordinator-General at the completion of construction.

24.6.3 Community Relations Monitor

ARTC will engage an appropriately skilled and experienced entity to act as the Community Relations Monitor for the duration of the construction works stage to:

- Review and provide advice to the EM on the construction CSEMP (including the Complaints Management System)
- Provide advice to the EM in relation to complaints, community engagement and consultation on mitigation management measures
- Be available to members of the community in accordance with the construction CSEMP.

The roles and responsibilities of the Community Relations Monitor are set out in Section 24.2.

24.6.4 Community Liaison Officer

The contractor will provide community liaison/engagement staff during the construction works stage to:

- Support communication between the contractor, nearby landowners, community members and other stakeholders
- Provide community feedback to the contractor in relation to the impacts of construction activities on the community, and suggested refinements to environment management measures
- Undertake engagement to support implementation of partnerships and community initiatives
- Provide information to the wider community in relation to construction programming, the nature of construction work, and impact mitigation measures
- Establish and maintain a process for receiving, recording and responding to complaints in relation to construction issues.

Depending on the CSEMP, one or more Community Liaison Officer/s may be provided, which will be determined during the detailed design stage.

Contact details for the Community Liaison Officer/s will be provided to all landowners adjacent to the Project footprint and as part of engagement with other residents and businesses, and will be made available to other community members through the Project's website and ARTC's other communication channels.

24.6.5 Directly impacted landowner and key stakeholder consultation

ARTC will undertake ongoing and proactive engagement with directly impacted landowners, businesses and managers of community and educational facilities in the regions impacted by the Project. Through this engagement, ARTC will work with stakeholders as design develops to identify likely impacts and develop effective mitigation strategies.

ARTC will work with individual landowners to accommodate the continuation of current property management activities and access across properties, where possible, into the detailed design and construction methodology. Individual property treatments will detail any required adjustments to fencing, access, farm infrastructure or relocation of impacted structures. When required, the Community Relations Monitor will attend meetings between ARTC and directly impacted stakeholders on construction issues and potential mitigation measures.

24.7 Complaints management

A complaints management system will be developed that applies to all Project employees, contractors and site visitors for the construction works stage. The aim of the system is to ensure that complaints are dealt with efficiently and effectively, and that stakeholders have confidence in the Project's complaint system.

Complaints can be lodged by any member of the public, landowners or other stakeholders.

The complaints management system will include:

- The capacity for community members to make enquiries or complaints on a 24-hour, 7-days-a-week basis during the construction works stage
- Promotion of the complaints procedure through direct information to people within 500 metres (m) of the Project's footprint, the ARTC Inland Rail website, advertisements and newsletters
- A register to track complaints and actions taken in response to complaints, to support provision of information to the Community Relations Monitor about complaints and their resolution as well as regular reporting via the monthly environmental report
- Reasonable access by the community to the Community Relations Monitor.

The Project complaints management system will be implemented from one (1) month before the start of pre-construction and early works, and will run for 12 months following the completion of construction. Complaints relating to commissioning and operation will be addressed through the ARTC complaints management system.

24.8 Construction hours

Construction will only commence once the relevant components of the Project approvals and corridor acquisition are complete, and the Project's CEMP has been endorsed as required.

The majority of the construction works for the Project will be undertaken during the day, however, extended hours on construction may be undertaken subject to appropriate controls and approval, to shorten the duration of the construction period and to minimise potential impacts to the community. Extended construction hours including night-time activities may be required for safety, logistics and construction reasons such as the delivery of oversized plant or structures requiring special arrangements to transport along public roads, works requiring continuous construction support such as continuous concrete pours, pipe-jacking or other forms of ground support necessary to avoid a failure or construction incident, and works required to be undertaken during rail possession.

The following primary construction hours are generally proposed:

- Monday to Sunday 6:00 am to 6:00 pm
- No work on public holidays.

Blasting activities would only be undertaken during the hours of:

- Monday to Friday 9:00 am to 3:00 pm
- Saturday 9:00 am to 1:00 pm
- No blasting on Sundays and public holidays.

The hours indicate the start and end times for daily construction work. Each day begins with preparation activities and mobilisation of work crews, and ends with task completion and securing the work site. Intensive construction work beings once the initial daily setup is complete and concludes as part of the end-of-day shutdown tasks.

Depending on the nature of the works some activities may need to be undertaken outside of the primary construction hours. Construction works outside of the primary hours may occur throughout the duration of the construction program in the following or similar scenarios:

- Work during rail corridor possessions. Where works are required within the active railway corridor of the South Western system it will be necessary to undertake works under track possessions, during which the contractor has control over an existing railway corridor. Extended work hours may be required during this time to enable works to be undertaken safely and to shorten the overall duration of disruption to the rail industry during the necessary closure of the South Western system during construction works
- The delivery of oversized plant or structures that police or other authorities have determined requires special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent or contain environmental harm
- Works to ensure construction personnel, road user or public safety
- In the event of significant weather approaching the construction site and protective works are required or weather sensitive works must be completed
- Delivery of 'in time' concrete, steel, and other construction materials and components delivered to site by heavy vehicles
- Movements of heavy plant and materials
- Transport, assembly, or decommissioning of oversized plant, equipment, components, or structures
- Works that require continuous construction support, such as continuous concrete pours, pipe-jacking or other forms of ground support necessary to avoid a failure or construction incident
- Works that cannot be undertaken during the day due to ambient daytime temperatures such as rail tamping where the stress-free temperature of the rail cannot be achieved during the primary hours of construction
- Haulage along the rail corridor
- Roadworks to local and arterial roads, including works required to maintain the safety of motorists and workers
- 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
- Arrival and departure of construction staff during shift change-overs
- Where a negotiated agreement is reached with sensitive receptors (owners and occupiers) to carry out works in accordance with the construction hours specified in the negotiated agreement.

Where works are required outside of the primary hours of construction, site-specific assessments, for example noise and vibration, would be undertaken to demonstrate that the environmental impacts, and risks associated with the works can be managed consistent with relevant guidelines and requirements. The assessments would determine the additional measures required to mitigate the identified impacts and support the justification of construction hours at the work locations.

When work is required outside of the primary hours of construction, such as night works and material deliveries, it will be carefully planned and subject to appropriate controls, particularly to mitigate noise and vibration impacts. The planning process will include consultation with affected individuals, the local community, and stakeholders to inform them of the proposed work, any anticipated impacts, and the measures implemented to control potential impacts.

24.8.1 Managing environmental impacts from construction works

Whilst construction works will be undertaken during various times of day, the methods to manage the generation of noise and vibration from all works will be determined in accordance with DTMR's *Transport Noise Management Code of Practice Volume 2 – Construction Noise and Vibration* (2023a).

The management of environmental issues during the construction stage will be in accordance with the structured approach of the Project's CEMP to demonstrate consistency with relevant guidelines, Project-specific requirements and all relevant laws. The CEMP will detail control measures based on site-specific assessments and the confirmed construction programs, and provide justification of nominated construction hours at the relevant work locations for compliance with applicable legislation, guidelines, and project-specific commitments. The planning process for any works undertaken during extended hours will include consultation with affected stakeholders to inform them of the proposed work, any anticipated impacts, and the measures implemented to control potential impacts.

24.9 Environmental management

This section provides discipline-specific environmental management requirements including:

- Environmental outcomes of relevant Project works
- Performance criteria, demonstrating how environmental outcomes will be achieved
- Mitigation measures
- Monitoring, auditing and reporting.

24.9.1 Land use and tenure

24.9.1.1 Environmental outcomes

- The Project is designed to avoid or mitigate impacts to existing land uses, where practicable
- Land required temporarily for the Project's construction is rehabilitated to be safe, stable, non-polluting and appropriate to accommodate future land uses, as identified through consultation with the landowner.

24.9.1.2 Performance criteria

- The Project is designed to co-locate with existing rail and road infrastructure and corridors, where possible, minimising the need to develop land that has not previously been subject to disturbance for transport infrastructure purposes
- The Project works and incidental works will require the acquisition of land by of negotiation and resumption. The land includes State land and State forest
- The Project footprint is limited to that required to safely and efficiently construct, operate and maintain the Project
- The Project is appropriately integrated with adjoining land uses. Where legal access was pre-existing and if practicable, access to adjoining land, utilities and infrastructure is maintained or re-established on completion of the Project construction works
- ARTC land access protocols and procedures will be followed
- Where land severance results in compromised continuation of existing land uses, ARTC will consult with affected landowners and identify mitigation measures to be documented within individual property agreements.

24.9.1.3 Management and mitigation measures

Land use and tenure aspects (including the securing of Project regulatory approvals and land acquisition processes) and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-3.

24.9.1.4 Monitoring, auditing and reporting

Implementation of land use and tenure elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with the processes specified in Section 24.5.

TABLE 24-3 MITIGATION MEASURES—LAND USE AND TENURE

Detailed design

Aspect	Mitigation measures
Property acquisition and approval	▸ Detailed design to further refine the Project footprint, to that which is required to safely construct, operate and maintain the Project including to minimise property acquisition requirements, property severance and disruption to land use and transport networks ▸ Individual property treatments to address land use impacts will be developed in consultation with landowners/occupants, with respect to the management of construction on, or adjacent to, private properties. These will detail any required adjustments to fencing, access, farm infrastructure or relocation of impacted structures, as required. Measures, where agreed, will be documented in individual property agreements ▸ ARTC will consult with directly impacted landowners whose property would be partially or fully acquired for the Project regarding land acquisition ▸ With the commencement of the acquisition of land process, ARTC will work with all directly impacted landowners to ensure that Project impacts are minimised or mitigated where possible ▸ ARTC's strategy to reduce the impacts of property acquisition on landowners, occupants and their families includes: ▸ meeting with all directly affected landowners and occupants who would need to relocate as the result of the Project's land acquisitions, to identify their specific needs and concerns and refer them to services that can support them in the relocation process, if required ▸ based on detailed design, meeting with directly affected landowners to confirm property-specific management measures including, as relevant: – property access arrangements – avoiding/minimising impacts on property uses – access and egress solutions across the rail corridor – noise mitigation, where triggered by noise exceedances ▸ provision of a relocation support team who will provide information, liaison and, if necessary, service referrals to residents who need to relocate ▸ ARTC will consult with the resource holders of authorities to prospect, pipeline licences and potential commercial areas within the Project footprint ▸ ARTC will consult with the Department of Primary Industries (DPI) (previously known as DAF) in the development of the final Environmental Offsets Delivery Strategy and delivery plans. ▸ ARTC will consult with the tenure holder of the Commodore Mine, regarding future development of the mine.
Landowner/occupier access to and use of property	▸ ARTC will engage in ongoing consultation with adjoining landowners to identify and resolve access requirements to property identified as being potentially affected by either the Project construction works or the completed Project infrastructure ▸ Where legal access to a property is permanently affected and a property has no other legal means of access, alternative access to and from a public road will be provided to an equivalent standard, where feasible and practicable ▸ The suitable design treatment for interfaces between the Project and private accesses will be developed in consultation with the relevant landowner, on a case-by case basis. ARTC will consult directly with adjacent landowners to inform detailed design and construction planning to identify their requirements for continued use of their land, having regard to: ▸ their needs for practical access to their land ▸ access to existing on-farm infrastructure, including water supplies ▸ existing arrangements for stock movements and the movement of farm machinery ▸ possible changes to boundary fencing ▸ established farm or property management practices.

Aspect	Mitigation measures
Interface with State land and State forests	▸ ARTC will consult with DPI and the Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRMMRRD) (previously known as DoR) regarding Project interface issues that have the potential to impact the management and use of State forests, and provide suitable buffers for both the construction and operations stages of the Project, where Project works have the potential to affect the use, operation and management of State land and State forests. Suitable buffers may include spatial and structural design responses, where relevant and practical. ▸ Other interfaces with State owned infrastructure (e.g. roads) will be resolved through consultation and agreement with the appropriate agency.
Design interface with stock routes	▸ Consultation with DNRMMRRD, GRC and TRC will continue through the detailed design stage to maintain the utility of existing public stock routes. ▸ Where stock fencing is required, fencing will be designed in accordance with the Project's general fencing strategy (Chapter 5: Project Description), unless an alternative approach is agreed with landowners, DNRMMRRD, GRC or TRC. This will occur prior to the removal or realignment of existing fencing and prior to any works being carried out on the subject land, unless otherwise agreed with the landowner. ▸ ARTC will implement and maintain a system for the communication of train movements through level crossings to facilitate safe movement of livestock and agricultural machinery across the rail corridor. The system will be developed in consultation with landowners, stock operators, DNRMMRRD, GRC or TRC and will be accessible to them prior to the commencement of operations. ▸ Connectivity for private stock movement will be provided through detailed design. Where disruption to private stock movements may occur during construction, appropriate temporary connectivity solutions will be agreed in advance with the relevant landowner and documented in a property agreement.
Design interface with barrier fences	▸ Detailed design drawings of ARTC's nominated fencing solution for the reinstatement of biosecurity fences will be submitted to GRC, DPI, DETSI (wild dog check fences) and the Darling Downs Moreton Rabbit Board (DDMRB) (rabbit fence) for acceptance.
Design interface with utilities	▸ The method for utility modification, upgrade, diversion or realignment will be confirmed through detailed design and consultation with the affected utility owners ▸ Disturbance of existing utilities will occur under access arrangements and approval with the relevant asset manager, obtained prior to commencing work ▸ Where permanent utility protection is required, it will be designed based on further geotechnical and soil condition data and will be subject to acceptance by the relevant utility owner ▸ Designs for utility protection, where necessary, will be developed in consultation with the relevant utility owner.

Pre-construction activities and early works

Aspect	Mitigation measures
Design interface with utilities	▸ Utilities within the Project footprint will be surveyed and marked prior to the relevant construction works commencing ▸ Where protection or relocation of a utility is required as an outcome of consultation with asset owners and detailed design, these works will be undertaken prior to the relevant construction works commencing ▸ Protection or relocation of utilities will be conducted in accordance with relevant legislation, standards and guidelines.
Design interface with fences	▸ Where severance of the wild dog check fence or DDMRB rabbit fence is required, fence realignment and reconstruction will be undertaken prior to the commencement of construction of rail infrastructure. Replacement fencing will be in accordance with detailed design in consultation and agreement with the with relevant stakeholders, including DETSI/Queensland Parks and Wildlife Service and Partnerships (QPWS&P), impacted landowners and lessees, DPI and GRC. ▸ DPI consultation is required before any modifications to the wild dog check fence are undertaken under section 91(3) of the *Biosecurity Act 2014* (Qld) (Biosecurity Act).

Construction works

Aspect	Mitigation measures
Access to private property	▸ Property owners, occupants and businesses will be advised in advance, of the timing and scope of activities in their area and potential impacts or interruptions to access, services, or property operational arrangements.
Interface with stock routes	▸ ARTC will coordinate with GRC and DNRMMRRD regarding the permitted use of the South Kurumbal Road stock route. ARTC will ensure traffic management is in place to assist in managing stock movement around the proposed construction laydown area in a safe and efficient manner.
Interface with utilities	▸ Construction activities will be planned and executed so as not to inhibit the safe and efficient operation of utilities that remain within the Project footprint ▸ Affected businesses and residences will be notified in advance of any planned interruptions (including durations) ▸ Disturbance of existing utilities will occur under access arrangements and approval with the relevant asset manager, obtained prior to commencing work ▸ In the event that previously unidentified underground utilities are encountered during construction, work will cease in proximity to the utility until the type and status of the services (operational/disused) can be confirmed, in accordance with *AS 1345 Identification of the contents of pipes, conduits and ducts* (Standards Australia, 1995).

Operations

Aspect	Mitigation measures
Land use	▸ If maintenance activities require access to private properties outside of the rail corridor, landowner approval will be obtained in advance of commencing the relevant activities in accordance with ARTC land access protocols and procedures.

24.9.2 Land resources

24.9.2.1 Environmental outcomes

- The Project results in minimal loss or degradation of soil resources, attributable to the Project
- The Project results in minimal degradation of aquatic and terrestrial habitats from erosion and increased sediment load
- The delivery of the Project does not result in new or exacerbated land contamination
- The Project maximises the potential for successful land rehabilitation following construction.

24.9.2.2 Performance criteria

- Erosion and sediment controls will be established at the commencement of ground disturbing works in an area and are maintained in effective working order until construction works have completed and the land has stabilised
- Contamination encountered during delivery of the Project is investigated and managed in accordance with the requirements of the EP Act and *National Environment Protection (Assessment of Site Contamination) Measure* (ASC NEPM)
- All land disturbed during construction will be rehabilitated, or otherwise stabilised, at the completion of works.

24.9.2.3 Management and mitigation measures

Land resources aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-4.

24.9.2.4 Monitoring, auditing and reporting

Implementation of land resources elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with the processes specified in Section 24.5.

TABLE 24-4 MITIGATION MEASURES—LAND RESOURCES

Detailed design

Aspect	Mitigation measures
General	▸ The draft Soil Management Plan (Appendix AB: Earthworks Strategy and Draft Soil Management Plan) will be further developed and finalised for the Project during the detailed design stage. The Plan will be based on updated design information, including any changed mass haul and cut-and-fill quantities with greater detail of the management requirements. The plan will draw from the existing information (including Appendix J: Soil Assessment Report, Appendix H: Geomorphology Report and Appendix AB: Earthworks Strategy and Draft Soil Management Plan), and will include the following procedures and protocols relevant to potential impacts on land resources: ▸ Topsoil and subsoil management ▸ Soil/land conservation objectives for the Project to minimise impacts on soil conservation plans and viable productive land, and include: – incorporation and maintenance of appropriate design measures to ensure overland flow through the landscape is not impeded by the project resulting in increased soil erosion or sedimentation of the surrounding environment. particularly for steams, gully and floodplains – consideration of stream and gully erosion, land slope, land use, soil type, rainfall, trafficability and farm type when designing new contour banks – retention of vegetation and embankment stabilisation to conserve soil – protection of surrounding of floodplains, infrastructure and horticulture ▸ Management of potentially hazardous soils, such as: – acid sulfate soils, which may occur in proximity to wetland features and water storages – erosive or dispersive soils, such as sodic soils, present between the Macintyre River and Yelarbon as well as along the fertile lands north of Inglewood to the west of Kooroongarra (Chapter 9: Land Resources (Figure 9-6)) – cracking/expansive clays (Vertosols) present between Macintyre River and Whetstone, Koorongarra and Gowrie (Chapter 9: Land Resources (Figure 9-6)) – saline soils, particularly in high salinity hazard areas such as between Kurumbul and Yelarbon ▸ Appropriate design considerations will be implemented where cracking/expansive clays feature, as well as minimising shrink-swell characteristics through methods such as maintaining a constant soil moisture level ▸ Development of a ESCP that specifies the type and location of erosion and sediment controls. The erosion and sediment control measures will be developed by a Certified Professional in Erosion and Sediment Control and be in accordance with the International Erosion Control Association's *Best Practice Erosion and Sediment Control* (2008) ▸ The finalised Soil Management Plan will include: – locations for specific temporary/permanent erosion and sediment control measures, such as: – sediment retention basins – scour protection (included in the revised reference design) – sediment fencing – berms and other surface flow diversions. – nomination of location-specific erosion controls will include consideration of site conditions, proximity to environmental receptors, adjoining land uses, climatic and seasonal factors, and will be based on an erosion risk assessment – minimise the area of disturbance during each stage to that required to enable the safe construction, operation and maintenance of the rail corridor: – scheduling of works with consideration to periods of higher rainfall (summer months) – establish and specify the monitoring and performance objectives for handover on completion of construction – stockpiling and management/segregation of topsoil where it contains native plants seedbank or weed material.

Aspect	Mitigation measures

General (continued)	▸ Where required, site specific Soil Management Plans will be developed for discrete sections of the Project footprint, to specify more precisely the management requirements for the specific soils, and their physical and chemical properties, encountered through those discrete section of the Project alignment.
	▸ Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction.
	▸ A Contaminated Land Management Plan will be developed for the Project during detailed design, as a component of the CEMP. The plan will be prepared by a suitably qualified person under the EP Act and will, at a minimum:
	  ▸ be developed based on the contaminated land strategy presented in Figure 24-3
	  ▸ specify management controls for works on land that is known or suspected of being contaminated and will outline the process to identify, document and manage contaminated sites
	  ▸ seek to minimise soil disturbance in areas listed on the Environmental Management Register (EMR) (Chapter 9: Land Resources (Table 9-16)).
	  ▸ establish the methodology and sampling and analysis plan for environmental site investigation where soil disturbance is required on an EMR site in the potentially contaminated area
	  ▸ establish an unexpected finds protocol/procedure if potentially contaminated materials, including unexploded ordinance, are encountered during construction activities.

Additional investigations	▸ Additional flooding, geomorphological, geotechnical and soils investigations will be undertaken to inform the design of earthworks, drainage structures and foundations for structures, suitability of borrow and quarry material, and construction planning for the Project. Additional geotechnical investigations will specifically target locations where the design includes:
	  ▸ cuts and embankments
	  ▸ bridge piers and abutments
	  ▸ floodplains, streams and gullies. Disturbance of potentially erodible soils and in areas in or near high value receiving environments such as watercourses, high value vegetation and agricultural land. Disturbance of any potentially hazardous soils, specifically material within or on the floodplains in cut off relict streams and billabongs or lakes adjacent to Macintyre River, Macintyre Brook, Condamine River and Oxley Creek
	▸ The erosion threshold velocity (ETV) for natural ground surfaces will be established from a site-specific assessment by a suitably qualified specialist, and in consideration of engineering guidelines. Drainage design and mitigations will be revisited in response to updated assessments.

Landform and material use	▸ Review and update the draft Soil Management Plan for the Project to reflect any changed mass haul and cut-and-fill quantities at the end of the detailed design process (as detailed in the ‘General’ category of this table, above).
	▸ Explore, through detailed design, the viability of opportunities for:
	  ▸ re-use of local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul
	  ▸ re-use of material excavated below the rail embankment for less critical parts of infrastructure
	  ▸ re-use of excavated material as a stabilised structural fill
	  ▸ re-use of ballast as high-quality general fill or structural fill to minimise the import of rock armour.
	▸ Identify and pursue further opportunities through design to minimise disturbance to existing landform to construct, operate and maintain the Project safely and efficiently.
	▸ Opportunities for embankment batter slope optimisation will continue to be investigated in detailed design with respect to soil type and geological profiles to ensure best practice treatment controls and erosion protection are incorporated in the final Project design.
	▸ Further design development aimed at optimising civil earthworks to minimise the overall fill deficit of the Project, maximise opportunities for material re-use and lead to as close to a net balance in earthworks as possible, including reusing excess material for works within the permanent footprint (e.g. landscaping) and for restoration of modified landform within the temporary footprint (e.g. restoring borrow pits).
	▸ Reuse of excess material for other developments (e.g. neighbouring construction activities), will be explored during the design process with priority given to other adjoining Inland Rail projects.
	▸ Identify opportunities for optimised embankment and batter slopes for optimal stability and erosion protection during detailed design.

Aspect	Mitigation measures
Flooding and soil management	▸ Further design development in consultation and agreement with impacted landowners and supported by further flood modelling, detailed survey and local soils and ecological information to inform detailed design. The Project's approach to the management of residual flood impacts and the hierarchy of control measures to minimise risks to people, property, infrastructure, and the environment is shown in Section 24.9.7.3 and Chapter 14: Flooding and Geomorphology (Figure 14-8 and Section 14.8). ▸ Assessment of treatment options will occur through the design development, in consultation with landowners and in line with the Flood Impact Objectives (FIOs) to ensure changes to overland flow and flooding regimes including flow velocities do not lead to increased erosion and sedimentation or damage to infrastructure. Treatment options may include scour protection (e.g. rip rap or gabions), culvert location, configuration, grade and spread, flow baffles/energy dissipators, and vegetated strips. ▸ The Project will be designed to achieve a 1% Annual Exceedance Probability (AEP) flood immunity to rail formation level and to, where possible, meet the FIOs detailed in Table 24-10. ARTC will continue to consult with impacted landowners regarding the flood modelling results and residual FIOs exceedances through development of the detailed design. Mitigation measures to effectively manage land resources related impacts from residual FIOs exceedances will be discussed with affected landowners, in line with the Project's Flood and Geomorphic Impacts Mitigation Framework (as detailed in Section 24.9.7.3). ▸ ARTC to consult with potentially affected landowners and other stakeholders during the detailed design stage regarding the Project, potential flood impacts and design outcomes in relation to hydrological profiles and impacts on land resources and infrastructure. ▸ Minimise changes in natural flow patterns and changes to flood-flow distribution across floodplain areas during design development. ▸ Drainage paths that are conveying runoff from adjoining terrain, minor watercourses, and gullies, to be further developed during detailed design to avoid ponding of water and/or excessive duration of inundation. ▸ Reassess flooding mitigations, if required as a result of design development, based on the outcomes of additional ETV analysis using site-specific and direct assessments by a suitably qualified specialist (e.g. flume method).
Acid sulfate soils (ASS)	▸ If ASS is identified through further investigations during detailed design, ASS will be managed in accordance with the *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0* (Dear et al., 2014) and the State Planning Policy.
Soil conservation plans	▸ The status of relevant soil conservation plans that may be impacted by the Project will be checked and confirmed during detailed design to ensure all current plans are identified which correspond to the Project footprint and those that have the potential to be impacted by the Project. This will be undertaken in consultation with DNRMMRRD and the landowners relevant to each soil conservation plan. ▸ If a soil conservation plan is found to be current and materially affected by the Project following application of the hierarchy of controls to reduce flood impacts as detailed in the Project's approach to flooding mitigation designed to avoid, reduce and manage impacts, ARTC will address the requirements for amending or modifying plans in accordance with the *Soil Conservation Act 1986* (Qld) and in consultation with DNRMMRRD and the impacted landowner during detailed design. If required, this would be progressed under the direction of a Suitably Qualified Professional and in consultation with DNRMMRRD and the holder of the soil conservation plan. ▸ Residual FIOs exceedances will be discussed with affected landowners, in line with the Project's Flood and Geomorphic Impacts Mitigation Framework (as detailed in Section 24.9.7.3).
Secondary salinity	▸ Proposed temporary earthworks and permanent landform for the Project are designed to avoid unwanted water ponding. This objective will be achieved through surface levelling and use of cross-drainage and longitudinal drains within the rail corridor. ▸ Design water retention structures, such as sediment basins, to prevent downward leakage of water, with the use of lining or similar. ▸ Design development to avoid, where possible, the need for diversions or alterations to water resources.

Aspect	Mitigation measures
Contaminated land	▸ Develop a Contaminated Land Management Plan, as a component of the CEMP during detailed design (as detailed in 'General' category of this table, above). ▸ A contamination assessment of EMR listed sites and other areas of potential contamination will be undertaken once detailed design, the Project footprint and the cut-and-fill balance are finalised, in accordance with the requirements of ASC NEPM.
Hazardous materials and dangerous goods	▸ Develop a Hazardous Materials Management Plan, as a component of the CEMP during detailed design (as detailed in Table 24-18).

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Landform and material use	▸ The sourcing of materials which may be needed for any soil stabilisation requirements (e.g. lime) from licenced facilities and in accordance with necessary approvals requirements. Appropriate risk mitigation and safety measures will be implemented to ensure stabilisation materials including lime and gypsum, are safely transported to and stored onsite to avoid spillage and minimise associated dust. The placement and treatment of the stabilisers during construction will also be planned and executed to avoid spillage and minimise associated dust. ▸ After exhausting reuse opportunities, spoil (e.g. material with no reuse potential) will be disposed of offsite at a licensed facility.
Contamination	▸ Suspected contaminated soils or materials, if encountered, will be managed in accordance with the unexpected finds protocol/procedure documented in the Contaminated Land Management Plan (as detailed in 'General' category of this table, above). ▸ Opportunities to treat and re-use contaminated materials within the rail corridor will be assessed and subject to a risk assessment, as per the contaminated land management strategy (Figure 24-3). ▸ Material that meets ASC NEPM contamination criteria for commercial/industrial land use settings and is deemed suitable from a geotechnical perspective will, where feasible, be beneficially reused or managed within the rail corridor (e.g. fill, capping, ballast or other beneficial reuse) where risks to human health and the environment can be managed. ▸ If material does not meet ASC NEPM contamination criteria for commercial/industrial land use settings, assess possible treatment options for effectiveness, feasibility and cost before disposal options are considered. Contaminated material that cannot reasonably be treated for re-use may be removed from site for disposal at a licenced landfill as contaminated waste. A Soil Disposal Permit under the EP Act will be obtained if contaminated soil is to be moved from a lot listed on the EMR. ▸ Contaminated material will be transported and disposed to a licenced facility in accordance with the EP Act and procedures within the Waste Management Plan (as detailed in Table 24-19).
Soil management	▸ Maintain topsoil quality and quantity throughout construction activities. ▸ Minimise the generation of dust from soil disturbing activities ▸ minimise exposure of dispersive subsoils through methods such as staging construction disturbance, topsoil replacement or rehabilitation immediately following stabilisation. ▸ Return land to a stable, safe and non-polluting landform (i.e. no subsidence or major erosion) with no greater management inputs than those required prior to land disturbance.
Erosion and sediment control	▸ Implement an ESCP as a component of the CEMP (as detailed in Table 24-9) to guide development of site or section specific ESCPs.
Secondary salinity	▸ The site surface will be levelled/include contouring and drainage to prevent inadvertent ponding of water through the construction works stage. ▸ Water that is dispersed for vegetation establishment, landscaping and rehabilitation will be consistent with the quality requirements specified for irrigation and general water use in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments, 2018). ▸ Avoid ponding and oversaturation of soils within the Project footprint.

Aspect	Mitigation measures
Hazardous materials and dangerous goods	▸ Implement the Hazardous Materials Management Plan, as a component of the CEMP (as detailed in Table 24-18). ▸ Where the bulk storage of diesel fuel is proposed, investigations to be undertaken prior to fuel depot establishment to understand existing site conditions and at the completion of the fuel depot use as determined by relevant environmental authorities obtained under the EP Act for the Project following EIS Project approval. ▸ Implement the Waste Management Plan, as a component of the CEMP (as detailed in Table 24-19). ▸ Where identified, asbestos-containing materials will be removed prior to the commencement of construction. Asbestos removal and handling will be conducted in accordance with relevant legislation, standards and guidelines. ▸ Asbestos-containing materials will be transported by a licenced service provider and disposed of at an appropriately licenced facility, in accordance with the requirements of the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act), *Work Health and Safety Act 2011* (Qld) and the EP Act.
Rehabilitation	▸ Reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively, consistent with the Rehabilitation and Landscaping Management Plan (as detailed in Table 24-5).

Operations

Aspect	Mitigation measures
Erosion and sediment control	▸ The effectiveness of permanent erosion and sediment control measures (e.g. scour protection or vegetated swales) will be monitored as part of the maintenance inspection schedule for the Project. ▸ Controls that are found to be failing or not performing as intended will either be modified or replaced, as required. ▸ Rail embankment slopes will be maintained to prevent slope face degradation. ▸ Maintenance of surface and subsurface drains will ensure effectiveness and to minimise risk of impact to surrounding and downstream environments and structures. ▸ Inspections will be carried out on waterway and drainage systems post-commencement of operations as per the agreed maintenance schedules to monitor scour, blockage or partial blockage of the waterway or drainage line, damage to waterways and drains, indications of overtopping of a structure and culvert/drain damage or collapse. ▸ Where defects are identified corrective actions will be undertaken, where required.

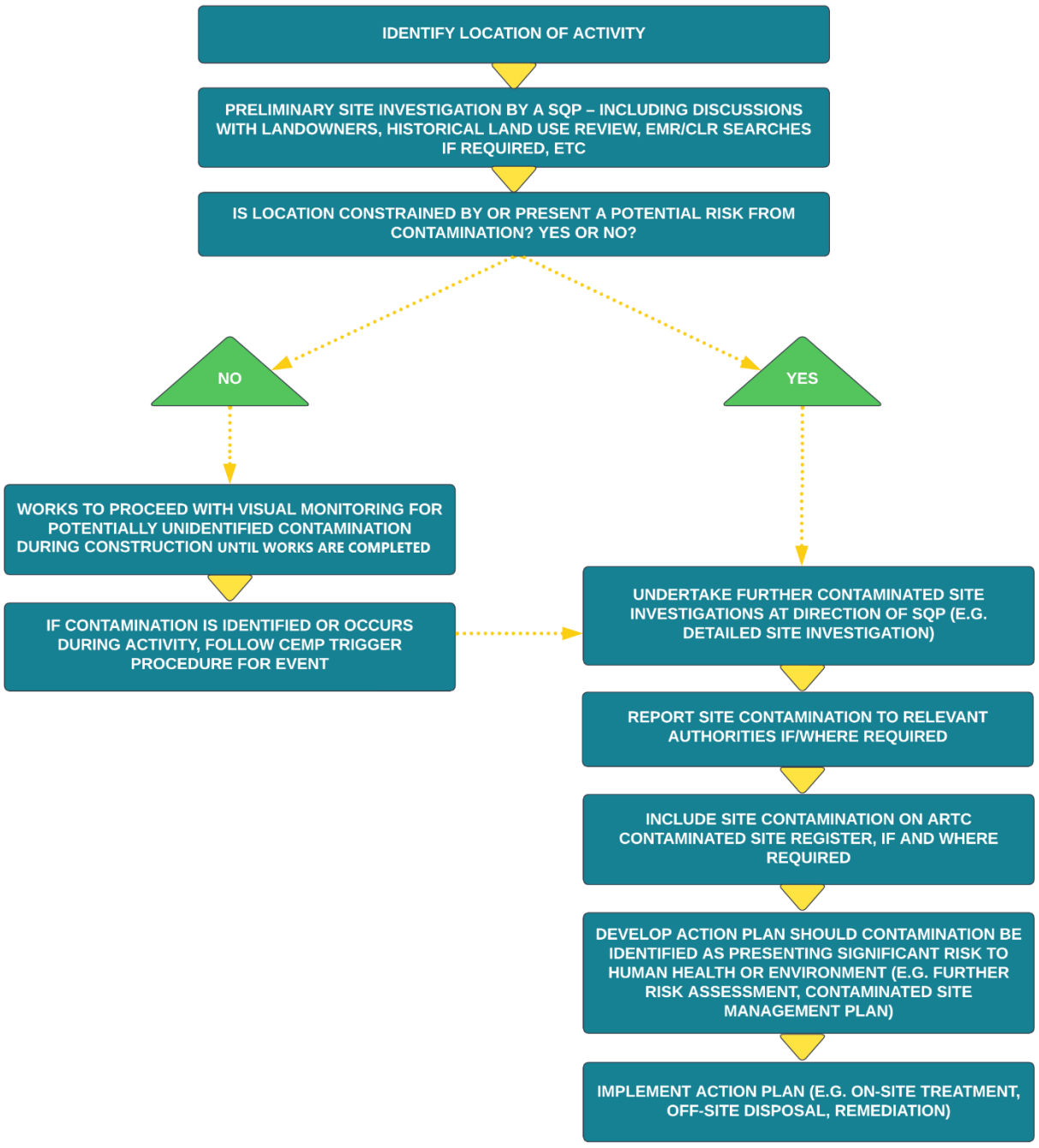

FIGURE 24-3 CONTAMINATED LAND MANAGEMENT STRATEGY FOR FUTURE ASSESSMENT WITHIN THE PROJECT FOOTPRINT

24.9.3 Landscape and visual amenity

24.9.3.1 Environmental outcomes

- The Project is designed to respond to, and address, visual impacts through appropriate mitigations
- The design of rail infrastructure and associated landscape treatments (including slope and stabilisation measures) responds appropriately to the natural and rural landscape, topography and landform, while complying with engineering design standards and legislative requirements
- The Project is designed and delivered to manage impacts and nuisance from construction and operation lighting while maintaining safety and efficiency.

24.9.3.2 Performance criteria

- Opportunities to reduce the Project's visual impact, such as through the consideration of interfaces with steep or prominent landforms, areas of remnant vegetation and watercourses, are considered during the detailed design stage
- Nuisance from construction lighting on sensitive places and nearby roads is avoided or minimised, where practicable. Any nuisance complaints received will be addressed in accordance with the complaints management procedure.

24.9.3.3 Management and mitigation measures

Landscape and visual amenity aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-5.

24.9.3.4 Monitoring, auditing and reporting

Implementation of landscape and visual amenity elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5.

TABLE 24-5 MITIGATION MEASURES—LANDSCAPE AND VISUAL AMENITY

Detailed design

Aspect	Mitigation measures
General	▸ A Rehabilitation and Landscaping Management Plan will be developed for the Project as a component of the CEMP. This plan will be developed in consultation with local councils and affected communities, including Traditional Owners, and will consider location and lot-specific reinstatement agreements. At a minimum, the Rehabilitation and Landscaping Management Plan will include and identify: ▸ location-specific objectives for rehabilitation, reinstatement and/or stabilisation. Outside of the Project rail corridor, lot-specific and township-specific (e.g. Yelarbon, Pampas, Brookstead, Pittsworth) rehabilitation and landscaping requirements may apply and will be developed in collaboration with the relevant landowner, local council or DTMR. Where the rail corridor passes through landscapes of importance to Traditional Owners, consultation will be undertaken (including with the Bigambul Native Title Aboriginal Corporation) to develop mitigation to 'care for Country'. Within the Project rail corridor, maintaining operational safety and rail formation stability will be the driving factors. ▸ timeframes, performance objectives and responsibilities for rehabilitation, reinstatement and/or stabilisation works (including biodiversity, vegetation establishment and erosion and sediment control outcomes to be achieved) ▸ where appropriate, how the objectives align with relevant recovery plans, threat abatement plans, conservation advice or policy guidance for target species in areas identified for rehabilitation ▸ actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, while minimising the duration of exposure in disturbed areas ▸ rehabilitation requirements, such as: – milling and removal of bitumen pavement – removal of any decommissioned culverts – tyning and ripping of base and sub-base material Application of soil ameliorants – topsoiling and/or compost blanket – stabilisation including planting and/ or seeding. ▸ how the stabilisation and rehabilitation works palettes consider native flora species endemic to the Darling Downs and Toowoomba regions or other suitable species appropriate to the landscape context and nursery/seed stock sources ▸ consideration for maintenance or performance issues of rehabilitation (e.g. use of groundcover that does not grow and obscure signals or impact the longevity of rail infrastructure) ▸ how the objectives align with relevant recovery plans, threat abatement plans, conservation advices, or policy guidance for target species in areas identified for rehabilitation ▸ how the reinstatement approach considers native flora species to the Darling Downs and Toowoomba regions, the pre-cleared regional ecosystems and other suitable species appropriate to the landscape context and nursery/seed stock sources ▸ procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas ▸ corrective actions if the outcomes of rehabilitation, reinstatement and/or stabilisation are not achieved.

Aspect	Mitigation measures
Landscape and visual impacts due to vegetation removal	▸ Clearing of areas of visually significant vegetation are minimised through detailed design processes, where feasible, to the minimum extent required to safely construct, operate and maintain the Project. Locations with visually significant vegetation include: ▸ East of Rainbow Reserve (approximately Chainage (Ch) 32.0 kilometres (km) to Ch 34.6 km) (NS2B) ▸ Yelarbon–Kurumbul Road (approximately Ch 0 km to Ch 15.0 km) ▸ Yelarbon township (approximately Ch 25.0 km to 27.0 km) ▸ Whetstone State Forest and adjoining forested areas (approximately Ch 37.5 km to Ch 50.0 km) ▸ Bringalily State Forest and adjoining forested areas (approximately Ch 50.0 km to Ch 96.0 km) ▸ Brookstead, particularly regarding the proposed rail corridor adjacent to Ware Street and the impact on the removal of existing vegetation that provides a key visual buffer for nearby residents (approximately Ch 151.0 km to Ch 155.0 km) ▸ Macintyre River, Macintyre Brook, Pariagara Creek, Cattle Creek, Native Dog Creek, Bringalily Creek, Nicol Creek, Back Creek, Grasstree Creek, Condamine River and Dry Creek, and their tributaries.
Landscape and visual impacts on watercourses	▸ Develop the detailed design to minimise impacts to waterways, riparian vegetation and in-stream flora and habitats. Locations include the Macintyre River, Macintyre Brook, Pariagara Creek, Cattle Creek, Native Dog Creek, Bringalily Creek, Nicol Creek, Back Creek, Grasstree Creek, Condamine River and Dry Creek, and their tributaries ▸ Adhere to a crossing structure hierarchy, with bridges preferred to culverts ▸ Aim to avoid, then minimise, the extent of waterway diversions or realignments.
Visual impact of rail infrastructure	▸ Infrastructure (such as structures, embankments/cuttings and bridges) will be designed with regard to landscape character and views, as identified in the landscape and visual amenity impact assessment (Chapter 10: Landscape and Visual Amenity), seeking to: ▸ **legacy**: implement consistent treatments along the Project alignment to enhance the overall recognition and legacy of the Project and wider Inland Rail Program. ▸ **bridges**: ensure that bridges are considerate of the local setting, connectivity requirements, crime prevention through environmental design (CPTED) and graffiti issues. In particular, assess urban design input to bridges (which have the potential to be viewed by the greatest number of viewers) to enhance their visual amenity and potential to create a positive legacy at the following locations: – Cunningham Highway road-over-rail bridge (near Yelarbon) (approximately Ch 25.6 km to Ch 26.0 km) – Gore Highway road-over-rail bridge (near Brookstead) (approximately Ch 153.2 km) – Millmerran–Inglewood Road rail-over-road bridge (approximately Ch 73.0 km) – Millmerran–Inglewood Road rail-over-road bridge (approximately Ch 115.5 km) – Oakey–Pittsworth Road rail-over-road bridge (approximately Ch 171.0 km) – Linthorpe Road road-over-rail bridge (near Southbrook) (approximately Ch 175.8 km) – Toowoomba–Cecil Plains Road rail-over-road bridge (approximately Ch 196.2 km) – Warrego Highway rail-over-road bridge (near Gowrie Mountain) (approximately Ch 203.0 km). ▸ **embankments**: at locations where embankments are near roads and/or adjoin bridge structures, minimise the extent to which embankments restrict views or affect views from nearby residences, including through selection of sensitive stabilisation techniques, revegetation or, where appropriate, screen planting. Particular consideration is to be given to the treatment opportunities for the new embankment along the northern edge of Pittsworth, between Ch 170.0 km and Ch 173.0 km. ▸ **cuttings**: assess opportunities to blend cut batters into their landscape setting (e.g. considering potential for revegetation, rock pitching), particularly with consideration to the cut near Athol (approximately Ch 189.0 km to Ch 190.0 km). ▸ **noise barriers**: where these are or may be required in the future, particularly in towns and urban areas, consultation with the local community will be undertaken during the detailed design stage to assess visual amenity and to ensure they are designed sympathetically to their surroundings and consider CPTED and graffiti issues. This will also include, where appropriate, consideration for the inclusion of landscaping, community artwork and urban design and/or transparent panelling. This strategy will be applied to any noise barriers identified as part of potential mitigation of noise impacts in the landscape and visual amenity impact assessment areas.

Aspect	Mitigation measures
Landscape design treatments	▸ Investigate opportunities for landscape treatments during the detailed design stage with reference to the key landscape characteristics and elements, including: ▸ **rural and natural landscapes**: the landscape design will respect the rural landscape. This includes providing earthworks and planting to screen the Project, wherever practicable and appropriate, to consider the local character and desirable views. This includes opportunities for the design of targeted planting adjacent to major earthworks where possible consistent with railway safety requirements and ARTC's *Engineering (Track & Civil) Code of Practice Section 17 Right of Way* (ARTC, 2013). For example, planting strips could be introduced adjacent to significant embankments to reduce visual impact and assist in integrating the landform into the existing landscape setting, and in the following locations: – selective planting adjacent to the Warrego Highway Bridge to screen the alignment and bridge abutments as viewed from Gowrie Mountain (approximately Ch 203.0 km) – adjacent to the Project alignment and adjacent to the bridge near Brookstead (approximately Ch 153.2 km) – adjacent to the Project alignment and adjacent to the bridge near Oakey-Pittsworth Road and Pittsworth (approximately Ch 169.0 km to Ch 176.0 km). ▸ **culturally sensitive landscapes**: the landscape design will provide opportunities to reflect Traditional Owner values. This includes consultation with affected Traditional Owners (including with the Bigambul Native Title Aboriginal Corporation) to develop appropriate landscape design treatments such as in the vicinity of Rainbow Reserve. ▸ **townships**: the landscape design will consider the local context. For example, the appearance and integration of new structures, fencing and noise barriers will be assessed for all Project components located in an urban area. ▸ Visual impact assessment to be updated during the detailed design stage to address design refinements.
Impacts on the setting of heritage landscapes	▸ Consider opportunities to avoid impacts, where possible, to the setting of items of Indigenous or non-Indigenous heritage, or natural significance, such as the old Brookstead Railway Station, Pampas Memorial Hall, Yelarbon Silos and the Yelarbon & District Soldiers Memorial Hall ▸ Assess the feasibility of implementing an interpretation strategy and wayfinding to assist in the interpretation of visual elements of heritage significance, such as old rail lines, bridges, buildings or other items of visual value.
Visual impacts of lighting	▸ Detailed design to incorporate lighting to the minimal level required to meet operational road and rail safety requirements for the Project ▸ Detailed design to assess and incorporate attenuation measures to minimise light spillage, such as selection of appropriate light fittings/shields and/or at-receptor treatments ▸ Limit the potential for vertical illuminance, by selecting luminaries that direct light downwards below the horizontal to avoid lateral glare ▸ Lighting impact assessment to be updated during the detailed design stage to address design refinements.
Impacts to fauna	▸ Undertake a wildlife lighting assessment in accordance with the *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023) with findings used to inform the preparation of a Wildlife Lighting Management Plan (as detailed in Table 24-6).

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Landscape and visual impacts due to vegetation removal	▸ Establish vegetation protection zones and project clearing extents prior to the commencement of works to avoid impacts on adjoining vegetation and habitats, as far as practicable. In particular, seek to retain key mature trees and vegetation corridors within the proposed non-resident workforce accommodation facility sites to provide amenity for residents and enable ease of rehabilitation.
Impacts to landscape and visual values	▸ Implement the Rehabilitation and Landscaping Management Plan (as detailed in the 'General' category of this table, above) to minimise disturbance to landscape and visual amenity values during the pre-construction activities and early works and construction stages ▸ Construction areas including stockpile areas, fuel storage areas and staff parking areas to be located outside the tree protection zone as defined in *AS 4970-2009: Protection of trees on development sites* (Standards Australia, 2009b).

Aspect	Mitigation measures
Impacts to landscape and visual values	▸ Minimise the height of all stockpiles to the greatest extent possible, to reduce their visual impact ▸ Consider temporary treatments (such as hoardings and screens) to site compounds and non-resident workforce accommodation facilities to assist in reducing visual impacts of temporary infrastructure and sun glare within close proximity of sensitive receptors (particularly townships including Yelarbon, Brookstead, Pampas and Pittsworth, and road networks). This should include consideration of opportunities to use features on temporary fencing/hoarding. This will include art-based treatments to assist with screening works from the public and using information boards (or similar) to educate and inform the public regarding construction works.
Visual impacts of lighting	▸ Where night works are required, light attenuation measures will be considered in consultation with potentially affected landowners ▸ Minimise light spill from the proposed non-resident workforce accommodation facilities at Yelarbon and Inglewood by orientating and/or shielding light sources so as not to impact on neighbouring sensitive receptors.
Reinstatement and rehabilitation	▸ Implement the Rehabilitation and Landscaping Management Plan (as detailed in the 'General' category of this table, above) following the completion of works within each area of the Project footprint, until the performance criteria are satisfactorily achieved ▸ Where temporary construction facilities are required, land will be returned to a stable condition that complies with the conditions of applicable landowner agreements and regulatory approvals (e.g. development approval under the *Planning Act 2016* (Qld) or environmental authority under the EP Act).

Operations

Aspect	Mitigation measures
Visual impacts of lighting	▸ In response to verified complaints about lighting on fixed infrastructure, consider opportunities for additional control measures.

24.9.4 Flora and fauna

24.9.4.1 Environmental outcomes

- The Project is designed and constructed to minimise impacts to existing ecological values of adjoining habitats
- Environmental offsets are provided to compensate for significant residual impact to matters of national environmental significance (MNES) and matters of State environmental significance (MSES).

24.9.4.2 Performance criteria

- The Project is designed and constructed to minimise the risk of fauna train strike, and for the provision of fauna connectivity measures of suitable design and location for affected species and their habitat, with reference to the Fauna Connectivity Strategy (Appendix P: Fauna Connectivity Strategy).
- Project works are undertaken in accordance with relevant plans including the Biodiversity Management Plans, Biosecurity Management Plans, Fauna Management Plan, Koala Management Plan, Wildlife Connectivity Plan, Rehabilitation and Landscaping Management Plan, Wildlife Lighting Management Plans, CEMP and the OEMP.
- Clearing of native vegetation for the Project is minimised as far as practicable and does not occur outside the Project footprint.
- The Project is designed and constructed to avoid and minimise the spread of weed and pest species.

24.9.4.3 Management and mitigation measures

Flora and fauna aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-6.

A summary of these mitigation measures, as they apply specifically to individual MNES and MSES is detailed in Chapter 11: Flora and Fauna (Table 11-27 and Table 11-28, respectively).

TABLE 24-6 MITIGATION MEASURES – FLORA AND FAUNA

Detailed design

Aspect	Mitigation measures
General	▸ A Biodiversity Management Plan will be developed for the Project during detailed design, as a component of the CEMP. The plan will detail appropriate criteria, directives and procedures in relation to the following: ▸ Methods and sequencing of protected plant pre-clearance surveys. Flora species will be targeted through these surveys include MNES and MSES flora identified as known, likely or with potential to occur within the Project footprint. ▸ Methods and sequencing of pre-clearance fauna surveys for relevant species. ▸ Staging works so that they avoid animal breeding periods (for species that breed within Australia) as much as possible within areas of habitat where relevant works are proposed. ▸ Staged and sequential clearing protocols to all areas impacted by the Project where threatened species have been identified. ▸ Animal handling protocols, including engagement of an approved fauna handler with a valid damage mitigation permit. ▸ Relocation of plants and habitat features for threatened species, where possible, and documented evidence of previous relocation success. ▸ Requirements for inspections and corrective actions during construction and rehabilitation activities. ▸ Requirements for biodiversity/fauna and flora management actions to be undertaken by suitably qualified persons. ▸ Protected matters unexpected finds procedure: In the event that unexpected threatened flora, fauna or threatened ecological communities (TECs) are discovered during construction, the unexpected finds procedure will be implemented as follows: – stop works, protect threatened species and inform ARTC – engage suitably qualified ecologist to undertake assessment and provide recommendations for management – where impacts can be avoided, works may proceed – where impacts cannot be avoided, – consult with agencies and submit management plan for approval – recommence works with updated controls where necessary – update Biodiversity Management Plan and include species in subsequent inductions and toolbox talks. ▸ Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction. ▸ Corrective actions if the outcomes do not achieve the adopted objectives. ▸ Incorporate the following mitigation measures into the Biodiversity Management Plan to prevent fauna injury or mortality during vegetation clearing activities: ▸ local wildlife groups will be contacted at least seven days prior to clearing to confirm they can receive any injured wildlife ▸ pre-clearance surveys to be undertaken by a suitably qualified ecologist within 48 hours of tree felling works and include the following: – identification and marking of habitat resources and habitat trees (e.g. those containing hollows, cracks or fissures and spouts, active nests, dreys or other signs of recent fauna usage and other habitat features including fallen timber/hollow logs, burrows and boulder piles) – identification of threatened species or habitat features that are suitable for translocation or salvage. ▸ Tree felling to be completed within 48 hours of pre-clearance surveys to limit the potential for new issues to arise (such as new active nests being built), adhering to recommendations made during the pre-clearance surveys. ▸ Tree felling supervision will be undertaken by a suitably qualified fauna spotter catcher after pre-clearance surveys have identified potential habitat features.

Aspect	Mitigation measures
General (continued)	▸ Prior to felling habitat trees identified in the pre-clearance survey, the following must be undertaken: ▸ completion of actions recommended from the pre-clearing surveys including salvage of identified habitat trees, additional assessments to determine threatened fauna usage of the area, identification of active burrows or dens, and any actions required to discourage fauna occupation and weed or feral animal requirements ▸ removal of any non-habitat trees/vegetation as close to the habitat tree as possible in order to create disturbance to discourage fauna usage of the habitat trees ▸ shaking of habitat trees (with heavy machinery) as appropriate may be undertaken to encourage fauna to abandon trees ▸ On the day of felling habitat trees, the following must be undertaken: ▸ all habitat trees will be subject to a visual inspection to survey for threatened species ▸ trees previously identified as containing fauna will be shaken and then felled, providing no fauna are identified ▸ the lowering of hollow-bearing trees will be done as gently as possible with heavy machinery ▸ if fauna are identified in a habitat tree on the day of felling, the fauna spotter catcher is to advise of the most appropriate method to minimise harm including leaving the tree overnight, further shaking, gradual removal of branches to discourage ongoing use, soft-felling of the tree with the animal in place, or measures to capture and relocate the animal to secure habitat ▸ uninjured animals shall be released on the day of capture into nearby secure habitat and should not be held for extended periods of time ▸ felled trees are to be rolled where appropriate so that the number of hollows blocked against the ground is minimised ▸ all felled trees shall remain in place for at least one night to allow any remaining fauna to escape ▸ Handling and relocation of terrestrial and aquatic fauna to suitable habitat will be undertaken to ensure injured and/or sick fauna are assessed and treated accordingly and recorded by a suitably qualified fauna spotter catcher ▸ Allow the safe and responsible handling of fauna (where required) and repatriation in pre-identified appropriate habitat outside of the Project footprint, in consultation with applicable landholders. ▸ A Biosecurity Management Plan will be developed for the Project during detailed design as a component of the CEMP. The plan will be developed in consultation with TRC and GRC to provide an approach and priorities that align with the *Toowoomba Region Biosecurity Plan 2020* and the *Goondiwindi Regional Council Strategic Biosecurity Plan 2022*. At minimum, the plan will be based on current weed and pest listing advice and include the following: ▸ requirements for pre-clearing surveys to determine current risks of weeds or pest animals being present within the Project footprint ▸ maps of the existing extent, confirmed through surveys, and severity of weed infestation including restricted matters including mother-of-millions (*Bryophyllum delagoense*), opuntioid cacti, African boxthorn (*Lycium ferocissimum*), lippia (*Phyla canescens*) and lantana (*Lantana camara*) and weed management requirements ▸ pest animal management controls, including protocols for severing, realigning, and reinstating the wild dog check fence and the DDMRB rabbit fence ▸ measures to confirm that soil movement complies with Queensland biosecurity requirements for managing the spread of imported fire ants (*Solenopsis invicta*) ▸ site hygiene and waste management procedures to deter pest animals ▸ locations and procedures for vehicle washdown (light vehicle and oversize vehicles), wheel washes and rumble grids ▸ weed surveillance and treatment during construction and rehabilitation activities such as: – vehicle and plant washdown requirements for fleet moving from low-risk areas to and high-risk areas – weed certification requirements for vehicles, plant and materials arriving onto the construction site.

Aspect	Mitigation measures
General (continued)	▸ Requirements in relation to pesticide and herbicide use, including any limitations on use, met particularly in proximity to watercourses, known areas of MNES or MSES habitat, or land uses sensitive to spray-drift from the application of pesticides and herbicides (e.g. organic farming practices) ▸ Erosion and sediment control risks associated with broad scale weed removal or treatment ▸ Monitoring of the effectiveness of weed hygiene measures as a component of the environmental monitoring procedure for the Project ▸ Corrective actions and adaptive management, should the outcomes not achieve the adopted objectives ▸ Update and finalise the draft Fauna Management Plan (Appendix N: Draft Fauna Management Plan) to allow for the avoidance and minimisation of impacts on fauna and fauna habitat, and compliance with relevant Commonwealth and State legislation, regulations, conditions of approval and permit requirements. Construction and operations stages of the Project will be covered by this management plan. Performance objectives of the Fauna Management Plan include: ▸ minimise habitat loss and degradation ▸ minimise the risk of fauna injury and mortality ▸ minimise the displacement of fauna by weeds and pests ▸ minimise negative impacts on landscape connectivity ▸ minimise negative impacts on aquatic environments ▸ minimise construction and operational disturbance to fauna ▸ target continuous improvement in procedures through monitoring and the implementation of corrective actions ▸ Update and finalise the draft Koala Management Plan (Appendix M: Draft Koala Management Plan) for the construction and operational stages of the Project to allow compliance with Commonwealth and State legislation, regulations, and permit requirements. The objectives of the plan are to: ▸ establish best-practice mitigation and management measures to be implemented During Design, pre-construction activities and early works, Construction Works and Operations stages of the Project ▸ define the key aspects of a Koala monitoring plan for all stages ▸ provide a framework for adaptive management, including schedules and triggers for audits and management plan review. ▸ Develop a Wildlife Connectivity Plan for the Project during detailed design to document how the Project design has included fauna crossing structures and other design features to integrate fauna connectivity into the detailed design. The plan will be developed progressively during the Project's detailed design based on the approach and outcomes in the Fauna Connectivity Strategy (Appendix P: Fauna Connectivity Strategy) and detail how the Project has incorporated ecological connectivity requirements in the Project's design. The plan will provide detail on: ▸ fauna crossing structures to facilitate appropriate fauna movement, including dedicated crossings, glider poles and canopy bridges ▸ fauna furniture within and adjacent to approaches of crossing structures, including but not limited to koala refuge poles and rails ▸ vegetation clearing restrictions in areas identified as important for ecological connectivity function such as watercourse crossings and priority connectivity zones (PCZs) ▸ fauna-exclusion fencing to funnel fauna into crossing structures and prevent them from accessing the railway to reduce the risk of wildlife-train collisions ▸ noise and light controls (e.g. baffles or walls) where noise and light impacts have the potential to impede the use of the fauna crossing structures ▸ landscaping and strategic revegetation within PCZs and in approaches to fauna crossing structures where required to enable consideration of ground coverings and low shrubs for fauna movement ▸ the predator monitoring and control program, to assess the abundance and use of crossing structures by predators that may reduce usage rates by target species. The program will be implemented for up to five years or until the habitat has been restored to a level that provides threatened fauna with protection from predators ▸ Bridge design at major watercourses will aim to minimise disturbance to riparian vegetation are far as practicable to support fauna movement, particularly in PCZs ▸ Permanent physical barriers will not be created in defined watercourses that could present a risk to aquatic fauna by restricting flow or result in changed flow conditions such as increased velocity, changed flooding behaviour or introduced turbulence that may adversely impact aquatic fauna.

Aspect	Mitigation measures
General (continued)	▸ A Wildlife Lighting Management Plan will be developed for the Project during detailed design to consider and manage impacts of artificial light on wildlife during both the construction and operations stages of the Project. The plan will: ▸ incorporate the findings of a risk-based Wildlife Lighting Assessment, prepared in accordance with the requirements of the *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023) into the Project's final construction methodology and design attenuation measures to manage artificial light for those species where artificial light has been demonstrated to affect behaviour, survivorship or reproduction. ▸ require Project lighting to be designed to the minimum level required to meet safety requirements for the Project. ▸ incorporate recommendations outlined in the *Fauna Sensitive Transport Infrastructure Delivery Manual* (DTMR, 2024). ▸ detail design measures to mitigate adverse impacts of artificial light on biodiversity corridors and fauna passage function, including the use of blue light filters, shields for reducing light spillage, at-receptor treatments and any attenuation measures required to mitigate adverse impacts of artificial light on biodiversity corridors and fauna passage function ▸ Property specific Offset Area Management Plans will be developed for the Project during detailed design and implemented for the Project, subject to approval under the EPBC Act. The Offset Area Management Plans will be informed by ARTC's Environmental Offset Delivery Strategy (Appendix Q: Environmental Offset Delivery Strategy) in order to drive matter specific conservation outcomes across each relevant offset property as detailed in the Environmental Offset Delivery Strategy.
Habitat loss through clearing	▸ Undertake targeted detailed ecological surveys of the Project footprint in accordance with the relevant survey guidelines for nationally threatened species. Data obtained from these detailed surveys will be used to refine the detailed design, including minimisation of the Project footprint and impacts to identified habitat, to the extent required for construction and safe operation. The data will also be used to inform the construction methodology for the Project surveys, which will include: ▸ protected plant surveys, during appropriate seasons, in accordance with the requirements of the *Flora Survey Guidelines –– Protected Plants* (DES, 2020a). Relevant flora MNES species will be targeted through these surveys ▸ terrestrial and aquatic fauna surveys, according to relevant fauna survey guidelines. Relevant fauna MNES species will be targeted through these surveys. Surveys for some species will need to be conducted during seasons when the species is likely to be present in the region. Aquatic surveys will occur during periods of surface water flow ▸ ARTC to investigate opportunities for potential translocation of threatened flora identified within the Project footprint. This will include: ▸ identification and survey of appropriate habitat outside the Project footprint during pre-construction surveys to inform potential translocation recipient sites. Offset sites will be used as a first preference for potential translocation recipient sites ▸ if required, development of a species-specific Translocation Management Plan, in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Commander et al., 2018) is accordance with relevant additional approvals as required ▸ Develop the detailed design and construction methodology to minimise the Project's temporary and permanent footprints and avoid impacts on mature native vegetation, protected matters and other ecologically important areas such as biodiversity corridors and PCZs, as far as reasonably practicable. ▸ ARTC to consult with TRC and GRC to further inform mitigation and management measures specific to matters of local environmental significance (MLES), where practicable. This will include consultation with TRC to identify measures to avoid, retain or mitigate clearing of particular areas of remnant vegetation that are 'Of Concern' where it is possible and reasonable to do so. These areas will include, but may not be limited to: ▸ remnant roadside trees along the Gore Highway ▸ koala habitat trees at Southbrook west of Geitz Road, Southbrook ▸ remnant patches near Murlaggan Road, Pittsworth ▸ trees along the existing rail line near Ware Street, Brookstead ▸ remnant riparian vegetation at both the main branch and northern branch of the Condamine River Remnant riparian vegetation at Grasstree Creek ▸ vegetation along Owen's Scrub Road, Millmerran ▸ remnant riparian vegetation at Back Creek ▸ remnant riparian vegetation at Bringalily Creek ▸ remnant riparian vegetation at Native Dog Creek.

Aspect	Mitigation measures
Fauna species injury and mortality	▸ Investigate opportunities for the potential translocation of threatened fauna individuals within the Project footprint, particularly for reptile species and the brigalow woodland snail (*Adclarkia cameroni*): ▸ identification and survey of appropriate habitat outside the Project footprint during pre-construction to inform potential translocation recipient sites. Offset sites will be used as a first preference for potential translocation recipient sites ▸ development of a species-specific Translocation Management Plan, in accordance with the *Protected Animal Translocation Interim Policy* (DES, 2022e), if required ▸ Undertake assessment and development of the design and location of fauna exclusion fencing to reduce fauna train strike risk, pursuant to the Fauna Connectivity Strategy, having regard to the following: ▸ the compatibility of each crossing structure approach with the general fencing principles at each location ▸ safety requirements for the rail corridor and adjoining properties (e.g. rail corridor fencing has not been proposed across the Condamine River floodplain to prevent the possibility of debris accumulation in fencing during flood events) ▸ consultation with adjoining landowners to confirm the acceptability of a localised fencing approach and confirm compatibility with their land use operation ▸ maintenance constraints that a fauna connectivity or fencing opportunity may introduce ▸ the provision of escape mechanisms such as jump outs, escape poles and one-way gates at regular intervals, which will be based on a review of results of monitoring of fauna fence escape mechanisms on other sections of Inland Rail (and other relevant studies) and incorporate these results into the detailed design of the Project ▸ guidelines documented in the *Fauna Sensitive Transport Infrastructure Delivery Manual* (DTMR, 2024). Where required, additional expert guidance in relation to specific design features will be sought during the detailed design process as required ▸ Priority will be given to fauna exclusion fencing in PCZs identified as important zones for landscape-scale corridor connectivity to channel fauna toward safe movement options to limit vehicle strikes and associated incidents.
Introduction and spread of weeds, pathogens and pest species	▸ ARTC to consult with TRC and GRC on the approach and priorities of biosecurity management for the Project, consistent with the *Toowoomba Region Biosecurity Plan 2020* and the *Goondiwindi Regional Council Strategic Biosecurity Plan 2022*. ▸ ARTC to liaise with GRC and DDMRB to confirm the fencing specifications for the wild dog check fence and rabbit fence, respectively. ▸ Where the Project footprint impacts the operational sections of the wild dog check fence, the detailed design will require reinstatement of the fence on a like-for-like basis in consultation and agreement with the relevant stakeholders, including DESI, impacted landholders and lessees, DAF and GRC.
Habitat fragmentation (loss of connectivity and barrier effects)	▸ Detailed design to incorporate the design requirements as outlined in Appendix P: Fauna Connectivity Strategy and be documented in the Wildlife Connectivity Plan (as detailed in the 'General' category of this table, above).
Noise and vibration	▸ Management measures for any indirect noise and vibration impacts to fauna will be considered and detailed in the Wildlife Connectivity Plan where required, with reference to the rationale and approach of the Fauna Connectivity Strategy and *Fauna Sensitive Transport Infrastructure Delivery* manual (DTMR, 2024).
Lighting	▸ Undertake a risk-based Wildlife Lighting Assessment to consider and manage impacts of artificial light on wildlife for both the construction and operational Project stages. The Wildlife Lighting Assessment will be undertaken in accordance with the requirements of the *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023), with the findings of the assessment used to inform the development of the Wildlife Lighting Management Plan (as detailed in the 'General' category of this table, above).

Aspect	Mitigation measures
Altered hydrology and flooding	▸ Refine the design of the Project's cross drainage structures to preserve existing flood patterns and characteristics as far as practicable, in order to address indirect impacts to ecological receptors by: ▸ minimising changes in natural flow patterns and changes to flood-flow distribution across floodplain areas ▸ maintaining drainage paths that are conveying runoff from adjoining terrain, minor watercourses, and gullies, to avoid ponding of water and/or excessive duration of inundation ▸ reassessing flooding mitigations, if required based on the outcomes of additional ETV analysis using site-specific and direct assessments by a suitably qualified specialist (e.g. flume method) ▸ minimising water ponding through surface levelling and use of cross-drainage and longitudinal drains within the rail corridor ▸ designing water retention structures, such as sediment basins, to prevent downward leakage of water, with the use of lining or similar ▸ avoiding, where possible, the need for diversions or alterations to water resources.
Aquatic habitat and degradation	▸ The Project will be designed to avoid, then minimise, the potential for diversion of watercourses (as defined under the *Water Act 2000* (Qld)) and waterways for waterway barrier works (as defined under the *Fisheries Act 1994* (Qld)), where practicable. ▸ Where practicable, minimise the extent of impacts to waterways, riparian vegetation and in-stream flora and habitats by: ▸ Adopting a waterway crossing structure hierarchy: bridges will be preferred to culverts to maintain permeability for fauna through identified PCZs such as riverine corridors, and biodiversity corridors for target fauna; however, local conditions and constructability impacts must be considered when determining the preferred environmental solution. ▸ Continuing to refine the Project design in response to hydraulic modelling outcomes. This includes addressing flood impact objectives with consideration of peak water levels, flow distribution, velocities, and duration of inundation, and implications for fish passage. Further, it also includes confirming bridge lengths, culvert sizing and numbers, localised scour, and erosion protection measures for both rail, road and other permanent Project infrastructure. ▸ Designing watercourse crossing structures (including culverts and bridges) and finalising construction methodologies to maintain fish passage, and minimise the need for ongoing maintenance and inspection, where applicable in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018). Where the Project does not meet the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018f), a development approval for operational work that is constructing or raising waterway barrier works will be sought where required. ▸ Designing works and finalising construction methodologies in accordance with the *Riverine protection permit exemption requirements* (WSS/2013/726) (Department of Regional Development, Manufacturing and Water (DRDMW),, 2023a). Where the Project does not meet the *Riverine protection permit exemption requirements* (DRDMW, 2023a), a riverine protection permit will be sought for works within a watercourse ▸ Undertake further seasonal fish surveys, for any waterway intersections that do not meet the *Accepted development requirements for waterway barrier works requirements*, to be conducted during times of adequate flow to gain an understanding of the baseline fish species composition and population abundance of these species. ▸ Stormwater controls, such as scour protection, will be developed and incorporated, where necessary, in accordance with the Project's flooding and geomorphology mitigation framework to manage impacts to the surrounding environment including water quality of wetlands and waterways and subsequent impacts to aquatic and terrestrial species that rely upon receiving environments a source of water. Measures will be appropriate to the site conditions, responding to the erosion risk assessment, environmental receptors, climatic zone, and seasonal factors. ▸ Require design modifications during the detailed design stage to be subject to re-runs of the existing flood models to demonstrate compliance with the design objectives of the Project, including for extent and time of inundation, afflux and flow velocities.

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Habitat loss through clearing	▸ Implement the Biodiversity Management Plan, as a component of the CEMP (as detailed in the 'General' category of this table, above). ▸ Supply the clearing limits and location of known sensitive areas (e.g. known MNES/MSES threatened species records and habitat areas) identified through habitat surveys undertaken during the detailed design stage, to the principal contractor via environmental constraints maps. ▸ Construction personnel are to be informed of the environmentally sensitive aspects of the Project site, including plans for impacted and adjoining areas showing vegetation communities, important flora and fauna habitat areas, and locations where threatened species, populations or ecological communities have been recorded. ▸ Clearing of native vegetation is to be minimised to the greatest extent practicable with the objective of reducing impacts to threated ecological communities and threatened species. Clearing extents will be limited to the area safely and reasonably required for permanent and temporary works, avoiding impacts to native vegetation and habitats as far as practicable. ▸ Prior to any clearing works being undertaken, the clearing extents/site boundary/limit of works will be clearly defined and marked. Designated revegetation/rehabilitation zones and other no-go areas (including large significant trees and any threatened flora to be retained) will also be marked. High-visibility tape, barricade webbing or similar will be used. All contractors will be briefed on clearing requirements and restrictions (including fines) to prevent over-clearing of these areas. Construction areas, including compounds, stockpiles, fuel storage areas, laydown areas and staff parking, will be located and established outside the tree protection zone as defined in *AS4970-2009 Protection of trees on development sites*. ▸ Pre-clearance surveys, including terrestrial and aquatic habitats undertaken in accordance with the Fauna Management Plan to include demarcation of habitat resources and habitat features that are suitable for translocation or salvage. ▸ Salvage and relocation of microhabitat features for offset properties or other adjacent suitable habitat will be undertaken as part of rehabilitation, reinstatement, habitat enhancement and beneficial re-use activities, as far as practicable, including in areas identified as important for functional movement corridors (e.g. priority connectivity zones) with consideration of the *Fauna Sensitive Transport Infrastructure Delivery Manual* (DTMR, 2024). Destruction and disposal of microhabitat features will only be considered where there are no practicable re-use options. ▸ Post-clearance surveys of disturbed areas to be undertaken to record extent of clearing that has occurred and to confirm that approved clearing limits have not been exceeded. ▸ Where necessary, clearing activities are to be conducted in accordance with approved performance requirements under the accepted development vegetation management codes. ▸ Where threatened flora species are retained or found to occur within the Project footprint, species-specific biosecurity controls will be implemented in proximity to the area of occurrence where required. ▸ Implement the Rehabilitation and Landscaping Management Plan (as detailed in Table 24-5). ▸ Where temporary construction facilities are required, land will be returned to a stable condition that complies with the applicable landowner agreements and if relevant, regulatory approvals. ▸ Reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively, as work fronts are completed.

Fauna species injury and mortality	▸ Implement the Biodiversity Management Plan, as a component of the CEMP (as detailed in the 'General' category of this table, above).
	▸ If any fauna is to sustain injury at any time during construction, the fauna must be handed over to an appropriate wildlife carer personnel or veterinary clinic within 24 hours and the correct ARTC personnel notified.
	▸ Management measures will be implemented to minimise fauna entrapment in excavations, including:
	  ▸ minimising to the extent practicable, the period of time the excavation is left open
	  ▸ providing opportunities for fauna to exit the excavation
	  ▸ daily pre-start inspections of work areas and removal of trapped fauna by suitably qualified fauna handler as required
	  ▸ in the event that native fauna are detected within the Project footprint, all mobile construction equipment in the area will cease work. Mobile construction equipment will not recommence until a wildlife handler has removed the fauna or it has been confirmed that the fauna has left the workspace. Any captured fauna will be removed and relocated to nearby adjacent habitat away from the construction zone in accordance with the fauna handling procedure and recorded in the fauna handling record sheet.

Aspect	Mitigation measures

Fauna species injury and mortality (continued)	▸ Works which have the potential to impact on a protected animal breeding place will be subject to a Species Management Program under the *Nature Conservation Act 1992* (Qld).
	▸ Vehicle speed limits will be controlled onsite to no more than 40 kilometres per hour (km/hr).
	▸ Temporary fencing will be installed around construction works where practicable, to discourage fauna from entering active construction zones.
	▸ The salvage and relocation of fish within isolated aquatic environments will be managed in accordance with the *Guidelines for fish salvage* (DAF, 2018).
	▸ An appropriately qualified person will be consulted to make an assessment on the method of recovery, transport and release of fish and other aquatic fauna, as required. As a minimum, the following will be implemented:
	  ▸ relocation will be undertaken by a suitably qualified person
	  ▸ dewatering pumps will have an intake screen.
	▸ A record of all fish recovered, and the location of their release will be maintained.
	▸ Dewatering of dams/waterbodies to be supervised by a suitably qualified fauna spotter catcher.
	▸ In the event of a spill incident during construction, any impacted aquatic environments will be assessed for the presence of fauna. If necessary, salvage and recovery efforts will be undertaken.

Reduction in biological viability of soil	▸ Implement the final Soil Management Plan (as detailed in Table 24-4) to avoid compaction and manage topsoils to manage impacts to the biological viability of soils. ▸ Topsoil stockpiles will be managed to maintain the viability of soil seed banks for threatened flora species. ▸ Construction activities will be sequenced to avoid longer than necessary duration of land disturbance and to enable timely rehabilitation post occupation when the land is no longer required to support the Project establishment. ▸ High traffic and heavy load works within areas of clayey and silty soils will be minimised during wet periods where possible. ▸ Land that is temporarily disturbed in support of construction activities (e.g. for access tracks, laydown areas and storage areas) will be rehabilitated at the end of its use for construction progressively and as soon as possible, in accordance with the Rehabilitation and Landscaping Management Plan (as detailed in Table 24-5).
Introduction and spread of weeds, pathogens and pest species	▸ Implement the Biosecurity Management Plan, as a component of the CEMP (as detailed in the 'General' category of this table, above). ▸ Property-specific weed hygiene requirements will be developed in consultation with the relevant landowners/operators prior to pre-construction/construction activities occurring on that property, outside of the permanent footprint. Protocols will be documented in individual property management agreements. ▸ Where the Project crosses the DDMRB fence at Ch 120.2 km, the fence will be reinstated, and a rabbit trap will be established in accordance with the design solution developed in consultation with DDMRB through the detailed design process. ▸ Any vegetated material containing, or with the potential to contain, weed seed material, will not be used for on-site mulching or erosion protection. ▸ ARTC to develop and implement a complaints management system to enable members of the public, landholders or other stakeholders to make enquires or complaints, including concerns regarding weeds and pests on a 24-hour, seven-day-a-week basis, during the construction stage.
Habitat fragmentation	▸ Implement the Wildlife Connectivity Plan (as detailed in the 'General' category of this table, above) to construct fauna connectivity infrastructure for ecological connectivity. ▸ Construction planning to consider construction of fauna crossings as soon as possible to reinstate safe fauna passage in accordance with the detailed design and Wildlife Connectivity Plan (as detailed in the 'General' category of this table, above). ▸ Implement the Rehabilitation and Landscaping Management Plan as a component of the CEMP (as detailed in Table 24-5). ▸ Stockpile cleared vegetation, which may be mulched or stored as is depending on the reinstatement/rehabilitation requirements for specific areas separately in a manner that does not unreasonably impede wildlife. ▸ Undertake rehabilitation of the banks of watercourses as soon as possible after construction works in the area have been completed using suitable substrate to support fauna movement, in accordance with the Wildlife Connectivity Plan. ▸ Undertake construction works sequentially to allow fauna to move around construction work areas.

Aspect	Mitigation measures
Noise and vibration	▸ Implement the Noise and Vibration Management Plan, as a component of the CEMP (as detailed in Table 24-13), to minimise noise and vibration impacts as a result of construction of the Project to ecologically sensitive receptors, by requiring: ▸ plant and equipment to be selected to minimise noise emissions, in-so-far-as possible while maintaining efficiency of function. Mufflers will be fitted, and all noise control equipment will be maintained in good working order ▸ where possible, requiring that plant be located away from ecologically sensitive receptors. Appropriate mitigation measures will be investigated. If required, site access roads will be located as far as practicable away from noise sensitive areas. ▸ Inform construction personnel of any environmentally sensitive aspects of the Project footprint, including plans for impacted and adjoining areas showing fauna breeding habitat within a 500 m buffer, identified during pre-clearance surveys, and locations where threatened species, populations or ecological communities have been recorded. ▸ Stage works so that they avoid animal breeding periods as much as possible within areas of breeding habitat. Works which have the potential to impact an identified protected animal breeding place will be subject to a Species Management Program under the *Nature Conservation Act 1992* (Qld). ▸ Where possible, locate/orient works to direct noise away from ecologically sensitive receptors. Materials and stockpiles are to be used to increase acoustic shielding, where feasible. If required, site access roads will be located as far as practicable away from noise sensitive areas. ▸ Where practicable, schedule night works near ecologically sensitive receptors (e.g. breeding places, 'koala hotspots') to a restricted number of nights per week, with night-time traffic redirected away from noise-sensitive receptors. ▸ Inform all workers on the importance of threatened fauna species, their location (where they are found to occur within or near the Project footprint), and procedures for working around them, through regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration impacts.
Air quality and dust	▸ Implement the Air Quality and Dust Management Plan as a component of the CEMP to prevent or minimise impacts to flora species and vegetation communities.
Lighting	▸ Implement the Wildlife Lighting Management Plan (as detailed in the 'General' category of this table, above) to manage impacts of artificial light on wildlife during construction. ▸ As a minimum, off-site lighting impacts will be minimised by: ▸ external lighting installed as low intensity lighting (except where required for safety or emergency purposes ▸ external lighting does not shine above the horizontal ▸ management of light generated during construction complies with AS/NZS 4282:2019 – Control of obtrusive effects of outdoor lighting.
Waste	▸ Implement the Waste Management Plan as a component of the CEMP to manage site hygiene and waste to avoid impacts relating to fauna.
Altered hydrology and flooding	▸ Implement the Flood Risk Management Plan (based on the Flood Risk Assessment) during construction works to mitigate impacts to fauna as a result of altered hydrology and flooding through construction planning and the layout of construction work sites and compounds, with consideration of overland flow paths and flood risk. ▸ Avoid, where possible, the need for diversions or alterations to water resources.
Erosion and sedimentation	▸ Implement the final Soil Management Plan (as detailed in Table 24-4). ▸ Implement the ESCP, including any site-specific ESCPs to manage Project activities and works in a manner that minimises harm to the surrounding environmental values. ▸ Stockpiling and management/segregation of topsoil where it contains native plants, seedbank or weed material. Establishing and specifying the monitoring and performance objectives for handover on completion of construction.

Aspect	Mitigation measures
Contaminated land	▸ Implement the Contaminated Land Management Plan as a component of the CEMP (as detailed in Table 24-4).
Modification of aquatic habitat	▸ Avoid, then minimise, the extent of temporary and permanent waterway diversions. Where temporary diversions are unavoidable, implement water quality and ESCP measures to minimise impacts to downstream environments and water users. Where permanent diversions are unavoidable, waterway diversion design will include simulation of natural features (e.g. meanders, pools, riffles, shaded and open sections, deep and shallow sections, and different types of sub-strata)) depending on the pre-disturbance environmental values, as per relevant guidelines and legislation. Maintenance activity locations, construction compounds and storage areas will be positioned away from waterways to the extent possible. ▸ Scheduling of construction activities to minimise time of works in or adjacent to drainage lines, waterways, or watercourses particularly during periods of flow. ▸ Laydown sites and stockpiles will be located an appropriate distance from riparian habitat to avoid indirect impacts on aquatic habitats. Direct impacts on in-stream vegetation and native vegetation on the banks of watercourses would be avoided, as far as practicable.
Works in watercourses/ barriers to fish passage	▸ Construction works to minimise the extent of impacts to watercourses, mapped waterways for waterway barrier works, and associated riparian vegetation and in-stream flora and habitats by: ▸ undertaking works in accordance with the *Riverine protection permit exemption requirements* (DRDMW, 2023a). Where the Project does not meet the *Riverine protection permit exemption requirements* (DRDMW, 2023a), a riverine protection permit will be sought for works within a watercourse ▸ undertaking works in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a), including for vehicle crossings for construction. Where the Project does not meet the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a), a development approval for operational work that is constructing or raising waterway barrier works will be sought where required.
Water quality	▸ Implement the Surface Water Management Plan (as detailed in Table 24-9) to manage potential impacts of releases of contaminants into wetlands and waterways (both ephemeral and permanent), including impacts on aquatic species, aquatic habitats, and species that rely upon the receiving environment as a water source. ▸ Consider, where appropriate, aligning the Surface Water Monitoring Framework (Section 24.9.6.4 and Chapter 13: Surface Water) with the in-stream monitoring program. The in-stream monitoring program is to be undertaken for the purposes of monitoring impacts to riparian vegetation, aquatic fauna and habitats. ▸ Refuelling will only occur at designated locations within the Project footprint and sited at suitable separation distances from ecological values, including surface water features and drainage lines. These refuelling locations will be equipped with on-site chemical and hydrocarbon absorbent socks/booms, spill kits and bunded as appropriate. ▸ Where the dewatering of excavations (e.g. trenches, pier holes) is required, water will need to meet the established water quality objectives for receiving waterways before being released/discharged into local waterways. This will be managed in accordance with applicable guidelines and standards.
Invasion of aquatic weeds and pest species	▸ If dewatering of existing storages is required, dewatering strategies will be required to comply with the Biosecurity Act to take reasonable measures to avoid the spread of pest species, for example, screening of pump intake.
Changes to groundwater resources affecting groundwater dependent ecosystems (GDEs)	▸ Implement the Groundwater Monitoring and Management Program (GMMP) (as detailed in Table 24-12) for the construction stage to minimise and manage potential impacts to GDEs

Operations

Aspect	Mitigation measures
Threatened flora	▸ Should individuals of a threatened flora species be retained or be found to be growing within the Project footprint during operations, annual monitoring will be conducted for three years and corrective actions to be implemented where Project-associated impacts are identified.

Fauna species injury or mortality	▸ ARTC to develop and implement a communication mechanism for members of the public to notify ARTC of issues, including concerns regarding fauna injury or mortality, and the spread of weeds, pest animals and pathogens.
	▸ Fauna exclusion fencing, fence escape mechanisms, connectivity structures and adjoining fauna furniture and vegetation within the rail corridor will be inspected and maintained in accordance with the Wildlife Connectivity Plan to retain integrity and reduce the likelihood of interaction between trains and fauna species.
	▸ Vegetation maintenance on the habitat side of the fauna exclusion fencing will be required to maintain a clearance zone such that species cannot use vegetation to climb onto the exclusion fencing, in accordance with the Wildlife Connectivity Plan.
	▸ The rail corridor will be inspected for trapped fauna during standard operational maintenance, in accordance with ARTC's rail corridor maintenance procedures and policies, including:
	  ▸ when an animal is detected within the rail corridor, if possible and safe to do so, the animal will be encouraged towards a fauna escape ramp, other escape mechanism or fence end, whichever is closest and provides a safe exit from the corridor
	  ▸ where required, a suitably qualified wildlife carer/handler will be engaged to remove trapped fauna and a health assessment will be undertaken by a wildlife veterinarian
	  ▸ information on the likely location of fauna breach of the fence will be used inform potential further measures to be applied to minimise/eliminate the risk of future incidents.
	▸ All fauna detected within the rail corridor including healthy, injured, sick or dead fauna will be recorded and reported in the operations fauna management and incident register.
	▸ Injured or sick fauna as assessed by a wildlife veterinarian must be handed over to appropriate wildlife carer personnel or veterinary clinic in accordance with the Fauna Management Plan.
	▸ Permanent boundary fencing will be inspected and maintained as part of standard operational maintenance, in accordance with the ARTC's rail corridor maintenance procedures and policies to maintain integrity and reduce the likelihood of fauna entanglement.
	▸ Rail maintenance access roads will be speed limited to no more than 40 km/hr to reduce the risk of vehicle strike.

Introduction and spread of weeds, pathogens and pest species	▸ Prepare and implement a Biosecurity Management Plan as a component of the Operations EMP, pursuant to the Biosecurity Act, GRC and TRC biosecurity plans and ARTC operational requirements of the rail corridor. The plan will include:
	  ▸ identification, locations and procedures for vehicle wash down
	  ▸ requirements for operational surveys to determine current risks of weeds or pest animals and appropriate weed management procedures
	  ▸ maps of the existing extent, confirmed through surveys, and severity of weed infestation (e.g. restricted matters and Weeds of National Significance) and weed management requirements
	  ▸ weed surveillance and treatment during maintenance activities
	  ▸ requirements in relation to pesticide and herbicide use, including any limitations on use; restrictions may apply in proximity to watercourses, known areas of MNES or MSES receptors and habitat, or land uses sensitive to spray-drift from the application of pesticides and herbicides
	  ▸ pest animal management controls
	  ▸ site hygiene and waste management procedures to deter pest animals
	  ▸ erosion and sediment control risks associated with broad scale weed removal or treatment.
	  ▸ corrective actions, should the outcomes not achieve the adopted objectives.
	▸ Monitoring of the effectiveness of weed hygiene measures as a component of the environmental monitoring procedure for the Project. Ongoing weed monitoring within the rail corridor will aim to maintain the pre-construction condition of TECs and habitats that adjoin the rail corridor.
	▸ Any outbreak of priority weeds and/or weeds of national environmental significance would be managed in accordance with the Biosecurity Act, the *Weeds of National Significance Weed Management Guide*, and the requirements of relevant authorities.
	▸ Where threatened flora species are found to occur within the Project footprint and will be retained, species-specific biosecurity controls will be implemented in proximity to the area of occurrence.
	▸ Implement a predator monitoring and control program, as identified in the Wildlife Connectivity Plan (as detailed in the 'General' category of this table, above)

Aspect	Mitigation measures
Habitat fragmentation and fauna connectivity	▸ An operations monitoring, evaluation and reporting program will be developed in the Operations EMP pursuant to the Fauna Connectivity Strategy (Appendix P) and will include monitoring of target fauna movements at crossings to assess the success of the fauna connectivity measures and crossing structures at managing fauna train strike risk and managing connectivity.
Lighting	▸ Lighting associated with operation of the Project including from rollingstock and static infrastructure such as safety lighting at road-rail interfaces will be maintained in accordance with the Wildlife Lighting Management Plan to consider and manage impacts of artificial light on wildlife in accordance with *National Light Pollution Guidelines for Wildlife* (DCCEEW, 2023).
Aquatic habitat degradation	▸ Where practical, maintenance activities within or adjacent to watercourses will be conducted in accordance with *Riverine protection permit exemption requirements* (DRDMW, 2023a). Where the Project does not meet the *Riverine protection permit exemption requirements* (DRDMW, 2023a) a riverine protection permit will be sought for works within a watercourse.
Works within watercourses/fish passage effects	▸ Where practical, maintenance activities will be conducted in accordance with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a). Where the Project does not meet the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a), a development approval for operational work that is constructing or raising waterway barrier works will be sought where required. ▸ Inspect and maintain drainage infrastructure that provides for the flow of watercourses in accordance with ARTC's standard operating procedures to address any issues that may lead to barriers to fish passage.
Erosion and sediment control	▸ The effectiveness and maintenance of permanent erosion controls (e.g. scour protection or vegetated swales) and surface and subsurface drains (including longitudinal drainage) will be monitored in accordance with ARTC's standard operating procedures. This will minimise detrimental effects on adjacent TECs, threatened flora species, wildlife habitat, wetlands and waterways, particularly downstream environments. ▸ additional inspections would be undertaken during and/or after flood events, dependent on the ability of operators to complete an inspection safely ▸ controls that are found to be failing or not performing as intended will either be modified or replaced ▸ where defects are identified and where it is deemed necessary, corrective actions will be undertaken as soon as reasonably practicable and where it is safe to do so ▸ Rail embankment slopes will be maintained to prevent slope face degradation.

24.9.4.4 Monitoring, auditing and reporting

The following section summarises the ecological surveys and follow-up monitoring that will be conducted during the pre-construction activities and early works, construction works and operations stages of the Project.

Implementation of other ecological elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 24.5.

Pre-construction activities and early works

Flora, fauna and habitat surveys will be conducted during the pre-construction activities and early works stage of the Project to further establish an ecological baseline, inform detailed design, and enable the development and finalising of environmental management plans, including those that are components to the CEMP. These specific surveys are detailed in Chapter 11: Flora and Fauna.

Construction

Flora, fauna and habitat surveys and monitoring will be conducted during the Project's construction stage to continue to ensure that ecological impacts are avoided in the first instance, or otherwise minimised. These specific surveys are detailed in Chapter 11: Flora and Fauna.

Operation

ARTC will monitor the effectiveness of the proposed mitigation measures for up to five years following commencement of operations or as deemed appropriate for specific measures. Learnings through the Project monitoring, auditing and reporting will be used to inform adaptive management of the Project. An adaptive management framework will facilitate change and improvement to the management strategies where the objectives of the proposed measures are not met.

Ecological monitoring to be conducted during operation of the Project include the following:

- Should a TEC patch be retained within the Project footprint, annual monitoring will be conducted against the initial BioCondition assessment for five years following commencement of operations. Corrective actions will be implemented where Project-associated impacts are identified.
- Should individuals of a threatened flora species be retained or be found to be growing within the Project footprint, annual monitoring will be conducted against the pre-construction flora surveys and will be continued for five years following commencement of operations. Corrective actions will be implemented where Project-associated impacts are identified.
- Evidence of fauna incursions into the rail corridor will be recorded and investigated, including wildlife-train collisions.
- An ongoing weed monitoring program will measure the effectiveness of weed hygiene and control measures, and target problem areas for weed control.
- Ongoing collection and analysis of Koala DNA samples from adjacent and broader areas from the Project, and an analysis of gene flow at 5-yearly intervals for 20 years.
- A monitoring program to assess the abundance and use of crossing structures by predators that may reduce usage rates by target species will be undertaken in accordance with the Wildlife Connectivity Plan. A predator control program will be undertaken at crossing structures within PCZs for up to five years or until the habitat has been restored to a level that provides threatened fauna with protection from predators.
- The fauna crossing structures and wildlife populations on either side of the Project will be monitored where practicable before construction, during construction and during operations to determine their level of effectiveness in maintaining ecological connectivity, avoiding risk to ecological function due to habitat fragmentation and minimising the risk of injury and mortality of fauna from wildlife-train collisions. Preliminary SMART mitigation goals and survey methods to evaluate the effectiveness of the crossing structures are outlined in Appendix P: Fauna Connectivity Strategy. These will be finalised and detailed in the Wildlife Connectivity Plan, the monitoring, evaluation and reporting and the wild dog predation monitoring program. This monitoring and evaluation program will adopt a scientifically robust approach in accordance with the *Fauna Sensitive Transport Infrastructure Delivery Manual* (DTMR, 2024).
- Noise and vibration monitoring at fauna crossing structures may be considered if monitoring of structures indicates the level of effectiveness of the structures is inadequate, to determine whether levels may be a deterrent for utilisation, particularly within areas of known wildlife corridors. This will be used to determine behavioural responses of fauna to train pass-bys and inform potential modifications to structures should noise or vibration from train pass-bys be identified as discouraging use of the structures by wildlife.

24.9.5 Air quality

24.9.5.1 Environmental outcomes

- The Project is designed and delivered to limit and manage potential air quality impacts, including nuisance dust and odour that may pose a risk to human and environmental health.

24.9.5.2 Performance criteria

- Construction works are planned and undertaken to avoid, or manage and mitigate impacts on the environmental values of air quality for sensitive receptors adjoining the Project footprint
- Project construction work areas are progressively rehabilitated and stabilised in accordance with the Rehabilitation and Landscaping Management Plan (Table 24-4) to minimise the potential for dust nuisance
- The Project is designed to protect health and wellbeing with respect to air quality. Air quality goals will be modelled to assess potential impacts at sensitive receptors.

24.9.5.3 Air quality goals

Air quality objectives and guidelines have been applied as air quality goals for the Project. The air quality goals adopted for the Project are presented in Table 24-7. The adopted air quality goals are ambient air quality goals and require consideration of existing background air quality in addition to contributions from the Project.

The environmental values that are being protected by each air quality goal are also presented in Table 24-7. The environmental values listed are taken from the *Environmental Protection (Air) Policy 2019* (EPP (Air)). The environmental values protected through adopting these air quality goals include the following:

- Health and wellbeing
- Protecting the aesthetics of the environment
- Health and biodiversity of ecosystems.

To achieve the environmental outcomes and performance criteria, the following is to be undertaken:

- Project construction works and operation must aim to achieve the goals in Table 24-7
- During construction and operation, monitor and report on air quality
- Nuisance from dust, odour and emissions arising from construction works and operation is minimised at sensitive receptors.

The mitigation measures available for the Project and included in Section 24.9.5.4 are measures that can be used to achieve the performance criteria and environmental outcome for air quality. Other mitigation measures may be adopted in order to achieve the performance criteria and environmental outcome, as required by the circumstances of the Project's construction and operation.

TABLE 24-7 PROPOSED AIR QUALITY GOALS

Pollutant	Air quality goal (µg/m^3, unless stated)	Averaging period	Environmental value	Source
Nitrogen dioxide (NO_2)	250	1 hour[1]	Health and wellbeing	EPP (Air)
	62	Annual	Health and wellbeing	EPP (Air)
	33	Annual	Health and biodiversity of ecosystems	EPP (Air)
Total Suspended Particulates (TSP)	90	Annual	Health and wellbeing	EPP (Air)
Particulate matter less than 10 micrometres (PM_{10})	50	24 hours	Health and wellbeing	EPP (Air)
	25	Annual	Health and wellbeing	EPP (Air)
Particulate matter less than 2.5 micrometres ($PM_{2.5}$)	25	24 hours	Health and wellbeing	EPP (Air)
	8	Annual	Health and wellbeing	EPP (Air)
Arsenic and compounds (measured as the total metal content in PM_{10})	6 ng/m^3	Annual	Health and wellbeing	EPP (Air)
Cadmium and compounds (measured as the total metal content in PM_{10})	5 ng/m^3	Annual	Health and wellbeing	EPP (Air)
Lead and compounds (measured as the total metal content in TSP)	0.5	Annual	Health and wellbeing	EPP (Air)
Nickel and compounds (measured as the total metal content in PM_{10})	22 ng/m^3	Annual	Health and wellbeing	EPP (Air)
Chromium (III) compounds (as PM_{10})	9	1 hour	-	NSW EPA
Chromium (VI) compounds (as PM_{10})	0.1	1 hour	Screening health risk assessment	Brisbane City Council *Air Quality Planning Scheme Policy*
	0.01	Annual	Screening health risk assessment	Brisbane City Council *Air Quality Planning Scheme Policy*
1,3-butadiene	2.4	Annual	Health and wellbeing	EPP (Air)
Benzene	5.4	Annual	Health and wellbeing	EPP (Air)
Toluene	1,100	30 minutes	Protecting aesthetic environment	EPP (Air)
	4,100	24 hours	Health and wellbeing	EPP (Air)
	400	Annual	Health and wellbeing	EPP (Air)
Xylenes	1,200	24 hours	Health and wellbeing	EPP (Air)
	950	Annual	Health and wellbeing	EPP (Air)
Benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons)	0.3 ng/m^3	Annual	Health and wellbeing	EPP (Air)
Polychlorinated dioxins and furans	3.0 x 10^{-08}	Annual	Screening health risk assessment	Brisbane City Council *Air Quality Planning Scheme Policy*
Dust deposition	120 mg/m^2/day	Monthly	Nuisance	DETSI Recommended[2]

Table notes:
µg/m^3 micrograms per cubic metre
ng/m^3 nanogram per cubic metre
mg/m^2/day milligram per square metre per day
1. Not to be exceeded more than one day per year
2. Not legislative, DETSI recommended Project goal to reduce likelihood of complaints. The dust deposition goal is a daily deposition average calculated using the deposition level predicted at a modelled receptor over an averaging period of one month.

24.9.5.4 Management and mitigation measures

Air quality aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-8.

For several of the mitigation measures proposed, the expected control efficiency (emission reduction percentage) has been nominated. The control efficiencies reported have been obtained from the National Pollutant Inventory *Emission Estimation Technique Manual for Mining* (Department of Sustainability, Environment, Water, Population and Communities, 2012b).

There are a number of mitigation measures presented in Table 24-8 that can be deployed in adverse conditions, for example, during dry periods or unfavourable wind conditions. As an example, the mitigation measures that could be employed under adverse conditions include:

- Dry conditions:
  - increase the application of water to stockpiles, unsealed haul roads and exposed areas where there is significant risk of wind erosion and fugitive dust emissions. If required, apply temporary ground-stabilising treatments
  - if water application is not practical, cover exposed areas with an impermeable covering (i.e. tarpaulin)
  - avoid or reduce the intensity of high magnitude dust-generating activities, such as blasting and ground-disturbing activities, including excavation and vegetation clearing
  - move the active works location to an area that has significant separation distance to sensitive receptors and where the risk of dust impact is lower
- Strong or adverse wind conditions (wind direction blowing from source to nearby sensitive receptor):
  - avoid or reduce the intensity of works in areas that are upwind of the nearest sensitive receptor
  - move the active works location to an area that is not upwind of the nearest sensitive receptor, or is benefitted by wind breaks (either natural or Project related)
  - increase the application of water to stockpiles and unsealed road sections located upwind of the nearest sensitive receptor. If required, apply temporary ground-stabilising treatments.
  - avoid ground-disturbing activities including excavation and vegetation clearing.

TABLE 24-8 MITIGATION MEASURES—AIR QUALITY

Detailed design

Aspect	Mitigation measures
General	▸ An Air Quality and Dust Management Plan will be developed for the Project during detailed design, as a component of the CEMP. The plan will include the following minimum requirements: ▸ minimise major dust-generating activities, e.g. blasting or material loading/unloading, during high wind speeds where practicable, spoil haulage including covering of loads when traversing roads to minimise and where possible avoid loss of loaded materials, rock debris and dust ▸ routing access roads and internal haul routes away from sensitive receptors wherever practically possible. For example: – residential dwellings and caravan parks – motels/hotels – schools and kindergartens – medical centres – public parks and recreation areas. ▸ restricting vehicle speeds on unsealed haul roads to reduce dust generation, e.g. to sign-posted speeds on public roads or to construction site speed limits on construction tracks (nominally 40 km/hr—to be determined through consultation with the relevant local government and documented in the Traffic Management Plan, as a component of the CEMP (Table 24-17) ▸ further speed restrictions on construction haul roads (e.g. from 40 km/hr to 20 km/hr) where the trafficable surface is within 200 m of a sensitive receptor ▸ long-term (3 months) stockpiled material will be covered or seeded to prevent wind erosion and dust generation ▸ regular cleaning of machinery and vehicle tyres to prevent track-out of dust onto public roads ▸ installation of rumble grids or similar at locations where construction traffic departs from the construction site and joins the public road network. In the vicinity of construction work sites, external roads will be swept and otherwise kept clean, free of loose or deposited soil or earth ▸ internal construction haul roads will be suitable surfaced to minimise dust emissions as soon as possible after the commencement of site activities ▸ revegetating disturbed areas as soon as practicable, in accordance with the Rehabilitation and Landscaping Management Plan (Table 24-4) ▸ vehicles and equipment will be appropriately maintained to maximise fuel efficiency ▸ visual monitoring of the effectiveness of dust controls will occur daily ▸ Detail the Project air quality complaints procedure: ▸ a complaint hotline for the Project will be established and advertised to enable members of the public to notify ARTC of issues, including the generation of excessive dust or other air emissions during construction ▸ in the event of a dust complaint, ARTC will: – in the first instance, investigate the cause of the complaint and confirm details of the complaint with respect to the nature and severity of impact – determine appropriate remedial action, where relevant – liaise with complainant over remedial action and liaise with administering authority if required – implement appropriate remedial action, if required ▸ establish a Project complaints register will record complaints relating to air quality, including records of remedial actions.

Aspect	Mitigation measures
General (continued)	▸ Development of the Air Quality and Dust Management Plan will be informed by a quantitative dispersion modelling assessment of potential construction dust impacts from major construction works areas. The quantitative assessment will be completed during the detailed design stage and prior to the relevant construction works commencing when more detailed construction information is available. The outcomes of the quantitative assessment will be used to inform the implementation of mitigation measures and the deployment of dust monitoring during the construction works stage. The scope of the assessment will be focused as follows: ▸ the assessment of airborne particulates, PM_{10}, $PM_{2.5}$ and deposited dust (derived from TSP) ▸ an estimate of predicted construction emissions, with a focus on modelling of major earthworks, as earthworks activities typically generate the highest quantities of dust. The assessment will be limited to activities occurring along the Project alignment ▸ the assessment of construction work required near Yelarbon (Ch 25.0 km), Brookstead (Ch 154.0 km) and Pittsworth (Ch 173.0 km), which are the most populated locations adjacent to the Project alignment ▸ activity rates based on the expected average earthworks intensity, as dust deposition has a monthly average criterion ▸ dust deposition monitoring will be undertaken at three locations as part of the assessment. It is assumed these locations will be in Yelarbon, Brookstead and Pittsworth. In addition, baseline dust deposition data will also be acquired in proximity to Commodore Mine (e.g. from Ch 120.0 km to Ch 128.0 km). This baseline data will enable comparison with dust deposition data during construction of the Project. Dust deposition monitoring will be completed at a small number of locations (< 5) adjacent to the Commodore Mine and nearby sensitive receptor locations. Monitoring will occur for a period of at least three months and will aim to collect data representative of dust generating activities that occur at the mine to provide baseline data on the existing air environment. This data will provide an indication of the impact on the local air quality from the nearby Commodore Mine and Millmerran Power Station. Dust deposition monitoring will be conducted in accordance with *AS/NZ 3580.10.1:2016 – Methods for sampling and analysis of ambient air, Method 10.1 Determination of particulate matter – Deposited matter – Gravimetric method* (Standards Australia and Standards New Zealand, 2016a). ▸ emission sources considered will be limited to those along the alignment. For example, haul vehicles would be assumed to be travelling along the alignment (e.g. up and back), and individual haul routes away from the alignment (e.g. to quarries) would not be considered ▸ the focus of the assessment will be pollutants with 24 hour (PM_{10} and $PM_{2.5}$) and monthly average (dust deposition) goals. It is expected that activity rates will be based on the expected average earthworks intensity (average determined by dividing quantity of earthworks by the length of program in working days) rather than maximum activity rates, as it is uncertain if realistic maximum activity information will be available ▸ annual average predictions are not proposed as there will be significantly greater uncertainty in long term predictions due to the transitional nature of construction ▸ models will be prepared for Yelarbon, Brookstead and Pittsworth, with two scenarios of these models investigated for each location: an unmitigated scenario and a mitigated scenario (six scenarios in total) considering the likely mitigation measures to be employed based on those described in Section 24.9.5.4 ▸ define and design temporary access tracks to minimise dust generation, e.g. appropriate surface treatments for the predicted construction traffic movements, installation of rumble grids, concrete pads or other physical measures to reduce track-out ▸ designate proposed stockpile locations within the Project footprint during the detailed design stage to identify local specific controls, if required.
Potential impacts to sensitive receptors and special areas	▸ Assessment of the potential for air quality and odour impacts to the intrinsic value of Aboriginal heritage sites will be undertaken during detailed design. If the assessment determines the potential for significant impact, mitigation and management measures will be identified to reduce the likelihood of significant impacts to occur. ▸ Undertake the quantitative dispersion modelling assessment of potential construction dust impacts from major construction works areas in proximity to sensitive receptors (as detailed in the 'General' category of this table, above) ▸ Design of fuel storage areas will ensure that fuel tanks will be located at least 50 m from the nearest sensitive receptor, with separation distances maximised as far as practical within site restrictions.

Aspect	Mitigation measures
Availability of water for dust suppression and stabilisation during construction	▸ During the detailed design stage, quantities of water required for dust suppression, construction, landscaping and stabilisation activities will be confirmed. The availability and suitability of water supply sources will be determined and where water supply is deemed insufficient or in high demand for other uses, other dust suppression and stabilisation methods will be implemented. These alternative methods may include: ▸ chemical dust suppressants ▸ covering stockpiles ▸ construction of wind breaks.
Emissions from construction vehicles	▸ Confirm haulage routes and access roads during detailed design based on the shortest and safest trafficable route for each vehicle type, in consultation with relevant road managers, to minimise vehicular emissions ▸ Planning of access and haulage routes will seek to maximise the use of sealed trafficable surfaces, where appropriate, and to locate access and haulage routes away from sensitive receptors ▸ Additional geotechnical data, collected during the detailed design stage, will be used to refine the earthworks balance for the Project by providing further confirmation on the expected quantities of suitable and unsuitable materials. The objective of refinement will be to further minimise the risk of material deficit for construction of the Project, thereby reducing the number of vehicular movements as part of the mass haul task. ▸ Opportunities to treat and re-use otherwise unsuitable materials will be identified and assessed during detailed design for applicability, with the objective of minimising vehicular movements, and emissions, for offsite disposal ▸ Opportunities for the use of ethanol blend fuels for use in construction will be investigated during detailed design. These opportunities will be adopted if found through investigation to be beneficial and if it is practical to do so.
Fugitive dust emissions (windborne erosion) during construction and operation	▸ Develop the Air Quality and Dust Management Plan, informed by the quantitative dispersion modelling assessment of potential construction dust impacts from major construction works areas, during detailed design, as a component of the CEMP (as detailed in the 'General' category of this table, above).
Carbon emissions reporting requirements	▸ Emissions reporting requirements for the construction works will be confirmed during the detailed design stage and will respond to National Greenhouse and Energy Reporting requirements.
Emissions from operational locomotives	▸ The vertical alignment of the rail will be subject to refinement and confirmation during detailed design. Opportunities to further optimise the track geometry will be assessed to reduce operational fuel consumption.
Emissions from idling locomotives	▸ Detailed design of the railway corridor will be developed to minimise impacts to sensitive receptors from emissions from idling locomotives, through consideration of topography, gradients, landscaping treatments and other surface treatments, where practical ▸ Identification of the final locations of the five crossing loops for the Project will seek to minimise the number of receptors in proximity to each loop.

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Impacts to sensitive receptors	▸ If on-site wastewater treatment systems are required for non-resident workforce accommodation facilities, these systems will be planned and positioned in accordance with separation distances consistent with the EPA Victoria guideline *Recommended separation distances for industrial residual air emissions* (EPA Victoria, 2013) and operated and maintained in accordance with conditions of approval (sought separately to the approval of the revised draft EIS). Based on the anticipated requirement for a treatment system with a capacity of 300 equivalent persons, and assuming that a mechanical or biological wastewater treatment system will be used, a minimum separation distance of 67 m to sensitive receptors will be provided. ▸ Laydown areas and other construction facilities (e.g. concrete batching plant, flash-butt welding facility, stockpiles) will be planned so that sources of emissions, such as temporary fuel tanks, generator sets, stockpiles, travel routes, etc, are positioned as far as possible from neighbouring sensitive receptors, within the confines of the temporary footprint and considering prevailing wind directions. ▸ The placement of non-resident workforce accommodation facilities to consider nearby Project related emissions sources (e.g. fuel tank storage, concrete batching plant, locomotive emissions from non-Project existing rail), fugitive emissions from construction, and considering the prevailing wind directions.

Aspect	Mitigation measures

Dust generation from earthworks, clearing and grubbing, construction activities, concrete batching and exposed areas	▸ Limit clearing to the extent required to construct the works, in accordance with the Project footprint as defined during detailed design
	▸ Stage clearing and grubbing activities to limit the size and duration of exposed areas
	▸ Controls will be implemented to prevent or minimise dust generation during activities involving excavation or disturbance of soils or vegetation, or handling ballast:
	  ▸ use of water sprays or water carts for dust suppression as required (anticipated emission reduction of 50 per cent for water sprays when loading to or from material stockpiles, anticipated emission reduction of 70 per cent when water sprays applied to trucks unloading material)
	  ▸ installation of hoardings or barriers on worksite perimeters where appropriate
	  ▸ polymer sealing of access roads or similar, where practicable within the construction worksites and ensuring sealed access roads into worksites are kept relatively dust free by regular sweeping and washing, wherever needed (emission reduction of up to 100 per cent is claimed in technical literature but performance to this level unrealistic in real-world application)
	  ▸ conducting demolition activities using appropriate dust controls such as water sprays
	  ▸ will install truck wheel wash stations in designated laydown areas, to control the spread of unsuitable materials from worksites
	  ▸ concrete batching plants will employ appropriate dust controls, such as water sprays, covering exposed areas as much as practical, and designing the orientation of the batching plant to limit the potential for impacts to the nearest sensitive receptors. The installation of fabric filters to cement silos would also significantly reduce fugitive dust emissions. A minimum separation distance of 100 m to the boundary of sensitive receptors for concrete batching plants will be provided
	▸ Implement the Air Quality and Dust Management Plan, as a component of the CEMP (as detailed in the 'General' category of this table, above) with respect to spoil haulage including covering of loads when traversing roads to minimise and where possible avoid loss of loaded materials, rock debris and dust
	▸ Water used in dust suppression will be consistent with the quality requirements specified for irrigation and general water use in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments, 2018). Suitable additives to the water will be investigated to improve dust suppression effectiveness and minimise water usage. Adopt the use of additives where appropriate and compliant with relevant approvals and legislation (i.e. the addition of soil binders to water for dust suppression on roads or hard stand areas). Disturbed areas and exposed surfaces will be stabilised as soon as practical following the completion of works in each area, in accordance with the Rehabilitation and Landscaping Management Plan (Table 24-4).
	▸ Disturbed areas and exposed surfaces will be stabilised as soon as practical following the completion of works in each area, in accordance with the Rehabilitation and Landscaping Management Plan. The following mitigation methods will be used, subject to final purpose of the exposed area:
	  ▸ initial establishment of vegetation (anticipated emission reduction of 30 per cent)
	  ▸ maintained revegetation (anticipated emission reduction of 90 per cent)
	  ▸ establishment of self-sustaining rehabilitation vegetation (anticipated emission reduction of 100 per cent)
	  ▸ sealing of exposed surface (i.e. concrete and asphalt) (anticipated emission reduction of 100 per cent)
	▸ Long-term stockpiles will be avoided wherever possible; however, where necessary (e.g. topsoil), long-term stockpiles will be established in designated locations. Stockpiles will be positioned to minimise erosion by the prevailing wind
	▸ Stabilise and protect long-term stockpiles from erosive processes while not in use, such as through impermeable cover or seeding
	▸ To reduce wind erosion from stockpiles, the following mitigation methods will be used, subject to water availability and stockpile activity:
	  ▸ water sprays (anticipated emission reduction of 50 per cent)
	  ▸ wind breaks or earthworks profiling (anticipated emission reduction of 30 per cent)
	  ▸ application of rock armour/covering (anticipation emission reduction of 30 per cent)
	  ▸ covering of the stockpile with an impermeable covering (i.e. tarpaulin) or binding agent (anticipated emission reduction of 100 per cent). If water sprays are implemented for stockpiles, the application rate of water will be increased for stockpiles that will receive new material regularly

Aspect	Mitigation measures
Dust generation from earthworks, clearing and grubbing, construction activities, concrete batching and exposed areas (continued)	▸ Dust emissions from blasting will be managed through avoiding blasting during adverse wind conditions. Blasting will not be undertaken if the prevailing wind direction and size of the blast is likely to transport dust emissions towards sensitive receptors within 500 m of the blast location. Blasting during periods of high wind speeds (>36 km/hr) will be avoided where practical. To determine potential for impact at sensitive receptors, risk assessments will be undertaken prior to blasting events. ▸ Direct exposure of construction workers to respirable silica and other airborne contaminants will be controlled through the use of appropriate personal protective equipment in line with ARTC's procedure *Personal Protective Equipment* (WHS-PR-009) (2022) (available on the ARTC extranet). ▸ Construction speed limits will apply to all unsealed routes used by construction vehicles. Applicable speed limits for local government roads will be determined through consultation with the relevant local council and documented in the Traffic Management Plan (as a component of the CEMP) (Table 24-17). ▸ Minimise the requirement for vehicle movement outside worked areas, where practically possible ▸ Landowners will be notified in advance of the commencement of construction activities in an area proximal to them. This notification will be in accordance with community notification procedures established for the Project and will provide information on the types of activities that will occur, indicative scheduling and the potential impacts that may be experienced (e.g. generation of dust).
Dust generation and deposition as a result of adverse weather conditions	▸ Avoid ground-disturbing activities during windy conditions (i.e. winds > 36 km/hr). When this is not practical, implement additional management measures, such as enhanced watering of access roads (anticipated emission reduction of 50 to 75 per cent) and works areas, to minimise the potential increase in dust ▸ Monitor meteorological conditions at worksites, particularly wind speed and direction. Implement additional dust suppression controls prior to the onset of adverse weather, including additional watering of access roads (anticipated emission reduction of 50 to 75 per cent) ▸ Maintain and improve (if necessary) weather-monitoring protocols to enable dust-suppression activities to occur prior to the onset of adverse weather ▸ Increase the application of water to stockpiles and access roads where necessary during extended dry conditions.
Cumulative effects of dust emissions from construction and external land uses or activities	▸ Undertake dust deposition monitoring during the active period of construction in proximity to Commodore Mine, at locations where baseline data was collected (above), to determine if construction results in significant dust impacts. Dust deposition monitoring to be in accordance with *AS/NZ 3580.10.1:2016 Methods for sampling and analysis of ambient air, Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method* (Standards Australia and Standards New Zealand, 2016a). The results of construction dust deposition monitoring will be included in construction environmental reporting. ▸ Advise the operators of the Commodore Mine of proposed construction activities scheduled to occur in proximity to the mine to enable coordinated consultation with potentially impacted stakeholders.
Emissions from combustion engines (construction vehicles and generators)	▸ Avoid queuing of the construction traffic vehicle fleet on public roads, which in turn would minimise the amount of exhaust emissions generated during construction works ▸ Marshalling and queuing of trucks and worksite vehicles to occur away from residential areas and other sensitive receptors, where possible ▸ Direct exhaust emissions from mobile and stationary plant away from the ground and sensitive receptors, where possible ▸ When locating temporary fuel storage, provide a minimum separation distance of 50 m from sensitive receptors and compliance with *AS 1940:2017 The storage and handling of flammable and combustible liquids* (Standards Australia, 2017a). This is of particular relevance where laydown facilities are in proximity to sensitive receptors, (e.g. B2G–LDN006.3 on Yelarbon–Kurumbul Road) ▸ Minimise the use and intensity of diesel powered engines and vehicles, as much as practicable ▸ For stationary plant and equipment, ensure all diesel motors are fitted with emission control measures and are regularly maintained to manufacturer's specifications ▸ Turn off idling plant equipment and vehicles when not in use

Aspect	Mitigation measures
Emissions from combustion engines (construction vehicles and generators) (continued)	▸ Minimise haul distances between construction sites to spoil sites ▸ Implement a regular maintenance program to ensure equipment and construction fleet are maintained to manufacturer's specifications ▸ Use appropriately sized equipment for construction activities ▸ Procure energy efficient construction equipment, when appropriate and subject to availability ▸ Minimise waste from construction by procuring pre-fabricated products, where possible ▸ Where possible, use low energy intensity building materials instead of high energy intensity materials ▸ Implement a regular maintenance program so that equipment and construction fleet are maintained to manufacturer's specifications.
Use of non-potable water for dust suppression	▸ Water used in dust suppression will be of suitable quality and not result in environmental or human health risks, or impact rehabilitation outcomes. Water additives used to improve dust suppression (e.g. the addition of soil binders to water for dust suppression on roads or hard stand areas) will be risk assessed prior to adoption.
Fugitive dust emissions from vehicles transporting materials to and from site	▸ During construction, additional monitoring for dust and other pollutants will be maintained in key locations adjacent to sensitive and susceptible urban and semi-urban locations, including Yelarbon, Brookstead and Pittsworth. Detailed monitoring plans will be developed in conjunction with construction planning and informed by water availability studies ▸ Vehicles transporting material to and from the maintenance works site on public roads will cover loads to minimise the potential for wind-blown dust emissions and spillages ▸ Implement road sweeping and washing of public road sections where earthen material has been deposited by construction vehicles to minimise dust generation. The need for sweeping and washing will be identified via visual observation ▸ Visually inspect vehicles entering/exiting the site and implement additional controls if corrective actions are required ▸ Implement road sweeping and wash down on public roads to minimise dust generation as required by visual trigger ▸ Install and maintain rumble grids, or similar, at the entry and exit points of laydown areas. ▸ If required, ensure use of lime in construction does not create lime dust nuisance by way of targeted mitigation. Dust mitigation will be implemented by storage of lime in enclosed containers when not in use, not applying in windy conditions, and controlled application near sensitive receptors ▸ Site-based construction traffic will be limited to identified haul routes as per the Traffic Management Plan, developed as a component of the CEMP (Table 24-17).
Greenhouse gas (GHG) emissions	▸ Maintain construction equipment and vehicles to ensure engine efficiency and minimise fuel use and resulting emissions ▸ Procure energy efficient construction equipment, when appropriate and subject to availability ▸ Minimise waste from construction by procuring pre-fabricated products, where possible ▸ Where possible, use low energy intensity materials instead of high energy intensity building materials ▸ Reduce third party (Scope 3) emissions by sourcing imported materials from local areas, minimising travel distances ▸ Reduce travel distances and fuel consumption on-site by planning construction haul roads and staging of related activities efficiently ▸ Minimise as much as possible the idling time of plant and equipment and switch engines off when not in use ▸ Minimise the extent of vegetation cleared during construction to the clearing limits required ▸ Recycle any waste produced where feasible.

Operations

Aspect	Mitigation measures
Operation of and emissions from freight trains along the alignment	▸ Before a train travels on the Inland Rail network, operators will make sure that the classes of dangerous goods, and the identification numbers of vehicles carrying dangerous goods, are recorded in the train consist documentation. Dangerous goods will be loaded, labelled, and marshalled in accordance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024). ▸ If coal is to be transported in future operation years, the potential for coal dust generation will require management via a Coal Dust Management Plan by the rail user and source of coal. The measures included in the Coal Dust Management Plan will aim to minimise surface lift-off of materials in transit and establish protocols to minimise spillage onto external areas of wagons. ▸ If coal is to be transported as part of future operations, prior to transportation of coal, engagement would be undertaken with existing stakeholders and members of the South West Supply Chain regarding coal dust management and monitoring requirements necessary to maintain the integrity of the existing *South West Supply Chain Coal Dust Management Plan* (2019), and maintain compliance with the air quality objectives as prescribed in the EPP (Air).
Emissions from combustion engines (construction vehicles and generators)	▸ Maintenance plant, vehicles and machinery will be maintained and operated in accordance with the manufacturer's recommendations to maximise fuel efficiency ▸ Minimise unnecessary travel between maintenance locations ▸ Turn off idling plant, equipment and vehicles when not in use.

Stakeholder communication	▸ Landowners will be notified in advance of the commencement of maintenance activities in an area proximal to them. This notification will be in accordance with community notification procedures established for the Project and will provide information on the types of activities that will occur, indicative scheduling and the potential impacts that may be experienced (e.g. generation of dust).
	▸ A complaint hotline for the Project will be established and advertised to enable members of the public to notify ARTC of issues, including the generation of excessive dust during operation and maintenance.
	▸ In the event of a complaint regarding air quality, ARTC will:
	  ▸ in the first instance, investigate cause of the complaint and confirm details of the complaint with respect to the nature and severity of impact
	  ▸ determine remedial action, where appropriate
	  ▸ liaise with complainant over remedial action, and with administering authority if required
	  ▸ implement appropriate remedial action where required.

Stakeholder communication	▸ Maintain a complaints register relating to air quality, including any associated remedial actions ▸ Monitor, record and audit complaints about dust and emissions in accordance with the relevant complaints management handling procedures.
Fugitive dust emissions from vehicles transporting materials to and from site (e.g. for maintenance)	▸ Awareness of operational personnel of the sensitivities with regard to elevated dust levels within and adjacent to the Project footprint ▸ Vehicles transporting earthen material to and from the maintenance works site on public roads will cover loads to prevent wind-blown dust emissions and spillages ▸ Implement road sweeping and washing of public road sections where earthen material has been deposited by maintenance vehicles to minimise dust generation. The need for sweeping and washing will be identified via visual observation ▸ Visually inspect vehicles entering/exiting the permanent footprint and implement additional controls if corrective actions are required ▸ During adverse wind conditions or extended dry conditions, visual inspection of stockpiles will be conducted and mitigation procedures implemented if required, such as increased watering.
Greenhouse gas emissions (other than operational rollingstock)	▸ Investigate opportunities for reducing fuel consumption, for example through the use of electric vehicles ▸ Maintain support vehicles and equipment to increase engine efficiency and minimise fuel use and resulting emissions ▸ Plan and stage maintenance activities considering efficiency and fuel consumption ▸ Investigate opportunities to reduce greenhouse emissions through the use of renewable energy ▸ Regular auditing of operational performance with a view to progressively improving efficiency and reducing emissions through reduced fuel consumptions ▸ Monitor, audit and report on greenhouse gas emissions from relevant significant activities and emission sources, and the success of abatement measures ▸ Develop a process for regularly reviewing new technologies to identify opportunities to further reduce emissions and energy use, consistent with best practice environmental management.

24.9.5.5 Monitoring, reporting and auditing

The following section describes the monitoring for particulate matter and dust deposition that will be conducted prior to and during construction. The requirements for monitoring will be documented in the Air Quality and Dust Management Plan.

The Air Quality and Dust Management Plan will include requirements for air quality monitoring, including for dust deposition monitoring, real-time dust monitoring, reporting and the complaints and resolution process. It will also describe the corrective actions and additional mitigations that may be undertaken in response to an exceedance or complaint. The Plan will be drafted and provided to relevant stakeholders for review and comment prior to finalisation.

Implementation of other air quality elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5.

24.9.5.6 Existing particulate matter monitoring

An air quality monitoring program was conducted for the Project consisting of the Inland Rail Air Quality Monitoring Station (AQMS) and Millmerran AQMS, which both monitor particulate matter less than 10 micrometres in diameter (PM^{10}) and particulate matter less than 2.5 micrometres in diameter PM_{10} and $PM_{2.5}$. These monitoring stations were established near the alignment to assist the air quality impact assessment (AQIA) and provide monitoring data to understand air quality in the AQIA area.

The monitoring data obtained by the Millmerran AQMS and Millmerran AQMS has been used to understand air quality in the area local to the Commodore Mine and Millmerran Power Station and guide the assessment of these existing emission sources (Chapter 17: Air Quality). The monitoring data from the Inland Rail AQMS has been adopted as background for the assessment of cumulative impacts.

Monitoring data from Inland Rail AQMS and Millmerran AQMS will be used in the quantitative assessment of construction dust impacts to determine baseline concentrations (which would be added to predicted Project construction activity contributions to allow for cumulative assessment). Monitoring data from the Inland Rail AQMS and Millmerran AQMS may also be used to estimate the contribution of the Project in the event that airborne particulate monitoring is undertaken during the construction works stage (i.e. in response to a complaint).

24.9.5.7 Construction air quality monitoring

Weather conditions monitoring

To aid in the avoidance of dust generation during adverse weather conditions, weather forecasts and observations for adverse weather (e.g. winds greater than 36 km/hr) will be monitored during the construction works stage of the Project.

During adverse weather conditions, enhanced management measures, such as increased water application and/or implementation of temporary stabilisation treatments will be implemented. When these measures are ineffective, and where practical to do so, ground-disturbing activities including excavation and vegetation clearing will be avoided during adverse wind conditions to limit the potential for significant dust generation and impacts offsite.

To assist with auditing and the analysis of air quality monitoring and complaints (f received), periods of adverse weather periods will be recorded in monthly environmental reports. Weather monitoring stations may be deployed along the alignment to assist in providing information on weather conditions.

Baseline dust deposition monitoring

Baseline dust deposition monitoring will be conducted prior to the commencement of construction. Baseline monitoring will be undertaken at Yelarbon, Brookstead, Pittsworth and in proximity to the Commodore Mine. This baseline data will enable comparison with dust deposition data obtained during construction of the Project.

Baseline monitoring is proposed for the area near Commodore Mine as this area has a higher potential for dust impacts due to the presence of an existing dust source (the mine). Baseline dust deposition monitoring data obtained will only be applicable to the area near the mine for the purpose of evaluating construction dust impacts and will not be applied across the alignment.

Dust deposition monitoring will be completed at a small number of locations (less than five) adjacent to the Commodore Mine and nearby sensitive receptor locations. The exact locations of the monitoring will be determined following review of land access requirements. Monitoring will occur for a period of at least three months and will aim to collect data representative of dust-generating activities that occur at the mine, such as blasting, to provide baseline data on the existing air environment. This data will provide indication of existing (baseline) dust deposition at locations that may be impacted by the Commodore Mine and Millmerran Power Station.

Baseline dust deposition monitoring undertaken at Yelarbon, Brookstead and Pittsworth will be undertaken at a single location for each town as part of the quantitative dust modelling assessment. The dust monitoring at these locations will be undertaken for a period of at least one month but may be extended. The results of the monitoring will be referred to when evaluating predicted dust deposition levels from quantitative modelling.

Dust deposition monitoring will be conducted in accordance with *AS/NZ 3580.10.1:2016 Methods for sampling and analysis of ambient air, Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method* (Standards Australia and Standards New Zealand, 2016a).

Monitoring near Commodore Mine

Dust deposition monitoring will continue to be conducted during the active period of construction in proximity to the Commodore Mine, at locations where baseline data was collected (refer above), to determine if construction activity is resulting in significant dust impacts. Dust deposition monitoring will be undertaken in accordance with *AS/NZ 3580.10.1:2016 Methods for sampling and analysis of ambient air, Method 10.1: Determination of Particulate Matter – Deposited matter – Gravimetric method* (Standards Australia and Standards New Zealand, 2016a). The results of construction stage dust deposition monitoring will be included in construction environmental reporting.

Monitoring near urban and semi-urban areas

In addition to air quality monitoring near the Commodore Mine, dust deposition monitoring will also be undertaken in urban and semi-urban areas including, but not limited to, the areas of Inglewood, Yelarbon, Pittsworth, Brookstead, Pampas and Gowrie Mountain. These more urban areas are of higher concern for air quality impacts due to the increased density of sensitive receptors located near construction activity areas and associated dust emission sources. The monitoring locations used for the baseline monitoring (refer above) will be maintained if land access agreements allow. Where new locations are required, the locations for monitoring in urban and semi-urban areas will be determined after the detailed design stage has commenced.

Further assessment of potential dust deposition at sensitive receptors from construction activity will be completed in future stages (prior to construction) when more detailed construction information is available. The outcomes of this further assessment will be used to guide requirements for the locations of dust deposition monitoring in urban and semi-urban areas. For example, where quantitative assessment determines that construction activity in an area has the potential to exceed the Project's dust deposition goal (120 mg/m^2/day—insoluble solids, monthly average), dust deposition monitoring will be undertaken at sensitive receptors near this activity area. Where multiple receptors are present at different orientations from the construction area, multiple dust deposition gauges will be deployed.

The Air Quality and Dust Management Plan will include requirements for air quality monitoring, including for dust deposition monitoring in urban and semi-urban areas.

Selection of the exact locations for the installation of dust deposition gauges will be undertaken by a suitably qualified air quality professional.

In the event that dust deposition monitoring determines exceedance of the Project's air quality goal (120 mg/m^2/day—insoluble solids, monthly average) at sensitive receptor(s) as a result of the Project, additional monitoring, including monitoring of airborne particulate concentrations (e.g. TSP or PM_{10}), may be required. If required, airborne particulate monitoring will be undertaken using a monitor that allows for continuous real-time monitoring.

If validated air quality complaints are received from locations that are not represented by the location of air monitoring stations, additional monitoring stations may be deployed or existing monitoring stations may be relocated.

All relevant results (inspections, monitoring, corrective measures and follow-up) will be included in environmental monitoring reports prepared by the Project.

Corrective actions to mitigate impacts and the minimise the risk of further exceedances will include, as a minimum:

- Review of the air quality monitoring data to determine the period/s of exceedance, along with local weather conditions
- Review of Project and non-Project related emission sources that may have been responsible for, or contributed to, the measured exceedance
- Estimate the contribution of the Project to the measured exceedance using the baseline monitoring data collected
- Upon identification of Project related emission source, undertake a review of the mitigation measures implemented at the time when the exceedance was recorded
- Evaluate the effectiveness of mitigation measures and standard working procedures and adjust or enhance the application of mitigation measures to reduce construction emissions and minimise the risk of future exceedances
- Monitor the effectiveness of enhanced mitigation measures, and if required, reduce the intensity of construction works.

ARTC commits to consult with the relevant stakeholders (including but not limited to TRC and GRC) during the process of establishing air quality monitoring stations, and in the auditing of any complaints to dust and other air quality emissions during construction works and operations stage of the Project.

24.9.5.8 Operations stage monitoring

Quantitative air quality monitoring will be undertaken during the operations stage at a location yet to be determined along the Queensland section of the Inland Rail alignment. This location may not be along the B2G section of the alignment. As the rail network manager, ARTC will be responsible for providing support and funding for air quality monitoring.

Requirements for the air quality monitoring station, including the location of the monitoring station, will be discussed with the stakeholders of the South West Supply Chain, including DETSI and DTMR. It is expected that the pollutant species monitored will include dust deposition and airborne concentrations of PM_{10} and TSP. It is also expected that the monitoring station will be generally equivalent in nature to the existing monitoring stations operating as part of the *South West Supply Chain Coal Dust Management Plan*.

The existing monitoring stations operating as part of the *South West Supply Chain Coal Dust Management Plan* currently include continuous monitoring of airborne concentrations of TSP, PM_{10} and $PM_{2.5}$ at Cannon Hill, and dust deposition monitoring at Cannon Hill, Fairfield and Toowoomba.

The purpose of the operations stage air quality monitoring will be to ensure that the Project is meeting, and will continue to meet, its air quality goals (Table 24-7). The data collected will be compared against the Project's air quality goals and may also be analysed to measure trends over time, such as identifying train services or conditions leading to higher than typical concentrations of air pollutants.

The ongoing need for the monitoring program and operation of the station will be reviewed after three years. The complexity of the monitoring may be reduced at that time to fewer pollutants, or ceased, if the following conditions are demonstrated:

- Measured concentrations are consistently low and consistent with predictions
- Measured concentrations are not expected to change significantly based on freight service forecasts.

The location for the air quality monitoring station will be selected in accordance with the requirements of *AS/NZS 3580.1.1:2016 Methods for sampling and analysis of ambient air, Part 1.1: Guide to siting air monitoring equipment* (Standards Australia and Standards New Zealand, 2016b). For example, the following are minimum requirements for a peak monitoring station measuring PM_{10} or $PM_{2.5}$:

- Sample inlet height between 1.5 m and 15 m
- Unrestricted airflow of 180° around sample inlet with no obstruction between the major source and the sample inlet
- 10 m from any object with a height exceeding 2 m below the height of the sample inlet (trees are measured from the dripline)
- No extraneous sources nearby
- No trees between sampling inlet and source.

Other site considerations for monitoring stations include security from vandalism, access for transporting and maintaining equipment and electricity supply, if required. The site should also have regard to the local influence of meteorology and topography.

Coal trains will join the Inland Rail alignment east of the Border to Gowrie section at Toowoomba (travelling eastbound). It is therefore likely that a monitoring site east of Toowoomba, i.e. not within the B2G section of the alignment, will be the most appropriate location as it will measure the impact of a higher number of freight services, covering the full range of potential sources including coal services.

The responsibility for the reporting of the monitoring data and the maintenance and ongoing operation of the monitoring station will be discussed with the stakeholders of the South West Supply Chain.

If a complaint related to air quality is received during the operations, investigations will be undertaken to verify the cause and nature of the complaint.

In the event that exceedances of the Project's air quality goals, as a result of Project activities, are recorded during the operations stage, corrective actions will be required to mitigate impacts and the minimise the risk of further exceedances. Corrective actions that may be undertaken include:

- Review of the air quality monitoring data to determine the period/s of exceedance
- Review of Project and non-Project related emission sources which may have been responsible for, or contributed too, the measured exceedance
- Upon identification of Project-related emission source, undertake a review of operational activities at the time when the exceedance was recorded
- Evaluation of the effectiveness of mitigation measures and standard operational procedures with respect to the potential for future exceedances.

24.9.5.9 Operations stage emissions reporting

Emissions reporting is to be undertaken where applicable. Emissions reporting requirements will be determined during the detailed design stage and will be consistent with Infrastructure Sustainability Council and National Greenhouse and Energy Reporting requirements.

24.9.6 Surface water

24.9.6.1 Environmental outcomes

- Post-construction water runoff from the Project's permanent footprint will not adversely impact downstream environments
- Where existing water bodies do not comply with water quality guidelines, water-quality objectives (WQOs) for the Project will not be worse than ambient historic and seasonal fluctuations
- Construction water take will be minimised by adopting water-efficient designs and construction methodologies.

24.9.6.2 Performance criteria

- Achieve site-specific water quality objectives for water chemistry, turbidity and sedimentation levels to minimise potential impacts to ecosystems and waterways and their associated values
- Water used on site during construction will be consistent with the quality requirements specified for irrigation and general water use in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments, 2018)
- Water quality downstream of the Project's construction works is within the site-specific WQOs established for the Project
- Project construction works are undertaken in accordance with the CEMP including plans for surface water, soils, rehabilitation and landscaping, and erosion and sediment control.

24.9.6.3 Management and mitigation measures

Surface water aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-9.

TABLE 24-9 MITIGATION MEASURES—SURFACE WATER

Detailed design

Aspect	Mitigation measures
General	▸ A Surface Water Management Plan will be developed for the Project as a component of the CEMP. The plan will be developed in consultation with local governments, relevant agencies and other stakeholders, after the establishment of location-specific water quality objectives and prior to construction commencing. The plan will provide a Surface Water Monitoring Framework (Section 24.9.6.4) which will be prepared in accordance with the *Receiving Environment Monitoring Program Guideline – for use with environmentally relevant activities under the EP Act* (DESI, 2024). The plan will provide most of the scope of a Receiving Environment Monitoring Program with the exception of the characterisation of releases, which are not proposed as part of the Project. The plan will also provide information to support (if necessary) an evaluation of the potential impacts of releases of contaminants to the environment, and will as a minimum, provide: ▸ s description of the Project and construction activities of relevance to surface water quality ▸ a description of the receiving waters ▸ water quality indicators (chemistry, turbidity, temperature, turbidity, electroconductivity) – refer to the Water Quality Guidelines ▸ management strategies and mitigation measures proposed to satisfy the performance criteria and achieve the surface water environmental outcomes ▸ monitoring program design: – locations of surface water monitoring sites – sampling frequency and timing, having regard to seasonal variations – sampling methods including Quality Assurance/Quality Control (QA/QC) procedures – analysis and interpretation of results ▸ spill prevention measures, as well as spill response procedures (should an accidental discharge take place) as follows: – report the incident to relevant supervisor. If warranted, evacuate the area and follow emergency procedures, i.e. calling ‘000’ – control the source of the spill to stop loss of the chemical/material – contain the chemical/material that has been spilled to prevent further spread – clean up the spilled chemical/material, for disposal to a licenced waste management facility ▸ spill management and discharge permitting system to reduce the risk of accidental discharge from site ▸ compliance and corrective action requirements ▸ reporting requirements and schedule. ▸ site-specific Stormwater Management plans for each of the temporary project facilities to effectively manage the overland flow within each site and discharge to the receiving environment under developed conditions ▸ An ESCP will be developed for the Project during detailed design as a component of the CEMP. The ESCP will guide development of site or section specific ESCPs and will be informed by updated and detailed erosion hazard risk assessments to calculate potential soil loss rates to confirm high-risk areas, and updated erosion and sediment control structure designs. These updated erosion hazard risk assessments will be undertaken using the Revised Universal Soil Loss Equation (RSULE) to inform preparation of ESCPs for specific sections of the proposed Project alignment. The erosion and sediment control measures will be developed by a certified practitioner in erosion and sediment control, in accordance with the intent of *Best Practice Erosion and Sediment Control* (International Erosion Control Association, 2008) and the *Soil Conservation Guidelines for Queensland* (Department of Science, Information Technology and Innovation, 2015) and will be implemented during construction of the Project.

Aspect	Mitigation measures
General (continued)	▸ The ESCP will include the number of and locations for specific temporary/permanent erosion and sediment control measures, such as sediment fencing and retention basins, scour protection, berms and other location-specific erosion controls based on consideration of site conditions. Ongoing ESCP reviews and revision processes will include: ▸ reviewing and updating the ESCPs regularly during construction ▸ minimising the area of disturbance during construction for the safe construction, operation and maintenance of the rail corridor ▸ revegetating sites in a timely manner following completion of construction ▸ scheduling of works with consideration to periods of higher rainfall (e.g. summer months) and minimising disturbance (e.g. timing of clearing to minimise amount of exposed soil) ▸ establishing and specifying the monitoring and performance objectives for handover on completion of construction ▸ planning to use existing tracks and designing new access tracks, either permanent and temporary with the aim of minimising disturbance of substrate and vegetation ▸ establishing erosion and sediment controls at the commencement of ground disturbing works and maintain to effective working order until works have completed and the area has stabilized ▸ minimising exposure of dispersive subsoils through methods such as staging construction disturbance, topsoil replacement or rehabilitation immediately following construction ▸ ensuring that excavation is undertaken in a manner to prevent erosion or landslip, and that working faces are limited to safe height and slopes, with surfaces drained to avoid ponding and erosion. ▸ monitoring the effectiveness of erosion controls installed as part of the environmental inspection schedule for the Project, as prescribed in the CEMP (Section 24.5.2) ▸ Modifying or replacing controls that are found to be failing or not performing as intended.
Erosion and sediment control	▸ Develop and update and finalise the draft Soil Management Plan for the Project (as detailed in Table 24-4) to detail procedures and protocols relevant to potential impacts on water quality and watercourses. ▸ Wherever a potential salinity risk is identified, the following design management measures should be implemented: ▸ temporary earthworks and permanent landform for the Project are designed to avoid unwanted water ponding. This objective will be achieved through surface levelling and use of cross-drainage and longitudinal drains within the rail corridor ▸ design water retention structures, such as sediment basins, to prevent downward leakage of water, with the use of lining or similar ▸ where possible, avoiding the need for diversions or alterations to water resources.
Interference with existing surface water	▸ The design is to be further developed during detailed design to: ▸ minimise the potential for diversion of watercourses (as defined under the *Water Act 2000* (Qld)) and waterways (as defined under the *Fisheries Act 1994* (Qld)) are minimised ▸ where practicable, minimise the extent of impacts to waterways, riparian vegetation and in-stream flora and habitats, in accordance with: – Riverine protection permit exemption requirements (WSS/2013/726) (DRDMW, 2023a) – accepted development requirements for operational work that is constructing or raising waterway barrier works (DAF, 2018a) – *State code 18: Constructing or raising waterway barrier works in fish habitats* (Department of State Development, Infrastructure, Local Government and Planning, 2022b) ▸ Where the Project does not meet the *Riverine protection permit exemption requirements* (DRDMW, 2023a) a riverine protection permit will be sought for works within a watercourse. ▸ Where the Project does not meet the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a), a development approval for operational work that is constructing or raising waterway barrier works will be sought where required. ▸ An in-stream monitoring program will be developed during the detailed design stage to inform design and management measures to be used at proposed waterway crossing activities during construction.

Aspect	Mitigation measures
Water quality	▸ The Surface Water Monitoring Framework (Section 24.9.6.4) will consider, where appropriate, aligning with the in-stream monitoring program. The in-stream monitoring program is to be developed for the purposes of monitoring impacts to riparian vegetation, aquatic fauna and habitats. It will be developed through the detailed design process to inform engineering design and management measures to be used at proposed waterway crossing activities.
Availability of water to users	▸ The design will be further developed during detailed design to avoid, where practicable, impacts to private water storages so that affected landowners retain access to existing natural resources ▸ If impacts to lawful access to existing natural resources cannot be avoided through design, appropriate compensation arrangements will be discussed and sought to be agreed with the relevant impacted landowner ▸ Where the Project will result in disturbance to private surface water storages (e.g. dams), ARTC will consult with the owners of relevant, legal storage structures prior to relevant works commencing to identify an approach to decommissioning or relocation of the structure. This may also include the usage or relocation of stored water and compensation (if applicable).
Construction water	▸ The water required for construction activities (volumes, quality, demand curves, approvals requirements and lead times) will be confirmed during detailed design through the construction approach refinement process and will be documented in a Construction Water Plan. ▸ the refinement process will assess the suitability of each potential water source, based on the following considerations: – available volume from identified source – legal access – volumetric requirement for the activity – water quality requirement for the activity – source location relative to the location of need. ▸ licences, approvals and agreements to access water from sources identified in the finalised Construction Water Plan will be obtained. These may include seasonal water assignments and/or water licences under the Water Act or access agreements with bulk water suppliers or private landowners. ▸ ARTC will consult with the relevant stakeholders including local governments where relevant, regarding the management of wastewater including options for treatment, reuse, and disposal.
Registered water users	▸ Confirm with the owners of water infrastructure on impacted lots, the intended purpose of the water and any associated water authorisations. Inform each landowner that: ▸ if a water licence attaches to land and the licensee ceases to be an owner of the land, on the day the licensee ceases to be the owner: (a) the licensee ceases to be the holder of the water licence; and (b) the registered owner of the land becomes the new licensee ▸ when ownership of a property is transferred, the water licence for the property may then be associated with multiple lots, and the water licence may need to be amended before the transfer of the land or it will be held jointly by the buyer and seller after the transfer. ▸ Identify landowners willing to supply construction water to the Project, including briefing the landholder on potential amendments required to the existing authorisations ▸ Where applicable, engage with any downstream landowners deemed at risk from the Project (e.g. where the Project may impact on instream or overland flow) ▸ ARTC to inform the contractor of existing water infrastructure and authorisations attached to a lot.

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Erosion and sediment control	▸ Implement the Soil Management Plan (as detailed in Table 24-4) and ESCP, including the installation and monitoring of site specific erosion and sediment controls in support of pre-construction activities and early works minor civil works, e.g. establishing laydown areas ▸ Install permanent longitudinal drains and erosion-control measures, such as sediment retention basins and scour protection, in accordance with the revised erosion and sediment control plans developed during detailed design ▸ Monitor the effectiveness of erosion controls installed as part of the environmental inspection schedule for the Project ▸ Controls that are found to be failing or not performing as intended will either be modified or replaced, as required ▸ Clearing extents are limited to the Project footprint, and clearing is scheduled to minimise the exposure time of unprotected earth to prevent sedimentation of receiving waterways ▸ Where practical, vegetation clearing and ground-disturbing works will be staged sequentially across the Project to minimise areas exposed to erosion and sediment risk of receiving waterways ▸ Implement the Rehabilitation and Landscaping Management Plan, as a component of the CEMP (as detailed in Table 24-5) to ensure surfaces are consolidated through either landscape, drainage and or pavement designs to reduce risks of operation and maintenance erosions and sediment control ▸ Surface profiling of the site will occur, to prevent inadvertent ponding of water.
Dewatering	▸ Where the dewatering of excavations (e.g. trenches and pier holes) is required, water must meet the established WQOs for receiving waterways before being released/discharged into local waterways ▸ If dewatering of existing storages is required, dewatering strategies will be required to comply with the Biosecurity Act to take reasonable measures to avoid the spread of pest species, e.g. screening of pump intake.
Construction water	▸ The extraction of water must occur in accordance with licenses, approvals and/or agreements ▸ Volume monitoring during extraction will be required for each source point, with extraction logs maintained ▸ Extraction reporting will occur, as required, in accordance with requirements of relevant licenses, approvals and/or agreements obtained to cover the activity ▸ Ensure efficient water application, so as to avoid prolonged oversaturation of soils within and adjoining the Project footprint.

Water quality	▸ Implement the Surface Water Management Plan, as a component of the CEMP (as detailed in the ‘General’ category of this table, above)
	▸ Scheduling construction works in defined watercourses and drainage features for drier months where logistically possible
	▸ Water will meet the established WQOs for receiving waterways before being released/discharged into local waterways. Water that does not comply with relevant WQOs will either be:
	  ▸ treated onsite to enable discharge
	  ▸ removed from site for disposal at an appropriately licenced facility.
	  ▸ water that is dispersed for vegetation establishment, landscaping and rehabilitation will be consistent with the quality requirements specified for irrigation and general water use in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments, 2018)
	▸ Bulk storage areas for dangerous goods and hazardous materials will be located away from areas of social and environmental receptors such that offsite impacts or risks from any foreseeable hazard scenario will not exceed the dangerous dose for the defined land use zone, i.e. either sensitive, commercial/community, or industrial, in accordance with the intent of *State Code 21: Hazardous chemical facilities* (Department of State Development, Infrastructure, Local Government and Planning, 2022) or the SPP.
	▸ Licenced transporters operating in compliance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024) will be used for the transportation of dangerous goods
	▸ Chemicals stored and handled as part of construction activities will be managed in accordance with relevant legislation, standards and guidelines

Aspect	Mitigation measures
Water quality (continued)	▸ Procedures will be established for safe and effective fuel, oil and chemical storage and handling. This includes storing these materials within roofed, bunded areas. The bunding will have floors and walls that are lined with an impermeable material, to prevent leaching and spills. ▸ Construction tasks will be scheduled to avoid, where possible, bulk earthwork activities within the 1% AEP extent during periods of elevated flood risk. Where works cannot be scheduled outside of this time period, activity-specific flood readiness and response planning will be required. This planning will be developed in consultation with the relevant local government and the Queensland Fire Department (QFD) and Queensland Police Service (QPS). ▸ Laydown areas and other construction facilities that are located within the 1% AEP extent will be temporary. Their planning and function in supporting construction will reflect the local flood risk, e.g. hazardous goods will not be bulk stored in these locations. ▸ Mobile plant will not be stored in the 1% AEP extent when not scheduled to be in use for construction purposes ▸ Plant maintenance and refuelling will be carried out in bunded areas set back a minimum of 50 m from waterways, with appropriate interception measures in place to avoid impacts to waterways, aquatic habitats, and groundwater. Appropriate spill-control materials, including booms and absorbent materials, will be provided onsite at refuelling facilities at all times. ▸ Appropriate waste bins will be located in laydown areas to facilitate segregation and appropriate containment of waste materials ▸ Where practicable, implementation of a 10 m exclusion area from the top of bank associated with any waterways within the temporary footprint.
Rehabilitation	▸ Reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively, consistent with the Rehabilitation and Landscaping Management Plan (as detailed in Table 24-5)

Operations

Aspect	Mitigation measures

Water quality	▸ Drainage structures will be inspected to assess physical condition, performance and structural integrity, with corrective measures implemented, as required. Maintenance of surface and subsurface drains will be required to ensure continued effectiveness and to minimise risk of impact to surrounding and downstream environments and structures.
	▸ Maintenance of plant, rollingstock and railway infrastructure will be carried out with appropriate interception measures in place to avoid impacts to waterways, aquatic habitats and groundwater. Appropriate spill control materials, including booms and absorbent materials, will be onsite at all times during maintenance activities.
	▸ Spill response procedures (should an accidental discharge take place) will be implemented, as follow:
	  ▸ report the incident to the relevant supervisor. If warranted, evacuate the area and follow emergency procedures, i.e. calling ‘000’
	  ▸ control the source of the spill to stop loss of the chemical/material
	  ▸ contain the chemical/material that has been spilled to prevent further spread
	  ▸ clean up the spilled chemical/material, for disposal to a licenced waste management facility
	▸ Mass discharge events (e.g. train derailment) will be responded to in a coordinated manner, with ARTC adopting the role of lead coordinator, with involvement of rollingstock operators, emergency service providers, local council representatives and State agency representatives, as relevant and necessary.

Erosion and sediment control	▸ The effectiveness of permanent erosion controls (e.g. scour protection or vegetated swales) will be monitored as part of the maintenance inspection schedule for the Project, as prescribed in the Operations EMP ▸ Controls that are found to be failing or not performing as intended will either be modified or replaced, as required ▸ The integrity of rail embankments will be regularly monitored and maintained to prevent slope face scour and degradation.

24.9.6.4 Monitoring, auditing and reporting

This section provides an overview of the baseline and construction-stage surface water monitoring that will be conducted for the Project. To provide a robust water quality monitoring strategy, targeted real-time monitoring surveys will be performed in addition to regular baseline monitoring.

Implementation of other surface water elements of the Outline EMP, CEMP, and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with the processes specified in Section 24.5.

ARTC will provide a detailed monitoring strategy for each water crossing during construction once exact locations and timeframes of Project construction works are established. Site-specific mitigation measures for each crossing location will be developed to allow for individual site characteristics and impact level of construction activities. Considerations for the site-specific monitoring strategy will be documented in the Surface Water Management Plan and will include:

- Water quality objectives
- Aquatic fauna and flora
- Environmental values including aesthetic quality of downstream waterbodies
- Soil salinity
- Flow regime
- Sediment loading
- Elevated exposure to nutrients and toxicants
- All work will be in accordance with *Accepted Development Requirements for Operational Work that is Constructing or Raising Waterway Barrier Works* (DAF, 2018a)
- Projects works to be undertaken in accordance with Surface Water Management Plan, Soil Management Plan, Rehabilitation and Landscaping Plan, and erosion and sediment control measures.

Monitoring requirements will be documented in the Surface Water Management Plan.

Baseline surface water monitoring

A program of baseline surface water monitoring has been undertaken as a part of the revised draft EIS investigations. This monitoring has enabled interim site-specific WQOs to be derived. Additional water quality sampling will be conducted prior to the commencement of construction to enable full calculation of site-specific WQOs, reflective of current climatic conditions, as a revision to the interim site-specific WQOs. Monitoring will include 18 data points over a two-year period to derive site-specific WQOs, in accordance with the *Queensland Water Quality Guidelines 2009* (DES, 2009).

The locations of sampling will generally be consistent with those adopted for the previous baseline sampling, as identified in Chapter 13: Surface Water. If, following detailed design, previous sites are no longer considered to be representative of surface water conditions in the Project footprint, then such locations will be changed for alternative locations that are closer to the Project footprint.

Surface water quality data will be collected at accessible sites in accordance with the *Monitoring and Sampling Manual* (DES, 2018c). Field personnel undertaking the surveys will be experienced in the collection and analysis of water quality samples.

At each sampling location, the same site characteristics will be recorded, and in-field measurements will be collected as have been collected for the previous baseline sampling (Chapter 13: Surface Water). Additionally, samples will be collected for laboratory analysis, and will be subject to the same suite of analysis as previous baseline sampling (Chapter 13: Surface Water).

Construction surface water monitoring

A construction surface water monitoring program will be designed and implemented in accordance with the Surface Water Management Plan, to be reviewed and accepted by the EM.

The locations, frequency and parameters of interest for water quality sampling during construction will be determined in relation to location-specific WQOs with consideration for:

- Construction activities with potential to impact water quality
- Seasonality
- Sensitive of receiving waterway
- Flow characteristics.

Water quality sampling will be limited to in-situ field parameters in the first instance (i.e. dissolved oxygen, pH, electroconductivity, temperature, turbidity and oxidation reduction potential) to provide instant results and evaluation of potential impacts from construction activities. Where exceedances of WQOs are recorded that cannot be attributed to natural background conditions, i.e. water quality values downstream of the construction site vary by +/- 20 per cent from upstream water quality values, then additional sampling and corrective mitigation measures may be warranted.

Corrective action procedures for patterns of WQO exceedance that can be attributed to the Project will be agreed with the EM prior to commencement of construction and documented in the CEMP. Quality assurance, data control and reporting requirements will also be agreed and included in the CEMP.

24.9.7 Flooding and geomorphology

24.9.7.1 Environmental outcomes

- The Project is designed and constructed to reduce the potential for adverse impacts on existing water flows, including overland flow, existing flooding and geomorphological regime.
- Potentially affected landowners and other stakeholders are consulted on the Project's potential flood impacts and design outcomes, and proposed construction staging in relation to hydrological profiles.

24.9.7.2 Performance criteria

- During the pre-construction activities and early works, and construction works stages, the Project implements mitigation measures identified through Flood Risk Assessments in order to address identified adverse flood impacts.
- The Project is designed with regard to the FIOs framework for land, receptors and infrastructure that are potentially impacted by the Project. Detailed consideration of flood impact potential is required where modelling indicates the FIOs are likely to be exceeded.

24.9.7.3 Flood impact objectives

In June 2020, the Australian Government established an independent International Panel of Experts for Flood Studies (the Expert Flood Panel) to provide advice to the Australian Government and the Queensland Government on the flood modelling and designs developed by ARTC for the Inland Rail in Queensland, and to provide assurance to the public that the flood models and reference designs developed by ARTC meet national guidelines and industry standards.

As an advisory body to government, the Expert Flood Panel was independent of ARTC in respect of the development, public consultation, and approvals for the Inland Rail EIS process.

The Expert Flood Panel undertook a comprehensive review of all the hydrologic and hydraulic modelling, supporting technical information and reporting prepared by ARTC and its consultants. The Expert Flood Panel prepared draft reports for each of the key catchments crossed by the Project alignment being Macintyre River, Macintyre Brook, Cremascos Road, Bybera Road, Pariagara Creek, Cattle Creek, Native Dog Creek, Bringalily Creek, Nicol Creek, Back Creek, Condamine River, Westbrook and Dry Creek, and Gowrie Creek. In each report the Expert Flood Panel documented a series of comments, and rated their risk level, in an Issues management register. ARTC, and its consultants, worked closely with the Expert Flood Panel to provide additional technical information and/or undertaking sensitivity testing to address the concerns of the Expert Flood Panel. The Expert Flood Panel provided their final report to the Queensland and Australian Governments on 6 September 2022, and it was released publicly on 7 October 2022.

The final report presented the outcomes of the Expert Flood Panel's review of the flood models and reference designs developed by ARTC for each of the Queensland projects, including this Project.

The FIOs for the Project were developed as part of the Expert Flood Panel review process. The FIOs are quantifiable flooding metrics aimed at identifying locations where the Project has the potential to cause a change in baseline flood characteristics that may result in adverse impacts. The nominated FIOs as presented in Table 24-10 were developed in consultation with the Expert Flood Panel to provide guidance as to the point at which a more detailed consideration of impact potential is required when they are exceeded.

TABLE 24-10 FLOOD-IMPACT OBJECTIVES

Parameter	Objectives					
Change in peak water levels (afflux)[1]	Existing habitable[2] and/or commercial and industrial buildings/premises (e.g. dwellings, schools, hospitals, shops) and sensitive infrastructure[3]	Yards or gardens of residential or commercial/ industrial properties/lots (excluding habitable[2] dwellings/ buildings)	Existing non-habitable structures (e.g. agricultural sheds, pump-houses)	Existing local roads currently in use Existing rail lines	State controlled roads	Agricultural and grazing land/forest areas and other non-agricultural land
	≤ 10 millimetres (mm)[4]	≤ 50 mm[5]	≤ 100 mm[4,6]	10 to 100 mm[7]	10 to 20 mm[7]	≤ 200[8] mm with localised[9] areas up to 400 mm
	Changes in peak water levels are to be assessed against the FIOs. Changes in peak water levels can have varying impacts on different infrastructure/land. The FIOs were developed to consider the FSRs in the vicinity of the Project. It should be noted that in many locations the presence of existing buildings or infrastructure limits the change in peak water levels. For peak water levels assessed at any structure, the change in peak water level is measured relative to the existing floor level.					
Change in duration of inundation[1,4]	Identify changes to time of inundation by determining time of submergence in existing and developed[10] cases. Assess impacts against the following objectives for habitable floors[2]: ▸ Where existing flood inundation is less than 1 hour–up to 1 hour duration of inundation ▸ Where existing flood inundation of 1 hour or more occurs–up to a 5 per cent increase in duration of inundation. For impacted roads/rail, the duration of inundation can increase by up to 10 per cent, subject to the determination of the time of submergence and consideration of impacts on accessibility/egress during flood events in consultation with the relevant authority. Assess impacts against the following objectives for all other land uses: ▸ Where existing flood inundation is less than 1 hour–up to 1 hour duration of inundation ▸ Where existing flood inundation of 1 hour or more occurs–up to a 10 per cent increase in duration of inundation. The duration performance targets do not apply to newly flooded land where compliant with afflux criteria (see general notes below).					
Flood flow distribution[1]	Aim to minimise changes in natural flow patterns and minimise changes to flood-flow distribution across floodplain areas. This includes the objective of maintaining drainage paths that are conveying runoff from adjoining terrain, minor watercourses, and gullies, to avoid ponding of water and/or excessive duration of inundation. Identify any changes and justify acceptability of changes by assessing the risk with a focus on land use and FSRs. The identification of changes to flow distribution is to include the consideration of a range of floods, from small (frequent) events for conditions throughout the event, to large and extreme (infrequent) events. This exercise will be undertaken to identify (and where deemed necessary, mitigate) any increased risk to FSRs associated with flow distribution changes.					

Velocities[1]	Maintain existing velocities where practical or minimise increases in velocities. Identify changes to velocities and impacts on external properties/lots.
	The ETV for natural ground surfaces should be established from a site-specific assessment by a suitably qualified specialist, and in consideration of engineering guidelines. For sealed surfaces, this same approach could be applied, or through reference to suitable guidelines/specifications.
	Assess against the following performance objectives:
	▸ Sealed surfaces (or surfaces otherwise protected against erosion):
	  ▸ for existing velocities equal to or greater than 1 metre per second (m/s) (or the defined ETV), the increase in velocity is limited to 20 per cent
	  ▸ for existing velocities (or velocities associated with new flow paths) less than 1 m/s, the maximum design velocity is 1.2 m/s (or the defined ETV)
	▸ Natural ground surfaces including watercourses, agricultural land, unimproved grazing land and other unsealed or unprotected areas:
	  ▸ for existing velocities equal to or greater than 0.5 m/s (or the defined ETV), the increase in velocity is limited to 10 per cent (or within an acceptable range as determined by geomorphological assessment)
	  ▸ for existing velocities (or velocities associated with new flow paths) less than 0.5 m/s (or the defined ETV), the maximum design velocity is 0.5 m/s (or the defined ETV).					

Parameter	Objectives
Hazard (velocity x depth product)[1]	Assess against the following objectives: Roads/rail, urban and commercial areas, dwellings: ▸ A 10 per cent increase in velocity x depth product. Other land: ▸ A 20 per cent increase in velocity x depth product. In both cases where the velocity x depth product is below 0.15 square metres per second (m^2/s) in the Developed[6] Case, no percentage change performance targets apply.
Extreme event risk management	Consider risks posed to neighbouring properties/lots and emergency access/egress for events larger than the 1% AEP event to minimise unexpected or unacceptable impacts. At sites with existing sensitive infrastructure[3], uses involving vulnerable people and/or any critical road network that was designed to be immune to flooding in any extreme event, the objective for increase in peak water level under the 0.2% AEP (1 in 500) is 10 mm[11]. At existing habitable[2] dwellings and/or commercial and industrial buildings/premises under the 0.05% (1 in 2000) AEP event, a maximum increase in peak water level of 250 mm applies.
Sensitivity testing	Consider risks posed by climate change and blockage in accordance with ARR (2019). Undertake assessment of impacts associated with Project alignment for both scenarios.

Table notes:
1. These FIOs apply for events up to and including the 1% AEP event and relate to land outside the rail corridor (as well as roads and level crossings that lie within/traverse the rail corridor). Where transport corridors are shared or lie immediately adjacent to the Inland Rail corridor, relevant FIOs apply as outlined in Table 24-10 (i.e. for existing rail, State-controlled roads and local roads).
2. Habitable floors include all lawfully occupied dwellings regardless of land use zoning.
3. Sensitive infrastructure means infrastructure that is an essential service required to operate during emergency events, including water treatment facilities, telecommunications substations and electrical substations.
4. Data permitting and based on a review of calibration outcomes, where negative calibration bias is identified, a suitable tolerance (commensurate with the bias) will be added to the design flood levels to assess afflux and duration acceptability against the nominated flood impact objective threshold.
5. This flood impact objective reduces to ≤20 mm for developed lots that are less than 1,000 square metres (m^2) in area.
6. The current usage of non-habitable structures will be reviewed as design progresses and additional detail becomes available (e.g. animal shelter versus horticultural packing facility). This could influence the application of one of the other FIOs, which may be more suited to the specific usage of the structure.
7. Consultation will be undertaken with the relevant asset owner based on the application of the appropriate FIOs. This consultation will present all changes (>10 mm) across the road or rail network to identify specific roads or sections of rail that require local and/or route specific considerations. In flood sensitive locations this may entail a lower afflux threshold being adopted.
8. Where the Project alignment crosses the Condamine River and Lockyer Creek floodplains, this objective reduces to 100 mm (with localised[9] areas up to 200 mm), in light of the combination of floodplain sensitivity, inundation duration, and land use (intensive horticulture).
9. 'Localised' is defined as the lesser of <1.0 ha or 5 per cent of an individual lot.
10. Developed scenario implies fully constructed/operational rail line and associated works.
11. The 0.2% AEP (1 in 500) event is only required to be assessed where adherence to the flood impact objective cannot be inferred from the 1% AEP and 1 in 2000 AEP event results.

General notes:
- Justification must be provided in the selection of a governing flood impact objective where two or more competing FIOs may apply–in the absence of such justification the most limiting of the applicable FIOs will apply.
- The ETV means the velocity at which water movement has the potential to create scour or erosion. For natural surfaces, the erosive threshold of the soil/ground cover/vegetative conditions will be established from an assessment by a suitably qualified specialist. In the absence of such assessment being undertaken an ETV of 0.5 m/s will be assumed.
- The effects of any increased lateral spread of floodwaters (i.e. associated with permissible afflux) beyond 1 ha or 5 per cent of the affected lot area should be considered on merit, taking into account affected receptors and land-usage (e.g. flood depth and flood duration).
- The term 'Road' relates to the operational road surface.
- Within the rail corridor erosion protection measures will be installed, as required. This is with a view to managing the risk of scour propagating beyond the rail corridor boundary.
- Consultation will be undertaken using the full suite of flood impact information, including afflux, velocity, duration and hazard. In locations where the afflux or velocity FIOs are exceeded, the change in flood hazard will be communicated to the landowner with respect to the combined flood hazard classifications as defined in ARR 2019 and the velocity x depth product.

It is recognised that further refinement and confirmation of site-specific mitigation measures will be undertaken during future design, construction and operations stages with respect to FIOs. It is noted the purpose of the FIOs is to identify areas where additional consideration is required and to determine whether the impact is acceptable, or mitigation is required. Mitigation measures adopted within the detailed design will be selected on a case-by-case basis and be subject to an analysis of their ability to reduce flood impact objective exceedances as well as their respective social, environmental, economic, engineering and landowner constraints, and will be informed by ongoing and collaborative consultation with landowners. This approach will allow for a robust process of mitigation selection to ensure that a focus on reducing flood impact objective exceedances is not considered in isolation from other Project aspects.

Additional detailed survey and local soils/vegetation information will be gathered to inform detailed design, along with ongoing consultation and discussion with landowners and stakeholders. These steps will aid in defining the preferred detailed design solution. Project and design constraints will also play a role in this definition process to ensure defendable and robust design solutions are achieved, as is the norm for linear infrastructure projects of this nature. It is recognised that it may not be possible to eliminate flood impact objective exceedances due to environmental or engineering constraints or due to prohibitive costs. It also may not be necessary where further assessment determines that the exceedances are not material and do not warrant further action.

Updated modelling will be undertaken in detailed design which will consider the effect of additional inputs such as noise walls at a local catchment scale, for all defined AEP events. Mitigation measures will be reviewed and updated as required based on updated modelling in the detailed design stage.

The Project's Flood and Geomorphic Impacts Mitigation Framework is presented in Figure 24-4 and discussed below.

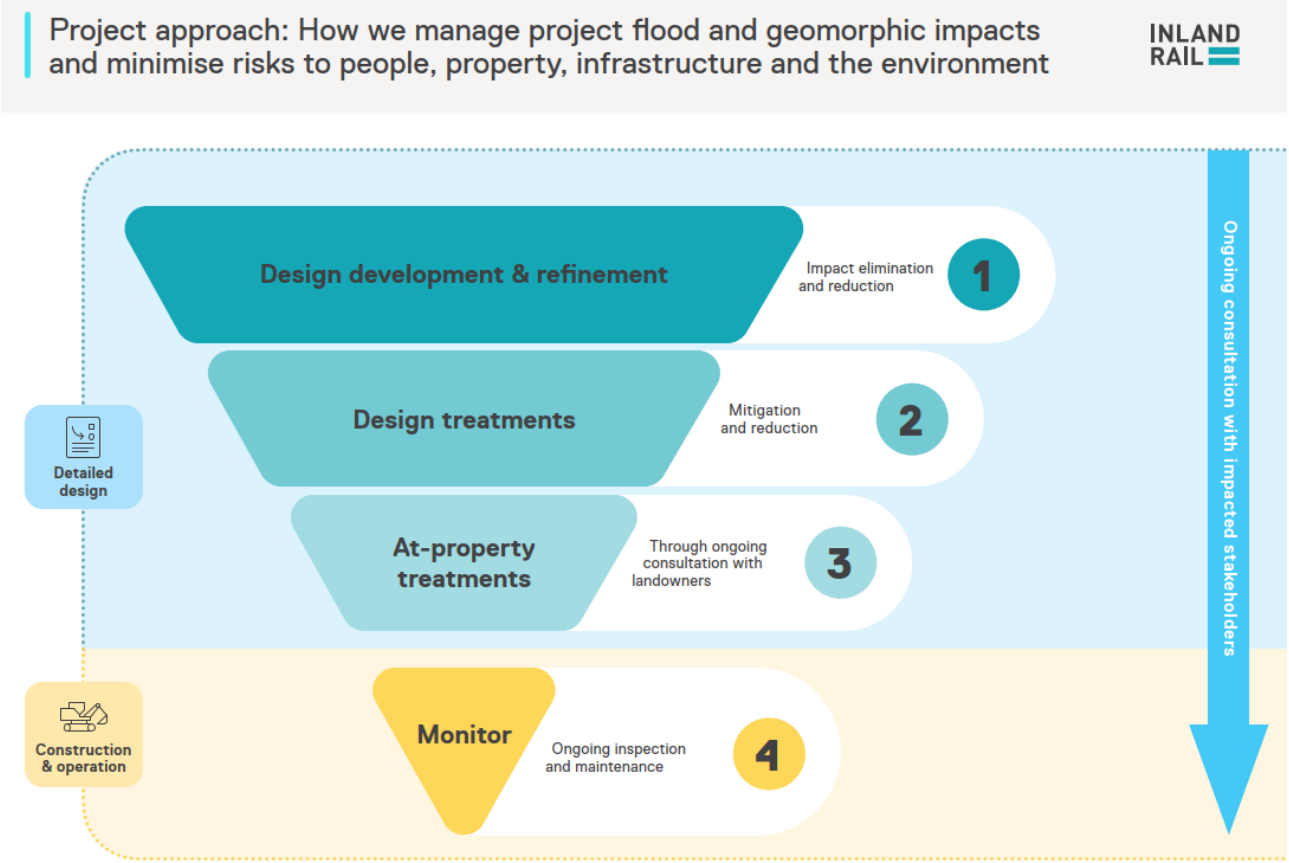

FIGURE 24-4 PROJECT FLOOD AND GEOMORPHIC IMPACTS MITIGATION FRAMEWORK

- **Step 1: Further design development and refinement**:
  - refine the flood models further in line with Expert Flood Panel recommendations (refer to the Issues Management Register in Appendix T1: Hydrology and Flooding Technical Report – Volume 1) for items that relate to detailed design requirements
  - further detailed consideration of, or investigation into, FIOs exceedances and geomorphic impacts to understand their consequences on land, waterways and FSRs
  - engage with landowners on a case-by-case basis to understand how FIOs exceedances are likely to affect their assets and/or operations
  - develop the Project's hydraulic design further (e.g. through additional cross-drainage structures, relocation or reconfiguration of cross drainage structures) to eliminate or reduce FIO exceedances and geomorphic impacts further, in consultation with directly impacted landowners.
- **Step 2: Revised design treatments**:
  - introduce alternative cross drainage solutions (e.g. additional cells, alternative types of structures, changes to pipe/box angles, changes to invert levels/grades, spreading of culvert cells)
  - scour and erosion protection measures
  - modifications to bridge configurations to minimise encroachment into waterway channels and geomorphic impacts
  - flow energy dissipaters
  - consideration of the proposed design treatment's ability to reduce FIOs exceedances and geomorphic impacts balanced with their social, environmental and economic impacts.

- **Step 3: At property/lot treatment:**
  - land agreements such as deed of release, easements, positive covenant, freehold acquisition
  - compensation for mitigation such as raising or restumping a house
  - consideration of the at-property treatment's ability to manage residual flooding and geomorphic impacts balanced with their social, environmental and economic impact.
- **Step 4: Monitor or adjust and refine**:
  - inspection and monitoring:
    - establish a baseline ground conditions through a detailed survey
    - identify any non-conformances
  - corrective action, if required:
    - investigate non-conformances
    - identification and implementation of corrective/preventative actions
    - develop reporting, close-out and ongoing maintenance/monitoring requirements
  - ongoing inspection, maintenance and reporting.

Where it is not practicable or feasible to achieve the FIOs at FSRs and/or the nominated land uses, acceptable impacts and/or appropriate mitigation measures will be determined on a case-by-case basis, including through consultation with stakeholders and landowners.

24.9.7.4 Management and mitigation measures

Flooding and geomorphological aspects and mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-11.

TABLE 24-11 MITIGATION MEASURES—FLOODING AND GEOMORPHOLOGY

Detailed design

Aspect	Mitigation measures

General	A Flood Risk Assessment and Flood Risk Management Plan will be developed for the Project as a component of the CEMP. The plan will outline management and control measures, as well as emergency procedures to be implemented during the pre-construction activities and early works, and construction works stages to ensure risks to the public, workers and the environment are managed. The plan will detail:
	• The requirements for flood risk assessments to manage the impacts of high-risk construction works
	• The following management criteria:
	  • minimise re-direction of flood water flow
	  • no adverse increases to flood levels at flood sensitive receptors
	  • maintain existing velocities, where practical
	  • erosion and sediment control managed in accordance with the ESCPs (as detailed in Table 24-9)
	• Detail mitigations specific to each of the Project's temporary project facilities in relation to the following components:
	  • Whetstone Material Distribution Centre (MDC):
	  – further optimisation of the Project's cross-drainage culverts will be undertaken to mitigate afflux at the Whetstone MDC
	  – the design is intended to allow the land to handle flooding events without adversely affecting adjacent stakeholders, ensuring a balance between the site's flood immunity and the broader community's flood immunity
	  – siting of any office/workshop buildings will consider the outcomes of a flood risk assessment and be located in areas away from hazardous areas.
	  – buildings and other critical infrastructure, such as electrical and chemical equipment, will be constructed on elevated foundations or pilings to lift them above the expected flood levels. The piles will utilise reinforced concrete or steel to support elevated platforms and working spaces above the peak flood depth
	  • Yelarbon non-resident workforce accommodation facility:
	  – the location and nature of the access road will be re-considered to ensure that safe access and egress to and from the site is achievable, and that any road works do not exacerbate flood risk elsewhere

Aspect	Mitigation measures
General (continued)	▸ Inglewood non-resident workforce accommodation facility: – the site will be designed to maintain the existing flow regimes within and around the site – any proposed floor levels will provide appropriate freeboards above the peak flood levels determined in the current flood risk assessment ▸ Turallin facility: – future connection to Turallin Road will ensure adequate provisions of conveyance and erosion protection on the Pine Creek main channel and avoid substantial development in the immediate overbank areas to minimise flood risk to site patrons and environmental impact to the watercourse – a future connection to Ellerslie Road, to the south of the site, will be considered as an alternative to the current proposed access to Turallin Road – any future development will consider impacts on nearby FSRs including the residential property present on the eastern bank of Pine Creek, adjacent the site access and Turallin Road connection – proposed floor levels in flood prone areas will provide appropriate freeboards above the peak flood levels determined in the current flood risk assessment – requirement for further assessment will be undertaken to assess and mitigate potential impacts on the fluvial geomorphic environment of any cross-drainage of the accessway across Pine Creek. ▸ The Project will be designed to achieve a 1% AEP flood immunity to rail formation level and aim to manage FIOs in accordance with the Project's Flooding and Geomorphic Impact Mitigation Framework ▸ Any design modifications during the detailed design stage will be subject to re-runs of the updated existing flood models to demonstrate compliance with the design objectives of the Project, including for extent and time of inundation, afflux, hazard and flow velocities. The modelling updates that are required during the detailed design stage, as stipulated by the Expert Flood Panel (and committed by ARTC) are summarised in each catchment chapter in Appendix T1: Hydrology and Flooding Technical Report–Volume 1. ▸ ARTC will continue to consult with impacted landowners regarding the flood modelling results and residual FIO exceedances through development of the detailed design. Mitigation measures to effectively manage residual FIO exceedances will be discussed with affected landowners, in line with the Project's Flood and Geomorphic Impacts Mitigation Framework (Section 24.9.7.5 (Figure 24-4)). ▸ In situations where impacted landowners and ARTC cannot reach agreement on sufficient mitigation/s or a mutually accepted outcome regarding flood impacts above the FIO, ARTC will consider alternative dispute resolution processes, including mediation. The selection of the appropriate dispute resolution mechanism will depend on the specific circumstances and will be negotiated between landowners and ARTC. ▸ The design requirements for modifying the existing Yelarbon levee will be confirmed through further consultation with GRC and incorporated into the detailed design in order to mitigate impacts from the Project on the Yelarbon township. Development approval for the modification of the Yelarbon levee will be obtained prior to the commencement of any modification works. ▸ Further develop and finalise the draft Soil Management Plan (as detailed in Table 24-4) to minimise potential impacts on watercourses and floodplains, including erosion and deposition during construction: ▸ the draft Soil Management Plan (Appendix AB: Earthworks Strategy and Draft Soil Management Plan) includes both general soil management measures not specific to a soil type as well as specific soil managing measures which include management measures by soil type including soils which are sensitive to change, such as cracking clays or texture contrast soils ▸ specific management measures for the identified Soil Management Units (SMUs) are included in Appendix AB: Earthworks Strategy and draft Soil Management Plan (Table 3-2). This includes Vertosols (black soils and cracking clays) which mainly occur between the Macintyre River and Whetstone, Koorongarra and Gowrie (Chapter 9: Land Resource (Figure 9-6) for ASC derived from detailed soils investigations within the Project footprint).Management measures for sensitive and erodible soils such as Vertosols (SMUs A1, A2, A3, A4, A5 and B) and Sodosols (SMUs H and I) include: – application of gypsum to improve soil structure, stability and workability and mitigate dispersion – care should be taken to avoid exposure of excavated material to erosive flood events or to avoid interference with the normal flow of water

Aspect	Mitigation measures

General (continued)	▸ Develop an ESCP, as a component of the CEMP (as detailed in Table 24-4) to confirm the number of and locations for specific temporary/permanent erosion and sediment control measures, including sediment basins, to reduce erosion/deposition impacts on channels and floodplains during construction
	▸ Develop the Rehabilitation and Landscaping Management Plan to require revegetation to be undertaken with suitable, native species (e.g. water couch and native (Aussie) blue grass) appropriate to the landscape context and nursery/seed stock sources (as detailed in Table 24-5)
	▸ Development of construction plans and schedules to consider works and controls adjacent waterways and minimise impacts to existing flow paths
	▸ Consideration of the controls detailed within the *Floodplain management for erosion control and high productivity on the Darling Downs* (Department of Primary Industries, 1988) will be undertaken during the detailed design stage to further refine the revised reference design. In particular, permanently grassing areas at culvert inlets and outlets to spread flow and reduce erosion and mitigation of active gullies.
	▸ Additional fluvial geomorphology considerations include:
	  ▸ reinstatement design to take into account the original landform setting, along with the new infrastructure to ensure sustainable functioning of runoff (i.e. slopewash, non-channelised flow and overland flow paths), channels, and floodplain environments in and around the ground disturbance areas
	  ▸ where ground disturbance has occurred, return to a state that functions appropriately within the context of the pre-disturbance fluvial geomorphic (i.e. soil and landform) environment
	  ▸ sodosols and Vertosols are highly susceptible to rilling and gullying if disturbed; as a result, it is vital that ground cover is established quickly during construction. Consider methods to distribute flow and reduce direct downslope flow during construction such as surface contouring or temporary low brush fencing. Consider the use of grasses effective at stabilising Vertosol soils
	▸ Assessment of the following will be undertaken:
	  ▸ positioning of bridge embankments with setback distances to be confirmed during detailed design to manage geomorphology considerations
	  ▸ consider options to move the bridge embankment out of the meander bend in watercourse SC 2, to reduce geomorphic impacts
	  ▸ reduce short radius bends in any permanent diversions and maintain as close to natural channel orientation and geometry as possible
	  ▸ consideration of hydraulic jumps will be undertaken during detailed design at locations where the proposed rail alignment is adjacent to existing cross-drainage structures to determine any potential changes to geomorphic conditions due to their formation
	  ▸ consideration of assessing differences in flow duration at elevated velocities for sites at increased risk of erosion will be undertaken to inform further mitigations
	  ▸ design of stabilisation measures for active gully erosion areas to minimise erosion and gully development within the Project's permanent footprint, with consideration of the mitigation and management measures detailed in the *Soil Conservation Guidelines for Queensland (*which includes a chapter on gully erosion and its control (Chapter 13, Carey Et al., 2015)) and the *Gully and Stream Bank Toolbox* (3rd Edition, March 2022)
	  ▸ design for high sediment transport areas, such as those sites with active gully erosion, to allow for the sediment to pass through culverts to minimise changes on the geomorphic environment
	  ▸ review of culvert dimensions for C Cs21 (culvert C73.53) to reduce potential blockage by woody debris
	  ▸ watercourses with no hydraulic Existing Case and Developed Case models to be further assessed, including C Ck 4, C Ck 5, SC 1, C Ck 1, NC 16 and PC 1
	▸ Relevant mitigations including those relating to erosion treatment options within and external to the Project corridor will be reviewed and revised as necessary based on the ETV analysis undertaken via direct testing methods.

Aspect	Mitigation measures
General (continued)	▸ A Borrow Pit Management Plan will be developed during detailed design for each of the Project's borrow pits. Each Borrow Pit Management Plan will: ▸ detail site specific management measures to minimise the potential for adverse impacts to the surrounding environment and community ▸ provide a structured approach to the management of environmental issues for the relevant phases associated with the borrow pits and access tracks including establishment, excavation and haulage and decommissioning ▸ incorporate construction planning and all relevant approval and permit conditions ▸ guide earthwork activities based on the confirmed construction methodologies and sequencing, and the outcomes of the flood risk assessment undertaken prior to the commencement of works to: – limit the potential impacts to flood regimes and natural overland flow from construction activities to being localised and temporary in nature – avoid re-direction of flood water flow – avoid increases to flood levels leading to adverse outcomes to flood sensitive receptors (FSRs) ▸ manage erosion and sediment control in accordance with the Project-wide approach and approved plans.
Emergency access route severance	▸ Impacts to emergency access routes will be managed by the following workflow: ▸ mitigation modelling and flood impact objective exceedance assessment ▸ identification of impacted roads where flood impact objective exceedances cannot be mitigated ▸ assessment of the impacted road as a 'link' to determine if the impact is negligible due flooding elsewhere and the road already inaccessible. This will be assessed against the Existing Case (i.e. without the Project) ▸ classification of impacts into high medium/low impacts based on the road hierarchy (i.e. state-controlled/local/track) and the above 'link' assessment ▸ Consultation with TRC and GRC Local Disaster Management Groups (LDMG/s) to discuss residual impacts and identify alternative local evacuation procedures, where necessary.
Safety risk to downstream population due to rail embankment failure during extreme flood event	▸ To minimise the potential risk to downstream receptors due to a rail embankment failure, the following mitigation measures will be considered on a case-by-case basis: ▸ embankment failure mechanisms during overtopping events for selected AEP design flood events ▸ design for overtopping events including: – crest level against design water surface profiles for selected AEP design flood events – overtopping flow rate for selected AEP design flood events – landward slope steepness, topsoil material and revetment lots – maintenance regime employed – Armouring of sections of embankment (e.g. rock, geotextile) to minimise overtopping scour potential ▸ local solutions to reduce the effects of overtopping including a 'low point' or spillway, to help control extreme situations in which a levee is overtopped by ensuring that the water overtops in the least vulnerable area, combined with sufficient drainage systems to get rid of the overtopped water ▸ ensure the design provides sufficient cross-drainage capacity to limit any head differential and hydrostatic pressure across the embankment during extreme events ▸ consideration of blockage risk and in turn, at any critical locations, consideration of the risk this could pose to potentially high risk receptors. Mechanisms to manage this could include blockage mitigation measures (e.g. fencing, debris screens and deflector walls) or redundant capacity, alternate structure types or configurations ▸ consideration of the *ARTC Emergency Management Plan* (RLS-PR-044) including coordination with the relevant local council and LDMG ▸ ensuring an appropriate Inland Rail embankment inspection and maintenance program as per relevant ARTC *Rail Track Engineering Practice Manuals for Civil Engineering* ▸ flood warning and community preparedness in accordance with the TRC and GRC Local Disaster Management Plans (LDMPs).

Pre-construction and early works and construction works

Aspect	Mitigation measures
General	▸ For works that occur within the 1% AEP extent, flood risk assessments will be completed for pre-construction and early works, and construction works within the Project footprint that are deemed to be high risk based on their proximity to FSRs. FRAs in these areas will assess impacts for more frequent events including two Exceedances per Year (EY), one EY, 50% AEP, 20% AEP and 10% AEP event given the temporary and dynamic nature of construction activities with consideration of methodology detailed in ARR 2019. Larger (i.e. rarer) flood events will be considered on a case-by-case basis where the risk profile of the proposed works would warrant it. Flood Risk Assessments will be undertaken in consultation with other projects to ensure that consideration of cumulative impacts is undertaken. Pre-construction and early works, and construction works will be managed by the following criteria: ▸ minimise re-direction of flood water flow ▸ no adverse increases to flood levels at FSRs ▸ maintain existing velocities where practical ▸ implement erosion and sediment controls for the Project in accordance with the ESCP (as detailed in Table 24-9) ▸ using detailed and confirmed construction methodology, the Flood Risk Assessments will be used to inform appropriate site controls and documented by a Flood Risk Management Plan, as a component of the CEMP (as detailed in the 'General' category of this table, above). Flood Risk Assessments will be used to ensure impacts to flood regimes and natural overland flow from construction activities are localised and temporary in nature. ▸ For works within defined watercourses, the following measures will be adopted: ▸ where practicable, in-stream works will be undertaken in accordance with the requirements of the *Riverine Protection Permit Exemption Requirements* (DRDMW, 2023a). Where the Project does not meet the *Riverine Protection Permit Exemption Requirements* (DRDMW, 2023a), a riverine protection permit with be sought for works within a watercourse ▸ disturbance areas will be minimised, and work zones delineated to ensure areas of disturbance are limited ▸ excavation will be undertaken in a manner to prevent erosion or slip, working faces will be limited to safe height and slopes, with surfaces drained to avoid ponding and erosion ▸ reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively and in accordance with the Rehabilitation and Landscaping Management Plan (as detailed in Table 24-5) ▸ stockpiling of material will be undertaken away from defined watercourses ▸ in the event of wet weather, the following additional controls would be implemented: – contractors subscribed to Bureau of Meteorology flood warning notifications – protection of exposed bank areas by geofabrics or similar ▸ removal of any construction waste and equipment away from potential areas of inundation and watercourses ▸ Locations of the laydown areas will be chosen to avoid areas that are within the 1% AEP floodplains where possible. However, due to the requirement of laydown areas for constructing bridges, some laydown areas must be within floodplains and near watercourses or drainage features. Laydown areas and other temporary project facilities that are located within the 1% AEP event inundation extents will be short-term in use. In such instances, the following precautions will be taken: ▸ the potential site will be surveyed prior to site establishment to understand the exact extent of potential flooding impact to facilities and storage areas ▸ the earthworks and temporary drainage will be designed to minimise flooding impacts ▸ Mobile plant will not be stored in the 1% AEP when not scheduled or in use for construction purposes.
Temporary project facilities (including Whetstone MDC, Yelarbon and Inglewood non-resident workforce accommodation facilities, Turallin facility and borrow pits)	▸ Implement the Flood Risk Management Plan for the temporary project facilities (as detailed in the 'General' category of this table, above) to ensure risks to the public, workers and the environment are managed through the construction and operation of the facility, noting the specific mitigations particular to each site ▸ Implement a site-specific Stormwater Management plan for each temporary project facility (as detailed in Table 24-9) to effectively manage the overland flow within each site and discharge to the receiving environment under developed conditions.

Aspect	Mitigation measures
Afflux	▸ As per those listed in the 'General' category above for the pre-construction activities and early works, and construction works stages.
Velocity	▸ As per those listed in the General category above for the pre-construction activities and early works, and construction works stages. ▸ Excavation will be undertaken in a manner to prevent erosion or landslip, working faces will be limited to safe height and slopes, with surfaces drained to avoid ponding and erosion. ▸ The follow mitigation and monitoring program will be implemented to manage and reduce impacts from increases in velocity: ▸ a baseline survey will be undertaken at cross-drainage structures and any other relevant stormwater-related infrastructure, to confirm the occurrence of, or pre-existence of, scour. The future occurrence or worsening of scour associated with the construction or operation of the Project will be evident in comparison with the baseline survey. Equally, the pre-existence of scour in advance of any construction or operational works will also be evident in reviewing the baseline survey ▸ implement the ESCP (as detailed in Table 24-9) to adequately manage scour and sedimentation on surrounding lands ▸ monitoring for scour at cross-drainage structures (and any other relevant stormwater-related infrastructure) during the pre-construction activities and early works, and construction works stage will be undertaken on the following periodic basis: – following rainfall events that have generated significant flow through either permanent or temporary cross-drainage structures (or at any other relevant stormwater-related infrastructure) – frequency is to be determined by ARTC during the detailed design stage ▸ where clear evidence of scour is observed in the monitoring data, this will be contrasted against the baseline survey data to confirm whether it is: (a) pre-existing scour with no observed change, (b) pre-existing scour that has been clearly exacerbated, or (c) newly generated scour ▸ if the findings point to (b) or (c) above, an engineer will document this in a report of their findings and recommend mitigation or remediation measures which will be implemented on site as soon as practicable. This may include, but is not limited to: – terrain remediation and/or stabilisation, including vegetation and/or revegetation strategies, or the introduction of other natural forms of energy dissipation – dumped rock/riprap (i.e. flexible erosion protection measures) – gabion baskets and reno-mattresses (i.e. semi-flexible erosion protection measures) ▸ Consultation with affected landowners, asset owners, or stakeholders may be warranted as part of the mitigation and remediation works, depending on the nature and extent of the works and any scour being experienced. This will ensure that community concerns are understood, and impacts rectified in consultation with the landowner.
Time of inundation	▸ As per those listed in the General category above.
Hazard	▸ As per those listed in the General category above. ▸ Construction tasks will be scheduled to avoid, where possible, bulk earthwork activities within the 1% AEP during periods of elevated flood risk. Where works cannot be scheduled outside of this time period, activity specific flood readiness and response planning will be required. This planning will be developed in consultation with the relevant local government and QFES.
Flow distribution	▸ As per those listed in the General category above. ▸ Application of the Flood Risk Management Plan including coordination with the relevant local council and LDMG to minimise risk to the community. ▸ Flood warning and community preparedness in accordance with the TRC and GRC LDMPs.

Commissioning and operations

Aspect	Mitigation measures
General	▸ Monitoring to ensure the operation of the Project does not result in negative impacts to the surrounding environment (e.g. increased scour). ▸ Inspection and maintenance of stormwater infrastructure to minimise ongoing impacts to property and infrastructure. ▸ Corrective action of any non-conformances, if required. ▸ Improving availability of flood information to allow the community to understand any residual risks due to the Project including searchability and sharing of information under appropriate arrangements and public availability of key project outputs. ▸ Community flood awareness and preparedness of the new flood hazards due to the presence of the Project. ▸ Evacuation route planning and improvement to ensure safe access and egress for the community and operations personnel during flood events. ▸ Additional signage of any residual risks due to the operation of the Project. ▸ Stakeholder engagement with impacted landowners including dispute resolution where necessary.
Afflux	▸ As per those listed in the 'General' category above for commissioning and operations.
Velocity	▸ As per those listed in the 'General' category above for commissioning and operations. ▸ The following mitigation and monitoring program will be implemented to manage and reduce impacts from increases in velocity: ▸ inspections will be carried out on waterway and drainage systems and erosion at prescribed intervals, with frequency to be determined by ARTC during the detailed design stage, ahead of the pre-commencement of operations ▸ physical inspections may be implemented in any defined high risk or sensitive areas, or where it might be deemed preferable and more suitable ▸ where clear evidence of scour is observed as per the monitoring data, this will be contrasted against the baseline survey data to confirm whether it is: (a) pre-existing scour with no observed change (b) pre-existing scour that has been clearly exacerbated, or (c) newly generated scour ▸ if the findings point to (b) or (c) above, an engineer will document this in a report of their findings and recommend mitigation and/or remediation measures to ensure the integrity of the drainage system is reinstated and any impact outside the permanent Project boundary will be rectified as soon as practicable and in consultation with the relevant landowner/asset manager ▸ where defects are identified and corrective actions are required, rectification works will be undertaken to reinstate defects back to baseline conditions ▸ asset inspections will be completed as soon as safe access can be achieved following a flood event.
Time of inundation	▸ As per those listed in the 'General' category above for commissioning and operations.
Hazard	▸ As per those listed in the General category above for commissioning and operations ▸ Consultation with both TRC and GRC LDMGs to discuss residual impacts and identify alternative local evacuation procedures, where necessary.
Flow distribution	▸ As per those listed in the General category above for commissioning and operations ▸ Application of a Project Flood Response Plan including coordination with the relevant local councils and LDMGs to minimise the risk to the community ▸ Application of the ARTC Emergency Management Plan (RLS-PR-044) including coordination with the relevant local councils and LDMGs ▸ Flood warning and community preparedness in accordance with the TRC and GRC LDMPs.

24.9.7.5 Monitoring, auditing and reporting

Implementation of flooding and geomorphology elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5.

24.9.8 Groundwater

24.9.8.1 Environmental outcomes

- Implement the Groundwater Management and Monitoring Program (GMMP) to manage groundwater inflow to construction works, including cuttings and excavations
- Implement the landowner bore 'make good procedure' to address groundwater resources that are impacted by the Project construction works.

24.9.8.2 Performance criteria

- During construction, the potential for groundwater contamination is minimised through the implementation of the Contamination Land Management Plan
- Baseline groundwater monitoring, modelling and analysis is undertaken prior to construction commencing to inform on potential risks associated with seepage and drawdown (i.e. water table lowering). Management measures identified through this baseline assessment are implemented in order to manage potential groundwater impacts.
- Consultation is undertaken with potentially affected groundwater users and other stakeholders on potential management measures required to address risks to groundwater resources.

24.9.8.3 Management and mitigation measures

Groundwater aspects and mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-12.

TABLE 24-12 MITIGATION MEASURES—GROUNDWATER

All

Aspect	Mitigation measures
General	▸ A GMMP will be developed for the Project to provide for an ongoing assessment of potential groundwater impacts throughout the various stages of the Project. The GMMP will comprise: ▸ Baseline GMMP ▸ Construction GMMP ▸ Operations GMMP. ▸ The GMMP will be assessed and updated before the commencement of each relevant Project stage such that the GMMP for subsequent stages is informed by the outcomes of the previous stage. This process of GMMP development and development during the detailed design and subsequent over Project stages is discussed in Section 24.9.8.4. The GMMP will include, as a minimum: ▸ description of the principal aquifers of interest, local use of groundwater, and the predicted impacts on groundwater ▸ description of the groundwater monitoring program including monitoring locations, monitoring frequency and the parameters to be recorded/analysed ▸ identification of the groundwater impact triggers and protocols for investigating and, if required, mitigating the impacts on groundwater ▸ description of the process of continual review and improvement of the GMMP to ensure it continues to meet its objectives.

Detailed design

Aspect	Mitigation measures
Interaction with groundwater by elements of the Project	▸ Undertake further geotechnical and hydrogeological investigations in parallel to the detailed design process to ensure site-specific geotechnical and groundwater conditions are reflected in the finalised design solution. Investigations will be targeted to specific locations, such as: ▸ bridge abutments ▸ significant cuts ▸ significant fill/embankments ▸ Revise the predictive groundwater modelling using additional information obtained during the detailed design stage to better understand seepage estimates and groundwater level variation resultant from cuts, both up and down gradient. Geological information and seepage analysis will be used to inform secondary approvals, drainage blanket specifications, or alternative design controls, for deep cuts into hard rock. ▸ Conduct site inspections of proposed cut locations to visually examine surface outcrops for sulphide minerals or remnant products indicative of sulphide mineralisation. This would inform the need for management of potential acid rock drainage (ARD) from cuttings in sedimentary units prior to construction works. ▸ The management of ARD (leachate) potential, if identified through additional site investigation, would be in accordance with *Preventing Acid and Metalliferous Drainage: Leading Practice Sustainable Development Program for the Mining Industry* (Commonwealth of Australia, 2016) and incorporated into design progression and the CEMP. ▸ Design culverts and embankments to minimise pre-loading and compaction of alluvial sediments. This will reduce the risk of altering shallow groundwater levels and recharge patterns. Embankment designs are to allow for openings (i.e. culverts and bridge spans) near creeks and rivers to assist with flow. ▸ Where design of embankment height allows, toe benching and drainage blankets will be provided for all transverse slopes greater than 7 degrees (1V:8H). ▸ Where design of embankment height allows, full embankment benching will be provided for all transverse slopes greater than 14 degrees (1V:4H). ▸ Install cutting face treatments and seepage control measures in accordance with QR *Civil Engineering Standard QR-CTS-Part 35 – Stone and Concrete Slope Protection* (2010) as part of the detailed design stage.
Impacts to landowner bores	▸ ARTC to continue consultation with landowners during detailed design, who have registered or unregistered bores potentially impacted by the Project. ▸ Where a groundwater bore is expected to be decommissioned or have access to it impaired as a result of the Project (the predicted impacts on groundwater resources is realised), 'make good' measures will be developed on a case-by-case bases in consultation with the affected landowner during the detailed design stage. An overview of the make-good process and make-good measures is described in Section 24.9.8.4 and summarised in Figure 24-6.
Sourcing of construction water	▸ As part of ARTC's construction water planning process, construction water procurement studies will be ongoing through the detailed design stage. Potential water supply options include supplemented, unsupplemented, and recycled sources. ▸ The use of new groundwater bores or licences for construction water is not a considered water source for the Project. If groundwater is to be sourced for construction water, trading or purchasing of existing allocated entitlements will be pursued through a trade agreement. ▸ Currently the water supply strategy does not include provision for new groundwater bores or licences in order to minimise impacts to aquifers and water users; however, during detailed design, the use of existing sustainable groundwater allocated entitlements to supplement the construction demand for the Project may be considered if owners of registered bores have capacity under their water entitlement that they wish to lease to ARTC under a water trading agreement. The volumes extracted would be within the existing licensing limits and the extent of drawdown experienced would be localised and consistent with that which is currently permissible for each licenced bore. ▸ Construction water sources will be finalised as the construction approach is refined during the detailed design stage and documented as part of the Construction Water Plan. The sources will be dependent on: ▸ climatic conditions as detailed design progresses and in the lead up to the pre-construction activities and early works, and construction works stages ▸ confirmation of water sources made available under private agreement.

Aspect	Mitigation measures
Groundwater quality	▸ Baseline groundwater monitoring data (levels and quality) will recommence at Project monitoring bores during detailed design in accordance with the Baseline GMMP (Section 24.9.8.4), incorporating the monitoring bores installed during the 2023 campaign ▸ Groundwater monitoring and sample collection will be conducted in accordance with recognised groundwater sampling guidelines such as the *Monitoring and Sampling Manual* (DES, 2018b) *and Groundwater Sampling and Analysis—A Field Guide* (Sundaram et al., 2009) ▸ Data collected during the detailed design stage will be used to establish a groundwater condition baseline for the Project prior to the commencement of construction. The groundwater quality baseline dataset provides a foundation against which construction works stage impacts can be monitored and compared. Baseline groundwater monitoring data will be used to establish: ▸ location/bore-specific impact thresholds in accordance with Using monitoring data to assess groundwater quality and potential environmental impacts (DES, 2021) ▸ responses to impact threshold exceedances, including 'make good' agreements. These requirements will be incorporated into the Construction GMMP ▸ A Contaminated Land Management Plan will be developed during the detailed design stage and incorporated into the CEMP (Table 24-4) ▸ Where potential for contamination risk exists, groundwater monitoring and investigations will be undertaken up-gradient and down-gradient prior to the commencement of construction works, to confirm the presence/absence of groundwater contamination and inform the requirement for management controls.

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Impacts to bores	▸ Where a groundwater bore is expected to be decommissioned or have access to it impaired as a result of the Project, 'make good' measures will be developed on a case-by-case bases and agreed in consultation with the affected landowner. Bores will be decommissioned in accordance with the *Minimum Construction Requirements for Water Bores in Australia (Edition 4)* (National Uniform Drillers Licencing Committee, 2020). ▸ Prior to construction works commencing, groundwater modelling and monitoring will be conducted up-gradient and down-gradient of any deep cuts, as well as cuts which intercept groundwater, to determine the potential for impact to groundwater in the vicinity of the cuts, including bores.
Water resources	▸ A Construction GMMP will be prepared and implemented prior to the relevant works commencing (as detailed in the 'General' category above and described in Section 24.9.8.4). ▸ Opportunities to re-use/recycle water during construction will be identified and implemented, where feasible (i.e. reuse of treated effluent from non-resident workforce accommodation facilities– further detail discussed in Chapter 5: Project Description).
Sourcing of construction water	▸ Although unlikely, should the Project access groundwater, such access will be secured through private agreement, and the licenced capacity of existing bores will not be exceeded. Flow and volume monitoring during extraction will be required for each bore, with extraction logs maintained.
Groundwater levels	▸ Groundwater level monitoring will be undertaken in accordance with the Construction GMMP to identify potential impacts to groundwater levels resulting from the Project. ▸ The Construction GMMP will incorporate groundwater monitoring at 'reference bores' up-gradient and down-gradient of any deep cuts, as well as cuts which intercept groundwater and shall be undertaken prior to, during and post construction, to determine if impacts have occurred as a result of the construction of the cuts.
Groundwater quality	▸ Where suspected contaminated soils or materials are identified, if encountered, these will be managed in accordance with the unexpected finds protocol/procedure documented in the Contaminated Land Management Plan, as a component of the CEMP (Table 24-4). ▸ Implement the Hazardous Materials Management Plan, as a component of the CEMP (Table 24-18).

Aspect	Mitigation measures
Groundwater quality (continued)	▸ Vehicle and plant maintenance will be undertaken in designated laydown areas, on hardstand surfaces. This will minimise the risk of contaminants from incidental spills or leaks (accidental discharge) from entering aquifers via infiltration or surface runoff. ▸ Refuelling will only occur at designated locations within the Project footprint and be sited at suitable separation distances from sensitive receptors, including surface water features and drainage lines. These refuelling locations will be equipped with onsite chemical and hydrocarbon absorbent socks/booms and spill kits. ▸ Bulk storage areas for dangerous goods and hazardous materials will be located away from areas of social and environmental receptors such that offsite impacts or risks from any foreseeable hazard scenario will not exceed the dangerous dose for the defined land use zone (i.e. either sensitive, commercial/ community, or industrial, in accordance with the intent of the State Planning Policy). ▸ Spill kits will be available at all work fronts and laydown areas in the event of a spill or leak. All vehicles and machinery will have dedicated spill kits. These refuelling locations will be equipped with onsite chemical and hydrocarbon absorbent socks/booms and spill kits. ▸ Mobile plant, drill rigs, and equipment will be maintained in accordance with manufacturer requirements and inspected frequently to minimise breakdowns and decrease the risk of contamination. ▸ All excavated material that is suspected to contain sulphides will be stockpiled, lined and covered, and managed to minimise rainfall infiltration and leaching. Where possible, treatment and onsite reuse is preferred to offsite disposal. A case-by-case assessment of the suitability of material for treatment and reuse will be required, in accordance with the earthworks material management options (Appendix AB: Earthworks Strategy and Draft Soil Management Plan) and spoil management (as detailed in Table 24-19).
Encountering ARD	▸ All excavated material that is suspected to contain sulphides will be stockpiled, lined and covered, and managed to minimise rainfall infiltration and leaching. Where possible, treatment and onsite reuse is preferred to offsite disposal. A case-by-case assessment of the suitability of material for treatment and reuse will be required, in accordance with the earthworks material management options (Appendix AB: Earthworks Strategy and Draft Soil Management Plan) and spoil management (as detailed in Table 24-19). ▸ If ARD (leachate) is identified during construction, seepage water from relevant deep cuts will be sampled at weekly intervals. This monitoring will involve the onsite screening of the seepage water for pH (trending down) and electrical conductivity (trending up), and comparison to the baseline groundwater results. Further laboratory analyses for the key analytes (i.e. pH, total dissolved solids, electrical conductivity, total suspended solids, alkalinity and dissolved metals) will be required if pH and electrical conductivity trends indicate the potential for oxidation occurring, and will be used to validate the presence or absence of ARD potential to mitigate potential leachate to the environment. ▸ If ARD contaminated discharge water/leachate is found to be generated from the deep cuts, this water may need to be impounded in ponds and stabilised via treatment with hydrated lime or dilution prior to disposal.

Operations

Aspect	Mitigation measures
Impacts to registered bores	▸ An Operations GMMP will be developed prior to operations commencing (as detailed in the 'General' category above and described in Section 24.9.8.4) to specify the groundwater monitoring requirements, if any, over the initial operation years of the Project.
Groundwater quality	▸ Before a train travels on the Inland Rail network, operators will make sure that the classes of dangerous goods, and the identification numbers of vehicles carrying dangerous goods, are recorded in the train consist documentation. Dangerous goods will be loaded, labelled, and marshalled in accordance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024). ▸ Appropriate controls are to be in place to prevent environmental incidents, including leaks/spills from refuelling activities and locomotive operations, and to protect the environment in the event of an incident. All fuel and chemical spills will be dealt with in a manner consistent with relevant health and safety guidelines. ▸ Procedures for the management of hazardous chemical spills and leaks will be developed and incorporated into the Operations EMP. These procedures will be in accordance with ARTC's *Work Instruction for Chemicals (WHS-WI-214) and Emergency Management Procedure (RLS-PR-044)* (2024)

24.9.8.4 Monitoring, auditing and reporting

Implementation of groundwater elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5 and as described below.

Baseline Groundwater Management and Monitoring Program

The Baseline GMMP's primary objective is to develop a baseline dataset that all subsequent monitoring will be assessed against to identify potential impacts from the Project in accordance with regulatory requirements. This dataset will also inform the development of Project-specific WQOs. Data collected during the baseline groundwater monitoring program has, to date, and will continue to, account for natural (seasonal) and/or anthropogenic fluctuations of groundwater levels or quality prior to construction. This is most important for the shallow alluvial aquifers, Walloon Coal Measures outcrop and Main Range Volcanics outcrop areas the Project traverses, as groundwater in these sediments are the most likely to fluctuate over time and has the greatest potential to be impacted as a result of the Project.

The baseline dataset resultant from this GMMP will provide site-specific information to support the assessment of potential Project impacts including intra- and inter-project cumulative impacts. Early identification of groundwater quality and monitoring local conditions over time promotes adaptive management for changing conditions to mitigate additional impact from the Project.

The groundwater monitoring network is presented in Chapter 15: Groundwater and reflects the revised reference design while addressing data gaps identified during monitoring.

The framework for groundwater level and quality monitoring, data management and reporting as part of the baseline monitoring program is presented in the sections below. Baseline groundwater monitoring to date has been conducted since 2018 and is discussed in detail in Chapter 15: Groundwater. Groundwater monitoring and sample collection has been conducted in accordance with groundwater sampling guidelines such as *Monitoring and Sampling Manual* (DES, 2018b) and *Groundwater Sampling and Analysis— A Field Guide* (Sundaram, et.al., 2009); future monitoring events should also adopt these guidelines until updated versions are available.

Baseline groundwater data will be compiled to provide a robust and repeatable baseline data set that will promote early and confident warning and validation of potential and predicted impacts from the Project. The baseline dataset will be adequate to develop site-specific WQOs, as warranted, to inform the Construction GMMP.

Groundwater level monitoring

In bores with sufficient water column, groundwater levels have been, and will continue to be, monitored using automated pressure transducers (level loggers) to record measurements at hourly intervals. The logger data will be downloaded and manual, static groundwater level measurements collected from each bore as a component of the onsite groundwater monitoring event. The manual measurement acts as a quality control check for the pressure transducers.

Groundwater quality monitoring

Groundwater quality samples are to be collected from all bores during every event. The analytes to be collected and assessed for each bore will be detailed in the GMMP and based on previous monitoring results, land use, Project design element, and Project stage. Field aquifer characteristics, including pH, EC, redox, dissolved oxygen, turbidity, and temperature will be monitored and measured prior to sample collection.

The following laboratory analytes were adopted for all bores (where sufficient water column is available) each monitoring event and should be maintained for ongoing monitoring, for aquifer characterisation:

- pH, EC and total dissolved solids
- Major anions (i.e. HCO_3^-, Cl^-, F, and SO_4^{2-})
- Major cations (i.e. Ca^{2+}, Mg^{2+}, Na^+, K^+)
- Dissolved and total metals (i.e. Al, As, B, Cd, Cr, Cu, Mn, Pb, Ni, Se, Mo, Ag, Zn, Fe and Hg)
- Nutrients (i.e. ammonia, nitrite, nitrate, total N and total P).

The following additional laboratory analytes were adopted for select bores and monitoring events to inform of existing concentrations based on land use, if any, and will be considered in the GMMP:

- Total recoverable hydrocarbons
- Benzene, toluene, ethylbenzene, xylenes
- Polycyclic aromatic hydrocarbons, including naphthalene
- Polychlorinated biphenyl.

Data management and reporting

The following data and reporting requirements were implemented:

- All groundwater data are validated with suitable quality assurance and quality control (QA/QC) protocols
- Monitoring data is reported in the form of a factual memorandum on a per monitoring event basis and will be reviewed and assessed at completion of baseline monitoring to identify trends and develop interim Project specific WQOs.

Construction Groundwater Management and Monitoring Program

The Construction GMMP will be developed using a risk-based approach with monitoring and sampling requirements dependent on the likelihood of construction activities to encountering groundwater and the location of such activities, along with the outcomes of the Baseline GMMP and final Project design. Groundwater monitoring for construction will include targeted locations where construction activities have potential to impact on groundwater quality and/or levels, as confirmed through detailed design.

Monitoring will be performed at locations (distance and depth/aquifer) up-gradient and down-gradient of the site where construction activities are occurring and at reference bores outside the anticipated extent of impact. Where construction activities are surficial in nature, monitoring of deep aquifers would not be warranted; however, surficial construction tasks may require specific monitoring for analytes being used in that task (task-specific monitoring).

Operations Groundwater Management and Monitoring Program

The Operations GMMP will be developed from the groundwater data and observations collected during previous Project stages and will include a framework for monitoring in response to an environmental spill or incident. Groundwater monitoring will continue into the operations stage to confirm that groundwater levels have recovered, where available, and/or to identify delayed impacts on groundwater, if any.

Landowner bore 'make-good 'procedure

The groundwater 'make good' or mitigation framework for the Project considers two pathways for bores to be made good: bores located on land accessed by the Project and bores located on land not accessed by the Project.

Where a groundwater bore is expected to be decommissioned or have access or usage to it impaired as result of the Project, 'make good' measures will be agreed in consultation with the affected landowners. An overview of the draft bore groundwater 'make-good process' is presented in Figure 24-6 with further detail provided in Chapter 15: Groundwater.

If the landowner does not accept the 'make good' assessment (either whether there is an impairment in the first place, or the level of impairment), ARTC will:

- Provide ARTC's bore assessment to the landowner for review by the landowner's suitably qualified person
- Advise the landowner that they are entitled to obtain a bore assessment from a suitably qualified person
- Advise the landowner that ARTC will pay their reasonable costs for such bore assessment
- Advice the landowner of their expectations as to reasonable costs of obtaining a bore assessment.

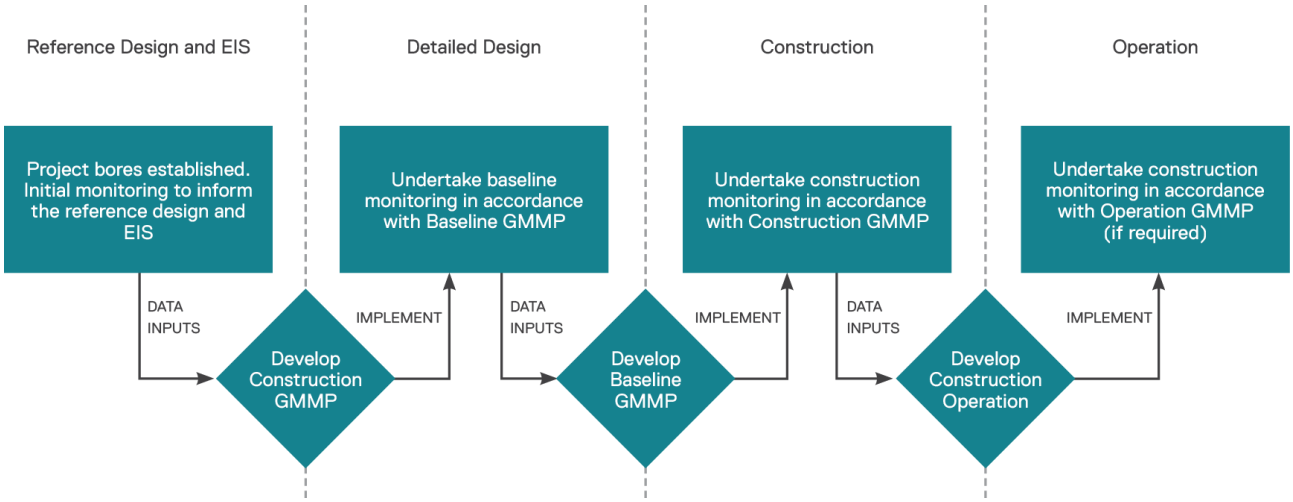

FIGURE 24-5 DEVELOPMENT AND IMPLEMENTATION OF THE GROUNDWATER MANAGEMENT AND MONITORING PROGRAM OVER SEQUENTIAL PROJECT STAGES

Bore make good process

ACRONYMS USED
REIQ Real Estate Institute of Queensland

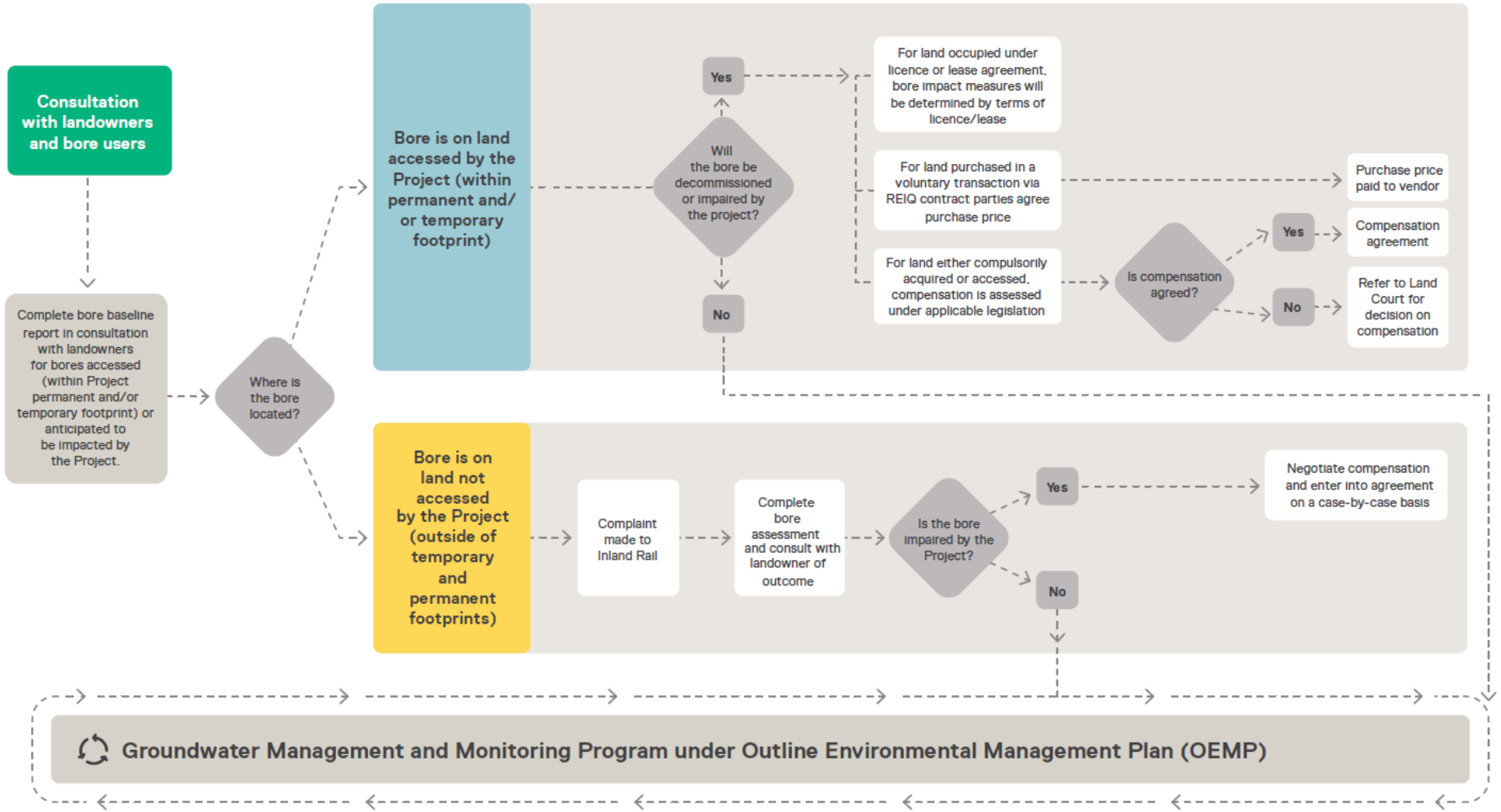

FIGURE 24-6 DRAFT GROUNDWATER BORE 'MAKE GOOD' PROCESS

24.9.9 Noise and vibration

24.9.9.1 Environmental outcomes

- The Project is designed, planned, and implemented to maintain human health and wellbeing, and the health and biodiversity of ecosystems by preventing or minimising environmental harm and nuisance.
- The Project is designed, planned, and implemented to maintain daily patterns of activity and to minimise impacts, including sleep disturbance at night.
- Project construction works and operation are managed to avoid vibration-related structural damage.

24.9.9.2 Performance criteria

- Conduct the Project construction works in accordance with the Noise and Vibration Management Plan, as a component of the CEMP, informed by the requirements of the *Transport Noise Management Code of Practice Volume 2 – Construction Noise and Vibration* (DTMR, 2023a).
- Manage noise from road traffic consistent with the criteria from the *Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise* (DTMR, 2013a).
- Design the railway for rollingstock operations in accordance with the criteria from *Interim Guideline – Operational Railway Noise and Vibration: Government Supported Transport Infrastructure* (DTMR, 2019c).
- The Project will investigate and implement reasonable and practicable measures to prevent or minimise environmental harm and nuisance from construction activities. The noise and vibration criteria from the DTMR Codes of Practice and Interim Guideline serve as the trigger threshold for implementing these measures. Monitor noise and vibration during construction works to inform the management of potential impacts and confirm the application of reasonable and practicable noise and vibration management measures.
- Undertake noise and vibration monitoring at the commencement of railway operations to demonstrate the Project meets the design requirements of the final Outline EMP.

24.9.9.3 Management and mitigation measures

Noise and vibration aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-13.

Best practice approaches will be applied to effectively manage noise and vibration impacts from the Project to ensure a suitable acoustic environment. Mitigation measures across relevant Project stages will be informed by confirmed construction programs, updated noise modelling, and the Project's final design, enabling verification of predicted impact levels and the appropriateness of proposed mitigation strategies. Measures will align with the Conditions of Approval, relevant noise criteria, and applicable guidelines and legislation, and will be in place prior to the commencement of each relevant project stage.

Noise and vibration management will be delivered through NVMPs, as components of the Construction Environmental Management Plan (CEMP) and the Operations Environmental Management Plan (EMP) for the construction and operational phases, respectively. Each N&V Management Plan will define the processes, roles, responsibilities, monitoring requirements, and corrective actions associated with noise and vibration management. The plans will confirm the mitigation measures to be implemented during the relevant project stage to ensure compliance with applicable legislation, guidelines, and project-specific commitments.

Monitoring will support the management of potential impacts and confirm that all reasonable and practicable mitigation measures are effectively applied. These measures will be developed and implemented in consultation with affected stakeholders and will be in place ahead of, and during, the respective project works to support the achievement of environmental outcomes. The performance of noise and vibration management will be subject to ongoing monitoring, with periodic reporting provided in accordance with the requirements of the NVMP.

Throughout the delivery and implementation of the Project, sensitive receptors will be consulted regarding:

- Predicted noise and vibration impacts for both construction works and operations stage of the Project
- Advance notification with details, including dates and duration, of construction activities that may result in noise and vibration being experienced within local communities
- Potential mitigation measures that will be applied and expectations of what the residual noise impacts would be.

Consultation will also be undertaken with sensitive receptors that may have unique circumstances for potential noise and vibration impacts, including:

- All emergency services buildings, such as the Pampas Rural Fire Brigade
- Community buildings such as the Brookstead Community Hall
- Campgrounds such as Woodspring Farm
- Accommodation areas for transport operators such as GrainCorp
- Agricultural business such as DA Hall and Co and Vary Agricultural Services
- The Department of Education to discuss potential impacts at Yelarbon State School, Brookstead State School, Southbrook Central State School, and Pittsworth State School.

Where railway noise barriers, or similar physical mitigation is proposed for Project operations, the local communities will be consulted to discuss the proposed mitigation and the predicted improvement to noise levels.

The predicted railway noise contour mapping will be made available to impacted landowners and residents. The mapping will present the noise impacts predicted by the modelling and the noise mitigation measures proposed to address such predicted impacts, and the expected attenuation of these mitigation measures.

Construction

Project construction, including pre-construction and early works, will be managed in accordance with the NVMP as a component of the CEMP. The Plan will be prepared and endorsed by the EM prior to the commencement of relevant works . The Noise and Vibration Management Plan will address the predicted noise and vibration emissions based on the finalised construction work programs and the location specific works planned along the Project. Such mitigation measures as required for construction to achieve the environmental outcomes, will be in place ahead of and during the Project construction works. The performance of the Project construction works will be monitored and actively managed, in accordance with the Noise and Vibration Management Plan, with periodic reporting available.

Works that have a minimal risk of noise and vibration impacts provide an opportunity to work outside the standard hours and benefit local communities and landowners by completing the works in a reduced timeframe.

The Project will implement physical mitigation such as noise barriers for the opening year of railway operations and start at-property treatments as soon as possible once the assessment of the final design is complete. This includes, where feasible, providing eligible at-property treatments for operational railway noise at the time of construction works, so the attenuation provided by the treatments also assists in reducing potential impacts from construction noise. The application of noise treatments including noise barriers will be done in consultation with affected local communities and landowners.

Operation impact management

The management of noise and vibration during operational project works will be governed by a Noise and Vibration Management Plan, which will form a component of the Operations Environmental Management Plan with the objective of supporting project delivery in a manner that protects human health and wellbeing by maintaining an appropriate acoustic environment. This plan will outline the processes, roles, and responsibilities for noise and vibration management, and confirm the mitigation measures to be implemented throughout the operation phase of the project.

The plan will be developed in accordance with the Conditions of Approval and all relevant legislation, and finalised prior to the commencement of operational works. The plan will include updated assessments of noise and vibration impacts based on the final, confirmed Project design. It will verify the results of previous assessments and demonstrate compliance with applicable interim guidelines, legislation, and project-specific requirements.

The plan will include:

- Confirmation of operational noise and vibration objectives
- Updated noise and vibration predictions based on final design and additional modelling
- A detailed description of confirmed mitigation measures to meet operational noise criteria
- Community liaison protocols and complaint handling procedures.

A review process to assess the effectiveness of operational mitigation measures post-commencement, including corrective actions and assessment of any need for additional measures to ensure compliance with noise and vibration outcomes

Monitoring details will be provided to support the management of potential impacts and to confirm the implementation of all reasonable and practicable mitigation measures. These measures will be applied in consultation with affected stakeholders and implemented in advance of, and during, operational works to ensure environmental outcomes are met. Performance will be regularly monitored, with results reported periodically. The operations NVMP will contain a maintenance plan for noise barriers to ensure they are maintained for appropriate management of long-term impacts of operational noise. ARTC will manage the ongoing maintenance of the noise barriers for the life of the relevant project works as appropriate.

TABLE 24-13 MITIGATION MEASURES—NOISE AND VIBRATION

Detailed design

Aspect	Mitigation measures
Road traffic noise	▸ Operational road traffic noise impacts will be re-assessed during the detailed design process, in accordance with CoP Vol 1, to confirm the receptors at which noise criteria may be exceeded. ▸ Mitigation of operational road traffic noise impacts from roads will be considered, in accordance with the CoP Vol 1, based on: ▸ exceedance of CoP Volume 1 criteria ▸ mitigation eligibility ▸ mitigation suitability ▸ Consultation with impacted landowners
Rail noise and vibration	▸ Operational rail noise and vibration will be re-assessed during the detailed design process ▸ Mitigation of railway noise and vibration will be implemented following the process described above based on: ▸ level of exceedance of the interim guideline criteria and sleep disturbance threshold ▸ most suitable reasonable and practicable mitigation option available for the each of the identified exceedances ▸ consultation with the impacted landowners.
Construction noise and vibration impacts on sensitive receptors	▸ Develop and refine the construction methodology, incorporating standard work practices with the aim of achieving compliance with construction noise and vibration performance criteria as specified in CoP Vol 2. Where criteria exceedances are predicted, the construction methodology will be required to incorporate all reasonable and practicable mitigation and management measures; where residual impacts are likely to prevail, additional management measures (see Section 16.12.1) would be required. ▸ Confirm the proximity of sensitive receptors to the finalised locations for construction activities, laydown areas and other construction facilities. Re-assess the predicted noise and vibration levels from these activities. ▸ A Noise and Vibration Management Plan will be developed as a component of the CEMP. This plan will include: ▸ construction noise and vibration criteria for the Project, as detailed in CoP Vol 2 ▸ location of sensitive receptors in proximity to the Project footprint ▸ location specific management measures for activities that could exceed the construction noise and vibration criteria, for example: – earthworks and civil works – structural work, including piling – concrete batching – blasting ▸ location, design, and timing of need for temporary noise barriers ▸ community notification process to advise of significant works with potential for noise nuisance or vibration at sensitive receptors and surrounding residences/premises ▸ locations and procedures for: – pre- and post-condition surveys – noise or vibration measurements in response to noise or vibration complaints where it will assist with resolving the complaint ▸ requirements for training, inspections, corrective actions, measurements, notification and classification of environmental incidents/complaints, record keeping and performance objectives for handover on completion of construction.
Construction noise mitigation through detailed design	▸ The need for and practicability of temporary noise barriers will be assessed following confirmation of the construction methodology for the Project during the detailed design phase. ▸ If temporary noise barriers are required, the location, design and timing of need will be documented in the Noise and Vibration Management Plan, as a component of the CEMP.

Aspect	Mitigation measures
Pre-condition surveys	▸ The requirement for building condition/dilapidation surveys will be reviewed during detailed design given it is highly dependent on the type of vibration-intensive works required relative to sensitive structures/buildings. With guidance from the safe working distances recommended in Appendix V: Noise and Vibration Assessment—Construction and Road Traffic, building condition surveys would be recommended for the following: ▸ Receptors that are predicted to exceed the structural damage vibration criteria recommended by the CoP Vol 2 (i.e. where sensitive receptors are located within the vibration safe working distances detailed in Appendix V: Noise and Vibration Assessment—Construction and Road Traffic) ▸ Receptors identified as being particularly sensitive to vibration. These are: – heritage buildings within: – 60 m of possible vibratory roller start up/run down—three identified – 86 m of percussive piling—none identified – other buildings within: – 25 m of possible vibratory roller start up/run down – 34 m percussive piling ▸ Structures within the damage radius of a blast location, calculated based on charge mass.
Baseline monitoring	▸ Additional baseline noise surveys may be required closer to the construction start date where the acoustic environment has changed.
Development to support operation	▸ The predicted operational noise impact data will be made available to impacted landowners and residents, through a noise model map on the Inland Rail B2G website, allowing stakeholders to understand the modelled noise level at specific locations. Modelling will inform detailed design. Further engagement will continue with all sensitive receptors and properties that are modelled to exceed noise levels. ▸ ARTC will develop a Maintenance Management Plan for noise barriers to ensure they are appropriately maintained and that the long-term impacts of operational noise continue can be mitigated. ARTC will manage the ongoing maintenance of noise barriers for the life of the relevant project works as appropriate.
Noise walls or barriers at the rail corridor boundary	▸ During detailed design noise walls or barriers will be considered where they can effectively control noise at groups of sensitive land uses and receptor buildings, and where the cost of mitigation is reasonable relative to the noise benefit provided, in terms of noise reduction combined with number of impacted receptors mitigated. ▸ The key considerations with rail noise walls or barriers, include: ▸ the proximity of key infrastructure such as local roads, crossing, utilities waterways and drainage culverts. Adjacent infrastructure can constrain the location, extent and performance of noise walls or barriers. These factors can prevent noise walls and barriers from being a reasonable or practicable noise mitigation option ▸ there would be little or no reduction in the noise emissions from the locomotive exhaust (relating to SEM) and train horns unless the wall or barrier structures are constructed to a height of at least 4 m and located within the rail corridor ▸ availability of suitable land between the rail line and sensitive receptors may constrain the construction of the base/foundations of the noise wall or barrier (this includes existing/proposed embankments or sub-surface conditions present). ▸ The design of the noise walls or barriers would need to achieve: a minimum noise reduction performance, control reflected sound and edge diffraction effects and meet specifications for earthworks, cross drainage, flooding, surface water run-off, stabilisation, wind loading, erosion, and durability. ▸ Social and environmental factors include loss of open aspect and breezes, connectivity, cohesion, severance, potential for vandalism and a need for graffiti removal, safety in design, collapse consequence, reduction in visual amenity of the landscape, loss of views and vistas and the removal of vegetation.
Low height noise barriers	▸ In situations where the primary noise source is from the wheel-rail interface, low height barriers (for example ≤ 2 m in height) can be constructed close to the outer rail track to manage operational noise. Typically, this mitigation option only suits single tracks and where only the rolling noise (dominant Leq metric) needs to be controlled.

Aspect	Mitigation measures
Earth mounds at the rail corridor boundary	▸ During detailed design, the following should be considered in regard to earth mounds for noise mitigation: ▸ the construction of earth bunds can be constrained by the available space between the rail corridor and neighbouring infrastructure ▸ earth mounds require considerably more space than the footprint of a rail noise barrier. A 2 m height earth mound could require an 8 m wide base ▸ earth mounds could provide a benefit to control perceptible rail noise impacts. Reductions in noise levels by at least 3 dBA could result in a perceptible improvement to the loudness of train passby events ▸ while earth mounds may not achieve specific noise-reduction performance, as can be achieved with noise walls or barriers, they can assist in reducing the overall noise levels to be closer to the assessment criteria ▸ in addition to the potential constraints associated with noise walls and barriers, the earth mound would also need to meet environmental and design requirements ▸ the implications to water through flow and flooding will need careful consideration to ensure the earth mounding does not adversely impede the movement of surface water.
Rail dampers	▸ During detailed design, sections of generally straight track that are not highly susceptible to prominent or regular wear would be most suited for the consideration of rail dampers to manage operational noise.
Level crossings—wayside horns	▸ During detailed design, wayside horns at level crossings instead of train horns, to provide a targeted noise event for vehicles and pedestrians will be considered.
Level crossings—soft tone alarm bells	▸ The design of level crossing alarm (warning) bells will be required to meet specific design standards including the consideration of soft tone bell designs.
Level crossings-silencing level crossing bells	▸ Where environmental or local situations warrant a reduction in audible warning sound levels, and a risk assessment involving the relevant authorities and human factors provides for safe mitigation, suppression of audible warning will be considered, especially during night periods when background noise levels may be low. ▸ At night (for example, between the hours of 22:00 and 06:00), silencing road warning bells will be considered (subject to a risk review) if: ▸ the road crossing is provided with booms and dedicated pedestrian audible warning devices are switched on in lieu of the road warning bells during the nominated time ▸ an assessment has determined a low likelihood of pedestrians using the road crossing during the nominated time ▸ In such cases, pedestrian audible warning devices will not be silenced.
Property controls—architectural treatment	▸ Where external rail noise levels are predicted to exceed the assessment criteria and other mitigation measures (such as noise barriers) are not feasible, the provision of at-property treatment will be considered. Treatments would only apply to habitable rooms or acoustically significant rooms/uses of sensitive buildings. Measures include upgraded acoustic glazing, acoustic window and door seals, and acoustic insulation for the roof are considered to mitigate noise intrusion. Upgrades to ventilation will also be considered, such as fresh air ventilation (acoustic ducting) or air conditioning will allow windows to be kept closed as a mitigation option while maintaining air flow. ▸ Consideration of architectural property treatment would be subject to the individual property. Suitability will be confirmed prior to the implementation of noise control treatments.
Property controls—property construction	▸ In rural locations, the age and construction of residential properties will influence the practical implementation of modern architectural treatments. This will include advice from suitably qualified professionals.
Property controls—consideration of low frequency noise content	▸ During detailed design, the control of low-frequency noise at properties will be required through architectural acoustic treatments.
At-property fence upgrades	▸ During detailed design, upgrading of existing fencing at the boundary of individual receptors with an ‘acoustic’ fence design will be considered. ▸ The potential for upgrading existing property fencing is limited by the line of sight between the railway and the receptor, the available land, and the requirements of local councils and regulatory authorities with respect to the height and materials permitted for property boundary fencing. An agreement between the landowner and ARTC would be required to undertake works on private property.

Aspect	Mitigation measures
Property relocation	▸ During detailed design, the relocation of residential buildings within the same land so that it is further from the rail corridor and noise levels would be lower will be considered. The relocation of property would be assessed on a case-by-case basis.
Negotiated agreements	▸ The implementation of at-property treatments and other measures to private property would be subject to an agreement between ARTC and the property owner.

Pre-construction activities and early works, and construction

Aspect	Mitigation measures

Standard work practices	▸ Construction hours:
	  ▸ with the exception of works for which standard hours construction works are not feasible or safe, works will be carried out within standard hours. This needs to be balanced against Project schedules/requirements
	  ▸ where construction works are required during non-standard hours, procedures to minimise the impact of any significant noise and/or vibration works will be prepared and followed
	  ▸ works close to schools will be staged, where practicable, to conduct work outside of school hours or during school holidays
	▸ Stakeholder engagement:
	  ▸ detailed stakeholder engagement is a key component for the management of potential impacts from construction impacts. Further details regarding stakeholder engagement will be provided in the CSEMP
	▸ Plant and equipment selection:
	  ▸ plant and equipment will be selected to minimise noise emission, as much as possible while maintaining efficiency of function
	  ▸ where required, residential-grade mufflers will be fitted, and all noise control equipment will be maintained in good working order
	  ▸ trucks will avoid use of engine brakes onsite.
	▸ Truck noise (offsite):
	  ▸ trucks will not be allowed to queue up outside residential areas prior to the approved start time
	  ▸ all trucks regularly used for the Project (e.g. body trucks, asphalt trucks) are to have mufflers and any other noise-control equipment is to be in good working order
	  ▸ trucking routes will use main roads where feasible
	▸ Clustering or equipment:
	  ▸ clustering of equipment within fleets will be minimised wherever practicable. Clustering of fleets (e.g. earthworks fleets and pavement fleets) will also be minimised wherever feasible
	▸ Rock hammer noise:
	  ▸ the emphasis on managing impacts from this activity generally involves minimising the duration to complete the works (relative to a particular receptor) in addition to ensuring that the community has been thoroughly informed of the works in advance. Implement respite periods involving scheduling work during periods when people are least affected to minimise exposure
	  ▸ minimise the duration of the rock-breaking construction activities by increasing the number of rock hammers used at one given time and location. For example, doubling the number of rock hammers operating concurrently in the same work spot would result in a marginal increase in the noise levels (in the order of up to 3 dBA) but would reduce the duration of the works
	▸ Site layout and access:
	  ▸ where possible, plant will be located/orientated to direct noise away from sensitive receptors. Materials and stockpiles are to be used to increase acoustic shielding, where feasible
	  ▸ if required, site access roads will be located as far as practicable away from noise-sensitive areas. Wherever possible, site layouts will be designed to minimise the need for vehicles to reverse
	▸ Deliveries to construction sites:
	  ▸ deliveries will be carried out generally within the standard hours
	  ▸ loading and unloading will be carried out as far as possible away from sensitive receptors

Aspect	Mitigation measures
Standard work practices (continued)	▸ Reversing alarms: ▸▸ mobile plant and trucks operating onsite for a significant portion of the Project will have tonal reversing alarm noise emissions minimised or replaced with squawker alarms, where practicable, recognising the need to maintain occupational safety ▸▸ where possible, drive-on/drive-off arrangements for trucks will be used, eliminating the need for reversing alarms to be used ▸ Fixed plant: ▸▸ acoustically significant fixed plant required for the Project (i.e. Whetstone MDC, concrete batch plants and accommodation camps) will be subject to further investigation for compliance against the CoP Vol 2 during the detailed design stage ▸ PA systems, radios and stereos: ▸▸ no public address systems will be used for this Project. Avoid the use of radios or stereos outdoors where neighbours can be affected ▸ Noise and vibration monitoring: ▸▸ noise monitoring may be carried out during critical stages of construction at nearest affected residences. Regular noise compliance checks of equipment will also be made ▸▸ vibration monitoring shall be carried out where vibration-intensive activities (e.g. vibratory compaction and rock breaking) are required to be carried out within the established safe working distances, or where there is a risk that levels may exceed the relevant structural damage criteria ▸ Vibration-intensive works: ▸▸ maintain the vibration safe working distances presented in Table 16-16, while operating vibration-intensive plant and equipment. Where vibration levels are predicted to approach the criteria for cosmetic building damage or limits for critical or sensitive areas, attended vibration measurements shall be undertaken at the commencement of vibration-generating activities to confirm that vibration limits are within the acceptable range ▸ Blasting: ▸▸ where vibration and overpressure from blasting or construction activities are predicted to approach the relevant limits, dilapidation surveys on potentially affected buildings shall be undertaken ▸▸ in practice, each blast will be carefully planned by a specialist blasting contractor to control the air-blast and vibration levels. The blasting assessment includes calculations to determine the blast parameters that are expected to control the emissions to meet the air-blast and blast vibration criteria ▸ Building condition surveys: ▸▸ building condition surveys to be undertaken at sensitive receptor buildings located within the safe working distances outlined in Table 16-16 ▸ Training: – site inductions for all employees and contractors will be undertaken and will address: – environmental aspects and impacts – proposal-specific and standard noise-management measures – licence and approval conditions – hours of work – environmental incident reporting and management procedures – complaint management ▸▸ daily site-specific briefings for all employees and contractors will include: – site-specific noise management measures – location of nearest noise-sensitive receivers – construction employee parking areas – behavioural practices (e.g. avoid swearing, shouting, dropping materials from heights) – designated loading/unloading areas and procedures.

Aspect	Mitigation measures

Reasonable and practicable mitigation and management measures	▸ Establishment of laydown areas:
	  ▸ limiting the number of dump trucks and graders (actual numbers to be confirmed during detailed design)
	  ▸ selection of quietest available dump trucks or use of noise source controls, such as the use of residential class mufflers. Limiting the number of equipment and using noise source controls can achieve reductions in noise levels in the order of 5 to 10 dBA
	  ▸ advance stakeholder engagement and ongoing regular communications on the activities and progress of the works shall be provided to the community (e.g. via newsletter, email and/or website)
	▸ Accommodation camps:
	  ▸ construction and operation of the temporary accommodation camps are to comply with the CoP Vol 2.
	▸ Temporary concrete batch plants:
	  ▸ reasonable and practicable mitigation measures to achieve compliance with CoP Vol 2 may include:
	  – selection of quieter plant
	  – careful design/layout of the site to direct noise away from sensitive receptors
	  – acoustic screening of elevated components, shielding provided by other site structures (e.g. offices, crib rooms, toilet blocks)
	▸ Whetstone MDC:
	  ▸ plant selection and acoustic design to limit the noise from the sand blasting activity to no more than 125 dBA SWL. Acoustic design options could include the addition of acoustic screening to the specific item of plant associated with the sand-blasting activity and adding attenuators to fan inlets, outlets or treatment to duct work
	  ▸ plant selection to limit the noise from the electric conveyor motors to no more than 101 dBA SWL. If more than 10 conveyor motors are needed, then a reduced SWL for each unit may be required
	  ▸ site establishment, rock hammering and/or crushing and screening activities required at the Taits Red Ridge and Heckendorf Road (south-east) borrow pits will be restricted to standard hours
	▸ Borrow pits:
	  ▸ operation of the D10 dozer during site establishment, rock hammering and/or crushing and screening activities, required at the Taits Red Ridge and Heckendorf Road (south-east) borrow pits, will be restricted to standard hours
	▸ Earthworks:
	  ▸ earthworks to be completed during standard hours unless monitoring demonstrates compliance with the CoP Vol 2 non-standard hours limit or where works are required as per the requirements detailed in Section 2.2.2 of Appendix V
	  ▸ using the quietest available equipment to complete the works
	  ▸ locating the loudest equipment, as far as practicable, from sensitive receptors. As an example, felled trees can be transported to mulchers.
	  ▸ locating noisy equipment behind objects (e.g. stockpiles, sheds, temporary barriers) to provide shielding
	  ▸ provision of respite periods or preferred noise-intensive periods.
	▸ For highly affected sensitive receptors, consideration of the following where the application of all reasonable and practicable mitigation measures (including respite periods) is deemed to be ineffective:
	  ▸ property treatments where longer-term impacts (i.e. >6 months) associated with the Project are identified
	  ▸ temporary (short-term) alternative accommodation for the duration of impact
	  ▸ preparation works prior to blasting are expected to primarily take place during standard hours; however, may also be undertaken during non-standard hours where compliance with the CoP Vol 2 can be demonstrated

Aspect	Mitigation measures

Reasonable and practicable mitigation and management measures (continued)	▸ Drainage works:
	  ▸ where available, equipment selection will favour the use of quieter and less vibration-emitting construction methods
	  ▸ avoid the simultaneous operation of noisy plant within discernible range of noise sensitive receptors where possible
	  ▸ advance notification of the works to all stakeholders and regular communications on the activities and progress of the works
	▸ Bridge construction:
	  ▸ conduct community consultation with all sensitive receptors predicted to exceed the noise limits in advance of the works occurring at each bridge site. The discussion of reasonable and practicable mitigation measures with affected parties will consider the overall duration of bridge construction works and exposure of noise levels at any individual receptor
	  ▸ use of the quietest available equipment to undertake the works particularly during non-standard hours works
	  ▸ locate noisy equipment to maximise shielding in the direction of sensitive receptors (e.g. adjacent to bridge abutments or embankments, within cuttings)
	  ▸ acoustic screening around the driven piling rigs
	▸ Rail civil:
	  ▸ conduct community consultation with all sensitive receptors predicted to exceed the noise limits in advance of the works occurring, clearly communicating the expected duration of the rail civil works
	  ▸ use of the quietest available equipment to undertake the works particularly during non-standard hours works.
	▸ Road civil:
	  ▸ conducting community consultation with all sensitive receptors predicted to exceed the noise limits in advance of the works occurring, clearly communicating the expected duration of the rail civil works
	  ▸ use of the quietest available equipment to undertake the works particularly during non-standard hours works.

Operations

Aspect	Mitigation measures
Operational road noise	▸ As per the guidance in the CoP Vol 1, post-construction noise monitoring will be undertaken for sections of new road and upgraded road where noise attenuation treatments have recently been constructed. Post-construction noise monitoring is to be undertaken within approximately 3 to 6 months of the opening/operation of the new/upgraded road or following completion of noise attenuation works. Post-construction road traffic noise monitoring will be undertaken at the same representative measurement sites where the baseline noise monitoring was undertaken.

Managing defective rollingstock	▸ Defects with the wagons, such as wheel flats or misaligned axles/ bogies, can cause discrete and potentially annoying high noise events. ARTC currently implements Wayside Monitoring Systems across the rail network to identify individual rollingstock and the specific sources of noise for the targeted mitigation of railway noise. The Wayside Monitoring Systems include:
	  ▸ wheel impact and load detector, bearing acoustic monitoring (RailBAM) and Squeal acoustic detector (RailSQAD)
	  ▸ angle of attack, hunting detector and wheel profile monitoring.
	  ▸ a similar monitoring program could be implemented to identify sources of high noise events. Once identified, defective rollingstock can be temporarily removed from service and defects repaired to address factors contributing to higher noise levels or discrete annoying noise characteristics.
	  ▸ it is likely the overall reduction to L_{Aeq}, and average SEM noise levels would be minor but would assist in managing noise events that could cause disturbance
	▸ Note that these measures will not be readily implementable by ARTC without appropriate commitments and funding arrangements from rail operators.

24.9.9.4 Monitoring, auditing and reporting

Implementation of noise and vibration elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5. Further detail on operations monitoring is described below.

A program of noise and vibration monitoring will be undertaken within six months of the commencement of railway operation on the Project. The purpose of the monitoring surveys will be to:

- Quantify the rail noise and vibration levels from the rail operations and determine the LAeq,24-hour and signal event maximum rail noise levels at the most affected sensitive receptors
- Assess compliance with the adopted operational noise and vibration criteria
- Provide an assessment of the effectiveness of any noise and vibration management and mitigation measures implemented
- Identify, if required, further noise and vibration mitigation measures to meet the adopted operational noise and vibration criteria.

The following measures have been adopted for the preparation of a noise and vibration monitoring plan for operation:

- A monitoring strategy will be prepared consistent with the requirements of relevant acoustic standards and guidelines for monitoring environmental noise and vibration from transportation sources
- The monitoring surveys will be planned and schedule the monitoring surveys with consideration to:
  - the rail movements during each day and night period. The survey period will include the days during which the highest number of train movements would be expected
  - at locations free from localised buildings and structures (other than noise barriers) that may screen or reflect noise
  - the condition of the rails and other rail infrastructure
  - weather conditions during the monitoring periods
- Monitoring will be conducted at the sensitive receptors with the potential for the highest received noise and vibration levels from rail operations
- Where feasible, noise levels will be assessed 1 m in front of the most affected building façade. Where noise levels are monitored in the free-field, a +2.5 dB(A) correction would be considered to adjust the free-field level for a noise level at the building façade
- If monitoring is required inside a building, the noise monitoring will be conducted at the centre of the habitable room that is most exposed to noise from rail operations
- Vibration will be monitored in the three axes representing the two horizontal and one vertical axes of displacement (movement). Vibration will be monitored as the Peak Particle Velocity (PPV) (mm/s) and vibration acceleration (m/s^2)
- If the noise and/or vibration levels are above the applicable criteria at any sensitive receptors, allowing for any monitoring and compliance tolerances, the key sources of rail noise and contributing factors (e.g. rail defects, excessive rail roughness, turnouts, or locomotive engine exhausts) will be identified to inform the investigation of reasonable and practicable mitigation measures.

The results of the monitoring surveys will be used as required to revise and update the rail noise and vibration predictions for the rail operations. In this regard, the validated noise and vibration levels would be applied to continually refine the conservatism and uncertainty in the predictions and support the selection of reasonable and practicable mitigation measures.

24.9.10 Cultural heritage

24.9.10.1 Environmental outcomes

- The Project is designed and constructed so there are no permanent impacts on identified heritage places outside the Project footprint
- Where detailed design studies identify that avoidance of a heritage place is not practical, impacts are addressed in accordance with the relevant management plan
- Aboriginal cultural heritage will be managed in accordance with a relevant approved Cultural Heritage Management Plan (CHMP) developed with the relevant Aboriginal Party in accordance with the Indigenous cultural heritage duty of care requirements under the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act).

24.9.10.2 Performance criteria

- The Project is designed and constructed in accordance with relevant management plans for aspects (e.g. air quality (dust deposition), vibration, flooding, soil erosion, visual amenity) that have the potential to impact areas of heritage significance
- For Project construction works encroaching within the 150 m zone of influence of a heritage place, predictive modelling is required to inform construction planning and the management and mitigation of excessive ground-borne vibration impacts on such places
- For Aboriginal heritage values, Project construction and maintenance works are undertaken in accordance with an approved CHMP developed with the relevant Aboriginal Party in accordance with the ACH Act
- For non-Aboriginal heritage values, Project construction and maintenance works are undertaken in accordance with approved conservation management plans under the *Queensland Heritage Act 1992* (Qld), where applicable.

24.9.10.3 Management and mitigation measures

Cultural heritage aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in the following tables, which have been separated into:

- All aspects of heritage (Table 24-14)
- Aboriginal heritage (Table 24-15)
- Non-Aboriginal heritage (Table 24-16).

24.9.10.4 Monitoring, auditing and reporting

Surveys and monitoring specified in Section 24.9.9.4 will apply to locations of heritage interest.

Implementation of other cultural heritage elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with the processes specified in Section 24.5.

TABLE 24-14 MITIGATION MEASURES – ALL ASPECTS OF HERITAGE

Detailed design

Aspect	Mitigation measures
General	▸ A Heritage Management Plan will be developed for the Project during detailed design, as a component of the CEMP. The plan will detail mitigation and management measures to be implemented during construction in relation to cultural heritage. The Heritage Management Plan will be separate to the Indigenous CHMP for the Project and will relate to all heritage aspects of importance to all stakeholders. It will include the following requirements, at minimum: ▸ unexpected finds ▸ human remains procedures ▸ site induction ▸ training ▸ heritage monitors ▸ inspections ▸ audits ▸ corrective actions ▸ notification and classification of cultural heritage incidents ▸ record keeping ▸ monitoring and performance objectives for handover on completion of construction ▸ specific conservation management requirements will be provided for places that cannot be avoided during construction, as agreed with the owners of each place. The following sites may experience a 'major magnitude of direct change' (Chapter 19: Cultural Heritage): – Gibinbell shearing complex (B2G-19-H02) – Cancer charity tree (B2G-19-H06) – Yelarbon Mill 2 (B2G-19-H09) – Protest public art (B2G-19-H22) – Pampas Memorial Hall (B2G-19-H25) – Green Hills Hotel complex (B2G-21-H13) ▸ location specific management measures to be implemented for each heritage place (Chapter 19: Cultural Heritage (Table 19-22)) ▸ communication protocols for informing staff of the nature and location of heritage places ▸ an 'unexpected finds' procedure, including assessment by a suitably qualified person and notification obligations under the applicable heritage legislation ▸ procedures for responding to encounters with potential burial sites or potential human skeletal material in accordance with legislative requirements ▸ identification of work areas to control clearing, earthworks, lay-down and storage, plant and equipment maintenance, and construction traffic movements to avoid 'no-go areas'.

Aspect	Mitigation measures
All heritage	▸ Undertake consultation with relevant heritage asset owners about the Project footprint and proposed activities including level of risk to the identified heritage value and, if relevant, develop site-specific design management measures with the asset owner/ government agency. ▸ Design to avoid or minimise direct and impacts to identified sites/items of Aboriginal and non-Aboriginal heritage significance where practicable. ▸ Design will be developed and refined in response to the outcomes of additional heritage surveys undertaken through the detailed design stage to avoid or minimise direct impacts to identified items/sites of historic heritage significance, where possible and practical to do so. ▸ Surveys will be conducted during the detailed design stage, ahead of ground disturbing works where sections of original rail infrastructure may be impacted. ▸ Construction planning undertaken through the detailed design stage of the Project will avoid or minimise directly impacting on identified sites/items of heritage significance where practicable. If items/sites cannot be avoided, appropriate mitigations are to be put in place (refer below and Table 24-15 and Table 24-16). ▸ The planning will seek to avoid vibration or other indirect impacts on identified sites/items of heritage significance within a 150 m buffer of the proposed works, where practicable. If items/sites cannot be avoided, appropriate mitigations are to be put in place (refer below and Table 24-15 and Table 24-16). ▸ Clearing extents/site boundary/limit of works are consistent with the detailed design development and marked with flagging or marking tape, signage or other suitable means to delineate 'no go areas'. Clearing extents are mapped and surveyed to be limited to that designated by the detailed design construction review process and within the Project footprint. ▸ All heritage assessments and mitigations are to be completed by suitably qualified professionals, in consultation with Indigenous or other stakeholders as required.

Pre-construction activities and early works, construction works

Aspect	Mitigation measures

All heritage	▸ Where impacts can be avoided to known Aboriginal or non- Aboriginal heritage, appropriate precautionary measures, such as informing relevant staff and contractors of the nature and location of the items and need to avoid impacts, detailing location on site maps
	▸ Construction planning will avoid disruption to commemorative and other community activities wherever possible
	▸ Temporary protective barricading will be installed around heritage places or artefacts that are located within 20 m of the Project footprint and are to be retained. These areas are to be established as 'no go areas' and mapped on all Project plans. Temporary protective barricading will include high visibility ground markers visible to personnel on foot and operating vehicles and machinery.
	▸ Works will not be performed on potential heritage items without required approvals and appropriate management plans in place
	▸ If a suspected Aboriginal or historic heritage item or site is identified, any works that may impact the item or site will stop, and the Unexpected Finds Procedure in the Heritage Management Plan, as a component of the CEMP, will be followed (as detailed in the 'General' category of this table, above)
	▸ Any responses to chance finds will only be undertaken by archaeologists qualified and experienced in the relevant discipline
	▸ In the event of the discovery of human remains, all work in the area will cease, the find will be protected, the Queensland Police Service (QPS) will be notified. All relevant Heritage Management Plan processes for the notification and management of human remains will be instigated (as detailed in the 'General' category of this table, above)
	▸ A heritage finalisation process will be initiated, including:
	  ▸ an end of Project heritage audit
	  ▸ the removal of any heritage exclusion zone fencing, ensuring that on ground conditions remain the same as when fenced.

Operations

Aspect	Mitigation measures
All heritage	Maintain a register of all known cultural heritage sites within the railway corridor and where applicable directly adjacent. Establish protocols as part of the existing management systems to ensure that works within proximity to these sensitive receptors have the relevant internal approvals and mitigation measures in place. For example: ▸ Potential for vibration impacts to heritage sites to be assessed prior to the undertaking of maintenance activities that have potential to result in vibratory impacts ▸ Pre- and post-condition structural surveys will be undertaken at all heritage buildings and structures when maintenance activities may result in exceedance of the structural damage vibration criteria relevant to the site (Chapter 16: Noise and Vibration) ▸ If impacts cannot be avoided, the following measures may be implemented: ▸ photographic and archival recording ▸ relocation ▸ archaeological monitoring ▸ repair ▸ Limiting additional disturbance, where possible Conducting heritage assessments, where necessary, for new work beyond the extent of existing disturbances.

TABLE 24-15 MITIGATION MEASURES – ABORIGINAL HERITAGE

Pre-construction activities and early works, and construction works

Aspect	Mitigation and management measures
Aboriginal heritage	▸ Impacts to Aboriginal heritage will be managed through a relevant approved CHMP, in accordance with the ACH Act, which includes the following management measures: ▸ a cultural heritage induction for Project staff ▸ developing a cultural heritage awareness program ▸ provisions for managing unexpected finds of cultural material or sites (including burials) ▸ In accordance with a relevant approved CHMP, impacts on previously unregistered and unassessed items or places of cultural heritage significance may be mitigated by: ▸ undertaking comprehensive cultural heritage surveys for Project activities ▸ provisions for managing unexpected finds of cultural material/sites (including burials) ▸ undertaking archaeological survey (including excavations where necessary) ▸ generating survey reports to provide detailed assessment and management recommendations ▸ assessing significance of any cultural heritage. ▸ recording (where Project activities may have a direct impact on cultural heritage values) ▸ establishment of buffer zones ▸ monitoring (during Project activities to ensure impacts to known cultural heritage are appropriately mitigated).

Operations

Aspect	Mitigation and management measures
Aboriginal heritage	▸ ARTC to delivery cultural heritage inductions for ARTC staff, including contractors and subconsultants ▸ ARTC to develop and implement a cultural heritage awareness program ▸ ARTC to implement procedures for managing unexpected finds of cultural material/sites (including burials) ▸ Where practicable, surface disturbance during operations will be contained to areas that have been previously surveyed for cultural heritage. ▸ Where maintenance activities require surface disturbance beyond the previously surveyed area or outside an area where there is an approved CHMP, assessment will be conducted in accordance with the requirements of the ACH Act.

TABLE 24-16 MITIGATION MEASURES – NON-ABORIGINAL CULTURAL HERITAGE

Detailed design

Aspect	Mitigation and management measures
Non-Aboriginal heritage	▸ A Heritage Interpretation Plan will be developed for the Project during detailed design to promote heritage values of the Project footprint, including consideration of: ▸ Green Hills Hotel complex (B2G-21-H13) ▸ locations of early rail infrastructure including: – Kurumbul Station (B2G-19-H01) – Gibinbell Siding (B2G-19-H03) – Whetstone siding (B2G-19-H13) – Yandilla Station (B2G-19-H21) – Pampas Station (B2G-19-H24) – Brookstead Station (B2G-19-H28) – Cecilvale Station (B2G-19-H30) – Yarranlea Station (B2G-19-H31) – Murlaggan Station (B2G-19-H32) ▸ Modelling for groundborne vibration will be updated as part of the detailed design stage to determine areas in which vibratory roller operation or other activities may result in exceedance of the structural damage vibration criteria in *DIN 4150-3:1999 Structural vibration - Effects of vibration on structures* (Deutsches Institut für Normung, 1999), and recommended in the *Transport Noise Management Code of Practice: Volume 2 – Construction Noise and Vibration* (DTMR, 2023a). Detailed design will assess a 150 m buffer area including additional heritage desktop reviews, survey and assessment, to determine if any further heritage places are at risk of impact ▸ Building condition/dilapidation surveys will be undertaken at heritage buildings where the structural damage vibration criteria may be exceeded. Surveys will occur during the detailed design stage, before undertaking vibration generating works, with the potential for monitoring during the construction activities in accordance with the Noise and Vibration Management Plan (Table 24-13). ▸ These places are to be confirmed during and following the completion of detailed design, updated vibration modelling, and any necessary additional heritage assessments, but are expected to include: ▸ Yelarbon & District Soldiers Memorial Hall (B2G-19-H04) ▸ ANZAC Memorial Garden (B2G-19-H05) ▸ Church (former) (B2G-19-H07) ▸ Yelarbon Mill 1 (B2G-19-H08) ▸ Yelarbon railway complex (B2G-19-H11) (silos only) ▸ Homestead complex (B2G-19-H14) ▸ Homestead (B2G-19-H15) ▸ Protest public art (B2G-19-H22) ▸ Homestead complex (B2G-19-H33) ▸ Avonlea homestead complex (B2G-21-H03) ▸ Brookstead Hotel (B2G-21-H09) ▸ House and windmill complex (B2G-21-H10) ▸ Green Hills Hotel complex (B2G-21-H13) ▸ Fairvale homestead complex (B2G-21-H14). ▸ The construction methodology will be developed during detailed design and tailored to limit vibration impacts to heritage listed structures, where possible (see the construction works and commissioning section of this table for further detail of the implementation of the methodology)

Aspect	Mitigation and management measures
Non-Aboriginal heritage (continued)	▸ Condition/dilapidation surveys will be undertaken at heritage places which may be subject to increased flood risk due to the Project. If necessary, additional mitigations to be put in place. These places are to be confirmed during and following the completion of detailed design, updated modelling and any necessary additional heritage assessments, but are expected to include: ▸ B2G-19-H15 Homestead ▸ B2G-21-H02 Yelarbon Cemetery ▸ Areas of rail heritage potential that have not been previously assessed are to be surveyed ahead of construction works. Surveys are to: ▸ identify and document any heritage values ▸ inform the development of specific management measures ▸ Archaeological surveys will be undertaken at heritage sites that are subject to direct impacts and have the potential for archaeological deposits. These complexes are: ▸ Gibinbell shearing complex (B2G-19-H02) ▸ House and windmill complex (B2G-21-H10) ▸ Green Hills Hotel complex (B2G-21-H13). ▸ if warranted by the results of an archaeological survey and the nature of the impacts, archaeological investigations will be undertaken (see rows below) ▸ Where heritage sites cannot be avoided or impacts sufficiently minimised, consultation with the relevant heritage asset owner/government agency will be undertaken to identify and implement appropriate mitigation measures. further mitigation measures will be put in place during the detailed design stage, such as: ▸ Archival recording: – undertake archival photographic recording in accordance with *Guideline: Archival Recording of Heritage Places* (Department of Environment and Heritage Protection, 2013c) – copies of archival records to be lodged with the John Oxley Library, and local libraries or historical societies as appropriate. ▸ Relocation: – relocation of heritage items is generally undesirable, as setting forms an intrinsic part of heritage value (International Council on Monuments and Sites (ICOMOS) (Australia) 2013), – however, if impacts cannot be managed in any other way, it may be appropriate to relocate buildings or items of moveable heritage to another location, such as a local historical society. The approach for any such requirements will be defined in the Heritage Management Plan (as a component of the CEMP) ▸ Archaeological investigations: – archaeological surface collection: – collect archaeological artefacts on the ground's surface – depending on nature of site may be undertaken in conjunction with, or in place of, excavation – Archaeological excavation: – Stage 1—test excavation to confirm subsurface deposit – Stage 2—salvage excavation of subsurface deposits (if required) – Stage 3—prepare and finalise post excavation report and analysis, and recommend any further management measures (if required).

Pre-construction activities and early works, and construction works

Aspect	Mitigation and management measures

Non-Aboriginal heritage	▸ The construction methodology will be tailored to limit vibration impacts to heritage-listed structures. Where possible vibration at heritage places to be kept below 2 mm/s in accordance with *DIN 4150-3:1999 Structural vibration - Effects of vibration on structures* (Deutsches Institut für Normung, 1999).
	▸ Vibration will be monitored at heritage places where exceedances of 2 mm/s are possible.
	▸ Where vibration exceedances occur, the construction methodology will be modified, where possible, to reduce impact, such as:
	  ▸ using damped tips on rock-breakers
	  ▸ using rock saws instead of blasting
	  ▸ using excavators with grabs and rake attachments instead of chainsaws during clearing
	  ▸ mulching cleared material at locations away from sensitive receptors
	  ▸ avoiding onsite fabrication work, where possible
	  ▸ using alternatives to impact-pile driving, where possible, such as continuous flight, auger-injected piles, pressed-in preformed piles, auger-bored piles, impact-bored piles, or vibratory piles
	  ▸ when piling, avoiding dynamic compaction using large tamping weights near sensitive and critical receptors, where possible
	  ▸ reducing energy per blow when piling (consider first whether this may result in prolonged exposure with no realised reduction in community disturbance).Plant and equipment selection will be reviewed with a preference for adopting quieter and non-vibratory plant items near sensitive receptors, where feasible and reasonable
	▸ Appropriately sized plant and equipment will be selected for each construction task, such as vibratory compactors and rock excavation equipment.
	▸ Construction planning will avoid disruption to commemorative and other community activities wherever possible. This includes ANZAC Day or Remembrance Day events at the Yelarbon & District Soldiers Memorial Hall (B2G-19-H04) and ANZAC Memorial Gardens (B2G-19-H05), and to funerals at the Yelarbon Cemetery (B2G-21-H2).
	▸ Any damage to heritage structures will be repaired in a way that seeks to conserve the heritage values of the place (Burra Charter, Article 1.4 (ICOMOS (Australia), 2013)
	▸ Any recommendations of the Heritage Interpretation Plan associated with construction elements will be implemented
	▸ If warranted by results of the pre-construction archaeological survey, archaeologists will monitor ground breaking works to identify any subsurface deposits.

Operations

Aspect	Mitigation and management measures
Non-Aboriginal heritage	▸ Potential for vibration impacts to heritage sites will be assessed before maintenance activities are undertaken ▸ Pre- and post-condition structural surveys will be undertaken at all heritage buildings and structures when maintenance activities may result in exceedance of the structural damage vibration criteria in *DIN 4150-3:1999 Structural vibration - Effects of vibration on structures* (Deutsches Institut für Normung, 1999) and recommended in *Transport Noise Management Code of Practice: Volume 2 – Construction Noise and Vibration* (Department of Transport and Main Roads, 2023a). This is likely to be all heritage structures within 50 m of the maintenance works, but exact distances will be determined by the vibration modelling.

24.9.11 Traffic, transport and access

24.9.11.1 Environmental outcomes

- The Project minimises potential impacts to road safety and traffic flow, public transport, school bus routes, property access, intersections, emergency services and road pavements throughout the construction stage
- The Project limits adverse impacts on the local community, including maintaining existing local car parking supply to satisfy community demand requirements
- Provision of traffic access for emergency services to construction worksites and adjoining properties and wider road network throughout construction
- Legal and practical access is provided for at private properties throughout the Project works.

Performance criteria

- Construction vehicles only travel on designated routes, including to avoid school zones during school pick up and drop off, and minimise the use of local streets
- Heavy vehicles are managed appropriately to avoid speeding, queuing, traffic incidents, over-loading and safety incidents
- A Project travel demand management campaign is implemented to inform DTMR, emergency services, local councils and the public on Project construction works and its effect on network operations and safety
- Each property solution to maintain legal and practical access is designed on a case-by-case basis through ongoing consultation with the landowner
- Onsite workforce parking is provided to address drive in/drive out demand and appropriate use of parking is reinforced during site induction and training.

24.9.11.2 Management and mitigation measures

Traffic, transport and access aspects, and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-17.

24.9.11.3 Monitoring, auditing and reporting

The effectiveness of traffic controls will be monitored in accordance with the Traffic Management Plan and Road Use Management Plan.

Implementation of traffic, transport and access aspects of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, reported and audited in accordance with the processes specified in Section 24.5.

TABLE 24-17 MITIGATION MEASURES – TRAFFIC, TRANSPORT AND ACCESS

Detailed design

Aspect	Mitigation measures
General	▸ A Traffic Management Plan will be developed for the Project during detailed design, as a component of the CEMP. The plan will be developed in consultation with DTMR, relevant local councils, an accredited road safety auditor and, where relevant, QR. The purpose of the plan will be to limit potential impacts to the public and road asset owners by managing construction movements and deliveries during peak periods, and minimise construction staff traffic using shuttles and public transport. The Plan will, as a minimum: ▸ identify the potential impacts that construction traffic is likely to have on transport infrastructure and detail ameliorative measures required to mitigate all identified impacts of the Project ▸ include the requirement to undertake a condition assessment of the road pavement for all designated construction traffic routes. This will be required to occur before the commencement of any operations and ongoing throughout construction at intervals developed in consultation with the contractor and the asset owner. ▸ specify the contractor as responsible for all works required to mitigate the impacts of construction traffic, requiring consideration to be given to: – 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 ▸ specify how access, road conditions, traffic network and safety across the rail corridor will be maintained during construction, including for emergency response vehicles ▸ determine secondary alternative construction route activities, in the event that the primary route is blocked off by an emergency/accident. Secondary construction routes will facilitate the construction activities. ▸ require that the plan be implemented during the construction stage and reviewed annually during construction for effectiveness, including review by relevant road authorities (i.e. local councils, DTMR) ▸ require that the plan be implemented in conjunction with a Road Use Management Plan agreed with each of the relevant local council (TRC, GRC), prior to the commencement of construction ▸ detail the procedure for ARTC to analyse community complaints and suggested improvements to the plan, including at level crossings to capture near-miss information ▸ Specific event Traffic Management Plans will be developed for special events (e.g. Australian Camp Oven Festival in Millmerran, regional road cycling events), in conjunction with DTMR, relevant location councils, event organisers and relevant stakeholders. The outcome of these will include bespoke plans providing safe and efficient pedestrian, cycle, public transport, and traffic flows during occasional events to minimise disruption to the community throughout construction.
Road safety for intersections	▸ Undertake a road safety audit during the detailed design stage where such road upgrade works are required. The audit will be undertaken by an accredited road safety auditor, in accordance with the Austroads *Guide to Road Safety Part 6A: Implementing Road Safety Audits* (Austroads, 2019b) ▸ Turn lanes will be designed and be fully compliant with the requirements and design criteria as outlined in the *Guide to Road Design Part 3 - Geometric Design* (2017a) and *Guide to Road Design Part 4 – Intersections and Crossings* (2017b)

Aspect	Mitigation measures
Road safety for intersections (continued)	▸ Requirements for turn lane treatments will be finalised during the detailed design stage and updated during the construction works stage and as per required risk assessments when preparing the Traffic Management Plan, also in accordance with the *Manual of Uniform Traffic Control Devices: Part 3 –Works on Roads* and DTMR's specification *MRTS02 – Provision for traffic requirements*. This will reflect updated construction duration estimates and final peak hour volumes ▸ All conflict points impacting vehicle turn path will be relocated/removed. Further road widening works of kerb turnouts or carriageway of minor road to accommodate vehicle swept path will be reviewed during the detailed design stage. ▸ Consultation between ARTC, TMR and local councils will be undertaken regarding the provision of road impact assessments and road safety audits for all impacted local and State-controlled roads. Additionally, ARTC will deliver appropriate mitigation measures which have been agreed by the relevant road authorities, and address identified road operation and safety matters and issues. Consultation during the detailed design stage will ensure directly impacted stakeholders are involved in developing the road safety mitigation measures. ▸ Opportunities to accommodate greater separation distances between rail and neighbouring roads will be investigated, in consultation with DTMR and in accordance with *AS 1742.7-2016* and the *Road Planning and the Design Manual – Edition 2: Volume 3, Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (DTMR, 2014b). ▸ Approval will be sought for construction works within a State-controlled road corridor from DTMR, and within a local government road corridor from the relevant local council. These will be required to be obtained through consultation with DTMR and the relevant local councils during the detailed design stage of the Project.

Access	▸ The detailed design will be developed to ensure that legal and practical access for private properties is provided.
	▸ ARTC will continue to consult with potentially impacted landowners during the detailed design stage and construction planning process on outcomes to minimise impacts to property access. This includes where property access adjoins a State-controlled road or a local government road.
	▸ The provision of suitable private property access during the construction works will form a component of property-specific management agreements developed in consultation with landowners.
	▸ Changes to individual property access onto and across properties may be offset by consolidating access in key locations, which may be facilitated through underpasses for stock and vehicles at appropriate locations. These solutions will be developed in consultation with affected landowners.
	▸ ARTC will consult with Toowoomba and Goondiwindi Local Disaster Management Groups, as well as QPS, Queensland Ambulance Service (QAS) and QFES during the detailed design stage regarding emergency access.
	▸ ARTC will consult with relevant stakeholders regarding Brookstead State School, Southbrook Central State School and Yelarbon State School, including the Department of Education for works undertaken near schools, to minimise disruption and maintain safe access, as practicable.
	▸ Safe corridor access and vehicle turnaround points will be provided for maintenance work to ensure sufficient setback while working adjacent to live railway.
	▸ The design of the rail maintenance access roads will consider the availability for use by emergency vehicles in the event of an incident.
	▸ Traffic management arrangements for construction sites, laydown areas or non-resident workforce accommodation facilities requiring access directly off/onto a State-controlled road will be negotiated with, and approved by, DTMR.
	▸ All construction access locations will be designed in accordance with Australian Standards and Austroads' guidance with:
	  ▸ appropriate sighting distances in both the vertical and horizontal
	  ▸ deceleration lanes for trucks
	  ▸ acceleration lanes for re-entering construction traffic
	  ▸ suitable stopping areas
	  ▸ appropriate signage and line marking
	▸ Where possible, access will be provided from secondary roads to minimise potential disruptions to the nearby arterial road network.

Aspect	Mitigation measures
Intersection/ sight distance	▸ Intersections will be assessed against requirements outlined in *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2023) requirements. Where insufficient sight distance is available, ARTC will apply the following mitigation strategies: ▸ avoid – investigate alternative construction routes which have adequate sight distance ▸ manage – sight distance issues through the implementation of the Traffic Management Plan which may temporarily reduce speeds to achieve sight distance compliance ▸ mitigate – propose works to mitigate sight distance issues ▸ Temporary road works, including diversion and signage, will be designed in accordance with the *Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads* (DTMR, 2019g) and the *Traffic and Road Use Management Manual: Volume 7 Road Works* (DTMR 2012b).
Intersection/ turn warrant	▸ Intersections will be assessed against requirements outlined in *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2023) requirements. Where adequate turn lane treatments are not available, ARTC will apply the following mitigation strategies: ▸ avoid – investigate alternative construction routes which avoid intersections with inadequate turn lane treatments ▸ manage – turn lane treatments through the implementation of the Traffic Management Plan which may temporarily reduce speeds to achieve sight distance compliance ▸ mitigate – propose works to upgrade the turn lane treatments. Agreement will be negotiated between ARTC and the relevant road authority on upgrade requirements and funding arrangements. Given that these are existing requirements, it is not anticipated that ARTC will fund these upgrades ▸ Temporary road works, including diversion and signage, will be designed in accordance with the *Manual of Uniform Traffic Control Devices: Part 3 - Works on Roads* (DTMR 2019g) and the *Traffic and Road Use Management Manual: Volume 7 Road Works* (DTMR 2012b.
Road-rail interfaces	▸ The design of road-rail interfaces will continue to be developed in accordance with the principles established in ONRSR Policy: Level Crossings (ONRSR, 2019a), and in reference to the ONRSR Guideline: Meaning of duty to ensure safety so far as is reasonably practicable – SFAIRP (ONRSR, 2021a) and the Queensland Level Crossing Safety Strategy 2012-2021 (DTMR, 2012a). ▸ Public level crossings will be designed in order to provide for safe design standards where sufficient stacking and, sight distances, lane marking, and signage prevail for a design vehicle consisting of a low loader. ▸ Level crossings will be provided with warning signage, line marking, and other relevant controls in accordance with the relevant national and ARTC standards and in accordance with all Traffic Management Plan and Road Use Management Plan procedures. ▸ Options for impact mitigation will depend on the specific activity being undertaken, and the location where it is occurring. ▸ Road safety audits will be undertaken at the level crossings in accordance with the Austroads guidelines. Level crossings will be reviewed to confirm the: ▸ level of protection continues to be appropriate ▸ infrastructure is appropriate for the traffic conditions ▸ Appropriate exclusion fencing will be designed near roads or where trespass is likely to occur. Specific fencing requirements will be agreed through discussion with adjoining landowners and asset owners. Agreed fencing requirements will be documented in a revised fencing strategy for the Project. ▸ Ongoing consultation with, as relevant, local councils, TfNSW, DTMR, emergency services, QR and affected landholders and, where applicable, the wider community during the detailed design stage of the Project to inform of the Project's status and likely disruptions. ▸ Threshold and ALCAM assessments will be undertaken to determine the appropriate protection type for the proposed crossing, as required (if required). Additionally, these assessments will be undertaken again during detailed design, including all ALCAM considerations, where applicable, as agreed upon between ARTC, the contractor, QR and the relevant councils.

Aspect	Mitigation measures
Road-rail interfaces (continued)	▸ ARTC to progress discussions, development and definition of the signalling system interface and associated operational procedures required to manage the interface between ARTC's CTC system and QR's Network ▸ The construction methodology for the components of the Project within the existing rail corridor for the South Western Line and the Millmerran Branch Line will be confirmed through discussion with QR and other key stakeholders. This consultation will be used to inform: ▸ the programming of construction activities requiring track possessions ▸ effective communication strategies with QR and other stakeholders ▸ The agreed construction methodology within the existing rail corridor for the QR South Western Line and the Millmerran Branch Line will be formulated in a wayleave agreement, or similar, between ARTC and QR. ▸ Track design will incorporate trackside monitoring systems. The locations for trackside monitoring systems will be confirmed and incorporated into the detailed design.

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Road link	▸ A travel demand management campaign will be developed to inform DTMR, emergency services, local councils and the public on construction works and its effect on network operations. ▸ Consultation with QR will be undertaken prior to use of existing level crossings. During construction, mitigation measures for existing level crossings along the construction routes may be required depending on the specific activity and the locations. The contractor will be required to consult with QR to determine appropriate controls at existing level crossings. ▸ Directional signage and line marking around construction sites and the surrounding network, including using Variable Message Signs if appropriate ▸ Relevant emergency services will be notified in advance and any required approvals will be sought prior to the movement of all hazardous/dangerous or oversize construction material and equipment. ▸ Pilot vehicles and police escorts will be used to warn opposing vehicles where loads are greater than 3.5 m wide and 25 m long. Additional pilot/escort and/or police escorts will be provided as per Section 6.3 of the *Guideline for Excess Dimension Vehicles in Queensland* (DTMR, 2013c) or the *Critical Areas and Roads in Queensland for Vehicles/Combinations Requiring Pilot/Escort* map, or a police permit when accompanying an oversize vehicle or combination. Travel outside of peak times, perhaps, such as the evenings or early mornings to avoid other vehicular conflict will be considered. All other safety aspects treating over-size and over-mass (OSOM) movements will be in accordance with the *Guideline for Excess Dimension Vehicles in Queensland* (DTMR, 2013c). ▸ Physical upgrade works at critical intersections or links where mitigation measures cannot be managed by traffic or construction management. ▸ Secondary alternative construction route activities will be determined as part of the Traffic Management Plan, in the event that the primary route is blocked off by an emergency/accident.
Pavement	▸ A rock bed, shaker grids or rumble pads will be installed as appropriate at vehicle/equipment site exit points. ▸ Unsealed roads: ▸ a visual pavement condition assessments (either manual or vehicle mounted high speed condition survey) will be undertaken prior to and post-construction activities. ▸ the pavement assessment for unsealed local government road will be agreed with local councils before construction commences and will identify measures to avoid, reduce or mitigate effects on the pavement life of the local government road. Typical measures include: – provide a payment contribution for future pavement works – seal an unsealed pavement – provide maintenance during construction – undertake road rehabilitation. – pre and post-construction rutting surveys

Aspect	Mitigation measures
Pavement (continued)	▸ Sealed and asphalt roads: ▸ a condition and dilapidation surveys and assessment (e.g. National Association of Australian State Road Authorities roughness count) will be undertaken prior to and post-construction activities, as well as at ongoing intervals during construction. These intervals will be agreed with local councils before construction commences and will identify measures to avoid, reduce or mitigate effects on the pavement life of the local government road. Typical measures include: – provide a payment contribution for future pavement works – provide extra pavement width (for example, to prevent edge degradation) – provide additional pavement thickness – provide maintenance during construction – undertake pavement rehabilitation. – pre and post-construction rutting surveys ▸ ARTC will consult with relevant stakeholders on mitigation measures to maintain structural capacities are maintained and seek agreement on the minimum design life of returned works as well as agreed contribution towards the consumption of pavement design life by construction related vehicles. ▸ ARTC will consult with the local government road owner regarding arrangements to maintain the envisaged impacted road for the duration of the construction period. This may entail works such as crack sealing, pothole patching, edge repairs, resealing, and grading of gravel roads.
Road-rail interfaces	▸ In accordance with Section 255 of the *Transport Infrastructure Act 1994* (Qld), works will not commence within the existing rail corridor without QR's written approval, unless this process is overwritten by a pre-agreement between ARTC and QR. ▸ If construction of Project components within the existing rail corridor is completed during a temporary possession of the rail corridor, works will be completed in accordance with the conditions of the temporary possession and/or wayleave agreement granted to ARTC by QR. ▸ All works carried out on QR property will be in accordance with the requirements of QR's Civil Engineering Technical Requirement: Work in or about Queensland Rail Property (CIVIL-SR-002).
Road safety for intersections	▸ Construction traffic on known school bus routes, or routes with significant cyclist or pedestrian activity will be restricted to only essential movements only during pick-up and set-down times on school days, or peak active transport periods. ▸ Further measures may include signage or protection on construction routes with a high proportion of cyclists or pedestrians, and employing contractor driver briefings on safe driving to avoid active transport users and community notifications. ▸ Once construction routes and vehicle numbers are finalised, specific measures to mitigate impacts to active transport users will be developed for the construction routes on a case-by-case basis. This is to minimise construction vehicles through areas of higher pedestrian or cyclists' activity, such as schools or town centres, and in peak periods to reduce the impact and potential safety issues. ▸ Relevant emergency services (e.g. QFD, QPS, QAS) will be notified in advance of temporary and permanent changes to the road network and of construction activities that may affect journey times for emergency vehicles. ▸ Relevant emergency services will be notified prior to the movement of all hazardous/dangerous or oversize construction material and equipment. Temporary traffic management will be implemented, for example road signs stipulating reduced speed limits. ▸ Identify and provide emergency accesses and routes to minimise adverse impacts to local residents, in consultation with emergency services ▸ Provision of heavy vehicle truck turning signage in combination with possible temporary speed reduction signage through the intersections for the duration of construction. These requirements will be determined and finalised during the construction works stage, as per required risk assessments within the Traffic Management Plan. ▸ Construction speed limits will apply to all unsealed routes used by construction vehicles. Applicable speed limits will be determined through consultation with the relevant local councils and documented in the Traffic Management Plan. Speed limits through construction routes of all types will ensure increased safety for local residents and construction workers.

Aspect	Mitigation measures
Road safety for intersections (continued)	▸ All OSOM and Restricted Access Vehicles will comply with the *Guideline for Excess Dimension Vehicles in Queensland* (DTMR, 2013c) in terms of transport safety. ▸ Licensed transporters operating in compliance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024) will be used for the transportation of dangerous goods. ▸ A DTMR *Form M994* will be completed and signed by a certified Level 3 Traffic Management Operator should any Regulatory Traffic Signs/Devices associated with any State-controlled road be required. Ensuring compliance with all relevant standards and guidelines will ensure that construction vehicles operate safely on all proposed construction vehicles, with appropriate mitigation measures applied. ▸ Regular maintenance and vegetation clearance will be carried out to maintain adequate sight lines. ▸ Undertake a road safety audit following the completion of the road upgrade works. The audit will be undertaken by an accredited road safety auditor, in accordance with the Austroads *Guide to Road Safety Part 6A: Implementing Road Safety Audits* (Austroads, 2019b)
Road safety for road links	▸ Implement the Traffic Management Plan as detailed in the 'General' category of this table, above ▸ Requirements for road upgrades will be updated during the construction works stage (as per the required risk assessments when preparing appropriate Traffic Management Plans) and Traffic Guidance Schemes such as the *Manual of Uniform Traffic Control Devices: Part 3 – Works on Roads* and DTMR's specification *MRTS02 – Provision for traffic requirements*. This will reflect updated construction duration estimates and final peak hour volumes. Additional Traffic Management Plan mitigation measures may include speed reductions and advisory signage. ▸ Ongoing consultation will be undertaken as required with relevant councils, TfNSW, DTMR, emergency services, QR and affected landowners and, where applicable, the wider community in the detailed design stage of the Project to inform of the Project's status and likely disruptions. ▸ Directional signage and line marking around construction sites and the surrounding network will be installed, including using Variable Message Signs if appropriate. Drivers and pedestrians will be directed past construction sites, and advice of potential delays, traffic diversions, speed restrictions or alternate routes will be provided. ▸ Implement a specific event Traffic Management Plan for special events, as detailed in the 'General' category of this table, above. ▸ Relevant emergency services will be notified in advance and any required approvals sought prior to the movement of all hazardous/dangerous or oversize construction material and equipment. Discussions will identify any existing emergency response routes which may be impacted by the transport corridors as well as possible solutions to minimise any potential impacts. ▸ Physical upgrade works will be undertaken at critical intersections or links where mitigation measures cannot be managed by traffic or construction management. The infrastructure upgrades will ensure additional capacity and resilience within the network to minimise network impacts. ▸ A travel demand management campaign will be implemented to inform DTMR, emergency services, local councils and the public of Project construction works and its effect on network operations. This is to relieve congestion by encouraging travel outside of peaks or mode shift by the public and increase awareness of construction works. ▸ Regular maintenance and vegetation clearance will be carried out to maintain adequate sight lines and maintain clear zones.

Operations

Aspect	Mitigation measures
Access	▸ The provision of suitable private property access during operations will form a component of property-specific management agreements developed in consultation with landowners.
Road link	▸ A protocol will be developed 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). The protocol will minimise any impact to emergency services due to potential changes to the road network and Project operation.
Road-rail interfaces	▸ ARTC will maintain safety treatments for passive and active level crossings (including sight lines) by conducting routine inspections of crossing infrastructure in accordance with ARTC's *engineering codes of practice and* will regularly review crossing performance and incident information to identify opportunities for improved performance and further reduction in risk. ARTC will work with road controlling authorities to manage any incidents at road-rail interfaces. ▸ Road safety audits will be undertaken at the level crossings, once completed, in accordance with the Austroads guidelines. During operations, 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. ▸ Railway safety messages will be provided to the community through awareness activities, community engagement activities, and campaigns to increase public awareness regarding the Project. Fact sheets and guidelines will also be freely available on the ARTC website, aiming to provide guidance to the community regarding safety around level crossings. ▸ key actions outlined within the *Queensland Level Crossing Safety Strategy 2012-2021* (DTMR, 2012a) will be implemented, including: ▸ promoting level crossing safety through public awareness campaigns ▸ maintain data collection, including near miss reporting ▸ maintain level crossing infrastructure in accordance with Australian Standards. Appendix AA: Traffic Impact Assessment provides further details on the level crossing strategy.

24.9.12 Hazard and risk

24.9.12.1 Environmental outcomes

- The risk of a health, safety or environmental incident is minimised during Project construction works and operations
- The potential risks of natural hazards including flooding, fire, cyclone or heatwave events occurring during Project construction works and operations are identified and managed.

24.9.12.2 Performance criteria

- A safe working environment is maintained for the construction workforce and visitors
- Potential health and safety risks from the Project to adjacent landowners and the community are identified and managed
- A Project Hazard and Risk Register is maintained to record and implement appropriate systems and procedures to manage and respond to both natural and man-made hazards and risks during construction
- The Project complies with relevant Australian Standards for the handling and storage of hazardous goods.

24.9.12.3 Management and mitigation measures

Hazard and risk aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-18.

Additional mitigation and management measures that relate to the following hazard and risk aspects have been documented elsewhere in this draft Outline EMP, as specified:

- Flooding (Table 24-11)
- Landslide, sudden subsidence, movement of rocks, loss of soil (Table 24-4)
- Contaminated land (Table 24-4)
- Rail incidents, including at road-rail interfaces (Table 24-17)
- Private access (Table 24-3)
- Wildlife and biodiversity (Table 24-6).

24.9.12.4 Monitoring, auditing and reporting

Implementation of hazard and risk elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5.

TABLE 24-18 MITIGATION MEASURES—HAZARD AND RISK

Detailed design

Hazard type	Aspect	Mitigation measures
General	General	▸ A Hazardous Materials Management Plan will be developed for the Project during detailed design, as a component of the CEMP. The plan will be prepared in consultation with QFES and relevant local governments. At a minimum, the plan will: ▸ identify the materials and chemicals required to be stored and used in support of construction, including volumes of each, such as: – fuel and oil – greases – blasting chemicals – concreting – welding gases – pesticides ▸ identify the laydown areas that will be used for storage of hazardous materials and designated locations for storage of hazardous materials within the bounds of those laydown areas. Bulk storage areas for dangerous goods and hazardous materials will be located away from areas of social (e.g. residential areas) and environmental receptors (e.g. watercourses) such that offsite impacts or risks from any foreseeable hazard scenario will not exceed the dangerous dose for the defined land use zone (e.g. either sensitive, commercial/community, or industrial, in accordance with the intent of the State Planning Policy) ▸ specify how dangerous goods and hazardous materials will be handled, stored and transported for the Project, with consideration for: – other dangerous goods being stored simultaneously – providing resilience from natural events, such as storms and floods. – all relevant legislation, standards, guidelines and safety data sheet information ▸ require safety data sheet information to be obtained from the supplier and stored in an easily accessible location ▸ describe the emergency response procedures in the event of an incident involving hazardous materials or dangerous goods, including retention of records as well as provision of records to landowners where required. ▸ An Incident Management Plan will be developed for the Inland Rail Program during detailed design and implemented for the Project, as required under ARTC's existing Emergency Management Procedure (RLS-PR-044) and in accordance with sections 112 and 113 of the *Rail Safety National Law*. The Plan will, at a minimum: ▸ identify the necessary resources, training and communication interfaces with relevant emergency organisations, to ensure effective emergency response for the Inland Rail Program and the Project ▸ provide response procedures for the following incident scenarios: – derailment and collision (including hazardous material freight) – fire and life safety – bomb threat – equipment – rollingstock or infrastructure failure – environmental issues – hazardous chemical spills – natural disaster.

Hazard type	Aspect	Mitigation measures
General (continued)	General (continued)	▸ A Blast Management Plan will be prepared by the appointed prescribed shotfirer, in consultation with geotechnical engineers and safety personnel, in support of each blasting event for the Project and will, at a minimum: ▸ specify procedures to: – identify the environment of explosive use, including flood, bushfire, landslide zones – identify other activities within proximity of explosives use – prevent misfire – minimise the risk associated with material projected by a blast – minimise adverse effects of ground vibration and shock waves caused by a blast – ensure explosives are not used after either the manufacturer's recommended shelf life or the approved, extended shelf life – ensure public safety, vehicular access and security, including temporary site road closures and warnings notifications before blasting ▸ Require that the prescribed shotfirer submit a safe blast design together with the Blast Management Plan to the Explosives Inspectorate a minimum of seven days before the scheduled blasting event, for assessment against the requirements under the act and *AS 2187.2:2006 Explosives—Storage and use, Part 2: Use of explosives* (Standards Australia, 2006a).
Natural	Flooding	▸ The Project will be designed to achieve a 1% AEP flood immunity to rail formation level and, at the same time, to avoid impacts exceeding the guiding design criteria on the existing flooding and drainage regime ▸ Design modifications during the detailed design stage will be subject to re-runs of the existing flood models to demonstrate compliance with the design objectives of the Project, including for extent and time of inundation, afflux and flow velocities ▸ A Flood Risk Management Plan will be developed to outline management and control measures and emergency procedures to be implemented during the pre-construction activities and early works, and construction works stages in order to mitigate flood impacts (as detailed in Table 24-11).
	Bushfire	▸ Appropriate access and egress solutions throughout Whetstone and Bringalily State forests will be incorporated into the detailed design and continued access will be allowed for in the construction methodology. This aspect of the design will be supported by consultation with DPI, QPWS&P and QFD (including timber harvesting and firefighting activities for maintaining emergency access, wildfire management and public access by recreation users). ▸ Further engagement with QFD will be undertaken to confirm the location of access tracks that may be affected by the Project's detailed design, and the actions required of the Project to provide firefighters access to the areas that they are currently able to service ▸ The rail corridor will be designed to manage bushfire risk in bushfire risk areas ▸ ARTC will undertake consultation with DPI and other relevant authorities to ensure sufficient access is provided for firefighting activities. ▸ Where provided, the rail maintenance access road will be designed to be suitable for use by emergency response vehicles in the event of an incident.

Hazard type	Aspect	Mitigation measures
Natural (continued)	Landslide, movement of soils or rocks and subsequent damage to property and infrastructure	▸ Additional geotechnical investigations will be undertaken during detailed design to ensure site-specific geotechnical conditions are reflected in the finalised design solution, in areas where the design includes: ▸ cuts ▸ embankments ▸ bridge piers and abutments ▸ Additional soil investigations will be completed if required to ensure that the design of structures, embankments, erosion control measures (temporary construction and permanent) and site rehabilitation planning are reflective of site-specific soil conditions. Soil investigations will be undertaken in accordance with the *Guidelines for surveying soil and land resources* (CSIRO/McKenzie et al., 2008), the *Australian soil and land survey field handbook* (CSIRO, 2009) and the *Guidelines for Soil Survey along Linear Features* (Soil Science Australia, 2015). Investigations will specifically identify materials that are: ▸ sodic (dispersive) ▸ saline ▸ acidic.
	Climatic conditions	▸ Climate change impacts will be reviewed and considered by ARTC during the detailed design of cross drainage structures for the Project. ▸ The use of elastic fasteners or heavier sleepers will be considered during detailed design to reduce the risk of track buckling as a result of extreme temperatures in future climatic scenarios ▸ The track will be designed to conform with all mandatory components of *AS/RISSB 7643 Track Stability* (Standards Australia, 2018e).
	Biosecurity	▸ A Biosecurity Management Plan will be developed during the detailed design as a component of the CEMP (as detailed in Table 24-6) to protect biodiversity and agricultural land uses adjoining the Project footprint, in compliance with the Biosecurity Act ▸ Where the Project interacts with the wild dog check fence, at approximately Ch 5.0 km and between Ch 50.1 km and Ch 56.0 km, the fence will be reinstated on the northwest side of the rail corridor. Reinstatement will be in accordance with the design solution agreed with GRC through the design process. ▸ Where the Project crosses the DDMRB fence at Ch 120.2 km, the fence will be re-established, and a rabbit trap will be established. Reinstatement will be in accordance with the design solution developed in consultation with the DDMRB through the design process.
Project	Rail incidents	▸ Rail track design will incorporate trackside monitoring systems, which will detect faults in the wheel set of trains and monitor rail wheel condition and defects to reduce the likelihood of rail incidents, including derailment. The locations for trackside monitoring systems will be confirmed and incorporated into the design.
	Emergency access and timber harvesting	▸ Consultation with Toowoomba and Goondiwindi LDMGs, in addition to QPS (including the Security and Counter-Terrorism Command), QAS and QPWS&P will continue throughout the design process to ensure that: ▸ appropriate access and egress solutions are incorporated into the design to enable movements across the rail corridor ▸ the scope and schedule of proposed works is communicated to first responders ▸ possible impacts and affected locations, groups and/or individuals are recognised ▸ Detailed design to provide for safe corridor access and vehicle turnaround points required for maintenance work, to ensure sufficient setback while working adjacent to live railway. Maintenance and emergency access roads will be designed so that it will allow separation to prevent interaction between trains and vehicles without impeding escape or rescue activities.

Hazard type	Aspect	Mitigation measures
Project (continued)	Emergency access and timber harvesting (continued)	▸ ARTC will provide the detailed design to DPI (Forestry) to assist with planning for timber salvage prior to construction commencing. ▸ The detailed design process will include further investigation and development to ensure emergency service access for local residents will be maintained during construction and operation for the Project. ARTC are committed to further investigations and consultations with stakeholders on the hazard reduction measures and impacts on emergency services access. ▸ A Traffic Management Plan (as detailed in Table 24-17) will be developed for the Project during detailed design, as a component of the CEMP, detailing how access across the rail corridor will be maintained during construction for emergency response vehicles.
	Road-rail interfaces	▸ Design will include active controls (e.g. flashing lights and boom gates) and/or passive controls or treatments (e.g. signage and pavement marking and suitable sight distance availability) in accordance with the *Guide to Development in a Transport Environment: Rail* (DTMR, 2015) and *AS 1742.7—Manual of uniform traffic control devices, Part 7: Railway crossings* (Standards Australia, 2016a) to reduce the likelihood and impact of road–rail collisions. Such measures will be implemented in conjunction with the road asset owner (i.e. DTMR and private owners). ▸ Design to include the provision of exclusion fencing where required near roads or where trespass is likely to occur, to reduce the likelihood of trespasser injury or death from rail collision. Specific fencing requirements are to be agreed through discussion with adjoining landowners and asset owners through the design development. ▸ A Traffic Management Plan will be developed for the Project during detailed design, as a component of the CEMP (as detailed in Table 24-17). ▸ A Road Use Management Plan will be developed for the Project during detailed design, in consultation with DTMR (as detailed in Table 24-17) ▸ ARTC to consult with relevant stakeholders on proposed mitigation measures to ensure structural capacities are maintained and agreement on the minimum design life of returned works and agreed contribution towards the consumption of pavement design life by construction related vehicles.
	Design interfaces with utilities	▸ Utility interface treatments that have been included in the revised reference design have been discussed with individual utility owners. The exact methodology for utility modification, upgrade, diversion or realignment will be subject to confirmation once the Project design is finalised and will be determined through further consultation with the affected utility owners. ▸ Designs for utility protection (modification, upgrade, diversion or realignment) will be in accordance with all relevant legislation, standards and guidelines, and will be subject further consultation with the affected utility owners and confirmation once the Project design is finalised.
	Existing infrastructure and utilities	▸ Utilities within the Project footprint will be surveyed and marked prior to the commencement of construction. ▸ Where protection or relocation of a utility is required as an outcome of consultation with asset owners and design, these works will be undertaken prior to the commencement of construction to reduce the likelihood of impacts to those services.

	Soil erosion and subsequent damage to property and infrastructure	▸ Soil/land conservation measures for the Project to minimise impacts on soil conservation plans and viable productive land, and include:
		  ▸ incorporation and maintenance of appropriate design measures to ensure overland flow through the landscape is not impeded by the project resulting in increased soil erosion or sedimentation of the surrounding environment. particularly for streams, gully and floodplains
		  ▸ consideration of stream and gully erosion, land slope, land use, soil type, rainfall, trafficability and farm type when designing new contour banks
		  ▸ retention of vegetation and embankment stabilisation to conserve soil
		  ▸ protection of surrounding of floodplains, infrastructure and horticulture.

Hazard type	Aspect	Mitigation measures
Project (continued)	Soil erosion and subsequent damage to property and infrastructure (continued)	▸ The status of relevant soil conservation plans that may be impacted by the Project will be checked and confirmed during detailed design to ensure all current plans are identified which correspond to the Project disturbance footprint and those that have the potential to be impacted by the Project. This will be undertaken in consultation with DNRMMRRD and the landowners relevant to each soil conservation plan. ▸ If a soil conservation plan is found to be current and materially affected by the Project following application of the hierarchy of controls to reduce flood impacts as detailed in the Project's approach to flooding mitigation designed to avoid, reduce and manage impacts, ARTC will address the requirements for amending or modifying plans in accordance with the *Soil Conservation Act 1986* (Qld) and in consultation with DNRMMRRD and the impacted landowner. If required, this would be progressed under the direction of a suitably qualified professional and in consultation with DNRMMRRD and the holder of the soil conservation plan.
	Contaminated land	▸ A Contaminated Land Management Plan will be developed for the Project during detailed design, as a component of the CEMP (Table 24-4).
	Asbestos	▸ A survey of infrastructure that will be demolished, removed or disturbed by the Project will be conducted prior to the commencement of construction to identify the potential for asbestos-containing materials such as housing and or older agricultural buildings, existing rail conduits, service pits, brake-lining form older rail rollingstock.
Dangerous goods and hazardous chemicals	Storage and handling chemicals	▸ A Hazardous Materials Management Plan will be developed for the Project during detailed design, as a component of the CEMP (as detailed in the 'General' category of this table, above). ▸ Establish waste storage and disposal procedures for hazardous materials and chemicals and dangerous goods prior to the establishment of site compounds/laydown areas and construction activities ▸ Develop an environmental incident checklist and communication plan in the event of reportable environmental incident arising from major spills, such that a procedure prepared to ensure that emergency services can be told of the location, types and quantities of the hazardous chemicals. The ARTC work instructions will be applied for all maintenance activities requiring the transport of dangerous goods within the rail corridor. The work instruction includes the following control measures to reduce the risk associated with dangerous goods storage and transport: ▸ where practical, dangerous goods, specifically detonators, will be transported in their original packaging and stored separately from one another on the vehicle ▸ all dangerous goods will be adequately restrained within the vehicle's confines to prevent movement during transit (e.g. gas bottles restrained to headboard or in designated ventilated storage compartments) ▸ the combined (aggregate) quantity of dangerous goods will not exceed 1,000 litres or kilograms ▸ any individual receptacle used for transporting dangerous goods will have capacity less than 500 litres or kilograms or dangerous goods licensing for both the vehicle and driver will apply ▸ all vehicles carrying mixed loads of dangerous goods will display the appropriate mixed class placard at least on the front and rear of the vehicle ▸ the vehicle will be fitted with appropriate safety equipment for the load as per ARTC operational procedures, including double-sided triangle reflector signals, fire extinguishers and personal protection equipment.
	Explosives	▸ A Blast Management Plan will be prepared by the appointed prescribed shotfirer, in consultation with geotechnical engineers and safety personnel, in support of each blasting event for the Project (as detailed in the 'General' category of this table, above) ▸ The prescribed shotfirer (the licensed person undertaking the blasting works) will be engaged during the detailed design stage to plan and undertake the necessary blasting activities for excavation of non-rippable rock using the assessments of geology undertaken within Chapter 9: Land Resources. The prescribed shotfirer will be required to maintain a security management system.
	Noise and vibration	▸ A Noise and Vibration Management Plan will be developed for the Project during detailed design, as a component of the CEMP (as detailed in Table 24-13).

Hazard type	Aspect	Mitigation measures
Dangerous goods and hazardous chemicals (continued)	Private access, stock routes	▸ Detailed design to provide: ▸▸ 10 m wide crossings at road–rail interface locations to reduce cattle pressure and crossing times ▸▸ use of cattle grids at the rail tracks to avoid cattle entering the corridor ▸▸ fences and gates consistent with the published guideline for 7.3 m openings: *Guideline: Fences on stock routes SLM/2019/5152* (DoR, 2022a) ▸▸ new stock corridor widths consistent with DoR *Operational policy: Land dealings affecting the stock route network SLM/2013/363* (DoR 2023).

Pre-construction activities and early works, and construction works

Hazard type	Aspect	Mitigation measures
Natural	Flooding	▸ Ancillary infrastructure such as construction compounds, stockpiles and laydown areas will be designed to achieve a 1% AEP flood immunity, where possible. Laydown areas and other temporary construction facilities that are located within the 1% AEP will be temporary and reflect the local flood risk. ▸ Some laydown areas must be located within floodplains and near water sources. In such instances, the following precautions will be taken: ▸▸ the potential site will be surveyed prior to site establishment to understand the exact extent of potential flooding impact to facilities and storage areas ▸▸ planning and the layout of construction facilities will be undertaken with consideration of overland flow paths and flood risk ▸▸ earthworks and temporary drainage for each laydown site will be designed to minimise flooding impacts ▸▸ critical equipment and mobile plant will be placed/stored on earthworks and/or plinths that raise it above the predicted 1% AEP water level. ▸ Construction tasks will be scheduled to avoid, where possible, bulk earthwork activities within the 1% AEP during periods of elevated flood risk. Where works cannot be scheduled outside of this time period, activity-specific flood readiness and response planning will be required. This planning and development of appropriate incident management and response procedures for natural disasters, including flooding, will be developed in consultation with the relevant disaster management groups for Toowoomba and Goondiwindi local government and QFD and QPS. ▸ Implement the Flood Risk Management Plan, as a component of the CEMP, in order to mitigate flood impacts (as detailed in Table 24-11).
	Bushfire	▸ Hot works and other activities that may act as a source of ignition will be restricted during periods with a BoM fire danger rating of ‘extreme’ or higher to reduce the likelihood of construction activities initiating or exacerbating a bushfire ▸ If hot works or other high fire-risk activities are required during periods of elevated fire danger, these works will be planned in accordance with best practice industry standards and in consultation with relevant authorities as required. Such works may require a permit (e.g. permit to light fire), issued by QFES ▸ Elevated risk activities and construction facilities/laydown areas will include the provision and positioning of appropriate fire-extinguishing equipment.
	Landslide, movement of soils or rocks and subsequent damage to property and infrastructure	▸ The period that soil is left exposed to erosional processes will be minimised, through progressive ground-cover revegetation, to reduce the likelihood of landslides ▸ Material will be temporarily stockpiled in accordance with the Soil Management Plan (Table 24-4) ▸ The geotechnical stability of blasted surfaces will be assessed by a geologist, or similar, prior to the area of works immediately surrounding the blast site being reopened for general construction activities ▸ Construction stage earthworks inspections will be conducted at regular intervals and in accordance with *Earthworks Construction Specification* (ETC-08-04) (ARTC, 2019) to identify defects and conditions that may affect or indicate problems with the stability of earthworks.
	Climatic conditions	▸ ARTC to apply a Project specific Flood Risk Management Plan including coordination with the relevant local councils and LDMGs for the construction phase of the Project (as detailed in Table 24-11).

Hazard type	Aspect	Mitigation measures
Natural (continued)	Biodiversity	▸ Implement the Biosecurity Management Plan, as a component of the CEMP (as detailed in Table 24-6) ▸ The effectiveness of weed hygiene measures will be monitored as a component of the construction environmental monitoring procedure for the Project ▸ Permanent fencing will be installed at locations that are required to limit fauna strike and/or maintain habitat connectivity.
Project	Rail incidents	▸ The construction approach for the components of the Project within the existing rail corridor for the QR South Western Line and the Millmerran Branch Line will be confirmed through discussion with QR to ensure coordination between operations to reduce likelihood of rail and/or road incidents. The agreed construction approach in these locations will require a wayleave agreement, or similar, between ARTC and QR. ▸ QR's approval will be obtained prior to commencement of work in accordance with section 255 of the *Transport Infrastructure Act 1994* (Qld) to ensure coordination between ARTC and QR is established for reduction of rail incidents between the operations ▸ If construction of Project components within the existing rail corridor is completed during a temporary possession of the rail corridor, then works will be completed in accordance with the conditions of the temporary possession and/or wayleave agreement granted to ARTC by QR ▸ All works carried out on QR property will be in accordance with the requirements of QR's *Civil Engineering Technical Requirement: Work in or about Queensland Rail Property* (CIVIL-SR-002) (QR, 2016) ▸ All work performed on QR property or when directed by QR will be under the supervision of a Possession Protection Officer or Protection Officer and will be carried out only at times authorised by QR or the QR-appointed project manager.
	Emergency access and timber harvesting	▸ Implement the Traffic Management Plan, as a component of the CEMP (as detailed in Table 24-17) to maintain access across the rail corridor during construction for emergency response vehicles
	Road-rail interfaces	▸ ARTC to consult with DTMR, local councils and where relevant, QR, to determine final construction and heavy vehicle routes ▸ Conduct pavement condition assessments prior and post-construction activities as well as at ongoing intervals during construction, with intervals agreed with Council prior to commencement of construction to ensure safe driving surfaces are maintained. ▸ ARTC to continue to consult with emergency services and LDMGs regarding construction traffic management ▸ Implement the Road Use Management Plan (as detailed in Table 24-17) ▸ Implement the Traffic Management Plan, as a component of the CEMP (as detailed in Table 24-17) ▸ If required and necessary for the Project, all rail access vehicles and oversize and over mass vehicles requiring transportation of special equipment will apply for the necessary permits from DTMR, QR and relevant authorities as well as the Heavy Vehicle National Regulator.
	Existing infrastructure and utilities	▸ Protection or relocation of utilities will be conducted in accordance with relevant legislation, Australian Standards, guidelines, utility policies and standards are to be used where utility interfaces occur ▸ Safe working distance between the Project footprint and the worked area of the Commodore Mine to be determined, to reduce the likelihood of worker or public injury ▸ The Roma-to-Brisbane gas pipeline and the decommissioned Moonie-to-Brisbane oil pipeline (which still presents a risk of potential flammable atmosphere in the pipeline) are to be considered in collaboration with pipeline operators to minimise the risk of loss of containment of gas or flammable atmospheres. Ongoing consultation with pipeline operators will be conducted throughout the Project. Consultation will also be undertaken in accordance with the *Petroleum and Gas (Production and Safety) Act 2004 (Qld)* and *AS 2885 Pipelines—Gas and liquid petroleum* (Standards Australia, 2008b) standards during Project activities.

Hazard type	Aspect	Mitigation measures
Project (continued)	Existing infrastructure and utilities (continued)	▸ Construction activities will be planned and executed so as not to inhibit the safe and efficient operation of utilities that remain located within the Project footprint ▸ Affected businesses and residences will be notified in advance of any planned interruptions (including durations) ▸ Disturbance of existing utilities will occur under access arrangements and approval with the relevant asset manager, obtained prior to commencing work ▸ In the event that previously unidentified underground utilities are encountered during construction, work will cease in proximity to the utility until the type and status of the services (operational/disused) can be confirmed, in accordance with *AS 1345 Identification of the contents of pipes, conduits and ducts* (Standards Australia, 1995) ▸ ARTC will ensure that the construction of the rail infrastructure will not exceed the height of the Toowoomba Wellcamp Airport Obstacle Limitation Surface.
	Soil erosion and subsequent damage to property and infrastructure	▸ Consultation with relevant agencies and landowners will continue throughout the construction stage of the Project to ensure that all soil conservation plans, including those not currently approved under the *Soil Conservation Act 1986* (Qld), are considered and appropriately mitigated, where required. ▸ Consultation and agreement with impacted landowners with respect to 'at property' treatments and ongoing inspection and maintenance.
	Contaminated land	▸ Contamination management and clean-up measures for spills that may occur during the construction stage of the Project, will be in accordance with the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* and amendment measures and the requirements of the EP Act.
	Asbestos	▸ Where identified, asbestos-containing materials will be removed prior to the commencement of construction. Asbestos removal and handling as well as tracking and recording of information will be conducted in accordance with relevant legislation, standards, guidelines and codes of practice. ▸ If material is encountered that is suspected of being asbestos-containing material, work will stop in the immediate vicinity. The suspected material will be subject to sampling and analysis by a certified professional for determination of its material classification.

		▸ If removal of more than 10 m^2 of asbestos is required, the necessary licence will be obtained from Workplace Health and Safety Queensland, as follows:
		  ▸ A Class Licence—Removal of loose (friable) asbestos
		  ▸ B Class Licence—Removal of bonded asbestos
		▸ Asbestos-containing materials will be transported by a licenced service provider and disposed of at an appropriately licenced facility, in accordance with the WRR Act and the EP Act.

	Fatigue and heat stress management	▸ ARTC will undertake a risk-based approach to determine appropriate shift and roster lengths and controls to minimise impacts associated with Fatigue. These will be detailed within the Project Work Health and Safety Management Plan to be developed prior to commencement of pre-construction activities and early works ▸ ARTC's existing work Instructions for fatigue management will apply to the Inland Rail network and this Project, to ensure conditions of work for employees align with the requirements of the *Work Health Safety Act 2011* (Qld) ▸ ARTC will follow the guidance document *Managing the risks of working in heat* (Safe Work Australia, 2017).
	Dust, respirable silica and other airborne contaminants	▸ Direct exposure of construction workers to respirable silica and other airborne contaminants will be controlled through the use of appropriate personal protective equipment in line with ARTC's procedure *Personal Protective Equipment* (WHS-PR-009) (2022b) to reduce the likelihood and consequence of construction work impacting worker health. ▸ Construction speed limits will apply to all unsealed routes used by construction vehicles to reduce vehicle-generated dust. Applicable speed limits will be determined through consultation with the relevant local government and documented in the Traffic Management Plan to be finalised and implemented prior to any construction activities commencing.

Hazard type	Aspect	Mitigation measures
Project (continued)	Dust, respirable silica and other airborne contaminants	▸ Dust-suppression water sprays, or alternative appropriate treatment, will be applied to unsealed surfaces trafficked by construction vehicles, to minimise the generation of dust. Additional dust-suppression controls will be implemented prior to the onset of adverse weather. This may include covering of stockpiles and additional watering of access roads. Water will be obtained from sustainable sources, with the necessary water entitlement, water allocation, water licence or water permit. ▸ Construction activities will be planned, in the first instance, to prevent dust generated by works extending beyond the Project footprint. Where this is not possible, landowners predicted to be affected will be notified in advance of the commencement of activities with potential to generate dust that propagates offsite. This notification will be in accordance with community notification procedures established for the Project.
	Noise and vibration	▸ Implement the Noise and Vibration Management Plan, as a component of the CEMP (as detailed in Table 24-13) ▸ Investigate complaints received and implement appropriate additional controls as per investigation outcomes.
	Private access, stock routes and emergency access	▸ During construction, should cattle move along the stock route/road corridor, communication will occur between the relevant local council and ARTC notifying them of the permit. Traffic management will be in place to ensure there is no conflict between stock and construction activities. The timing between construction laydown requirements and the use of the holding yards for the operational rail environment is to not create any conflict. ▸ Implement the Traffic Management Plan, as a component of the CEMP (as detailed in Table 24-17). This plan will specify how access across the rail corridor will be maintained during construction for private access, emergency response vehicles and stock route movements.
	Road incidents	▸ Implement the Traffic Management Plan, as a component of the CEMP (as detailed in Table 24-17).
	Outdoor workplace lighting safety	▸ Existing ARTC management plans and codes of practice will be applied to the construction and commissioning of the Inland Rail network, including this Project, to reduce the likelihood of impacts from lighting in outdoor working conditions, which include complying with relevant standards in *AS/NZS 1680.5:2012 Interior and workplace lighting, Part 5: Outdoor workplace lighting* (Standards Australia/Standards New Zealand, 2012).
Dangerous goods and hazardous chemicals	Storage and handling chemicals	▸ Vehicle and plant maintenance will be undertaken in designated bunded laydown areas, on hardstand surfaces. This will minimise risk of contaminants from incidental spills or leaks (accidental discharge) from entering aquifers via infiltration or surface runoff ▸ Bulk storage and refuelling will only occur at designated locations within the Project footprint and sited at suitable separation distances from sensitive receptors, including surface water features and drainage lines. These refuelling locations will be equipped with onsite chemical and hydrocarbon absorbent socks/booms and spill kits ▸ Bulk storage areas for dangerous goods and hazardous chemicals, other than fuel, will be located away from areas of social and environmental receptors such that offsite impacts or risks from any foreseeable hazard scenario will not exceed the dangerous dose for the defined land use zone, i.e. either sensitive, commercial/community, or industrial, in accordance with the intent of the State Planning Policy ▸ Mobile refuelling will be undertaken at suitable separation distances from sensitive receptors, including surface water features and drainage lines ▸ Licensed transporters operating in compliance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024) will be used for the transportation of dangerous goods ▸ Chemicals stored and handled as part of construction and or operational activities will be managed in accordance with relevant legislation, standards and guidelines ▸ Safety data sheet information will be obtained from the suppliers of chemicals and stored in an easily accessible location ▸ Spill kits will be available at all work fronts and laydown areas in the event of a spill or leak. Spill kits will be available at all work fronts and made known to the onsite personnel. These refuelling locations will be equipped with onsite chemical and hydrocarbon absorbent socks/booms and spill kits

Hazard type	Aspect	Mitigation measures
Dangerous goods and hazardous chemicals (continued)	Storage and handling chemicals (continued)	▸ Mobile plant, drill rigs and equipment will be maintained in accordance with manufacturer requirements and inspected frequently to minimise breakdowns and decrease the risk of contamination ▸ Implementation of a GMMP and adaption of the program for each stage of the Project will allow for sufficient monitoring of the groundwater regime to identify potential impacts on groundwater quality (as detailed in Table 24-12) ▸ Procedures for the management of hazardous chemical spills and leaks to be implemented in accordance with the Hazardous Materials Management Plan (as detailed in the 'General' category of this table, above).

	Explosives	▸ Where explosives are used during construction, the works will be undertaken by the holder of a shotfirer licence, in accordance with the Explosives Act and *AS 2187.2:2006 Explosives—Storage and use, Part 2: Use of explosives* (Standards Australia, 2006a). Explosives will be stored, handled and transported by the prescribed shotfirer, who will be responsible for the security of the explosives for the entire duration of the task, including the segregation of incompatible products.
		▸ Notification requirements of the *Explosives Act* (Qld) will be followed including:
		  ▸ before undertaking a blast
		  ▸ before importing or exporting explosives
		  ▸ when storing or interacting with stored explosives at explosive storage facilities and government activities
		  ▸ when there are changes to buildings and vehicles related to the storage or transport of explosives
		  ▸ after conducting an explosive trial
		▸ Record of the amount and the type of explosive purchased and used, and a record of each blast conducted by the appointed prescribed shotfirer will be kept in accordance with the Explosives Act
		▸ Proper stemming (sealing of blast holes) will be used in the preparation of charges and appropriate charge ratios will be used to limit the amount of fly rock produced by a blast
		▸ Where drilling and blasting is to be undertaken, residents, occupants and other stakeholders within a 1 km radius of a blast location will be notified a minimum of three calendar days in advance of a blast occurring. This notification will be in accordance with community notification procedures established for the Project.
		▸ A complaint hotline will be established for the Project to enable members of the public to notify ARTC of issues, including the generation of excessive noise and/or vibration during construction.

Commissioning and operations

Hazard type	Aspect	Mitigation measures

Natural	Flooding	▸ Routine and post flood event inspections will be carried out during operations to identify defects and conditions that may affect waterway and drainage system capacity or indicate increased risk of flooding, such as:
		  ▸ scour
		  ▸ blockages due to debris build up
		  ▸ indication of floods overtopping a structure
		  ▸ culvert or drain damage or collapse
		▸ Where defects are identified and corrective actions are required, these works will be completed in undertaken in accordance with defect inspection findings and associated site-specific environmental controls
		▸ ARTC will engage with the LDMGs for Toowoomba and Goondiwindi to coordinate appropriate incident management and response procedures for natural disasters, including flooding.

Hazard type	Aspect	Mitigation measures
Natural (continued)	Bushfire	▸ Existing ARTC management plans and codes of practice will be applied to the operation of the Inland Rail network, including this Project, to reduce the likelihood of ignition or exacerbation of bushfire ▸ Communication protocols will be established with DPI, QFD and QPWS&P for the operation of the Project, to ensure that all relevant stakeholders are aware of planned (e.g. controlled burns, railway crossing closures) or unintended events (e.g. escaped fires) that have potential to impact on the provision of services by others. ▸ Ongoing communications will be undertaken with DPI regarding emergency access and maintenance activities to provide ongoing emergency access for firefighting and essential maintenance activities.
	Landslide, movement of soils or rocks and subsequent damage to property and infrastructure	▸ Operational embankment and cutting inspections will be conducted at regular intervals to identify defects and or environmental conditions that may affect or indicate problems with the stability of the earthworks on the corridor. If required, corrective actions will be implemented as identified within the inspection report.
	Climatic conditions	▸ Operations on the corridor will comply with mandatory speed restrictions during hot weather. ▸ Regular rail inspection, maintenance, and de-stressing of the rail to maintain track stability during both seasonal and annual temperature fluctuations. ▸ Adaption strategies for climatic conditions will be reviewed through operational risk assessments. ▸ ARTC will develop and implement an operations Flood Emergency Response Plan, including coordination with the relevant local councils and LDMGs.
	Biosecurity	▸ Routine inspections of the operations footprint will be undertaken as part of the operations Biosecurity Management Plan (as detailed in Table 24-6) and general maintenance of the Project footprint and include weed identification and appropriate management. ▸ Fauna exclusion fencing and connectivity infrastructure will be monitored to ensure integrity and effectiveness throughout the life of project with any damage being repaired efficiently to reduce potential for fauna/rail interactions during operations.
Project	Rail incidents	▸ The quantities and types of dangerous goods that may be transported will be managed in accordance with the requirements of the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024) ▸ Trackside monitoring systems will be adopted and maintained, which will detect faults in the wheel set or trains and monitor rail wheel condition and defects to reduce the likelihood rail incidents, such as derailments ▸ A signalling and communications testing procedure will be developed and implemented for the Inland Rail network, including for this Project, to reduce the likelihood and consequence of rail collisions ▸ ARTC will coordinate with QR for operation activities within a shared active rail corridor, as required, to ensure safe operation ▸ Maintenance inspections of bridge structures will be undertaken generally in accordance with ARTC's current practices and procedures ▸ Inspections of bridge structures will be undertaken in three levels: visual Inspections (two-year frequency), engineering inspections (12-year frequency) and special inspections (as required). The inspections will require visual inspection and, in some cases, non-destructive testing and sampling.
	Emergency access and timber harvesting	▸ Operational rail maintenance access road will be available for use by emergency vehicles and firefighting requirements as per ongoing consultation with the LDMGs, DPI, QFD, QAS and QPS in the event of an incident or egress requirements.

Hazard type	Aspect	Mitigation measures
Project (continued)	Road-rail interfaces	▸ ARTC will conduct routine operational inspections of crossing infrastructure and will regularly review crossing performance and incident information to identify opportunities for improved performance and further reduction in road rail interface risk ▸ Railway safety messages will be provided to the community through awareness activities, community engagement activities, and campaigns to increase public awareness regarding the Project. Fact sheets and guidelines will also be freely available on the ARTC website, aiming to provide guidance to the community regarding safety around level crossings. ▸ In the event of trespass or vandalism on the ARTC rail corridor and trackside, staff will instruct intruders to leave the corridor immediately. Incidents will be reported to the QPS, as required, for assistance and resolution. ▸ Implementation of train notification procedures for the planned crossing of the rail corridor by stock.
	Existing infrastructure and utilities	▸ Maintenance activities will comply with the clearance distances as specified in the *Requirements for Electric Aerials Crossing ARTC Infrastructure* (ARTC, 2021), to ensure sufficient clearance and prevent contact with live electricity ▸ Consultation with owners of licenced petroleum and gas pipeline assets located in the Project footprint (APA's Roma–Brisbane gas pipeline and Santos' Moonie–Brisbane oil pipeline) will occur prior to undertaking maintenance activities in proximity to these utilities.
	Soil erosion and subsequent damage to property and infrastructure	▸ Routine inspection of the Permanent footprint will be undertaken as part of ARTCs operational management processes to identify any signs of scour or erosion and rectification works as identified during the inspection to minimise the risk of further erosion and impacts to environment, property and infrastructure.
	Contaminated land	▸ If land contamination is caused by operational activities associated with the Project, the nature and extent of contamination will be investigated in accordance with the requirements of the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* and EP Act, with identified amendment measures actioned and reported.
	Fatigue and heat stress management	▸ ARTC's existing work Instructions for fatigue management will apply to the Inland Rail network and this Project, to ensure conditions of work for employees align with the requirements of the *Work Health Safety Act 2011* (Qld) ▸ ARTC will follow the guidance document *Managing the risks of working in heat* (Safe Work Australia, 2017).
	Dust, respirable silica and other airborne contaminants	▸ Should coal be planned to be transported as part of future operations, prior to transportation of coal, engagement would be undertaken with stakeholders and members of the South West Supply Chain regarding coal dust management and monitoring requirements necessary to maintain the integrity of the existing *South West Supply Chain, Coal Dust Management Plan* (South West Supply Chain, 2019). ▸ A complaint hotline will be established for the Project to enable members of the public to notify ARTC of issues, including the generation of excessive dust or other air emissions during operation, response to the hotline comments will include visual inspections and implementing appropriate mitigation procedures as required, such as increased watering, reducing maintenance vehicle use/speed on access tracks/rail maintenance access road.
	Private access, stock routes	▸ ARTC will implement and maintain a system for the communication of train movements through level crossings to facilitate safe movement of livestock and agricultural machinery across the rail corridor. The system will be developed in consultation with landowners, stock operators and DNRMMRRD and be accessible to them prior to the commencement of operation.

Hazard type	Aspect	Mitigation measures
Dangerous goods and hazardous chemicals	Storage and handling of chemicals	▸ An Environmental incident checklist and communication plan will be developed prior to operations commencing in the event of reportable environmental incident arising from major spills, such that a procedure prepared to ensure that emergency services can be told of the location, types and quantities of the hazardous chemicals. ARTC work instructions will be applied for all maintenance activities requiring the transport of dangerous goods within the rail corridor. The work instruction includes the following control measures to reduce the risk associated with dangerous goods storage and transport: ▸ where practical, dangerous goods, specifically detonators, will be transported in their original packaging and stored separately from one another on the vehicle ▸ all dangerous goods will be adequately restrained within the vehicle's confines to prevent movement during transit (e.g. gas bottles restrained to headboard or in designated ventilated storage compartments) ▸ the combined (aggregate) quantity of dangerous goods will not exceed 1,000 litres or kilograms ▸ any individual receptacle used for transporting dangerous goods will have capacity less than 500 litres or kilograms or dangerous goods licensing for both the vehicle and driver will apply ▸ all vehicles carrying mixed loads of dangerous goods will display the appropriate mixed class placard at least on the front and rear of the vehicle ▸ the vehicle will be fitted with appropriate safety equipment for the load as per ARTC operational procedures, including double-sided triangle reflector signals, fire extinguishers and personal protection equipment. ▸ Procedures for the management of hazardous chemical spills and leaks will be developed and incorporated into the Operations EMP for the Project and will include: ▸ a site map that indicates where hazardous chemicals are located ▸ consideration as to whether fire protection systems are appropriate where hazardous chemicals may be stored ▸ consideration of whether hazardous chemicals may affect where an evacuation point should be (e.g. is there a risk of fire, explosion or toxic fumes) ▸ consideration of any specific emergency equipment or safety equipment needs (e.g. type of fire extinguisher, required first aid kit contents, and whether emergency showers or eyewash stations are needed, and the best location for such equipment) ▸ spills kits for the appropriate chemicals (e.g. Hazchem, general, aquatic and marine spill kits, adequately signed, located and staff to be trained in their use) ▸ The spill response controls and clean up procedures as per the provision of their safety data sheet, ensuring environmental harm is minimised.
	Explosives	▸ Before a train travels on the Inland Rail network, operators must make sure that the classes of dangerous goods, and the identification numbers of vehicles carrying dangerous goods, are recorded in the train consignment documentation ▸ Dangerous goods must be loaded, labelled, and marshalled in accordance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2024). Freight carts will display appropriate Hazchem signage, including placards, and carry appropriate spill containment equipment to be used by emergency services personnel in the event of an emergency. ▸ Maintenance crews working on the Inland Rail network will be required to have completed safe work training, which includes a module on the use of railway track signals ▸ ARTC will continue to consult with InterGen to establish communication protocols for the operations stage of the Project to ensure compatibility between ARTC activities and Commodore Mine operating activities ▸ If Commodore Mine's operational plans change and blasting impacts on the Project may occur, then ARTC will consult with the mine operator to establish protocols and procedures for conducting blasting activities in proximity to the Project during operation.

24.9.13 Waste and resource management

24.9.13.1 Environmental outcomes

- Wastes generated during Project works are stored, handled, treated, reused, recycled and disposed of lawfully and in a manner that protects environmental values
- The Project is designed to minimise waste generation during Project construction works and operations
- Waste reduction targets are established for Project.

24.9.13.2 Performance criteria

- Adopt a waste and resource management hierarchy (avoid/reduce, reuse, recycle, recover, treat, dispose) across the Project
- Assess, classify, manage, and dispose of waste in accordance with the relevant State regulatory requirements and guidelines
- The Project design aims to achieve a net balance of cut and fill, to avoid or minimise the need for offsite disposal of material.

24.9.13.3 Management and mitigation measures

Waste and resource management aspects and proposed mitigation measures for the detailed design, pre-construction activities and early works, construction works and operations stages of the Project are detailed in Table 24-19.

24.9.13.4 Monitoring, auditing and reporting

Implementation of waste and resource management elements of the Outline EMP, CEMP and Operations EMP, together with compliance against all relevant permit and approval conditions will be monitored, audited and reported in accordance with processes specified in Section 24.5.

TABLE 24-19 MITIGATION MEASURES—WASTE MANAGEMENT

Detailed design

Aspect	Mitigation measures
General	▸ Develop a Waste Management Plan, as a component of the CEMP, in consultation with relevant stakeholders (e.g. GRC, TRC and waste facility operators) that, as a minimum, establishes: ▸ waste targets (or waste reduction targets) to be achieved for the Project, consistent with the WRR Act ▸ general protocols and performance objectives for keeping the work site clean and tidy ▸ processes for documenting waste volumes, types and how these will be compared to waste targets in accordance with the Environmental Protection Regulation 2019 (Qld) (EP Regulation) ▸ confirmation of waste streams and estimated volumes ▸ temporary waste storage areas and disposal locations on and off site (Chapter 22: Waste and Resource Management) ▸ requirements for secure temporary storage, collection frequency and disposal/recycling requirements, in accordance with the EP Regulation ▸ requirements for regulated waste disposal including how waste will be isolated, stored, and transported to pre-determined destinations agreed in consultation with relevant stakeholders ▸ requirements for the provision of regulated waste disposal receptacles, storage bins and coverage (if required) ▸ waste disposal and NEPM criteria for disposal sites, in accordance with the environmental authority conditions for each facility ▸ requirement for the Project to engage a licenced waste transportation contractor to transport regulated waste from the Project footprint to appropriately licenced disposal facilities ▸ methods for survey of infrastructure that will be removed or disturbed by the Project prior to the commencement of construction, to identify asbestos-containing materials and other hazardous materials ▸ requirements for waste isolation, for example green waste, commercial and industrial waste, construction and demolition waste, general waste, regulated waste and recyclables, in accordance with the EP Regulation ▸ procedures and reporting/documenting requirements for ensuring waste transporters and receivers are appropriately licenced according to the type of waste, in accordance with the EP Regulation ▸ requirements for training, inspections, monitoring, corrective actions, notification, classification of environmental incidents and compliance audits ▸ requirements for workers to have relevant skills and qualifications for removal and handling of asbestos-containing materials, including Workplace Health and Safety Queensland licencing requirements ▸ requirements for record-keeping, notification processes, monitoring and performance objectives for handover on completion of construction.
Generation of waste	▸ Maximise the reuse of local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul ▸ Maximise the reuse of material excavated below the rail embankment for less critical parts of infrastructure ▸ Maximise the reuse of excavated material as a stabilised structural fill ▸ Optimise the number, width and depth of cuts to limit the generation of material that would be considered surplus to Project requirements ▸ Continue to investigate the viability of the reuse of ballast as high-quality general fill or structural fill to minimise the import of rock armour ▸ Refine the horizontal and vertical design and alignments to minimise the quantity of offsite fill required ▸ Review the cut-and-fill balance for the Project during detailed design to minimise reliance on the external sourcing of fill ▸ ARTC to consult with relevant local governments and waste facility operators prior to the commencement of construction to confirm the Project's approach to waste disposal and spoil management ▸ Assess and confirm opportunities for the beneficial use of materials under the end of waste (EOW) framework. If appropriate to do so, ARTC will register as a resource producer to operate under an EOW code.

Pre-construction activities and early works, and construction works

Aspect	Mitigation measures
Hazardous waste	▸ Regulated wastes and contaminated soils or other waste hazardous materials must be transported and disposed of in accordance with the EP Act and procedures within the Waste Management Plan ▸ For management and handling of hazardous materials, workers will have and/or complete training to gain appropriate skills and qualifications in accordance with the Hazardous Materials Management Plan (as detailed in Table 24-18) ▸ Where identified, asbestos-containing materials will be removed prior to the commencement of construction. Asbestos removal and handling will be conducted in accordance with relevant legislation, standards and guidelines ▸ Asbestos-containing materials will be transported by a licenced service provider and disposed of at an appropriately licenced facility, in accordance with the requirements of the WRR Act, *Work Health and Safety Act 2011* (Qld) and the EP Act.
Waste generation	▸ Monitor waste generation to achieve waste reduction targets established in construction contract documentation ▸ Project to adhere to the practices of the WRR Act waste and resource management hierarchy (detailed in Appendix AB: Earthworks Strategy and Draft Soil Management Plan), which sets out options for managing waste from avoiding, to reusing, recovering, treating and disposing of waste ▸ All cut material will be stockpiled and stored based on material type (as per the Earthworks Material Specification (outlined in Appendix AB: Earthworks Strategy and Draft Soil Management Plan) and reused onsite, where possible, with or without treatment ▸ Portable toilets and amenities to be serviced and maintained to ensure efficient operation and minimise environmental risks associated with their operation and decommissioning ▸ Appropriate waste bins will be located in general waste storage areas to facilitate segregation and appropriate containment of waste materials ▸ Each storage area will be provided on hardstand or within suitable receptables or bunding for the waste stream being stored ▸ Recorded waste generation and disposal data to be reported as a component of monthly construction environmental reporting.
Disposal of waste	▸ Waste generated by the Project will be disposed of at licenced waste-management facilities ▸ Sewage sludges and residues (regulated waste) are to be removed by a licensed regulated waste transporter, for disposal at a municipal treatment facility to be identified in consultation with the relevant councils and utility providers. Grease trap and interceptor wastes will be pumped out and removed by a licensed regulated waste transporter ▸ Waste tracking documentation is to be retained by all waste handlers for materials removed from site for disposal in accordance with of the EP Regulation. Waste tracking information must be submitted to DETSI for the Queensland Waste Disposal Levy to be applied. Accurate waste tracking information provides means for waste facilities to apply or transfer the levy at each facility's discretion, according to the type of material being disposed. ▸ Loose and/or dispersible loads are to be secured and covered during transportation to minimise and avoid loss of loaded materials, rock debris and dust ▸ Waste disposal is to be conducted in accordance with the Waste Management Plan (as detailed in the 'General' category of this table, above).

Operations

Aspect	Mitigation measures
Waste generation	▸ Operators and maintenance crews to adhere to the practices of the WRR Act waste and resource management hierarchy, which sets out options for managing waste, from avoiding, to reusing, recovering, treating and disposing of waste.
Disposal of waste	▸ Wastes to be disposed of at appropriately licenced facilities where disposal to landfill is unavoidable ▸ Waste tracking documentation to be retained by the maintenance supervisor for materials removed from site for disposal.
Hazardous waste	▸ The transportation of regulated wastes and contaminated soil or other materials will be conducted by appropriately licenced contractors for disposal at licenced facilities in accordance with the EP Act.