# CHAPTER 22

# Outline Environmental Management Plan

**INLAND RAIL—BORDER TO GOWRIE** ENVIRONMENTAL IMPACT STATEMENT

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

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# 22. Outline Environmental Management Plan

## 22.1 Introduction

This chapter describes the Outline Environmental Management Plan (EMP) for the Inland Rail—Border to Gowrie Project (the Project), which:

- Provides an environmental management framework to enable the identified environmental and social outcomes to be achieved for the detail design, pre-construction, construction and operation of the Border to Gowrie Project
- Establishes the process for the preparation and implementation of the Construction EMP (CEMP) and the Operation EMP, including sub-plans.

The Outline EMP is presented as a draft plan for EIS purposes. The intent is that the Outline EMP be further developed during the post-Environmental Impact Statement (EIS) stage, incorporating relevant approval and permit conditions, to form the basis for the CEMP. The CEMP will be developed by the Principal Contractor prior to the commencement of construction.

Prior to the commencement of Project operation, ARTC will prepare an Operation EMP to ensure that reasonable environmental outcomes are achieved for the operation of the Project. The Operation EMP will support and be in accordance with ARTC policies and procedures that will apply to the broader Inland Rail Program.

### 22.1.1 Structure of the Outline Environmental Management Plan

The Outline EMP:

- Describes the key elements of the Project
- Describes the environmental management framework for the Project
- Describes the relationship between the CEMP and other environmental management documents
- Describes monitoring, reporting, auditing, review and documentation requirements
- Describes processes for dealing with non-compliance, including corrective actions
- Includes requirements for training and awareness, community and stakeholder engagement
- Outlines the complaints-management and response process.

The Outline EMP includes sub-plans for the following specific matters:

- Land use and tenure
- Land resources
- Landscape and visual amenity
- Flora and fauna
- Air quality
- Surface water
- Hydrology and flooding
- Groundwater
- Noise and vibration
- Cultural heritage
- Traffic, transport and access
- Hazard and risk
- Waste and resource management.

The Outline EMP also provides an overview of the Social Impact Management Plan (SIMP) that will be implemented for the Project.

### 22.1.2 Structure of environmental management plan sub-plans

Each sub-plan in this Outline EMP, presented in Section 22.11, includes:

- **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 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 must 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 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 and Community Relations Monitor (refer Section 22.3).
- **Monitoring requirements**—monitoring and reporting requirements to demonstrate that the environmental outcomes have been achieved.

It is proposed that any conditions that are imposed by the Coordinator-General in the EIS evaluation report will be incorporated into the Principal Contractor's CEMP to ensure that all works are authorised and consistent with the imposed conditions.

It is expected that the CEMP will be developed in advance of relevant Project works and will be amended/updated as construction proceeds.

### 22.1.3 Proposed activities

#### 22.1.3.1 Detail design

Detail design is the process of developing the approved reference design up to an 'approved for construction' stage.

Detail design includes outputs such as 2-D and 3-D models, detailed engineering drawings, construction specifications, environmental design requirements identified during development of the EIS and reference design, and detailed bill of quantities for estimates and procurement.

Environmental requirements to be implemented during detail design have been identified in the Outline EMP, to avoid, minimise or mitigate community and environmental impacts of the Project during early works/pre-construction, construction and operation.

#### 22.1.3.2 Pre-construction

Pre-construction activities are required to enable construction of temporary and permanent infrastructure components of the Project to commence. These activities are expected to include but are not limited to:

- Land acquisition
- Obtaining additional environmental and planning approvals
- Establishment of access tracks
- Relocation or protection of Queensland Rail (QR) assets
- Utility/service relocations (excluding those undertaken by third parties as part of enabling works)
- Modification of biosecurity fencing
- Installation of boundary fencing
- Establishment of initial laydown areas.

Some pre-construction activities may occur concurrently with detail design activities. This includes land survey, geotechnical, soils and hydrogeological investigations, and baseline environmental monitoring.

### 22.1.3.3 Construction

The general construction activities for the Project will include:

- Site set out and pegging, including establishing clearing limits
- Establishment of additional laydown areas and compounds, including vehicle inspection/workshops, washdown facilities and temporary fencing as required
- Clearing—using dozers, chainsaws, excavators, trucks and similar equipment
- Bulk earthworks—major cut-to-fill operations include the winning of suitable construction material from sections of cut along the Project alignment or from borrow pits external to the site
- Construction of drainage infrastructure—cut-off drains, table drains and culvert structures
- Enhancement, relocation and/or upgrading of utilities and engineering infrastructure
- Construction/installation of concrete railway bridges and culverts
- Ballast—supply, delivery and installation
- Concrete sleepers—supply, delivery and installation
- Installation of rail track and other items of rail infrastructure using rail-mounted equipment
- Installation of railway signalling and communications equipment
- Other miscellaneous activities to complete the works, such as reinstatement and rehabilitation of temporary works areas and landscaping in accordance with the Project landscape design.

Additionally, transportation of equipment, materials and workforce will also take place across the Project.

### 22.1.3.4 Reinstatement and rehabilitation

Site restoration will be undertaken in accordance with the following:

- Inland Rail Environment and Sustainability Policy (refer Appendix E: Corporate Environment and Safety Policies)
- Inland Rail Landscape and Rehabilitation Strategy (available from **inlandrail.artc.com.au/environment_safety**)
- Border to Gowrie Rehabilitation and Landscaping Sub-plan.

The Inland Rail Landscape and Rehabilitation Strategy documents ARTC's approach to meeting these obligations and establishes governing landscape objectives and principles. The strategy also outlines landscape and rehabilitation treatment solutions for the various phases of the Inland Rail Program. This includes the rail corridor and ancillary infrastructure, as well as temporary works areas, such as construction access, site compounds, non-resident workforce accommodation, borrow pits and other enabling works.

Opportunities for beneficial re-use of construction facilities, such as laydown areas and non-resident workforce accommodation, will be investigated through consultation with local governments and relevant stakeholders.

Where a beneficial re-use cannot be identified, the construction facilities will be progressively decommissioned so that reinstatement and revegetation activities can commence as soon as possible. A Project-specific Rehabilitation and Landscaping Management Sub-plan will be developed prior to the completion of construction for the management of land that is not required for the operation phase. The Rehabilitation and Landscaping Management Sub-plan will be developed based on the Inland Rail Landscape and Rehabilitation Strategy and property-specific reinstatement commitments.

Rehabilitation will be undertaken progressively based on the construction methodology and staging, and would incorporate:

- Demobilising site compounds and facilities
- Removal of all materials, waste and redundant structures, including pavement and hardstand, from the works sites
- Forming and stabilising of exposed earth materials and stockpiles where required
- Removal of all temporary work site signs
- Removal of temporary fencing
- Establishing permanent fencing where needed
- Decommissioning site access roads that are no longer required
- Restoration of disturbed areas as required.

Upon removal of construction site offices, laydowns and stockpile areas, retained topsoil will be spread over the area and seeding, or other treatments, will be applied in accordance with the Rehabilitation and Landscaping Sub-plan (refer Table 22.5).

Access roads and tracks that will no longer be used will be rehabilitated by restoring natural contours and stabilised, as appropriate.

Erosion- and sediment-control measures will be left in place, monitored and maintained until the relevant erosion- and sediment-control plan catchment areas are stabilised.

#### 22.1.3.5 Commissioning

All construction works will be subject to approved Testing and Commissioning Plans, as required, and appropriate Inspection and Test Plans.

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 the Australian Rail Track Corporation's (ARTC) and Queensland Rail's (QR) operational requirements. Testing and commissioning of the Project is scheduled to occur over a six-month period, commencing at the beginning of 2026.

## 22.2 Approach to environmental management

This Outline EMP exists within a suite of documents that will guide the delivery of the Project, being the:

- ARTC corporate policies
- ARTC's Environmental Management System (EMS)
- Inland Rail Environment and Sustainability Policy.

Each of these elements are described in the following sections.

### 22.2.1 ARTC corporate policies

ARTC's system of corporate governance comprises corporate policies and core values. This governance system applies across the whole of the ARTC network, including all works associated with the Inland Rail Program.

In addition to various legislative compliance requirements, all works associated with the Inland Rail Program will be completed in accordance with the following ARTC corporate policies:

- ARTC Environmental Policy (Appendix E: Corporate Environment and Safety Policies)
- ARTC Safety Policy (Appendix E: Corporate Environment and Safety Policies).

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

### 22.2.2 ARTC Environmental Management System

ARTC's EMS supports effective management of environmental risk and legal obligations during the detail design, construction and commissioning phases of development of the Project. On the commencement of operation of the Project, ARTC's EMS, and operational and maintenance procedures will apply across the whole of the network, including for the Border to Gowrie Project.

### 22.2.3 Inland Rail Environment and Sustainability Policy

ARTC have developed an Inland Rail Environment and Sustainability Policy (refer Appendix E: Corporate Environment and Safety Policies).

The sustainability commitments embedded into the Inland Rail Environment and Sustainability Policy have guided the Project's approach to sustainability. This is evidenced by the sustainability opportunities that have been identified in Chapter 6: Sustainability, as well as initiatives and measures that are proposed for specific matters, where relevant.

A Sustainability Management Plan will be developed for the delivery of the design and construction of the Project. The Plan will be reviewed and audited as part of the Infrastructure Sustainability (IS) Program rating ARTC are pursuing in line with Version 1.2 of the IS rating scheme. Prior to the commencement of operations, the design- and construction-phase Sustainability Management Plan will be reviewed and updated to focus on operations and maintenance activities.

## 22.3 Roles and responsibilities

The roles and responsibilities of relevant entities for delivery of the Project works are set out in Table 22.1. These roles may be refined as contractual arrangements are finalised, and subject to changing agency responsibilities.

Each member of the Project delivery team has a 'general environmental duty' under Section 319 of the *Environmental Protection Act 1994* (Qld) (EP Act), and must not carry out any activities that cause, or are likely to cause, unauthorised environmental harm, unless all reasonable and practical measures are taken to prevent or minimise harm.

**TABLE 22.1 ROLES AND RESPONSIBILITIES**

| Role | Responsibilities |
|---|---|
| ARTC | ▸ Proponent for the Project<br>▸ Administers the Project agreement<br>▸ Oversees the contractor's detail design process to achieve the environmental outcomes<br>▸ Participate in community engagement activities<br>▸ Engage the environmental monitor, for the duration of construction<br>▸ Engage the Community Relations Monitor for the duration of construction. |
| Principal Contractor | ▸ Prepare, maintain and implement the CEMP<br>▸ Deliver the Project in accordance with all laws, including conditions of approvals<br>▸ Provide notifications and reports, as required by law, including conditions of approvals<br>▸ Ensure the construction workforce are properly and regularly trained in environmental responsibilities, including cultural heritage responsibilities, in accordance with the CEMP<br>▸ Establish and maintain a complaints management system, to receive and respond to complaints. |
| Coordinator-General | ▸ Administers the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act)<br>▸ Approve the Outline CEMP in accordance with any imposed conditions<br>▸ Receive reporting and notification in accordance with any imposed conditions. |
| Environmental Monitor | ▸ Review and endorse the contractor's CEMP (including sub-plans) and revisions against the Draft Outline EMP and any imposed conditions<br>▸ Monitor compliance with the CEMP (including sub-plans) and any imposed conditions<br>▸ Maintain a current copy of the CEMP (including sub-plans) including any progressive revisions and records of modifications to the Project's construction or commissioning procedures<br>▸ Maintain a register of sensitive receptors<br>▸ Review any audit and compliance reports prepared by the contractor or the Proponent<br>▸ Have oversight of the implementation of the environmental monitoring requirements established in the CEMP. Review the results of the monitoring and verify these results if the Environmental Monitor considers it necessary. |
| Community Relations Monitor | ▸ Provide monthly reports on community issues emerging from the construction and commissioning activities in relation to any imposed conditions, the CEMP, complaints, monitoring and community relations<br>▸ Communicate with ARTC and the Environmental Monitor with regard to any imposed conditions, the CEMP, the SIMP, community consultation strategies and community concerns<br>▸ Review complaints procedures and the resolution of complaints and corrective action reporting to assess performance of the construction contractor's implementation of the SIMP and CEMP<br>▸ Facilitate discussions between the ARTC, the contractor and affected entities about mitigation measures, as required by either the ARTC or the affected entity<br>▸ Provide advice to the Environmental Monitor in relation to complaints. |
| Community Reference Group | ▸ Provide feedback to ARTC and the contractor in relation to construction planning, impacts and mitigation measures. |

## 22.4 Training and awareness

All Project personnel will be required to 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 at all times.

All employees, contractors and subcontractors will receive an environmental induction that will include, but not be limited to:

- CEMP requirements
- Relevant imposed conditions
- Statutory duties in regard to notification of environmental harm
- 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 this Outline EMP are understood by all site personnel.

Environmental education of environmental risks and issues, such as dust and air quality; erosion and sediment controls (during wet seasons or prior to forecasted events); fauna awareness during clearing phases or breeding periods, etc. for the Project will be communicated as relevant (such as seasonal, work activity etc) 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 through Project database recording, with summaries of topics included within Project environmental monthly reporting. The effectiveness of these communication methods will be subjected to periodic review.

## 22.5 Incidents and emergencies

Sections 320 to 320G of the EP Act outline the requirements for the duty to notify of environmental harm. Pollution incidents and activities that cause or threaten to cause serious environmental harm or material environmental harm must be reported within 24 hours to the Department of Environment and Science (DES), and other stakeholders, as required, so that appropriate action can be taken to prevent or limit possible environmental harm.

All staff and contractors will be required to report any environmental incidents (including complaints) or breaches of the approval conditions in accordance with the requirements and timeframes set out in the CEMP 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 construction and commissioning.

## 22.6 Inspections, monitoring, auditing and reporting

Inspections, monitoring, auditing and reporting will be undertaken to document compliance with imposed conditions and the CEMP.

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

### 22.6.1 Environmental inspections

The CEMP will include requirements for inspections of construction sites to ensure compliance with imposed conditions and other Project-specific plans.

### 22.6.2 Environmental monitoring

Environmental monitoring programs will be developed for the pre-construction and construction phases 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.

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, as follows:

- Surface water sampling: *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES, 2018a)
- Groundwater:
  - *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES, 2018a)
  - *Groundwater Sampling and Analysis—A Field Guide* (Sundaram et al., 2009).
- Air quality:
  - AS/NZS 3580.9.11:2016 ($PM_{10}$) (Standards Australia, 2016a)
  - AS/NZS 3580.9.12:2013 ($PM_{2.5}$) (Standards Australia, 2013a)
  - AS/NZ 3580.10.1:2003—*Determination of Particulate Matter—Deposited matter—Gravimetric method* (Standards Australia, 2003)
- Noise and vibration: *Transport Noise Management Code of Practice: Volume 2—Construction Noise and Vibration* (CoP Vol 2) (Department of Transport and Main Roads (DTMR), 2016)

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 (NATA) accredited laboratory for analysis, unless otherwise stated in a sub-plan or as approved by the Environmental Monitor. The results of the monitoring programs will be interpreted and reviewed regularly through monthly 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. These changes in work practices will be reflected in amendments to the CEMP, as appropriate.

### 22.6.3 Auditing

During construction and commissioning, environmental audits will be completed to assess compliance with all applicable environmental requirements, including the imposed conditions and the CEMP. This will include internal audits (an internal audit plan will be developed) and third-party independent audits. 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:

- Any imposed conditions determined by the Coordinator-General or as stated in approval, licence and permit conditions
- The CEMP, including sub-plans.

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.

### 22.6.4 Reporting

During construction, a monthly construction compliance report will be prepared by the Principal Contractor. 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.

For the duration of construction, an Annual Construction Report will be prepared that includes:

- A compliance evaluation table detailing the relevant imposed condition, whether compliance with the imposed condition was 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 relevant local activities, 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).

## 22.7 Document control

Records that are applicable to construction and commissioning environmental management will be retained for a minimum of five years post construction. Environmental records will include but will not be limited to:

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

## 22.8 Community and stakeholder engagement principles

Consultation has been undertaken to inform development of the reference design and the draft EIS. Community and stakeholder engagement will continue to inform detail design and the development of mitigation measures as the Project progresses.

Following Project approval, ARTC will develop a detailed Community and Stakeholder Engagement Plan, as a commitment of the SIMP, to guide and monitor engagement activities during the construction phase. The SIMP and commitments within it are discussed in Section 22.12.

## 22.9 Complaints management

A Project Complaint Management Handling Procedure will be developed that applies to all Project employees, contractors and site visitors. The aim of the procedure is to ensure that complaints are dealt with efficiently and effectively, and that stakeholders have confidence in the organisation's complaint system.

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

The Complaint Management Handling Procedure includes the following steps:

- **Acknowledge:** Upon receiving a complaint, ARTC Inland Rail staff will take reasonable steps to ensure that the complaint is properly understood and seek clarification or additional information from the complainant, where required. ARTC Inland Rail will report the complaint and forward it to the relevant area for appropriate action or information. Where sufficient stakeholder contact details have been provided, all complaints will receive formal written acknowledgment of complaint receipt within two business days.
- **Assessment:** A preliminary assessment of the complaint is conducted to determine whether the complaint is one which ARTC can resolve, or needs to be referred to another appropriate agency or party (e.g. a local council or government agency)
- **Planning:** Straightforward complaints can often be resolved on first contact. If this is not the case and the complaint requires investigation, a planning process will be undertaken to identify what is to be investigated, the steps involved in investigation, the remedy the complainant is seeking and other possible remedies.
- **Investigation:** ARTC will investigate the complaint, based on the principles of impartiality, confidentiality and transparency
- **Response:** The progress of the complaint will be monitored and communicated to the complainant, until the outcome has been communicated to the complainant
- **Follow-up:** Feedback will be sought from the complainant on the effectiveness of the implemented remedial action. If a complainant is dissatisfied with the effectiveness of the initial remedial action, options for further action will be considered, assessed and implemented, if appropriate. This further review of remedial options will be carried out by a representative who has not been involved in the initial addressing of the matter.

## 22.10 Construction hours

The construction program will generally be based on the hours presented in Table 22.2.

The construction hours nominated for the Project are intended to include allowance for daily administrative and preparatory tasks. For example, pre-start briefings for the workforce in centralised locations (e.g. non-resident workforce accommodation, laydown areas etc.), mobilisation of the workforce to work fronts, and daily site-specific task planning meetings. Similarly, securing the work site and workforce demobilisation from site is intended to occur during the evening period of the nominated construction hours.

It is intended that noise-generating construction activities (e.g. operation of plant, generation of impulsive noise etc.) will, where possible, be conducted within the standard work hours in CoP Vol 2.

Noise-generating construction activities outside of standard hours, as per CoP Vol 2, will only be undertaken where:

- A location and activity specific noise assessment has been undertaken
- Assessment has concluded that there are no nearby sensitive receivers, or that impacts to receivers can be appropriately managed, as defined by the CoP Vol 2
- Consultation with the local community is demonstrated.

**TABLE 22.2 PROPOSED HOURS OF WORK FOR CONSTRUCTION ACTIVITIES**

| Description of works | Hours of work | |
|---|---|---|
| Surface Works (other than works set out below) | **Day works:**<br>Monday–Friday<br>6:30 am to 6:00 pm<br>Saturday<br>6:30 am to 1:00 pm<br>No work on Sundays or public holidays | **Night works**<br>(Only if the construction works comply with CoP Vol 2)<br>Monday–Friday<br>6:00 pm to 10:00 pm<br>Saturday<br>1:00 pm to 5:00 pm<br>No work on Sundays or public holidays |
| Spoil haulage | 24 hours a day, 7 days a week | |
| Transport, assembly or decommissioning of oversized plant, equipment, components or structures | 24 hours a day, 7 days a week | |
| Delivery of 'in time' materials such as concrete, hazardous materials, large components and machinery | 24 hours a day, 7 days a week | |
| 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 | 24 hours a day, 7 days a week | |
| Materials and equipment delivery | 24 hours a day, 7 days a week | |
| Works in a rail corridor (track possessions) | 24 hours a day, 7 days a week and in accordance with the hours of work prescribed by the rail infrastructure manager (QR) | |
| Works in a road | In accordance with the hours of work prescribed by the road authority in any permit under a local law (for a local government) or a permission under the *Transport Infrastructure Act 1994* (Qld) (TI Act), or, if no hours of work are prescribed, works may be undertaken Monday–Saturday (not public holidays) 6am–6pm. | |
| Works carried out in an emergency to avoid the loss of life, damage to property or to prevent environmental harm | At any time | |
| Blasting | Monday–Friday:<br>9:00 am–5:00 pm<br>Saturday:<br>9:00 am–1:00 pm<br>No blasting on Sundays or public holidays | |

## 22.11 Outline environmental management sub-plans

This section provides sub-plans for specific matters addressed in the draft EIS, drawing on the outcomes of the assessments in Chapter 7 to Chapter 20. The sub-plans establish a framework for what will be prepared as components of the CEMP during the next phase of the Project.

### 22.11.1 Land use and tenure

#### 22.11.1.1 Environmental outcomes

Project works are designed and managed to minimise the potential adverse impacts to surrounding land use.

#### 22.11.1.2 Performance criteria

- Design works in order to minimise the need for land resumption and adverse impacts to existing and adjacent land uses
- Set out procedures for accessing the work sites on public or private land, for the purpose of minimising potential impacts to the environment and to landowners and occupiers
- The Project footprint is refined and limited to that which is required to safely and efficiently construct, operate and maintain the Project.

#### 22.11.1.3 Proposed mitigation measures

Relevant aspects and proposed mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.3.

#### 22.11.1.4 Monitoring

Implementation of land use and tenure elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.3 PROPOSED MITIGATION MEASURES—LAND USE AND TENURE**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design | Property acquisition and approval | ▸ Detail design to further refine the Project disturbance footprint identified and assessed in the EIS, to that which is required to safely construct, operate and maintain the Project<br>▸ Minimise property acquisition requirements, property severance and disruption to land use and transport networks<br>▸ Property acquisitions will be undertaken in accordance with the requirements of the AL Act<br>▸ Compensation will be provided where the Project requires the acquisition of properties in accordance with the requirements of the AL Act<br>▸ Mitigation measures for individual property treatments will be developed in consultation with landowners/occupants, with respect to the management of construction on, or immediately 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.<br>▸ Once the proponent is granted tenure for construction and a sub-lease for the rail corridor, it will consult with petroleum tenure holders, in accordance with relevant aspects of the *Land Access Code* (DNRME, 2016d)<br>▸ Negotiation agreements with mineral and petroleum resource interest holders to be finalised prior to construction activities commencing. This includes consultation with the resource holders of the authority to prospects, pipeline licences and potential commercial areas within the Project footprint.<br>▸ ARTC will undertake further consultation with DAF and QBA during detail design to confirm the potential direct and indirect impacts of the Project on apiary sites within the Whetstone and Bringalily State forests and requirements for construction and operation of the Project. |
| | Biosecurity | ▸ 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, where agreed, will be documented in individual property agreements.<br>▸ A Biosecurity Management Sub-plan will be developed as a component of the CEMP (refer Section 22.11.4.3). |
| | Design interface with stock route | ▸ The reference design interfaces with the State stock route network in 12 locations. Consultation with the Department of Natural Resources, Mines and Energy (DNRME), Goondiwindi Regional Council (GRC) and Toowoomba Regional Council (TRC) will continue through the detail design process to ensure that the detail design for the Project achieves continued useability of existing stock routes.<br>▸ In the event that private stock routes are identified through consultation with landowners, a means of continued stock movement connectivity will be included in the detail 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.<br>▸ Where stock fencing is required, fencing will be constructed in accordance with the Project's general fencing strategy (refer Chapter 5: Project Description), unless an alternative approach is agreed with landowners, DNRME, GRC or TRC. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Landowner/occupier access to property | ▸ ARTC will work with individual landowners to ensure the continuation of current property management activities and that access across properties is accommodated, where possible, in the detail design and construction methodology process. Solutions may include:<br>▸ The provision of crossing points or underpasses for access to fragmented or isolated properties<br>▸ Maintained access to existing water supply<br>▸ Relocation of dams or irrigation systems<br>▸ Relocation of existing private infrastructure and utilities.<br>▸ 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.<br>▸ 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. |
| | Design interface with barrier fences | ▸ Detail design drawings of ARTC's nominated fencing solution for reinstatement of biosecurity fences will be submitted to GRC (wild dog check fences) and Darling Downs–Moreton Rabbit Board (DDMRB) (rabbit fence) for acceptance prior to commencement of construction. |
| | Design interface with utilities | ▸ Utility interface treatments that have been included in the 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.<br>▸ Designs for utility protection, where necessary, will be developed in consultation with the relevant utility owner and be in accordance with the following:<br>▸ Electricity:<br>- *Electrical Safety Act 2002* (Qld)<br>- Electrical Safety Regulation 2002<br>- ENA NENS 03-2006: *National Guidelines for Safe Access to Electrical and Mechanical Apparatus* (Energy Networks Association, 2006)<br>- AS/NZS 7000 *Overhead Line Design* (Standards Australia, 2016c)<br>- Safe *Work Australia Model Code of Practice— Managing Electrical Risks in the Workplace* (Safe Work Australia, 2018b)<br>▸ Gas and petroleum pipelines:<br>- *Petroleum & Gas (Production & Safety) Act 2004* (Qld)<br>- AS 2885 *Pipelines—Gas and liquid petroleum* (Standards Australia, 2008b)<br>- AS/NZS 4645 *Gas Distribution Network* (Standards Australia, 2018d)<br>▸ Communications:<br>- *Telecommunication Cabling Provider Rules 2014*<br>- *Telecommunications Technical Standard (Requirements for customer cabling products*—AS/CA S008) 2015<br>- Australian Standard—*Installation requirements for customer cabling (Wiring Rules)* (Communications Alliance Ltd, 2020) |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Design interface with utilities (continued) | ▸ Water:<br>– *Water Supply Code of Australia* (Water Services Association of Australia, 2011)<br>– AS/NZS 2566 *Buried flexible pipeline: Structural design* (Standards Australia, 1998b)<br>▸ Sewerage:<br>– *Gravity Sewerage Code of Australia* (Water Services Association of Australia, 2014)<br>– *Pressure Sewerage Code of Australia* (Water Services Association of Australia, 2007)<br>– AS/NZS 2566 *Buried flexible pipeline: Structural design* (Standards Australia, 1998b) |
| | Rehabilitation and reinstatement of land | ▸ A Rehabilitation and Landscaping Management Sub-plan will be developed for the Project, as a component of the CEMP (refer Section 22.11.2.3). |
| Pre-construction | Design interface with utilities | ▸ Utilities within the Project footprint will be surveyed and marked prior to the commencement of construction<br>▸ Where protection or relocation of a utility is required as an outcome of consultation with asset owners and detail design, these works will be undertaken prior to the commencement of construction to reduce the likelihood of impacts to those services<br>▸ Protection or relocation of utilities will be conducted in accordance with relevant legislation, Australian Standards and guidelines (refer above). |
| | Design interface with barrier fences | ▸ Where severance of the wild dog check fence or DDMRB rabbit fence is required, fence realignment and reconstruction will be undertaken as an early works package prior to the commencement of construction of rail infrastructure. |
| Construction | 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 the potential impacts or interruptions to access, services, or property operational arrangements. |
| | Biosecurity | ▸ Implementation of the Biosecurity Management Sub-plan (refer Section 22.11.4.3)<br>▸ The effectiveness of weed hygiene measures will be monitored as a component of the environmental monitoring procedure for the Project<br>▸ Any vegetated material containing, or with the potential to contain, weed seed material will not be used for onsite mulching or erosion protection purposes<br>▸ A complaint hotline for the Project will be established and advertised to enable members of the public to notify ARTC of issues, including concerns regarding weeds and pests. |
| | Interface with utilities | ▸ Construction activities will be planned and executed to not inhibit the safe and efficient operation of utilities that remain located within the Project footprint<br>▸ Affected businesses and residences will be notified in advance of any planned interruptions (including durations).<br>▸ Disturbance of existing utilities will occur under access arrangements and approval with the relevant asset manager, obtained prior to commencing work<br>▸ 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). |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Construction (continued) | Rehabilitation and reinstatement | ▸ Land that is temporarily disturbed in support of construction activities construction (e.g. for access tracks, laydown areas, etc.) will be rehabilitated at the end of its use for construction, unless otherwise required<br>▸ Reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively, consistent with the Rehabilitation and Landscaping Management Sub-plan (refer Section 22.11.2.3). |
| Operation | 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 activities, in accordance with ARTC land-access protocols and procedures. |

### 22.11.2 Land resources

#### 22.11.2.1 Environmental outcomes

- To manage ground disturbance activities during pre-construction, construction and operational activities, to minimise environmental impacts to land and maximise the potential for successful land rehabilitation following construction
- Manage the storage, transport and handling of hazardous materials during site construction and operational activities to protect the environment
- Manage the health and environmental risks from contaminated land.

#### 22.11.2.2 Performance criteria

- Project works do not cause erosion or contamination beyond the temporary or permanent works
- Project works are undertaken in accordance with approved erosion and sediment control plans
- Problematic soils are managed and treated to avoid adverse impacts to environmental values
- The storage, transport and use of hazardous materials in accordance with Australian Standards and the Dangerous Goods Code.
- Any imported fill is tested and classified to confirm it is not contaminated and suitable for use for the Project
- All contamination incidents are rectified as soon as possible, and in accordance with legislative requirements
- Minimise the import and disposal of fill material
- Minimise and manage the environmental and health impacts arising from disturbance of pre-existing contaminated and/or hazardous soil and materials.

#### 22.11.2.3 Proposed mitigation measures

Relevant aspects and proposed mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.4.

#### 22.11.2.4 Monitoring

Implementation of land resources elements of the CEMP, and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

The success of rehabilitation and/or reinstatement will be monitored over the initial stabilisation period, in accordance with the timeframes established in the Rehabilitation and Landscaping Management Sub-plan (refer Table 22.4).

**TABLE 22.4 PROPOSED MITIGATION MEASURES—LAND RESOURCES**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design | Additional investigations | ▸ Additional geotechnical investigations will be undertaken to inform the design of earthworks and foundations for structures, suitability of borrow and quarry material, and construction planning for the Project. Additional geotechnical investigations will specifically target locations where:<br>▸ The design includes:<br>- Cuts<br>- Embankments<br>- Bridge piers and abutments.<br>▸ Potential/actual acid sulphate soils (ASS), specifically material within Macintyre River, Macintyre Brook, Condamine River and Oxley Creek, may be disturbed by construction.<br>▸ Detailed soil investigations will be undertaken at a suitable sampling intensity, with the target of achieving soil mapping at a 1:10,000 scale. Detailed soil investigations will enable identification of potential/actual problematic soils including: acid sulfate, reactive, erosive, dispersive, saline, acidic, alkaline and liberation of contaminants. Examples of soils that will require specific design consideration include:<br>▸ The high naturally occurring sodicity of soils in the Yelarbon area (sodosols)<br>▸ Cracking clays of the Condamine River floodplain (vertosols).<br>▸ The methodology for the detailed soil investigation will be developed in consultation with DNRME and will be in accordance with the *Guidelines for surveying soil and land resources* (McKenzie et al., 2008), the *Australian soil and land survey field handbook* (National Committee on Soil and Terrain, 2009) and the *Guidelines for Soil Survey along Linear Features* (Soil Science Australia, 2015)<br>▸ Soil investigations will be conducted under the supervision of a suitably qualified soil practitioner<br>▸ Additional soil data will be used to ensure that the design of structures, embankments, erosion control measures (temporary and permanent), soil treatment and management and site rehabilitation planning are reflective of site-specific soil conditions. |
| | Landform and material use | ▸ Optimise the number, width and depth of cuts to avoid the generation of material that would be considered surplus to Project requirements<br>▸ Based on reviewed cut-and-fill balance, determine the number of borrow pits and volumes from each that is required to supply the confirmed material demand for the Project<br>▸ Review and update the draft Spoil Management Strategy (refer Appendix Y: Spoil Management Strategy) for the Project to reflect anticipated cut-and-fill quantities at the end of the detail design process<br>▸ Explore, through detail design, the viability of opportunities for re-use of:<br>▸ Local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul<br>▸ Material excavated below the rail embankment for less critical parts of infrastructure<br>▸ Excavated material as a stabilised structural fill<br>▸ Ballast as high-quality general fill or structural fill to minimise the import of rock amour. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Landform and material use | ▸ Cut batter angles will need to be appraised during detail design based on material strengths and other geotechnical properties. Stability analysis will be required to assess the factor of safety of these cut slopes. Slopes of 1V:2H and the application of topsoil and seeding have been assumed for the reference design. The appropriateness of this gradient and erosion protection will require confirmation through trials and further testing, as part of the detail design.<br>▸ Opportunities for slope batter optimisation will be assessed through the detail design<br>▸ Stability of creek/waterway banks will be assessed, and treatment measures be designed to control erosion and sediment movement. |
| | Soil management | ▸ Develop a Soil Management Sub-plan as a component of the CEMP that includes the following procedures and protocols relevant to potential impacts on land resources:<br>▸ Soil/land conservation objectives for the Project to minimise impacts on soil conservation plans and viable productive land, and include:<br>- Appropriate design measures to ensure velocity of flow remains low enough to avoid erosion of contour banks and waterways<br>- Consideration of land slope, land use, soil type, rainfall, trafficability and farm type when designing new contour banks<br>- Stabilisation of banks.<br>▸ Management of problem soils, such as:<br>- ASS<br>- Erosive or dispersive soils, such as sodosols, that are expected to be encountered between the Macintyre River and Yelarbon as well as along the fertile lands north of Inglewood to the west of Kooroongarra<br>- Cracking/expansive clays (vertosols) that are expected to be encountered between Kooroongarra and Millmerran and from Yandilla to Gowrie<br>- Saline soils, particularly in high-salinity hazard areas, such as between Kurumbul and Yelarbon.<br>▸ Minimising exposure of dispersive subsoils through methods such as staging construction disturbance, topsoil replacement or rehabilitation immediately following construction<br>▸ Appropriate design considerations will be implemented where cracking/expansive clays feature, as well as minimising shrink swell characteristics through methods such as keeping constant soil moisture<br>▸ Specification of the type and location of erosion and sediment controls (see below)<br>▸ Stockpiling and management/segregation of topsoil where it contains native plants seedbank or weed material<br>▸ Vehicle, machinery and imported fill hygiene protocols and documentation, in accordance with the requirements of the *Biosecurity Act 2014* (Qld). |
| | Acid sulfate soils (ASS) | ▸ If ASS are identified through further geotechnical investigations and will be disturbed by construction activities, an ASS Management Plan will be developed, if required in accordance with the *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0* (Dear et al., 2014) and the *State Planning Policy* (SPP) (Department of Infrastructure, Local Government and Planning (DILGP), 2017c). |
| | Soil conservation plans | ▸ If a soil conservation plan is found to be current and materially affected by the Project, ARTC will consider options for amending or modifying that plan in accordance with the *Soil Conservation Act 1986* (Qld). If required, this would be progressed in consultation with DNRME and the holder of the soil conservation plan. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Erosion and sediment control | ▸ Where possible, further reduce the Project footprint to that required to safely and efficiently construct, operate and maintain the Project. Opportunities to do so are primarily located along greenfield sections of the Project alignment.<br>▸ Erosion and sediment control measures will be developed by a Certified Practitioner in Erosion and Sediment Control in accordance with the *Best Practice Erosion and Sediment Control* (International Erosion Control Association (IECA), 2008) and with reference to *Soil Conservation Guidelines for Queensland* (Department of Science, Information Technology and Innovation (DSITI), 2015) and will be implemented during construction of the Project. The Soil Management Sub-plan will include:<br>▸ Locations for specific temporary/permanent erosion and sediment-control measures, such as:<br>- Sediment retention basins<br>- Scour protection (included in the reference design)<br>- Sediment fencing<br>- Berms and other surface-flow diversions.<br>▸ 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<br>▸ Minimise the area of disturbance during each stage to that required to enable the safe construction, operation and maintenance of the rail corridor<br>▸ Scheduling of works with consideration to periods of higher rainfall (summer months)<br>▸ Establish and specify the monitoring and performance objectives for handover on completion of construction.<br>▸ Where practical, plan to use existing tracks. Design new access tracks (permanent and temporary) with the aim of minimising disturbance of substrate and vegetation. |
| | Secondary salinity | ▸ Ensure that temporary earthworks and permanent landform for the Project are designed to avoid unwanted ponding of water. This objective will be achieved through surface levelling and use of cross-drainage and longitudinal drains within the rail corridor.<br>▸ Design water-retention structures, such as sediment basins, to prevent downward leakage of water, with the use of lining or similar<br>▸ Avoid, where possible, the need for diversions or alterations to waterways<br>▸ The ultimate water-sourcing strategy for the Project will be documented in a Construction Water Plan (refer Section 22.11.6.3). The quality of water from available sources will be considered in the development of the Plan. |
| | Contamination, land and soil | ▸ A Contaminated Land Management Sub-plan will be developed by a suitably qualified person, as recognised under the EP Act, and incorporated into the CEMP. This sub-plan will:<br>▸ 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<br>▸ Seek to minimise soil disturbance in areas listed on the Environmental Management Register (EMR) (e.g. Lot 1 RP835800 and Lot 8 SP126840). A Soil Disposal Permit under the EP Act is required if contaminated soil is to be moved from a lot listed on the EMR.<br>▸ 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 (e.g. Lot 1 RP835800 and Lot 8 SP126840). |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Contamination, land and soil (continued) | ▸ Establish an unexpected finds protocol/procedure in the event that potentially contaminated materials, including unexploded ordnance (UXO), are encountered during construction activities<br>▸ A contamination assessment of EMR-listed sites and other areas of potential contamination will be undertaken once detail design, Project footprint and the cut-and-fill balance are finalised, in accordance with the requirements of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (ASC NEPM) (National Environment Protection Council (NEPC), 2013). |
| | Rehabilitation | ▸ A Rehabilitation and Landscaping Management Sub-plan will be developed for the Project, as a component of the CEMP. This sub-plan will be based on the Inland Rail Landscape and Rehabilitation Strategy, and soils data obtained through detailed investigations, specifying:<br>▸ Location-specific objectives for rehabilitation, reinstatement and/or stabilisation<br>▸ Within the rail corridor, maintaining operational safety and rail formation stability will be the driving factors<br>▸ Objectives and timeframes for rehabilitation and/or reinstatement/stabilisation works (including biodiversity, vegetation establishment, and erosion and sediment control outcomes to be achieved)<br>▸ Where appropriate, how the objectives align with relevant recovery plans, threat abatement plans, conservation advices or policy guidance for target species in areas identified for rehabilitation<br>▸ Details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, while minimising the duration of exposure in disturbed areas<br>▸ Include rehabilitation requirements such as:<br>- Milling and removal of bitumen pavement<br>- Removal of any decommissioned culverts<br>- Tyning and ripping of base and sub-base material<br>- Application of soil ameliorants<br>- Topsoiling and/or compost blanket<br>- Stabilisation and rehabilitation (e.g. planting and or seeding).<br>▸ 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<br>▸ 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<br>▸ Procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas<br>▸ Corrective actions if the outcomes of rehabilitation and/or reinstatement/stabilisation are not achieved. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction | Soil conservation plans | ▸ Undertake minor civil works (e.g. re-shaping existing contour banks), as required, by the modification of soil conservation plans for properties adjoining the Project (refer above). |
| Construction | 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 Sub-plan (refer above)<br>▸ Opportunities to treat and re-use contaminated materials within the rail corridor will be assessed and subjected to a risk assessment. |
| | Erosion and sediment control | ▸ Implement the Soil Management Sub-plan<br>▸ Install permanent erosion-control measures, such as sediment retention basins and scour protection, in accordance with the detail design<br>▸ Excavation will be undertaken in a manner to prevent erosion or landslip, working faces shall be limited to safe height and slopes, with surfaces drained to avoid ponding and erosion<br>▸ Monitor the effectiveness of erosion controls installed as part of the environmental inspection schedule for the Project, as prescribed in the CEMP<br>▸ Controls that are found to be failing or not performing as intended will either be modified or replaced, as required. |
| | Secondary salinity | ▸ Surface levelling of the site will occur to prevent inadvertent ponding of water<br>▸ 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* (ANZECC/ARMCANZ Guideline 2018) (Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2018)<br>▸ Ensure efficient water application, so as to avoid prolonged oversaturation of soils within and adjoining the Project footprint. |
| | Rehabilitation | ▸ Reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively, consistent with the Rehabilitation and Landscaping Management Sub-plan (refer above). |
| Operation | 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 Operation EMP<br>▸ Controls that are found to be failing or not performing as intended will either be modified or replaced, as required<br>▸ Rail embankment slopes will be maintained to prevent slope-face degradation<br>▸ 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. |

### 22.11.3 Landscape and visual amenity

#### 22.11.3.1 Environmental outcomes

- Project works are designed to minimise vegetation loss and mitigate impacts through appropriate rehabilitation
- Project works are designed to minimise impacts on the visual amenity of watercourses
- The design of rail infrastructure and associated landscape treatments (including slope and stabilisation measures) responds to the natural and rural landscape, topography and landform, to the greatest extent possible, while complying with engineering design standards and legislative requirements
- Rehabilitation/reinstatement results in a stabilised landscape, requiring minimal maintenance.

#### 22.11.3.2 Performance criteria

- Ancillary facilities required during construction are located to minimise visual impacts
- Land that is temporarily disturbed by construction activities is rehabilitated progressively in accordance with the Rehabilitation and Landscaping Management Sub-plan
- Nuisance from construction lighting on sensitive places and nearby roads is avoided.

#### 22.11.3.3 Proposed mitigation measures

Relevant aspects and proposed mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.5.

Refer to Section 22.11.2.3 for details regarding the Rehabilitation and Landscaping Management Sub-plan.

#### 22.11.3.4 Monitoring

Implementation of landscape and visual amenity elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.5 PROPOSED MITIGATION MEASURES—LANDSCAPE AND VISUAL AMENITY**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design | Landscape and visual impacts due to vegetation removal | ▸ Clearing extents of visually significant vegetation are further limited, where feasible, to that required to safely construct, operate and maintain the Project. Locations include:<br>▸ East of Rainbow Reserve (Viewpoint 1) (approximately Ch 32 km to Ch 34.6 km)<br>▸ Yelarbon–Kurumbul Road (approximately Ch 0.00 km to Ch 8.00 km)<br>▸ Whetstone State Forest and adjoining forested areas (approximately Ch 37.8 km to Ch 50.0 km)<br>▸ Bringalily State Forest and adjoining forested areas (approximately Ch 55.2.7 km to Ch 94.4 km)<br>▸ Through Brookstead, particularly regarding the alignment of 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 151.6 km to Ch 153.0 km)<br>▸ Associated with river and creek crossings (see below).<br>▸ A Rehabilitation and Landscaping Management Sub-plan will be developed for the Project, as a component of the CEMP (refer Section 22.11.2.3). |
| | Landscape and visual impacts on watercourses | ▸ Develop the detail design to minimise impacts to waterways, riparian vegetation and in-stream flora and habitats. Particular locations include 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<br>▸ Continue to adhere to a crossing structure hierarchy, with bridges preferred to culverts<br>▸ 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 (refer Chapter 9: Landscape and Visual Amenity), seeking to:<br>▸ *Legacy*: Implement consistent treatments along the Project alignment to enhance the overall recognition and legacy of the Project and Inland Rail<br>▸ *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 the following bridges (which have potential to be viewed by the greatest number of viewers) to enhance their visual amenity and potential to create a positive legacy:<br>- Cunningham Highway road-over-rail bridge (near Yelarbon) (approximately Ch 25.6 km to Ch 26.0 km)<br>- Gore Highway road-over-rail bridge (near Brookstead) (approximately Ch 153.2 km)<br>- Millmerran–Inglewood Road rail-over-road bridge (approximately Ch 73.0 km)<br>- Millmerran–Inglewood Road rail-over-road bridge (approximately Ch 115.5 km)<br>- Oakey–Pittsworth Road rail-over-road bridge (approximately Ch 171.0 km)<br>- Linthorpe Road road-over-rail bridge (near Southbrook) (approximately Ch 175.8 km)<br>- Toowoomba–Cecil Plains Road rail-over-road bridge (approximately Ch 196.2km)<br>- Warrego Highway rail-over-road bridge (near Gowrie Mountain) (approximately Ch 203.0 km). |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Visual impact of rail infrastructure (continued) | ▸ *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. Particularly consider treatment opportunities for the new embankment along the northern edge of Pittsworth, between Ch 170.0 km and Ch 173.0 km.<br>▸ *Cuttings*: Assess opportunities to blend cut batters into their landscape setting (e.g. considering potential for revegetation, rock pitching, etc.). Particularly with consideration to the cut near Athol (approximately Ch 189.0 km to Ch 190.0 km).<br>▸ *Noise barriers:* Where noise barriers are confirmed as necessary through detail design for effective noise attenuation, ensure they are designed with regard to landscape character and consider materials, finishes, colour selection, CPTED and graffiti issues. Where appropriate, consider the inclusion of community artwork into the design. |
| | Landscape design treatments | Develop a landscape design for the Project with landscaping treatments determined that reference the key landscape characteristics and elements identified in the draft EIS, with particular emphasis on design that is appropriate to the setting as described below:<br>▸ *Rural and natural landscapes:* The landscape design will respect and enhance the rural landscapes. This includes:<br>▸ Provide earthworks and planting to screen the Project, wherever practicable and appropriate, to maintain local character and desirable views. This includes further opportunity for design of targeted planting adjacent to major earthworks within the rail corridor to the extent consistent with railway safety requirements and ARTC *Engineering (Track & Civil) Code of Practice Section 17 Right of Way Requirements* (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:<br>- 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)<br>- Adjacent to the alignment and adjacent to the bridge near Brookstead (approximately Ch 153.2 km) to assist to integrate the Project into its landscape context.<br>▸ *Ecologically sensitive areas:* The landscape design will provide opportunities for ecological gain to benefit biodiversity. This includes:<br>▸ Development and use of planting and seed mixes to maximise and connect native habitat types for ecological gain<br>▸ Enhancement of landscape corridors and ecological links by, where possible, joining or re-joining fragmented areas of habitat (where identified in Appendix M: Preliminary Fauna Movement Provision and Fencing Strategy).<br>▸ *Townships:* The landscape design will enhance or complement the local context, e.g. the appearance and integration of new structures, fencing and noise barriers will be assessed for all Project components located in an urban area. |
| | Impacts on the setting of heritage landscapes | ▸ Refine the Project footprint and develop the construction methodology to avoid impacts, where possible, to items of Aboriginal, historic or natural heritage significance, such as the old Brookstead railway station, Yelarbon Silos and the Yelarbon and District Soldiers Memorial Hall<br>▸ 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. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Visual impacts of lighting | ▸ Detail design to incorporate lighting to the minimal level required to meet operational road and rail safety requirements for the Project<br>▸ Attenuation measures to minimise light spillage will be assessed and incorporated into the detail design, such as selection of appropriate light fittings/shields and/or at-receptor treatments<br>▸ Limit the potential for vertical illuminance, by selecting luminaries that direct light downwards, below the horizontal, to avoid lateral glare. |
| Pre-construction | Impacts to landscape and visual values | ▸ Implement the Rehabilitation and Landscaping Management Sub-plan (refer Section 22.11.2.3) to minimise disturbance to landscape and visual amenity values during the site establishment phase<br>▸ Construction areas including stockpile areas, fuel storage areas and staff parking areas to be located outside the tree protection zone as defined in AS4970-2009*: Protection of trees on development sites* (Standards Australia, 2009). |
| Construction | Landscape and visual impacts due to vegetation removal | ▸ Establish vegetation protection zones and Project clearing extents prior to commencement of works, to avoid impacts on adjoining vegetation and habitats as far as practicable<br>▸ Where temporary construction facilities/borrow pits 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 and/or Environmental Authority). |
| | Impacts to landscape and visual values | ▸ Minimise height of all stockpiles to the greatest extent possible to reduce their visual impact<br>▸ Temporary treatments (such as hoardings and screens) to site compounds and non-resident workforce accommodation will be considered, 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). These include opportunities to use features on temporary fencing/hoarding. This will include art-based treatments to assist with screening the works from the public and using information boards (or similar) to educate the public about the construction works. |
| | Visual impacts of lighting | ▸ Avoid night works to the greatest extent possible close to residences<br>▸ Where night works are unavoidable, consider light attenuation measures in discussion with potentially affected landowners<br>▸ Minimise light spill from the proposed non-resident workforce accommodation at Yelarbon, Inglewood and Turallin 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 Sub-plan (refer Section 22.11.2.3) following the completion of works within each area of the Project footprint until performance criteria are satisfactorily achieved. |
| Operation | Visual impacts of lighting | ▸ In response to legitimate complaints, consider additional control measures, such as screening of sensitive receptors. |

### 22.11.4 Flora and fauna

#### 22.11.4.1 Environmental outcomes

- Project works are designed and managed to minimise impacts to the existing ecological values of the adjoining habitats
- Environmental offsets are provided where Project works have a significant residual impact on flora and fauna that are matters of national or State environmental significance (MNES or MSES).

#### 22.11.4.2 Performance criteria

- Clearing for the Project does not occur outside of the Project disturbance limits
- Appropriate fauna habitat connectivity measures, including fencing and fauna movement structures, are provided during construction in accordance with detail design to ensure permeability for wildlife
- Weeds and pests within the Project area are appropriately managed
- An Environmental Offsets Delivery Strategy (Queensland) is prepared and implemented for the Project that:
  - Adopts a strategic approach to environmental offsets, in order to maximise the co-location of offsets
  - Appropriately balances direct and indirect offsets
  - Is prepared in consideration of the relevant State and Australian Government environmental offsets policies.
- Environmental offsets are provided for significant, residual impacts on matters of national environmental significance (MNES) and matters of State environmental significance (MSES), in accordance with the Environmental Offsets Delivery Strategy (Queensland).

#### 22.11.4.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction and construction phases of the Project have been grouped and presented, as follows:

- Table 22.6 identifies overarching mitigation and management measures for all ecological values
- Table 22.7 provides mitigation measures specific to sensitive environmental receptors (flora and fauna) that are regarded as MNES
- Table 22.8 provides mitigation measures specific to sensitive environmental receptors (flora and fauna) that are regarded as MSES.

The specific management measures for MNES and MSES target habitat types in the first instance, as opposed to individual species; therefore, some MNES and MSES species are grouped together in Table 22.7 and Table 22.8, despite being of different taxonomic classes. For example, Condamine earless dragon, five-clawed worm-skink, Dunmall's snake, squatter pigeon, south-eastern long-eared bat and koala have been grouped together in Table 22.7, as each of these species is known to occupy overlapping habitat within the Project footprint. Species-specific measures have been nominated within these groupings, where relevant.

**TABLE 22.6 PROPOSED MITIGATION MEASURES—ALL ECOLOGICAL VALUES**

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design | Flora and fauna/ biodiversity | A Biodiversity Management Sub-plan will be developed as part of the CEMP and will comply with any applicable approval conditions. This sub-plan will include appropriate criteria, directives and procedures in relation to:<br>▸ Methods and sequencing of protected plant surveys, including seasonal timing, in accordance with the requirements of the Flora Survey Guidelines—Protected Plants (DES, 2019e). Flora species to be targeted through these surveys include:<br>▸ MNES:<br>– Tara wattle (*Acacia lauta*)<br>– Hairy-joint grass (*Arthraxon hispidus*)<br>– *Bertya opponens*<br>– King blue-grass (*Dichanthium queenslandicum*)<br>– Bluegrass (*Dichanthium setosum*)<br>– Shiny-leaved ironbark (*Eucalyptus virens*)<br>– Belson's panic (*Homopholis belsonii*)<br>– Winged peppercress (*Lepidium monoplocoides*)<br>– Wandering pepper-cress (*Lepidium peregrinum*)<br>– Coolmunda leucopogon (*Leucopogon* sp. Coolmunda (D. Halford Q 1635))<br>– *Macrozamia machinii*<br>– Hawkweed (*Picris evae*)<br>– Dunmore prostanthera (*Prostanthera* sp. Dunmore)<br>– Austral cornflower (*Rhaponticum australe*)<br>– Austral toadflax (*Thesium australe*)<br>– Slender tylophora (*Tylophora linearis*)<br>– Xerothamnella herbacea<br>– Westringia parvifolia.<br>▸ MSES flora:<br>– A sedge (*Cyperus clarus*)<br>– Tall hawkweed (*Picris barbarorum*)<br>– Finger panic (*Digitaria porrecta*) |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Flora and fauna/ biodiversity (continued) | ▸ Methods and sequencing of pre-clearance fauna surveys, including terrestrial, aquatic habitats and breeding habitats (including burrows and hollow bearing trees/logs, existing culverts and structures). Fauna species to be targeted through these surveys include:<br>▸ MNES:<br>– Brigalow woodland snail (*Adclarkia cameroni*)<br>– Five-clawed worm-skink (*Anomalopus mackayi*)<br>– Regent honeyeater (*Anthochaera phrygia*)<br>– Australasian bittern (*Botaurus poiciloptilus*)<br>– Curlew sandpiper (*Calidris ferruginea*)<br>– Large-eared pied bat (*Chalinolobus dwyeri*)<br>– Spotted-tailed quoll (*Dasyurus maculatus maculatus*)<br>– Collared delma (*Delma torquata*)<br>– Yakka skink (*Egernia rugosa*)<br>– Red goshawk (*Erythrotriorchis radiatus*)<br>– Dunmall's snake (*Furina dunmalli*)<br>– Squatter pigeon—southern subspecies (*Geophaps scripta scripta*)<br>– Painted honeyeater (*Grantiella picta*)<br>– Swift parrot (*Lathamus discolor*)<br>– Murray cod (*Maccullochella peelii*)<br>– South-eastern long-eared bat (*Nyctophilus corbeni*)<br>– Greater glider (*Petauroides volans*)<br>– Brush-tailed rock-wallaby (*Petrogale penicillata*)<br>– Koala (*Phascolarctos cinereus*)<br>– Grey-headed flying-fox (*Pteropus poliocephalus*)<br>– Australian painted snipe (*Rostratula australis*)<br>– Black-breasted button-quail (*Turnix melanogaster*)<br>– Condamine earless dragon (*Tympanocryptis condaminensis*).<br>▸ MSES fauna:<br>– Common death adder (*Acanthophis antarcticus*)<br>– Glossy black-cockatoo (*Calyptorhynchus lathami lathami*)<br>– Major Mitchell's cockatoo (*Lophochroa leadbeateri*) |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Flora and fauna/ biodiversity (continued) | ▸ MNES fauna (non-threatened migratory species):<br>– Common sandpiper (*Actitis hypoleucos*)<br>– Fork-tailed swift (*Apus pacificus*)<br>– Sharp-tailed sandpiper (*Calidris acuminata*)<br>– Pectoral sandpiper (*Calidris melanotos*)<br>– Red-necked stint (*Calidris ruficollis*)<br>– Oriental cuckoo (*Cuculus optatus*)<br>– Latham's snipe (*Gallinago hardwickii*)<br>– Black-faced monarch (*Monarcha melanopsis*)<br>– Yellow wagtail (*Motacilla fla*va)<br>– Satin flycatcher (*Myiagra cyanoleuca*)<br>– Osprey (*Pandion haliaetus*)<br>– Glossy ibis (*Plegadis falcinellus*)<br>– Rufous fantail (*Rhipidura rufifrons*)<br>– Spectacled monarch (*Symposiachrus trivirgatus*)<br>– Common greenshank (*Tringa nebularia*).<br>▸ Staging works so that they avoid animal breeding periods as much as possible within areas of habitat (large watercourses)<br>▸ Staged and sequential clearing protocols<br>▸ Animal handling protocols, including engagement of an approved fauna handler with a valid damage-mitigation permit<br>▸ Relocation of plants and habitats for threatened species, where possible, and documented evidence of previous relocation exists<br>▸ Requirements for inspections and corrective actions during construction and rehabilitation activities<br>▸ Biodiversity/fauna and flora management actions to be undertaken by suitably qualified persons<br>▸ Requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction<br>▸ Corrective actions should the outcomes not achieve the adopted objectives.<br>▸ A Soil Management Sub-plan will be developed as a component of the CEMP (refer Section 22.11.2.3)<br>▸ Where practical, plan to use existing tracks. Design new access tracks (permanent and temporary) with the aim of minimising disturbance of substrate and vegetation.<br>▸ Detailed ecological surveys of the Project footprint will be undertaken in parallel to the development of the detail design. These surveys will be in accordance with the relevant survey guidelines for nationally threatened species, published in accordance with the EPBC Act. Data obtained from these detailed surveys will be used to refine the quantification of ecological impacts and revise the calculation of offset requirements for the Project. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Riparian vegetation, aquatic fauna and habitats | ▸ The design will continue to be developed to minimise the extent of impacts to waterways, riparian vegetation and in-stream flora and habitats, in accordance with the intent of:<br>▸▸ Riverine protection permit exemption requirements (WSS/2013/726). Where the Project is unable to comply with the exemption requirements, a riverine protection permit will be sought for works within a watercourse.<br>▸▸ *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (Department of Agriculture and Fisheries (DAF), 2018e), e.g. for the dimensions, design and configuration of new culvert crossings. Where the Project is unable to comply with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works*, a development approval for operational work that is constructing or raising waterway barrier works will be sought. |
| | Water quality | ▸ A Surface Water Management Sub-plan will be developed as a component of the CEMP (refer Section 22.11.6.3). |
| | Fauna movement | ▸ Fauna movement opportunities (refer Appendix M: Preliminary Fauna Movement Provision and Fencing Strategy) will be assessed and, where appropriate, developed during detail design, including:<br>▸▸ Assessment of the compatibility of each approach with the general design principles at each location<br>▸▸ Consideration of safety requirements for the rail corridor and adjoining properties, e.g. elevated fauna crossing structures may provide insufficient clearance for double-stacked trains<br>▸▸ Consultation with adjoining landowners to confirm the acceptability of a fauna movement solution and ensure compatibility with their land-use operation, e.g. grazing, animal husbandry, etc.<br>▸ Fauna passage design will be consistent with the intent of the *Fauna Sensitive Road Design Manual* (DTMR, 2000) and, where applicable, will include species-specific requirements. |
| | Fauna fencing | ▸ Fauna fencing opportunities (refer Appendix M: Preliminary Fauna Movement Provision and Fencing Strategy) will be further assessed and, where appropriate, developed during detail design, including:<br>▸▸ Assessment of the compatibility of each approach with the general fencing principles at each location<br>▸▸ Consideration of 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<br>▸▸ Consultation with adjoining landowners to confirm the acceptability of a localised fencing approach and ensure compatibility with their land-use operation<br>▸▸ Consideration for maintenance constraints that a fauna connectivity or fencing opportunity may introduce.<br>▸ Fauna fencing will be designed in reference to guidelines documented in the *Fauna Sensitive Road Design Manual* (DTMR, 2000). Additional expert guidance in relation to specific design features will be sought during the detail design process.<br>▸ Priority will be given to fauna fencing in areas identified as State, regional or local fauna movement corridors to channel fauna toward safe movement options (i.e. culverts) to limit vehicle strikes and associated incidents. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Weeds and pests | ▸ A Biosecurity Management Sub-plan will be developed as a component of the CEMP. This Plan will include:<br>▸ Requirements for pre-clearing and operational surveys to determine the risk of weeds or pest animals being present within the Project footprint<br>▸ Maps of the existing extent, confirmed through surveys, and severity of weed infestation (e.g. 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<br>▸ Pest animal management controls, including protocols for severing, realigning and reinstating the wild dog check fence and the DDMRB rabbit fence<br>▸ Site hygiene and waste-management procedures to deter pest animals<br>▸ Locations of vehicle washdown (light vehicle and oversize vehicles), wheel washes and rumble grids<br>▸ Weed surveillance and treatment during construction and rehabilitation activities such as:<br>- Vehicle and plant washdown requirements for fleet moving from low-risk areas to high-risk areas<br>- Weed certification requirements for vehicles, plant and materials arriving onto the construction site.<br>▸ 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 habitat or land uses sensitive to spray-drift from the application of pesticides and herbicides (e.g. organic farming practices)<br>▸ Erosion and sediment control risks associated with broad-scale weed removal or treatment<br>▸ Corrective actions should the outcomes not achieve the adopted objectives.<br>▸ 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, where agreed, will be documented in individual property management agreements.<br>▸ Further liaison with GRC and DDMRB will be undertaken during detail design to confirm the fencing specifications for the dog check and rabbit exclusion fence, respectively. |
| | Rehabilitation | ▸ A Rehabilitation and Landscaping Management Sub-plan will be developed for the Project, as a component of the CEMP (refer Section 22.11.2.3). |
| | Offsets | ▸ Restriction of the Project footprint through detail design as far as practical to that required to safely and efficiently construct and operate the Project. In doing so, areas of MNES, MSES and their associated habitat will be avoided, thereby minimising significant adverse residual impacts to MNES.<br>▸ Significant adverse residual impact to habitat for MNES and MSES will be re-calculated to confirm the Project's offset obligations under Australian Government and State requirements<br>▸ A Project offset plan will be developed to provide for the staged delivery of offsets and finalised in consultation with relevant Australian Government and State regulatory agencies. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Pre-construction | Flora and fauna/biodiversity | ▸ The Biodiversity Management Sub-plan, as a component of the CEMP, will be implemented (refer above)<br>▸ Scheduling of construction activities to minimise time of works in or adjacent to drainage lines, waterways or watercourses, particularly during periods of flow<br>▸ 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* (Standards Australia, 2009). |
| | Rehabilitation | ▸ The Rehabilitation and Landscaping Management Sub-plan, as a component of the CEMP, will be implemented (refer above). |
| | Weeds and pests | ▸ Where the Project footprint interacts with the wild dog check fence, between chainages Ch 26.8 km and Ch 56.0 km (approximately), the fence will be reinstated on the northwest side of the rail corridor in accordance with the design solution agreed with GRC through the detail design process<br>▸ Where the Project crosses the DDMRB fence at chainage 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 detail design process<br>▸ Undertake pre-construction survey and mapping of weeds within the Project footprint, prior to the commencement of pre-construction and construction activities, in accordance with the Biosecurity Management Sub-plan (refer above). |
| | Flora | ▸ Protected plant surveys, in accordance with the requirements of the *Nature Conservation Act 1992* (Qld) (NC Act), will be undertaken as required in support of pre-construction enabling works. Such works may include additional geotechnical investigations to confirm the viability of borrow pit locations, re-fencing works or the establishment of non-resident workforce accommodation.<br>▸ Prior to any pre-construction clearing works being undertaken, the clearing extents/site boundary/limit of works will be clearly defined with flagging or marking tape. No-go areas will also be marked.<br>▸ A qualified Fauna Spotter Catcher will undertake pre-clearance surveys of remnant and regrowth vegetation<br>▸ The Fauna Spotter Catcher will supervise the subsequent clearing of remnant and regrowth vegetation. |
| Construction | Flora and fauna/biodiversity | ▸ Minimise clearance of remnant vegetation to that necessary for construction. Ensure all necessary permits and approvals are in place prior to the commencement of construction.<br>▸ Where necessary, clearing activities are to be conducted in accordance with approved performance requirements under the accepted development vegetation management codes<br>▸ Clearly mark designated revegetation/rehabilitation zones and other no-go areas (including large significant trees) prior to any vegetation clearing. 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.<br>▸ Where possible, minimise loss of canopy vegetation and works that will lead to the proliferation of weed species<br>▸ A qualified Fauna Spotter Catcher will undertake pre-clearance surveys of vegetation and will supervise the subsequent clearing of vegetation<br>▸ 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. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Construction (continued) | Riparian vegetation and aquatic habitats | ▸ 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.<br>▸ The Surface Water Management Sub-plan, as a component of the CEMP, will be implemented (refer Section 22.11.6.3)<br>▸ Works within or adjacent to watercourses will be conducted in accordance with the intent of:<br>  ▸ *Riverine protection permit exemption requirements* (WSS/2013/726) (DNRME, 2018a) or conditions of a riverine protection permit issued for the Project<br>  ▸ *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018e) or conditions of development approval for operational work that is constructing or raising waterway barrier works.<br>▸ The salvage and relocation of fish within isolated aquatic environments will be managed in accordance with *Guidelines for fish salvage* (DAF, 2018f)<br>▸ 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:<br>  ▸ Relocation will be undertaken by a suitably qualified person<br>  ▸ Dewatering pumps will have an intake screen<br>  ▸ Records of all fish recovered, and the location of their release will be maintained.<br>▸ 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. |
| | Flora | ▸ Minimise clearance of remnant vegetation to that necessary for construction and safe operation<br>▸ Clearly mark designated revegetation/rehabilitation zones and other no-go areas (including large significant trees) prior to any vegetation clearing. High-visibility tape, barricade webbing, or similar, will be used. All contractors are to be briefed on clearing requirements and restrictions (including fines) to prevent over-clearing of these areas.<br>▸ Where possible, minimise loss of canopy vegetation and works that will lead to the proliferation of weed species<br>▸ Topsoil stockpiles will be a maximum of 2.5 m in height to avoid heat sterilisation of the seed bank<br>▸ Topsoil stockpiles will be managed to maintain the viability of soil seed banks for threatened flora species, such as Belson's panic (*Homopholis belsonii*), tall hawkweed (*Picris barbarorum*), finger panic (*Digitaria porrecta*), austral toadflax (*Thesium australe*) and austral cornflower (*Rhaponticum australe*). |
| | Fauna passage | ▸ Fauna movement opportunities will be constructed to reinstate safe fauna passage as soon as possible, in accordance with the fauna movement strategy (refer Appendix M: Preliminary Fauna Movement Provision and Fencing Strategy), which will be finalised and documented in the detail design. |
| | Fauna fencing | ▸ Fauna fencing will be installed where practically possible, generally in accordance with the fencing strategy (refer Appendix M: Preliminary Fauna Movement Provision and Fencing Strategy), which will be finalised and documented in the detail design. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Construction (continued) | Weeds and pests | ▸ The Biosecurity Management Sub-plan, as a component of the CEMP, will be implemented (refer above)<br>▸ The effectiveness of weed hygiene measures will be monitored as a component of the environmental monitoring procedure for the Project<br>▸ Any vegetated material containing, or with the potential to contain, weed seed material will not be used for onsite mulching or erosion protection<br>▸ A complaint hotline for the Project will be established and advertised to enable members of the public to notify ARTC of issues, including concerns regarding weeds and pests. |
| | Erosion and sediment control | ▸ Implement the Soil Management Plan, including erosion and sediment controls, as a component of the CEMP (refer Section 22.11.2.3). |
| | Rehabilitation and landscaping | ▸ The Rehabilitation and Landscaping Management Sub-plan, as a component of the CEMP, will be implemented (refer Section 22.11.2.3)<br>▸ Rehabilitation and landscaping will occur sequentially as work fronts are completed<br>▸ The rail corridor will be maintained free of woody vegetation. |
| Operation | Riparian vegetation and aquatic habitats | ▸ Maintenance activities within or adjacent to watercourses will be conducted in accordance with the intent of:<br>  ▸ *Riverine protection permit exemption requirements* (WSS/2013/726) (DNRME, 2018a) or conditions of a riverine protection permit issued for the Project<br>  ▸ *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018e) or conditions of development approval for operational work that is constructing or raising waterway barrier works. |
| | Weeds and pests | ▸ Weed management protocols for the operational rail corridor and other ARTC facilities will be in accordance with the requirements of the *Biosecurity Act 2014* (Qld), ARTC operation and maintenance procedures and policies, and the Operation EMP. These protocols will include:<br>  ▸ Site hygiene and waste-management procedures to deter pest animals<br>  ▸ Weed surveillance and treatment during operation and maintenance activities<br>  ▸ 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 habitat or land uses sensitive to spray-drift from the application of pesticides and herbicides<br>  ▸ Vehicle, machinery and imported fill hygiene protocols and documentation<br>  ▸ Erosion and sediment control risks associated with broad-scale weed removal or treatment<br>  ▸ Corrective actions should the outcomes not achieve the adopted objectives. |
| | Fauna passage | ▸ Fauna movement/passage infrastructure and surrounding vegetation will be inspected and maintained during operation to retain the integrity/viability of the fauna movement opportunities. |
| | Fauna fencing | ▸ Fauna movement/passage infrastructure, fencing and surrounding vegetation will be inspected and maintained during operation. |

**TABLE 22.7 PROPOSED MITIGATION MEASURES FOR SPECIFIC ECOLOGICAL RECEPTORS THAT ARE MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE**

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| **Construction** | |
| Brigalow (*Acacia harpophylla* dominant and codominant), Weeping Myall Woodlands and Poplar Box Grassy Woodlands | ▸ Pre-construction surveys will be carried out to confirm to what extent the identified Threatened Ecological Communities (TECs) occur within, or adjacent to, the Project footprint. Where TECs are found to occur, condition assessment will be undertaken (using BioCondition assessment) with regular monitoring against initial assessment values. Corrective actions to minimise impacts are to be implemented where Project-associated impacts are identified.<br>▸ Quantification of the area of TECs removed to enable the Environmental Offsets Delivery Strategy—Queensland to be refined<br>▸ The Soil Management Sub-plan (refer Section 22.11.2.3) is to include soil conservation measures and erosion and sediment controls with specific reference/controls to identified TEC areas<br>▸ The Biosecurity Management Sub-plan will include reference to relevant guidelines to control potential deleterious pathogens, including *Phytophthora cinnamomi* and myrtle rust (*Austropuccinia psidii*) associated with Project activities, both of which may impact eucalypt species<br>▸ Design modifications during the detail design phase will seek to maintain inundation regimes within the TEC as close to natural conditions as possible<br>▸ Annual monitoring of TECs retained within the Project footprint against the initial BioCondition assessment. Corrective actions to be implemented where Project-associated impacts are identified.<br>▸ Where possible, rehabilitation of disturbed areas, within the Project footprint but outside of the rail corridor, using endemic species. |
| King bluegrass (*Dichanthium queenslandicum*), winged peppercress (*Lepidium monoplocoides*), *Xerothamnella herbacea*, Belson's panic (*Homopholis belsonii*), hawkweed (*Picris evae*), austral cornflower (*Rhaponticum australe*), and *Westringia parvifolia* | ▸ Pre-construction protected flora surveys, as per the NC Act, within the Project footprint that target areas identified as potential habitat for the species, as per species habitat mapping (Appendix L: Matters of National Environmental Significance Technical Report). In particular, the following will be targeted:<br>  ▸ Suitable habitat in the Yelarbon/Inglewood area for *Westringia parvifolia* and *Xerothamnella herbacea*<br>  ▸ All other identified threatened flora species occur on the dark clay soils in the northern portion of the Project footprint (north of Bringalily State Forest).<br>▸ Undertake translocation of specimens where appropriate for a species and where there is documented record of previous translocation trials/schemes<br>▸ Where a threatened flora species is found to occur within the Project footprint, pre-construction condition assessment of species habitat will be undertaken (using BioCondition assessment) with regular monitoring against initial assessment values. Corrective actions to minimise impacts are to be implemented where Project-associated impacts are identified.<br>▸ Quantification of the area of threatened flora species removed to enable the Environmental Offsets Delivery Strategy–Queensland to be refined<br>▸ The Soil Management Sub-plan (refer Section 22.11.2.3) is to include soil conservation measures and erosion and sediment controls with specific reference to identified habitat for threatened flora (where they are found to occur)<br>▸ 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<br>▸ Annual monitoring of threatened flora species retained within the Project footprint against the initial BioCondition assessment. Corrective actions to be implemented where Project-associated impacts are identified.<br>▸ Where possible, rehabilitation of disturbed areas within the Project footprint but outside of the rail corridor using endemic species. |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| Wandering peppercress (*Lepidium peregrinum*), coolmunda leucopogon (*Leucopogon* sp. Coolmunda), slender tylophora (*Tylophora linearis*), hairy-joint grass (*Arthraxon hispidus*), *Bertya opponens*, ooline (*Cadellia pentastylis*), bluegrass (*Dichanthium setosum*), shiny-leaved ironbark (*Eucalyptus virens*), Dunmore prostanthera (*Prostanthera* sp. Dunmore), *Macrozamia machinii* and austral toadflax (*Thesium australe*) | ▸ Pre-construction protected flora surveys, as per the NC Act, within the Project footprint that target areas identified as potential habitat for the species as per species habitat mapping (Appendix L: Matters of National Environmental Significance Technical Report)<br>▸ Undertake translocation of specimens where appropriate for a species and there is documented record of previous translocation trials/schemes<br>▸ Where a threatened flora species is found to occur within the Project footprint, pre-construction condition assessment of species habitat will be undertaken (using BioCondition assessment) with regular monitoring against initial assessment values. Corrective actions to minimise impacts are to be implemented where Project-associated impacts are identified.<br>▸ Quantification of the area of threatened flora species removed to enable the Environmental Offsets Delivery Strategy—Queensland to be refined<br>▸ The Soil Management Sub-plan (refer Section 22.11.2.3) is to include soil conservation measures and erosion and sediment controls, with specific reference to identified habitat for threatened flora (where they are found to occur)<br>▸ 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<br>▸ Annual monitoring of threatened flora species retained within the Project footprint against the initial BioCondition assessment. Corrective actions to be implemented where Project-associated impacts are identified.<br>▸ Where possible, rehabilitation of disturbed areas within the Project footprint but outside of the rail corridor using endemic species. |
| Murray cod (*Maccullochella peelii*) | ▸ Construction activities scheduled to avoid/minimise instream works and associated riparian habitat in identified habitat, where possible<br>▸ Construction works will, where possible, take place outside of the wet season when flows in floodplain systems are more likely<br>▸ Pre-construction surveys of watercourse crossings that are identified as potential habitat if suitable waterholes are present (i.e. Condamine River floodplain channels and Macintyre River) to identify whether the species occurs. Surveys will follow the *Survey guidelines for Australia's threatened fish* (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2011b).<br>▸ Where a temporary impoundment or diversion is required for construction purposes and the species is found to be present, an appropriately qualified person will be consulted to make an assessment on the method of recovery, transport and release of fish and will follow relevant State (DAF) fish salvage guidelines during construction activities<br>▸ Where possible, instream habitat will be reinstated to pre-construction state (e.g., replacement of large woody debris and ensure no or limited change to instream flows and to allow fish passage)<br>▸ Implementation of the Biosecurity Management Sub-plan (refer Table 22.6), Soil Management Sub-plan (refer Section 22.11.2.3) and the Surface Water Management Sub-plan (refer Section 22.11.6.3). |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| Wetland migratory species: Common sandpiper (*Actitis hypoleucos*), sharp-tailed sandpiper (*Calidris acuminate*), pectoral sandpiper (*Calidris melanotos*), red-necked stint (*Calidris ruficollis*), Latham's snipe (*Gallinago hardwickii*), yellow wagtail (*Motacilla flava*), Osprey (*Pandion haliaetus*), Glossy ibis (*Plegadis falcinellus*), Common greenshank (*Tringa nebularia*)<br>Wetland birds: Australian painted snipe (*Rostratula australis*), Australasian bittern (*Botaurus poiciloptilus*) and curlew sandpiper (*Calidris ferruginea*) | ▸ Pre-construction surveys of wetlands identified as potential habitat of species to identify whether any of these species occurs<br>▸ Restricted works measures in place should nesting species be detected<br>▸ Implement measures to ensure pest predator fauna are not attracted to works areas or to using the Project area for shelter<br>▸ Implementation of the Biosecurity Management Sub-plan (refer Table 22.6), Soil Management Sub-plan (refer Section 22.11.2.3) and the Surface Water Management Sub-plan (refer Section 22.11.6.3)<br>▸ Establish and maintain a fauna management and incident register to record sightings and/or incidents involving fauna species during the undertaking of Project activities. |
| Condamine earless dragon (*Tympanocryptis condaminensis*), five-clawed worm-skink (*Anomalopus mackayi*), Dunmall's snake (*Furina dunmalli*), squatter pigeon (Southern Subspecies) (*Geophaps scripta scripta*), South-eastern long-eared bat (*Nyctophilus corbeni*) and koala[1] (*Phascolarctos cinereus*) | ▸ Pre-construction surveys of areas identified as potential habitat of species, as per species habitat mapping (Appendix L: Matters of National Environmental Significance Technical Report), to establish whether individuals occur within the Project footprint. Particular focus on the following:<br>  ▸ Suitable habitat on dark clay soils in northern portion of the alignment for Condamine earless dragon (*Tympanocryptis condaminensis*) and five-clawed worm-skink (*Anomalopus mackayi*) (refer *Survey guidelines for Australia's threatened reptiles* (DSWEPaC, 2011a) for survey methods)<br>  ▸ Suitable habitat in the Inglewood area for Dunmall's snake (*Furina dunmalli*) (refer *Survey guidelines for Australia's threatened reptiles* (DSWEPaC, 2011) for survey methods)<br>  ▸ Identified potential habitat for south-eastern long-eared bat (*Nyctophilus corbeni*) with focus on areas outside of the State forests north of Inglewood where the species can be assumed as present (refer *Survey guidelines for Australia's threatened bats* (DEWHA, 2010a) for survey methods)<br>  ▸ Identified potential habitat for squatter pigeon (Southern Subspecies) (*Geophaps scripta scripta*) with focus on areas outside of the State forests north of Inglewood where the species scan be assumed as present (refer *Survey guidelines for Australia's threatened birds* (DEWHA, 2010b) for survey methods)<br>  ▸ Koala (*Phascolarctos cinereus*) may be assumed as potentially present throughout eucalypt woodlands in the Project footprint. |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| Condamine earless dragon (*Tympanocryptis condaminensis*), five-clawed worm-skink (*Anomalopus mackayi*), Dunmall's snake (*Furina dunmalli*), squatter pigeon (Southern Subspecies) (*Geophaps scripta scripta*), South-eastern long-eared bat (*Nyctophilus corbeni*) and koala[1] (*Phascolarctos cinereus*) | ▸ Undertake pre-clearance ground surveys for Condamine earless dragon (*Tympanocryptis condaminensis*) and five-clawed worm-skink (*Anomalopus mackayi*) where pre-construction surveys have identified the species as occurring or likely to occur<br>▸ Undertake retrieval of tree hollows, where safe to do so, during vegetation clearing, allowing for inspections for roosting south-eastern long-eared bat (*Nyctophilus corbeni*)<br>▸ Implement protocols to allow safe daytime storage of roosting bats and evening release of individuals<br>▸ Vegetation clearing within the Project footprint in koala (*Phascolarctos cinereus*) habitat will be carried out in a manner that will minimise stress on potential individuals as much as is practicably possible (e.g. sequential clearing and minimising time of disturbance to animals)<br>▸ Restricted works measures in place should koala or squatter pigeon (Southern Subspecies) (*Geophaps scripta scripta*) be observed within Project footprint, to allow safe movement away from the works area<br>▸ Implement measures to allow safe and responsible handling of fauna (where required) and repatriation in pre-identified appropriate habitat outside of the Project footprint<br>▸ Koalas (*Phascolarctos cinereus*) that are subject to handling will be examined and, if suspected of chlamydia infection, will be taken to a predesignated veterinarian/wildlife care facility for treatment prior to release<br>▸ Establish and maintain a fauna management and incident register to record sightings and/or incidents involving fauna species during the undertaking of Project activities<br>▸ The Biosecurity Management Sub-plan (refer Table 22.6) will include reference to relevant guidelines to control potential deleterious pathogens, including *Phytophthora cinnamomi* and myrtle rust (*Puccinia psidii*) associated with Project activities; both of which may impact eucalypt species and therefore koala (*Phascolarctos cinereus*)<br>▸ Fauna crossing structures and fencing are installed in accordance with design specifications<br>▸ Rehabilitation of temporary construction areas where woodland habitat has been cleared. Revegetation plant species will be obtained from a reliable source that is certified free of pathogens. |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| Collared delma (*Delma torquata*), yakka skink (*Egernia rugosa*), spotted-tail quoll (*Dasyurus maculatus maculatus*), greater glider (*Petauroides volans*), large-eared pied bat (*Chalinolobus dwyeri*) and brigalow woodland snail[1] (*Adclarkia cameroni*) | ▸ Pre-construction surveys of areas identified as potential habitat of species, as per species habitat mapping (Appendix L: Matters of National Environmental Significance Technical Report), to establish whether individuals occur within the Project footprint. Surveys will be species specific, following the *Survey guidelines for Australia's threatened mammals* (DSEWPaC, 2011c) and *Survey guidelines for Australia's threatened reptiles* (DSEWPaC, 2011a) and include the following:<br>▸ Identification of species-specific habitat and habitat features considered suitable for species presence (e.g. cliff faces/boulder piles for large-eared pied bat (*Chalinolobus dwyeri*) and spotted-tail quoll (*Dasyurus maculatus*), and loose surface rocks for collared delma (*Delma torquata*)<br>▸ Targeted surveys for Brigalow woodland snail (*Adclarkia cameroni*) in identified habitat (Condamine River floodplain riparian woodland). Surveys to be carried out as per expert advice.<br>▸ Implement measures to ensure safe retrieval of tree hollows during vegetation clearing and allow safe movement of species (e.g. greater glider (*Petauroides volans*)) away from works area<br>▸ Implement measures to ensure retrieval of potential habitat elements (loose surface rock, large fallen timber) during vegetation clearing and placement in adjacent unimpacted habitat<br>▸ Implement restricted works measures should larger species (spotted-tail quoll (*Dasyurus maculatus*)) be observed within the Project footprint to allow safe movement away from works area<br>▸ Implement measures to allow safe handling of fauna (where required) and repatriation in a suitable habitat away from site<br>▸ Establish and maintain a fauna management and incident register to record sightings and/or incidents involving fauna species during the undertaking of Project activities<br>▸ All workers will be briefed 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. |
| Grey-headed flying-fox (*Pteropus poliocephalus*) | ▸ Pre-construction surveys of riparian habitat identified as potential roost sites of species. The purpose of surveys will be to identify whether camps occur within or near the Project footprint. It is noted that the species were recorded at a known flying-fox roost site in Inglewood (3 km south of Project) during Project surveys, although this is not known to be a regular roost. No other regular roosts for the species have been previously identified within 10 km of the Project.<br>▸ Should a roost site be found to occur, management actions will incorporate the mitigation standards detailed in the Australian Government's *Referral guideline for management actions in grey-headed and spectacled flying-fox camps* (DotE, 2015a). |
| Woodland birds: Swift parrot (*Lathamus discolour*), painted honeyeater (*Grantiella picta*), regent honeyeater (*Anthochaera Phrygia*), red goshawk (*Erythrotriorchis radiatus*), oriental cuckoo (*Cuculus optatus*), black-faced monarch (*Monarcha melanopsis*), satin flycatcher (*Myiagra cyanoleuca*), rufous fantail (*Rhipidura rufifrons*), spectacled monarch (*Symposiachrus trivirgatus*) | ▸ Pre-construction surveys of woodlands identified as potential habitat (refer habitat mapping in Appendix L: Matters of National Environmental Significance Technical Report), particularly for:<br>▸ Red goshawk (*Erythrotriorchis radiatus*) to identify whether individuals occur and potentially nest within the Project footprint<br>▸ Painted honeyeater (*Grantiella picta*) in relevant nesting habitat (Brigalow woodlands) to determine whether the species and potential nesting occurs within the Project footprint<br>▸ Other nest sites within the Project footprint, as per MNES guidelines, where suitable nesting habitat (i.e. large emergent trees near water) is identified.<br>▸ Should active nest sites for either red goshawk (*Erythrotriorchis radiatus*) or painted honeyeater (*Grantiella picta*) be identified, restricted works measures will be implemented to allow nesting to continue undisturbed. |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| **Operation** | |
| All sensitive receptors | ▸ Ongoing weed monitoring within the rail corridor with specific reference to maintaining the pre-construction condition of TECs and habitats that adjoin the rail corridor<br>▸ Maintenance of erosion and sediment controls within the rail corridor with specific reference to maintaining the pre-construction condition of TECs and habitats that adjoin the rail corridor<br>▸ Maintenance of the effectiveness of cross-drainage structure (e.g. culverts) to ensure continued connectivity of watercourses and drainage features that are aligned across the rail corridor<br>▸ Maintain a fauna management and incident register, including observed collisions associated with rail operations<br>▸ Information on fauna strike will be used to monitor the effectiveness of structures for fauna passage and to inform potential for further measures to be applied to minimise/eliminate the risk of future incidents. |

**Table note:**
1. The specific management measures for MNES target habitat types in the first instance, as opposed to individual species; therefore, some MNES species are grouped together despite being of different taxonomic classes.

**TABLE 22.8 PROPOSED MITIGATION MEASURES FOR SPECIFIC ECOLOGICAL RECEPTORS THAT ARE MATTERS OF STATE ENVIRONMENTAL SIGNIFICANCE**

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| **Construction** | |
| *Cyperus clarus*, finger panic (*Digitaria porrecta*), tall hawkweed (*Picris barbarorum*) | ▸ Pre-construction protected flora surveys, as per the NC Act, within the Project footprint that target areas identified as potential habitat for the species, as per species habitat mapping (refer Appendix J: Terrestrial Ecology Technical Report). Potential suitable habitat for *Cyperus clarus*, finger panic (*Digitaria porrecta*) and tall hawkweed (*Picris barbarorum*) exists between Millmerran and Toowoomba, particularly within road and rail reserves that contain basalt-derived soils (i.e. black soils).<br>▸ Undertake translocation of specimens, where appropriate, for a species where there is documented record of previous translocation trials/schemes<br>▸ Where a threatened flora species is found to occur within the Project footprint, pre-construction condition assessment of species habitat will be undertaken (using BioCondition assessment) with regular monitoring against initial assessment values. Corrective actions to minimise impacts are to be implemented where Project-associated impacts are identified.<br>▸ The Soil Management Sub-plan (refer Section 22.11.2.3) is to include soil conservation measures and erosion and sediment controls, with specific reference to identified habitat for threatened flora (where they are found to occur)<br>▸ 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<br>▸ Annual monitoring of threatened flora species retained within the Project footprint against the initial BioCondition assessment. Corrective actions to be implemented where Project-associated impacts are identified.<br>▸ Where possible, rehabilitation of disturbed areas within the Project footprint but outside of the rail corridor using endemic species. |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| Platypus | ▸ Construction activities scheduled to avoid/minimise instream works and associated riparian habitat in identified habitat, where possible<br>▸ Construction works will, where possible, take place outside of the wet season when flows in floodplain systems are more likely<br>▸ Pre-construction surveys of watercourse crossings that are identified as potential habitat if suitable waterholes are present (i.e. Condamine River floodplain channels and Macintyre River) to identify whether the species occurs<br>▸ Where a temporary impoundment or diversion is required for construction purposes and the species is found to be present, an appropriately qualified person will be consulted to make an assessment on the requirement for a species management program, should breeding places (i.e. burrows) be present<br>▸ Where possible, instream habitat will be reinstated to pre-construction state (e.g. replacement of large woody debris and ensure no or limited change to instream flows and passage)<br>▸ Implementation of the Biosecurity Management Sub-plan (refer Table 22.6), Soil Management Sub-plan (refer Section 22.11.2.3) and the Surface Water Management Sub-plan (refer Section 22.11.6.3). |
| Common death adder (*Acanthophis antarcticus*) and short-beaked echidna[1] (*Tachyglossus aculeatus*) | ▸ Pre-construction surveys of potential habitat of these species to identify whether individuals occur within the Project footprint. Surveys will target those areas identified as potential habitat for the species as per species habitat mapping (Appendix J: Terrestrial Ecology Technical Report) and be carried out as per relevant DES guidelines. Surveys specifically to look for short-beaked echidna (*Tachyglossus aculeatus*) breeding burrows and assess the requirement for a Species Management Program to tamper with animal breeding places, in accordance with the *Nature Conservation (Animals) Regulation 2020*.<br>▸ Undertake pre-clearance ground surveys for the common death adder (*Acanthophis antarcticus*) and short-beaked echidna (*Tachyglossus aculeatus*) where pre-construction surveys have identified the species as occurring or likely to occur<br>▸ Implement measures to allow safe and responsible handling of fauna (where required) and repatriation in pre-identified appropriate habitat outside of the Project footprint<br>▸ Measures to responsibly handle injured fauna<br>▸ Measures to control vehicle speed limits onsite to no more than 40 km/hr<br>▸ Establish and maintain a fauna management and incident register to record sightings and/or incidents involving fauna species during the undertaking of Project activities<br>▸ Fauna crossing structures and fencing are installed in accordance with design specifications<br>▸ Rehabilitation of temporary construction areas where habitat has been cleared. Revegetation plant species will be obtained from a reliable source that is certified free of pathogens. |
| Glossy black-cockatoo (*Calyptorhynchus lathami*), Major Mitchell's cockatoo (*Lophochroa leadbeateri*) | ▸ Pre-construction surveys of woodlands within the Project footprint identified as potential habitat (refer habitat mapping in Appendix J: Terrestrial Ecology Technical Report). Surveys for nest sites will be as per DES guidelines where suitable nesting habitat (i.e. large trees containing hollows) is identified.<br>▸ Should active nest sites for either parrot be identified, restricted works measures will be implemented to allow nesting to continue undisturbed. |

| Sensitive environmental receptor | Receptor-specific mitigation and management measures (in addition to those specified in Table 22.6) |
|---|---|
| **Operation** | |
| All sensitive receptors | ▸ Ongoing weed monitoring within the rail corridor with specific reference to maintaining the pre-construction condition of TECs and habitats that adjoin the rail corridor<br>▸ Maintenance of erosion and sediment controls within the rail corridor with specific reference to maintaining the pre-construction condition of TECs and habitats that adjoin the rail corridor<br>▸ Maintenance of the effectiveness of cross-drainage structure (e.g. culverts) to ensure continued connectivity of watercourses and drainage features that are aligned across the rail corridor<br>▸ Maintain a fauna management and incident register including observed collisions associated with rail operations<br>▸ Information on fauna strike will be used to monitor the effectiveness of structures for fauna passage and to inform potential for further measures to be applied to minimise/eliminate the risk of future incidents. |

**Table note:**

1. The specific management measures for MSES target habitat types in the first instance, as opposed to individual species; therefore, some MSES species are grouped together despite being of different taxonomic classes.

#### 22.11.4.4 Monitoring

The following section summarises the ecological surveys and follow-up monitoring that will be conducted during the pre-construction, construction and operation phases 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 22.6.

**Pre-construction**

The following flora, fauna and habitat surveys will be conducted during the pre-construction phase of the Project to establish an ecological baseline, inform the development of the CEMP and enable the Environmental Offsets Strategy (Queensland) to be finalised:

- Survey and mapping of weeds within the Project footprint, prior to the commencement of pre-construction and construction activities, in accordance with the Biosecurity Management Sub-plan
- BioCondition surveys of TECs and remnant and regrowth vegetation communities within and immediately adjacent to the Project footprint, to establish the pre-condition, confirm extent of impact and establish offset requirements
- Protected plant surveys, in accordance with the requirements of the NC Act, will be undertaken, as required, in support of pre-construction enabling works and construction activities
- Surveys of areas identified as potential habitat of Endangered, Vulnerable or Near Threatened (EVNT) species, as per species habitat mapping (Appendix L: Matters of National Environmental Significance Technical Report), to establish whether individuals occur within the Project footprint. Surveys will be species specific, following the *Survey guidelines for Australia's threatened mammals* (DSEWPaC, 2011c) and *Survey guidelines for Australia's threatened reptiles* (DSEWPaC, 2011a).

**Construction**

The following flora, fauna and habitat surveys and monitoring will be conducted during construction of the Project to continue to ensure that ecological impacts are avoided in the first instance, or otherwise minimised:

- Undertake pre-clearance surveys in areas where EVNT species have potential to occur
- The effectiveness of weed hygiene measures will be monitored as a component of the environmental monitoring procedure for the Project (refer Section 22.6.2)
- Annual monitoring of TECs retained within the Project footprint against the initial BioCondition assessment. Corrective actions to be implemented where Project-associated impacts are identified.
- Annual monitoring of threatened flora species retained within the Project footprint against the initial BioCondition assessment. Corrective actions to be implemented where Project-associated impacts are identified.

**Operation**

During operation, weed monitoring within the rail corridor will be conducted in accordance with ARTC's rail corridor maintenance procedures and policies and with the Outline EMP.

The success of rehabilitation and/or reinstatement will be monitored over the initial stabilisation period, in accordance with the timeframes established in the Rehabilitation and Landscaping Management Sub-plan (refer Section 22.11.2.3).

### 22.11.5 Air quality

#### 22.11.5.1 Environmental outcomes

Construct the Project in a manner that minimises air quality impacts (including nuisance dust, odour and emissions) and risks to human health and wellbeing, amenity and environmental values.

#### 22.11.5.2 Performance criteria

Construction works aim to achieve the objectives in Table 22.9, at a sensitive place.

**TABLE 22.9 CONSTRUCTION AIR QUALITY OBJECTIVES**

| Pollutant | Air quality objective | Averaging period | Environmental value |
|---|---|---|---|
| Total suspended particulates | 90 µg/m$^3$ | Annual | Health and wellbeing (Environmental Protection (Air) Policy 2019) (EPP (Air)) |
| $PM_{10}$ | 50 µg/m$^3$ | 24 hours | Health and wellbeing (EPP (Air)) |
| | 25 µg/m$^3$ | Annual | Health and wellbeing (EPP (Air)) |
| $PM_{2.5}$ | 25 µg/m$^3$ | 24 hours | Health and wellbeing (EPP (Air)) |
| | 8 µg/m$^3$ | Annual | Health and wellbeing (EPP (Air)) |
| Dust deposition[1] | 120 mg/m$^2$/day | Monthly | Protecting aesthetic environment |

**Table notes:**
EPP (Air) = *Environmental Protection (Air) Policy 2019*
µg/m$^3$ = micrograms per cubic metre
mg/m$^2$/day = microgram per square metre per day
1 Dust deposition is assessed as the insoluble solids component of deposited dust. Not a legislative objective—recommended Project objective to reduce likelihood of complaints.

### 22.11.5.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.10.

During operation, ARTC will be responsible for management of access to the Inland Rail network by third-party freight train operators and maintenance of the railway and other infrastructure components within the rail corridor. Dust- and air-quality management measures will be incorporated into the environmental risk management frameworks that will apply to third-party freight train operators as part of network access agreements. The access agreements established will require train operators to prepare suitably detailed environmental management plans for their operations, to specify how the operator will manage all foreseeable risks. These plans will include clear performance requirements and traceable corrective measures and be subject to verification and auditing by ARTC.

There is presently no foreseeable market-driven demand for coal to be transported on the Inland Rail network, between the NSW/QLD border and Gowrie; however, the transportation of coal on this section of the network cannot be precluded in future operation years. If coal is to be transported in future operation years, the potential for coal-dust generation would require management via a Coal Dust Management Plan (CDMP). The measures included in the CDMP will aim to minimise surface lift-off of materials in transit and establish protocols to minimise spillage onto external areas of wagons. To achieve this, the following measures would be included:

- A requirement for veneering on loaded coal at coal-loading facilities prior to its transportation along the rail network:
  - Coal washing and moisture management
  - Load profiling and use of 'garden bed profile'.
- Monitoring of performance.

If a CDMP was required to support future operation years, the plan would be prepared in consultation with the relevant regulatory agency at that time.

**TABLE 22.10 PROPOSED MITIGATION MEASURES—AIR QUALITY**

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design | Emissions from construction vehicles | ▸ Haulage routes and access roads will be confirmed for construction of the Project based on the shortest and safest trafficable route for each vehicle type, in consultation with relevant road managers, to minimise vehicular emissions<br>▸ Planning of haulage routes will seek to maximise the use of sealed trafficable surfaces, where appropriate to do so<br>▸ Additional geotechnical data will be used to refine the earthworks balance for the Project by providing further confirmation on the expected quantities of reusable, unusable and excess material. The objective of refinement will be to further minimise the material deficit for construction of the Project, thereby reducing the number of vehicular movements as part of the mass haul task.<br>▸ Opportunities to treat and re-use otherwise unusable materials will be identified and assessed for applicability, with the objective of minimising vehicular movements and emissions for offsite disposal<br>▸ Opportunities for the use of ethanol-blend fuels during construction will be investigated. 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 | ▸ The extent of sensitive receptor impacts will be re-assessed through the detail design process once the Project footprint and construction methodology has been confirmed. The location and classification of sensitive receptors in proximity to the finalised Project footprint will be confirmed as part of the re-assessment process.<br>▸ Baseline particulate data ($PM_{10}$ and $PM_{2.5}$) will be collected from the air-quality monitoring station on Millmerran–Inglewood Road, Millmerran. Refer Section 22.11.5.4.<br>▸ Establish baseline dust deposition data (Total Suspended Particulates (TSP)) prior to construction in proximity to Commodore Mine (e.g. from Ch 120.0 km to Ch 128.0 km). This baseline data will enable comparison with TSP 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. Refer Section 22.11.5.4.<br>▸ Development of a Dust Management Sub-plan prior to construction commencing. The sub-plan will include the following measures, tailored to be specific to the construction methodology, once confirmed:<br>  ▸ Minimise major dust-generating activities, e.g. blasting or material loading/unloading, during high wind speeds where practicable and unwatered<br>  ▸ Routing roads away from sensitive receptors wherever practically possible<br>  ▸ 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 Sub-plan within the CEMP—refer Section 22.11.11.3)<br>  ▸ Further speed restrictions on construction tracks (e.g. from 40 km/hr to 20 km/hr) where the trafficable surface is within 200 m of a sensitive receptor<br>  ▸ Long-term stockpiled material will be covered or seeded to prevent wind erosion from the prevailing wind<br>  ▸ Regular cleaning of machinery and vehicle tyres to prevent track-out of dust onto public roads<br>  ▸ Installation of rumble grids, or similar, at locations where construction traffic departs from the construction site and joins the public road network<br>  ▸ Internal construction roads will be appropriately surfaced as soon as possible after the commencement of site activities<br>  ▸ Revegetating disturbed areas as soon as practicable, in accordance with the Rehabilitation and Landscaping Management Sub-plan (refer Section 22.11.2.3)<br>  ▸ Vehicles and equipment will be appropriately maintained to maximise fuel efficiency<br>  ▸ Visual monitoring of the effectiveness of dust controls will occur daily. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Fugitive dust emissions (windborne erosion) during construction and operation (continued) | ▸ 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.<br>▸ Establish designated stockpile locations within the Project corridor. |
| | Emissions from operational locomotives | ▸ The vertical alignment of the rail will be subject to refinement and confirmation through the detail design. Opportunities to further optimise the track geometry will be assessed to reduce operational fuel consumption. |
| | Emissions from idling locomotives | ▸ Detail 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.<br>▸ The confirmation of the location of the five crossing loops for the Project will seek to minimise the number of receptors in proximity to each loop. |
| Pre-construction and construction[1] | Impacts to sensitive receptors | ▸ If onsite wastewater treatment systems are required for non-resident workforce accommodation, these systems will be planned and positioned in accordance with separation distances consistent with the Environment Protection Authority (EPA Victoria) guideline *Recommended separation distances for industrial residual air emissions* (EPA Victoria, 2013) and operated and maintained by a suitably qualified person in accordance with conditions of approval (sought separately to approval sought through the EIS). Based on the anticipated requirement for a treatment system with a capacity of 300 EP, 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.<br>▸ Laydown areas and other construction facilities (e.g. concrete batching plant, flash-butt welding facility) will be planned to ensure that sources of emissions, such as temporary fuel tanks and generator sets, are positioned as far as possible from neighbouring sensitive receptors, within the confines of the construction footprint. |
| | Dust generation from earthworks, clearing and grubbing, construction activities and exposed areas within the construction footprint | ▸ Limit clearing to the extent required to construct the works, in accordance with the Project footprint defined during detail design<br>▸ Stage clearing and grubbing activities to limit the size and duration of exposed areas<br>▸ Implement controls to prevent or minimise dust generation during activities involving excavation or disturbance of soils or vegetation, or handling ballast, e.g.:<br>  ▸ 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)<br>  ▸ Installation of hoardings or barriers on worksite perimeters where appropriate<br>  ▸ 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 possible for polymer sealing subject to the sealing method adopted)<br>  ▸ Conducting demolition activities using appropriate dust controls such as water sprays<br>  ▸ Installing truck wheel wash stations in designated laydown areas to control the spread of unsuitable materials from worksites.<br>▸ Determination of which dust controls to apply in a given instance will be guided by the objective to minimise the use of water during construction to that which is absolutely necessary |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Pre-construction and construction[1] (continued) | Dust generation from earthworks, clearing and grubbing, construction activities and exposed areas within the construction footprint (continued) | ▸ 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* (ANZECC & ARMCANZ, 2018). Investigate suitable additives to the water 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).<br>▸ Stabilise disturbed areas and exposed surfaces as soon as practical following the completion of works in each area, in accordance with the Rehabilitation and Landscaping Management Sub-plan (refer to Section 22.11.2.3).<br>▸ The following mitigation methods may be used subject to the final purpose of the exposed area:<br>  ▸ Initial establishment of vegetation (anticipated emission reduction of 30 per cent)<br>  ▸ Maintained revegetation (anticipated emission reduction of 90 per cent)<br>  ▸ Establishment of self-sustaining rehabilitation vegetation (anticipated emission reduction of 100 per cent)<br>▸ Sealing of exposed surface (i.e. concrete, asphalt, etc) (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.<br>▸ Stabilise and protect long-term stockpiles from erosive processes while not in use, such as through impermeable cover or seeding.<br>▸ To reduce wind erosion from stockpiles, the following mitigation methods may be used subject to water availability and stockpile activity:<br>  ▸ Water sprays (anticipated emission reduction of 50 per cent)<br>  ▸ Wind breaks or earthworks profiling (anticipated emission reduction of 30 per cent)<br>  ▸ Application of rock armour/covering (anticipation emission reduction of 30 per cent)<br>▸ 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 which will receive new material regularly.<br>▸ Direct exposure of construction workers to respirable silica and other airborne contaminants will be controlled through the use of appropriate Personal Protective Equipment<br>▸ 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 government and documented in the Traffic Management Sub-plan within the CEMP (refer Section 22.11.11.3).<br>▸ Minimising the requirement for vehicle movement outside worked areas, where practically possible<br>▸ 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).<br>▸ 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<br>▸ In the event of a dust complaint, ARTC will:<br>  ▸ In the first instance, investigate cause of the complaint<br>  ▸ Determine appropriate remedial action<br>  ▸ Liaise with administering authority and/or complainant over remedial action<br>  ▸ Implement appropriate remedial action.<br>▸ Maintain a complaints register relating to air quality, including record of remedial actions. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Pre-construction and construction[1] (continued) | 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 generation.<br>▸ Monitor meteorological conditions at worksites and designated stockpile locations, particularly wind speed and direction. Implement additional dust suppression controls prior to the onset of adverse weather, including covering of stockpiles (anticipated emission reduction of 100 per cent for impermeable cover) and additional watering of access roads (anticipated emission reduction of 50 to 75 per cent).<br>▸ Maintain and improve (if necessary) weather-monitoring protocols to enable dust-suppression activities to occur prior to the onset of adverse weather. |
| | Cumulative effects of dust emissions from construction and external land uses or activities | ▸ Undertake dust deposition (TSP) monitoring during the active period of construction in proximity to Commodore Mine, at locations where baseline data was collected (refer above), to determine if construction results in significant dust impacts. Dust deposition monitoring to be in accordance with AS/NZ 3580.10.1:2003 *Determination of Particulate Matter—Deposited matter—Gravimetric method* (Standards Australia, 2003). The results of construction dust deposition monitoring will be included in construction environmental reporting.<br>▸ 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<br>▸ Marshalling and queuing of trucks and worksite vehicles to occur away from residential areas and other sensitive receptors, where possible<br>▸ Direct exhaust emissions from mobile and stationary plant away from the ground and sensitive receptors, where possible<br>▸ 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.<br>▸ Minimise the use and intensity of diesel engines, as much as practicable<br>▸ For stationary plant and equipment, ensure all diesel motors are fitted with emission control measures and are regularly maintained to manufacturer's specifications<br>▸ Turn off idling plant equipment and vehicles when not in use<br>▸ Minimise haul distances between construction sites to spoil sites<br>▸ Implement a regular maintenance program to ensure equipment and construction fleet are maintained to manufacturer's specifications<br>▸ Use appropriately sized equipment for construction activities<br>▸ Procure energy efficient construction equipment, when appropriate<br>▸ Minimise waste from construction by procuring pre-fabricated products, where possible<br>▸ Where possible, use low energy intensity building materials instead of high-energy intensity materials<br>▸ Minimise haul distances between construction sites to spoil sites<br>▸ Implement a regular maintenance program to ensure equipment and construction fleet are maintained to manufacturer's specifications<br>▸ Use appropriately sized equipment for construction activities. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Pre-construction and construction[1] (continued) | Fugitive dust emissions from vehicles transporting materials to and from site | ▸ Vehicles transporting material to and from the maintenance works site on public roads will cover loads to prevent wind-blown dust emissions and spillages<br>▸ Visually inspect vehicles entering/exiting the site and implement additional controls if corrective actions are required<br>▸ Install rumble grids, or similar, at the entry and exit points of laydown areas.<br>▸ Site-based construction traffic is limited to identified haul routes as per the Traffic Management Sub-plan. |
| | Potential greenhouse gas (GHG) emissions (other than combustion engine emissions) | ▸ Procure energy efficient construction equipment when appropriate<br>▸ Minimise waste from construction by procuring pre-fabricated products where possible<br>▸ Where possible, use low energy intensity materials instead of high energy intensity building materials. |
| Operation | Particulate matter and other emissions from freight on operation locomotives | ▸ If coal is to be transported in future operation years, the potential for coal dust generation will require management via a CDMP. The measures included in the CDMP will aim to minimise surface lift-off of materials in transit and establish protocols to minimise spillage onto external areas of wagons. The plan will be prepared in consultation with the relevant regulatory agency at the time. |
| | Emissions from combustion engines (construction vehicles and generators) | ▸ Maintenance plant, vehicles and machinery will be maintained and operated in accordance with manufacturer's recommendations to maximise fuel efficiency<br>▸ Minimise unnecessary travel between maintenance locations<br>▸ 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).<br>▸ 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<br>▸ In the event of a dust complaint, ARTC will:<br>  ▸ In the first instance, investigate cause of the complaint<br>  ▸ Determine appropriate remedial action<br>  ▸ Liaise with administering authority and/or complainant over remedial action<br>  ▸ Implement appropriate remedial action.<br>▸ Maintain a complaints register relating to air quality, including remedial actions. |
| | Fugitive dust emissions from vehicles transporting materials to and from site (e.g. for maintenance) | ▸ All operational personnel are aware of the sensitivities with regard to elevated dust levels within and adjacent to the Project footprint<br>▸ Vehicles transporting material to and from the maintenance works site on public roads will cover loads to prevent wind-blown dust emissions and spillages<br>▸ Visually inspect vehicles entering/exiting the site and implement additional controls if corrective actions are required<br>▸ During adverse wind conditions, visual inspection of stockpiles will be conducted and mitigation procedures implemented if required. |

**Table notes:**
1. Combined, as there is no distinction between mitigation measures applicable for pre-construction and construction phases of the Project

### 22.11.5.4 Monitoring

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 Dust Management Sub-plan that will support the CEMP.

Implementation of other air quality elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**Particulate matter**

To improve the understanding of background air quality in proximity to Commodore Mine and Millmerran Power Station, an air-quality monitoring station has been installed at a location representative of receptors near the mine and power station. The monitoring station is located at 524 Millmerran–Inglewood Road, Millmerran, approximately 1.4 km north of the Commodore Mine, and is referred to as the Millmerran Air Quality Monitoring Station (AQMS).

Consistent with the pollutants of concern for the assessment, the Millmerran AQMS monitors concentrations of PM10 and PM2.5 and measures meteorological conditions. Monitoring is undertaken using Beta Attenuation Monitoring in accordance with AS/NZS 3580.9.11:2016 (PM10) and AS/NZS 3580.9.12:2013 (PM2.5). The monitoring station has been positioned in accordance with requirements listed in AS/NZS 3580.1.1:2016.

Monitoring at the Millmerran AQMS has started but, at the time of reporting, insufficient measurement data is available for inclusion in the draft EIS. Monitoring at this location will continue for a minimum period of 12 months. Data from this location will be used to guide the detail design and finalisation of the construction approach for the Project to ensure that air-quality impacts to sensitive receptors are avoided or minimised as much as possible.

**Dust deposition**

#### Baseline monitoring

Baseline dust deposition (TSP) monitoring will be conducted prior to the commencement of construction in proximity to Commodore Mine. This baseline data will enable comparison with TSP data obtained during construction of the Project. Dust deposition monitoring will be completed at a small number of locations (< 5) between Ch 120.0 km to Ch 128.0 km, adjacent to the Commodore Mine and nearby sensitive receptor locations.

Monitoring will occur for a period of 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 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 3580.10.1:2003 *Determination of Particulate Matter—Deposited matter—Gravimetric method* (Standards Australia, 2003).

#### Construction monitoring

Dust deposition (TSP) monitoring will be conducted during the active period of construction in proximity to Commodore Mine (e.g. from Ch 120.0 km to Ch 128.0 km), at locations where baseline data was collected (refer above), to determine if construction results in significant dust impacts. Dust deposition monitoring will be in accordance with AS/NZ 3580.10.1:2003 *Determination of Particulate Matter—Deposited matter—Gravimetric method* (Standards Australia, 2003). The results of construction-phase dust deposition monitoring will be included in construction environmental reporting, as specified in Section 22.6.4.

## 22.11.6 Surface water

### 22.11.6.1 Environmental outcomes

- To ensure that water quality entering creeks and waterways downstream during and post construction meets with approved statutory guidelines
- Where the water quality of existing water bodies does not comply with the guidelines, water-quality objectives should not exceed ambient historic and seasonal fluctuations
- To maintain the aesthetic quality of downstream water bodies, waters should be kept free from:
  - Floating debris, oil, grease and other objectionable matter
  - Substances that produce undesirable colour, odour, taste or foaming
  - Substances that produce undesirable aquatic life, such as algal blooms, or dense growths of plants or insects
  - No visible evidence of contaminants and pollutants leaving the site through stormwater runoff.
- Construction water sourcing to be minimised by adopting water-efficient designs and construction methodologies.

### 22.11.6.2 Performance criteria

- Steps are taken to investigate and maximise the use of water collected on site, including use of water captured within sediment basins
- Use of potable water is minimised where possible
- Project works are undertaken in accordance with the erosion and sediment control plans (refer Section 22.11.2.3)
- Water quality monitoring demonstrates that the construction works do not have an adverse impact on water quality upstream or downstream of works
- Stormwater discharges released from the construction worksites to receiving surface waters must comply with objectives established in the CEMP at the nominated discharge points.

### 22.11.6.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.11.

**TABLE 22.11 PROPOSED MITIGATION MEASURES—SURFACE WATER**

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design | Erosion and sediment control | ▸ Develop a Soil Management Sub-plan, including erosion and sediment controls plans, as a component of the CEMP (refer Section 22.11.2.3). |
| | Interference with existing surface water | ▸ The detail design will be developed to ensure that the potential for diversion of watercourses, (as defined under the *Water Act 2000* (Qld) (Water Act)), and/or waterways (as defined under the *Fisheries Act 1994* (Qld) (Fisheries Act)) are minimised<br>▸ The detail design will continue to be developed to minimise the extent of impacts to waterways, riparian vegetation and in-stream flora and habitats, in accordance with the intent of:<br>  ▸ Riverine protection permit exemption requirements (WSS/2013/726)<br>  ▸ *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018e)<br>▸ Where the Project is unable to comply with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018e), a development approval for operational work that is constructing or raising waterway barrier works will be required<br>▸ Where the Project is unable to comply with the exemption requirements, a riverine protection permit will be required for works within a watercourse. |
| | Water quality | ▸ A Surface Water Management Sub-plan will be developed as a component of the CEMP to provide a surface water monitoring framework for the Project that establishes:<br>  ▸ Additional monitoring and sampling required to establish baseline water-quality conditions, as a continuation of data collected during development of the draft EIS. Baseline water-quality conditions will preferentially use water-quality monitoring sites used within the draft EIS, with consideration of construction activities, seasonality and watercourse sensitivity. These will be monitored, at a minimum monthly, for a period of 12 months prior to commencement of construction, to determine baseline conditions as a reference for monitoring of impact (as per *Queensland Water Quality Guidelines* (QWQG) (DEHP, 2009)).<br>  ▸ Watercourse-specific water-quality values, based on baseline data, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2018), QWQG and relevant Water Quality Objectives (WQOs) under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*<br>  ▸ Frequency and location of surface water sampling during construction of the Project, with consideration for:<br>  - Construction activities with potential to impact water quality<br>  - Seasonality<br>  - Sensitivity of receiving watercourse.<br>  ▸ In-situ water-quality parameters (pH, electrical conductivity, dissolved oxygen, temperature, oxidation-reduction potential and total dissolved solids) and laboratory analysis required for samples collected at each sampling location<br>  ▸ Quality assurance and quality control requirements for surface water sampling and analysis<br>  ▸ A risk-management framework for evaluation of the risks to surface water quality and ecosystems in the receiving environment<br>  ▸ Responses to impact threshold exceedances (to be determined after the establishment of baseline water-quality conditions)<br>  ▸ Data management and reporting requirements.<br>▸ The Surface Water Management Sub-plan will be developed in consultation with DNRME and DES prior to implementation for construction, after the establishment of location-specific impact thresholds. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Availability of water to users | ▸ The detail design will be developed to ensure that, where possible, private water storages are avoided and that affected landowners retain access to existing natural resources<br>▸ If impacts to access to existing natural resources cannot be avoided through design, appropriate compensation arrangements will be discussed and agreed with the relevant impacted landowner<br>▸ 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 works commencing, to agree 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 construction water requirements (volumes, quality, demand curves, approvals requirements and lead times) will be confirmed through the construction approach refinement process. The refinement process will use a hierarchical approach to confirming the suitability of water sources, with a focus on using existing sustainable allocated water entitlements from private water holders. The ultimate water-sourcing strategy for the Project will be documented in a Construction Water Plan and be dependent on:<br>▸ Climatic conditions in the lead up to construction<br>▸ Confirmation of private water sources made available to the Project by landowners under private agreement<br>▸ Confirmation of access agreements with local governments for sourcing of mains water.<br>▸ Licenses, approvals and agreements to access water from sources identified in the finalised Construction Water Plan will be obtained. These may include water licenses under the Water Act or access agreements with bulk water suppliers or private landowners.<br>▸ ARTC to review the ability for the take of water to be done in accordance with the *Exemption requirements for construction authorities for the take of water without a water entitlement (WSS/2013/666)* (DNRME, 2019b). |
| | Rehabilitation | ▸ A Rehabilitation and Landscaping Management Sub-plan will be developed for the Project, as a component of the CEMP (refer Section 22.11.2.3). |
| Pre-construction | Erosion and sediment control | ▸ Install initial erosion and sediment controls in support of pre-construction minor civil works, e.g., establishing laydown areas, in accordance with the Soil Management Sub-plan (refer Section 22.11.2.3). |
| Construction | Erosion and sediment control | ▸ Implement the Soil Management Sub-plan, including temporary erosion and sediment controls (refer Section 22.11.2.3)<br>▸ Install permanent erosion-control measures, such as sediment retention basins and scour protection, in accordance with the detail design and erosion and sediment control plans<br>▸ Monitor the effectiveness of erosion controls installed as part of the environmental inspection schedule for the Project, as prescribed in the CEMP<br>▸ Controls that are found to be failing or not performing as intended will either be modified or replaced, as required<br>▸ Clearing extents will be limited to the Project footprint and clearing will be scheduled to minimise the exposure time of unprotected earth to prevent sedimentation of receiving waterways<br>▸ 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. |
| | Dewatering | ▸ Where the dewatering of excavations (e.g. trenches, pier holes etc.) is required, water will need to meet the established WQOs for receiving waterways before being released/discharged into local waterways<br>▸ If dewatering of existing storages is required, dewatering strategies will be required to comply with the *Biosecurity Act 2014* (Qld) to take reasonable measures to avoid the spread of pest species, e.g., screening of pump intake. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Construction (continued) | Construction water | ▸ The extraction of water will occur in accordance with licenses, approvals and/or agreements<br>▸ If the *Exemption requirements for construction authorities for the take of water without a water entitlement (WSS/2013/666)* (DNRME, 2019b) are considered to be applicable to ARTC and the Project, then the take of water will occur in accordance with the exemption requirements<br>▸ Extraction reporting will occur, as required, in accordance with requirements of relevant licenses, approvals and/or agreements obtained to cover this activity. |
| | Water quality | ▸ Implementation of the Surface Water Management Sub-plan (refer above)<br>▸ Water will need to meet the WQOs established under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* for receiving waterways before being released/discharged into local waterways. Water that does not comply with relevant water-quality objectives will either be:<br>  ▸ Treated onsite to enable discharge<br>  ▸ Used for construction water purposes that are not quality dependent, if safe to do so (e.g. dust suppression)<br>  ▸ Removed from site for disposal at an appropriately licensed facility.<br>▸ Bulk storage areas for dangerous goods and hazardous materials will be located away from waterways and drainage lines 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 SPP.<br>▸ 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.<br>▸ Construction tasks will be scheduled to avoid, where possible, bulk earthwork activities within the extent of a 1% annual exceedance probability (AEP) event 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 Queensland Fire and Emergency Service (QFES).<br>▸ Laydown areas and other construction facilities that are located within the 1% AEP flood extents 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.<br>▸ Mobile plant will not be stored within the 1% AEP flood extents when not scheduled to be in use for construction purposes<br>▸ Plant maintenance and refuelling will be carried out at suitable separation distances from riparian vegetation and 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 onsite at refuelling facilities at all times.<br>▸ Appropriate waste bins will be located in laydown areas to facilitate segregation and appropriate containment of waste materials. |
| | Rehabilitation | ▸ Reinstatement, stabilisation and rehabilitation of disturbed areas will be undertaken progressively, consistent with the Rehabilitation and Landscaping Management Sub-plan (refer Section 22.11.2.3). |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Operation | Water quality | ▸ Cross-drainage structures will be inspected to assess physical condition and performance, structural integrity and corrective measures in accordance with ARTC's maintenance codes of practices and procedures<br>▸ Plant maintenance and refuelling will be carried out in accordance with ARTC work instructions, with appropriate interception measures in place to avoid impacts to waterways, aquatic habitats, and groundwater. |
| | 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 by ARTC maintenance codes of practices and procedures and the Operation EMP<br>▸ Controls that are found to be failing or not performing as intended will either be modified or replaced as required<br>▸ The integrity of rail embankments will be maintained to prevent slope face scour and degradation<br>▸ 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. |

### 22.11.6.4 Monitoring

The following section describes the surface water monitoring that will be conducted during the pre-construction phase, to establish baseline conditions, and during construction, for the monitoring of performance against adopted WQOs. The requirements for monitoring will be documented in the Surface Water Management Sub-plan that will support the CEMP.

Implementation of other surface water elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**Baseline monitoring**

Monitoring and sampling of surface water within the impact assessment area will be conducted prior to the commencement of construction to:

- Determine baseline conditions as a reference for monitoring of impact
- Enable location-specific guideline values to be developed
- Inform finalisation of the Surface Water Management Sub-plan.

Baseline water-quality conditions will preferentially be undertaken at water-quality monitoring sites previously monitored for development of the draft EIS. These will be monitored at quarterly intervals (minimum), for a period of 12 months prior to commencement of construction (as per QWQG). Additional monitoring and sampling may also be undertaken in response to large rain events.

Surface water quality data will be collected at accessible sites in accordance with the DES *Monitoring and Sampling Manual* (DES, 2018a).

At each sampling location, the following in-situ parameters will be recorded:

- Dissolved oxygen (milligrams per litre) (mg/L) and saturation (per cent)
- pH
- Electrical conductivity (microsiemens per centimetre) (µs/cm)
- Temperature (°C)
- Turbidity (Nephelometric turbidity units) (NTU)
- Total dissolved solids (parts per million) (ppm)
- Oxidation reduction potential (millivolts) (mV).

Samples will also be collected from each site for laboratory analysis for the following analytes:

- Conductivity and salinity
- Total suspended solids
- Total hardness as CaCO3 (Alkalinity)
- Nutrient suite (ammonia, nitrite, nitrate, total nitrogen, Total Kjeldahl Nitrogen, nitrogen oxides, reactive phosphorous and total phosphorous)
- Organic nitrogen
- Dissolved metals (eight metals suite: arsenic, cadmium, chromium, copper, nickel, lead, zinc and mercury)
- Polycyclic aromatic hydrocarbons
- Chlorophyll *a.*

Samples will be submitted for analysis to a National Association of Testing Authorities (NATA) accredited laboratory.

Monitoring data will be used to establish baseline water conditions prior to the commencement of construction. WQOs for waterways within the Project footprint, against which changes to water quality will be assessed, will be determined in reference to the relevant water quality guidelines, ANZECC/ARMCANZ 2000/2018 guidelines and baseline data. Where alternate guidelines are used to establish water-quality objectives, justification for this will be provided.

Adopted WQOs will be documented in the Surface Water Management Sub-plan, as a component of the CEMP.

**Construction monitoring**

A Surface Water Management Sub-plan will be prepared as a component of the CEMP to establish the framework for the monitoring and management of water quality during construction of the Project. The Surface Water Management Sub-plan will be developed after the establishment of location-specific WQOs. The sub-plan will specify:

- Frequency and location of surface water sampling during construction of the Project, with consideration for:
  - Baseline conditions of waterways within the Project footprint, e.g. monitoring requirements for ephemeral waterways may differ to permanently flowing waterways
  - Construction activities with potential to impact water quality, such as those listed above
  - Seasonality
  - Sensitivity of receiving watercourse.
- Contingency and ameliorative measures if adverse impacts to water quality are identified, with reference to the impact triggers defined as part of the water-quality monitoring program, based on baseline data
- Quality assurance and quality control requirements for surface water sampling and analysis
- Data management and reporting requirements.

## 22.11.7 Hydrology and flooding

### 22.11.7.1 Environmental outcomes

- Project works are planned and staged to minimise the potential for adverse impacts on existing water flows and/or flooding profiles
- Project works must not cause adverse flooding impacts at flood-sensitive receptors (including, but not limited to, existing dwellings, sheds, farm buildings and infrastructure, crops and roads in the vicinity of the Project) up to and including the 1% AEP flood event.

### 22.11.7.2 Performance criteria

The flood-impact objectives that have been adopted for the Project are presented in Table 22.12. These objectives address the requirements of the ToR and have been used to guide the development and refinement of the reference design.

Acceptable impacts will ultimately be determined on a case-by-case basis with interaction with stakeholders/landowners through the community engagement process, using these objectives as guidance. This will consider flood-sensitive receptors and land use within floodplains that are traversed by the Project.

**TABLE 22.12 FLOOD-IMPACT OBJECTIVES**

| Parameter | Objectives | | | | | |
|---|---|---|---|---|---|---|
| **Change in peak water levels**[1] | Existing habitable and/or commercial and industrial buildings/premises (e.g. dwellings, schools, hospitals, shops) | Residential or commercial/industrial properties/lots where flooding does not impact dwellings/ buildings (e.g. yards, gardens) | Existing non-habitable structures (e.g. agricultural sheds, pump-houses) | Roadways<br>Rail lines | Agricultural (cropping) land | Agricultural (grazing) land/forest areas and other non-agricultural land |
| | ⩽ 10 mm | ⩽ 50 mm | ⩽ 100 mm | ⩽ 100 mm | ⩽ 100 mm with localised areas up to 400 mm | ⩽ 200 mm with localised areas up to 400 mm |
| | Changes in peak water levels are to be assessed against the above proposed limits. Changes in peak water levels can have varying impacts on different infrastructure/land, and flood impact objectives were developed to consider the flood-sensitive receptors in the vicinity of the Project. In some instances, the presence of existing buildings or infrastructure may limit the change in peak water levels. | | | | | |

| Parameter | Objectives |
|---|---|
| **Change in duration of inundation**[1] | Identify changes to duration of inundation through determination of Time of Submergence (ToS)[2]<br>For roads, determine the Average Annual Time of Submergence (AAToS) (if applicable) and consider impacts on accessibility during flood events<br>Justify acceptability of changes through assessment of risk with a focus on land use and flood-sensitive receptors. |
| **Flood flow distribution**[1] | Aim to minimise changes in natural flow patterns and minimise changes to flood flow distribution across floodplain areas<br>Identify any changes and justify acceptability of changes through assessment of risk with a focus on land use and flood-sensitive receptors. |
| **Velocities**[1] | Maintain existing velocities where practical<br>Identify changes to velocities and impacts on external properties<br>Determine appropriate scour mitigation measures considering existing soil conditions<br>Justify acceptability of changes through assessment of risk with a focus on land use and flood-sensitive receptors. |
| **Extreme event risk management** | Consider risks posed to neighbouring properties for events larger than the 1% AEP event to ensure no unexpected or unacceptable impacts. |
| **Sensitivity testing** | Consider risks posed by climate change and blockage in accordance with Australian Rainfall and Runoff 2016.<br>Undertake assessment of impacts associated with Project alignment for both scenarios. |

**Table notes:**
1. These flood-impact objectives apply for events up to and including the 1% AEP event.
2. Changes to duration of inundation of >+/- 1hour change, and > 0.2 ha affected have been reported in this chapter.

### 22.11.7.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.13.

### 22.11.7.4 Monitoring

Implementation of hydrology and flooding elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.13 PROPOSED MITIGATION MEASURES—HYDROLOGY AND FLOODING**

| Delivery phase | Aspect | Proposed mitigation measure |
|---|---|---|
| Detail design | Flooding | ▸ The Project has been designed to achieve a 1% AEP flood immunity to rail formation level and to meet the flood-impact objectives detailed in Table 22.12. These same design principles will apply to the detail design of the Project.<br>▸ Design modifications during the detail design phase will be subject to re-runs of the existing flood models to demonstrate continued compliance with the design objectives of the Project, including for extent and duration of inundation, afflux and flow velocities<br>▸ ARTC will continue to consult with impacted landowners in regard to the results of local catchment modelling through finalisation of the EIS and development of the detail design. The purpose of this consultation will be to ensure that impacts to property-scale water balance features, such as irrigation channels and dams, are appropriately considered in the EIS and Project design. Feedback from this consultation will be used to update flood modelling for the Project, if appropriate to do so. Outcomes of this consultation and revised local catchment modelling will be incorporated into the Final EIS.<br>▸ Hydrology and flooding impacts due to the alteration of design will be communicated to affected landowners<br>▸ Consultation with impacted stakeholders will continue through detail design to ensure that alterations to the design and its impacts are communicated back to landowners<br>▸ The design requirements for modifying the existing Yelarbon levee will be confirmed through further consultation with GRC and incorporated into the detail design. It is anticipated that the modified levee would be considered a Category 2 levee (Schedule 10 of the Water Regulation 2016). This is Code Assessable development, with local government (GRC) as the assessment manager.<br>▸ Development approval for the modification of Yelarbon levee will be obtained prior to the commencement of any modification works. |
| Pre-construction | Flooding | ▸ Impacts must be determined at all drainage structures and waterways affected by construction works. The change in flood levels and impacts on infrastructure and properties outside the rail corridor must be justified for a range of events up to and including the 1% AEP event. |
| Construction | Flooding | ▸ 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.<br>▸ Laydown areas and other temporary construction facilities that are located within the 1% AEP event inundation extents will be short term in use. 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.<br>▸ Mobile plant will not be stored in the 1% AEP when not scheduled for, or in use for, construction purposes. |
| Operation | Flooding | ▸ Inspections will be carried out in accordance with ARTC's maintenance codes of practice and procedures to identify defects and conditions that may affect waterway and drainage system capacity or indicate increased risk of flooding, such as:<br>  ▸ Scour<br>  ▸ Blockages due to debris build up<br>  ▸ Indication of floods overtopping a structure<br>  ▸ Culvert or drain damage or collapse.<br>▸ Where defects are identified and corrective actions are required, these works will be completed in accordance with the Operation EMP for the Project in addition to ARTC's maintenance codes of practice and procedures<br>▸ Asset inspections will be completed as soon as safe access can be achieved following a flood event. |

## 22.11.8 Groundwater

### 22.11.8.1 Environmental outcomes

- Groundwater inflow to construction works, including cuttings and excavations, is minimised
- Project works do not adversely impact groundwater quality
- Project works are designed to minimise the use of, and impacts on, groundwater resources and existing users.

### 22.11.8.2 Performance criteria

- Contamination of groundwater by construction materials is avoided
- Risks associated with seepage, drawdown (i.e. water table lowering) and environmental management requirements during construction are identified through appropriate baseline groundwater monitoring, modelling and analysis prior to commencement of construction works.

### 22.11.8.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.14.

**TABLE 22.14 PROPOSED MITIGATION MEASURES—GROUNDWATER**

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design | Interaction with groundwater by elements of the Project | ▸ Further geotechnical and hydrogeological investigations will be undertaken in parallel to the detail 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:<br>  ▸ Locations of bridge abutments<br>  ▸ Locations of significant cuts<br>  ▸ Locations of significant fill.<br>▸ Predictive numerical modelling will be re-run using additional information obtained from further geotechnical and hydrogeological investigations, in addition to finalised cut dimensions. This revised modelling will be completed to better understand seepage estimates and groundwater level variation resultant from cuts. The reference design provides for a minimum 300 mm drainage blanket to be applied in all cuttings where there is known or suspected groundwater to within 2 m of the base of the cutting. Seepage analysis will be used to advise drainage blanket specifications, or alternative, more effective, seepage-control measures, on a cut-by-cut basis.<br>▸ Site inspections of proposed cut locations will be conducted 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.<br>▸ The management of acid rock drainage (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)<br>▸ Culverts and embankments will be designed to minimise pre-loading and compaction of alluvial sediments. This will reduce the risk of altering shallow groundwater levels and recharge patterns. The current embankment designs allow for openings (i.e. culverts and bridge spans) near creeks and rivers to assist with flow.<br>▸ Where embankment height allows, toe benching and drainage blankets are to be provided for all transverse slopes greater than 7° (1V:8H)<br>▸ Where embankment height allows, full embankment benching is to be provided for all transverse slopes greater than 14° (1V:4H). |
| | Impacts to registered bores | ▸ Landowners affected by the Project will be consulted to confirm the location of registered bores and to establish the presence of any unregistered bores within the Project footprint that may be decommissioned to enable construction and operation of the Project. Where a groundwater bore is expected to be decommissioned or have access to it impaired as result of the Project, 'make good' measures will be agreed in consultation with the affected landowner. |
| | Sourcing of construction water | ▸ The construction water requirements (i.e. volumes, quality, demand curves, approvals requirements and lead times) will be confirmed as the construction approach is refined. The ultimate water sourcing strategy for the Project will be documented in a Construction Water Plan developed for the Project (refer Section 22.11.6.3).<br>▸ The use of groundwater to supplement the construction demand for the Project may be considered if private owners of licensed/registered bores have capacity under their water licence or entitlement that they wish to sell to, or trade with, ARTC under a private agreement. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design (continued) | Groundwater quality | ▸ Continue collection of baseline groundwater monitoring data (levels and quality) from monitoring bores established for the Project through the EIS process, as well as from additional bores installed through the detail design process, in accordance with the Baseline Groundwater Monitoring and Management Program (GMMP) (refer Section 22.11.8.4). Data will be collected to provide a robust dataset for characterisation of the primary aquifers of relevance over a time sufficient to identify seasonal variation trends.<br>▸ Groundwater monitoring and sample collection will be conducted in accordance with recognised groundwater sampling guidelines such as the *Monitoring and Sampling Manual* (DES, 2018a) and *Groundwater Sampling and Analysis—A Field Guide* (Sundaram et al., 2009).<br>▸ Collected data will be used to establish a groundwater condition baseline for the Project against which construction-phase impacts can be monitored and compared (refer Section 22.11.8.4). Baseline groundwater monitoring data will be used to:<br>▸ Derive location/bore-specific groundwater monitoring procedures<br>▸ Establish location/bore-specific impact thresholds<br>▸ Establish responses to impact threshold exceedances, including 'make good' agreements.<br>These details will be incorporated into the Construction GMMP, which will be subject to approval from DNRME and DES prior to implementation.<br>▸ A Contaminated Land Management Sub-plan will be developed and incorporated into the CEMP (refer Section 22.11.2.3). |
| Pre-construction | Impacts to registered bores | ▸ There are 30 registered bores within the Project footprint for the reference design. These bores, plus unregistered bores that also occur within the Project footprint, are likely to be decommissioned for the progression of the Project. Bores identified within the construction footprint will be decommissioned in accordance with the *Minimum Construction Requirements for Water Bores in Australia—Edition 3* (National Uniform Drillers Licensing Committee, 2012). |
| | Sourcing of construction water | ▸ Private agreements will be negotiated to secure access to registered bores for use of sustainable groundwater supplies during construction, if required by the Project as part of the construction water strategy (refer above). |
| Construction | Water resources | ▸ The Construction GMMP will be implemented (refer above and Section 22.11.8.4)<br>▸ Opportunities to re-use/recycle water during construction will be identified and implemented, where feasible. |
| | Sourcing of construction water | ▸ In circumstances where groundwater access is secured through private agreement, the licensed capacity of existing bores will not be exceeded. Flow and volume monitoring during extraction will be required for each bore, with extraction logs maintained. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Construction (continued) | Groundwater quality | ▸ Suspected contaminated soils or materials, if encountered, will be managed in accordance with the unexpected finds protocol/procedure documented in the Contaminated Land Management Sub-plan (refer Section 22.11.2.3)<br>▸ Opportunities to treat and re-use contaminated materials within the rail corridor will be assessed and subjected to a risk assessment<br>▸ Vehicle and plant maintenance will be undertaken in designated 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<br>▸ 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.<br>▸ 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 SPP).<br>▸ A Hazardous Materials Management Sub-plan will be prepared and implemented as a component of the CEMP (refer Section 22.11.12.3)<br>▸ 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.<br>▸ Drilling and excavation activities during construction will make use of drilling fluids and chemicals that are environmentally neutral and biodegradable. 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.<br>▸ 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 Project's Spoil Management Strategy (Appendix Y: Spoil Management Strategy). |
| | Encountering potential acid sulphate soils (PASS) and/or acid rock drainage (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 Project's Spoil Management Strategy (refer Appendix Y: Spoil Management Strategy).<br>▸ If ARD potential is identified through pre-construction investigations (refer above), seepage water from the relevant deep cuts will be sampled at weekly intervals to monitor for the occurrence of acid rock oxidation. 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.<br>▸ 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 neutralised via treatment with hydrated lime or dilution prior to release into the surrounding catchment or other discharge mechanism. |

| Delivery phase | Aspect | Mitigation and management measures |
|---|---|---|
| Operation | Impacts to registered bores | ▸ An Operation GMMP will be developed in consultation with the relevant regulatory agencies to specify the groundwater monitoring requirements, if any, over the initial operation years of the Project (refer Section 22.11.8.4). The need for monitoring during operation will be informed by groundwater observations and data collected during construction of the Project. |
| | Groundwater quality | ▸ 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 consist documentation. Dangerous goods must be loaded, labelled, and marshalled in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Commonwealth of Australia, 2018b).<br>▸ 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.<br>▸ Procedures for the management of hazardous chemical spills and leaks will be developed and incorporated into the Operation EMP for the Project. These procedures will be in accordance with ARTC's work instructions and emergency management procedures.<br>▸ All maintenance activities will be conducted in accordance with ARTC work instructions and procedures, in addition to the Operation EMP. |

### 22.11.8.4 Monitoring

The GMMP provides for an ongoing assessment of the potential groundwater impacts that may be attributed to the Project. The GMMP incorporates principles of performance assessment and adaptive management; a structured, iterative process for decision making. The GMMP will be assessed and updated before the commencement of each future Project phase (pre-construction/baseline, construction and operation) such that the GMMP for subsequent phases is based on the outcomes of the previous phase. This process of GMMP development and development over sequential Project phases is shown on Figure 22.1.

**Baseline Groundwater Management and Monitoring Program**

The Baseline GMMP's primary objective is to develop a robust baseline dataset from which all subsequent monitoring will be assessed against to identify impacts. This dataset will also inform the development of Project-specific WQO trigger values. The Baseline GMMP will be developed and implemented during the detail design stage to inform refinement of design and ensure a suitable groundwater baseline dataset is established before the commencement of construction.

The pre-construction/baseline dataset is to be the reference dataset for future groundwater monitoring and, as such, may be supplemented with existing groundwater data, inclusive of publicly available and verified data. A continuation of the EIS groundwater monitoring is currently ongoing, to inform natural seasonal variations within the aquifers. This monitoring will continue in anticipation of the formal Baseline GMMP being established.

An indicative network of monitoring bores for the Baseline GMMP is summarised in Table 22.15. The indicative network is subject to landowner negotiations and access and will be refined during the detail design phase. If bores specified in Table 22.15 cannot be accessed, or are unsuitable for monitoring for other reasons, an alternative existing bore may be nominated. In the absence of a suitable alternative existing bore, dedicated environmental monitoring bores may be installed. These environmental monitoring bores would be sited in locations to provide adequate coverage up and down hydraulic gradient in areas of potential groundwater impact and to further understand the heterogeneity of the Condamine Alluvium.

The baseline dataset will be compiled, and the Construction GMMP developed, prior to the commencement of the construction of the Project.

The following provides a framework for groundwater level and quality monitoring, data management and reporting from which the Baseline GMMP will be developed.

#### Groundwater level monitoring

Groundwater levels for bores within the indicative monitoring network are to be monitored using automated pressure transducers (groundwater level loggers) to record measurements at least every 12 hours. This is particularly required to establish the baseline groundwater dataset from which potential impacts can be assessed during construction and operation of the Project and to allow for identification of groundwater users in proximity to the Project.

Manual measurements on all bores within the indicative monitoring network is proposed monthly during establishment of the baseline groundwater dataset, to allow for a quality control check against the pressure transducers as this will be the basis of comparison for the Project. Pressure transducer data will be downloaded on a bimonthly basis, during the Baseline GMMP, to coincide with groundwater-quality monitoring and manual water-level measurements.

Data collected during the baseline groundwater-level monitoring program will account for natural (seasonal) or anthropogenic fluctuations of groundwater levels prior to construction. This is important for the alluvial aquifers, as the water levels in these sediments are key to the design, construction, and operation of the Project; are the most likely to vary over time due to climate and local groundwater abstraction; and will allow for identification of non-project related influences on groundwater levels. For example, dewatering/pumping for construction works/water supply being undertaken for works at Commodore Mine may create an area of influence measurable in proximity to the Project with potential to impact on groundwater resources and/or private bores. This information is important to capture to ensure discernibility between the impacts of the Project and those from other influences.

The baseline groundwater level monitoring program will be completed in enough time prior to commencement of construction works to allow for assessment of the data and the development of the Construction GMMP.

### Groundwater quality monitoring

Groundwater quality samples will be collected from bores within the indicative monitoring network on a bimonthly basis, to coincide with the groundwater level monitoring program (refer above). Groundwater samples will be subject to in-field and laboratory analyses. The quality data collected during the baseline program will be used to assess potential impacts of the Project on local groundwater resources and on proposal-specific WQOs through all stages of the Project.

Data collected during the baseline groundwater monitoring program will account for natural (seasonal) or anthropogenic fluctuations of groundwater levels prior to construction. This is especially applicable to the shallow aquifers that are hydraulically connected to surface water as, after the dry season (negligible recharge), a first-flush/flow of recharge to these sediments can result in markedly different quality from data collected within and after the wet season.

The baseline quality dataset will also be used to indicate the potential for ARD prior to construction works and inform the suitability of local groundwater for construction water purposes, if required.

Field parameters to be collected during sampling include pH, electrical conductivity, temperature, redox potential and dissolved oxygen.

The following analytical suite is suggested for laboratory analyses for the baseline groundwater quality dataset and is considered sufficient to identify potential ARD and establish a baseline for future monitoring of Project impacts:

- pH, electrical conductivity and total dissolved solids
- Major anions (i.e. $HCO_3^-$, $Cl^-$ and $SO_4^{2-}$)
- Major cations (i.e. $Ca^{2+}$, $Mg^{2+}$, $Na^+$, $K^+$ and Si)
- 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 nitrogen and total phosphorous).

The baseline (pre-construction) monitoring program will be completed in sufficient time, prior to commencement of construction works, to allow for assessment of the data, including trends. This data will be used to develop groundwater quality trigger levels (warning and action levels).

Groundwater monitoring and sample collection will be conducted in accordance with recognised groundwater sampling guidelines such as the *Monitoring and Sampling Manual* (DES, 2018a) and *Groundwater Sampling and Analysis—A Field Guide* (Sundaram et al., 2009) unless an updated version is available prior to commencement of the baseline monitoring program.

### Data management and reporting

The following data and reporting requirements would be implemented:

- All groundwater data will be validated with suitable quality assurance and quality control protocols applied
- Monitoring data will be assessed on a quarterly basis, initially, to identify trends and compare to trigger levels (baseline and pre-construction). This will also enable the Baseline GMMP to be revised, if required.

**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 encountering groundwater and the location of such activities. Monitoring will be localised to areas where construction activities have potential to impact on groundwater quality and/or levels, as confirmed through detail design. The localised task and risk-based monitoring will be performed at locations (distance and depth/aquifer) up- and down-gradient of the site where construction activities are occurring. For example, where construction activities are surficial in nature, no monitoring of deep aquifers would be warranted; however, surficial construction tasks may require total dissolved solids and pH monitoring within the alluvial aquifers to ensure the baseline levels are not impacted as a result of local works (task-specific monitoring).

The surface water monitoring program for the Project will be used to inform and complement the Construction GMMP. For example, in the instance a surface water sample in an area of known hydraulic connectivity with the alluvial aquifers returns an elevated result during construction, this may trigger a groundwater sample to be obtained from the local alluvial aquifer to inform of any impacts; however, if surface water quality results are within/below acceptable values, sampling of the alluvial aquifers in this area may not be warranted.

**Operation Groundwater Management and Monitoring Program**

The Operation GMMP will be based on groundwater data and observations collected during construction of the Project. Monitoring may be warranted over the initial years of construction if construction data indicates that local groundwater conditions are yet to return to baseline and/or stabilise following completion of construction activities. Monitoring may also be warranted in response to a spill/incident. Operation monitoring results will be assessed against the Construction GMMP and baseline dataset, as appropriate.

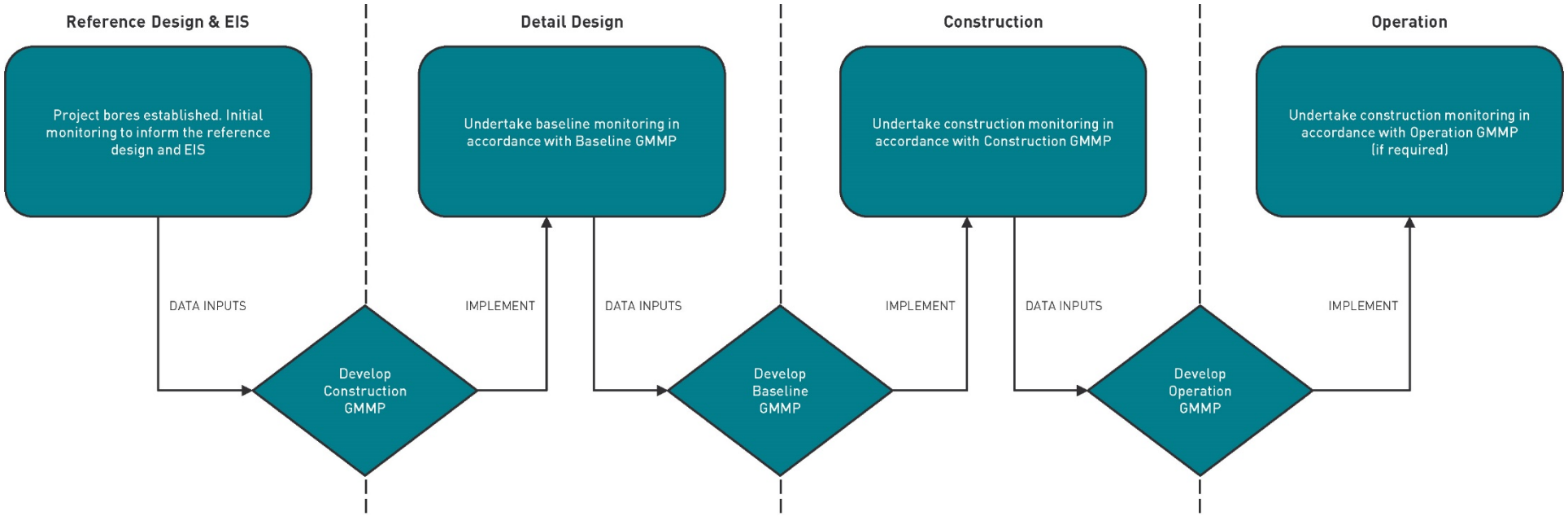


**FIGURE 22.1 DEVELOPMENT AND IMPLEMENTATION OF THE GROUNDWATER MANAGEMENT AND MONITORING PROGRAM OVER SEQUENTIAL PROJECT PHASES**

**TABLE 22.15 INDICATIVE GROUNDWATER MANAGEMENT AND MONITORING PROGRAM NETWORK OF MONITORING BORES**

| Chainage (km) | Bore ID | Easting[1] | Northing[1] | Bridge or Cutting | Aquifer | Screen interval (mbgl) | Monitoring type | Rational |
|---|---|---|---|---|---|---|---|---|
| 55.0 | 310-BH2206 | 302299 | 6853323 | C08 | WCM | 16.7 to 25.7 | Water levels and quality | Monitor water levels and quality surrounding deep cutting C08 |
| 59.0 | 310-BH2308 | 305930 | 6855563 | | WCM | 9 to 14.45 | Water levels and quality | |
| 136.0 | 310-BH2231 | 338076 | 6918598 | Dry Creek Bridge | Alluvium | 11.4 to 17.4 | Water levels and quality | Background alluvium levels for bridge structure |
| 142.8 | 310-BH2233 | 340530 | 6922012 | Condamine River rail bridges | Alluvium | 9.5 to 12.5 and 18.5 to 24.45 | Water levels and quality | Background Condamine Alluvium levels – monthly data available from DNRME |
| 143.0 | RN42231089 | 338799 | 6922879 | | Alluvium | XX | Water levels only | |
| 143.2 | 310-BH2234 | 340696 | 6922345 | | Alluvium | 17 to 24.5 | Water levels and quality | |
| 148.8 | 310-BH2235 | 344710 | 6926073 | Condamine River North Branch rail bridge | Alluvium | 31.0 to 40.0 | Water levels and quality | Background alluvium levels for bridge structure |
| 172.6 | RN119211 | 365749 | 6935428 | C037 | MRV | 66 to 75 | Water levels and quality | Landowner bore within the Project footprint and down gradient of C037 |
| 173.0 | RN56564 | 366137 | 6934525 | | MRV | XX to 56 | Water levels and quality | Background levels and quality for C037 |
| 188.0 | 310-BH2344 | 377527 | 6944383 | C044 | MRV | 9 to 14.95 | Water levels and quality | Background levels and quality for C044 |
| 188.6 | RN35264 | 377548 | 6944943 | | MRV | XX to 62.4 | Water levels and quality | Within C044 drawdown envelope |
| 189.8 | RN52509 | 378064 | 6946048 | | MRV | 6 to 43 | Water levels and quality | Within C044 drawdown envelope |

**Table notes:**
1 MGA94 Z56
XX = unknown construction detail

## 22.11.9 Noise and vibration

### 22.11.9.1 Environmental outcomes

- Project works are designed, planned and implemented to maintain human health and wellbeing with respect to noise and vibration, to the extent reasonable and practicable
- Project works are designed, planned and implemented to maintain daily patterns of activity and to minimise sleep disturbance at night
- Project works are managed to avoid vibration-related structural damage to all properties.

### 22.11.9.2 Performance criteria

- The Project is designed to achieve:
  - The railway noise objectives in Table 22.16, Table 22.17 and Table 22.18
  - The railway vibration objectives in Table 22.19
  - The road noise objectives of *Transport Noise Management Code of Practice Volume 1—Road Traffic Noise* (CoP Vol 1) (DTMR, 2013a)
- Construction activities are planned and conducted to achieve the noise and vibration objectives in DTMR CoP Vol 2 (DTMR, 2016) at a sensitive receptor.

**TABLE 22.16 AIRBORNE NOISE MANAGEMENT LEVELS FOR RESIDENTIAL RECEPTORS**

| | Noise trigger levels (external) | |
|---|---|---|
| **Type of development** | **Day (7:00 am–10:00 pm)** | **Night-time (10:00 pm–7:00 am)** |
| New rail line development | Predicted rail noise levels exceed: | |
| | $LA_{eq}$(15 hour) 60 dB(A) | $L_{Aeq}$(9 hour) 55 dB(A) |
| | $L_{AFmax}$ 80 dB(A) | $L_{AFmax}$ 80 dB(A) |

**TABLE 22.17 AIRBORNE NOISE OBJECTIVES FOR OTHER SENSITIVE RECEPTORS**

| | Noise objectives (when receptor premises are in use)—New rail line development[1] |
|---|---|
| **Type of development** | **Resulting rail noise levels exceed:** |
| Schools, educational institutions and childcare centres | $L_{Aeq(1\ hour)}$ 40 dB(A) (internal) |
| Places of worship | $L_{Aeq(1\ hour)}$ 40 dB(A) (internal) |
| Hospital wards | $L_{Aeq(1\ hour)}$ 35 dB(A) (internal) |
| Hospital other uses | $L_{Aeq(1\ hour)}$ 60 dB(A) (external) |
| Open space—passive use (e.g. parkland, bush reserves) | $L_{Aeq(15\ hour)}$ 60 dB(A) (external) |
| Open space—active use (e.g. sports field, golf course) | $L_{Aeq(15\ hour)}$ 60 dB(A) (external) |

**Table notes:**
$L_{Aeq}$ = A-weighted equivalent noise level measure in decibels
1 A new rail line development is a rail infrastructure project on land that is not currently an operational rail corridor

**TABLE 22.18 RAILWAY GROUND-BORNE NOISE OBJECTIVES**

| Type of development | Sensitive receptors | Internal ground-borne noise objectives | |
|---|---|---|---|
| | | Use period[1] | Single event maximum[2] |
| New railway or upgrading existing railway | Accommodation activities | Daytime | ≤ 40 dB(A) |
| | | Evening/night-time | ≤ 35 dB(A) |
| | Educational establishments<br>Childcare centres<br>Health care services<br>Hospitals | While in use | ≤ 35 dB(A) |
| New railway or upgrading existing railway | Community uses (excluding a court of law)<br>Places of worship<br>Offices | | ≤ 40 dB(A) |
| | Court of law (court rooms) | | ≤ 30 dB(A) |

**Table notes:**
1. Daytime 7.00 am to 6.00 pm, evening 6.00 pm to 10.00 pm and night-time 10.00 pm to 7.00 am
2. Arithmetic average of $L_{ASmax}$ levels from the 15 single highest events, or all events if less than 15, during a Use Period within a 24-hour period. $L_{ASmax}$ is the maximum A-weighted noise level of a pass-by event, measured using the 'slow' response setting

**TABLE 22.19 RAILWAY GROUND-BORNE VIBRATION OBJECTIVES**

| Type | Sensitive receptors | Internal ground-borne vibration objectives[2] | |
|---|---|---|---|
| | | Use period[1] | Vibration dose value |
| New railway or upgrading existing railway | Accommodation activities | Daytime | ≤ 0.20 m/s$^{1.75}$ |
| | | Evening | |
| | | Night-time | ≤ 0.13 m/s$^{1.75}$ |
| | Educational establishment, childcare centres, health care services, hospitals, community uses, places of worship and offices. | While in use | ≤ 0.40 m/s$^{1.75}$ (all areas) |
| | | | ≤ 0.10 m/s$^{1.75}$ (critical areas) |

**Table notes:**
m/s$^{1.75}$ = The root mean quad of acceleration, which is measured in metres per second
1. Daytime 7.00 am to 6.00 pm, evening 6.00 pm to 10.00 pm and night-time 10.00 pm to 7.00 am
2. Table 6—Vibration Criteria (internal) for New Sensitive Development. DTMR *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure*, Version 2, May 2013

### 22.11.9.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.20. The noise mitigation measures implemented for the Project will be confirmed prior to the commencement of construction as the detail design and construction method is refined and confirmed.

#### Construction

Of the construction noise mitigation measures identified in Table 22.20, those which can be quantified can be expected to provide between 4 and 11 dB(A) of attenuation. Exceedances that are greater than 10 dB(A) may not be fully mitigated to below the applicable noise objectives through the application of physical attenuation alone. In some circumstances, residual noise impacts may still be experienced after all reasonable and practicable mitigation measures have been applied. Where such residual impacts are experienced, further administrative controls or architectural treatments may be considered in consultation with the affected occupant. Administrative controls may include periods of respite incorporated into the construction schedule or temporary relocation of affected occupants.

Respite involves scheduling work periods when people are least affected, such as by:

- Scheduling work for when premises are not in operation
- Restricting the works to occur within standard hours as defined by CoP Vol 2
- Restricting the number of nights per week that works are undertaken near sensitive receptors.

Respite is the preferred method of mitigating residual exceedances, in accordance with the CoP Vol 2.

Temporary relocation involves the relocation of affected occupants for short periods of time where all other reasonable and practicable measures, including respite periods, are proven ineffective and further mitigation is impractical. Examples of temporary relocation may involve the offer of alternative accommodation for the duration of impact.

Architectural treatments may involve the provision of alternative ventilation where the windows are to remain closed; however, the performance of the building envelope may be limited by specific elements (e.g. windows and doors) and architectural treatments would primarily focus on those elements.

Residual impacts are reduced for construction activities as these are not permanent noise sources and will cease once nearby construction is complete.

**Operational railway noise**

The following operational railway noise strategy has been adopted by ARTC across the Inland Rail Program as the basis for selecting feasible and reasonable operational noise mitigation:

- Noise barriers are generally only considered where groups of triggered receptors are apparent. For isolated receptors, such as single dwellings in rural areas, noise barriers would generally not be considered.
- The noise mitigation for isolated receptors is expected to include:
  - At-property architectural treatments to the building (such as increased glazing or facade constructions) to control rail noise inside building
  - Upgrades to the receptor property boundary fencing to improve screening of rail-noise levels.
- For two receptors on the same side of the track, the potential for a noise barrier or architectural treatment of the building will be considered on a case-by-case basis
- For three or more receptors on the same side of the track, noise barriers will be considered as a primary noise mitigation option
- While noise barriers in combination with architectural acoustic treatments would not generally be provided, there may be exceptions.

Further to the above strategy, the selection and specification of as-required noise mitigation also requires the consideration of a range of safety, engineering, environmental and cost factors. These factors are considered in determining whether a mitigation option is feasible and reasonable to implement.

Based on both the location of the sensitive receptors and the margin by which the noise objectives are triggered, the feasible and practicable options for noise management are expected to be limited to:

- Consideration of rail noise barriers (or similar) at Yelarbon, Brookstead and Pittsworth. Conceptual noise barrier options have been reviewed in Appendix T: Operational Railway Noise and Vibration Technical Report.
- Architectural acoustic treatments to buildings to control rail noise within the internal environment of the building
- Upgrades to existing property boundary fencing to improve screening of rail noise levels.

Specific at-property treatments may also need to be considered for the following sensitive receptors:

- Yelarbon State School
- Yelarbon Scouts Hall
- Brookstead State School
- Pampas Memorial Hall
- Pittsworth & District Assembly of God church.

The noise assessment objectives apply to specific, noise-sensitive room uses where aspects such as acoustic amenity and speech intelligibility are important. During the detail design phase, it will be necessary to survey the buildings to exclude rooms and buildings that are not noise sensitive, from the consideration of at-property treatments.

The assessment has identified that noise mitigation, such as railway noise barriers, would be investigated at the towns of Yelarbon, Brookstead and Pittsworth, where railway noise levels at nearby sensitive receptors are typically more than 5 dB(A) above the noise trigger levels, the receptors are within 200 m of the rail corridor and in groups of three or more receptors on the same side of the track.

Whether rail noise barriers would be a reasonable and practicable noise mitigation strategy will be determined by ARTC during detail design of the Project. This analysis will consider all design, engineering, environmental and social factors that determine the location, extent and height of the noise barriers (or similar structures). In particular, the investigations will need to consider aspects such as flooding and management of surface water, wind loading, visual amenity and safety within and outside the railway corridor.

To address residual impacts associated with rail noise levels remaining above the objectives, the Project may need to consider supplementing mitigation such as railway noise barriers with additional at-property treatments. This will be determined by ARTC on a case-by-case basis.

**TABLE 22.20 PROPOSED MITIGATION MEASURES—NOISE AND VIBRATION**

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Detail design | Construction noise and vibration impacts on sensitive receptors | ▸ Develop and refine the construction methodology with the aim of achieving compliance with construction noise and vibration performance objectives as specified in CoP Vol 2 (refer Section 22.11.9.2)<br>▸ 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.<br>▸ A Noise and Vibration Management Sub-plan will be developed as a component of the CEMP. This sub-plan will include:<br>▸ Construction noise and vibration objectives in CoP Vol 2 (refer Section 22.11.9.2)<br>▸ Location of sensitive receptors in proximity to the Project footprint<br>▸ Location-specific management measures for activities that could exceed the construction noise and vibration objectives, for example:<br>– Earthworks and civil works<br>– Structural work, including piling<br>– Concrete batching<br>– Blasting.<br>▸ Location, design and timing of need for temporary noise barriers<br>▸ Community notification process to advise of significant works with potential for noise nuisance or vibration at sensitive receptors and surrounding residences/premises<br>▸ Locations and procedures for:<br>– Pre and post-condition surveys<br>– Noise or vibration monitoring in response to validated complaints.<br>▸ Requirements for training, inspections, corrective actions, monitoring, notification and classification of environmental incidents/complaints, record keeping and performance objectives for handover on completion of construction. |
| | Design of the rolling stock and rail tracks | ▸ Investigate the potential for the application of rail dampers on sections of generally straight track that would not be highly susceptible to prominent or regular wear<br>▸ Consider the implementation of wayside monitoring systems, including:<br>▸ Wheel impact and load detector, bearing acoustic monitoring (RailBAM) and Squeal acoustic detector (RailSQAD)<br>▸ Angle of attack, hunting detector and wheel profile monitoring.<br>▸ Investigate the use and effectiveness of wheel dampers (where the wheel is the dominant source over the rail) and managing the wheel profile in consultation with freight operators. |
| | Control of noise from safety warning devices | ▸ Investigate the suitability of use of automated wayside horns at level crossings to provide a targeted audible noise event for vehicles and pedestrians at the level crossing, to remove the need for the train to sound its horn adjacent to sensitive receptors<br>▸ Where practicable, use soft-tone warning bells at level crossings to reduce maximum noise levels form the alarm bells in proximity to sensitive receptors. |

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Detail design (continued) | Noise walls or barriers at the rail corridor boundary | ▸ Noise walls or barriers will only be considered at Yelarbon, Brookstead and Pittsworth, where the mitigation can effectively control noise at groups of sensitive land uses and receptor buildings and where noise level reductions of generally in the order of 5 dB(A) or more are required at sensitive receptors.<br>▸ The key considerations with rail noise walls or barriers, include:<br>▸ The proximity of key infrastructure, such as local roads, pedestrian crossings, waterways and drainage culverts, can constrain the location and extent of noise walls or barriers. These factors can prevent noise walls and barriers from being a feasible or practicable noise mitigation option.<br>▸ There would be little or no reduction in the noise emissions from the locomotive exhaust 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<br>▸ Availability of land between the rail line and receptors may constrain the construction of the base/foundations of the noise wall or barrier<br>▸ The location, extent and height of noise walls barriers would need to be designed to achieve a minimum noise reduction performance, control reflected sound and meet specifications for earthworks, stabilisation, wind loading and erosion<br>▸ The implications to water through flow and flooding will need careful consideration to ensure any noise walls or barriers do not adversely impede the movement of surface water.<br>▸ Social and environmental factors to be considered for the provision of noise walls or barriers include:<br>▸ Loss of open aspect and breezes<br>▸ Potential for vandalism and a need for graffiti removal<br>▸ Reduction in visual amenity of the landscape<br>▸ Loss of views and vistas.<br>▸ The removal of vegetation. |
| | Earth mounds at the rail corridor boundary | ▸ Earth mounds will only be considered where the mitigation can effectively control noise at groups of sensitive land uses and receptor buildings at Yelarbon, Brookstead and Pittsworth and where noise level reductions (of generally in the order of 5 dB(A) or more) are required at sensitive receptors.<br>▸ When reviewing the practical application of earth mounds, the following will be considered:<br>▸ The construction of earth bunds can be constrained by the available space between the rail corridor and neighbouring infrastructure<br>▸ Earth mounds require considerably more space than the footprint of a rail noise barrier. A 2-m high earth mound could require an 8-m wide base<br>▸ Earth mounds could provide a benefit to control perceptible rail noise impacts. Reductions in noise levels by at least 3 dB(A) could result in a perceptible improvement to the loudness of train pass-by events<br>▸ A review of conceptual earth mounding identified that, outside of the main townships, earth mounds up to 3 m in height could reduce the $L_{Aeq}$ noise levels by at least 3 dB(A)<br>▸ While earth mounds may not achieve the same 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 objectives<br>▸ In addition to the potential constraints associated with noise walls and barriers, the earth mound would also need to be designed to meet contamination, dust, health and ecological requirements.<br>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. |

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Detail design (continued) | Property controls | ▸ In circumstances where mitigation within the rail corridor is not found to be feasible, and all other mitigation options are exhausted, property controls will be investigated and implemented<br>▸ The implementation of architectural treatments and other measures to private property would likely be subject to the agreement of commercial and legal terms between ARTC and the property owner<br>▸ Property noise control measures may include:<br>  ▸ Architectural property and construction treatments subject to an inspection of each individual property to confirm its suitability for the implementation of noise control treatments<br>  ▸ Upgrading existing property fencing subject to landowner agreement.<br>▸ Relocation of property assessed on a case-by-case basis, subject to assessment, to ensure there would be a notable improvement to the noise environment at the relocation site. |
| | Road traffic noise | ▸ The vertical and horizontal alignment of new and upgraded road components will be designed to minimise the number of receptors at which CoP Vol 1 criteria are predicted to be exceeded. The design will be reviewed in all locations, but with particular focus on locations where objectives are projected to be exceeded by the reference design, as follows:<br>  ▸ New road components:<br>  – Cunningham Highway (Ch 25.2 km)<br>  – Quibet Road (Ch 171.0 km)<br>  – Lochaber Road (Ch 172.6 km)<br>  – Biddeston–Southbrook Road (Ch 183.0 km).<br>  ▸ Upgrades of the Gore Highway at Ch 146.6 km, Ch 153.0 km and Ch 183.4 km.<br>▸ Operational road traffic noise impacts will be iteratively re-assessed during the detail design process, in accordance with CoP Vol 1, to confirm the receptors at which noise objectives may be exceeded<br>▸ Where CoP Vol 1 criteria may be exceeded at a sensitive receptor, the following potential mitigation measures for both upgraded and new road sections will be investigated for effectiveness and incorporated into the detail design, as appropriate:<br>  ▸ A noise barrier in the form of a landscaped earth mound and/or a noise fence<br>  ▸ Pavement surface treatment<br>  ▸ Provision of acoustic façade treatments to affected sensitive receptors.<br>A combination of mitigation measures may be appropriate. |

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Pre-construction | Pre-condition surveys | ▸ Building condition/dilapidation surveys will be undertaken at the following locations:<br>▸ Receptors that are expected to exceed the structural damage vibration criteria given by DIN 4150.3 (Deutsches Institut für Normung, 1999) and recommended by the CoP Vol 2<br>▸ Receptors identified as being particularly sensitive to vibration. These are:<br>– Heritage buildings within:<br>▸ 60 m of possible vibratory roller start up/run down—six identified<br>▸ 135 m of percussive piling—none identified<br>– Other buildings within:<br>▸ 40 m of possible vibratory roller start up/run down<br>▸ 80 m percussive piling<br>– Structures within the damage radius of a blast location, calculated based on charge mass:<br>▸ Receptors which are expected to exceed the structural damage vibration performance objectives as stipulated in CoP Vol 2 (refer Section 22.11.9.2). |
| Construction | Communication and notification | ▸ The results of refined construction noise and vibration modelling will be communicated to potentially affected residents and occupants (sensitive receptors) with information to enable them to understand the likely nature, extent and duration of noise and vibration impacts during construction<br>▸ Construction progress and upcoming activities will be communicated to local residents and stakeholders, particularly when noisy or vibration-generating activities are planned, such as vibratory compaction and piling<br>▸ A telephone line will be advertised for the Project to enable members of the public to notify ARTC of issues, including the generation of excessive noise and/or vibration. |
| | Monitoring | ▸ Vibration monitoring will be undertaken at representative locations where the potential for building/structural damage risk has been identified due to potential exceedance of the Project structural damage performance objectives as specified in CoP Vol 2 (refer Section 22.11.9.2)<br>▸ Monitoring will occur for the duration of vibratory activities that have the potential to result in exceedance of objectives at one or more receptor locations<br>▸ Vibration monitoring will be undertaken by a suitably qualified professional, in accordance with the CoP Vol 2<br>▸ Noise and/or vibration monitoring may be undertaken in response to noise or vibration complaints to assess compliance of construction activities against adopted objectives, as detailed in CoP Vol 2 (refer Section 22.11.9.2). All acoustic instrumentation will comply with AS IEC 61672.1-2004 *Electroacoustics—Sound level meters—Specifications* (Standards Australia, 2004). |
| | Construction work hours | ▸ The construction program will generally be based on the hours presented in Section 22.10. Construction works will aim to achieve the construction noise performance objectives as specified in CoP Vol 2 (refer Section 22.11.9.2)<br>▸ Noise-generating construction activities outside of standard hours (CoP Vol 2) will only be undertaken where:<br>▸ A location and activity specific noise assessment has been undertaken<br>▸ Assessment has concluded that there are no nearby sensitive receptors, or impacts to receivers can be appropriately managed, as defined by the CoP Vol 2<br>▸ Consultation with the local community is demonstrated. |

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Construction (continued) | Equipment selection | ▸ Equipment selections will be reviewed with a preference for adopting quieter and non-vibratory plant items near sensitive receptors, where feasible and reasonable. This is particularly important for any non-standard hours construction activities where sensitive receptors are nearby. Vibration-intensive stationary plant, such as generators located near sensitive receptors, will be isolated with isolation pads.<br>▸ Appropriately sized equipment will be selected for the task, such as vibratory compactors and rock excavation equipment. For example, a 22-t excavator is expected to operate 8 dB(A) quieter than a 40-t excavator, based on equipment noise emissions given by BS5228.1. |
| | Alternative construction methods | ▸ Alternative construction methods will be assessed and adopted, where practicable, to reduce noise and vibration impacts, such as:<br>▸ Using damped tips on rock-breakers<br>▸ Using rock saws instead of blasting<br>▸ During clearing, using excavators with grabs and rake attachments instead of chainsaws<br>▸ Mulching at locations away from sensitive receptors<br>▸ Avoiding onsite fabrication work, where possible<br>▸ 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<br>▸ When piling, avoid dynamic compaction using large tamping weights near sensitive and critical receptors where possible<br>▸ Reducing energy per blow when piling (consider first whether this may result in prolonged exposure with no realised reduction in community disturbance). |
| | Blasting | ▸ Vibration impacts from blasting will be assessed by the Principal Contractor once the locations and depths of blasting and the charges to be used are confirmed. This assessment will confirm the receptors/locations at which blasting impacts are expected to exceed the Project blasting vibration performance objectives as specified in CoP Vol 2 and DEHP Guideline, *Noise and Vibration from Blasting* (DEHP, 2016c), if at all.<br>▸ Where blasting impacts are expected to exceed the Project blasting performance objectives, as specified in CoP Vol 2 and DEHP Guideline, *Noise and Vibration from Blasting* (DEHP, 2016c), the following measures are proposed, where practicable:<br>▸ Reducing the charge size by use of delays and reduced charge masses<br>▸ Ensuring adequate blast confinement to minimise the amount of overpressure<br>▸ Avoiding secondary blasting, where possible. The use of rock breakers or drop hammers may be an acceptable alternative.<br>▸ Avoiding blasting during heavy cloud cover or during strong winds blowing towards sensitive receptors<br>▸ Establishing a blasting timetable through community consultation, with blast times negotiated with surrounding sensitive receptors.<br>▸ Residents, occupants and other stakeholders within 1 km radius of a blast location (or wider, if deemed appropriate by pre-blast assessment) will be notified a minimum of three calendar days in advance of a blast occurring. |

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Construction (continued) | Use and siting of plant | ▸ Where possible, plant will be located and oriented away from nearby receptors, e.g. non-resident workforce accommodation<br>▸ Where possible, the duration of simultaneous operation of noise or vibration-intensive plant will be minimised. Plant and equipment used intermittently or no longer in use will be throttled or shut down.<br>▸ Construction plant, vehicles and machinery will be maintained and operated in accordance with manufacturer's instructions to minimise noise and vibration emissions. |
| | Silencers and dampers | ▸ All mechanical plant near sensitive receptors will be silenced by best practical means, such as:<br>  ▸ Internal combustion engines will be fitted with a suitable muffler, operating as per the manufacturer's specifications<br>  ▸ Pneumatic tools will be fitted with an effective silencer on their air exhaust port, where feasible and practicable<br>  ▸ Aggregate bins and chutes will be lined with a rubber material, to dampen the vibration of the structure<br>  ▸ When piling, acoustic damping will be provided to sheet steel piles to reduce vibration and resonance<br>  ▸ When piling, resilient pads will be used between pile and hammerhead. Care will be taken when selecting a resilient pad, as energy is transferred to the pad in the form of heat.<br>▸ Where vibration impacts at sensitive receptors are expected to exceed the Project vibration performance objectives as specified in CoP Vol 2 (refer Section 22.11.9.2), cut-off trenches to interrupt the direct transmission path of vibrations between source and receptors may be provided, where reasonable and safe to do so. |
| | Shield stationary noise sources | ▸ Stationary noise sources (such as pumps, compressors, generators, etc.) near noise-sensitive receptors will be shielded or enclosed, where feasible and reasonable. |
| | Shield sensitive receptors from noise sources | ▸ Where possible, structures and noise-emitting plant will be located such that the structures provide some shielding to nearby receptors. Structures include:<br>  ▸ Temporary site buildings, such as sheds<br>  ▸ Materials stockpiles<br>  ▸ Fencing<br>  ▸ Storage/shipping containers.<br>▸ The need for and practicability of temporary noise barriers will be assessed following confirmation of the construction methodology for the Project during the detail design phase<br>▸ If temporary noise barriers are required, the location, design and timing of need will be documented in the Noise and Vibration Management Sub-plan, as a component of the CEMP. |
| | Minimise disturbance arising from construction vehicle movements and delivery of goods to construction sites | ▸ Non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on all construction vehicles and mobile plant regularly used onsite and for any out-of-hours work<br>▸ Site access points and roads will be sited as far as is practical from sensitive receptors<br>▸ Acoustic shielding will be considered if loading/unloading areas are close to sensitive receptors<br>▸ Delivery vehicles will be fitted with straps rather than chains, where possible<br>▸ Designated parking areas for light vehicles and trucks will be established away from residences |

| Delivery phase | Aspect | Mitigation measures |
|---|---|---|
| Construction (continued) | Construction traffic | ▸ To reduce noise from construction vehicles, where reasonable to do so:<br>  ▸ Regularly grade unsealed roads<br>  ▸ Fill in potholes on sealed access roads and hardstand areas.<br>▸ Marshalling and queuing of trucks and worksite vehicles to occur away from residential areas and other sensitive receptors, where possible<br>▸ Where practicable, night-time construction traffic would be redirected away from noise-sensitive receptors<br>▸ The speed of construction traffic restricted to the sign-posted speed limit and maintained near noise-sensitive receptors. |
| Operation | Rolling stock noise | ▸ Train operators implement a program of routine wagon maintenance to remove identified defects that would assist in managing noise events that could cause disturbance. |
| | Vibration | ▸ Undertake a pre-operation structural survey of cultural areas of interest if they are retained and situated within 15 m of the outer rail, to establish the condition of these areas of interest for comparison in the event of future structural concerns. |

### 22.11.9.4 Monitoring

The following section describes the surveys and monitoring that will be conducted during the pre-construction, construction and operation phases of the Project.

Implementation of other noise and vibration elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

#### Pre-construction

Building condition/dilapidation surveys will be undertaken pre-construction at receptors identified as being particularly sensitive to vibration, including heritage buildings. Building surveys will also be undertaken at vibration-sensitive receptors that are expected to exceed the structural damage vibration objectives in Section 22.11.9.2.

#### Construction

During construction, vibration monitoring will be undertaken at locations where the potential for building/structural damage risk has been identified due to potential exceedance of the structural damage objectives in Section 22.11.9.2. Vibration monitoring will be undertaken by a suitably qualified professional, in accordance with the CoP Vol 2.

Noise monitoring will be undertaken to verify compliance with construction-phase objectives at locations and at times nominated in the Noise and Vibration Management Sub-plan. Noise and/or vibration monitoring may also be undertaken in response to legitimate noise or vibration complaints.

#### Operation

Pre-operation structural surveys of areas of heritage interest will be conducted if they are retained and situated within 15 m of the outer rail, to establish the condition of these areas of interest for comparison in the event of future structural concerns.

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 daytime and night-time rail operations and determine the $L_{Aeq(15\ hour)}$ daytime, $L_{Aeq(9\ hour)}$ night-time and $L_{Amax}$ rail noise levels at the most affected sensitive receptors
- Assess the Project's compliance with the adopted operational noise and vibration objectives
- Provide an assessment of the effectiveness of any noise and vibration management and mitigation measures implemented on the Project
- Identify, if required, further noise and vibration mitigation measures to meet the adopted operation noise and vibration objectives.

An Operational Noise and Vibration Monitoring Plan will be developed, prior to the commencement of operation, to establish the framework for operational monitoring. The Operational Noise and Vibration Monitoring Plan will be developed based on the following principles:

- Monitoring will be consistent with the requirements of relevant acoustic standards and guidelines for monitoring environmental and transport noise and vibration
- Monitoring will be scheduled with consideration to:
  - The rail movements during each daytime and night-time 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.
- Subject to land access approval, monitoring will be conducted at 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 will be considered to adjust the free-field level for a noise level at the building façade.
- If monitoring within a property is deemed necessary, the noise monitoring would 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 horizontal, vertical and axial direction of displacement (movement). Vibration will be monitored as the Peak Particle Velocity (mm/s) and vibration acceleration (m/s$^2$).
- If the noise and/or vibration levels are above the applicable objectives 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 levels, turnouts, locomotive engine exhausts) will be identified to inform the investigation of reasonable and practicable mitigation measures.

## 22.11.10 Cultural heritage

### 22.11.10.1 Environmental outcomes

- Construction will be managed under the Cultural Heritage Management Plans (CHMPs) for the Project between ARTC and Bigambul People, Western Wakka Wakka People and the endorsed Aboriginal parties for the unclaimed area in 2018 (CLH017009) prepared and executed in accordance with the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act).
- Construction works are designed, located and undertaken to avoid or minimise impacts or disturbance of Aboriginal, historic and natural heritage items.

### 22.11.10.2 Performance criteria

- Comply with the approved CHMPs under the ACH Act
- Provide opportunities for ARTC staff and contractors to learn about the Aboriginal cultural heritage and non-Indigenous heritage associated with delivery of the Inland Rail Program
- Clearing extents avoid impacts to previously undisturbed areas, as far as practicable
- Project works avoids direct and indirect impacts (e.g. vibration) to identified items/sites/areas of Aboriginal heritage significance, historic and natural heritage significance, where practicable.

### 22.11.10.3 Cultural Heritage Management Plans

The ACH Act is intended to provide effective recognition, protection and conservation of Aboriginal cultural heritage. The ACH Act protects Aboriginal 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.

A person who carries out an activity is taken to have complied with the cultural heritage duty of care in relation to Aboriginal cultural heritage if, among other things, the person is acting under an approved CHMP.

CHMPs for the Project were developed between ARTC and the relevant Aboriginal parties in 2018 (CLH017009) and approved under the ACH Act. Indigenous cultural heritage will be managed under the approved CHMPs. These CHMPs have been approved under the ACH Act and consequently meet all the requirements for the identification, assessment and management of Aboriginal heritage under the Project's ToR and the ACH Act.

The scope of the CHMPs only covers the construction of new rail transport infrastructure and associated structures, as well as the corridor owned/managed by ARTC, and not QR maintenance of the existing rail corridor. Details of these CHMPs are confidential to the signatories and are not provided within this chapter.

### 22.11.10.4 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are provided in Table 22.21.

### 22.11.10.5 Monitoring

Surveys and monitoring specified in Section 22.11.9.4 will apply to locations of heritage interest.

Implementation of other heritage elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.21 PROPOSED MITIGATION MEASURES—ALL HERITAGE**

| Phase | Aspect | Mitigation and management measures |
|---|---|---|
| Detail design | All heritage | Design will be developed and refined in response to the outcomes of additional heritage surveys undertaken through the detail design phase to avoid direct impacts to identified items or sites of Indigenous, historic and natural heritage significance, where possible and practical to do so. |
| | Non-Indigenous heritage | Undertake archaeological survey of heritage sites that are complexes within the Project footprint, to map elements and identify areas of possible subsurface deposit. These complexes are:<br>▸ Gibinbell shearing complex (B2G-19-H02)<br>▸ Yelarbon railway complex (B2G-19-H11)<br>▸ Homestead complex (B2G-19-H14). |
| Pre-construction | All heritage | A Cultural Heritage Management Sub-plan will be developed as a component of the CEMP and will detail mitigation and management measures to be implemented during construction in relation to cultural heritage. The Cultural Heritage Management Sub-plan will be separate to the CHMPs for the Project and will relate to all heritage aspects of importance to all stakeholders. It will include:<br>▸ Requirements for:<br>▸▸ Site induction<br>▸▸ Training<br>▸▸ Heritage monitors<br>▸▸ Inspections<br>▸▸ Audits<br>▸▸ Corrective actions<br>▸▸ Notification and classification of environmental incidents<br>▸▸ Record keeping<br>▸▸ Monitoring and performance objectives for handover on completion of construction.<br>▸ Specific management requirements for sites/items that cannot be avoided during construction, as agreed with owners or managers of each site/item, particularly the following sites that may experience a major magnitude of direct change:<br>▸▸ Gibinbell shearing complex (B2G-19-H02)<br>▸▸ Cancer charity tree (B2G-19-H06)<br>▸▸ Yelarbon Mill 2 (B2G-19-H09)<br>▸▸ Homestead complex (B2G-19-H14)<br>▸▸ Outbuildings (B2G-19-H19)<br>▸▸ Protest public art (B2G-19-H22)<br>▸▸ Pampas Memorial Hall (B2G-19-H25)<br>▸▸ Archaeological site (B2G-19-H34). |

| Phase | Aspect | Mitigation and management measures |
|---|---|---|
| Pre-construction (continued) | All heritage | ▸ Communication protocols for informing staff and contractors of the nature and location of heritage items and need to avoid impacts, detailing the locations on site maps<br>▸ Appropriate measures to identify and respond to (avoid, minimise, mitigate) impacts on matters of non-Indigenous heritage<br>▸ An unexpected finds procedure, including assessment by a suitably qualified person and notification obligations under the applicable heritage legislation<br>▸ Procedures for responding to encounters with potential burial sites or potential human skeletal material in accordance with legislative requirements<br>▸ Clearing extents/site boundary/limit of works are consistent with the detail design requirements and marked with flagging or marking tape, signage or other suitable means to delineate 'no-go areas'<br>▸ Clearing extents are limited to that required to construct the works. |
| | Indigenous heritage | ▸ Impacts to Indigenous heritage will be managed through the CHMPs, in accordance with the ACH Act, which includes the following management measures:<br>  ▸ A cultural heritage induction for Project staff<br>  ▸ Developing a cultural heritage awareness program<br>  ▸ Provisions for managing unexpected finds of cultural material or sites (including burials). |
| | Non-Indigenous heritage | ▸ Pre-construction and post-construction condition/dilapidation surveys to be undertaken at all heritage places at risk of vibration impact. These places are to be confirmed following the completion of detail design, but are expected to include:<br>  ▸ Yelarbon & District Soldiers Memorial Hall (B2G-19-H04)<br>  ▸ Anzac Memorial Garden (B2G-19-H05)<br>  ▸ Church (former) (B2G-19-H07)<br>  ▸ Yelarbon Mill 1 (B2G-19-H08)<br>  ▸ Petrol station (B2G-19-H10)<br>  ▸ Homestead complex (B2G-19-H14)<br>  ▸ Homestead (B2G-19-H15)<br>  ▸ Outbuildings (B2G-19-H19)<br>  ▸ Protest public art (B2G-19-H22)<br>  ▸ Pampas Memorial Hall (B2G-19-H25)<br>  ▸ Homestead complex (B2G-19-H33). |

| Phase | Aspect | Mitigation and management measures |
|---|---|---|
| Pre-construction (continued) | Non-Indigenous heritage | ▸ If warranted by results of archaeological survey, undertake a two-stage archaeological excavation, including:<br>  ▸ Stage 1—Test excavation to confirm subsurface deposit<br>  ▸ Stage 2—Salvage excavation of subsurface deposits (if required).<br>▸ Undertake archival photographic recording of sites or places that will be directly impacted by the Project in accordance with the *Guideline: Archival Recording of Heritage Places* (DEHP, 2013b)<br>▸ Copies of archival records will be lodged with the John Oxley Library and local libraries or historical societies, as appropriate<br>▸ Relocation of heritage items is generally undesirable, as setting forms an intrinsic part of heritage value (International Council on Monuments and Sites (ICOMOS), 2013); however, subject to site owner/manager agreement, it may be appropriate to relocate buildings or items of moveable heritage to an alternative location<br>▸ Potential for vibration impacts to heritage sites to be re-assessed following confirmation of the location of activities, plant types and methods of construction<br>▸ Building condition/dilapidation surveys will be undertaken at heritage buildings within 60 m of possible vibratory roller operation or when other activities may result in exceedance of the structural damage vibration criteria in DIN 4150.3 (Deutsches Institut für Normung, 1999) and recommended in CoP Vol 2 (DTMR, 2016). |
| Construction | All heritage | ▸ Temporary protective barricading will be installed around heritage places or artefacts that are located within the Project footprint and are to be retained<br>▸ If a suspected Indigenous 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 Cultural Heritage Management Sub-plan will be followed<br>▸ Any responses to chance finds will only be undertaken by archaeologists qualified and experienced in the relevant discipline<br>▸ 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 Cultural Heritage Management Sub-plan processes for the notification and management of human remains will be instigated. |
| | Indigenous heritage | ▸ Impacts to previously unregistered and unassessed items or places of cultural heritage significance will be managed in accordance with the CHMPs. |

| Phase | Aspect | Mitigation and management measures |
|---|---|---|
| Construction (continued) | Non-Indigenous heritage | ▸ The construction methodology will be tailored to limit vibration impacts to heritage-listed structures<br>▸ Vibration at heritage places (refer above) to be kept below 2 mm/sec (in accordance with DIN4150-3)<br>▸ If warranted by results of archaeological survey, archaeologists will monitor ground-breaking works to identify any subsurface deposits<br>▸ Vibration will be monitored at places where threshold exceedances are possible<br>▸ Where vibration exceedances occur, the construction methodology will be modified, where possible, to reduce impact, such as:<br>  ▸ Using damped tips on rock-breakers<br>  ▸ Using rock saws instead of blasting<br>  ▸ Using excavators with grabs and rake attachments instead of chainsaws during clearing<br>  ▸ Mulching cleared material at locations away from sensitive receptors<br>  ▸ Avoiding onsite fabrication work, where possible<br>  ▸ 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<br>  ▸ When piling, avoiding dynamic compaction using large tamping weights near sensitive and critical receptors, where possible<br>  ▸ Reducing energy per blow when piling (consider first whether this may result in prolonged exposure with no realised reduction in community disturbance).<br>▸ 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<br>▸ Appropriately sized plant and equipment will be selected for each construction task, such as vibratory compactors and rock excavation equipment<br>▸ Any damage to heritage structures will be repaired in a way that conserves the heritage values of the place (refer to the Burra Charter, Article 1.4). |
| Operation | Non-Indigenous heritage | ▸ Potential for vibration impacts to heritage sites will be assessed before maintenance activities are undertaken<br>▸ 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 and recommended in CoP Vol 2. |

## 22.11.11 Traffic, transport and access

### 22.11.11.1 Environmental outcomes

- Project construction traffic is managed to avoid or minimise and mitigate adverse impacts on road safety and traffic flow, public transport, school bus routes, property access and existing road pavements
- Workforce parking is provided within the disturbance footprint and managed to avoid, minimise and mitigate adverse impacts to the local community
- Traffic access for emergency services to construction worksites and adjoining properties and wider road network identified within the Traffic Impact Assessment is maintained throughout the construction phase
- Reasonable access is maintained to properties throughout Project works.

### 22.11.11.2 Performance criteria

- Construction vehicles travel on designated routes defined in the Traffic Management Sub-plan
- Construction vehicles, including spoil haulage vehicles, are managed to avoid school zones during school pick up and drop off, and minimise the use of local streets
- Construction vehicles that are 'heavy vehicles' are managed appropriately to avoid speeding, queuing, traffic incidents and to manage and avoid over-loading, spills and safety incidents
- Information about the timing and scale of changes to traffic and transport conditions on traffic networks in the vicinity of Project works is provided in advance to the local community, road users and on request to other people interested in the Project works
- Access to private properties is maintained during construction, unless an acceptable solution is agreed with the property owner
- A Traffic Management Sub-plan will be developed and implemented by the Construction Contractor and communicated to all site personnel during site induction, including requirements for traffic routes and parking
- The construction workforce is provided with adequate onsite parking and use of parking is reinforced during induction and training.

### 22.11.11.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation phases of the Project are included in Table 22.22.

### 22.11.11.4 Monitoring

Pavement condition assessments will be conducted in accordance with the approved RUMP.

The effectiveness of traffic controls will be monitored in accordance with the approved Traffic Management Sub-plan and RUMP.

Implementation of traffic and transport elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.22 PROPOSED MITIGATION MEASURES – TRAFFIC, TRANSPORT AND ACCESS**

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design | Road safety | ▸ A safety assessment of the detail design and proposed construction traffic routes will be required, in accordance with the GTIA. The safety assessment will determine the locations where road safety audits are required.<br>▸ As a minimum, road safety audits will be undertaken for all public level crossings included in the detail design to confirm:<br>▸ For detail design:<br>- The safety measures proposed by the detail design are appropriate<br>- The detail design is appropriate for the traffic conditions<br>- The crossing is designed to provide suitable stacking and sight distance.<br>▸ For construction traffic route planning:<br>- Safety controls at existing level crossings including those which may not be on the Project alignment are appropriate for the anticipated type of traffic during construction of the Project. ARTC will utilise previous ALCAM assessments for existing level crossings, that are made available by QR, as an input into this assessment<br>- The design and condition of existing level crossings are appropriate to withstand the size, mass and frequency of construction vehicles expected to use each crossing.<br>▸ Road safety audits will be undertaken by an accredited road safety auditor, in accordance with relevant parts of Austroads' *Guide to Road Safety Part 6A: Implementing Road Safety Audits* (Austroads, 2019)<br>▸ Consultation with relevant local governments, DTMR, QR and emergency service providers (e.g. QFES, QAS, QPS) will continue through the detail design and construction planning process to ensure that safety concerns and issues are addressed through development of the detail design and the construction methodology. Through this consultation process, stakeholders will be provided with details of the relevant construction management plans and the Traffic Management Sub-plan.<br>▸ 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 *Road Planning and the Design Manual—Edition 2: Volume 3, Supplement to Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (DTMR, 2017). |
| | Road network | ▸ The traffic impact assessment will be updated and finalised, in accordance with the process specified in the GTIA, to reflect the detail design, construction method (including material sources and quantities) and the finalised construction traffic routes<br>▸ A travel demand management awareness campaign will be developed to inform the public on the proposed construction works and its potential effect on local road network operations. The purpose of this awareness campaign would be to relieve congestion by encouraging travel outside of peaks and increase public awareness of planned construction works.<br>▸ A Traffic Management Sub-plan will be prepared prior to the commencement of construction, as a component of the CEMP, as a joint effort between the Principal Contractor, ARTC, DTMR, QR, local governments and an accredited road-safety auditor, once preferred construction routes are confirmed. This plan will reflect the finalised traffic impact assessment and will:<br>▸ Outline:<br>- Traffic demand<br>- Routing<br>- Controls<br>- Special vehicle requirements<br>- How works to accommodate these are integrated into the operation of the road network. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Road network (continued) | ▸ Detail measures to:<br>– Safely manage traffic when undertaking works in a road reserve<br>– Minimise traffic delays resulting from the development/construction<br>– Manage construction vehicles accessing and leaving the site<br>– Manage safety and maintain asset integrity on construction traffic routes, including existing level crossings that are not on the Project alignment<br>– Manage road intersections that experience increased usage due to construction vehicle movements<br>– Maintain property access<br>– Minimise disruption to adjacent properties<br>– Minimise disturbance to the environment<br>– Meet the requirements of legislation and codes of practice regarding traffic management<br>– Cater for special events, e.g., Millmerran Camp Oven Festival and regional cycling events.<br>▸ Acknowledge and consider:<br>– Designated construction routes<br>– Approaches to seasonality, including usage of stock routes<br>– Areas of significant pedestrian and cyclist activity<br>– Standard hours of work and deliveries<br>– Specific hours of deliveries impacted by local land uses (e.g. school zones)<br>– Bus service operations (e.g. public transport, school buses, long distance services)<br>– Workforce transportation<br>– Workforce parking, with the provision of onsite tool storage, where practicable.<br>▸ Identify secondary, alternative construction routes, in the event that the primary route is blocked off by an emergency/accident<br>▸ Be in accordance with the latest edition of the Manual of Uniform Traffic Control Devices: Part 3: Traffic control for works on roads (DTMR, 2019d).<br>▸ Works identified within the Traffic Management Sub-plan may require the preparation of Traffic Control Plans (TCPs), also referred to as Traffic Guidance Schemes. Specific TCPs are required for each separate element of the works identified to be undertaken within the Traffic Management Sub-plan. TCPs detail the traffic control signs, devices and measures to be applied at work sites to warn traffic and guide it through, or past, a work area or temporary hazard. This includes plans/diagrams that illustrate the arrangement of signage and devices used to manage traffic. Highlight the temporary signage, markings, speed zones, barriers and works with the aim to:<br>▸ Warn drivers of the changes to the usual conditions<br>▸ Inform drivers about the changing conditions<br>▸ Guide drivers through the work sites<br>▸ Ensure safety of works and external road users. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Road network (continued) | ▸ A Road Use Management Plan (RUMP) will be prepared for the Project in accordance with the GTIA to support works to the existing road network. The purpose of developing the RUMP for the Project will be to:<br>▸ Identify, where required, appropriate traffic and transport management strategies for the use of the State-controlled roads and local government roads for each of the construction stages of the Project<br>▸ Minimise the impact on the efficiency of road networks<br>▸ Minimise safety impacts from construction vehicles entering and leaving construction sites.<br>The RUMP will:<br>▸ Summarise updated Project traffic information on which the updated road impact assessment and proposed mitigation strategies are based<br>▸ Briefly list roles and responsibilities for RUMP implementation<br>▸ Detail finalised impact mitigation strategies, focusing on controls-based or road-use management strategies. Road-use management strategies include:<br>– Use of variable message signs – Travel demand management – Use of shuttle buses to transport workers.<br>▸ Avoiding peak hour traffic, especially near schools/bus routes.<br>▸ The RUMP will be developed in consultation with DTMR, local governments and emergency service providers and will be finalised prior to the commencement of construction<br>▸ The locations on construction traffic routes where turning treatments are required will be confirmed through assessment in accordance with the requirements of Austroads *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management* (Austroads, 2020)<br>▸ Where required, turning treatments will be designed in consultation with the relevant road-controlling authority and in accordance with the requirements of Austroads *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (Austroads, 2017). Turning treatments will be documented in the RUMP. |
| | Access | ▸ The detail design will be developed to ensure that legal access for private properties is maintained<br>▸ ARTC will continue to consult with potentially impacted landowners through the detail design and construction planning process to develop and implement property-specific measures to avoid or minimise impacts that could affect property access<br>▸ ARTC will continue to consult with residents of Brookstead, TRC and DTMR to refine and conclude the optimal road reconfiguration and access solution for the township of Brookstead<br>▸ The construction and operational phase provision of suitable private property access 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.<br>▸ Consultation with Toowoomba and Goondiwindi Local Disaster Management Groups, in addition to QPS, QAS and QPWS, will continue through the detail design process to ensure that appropriate access and egress solutions are incorporated into the detail design, to enable movements across the rail corridor<br>▸ Consultation with the Department of Education to ensure that mitigation measures required to be implemented to maintain the current levels of access and operation of Brookstead State School, Southbrook Central State School and Yelarbon State School are incorporated into the detail design and/or construction planning. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Access | ▸ Safe corridor access and vehicle turnaround points will be provided for maintenance work to ensure sufficient setback while working adjacent to live railway. Maintenance and emergency access roads will be designed such that it will allow separation, to prevent interaction between trains and vehicles without impeding escape or rescue activities<br>▸ Traffic management arrangements for construction sites, laydown areas or non-resident workforce accommodation requiring access directly off/onto a State-controlled road will need to be negotiated with and approved by DTMR<br>▸ All construction access points will be designed in accordance with Australian Standards and include:<br>  ▸ Appropriate sighting distances in both the vertical and horizontal<br>  ▸ Deceleration lanes for trucks<br>  ▸ Acceleration lanes for re-entering construction traffic<br>  ▸ Appropriate signage and line marking<br>▸ Where possible, access will be provided from secondary roads to minimise the potential disruptions to the nearby arterial road network. |
| | Interface with existing QR network | ▸ Detail design will be developed in accordance with the requirements of the Basis of Design<br>▸ The interoperability of the ATMS with QR's network will be confirmed through consultation with QR, with compatibility requirements incorporated into the detail design for the Project<br>▸ Track design will incorporate trackside monitoring systems, which will detect faults in train wheel set and monitor rail wheel condition and defects. The locations for trackside monitoring systems will be confirmed and incorporated into the detail design.<br>▸ The construction approach 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 who are reliant on access to these operational rail lines (e.g. GrainCorp). This consultation will be used to inform:<br>  ▸ The programming of construction activities requiring track possessions<br>  ▸ Effective communication strategies with QR and other stakeholders.<br>▸ The agreed construction approach within the existing rail corridor for the South Western Line and the Millmerran Branch Line will be formulated in a wayleave agreement, or similar, between ARTC and QR. |
| | Road–rail interfaces | ▸ The design of road–rail intersections will continue to be developed in consultation with DTMR and QR to be in accordance with the principles established in the *Office of the National Safety Regulator (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, 2016b) and the *Queensland Level Crossing Safety Strategy 2012–2021* (DTMR, 2012)<br>▸ Physical controls, such as boom gates and/or warning lights, will be incorporated into the design at active level crossing locations in accordance with the *Guide to Development in a Transport Environment: Rail* (DTMR, 2015), *Manual of Uniform Traffic Control Devices Part 7: Railway Crossings* (DTMR, 2019e) and ARTC *Engineering Code of Practice—Level Crossings* (ARTC, 2011)<br>▸ Detail design of appropriate exclusion fencing is required near roads or where trespass is likely to occur. Specific fencing requirements are to be agreed through discussion with adjoining landowners and asset owners. Agreed fencing requirements will be documented in a revised fencing strategy for the Project. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Pavement | ▸ A detailed pavement impact assessment will be undertaken during the detail design phase on State-controlled roads that will be used by construction traffic. The assessment will be in accordance with the GTIA, once the Principal Contractor has been appointed and construction routes have been confirmed. The detailed pavement impact assessment will identify measures to avoid, reduce or mitigate effects on the pavement life of State-controlled roads that will be used by the Project, such as:<br>▸ Provide a payment contribution for future pavement works<br>▸ Provide extra pavement width (e.g. to prevent edge degradation)<br>▸ Provide additional pavement thickness<br>▸ Seal an unsealed pavement<br>▸ Provide maintenance during construction<br>▸ Undertake pavement rehabilitation.<br>▸ For sealed local government roads, a condition assessment will be conducted (e.g. National Association of Australian State Road Authorities roughness count) prior and post construction activities, as well as at annual intervals during construction<br>▸ For unsealed local government roads, a visual condition will be conducted (either manual or vehicle mounted high speed condition survey) prior to and post construction activities. The scope for pavement assessments of unsealed local government roads will be agreed with relevant local governments before construction commences<br>▸ The scope and frequency of pavement condition assessments that are to be required during the construction period will be documented in the RUMP. |
| | Consultation | ▸ The detail design and construction method for the Project will be developed in combination with continued consultation with relevant local governments, DTMR, QR and emergency service providers (e.g. QFES, QAS and QPS)<br>▸ Continued consultation will be necessary with QR to confirm:<br>▸ Interconnectivity and interoperability details of the Inland Rail network with the existing railway network<br>▸ Construction approach for the Project within existing rail corridor. The agreed construction approach in these locations will require a wayleave agreement, or similar, between ARTC and QR<br>▸ Continued consultation with Toowoomba Wellcamp Airport will be required to ensure that the detail design and construction methodology for the Project do not impact on the current and planned future operations of the airport |
| Pre-construction and construction[1] | Road network | ▸ Construction works cannot commence within a State-controlled road corridor without written approval from DTMR. This will be required to be obtained through consultation with DTMR during the detail design phase of the Project.<br>▸ The Traffic Management Sub-plan will be implemented and reviewed annually for effectiveness, including review by relevant road-controlling authorities<br>▸ Implement the travel demand management awareness campaign (refer above) to notify relevant local governments, DTMR, emergency service providers and community members of the construction activities occurring in support of the Project, temporary alternations to the existing road network and potential impacts on journey time<br>▸ Use directional signage and line marking around construction sites and the surrounding network, including using Variable Message Signs (VMS), if appropriate<br>▸ Develop and implement specific traffic management plans for special events (e.g. Australian Camp Oven Festival in Millmerran, regional road cycling events), to be developed in conjunction with DTMR, relevant local governments and event organisers. |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction and construction[1] (continued) | Road safety | ▸ ARTC's existing *Work Instruction for Fatigue* (WHS-WI-423) (available on the ARTC extranet **artc.com.au/library/WHS-WI-423.pdf**) will be implemented for the Project to ensure conditions of work of personnel align with requirements of the *Work Health and Safety Act 2011* (Qld) (WHS Act)<br>▸ Construction traffic on known school bus routes will be restricted to only essential movements during pick-up and set-down times on school days<br>▸ Relevant emergency services (e.g. QFES, 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<br>▸ Relevant emergency services will be notified in advance prior to the movement of all hazardous/dangerous or oversize construction material and equipment. Temporary traffic management to be implemented, e.g. road signs stipulating reduced speed limits.<br>▸ All Oversize Overmass and Restricted Access Vehicles will comply with the *Guideline for Excess Dimension Vehicles in Queensland* (DTMR, 2013d) in terms of transport safety<br>▸ 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 government and documented in the Traffic Management Sub-plan within the CEMP.<br>▸ Licensed transporters operating in compliance with *Australian Code for the Transport of Dangerous Goods by Road and Rail* (Commonwealth of Australia, 2018b) will be used for the transportation of dangerous goods<br>▸ A 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 roads be required<br>▸ Temporary road works, including diversion and signage, will be in accordance with the *Manual of Uniform Traffic Control Devices: Part 3—Traffic control for works on roads* (DTMR, 2019d). |
| | Road–rail interface | ▸ ARTC and QR will jointly undertake pre-construction and post-construction condition surveys of all existing level crossings that will be used by construction traffic. The need for rectification works will be determined through comparison of pre-construction and post-construction survey results. The party responsible for the undertaking of rectification works and the scope of those works will be agreed through discussions between ARTC and QR<br>▸ Level crossings that are under possession of the constructing authority will be provided with warning signage, line marking, and other relevant controls, in accordance with the *Guide to Development in a Transport Environment: Rail* (DTMR, 2015), *Manual of Uniform Traffic Control Devices Part 7: Railway Crossings* (DTMR, 2018c) and with the Traffic Management Sub-plan and RUMP procedures. |
| | Interface with existing QR network | ▸ In accordance with Section 255 of the *Transport Infrastructure Act 1994* (Qld), works cannot commence within the existing rail corridor without QR's written approval, unless this process is overwritten by a pre-agreement between ARTC and QR<br>▸ If construction of Project components within 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<br>▸ 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). |

| Delivery phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Pre-construction and construction[1] (continued) | Pavement | ▸ Install shaker grids or rumble pads at entry/exit points from all laydown areas<br>▸ Pavement condition assessments during and at the conclusion of construction will be carried out at the frequency specified in the RUMP<br>▸ Local government and DTMR-approved maintenance contractors will be used for construction, modification or rectification of roads. This may entail works such as crack sealing, pothole patching, edge repairs, resealing and grading (of gravel roads), etc. |
| Operation | Road network | ▸ Develop a protocol between ARTC and emergency service providers, defining appropriate and co-ordinated responses and communication in the event of emergencies during operations, e.g. access to real-time information about crossing times and access to alternate crossing points). |
| | Road–rail interface | ▸ ARTC will conduct routine inspections of crossing infrastructure in accordance with ARTC's codes of practice, and will regularly review crossing performance and incident information to identify opportunities for improved performance and further reduction in risk<br>▸ 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.<br>▸ Key actions outlined within the *Queensland Level Crossing Safety Strategy 2012–2021* (DTMR, 2012) will be implemented, including:<br>  ▸ Promoting level crossing safety through public awareness campaigns<br>  ▸ Maintain data collection, including near-miss reporting<br>  ▸ Maintain level crossing infrastructure in accordance with Australian Standards. |
| | Access | ▸ The rail maintenance access roads will be available for use by emergency vehicles in the event of an incident. |

**Table notes:**
1. Combined, as there is no distinction between mitigation measures applicable for pre-construction and construction phases of the Project

## 22.11.12 Hazard and risk

### 22.11.12.1 Environmental outcomes

- Appropriate measures are implemented to avoid or minimise the risk of a health, safety or environmental incident during Project works
- Emergency management plans are in effect to manage potential natural hazards including flooding, fire, cyclone or heatwave events during Project works.

### 22.11.12.2 Performance criteria

- A safe working environment is maintained for the construction workforce, near neighbours and other stakeholders
- 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
- Comply with relevant Australian Standards for the handling and storage of hazardous goods.

### 22.11.12.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.23.

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

- Flooding (refer Table 22.11)
- Landslide, sudden subsidence, movement of soil or rocks (refer Table 22.4)
- Contaminated land (refer Table 22.4)
- Rail incidents (refer Table 22.22)
- Road–rail interfaces (refer Table 22.22)
- Private access (refer Table 22.22)
- Wildlife and biodiversity (refer Table 22.6).

### 22.11.12.4 Monitoring

Implementation of hazard and risk elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.23 PROPOSED MITIGATION MEASURES—HAZARD AND RISK**

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Detail design | Natural | Bushfire | ▸ Appropriate access and egress solutions throughout Whetstone and Bringalily State forests will be incorporated into the detail design and continued access will be allowed for in the construction methodology. This aspect of the design will be supported by consultation with DAF and QPWS (DES).<br>▸ The rail corridor will be designed to be free of woody vegetation, thereby acting as a firebreak in bushfire risk areas, e.g. Whetstone and Bringalily State forests. This aspect of the design will be supported by consultation with DAF to ensure sufficient access is available for emergency access and firefighting activities.<br>▸ Where provided, the rail maintenance access road (RMAR) will be designed to be suitable for use by emergency response vehicles. |
| | Natural | Climatic conditions | ▸ The detail design will be developed to accommodate the outcomes of climate analysis. This analysis will be conducted in accordance with the *Australian Rainfall and Runoff Guidelines* (Ball et al., 2016) by increasing the rainfall intensities for the local catchments to reflect Representative Concentration Pathway (RCP) 8.5. RCP8.5 is a future climate trend projection, reflective of a low effort made to curb greenhouse gas (GHG) emissions; therefore, RCP8.5 projections are reflective of a close to worst-case climactic scenario for 2011. This corresponds to an increase in temperature of 4.2°C in 2090 and an increase in rainfall intensity of 23 per cent. The incorporation of this analysis into design will ensure the Project is designed for the expected effects of climatic conditions (RCP8.5) for the design life of the Project.<br>▸ The use of elastic fasteners or heavier sleepers will be considered to reduce the risk of track buckling as a result of extreme temperatures in future climatic scenarios<br>▸ The type and colour of track materials will be selected to reduce heat load on trackside equipment as a result of extreme temperatures in future climatic scenarios<br>▸ The track will be designed to conform with all mandatory components of *AS/RISSB 7643—Track Stability* (Standards Australia, 2018c).<br>▸ Adaption strategies for climatic conditions will be identified and adopted through detail design. Strategies may include installing an early flood warning system to alert ARTC to impending flood risks, locating critical electrical systems (signalling, communications huts, etc.) above potential flood zones and considering the use of solar and battery devices to ensure uninterrupted operation of signalling and network communication in the event of power failure. |
| | Project | Historical and abandoned mines | ▸ Additional geotechnical investigations will be undertaken along the entirety of the Project alignment to establish the geotechnical conditions over which the Project will be located, thereby identifying the location of unrecorded abandoned mine workings. This geotechnical information would be used during detail design to establish engineered controls to manage risks associated with such findings. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Detail design (continued) | Project | Design interfaces with utilities | ▸ Utility interface treatments that have been included in the 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.<br>▸ Designs for utility protection, where necessary, will be developed in consultation with the relevant utility owner and be in accordance with the following:<br>▸ Electricity:<br>- *Electrical Safety Act 2002* (Qld)<br>- Electrical Safety Regulation 2002<br>- ENA NENS 03-2006: *National Guidelines for Safe Access to Electrical and Mechanical Apparatus* (Energy Networks Association, 2006)<br>- AS/NZS 7000 *Overhead Line Design* (Standards Australia, 2016c)<br>- Safe *Work Australia Model Code of Practice— Managing Electrical Risks in the Workplace* (Safe Work Australia, 2018b)<br>▸ Gas and petroleum pipelines:<br>- *Petroleum & Gas (Production & Safety) Act 2004* (Qld)<br>- AS 2885 *Pipelines— Gas and liquid petroleum* (Standards Australia, 2008b)<br>- AS/NZS 4645 *Gas Distribution Network* (Standards Australia, 2018d)<br>▸ Communications:<br>- *Telecommunication Cabling Provider Rules 2014*<br>- *Telecommunications Technical Standard (Requirements for customer cabling products*—AS/CA S008) 2015<br>- Australian Standard—*Installation requirements for customer cabling (Wiring Rules)* (Communications Alliance Ltd, 2020)<br>▸ Water:<br>- *Water Supply Code of Australia* (Water Services Association of Australia, 2011)<br>- AS/NZS 2566 *Buried flexible pipeline: Structural design* (Standards Australia, 1998b)<br>▸ Sewerage:<br>- Gravity Sewerage Code of Australia (Water Services Association of Australia, 2014)<br>- Pressure Sewerage Code of Australia (Water Services Association of Australia, 2007)<br>▸ AS/NZS 2566 Buried flexible pipeline: Structural design (Standards Australia, 1998b) |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Pre-construction | Project | Existing infrastructure and utilities | ▸ Utilities within the Project footprint will be surveyed and marked prior to the commencement of construction<br>▸ Where protection or relocation of a utility is required as an outcome of consultation with asset owners and detail design, these works will be undertaken prior to the commencement of construction to reduce the likelihood of impacts to those services<br>▸ Protection or relocation of utilities will be conducted in accordance with relevant legislation, Australian Standards and guidelines (refer above)<br>▸ 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<br>▸ The Roma–Brisbane gas pipeline and the decommissioned Moonie–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* standards (Standards Australia, 2008b) during Project activities. |
| | Project | Asbestos | ▸ A survey of infrastructure that will be removed or disturbed by the Project will be conducted prior to the commencement of construction to identify asbestos-containing materials<br>▸ 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 the:<br>  ▸ *National Environmental Protection (Assessment of Site Contamination) Measure 2013* (NEPC, 2013)<br>  ▸ Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia or equivalent<br>  ▸ Safe Work Australia Model Code of Practice—*How to Manage and Control Asbestos in the Workplace* (2016)<br>  ▸ Safe Work Australia Model Code of Practice—*How to Safely Remove Asbestos* (2018a).<br>▸ 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:<br>  ▸ A Class Licence—Removal of loose (friable) asbestos<br>  ▸ B Class Licence—Removal of bonded asbestos.<br>▸ Asbestos-containing materials will be transported by a licensed service provider and disposed of at an appropriately licensed facility, in accordance with the requirements of the *Waste Reduction and Recycling Act* (Qld) (WRR Act) and the EP Act. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Pre-construction (continued) | Dangerous goods and hazardous chemicals | Storage and handling chemicals | ▸ A Hazardous Materials Management Sub-plan will be prepared and implemented as a component of the CEMP. The sub-plan will be required to:<br>▸ Identify the materials and chemicals required to be stored and used in support of construction, including volumes of each, such as:<br>– Fuel and oil<br>– Greases<br>– Blasting chemicals<br>– Concreting<br>– Welding gases<br>– Pesticides.<br>▸ Specify how dangerous goods and hazardous materials and chemicals will be handled, stored and transported for the Project, with consideration for:<br>– Other dangerous goods being stored simultaneously<br>– Providing resilience from natural events, such as storms and floods.<br>▸ Describe the response procedures, in the event of an incident involving hazardous materials and chemicals or dangerous goods<br>▸ Establish the waste storage and disposal procedures for hazardous materials and chemicals and dangerous goods. |
| | Dangerous goods and hazardous chemicals | Explosives | ▸ A licensed shotfirer (blasting contractor) will be engaged to plan and undertake the necessary blasting activities for excavation of non-rippable rock. The Blasting Contractor will be required to maintain a security management system.<br>▸ A Blast Management Plan will be produced by the appointed Blasting Contractor, in consultation with geotechnical engineers and safety personnel, in support of each blasting event for the Project and will specify procedures to:<br>▸ Prevent misfire<br>▸ Minimise the risk associated with material projected by a blast<br>▸ Minimise adverse effects of ground vibration and shock waves caused by a blast<br>▸ Ensure explosives are not used after either the manufacturer's recommended shelf life or the approved, extended shelf life<br>▸ Ensure public safety, vehicular access and security, including temporary site road closures and warnings notifications before blasting<br>▸ Identify other activities within proximity of explosive use<br>▸ Identify the environment of explosive use, including flood, bushfire, landslide zones. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Construction | Natural | Bushfire | ▸ Hot works and other activities that may act as a source of ignition will be restricted during periods with a Bureau of Meteorology (BoM) fire danger rating of 'extreme' or higher, to reduce the likelihood of construction activities initiating or exacerbating a bushfire<br>▸ 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 ARTC's *Total Fire Bans Procedure* (ETM-13-01) (ARTC, 2019d). Such works may require a permit (e.g. permit to light fire), issued by QFES.<br>▸ Bushfire prevention and response procedures will be incorporated into the CEMP to reduce the likelihood and impact of bushfires ignited or exacerbated by the Project. This will include the provision and positioning of appropriate fire-extinguishing equipment. |
| | Natural | Climatic conditions | ▸ Best-practice opportunities for the reduction of GHG generation during construction will be assessed and adopted, where practical and appropriate to do so, including:<br>▸ Selection of construction materials with low embodied energy<br>▸ In-vehicle monitoring systems for road vehicles. |
| | Project | Fatigue and heat stress management | ▸ ARTC's existing *Work Instruction for Fatigue* (WHS-WI-423) will be implemented for the Project to ensure conditions of work of personnel align with requirements of the *Work Health Safety Act 2011* (Qld).<br>▸ In accordance with ARTC's existing *Work Instruction for Fatigue* (WHS-WI-423), the following hours of work will apply:<br>▸ Maximum scheduled shift length, including travel—13 hours<br>▸ Maximum hours in seven days—60 hours<br>▸ Maximum hours in 14 days—108 hours<br>▸ Minimum break between shifts—8 hours<br>▸ Maximum consecutive night shifts (8 hours)—6 shifts<br>▸ Maximum consecutive night shifts (10 hours)—5 shifts<br>▸ Maximum consecutive night shifts (12 hours)—4 shifts. |
| | Project | Asbestos | ▸ 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.<br>▸ Where identified, asbestos-containing materials will be removed in accordance with the same requirements that apply to pre-construction removal (refer above). |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Construction (continued) | Project | Existing infrastructure and utilities | ▸ Construction activities will be planned and executed to not inhibit the safe and efficient operation of utilities that remain located within the Project footprint<br>▸ Affected businesses and residences will be notified in advance of any planned interruptions (including durations)<br>▸ Disturbance of existing utilities will occur under access arrangements and approval with the relevant asset manager, obtained prior to commencing work<br>▸ 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). |
| | Dangerous goods and hazardous chemicals | Storage and handling chemicals | ▸ Construction facilities where bulk hazardous materials may be used or stored have been located outside of the 1% AEP floodplain in accordance with the intent of the SPP due to the risk of land and water contamination, if flooded. Additionally, the locations where vehicle maintenance and refuelling activities will occur will be located to achieve appropriate separation to riparian vegetation and waterways.<br>▸ 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 SPP.<br>▸ The Hazardous Materials Management Sub-plan (refer above) will be implemented as a component of the CEMP<br>▸ Licensed transporters operating in compliance with the *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2018) will be used for the transportation of dangerous goods<br>▸ Chemicals stored and handled as part of construction activities will be managed in accordance with:<br>  ▸ The *Work Health Safety Act 2011* (Qld) and Regulation<br>  ▸ AS 2187.1:1998 *Explosives—Storage, transport and use Storage* (Standards Australia, 1998a)<br>  ▸ AS 2187.2:2006 *Explosives—Use of Explosives* (Standards Australia, 2006)<br>  ▸ AS 1940:2017 *Storage and Handling of Flammable and Combustible Liquids* (Standards Australia, 2017a)<br>  ▸ AS 3780:2008 *The Storage and Handling of Corrosive Substances* (Standards Australia, 2008a)<br>  ▸ *Australian Code for the Transport of Explosives by Road & Rail* (Workplace Relations Ministers Council, 2009)<br>  ▸ The requirements of chemical safety data sheets.<br>▸ Safety data sheet information will be obtained from the suppliers of chemicals and stored in an easily accessible location<br>▸ Implementation of a Groundwater Monitoring and Management Plan 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 (refer Chapter 13: Groundwater). |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Construction (continued) | Dangerous goods and hazardous chemicals | Explosives | ▸ Where explosives are used during construction, the works will be undertaken by the appointed licensed Blasting Contractor, in accordance with the *Explosive Act 1999* (Qld) and AS 2187:2006 *Explosive—Storage, Transport and Use* (Standards Australia, 2006). Explosives will be stored, handled and transported by the licensed Blasting Contractor, who will be responsible for the security of the explosives for the entire duration of the task, including the segregation of incompatible products.<br>▸ Notification requirements of the *Explosives Act 1999* (Qld) will be as followed:<br>▸ Before undertaking a blast<br>▸ Before importing or exporting explosives<br>▸ When storing or interacting with stored explosives at explosive storage facilities and government activities<br>▸ When there are changes to buildings and vehicles related to the storage or transport of explosives<br>▸ After conducting an explosive trial.<br>▸ The appointed licensed Blasting Contractor will submit a safe blast design and Blast Management Plan (refer above) to the Explosives Inspectorate a minimum of seven days before the scheduled blasting event, for assessment against the requirements under the Act and AS 2187:2006 *Explosive—Storage, Transport and Use* (Standards Australia, 2006). |
| | | | ▸ Record of the amount and the type of explosive purchased and used, and a record of each blast conducted by the appointed licensed Blasting Contractor will be kept in accordance with the *Explosive Act 1999* (Qld)<br>▸ 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<br>▸ 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.<br>▸ 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. |
| Operation | Natural | 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<br>▸ Communication protocols will be established with QFES and QPWS (DES) 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<br>▸ The rail corridor (nominally a minimum of 40 m wide) will be maintained free of woody vegetation. |
| | Natural | Climatic conditions | ▸ Railway operations will comply with mandatory speed restrictions during hot weather<br>▸ Regular rail inspection, maintenance, and de-stressing of the rail will be conducted to maintain track stability during both seasonal and annual temperature fluctuations. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Operation (continued) | Project | Rail incidents | ▸ The quantities and types of dangerous goods that may be transported will be managed in accordance with the requirements of the National Transport Commission's *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2018)<br>▸ 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 of rail incidents, such as derailments<br>▸ 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<br>▸ ARTC will coordinate with QR for operation activities within a shared active rail corridor, as required, to ensure safe operation. |
| | | Bridges | ▸ Maintenance inspections of bridge structures will be undertaken generally in accordance with ARTC's current practices and procedures<br>▸ Inspections of bridge structures will be undertaken in three levels, visual Inspections (2-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 | ▸ The RMAR will be available for use by emergency vehicles in the event of an incident<br>▸ Training of personnel through desktop and simulated test exercises will be designed to ensure that, individually and collectively, the Incident Management Procedures adequately address the requirements for emergency management. |
| | | Fatigue and heat stress | ▸ 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)<br>▸ ARTC will follow the guidance document published by Safe Work Australia, *Managing the risks of working in heat* (2017). |
| | | Existing infrastructure and utilities | ▸ Maintenance activities will comply with the clearance distance as specified in the *Engineering Standard for Requirements—Electric Aerials Crossing ARTC Infrastructure* (ARTC, 2005), to ensure sufficient clearance and prevent contact with live electricity<br>▸ Consultation with owners of licensed 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. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Operation (continued) | Dangerous goods and hazardous chemicals | Storage and handling chemicals | ▸ 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 consist documentation<br>▸ 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, 2018). 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.<br>▸ Chemicals stored and handled as part of normal operation and maintenance activities will be managed in accordance with Australian Standards<br>▸ Safety data sheet information will be obtained from the supplier of chemicals and stored in an easily accessible location<br>▸ Procedures for the management of hazardous chemical spills and leaks will be developed and incorporated into the Operation EMP for the Project. The procedures will include:<br>  ▸ A site map that indicates where hazardous chemicals are located<br>  ▸ Consideration as to whether fire protection systems are appropriate for where hazardous chemicals may be stored<br>  ▸ 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?<br>  ▸ 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<br>  ▸ 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<br>  ▸ The spill response controls and clean up procedures as per the provision of their safety data sheet, ensuring environmental harm is minimised<br>  ▸ Environmental incident checklist and communication plan in the event of a 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. |

| Delivery phase | Hazard type | Aspect | Proposed mitigation measures |
|---|---|---|---|
| Operation (continued) | Dangerous goods and hazardous chemicals (continued) | Storage and handling chemicals (continued) | ▸ The ARTC's 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:<br>▸ Where practical, dangerous goods will be transported in their original packaging and stored separately from one another on the vehicle, specifically detonators<br>▸ 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<br>▸ The combined (aggregate) quantity of dangerous goods will not exceed 1,000 L or kg<br>▸ Any individual receptacle used for transporting dangerous goods will have capacity less than 500 L or kg or dangerous goods licensing for both the vehicle and driver will apply<br>▸ 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<br>▸ The vehicle will be fitted with appropriate safety equipment for the load as per ARTC operational procedures, including double-sided triangle reflector signals, fire extinguisher(s) and personal protective equipment. |
| | | Explosives | ▸ 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 audible track warning devices<br>▸ ARTC will continue to consult with InterGen to establish communication protocols for the operation phase of the Project, to ensure compatibility between ARTC activities and mining operating activities<br>▸ 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. |

## 22.11.13 Waste management

### 22.11.13.1 Environmental outcomes

- All wastes generated during Project works are stored, handled, treated, reused, recycled and/or disposed of lawfully and to reduce environmental harm
- Measures are implemented to reduce the amount of waste generated by the Project works.

### 22.11.13.2 Performance criteria

- Adopt a waste 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
- Establish and meet construction waste targets
- Implementation of opportunities identified for beneficial reuse of spoil and other materials during detail design and construction in accordance with appropriate management procedures and relevant applicable legislation and regulations
- Minimise the import and disposal of fill material.

### 22.11.13.3 Proposed mitigation measures

Potential impacts and corresponding mitigation and management measures for the detail design, pre-construction, construction and operation of the Project are included in Table 22.24.

### 22.11.13.4 Monitoring

Implementation of waste management elements of the CEMP and compliance against conditions of approval will be monitored, audited and reported in accordance with processes specified in Section 22.6.

**TABLE 22.24 PROPOSED MITIGATION MEASURES—WASTE MANAGEMENT**

| Phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design | Generation of waste | ▸ Aim to maximise the reuse of local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul<br>▸ Aim to maximise the reuse of material excavated below the rail embankment for less critical parts of infrastructure<br>▸ Aim to maximise the reuse of excavated material as a stabilised structural fill<br>▸ Optimise the number, width and depth of cuts to avoid the generation of material that would be considered surplus to Project requirements<br>▸ Continue to investigate the viability of the reuse of ballast as high-quality general fill or structural fill to minimise the import of rock amour<br>▸ Refine the horizontal and vertical design and alignments to minimise the quantity of offsite fill required<br>▸ Review the cut-and-fill balance for the Project based on the detail design, to minimise reliance on the external sourcing of fill<br>▸ Review and update the draft Spoil Management Strategy (refer Appendix Y: Spoil Management Strategy) for the Project to reflect anticipated cut-and-fill quantities at the end of the detail design process. The Spoil Management Strategy will be finalised prior to the commencement of construction.<br>▸ Undertake a waste reduction review to identify opportunities to meaningfully achieve the waste reduction targets through detail design, construction and operation of the Project<br>▸ Assess and confirm opportunities for beneficial use of materials under the End of Waste (EOW) framework. If appropriate to do so, ARTC and/or its construction contractors will register as a resource producer to operate under an EOW code<br>▸ Develop a Waste Management Sub-plan, as a component of the CEMP. As a minimum, the sub-plan will establish:<br>  ▸ Waste targets (or waste reduction targets) to be achieved for the Project, in accordance with the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act)<br>  ▸ General protocols and performance objectives for keeping the work site clean and tidy<br>  ▸ Processes for documenting waste volumes, types and how these will be compared to waste targets<br>  ▸ Confirmation of waste streams and estimated volumes<br>  ▸ Identify temporary waste storage areas and disposal locations on and offsite<br>  ▸ Confirm waste disposal and National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM) criteria for disposal sites, in accordance with the environmental authority conditions for operational facilities<br>  ▸ 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<br>  ▸ Requirements for waste segregation, e.g. green waste, commercial and industrial (C&I) waste, construction and demolition (C&D) waste, general waste, regulated waste and recyclables, in accordance with the *Environmental Protection Regulation 2008*<br>  ▸ Requirements for secure temporary storage, collection frequency and disposal/recycling requirements, in accordance with the *Environmental Protection Regulation 2008.* |

| Phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Detail design (continued) | Generation of waste (continued) | ▸ Procedures and reporting/documentation requirements for ensuring waste transporters and receivers are appropriately licenced according to the type of waste, in accordance with the *Environmental Protection Regulation 2008*<br>▸ Requirements for training, inspections, audits, corrective actions, notification and classification of environmental incidents<br>▸ Record keeping, monitoring and performance objectives for handover on completion of construction. |
| | Disposal of waste | ▸ Engagement with owners and operators of licensed waste disposal facilities and licensed waste carriers. |
| Pre-construction | Hazardous waste | ▸ Where identified, asbestos-containing materials will be removed prior to the commencement of construction. Asbestos removal and handling will be conducted in accordance with the measures specified in Section 22.11.12.3.<br>▸ Asbestos-containing materials will be transported by a licensed service provider and disposed of at an appropriately licensed facility, in accordance with the requirements of the WRR Act, *Work Health and Safety Act 2011* (Qld) and the EP Act. |
| Construction | Waste generation | ▸ Monitor waste generation to ensure adherence to waste-reduction targets established in construction contract documentation<br>▸ Contractors 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<br>▸ All cut material of appropriate suitability as per ARTC Earthworks Material Specification (ETC-08-03) (ARTC, 2019e) should be stockpiled separately and reused on site where possible, with or without treatment<br>▸ Portable toilets and amenities to be serviced and maintained to ensure efficient operation and minimise environmental risks associated with their operation and decommissioning<br>▸ Grease trap and interceptor wastes will be pumped out and removed by a licensed regulated waste transporter<br>▸ Appropriate waste bins will be located in general waste storage areas to facilitate segregation and appropriate containment of waste materials<br>▸ Each storage area will be provided on hardstand or within suitable bunding for the waste stream being stored. |
| | Disposal of waste | ▸ Wastes to be disposed of at appropriately licensed facilities where disposal to landfill is unavoidable<br>▸ Transportation of waste by appropriately licensed carriers<br>▸ Waste tracking documentation to be retained by the Principal Contractor for materials removed from site for disposal. |
| | Hazardous Waste | ▸ Regulated wastes and contaminated soils or other materials must be transported and disposed in accordance with the EP Act and procedures within the Waste Management Sub-plan<br>▸ Asbestos-containing materials will be transported by a licensed service provider and disposed of at an appropriately licensed facility, in accordance with the requirements of the WRR Act, *Work Health and Safety Act 2011* (Qld) and the EP Act. |

| Phase | Aspect | Proposed mitigation measures |
|---|---|---|
| Operation | 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<br>▸ Waste management commitments in accordance with the WRR Act waste and resource management hierarchy and procedures will be developed for inclusion in the Operation EMP for the Project. |
| | Disposal of waste | ▸ Wastes to be disposed of at appropriately licensed facilities where disposal to landfill is unavoidable<br>▸ 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. |

## 22.12 Social impact management plan

### 22.12.1 Overview

A social impact management plan (SIMP) for the Project has been documented in Chapter 15: Social, and is separate to this Outline EMP. The SIMP outlines the objectives, outcomes and performance measures for mitigation of social impacts, and the actions that ARTC will undertake and/or require its contractor to undertake. Measures intended to enhance Project benefits and opportunities are also provided.

The aim of the SIMP is to:

- Provide guidance for the mitigation of negative impacts on stakeholders and communities
- Support adaptive management of social impacts, by enabling communication between stakeholders and the Project during the detail design, pre-construction and construction process, to identify any need for improvements to management measures
- Describe ARTC's initiatives and partnership opportunities that will maximise local employment and business opportunities and bring about long-term benefits for local communities.

Management measures are provided in the SIMP in five sub-plans:

- Community and Stakeholder Engagement
- Workforce Management
- Housing and Accommodation
- Health and Community Wellbeing
- Local Business and Industry Content.

Each sub-plan includes:

- Objectives and desired outcomes
- Measures to mitigate social impacts and enhance Project opportunities
- The timing for delivery of mitigation measures, i.e. detail design, pre-construction and construction stages.

The Project is currently in the reference design stage and, if approved to proceed, will undergo a detail design and construction planning phase. ARTC and its Principal Contractor 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.

The Project will develop further detail of the SIMP as part of its detail design phase. This will include engagement with the Principal Contractor and stakeholders, as identified in the action plans, to review the measures outlined in the SIMP, the responsibilities of each party, implementation plans, timing and performance monitoring. This will inform the Principal Contractor's implementation of SIMP commitments 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 have dedicated personnel to coordinate and monitor SIMP implementation.

Prior to commissioning the Project, a SIMP for the operational phase 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 phase (refer Section 22.12.2), which includes stakeholder engagement in monitoring impacts and the effectiveness of mitigation measures.

### 22.12.2 Monitoring and reporting

The purpose of SIMP monitoring is to:

- Track and enable reporting on delivery of measures that mitigate social impacts or increase community benefits
- Collect data on the effectiveness of mitigation and benefit enhancement measures
- Support identification of corrective actions to improve the effectiveness of mitigation and benefit enhancement measures.

The monitoring framework provided in Chapter 15: Social outlines, for each SIMP sub-plan:

- Impacts addressed
- Desired outcomes
- Performance measures
- Monitoring mechanisms
- Data sources
- Monitoring frequency during construction.

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 (CRG) at each meeting and a report against performance measures will be presented to the CRG, TRC and GRC annually, during construction. The monitoring program will be reviewed prior to operations, revised to recognise the completion of construction and implemented, as relevant, for the operations phase.

ARTC will review the SIMP annually during the construction phase and, where necessary, update it based on monitoring results, including stakeholder feedback. This will include a process for reviewing social impact management and benefit enhancement measures to assess whether they are still appropriate, and whether any new issues or initiatives have emerged that should be included in ongoing mitigation and/or monitoring. This will include consultation with the TRC, GRC and the Project's CRG. Reports on the annual SIMP review will be provided to the Office of the Coordinator-General and to the Project's CRG during the construction phase.

A review of the SIMP and its implementation plan will be undertaken by an independent third party by the end of Year 1 of construction, prior to commissioning the Project, and again during Year 3 of operations. These reviews will include consultation with local governments, landowners adjacent to the Project footprint, community members and Queensland Government agencies. The independent SIMP reviews will identify the effectiveness of SIMP strategies, and any changes which need to be made to the SIMP to ensure ongoing effectiveness.