

17. Environmental management plan



17. Environmental Management Plan

17.1 Introduction

This draft EMP has been prepared in order to propose environmental protection commitments to protect the environmental values potentially affected by the proposed rail works.

Commitments are proposed and identified, including environmental protection objectives, standards, measurable indicators and control strategies (ie to demonstrate how the objectives will be achieved).

The EMP will be refined and expanded further as required during the detailed design phase of the Project and through consultation with State and Local Government agencies.

17.1.1 Basis for the Plan

An important requirement of a Project of this nature is the preparation of an EMP to ensure the environmental safeguards proposed as a result of the Project planning and environmental assessments are enacted in an appropriate and timely fashion.

The potential exists for the degradation of the site and surrounding natural values. This would be likely to occur during the construction and operational stages of this Project and has been identified during the course of the environmental studies performed for this Project.

Planning and design measures are therefore necessary to ensure that all reasonable measures are taken to protect the environmental values, which may be impacted during construction and operational activities.

17.1.2 Aim of the Plan

The aim or purpose of this EMP is to detail the actions and procedures to be carried out during the implementation phase of the project in order to mitigate adverse and enhance beneficial environmental and social impacts. The environmental studies and consultation conducted as part of the EIS have identified the potential construction and operational impacts of proceeding with the Project.

A range of mitigation measures have been identified from the EIS environmental studies to mitigate and manage these potential impacts and need to be implemented during the construction and operational phases of the Project.

The EMP addresses the proposed mitigation measures, records environmental commitments and establishes the framework to ensure they are implemented during each stage of the project. In effect, the EMP becomes the key reference document in that it converts the undertakings and recommendations of the environmental studies into a set of actions and commitments to be followed by the designers, constructors and QR.

The EMP will also serve as the benchmark for measuring the effectiveness of environmental protection and management. This can be achieved by specifying the monitoring, reporting and auditing requirements, with nominated responsibilities and timing to ensure the necessary mitigation measures are met. The EMP also makes provision, as appropriate, for unforeseen events by outlining corrective actions which may be implemented in these situations.

17.1.3 Format of the EMP

The EMP is structured as follows:

- Relevant statutory obligations and regulatory framework within which the Project will be required to progress (refer Section 17.2).

- Management structure and general project responsibilities for staff involved in the project (refer Section 17.3).
- Environmental induction requirements (refer Section 17.4).
- Environmental management strategies for environmental aspects (refer Sections 17.5 to 17.18)
- Subsequent stages of the environmental management process during the detailed design, construction and operational stages of the project (refer Section 17.19).

To increase the useability of the EMP, it has been prepared as a stand-alone document.

QR environmental management approach

QR is committed to the effective management of environmental risks in all its activities including construction and operations.

QR's corporate environmental management system is based on ISO 14001 and is integrated, where beneficial at a corporate level, with its safety and security, human resource, and general management systems. The system implements the QR Environmental Policy and at the development level is reflected in QR's Environmental and Planning Process Manual.

QR have appointed a construction contractor that are certified to ISO14000 to ensure compliance with environmental regulations and environmental best practice is delivered throughout the construction of the Project. The contractors EMS, which is certified to ISO14001 is provided in Appendix L.

Queensland Rail's Environmental Policy

It is QR's policy to manage all activities and services to minimise the impact on the environment and to meet legal, social and moral obligations.

To achieve these obligations, QR will consider environmental issues as part of everyday decision-making processes and will:

- Provide an environmental management system that reflects the major environmental risks.
- Apply sound management practices based on the principles of ecologically sustainable development.
- Protect the environment through reducing pollution, resource conservation, minimising waste and protecting significant habitats and species.
- Ensure open communication with the community, industry and government on environmental issues.
- Create an environmentally aware culture where responsibilities are assigned and clearly understood.
- Provide a strategic direction to continually improve environmental management and overall performance.
- Provide an audit and review framework to ensure that the system is operational, effective and is meeting the requirements of this policy.

17.2 Statutory obligations

17.2.1 National strategies and international conventions

The following national policies provide the guiding principles for the design, construction and operation of the proposed rail infrastructure:

- National Ecologically Sustainable Development (ESD) Strategy 1992
- National Greenhouse Response Strategy 1992
- Framework Convention on Climate Change 1994

Other international conventions and agreements relevant to the rail infrastructure include:

- **CAMBA** – Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their environment.
- **JAMBA** – Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their environment.
- **Ramsar Convention on Wetlands** – The Convention on wetlands, signed in Ramsar, Iran, 1971, is an inter-governmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

In addition to the conventions and agreements above, a further two conventions are identified as being indirectly relevant to the coal terminal. These are:

- **CMS or Bonn Convention** – The Convention on the Conservation of Migratory Species of Wild Animals aim is to conserve terrestrial, marine and avian migratory species throughout their range.

The convention is aimed at restricting harvesting, conserving habitats and controlling other adverse factors. The species covered include marine mammals, sea turtles and sea birds.

- **Convention on Biological Diversity** – is a comprehensive, binding agreement covering the use and conservation of biodiversity.

17.2.2 Regulatory process

The following legislation is considered relevant to the Project:

- *Aboriginal and Torres Strait Island Heritage Protection Act 1986*
- *Aboriginal Cultural Heritage Act 2003*
- *Acquisition of Land Act 1967*
- *Animal Care and Protection Act 2001*
- *Coastal Protection and Management Act 1995*
- *Dangerous Goods Safety Management Act 2001*
- *Environmental Protection Act 1994*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Fisheries Act 1994*
- *Health Regulations under the Health Act.*
- *Integrated Planning Act 1997*
- *Lands Act 1994*
- *Nature Conservation (Wildlife) Regulation 1994*
- *Plant Protection (Red Imported Fire Ant) Quarantine Notice 2001*
- *Queensland Heritage Act 1992*
- *Soil Conservation Act 1986*
- *Transport Infrastructure Act 1994*
- *Transport Planning and Coordination Act 1994*
- *Road and Rail Transport (Dangerous Goods) Act 1997*
- *Vegetation Management Act 1999*
- *Water Act 2000*
- *Workplace Health and Safety Act 1995*

A summary of the likely approvals required for the construction phase of the Project are provided in Table 17.1

Table 17.1 Summary of likely approvals – Construction

Legislation	Administering Authority	Development action	Approval/Permit
<i>Aboriginal Cultural Heritage Act 2003</i>	DNRW	Construction works	Aboriginal cultural heritage investigation and Cultural Heritage Management Plan
<i>Environmental Protection Act 1994 and Integrated Planning Act 1997</i>	EPA	ERA 11(b): Crude oil or petroleum product storing having a combined total storage capacity of 500,000 L or more	Development Permits and Registration Certificates
		ERA 15 (b): Sewage treatment operating, having a peak design capacity to treat sewage of 100 or more equivalent persons but less than 1500 equivalent persons	
		ERA 19(a): Dredging not more than 5,000 t a year	
		ERA 20(c): Extracting rock or other material having a design capacity of 100,000 t or more a year	
		ERA 22(c): Screening, washing, crushing, grinding, milling, sizing or separating material extracted from the earth, having a design capacity of 100,000 t or more a year	
		ERA 62: Concrete batching	
		Removal of contaminated soil from sites listed on CLR or EMR	Development Permit (if required)
<i>Fisheries Act 1994 and Integrated Planning Act 1997</i>	DPIF	Work in areas causing removal, destruction or damage to marine plants	Development Permit (if required)
		The construction or raising of a waterway barrier	Development Permit
<i>Nature Conservation Act 1992</i>	EPA	Taking, using, keeping or interfering with a protected animal or plant	Permit if protected plants are affected by Project
<i>Vegetation Management Act 1999 and Integrated Planning Act 1997</i>	DNRW	Removal of Regional Ecosystems as defined by the EPA under the Act	Development Permit
<i>Water Act 2000</i>	DNRW	Destroying of vegetation, excavating or placing fill in a watercourse, lake or spring	Riverine Protection Permit or compliance with DNRW guidelines shown
		Stream diversion for Elizabeth and Willy Creeks	Water Licence

Table Notes:

DES = Department of Emergency Services
DPIF = Department of Primary Industries and Fisheries
EPA = Environmental Protection Agency
DNRW = Department of Natural Resources and Water

ERA = Environmentally Relevant Activity
CLR = Contaminated Land Register
EMR = Environmental Management Register

17.2.3 Monitoring and auditing standards and guidelines

The following standards apply to monitoring and auditing of performance:

Water and wastewater

- Water Quality Sampling Manual: for use in Testing for Compliance with the *Environmental Protection Act 1994*. Third Edition (EPA 1994)
- Standard Methods of the Examination of Water and Wastewater – American Public Health Association (APHA)/Australian Waste Water Association (AWWA)
- AS 2031 Selection of Containers and Preservation of Water Samples for Chemical and Microbiological Analysis

Soils

- Australian and New Zealand Environment and Conservation Council (ANZECC)/National Health and Medical Research Council (NHMRC) – Guidelines for the Assessment and Management of Contaminated Sites
- Queensland Government Chemical Laboratory – Guidelines for Soil Sampling
- Queensland Acid Sulfate Soil Investigation Team (QASSIT) “Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998”
- Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (Department of Environment 1998)

Air quality

- AS 3580 Methods of Sampling and Analysis of Ambient Air

Noise and vibration

- QR Code of Practice for Railway Noise Management
- Environmental Guideline. Noise from Construction, Renovation, Maintenance and Demolition Sites (DEC 1989)
- Noise Measurement Manual, Third Edition, 2000
- AS 1055.1 and AS 1055.2 Acoustics – Description and Management of Environmental Noise
- AS 2187 Explosives – Storage Transport and Use (Explosives Code)
- AS 2436 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- AS 2659.1 Guide to the Use of Sound Measuring Equipment and
- AS 2659 Sound Level Meters

Dangerous goods

- AS 1216 Classification, Hazard Identification and Information Systems for Dangerous Goods
- AS 1678 Emergency Procedure Guides – Transport
- AS 1940 Storage and Handling of Flammable and Combustible Liquids
- AS 2508 Safe Storage and Handling Information Cards for Hazardous Materials
- AS 2809 Road Tank Vehicles for Dangerous Goods and
- AS 2931 Selection and Use of Emergency Procedure Guides for Transport of Dangerous Goods.

17.2.4 Best practice

For the purposes of the EMP the term “best practice” refers to the environmental management of an activity (which achieves) an ongoing minimisation of environmental harm of the activities through cost effective and practical measures currently used nationally and internationally for the activity.

17.2.5 Environmental management strategies

The structure of the environmental management strategies that follow are to assist in separate consideration of the relevant environmental issues. It is intended that this format be user-friendly and amenable to review and amendment. Where appropriate, management strategies for individual sections of the Project have been identified. The contents of a typical strategy are described below.

- Commitment or Objective
- Mitigation Measures (design, construction and operation where relevant)
- Monitoring (if required)

17.3 Project management

The project delivery method for the rail infrastructure is by way of an Alliance between QR, designers (Connell Hatch and Parson Brinkerhoff) and constructor (Macmahon and MVM Rail). For the purposes of this EMP the following roles have been used:

- Alliance Design Team
- Alliance Environmental Manager
- EIS Consultant
- Alliance Construction Contractor
- Owner participant (QR)

The specific roles and responsibilities will be outlined and detailed in the Construction EMP.

17.4 Environmental induction

In accordance with QR's training protocols, all personnel working on the site, including all QR personnel and maintenance providers/subcontractor, must attend an induction prior to commencing works. This induction training will cover QR's Safety and Environmental Awareness requirements and all the relevant provisions of the Construction EMP (EMP(C)) prior to commencing works. The training will also incorporate the following:

- Information to provide a basic understanding of the EMP(C) and site-specific environmental issues.
- Information on sensitive issues and the need to carry out work activities with as little environmental impact as possible.
- Explanations of the correct environmental reporting protocols, complaints procedures, non-compliances and actions required in the event of an incident.
- Information on known environmental hazards relating to site activities and site preparedness and response plans.

A list of all inducted personnel shall be maintained by the Alliance, recording, as a minimum, the name of the inductee, date of induction and the elements of the induction attended.

17.5 Topography, geology and soils

17.5.1 Objectives

- To manage ground disturbance activities during pre-construction, construction and operational activities to minimise environmental impacts and maximise the potential for successful land rehabilitation following construction.
- To ensure any acid sulfate soils (ASS) that may be disturbed during pre-construction, construction and operational activities are identified and managed to minimise potential impacts to surrounding land and nearby water bodies.
- Manage the storage, transport and handling of hazardous materials during site construction and operational activities to protect human health and the environment.

- Manage the health and environmental risks from contaminated land.
- Manage the way contaminated soil is removed and disposed to ensure the risk is not relocated to another site.
- Minimise the potential and risk for hazardous events.
- Minimise soil erosion.
- Minimise loss of fertile topsoil material.
- Aim to improve soil and geotechnical stability.

17.5.2 Mitigation measures

The measures to be implemented throughout the duration of the Project design, construction and operation phases in order to mitigate the potential impacts of construction and operation of the project include:

Design

- Minimise works associated with and impacts on creeks, surface drainage lines and wetland areas through design of embankments, filling, vegetation clearing, bridge and culvert structures.
- Protect creeks, drainage lines and wetland areas through design.
- Minimise project footprint and impacts to land currently under sugar cane production.
- The design process will require the input of a comprehensive level of information on the subsurface profile relating to strength, geotechnical and chemical properties of soils and site geology and the hydrogeological regime of the underlying groundwater system.
- Further detailed geotechnical investigations will be required to obtain information relating to detailed geotechnical stability assessments, bridge foundation designs, rail embankment designs and potential settlement of structures and fill embankments in order to suppress the aggressive, high swell nature of some areas of clay material within the project area.
- Detailed investigation of proposed borrow areas will be required to obtain information relating to the suitability and availability of construction materials from offsite sources.
- Scheduling of bulk earthworks and excavation and filling activities should be undertaken to ensure that these activities are minimised during adverse seasonal and climatic conditions (ie minimise active earthworks areas during the wet season – November to April).
- Detailed engineering design of the proposed rail infrastructure will need to be carried out in accordance with good engineering practice.
- Detailed investigation of areas of proposed disturbance within the rail yard, rail corridor and properties affected by the Project to adequately assess the environmental status of soils or subsurface materials (including groundwater resources) be disturbed during construction.
- An Acid Sulfate Soil investigation will need to be completed for the areas of proposed disturbance within the Plane Creek floodplain at the northern end of the project area.
- Further investigation and analysis of soil physical and chemical properties will be required in accordance with the Planning Guidelines for the Identification of Good Quality Agricultural Land for each mapped soil unit within the project area.
- Design of embankments and cut and fill areas associated with all aspects of rail infrastructure will be designed in accordance with the recommendations of the geotechnical investigations undertaken as part of the preliminary and detailed design stage of the project.
- Identify areas within the project area that will require ground improvement measures to be implemented prior to and during construction.
- Design retaining wall structures to accommodate some water pressure distribution in accordance with recommendations and findings of the geotechnical investigations that have been undertaken for the Project.

Construction

- Soil handling and management measures will be developed in the EMP and implemented prior to the commencement of construction. These measures will be incorporated into the Construction EMP and will include:
 - Acid sulfate soils
 - Erosion and sediment control
 - Topsoil management
 - Soil contamination protection and management
- A site rehabilitation/revegetation schedule and plan will be required to be developed and implemented progressively throughout construction in order to stabilise exposed erosion prone soils and subsoils as quickly as possible.
- Drainage and overland flow will need to be carefully managed and controlled so as not to impact on the stability of the rail embankments.
- All cut and fill procedures should be carried out in accordance with the relevant QR engineering standards and specifications, AS3798-1996 and all findings and recommendations detailed in the geotechnical investigations and reports completed during the preliminary and detailed design stages of the project.
- Prepare construction areas in accordance with recommendations and findings of the preliminary and detailed geotechnical investigations.
- Conduct excavation trials prior to commencement of bulk earthworks in order to confirm the type and size of equipment required to effectively and safely complete earthworks.
- Remove soft soils during preparatory earthworks to reduce risks associated with uncontrolled settlement of unconsolidated material under load.

Operational

- Periodic maintenance of surface drainage controls will be required.
- Periodic monitoring and maintenance of erosion prone, dispersive soils will be required in order to maintain stable surface soils, prevent accelerated erosion, remediate disturbed soils and protect vulnerable soils and sensitive areas in the receiving environment.

17.6 Land use

17.6.1 Objectives

- Plan construction works in order to minimise the need for land resumption and adverse impacts to 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.
- Ensure through adequate mitigation that the railway design minimises the long-term impact of noise complying with Guidelines to local communities during the operational phase.
- Ensure nuisance issues such as dust from loads and earth carried onto neighbouring sealed roads is controlled and managed appropriately.

17.6.2 Mitigation measures

Design

During the detailed design phase QR will undertake the following:

- Continued consultation with directly affected property owners.
- Where possible minimise private land requirements.

Following construction, surplus land not required for the Project or potential future rail development will be leased to allow suitable land to return to sugar cane production.

17.7 Transport and traffic

17.7.1 Objectives

- To minimise the impact on existing traffic and infrastructure associated with the transport of plant, equipment and materials during pre-construction, construction and operations.
- Manage interactions between railway activities and other infrastructure.
- Develop and implement a Traffic Management Plan to minimise the disruption caused by construction machinery and material delivery schedules to existing public roads and traffic flows.
- Access from public roads to construction sites must be managed in accordance with all State regulatory requirements, including warning signage and transport control staff at critical intersections.
- Ensure the rail and road infrastructure and ancillary services operate in a safe and efficient manner.
- Minimise disruption and delay to the existing rail network during construction.

17.7.2 Mitigation measures

The following mitigation measures will be implemented:

Design

General

- Access points will be designed to minimise impact on the external road network where possible, for example haul roads will be built within the site, so that construction traffic does not create dust on unsealed roads or damage unsealed roads such as Gurnetts Road during wet weather.
- Grade separation at key intersections is proposed to remove conflict between construction/operation traffic and trains.
- Emergency access and egress to be provided at the southern and northern ends of the site to provide rapid means of evacuation in an emergency, and so that emergency vehicles such as ambulances or fire tenders can reach the site from either the north or south. This is in addition to access in the middle of the site from Armstrong Beach Road.

Temporary accommodation village

- An access to the temporary accommodation village will be provided on the northern side of Armstrong Beach Road, at a point which allows adequate sight distance to and from the access.

Armstrong Beach Road

- Armstrong Beach Road may be realigned in the vicinity of the Jilalan Rail Yard to allow for the modification to an existing bridge or a completely new structure. This will be done in association with a localised realignment of the northern end of Gurnetts Road.
- The existing rail bridge is proposed to be upgraded to improve safety by eliminating the horizontal curve and reducing traffic speeds on the approaches to the bridge. The bridge will be substantially extended in length to allow a straight crossing over all rail lines between Armstrong Beach Road and Gurnetts/Smyths Road.
- Vehicle speeds on either approach to the bridge will be regulated with the introduction of two roundabouts, with horizontal geometry designed to ensure safe and consistent traversal speeds. The roundabouts will be clearly signed, line-marked, and will be lit to the standard prescribed in AS1158.

- A direct access may be proposed from Armstrong Beach Road into the Jilalan site between the existing railway line and the proposed provisional tracks. Peak hour turning volumes/opposing traffic volumes indicate a requirement for the provision of a protected right turn lane (as per the warrant contained in DMR Chapter 13 Intersections at Grade) for the site access.
- The access geometry will be sufficient to accommodate a B-Double or standard low loader vehicle.

Oonooie Road

- The Oonooie Road level crossing will be grade separated to allow for the efficient movement of existing coal trains and road freight at the crossing. This is designed to remove any conflict between trains and road traffic, and therefore prevent vehicles queuing.

Smyths Road

- The existing Smyths Road level crossing (north of Armstrong Beach Road) is expected to be grade separated, with the crossing constructed under a new embankment between the existing rail and Plane Creek.
- The potential conflict between road and rail traffic will be removed with no impediment to traffic flow, resulting an operational improvement.

Construction

- A temporary accommodation village will be established to the north of Armstrong Beach Road with an access directly onto this road. The access will be clearly delineated with sufficient sight distance for the speed environment.
- The site is expected to be signed to indicate restricted areas. Some fencing may also be used to prevent unauthorised or unintended access to construction areas.
- Appropriate access will be maintained to provide for rail maintenance requirements.
- Traffic Management Plan will be prepared and implemented during construction to minimise potential traffic impacts.

17.8 Hydrology and hydraulics

17.8.1 Objectives

- In areas of current or future development there should be no worsening of flood levels in existing watercourses and culvert locations.
- Ensure flow rate and volume of site runoff does not cause a significant increase in stream energy in downstream waters such as is likely to cause stream bank or bed erosion.
- Ensure that existing stormwater flows are not impeded and can discharge to receiving waters.

17.8.2 Mitigation measures

Design

- Bridges allow for the passage of flood flows to utilise available storage on the downstream side of the railway embankment resulting in negligible increases in existing peak flood levels.
- Areas around bridge abutments will be suitably protected to avoid scour.
- Detailed hydraulic analysis to ascertain negligible impacts on existing flood patterns within Plane Creek will occur during the detailed design phase.
- Scour protection is proposed at all culvert inlets and outlets within Elizabeth Creek to prevent erosion from high velocities. The base of the Elizabeth Creek channel will also be lined with rock to prevent souring.

- The meanders of the natural Elizabeth Creek channel between the proposed rail lines not excised by the proposed drainage alignment will remain in their existing state and open to the excavated channel.
- Where the flow of Elizabeth Creek exits the proposed alignment and discharges into the existing bank, gabions will be installed to prevent scour and the channel bed will be protected with rip-rap.
- Within Willy Creek velocities at the outlets of the culvert cells were found to be around 0.9 m/s, and as a precaution it is proposed to use rip-rap at these locations for scour protection.
- The base of the Willy Creek channel will be rock lined to prevent erosion.
- The excavated channel within Willy Creek will encompass the existing natural channel between the culverts.

17.9 Surface water quality

17.9.1 Objectives

- To ensure that water quality entering creeks and waterways downstream during and post construction process meets with the 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 protect 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 sustained or significant increase in pollutant levels in receiving waterways.
- No visible evidence of contaminants leaving the site through stormwater runoff.
- No litter leaving the site during construction or operational phases.
- Maximise use of mitigation measures such as Water Sensitive Urban Design (WSUD) devices between construction and operational phases of the Project.
- Water quality during construction should be within any limits set by environmental authorities.

17.9.2 Mitigation measures

The following mitigation measures will be implemented throughout the design, construction and operational phases of the Project:

Design

The following will be prepared during the design phase:

- ASS mitigation measures
- Erosion and Sediment Control Plan
- Waste Management Sub Plan

Construction

Sedimentation and runoff

- Maximise the areas of vegetation within the project area. Wetland communities and riparian zones are natural buffer zones removing sediment and other pollutants.
- Stockpile materials and soils away from natural drainage areas.
- Implement mechanisms to slow and/or prevent overland runoff. Such mechanisms include the planting of vegetation and/or the installation of artificial structures (ie geofabric and bunds).

- Areas of erosion and/or dispersive soils to be isolated and remediated to prevent further degradation.
- Where possible undertake significant earthworks during the dry season and install temporary bunding or sediment traps.
- Where practical, monitor discharges on an event basis from all discharge points.
- Minimise works within watercourses and riparian zones.
- No filling, draining or alteration of any waterway, excluding that necessary for the development.
- To minimise sedimentation and scouring of the watercourse, design culverts and bridge abutments to conform to the watercourse morphology where possible.
- Minimise the removal of riparian vegetation and minimise disturbance to the natural beds and banks of the waterways.
- The outer banks of stream bends are often particularly unstable and prone to erosion, therefore access or disturbance to these areas should be minimised during construction works.
- Minimise heavy machinery within fragile or erosion-prone areas.
- Due to the ephemeral nature of many of the creeks, stream construction works should, where possible take place during the dry season when the risks of sedimentation and downstream impacts will be minimised.
- Effective erosion and sediment control measures should be installed prior to construction works commencing (eg such as the use of appropriately designed sediment containment screens).
- Where a waterway has a continuous flow throughout the year, other control measures may be implemented to reduce impacts to water quality downstream of the site (eg the use of floatation sediment curtains).
- The effectiveness of all sediment and erosion control devices should be regularly monitored and maintained to ensure their effectiveness.
- Design and implement an Erosion and Sediment Control Plan to minimise the sedimentation from the project area to downstream of waterways.
- Stabilise disturbed areas of soil (where possible) as soon as practical, to minimise soil erosion and downstream sedimentation.
- Ensure dust suppression measures are implemented throughout the construction process to minimise damage to prevent dust deposition on waterways and wetland habitats within the project area.
- Ensure a competent person with experience in environmental management is present on the project area during construction to address any environmental issues in a timely manner.
- Establish a water quality monitoring programme within the vicinity of the affected creeks and their downstream environs.

Hydrocarbon and chemical management

- To minimise the impact of a hydrocarbon or chemical spill, the following measures will be implemented:
 - As part of the Standard Operating Procedure all employees will be educated in the response to a spill or leak.
 - Chemical spill kits will be located within vehicles carrying chemicals and near chemical storage areas.
 - Chemical storage areas and wash down facilities are to be located away from existing drainage lines and have appropriate bunding and waste water collection mechanisms.
 - Chemical and hydrocarbon wastewater must be disposed to a liquid waste disposal facility or company, or treated to an acceptable level for discharge with the permission of the responsible authority.
 - Waste storage facilities and spoil placement areas are to be located away from existing drainage lines and have appropriate bunding and drainage mechanisms.

Operation

- Wagon Maintenance Shed, Wagon Wash Bays and Provisioning Shed will all be covered and clean water will be directed away from the new pollution control system. This will prevent contaminating stormwater with untreated water from these areas.
- Stormwater generated from the carpark will be directed to a grass swale to remove sediment and filter out any hydrocarbons generated in this area. This water will then be directed to the area north of the carpark. This approach should be applied to any other area of the site that is not directed through the pollution control system.
- Stormwater generated on rail and road will drain away from these structures.
- Herbicides should be applied carefully to ensure that there is no potential for excess herbicides entering the aquatic environment (refer Chapter 6).
- Minimise the amount of coal dust emanating from coal wagons passing through the project area to reduce the potential risk of dust being deposited on the waterways and wetland habitats in the surrounding area.
- Ensure all chemicals used on the project area are properly contained and disposed of to prevent soil contamination and subsequent leaching and damage to waterways.
- Bunding of all chemical storage areas to reduce the potential risk of a chemical/fuel spill impacting on the surrounding waterways and groundwater.

17.9.3 Surface water monitoring

Construction

In situ event based monitoring will provide valuable real-time information of the water quality of the waterways potentially influenced by the construction works:

- *In situ* parameters to be measured will include pH, conductivity, DO, turbidity, with a visual assessment of each monitoring site for the presence of oil or grease films on the water surface.
- Water quality monitoring will be event based and conducted at appropriate points of discharge to the waterway and also at points downstream of the discharge point or construction works. This will provide information on the potential sources of contamination and extent of the potential impacts.
- *In-situ* monitoring of water samples and water quality analyses will be conducted at the same time to enable the correlation of related parameters. Monitoring will also be conducted upstream and downstream of the project area, preferably at the sites already established.
- This monitoring programme will be conducted twice prior to construction, to provide information on the water quality of the waterways, within the project area, during the wet and dry season.
Note: Dry season water quality data was collected in June 2007.

Operation

During operation waterways within the area will be monitored in accordance with the new ERA licence conditions.

Results gathered through the water quality assessment will be compared with the background values obtained during the pre-construction phase of the Project, as well as the Environmental Values and WQO of QWQG and ANZECC 2000. If levels are encountered which exceed the trigger levels then additional investigation and mitigation measures will be implemented as soon as possible.

17.10 Groundwater

17.10.1 Objectives

- Ensure construction activities have no adverse impact on the existing levels and water quality of local and regional groundwater.

- Develop and implement strict controls for the management and storage of all hazardous goods onsite and that a spill response programme and equipment, including training, are in place.
- Manage the potential for impacts resulting from the migration of contaminated groundwater.

17.10.2 Mitigation measures

Design

- Areas used for the storage, use and processing of potential contaminants will be designed to allow the containment of leakages, spills and use. Storage facilities designs will include bunded areas to ensure that no potential leaks or spills can propagate to the groundwater.
- Facilities where potential contaminants are used will be designed to prevent the propagation of contaminants to the environment through the use of separators and wastewater treatment facilities. Attention will be paid to the potential transfer of contaminants during rainfall events and facility cleaning.
- Fuel and chemical storage areas will be designed with suitable bunding, in accordance with the appropriate standards, and where possible incorporate roofing to prevent rainfall accumulating within the bunding. It is recommended that the bund be designed to contain spillages and leaks from liquids used and stored, and to facilitate clean-up operations. The net capacity of a bunded compound in a storage facility should be at least 120% of the net capacity of the largest tank. If the material to be bunded, is contained in drums (or other small containers), the bunded area should contain at least 25% of the total volume of the stored products.
- The bund floor and wall must be built of materials impervious to the contents of any tank or container within the bund. The bunded area must be capable of preventing the migration of any spillage or leakage to the surrounding environment. A collection sump will be provided in the bund floor to make it easy to remove liquids and the floor must be graded in such a way that liquids collect in the sump.
- Site structure design will account for the presence of groundwater on the site with respect to potential embankment stability, floor heave and corrosive water issues. Significantly, the proposed cuttings, to approximately 17 m depth, for the provisioning, by-pass and wagon maintenance tracks require special attention and monitoring of groundwater conditions needs to be implemented prior to construction.
- Monitoring bores will be placed during the geotechnical investigation phase and water levels monitored until construction begins. Aquifer tests will need to be undertaken to determine the quantity of groundwater on site to assist with the design and construction of the cuttings.

Construction

- All fuels and chemicals used during the construction phase of the Project will be stored in bunded facilities that prevent spills, leakage, or over topping of the facility. The facility will prevent any migration of fuels or chemicals to surface water bodies or the underlying groundwater.
- All excavated soil will be stockpiled with appropriate bunding.
- Excavations that will remain open for any considerable time and that intercept the groundwater will be bunded to prevent any impact on the exposed groundwater through ingress of potentially contaminated surface water runoff from surrounding areas.
- Groundwater within the area of structures be tested for corrosive nature and design changes implemented to reflect results if necessary.
- Groundwater levels and quality be monitored to ensure that significant depletion of the resource does not occur, with specific emphasis on the monitoring of potential seawater intrusion and the effects of stream/aquifer interaction such as stream depletion.
- Groundwater can be expected to be encountered during the construction of the rail alignment cuttings, provision should be made for the control of water entering the construction area, its containment and control to prevent silt entrainment to streams, and the removal of water from the site.

Operational

- Should an uncontrolled spill occur it will be contained as soon as is possible and clean up commenced immediately. All fuel and chemical spills should be dealt with in a manner consistent with relevant health and safety guidelines.

17.10.3 Groundwater monitoring

A groundwater monitoring network will be installed to establish a baseline groundwater condition in the short term prior to construction. This monitoring network will include bores that establish the quality of groundwater entering the site from upgradient and groundwater quality exiting the site under current conditions. Additionally, monitoring bores should be located within the area of current operations targeting sites of potential contaminant sources.

Further, additional monitoring bores will be placed throughout the expansion area such that predevelopment groundwater quality can be established and groundwater gradients and flow direction can be calculated from monitoring results.

Initial analysis of groundwater samples collected from the monitoring network will include pH, electrical conductivity, major ions, metals (Cd, Co, Cr, Cu, Hg, Ni, Pb, and Zn), non-metals (As, CN, S, sulphides and sulphates), total hydrocarbons, Benzene, Ethyl benzene, Toluene, Xylene (BTEX), organochlorines and organophosphates, and phenyls.

The groundwater monitoring network will consist of three to four monitoring bores along the western boundary of the project area to establish groundwater inflows. A similar number of bores will be established along the eastern extent to establish the groundwater flow direction and allow the collection of samples for analysis. A number of monitoring bores will be placed adjacent to potential contaminant sources within the established site for the monitoring of current groundwater conditions. Additionally, a number of bores will be strategically placed within the proposed expansion areas so that they will remain in place to form part of a monitoring network post development.

All monitoring bores will be surveyed to the Australian Height Datum (AHD) at establishment. Water levels for all monitoring bores will be recorded on a weekly basis for a period of a month to establish a short term groundwater flow condition. Water level monitoring will then be reviewed and the long term monitoring period established based on initial results.

A baseline sampling round of all monitoring bores will be conducted for the above analytes as soon as possible after the establishment of the network. Analytical results will then be reviewed and a monitoring plan established based on the results.

17.11 Air quality

17.11.1 Objectives

- To manage impacts to air quality during pre-construction, construction and operations due to emissions from vehicles, plant and equipment.
- To minimise the generation of dust and associated impacts during construction and operational activities such as vehicle travel on unsealed roads, earthworks, coal transport and stockpiling.
- Minimise potential for nuisance impacts as a result of dust emissions.
- Minimise emissions of pollutants from construction vehicles and machinery.
- Minimise potential odour impacts.
- Minimise greenhouse gas emissions (GHG) due to construction and operation of the Project.
- Provide opportunities for minimising GHG emissions.

17.11.2 Mitigation measures

Construction

In order to control dust emissions related to construction activities and thus reduce the risk of dust nuisance at the location of nearby residences, a number of dust control measure will be taken, including:

- Development of a Dust Management Sub Plan prior to construction commencing.
- Minimising significant dust generating activities during high wind speeds where practicable and unwatered.
- Restricting vehicle speeds on unsealed haul roads to reduce dust generation.
- Avoiding spillages and prompt cleanup of any that occur.
- Covering haul vehicles moving outside the construction site.
- Stockpiled material should be treated appropriately to prevent wind erosion from the prevailing southeast wind.
- Regular cleaning of machinery and vehicle tyres will prevent track-out of dust to public roads
- Minimising onsite burning or incineration.
- Ensuring that roads are appropriately surfaced as soon as possible after the commencement of site activities.
- Routing roads away from sensitive areas wherever possible.
- Revegetating disturbed areas as soon as possible.
- Vehicles and equipment are to be appropriately maintained to minimise air emissions.
- Visual monitoring of dust to occur on a daily basis.
- Dust deposition gauges and real time air quality monitoring will occur at nearby residential dwellings, only if all operational ways of reducing dust levels have been investigated and exhausted.

During construction, emissions of greenhouse gases may be minimised by implementing a variety of mitigation and management measures including:

- Minimising haul distances between construction sites to spoil sites.
- Implementing regular maintenance program for equipment and construction fleet.
- Using appropriately sized equipment for construction activities.
- Minimising waste from construction.

Operational

In regards to the impact of emissions associated with activities at the yard, these will be minimised by implementing a variety of mitigation techniques, including:

- Regular maintenance of all equipment.
- Minimising unnecessary travel between sheds.
- Minimising the duration that multiple shunt locomotives operate in close proximity.
- In order to reduce the potential for impact of dust emissions from the northbound coal wagons, the duration that fully-loaded coal trains are held 'in-transit' at the facility (ie while waiting for access to the port unloading facility) should be minimised, particularly during periods of strong wind conditions.
- Only minimal amounts of reclaimed coal dust are held on site. During adverse wind conditions visual inspection of stockpiles should be conducted and mitigation procedures implemented if required.
- Maintain a complaint register relating to air quality, including remedial actions.
- Implement corrective actions if dust levels exceed the nominated non compliance level, including identification of the source.

- Notify residents, commercial operators and the community if dust generating maintenance activities will be undertaken. A minimum of 48 hours notice should be given to residents.
- Air quality should be compliant with the requirements of the *Environmental Protection Policy (Air) 1997*.
- Ensure all operational personnel are aware of the sensitivities with regard to elevated dust levels within and adjacent to the project area.

QR is currently undertaking a Coal Loss Environmental Evaluation which includes identifying strategies to reduce the risk of coal loss from loaded coal wagons in Central Queensland. The evaluation will include consultation with key stakeholders. An interim report will be provided to the EPA by 31 January 2008, and the final report is due 31 March 2008. QR will implement the relevant findings of the study at the Jilalan Rail Yard during the operational phase of the Project.

During the operation of the upgraded rail yard, emissions of greenhouse gases may be minimised by implementing a variety of mitigation and management measures, including:

- Minimising electrical consumption.
- Selecting of fuel efficient motorised equipment.
- Ensuring that all equipment is maintained regularly.
- Using appropriately sized equipment for yard activities.
- Minimising unnecessary operation of equipment.
- Segregation of general waste into recycling materials and general waste.
- Energy conservation and greenhouse audits in accordance with the requirements of the National Greenhouse Challenge Plus annual progress reports.

17.12 Waste

17.12.1 Objectives

- Prevent damage to the environment and protect and enhance the environmental values of the area including:
 - The life, health and wellbeing of people
 - The diversity of ecological processes and associated ecosystems
 - Land use capability, having regard to economic considerations.
- To minimise waste generation and ensure appropriate handling and disposal of domestic and industrial wastes generated during pre-construction, construction and maintenance activities.
- Ensure the operation complies with Environmental Licence conditions.
- All waste streams will have regard to the *Environment Protection (Waste Management) Policy 2000* principles, especially the waste management hierarchy of waste avoidance, reuse, recycling, treatment and disposal.

17.12.2 Mitigation measures

Construction

Prepare and implement a Waste Management Sub Plan which addresses the following:

- Prevent damage to the environment.
- Move the company and community towards ecologically sustainable development.
- Ensure the operation complies with Environmental Licence conditions.
- Outline the requirements of the *Environmental Protection Regulation (Waste) 2000*.
- Minimise waste generation and the cost of waste for all stages of the construction of the rail facilities.

- Where possible, the quantity of wastes generated and removed from site will be reduced, with wastes to be segregated and recycled. Onsite reuse of wastes including soil, green waste and concrete is to be undertaken, with wastes associated with materials packaging returned to suppliers wherever possible. Remaining wastes during the construction phase will be recycled or disposed at Council's landfill where recycling is not feasible.
- Regulated waste will be removed by a regulated waste contractor.
- Appropriate disposal permits for the disposal of contaminated soil from site will be obtained in accordance with Section 424 of the EP Act. Disposal permits enable appropriate and legal disposal and tracking of contaminated soil or materials.
- Storage of waste materials will be in bunded or stormwater controlled areas where required.

Operational

- Where possible, the quantity of wastes generated and removed from site will be reduced, with wastes to be segregated and recycled. Onsite reuse of wastes including soil, green waste and concrete is to be undertaken, with wastes associated with materials packaging returned to suppliers wherever possible. Remaining operational wastes will be recycled or disposed at Council's landfill where recycling is not feasible.
- Waste collection practices will be designed to prevent the site from becoming contaminated by oil or chemical spills during construction. New opportunities to reduce, reuse or recycle waste that may become available will be incorporated into the waste management strategy.
- Appropriate disposal permits for the disposal of contaminated soil from site will be obtained in accordance with Section 424 of the EP Act. Disposal permits enable appropriate and legal disposal and tracking of contaminated soil or materials.
- Storage of waste materials will be in bunded or stormwater controlled areas where required.

17.12.3 Waste monitoring

Construction

- Records of all waste materials generated during the construction phase are to be maintained. These records shall form part of a regular environmental management audit process for the construction works.

Operation

- Records of all waste materials generated at the facility during operation are to be maintained (note, these may be maintained by the Waste Contractor). These records shall form part of a regular environmental management audit process for the site.

17.13 Noise and vibration

17.13.1 Objectives

- Construction noise and vibration impacts to be reduced as far as practicable through the implementation of appropriate management procedures.
- Operational noise levels to be maintained by appropriate mitigation measures, including appropriate infrastructure design and noise mitigation measures.
- To minimise the impacts of noise and vibration associated with pre-construction, construction and operational activities on local residents, sensitive places and sensitive animals.
- Design and implement a public complaint system to deal with construction noise and other impacts from construction and operational traffic movements.
- Design and implementation of mitigation measures to achieve compliance with the project noise and vibration goals, where feasible and reasonable.

17.13.2 Mitigation measures

Design

During the detailed design phase investigate the possibility of moving the rail infrastructure to the west, further away from residential dwellings to the east of the project area.

Given the noise modelling information provided, the accuracy of the modelling predictions and the number of variables and assumptions, rail noise levels at sensitive receptor locations will be investigated in more detail during the detailed design phase of the Project. Monitoring will be undertaken for a single 48 hour period at representative noise sensitive receptors.

If exceedances of QR's noise criteria are identified during the detailed design phase, mitigation measures will need to be investigated, as required.

During the detailed design phase of the Project consideration will be given to the completion of building condition surveys for any buildings that fall within the safe working distances for the prevention of cosmetic damage.

Construction

In general, the quietest suitable plant and equipment will be utilised in combination with management measures in order to minimise the noise impacts on the local community.

The management of noise impacts is best achieved by the efficient scheduling of these activities and restricting their hours of operation to those times of the day during which the noise from such sources is least likely to be disruptive.

Noise mitigation strategies would need to be considered and implemented during any evening and night-time work periods.

AS2436-1981 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*" sets out numerous practical recommendations to assist in mitigating construction noise emissions. Noise control strategies that will be implemented during the construction phase are listed below.

Source noise control strategies

- Quietest plant and equipment that can economically undertake the work should be selected, wherever possible.
- Regular maintenance of equipment to keep it in good working order.

Source noise controls

- Noise measurements of plant and equipment to maintain/check noise emissions.
- Mobile plant and other diesel powered equipment to be fitted with residential class mufflers.
- Minimise the usage of truck exhaust brakes onsite.
- Where possible, use silenced air compressors onsite.

Work practice control strategies

- Construction work to occur within the daytime period, wherever possible.
- Where practicable, avoid the coincidence of plant and equipment working simultaneously close together.
- Operators of construction equipment are to be made aware of the potential noise issues and of techniques to minimise noise emissions through a continuous process of operator education.

Work practice controls

- Reversing alarms within construction areas cannot be avoided for safety reasons. Consideration should therefore be given to sourcing so-called “quiet” white-noise alarms whose annoying character diminishes quickly with distance and self-adjusting alarms which adjust emission levels relative to the local background noise level.
- Large rocks are to be placed in dump trucks not dropped.
- Horn signals should be kept at a low volume, where feasible without compromising public and employee safety.

Community liaison strategies

It has been well established that resident sensitivity thresholds are strongly influenced by “fear of the unknown”, the unexpected and by concerns surrounding the possibility of damage to their dwellings. While these typical reactions are clearly understandable, the underlying concerns are often technically unjustified.

It is therefore proposed to implement, as part of the broader community involvement plan, a well-planned, focussed community awareness programme in order to improve the understanding of the noise and vibration issues and to assist in allaying potential fears and concerns, particularly where vibration is the perceived concern. This programme may include, for example:

- Active community consultation and the maintenance of positive relations with residents. Representative groups of the community could be invited to attend a short, concentrated Noise and Vibration Briefing prior to the works approaching their community.
- Ensure measures are undertaken to reduce the noise and vibration impact at neighbouring properties.
- Where construction noise levels exceed the recommended criteria or in the event of complaints, an investigation of construction noise will be required.
- Provision of a complaints phone number.

Community liaison controls

- Construction site personnel are to be made aware of all community attitudes and complaints.
- Residents are to be made aware of the times and duration that they will likely be affected. Making residents aware of likely future occurrence of noise significantly reduces annoyance and allows people to make arrangements accordingly.

Vibration

Where possible, the safe working distances described in Table 10.12 should be adhered to onsite. It is recommended to carry out vibration monitoring to confirm these buffer zones close to sensitive receivers. Monitoring should also be undertaken in the event that vibration intensive activities, such as vibratory rolling or pile driving are required to be carried out within the established buffer zones.

The use of compactors should be examined as a substitute for vibratory rollers. Likewise, bored piles should be used for bridge supports where feasible as opposed to driven piles.

Further investigations are also recommended for any structures within and around the safe working distances in order to determine if the “light weight” cosmetic damage criterion (as used for this assessment), is applicable or whether a higher value may be more appropriate.

Operational

Given the noise modelling information provided, the accuracy of the modelling predictions and the number of variables and assumptions rail noise levels at sensitive receptor locations will be confirmed during post-commissioning of the line. Monitoring will be undertaken for a single 48 hour period at representative noise sensitive receptors.

17.14 Flora and fauna

17.14.1 Objectives

- To minimise the potential for impacts to flora and fauna species and vegetation communities, particularly those of state and/or national listed significance, during pre-construction, construction, and operational activities.
- Minimise clearance of terrestrial vegetation, marine plants and habitat.
- Rehabilitate disturbed areas and maintain to avoid colonisation by weeds.
- Implement fauna and habitat management measures that prevent injury to terrestrial fauna.
- Minimise impacts to fauna during pre-construction and construction.
- Implement infrastructure design measures that minimise impacts to terrestrial and aquatic fauna and habitats.
- Implement a rehabilitation plan for the revegetation and reinstatement of terrestrial habitat.

17.14.2 Mitigation measures

Design

Vegetation clearing and earthworks

- Maximise the width of the buffer between the railway lines and associated earthworks and *Cycas ophiolitica* and *Eucalyptus raveretiana* (Black ironbox).
- Where railway lines cross Elizabeth and Willy Creeks explore opportunities to use bridges rather than culverts to minimise the clearing of riparian vegetation and minimise disruption to the creek channel.
- Minimise rail corridor footprint through innovative design techniques to limit disturbance to vegetation and waterways, where possible.
- Where possible, minimise the disturbance to marine plants within the Plane Creek area and wetland vegetation in order to retain their ecological value and their buffering abilities.

Conservation and protection measures

- Utilise a high flow bypass channel across previously cleared land rather than straightening Elizabeth Creek.
- Locate the locomotive turnaround facility to avoid the significant wetland (Site K) and adjacent vegetation. Any works proposed within 1 km to the north or south of this area should be carefully considered due to the negative impacts that it will have on habitat values in this area.
- In consultation with the EPA and DNRW find opportunities for offsetting removal of the area of RE 8.12.12a and riparian vegetation along Elizabeth and Willy Creeks in the areas adjacent to the project area and remnant vegetation.
- Maximise and retain wildlife corridors within the project area – these are primarily the riparian zones associated with Plane Creek, Elizabeth Creek and Willy Creek. Limit the disturbance and reduced function of these corridors as these serve as the last viable wildlife corridors in the local area.
- Where practical include opportunities to widen the remaining riparian vegetation within the project area to a minimum of 20 m on each bank using pioneer species with dense canopies to close the edge (in order to minimise weed invasion and other edge effects).
- Design structures to minimise risk to fauna (ie prevent bird nesting and/or roosting).

- Design bridges to minimise impact on riparian zones.
- Where culverts must be installed rather than bridges, culverts shall be fitted with raised ledges (of 100 mm) on at least one side of the culvert; where multiple culverts are to be used set the invert level of the outer culverts so that they provide dry access for small ground dwelling fauna. Explore best practice fish friendly culvert design (ie culvert inverts).
- Adequate lighting shall be provided within culverts (eg skylights) where continuous crossings are longer than 30 m.
- Define areas to be rehabilitated and/or revegetated as part of the design to address loss of connectivity between existing habitat areas (ie improve wildlife corridor function).
- Additional lighting shall be designed in such a way that the structures and lights have a minimal impact on surrounding habitats and fauna (refer Section 17.18.2).

Pollution control systems

- Any fuel and chemical storage facilities should be designed in order to provide sufficient buffer zone and limited pathway to aquatic environments.
- Any waste storage facilities being incorporated into the design of the Project shall be located and designed in such a way that it will be protected from fauna.

Management system measures

- Prepare a Construction Environment Management Plan (EMP(C)) supported by drawings showing spatially where the various management measures are to be implemented.

Construction

Vegetation clearing and earthworks

- Install erosion and sediment control measures, prior to construction.
- Ensure dust suppression mechanisms are in place throughout the construction period.
- Minimise clearance of remnant vegetation to that necessary for construction. Ensure all necessary permits and approvals are in place prior to commencing such works.
- Minimise disturbance to riparian and instream vegetation to prevent bank erosion and excess sedimentation.
- No filling, draining or alteration of any waterway is to occur unless absolutely necessary for construction. Ensure all necessary permits and approvals are in place prior to commencing such works.
- There shall be no additional clearing of native vegetation to accommodate temporary facilities such as site offices, stockpiles and plant and equipment storage.
- Where practical access tracks will be constructed clear of waterways.
- Mulching of cleared vegetation should occur as soon as practicable after clearing to avoid resident fauna populations moving into the stockpiles of felled trees. If stockpiles are not mulched immediately after clearing, it is recommended that a spotter/catcher be present whilst plant machinery disturbs the stockpile prior to mulching to attempt to move any fauna that may be within the stockpile prior to mulching.
- Culverts and other infrastructure should be installed so that they do not impede water and fauna movement within existing creeks and do not exacerbate scouring and sedimentation.

Conservation and protection measures

- If the *Cycas ophiolitica* and *Eucalyptus raveretiana* (Black ironbox) are to be retained collect seed from them for propagation and planting in suitable locations nearby to increase numbers and density to aid in their long term survival in the area (to be negotiated with the EPA).

- If the *Cycas ophiolitica* cannot be retained in their current location relocate them to another suitable area outside the project area (to be negotiated with the EPA).
- If the *Eucalyptus raveretiana* (Black ironbox) cannot be retained collect seed from them for propagation and planting in suitable locations outside the project area (to be negotiated with the EPA).
- Minimise operation of heavy equipment within the riparian zone or adjacent to waterways and ensure that construction vehicles and machinery remain on designated roadways.
- Disturbances within and around the wetland area shall be kept to a minimum, particularly during the summer migratory season.
- Protect and clearly define/mark all vegetation for retention which will be clearly communicated to work crews. Vegetation (trees) to be retained shall be protected by exclusion fences. Exact location should be verified on site in consultation with the Environmental Officer.
- Trees and stags containing hollows are to be marked prior to construction and are to be retained unless they present a significant risk to the health and safety of people and property.
- Where hollows are destroyed, bat and habitat boxes suitable for Sugar gliders should be obtained and be placed between 3 and 6 m from the ground for microbats, 4 to 8 m for Sugar gliders on the eastern, southern and western side of the tree.
- Bat boxes should be placed at the rate of 30 per ha of woodland/forest vegetation removed in Sites E, F and J in areas adjacent to the cleared areas. These should be clustered in groups of three or four (one per tree) within a radius of 10 to 15 m.
- Boxes suitable for Sugar gliders should be placed at the rate of 20 per ha of woodland/forest vegetation removed in Site E in areas adjacent to the cleared areas. Glider poles should not be used due to risk of electrocution.
- Implement a procedure if an injured animal is encountered.
- Hollow bearing trees and cleared vegetation may be used in rehabilitation and/or landscaping activities to improve habitat complexity.
- Hollow logs on the ground shall be kept intact and where possible moved to adjoining habitats.
- Exclude parking of vehicles, storage of plant and equipment and stockpiling from the drip zone of trees to be retained.
- Mulch cleared vegetation for reuse in any revegetation works where possible. Do not include seeds and other propagules of environmental and declared weeds.
- Stabilise disturbed areas of soil either by grass seeding or replanting with endemic vegetation (where possible) as soon as practical, to minimise soil erosion and downstream sedimentation.
- Ensure dust suppression measures are implemented throughout the construction process to minimise damage to adjacent REs, significant non remnant vegetation and significant species.
- Revegetate the entrances to culverts to enhance their potential for use as fauna underpasses.

Pollution control systems

- Fuel and chemical storage facilities should be designed in order to provide sufficient buffer zone and limited pathway to aquatic environments.

Management system measures

- Ensure an appropriately qualified Environmental Officer is present on the construction site at all times during construction to address any environmental issues in a timely manner.
- Prepare and implement a Weed Management Sub Plan (including wash down for vehicles prior to entering the project area) to prevent the introduction of additional weed species and the further spread of existing species within the project area. This should operate throughout the construction and maintenance period.
- Prepare and implement an Erosion and Sediment Control Plan to minimise the sedimentation from the project area downstream of Plane, Elizabeth and Willy Creeks.

- Prepare and implement an Erosion and Sediment Control Plan in order to protect all waterways within the project area from reduced water quality as a result of increased sediment and nutrient loads. This is particularly important due to the sensitivity of the downstream environment (Sarina Inlet and Llewellyn Bay and ultimately the Great Barrier Reef).
- Prepare and implement a Dust Monitoring Programme and Water Quality Monitoring Programme (eg visual observation) within the vicinity of the three creeks and their downstream environs and ensure it commences prior to construction works.
- Prepare and implement bushfire management measures (as part of site emergency procedures) to minimise damage to adjacent regional ecosystems, wetland and riparian vegetation.
- Implement a revegetation/rehabilitation plan for the area.
- Prepare and implement a Fauna Management Sub Plan which shall include but not be limited to the following:
 - An EPA certified spotter/catcher must be engaged for the length of clearing works, clearing must not commence until a spotter/catcher has inspected the area and given approval for works to commence.
 - All native fauna is protected, including snakes and any fauna that is discovered onsite must not be harmed, a spotter/catcher will relocate fauna to similar habitat within the area. If the animal is in an area where works are to occur, work must cease until a certified spotter/catcher or EPA representative has removed the animal.
 - Inspection of the area to identify any hollow bearing trees. Trees with significant hollows (ie with a diameter of 10 cm or greater) than will be checked and where necessary relocated or replaced at a 1:1 ratio.
 - Provisions shall be made for tree hollows to be removed from habitat trees and retained to be reattached to other suitable trees outside of the project area. A cherry picker should be used when removing the hollows so that they can be lowered safely to the ground before the tree is felled to avoid any animals being injured.
 - The replacement of any hollows knocked down or damaged during clearing shall be employed (ratio will depend on existing density and consultation with the EPA). Hollows that have been removed from habitat trees should be reattached to a tree of the same species facing in the same aspect, by the spotter/catcher preferably within the same day of the hollow being removed so that the animal inside does not need to be re-located without a hollow.
 - Inspect trenches, culverts and other structures daily to ensure that no fauna species are trapped or injured due to site works.
 - Install trench ramps at 15 degree slope every 30 m or place branches or suitable material for fauna to climb and escape from trenches.
- Prepare and implement a Pest Management Sub Plan which shall include but not be limited to the following:
 - During construction, sighting of declared species to be reported to relevant officer in DNRW and further management steps to be advised by government department and/or Sarina Shire Council.
 - Contractors shall not willingly introduce declared pest species as listed under the LP Act.
 - Implement waste management measures to avoid increased numbers of introduced animals and opportunistic native fauna in the project area and adjacent areas during construction activities.
 - Imported material to be checked. No biotic or abiotic contamination is to enter the construction site.
- Prepare and implement a Hazardous Materials Management Sub Plan that includes procedures that will assist in the avoidance of material spills and ensure prompt clean up of any that occur.

Operational

Vegetation clearing and earthworks

- Maintenance works are carried out within designated areas and/or offsite. This should be an area that is currently cleared within the project area.
- Any new access tracks shall be constructed clear of waterways wherever possible.

Conservation and protection measures

- Maintenance contractors are to remain on designated tracks and shall not disturb surrounding vegetation.
- Exclude parking of vehicles, storage of plant and equipment and stockpiling from the drip zone of trees to be retained. These activities should be confined to currently cleared areas only.
- All native fauna is protected and shall not be intentionally harmed as a result of workers or workers actions.

Pollution control systems

- Ensure any chemicals used on the project area are properly contained and disposed of to prevent soil contamination and subsequent damage to native vegetation

Management system measures

- Traffic should be restricted to constructed access tracks.
- Prepare and implement a Weed Management Sub Plan for the project area. Ensure herbicides are applied judiciously to avoid damaging non target flora and vegetation (consider the use of steam weeding technology rather than applying herbicides).
- Prepare and implement a Pest Management Sub Plan. Discourage the feeding of wildlife by personnel throughout the project area.
- Prepare and implement an Emergency Response Plan to address the risk and management of operational activities in relation to fire risks.

17.15 Cultural heritage

17.15.1 Objectives

- Prevent the loss of, or damage to, items of Indigenous and non-Indigenous cultural heritage as a result of construction works.
- Ensure all indigenous and non-indigenous cultural heritage artefacts and sites of significance are identified, protected and managed in accordance with all relevant statutory requirements during pre-construction, construction and maintenance activities.

17.15.2 Mitigation measures

To minimise the impact from construction on the existing Indigenous and Non-indigenous environment, the following management measures will be implemented:

- Ongoing consultation with Traditional Owner representatives.
- Finalise the draft CHMP (refer Appendix M) and obtain approval from DNRW.
- Project works to be undertaken in accordance with the ACH Act.
- Implement the CHMP, which will include requirements for monitoring construction, specifically excavation activities within the proposed project area.

- Construction staff to attend cultural heritage inductions, by Traditional Owner group representatives prior to commencement of works, to promote an understanding of the potential indigenous heritage existing within the development.
- Construction staff will be made aware of the importance of the ACH Act and the Duty of Care.

The Operational EMP for the rail infrastructure will include the requirement to comply with the ACH Act.

17.16 Social

17.16.1 Objectives

- Minimise the impacts of construction activities on the existing values and structure of nearby local communities.
- Wherever possible, enhance the development of community well being and amenity, including the provision of commercial and employment opportunities.
- Develop and implement a comprehensive Community Liaison programme, including regular meetings with community representatives and a project construction awareness programme.
- Provide clear communication to community members of the project objectives, project definition and scope of the assessment to allow community members to consider the potential issues, benefits and impacts.
- Obtain community input to identifying local values and knowledge to be considered in the impact assessment investigations and development of the design.
- Provide inclusive and regular opportunities for community members to participate in consultation.

17.16.2 Mitigation measures

To minimise the impacts of construction the following mitigation measures will be implemented:

- Any land that is not utilised for the construction of this Project will be retained for cane production.
- QR will upgrade the existing at-grade intersection of Oonooie Road with the North Coast Line to an above grade intersection with an overpass. This will provide 24 hour unrestricted access to CSR Ethanol Distillery, Oonooie Facility and the cane lands along Gurnetts Road.
- The Alliance Construction Team will source the workforce from the local area where possible.
- The Alliance Construction Team will liaise with local employment agencies and training providers regarding the provision of suitable training opportunities. Where possible, this will specifically target opportunities for unemployed people.
- Should labour need to be imported to the Mackay region, the proposed accommodation village and associated facilities, including recreational facilities and transport to and from the construction site will reduce negative impacts on the local community.
- The development of a construction accommodation village in the Sarina Shire. The site will not only be practical for project needs but offer some potential for a lasting benefit to the community.
- The accommodation village will accommodate a minimum of 250 workers with a capacity to accommodate up to 300 people.
- It is proposed that the accommodation village will be constructed and demobilised in stages of 50 to 100 rooms at a time.
- The facility is anticipated to provide kitchen and dining facilities, recreation room, gymnasium, storage, laundry and cool room.
- Access will be provided to the accommodation village directly from Armstrong Beach Road so as to minimise the impact on local traffic.
- The provision of buses to and from the site and into the Sarina township reducing the number of vehicles on the road.

17.17 Health and safety

17.17.1 Objectives

- Establish a Workplace Safety Ethic and Programme.
- Ensure a prompt and appropriate response is made to unplanned incidents where life and property are threatened during the construction phase.
- Provide a safe work site during the construction phase, achieve sustained reductions in the number of accidents during the operation phase and maintain a safe and secure site environment.
- Ensure that satisfactory safety provisions are implemented during construction and for the operational phase of the Project.
- Identify potential hazards and risks and apply appropriate impact treatment and/or prevention mitigation measures.

17.17.2 Mitigation measures

The following mitigation measures will be implemented to minimise potential health and safety impacts:

Design

- All design is to be to relevant Australian Standards, Sarina Shire Council and regulatory requirements. For North Queensland, this includes allowance for severe climatic events such as cyclones and flooding.
- Design is to minimise interaction with the general public through minimal rail crossings and access to the Jilalan Rail Yard.
- Consideration will be given to potential mosquito breeding in the design stage. Queensland Health (2002) has published Guidelines to minimise mosquito and biting midge problems in new development areas. This document provides advice on how to prevent or minimise the impact of mosquitoes and other biting insects in new development areas.
- Constructed wetlands, water impoundments, grass swales and open earth drains will all be designed so as to minimise mosquito breeding. The Australian Mosquito Control Manual (Mosquito Control Association of Australia 2002) has helpful advice on mosquito control.

Construction

- To increase general site safety and to assist in preventing minor injuries during project construction all persons on site will wear appropriate Personal Protective Equipment (PPE) including:
 - Hard hat
 - Safety glasses
 - Steel capped boots
 - High visibility clothing
 - Ear protection when conditions warrant their use
 - Dust masks when conditions warrant their use
- Construction and installation of water storages will be carried out in accordance with Part 8, Mosquito Prevention and Destruction of the Health Regulation 1996. Where a risk assessment process has identified that there is a significant risk of mosquito borne disease, holding tanks for recycled water should be designed so as to prevent entry of mosquitoes.

Operational

- Implement and update as required relevant QR procedures and documents for the Jilalan Rail Yard.
- Regular maintenance of all structures associated with storage or treatment of recycled water is necessary to minimise mosquito breeding. For example, if mosquitoes are present in open water storage, water plants should be cleared away from the edge of the storage to reduce habitat for larvae. In particular, recent research suggests that dense mats of surface vegetation or fallen decaying material can encourage mosquito breeding (Dale *et al*/2001).
- When recycled water is used for irrigation, surface ponding should be prevented by appropriate irrigation scheduling.
- Open recycled water storages should be monitored regularly to identify presence of mosquito larvae.
- If a potential health risk from mosquito breeding has been identified, biological control using natural predators, such as aquatic invertebrates or native fish known to prey upon mosquito larvae, may be considered.

17.18 Visual amenity and landscape character

17.18.1 Objectives

- Implement revegetation measures to promote the use of native Australian vegetation species.
- To protect and enhance the visual amenity of the site and surrounding areas.
- To design and implement a landscape programme that integrates the development into the existing character of the site through the use of local native species.
- Minimise visual impacts of Project.
- Strengthen natural corridors and rehabilitate degraded areas.

17.18.2 Mitigation measures

Design

Artificial lighting

The following measures will be implemented to minimise the adverse impacts of artificial lighting on fauna:

- Install lights that do not emit rays above the horizontal plane and spill minimal amounts of light above the area to be lit (Autonomous Government of Catalonia 1998).
- Use lighting that only emits sufficient light to achieve the purpose it is required for.
- Use light fittings which cause minimal dispersion of light outside the target area.

The following measures are recommended to minimise the adverse impacts of artificial lighting on local residents:

- Use light fittings which cause minimal dispersion of light outside the target area.
- Provide screening vegetation around the edge of the project area to filter any light spill.

Other infrastructure

The following measures will be implemented to minimise the adverse impacts of the design on local residents:

- Locate railway infrastructure as far away from the residential dwellings that are to remain as practical.

- Incorporate areas of soft landscaping (vegetation) into the design to soften and screen the proposed rail infrastructure and rollingstock from passing traffic (road and rail) and local residents.
- Provide a vegetated buffer zone along western side of Gurnetts Road. The design and species selection shall comply with all relevant Main Roads Department guidelines for clear zones, sight distances and clearances to other elements for the speed environment of Gurnetts Road and connecting roads. The following local native species are suggested because of their hardiness and their ability to provide visual screening:
 - Red wattle (*Acacia flavescens*)
 - River oak (*Casuarina cunninghamiana*)
 - Cottonwood (*Hibiscus tiliaceus*)
 - Creek matrush (*Lomandra hystrix*)
 - Blush macaranga (*Macaranga tanarius*)
 - Red kamala (*Mallotus philippensis*)
 - Weeping teatree (*Melaleuca leucadendra*)
 - Brown pittosporum (*Pittosporum venulosum*)
 - Scrub cherry (*Syzygium australe*) including cultivated forms.

Operational

The following measures will be implemented to minimise the adverse impacts of the operation of the rail infrastructure:

- Maintain areas of screening vegetation and include a programme of replanting vegetation that is senescing and no longer providing optimal screening.
- Maintain the rail infrastructure and the project area in a clean and tidy condition.

17.19 Environmental Management Process

17.19.1 Preamble

QR's Environmental, Planning and Processes Manual and documentation requirements are summarised below.

Environmental Management Plan (Planning) (EMP(P))

The EMP(P) summarises the assessment and lists management recommendations for planning, also including recommendations for design, construction and operations.

Design drawings

Incorporates all environmental management measures that can realistically be shown on a drawing at this stage of the Project.

Environmental Design Report (EDR)

Documents how the planners and designers have incorporated the recommendations of the EMP(P) into planning and design.

Environmental Management Plan (Construction) (EMP(C))

The Alliance Construction Team, using information from the above sources, prepares the EMP(C). The plan would typically cover erosion and sediment control, the need for fauna spotter/catchers etc.

The EMP (C) will consist of the following subplans:

- Erosion and sediment control
- Acid sulfate soil management
- Flora and fauna
- Weed management
- Dust management
- Noise and vibration management
- Waste management
- Cultural heritage management

The final EMP (C) may include additional environmental measures to meet project demands and will be in accordance with the Alliance Construction Team's EMS (refer Appendix L).

Construction drawings

Incorporate as much direction on environmental management as practicable (eg siting of no-go vegetation areas, permanent erosion control devices etc).

Audit, feedback and improvement

This should at least be done at 'practical completion' stage, but could be done at any time. It can be formal or informal and include office and/or onsite issues.

Environmental Management Plan (Operation) (EMP(O))

Summarise the assessment and lists management recommendations for operations (may include above and/or below rail considerations relating to maintenance, decommissioning etc).

The EMP (O) will consist of the following sub plans:

- Erosion and sediment control
- Acid sulfate soil management
- Flora and fauna
- Weed management
- Dust management
- Noise and vibration management
- Waste management
- Cultural heritage management

The final EMP (O) may include additional environmental measures to meet project demands.

This EMP will be refined following a government decision on the Project and will form the EMP(P) for the Project.

17.19.2 Content of an EMP

The Construction and Operational EMPs should address the requirements of the relevant environmental management strategies outlined in the EMP in separate sections. The EMPs should provide information under several different headings (which complement those in the environmental management strategies) as outlined below.

- **Overview of Impacts and Existing Situation** – The anticipated construction and/or operational impacts of the Projects as determined in the EIS and EMP(P) should be detailed.

- **Objectives** – This section should provide the management objectives or environmental commitments to be achieved, as included in the 'objectives' section of the relevant environmental management strategy.
- **Mitigation Measures** – This section should provide details of the actions to be performed onsite. These actions should be developed from the requirements provided in the 'mitigation measures' section of the relevant environmental management strategy.
- **Monitoring** - This section should provide information on the monitoring activities to be performed. The actions included in this section may be sourced from the 'Monitoring' section of the relevant environmental management strategy.
- **Reporting** - This section should provide information on the reporting which will be performed by the Alliance Construction Team. The details included in this section may be able to be sourced from the 'Reporting' section of the relevant environmental management strategy.
- **Non Compliance** – This section should provide information on the corrective actions to be implemented. The level or extent of corrective actions implemented should reflect the seriousness of the event. The various indicators which should trigger the implementation of corrective actions are provided in the 'corrective actions' section of the relevant environmental management strategy.
- **Corrective Actions** – This section should outline the action, or the commitment for action, to be implemented when a specified mitigation measures is not met or legislative requirements have been exceeded.

17.19.3 Submission of an EMP(C)

The Alliance Construction Team will submit an EMP(C) to QR for approval prior to major construction activities commencing.

The Alliance Construction Team will have overall responsibility for the full and complete implementation of the EMP(C).

17.19.4 Reporting

Alliance Environment Officer to prepare and submit a monthly environment report to QR. The monthly report is to include:

- Monthly monitoring results
- Audit results
- Incidents
- Corrective action/response

17.19.5 Auditing

The Alliance Construction Team will include in the reporting section of the EMP(C) the requirement to submit weekly checklist audit reports to QR.

The EIS Consultant will audit the Alliance Construction Team's implementation of their EMP(C) on a monthly basis.

Actions to be undertaken by the EIS Consultant during the audit are likely to include:

- Check monitoring programme and reporting procedures.
- Undertake investigations where necessary.
- Review performance standards and criteria against results.
- Prepare audit reports over time (with respect to agreed schedule) and submit to the QR.
- Procedures for non compliance and exceedance/investigation/intervention of indicators identification.