HANCOCK PROSPECTING PTY LTD

Alpha Coal Project Supplementary Environmental Impact Statement

AC Railway Corridor – Environmental Management Plan

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Appendix AC Environmental Management Plan

AC.1 Introduction

AC.1.1 Purpose and Structure

This Environmental Management Plan (EM Plan) has been developed to address the environmental management requirements relevant to the rail component of the Alpha Coal Project (Rail) (herein referred to as the Project).

The following EM Plan details the measures to be adopted to address identified impacts during the construction and operation of the Project.

In essence, the EM Plan is to provide Hancock Prospecting Pty Ltd (HPPL) (the Proponent) and the construction contractors with a practical guide to ensure compliance by all parties with the environmental requirements. The EM Plan achieves this by providing a framework for control and monitoring of impacts arising from Project activities. The aim is to minimise the potential for negative impacts on the environment. The EM Plan also identifies corrective actions if monitoring indicates that the performance requirements have not been met.

The EM Plan has been prepared to respond to the potential impacts associated with the Project as identified in the Environmental Impact Statement (EIS) and the proposed mitigation measures identified. The Proponent acknowledges that further consultation and negotiation with the Department of Employment, Economic Development and Innovation (DEEDI) is required with respect to the establishment of development conditions for the Project, including those relating to specific mitigation, control and monitoring requirements for certain potential impacts (i.e. such as potential impacts to the Caley Valley Wetlands). The EM Plan will be reviewed and finalised following the issuing of development conditions for the Project.

The management measures and site monitoring required to ensure that potential impacts are identified and minimised are presented in this EM Plan. This plan is specific to the construction and operation of the Project and will be finalised following completion of the EIS and the issuing of development conditions for the Project.

AC.1.2 The Project

HPPL is proposing to construct a standard gauge, 495 km long railway line for the purposes of transporting processed coal from the Alpha Coal Mine site to the Port of Abbot Point north of Bowen. The proposed railway line is a vital piece of infrastructure that will enable export of 60 million tonnes per annum (Mtpa) of quality thermal coal to overseas markets.

The proposed railway line commences at the Galilee Basin in Central Queensland. The Galilee Basin spans over 247,000 km^2 of land and holds over 14 billion tonnes of Joint Ore Reserves Committee (JORC) compliant coal that has been identified by several proponents. As such, the proposed rail corridor will be an essential part of opening up the Galilee Basin for export of thermal coal and other products. As a result, the proposed railway line will benefit the Central Queensland region, State of Queensland and the nation. The northern section of the railway enters the Abbot Point State Development Area (APSDA) and ends at a rail loop and dump station immediately south of the Abbot Point Coal Terminal.

The proposed railway line will enable export of 60 Mtpa of quality thermal coal for a lifespan of approximately 30 years. With construction of additional passing loops to the single line track and selective partial duplication, there is potential to further increase the tonnage and thus service other

potential mines from the Galilee Basin. HPPL has undertaken to make the track available to third party users under a Voluntary Undertaking pursuant to the *Trade Practices Act 1974.*

In addition to the main line from the Alpha Coal Mine to the Port of Abbot Point, the Project also involves construction of the following:

- two balloon loops, one at the Alpha Coal Mine for loading and one at the Port of Abbot Point for unloading;
- nine passing loops each approximately five km long to accommodate export of 60 Mtpa of coal;
- maintenance tracks along the railway line;
- marshalling yard (including a passing loop) at the entry to the APSDA; and
- five workers' accommodation villages (two temporary and three semi-permanent) accommodating for 450 - 500 personnel per camp.

From a regional perspective, the majority of the Project lies within the Whitsunday Hinterland and Mackay (WHAM) region, with a small area lying within the Central West Region at the Alpha Township.

The Project stretches between the Alpha Coal Mine, 38 km northwest of the town of Alpha and the Abbot Point coal export terminal, 22 km north-west of Bowen. The rail corridor proceeds in a generally north-easterly direction from the Alpha Coal Mine, crossing the Belyando River and several of its tributaries in the first 100 km. The railway crosses generally relatively flat lowlands before commencing a gentle climb from near Eaglefield adjacent to the Suttor River, to a point near the existing Newlands mine. This is the highest point on the railway at approximately 300 m above sea level. In the vicinity of the Newlands mine, the railway runs parallel to the Newlands Railway and Queensland Rail (QR) Northern Missing Link railway for approximately 70 km through a pass in the Leichhardt Range and parallel to the Newlands Railway to a point near the Bowen River. The Railway then travels in a north-westerly direction on crossing the Bowen River, then passing down the Bowen River valley through mostly grazing land toward Mt Herbert. The railway passes to the west of Mt Herbert through a pass in the Clarke Range. From this point, the railway travels north-easterly crossing the Bogie River, then finally in an easterly direction entering the Abbot Point area on its western boundary. Within the Abbot Point area it runs parallel to the existing Newlands Rail line for approximately six to eight km.

The railway passes approximately 70 km to the northeast of the town of Clermont, 55 km to the northeast of the town of Moranbah, 35 km to the east of Mt Coolon, 20 km to the west of Collinsville, and enters the Abbot Point area 25 km west of Bowen.

AC.1.3 Project Proponent

HPPL is a privately owned diversified Australian prospecting and mining company that has discovered mineral deposits throughout Australia, some of which have underpinned Western Australia's iron ore export industry. Founded by Lang Hancock more than 50 years ago, Hancock has a long history in the minerals exploration and development industries across Australia. The company has held coal tenements in Queensland for more than 30 years.

AC.1.4 Stakeholders

Stakeholders who could be included (but not limited to) in the Construction and Operation of the Project are summarised in Table AC-1.

Table AC -1 Stakeholders

Stakeholder Group	Stakeholders
Landholders	Landholders will be directly impacted by the Project
Regional Councils	Barcaldine Regional Council Isaac Regional Council Whitsunday Regional Council
Queensland Government	Department of Infrastructure and Planning (Social Impact Assessment Unit,) Department of Employment, Economic Development and Innovation, Department of Communities, Department of Education and Training, Queensland Police, Department of Main Roads, Department of Environment and Resource Management and Queensland Health.
Residents of the regional study area	People living in the Local Government Areas of Barcaldine, Isaac and Whitsunday Regional Council.
Service providers in the regional study area	For example, health, education, training, emergency services.
Businesses in the regional study area	Businesses based in the towns of Alpha, Clermont, Collinsville and Bowen, this may occur through local progress associations or Chambers of Commerce.
Interest groups	For example, environmental groups

AC.2 General Environmental Management

AC.2.1 Environmental Management Systems

The Proponent will develop an Environmental Management System for the Project.

AC.2.2 Environmental Policy

HPPL will develop an environmental policy relevant to the Project.

AC.2.3 Planning

The following will be developed in relation to the Project to support HPPL's Environmental Management System:

- A detailed register of aspects and impacts
- A legal and other requirements register
- Objectives, Targets and Programs relevant to each environmental element of the Project.

AC.2.4 Implementation and Operation

AC.2.5 Roles and Responsibilities

A number of parties have responsibilities in relation to the implementation of the EM Plan. Broadly, responsibility for environmental management will be assigned as shown in Table AC-2.

All Project staff have a responsibility under the General Duty of Care of the *Environmental Protection Act 1994* and must adhere to the procedures outlined in the EM Plan at all times. HPPL will incorporate environmental management requirements into job descriptions at all levels of operations.

Importantly, the General Manager will hold ultimate responsibility for environmental compliance and implementation of HPPL's Environmental Policy. This is consistent with Sections 492 and 493 of the *Environmental Protection Act 1994.*

Table AC-2 Roles and responsibilities

Role	Responsibilities
HPPL	Implementation and monitoring of the EM Plan. Ensure all supervisory and management staff are aware of and understand their responsibilities under this EM Plan. Ensure that appropriate and adequate resources are allocated to allow for the effective implementation and maintenance of the EM Plan. Ensure periodic reviews of environmental performance are conducted. Report any major environmental incidents that may have a significant impact on the surrounding environment. Ensure that its employees and contractors receive the relevant environmental instruction in relation to the EM Plan and be made aware of and understand their obligations and duties.
Construction Contractor	Be aware of and understand the contents of and the reason for implementing the elements of the EM Plan and ensure all personnel including subcontractors adhere to these requirements. Ensure adequate training in the elements of the EM Plan is provided to all personnel, including contractors. Ensure that personnel involved in the Project, including subcontractors and visitors, have received any environmental training required to ensure they are aware and understand their responsibilities under the EM Plan and environmental approvals adhere to the strategies outlined in the EM Plan. Carry out all work in accordance with the procedures outlined in the EM Plan. Make sure that all environmental safeguards and precautions are in place and adhered to at all times at the site and activity. Regularly inspect and monitor all activities for adherence to proper environmental safeguards. Ensure that all equipment used is properly serviced and that all precautions are in place to prevent the likelihood of an environmental incident occurring. Report all environmental incidents to the Superintendent's representative within 24 hours.
Superintendent's Representative	Be aware of and understand the contents of and the reason for implementing the elements of the EM Plan.
All employees and sub-contractors	Exercise environmental due diligence and achieve compliance with the EM Plan. Report all environmental incidents to the Principal within 24 hours of them occurring.

AC.2.6 Competence, Training and Awareness

A training needs assessment and training plan will be developed for the proposed mining and related activities. This will incorporate environmental and cultural heritage awareness training as shown in Table AC-3.

Table AC-3: Training Needs Matrix

Position	General environmental and cultural heritage induction	Short environmental and cultural heritage induction	Spill avoidance and response	Incident response	Incident investigation, reporting and follow up	Compliance and General Environmental Duty	Environmental degree qualification	Task specific training	Cultural awareness training	Environmental auditing	Fire fighting	Fauna spotting
HPPL Project Manager and Senior Management	✓					✓			✓			
Contractor's Project Manager and Senior Staff	✓			✓	✓	✓			✓			
Environmental Manager	✓		✓	✓	✓	✓	✓		✓	✓		
Administration team	✓		✓	✓				✓	✓			
Supervisors	✓			✓	✓			✓	✓		✓	
Environmental Officers	✓		✓	✓	✓		✓	✓	✓	✓		✓
General employees and contractors (1)	✓		✓	✓				✓	✓		✓	
Visitors		✓										

(1) Requirements for contractors may be varied based on a risk assessment of work to be undertaken.

AC.2.7 Communications

Internal reporting and communication systems and requirements will be developed as follows:

- environmental sections in weekly and monthly Project reports, reporting performance against objectives, targets and key indicators
- environment as an agenda item at all management and supervisor meetings
- environmental monitoring results reported monthly, quarterly and annually.
- incident reporting including environmental incident reporting requirements
- complaints recording and management
- environmental risk assessment incorporated into job safety and environmental analysis and pre-start checklists
- environmental notice boards at key locations around the site
- environmental topics at tool box talks.

External reporting requirements are expected to include:

- Statutory environmental reporting requirements under the Environmental Protection Act 1994 and associated Environmental Authority including:
  - Annual return
  - Incidents causing or likely to cause material environmental harm
  - Any non-compliances with the Environmental Authority
- Any environmental reporting requirements agreed in the Indigenous Land Use Agreement, for example regular reporting on vegetation clearing, aquatic ecosystem health and rehabilitation progress.
- National Pollutant Inventory reporting
- National Greenhouse Emissions Reporting (or equivalent system that may be introduced in future)
- Complaints.

AC.2.8 Documentation

Documentation relating to the EMS will be maintained on site. Documentation will be made available and accessible to all those with assigned environmental responsibilities under the EM Plan/EMS.

AC.2.9 Document Control

All documentation developed in relation to the EMS will be managed in accordance with the site-wide document control system.

AC.2.10 Operational Control

Operational controls will be developed based on the requirements set out in this EM Plan.

Additional operational controls in relation to social and socio-economic aspects and impacts are contained in the separate Social Impact Monitoring Plan (Refer to Volume 3, Section 26 of the EIS).

The separate Traffic and Transportation Management Plan (to be developed) sets out controls in relation to traffic and transport related impacts, including environmental and amenity impacts.

The separate Cultural Heritage Management Plans set out controls and requirements in relation to management of cultural heritage.

AC.2.11 Emergency Preparedness and Response

An incident response plan will be developed for the proposed mining and associated activities. This will incorporate responses to environmental incidents including:

- Chemical, fuel and oil spill on or off the site;
- Bushfire, including a fire management regime;
- Vehicle accidents.

AC.2.12 Checking

AC.2.13 Monitoring and Measurement

Monitoring and measurement requirements in relation to elements of this EM Plan. The key monitoring tool will be daily and weekly inspection checklists that will be completed in relation to the range of environmental impacts identified.

Additional monitoring requirements in relation to social and socio-economic aspects and impacts are contained in a separate Social Impact Monitoring Plan (SIMP).

AC.2.14 Evaluation of Compliance

Evaluation of compliance will be achieved by internal and external auditing as specified in Section AC.2.17 below.

AC.2.15 Non-Conformity, Corrective Action and Preventive Action

Non-conformities and corrective actions will be recorded on environmental management checklists. Where items can be closed out promptly, the checklists shall be used to record this. Where items cannot be closed out promptly, or require more widespread management response, these will be entered into a Corrective Action register. Any identified non-conformances that cannot be addressed immediately, or that require changes to procedures or systems will be entered into the register. Corrective actions arising from incident investigations will also be included in the corrective action register.

The register will include:

- The actual non-conformance, including a root cause analysis
- Actions required to address the non conformance, including:
  - Actions required to repair any environmental damage
  - Actions to prevent recurrence
  - Changes to procedures, systems or practices to prevent recurrence
  - Training and awareness requirements related to any of the above, for example tool box talks
- The person(s) assigned to undertake the actions, with an automatic notification system
- Time frames in which the actions will be undertaken
- Close out.

AC.2.16 Control of Records

All records generated through implementation of the EMS/EM Plan will be maintained on site using a centralised records and data management system.

The Proponent and the construction contractor must maintain all environmental communications including reports, audits, complaints, minutes of meetings, records of non-conformances, corrective actions and site inspections such that they are readily retrievable.

AC.2.17 Internal and External Audits

An internal and external auditing program will be established including:

- legal compliance audits conducted (external);
- EMS certification and maintenance audits (external);
- internal daily, weekly and rain event inspections of key aspects of the activity;
- internal EMS compliance audits;
- internal monitoring results reviews; and
- external EMS compliance audits.

Audit results will be reported to the site Management Team. Recommendations from audits will be incorporated into the Corrective Action Register.

AC.2.18 Management Review

During construction, management review will be incorporated into contract review processes.

During operations, management review will be carried out annually, or more frequently if significant compliance issues arise.

The Environmental Manager will prepare documentation for Management Review as follows:

- results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes;
- communication(s) from external interested parties, including complaints;
- the environmental performance of the organization;
- the extent to which objectives and targets have been met;
- status of corrective and preventive actions;
- follow-up actions from previous management reviews;
- changing circumstances, including developments in legal and other requirements related to its environmental aspects; and
- recommendations for improvement.

The Management Review team will then be asked to review and discuss documentation and adopt recommendations for improvement or amend such recommendations as it sees fit, before adopting the amended recommendations.

AC.3 Air Quality

AC.3.1 Background

The landscape along the 495 km Project corridor is rural with the majority of the existing sources of emissions derived from:

- products of combustion from fuel burning vehicles and equipment;
- smoke from low-temperature scrub and agricultural burning;
- wind erosion;
- sea salt (coastal areas);
- mining and extractive industry; and
- vehicle movements across dirt roads.

The main pollutant of concern is dust or particulate matter, particularly in the respirable range. Due to the intermittent nature of many of the sources, background concentrations can vary significantly.

Greenhouse gas emissions arise from all of these sources except for sea salt and wind erosion of soils.

AC.3.2 Environmental Values

The relevant environmental values to be enhanced or protected under the *Environmental Protection (Air) Policy 2008* (EPP (Air)) are the qualities of the environment that are conducive to:

- protecting the health and biodiversity of ecosystems;
- human health and wellbeing;

- protecting the aesthetics of the environment, including the appearance of buildings, structures and other property; and
- protecting agricultural use of the environment.

There are no sensitive receptors within 100m of the proposed rail alignment. There are two residences within 500 m of the proposed alignment. In addition, farm workers may come within 500 m of the alignment during construction. The alignment passes close to some areas of vegetation that may be sensitive to dust deposition. The alignment does not pass through any areas used for cropping but does pass through land suitable for cropping.

Environmental values have not been set in relation to greenhouse gas emissions. As a signatory to the Kyoto protocol, Australia has committed to reach 108% of its 1990 greenhouse gas emissions by 2012. However, Australia has not yet introduced any internal legislative or policy measures that set targets for individual emitters.

AC.3.3 Potential Impacts on the Environmental Value

Construction impacts relate largely to dust emissions from:

- vehicle movements over unsealed surfaces; and
- exposure of soils to wind erosion.

Dust emissions may affect receptors within 500 m of the alignment, however with mitigation measures, impacts are likely to be restricted to within 100 m or less.

Emissions from construction vehicles and equipment are not likely to contribute significantly to degradation of environmental values in relation to air quality.

Potential sources of air emissions from the operation phase of the Project include:

- exhaust emissions from diesel powered locomotive engines; and
- fugitive coal dust emissions from uncovered coal wagons in transit.

Modelling indicates that emissions from these sources are all well within air quality criteria both in terms of in-air concentrations and dust deposition.

AC.3.4 Environmental Protection Objectives

Environmental protection objectives include the following:

- to avoid impacts on human health and amenity arising from particulate emissions;
- to minimise dust emissions beyond 100 m of construction activities; and
- to minimise greenhouse gas emissions.

AC.3.5 Performance Criteria

Relevant air quality criteria are shown in Table AC-4.

Table AC-4: Relevant air quality criteria

	Air Quality Indicator	Criterion, µg/m	Averaging Period	Permissible non-compliances
EPP (Air) and NEPM (Air)	$PM_{2.5}$	25	24 hours	-
		8	1 year	-
	PM_{10}	50	24 hours	5 days each year
EPP (Air)	Total suspended particles	90	1 year	
EPP(Air) and NEPM (Air)	Carbon Monoxide	11,000 (9.0 ppm[1])	8 hours	1 day each year
	Sulphur Dioxide	570 (0.20 ppm[1])	1 hour	1 day each year
		230 (0.08 ppm[1])	24 hours	1 day each year
		57 (0.02 ppm[1])	1 year	-
	Nitrogen Dioxide	250 (0.12 ppm[1])	1 hour	1 day each year
		62 (0.03 ppm[1])	1 year	-
EPP(Air)	Benzene	10	1 year	-
	Toluene	4,100	24 hours	-
		410	1 year	-
	Xylenes	1,200	24 hours	-
		950	1 year	-
PEM (2)	Dust deposition	4 g/m^2/month	1 year	NA

1 Converted from ppm to µg/m^3 at zero degrees Celsius.

2 Protocol for Environmental Management (PEM)" - State Environment Protection Policy (Air Quality Management) for Mining and Extractive Industries, EPA Victoria 1997

AC.3.6 Control Strategies

AC.3.7 Air Quality

During construction, the following control strategies and measures will be implemented:

- soil stock piles will be placed in areas protected from the wind and away from public places where possible. Stockpiles will be aligned with prevailing winds to minimise cross sectional area presented to the prevailing wind direction. Spoil stockpiles will be lightly compacted after placement;
- existing vegetation will be retained where possible or cleared areas and stockpiles re-vegetated with fast growing species for rapid coverage to temporarily or permanently stabilise soil;
- construction traffic will be controlled by designating specific routes for haulage and access. Vehicle speeds on unsealed surfaces will be limited to 50 km/hr, or less if significant dust plumes arise;
- all trucks hauling dirt, sand, soil or other loose materials to and from the construction site will be covered when traveling on public roads;
- wheel wash units or rumble pads will be installed where vehicles enter and exit unpaved roads onto paved roads. Wash-off equipment for trucks and any equipment will be available for any vehicles leaving the site to remove excessive dirt, mud or debris from tyres and other under-surfaces. Material spillage on sealed roads will be cleaned up as soon as possible;
- all construction vehicles, mobile plant and machinery will be maintained and operated in accordance with the manufacturers' specifications to minimise exhaust emissions; and

- any complaints received in relation to dust emissions will be recorded and acted upon in accordance the complaints handling procedure.

During operation, the following control measures will be implemented:

- significant coal spillage (from a derailment for example) in the corridor will be cleaned up on as required basis;
- continue to seek improved coal loading techniques to reduce over-filling (and subsequent coal spillage onto the rail corridor);
- improve the profile of the coal load to reduce surface erosion during transport;
- avoid allowing trains to idle near sensitive receptors; and
- should sensitive receptors locate within 100 m of the alignment, review dust emission levels.

AC.3.8 Greenhouse Gas Emissions

A greenhouse gas emissions minimisation strategy will be developed for the construction and operation stages of the Project. The following opportunities will be examined in relation to the GHD emissions minimisation strategy;

- using biofuels;
- backloading on trucks;
- use of gravel instead of concrete slabs as a base for the demountable single units in the construction camps;
- using the most direct travel route possible;
- disposal/reuse of surplus excavated material including opportunities for coordination with concurrent construction activities in the vicinity;
- educating truck drivers to implement smoother driving practices;
- coordinating staff travel arrangements to minimise aircraft and bus trips by maximising passenger loads on each trip;
- including embodied energy considerations in material selection and procurement strategy during detailed design and for the life of the Project;
- investigating opportunities to maximise the amount of revegetation on site;
- considering the potential for alternative energy sources rather than grid connected electricity;
- selecting appliances based on energy efficiency;
- installing timers and light level sensors on lighting systems around the camps;
- using Green Building Council of Australia Green Star assessment tools to minimise energy use in the construction offices and accommodation buildings;
- designing accommodation camps villages and other buildings to maximise natural ventilation and cooling;
- selecting efficient air conditioning systems and set operating temperatures to maximise efficiency in the workers and constructions camps;
- considering use of solar panels and solar hot water heating for the accommodation camps. Solar panels might also be able to be used for road lighting and powering isolated items such as pumps; and

- selecting site transport vehicles based on energy consumption, with target environmental performance with no less than 5 points in greenhouse and air pollution rating.

AC.3.9 Monitoring and Corrective Action

Construction:

- ongoing visual inspections of working areas and access tracks to check dust levels; and
- enhance dust mitigation strategies if visible dust deposition is occurring at sensitive receptors

Operation:

- check for coal spills in routine maintenance checks;
- clean up any coal spills that are identified immediately; and
- undertake dust deposition monitoring if sensitive receptors relocate to within 100 m of the alignment.

AC.3.10 Surface Water

AC.3.11 Background

The majority of the rail corridor is located within the Burdekin Basin catchment, crossing the subcatchments of Belyando/Suttor, Bowen Broken and lower Burdekin. The northernmost part of the rail corridor is located within the much smaller Don River catchment (3,885 km^2). Many smaller order streams are ephemeral.

All catchments drain to the Great Barrier Reef World Heritage Area/Marine Park. Two wetlands of note are located adjacent to or close to the Project:

- Caley Valley Wetland at Abbot Point. The Project skirts the edge of this wetland; and
- Bowen River: Birralee - Pelican Creek Aggregation. The Project crosses the Bowen River about 3.5 km upstream of this wetland.

Apart from protection of ecological values, water from surface waters is used for stock watering and other agricultural uses. The Bowen River is an important recreational location with activities including recreational fishing. The Belyando-Suttor sub-basin flows into the Burdekin Falls Dam which is an important source of water supply for irrigators and central Queensland towns and cities.

AC.3.12 Environmental Value

The *Environmental Protection Policy (Water) 2009* provides a framework for managing water, including identification of environmental values associated with water and setting of water quality objectives.

Environmental values identified for waters in the study area are:

- farm water supply;
- stock watering and irrigation;
- human consumption of aquatic foods (recreational fishing);
- primary and secondary recreation;
- visual recreation;
- suitability for raw drinking water supply (the Burdekin dam services Townsville-Thuringowa, Bowen and surrounding towns); and

- cultural and spiritual values.

AC.3.13 Potential Impacts on the Environmental Value

The following potential impacts to surface water were identified for the construction and operating phases:

- increased sediment load in runoff and at stream crossings;
- other water quality impacts associated with pesticides for weed control
- stormwater discharge and flow redirection;
- construction water use; and
- hydraulic impacts.

AC.3.14 Environmental Protection Objectives

- to avoid degradation of water quality due to construction or operation of the Project;
- to avoid impacts on other water users arising from construction or operation of the Project; and
- to minimise alteration to catchment hydrology, including localised drainage patterns.

AC.3.15 Performance Criteria

For the purposes of managing Project impacts, the following water quality objectives have been set as shown in Table AC-5.

Table AC-5: Water quality management objectives

Variable	Management Objective
Dissolved oxygen (% saturation)	The lessor of: • 70%; and • 90% of upstream value;
Turbidity (NTU)	The lesser of: • upstream value less 2 NTU; and • 90% of upstream value.
pH	No less than 6.5

For the surface water drainage the following design criteria have been adopted:

- environmental culverts:
  - 600 mm diameter culvert located every 400 m where fill embankment exceeds 1.2 m high; and
  - provided to assist in maintaining sheet flow.
- minor culverts:
  - locations with flow up to 50 m^3/s;
  - designed for 1:20 year ARI Storm;
  - 300 mm freeboard to top of formation; and
  - no overtopping of rail up to 1:50 year ARI storm.
- major culverts:
  - locations with flow from 50 m^3/s to 250 m^3/s;
  - designed for 1:50 year ARI Storm;

  - 300 mm Freeboard to Top of Formation; and
  - No overtopping of rail up to 1:50 year ARI Storm + 300 mm.
- bridge structures:
  - locations with flow over 250 m3/s;
  - designed hydraulics for 1:50 year ARI Storm; and
  - 500 mm freeboard to underside of beams.
- afflux limited to ensure no damage to upstream infrastructure:
  - adopted mainline maximum allowed afflux = 1.5 m; and
  - port maximum allowed afflux = 0.15 m.

AC.3.16 Control Strategies

Design phase:

- undertake detailed hydraulic modelling at the design stage to minimise the effects of increased flood heights and local flow velocity as the result of new bridges and culverts;
- analyse scour potential at stream crossings and incorporate appropriate measures to stabilise bed and banks of streams into designs; and
- design earthworks to minimise changes in drainage paths.

Construction phase:

- develop and implement an erosion and sediment control plan as described in Volume 3, Section 5.3.5 of this EIS;
- conduct ongoing maintenance of erosion and sediment control measures;
- retain erosion and sediment controls until reinstatement success criteria have been achieved;
- where practicable undertake major earthworks during the dry season;
- isolate and remediate existing erosion areas in the immediate vicinity of the construction works to prevent further damage;
- where possible use existing (access) tracks to avoid new ground and soil instability problems;
- stabilise and rehabilitate completed areas as soon as possible;
- stabilise bed and banks of streams as immediately after construction;
- as far as possible construct stream crossings in the dry season;
- restore drainage patterns as closely as possible post construction;
- minimise any filling, draining, damming or alteration of waterways; and
- obtain construction water from existing allocations where possible.

Operation Phase:

- undertake detailed hydraulic modelling at the design stage to minimise the effects of increased flood heights and local flow velocity as the result of new bridges and culverts;
- minimise use of pesticides and use only pesticides with low residual impacts; and
- clean up any coal spills immediately.

Measures for management of water quality impacts from spills and leaks of oils and fuels are covered in Volume 3, Section 11 of this EIS.

AC.3.17 Monitoring and Corrective Action

Design:

- check design drawings to ensure that hydraulic design criteria (and fish passage design criteria) have been met; and
- modify drawings as required.

Construction:

- when constructing across streams with flowing water, monitor pH, dissolved oxygen and turbidity at least 50 m upstream and 20 m downstream daily; and
- if water quality monitoring results exceed water quality management objectives set out in Table AC-5, repeat in one hour.
- if water quality monitoring results exceed water quality management objectives set out in Table AC-5 for two consecutive readings taken one hour apart:
  - review erosion and sediment control measures and improve existing measures or add additional measures to reduce sediment mobilisation and increase sediment retention;
  - check for sources of acidity and neutralise with lime or other suitable neutralising agent; and
  - consider whether aeration is necessary to restore dissolved oxygen (consider potential to increase turbidity).
- inspect erosion and sediment control devices weekly;
- inspect erosion and sediment control devices before significant wet weather events and as soon as safely possible immediately after any wet weather event exceeding 20 mm rain in 24 hours (as reported on Bureau of Meteorology website); and

Operation:

- monitor the alignment, and particularly stream crossings and drainage lines for erosion;
- repair any eroded areas promptly;
- undertake drainage modifications if required to prevent recurrence of erosion;
- inspect alignment for coal spills regularly; and
- clean up any coal spills promptly and restore any streams damaged by coal spills.

AC.3.18 Groundwater

Groundwater impacts are not anticipated to arise as a result of either construction or operation of the Project.

Ongoing inspections of the alignment during construction and operation will identify whether any unexpected groundwater interactions are occurring and management measures can then be developed.

AC.3.19 Noise and Vibration

AC.3.20 Background

The land use immediately surrounding the Project corridor is primarily rural in nature and background noise levels are low, consistent with this. Major noise sources include existing mining activities in the Bowen Basin and rail and road infrastructure.

AC.3.21 Environmental Value

Two sensitive residential receptors have been identified in close proximity to the Project as shown in Table AC-6.

Table AC-6: Sensitive receptors

Receptor	Easting	Northing	Distance from proposed track in metres (m)	Description of receptor
R1*	587080	7701148	113	Occupied dwelling
R2	549392	7748051	260	Occupied dwelling

* Note, the nature of this building is unknown, therefore this receptor has been conservatively assumed to be an occupied

The key environmental values for the acoustic environment are outlined within Section 7 of the *Environmental Protection (Noise) Policy 2008* (EPP Noise) as follows:

(a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

(b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—

(i) sleep;

(ii) study or learn;

(iii) be involved in recreation, including relaxation and conversation; and

(c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

AC.3.22 Potential Impacts on the Environmental Value

Potential impacts during construction will arise from noise from construction equipment and activities. Impacts will mainly occur along the alignment and will be short term. It is likely that most construction activities will occur during daylight hours. The sensitive receptors identified may be affected by construction noise.

During construction, noise impacts may also occur along roads and tracks used to bring materials and equipment to the alignment. This type of noise will be short term and intermittent.

During operations, up to 14 train movements per day will generate noise. Noise modelling indicates that planning guidelines for rail facilities are met at the two sensitive residential receptors identified. Intermittent noise may also arise from maintenance activities and vehicles.

There may be some noise associated with temporary and permanent construction camps but this is unlikely to cause any significant disturbance.

Vibration related impacts are not anticipated. Vibrations from construction may be just discernible at the nearest residential sensitive receptor, if blasting is required.

AC.3.23 Environmental Protection Objectives

Construction:

- minimise noise related impacts on sensitive receptors

Operation:

- protect environmental values for sensitive receptors

AC.3.24 Performance Criteria

For railway operation noise criteria are set as follows:

- 65dB(A) $L_{eq, 24hr}$; and
- 87dB(A) L_{Amax}.

Vibration performance criteria have not been included as vibration related impacts are not predicted.

AC.3.25 Control Strategies

Construction:

- notify landholders of construction works in advance of commencement of works. Provide information on likely timing and duration of works and contact details in the event of questions or complaints;
- notify landholders of any proposed blasting activities; and
- notify landholders of any proposed night time construction works.

Operation:

- review noise control measures if sensitive receptors move to within 100m of the alignment.

AC.3.26 Monitoring and Corrective Action

Construction and operation:

- monitor noise levels at sensitive receptors (within 250 m for the alignment) during day and night;
- respond to any complaints arising in relation to noise.

AC.3.27 Waste Management

AC.3.28 Background

Waste generation for the construction and operation of the Project may include:

- vegetation,
- typical construction wastes including packaging, surplus construction materials such as timber, concrete, gravel, metals and plastics,
- surplus spoil from earthworks and drainage construction,
- electrical and telecommunications cabling off-cuts, and
- typical domestic waste - to be generated from occupation of accommodation villages.

AC.3.29 Environmental Value

The Environmental Protection (Waste) Policy 2000 states the following environmental values in relation to waste management:

(a) the life, health and wellbeing of people; and

(b) the diversity of ecological processes and associated ecosystems; and

(c) land use capability, having regard to economic considerations.

Each of these values is relevant to the Project as the alignment passes through settled areas, areas of ecological value and areas of productive agricultural land.

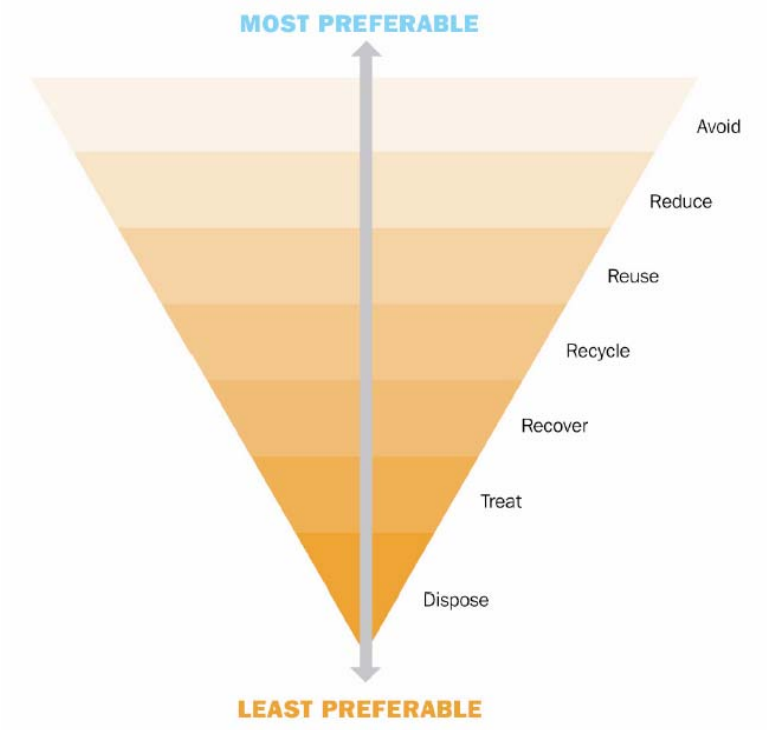
AC.3.30 Potential Impacts on the Environmental Value

If wastes are not managed and disposed of properly, environmental values such as health and wellbeing of people, ecosystem health and land use capability may be affected.

Wastes also represent a loss of resources.

AC.3.31 Environmental Protection Objectives

Objectives for waste management are based on the waste management hierarchy.



AC.3.32 Performance Criteria

The following performance criteria are proposed for waste management:

- all waste materials are handled and stored in a safe and appropriate manner;
- there is no environmental impact on, and disturbance to, the surrounding environment from waste;
- the construction equipment is maintained in a clean and tidy manner; and
- no waste is to be disposed of in the marine or terrestrial environment or incinerated.

AC.3.33 Control Strategies

The following control strategies are proposed for waste management:

- minimise vegetation clearing where possible;
- ensure vegetation materials are mulched and used onsite for rehabilitation and revegetation works;
- ensure larger vegetation materials such as hollow logs and hollow bearing trees are stockpiled for use in rehabilitation activities or placed in adjoining bush land;
- where safe and feasible, reuse spoil onsite as backfill or as non-load bearing fill;
- transport any surplus spoil that cannot be reused off-site to an approved landfill site or to borrow pits;
- locate material and stockpiling areas within the construction corridor until its ultimate destination is determined;
- ensure detailed design and specifications are undertaken so as to minimise the generation of waste during construction and the durability of materials is considered;
- set up designated waste transfer areas;
- store recyclable waste separately from residual/non-recyclable waste;
- appropriately manage stockpile areas and storage areas;
- recycle steel off cuts or scrap;
- reuse or recycle timber and plywood;
- dispose non-recyclable construction materials at a licensed waste facility;
- store all chemicals, fuels and oils at appropriately bunded areas in accordance with Australian Standards;
- use pre-painted products to minimise use of paints and solvents;
- provide recycling bins around accommodation villages, site offices and amenities;
- ensure garbage is removed by an appropriate licensed contractor;
- ensure used furniture and equipment from decommissioning is sold/reused or donated to charity where possible. Otherwise dispose off at an appropriately licensed landfill;
- store used oils, oily rags, solvents, lubricants and fuel in covered and bunded areas;
- remove excess ballast and clean fill off site for reuse, as possible;
- recycle any ballast that cannot be reused as ballast; and
- send worn steel rail to scrap metal recycler.

AC.3.34 Monitoring

The following monitoring procedures are proposed for the construction and operation phases of the Project:

- inspect waste storage areas on a weekly basis to make sure that wastes are being stored properly
- maintain a waste register for all hazardous wastes and operation wastes. Review register monthly to identify any dramatic changes in waste generation patterns and possible opportunities for waste minimisation.

AC.3.35 Commitments

The following Proponent commitments are proposed for the Project:

- the construction contractor is responsible for ensuring that appropriate waste handling and storage procedures are implemented;
- in the event of the release of wastes into the terrestrial environment, the construction contractor is to report the incident to the Superintendent's site representative immediately and complete an Environmental Incident Report and Corrective Action Report. This report is to be completed within 24 hours of the incident occurring. The construction contractor must forward the aforementioned report to the Superintendent's site representative who will organise for this to be forwarded to the Principal and the Superintendent's representative as soon as possible; and
- implement appropriate management and preventative measures to reduce the potential for an environmental incident.

AC.3.36 Land Management

AC.3.37 Background

The Project is approximately 500 km in length and will traverse numerous soil types, topographical feature, geological units and will be impacted on by varying climatic conditions.

Soils encountered along the Project alignment include dispersive soils and cracking clays (soils that shrink and crack when dried and swell and "clump" when wet). These soil types will need to be addressed in design and also managed during construction. Soils along the Project also have moderate to high salinity hazard. Acid sulfate soils may be encountered at the Abbot Point end of the alignment.

The alignment crosses areas of Good Quality Agricultural Land (GQAL).

Eleven properties along the Project are listed on the Environmental Management Register for notifiable activities such as cattle dips and fuel storage, and soil contamination may have occurred as a result of these.

An Erosion and Sediment Control Criteria (refer to Volume 2, Appendix AD of SEIS) and Acid Sulfate Soils Management Framework (refer to Volume 2, Appendix Z of SEIS) have been prepared as part of the Supplementary EIS (SEIS) for the Project. Identified potential impacts and performance criteria will be considered in drafting of further management plans.

AC.3.38 Environmental Values

Land based environmental values and characteristics include:

- moderate to slight gradients
- soils with moderate to high salinity hazard
- dispersive and erodible soils
- cracking clays (shrink swell soils)
- acid sulfate soils (ASS); and
- good quality agricultural land (GQAL)
- coal resources and reserves.

AC.3.39 Potential Impacts on the Environmental Value

- loss of GQAL and sterilisation of coal resources and reserves
- exposure of soils to erosive forces
- difficulties arising from handling of shrink/swell soils and in particular ongoing issues with rehabilitation
- secondary salinisation;
- disturbance of actual and potential acid sulphate soils at Abbot Point;
- disturbance and possible migration of contaminants;
- contamination of soil from spills;
- erosion of valuable topsoil resources during the construction and operation phase;
- temporary and permanent changes to the topography and landforms resulting in a change in catchment characteristics;
- land use change and impacts on workability of agricultural landholdings;
- impacts on existing infrastructure;
- impacts on view sheds; and
- Construction and operation activities also have potential to cause soil contamination through spills of fuels and oils and use of pesticides. soil contamination.

AC.3.40 Environmental Protection Objectives

- minimise impacts on land based resources including GQAL, agricultural productivity and coal resources and reserves
- avoid environmental harm and reduced soil productivity arising from release of sediments, salinisation of soil, oxidation of acid sulfate soils, disturbance of contaminated soils and contamination of soils
- minimise topographic and drainage changes
- minimise disruption to infrastructure
- avoid accidental damage to existing infrastructure and services
- protect soil resources such that rehabilitation is successful.

AC.3.41 Performance Criteria

- topographic changes do not result in exacerbation of flooding, reduced downstream flows or increased erosion through concentration of flows
- contaminated soils are managed such that there are no releases of contaminants to the environment
- acid sulfate soils are managed such that there is no release of acidic material to surface waters during construction or operation
- no accidental damage to existing infrastructure and services
- rehabilitation is carried out such that 80% vegetation cover is achieved on all disturbed surfaces within three months of completion of construction
- reduction of agricultural productivity and sterilisation of coal resources is minimised.

The following documents are relevant to land management:

- For contaminated soils, soil contaminant levels are established in:
  - National Environment Protection (Assessment of Site Contamination) Measure (NEPM); and
  - Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland, (Department of Environment (DoE)), 1998.
- The following standards and guidelines are applicable in relation to hazardous materials:
  - AS 1940 – storage and handling of flammable and combustible liquids
  - Australian Dangerous Goods Code (transport of dangerous goods by road and rail)
- For acid sulfate soils, Soil Management Guidelines, 2004 (QASSIT)
- For GQAL, State Planning Policy 1/92 *Development and the Conservation of Agricultural Land*

AC.3.42 Control Strategies

For the design phase:

- optimise the alignment to minimise impacts on agricultural productivity and sterilisation of coal resources
- undertake a detailed geotechnical investigation prior to construction of the railway line;
- develop an earthworks schedule that:
  - achieves a cut/fill balance
  - minimises changes to topography, particularly where this results in changes to drainage patters
  - minimises construction footprint wherever possible;
- identify areas where problem soils (highly dispersive, saline, cracking clays, potential acid sulfate soils)
- ensure the design and construction of the railway line takes into account issues arising from cracking clays and highly dispersive soils including:
  - allowing for expansion joints;
  - encapsulating soils by placing and compacting swelling clays within embankment cores to minimize exposure to drying/wetting;
  - incorporating moisture control barriers with foundation swelling clays to control lateral seasonal migration of moisture;
  - applying lime stabilisation to reduce plasticity and shrinkage potential; and
  - where the shrink/swell ratio is unacceptable, identifying appropriate disposal locations for these soils.
  - avoiding disturbance of highly dispersive soils where possible;
- include drainage requirements in design such that concentration of flow does not occur and erosion is avoided
- avoid rocky outcrops if possible;
- undertake an ASS investigation at Abbot Point.
- provide occupational crossings in accordance with landholder agreements;

- install grade separated intersections on major roads as identified; and
- establish appropriate controlled “at-grade” crossings where required following risk assessment.

Construction Phase:

- implement an erosion and sediment control plan during construction, and until post-construction rehabilitation has been completed, with a particular emphasis on controlling drainage across dispersive soils;’
- prepare and implement an acid sulfate soil management plan
- chemically ameliorate dispersive soils through treatment of the soil with gypsum, hydrated lime or aluminium sulfate to promote bonding of soil particles to reduce dispersion potential;
- encapsulate, sealing or capping dispersive soils so that the soils are not exposed to running water;
- rehabilitating after construction, including replacement of topsoil and re-vegetation to minimise exposure of dispersive soils to erosive forces; and
- develop a procedure for management of inadvertent fossil finds
- undertaking all blasting activities in accordance with regulatory requirements and relevant Australian standards; and
- prior to excavation and blasting, identify locations of all infrastructure and services and provide measures to protect from impacts.
- if dispersive soils are necessary to be incorporated as construction material, undertake appropriate treatment of the soil first;
- undertake appropriate measures required to stabilise the soil moisture content of shrink and swell soils;
- avoid works during the wet season and erosive rainfall events;
- appropriately manage works and avoid increasing the risk of erosion;
- manage soils that are at risk of becoming waterlogged;
- manage acidic and alkaline soils;
- rehabilitate disturbed areas once construction is completed;
- develop and implement a Erosion and Sediment Control Management Plan;
- implement soil and stockpile management measures;
- implement principles of drainage control, sediment control and erosion control in areas of dispersive sodic soils;
- restore construction accommodation villages and storage areas located within a GQAL resource to pre-existing conditions following completion of the Project;
- replenish nutrients of GQAL resources that are disturbed during construction and are not within the rail corridor;
- minimise impacts on structural characteristics of the GQAL resources;
- restore drainage flows and pathways into the various catchments that will be affected by the Project;
- replace the topsoil resources nearest to pre-disturbance condition; and

- conduct pre-clearing checks for potential soil contamination across the rail corridor;
- conduct a preliminary contaminated land assessment prior to any activities in an Environmental Management Register (EMR) listed site that may contain contaminated soil;
- if contaminated land is identified further investigate and develop a remediation plan;
- develop appropriate management and disposal methods for contaminated soils and other materials;
- dispose of contaminated soils to authorized facilities on-site or off-site in accordance with disposal permits;
- avoid disturbance of known contaminated areas where possible;
- design fuel, oil and chemical storage areas in accordance with Australian Standards;
- inspect and maintain all vehicles, plant and machinery to ensure they are not at risk of leaking, or spilling contaminants;
- prepare a spill response plan including requirements for spills to be reported and immediately contained and cleaned up;
- develop procedures for handling and using fuels, oils and other chemicals;
- train workers in proper procedures for handling and use of fuels, oils and other chemicals;
- incorporate spill response procedures into incident response plan;
- train personnel in spill response;
- maintain spill response kits and personal protective equipment in tanker trucks and at all locations where spills may occur. Ensure spill response kits are appropriately sized for the potential spill volumes;
- transport dangerous goods and potential contaminants in accordance with Australian Code for Transport of Dangerous Goods by Road and Rails (ADG) Code;
- establish and implement procedures for storage and handling including refuelling;
- provide spill response equipment in a location that is readily available for clean up of spills.
- If significant soil contamination occurs as a result of a major spill, develop a site management plan in relation to ongoing clean up.
- minimise loss or damage to vegetation within the rail corridor and adjacent road reserves;
- ensure work sites are not over-lit and minimise additional light spillage from the rail corridor into adjacent visually sensitive properties;
- remove temporary hoardings, barriers, traffic management and signage when no longer required;
- store materials and machinery tidily during the works;
- ensure access roads to the rail corridor are free of dust and mud as far as reasonably practicable;
- undertake rehabilitation planting where possible to replace vegetation that provided screening to adjacent sensitive visual receptors; and
- retain erosion and sediment control devices until rehabilitation success (80% cover) has been achieved.

Operation:

- develop and implement a Decommissioning and Rehabilitation Plan;
- use only low residual pesticides such as glyphosate;
- use licenced operators for pesticide application;
- clean up any spills of diesel promptly; and
- clean up coal spillage adjacent to the track promptly.

AC.3.43 Monitoring and Corrective Action

Design:

- check that design requirements have been met.

Construction

- inspect erosion and sediment control devices weekly and repair any damaged or ineffective devices, remove any built up sediment;
- inspect erosion and sediment control devices before significant wet weather events and as soon as safely possible immediately after any wet weather event exceeding 20 mm rain in 24 hours (as reported on BoM website);
- monitor acid sulfate soil management as per ASS management plan;
- monitor rehabilitation success through weekly inspections in the first four weeks after seeding, and then monthly until 80% cover has been achieved; and
- inspect fuel storage areas weekly and clean up and repair any ineffective storage areas.

Operation:

- monitor the alignment, and particularly stream crossings and drainage lines for erosion; and
- repair any eroded areas promptly.

AC.3.44 Terrestrial Ecology

AC.3.45 Background

The Project occurs in the Burdekin Catchment and passes through two bioregions: the Brigalow Belt and Desert Uplands. The Brigalow Belt is a particularly diverse bioregion supporting eight Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed Threatened Ecological Communities (TEC) and 84 Queensland *Nature Conservation Act 1992* (NC Act) or EPBC Act listed flora and fauna species.

The current certified regional ecosystem (RE) mapping (version 6.0) identified 68 REs within the study area. Field surveys confirmed this number. However amendments were made to the designation of some REs. Based on the amended RE mapping, the Project corridor intersects 10 endangered, 19 of concern and 39 least concern REs as classified under the *Vegetation Management Act 1999* (the VM Act). In planning a rail alignment, level terrain is generally favoured, and as a result, REs located on plains and low rises will be the most heavily impacted.

The alignment will pass through 10 endangered REs (111.4 ha) all of which are listed as components of a TEC under provisions of the EPBC Act. The majority of the endangered REs are Brigalow communities. The alignment will also pass through a total of 19 REs (104.1 ha) that are classified as of concern under the VM Act.

Key impacts on Matters of National Environmental Significance (MNES) protected under the EPBC Act include the likely clearing of 110 ha of the Brigalow TEC, 108 ha of Natural Grasslands of the Central Queensland Highlands TEC and 14 ha of Semi Evergreen Vine Thicket TEC. The Weeping Myall Woodlands TEC was not found and is unlikely to occur in the Project corridor. Three EPBC Act listed plant species (black ironbox, king bluegrass *Dicanthium queenslandium* and bluegrass *Dicanthium setosum*) will potentially experience localised impacts. Although 14 EPBC Act listed fauna species have the potential to occur in the study area and 26 EPBC Act listed migratory bird species were confirmed present, no significant impacts are expected on EPBC Act listed fauna as a result of the Project.

AC.3.46 Environmental Value

Terrestrial ecological values include:

- four Endangered TECs listed under the EPBC Act were identified within the study area:
  - Brigalow (*Acacia harpophylla* dominant and co-dominant);
  - Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin;
  - Semi-evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; and
  - Weeping Myall Woodlands.
- Australian Heritage Places:
  - Mazeppa National Park; and
  - Mount Abbot.
- Two wetlands of national importance:
  - The Caley Valley Wetland; and
  - The Bowen River: Birralee - Pelican Creek Aggregation.
- Regional Ecosystems (RE) - 68 REs within the study area including 10 classified as endangered, 19 of concern and 39 least concern under the VM Act;
- Essential Habitat:
  - *Croton magneticus* within 2 km of chainage 317 km; and
  - *Croton magneticus* within 2 km of chainage 312 km.
- Wildlife Online: 1,862 vascular taxa of which 239 were introduced species;
- HERBRECS: 1,960 vascular taxa of which 242 were introduced species;
- Field surveys recorded 367 plant species, of which 334 were native (91%). 175 of these species (including 15 introduced species) were recorded in the dry season. Overall, 76 families are represented. The most species rich families represented were: Poaceae (92 taxa); Fabaceae (40 taxa); Cyperaceae (13 taxa); Mimosaceae (19 taxa); and Myrtaceae (29 taxa);
- Amphibians – 13 species;
- Reptiles – 36 species;
- Mammals – 41 species; and
- Birds – 131 species.

AC.3.47 Potential Impacts on the Environmental Value

Potential impacts on environmental values include:

- loss of vegetation, habitat and resources;
- loss of resources and associated biodiversity;
- mortality of terrestrial fauna;
- habitat degradation – light, noise and vibration disturbance;
- dust;
- introduced species;
- fire hazards;
- restriction of fauna movement;
- sedimentation and erosion; and
- changes to floodplain hydrology.

AC.3.48 Environmental Protection Objectives

To main objective is to ensure minimal impact upon terrestrial flora and fauna from the construction and operation of the Project.

AC.3.49 Performance Criteria

Monitoring indicates no significant impacts on terrestrial ecology based on the monitoring results.

AC.3.50 Control Strategies

Terrestrial ecology control strategies include:

- restrict the extent of clearing to the minimal amount necessary particularly in locations containing endangered and of concern REs, threshold REs and REs listed as constituents of TECs protected under the EPBC Act;
- clearly identify the extent of areas to be cleared and those that must not be cleared or damaged on construction plans and in the field;
- employ an ecologist to accompany clearing of woody vegetation during set out;
- where possible locate all construction facilities such as equipment storage, offices and accommodation villages within already cleared areas;
- reuse hollow logs and hollow bearing trees;
- approach areas of high ecological values such as riparian corridors with care;
- construct culverts in areas where the railway line bisects important habitat;
- restrict clearing of trees with large raptor nests;
- employ a qualified fauna spotter;
- develop a flora and fauna species relocation plan particularly for threatened species;
- erect temporary fencing around the construction zones in accordance with an approved site management plan;

- if any pits/trenches are to remain open after daily site works have completed, ensure they are securely covered by an impenetrable barrier, if possible, or fauna ramps (e.g. log ramps or wooden planks) are put in place to provide a potential means of escape for trapped fauna;
- educate employees of environmental responsibilities during inductions;
- enforce on-site speed limits;
- establish and maintain a fauna mortality register;
- use appropriate lighting in work areas and related Project areas and employ directional lighting with protective guards;
- ensure all equipment is appropriately serviced, maintained and certified weed free;
- implement dust suppression techniques during the construction stage of the Project in accordance with the Erosion and Sediment Management and Control Plan;
- ensure soil stockpiles are appropriately located and covered;
- develop and implement a Weed and Pest Management Plan;
- conduct a weed audit of up to 20% of the Project corridor that has easily recognisable weeds, particularly parthenium;
- after mapping of all weeds present in the Project corridor, dispose of the weeds prior to commencement of construction;
- place appropriate signs advising of the presence of parthenium;
- do not relocate soil in areas where parthenium and other declared weeds are present;
- develop and implement a Fire Management Plan;
- where possible maximise the height of the rail alignment above watercourses to optimise the chances of wildlife movement along watercourses;
- construct fauna underpasses within important habitat areas;
- stockpile top soil and mark appropriately in areas where it is to be redistributed after works are completed. Do not mix soil profiles as the sub-surfaces of many soils in this region are likely to be sodic;
- rehabilitate disturbed ground surfaces as soon as practicable to minimise exposed surface periods;
- fence the rail easement as necessary and progressively prior to construction and ensure the fence is made out of durable materials. If possible do not use barbed wire;
- remove dead carcasses from the rail alignment as soon as possible to reduce the occurrence of predators;
- conduct a post-construction weed audit of the Project corridor at the end of the first wet season following completion;
- rehabilitate any disturbed wildlife areas outside the rail corridor after construction;
- establish protective vegetation and sediment ponds to buffer sensitive flora and fauna habitats from run-off and sedimentation;
- establish a Water Quality Monitoring Program;
- utilise culverts in order to allow the movement of water;
- conduct hydrology modelling of relevant areas;

- map and clearly mark on the ground the locations of populations of species of conservation significance;
- restrict access to ground within the drip line of any tree or shrub belonging to a species of conservation significance that is located next to impact areas;
- conduct clearing in accordance with a Species or Population Management Plan developed for specific species / populations, and under the supervision of a suitably briefed ecologist;
- collect seeds from black ironbox trees and where feasible other species of conservation significance that may occur within the Project corridor prior to removal, for redistribution in adjacent areas, to be added to the seed stock of a suitable conservation group, or to supplement rehabilitation efforts in approved offset areas;
- raise seed stock in nurseries and re-establish populations on site, where possible;
- transplant conservation significant species where it is not possible to avoid impacts, for translocation to a suitable site elsewhere;
- offset in accordance with DERM policies and clearing permit conditions;
- minimise the width of the transport corridor within ephemeral creek habitats; and
- design to include culverts with an area of dry passage within gilgaied landscapes and allow small fauna to cross beneath the rail alignment.

AC.3.51 Monitoring

- implement regular monitoring of:
  - pest species and weeds;
  - fauna strike and mortality during construction and operation of feral species; and
  - water and sediment quality.
- for areas of the site that are to be rehabilitated, a photographic record will be prepared by the contractor prior to construction commencing. This will be used as a baseline against which to measure the success of rehabilitation;
- conduct three monthly audits of the Weed and Pest Management Plan for a period of twelve months and recommend adaptive management for weed invasions in habitats adjacent to the Project corridor; and
- on completion of the construction works, monthly visual inspections of the rehabilitated areas will be carried out for a period of 12 months.

AC.3.52 Aquatic Ecology

AC.3.53 Background

The existing aquatic environment within the study area is dominated by riverine habitats with smaller areas of estuarine and lacustrine/palustrine habitats.

AC.3.54 Environmental Value

The existing aquatic environmental values include:

- riverine habitats are primarily ephemeral and characterised by a uniform channel with a sandy/gravel substrate and little in-stream habitat. Due to their ephemeral nature, low abundance of habitat features and degradation from cattle and weeds, these rivers/creeks generally provide

low value habitat for aquatic fauna. Of particular habitat importance is the nationally important Bowen River: Birralee - Pelican Creek Aggregation. This river contains a range of unique aquatic habitats that are unavailable in other habitats within the study area;

- estuarine habitats within the study area include mangrove and saltwater wetlands and adjacent tidal creeks. These habitats are located within the nationally important Caley Valley Wetland, at the northern end of the proposed rail alignment;
- lacustrine and palustrine habitats are scattered throughout the study area and include the nationally important Caley Valley Wetland and the Bowen River: Birralee - Pelican Creek Aggregation (located approximately 2.6 km from the Project alignment);
- overall aquatic habitats within the study area are dynamic and vary over a temporal scale in association with catchment climatic conditions. During periods of high water flow, water quality is relatively constant throughout the river and the main influences on water quality are associated with sedimentation and the input of nutrients. Water quality during no/low flow conditions is highly variable on a temporal and spatial scale and is largely influenced by local land use;
- aquatic habitats within the study area provide habitat for a range of generalist fauna and flora species. No listed-threatened species have been previously recorded or are predicted to occur in the study area;
- aquatic reptiles inhabiting the Burdekin Catchment include two crocodile and five freshwater turtle species. The estuarine crocodile is listed as marine and 'migratory under the EPBC Act and vulnerable under the NC Act. Whilst no turtle species within the Burdekin Catchment are listed under the EPBC or NC Act, the Irwin's turtle is endemic to the Burdekin Catchment and has been listed as high priority for conservation under the DERM 'Back on Track' prioritisation framework for conservation management of Queensland's wildlife;
- the platypus (*Ornithorhynchus anatinus*) is listed as special least concern wildlife under the NC Act. Within the study area, suitable habitat for the platypus is likely to be restricted to permanently inundated water bodies that provide habitat throughout the year (e.g. Bowen River; Suttor River);
- macroinvertebrate diversity and community composition within the Burdekin Catchment is characteristic of river systems with highly variable and unpredictable environmental condition. Within these systems, macroinvertebrate diversity is relatively low and communities are dominated by generalist species with few pollution sensitive taxa;
- a total of 55 native aquatic dependent flora species are known to occur within the Burdekin Catchment and nine of these species have been identified as priority species in the DERM Aquatic Conservation Assessment for the riverine wetlands of the Great Barrier Reef Catchment; and
- a total of 17 exotic aquatic dependent flora species are known to occur in the Burdekin Catchment and ten of these are listed as Commonwealth Weeds of National Significance and/or are listed as declared weeds under Queensland's *Land Protection* (*Pest and Stock Route Management*) *Act 2002*. Only rubber vine (*Cryptostegia grandiflora*) was observed in the study area. Marine plants, protected under the *Fisheries Act 1994*, are located in the estuarine habitats of the Caley Valley Wetland. Species present include: salt couch (*Sporobolus virginicus*) and weeping paperbark (*Melaleuca leucadendra*).

AC.3.55 Potential Impacts on the Environmental Value

Potential impacts on aquatic environmental values include:

- potential construction impacts:

  - loss of aquatic habitat;
  - fauna mortality;
  - alteration to in-stream and floodplain hydrology;
  - increased sedimentation, run-off and dust;
  - light, noise and vibration disturbance; and
  - increase in abundance and diversity of introduced species.
- potential operation impacts:
  - fauna mortality;
  - alteration to in-stream and floodplain hydrology;
  - increased sedimentation, run-off and dust;
  - coal dust emission;
  - light, noise and vibration disturbance; and
  - increase in abundance and diversity of introduced species.

AC.3.56 Environmental Protection Objectives

The main objective is to ensure minimal impact upon aquatic flora and fauna from the construction and operation of the Project.

AC.3.57 Performance Criteria

Monitoring indicates no significant impacts on aquatic ecology based on the monitoring results.

AC.3.58 Control Strategies

Aquatic ecology control strategies include:

- when undertaking works in aquatic habitats in the wet season, implement protection measures in accordance with approved site management plan;
- minimise the loss of nationally important Caley Valley Wetland habitat;
- restrict the extent of vegetation clearing and earthwork to the minimal amount necessary in all aquatic habitat locations;
- where possible locate construction lay down areas and associated facilities away from aquatic habitats, where possible;
- undertake appropriate offsets if clearing of marine plants in estuarine habitats is required;
- develop an Aquatic Fauna Species Relocation Plan for the Caley Valley Wetland;
- erect temporary bunding around aquatic habitats within the construction zone;
- educate employees of environmental responsibilities during inductions including treating all native fauna species as protected;
- enforce on-site speed limits;
- ensure in-stream flows are maintained via a flow diversion system;
- ensure a fauna spotter is available to capture and relocate fauna species trapped in isolated habitats;

- maintain water quality in accordance with criteria to be determined in consultation with DERM;
- develop and implement an Erosion and Sediment Management and Control Plan;
- maintain clean operating conditions in vehicles and machines;
- develop and implement a Waste and Hazardous Materials Management Plan;
- ensure all construction machinery and materials bought onto site are weed, seed and mud free and have undergone a thorough inspection;
- rehabilitate disturbed ground surfaces as soon as practical;
- monitor turtle mortality rates at large palustrine habitats;
- develop and install turtle exclusion barriers in areas that demonstrate high risk of mortality;
- avoid fragmentation of estuarine and lacustrine/palustrine habitats;
- provide culverts at key areas within floodplain habitats;
- minimise introduction of oil and fuel through cleaning and maintaining trains;
- construct ballast top bridges over aquatic habitats to minimise waterway contamination;
- ensure train operations are conducted in accordance with a Coal Dust Management Plan;
- ensure coal loading and unloading procedures minimise effect on the environment;
- ensure train cleaning is undertaken regularly;
- ensure trains are not overloaded;
- ensure operational lights are not located within or adjacent to aquatic habitats;
- restrict speed limits within the Caley Valley Wetland; and
- develop a Weed and Pest Management Plan.

AC.3.59 Monitoring

Implementation of an approved Monitoring Programs during construction and operation of the Project.

AC.3.60 Cultural Heritage

Cultural Heritage Management Plans (CHMP) will be finalised prior to the commencement of construction. The Proponent is required to implement the CHMPs in conjunction with Aboriginal Parties. The content of these plans is not appropriate for public disclosure.

AC.3.61 Non-Indigenous Cultural Heritage

A Non-Indigenous Conservation and Heritage Management Plans (CMP) will be prepared for areas identified during field observations as having heritage value and significance. These plans will be prepared prior to commencement of Project construction.