Appendix O

Environmental Management Plan

PACIFIC ALUMINIUM

Contents

Contents ..... **i**

Figures ..... **iv**

Tables ..... **v**

Abbreviations ..... **viii**

1 Introduction **1-1**

1.1 Structure of document 1-1

1.2 Overview of the project 1-1

1.3 Purpose, scope and structure of document 1-2

1.3.1 Purpose of document 1-2

1.3.2 Scope of document 1-3

1.4 Legislative and regulatory requirements 1-5

2 Implementation **2-1**

2.1 Role of the EMP within management framework 2-1

2.2 Roles and responsibilities 2-2

2.3 Environmental awareness training and inductions 2-2

2.4 Incidents and corrective actions 2-2

2.5 Auditing 2-3

2.6 Reporting and approval arrangements 2-3

2.7 Document review and control 2-4

3 Provisional Soil and Landform Management Plan **3-1**

3.1 Environmental aspects to be managed 3-1

3.2 Performance management 3-1

3.3 Implementation strategy 3-2

3.3.1 Soil erosion 3-2

3.3.2 Riparian habitats, watercourse crossings and downstream impacts 3-3

3.3.3 Poor construction, operation and rehabilitation practises 3-4

3.3.4 Slope instability and landslides 3-4

3.3.5 Landforms 3-4

3.3.6 Exposure of acid sulphate soils 3-4

3.3.7 Soil contamination 3-5

3.3.8 Karst formation impacts 3-5

3.3.9 Related Environmental Management Plans (EMPs) 3-6

3.4 Monitoring program 3-6

3.5 Contingencies and corrective action 3-6

4 Provisional Hydrology and Water Quality Management Plan 4-1
4.1 Environmental aspects to be managed 4-1
4.2 Performance management 4-1
4.3 Implementation strategy 4-1
4.4 Monitoring program 4-2
4.5 Contingencies and corrective action 4-2
5 Provisional Vegetation Management Plan 5-1
5.1 Environmental aspects to be managed 5-1
5.2 Performance management 5-1
5.3 Implementation strategy 5-1
5.4 Monitoring program 5-1
5.5 Contingencies and corrective action 5-1
6 Provisional Terrestrial and Aquatic Fauna and Habitat Management Plan 6-1
6.1 Environmental aspects to be managed 6-1
6.2 Performance management 6-1
6.3 Implementation strategy 6-1
6.4 Monitoring program 6-1
6.5 Contingencies and corrective action 6-1
7 Provisional Introduced Fauna Management Plan 7-1
7.1 Environmental aspects to be managed 7-1
7.2 Performance management 7-1
7.3 Implementation strategy 7-1
7.4 Monitoring program 7-1
7.5 Contingencies and corrective action 7-1
8 Provisional Air Quality Management Plan 8-1
8.1 Environmental aspects to be managed 8-1
8.2 Performance management 8-1
8.3 Implementation strategy 8-1
8.4 Monitoring program 8-1
8.5 Contingencies and corrective action 8-1
9 Provisional Health and Safety Management Plan 9-1
9.1 Environmental aspects to be managed 9-1
9.2 Performance management 9-2
9.3 Implementation strategy 9-2
9.4 Monitoring program 9-2
9.5 Contingencies and corrective actions 9-2

10 Provisional Cultural Heritage Management Plan 10-1
10.1 Environmental aspects to be managed 10-1
10.2 Performance management 10-1
10.3 Implementation strategy 10-1
10.4 Monitoring program 10-2
10.5 Contingencies and corrective action 10-2
11 Provisional Fire Management Plan 11-1
11.1 Environmental aspects to be managed 11-1
11.2 Performance management 11-1
11.3 Implementation strategy 11-1
11.4 Monitoring program 11-1
11.5 Contingencies and corrective action 11-1
12 Provisional Noise and Vibration Management Plan 12-1
12.1 Environmental aspects to be managed 12-1
12.2 Performance management 12-1
12.3 Implementation strategy 12-1
12.4 Monitoring program 12-1
12.5 Contingencies and corrective action 12-1
13 Provisional Greenhouse Gas Emissions Management Plan 13-1
13.1 Environmental aspects to be managed 13-1
13.2 Performance management 13-1
13.3 Implementation strategy 13-1
13.4 Monitoring program 13-1
13.5 Contingencies and corrective action 13-1
14 Provisional Traffic Management Plan 14-1
14.1 Environmental aspects to be managed 14-1
14.2 Performance management 14-1
14.3 Implementation strategy 14-1
14.4 Monitoring program 14-1
14.5 Contingencies and corrective action 14-1
15 Waste Management Plan 15-1
15.1 Environmental aspects to be managed 15-1
15.2 Performance management 15-1
15.3 Implementation strategy 15-1
15.4 Monitoring program 15-1
15.5 Contingencies and corrective action 15-1

16 Provisional Weed Management Plan 16-1
16.1 Environmental aspects to be managed 16-1
16.2 Performance management 16-1
16.3 Implementation strategy 16-1
16.4 Monitoring program 16-1
16.5 Contingencies and corrective action 16-1
17 Provisional Rehabilitation Management Plan 17-1
17.1 Environmental aspects to be managed 17-1
17.2 Performance management 17-2
17.3 Implementation strategy 17-2
17.3.1 Rationale of the rehabilitation strategy 17-2
17.3.2 Topsoil 17-3
17.3.3 Cleared vegetation 17-3
17.3.4 Timing 17-3
17.3.5 Native species and seeds 17-3
17.3.6 Natural re-colonisation 17-3
17.3.7 Rehabilitation of riparian and ephemeral habitats 17-3
17.4 Monitoring program 17-4
17.5 Contingencies and corrective action 17-4
18 Provisional Decommissioning Plan 18-1
18.1 Regulatory framework 18-1
18.2 Decommissioning objectives 18-1
18.3 Decommissioning options 18-1
18.4 Final decommissioning plan 18-1
Appendix A: EIS commitments ..... Appendix 1

Figures

Figure 1-1: Location of proposed Katherine to Gove Gas Pipeline and land tenure in the region 1-4

Tables

Table 1-1: Key risks and relevant management sub-plans....1-3

Table 1-2: Provisions management sub-plans included in EMP....1-5

Table 3-1: Proposed HDD watercourse crossings....3-3

Table 3-2: Soil and landform management objectives, targets and performance indicators....3-7

Table 3-3: Soil and landform management implementation strategy....3-9

Table 3-4: Soil and landform monitoring program....3-14

Table 3-5: Soil and landform contingency actions....3-16

Table 4-1: Hydrology and water quality management objectives, targets and PIs....4-3

Table 4-2: Hydrology and water quality management implementation strategy....4-4

Table 4-3: Hydrology and water quality monitoring program....4-6

Table 4-4: Hydrology and water quality contingency actions....4-7

Table 5-1: Vegetation management objectives, targets and performance indicators....5-2

Table 5-2: Implementation of vegetation management actions....5-3

Table 5-3: Vegetation monitoring program....5-5

Table 5-4: Vegetation contingency actions....5-6

Table 6-1: Terrestrial and aquatic fauna and habitat management objectives, targets and PIs....6-2

Table 6-2: Terrestrial and aquatic fauna and habitat management implementation strategy....6-4

Table 6-3: Terrestrial and aquatic fauna and habitat monitoring program....6-7

Table 6-4: Terrestrial and aquatic fauna and habitat contingency actions....6-8

Table 7-1: Introduced species management objectives, targets and performance indicators....7-2

Table 7-2: Introduced species management implementation strategy....7-3

Table 7-3: Introduced species monitoring program....7-4

Table 7-4: Introduced species contingency actions....7-4

Table 8-1: Air quality management objectives, targets and performance indicators....8-2

Table 8-2: Implementation of air quality management actions....8-3

Table 8-3: Air quality monitoring program....8-4

Table 8-4: Air quality contingency actions....8-5

Table 9-1: Health and safety management objectives, targets and performance indicators....9-3

Table 9-2: Implementation of health and safety management actions 9-4

Table 9-3: Health and safety monitoring program.....9-9

Table 9-4: Health and safety contingency actions 9-11

Table 10-1: Cultural heritage management objectives, targets and performance indicators 10-3

Table 10-2: Cultural heritage management implementation strategy.....10-4

Table 10-3: Cultural heritage monitoring program 10-6

Table 10-4: Cultural heritage contingency actions.....10-7

Table 11-1: Fire management objectives, targets and performance indicators.....11-2

Table 11-2: Implementation of fire management actions.....11-3

Table 11-3: Fire monitoring program 11-4

Table 11-4: Fire contingency actions 11-4

Table 12-1: Noise and vibration management objectives, targets and performance indicators.....12-2

Table 12-2: Implementation of noise and vibration management actions 12-3

Table 12-3: Noise and vibration monitoring program.....12-4

Table 12-4: Noise and vibration contingency actions 12-5

Table 13-1: GHG management objectives, targets and performance indicators.....13-2

Table 13-2: Implementation of GHG emissions management actions 13-3

Table 13-3: GHG emissions monitoring program 13-5

Table 13-4: GHG emissions contingency response and corrective actions 13-6

Table 14-1: Traffic management objectives, targets and performance indicators.....14-2

Table 14-2: implementation of traffic management actions 14-3

Table 14-3: Traffic monitoring program.....14-6

Table 14-4: Traffic contingency actions 14-6

Table 15-1: Waste management objectives, targets and performance indicators.....15-2

Table 15-2: Waste management implementation strategy 15-4

Table 15-3: Waste monitoring program 15-6

Table 15-4: Waste contingency actions 15-7

Table 16-1: Weed management objectives, targets and performance indicators 16-2

Table 16-2: Implementation of weed management actions 16-3

Table 16-3: Weed monitoring program 16-4

Table 16-4: Weed contingency response and corrective actions 16-4

Table 17-1: Disturbance area of the project.....17-1

Table 17-2: Rehabilitation and revegetation objectives, targets and performance indicators 17-5

Table 17-3: Implementation of rehabilitation and revegetation actions 17-7

Table 17-4: Rehabilitation monitoring program.....17-9

Table 17-5: Rehabilitation contingency response and corrective actions.....17-10

Abbreviations

ASS	Acid Sulphate Soils
EA Act	Environmental Approvals Act
EIS	Environmental Impact Statement
ELA	Eco Logical Australia
EMP	Environmental Management Plan
EMS	Emergency Management System
EPA	Environment Protection Agency
EP Act	Energy Pipelines Act (NT)
EPBC Act	Environmental Protection and Biodiversity Conservation Act (Commonwealth)
ESCP	Erosion and Sediment Control Plan
GHG	Greenhouse Gas
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
HSE	Health, Safety Environment
HSEQMS	Health, Safety, Environment and Quality Management System
IECAA	International Erosion Control Association Australasia
IPA	Indigenous Protected Area
KGGP	Katherine to Gove Gas Pipeline
KP	Kilometre Point
LHAI	Laynhapuy Homelands Association Incorporated
NLC	Northern Land Council
NRETAS	Natural Resources, Environment, and the Arts and Sport
NTG	Northern Territory Government
NTASS Act	Northern Territory Aboriginal Sacred Sites Act
PPE	Personal Protection Equipment
SOP	Safety and Operating Plan
SPI	Significant Potential Incidents
TEC	Threatened Ecological Community

1 Introduction

1.1 STRUCTURE OF DOCUMENT

This EMP has been prepared to provide separate stand-alone management sub-plans for the KGGP Project, and is structured as provided below:

Section 1: Introduction.

Section 2: Implementation

Section 3: Provisional management sub-plans.

1.2 OVERVIEW OF THE PROJECT

Pacific Aluminium proposes to construct the Katherine to Gove Gas Pipeline (KGGP).

The key objectives of the KGGP Project are to:

- Maintain and sustainably operate the Gove refinery and mining operations.
- Enable the Gove refinery operation to continue to contribute to the regional, Northern Territory and national economies.
- Deliver an ecologically sustainable development that balances economic, ecological and social outcomes.
- Reduce air emissions from the Gove refinery.
- Comply with and, wherever feasible, exceed legislative requirements.
- Avoid or mitigate environmental and social impacts.
- Rehabilitate the landform in areas disturbed to allow for continued land use in the area traversed by the pipeline.

The final location of the KGGP is subject to detailed design but is not expected to vary significantly from the pipeline corridor outlined in Figure 1. The KGGP would connect (tie-in) with the existing NT Amadeus Gas Pipeline at a location south of Katherine, to be determined in detailed design. After crossing the Stuart Highway, the KGGP would then follow an eastern route passing near the community of Beswick, before heading in a north-easterly direction towards Gove. Total length of the pipeline would be 603 km. Major waterways to be crossed would include: King River, Waterhouse River, Mainoru River, Wilton River, Goyder River, Boggy Creek, Cato River, Giddy River and Latram River. The majority of the pipeline route is located on sandy undulating plains.

The pipeline would have an external diameter of 324 mm and consist of a buried high-tensile steel pipe, which would generally be constructed within a 30 m wide 'Right of Way' (ROW). The pipeline ROW may require widening to 40 m in areas of difficult topography (e.g. ranges or waterway and infrastructure crossings) and in localised areas where additional work spaces are required. The location of the ROW has been determined within a currently defined 100 m wide pipeline corridor. The exact location of the ROW within the pipeline corridor would be determined at the time of survey and pegging.

Supporting infrastructure, including three scraper stations and five main line valves (MLV) would be required to be constructed outside of the construction corridor, as well as one compressor station at King River. Temporary infrastructure required for construction includes 5 construction camps. Approximately 265 km of existing access tracks and 110-150 km of new access tracks would be required.

The KGGP and associated facilities would be designed, tested, operated, maintained and decommissioned in accordance with relevant legislation, licence conditions, the Australian Pipeline and Industry Association's (APIA) *Code of Environmental Practice* (2009) and AS2885 'Pipelines–Gas and Liquid Petroleum' (Parts 1, 2, 3 & 5).

Depending on statutory approvals and weather conditions (and subject to delay by 'force majeure' type events), construction would be undertaken between November 2013 and December 2014 with the majority of construction activities ramping up in March 2014 and peaking between July and August. Construction is based on the requirement of first free flow gas to Gove by first quarter 2015 and would be undertaken in two sections or 'construction spreads' primarily over the 2014 dry season.

The pipeline is planned to be built, operated and owned by Pacific Aluminium with operation and maintenance possibly being subcontracted to an organisation with current experience in management responsibilities for such infrastructure.

1.3 PURPOSE, SCOPE AND STRUCTURE OF DOCUMENT

1.3.1 Purpose of document

This EMP has been prepared to address Section 7 of the Katherine to Gove Gas Pipeline EIS Guidelines and provide a consolidated plan for the environmental management of the KGGP Project.

Implementation of the KGGP Project in accordance with the EMP will ensure that the KGGP Project meets all environmental obligations including legislation, regulations and conditions of approval.

The EMP comprises a series of management sub-plans describing measures to be applied to avoid and minimise the environmental impacts of the KGGP Project, monitoring to track and assess management performance against targets, and contingency measures to mitigate unavoidable or accidental impact.

The EMP has been developed during the feasibility stage of the development of the KGGP project. Accordingly the management sub-plans are conceptual and have been termed 'provisional' in acknowledgement that as the project enters the design and implementation phases, there will be more specificity around aspects of project construction and operation and the management plans will likewise become more detailed. The EMP would also continue to be developed and refined following the conclusion of the assessment process, taking into consideration the proposed timing of development activities, comments on the draft EIS and incorporating the recommendations and conclusions of the Environmental Assessment Report. A key element of the transition to more specificity around management measures will be arrangements to be put in place by the construction contractor. Wherever possible these have been foreshadowed in this EMP and the detailed Construction and Operational EMPs will be submitted as part of the Pipeline Management Plan process required as part of the consent process under the *Energy Pipelines Act*.

1.3.2 Scope of document

A risk assessment for the KGGP Project was undertaken during the preparation of the EIS. The risk assessment identifies the potential impacts with a greater environmental risk, and consequently where environmental impact assessment and management should be focussed. The environmental aspects that generated pre-mitigation risk ratings as medium or above and their associated management sub-plan in the EMP are summarised in Table 1-1.

Table 1-1: Key risks and relevant management sub-plans

RISK	RELEVANT MANAGEMENT SUB-PLAN
Vegetation clearing	Vegetation and Flora Management Plan Terrestrial and Aquatic Fauna Management Plan Landform and Soils Management Plan Rehabilitation Management Plan Cultural Heritage Management Plan
Excavation (e.g. fauna falling into trenches (injury, mortality)	Terrestrial and Aquatic Fauna Management Plan Terrestrial and Aquatic Fauna and Habitat Management Plan Health and Safety Management Plan Cultural Heritage Management Plan
Physical presence of infrastructure.	Terrestrial and Aquatic Fauna Management Plan Terrestrial and Aquatic Fauna and Habitat Management Plan Introduced Fauna Management Plan Weed Management Plan Rehabilitation Plan
Vehicle movements	Traffic Management Plan Noise and Vibration Management Plan Weed Management Plan
Fire ignition	Weed Management Plan Fire Management Plan Health and Safety Management Plan
Liquid waste disposal	Waste Management Plan Hydrology and Water Quality Plan
Spills and leaks	Waste Management Plan Hydrology and Water Quality Plan
Atmospheric emissions (including dust).	Air Quality Management Plan Greenhouse Gas Management Plan
Noise and vibration	Noise and Vibration Management Plan

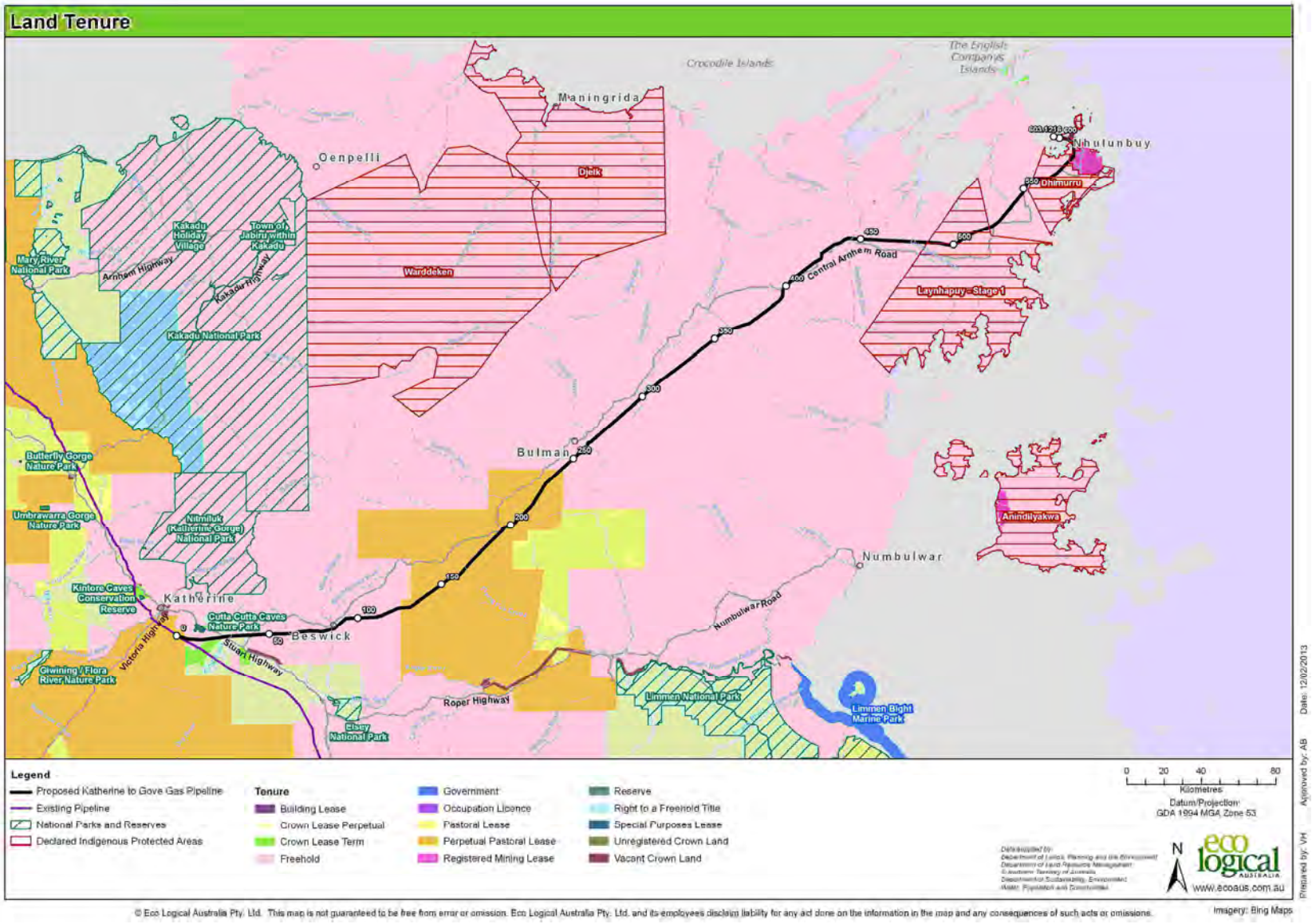

Figure 1-1: Location of proposed Katherine to Gove Gas Pipeline and land tenure in the region

The management sub-plans included in the EMP relate to the design, construction and/or operational phases of the KGGP Project, as appropriate (Table 1-2). A separate preliminary decommissioning plan is contained in the EMP.

Table 1-2: Provisions management sub-plans included in EMP

MANAGEMENT SUB-PLAN INCLUDED IN THE EMP	DESIGN	CONSTRUCTION	OPERATIONS
Soil and landform	✓	✓	✓
Hydrology and water quality	✓	✓	✓
Vegetation	✓	✓	✓
Terrestrial and aquatic fauna and habitat	✓	✓	✓
Introduced fauna	✓	✓	✓
Air quality	✓	✓	✓
Health and safety		✓	✓
Cultural heritage	✓	✓	✓
Fire		✓	✓
Noise and vibration	✓	✓	✓
Rehabilitation	✓	✓	✓
Greenhouse gas emissions	✓	✓	✓
Traffic	✓	✓	✓
Waste	✓	✓	✓
Weeds	✓	✓	✓

1.4 LEGISLATIVE AND REGULATORY REQUIREMENTS

Pacific Aluminium has identified the regulatory controls that would be applied to ensure appropriate management of the KGGP Project. The key controls include (but are not limited to):

- Environmental conditions of consent to construct and consent to operate the KGGP granted by the NT Minister for Mines and Energy under the *Energy Pipelines Act* and addressing recommendations made by the NT EPA in their assessment report for the project, made pursuant to the EA Act.
- Environmental conditions in any Approval issued by the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities allowing the KGGP Project to be implemented under the *Commonwealth Environment Protection and Biodiversity Conservation Act* (EPBC Act).
- Conditions of consent to clear native vegetation (if consent is required: exemptions or limitations with respect to pipeline infrastructure are understood to exist).
- Conditions of a licence to extract water from surface or groundwater issued pursuant to the *Water Act* (if a licence is required: exemptions or limitations with respect to pipeline infrastructure are understood to exist).
- Conditions of a licence to discharge waste to water issued pursuant to the *Water Act*.
- Conditions of consent to disturb archaeological material issued pursuant to the *Heritage Act*.
- Restricted Work Areas established to protect Aboriginal sacred sites under the *Northern Territory Aboriginal Sacred Sites Act.*

2 Implementation

2.1 ROLE OF THE EMP WITHIN MANAGEMENT FRAMEWORK

Pacific Aluminium conducts its operations within a culture of continuous improvement (consistent with the ISO 14001 EMS framework). ISO14001 is an internationally recognised continuous improvement model, the key elements of which include assessing environmental risk and legal requirements, developing objectives and targets for improvement, training, operational control, communication, emergency response, corrective actions, audits and reviews.

The EMS is designed on the principles of continual improvement and adopts the methodology of 'Plan, Do, Check and Review (Act)'.

The EMS is subject to periodic review and may be updated from time to time. It is divided into the following 17 elements, each of which sets out to achieve a specific objective that enables the identification and management of environmental risks and opportunities.

The construction phase of the KGGP Project would be managed largely under Element 7 (Supplier and contractor management), the key features of which are:

- Suppliers of material, equipment, services and labour are evaluated to determine the environmental risks of activities and uses of materials and equipment.
- Contractors scope of work, environmental risk assessment and environmental management plans are defined and agreed prior to start of work.
- Contractors have an assigned contract manager to oversee their mobilisation to site and on-site work performance.
- Contractors are aware of environmental requirements, are trained for work, and have required work permits in place.
- Contractor's performance is measured and evaluated.
- Hazardous materials used on-site are approved for their intended use and documented in a register.
- Material safety data sheets (MSDS) are available for all materials used in the workplace.
- Work procedures include required controls for the safe transport, storage, use and disposal of hazardous materials and equipment.

The operational phase of the KGGP Project will be managed largely under Element 10 (Operational control), the key features of which are:

- Operational controls (including environmental management plans) are in place to manage environmental risks.
- Operational controls are in place to conform to the Proponent's performance requirements.
- Work procedures are developed detailing how the required environmental operational controls are implemented and maintained.
- Work procedures are readily available and used by personnel to conduct their daily work activities.
- Operational controls are inspected and maintained to ensure the expected level of protection is provided.

- Work procedures are kept up to date to ensure they accurately reflect current practices.

This EMP provides the overarching framework that will guide the preparation of a detailed Construction Environment Management Plan (CEMP) and Operational Environment Management Plan (OEMP). These plans will be incorporated or referenced in the Pipeline Management Plan, required for the consent to construct or consent to operate the KGGP Project under the *Energy Pipelines Act* (Northern Territory). The EMP also functions to guide mitigation measures relevant to potential impacts on Matters of National Environmental Significance (MNES) and assist in meeting conditions of approval applied under the EPBC Act.

2.2 ROLES AND RESPONSIBILITIES

The roles and responsibilities under this EMP are as follows:

Pacific Aluminium: Proponent of the KGGP Project with overall responsibility for ensuring conditions of consent are met and that construction and operation meet the requirements of the Pipeline Management Plan and associated environment management plans. This is achieved through systems and third party auditing of the delivery of the CEMP and OEMP. Pacific Aluminium also has overall responsibility for ensuring landholder expectations and obligations are met with respect to standards of reinstatement and rehabilitation.

Contractor: Responsible for on-ground delivery of management measures, consistent with the CEMP and OEMP and maintaining appropriate control measures. The CEMP will outline the roles and responsibilities for on-ground construction personnel including sub-contractors. This will include:

- Environmental Manager.
- Environmental Officers:
- Fauna Handlers
- Land liaison officers.

2.3 ENVIRONMENTAL AWARENESS TRAINING AND INDUCTIONS

An induction will be a pre-requisite before accessing the construction site and / or commencing any work on the KGGP Project. Induction would include a familiarisation with the KGGP Project, and to the applicable Environment, Health and Safety; and Cultural Heritage Management policies and procedures. Inductees will be specifically introduced to the detailed project CEMP, and to their roles and responsibilities as defined in that document. Similar processes will be followed during the operational phase, consistent with the OEMP.

2.4 INCIDENTS AND CORRECTIVE ACTIONS

Pacific Aluminium is committed to meeting its community and stakeholder responsibilities and recognises that a clear grievance process is an important tool to assess the KGGP Project's overall environment and social performance as well as gaining an understanding of perceptions and concerns around day-today activities.

Pacific Aluminium's existing *Community Observation and Feedback Management Procedure* (March 2012) will be applied to the KGGP Project and will be outlined in a Communication Stakeholder Engagement Plan (CSEP). All project and contractor staff will be required to adhere to the procedure to ensure the timely capture of any community observation, requests and concerns, and ensure that feedback is provided.

The *Community Observation and Feedback Management Procedure* outlines responsibilities for lodging, investigation and responding to any community observations, and the timeframes within which feedback must be given. Procedures for responding to emerging and potentially serious issues are also outlined. All stakeholder and community interaction will be lodged in a consultation database. This database will be used to monitor stakeholder sentiment and any emerging issues. Engagement outcomes will also be recoded and reported and evaluated as part of the annual review of the CSEP.

The contractor would also develop and implement controls and incident reporting: Control measures will be developed and documented to ensure that the objectives of the CEMP are met. All complaints and incidents will be dealt with promptly and efficiently by suitably trained and qualified personnel. All significant environmental incidents, including near-misses, will be reported and investigated immediately by the Construction Contractor using their approved reporting procedure, which will identify appropriate corrective actions. An Incidents and Complaints Register will be maintained by the Construction Contractor, and will be available for inspection as required by the representative of the regulator.

2.5 AUDITING

A key consideration for the environmental management of the KGGP project will be to ensure that systems are in place to ensure that the measures in the provisional management plans are accounted for in the preparation of the detailed CEMP and OEMP that would be the subject of authorisation. Systems should ensure there is sound reasoning if changes are made to the measures outlined in this EMP and that during construction, the commitments of the management plans are being adhered to.

This will be achieved through project controls implemented by both Pacific Aluminium and the construction and operations contractor including:

- Third party review of detailed management plans for their conformity with EIS commitments.
- Contractor environmental controls.
- Inspection and third party auditing of construction of the project (regular inspections and two formal compliance audits).
- Third party compliance auditing of project operation (annual).

The contractor will ensure control measures are be periodically reviewed for adequacy and amended as required to ensure adverse environmental impacts are minimised.

2.6 REPORTING AND APPROVAL ARRANGEMENTS

Pacific Aluminium will approve the CEMP and OEMP prepared by the contractor and require the contractor to report on the implementation of the CEMP and OEMP, consistent with the requirements of consent to construct and consent to operate issued pursuant to the *Energy Pipelines Act*.

Pacific Aluminium intends to publicly report on environmental performance of the construction and operation phases through its annual sustainability report.

2.7 DOCUMENT REVIEW AND CONTROL

The EMP would continue to be developed and refined following the conclusion of the assessment process, taking into consideration the proposed timing of development activities, comments on the EIS and incorporating the Environmental Assessment Report recommendations and conclusions. At that point a review of the CEMP and OEMP prepared by the contractor would be undertaken by a third party to ensure alignment with this EMP.

During the operational phases the contractor's OEMP would be reviewed by Pacific Aluminium on an annual basis to ensure that:

- The environmental targets and performance indicators continue to be appropriate.
- Actions in the implementation strategy have been achieved and/or continue to be appropriate.
- The monitoring program continues to align with the operational phase of the project.

To achieve the purpose of the review, input will be sought from the contractors implementing the KGGP Project, relevant government agencies and key stakeholders.

3 Provisional Soil and Landform Management Plan

3.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

Activities of the project that may potentially impact landform and soils are outlined in more detail in Chapters 2 and 6 of the Draft EIS. They can be broadly categorised into three phases:

- Initial activities required for pipeline planning and surveying.
- Activities related to the construction phase of the project.
- Activities relating to the permanent pipeline infrastructure.

Specific environmental aspects of these activities that may require soil and landform management include:

- Vegetation clearing.
- Soil disturbance (e.g. through scraping and excavation).
- Soil compaction (e.g. from heavy machinery).
- Watercourse crossings.
- Handling and storage of hazardous materials.
- Rock blasting.
- Vehicle traffic.
- Construction, operation and rehabilitation practices.

See also Chapter 5 of this Draft EIS for a definition and risk assessment of the major environmental aspects listed above.

These aspects may potentially result in a number of direct and indirect impacts including:

- Soil loss via wind and water erosion (e.g. loss of topsoil and sub-surface soils).
- Alteration of soil properties.
- Landslides and slope instability.
- Alterations to landforms
- Reduced rehabilitation and revegetation success.
- Loss of existing vegetation.
- Exposure of acid sulphate soils.
- Soil contamination.
- Karst formation impacts.

An assessment of environmental aspects and potential impacts on landforms and soils as a result of the project, and key proposed mitigation responses to minimise these impacts are discussed in Chapter 6 of the Draft EIS.

A discussion of the key aspects, potential direct and indirect impacts and the proposed actions are provided in the Implementation strategy below.

3.2 PERFORMANCE MANAGEMENT

Environmental targets and performance indicators have been prescribed in line with soil and landform management objectives for the KGGP Project (Table 3-2).

3.3 IMPLEMENTATION STRATEGY

Specific actions have been identified to assist in achieving soil and landform management objectives for the KGGP Project (Table 3-3).

3.3.1 Soil erosion

Soil loss via wind or water erosion has many direct and indirect impacts, including:

- Removal of valuable top soil and possibly sub soils with associated impacts on plant growth.
- Long term instability of disturbed areas, leading to reduced rehabilitation success.
- Damage to roads, fence lines and other infrastructure.
- Siltation of watercourses.
- Reduction in water quality in creeks, rivers and coastal areas with associated impacts on aquatic life.

Erosion risk across most Northern Territory landscapes is considered to be at least moderate due to the occurrence of high intensity rainfall. Slopes of one per cent or greater are considered to be an erosion risk (NRETAS 2010). Given the incidence of high intensity rainfall across the region encompassing the project area, the potential for erosion on cleared and disturbed soils is significant. Exposure of soils due to vegetation clearing and earthworks increases the risk of erosion; the extent of which will be dependent on a range of factors including soil type, landform, slope angle and position, rainfall and management. Particularly sensitive areas include drainage areas, steep slopes with shallow soils, and areas with fragile soil types including sandy and sodic or dispersive soils.

The principles for effective erosion and sediment control will follow the 'NT Government Erosion and Sedimentation Control Guidelines – Service Corridors' (NRETA undated):

- Minimise the extent and duration of soil disturbance.
- Control the location and velocity of drainage flow during the construction phase.
- Minimise soil erosion initiated by wind, rain or concentrated flow.
- Minimise sediment runoff from the site.
- Promptly revegetate or stabilise all exposed and or unstable soil surfaces.
- Develop an Erosion and Sediment Control Program (ESC Program) and amend the program to minimise environmental harm.
- Adequately install, operate and maintain all ESC measures.

Erosion mitigation and dust suppression measures (including the use of water trucks) will be implemented to stabilise soils subject to heavy construction traffic.

A Rehabilitation Management Plan proposes to revegetate disturbed areas with a dense cover of appropriate native grasses based on the level of risk and the reasonable expectations of relevant stakeholders. Criteria associated with the risk of erosion, weed infestation, slope, soil type and requirements to establish fauna habitat and protect cultural heritage sites would be developed to identify disturbed areas that require active revegetation with native grasses. Low risk areas will also be rehabilitated according to the procedures outlined in Chapter 2 of the Draft EIS and control measures outlined in this Provisional Soil and Land Management Plan, but these areas are likely to regenerate naturally and therefore no active revegetation will be undertaken.

Mitigation and management measures prescribed in this plan (Table 3-3) would be implemented during construction and operation to reduce the potential for soil erosion in the project area, with the result that the risks are minimised and effective management measures are applied to control erosion if detected.

3.3.2 Riparian habitats, watercourse crossings and downstream impacts

The pipeline alignment was modified in early design stages to avoid vegetation communities sensitive to disturbance and at risk of significant soil erosion (i.e. ecologically sensitive habitats such as riparian corridors). However, some water crossings will still be required. The method used at each watercourse crossing would be dependent on environmental factors, geotechnical constraints and stakeholder views in regards to the significance of the watercourse.

Horizontal Directional Drilling (HDD) and open-cut are the preferred construction methods. The use of HDD construction techniques minimises surface disturbance and substantially reduces any potential impacts to riparian vegetation (see Chapter 7 of the Draft EIS for more detail). HDD would be used at any watercourse that is determined to be in flow by the construction contractor at the time of constructing the water crossing. Nine watercourses have already been identified as potentially requiring HDD for ecological and engineering reasons (Table 3-1).

Table 3-1: Proposed HDD watercourse crossings

Stream	KP (km)	Catchment Area (km^2)	Minimum 'Dry' Season Flow (L/s)
King River	29.5	365	5
Waterhouse River	83.7	3280	50
Mainoru River	209.5	1865	185
Wilton River	259.5	4505	445
Goyder River	360.5	995	560
Boggy Creek	511.5	135	130
Cato River	539.7	80	75
Giddy River	571.7	80	75
Latram River	581.0	85	220

The rehabilitation requirements of each watercourse crossings will be assessed individually. Significant rehabilitation is less likely to be required where HDD will be used (e.g. major river systems) than where open trenching techniques will be used (e.g. smaller, dry/ephemeral water courses), with the latter constructions likely to be of smaller scale.

The rehabilitation strategy outlined in the Provisional Rehabilitation Management Plan also applies for the rehabilitation and revegetation of the riparian and ephemeral habitats that may be impacted by the construction of the pipeline. In addition, provisions will be made for the sensitivity and seasonal fluctuations of these habitats. While the overall reinstatement of the watercourse to its original profile and the stabilisation of banks and beds will be the primary objective, varying water levels, flows and natural erosion and deposition points need to be assessed and taken into account in the rehabilitation approach. Bank stabilisation is of high priority and options may include benching, organic fibre mulching (e.g. jute matting) and/or direct planting of tubestock (seedlings).

The potential impacts downstream and on the aquatic habitats will be assessed at each water crossing and appropriate sediment controls installed where required.

3.3.3 Poor construction, operation and rehabilitation practises

Poor construction, operation and rehabilitation practices can cause and exacerbate existing rill and gully erosion, lead to sedimentation of waterways, threaten the integrity of infrastructure, and facilitate the colonisation of aggressive weed species which alter habitats and adversely affect fire regimes. Avoidance of poor rehabilitation practices is of particular concern for linear developments (where length of slope exacerbates risk) and for those involving riparian and in-stream developments in which rehabilitation must be sufficiently progressed to withstand significant wet season stream flows.

3.3.4 Slope instability and landslides

The pipeline route traverses relatively flat topography but in some areas does encounter moderate to steeply sloping topography. Construction of the pipeline in these areas could under certain conditions initiate landslides or lead to slope instability and erosion.

Where the pipeline route skirts areas such as the Mitchell Ranges and other similar topographical features, it typically passes through valleys where colluvium (which is characterised as landslide debris) is present.

No previous assessments have been undertaken to identify the potential for landslides and slope instability along the proposed pipeline alignment. Potential hazards should be confirmed through aerial photography and LIDAR interpretation, field mapping and where appropriate direct investigation prior to construction.

Impacts associated with slope instability and landslide during construction of the pipeline would be managed through implementation of measures summarised in Table 3-3.

3.3.5 Landforms

Construction activities to be undertaken during the development of the KGGP that may potentially affect the existing topography of the project area, not considering mitigation efforts, include:

- Earthworks and ground levelling associated with topsoil stripping, temporary excavations and creation of stockpiles.
- Rock blasting in areas where engineering difficulties are anticipated to arise.

These activities are not expected to significantly alter the existing topography of the project area or surrounds as the KGGP route was chosen to avoid areas of greater topographic range such as the Mitchell Ranges and has a relatively flat topography. It is unlikely the construction of the KGGP would have a significant impact upon the geology of the project area given that less than 10 % of the project area is expected to encounter rock during excavations. The occurrence of significant soil erosion events could potentially alter some of the topography within the project area.

3.3.6 Exposure of acid sulphate soils

Excavation of the pipeline ROW is the key construction activity to be undertaken that may potentially disturb or expose ASS. If ASS were disturbed or exposed as a result of excavation during construction of the pipeline ROW, the following potential impacts may result:

- Adverse changes to the water quality of the soil, groundwater, surface water, wetlands, watercourses and estuaries.
- Degradation of ecosystems and ecosystem services dependant on water.
- Loss of habitat and biodiversity (specifically fish kills).
- Corrosion of metallic and concrete structures such as roads, bridges, pumps, pipes and foundations.

- Invasion of and dominance of wetlands and waterways by acid tolerant water plants, plankton and pathogens.
- Poor rehabilitation outcomes.
- Increased human health risks associated with contamination of soil or, groundwater and acid dust.

The desktop assessment undertaken by Worley Parsons indicated that the pipeline ROW intersects the Ef land system (which has the potential for inland ASS) at approximately KP581, 589 and 594. This assessment was limited by the scale of mapping used to determine potential ASS environments. As a result, field-based assessment would be undertaken prior to construction to identify and confirm areas of potential ASS. Should such areas be confirmed, an Acid Sulphate Soils Management Plan will be developed prior to construction describing the proposed construction methods and management measures to be implemented during construction and operation including: general ASS management requirements; techniques commonly used to treat ASS during and post construction; validation testing; and dewatering and storage requirements.

Potential impacts from the exposure of ASS soils are managed through avoidance, minimisation and mitigation (see Chapter 6 Draft EIS). The broad scale desktop assessment identified potential ASS environment, which would be followed up with a field based assessment prior to construction. Should ASS be encountered a detailed and site specific ASS Management Plan would be developed based on the National Guidance of Acid Sulfate Soils (EPHC & NRMMC 2011) and the Best Practice Erosion & Sediment Control Documents by the International Erosion Control Association Australasia (IECAA 2012). The plan would include construction methods and management measures to:

- Prevent or control oxidation (e.g. keep sediments covered by water).
- Control or treat acidification (e.g. neutralise by adding chemical ameliorants, organic matter and/or stored alkalinity in the ecosystem).
- Protect adjacent of downstream environments (e.g. isolate site, neutralise and dilute surface water etc.).
- Assess risks and undertake monitoring.

The result of these methods and measure will be that residual environmental impacts of ASS following mitigation will be negligible.

3.3.7 Soil contamination

Vehicle and plant refuelling activities would be undertaken during construction. Fuel and other small chemical or hydrocarbon spills could occur during refuelling operations, potentially impacting the surrounding soils. Hazardous waste storage facilities and handling equipment would be segregated and bunded, kept in good order and designed in such a way as to prevent and contain spills.

Mitigation and management measures prescribed in this plan (Table 3-3) would be implemented during construction and operation to reduce the potential for soil contamination in the project area. With the implementation of mitigation and management measures, it is considered unlikely that contamination of soils from spills would occur as a result of implementation of the project.

3.3.8 Karst formation impacts

Desktop and field studies have indicated the potential for karst formations to be present in geological formations between KP0-KP60 (the Daly River Group) and KP486-KP560; with an existing sinkhole identified east of Boggy Creek (KP511.6).

An assessment of the potential for karst formations within these areas is proposed and would be completed during the 2013 dry season.

3.3.9 Related Environmental Management Plans (EMPs)

This environmental management plan (EMP) is closely linked with other Provisional EMPs such as:

- Hydrology and Water Quality Management Plan.
- Waste Management Plan.
- Rehabilitation Management Plan.

3.4 MONITORING PROGRAM

The monitoring program for soil and landform (Table 3-4) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

3.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that environment objectives and targets for soil and landform management are not being achieved, contingency actions (Table 3-5) will be enacted.

Table 3-2: Soil and landform management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
To minimise soil disturbance, degradation and erosion.	No accelerated erosion during and post construction.	Extent of areas successfully rehabilitated. Number of significant erosion incidents. Number of chemical and hydrocarbon spills. No evidence of non-compliance with relevant approval conditions.
	Erosion identified and mitigated in a timely manner for the duration of construction and operation.	
	Erosion control structures adequately maintained for the duration of construction and operation.	
	All sediment contained within the work areas and no visible increase in the turbidity of downstream surface waters during construction.	
	Cleared areas stabilised and erosion control structures in place prior to significant rain events/wet season.	
	Rehabilitate and revegetate disturbed areas in accordance with the Provisional Rehabilitation Management Plan.	
	No contamination of soils from chemical or hydrocarbon spills, or non-hazardous liquid or solid waste.	
	Compliance with relevant legislation.	
To minimise the potential for soil erosion to occur in the long-term during and post construction	No accelerated erosion during and post construction.	Extent of areas successfully rehabilitated. Number of significant erosion incidents. Documentation of ongoing monitoring and required remediation.
	Erosion control structures adequately maintained for the duration of construction and operation.	
To minimise turbidity impacts on surface and ground waters.	All sediment contained within the work areas and no visible increase in the turbidity of downstream surface waters during construction.	Extent of areas successfully rehabilitated Number of significant erosion incidents.

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
	Erosion identified and mitigated in a timely manner for the duration of construction and operation.	Documentation of ongoing monitoring and required remediation
To minimise the impact on rivers/creeks/water bodies	Vegetation clearance to be kept to a minimum.	Compliance with vegetation clearing conditions Monitoring of rehabilitation and revegetation indicates stable beds and banks and progress towards self-sustaining ecosystems.
	HDD to be used at nine watercourses (see Table 3-1) and at any other watercourses determined to be 'in flow' at the time of construction.	
	Techniques which facilitate the rapid stabilisation of beds and banks prior to wet season flooding to be applied where required.	
	Rehabilitate and revegetate disturbed riparian areas with appropriate native vegetation where required.	
	Overall re-instatement of the watercourse as close as possible to its original profile .	
To optimise rehabilitation success.	Rehabilitation to occur within six months of construction completion and prior to the onset of the wet-season.	Extent of areas successfully rehabilitated Number of significant erosion incidents Documentation of ongoing monitoring and required remediation.
	Rehabilitation to be progressively undertaken after clearing including erosion and sediment controls.	
	Topsoil and vegetation matter reused in rehabilitation and landscaping.	
	Topsoil to be stored less than 4-5 months.	
To minimise the potential for exposure of ASS	No exposure of ASS as a result of the project.	Development and implementation of ASS management plan should pre-construction field-based assessment determine the presence of ASS.

Table 3-3: Soil and landform management implementation strategy

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Topography protection	The pipeline route will avoid areas of greater topography range as much as possible.	✓		
	The pipeline earthworks will be kept to a minimum, with the trench having a depth of 1.5–2.0 m and a width of approximately 700 mm wide.	✓	✓	
	The construction corridor will be clearly marked and the area of disturbance minimised as far as practical.	✓	✓	
	Vegetation will be cleared within a 30 m construction ROW, and the cleared vegetation and stripped topsoil will be stockpiled and respread during reinstatement.		✓	
	Cleared areas along the construction ROW and redundant access routes will be rehabilitated, including reseeding with native grass species, shrubs and trees, where required.		✓	
	Rehabilitation of disturbed areas will be undertaken as soon as practicable.		✓	
	An Erosion and Sediment Control Management Plan (ESCP) will be prepared in line with the 'NT Erosion and Sediment Control Guidelines for Service Corridors' (NRETA undated) prior to construction. A risk assessment approach will be taken to determine levels of erosion control and rehabilitation required along various sections of the pipeline corridor and its ancillary facilities.	✓	✓	✓
	Areas of fill that have subsided will be backfilled to surrounding natural ground levels.		✓	✓
	Existing roads, tracks and disturbed areas will be utilised as far as practicable to minimise disturbance to the surrounding environment.	✓	✓	✓
Erosion and sedimentation	The total area to be disturbed will be restricted to the minimum area required to construct the pipeline and above ground facilities.	✓	✓	
	A detailed ESCP will be developed that identifies site specific construction techniques,	✓	✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	management requirements and guidelines for erosion and sediment control for all areas disturbed during construction and for post-construction management throughout the life of the project.			
	Vegetation will be cleared and rehabilitated progressively throughout construction to minimise the period that bare soil is left exposed to erosion.		✓	
	Vegetation will be stockpiled along the construction corridor and will be re-used to stabilise work areas and facilitate revegetation.		✓	
	Impacts on watercourse crossings will be minimised by using HDD at a minimum of nine watercourse crossings. Any additional watercourses that are deemed to be 'in flow' at the time of construction will be considered for HDD.		✓	
	Construction activities involving significant land disturbance will be confined to the 'dry' season.		✓	
	Sediment traps, level sills, and silt fences will be installed to minimise soil loss from the working areas, diversion banks and roll-over banks.		✓	✓
	Routine inspections of sediment control structures, as well as inspections following storm events, will be conducted. During these inspections, sediment control structures are inspected for capacity, structural integrity and effectiveness. Ensure that natural drainage is maintained down slope of the easement and areas of fill that have subsided are backfilled to ground level. Inspections will be documented in accordance with the ESCP.		✓	✓
Soil quality	Vegetation will be stockpiled along the construction corridor and will be re-used to stabilise work areas and facilitate soil development and revegetation.		✓	
	Landfill sites to be identified. Approvals and permits will be obtained prior to using any waste reception facilities.	✓	✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Negotiate on-site burial of waste with relevant authorities and local stakeholders for areas where stockpiling putrescibles waste is not appropriate.	✓		
	Any excess non reusable excavated soil will be stored within the construction corridor and only disposed of at licensed landfill facilities subject to approval.	✓	✓	
	Fuel and chemical storage and wastewater treatment facilities will be designed and constructed to Australian standards.	✓		
	A Provisional Hydrotest Management Plan will be developed and implemented.	✓		
	Topsoil will be stripped and stockpiled in stabilised piles less than 1.5 m, along the construction corridor and will be reused in rehabilitation and landscaping.		✓	
	Spoil will be stored and set back from watercourse banks and earthworks will be contained within approved work areas.		✓	
	Approximately 17 km of the project area will be validated by field sampling and analysis for potential ASS prior to construction.	✓	✓	
	If areas of potential ASS are confirmed in the project area through field investigations, an Acid Sulphate Soils Management Plan will be developed prior to construction which will describe the proposed construction methods and management measures to be implemented during construction and operation, including general ASS management requirements, techniques commonly used to treat ASS during and post construction, validation testing, dewatering and storage requirements.		✓	✓
Rehabilitation of disturbed areas - terrestrial	Vegetation will be cleared and rehabilitated progressively throughout construction to minimise the period that bare soil is left exposed to erosion. Rehabilitate disturbed areas based on risk associated with weed incursion and soil erosion criteria and the reasonable expectations of relevant stakeholders.		✓	

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Maintenance of rehabilitated areas until the required outcome is achieved.			✓
	Topsoil to be stored no longer than 4-5 months and away from weeds. No topsoil to be used in the immediate pipeline area. Subsoils can be used for revegetation if assessed as suitable.		✓	
	Cleared vegetation should be used in the revegetation wherever practical and not a fire hazard.		✓	
	Depending on the assessed erosion risk, areas may be made stable to facilitate natural revegetation, be revegetated with native grasses to reduce erosion risk or be revegetated with native shrubs and trees, for example to reduce wind erosion or restore fauna habitats.		✓	
	Plant species to match the habitats and regions. Select grass species with low fuel loads and good root systems. Where revegetation with grass species is required, direct seeding techniques to be used. Seeds to be sourced in the Katherine to Gove region.	✓		
Rehabilitation of disturbed areas – riparian, ephemeral and other sensitive areas	Sensitive areas including riparian areas, drainage lines, saturated soils, and other areas of high erosion risk will be identified and rehabilitated as a matter of priority.	✓	✓	
	Rehabilitation of riparian vegetation at trenched river crossings required. Rehabilitation of these and other sensitive areas may require a range of techniques including - engineered benches/terraces/embankments for erosion control. - a range of additional stabilisation materials such as roll out organic fiber mulch (jutemat). - direct seeding of native grass, tree and shrub species. - the use of tubestock (where feasible).		✓	

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	In riparian areas, techniques which facilitate the rapid stabilisation of beds and banks prior to wet season flooding will be required.			✓
	Plant species to match the habitats and regions Seeds to be sourced in the Katherine to Gove region	✓ ✓		

Table 3-4: Soil and landform monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY	PROCEDURE	PURPOSE
Existing topography	Locations where rock blasting occurs	Construction phase (dry season): monthly	Visual inspection	To minimise alterations to the existing landscapes/landforms.
	Soil and vegetation stockpiles	Construction phase (dry season): monthly	Visual inspection	
	Earthworks areas	Construction phase (dry season): monthly	Visual inspection	
Erosion and sedimentation	Sediment control structures	Construction phase (dry season): monthly Operational phase: pre- and post-wet season	Control structures are inspected for capacity, structural integrity and effectiveness	To identify when sediment accumulation is approaching or exceeding the limit To minimise soil disturbance, degradation and erosion. To minimise turbidity impacts on surface and ground waters. To optimise rehabilitation success. To minimise the potential for soil erosion to occur in the long-term during and post operation.
	Areas with high erodibility potential	Construction phase (dry season): monthly Operational phase: pre- and post-wet season	Visual inspection Photo point monitoring Reporting	
	Access tracks	Construction phase (dry season): monthly Operational phase: pre- and post-wet season	Visual inspection	
	Soil and vegetation stockpiles	Construction phase (dry season): monthly	Visual inspection	
	Watercourse crossings	Construction phase (dry season): monthly Operational phase: pre- and post-wet season	Visual inspection Photo point monitoring Reporting	
Soil quality	All areas where hazardous materials is stored and/or handled	Construction phase (dry season): monthly Operational phase: pre-	Visual inspection Incident reporting	

PARAMETERS	LOCATION	PHASE & FREQUENCY	PROCEDURE	PURPOSE
		and post-wet season	Soil contamination assessment	
Rehabilitation progress	Low to moderate-risk areas(e.g. Construction areas, watercourse crossings, construction camps etc.)	Construction phase (dry season): monthly Construction phase (shoulder season): immediately post rainfall	Photo point monitoring and visual inspection. Reporting on vegetation (including weed) cover, fire scars and any evidence of erosion/sediment deposition. Provision of recommendations for immediate remedial works.	To ensure rehabilitated areas are adequately stabilised prior to the onset of the wet season. To prevent damage to pipeline infrastructure and surrounding environment (eg. from erosion and dry-season fires).
		Operational phase: pre- and post-wet season	Photo point monitoring and visual inspection. Reporting of vegetation/weed cover and erosion/sediment deposition. Provision of recommendations for remedial work to be undertaken prior to subsequent wet season.	To optimise rehabilitation success for the long-term. To ensure longer term integrity of pipeline route and minimise environmental impacts
	High risk areas (e.g. riparian areas, drainage lines, riparian areas, saturated soils)	Construction phase: weekly and immediately post-rainfall (access allowing)	Photo point monitoring and visual inspection. Reporting on % vegetation (including weed) cover and erosion/sediment deposition. Provision of recommendations for urgent remedial work.	To ensure rehabilitated areas are adequately stabilised prior to the onset of the wet season. To prevent damage to pipeline infrastructure and surrounding environment.
		Operational phase: pre- and post-wet season	Photo point monitoring and visual inspection. Reporting of vegetation/weed cover and erosion/sediment deposition. Provision of	To ensure longer term integrity of pipeline route and minimise environmental impacts

PARAMETERS	LOCATION	PHASE & FREQUENCY	PROCEDURE	PURPOSE
			recommendations for remedial work to be undertaken prior to subsequent wet season.	

Table 3-5: Soil and landform contingency actions

TRIGGER	ACTION
Increased run-off leading to erosion of soil and subsequent deposition.	**1.** Investigate cause (e.g. construction, wind and/or soil erosion, feral animals, inappropriate soil and/or sediment controls). **2.** Undertake a risk assessment (risk of remediation options vs do nothing options). **3.** Remediate cause if possible. **4.** Maintenance of rehabilitated areas until the required outcome is achieved. **5.** Adaptive management (review ESCP and implement changes).
Formation of gullies.	1. Investigate cause. 2. Undertake maintenance as required. 3. Adaptive management (review ESCP and implement changes).
Compaction of soil	1. Investigate cause. 2. Undertake a risk assessment (risk of remediation options vs do nothing options). 3. Remediate cause if possible (e.g. deep ripping). 4. Maintenance of rehabilitated areas until the required outcome is achieved. 5. Adaptive management (review ESCP and implement changes).
Exposure of ASS	1. Investigate cause. 2. Implement mitigation measures (to be identified in ASS Management Plan). 3. Monitor. 4. Maintain mitigation measures until desired outcome is achieved.

4 Provisional Hydrology and Water Quality Management Plan

4.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

Hydrological regimes, surface waters, ground waters and inland drainage systems are the principal receptors of potential impacts from pipeline construction and operation. Particular activities that represent a risk of environmental impact are:

- Construction of watercourse crossings.
- Land clearing for the ROW and topsoil stockpiling.
- Disturbance of vegetation and soils during construction.
- Trench dewatering required in areas of acid sulphate soils (if any).
- Track access and lay down area construction and maintenance.
- The source and disposal of water used in hydrostatic testing of the pipeline during commissioning.
- Construction camp operation, water extraction and wastewater disposal.
- Leakage or spillage from fuel and chemical storage, handling and distribution systems during construction and operation.

Contamination of water resources with increased sediments, wastewater, hydrocarbons and other chemicals, and\or over extraction may:

- Cause changes to the species composition and abundance of aquatic flora and fauna.
- Cause the death of aquatic flora and fauna.
- Cause a decline in health of wetland ecosystems and other groundwater dependent systems.
- Make water unsuitable for consumption by humans and animals.

The Hydrology and Water Quality Management Plan will deal with the following aspects:

- Water course crossings.
- Groundwater and surface water protection.
- Hydrotest disposal.
- Spills, leaks and chemical storage.

4.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of potential impacts to hydrological processes and inland water quality (Table 4-1).

4.3 IMPLEMENTATION STRATEGY

Specific actions have been identified to assist in achieving hydrology and water quality management objectives for the KGGP Project (Table 4-2).

4.4 MONITORING PROGRAM

The monitoring program for hydrology and water quality (Table 4-3) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

4.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for hydrology and water quality are not being achieved, contingency actions (Table 4-4) will be enacted.

Table 4-1: Hydrology and water quality management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
To minimise impacts on the hydraulic regime and riverine ecology of the project area.	Extraction of water from surface watercourses has no significant negative impacts on flow regimes and riverine ecology.	Development of management plans for the extraction of water from surface water sources. Installation of temporary stream gauges, as required. Compliance with NT Government environmental flow requirements.
To minimise physical disturbance to waterways and effectively rehabilitate disturbed areas.	All watercourse crossings are effectively rehabilitated prior to the onset of wet season following construction.	Watercourse rehabilitation completed prior to onset of wet season. No incidences of significant erosion in waterways as a result of pipeline construction.
To employ effective storm water management.	Stormwater discharge from construction sites does not lead to erosion, sedimentation or contamination of nearby waterways.	No detectable increase in erosion and sedimentation along watercourses. Effective separation of stormwater runoff from 'clean' areas and those at a higher risk of potential contamination (e.g. fuel and chemical stores).
To minimise the risk of fuel and chemical spills and employ effective management measures in the event of a spill.	Development of effective spill response procedures No fuel and chemical spills.	Spill kits are available at all chemical storage facilities. Number of fuel and chemical spill incidents.

Table 4-2: Hydrology and water quality management implementation strategy

FACTOR	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Hydraulic regime and riverine ecology	Develop management plans for the extraction of water from surface water in order to minimise potential impacts on hydrologic regime and river ecosystems. The management plans may require the installation of temporary stream gauges to facilitate monitoring of flows in the streams.	✓	✓	
	Investigate 'dry' season flow behaviour of surface water resources and baseflow from groundwater in order to develop appropriate operating rules for sustainable extraction of water from surface water and groundwater resources.	✓		
	Develop and implement the Water Supply and Adaptive Management Strategy (Chapter 7 of the Draft EIS) to minimise impacts on river ecosystems resulting from the extraction of water for pipeline construction.		✓	
Groundwater quantity and quality	Undertake additional investigations to better assess the risks to groundwater quantity and quality as a result of the project construction and operation and develop and implement the Water Supply and Adaptive Management Strategy to negate risks to groundwater resources and groundwater dependent ecosystems.	✓	✓	
Physical disturbance of waterways	Horizontal Direct Drilling (HDD) will be used at nine watercourses (see Table 3-1) and at any other watercourse determined to be 'in flow' at the time of construction.		✓	
	Implement erosion control and rehabilitation measures outlined in the Provisional Soil and Landform Management Plan and Provisional Rehabilitation Management Plan.		✓	✓
	Develop, implement and review Erosion and Sediment Control Plans (ESCP) for waterways in recognition of high erosion risk.		✓	
	Maintain and repair ESCP measures			✓
Stormwater management	Develop and implement a Stormwater Management Plan (SWMP).	✓	✓	
	Construct stormwater management works in accordance with SWMP, including diversion drains, sedimentation/detention basins, internal site drainage, and bunding of contamination risk areas	✓	✓	

FACTOR	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Implement a litter and solids management plan to minimise gross solids loads in runoff.		✓	
Chemicals and fuels	Maintain and clean vehicles, plant and equipment in areas where the resultant contaminants cannot be released to any watercourse.		✓	
	All fuels and chemicals to be stored and handled in accordance with AS 1940 and AS 3780 to minimise the potential for contamination of stormwater runoff from the site.		✓	
	Hydrotest water will be disposed of by ground application in stable environment. The land disposal area should be located more than 100 m from the nearest watercourse and the hydrotest water quality for release to land should comply with the limits set out in Table 7-7 of the Draft EIS. If suitable land not available, appropriately constructed evaporation pond to be used.		✓	
	Hazardous materials to be dealt with in accordance with actions specified in Provisional Waste Management Plan, including provision of spill kits at all chemical storage facilities.		✓	
Induction and training	All site personnel will be required to undertake inductions and training relating to the hydrology and water quality measures outlined in this EMP.		✓	

Table 4-3: Hydrology and water quality monitoring program

PARAMETERS	LOCATION	FREQUENCY	PROCEDURE	PURPOSE
Surface water flow regimes	At key surface water extraction sites.	Monthly	Install temporary stream gauges Monitor upstream and downstream flows of extraction location using staff gauge. Cease extraction if upstream flow conditions significantly change. Cease extraction if water level drops excessively at critical downstream location. Above consistent with implementation of the Water Supply and Adaptive Management Strategy.	To minimise impacts on the hydraulic regime and riverine ecology of the project area.
Groundwater quantity and quality	Existing groundwater bores along the pipeline corridor.	Prior to construction and then as determined by proposed level of use	Implement the Water Supply and Adaptive Management Strategy.	To negate risks to groundwater resources and groundwater dependent ecosystems.
Storm water management systems	Construction camps and facilities.	Wet season – weekly or post significant rainfall events	Visually inspect all stormwater management devices.	To ensure the ongoing effectiveness of stormwater management systems and prevent erosion, sedimentation and contamination of waterways.
Hazardous waste and chemical storage monitoring	Construction corridor Construction camps Pipeline ROW	Weekly	Inspect hazardous waste handling activities and storage areas.	To ensure hazardous waste is stored in accordance with regulatory requirements and Australian Standards.

Table 4-4: Hydrology and water quality contingency actions

TRIGGER	ACTION
Monitored impact on flow regime	1. Implement Water Supply and Adaptive Management Strategy.
Excessive drawdown of aquifers.	1. Implement Water Supply and Adaptive Management Strategy.
Integrity of on-site drainage management system compromised.	1. Investigate cause. 2. Undertake maintenance and remediation as required (e.g. remove accumulated material). 3. Modify/re-engineer on-site drainage management system as required.
Increased sediment load in waterways.	
Erosion of infrastructure/waterway.	
Water quality adversely affected by a spill or leak.	1. Initiate spill response procedures, including: a) control the spill b) contain the spill c) clean up the spill 2. Report the incident and notify appropriate authority. 3. Investigate cause. 4. Undertake treatment as required. 5. Review spill response procedure. 6. Review the need for personnel training.
Integrity of liquid storage or refuelling area compromised.	1. Investigate cause 2. Undertake maintenance as required 3. Modify/re-engineer containment system as required

5 Provisional Vegetation Management Plan

5.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The key environmental aspects of the project with the potential to impact vegetation communities and threatened or conservation significant flora includes:

- Vegetation clearing.
- Introduction and spread of exotic species.
- Fire ignition leading to altered frequency or spatial distribution of fire in the landscape.

Details of rehabilitation are provided in the Provisional Rehabilitation Plan, separate to this EMP.

5.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of potential impacts to vegetation and flora (Table 5-1).

5.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with vegetation management objectives, in a Vegetation Management Implementation Strategy (Table 5-2).

5.4 MONITORING PROGRAM

The monitoring program for vegetation and flora (Table 5-3) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

5.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for vegetation and flora management are not being achieved, contingency actions will be enacted, as per Table 5-4.

Table 5-1: Vegetation management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS AND MONITORING
Minimise adverse impacts to vegetation within the project area.	Clearing limited to approved areas.	Regular inspections and monitoring indicate that clearing has only been undertaken in approved areas.
	Rehabilitation undertaken progressively and as soon as possible after completion of construction.	Progressive rehabilitation undertaken in accordance with the Provisional Rehabilitation Plan.
Prevent degradation of vegetation outside approved disturbance areas.	Clearing limited to approved areas.	Regular inspections and monitoring indicate no degradation of vegetation adjacent to approved disturbance areas as a result of project construction.
	No disturbance to vegetation outside the approved area.	
Minimise, and where possible, avoid clearing of listed threatened flora (if present) and conservation significant species.	Any occurrences of *Pternandra coerulescens* within the pipeline ROW are identified and avoided, where possible. If avoidance is not possible, remedial actions are implemented to mitigate removal of individual plants. Impacts on species of conservation significance are minimised.	Clearing undertaken in compliance with regulatory approvals.
		Information regarding the significance, occurrence and location of any listed or conservation significant species within the project area has been provided to all relevant construction personnel prior to commencement of works.
		Identified opportunities to avoid/minimise clearing of *Pternandra coerulescens* (if present), *Callitris intratropica*, *Cycas orientis* and *Cycas arnhemica* are documented.
Avoid clearing of the Arnhem Plateau Sandstone Shrubland Complex (an endangered ecological community).	No clearing of the Arnhem Plateau Sandstone Shrubland Complex is undertaken.	Subsequent surveys confirm TEC is not in pipeline corridor.
		Comparison of survey results and placement of ancillary infrastructure, camps and access roads confirm none are located in this vegetation community.
Prevent the introduction and spread of introduced flora.	No significant net increase in the type or prevalence of introduced flora in the project area throughout the life of the project.	Monitoring reveals no new or increased infestations of introduced flora in the project area as a result of pipeline construction. No incidents of non-compliance with equipment hygiene inspection procedures.
Prevent fire impact on vegetation within the project area.	Activities associated with the project do not result in uncontrolled fires.	No reported incidents of project-induced fire resulting in damage to native vegetation.
	In the event of a project-induced fire, steps are taken to control and suppress the fire.	In the event of a project-induced fire, emergency response is successfully activated and implemented (including on-site response and notification of emergency response authorities).

Table 5-2: Implementation of vegetation management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Native vegetation clearing.	Clearing will be undertaken in accordance with NTG regulatory approvals and clearing guidelines (NRETA undated).	✓	✓	
	The approved disturbance area will be defined either on the ground (eg. by flagging) and/or by Global Positioning System (GPS) coordinates in earthmoving equipment and approved disturbance boundaries will be verified prior to construction.		✓	
	All relevant construction personnel will be provided with information outlining clearing boundaries prior to the commencement of on-ground works.		✓	
	Where possible existing tracks and/or disturbed areas will be used for developing access tracks in preference to clearing native vegetation.	✓	✓	
	Vehicle and machinery use will be confined to the construction corridor and designated tracks and roads that have been subject to environmental clearance.		✓	
	Siting of lay down areas, access roads, turning circles and borrow pits will be in accordance with the Site Selection Protocol (Appendix U).	✓		
Protection of listed threatened species, conservation significant species and vegetation communities.	Horizontal Direct Drilling (HDD) will be used at nine watercourses (see Table 3-1) and at any other watercourse determined to be 'in flow' at the time of construction.	✓	✓	
	Inspections will be undertaken at the Latram River crossing to confirm the absence (or otherwise) of *Pternandra coerulescens*. If found, construction methods will be reviewed. If avoidance is not possible, remedial actions will be investigated to mitigate removal of plants.		✓	
	Species of conservation significance observed in close proximity to the pipeline ROW will be flagged in the field and recorded as GPS coordinates in earthmoving equipment to prevent disturbance. Access will be restricted where possible.	✓	✓	✓
	Watercourse crossings along access tracks and the construction corridor will be designed and constructed in accordance with NTG guidelines on erosion and sediment control (NRETA undated) and best practice guidelines (IECAA 2012).	✓	✓	

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Landowners will be consulted about the potential for salvage of commercially valuable Cycad species that will otherwise be removed during construction.	✓	✓	
Weed management.	Weed control measures will be undertaken as specified in the Provisional Weed Management Plan.		✓	✓
	Rehabilitation will be undertaken in a manner which minimises the potential for weed introduction and spread. Refer to the Provisional Rehabilitation Management Plan for more detail.		✓	✓
Fire management.	Fire management measures will be undertaken as specified in the Provisional Fire Management Plan.		✓	✓
Inductions and training.	All site personnel will be required to undertake inductions and training relating to vegetation management measures outlined in this EMP.		✓	

Table 5-3: Vegetation monitoring program

PARAMETERS	LOCATION	PHASE &FREQUENCY [CONSTRUCTION/OPERATION]	PROCEDURE	PURPOSE
Reconciliation of approved clearing with actual clearing.	Disturbed areas	Construction phase Weekly	Visual inspection.	To ensure clearing is in accordance with relevant approvals.
Vegetation degradation.	Adjacent to approved disturbance area	Construction phase Fortnightly	Visual inspection and photo monitoring at key sites.	To ensure vegetation communities adjacent to construction areas are not degraded.
Rehabilitation success.	Disturbed areas	Construction and operational phases Ongoing	Visual inspection and photo monitoring at key sites in accordance with Provisional Rehabilitation Management Plan	To ensure successful rehabilitation of pipeline ROW.
Erosion and/or sediment deposition.	Disturbed areas	Construction and operational phases Ongoing	Visual inspection in accordance with the Soil and Landform Management Plan.	To ensure vegetation communities adjacent and/or down-slope of construction areas are not degraded.
Introduction and spread of weeds.	Project area	Construction and operational phase Ongoing	As per Provisional Weed Management Plan. Monitor existing infestations in pipeline ROW and control spread. Identify and record new infestations and undertake appropriate control measures.	To ensure the effective management of weeds and to meet appropriate regulatory requirements.
		Construction and operational phases Annually	Map weed infestations.	
Increased fire risk.	Project area	Construction and operational phase Ongoing	Implement measures outlined in the Provisional Fire Management Plan Investigate and document the details of any fires initiated as a result of project activities.	To reduce the risk of accidental fire ignition and subsequent impacts on the surrounding environment.

Table 5-4: Vegetation contingency actions

TRIGGER/CRITERIA	ACTION
Marked clearing boundary not in accordance with approvals.	1. Stop work in relevant area. 2. Investigate and complete an incident report. 3. Implement corrective actions, including the amendment of clearing boundaries.
Clearing outside the approved area is identified.	1. Stop work in relevant area. 2. Investigate and complete an incident report. 3. Report to regulators as required (with notice of proposed corrective action). 4. Implement corrective actions, including rehabilitation where required.
Areas of unacceptable erosion identified.	1. Investigate and complete an incident report outlining options for control and future prevention. 2. Remediate affected area.
Population(s) of threatened flora species not previously recorded, are found within the project area.	1. Provide for the interim protection of newly recorded species. 2. Report the occurrence(s) to relevant authorities. 3. Investigate opportunities to avoid or minimise impacts. 4. If avoidance is not possible, investigate options for mitigating impact and follow appropriate regulatory procedures.
Introduced flora species are discovered or spread within the project area.	1. Undertake weed control. 2. Review relevant procedures (e.g. vehicle hygiene procedures) and modify as required. 3. Record location and abundance.
Fire incident occurs.	1. Immediately extinguish the fire. 2. Investigate and complete an incident report. 3. Implement appropriate measures to avoid re-occurrence. 4. Rehabilitate affected area as required.

6 Provisional Terrestrial and Aquatic Fauna and Habitat Management Plan

6.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

Construction activities have the potential to impact on terrestrial and aquatic fauna through the following aspects of the KGGP:

- Clearing and earthworks for construction, including in sensitive habitats (e.g. potential nesting habitats, monsoon vine forest; riparian and wetland habitats).
- Open trench excavations for pipeline installation potentially resulting in fauna capture.
- Pipeline water crossings causing barriers to fish movement.
- Increased access and vehicle movement associated with construction and pipeline maintenance resulting in collisions with fauna and affecting fauna behaviour.
- Noise, vibration, light and dust generation from construction, potentially affecting fauna behaviour.
- Vehicle and personnel introducing and/or spreading exotic fauna species and fish diseases.
- Machinery, vehicles and personnel introducing ignition sources for bushfire.
- Risk of spills of hydrocarbons, hazardous materials or wastewater discharges resulting in contamination of waterbodies on which fauna are dependent.

This Management Plan addresses management of issues relating to impacts to significant species, including those listed under the EPBC Act potentially affected by the KGGP. The management approach for rehabilitation is described in the Provisional Rehabilitation Management Plan.

6.2 PERFORMANCE MANAGEMENT

Environmental targets and performance indicators have been prescribed in line with fauna and habitat management objectives for the KGGP Project (Table 6-1).

6.3 IMPLEMENTATION STRATEGY

Specific actions have been identified to assist in achieving fauna and habitat management objectives for the KGGP Project (Table 6-2).

6.4 MONITORING PROGRAM

The monitoring program for terrestrial and aquatic fauna and habitats (Table 6-3) has been designed to ensure that construction and operation of the KGGP are consistent with prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets. Monitoring of surface water and groundwater to ensure aquatic fauna habitat is not lost/degraded/contaminated is addressed in the Hydrology and Water Quality Management Plan.

6.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that environment objectives and targets for fauna and fauna habitat are not being achieved, contingency actions (Table 6-4) will be enacted. Contingency actions relating to potential impacts to fauna habitat/vegetation are addressed in Table 6-4.

Table 6-1: Terrestrial and aquatic fauna and habitat management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
Minimise direct impacts to terrestrial and aquatic fauna habitat.	Total area of fauna habitat cleared by completion of construction will not exceed 2200 ha.	Regular inspections and annual monitoring shows the area of actual clearing is not more than the area approved for clearing.
	Demonstrated process for finalising alignment of Pipeline ROW in pipeline corridor, and location of ancillary infrastructure, construction camps and access roads that incorporates consideration of sensitive fauna habitats where apparent from surveys including monsoon vine forest, wetlands and riparian zones.	Documented process for planning of infrastructure placement that uses avoidance/minimisation of disturbance of sensitive fauna habitats.
	No direct disturbance of watercourses with significant flows during construction.	Construction/Horizontal Directional Drilling (HDD) records, water crossing inspections and photos of water crossings at time of construction.
	Rehabilitation targets as per Preliminary Rehabilitation Management Plan.	Preliminary Rehabilitation Management Plan Performance Indicators.
Minimise impacts to significant fauna species likely to be present in project area.	Demonstrated process for finalising alignment of pipeline ROW in pipeline corridor, and location of ancillary infrastructure, construction camps and access roads. The process will use location criteria/rules to minimise disturbance to areas of potentially higher value habitat for significant fauna species, where apparent from surveys. These habitats include: • Tall forest (large, over 20 m tall trees) close to permanent water (for Red Goshawk, Northern Masked Owl). • Core habitat (wet season feeding habitat, dry season feeding habitat in association with waterholes and tall stands of *Eucalyptus tintinnans*) on rocky hills for Gouldian Finch between KP0 and KP140 and north-east of Bulman. • Wetland areas (for Australian Painted Snipe, Australasian Bittern and migratory wetland bird species). • Preferred habitats for and in proximity to other threatened species if and where recorded in project area.	Documented process for planning or report on outcomes of infrastructure placement.
	No direct disturbance of watercourses with significant flows during construction to avoid potential impacts to Freshwater Sawfish.	Construction/Horizontal Directional Drilling (HDD) records, water crossing inspections and photos of water crossings at time of

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
		construction.
	No statistically significant reduction in Beswick//Chambers River Gouldian Finch population attributable to project construction for two years following completion of constructions.	Gouldian Finch monitoring results.
Minimise injury/death of individual vertebrate fauna during construction.	Trench fauna management procedures implemented daily during construction. Injured animal procedure adhered to during construction and pipeline maintenance.	Environmental Incident Reports for fauna encounters. Daily fauna trench clearance reports No incidents of vehicle speeds exceeded on ROW and access roads.
Prevent introduction/spread of weeds and feral animals that may affect fauna/fauna habitat during construction or maintenance of pipeline.	No reports of new feral animal or invasive weed infestations in project area attributable to construction activities within two years of completion of construction. No reports of new feral animal or invasive weed infestations along ROW or access roads attributable to pipeline maintenance activities.	Construction area inspections Ranger group feedback Annual inspections of ROW and access roads for weeds and feral animals.
Prevent bushfire impacts to fauna habitat during construction or maintenance of pipeline.	No fire incident to occur as a result of the project.	No reported incidents of uncontrolled fire resulting in damage to native vegetation / fauna habitats.

Table 6-2: Terrestrial and aquatic fauna and habitat management implementation strategy

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Timing of construction	Construction activities involving excavations will be restricted to the 'dry season' as much as possible	✓	✓	
	Clearing will be undertaken in stages to allow for the progressive movement of fauna into areas outside the proposed disturbance area.	✓	✓	
Threatened/ migratory species management	Prepare and implement a process for finalising the alignment of the Pipeline ROW in the Pipeline Corridor, and location of ancillary infrastructure, construction camps and access roads, that seeks to minimise disturbance to areas of potentially higher value habitat for significant fauna species, where apparent from surveys. These habitats include: • Tall forest (large, over 20 m tall trees) close to permanent water (for Red Goshawk, Northern Masked Owl). • Core habitat (wet season feeding habitat, dry season feeding habitat in association with waterholes and tall stands of *Eucalyptus tintinnans*) on rocky hills for Gouldian Finch between KP0 and KP140 and north-east of Bulman. • Wetland areas (for Australian Painted Snipe, Australasian Bittern and migratory wetland bird species). • Mosaic grassland vegetation within preferred open forest and woodland habitat if identified in surveys to have relative higher potential to support Eastern Partridge Pigeon. • Land immediately up-gradient of potential rainforest Gove Crow Butterfly habitat. • Preferred habitats for and in proximity to other threatened species if and where recorded in project area.	✓	✓	
Habitat clearing	Construction activities in the vicinity of sensitive fauna habitats at watercourse crossings and along the access routes will be undertaken as early as possible in the dry season with attention to timing of Red Goshawk breeding season at end of the dry season.	✓	✓	
	Construction activities will be undertaken between KP0 and KP140 prior to the early wet season period (October – November) in which Gouldian Finch access to water in the landscape becomes limited.	✓	✓	

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	A documented process will be prepared and implemented in ongoing detailed project planning to examine opportunities to reduce the disturbance footprint.	✓	✓	
	The total area of habitat to be cleared will be the minimum area required to construct the pipeline, above ground infrastructure, temporary construction sites and access tracks.		✓	
	Best endeavours will be used to avoid clearing tall trees on along the edges of the pipeline corridor and and/or prune branches (where feasible) rather than felling tree.		✓	✓
	Clearing of large trees at watercourse crossings will be avoided where possible to reduce erosion and increased sedimentation.	✓	✓	
	Habitat in approved areas to be disturbed will be cleared consistent with actions described in Vegetation Management Plan.		✓	
	Sensitive fauna habitats in proximity to working areas will be clearly marked and access to these areas will be prohibited i.e. refuge waterholes, potential habitat trees.		✓	
	The pipeline ROW will be reinstated following pipeline construction and all areas not required following construction including temporary access roads, laydown areas, and construction camps rehabilitated according to the Rehabilitation Management Plan.		✓	
Fauna handling / encounter response	At least one qualified fauna handler will be available on-site at all times.		✓	
	Vehicle drivers and construction staff will arrange translocation (by licensed handlers) of fauna observed in ROW.		✓	
	Native animals encountered adjacent to ROW or in other construction areas will not be interfered with unless there is a threat to personnel safety in which case construction staff will arrange translocation (by licensed handlers).		✓	
Vehicle	Light vehicles will be restricted \ to designated tracks and drivers will abide by the allocated speed limit (except in cases of emergency) to minimise fauna fatality or injury by moving		✓	

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
movement	vehicles.			
	Lower vehicle speeds through areas of the ROW if and where the significant species have been previously recorded in surveys or observed by personnel will be applied.	✓	✓	
Fauna entrapment / trench management	Pipes will be inspected by fauna handlers prior to welding and observed fauna removed.		✓	
	Welded pipeline sections will be capped at end of shifts to prevent fauna entry.		✓	
	Trench plugs and fauna exit ramps will be installed at both ends of trenches at intervals not exceeding 1000 m.	✓	✓	
	Open trenches will be inspected and cleared by fauna handling teams within four hours after sunrise according to the trench monitoring procedure.		✓	
	Open trench lengths will not exceed lengths capable of being practically inspected and cleared in accordance with this protocol by the available fauna teams at any time.		✓	
	Trench monitoring will continue throughout any breaks in construction for all open trench.		✓	
	Water at base of trenches will be extracted daily to ensure no pooling of water.		✓	
	Open trench will be inspected by construction contractor half an hour prior to backfilling and any entrapped fauna cleared by a fauna handler before backfilling can be completed.		✓	
Ancillary infrastructure	Assessments of areas in which construction camps and access roads are to be placed will be undertaken to identify potential breeding and dry season feeding habitat or water resources to be avoided in final design and placement of this infrastructure.	✓		
Watercourse Crossings	As per Hydrology and Water Quality Management Plan.		✓	
Post-construction	Grass coverage would be encouraged along the single 4WD track adjacent to the pipeline to remain post-construction, continuing to allow fauna movement across.			✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	If sick or injured wildlife are encountered, a nominated carer will assess possible rescue and rehabilitation of the animal.			✓
Feral animal control	As per Introduced Fauna Management Plan.		✓	✓
Weed control	As per Weed Management Plan.		✓	✓
Fire prevention and management	As per Fire Management Plan.		✓	✓
Training and Inductions	All site personnel will be subject to an Environmental Induction and training incorporating information on significant species likely to occur in Project area and what to do if sighted and/or encountered.		✓	✓

Table 6-3: Terrestrial and aquatic fauna and habitat monitoring program

PARAMETERS	LOCATION	FREQUENCY	PROCEDURE	PURPOSE
Construction area inspections	Disturbed working areas Watercourse crossings Access tracks	Daily	Check: Clearing boundaries are pegged and accurate Check no clearing outside of approved boundaries.	To ensure clearing is in accordance with approvals.
Trench monitoring	Open trench during construction	Daily	Daily inspections by trained fauna handler of all open lengths of pipeline trench to be undertaken in morning and be completed within 4 hours of sunrise.	To check for any vertebrate fauna that may have fallen in open trench overnight and Inspection of the entire base of the trench, with attention to evidence of burrowing reptiles, and inspection of all shelters/refuges.
Beswick/Chambers River	Chambers River area	Annual, for up to	Target searches and watches	To confirm construction is not having/does

PARAMETERS	LOCATION	FREQUENCY	PROCEDURE	PURPOSE
Gouldian Finch population	east of Beswick, between KP100 and KP125 Potentially broadened based on 2013 dry season survey.	three years following completion of construction	at waterholes late in the dry season (12 hours over four days). Area searches 20 hours over five days over a 50 ha area.	not have a detrimental impact on the Gouldian Finch population. To provide further information on the Beswick/Chambers River population.

Table 6-4: Terrestrial and aquatic fauna and habitat contingency actions

TRIGGER	ACTION
Disturbance to area outside of the approved disturbance boundary is reported or noted through monitoring.	1. Report as Environmental Incident and initiate Incident Response Procedure, including: a) Stop work in the vicinity of the disturbance boundary. b) Investigate cause and report to regulators as required (with notice of proposed corrective action). c) Implement corrective actions, including rehabilitation where required.
Injury or death of conservation significant vertebrate fauna as a result of vehicle collision or other human interaction.	Measures in accordance with the Wildlife Interaction Policy will be undertaken, including: 1. Investigate cause. 2. Undertake appropriate remedial action (e.g. contacting a nominated carer to assess possible rescue and rehabilitation of the animal) as required. 3. Report as an Incident. 4. Revise procedures and education / induction programs as required to prevent reoccurrence. 5. Collate reports of any such incidents for regular reporting to NT EPA.
A new Threatened species not previously recorded, is found within the Proposal area.	1. Stop work in immediate area if animal is still in construction area 2. Allow opportunity for animal to leave construction area or where appropriate qualified fauna handler to relocate to adjacent habitat 3. Recommence work with minimum working widths in ROW only. 4. Assess likely extent of habitat for Threatened species 5. Investigate opportunities to prevent or minimise the impact to recorded fauna such as evaluating potential to relocate temporary construction areas, access roads, camps or any other infrastructure that there is potential to shift at this stage of planning and construction 6. Report finding and management approach to NT EPA and other relevant agencies 7. Indicate 'no-go' areas/ habitats to be avoided through flagging/re-pegging.

7 Provisional Introduced Fauna Management Plan

7.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following environmental aspects may result in impacts to the environment from introduced fauna through the following:

- The use of earthmoving equipment, vehicles, and construction materials and fill, sourced from elsewhere in the region, Australia and overseas, has the potential to introduce exotic fauna species that currently do not occur in the area.
- Vegetation clearing and soil disturbance creates conditions of maximum suitability for the establishment and spread of introduced species.
- Yellow Crazy Ants are exotic species present in the eastern section of the construction corridor but not in the west. Construction activity could assist the spread of these species which are known to negatively impact on native fauna.

7.2 PERFORMANCE MANAGEMENT

Environmental targets and performance indicators have been prescribed in line with introduced fauna management objectives for the KGGP Project (Table 7-1).

7.3 IMPLEMENTATION STRATEGY

Specific actions have been identified to assist in achieving introduced fauna management objectives for the KGGP Project (Table 7-2).

7.4 MONITORING PROGRAM

The monitoring program for introduced fauna (Table 7-3) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

7.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for introduced fauna management are not being achieved, contingency actions (Table 7-4) will be enacted.

Table 7-1: Introduced species management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
To prevent the spread of feral animals and introduced pests.	No Yellow Crazy Ants transported in construction vehicles and equipment.	No new infestations of Yellow Crazy Ants are recorded in the pipeline corridor. No noticeable increase in the abundance of feral animals.
	Compliance with relevant legislation.	
To prevent the spread of exotic aquatic fauna species and fish disease.	No increase in exotic fauna species or fish diseases.	Appropriate hygiene measures are implemented. No surface water is extracted and released into a different catchment unless a thorough risk assessment has deemed it appropriate.

Table 7-2: Introduced species management implementation strategy

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Feral animal control	Feeding feral animals will be prohibited.		✓	
	Domestic animals will not be permitted in the project area.		✓	
	Systems will be established for reporting of Yellow Crazy Ant sightings.			
	Continued support will be provided to the Yellow Crazy Ant eradication program conducted through Dhimurru Aboriginal Corporation.	✓	✓	
Disease control	Rehabilitation will be undertaken in accordance with a Rehabilitation Management Plan.		✓	✓
	Exotic species and diseases present in the project area will be identified prior to construction.	✓		
	No surface water will be extracted and released into a different catchment unless a thorough risk assessment has deemed it appropriate.		✓	
Training and Inductions	All site personnel will be required to undertake inductions and training relating to measures outlined in this EMP.		✓	

Table 7-3: Introduced species monitoring program

PARAMETERS	LOCATION	FREQUENCY	PROCEDURE	PURPOSE
Feral animals	Pipeline ROW	Opportunistically	Visual assessment	To monitor occurrence of feral species and implement management action if required

Table 7-4: Introduced species contingency actions

TRIGGER	ACTION
Introduced fauna species are discovered or spread within the Project area	1. Undertake weed control. 2. Review relevant procedures (e.g. vehicle hygiene procedures) and modify as required. 3. Record location and abundance information.
Noticeable increase in feral animal numbers within the project area.	1. Undertake feral animal eradication program. 2. Record location and abundance information.
New diseases, or increased occurrence of disease is evident throughout project area.	1. Investigate cause. 2. Undertake eradication programme (if applicable). 3. Review and update relevant procedures. 4. Record location and abundance information.

8 Provisional Air Quality Management Plan

8.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The environmental aspects of the project with the potential to affect air quality within the project area include:

- Removal of vegetation.
- Earth moving activities.
- Vehicle movement along unsealed roads and construction corridor.
- Blasting and trenching activities.
- Trench padding.
- Open stockpiles.
- Backfill activities.
- Vegetation clearing.
- Operation of gas turbine at King River compressor station.
- Venting.

Air emissions of gases and dust produced as part of implementation of the project could result in negative impacts to the following environmental factors:

- Human health and Safety.
- Vegetation and flora.
- Fauna.
- Surface water.

8.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of air quality (Table 8-1).

8.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with air quality management objectives, in an Air Quality Management Implementation Strategy (Table 8-2).

8.4 MONITORING PROGRAM

The monitoring program for potential impacts caused by a reduction in air quality has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 8-3). Monitoring will measure the success of these actions in accordance with management objectives and targets.

8.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for air quality management are not being achieved, contingency actions will be enacted, as per Table 8-4.

Table 8-1: Air quality management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS [what will be monitored to determine how well target has been met]
Minimise to the greatest extent possible a reduction in air quality generated through the activities of the project.	No air pollution incidents/events caused by dust deposition resulting from construction or operation activities.	All management actions are adhered to and there are no reported incidents related to air quality
	Compliance with the: - *Waste Management and Pollution Control Act.* - *Public and Environmental Health Act* - *Work Health and Safety (National Uniform Legislation) Act* - *National Occupational Health & Safety Commission Act 1985*	
To minimise potential impacts to human health and safety from dust and hazardous gases.	No incidents of health impacts to individuals or groups resulting from the project.	Levels of emissions and no reported incidents to health and safety
To minimise the potential impacts of a reduction in air quality (dust emissions) on the surrounding environment.	No air pollution incidents/events caused by dust deposition resulting from construction or operation activities.	Air quality within the project area compared to previous years
	No recorded incidents/impacts to vegetation and flora, fauna or decrease in surface water quality.	Quality of vegetation and flora, fauna habitat and surface water.

Table 8-2: Implementation of air quality management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Management of dust emissions.	Ensure that vehicles, machinery and loads are properly maintained and covered to minimise dust emissions.		✓	✓
	Minimisation of land clearing, when practicable, to reduce risk of wind erosion.		✓	
	Adhere to vehicle speed limits as per Traffic Management Plan.		✓	✓
	Regularly water unsealed roads, exposed ground surfaces and stockpiles with water tankers/carts using non-saline water or with an alternative approved substance (crusting agent).		✓	
	Watering of all non-active stockpiles or covering with an impermeable layer to reduce wind erosion.		✓	
	Watering of excavated material prior to major handling to ensure high moisture content and reduce available particulate matter.		✓	
	Minimisation of haul truck overburden dump drop heights (e.g. use of chutes)		✓	
	Minimisation of heavy vehicle traffic (e.g. graders and haul trucks), particularly traffic moving overburden, to reduce disturbance of low moisture material.		✓	
	Monitoring of current and projected weather patterns during the construction phase to predict the occurrence of adverse conditions conducive to high dust generation		✓	
	Scheduling of construction activities known to generate high levels of dust to avoid adverse weather conditions.		✓	
	Soil stabilisation will be undertaken through early rehabilitation of the project area as per the Rehabilitation Management Plan.		✓	✓
	General housekeeping practices to ensure there is no accumulation of waste materials, within the construction area, that may generate dust.		✓	✓
Management of hazardous gas emissions.	Periodic leak surveys to detect fugitive gas releases from pipeline as required by AS2885.		✓	✓
	Ensure design, construction and operations programs reduce risk of air emissions from venting or pipeline failure.	✓	✓	✓
Inductions and training.	All site personnel (construction and operation) will be subject to an Environmental Induction for Air Quality, which will include information about air quality management, safety and prevention measures (dust control).		✓	✓

Table 8-3: Air quality monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY [CONSTUCTION/OPERATION]	PROCEDURE	PURPOSE
Evidence of reduction in air quality from dust emissions.	Project area.	Ongoing.	Visual observation of dust emissions. Report and investigate any reduction in air quality within the project area to determine cause.	To ensure that no air quality incidents resulting from dust occur as a result of activities related to the construction and/or operation of the project.
Evidence of unacceptable levels of hazardous gas emissions.	Project area.	Ongoing.	Inspection and monitoring of King River compressor station and periodic inspection of pipeline to check for leaks.	To ensure that no air quality incidents resulting from hazardous gas emissions occur as a result of activities related to the construction and/or operation of the project.

Table 8-4: Air quality contingency actions

TRIGGER/CRITERIA	ACTION
Reduction in air quality occurs.	1. Report as Incident and initiate Incident Response Procedure, including as appropriate: a) Determine the spatial extent of the incident. b) Investigate the cause. c) Implement any urgent measures required. d) Review and procedure and quality controls.

9 Provisional Health and Safety Management Plan

Overall management of HSE impacts of the project will be guided by the Health, Safety, Environment and Quality Management System (HSEQMS). A comprehensive HSEQMS will be developed for the project and this will have the following components:

- Policy.
- Legal and other requirements.
- Hazard identification and risk management.
- HSEQ Management improvement planning.
- Organisational resources, accountabilities and responsibilities.
- Training, competency and awareness.
- Supplier and contractor management.
- Documentation and document control.
- Communication and consultation.
- Operational control.
- Management of Change.
- Business resilience and recovery.
- Measuring and Monitoring.
- Non-conformance, incident and action management.
- Data and records management.
- Performance assessment and auditing.
- Management review.

9.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The aspects of the project with the potential to affect human health and safety within the project area include:

- Vegetation clearing.
- Excavation.
- Physical presence of infrastructure.
- Vehicle movements.
- Fire ignition.
- Liquid (including septic) and solid waste disposal.
- Hazardous substance use.
- Spills and leaks.
- Dust emissions.
- Light emissions.
- Ionising radiation.
- Noise and vibration emissions.
- Isolation.
- Fatigue.
- Presence of native and feral animals.
- Soil and water-borne bacteria and parasites.
- Biting insects.

- Solar radiation and heat.
- Poor food &/or water quality management.
- Manual handling.

Activities associated with the above aspects could potentially impact on the health and safety of project workers/contractors or the public through injury or loss of life. The management and mitigation measures presented in this plan aim to minimise the potential for these impacts.

9.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of health and safety (Table 9-1). This is consistent with the requirements of Sections 1, 4, 13, and 16 of the HSEQMS.

9.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with health and safety management objectives, in a Health and Safety Management Implementation Strategy (Table 9-2). These components largely form the substance of Section 10 of the HSEQMS.

9.4 MONITORING PROGRAM

The monitoring program for potential impacts to health and safety has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 9-3). Monitoring will measure the success of these actions in accordance with management objectives and targets and is consistent with Section 13 and 14 of the HSEQMS.

9.5 CONTINGENCIES AND CORRECTIVE ACTIONS

If monitoring indicates that objectives and targets for health and safety management are not being achieved, contingency actions will be enacted, as per Table 9-4. This is consistent with Section 14 of the HSEQMS.

Table 9-1: Health and safety management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
Reduce the risk for injury or loss of life as a result of the project to as low as reasonably practicable.	No health and safety incidents/events caused by activities associated with the project.	Lost Time Injury Frequency Rate (LTIFR). Total Recordable Injury Frequency Rate (TRIFR). Total Recordable Injury Severity Rate (TRISR). Occupational Illnesses. Significant Potential Incidents (SPI). Significant Potential Incident Closure Rate. Breaches of Health and Safety Policy. Breaches of Health and Safety Standards. No. of breaches of applicable Acts. Monitoring the effectiveness of action closure.
	Compliance with relevant public health and occupational health and safety legislation including: - *Public and Environmental Health Act* - *Work Health and Safety (National Uniform Legislation) Act* - *National Occupational Health & Safety Commission Act 1985*	

Table 9-2: Implementation of health and safety management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Solar radiation and heat (contractors and employees)	Shade and cooling will be provided wherever practicable (for example air conditioned vehicles, plant and accommodation).		✓	✓
	Appropriate Personal Protective Equipment (PPE) will be worn at all times by work contractors and employees including long sleeve shirts, long trousers, broad-brimmed hats and sunscreen.		✓	✓
	Cool water will be provided and made readily available at all times.		✓	✓
	Wherever practicable, tasks with high physiological demand will be scheduled for cooler periods.		✓	✓
	Reasonable work/rest regimens appropriate to tasks will be implemented.		✓	✓
	Close observation /acclimatisation of new/returning personnel will be undertaken.		✓	✓
	Education of contractors and employees will be undertaken on a regular basis regarding PPE and requirements for undertaking safe work in hot conditions.		✓	✓
Biting insects (contractors, employees and public)	The guidance contained in the medical entomology guideline: 'Personal protection from mosquitoes & biting midges in the NT, 2011' produced by the Northern Territory Government will be adhered to and avoidance will be practised where feasible.		✓	✓
	Where avoidance is not possible personal protection such as the use of protective clothing and appropriate repellents will be used.		✓	✓
	Screening will be used at camp accommodation. Lighting diversion and adult insect control will be employed if feasible.		✓	
	When disturbing vegetation and soil for any reason, drainage will be optimised.		✓	✓
	Water storage open to ingress of insects will be avoided wherever possible. When open storage is necessary, the duration will be kept to a minimum.		✓	✓
	Discharge of grey water, wastewater and hydrotest water will be kept to a practical minimum and care taken to prevent long term pooling.		✓	
	Inspections and evacuation will be undertaken of all receptacles in the project areas which can retain water and provide breeding habitat for mosquitoes.		✓	✓
Soil and water borne bacteria and	The workforce induction will include awareness of these hazards, and the need for strict attention to personal hygiene, good use of PPE and immediate treatment of cuts and		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
parasites (contractors and employees)	abrasions.			
Fatigue and fitness for work (contractors and employees)	A fitness for work and fatigue management programme will be included in the implementation component of the Health Programme to be developed by the Proponent. The fatigue management programme will include measures and procedures to minimise fatigue risk resulting from climatic conditions, medications, alcohol or illicit substances and failure to get adequate rest when off shift in camp or on leave.		✓	✓
	The Proponent's Drugs and Alcohol Policy and Fitness for Work Policy will be implemented and adhered to by all employees, contractors and visitors.		✓	✓
	A random drug and alcohol testing program will be implemented at work sites.		✓	✓
	Drivers will be required to take regular breaks.		✓	✓
	Driver training will be undertaken and will include training on fatigue management.		✓	✓
	Toolbox and/or pre start meetings will be undertaken daily.		✓	✓
	When operating a vehicle, the driver must adhere to the driving hours and rest periods in the Journey Management Plan (to be developed by the proponent). The minimum requirements are: - 10-minute, or longer, rest break every two hours. - 30-minute rest break after five hours of continuous driving. - Driving for no more than 10 hours in a 24-hour period, unless you are a professional driver.		✓	✓
	The requirements for professional drivers are: - Do not drive for more than 12 hours unless a risk assessment has been undertaken and authorised for extension to this period. - Do not drive for more than 14 hours. - Do not drive without documented approval from your supervisor if you have had less than eight hours complete rest in the previous 24-hour period.		✓	✓
Catering and water supply management (contractors and employees)	Catering will be managed in accordance with recognised best practice standards. The supply of drinking water will comply with the Australian Drinking Water Guidelines 2011, as published by the National Health and Medical Research Council.		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Hazardous substances (contractors, employees and public)	All hazardous substances used on the project will be controlled and registered in accordance with the Waste Management Plan.		✓	✓
	Material safety data sheets will be obtained and used, in conjunction with appropriate workplace risk assessments, for development of safe handling, storage and disposal procedures.		✓	✓
	Disposal of hazardous substances will also be covered by waste management procedures designed to protect both the environment and local communities.		✓	✓
Dust, Fumes, Mists, Vapours and Gases (contractors, employees and public)	Airborne health hazards arising from construction activities, such as welding, grit blasting, coating/repair and pipeline purging etc will be controlled by standard work procedures and workplace risk assessments, and dust will be managed in accordance with measures contained within the Air Quality Management Plan.		✓	✓
	Utilise appropriate PPE when conducting activities that generate dust, fumes, mists, vapours or gases.		✓	✓
Working in isolation – medical emergencies (contractors, employees and public)	Evacuation procedures will be developed based on quickest possible response and access to hospital.		✓	✓
	Sufficient numbers of personnel will be trained in first aid, with appropriate mobile and camp-based equipment. The required level of first aid capability will be determined via detailed assessment of available options for evacuation and access to treatment centres from each construction spread.		✓	✓
	Reliable communication methods will be established with appropriate centres for medical advice.		✓	✓
	Medical facilities will be established at each construction camp and a medical officer stationed on each spread, with a 4WD ambulance and medical equipment.		✓	✓
Dangerous fauna (contractors and employees)	The workforce will be instructed on the fauna which may be encountered, their typical behaviours and where applicable, the hazards they present. Measures will be taken to minimise the potential for workforce-fauna contact.		✓	✓
	Members of the workforce with wildlife handling skills will be identified and utilised when fauna require active relocation away from the worksite e.g. Snake removal.		✓	
Safety management during	During the construction and commissioning phases of the project the following safety procedures will be developed and adhered to: - Corridor access management.		✓	

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
construction and operation (contractors, employees and public)	- Permit to work system. - Plant and equipment. - Welding. - Hydrotesting. - Trenching and excavation. - Confined spaces. - Manual handling. - Noise. - Electrical safety. - Vehicles and driving. - Working at heights. - Cranes and lifting.			
	A Safety and Operating Plan (SOP) is required under AS2885 Part 3 – Operations and Maintenance. This plan will be developed and will be the key document for managing safety risks associated with the project. The plan will include the requirements for: • Workforce and visitor induction requirements. • Competent supervision. • Risk assessment procedures. • Communications protocols. • Effective contractor management.		✓	✓
	Emergency equipment will be provided at each camp and spread location including EPIRBs.		✓	✓
	Visitors to the project area will be required to report to the site office and site induction arrangements will be established for visitors and the workforce.		✓	✓
	Construction camp managers will work closely with the local police including informing the police of camp operations, staff rotation times and any issues requiring police involvement.			
	While operating close to Tindall Air Force Base, construction camp managers will work closely with Base leadership to ensure no interference with the operations of the base.			
	Corridor restrictions will be imposed including prohibited activities and items, such as		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	pets, firearms and illegal drugs.			
	Speed limits and safe driving will be reinforced.		✓	✓
	All drivers requiring access along the corridor will be required to attend a suitable recognised off-road driving course.		✓	✓
	All contractors utilised will be required to fulfil pre-qualification requirements. Potential contractors transporting equipment and material on-site would be required to fulfil pre-qualification requirements and checks will be performed to ensure that safe procedures and practices are used.		✓	✓
	Public thoroughfare will be maintained at all times during construction works across roads and crossings.	✓	✓	✓
	A Traffic Management Plan will be implemented, with safety measures including safety signs and flagmen, in compliance with road authorities.		✓	
	Warning signs will be installed and speeds restricted on both the corridor and the road/track, approaching the crossing.		✓	✓
	Barriers will be erected to restrict public access to the corridor where appropriate.	✓	✓	✓

Table 9-3: Health and safety monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY [CONSTUCTION/OPERATION]	PROCEDURE	PURPOSE
Compliance with health standards and avoidance of health impacts from the project.	Project area.	Construction / Operation.	Health surveillance monitoring program with the following minimum components: • Pre-employment medical program. • Hydration testing. • Random Drug and Alcohol testing regime. • Dust monitoring. • Vapour and fume monitoring. • Vector monitoring. • Noise monitoring. • Radiation monitoring. • In field monitoring of compliance to health standards. Analyse trends from health incidents reported. Monitor timely completion of corrective actions.	To ensure that the workforce are fit for work and no health impacts occur as a result of activities related to the construction and/or operation of the project.

Compliance with safety standards and avoidance of safety impacts from the project.	Project area.	Construction / Operation.	Safety monitoring program with the following minimum components: • In field monitoring of compliance with safety standards. • Monitoring the effectiveness of pre-task risk assessment. • Monitoring of compliance with Traffic Management Plan, including speed monitoring. Analyse trends from safety incidents reported including SPIs. Monitor timely completion of corrective actions.	To ensure that the workforce understand key controls in managing the risk of injury and loss of life and are applying these effectively to minimise or eliminate injuries as a result of activities related to the construction and/or operation of the project.

Table 9-4: Health and safety contingency actions

TRIGGER/CRITERIA	ACTION
Disaster or other emergency situation.	Activation of Emergency Response Plan. Following control of situation, debrief response and modify plan as required to achieve a more effective response.
Exceedance of an exposure limit from a health standard.	Record exceedance as an incident. Assess maximum reasonable outcome to determine level of investigation and priority for rectification actions. Investigate the cause. Implement corrective actions to avoid a reoccurrence.
Other non-compliance with a health standard.	Record non-compliance as an incident. Assess maximum reasonable outcome to determine level of investigation and priority for rectification actions. Investigate the cause. Implement corrective actions to avoid a reoccurrence.
Non-compliance with a safety standard.	Record non-compliance as an incident. Assess maximum reasonable outcome to determine level of investigation and priority for rectification actions. Investigate the cause. Implement corrective actions to avoid a reoccurrence.
Significant potential incident.	Investigate the cause as a priority. Identification and implementation of corrective actions to avoid a reoccurrence.
First aid case.	Provide appropriate first aid response. Make work area safe and preserve scene of the incident. Investigation of the cause. Identification and implementation of actions to prevent reoccurrence.
Injury.	Ensure injured person receives appropriate medical attention. Make work area safe and preserve the scene of the incident. Complete all statutory notifications. Manage next of kin notifications. Investigation of the cause in conjunction with the relevant statutory authorities. Identification and implementation of actions to prevent reoccurrence. Manage rehabilitation and return to work processes for injured worker.
Fatality.	Activate Emergency Response procedures including:

TRIGGER/CRITERIA	ACTION
	• Make work area safe, cease work and preserve scene of the incident. • Complete all statutory notifications. • Notification of next of kin in conjunction with Police (who have jurisdiction). • Provide support to workforce. Investigation of the cause in conjunction with the relevant statutory authorities. Identification of action to prevent reoccurrence. Implementation of actions.

Note: the HSEQMS will provide guidance of the level of investigation of an incident required. This will be linked to the severity of the incident.

10 Provisional Cultural Heritage Management Plan

10.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The project area occurs on Aboriginal freehold lands including the Beswick Aboriginal Land Trust and the Arnhem Land Aboriginal Land Trust. These lands comprise approximately 70% of the length of the KGGP.

All Aboriginal archaeological places and objects are protected under the Northern Territory *Heritage Act*. Archaeological surveys have been undertaken along most of the pipeline corridor and will be completed for the project area during the 2013 dry season.

A small number of Aboriginal archaeological sites and a larger number of background scatters have been found during surveys of the pipeline corridor. Additional archaeological sites are likely to be found in the remainder of the project area when surveyed and there is potential for new surface or subsurface archaeological material to be found during construction.

These sites will require a range of management measures including avoidance and protective measures if possible but otherwise, will require consent to disturb under the *Heritage Act*.

All Aboriginal sacred sites are protected under the *Northern Territory Aboriginal Sacred Sites Act* (NTASS Act) and it is an offence to desecrate a site or enter, remain on or carry out work on a sacred site except with the appropriate authorisation (an Authority Certificate) from the Aboriginal Areas Protection Authority (AAPA).

Restricted Work Areas (within which Aboriginal Sacred Sites are located) were defined from the Authority Certificates issued for the earlier TTP proposal. The processes of consultation for new Authority Certificates are underway. New and or amended Restricted Work Areas may emerge from this new process.

No declared sites of historic cultural heritage significance that are formally protected under national or Northern Territory heritage laws are located in the project area. A small section of one historic (but not protected) site (the remains of the North Australian Railway) will be unavoidably disturbed during construction.

The key aspect of the KGGP Project that may affect Indigenous heritage values and historic cultural heritage values, without considering mitigation efforts, is physical disturbance of the land surface during construction and operations.

10.2 PERFORMANCE MANAGEMENT

Environmental targets and performance indicators have been prescribed in line with cultural heritage management objectives for the KGGP Project (Table 10-1).

10.3 IMPLEMENTATION STRATEGY

Specific actions have been identified to assist in achieving cultural heritage management objectives for the KGGP Project (Table 10-2).

10.4 MONITORING PROGRAM

The monitoring program for cultural heritage (Table 10-3) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

10.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for cultural heritage are not being achieved, contingency actions (Table 10-4) will be enacted.

Table 10-1: Cultural heritage management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
To protect known and new Aboriginal archaeological sites not approved to be disturbed under *Heritage Act* (NT).	No unauthorised disturbance to archaeological sites during construction or operations.	Environmental Incident Reports. Regular inspection and on-ground management of archaeological sites. New sites and objects reported to the NT Government.
	Any new archaeological sites or objects to be reported consistent with s114 of the *Heritage Act*.	
To comply with provisions of the *Heritage Act (NT)* where disturbance of Aboriginal archaeological sites cannot be avoided by construction or operations.	No unauthorised disturbance to archaeological sites during construction or operations.	Environmental Incident Reports. Regular inspection and on-ground management of archaeological sites. Any authorised disturbance to an archaeological site or object to be reported including “before” and “after” documentation and photographs.
	Compliance with any conditions set under section 76 of the *Heritage Act 2011* (NT) approval to do works.	
To avoid and protect all known Aboriginal sacred sites in the project area and to comply with the provisions of the NTASS Act where construction encroaches near a sacred site.	No disturbance of Aboriginal sacred sites during construction or operations.	Environmental Incident Reports. Regular inspection with respect to construction activities and Restricted Work Areas.
	Compliance with the conditions of Authority Certificates and the requirements of Restricted Work Areas established under the NTASS Act.	
To minimise disturbance to Historic Cultural Heritage sites and values in the project area.	Disturbance to the North Australia Railway site is minimal.	Environmental Incident Reports. Regular inspection and on-ground management. Documentation of disturbance including “before” and “after” documentation and photographs reported to the NT Government.
To continue to liaise with the Aboriginal traditional owners in relation to cultural heritage management.	Positive relationship with Aboriginal traditional owners in relation to cultural heritage management at the site.	Outcomes of liaison with Aboriginal traditional owners in relation to cultural heritage management.

Table 10-2: Cultural heritage management implementation strategy

FACTOR	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Protection and appropriate management of archaeological sites	Additional survey work will be undertaken during the 2013 dry season and pre-construction to identify Aboriginal archaeological sites at construction camps, unsurveyed sections of the pipeline corridor and access tracks.	✓	✓	
	Regular ongoing liaison with the traditional twners in relation to Aboriginal archaeological sites will occur throughout the life of the project.	✓	✓	✓
	All new archaeological sites to be documented, mapped and reported pursuant to section 114 of the *Heritage Act* .		✓	✓
	The location of archaeological sites of medium – high significance will be mapped on the project GIS as avoidance sites.	✓	✓	
	Archaeological sites in proximity to construction activity will be demarcated appropriately through fencing and or signage or otherwise protected in consultation with Aboriginal traditional owners.		✓	
	All ground disturbance will be authorised via Pacific Aluminium's Approvals Co-ordination Procedure.		✓	
	Opportunities for reducing impact to archaeological sites will be considered and, wherever practicable, implemented.	✓	✓	✓
	Internal authorisations for ground disturbance will be obtained in accordance with the Pacific Aluminium Approvals Coordination System established for the KGGP, for areas to be disturbed.		✓	
	Sites that cannot be avoided and must be disturbed will be subject to consent under part 3.2 of the NT *Heritage Act* and consultation with Aboriginal traditional owners.		✓	
	All disturbance of archaeological sites will be documented including "before" and "after" photographs and reported to the CEO Heritage Conservation.		✓	
Protection of Aboriginal Sacred Sites	Application will be made to Aboriginal Areas Protection Authority (AAPA) for Authority Certificates under NTASS Act.	✓		
	The location of Restricted Work Areas will be mapped onto the project GIS as avoidance sites	✓		
	Regular ongoing liaison with the traditional owners in relation to protection of	✓	✓	✓

FACTOR	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Aboriginal sacred sites will occur throughout the life of the project			
Protection and management of historic cultural heritage	The area of the North Australian Railway to be disturbed will be reduced as far as practicable.	✓		
	The area of the North Australian Railway to be disturbed will be demarcated appropriately through fencing and or signage.		✓	
	Advice from the Heritage Branch of the Department of Lands, Planning and Environment will be sought prior to disturbance of the North Australian Railway.	✓	✓	
	Disturbance of the North Australia Railway will be documented including “before” and “after” photographs and reported to the NT Government.		✓	

Table 10-3: Cultural heritage monitoring program

LOCATION	FREQUENCY	PARAMETERS	PROCEDURE	PURPOSE
Construction				
Aboriginal archaeological sites and historic cultural heritage sites to be protected.	Twice (during construction phase and rehabilitation).	Integrity of demarcation measures. Evidence of disturbance to archaeological or heritage site.	Visual observations including photographic comparison.	To ensure sites designated for protection are not at risk of disturbance.
Aboriginal sacred sites to be protected.	In consultation with AAPA and Aboriginal traditional owners.	Compliance with established Restricted Work Areas. Adherence with cultural protocols. Views of Traditional owners.	Consultation with AAPA and Aboriginal traditional owners.	To ensure Aboriginal sacred sites are protected and cultural protocols adhered to.
Project area.	Opportunistically.	Previously unrecorded Aboriginal heritage site/artefact.	Visual identification and formal assessment. New sites/artefacts will be reported to the appropriate authorities in accordance with section 114 of the *Heritage Act*.	To identify previously unidentified heritage sites and to assess significance in order to determine management requirements.
Operation				
Aboriginal archaeological sites and historic cultural heritage sites to be protected.	Opportunistically.	Integrity of demarcation measures Evidence of disturbance to archaeological or heritage site.	Visual observations including photographic comparison.	To ensure sites designated for protection are not at risk of disturbance.
Aboriginal sacred sites to be protected.	In consultation with AAPA and Aboriginal traditional owners.	Compliance with established Restricted Work Areas. Adherence with cultural protocols Views of Traditional owners.	Consultation with AAPA and Aboriginal traditional owners.	To ensure Aboriginal sacred sites are protected and cultural protocols adhered to.
Decommissioning				
To be determined in consultation with landholders				

Table 10-4: Cultural heritage contingency actions

TRIGGER	ACTION
Protected areas are not as shown in the GIS	1. Stop work in the area immediately adjacent to the barrier. 2. Investigate and report. 3. Implement corrective actions.
Unauthorised disturbance to heritage site designated for protection.	1. Report as Environmental Incident and initiate Incident Response Procedure, including: • stopping work in the vicinity of the site • investigating cause • implementing corrective actions, including re-establishing original or improved barriers as required. 2. If necessary, consult with relevant stakeholders (CEO Heritage Conservation and Aboriginal traditional owners) to determine actions required to restore the site to its original condition.
Unauthorised disturbance to Aboriginal sacred site.	1. Report as Environmental Incident and initial Incident Response Procedure • stopping work in the vicinity of the site • investigating cause • implementing corrective actions, including re-establishing original or improved barriers as required 2. Notify and consult with Aboriginal traditional owners and AAPA to determine actions required to restore the site to its original condition.
Uncovering or identification of a previously unrecorded Aboriginal heritage site/artefact.	1. Stop work in the vicinity of the potential heritage site 2. Notify Pacific Aluminium immediately to determine further actions

11 Provisional Fire Management Plan

11.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The environmental aspects of the project with the potential to affect fire frequency and intensity within the project area include:

- Fire ignition leading to altered frequency or spatial distribution of fire in the landscape, including:
  - Seasonal wildfires sourced from outside of the pipeline corridor.
  - Controlled burns sourced from outside of the pipeline corridor.
  - Accidental fire sourced from outside or within the pipeline corridor.

Activities that may facilitate the start and/or spread of accidental fire within the pipeline corridor include:

- Earthworks, including vegetation clearance and topsoil removal.
- Use of machinery that can generate sparks.
- Transport and storage of flammable materials.
- Improper disposal/extinguishing of cigarettes
- Deliberate ignition.

The integrity of vegetation in and surrounding the project area could be diminished by more frequent fires, especially if fire sensitive habitats such as riparian zones or monsoon rainforests are affected.

11.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of fire (Table 11-1).

11.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with fire management objectives (Table 11-2). Project-specific management actions have also been prescribed.

11.4 MONITORING PROGRAM

The monitoring program for potential impacts caused by fire (Table 11-3) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

11.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for fire management are not being achieved, contingency actions (Table 11-4) will be enacted.

Table 11-1: Fire management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
Prevent the initiation of wild fires as a result of project activities.	No fires ignited by construction activities.	Number of uncontrolled fires initiated as a result of the project. No significant increase or decrease in the frequency and extent of fire in the pipeline region compared to previous years as indicated by regional fire monitoring (reported on the North Australian Fire Information (NAFI) website http://www.firenorth.org.au/nafi2/).
	Effective fire prevention, control and management measures are in place.	
	Compliance with the *Bushfires Act.*	
Minimise the potential impacts of fire on the pipeline ROW and adjacent environments.	Effective fire prevention, control and management measures are in place.	
	Compliance with the *Bushfires Act.*	

Table 11-2: Implementation of fire management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Fire management and response – external source (e.g. wildfires).	Fire breaks will be maintained around above ground ancillary infrastructure.		✓	✓
	A coordinated approach to bush-fire control will be developed with reference to surrounding landholders and Bushfires NT.		✓	✓
	An emergency response plan will be developed and implemented.		✓	
	Appropriate short and long term fire reduction strategies will include measures undertaken as part of the Weed Management Plan and Rehabilitation Management Plan.		✓	✓
Fire management and response – internal source.	All plant and equipment will be maintained and operated to comply with relevant fire safety standards.		✓	✓
	Appropriate fire safety measures and strategies will be implemented in association with all buildings, vehicles and machinery.		✓	✓
	Appropriate records of fires ignited within the project area will be maintained.		✓	✓
	An emergency response plan will be developed and implemented.		✓	✓
Inductions and training.	All site personnel will be required to undertake inductions and training relating to the fire management measures outlined in this EMP.		✓	✓

Table 11-3: Fire monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY	PROCEDURE	PURPOSE
Evidence of fire incident.	Pipeline ROW, ancillary infrastructure, and surrounds.	Construction and operational phases. Ongoing.	Investigate and document the details of any fire initiated as a result of project activities.	To reduce the risk of accidental fire ignition and subsequent impacts on the surrounding environment.
Wildfires from external sources.	Pipeline region.	Construction and operational phases. Ongoing.	Utilise regional fire monitoring tools as appropriate (NAFI website http://www.firenorth.org.au/nafi2	To support the safe and efficient conduct of pipeline construction and operation.
Introduction and spread of high fire risk weeds.	Pipeline ROW, ancillary infrastructure.	Construction and operational phases. Ongoing.	Manage risks associated with the potential spread of high fire risk weeds such as Gamba Grass and Mission Grass, as outlined in the Provisional Weed Management Plan.	To reduce the spread of high fire risk weeds such as Gamba and Mission Grass.

Table 11-4: Fire contingency actions

TRIGGER/CRITERIA	ACTION
Localised fire incident	1. Implement emergency response plan. 2. Investigate cause and complete incident report. 3. Assess any impacts on rehabilitated areas and implement appropriate remedial measures.
Externally sourced fire threat	1. Implement emergency response plan. 2. Investigate cause and complete incident report. 3. Assess any impacts on rehabilitated areas and implement appropriate remedial measures.

12 Provisional Noise and Vibration Management Plan

12.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The environmental aspects of the project with the potential to emit noise and vibration within the project area include:

- Vegetation clearing.
- Excavation.
- Blasting.
- Pipeline installation.
- Vehicle movements.
- Power generation.

Noise and vibration produced as part of implementation of the project could result in negative impacts to the following environmental factors:

- Amenity.
- Human health and Safety.
- Fauna.
- Aboriginal and Cultural Heritage.

12.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of noise and vibration (Table 12-1).

12.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with noise and vibration management objectives in a Noise and Vibration Management Implementation Strategy (Table 12-2).

12.4 MONITORING PROGRAM

The monitoring program for potential impacts of noise and vibration has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 12-3). Monitoring will measure the success of these actions in accordance with management objectives and targets.

12.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for noise and vibration management are not being achieved, contingency actions will be enacted, as per Table 12-4.

Table 12-1: Noise and vibration management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
Minimise to the greatest extent possible noise generated during the construction and operation of the project and prevent significant noise-related impacts.	Noise and vibration levels from the following activities do not cause unreasonable annoyance for humans at the receiving sensitive receptors: • Day time rock hammer, trenching, trench breaking, stringing, bending and pipe lowering activities at Wallaby Beach. • Night time hydrostatic testing activities at Nhulunbuy, Birritjimi (Wallaby Beach) and Galupa. • Day evening and night time blowdown activities at Nhulunbuy. • Temporary increase in traffic at Barunga and Nhulunbuy.	All management actions are being adhered to and there are no reported complaints or incidents related to noise.
	Noise levels cause minimal disturbance to fauna and habitats.	All management actions are being adhered to and there are no reported incidents from noise and vibration for fauna and habitats
Maintain compliance with NT guideline noise levels.	Compliance with relevant regulatory requirements including: *Noise guidelines for development sites – In the Northern Territory* (NT EPA 2013). *Waste Management and Pollution Control Act.*	Monitoring of noise shows that predicted average construction noise levels for all receivers is not exceeded.
No impacts to Aboriginal sacred sites or heritage places.	No recorded disturbance to Aboriginal sacred sites or heritage places due to vibration (e.g. subsidence).	Monitoring of Aboriginal sacred sites and heritage places shows no disturbance/damage to these sites.

Table 12-2: Implementation of noise and vibration management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Management of noise and vibration	Blasting activities will be restricted to daylight hours.		✓	
	Plant, equipment and vehicles will be well maintained. Damaged or faulty equipment resulting in higher noise emissions will not be operated until it is repaired or maintained.		✓	✓
	Stationary equipment with potential to generate significant noise will be screened, enclosed or otherwise located to achieve acceptable noise levels.		✓	✓
	Where possible, equipment will be turned off when not in use.		✓	✓
	Driving practices that reduce noise such as minimising the use of engine breaks and extended periods of engine idling will be enforced.		✓	✓
	Workers will wear appropriate hearing protection if in proximity to machinery for extended periods. Workers exposed to elevated noise levels above occupational limits will have hearing tests.		✓	✓
	Warning signs will be installed in active work areas subject to noise.		✓	✓
	Speed controls will be used in all project vehicles.		✓	✓
	Night-time traffic along roads adjacent to residential or other sensitive land uses will be managed to minimise traffic.		✓	
	Proponent and contractor vehicles will be regularly maintained in line with the vehicle manufacturer's requirements to ensure that noise emissions are within acceptable limits.		✓	✓
	Access routes will be selected in consideration of potential noise impacts upon communities.	✓	✓	
	Construction traffic associated with the pipeline construction will be routed via main roads and highways and along the ROW wherever possible.		✓	
	Regular road maintenance will be undertaken including grading of the access roads.		✓	
Inductions and training	All site personnel will be subject to an Environmental Induction for Noise, which will include information about noise management measures, protocols, and construction hours.		✓	✓

Table 12-3: Noise and vibration monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY	PROCEDURE	PURPOSE
Evidence of exceedance in noise levels	Birritjimi. Galupa. Nhulunbuy. Barunga.	Construction. Ongoing.	Noise monitoring to be undertaken at the listed locations during construction. Any exceedance in noise levels will be reported and investigated.	To ensure that noise levels do not result in impacts to project workers, contractors or the public.
Evidence of vibration impacts (e.g. subsidence)	Mitchell Ranges. Beswick region.	Construction. Ongoing.	Inspection and monitoring of the listed areas during blasting operations. Visual observation of any observable impacts from vibration.	To ensure that vibration resulting from blasting activities do not impact workers, contractors or the public or the surrounding environment (Aboriginal sacred sites or heritage places).

Table 12-4: Noise and vibration contingency actions

TRIGGER	ACTION
Monitoring reveals noise levels are above acceptable levels.	Report as Environmental Incident and initiate Incident Response Procedure, including a) Investigate cause. b) Implement corrective actions where required.
Noise complaint is received.	Report as Environmental Incident and initiate Incident Response Procedure, including a) Investigate cause. b) Implement corrective actions where required.
Monitoring reveals vibration impacts have occurred (e.g. to an Aboriginal sacred site).	Report as Environmental Incident and initiate Incident Response Procedure, including a) Investigate cause. b) Report to relevant government agency. c) Implement corrective actions where required.

13 Provisional Greenhouse Gas Emissions Management Plan

13.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The environmental aspects of the project with the potential to contribute to Greenhouse Gas emissions (GHG emissions) in the project area include:

- Grading, trenching, pipe-laying, backfilling.
- Transport of pipeline sections.
- Operate construction camps.
- Fuel haulage.
- Transport of camp infrastructure and plant.
- Transport of workers.
- Water haulage.
- Vegetation clearing.
- Airline travel.
- Embedded energy emissions for steel pipes (emissions associated with the energy required in producing the steel).
- Pipeline fugitive emissions.
- Compressor Station blow-down.
- Pipeline blow-down.
- Inline compressor gas consumption.
- Leaks around compressor seals.

13.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of GHG emissions (Table 13-1).

13.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with GHG emissions management objectives in a GHG Emissions Management Implementation Strategy (Table 13-2).

13.4 MONITORING PROGRAM

The monitoring program for GHG emissions resulting from the project has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 13-3). Monitoring will measure the success of these actions in accordance with management objectives and targets.

13.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for GHG emissions are not being achieved, contingency actions will be enacted, as per Table 13-4.

Table 13-1: GHG management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS [what will be monitored to determine how well target has been met]
Minimise GHG emissions in relation to construction and operation of the pipeline.	Ensure design, operations and maintenance programs reduce greenhouse gas emissions from venting or pipeline failure to as low as reasonably practicable.	Ongoing monitoring of pipeline operating parameters, equipment status and malfunction alarms at remote facilities show minimal levels of GHG emissions across the project.
	Ensure vegetation clearance is minimised and rehabilitation of the project area is as rapid as possible.	Regular inspections and annual monitoring shows the area of actual clearing is not more than the area approved for clearing and progressive rehabilitation is undertaken in accordance with the Provisional Rehabilitation Plan
	Ensure energy efficiency measures are incorporated into the construction and operation phases.	Monitoring and tuning energy generation for optimal performance show no early detection of any deterioration in energy efficiency.

Table 13-2: Implementation of GHG emissions management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Management of GHG emissions – clearing of vegetation.	Clearing the minimum amount of vegetation including grass cover for project works.	✓	✓	
	Progressively rehabilitating land cleared for construction, especially exposed soils.		✓	
	Maximise the amount of land re-vegetated.		✓	
	Encourage regrowth and revegetation of the pipeline ROW through at least 60% of the ROW being allowed to regrow. Actions to encourage this include: - seeding with local grass species in order to more immediately stabilise disturbed areas and to help stop weeds taking hold. - stockpiled topsoil and cleared vegetation would be respread to encourage regrowth from natural seed bank. - Some re-planting in high risk areas where stability needs to be rapidly achieved.		✓	
Management of GHG emissions – pipeline construction activities.	Using fuel efficient vehicles and machinery where practicable and optimise transport logistics (of people and equipment) to reduce fuel consumption.		✓	
	Maintaining diesel engines in the trucks and plant-laying equipment to prevent excessive exhaust emissions.		✓	
	Back-loading of trucks, and sourcing materials and services from local suppliers where possible.		✓	
	Operating the vehicles and machinery in a fuel efficient manner e.g. on-site vehicles to be operated at an optimal speed, and no idling for extended periods.		✓	
	Assessing construction techniques to determine the most fuel efficient and least GHG intensive methods, i.e. on-site versus modular construction.		✓	
	Assessing the use of alternative fuels e.g. CNG, LNG, LPG and biodiesel versus diesel and petrol.		✓	
	Sourcing low embedded emissions construction materials where appropriate.		✓	
Management of GHG emissions – pipeline operation activities.	Carrying out regular corrosion and leak detection monitoring, intelligent pigging and regular patrols to check for leaks and undertake prompt repairs. This is important around pressure relief valves, compressor seals around rod packing, connectors and pneumatic controllers.			✓
	Conducting regular energy audits for the compressor station to ensure compressor turbine operates at peak efficiency.			✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	When carrying out pipeline blow-down activities for pipeline maintenance, consider using pipeline pump-down techniques.			✓
	Flaring the compressor seal gas rather than allowing it to leak to the atmosphere.			✓
	Allowing pressures in the line to decline prior to venting, thereby reducing the volume of gas released to the atmosphere.			✓
	Ongoing monitoring of pipeline operating parameters, equipment status and malfunction alarms at remote facilities to enable early detection of gas release and minimise the volumes of gas vented where possible.			✓

Table 13-3: GHG emissions monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY	PROCEDURE	PURPOSE
Evidence of corrosion or leak in pipeline.	Pipeline ROW.	Construction and Operational Phases; Ongoing.	Report and investigate source of corrosion or leak and apply corrective measures to repair.	To ensure that no corrosion or gas leaks occur.
Evidence of equipment malfunction at remote facilities.	Project area.	Construction and Operational Phases; Ongoing.	Report and investigate any malfunction in equipment at remote operating facilities, apply corrective measures to repair.	To ensure early detection of any gas release at remote facilities and minimise the volumes of gas vented where possible.
Reconciliation of approved clearing with actual clearing.	Disturbed areas.	Construction phase. Biannually.	In accordance with Pacific Aluminium standard procedures.	To ensure clearing is in accordance with relevant approvals.
Rehabilitation success.	Disturbed areas.	Construction and operation phase. Ongoing.	Visual inspection and photo monitoring at key sites in accordance with Provisional Rehabilitation Management Plan.	To ensure successful rehabilitation of pipeline corridor and maximise carbon sequestration following vegetation clearing.

Table 13-4: GHG emissions contingency response and corrective actions

TRIGGER/CRITERIA	ACTION
Marked clearing boundary is not in accordance with approvals.	1. Stop work in area immediately adjacent to clearing boundary. 2. Complete incident report and investigations. 3. Implement corrective actions, including the amendment of clearing boundaries.
Corrosion of pipeline/gas leak occurs.	1. Report as Incident and initiate Incident Response Procedure, including as appropriate: a) Determine the spatial extent of the corrosion/gas leak. b) Investigate the cause. c) Implement urgent corrective measures as required. d) Review procedure and quality controls.
Equipment malfunction at remote facilities causing gas leak.	1. Report as Incident and initiate Incident Response Procedure, including as appropriate: a) Determine the spatial extent of the gas leak. b) Investigate the cause. c) Implement urgent corrective measures as required. d) Review procedure and quality controls.

14 Provisional Traffic Management Plan

14.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The environmental aspects of the project with the potential to affect traffic within the project area include:

- Infrastructure works to existing and new roads to facilitate the movement of heavy vehicles.
- Construction of new access roads, off public roads.
- Heavy vehicle movements during construction.
- Increased light and heavy vehicle movements on public roads.

The environmental factors that may be impacted by changes in traffic related aspects are:

- Human health and safety.
- Existing services and infrastructure.
- Cultural and Historic Heritage Sites.
- Public amenity.
- Native fauna.
- Soil and Surface Water.

14.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of traffic (Table 14-1).

14.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with traffic management objectives, in a Traffic Management Implementation Strategy (Table 14-2).

14.4 MONITORING PROGRAM

The monitoring program for potential impacts caused by traffic has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 14-3). Monitoring will measure the success of these actions in accordance with management objectives and targets.

14.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for traffic management are not being achieved, contingency actions will be enacted as per Table 14-4.

Table 14-1: Traffic management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS
To ensure site traffic is managed in such a way so as not to adversely impact on community, road users and sensitive habitats.	No complaints received.	Relevant reporting indicates no traffic related complaints received during construction of the project.
	Zero-incident safety record.	Relevant reporting indicates zero traffic incidents (including spills of hazardous materials during transport).

Table 14-2: Implementation of traffic management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Management of traffic – general.	Restrict heavy vehicles to travelling only on designated haul routes and ensure they are not loaded beyond legal limits.		✓	✓
	Where over dimension loads are required to be delivered to site, all travel will be subject to relevant approvals as required and forward advice will be provided to key stakeholders (TMR, NT Police etc.) in advance of the movement schedule commencing.		✓	
	Adhere to posted speed limit on site and along access roads and all project work areas (work sites and camps will have signed speed limits normally ranging from 40km to 10km in the vicinity of pedestrians or signed sites).		✓	✓
	80 km/h when driving on unsealed roads.		✓	✓
	Vehicles are to be parked such that they will not roll if the brakes fail or provide a hazard to other road users.		✓	✓
	Vehicles are to drive with headlights on at all times.		✓	✓
	All vehicles shall be equipped with a means of communication, e.g. mobile phone, UHF Radio and/or satellite phone.		✓	✓
	When transmitting a message by telephone or radio, the Driver must clearly identify himself by providing the following information: - Name. - Vehicle reference or badge number. - Exact location. - Nature of emergency (if any). - Seriousness of emergency (if any).		✓	✓
	Truck movements on the ROW and access tracks will take place during daylight hours where possible.		✓	✓
	Liaison will take place between the constructor and local bus service operators to ensure the impact of the project on existing public transport networks is minimised.		✓	
	Where convoying of project vehicles occurs on public roads, adequate distance between vehicles will be maintained to allow safe and legal overtaking of other road users.		✓	✓
	If a project vehicle is causing excessive delay to other road users the driver should consider pulling over at the earliest, safe opportunity to allow vehicles to pass.		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Night traffic will be avoided but if in the event that no other option is viable access arrangements will be made with landowners and in accordance with local regulatory requirements.		✓	✓
	The requirement for flags or escort pilot vehicles will be determined during construction. Appropriate licences and permits for the transport of large loads will be obtained prior to construction.		✓	
	Where any change to existing traffic arrangements is proposed or where roadwork conflicts with normal traffic movements, a traffic guidance scheme will be prepared and will clearly detail the revised traffic arrangements at all locations affected by the change or conflict.		✓	
	Traffic management roles and responsibilities will be developed and allocated.	✓	✓	
	Details of all road closures/detours will be provided.	✓	✓	✓
	Audits of roads impacted by project traffic will be undertaken in stages over the duration of construction of the project to identify any safety issues in the project road footprint (e.g. increase in traffic) and implement appropriate corrective/mitigation measures (e.g. regular pavement maintenance).		✓	
Management of traffic - extreme weather conditions.	Suspension of all transport operations deeded as being unsafe during or following extreme weather events.		✓	✓
	All vehicles to carry adequate emergency food, water and communication devices.		✓	✓
	A Journey Management Plan will be prepared and will include the results of a route selection assessment to be undertaken in consultation with the construction contractor's transport specialist and the road authority.		✓	✓
	Regular review of road condition reports will be provided by road authorities and Project staff and will be assessed against the proposed vehicle use, current weather conditions and road authority instructions.		✓	✓
Hazardous materials transport and refuelling	An Emergency Action Plan including notification procedures, response and clean-up procedures will be developed and will be available at sites and in the event that any vehicle is involved in an accident and/or the material is spilled.	✓	✓	✓
	Vehicle operation and maintenance is to be undertaken as per procedures documented in vehicle manuals.		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Refuelling of vehicles will be carried out at: - Licensed retail outlets or contractor service centres. - At construction camp sites. - By mobile refuelling trucks at work sites and along the ROW, primarily for plant and equipment.		✓	✓
	The transport of hazardous materials will not occur without prior notification of local government, NT Department of Construction and Infrastructure and the Northern Territory Police.		✓	✓
	The transport of hazardous goods shall be conducted in accordance with the relevant laws and regulations of the Northern Territory and the Commonwealth.		✓	✓
	All hazardous materials will be clearly labelled with appropriate documentation for transport describing the contents, including a Material Safety Data Sheet (MSDS).		✓	✓
	All vehicles carrying hazardous materials will have reliable telecommunication contact (e.g. two-way radio; mobile phone).		✓	✓
	A Waste Management Plan shall be fully implemented.		✓	✓
Response to traffic incident	An emergency response unit with trained medical attendants will be readily available at all locations during construction for a timely response.		✓	✓
	An Emergency Response Plan will be developed and maintained.	✓	✓	✓
Inductions and training	All site personnel will be required to undertake inductions and training relating to the traffic management measures outlined in this EMP.	✓	✓	✓

Table 14-3: Traffic monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY [CONSTUCTION/OPERATION]	PROCEDURE	PURPOSE
Evidence of traffic incident.	Project area.	Construction and Operation phases, ongoing.	Report and investigate any traffic incident within the project area to determine cause.	To ensure that no traffic incidents occur as a result of activities related to the construction and/or operation.
Hazardous materials spill.	Project area and surrounding roads.	Construction and Operation phases, ongoing.	Report and investigate any hazardous material spill incident within the project area to determine cause.	To ensure that no hazardous material spills occur during transport/refuelling during construction and/or operation.
Track and road condition.	Project area.	Construction and Operation phases, ongoing.	Monitor road pavement conditions for wear and tear and arrange maintenance as necessary.	To ensure the condition of roads and tracks does not degrade as a result of the project.

Table 14-4: Traffic contingency actions

TRIGGER/CRITERIA	ACTION
Traffic incident occurs	1. Report as Incident and initiate Incident Response Procedure, including as appropriate: e) Respond to incident immediately f) Investigate the cause g) Implement any urgent measures required h) Review procedure and quality controls
Road and track condition decreases	1. Report area of concern 2. Initiate Response Procedure, including as appropriate: a) Investigate the cause b) Implement any urgent measures required c) Review procedure and quality controls d) Implement corrective management to return road/track to original condition e) Monitor area to ensure no repeat decrease in condition

15 Waste Management Plan

15.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

During construction and operation, there will be three main components of waste:

- Solid waste including construction, domestic and green waste.
- Liquid waste including sanitary wastewater and hydrotest water.
- Hazardous waste for example used oils and greases.

Waste management issues include:

- Disposal and storage of construction waste, excess materials or surplus excavated material.
- Disposal and storage of domestic and green waste.
- Disposal of liquid wastes (including hydrotest and sewage).
- Disposal of hazardous waste.

Waste, if inappropriately managed, has the potential to contaminate soils, groundwater and surface waters and pose a risk to human health.

15.2 PERFORMANCE MANAGEMENT

Environmental targets and performance indicators have been prescribed in line with waste management objectives for the KGGP Project (Table 15-1).

15.3 IMPLEMENTATION STRATEGY

Specific actions have been identified to assist in achieving waste management objectives for the KGGP Project (Table 15-2).

15.4 MONITORING PROGRAM

The monitoring program for waste (Table 15-3) has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions. Monitoring will measure the success of these actions in accordance with management objectives and targets.

15.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that environment objectives and targets for waste management are not being achieved, contingency actions (Table 15-4) will be enacted.

Table 15-1: Waste management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS AND MONITORING
To minimise environmental impacts associated with waste generation.	No inappropriate disposal or management of waste.	No instances of inappropriate waste disposal or contamination. No instances of non-compliance with regulatory requirements.
	No contamination of soil, air or water as a result of waste handling.	
	Petroleum activities do not result in the release or likely release of contaminants to the environment from the storage, conditioning, treatment and disposal of regulated waste materials.	
	Compliance with the NT Government's regulatory requirements including the 'Code of Practice for small on-site sewage and sullage treatment systems and the disposal and reuse of sewage effluent' (Department of Health 1996).	
To minimise environmental impacts associated with the storage and handling of chemicals and dangerous goods.	Petroleum activities do not result in the release or likely release of a hazardous contaminant to the environment.	No accidental spill of chemicals or dangerous goods.
	Storage and handling procedures correct and appropriate.	
	Dangerous goods will be stored and handled as per the requirements of relevant Australian Standards.	
	All containment systems will be designed to minimise rainfall collection within the system.	
Maximise recycling, reuse and recovery.	Develop and implement Waste Management Plans for each phase or component of construction and operations, based on the waste management hierarchy of waste avoidance, reduction, reuse and recycling.	The results of inspections, audits and incident reports.
	Minimise and recycle waste where practicable, or dispose of at approved facilities.	

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS AND MONITORING
	Reuse green waste (excess vegetation) after rehabilitation wherever possible.	
	Segregate used oils, greases and tyres from other waste and reuse or recycle, if possible; otherwise dispose of in accordance with legislation.	
Protect the quality of local land and water resources during pipeline hydrotesting.	No water will be extracted from a surface water body for any purpose prior to an evaluation of the potential environmental impacts of extraction and consistent with Water Supply and Adaptive Management Strategy.	Attainment of, and compliance with, required licencing.
	No adverse impacts on soil or surface water as the result of hydrotesting water discharges.	

Table 15-2: Waste management implementation strategy

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Identify and classify waste streams.	Classify waste streams and develop and implement waste management plans based on hierarchy of waste reduction, reuse and recycling.	✓	✓	✓
Waste avoidance/ Waste reduction.	Purchase and use products that generate minimal waste (including packaging).	✓	✓	
Waste disposal and transport.	Treat and/or dispose of sewage and putrescibles in accordance with regulatory requirements. Ensure all waste is contained appropriately, taking into consideration fire safety, pest and odour control, and protection of water and soil resources. No water used for any purpose during construction, commissioning or operation will be released directly into a water body.	✓	✓	
Waste reuse.	Explore opportunities for reuse of waste products.		✓	
Waste recycling and recovery.	Minimise and recycle waste where practicable, or dispose of at approved facilities. Segregate used oils, greases and tyres from other waste and reuse or recycle, if possible; otherwise dispose of in accordance with legislation.		✓	
Hazardous materials.	Create and maintain a hazardous materials inventory.		✓	✓
	Dispose of hazardous waste materials (controlled wastes) in accordance with regulatory requirements.		✓	✓
	All hydrocarbon storage facilities and re-fuelling locations will be bunded, in compliance with licensing and permit conditions and relevant Australian Standards.		✓	✓
	Refuelling will be undertaken in accordance with Australian Standards.		✓	✓
	Hydrocarbon treatment facilities will be installed at wash down and workshop areas to minimise potential release of hydrocarbons to the environment.		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
	Appropriate spill response procedures will be employed and associated equipment located adjacent to hazardous waste storage and use areas, and hydrocarbon storage and refuelling areas. Any soil contaminated by accidental spills will be appropriately treated. Where required, incident investigations and remediation of contaminated areas will be carried out.		✓	✓
	Waste dumps will be located and designed according to regulatory requirements.		✓	
Hydrotesting.	Prepare and implement a Hydrotest Management Plan that will document how chemical usage has been minimised, extraction and discharge locations selected and proposed methods to treat and manage water.		✓	
Inductions and training.	All site personnel will be required to undertake inductions and training relating to the waste management measures outlined in this EMP.		✓	✓

Table 15-3: Waste monitoring program

PARAMETERS	FREQUENCY	LOCATION	PROCEDURE	PURPOSE
Waste storage and disposal facilities.	Weekly.	Construction corridor Construction camps Pipeline ROW.	Maintain records of waste types and volumes and disposal procedures.	To ensure stores and disposal facilities are functioning sufficiently and dealing adequately with waste.
Litter/general waste.	Weekly.	Construction corridor Construction camps Pipeline ROW.	Undertake visual inspections for litter and general waste.	To identify issues with regards to waste segregation and/or inappropriate waste disposal.
Liquid waste.	Weekly/Monthly.	Construction corridor Construction camps Pipeline ROW.	Inspect wastewater storage area and hydrotest water discharge areas.	To ensure the correct disposal of waste water and hydrotest water.
Hazardous waste and chemical storages monitoring.	Weekly.	Construction corridor Construction camps Pipeline ROW.	Inspect hazardous wastes handling activities and storage areas.	To ensure hazardous waste is stored in accordance with regulatory requirements and Australian Standards.
Vehicles and machinery.	As per relevant maintenance schedules.	All vehicles and machinery.	Check vehicles, plant and equipment are maintained as per maintenance schedules.	To reduce the risk of spills and leaks.
HDD.	As per relevant maintenance schedules.	HDD crossings.	Check HDD equipment is maintained as per maintenance schedules to check for leaks or damage.	To ensure no spillages, leaks from liquid or solid waste tanks or containments (i.e. drill cuttings or drill fluids pits).
	Daily.		Inspect waste handling and storage processes to check appropriate and effective handling, Ensure secure storage and containment of HDD wastes.	

PARAMETERS	FREQUENCY	LOCATION	PROCEDURE	PURPOSE
General waste.	Annually for two years following construction.	Pipeline ROW.	Conduct a post-construction audit of the pipeline ROW and other related infrastructure.	To ensure all waste materials have been removed from the ROW.

Table 15-4: Waste contingency actions

TRIGGER	ACTION
Unknown waste is located (including contaminated spoil)	1. Classify waste. 2. Determine appropriate treatment/disposal.
Accidental spill or leak occurs	1. Report incident and notify appropriate authority. 2. Follow appropriate spill response procedures.

16 Provisional Weed Management Plan

16.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

The environmental aspects of the project with the potential to introduce and facilitate the spread of weeds within the project area include:

- Use of earthmoving equipment, vehicles, construction materials and fill.
- Vegetation clearing and soil disturbance.

Activities that involve disturbance of native vegetation create suitable conditions for weeds to rapidly establish and develop into infestations that are then difficult to manage. Once weeds become established they compete with native vegetation, may inhibit access to infrastructure, and in the case of the grassy weeds, can create conditions for hot, intense fires that have adverse impacts on ecological integrity. Management of weeds will be required to reduce the potential additional effect of increased risk of fire as well as other ecological impacts.

16.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for the management of weeds (Table 16-1).

16.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with weed management objectives, in a Weed Management Implementation Strategy (Table 16-2).

16.4 MONITORING PROGRAM

The monitoring program for potential impacts caused by weeds has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 16-3). Monitoring will measure the success of these actions in accordance with management objectives and targets.

16.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for weed management are not being achieved, contingency actions will be enacted, as per Table 16-4.

Table 16-1: Weed management objectives, targets and performance indicators

MANAGEMENT OBJECTIVES	TARGETS	PERFORMANCE INDICATORS AND MONITORING
To prevent the introduction and spread of weed species through project activities.	No new weed species introduced into the project area.	Extent of weeds currently present within and immediately surrounding the project area documented prior to construction, with particular emphasis on the target weeds (Gamba Grass, Mission Grass and Prickly Acacia). Monitoring reveals no new or increased infestations of weed species in, or immediately adjacent to, the project area. No incidents of non-compliance with *Weeds Management Act* and internal weed hygiene and control procedures.
	No spread of existing weed species into new areas.	
	New weed infestations identified, reported and treated prior to seed-set.	
	Compliance with the *Weeds Management Act.*	
To minimise the potential impacts of weeds on the surrounding environment.	No significant net increase in the type or prevalence of weeds in the project area throughout the life of the project.	
	Compliance with the *Weeds Management Act.*	

Table 16-2: Implementation of weed management actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Existing weed infestations.	Baseline data on the extent of weed species within and immediately surrounding the project area will be documented, with particular emphasis on the distribution and abundance of target species (Gamba Grass, Mission Grass and Prickly Acacia.	✓		
	A weed risk assessment will be undertaken along the pipeline corridor identifying key weed management areas and specifying levels of monitoring and control in those areas.	✓	✓	✓
New weed infestations.	Specific procedures will be established and implemented for reporting, controlling and monitoring new weed infestations.	✓	✓	✓
Operational procedures.	The locations of all work sites, including borrow pits and lay down areas will be accurately recorded for future weed monitoring.	✓	✓	✓
	Hygiene procedures will be developed and implemented for plant, vehicles, equipment and materials, including the construction and operation of wash/blow down facilities at key sites.		✓	✓
	Washdown wastewater will be collected and treated in an appropriate manner prior to disposal.		✓	✓
Rehabilitation.	Rehabilitation will be undertaken in a manner which minimises the potential for weed introduction and spread. (Refer to the Provisional Rehabilitation Management Plan for more detail).		✓	✓
Inductions and training.	All site personnel will be required to undertake inductions and training relating to the weed management measures outlined in this EMP.		✓	✓

Table 16-3: Weed monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY [CONSTRUCTION/OPERATION]	PROCEDURE	PURPOSE
Existing and new infestations.	Pipeline ROW and immediately adjacent areas.	Construction and operational Once-off.	Collect and document baseline data on the extent of weed species within and immediately surrounding the project area with particular emphasis on target species (Gamba Grass, Mission Grass and Prickly Acacia).	To provide a foundation for future monitoring and assist in identification of high risk areas.
	Pipeline ROW.	Construction and operational Ongoing.	Visually inspect, identify and record any new infestations using GPS.	To ensure new infestations are immediately controlled.
	Pipeline ROW.	Construction and operation. Annually.	Document extent of existing and any new infestations.	To assist in development of annual weed control program and inform the effectiveness of ongoing operational practices.

Table 16-4: Weed contingency response and corrective actions

TRIGGER/CRITERIA	ACTION
Existing weed infestations are spread or new infestations are found within the project area.	**1.** Undertake weed control. **2.** Review weed control program and relevant procedures (e.g. vehicle hygiene procedures) and modify as required. **3.** Record location and abundance.

17 Provisional Rehabilitation Management Plan

17.1 ENVIRONMENTAL ASPECTS TO BE MANAGED

Activities of the project with the potential to require rehabilitation are outlined in Chapters 2, 6 and 8 of the Draft EIS. They can be broadly categorised as:

- Initial activities required for pipeline planning and surveying.
- Activities related to the construction phase of the project.
- Activities relating to the permanent pipeline infrastructure.

Specific environmental aspects of these activities requiring rehabilitation will include:

- Vegetation clearance.
- Soil disturbance and soil compaction.
- Watercourse crossings of the pipeline.

The anticipated native vegetation clearing required for the construction of the KGGP and associated infrastructure may be up to 2,200 ha (Table 17-1). Whilst all disturbed areas will be rehabilitated, a large proportion (up to 1,365 ha) of the cleared areas will require disturbance only during the construction phase and will be actively or passively returned to native woody vegetation communities over the longer term (Table 17-1). The remaining likely permanent development footprint (up to approximately 835 ha) includes permanent structures, access roads and infrastructure, but also includes all areas of the ROW that would return to a cover of native grasses and where deep rooted woody plants would not be allowed to grow (e.g. area immediately above the buried pipeline).

Table 17-1: Disturbance area of the project

ACTIVITY	COMPONENTS INCLUDED	LIKELY TEMPORARY DEVELOPMENT FOOTPRINT	LIKELY PERMANENT DEVELOPMENT FOOTPRINT	LIKELY AREA (PROPORTION TO RETURN TO NATIVE WOODY VEGETATION
KGGP ROW	• Clearing 30 m wide for the length of the pipeline • Turning bays • Additional ROW working width at water crossings	1,850 ha	740 ha	1,110 ha (60%)
Ancillary infrastructure	• Stockpiles • Compressor station • Mainline valves • Scraper stations • Anode beds • Meter station • Construction camps	180 ha	10 ha	170 ha (94%)
Construction access	• Access tracks (110-150 km) • Borrow pits	140 – 170 ha	70 – 85 ha	70 – 85 ha (50%)
TOTAL		**up to 2,200 ha**	**up to 835 ha**	**up to 1,365 ha**

The KGGP is 603 km long and crosses eight broad vegetation groups on the Savannah map by Fox *et al*. 2001. The most common vegetation group is woodlands and open-woodlands dominated by *Eucalyptus tetrodonta* and *E. miniata* (56% of the ROW). See Chapter 8 of the Draft EIS for further information on the flora and vegetation communities impacted by vegetation clearance.

Potential environmental impacts of the above activities requiring rehabilitation and revegetation would include:

- Loss of habitat (terrestrial, riparian and ephemeral).
- Loss of natural re-colonisation potential due to soil compaction, soil erosion and/or weeds.
- Soil erosion from lack of vegetation cover (terrestrial, ephemeral and riparian habitats).
- Weed incursion from lack of vegetation cover (terrestrial, ephemeral and riparian habitats).

Consultations with landholders in April 2013 indicated concerns about an increase in weeds from the proposed pipeline and consequently an increase in the frequency and severity of fire and potential impacts on sacred sites.

17.2 PERFORMANCE MANAGEMENT

Management objectives, environmental targets, and performance indicators have been developed for rehabilitation (Table 17-2).

17.3 IMPLEMENTATION STRATEGY

Management actions have been prescribed in accordance with rehabilitation objectives, in a Rehabilitation Implementation Strategy (Table 17-3).

17.3.1 Rationale of the rehabilitation strategy

As the construction of the project occurs in a region with highly aggressive, wind dispersed weed species and seasonal monsoonal rainfall the potential for weed infestation (and the subsequent impacts of fire associated with weeds) and erosion needs to be managed appropriately. To address both, this Rehabilitation Management Plan proposes to revegetate disturbed areas with a dense cover of appropriate native grasses based on the level of risk and the reasonable expectations of relevant stakeholders. Criteria associated with the risk of erosion, weed infestation, slope, soil type and requirements to establish fauna habitat and protect cultural heritage sites would be developed to identify disturbed areas that require active revegetation with native grasses.

Low risk areas will also be rehabilitated according to the procedures outlined in Chapter 2 and control measures outlined in the Provisional Soil and Land Management Plan, but these areas are likely to regenerate naturally and therefore no active revegetation will be undertaken.

Some areas may also be revegetated with native shrubs and trees, for example to reduce wind erosion, to enhance visual amenity and to restore Gouldian Finch and other fauna habitats. All disturbed areas would be regularly monitored and maintenance conducted in areas that are not performing in accordance with rehabilitation performance indicators.

17.3.2 Topsoil

Weeds and consequently fire are important management issues for the success of any revegetation in the Top End. Studies in the region have found that topsoil may become a major source of weeds if sourced from weed infested areas or stockpiled during the seeding period of weeds. Also the desirable characteristics of topsoil, such as nutrient and organic matter content, and symbiotic microorganisms, decline very rapidly (less than six months) in tropical climates. Therefore, topsoil should not be stored longer than four to five months.

Topsoil should not be used in the immediate area above the buried pipeline and other areas to be kept free of trees and shrubs as it may contain seeds of deep rooted woody species.

In case there is no topsoil available the subsurface soils can be used as a substrate for revegetation, but should be assessed for suitability (e.g. ASS potential, rock and gravel content, weeds).

17.3.3 Cleared vegetation

Cleared vegetation may be used for stabilisation and soil erosion control in the revegetation. Logs and other debris also capture valuable resources such as runoff and leaf litter and provide habitat for smaller animals The long term benefits to the revegetation will be enhanced nutrient cycling, soil development, water retention and biodiversity.

17.3.4 Timing

Rehabilitation, including the revegetation with native grasses, will commence as soon as construction activities are completed. Ideally, the grasses should be established before the first wet season rains to provide a protective cover against soil erosion. However, depending on the early wet season weather patterns, re-seeding may be necessary until a grass cover is established.

17.3.5 Native species and seeds

The native plant species should be matched to the habitats and regions (e.g. coastal versus inland) and be sourced locally in the Katherine to Gove region. In line with recent findings, a strict provenance zone (e.g. 30 km radius) is not recommended as some genetic variation provides the revegetation with the adaptability needed for climate change. The selected grass species should have a low fuel load, but a good root system to prevent erosion and to dominate the site.

17.3.6 Natural re-colonisation

Natural re-colonisation of native vegetation is likely to occur over time due to the relatively small scale (e.g. construction camps) and/or the linear shape and narrow width of the clearings (e.g. ROW, access tracks) and most importantly, due to the overall close proximity to largely intact native vegetation and ecosystems.

However, the success and progress of the natural re-colonisation depends on the ‘habitability’ of the cleared areas, with soil erosion and compaction issues, major competition from weeds and a high fire frequency all having a negative impact.

17.3.7 Rehabilitation of riparian and ephemeral habitats

Significant rehabilitation is less likely to be required where HDD will be used (e.g. major river systems) than where open trenching techniques will be used (e.g. smaller, dry/ephemeral water courses); albeit, the latter constructions will be of a smaller scale.

The above parameters also apply for the rehabilitation and revegetation of the riparian and ephemeral habitats that may be impacted by the construction of the pipeline. In addition, provisions will be made for the sensitivity and seasonal fluctuations of these habitats. While the overall reinstatement of the watercourse to its original profile will be the primary objective, varying water levels, flows and natural erosion and deposition points need to be assessed and taken into account in the rehabilitation approach. Bank stabilisation is of high priority and options may include benching, organic fibre mulching (e.g. jute matting) and/or direct planting of tubestock (seedlings).

17.4 MONITORING PROGRAM

The monitoring program for rehabilitation works has been designed to ensure that construction and operation of the KGGP are consistent with the prescribed management actions (Table 17-4). Monitoring will measure the success of these actions in accordance with management objectives and targets.

17.5 CONTINGENCIES AND CORRECTIVE ACTION

If monitoring indicates that objectives and targets for rehabilitation are not being achieved, contingency and corrective actions will be enacted, as per Table 17-5.

Table 17-2: Rehabilitation and revegetation objectives, targets and performance indicators

OBJECTIVES	TARGETS	PERFORMANCE INDICATORS AND MONITORING
To minimise the permanent loss of habitat.	Keep vegetation clearance to a minimum that is required Rehabilitate disturbed habitats in accordance with this provisional Rehabilitation Management Plan, including particular attention to sensitive areas, and procedures established in other Provisional Management Plans including those relating to Soils and Landform, Vegetation, Fauna, Fire and Weeds. Undertake clearing and construction works in a manner which reduces the risk of erosion and minimises the need for subsequent rehabilitation. Minimise soil degradation and erosion in accordance with the Provisional Soils and Landforms Management Plan. Minimise disturbance to vegetation in accordance with the Provisional Vegetation Management Plan.	Only planned vegetation clearance is undertaken - Clearly identify areas to be cleared and ensure operators are informed. - Regular inspections during construction to monitor vegetation clearance that has occurred. Habitats are re-established (to the greatest extent possible) - Monitor rehabilitation and revegetation success.
To minimise soil erosion from lack of vegetation cover.	Rehabilitate and revegetate disturbed areas in accordance with the Provisional Soil and Land Management and Rehabilitation Management Plans. Minimise soil degradation and erosion in accordance with the Provisional Soils and Landforms Management Plan.	Minimal soil erosion - Monitor soil erosion.
To minimise weed incursion from lack of vegetation cover.	Revegetate disturbed areas at high to medium risk of weed invasion with a dense native vegetation cover to minimise weed incursion. Manage weeds to the extent practical and in accordance with the Provisional Weed Management Plan.	No major weed outbreaks - Monitor weeds.
To maximise natural revegetation potential.	Deep tillage of all compacted soils Implementation of the Provisional Soil and Land Management Plan. Rehabilitate disturbed areas based on risk associated with weed incursion and soil erosion and the reasonable.	Surrounding native vegetation re-colonising the disturbed area - Monitor soil erosion - Monitor revegetation success - Monitor weeds

OBJECTIVES	TARGETS	PERFORMANCE INDICATORS AND MONITORING
	expectations of relevant stakeholders. Manage weeds to the extent practical.	
To avoid deep rooted woody vegetation growth within the pipeline area.	No deep rooted vegetation to impact on the pipelines integrity.	No deep rooted woody vegetation to grow in the immediate pipeline area - Monitor occurrence of deep rooted species.
To minimise the impact on rivers/creeks/water bodies.	Keep vegetation clearance to a minimum. Use HDD wherever possible. Implementation of the Provisional Soil and Land Management Plan. Rehabilitate and revegetate disturbed riparian areas with appropriate native vegetation where required.	Only proposed vegetation clearance to be undertaken - Regular inspections during construction to ensure minimal vegetation clearance occurred. Riparian habitats re-established (to the greatest extent possible) - Monitor rehabilitation and revegetation success.

Table 17-3: Implementation of rehabilitation and revegetation actions

PARAMETER	ACTION	IMPLEMENTATION PHASE		
		DESIGN	CONSTRUCTION	OPERATION
Planning.	Detailed rehabilitation plans, including erosion sediment control and revegetation plans will be prepared prior to commencement of operations and will be implemented for the life of the project. Procedures for rehabilitation of various stages and elements of the pipeline construction and operation will be developed in accordance with identified levels of erosion risk following an assessment of soil type, slope and site sensitivity.	✓		
Timing.	Rehabilitation of disturbed areas will commence progressively and as soon as practicable to minimise exposure of bare soils.		✓	✓
	At project completion all rehabilitation will be completed within 3 wet seasons,			✓
Rehabilitation of disturbed areas – terrestrial.	Rehabilitate disturbed areas based on risk associated with weed incursion and soil erosion and the reasonable expectations of relevant stakeholders.		✓	✓
	Where seeding is required, direct seeding techniques to be used.		✓	
	Rehabilitation to take place as soon as construction ceases.		✓	✓
	Maintenance of rehabilitated areas until the required outcome is achieved.		✓	✓
				✓
	Topsoil to be stored no longer than 4-5 months and away from weeds		✓	
	No topsoil to be used in the immediate pipeline area		✓	
	Subsoils can be used for revegetation if assessed as suitable		✓	
	Cleared vegetation should be used in the revegetation wherever practical and not a fire hazard		✓	✓
	Plant species to match the habitats and regions	✓		
	Seeds to be sourced in the Katherine to Gove region	✓		
	Select grass species with low fuel loads and good root systems	✓		
	Facilitate natural re-colonisation through management of soil erosion, soil compaction, weed and fire management		✓	✓
Rehabilitation of disturbed areas – riparian, ephemeral and other sensitive areas.	Sensitive areas including riparian areas, drainage lines, saturated soils, and other areas of high erosion risk will be identified and rehabilitated as a matter of priority	✓	✓	
	All watercourse crossings with water flowing are to be constructed using HDD, minimising disturbance of riparian vegetation.		✓	
	Rehabilitation of riparian vegetation at trenched river crossings (minor rivers without water		✓	✓

PARAMETER	ACTION	IMPLEMENTATION PHASE		
	flowing) required. Rehabilitation of these and other sensitive areas may require a range of techniques including - engineered benches/terraces/embankments for erosion control. - a range of additional stabilisation materials such as roll out organic fiber mulch (jutemat). - direct seeding of native grass, tree and shrub species. - the use of tubestock (where feasible). In riparian areas, techniques which facilitate the rapid stabilisation of beds and banks prior to wet season flooding will be required.		✓ ✓	✓ ✓
	Plant species to match the habitats and regions. Seeds to be sourced in the Katherine to Gove region.	✓ ✓		

Table 17-4: Rehabilitation monitoring program

PARAMETERS	LOCATION	PHASE & FREQUENCY [CONSTUCTION/OPERATION]	PROCEDURE	PURPOSE
Vegetation re-establishment Erosion/sedimentation Weed incursion Fire	Low to moderate-risk areas.	Construction phase (dry season): monthly. Construction phase (shoulder season): immediately post rainfall.	Photo point monitoring and visual inspection. Reporting on vegetation (including weed) cover, fire scars and any evidence of erosion/sediment deposition. Provision of recommendations for immediate remedial works.	To ensure rehabilitated areas are adequately stabilised prior to the onset of the wet season. To prevent damage to pipeline infrastructure and surrounding environment (e.g from erosion and dry-season fires).
		Operational phase: pre- and post-wet season.	Photo point monitoring and visual inspection. Reporting of vegetation/weed cover and erosion/sediment deposition. Provision of recommendations for remedial work to be undertaken prior to subsequent wet season.	To ensure longer term integrity of pipeline route and minimise environmental impacts.
	High-risk areas (e.g. drainage lines, riparian areas, saturated soils).	Construction phase: weekly and immediately post-rainfall.	Photo point monitoring and visual inspection. Reporting on % vegetation (including weed) cover and erosion/sediment deposition. Provision of recommendations for urgent remedial work.	To ensure rehabilitated areas are adequately stabilised prior to the onset of the wet season. To prevent damage to pipeline infrastructure and surrounding environment.
		Operational phase: pre- and post-wet season.	Photo point monitoring and visual inspection. Reporting of vegetation/weed cover and erosion/sediment deposition. Provision of recommendations for remedial work to be undertaken prior to subsequent wet season.	To ensure longer term integrity of pipeline route and minimise environmental impacts.

Table 17-5: Rehabilitation contingency response and corrective actions

TRIGGER/CRITERIA	ACTION
Rehabilitation fails to stabilise.	1. Investigate cause (e.g. construction, wind and/or soil erosion, feral animals, inappropriate soil and/or sediment controls). 2. Remediate cause if possible. 3. Maintenance of rehabilitated areas until the required outcome is achieved.
Revegetation/grass seeds fail to establish	1. Investigate cause (e.g. soil erosion, low seed viability, seeds washed away). 2. Remediate cause if possible. 3. Maintenance of rehabilitated areas until the required outcome is achieved. 4. Continue to monitor revegetation establishment.
Revegetation fails to thrive.	1. Investigate why revegetation fails to thrive (nutrient deficiency, low seed viability, soil erosion or compaction issues etc.). 2. Remediate cause (fertilise, re-seed/re-plant etc.). 3. Continue to monitor revegetation progress.
Unplanned vegetation clearance.	1. Investigate why unplanned vegetation clearance occurred. 2. Mitigate cause (e.g. better operator training, better delineation of areas to be cleared). 3. More regular inspections of vegetation clearance operations.
Weed outbreak.	1. Assess threat to revegetation, based on aggressiveness and fuel load of the species. 2. If deemed a threat, implement weed management activities for the outbreak in accordance with the Weed Management Plan.
Deep rooted plant species in immediate pipeline area.	1. Eradicate plants.

18 Provisional Decommissioning Plan

18.1 REGULATORY FRAMEWORK

The KGGP and associated facilities would be designed, tested, operated, maintained and decommissioned in accordance with relevant legislation, licence conditions and the Australian Pipeline and Industry Association's (APIA) *Code of Environmental Practice* (2009) and AS2885 'Pipelines–Gas and Liquid Petroleum' (Parts 1, 2, 3 & 5). The APIA Code of Environmental has been established to define the best practice techniques and methods presently available to mitigate or eliminate the environmental impact of pipeline construction, operation and decommissioning. The code aims to provide guidance and direction in the management of the environmental aspects of pipeline planning, design, construction, operation and decommissioning. The KGGP Project will adhere to the requirements of the Code.

18.2 DECOMMISSIONING OBJECTIVES

The objective of decommissioning is to close down operations and remove surface structures, leaving the environment as near as practicable to its original condition. Decommissioning would be carried out in accordance with legislation, guidelines and industry best practicable technology at the end of the project life. In general, decommissioning requirements are project-specific, being considered on a case-by-case basis, assessing both the environmental and commercial costs.

18.3 DECOMMISSIONING OPTIONS

There are typically three options involved in the decommissioning of a pipeline. These are:

- Removal.
- Suspension.
- Left *in situ*.

The KGGP would be designed with an operational life of 50 years. Removal of the pipeline would not be environmentally preferable as it would involve excavation and considerable land disturbance. It is likely that the KGGP would remain buried (suspension or left *in situ*) at the end of the project life.

Both suspension and in situ options involve disconnecting the pipeline from the system. The suspension option involves filling the pipeline with an inert material, such as nitrogen, and maintaining as per an operating pipeline. The *in situ* option involves disconnecting the pipeline from the cathodic protection system and leaving the pipeline to degrade. If the *in situ* option was adopted all above ground facilities and supporting structures would be removed and these areas reinstated.

18.4 FINAL DECOMMISSIONING PLAN

A final decommissioning plan and rehabilitation programme would be developed and implemented in consultation with landowners and relevant authorities at the time of decommissioning to ensure that the area is suitably rehabilitated. If the *in situ* option was adopted, the remaining disturbed areas along the ROW would be rehabilitated with the objective of returning the area to a condition consistent with the landholder's intended use for the land.

The plan would address drivers, costing, and timing as well as monitoring and rehabilitation requirements for disturbed areas. Decommissioning of the pipeline would comply with legislative requirements, relevant Australian Standards and industry practice in force at the time the KGGP project ceases, and in consultation with landowners.

Appendix A: EIS commitments

This table summarises the key commitments made by Pacific Aluminium to mitigate environmental impacts from the construction, operation and decommissioning of the KGGP. As this table is summary in nature, it serves to highlight important commitments only. The full range of commitments is presented in the draft EIS and EMP. Performance indicators for the commitments are detailed in the EMP unless otherwise mentioned in the table.

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
Standards of facility design and construction.	The KGGP and associated facilities would be designed, tested, operated, maintained and decommissioned in accordance with relevant legislation, licence conditions the Australian Pipeline and Industry Association's (APIA) *Code of Environmental Practice* (2009) and AS2885 'Pipelines–Gas and Liquid Petroleum' (Parts 1, 2, 3 & 5).	Throughout the life of the KGGP Project.	Chapter 2 (Project Description)
Alternative energy supplies.	Pacific Aluminium will continue to explore small and large scale solar photovoltaic systems to supplement the electricity demands of Nhulunbuy.	When the electricity demands of Nhulunbuy township increases.	Chapter 3 (Alternatives)
Location of supporting facilities (mainline valves, scraper stations, compressor station etc).	Final site selections would address the Site Selection Protocol (addressing environmental and cultural heritage constraints).	Design phase.	Chapter 2 Project Description) Appendix U (Site Selection Protocol)
Disturbance footprint / native vegetation clearing.	Disturbance footprint for construction to be reduced to as small as possible - construction activities for the pipeline would generally be contained within a 30 m wide ROW. The use of existing roads/tracks for access would be maximised (although new access tracks are required).	Design phase.	Chapter 2 (Project Description) Chapter 8 (Vegetation)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	Clearing will only occur within the approved disturbance area which will be clearly marked		
Timing of land disturbance.	Construction activities involving significant land disturbance would be confined to the dry season, wherever possible	Construction phase	Chapter 6 (Landform and Soils)
Location of borrow pits, additional working widths for turning areas, HDD, water storage dams, evaporation ponds).	Final site selections would address the Site Selection Protocol (addressing environmental and cultural heritage constraints).	Design phase.	Chapter 2 (Project Description)
Location of construction camps.	Final site selections would address the Site Selection Protocol (addressing environmental and cultural heritage constraints).	Design phase.	Chapter 2 (Project Description)

Location of access tracks.	Prior to construction of access tracks, Pacific Aluminium will conduct flora, fauna and heritage evaluations of areas through which these roads will be placed, including desktop study and targeted pre-clearing inspections ahead of construction, to identify the following areas or features requiring consideration in management of construction:
	• Areas or features of high conservation significance
	  ○ Vegetation representative of the Arnhem Plateau Sandstone Shrubland TEC.
	  ○ Known, likely or potential critical, regionally significant and/or locally restricted habitat for threatened and/or migratory species listed under Territory or Commonwealth legislation.
	  ○ Sites of archaeological or cultural heritage significance.
	• Other areas requiring consideration for environmental
		Design phase to 6 months after completion of construction.	Chapter 2
			(Project Description
			
			Chapter 8 (Vegetation)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	management ○ Sensitive habitat such as wetlands, monsoonal rainforest, melaleuca forest, or riparian vegetation. ○ Major weed infestations. ○ Sites of Yellow Crazy Ant infestation. ○ Highly erodible soils. ○ Flood prone areas. Within six months of completion of construction, Pacific Aluminium will submit a Final Access Road Alignment Summary Report to the NT Government and DSEWPaC demonstrating how the access roads were designed and constructed to: • Avoid direct disturbance of areas or features of high conservation significance. • Avoid, unless not reasonably practicable, and take into account other areas requiring consideration for environmental management. The Summary will indicate those access roads, or parts thereof, that were temporary and how these have been or are in process of being rehabilitated following construction.		
Hazardous materials spills (including fuel)	Hazardous materials storage facilities and handling equipment would be segregated and bunded, kept in good order and designed in such a way as to prevent and contain spills.	Construction phase	Chapter 6 (Landform and Soils)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
Watercourse crossings / terrestrial fauna.	Drainage in and adjacent to known Gouldian Finch water sources and/or seasonal wetland areas will be reinstated as soon as practicable following construction.	Construction phase	Chapter 7 (Water Resources)
Water resources / water extraction.	Water extraction from surface and groundwater sources will be in accordance with the Water Supply and Adaptive Management Strategy. A work program to develop the Strategy will be implemented during 2013. The Strategy would include the following requirements with respect to surface water extraction: • Monitor flows upstream and downstream of extraction location using staff gauge. • Cease extraction if upstream flow conditions significantly change. • Cease extraction if water level drops excessively at critical downstream location. Any extraction of groundwater will not be located in areas where extraction could foreseeably lead to a significant alteration in the hydrological regime of known Gouldian Finch watering locations and/or regionally significant wetlands.	Finalised in the design phase Implemented in the construction phase	Chapter 7 (Water Resources)
Water resources / disposal of waste water.	Both grey water and sewerage which will be treated on site and disposed of in accordance with statutory regulations, including *'Code of Practice for small on-site sewage and sullage treatment systems and the disposal and reuse of sewage effluent'*.	Construction phases.	Chapter 7 (Water Resources)
Vegetation / threatened flora species.	Additional field surveys near the Mitchell Ranges will be undertaken in 2013, the results of which will be provided in the	2013 dry season	Chapter 8 (Vegetation)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	supplement to this Draft EIS.		
Vegetation / threatened flora species/ *Pternandra coerulescens.*	Inspections will be undertaken prior to the commencement of constructing crossings at Latram, Giddy and Cato Rivers to confirm the absence of this species in areas to be disturbed. If any individuals were unexpectedly found, construction methods would be reviewed to avoid individuals where practicable. If avoidance was not possible, remedial actions would be investigated to mitigate the removal of individuals including consideration of translocation.	Construction phase	Chapter 8 (Vegetation)
Vegetation / species of conservation significance / Cycads.	The potential for salvaging plants either removed during the clearing process, or prior to their removal, will be considered in consultation with land owners.	Construction phase	Chapter 8 (Vegetation)
Vegetation / weeds.	Major weed infestations will be confirmed during the 2013/2014 dry season survey using the results from both the desktop review and field survey.	2013 and 2014 dry season	Chapter 8 (Vegetation)
Disposal of hydrotest water / aquatic fauna / water quality	Disposal of hydrotest water would be in accordance with Australian Pipeline Industry Association (APIA) Code of Environmental Practice. The disposal of hydrostatic test water to land would be carried out in a manner that ensures: • Vegetation is not damaged. • Soil erosion and soil structure damage is avoided. • No surface ponding of released water occurs. • The quality of groundwater is not adversely affected.	Construction phase	Chapter 2 (Project Description) Chapter 7 (Water Resources)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	• No release of water to any surface waters occurs. Prior to disposal, hydrostatic test water would be tested and where the limits shown in Table 7-7 are exceeded, water treatment would be undertaken.		
Acid sulphate soils.	Field assessment would be undertaken ahead of construction to identify and confirm areas of potential ASS. An Acid Sulphate Soils Management Plan will be developed prior to construction describing the proposed construction methods and management measures to be implemented during construction and operation including: general ASS management requirements; techniques commonly used to treat ASS during and post construction; validation testing; and dewatering and storage requirements.	Design and construction phase.	Chapter 6 (Landform and Soils)
Landform stability / erosion.	Trench breakers, contour benching and berms or water breaks with velocity stops or rock protection would be installed to control erosion along the ROW.	Construction phase	Chapter 2 (Project Description)
Landforms / karst formations.	An assessment of the potential for karst formations within identified areas along the pipeline corridor will be conducted. would be completed during the 2013 dry season.	Completed during 2013	Chapter 6 (Landform and Soils)
Rehabilitation of disturbed areas.	To provide initial stability to the reinstated landform, reduce weed ingress and encourage regrowth of native vegetation, disturbed areas where risk factors or landholder considerations are relevant would be re-seeded with suitable native grass species before the on-set of the first wet season. Vegetation will be cleared and areas rehabilitated progressively	Construction to decommissioning phases	Chapter 2 (Project Description) Chapter 8 (Vegetation)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	throughout construction to minimise the period of disturbance.		
Open trench / wildlife injury or mortality.	Constructor will ensure numerous escape ramps along the trench and frequent checking of the trench for captured animals, for subsequent removal and release. The Terrestrial and Aquatic Fauna Management Plan would include details on number of ramps per length of trench and frequency of monitoring and release of trapped fauna. The time between opening and closing the pipeline trench will be the shortest time possible for construction	Construction phase	Chapter 9 (Terrestrial and Aquatic Fauna)
Terrestrial fauna / Gouldian Finch.	Pacific Aluminium will implement a monitoring program for the known population of Gouldian Finch at Beswick/Chambers River. This will be implemented throughout construction and for the three years following completion of construction. The objective of the monitoring will be to confirm construction is not having/does not have a detrimental impact on the Gouldian Finch, and to provide further information on the population itself.	Construction and operation phase	Chapter 10 (Matters of National Environmental Significance)
National Parks and Reserves / Indigenous Protected Areas.	Measures are proposed to promote consultation, collaboration and coordination between the implementation of project specific mitigation measures and the management plans and programs delivered by IPA managers including • Specific consultation and input from the DAC and LHAI on the Environment Management Plan for the KGGP Project. • Continuing funding by Pacific Aluminium of the collaborative Yellow Crazy Ant eradication program	Construction phase	Chapter 11 (Parks, Reserves and Areas of High Conservation)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	within the Gove region for the Gove operations with DAC and CSIRO. • Opportunity for Dhimurru and Yirralka Rangers to participate in project specific environmental controls such as weed management and rehabilitation. • Establishment of clear and agreed processes that enable DAC and LHAI to rapidly bring issues to the Proponent's attention during the construction period. • Opportunity for Dhimurru and Yirralka Rangers to participate in ongoing monitoring of the effectiveness of rehabilitation of disturbed areas.		
National Parks and Reserves / Indigenous Protected Areas.	If Wonga Creek is in flow (as determined by the construction contractor) and HDD cannot be undertaken (e.g. drilling hits impenetrable rock, under the riverbed), then a reactive monitoring program would be developed in consultation with DAC, for early detection and mitigation of excessive addition of sedimentation to Wonga Creek.	Construction phase	Chapter 11 (Parks, Reserves and Areas of High Conservation)
Aboriginal and historic cultural heritage / sacred sites.	Pacific Aluminium has engaged the AAPA to consult with Aboriginal traditional owners with a view to identifying the sacred sites in proximity to the project area. Upon notification from the AAPA, Pacific Aluminium understands that appropriate Restricted Work Areas would be established for all phases of the project. The new processes initiated for the grant of Authority Certificates for the project area will ensure that all known Aboriginal sacred sites are avoided by realignment and re-siting so that no sacred	Construction, operation and decommissioning phases	Chapter 13 (Aboriginal and historic cultural heritage)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	sites are directly impacted.		
Aboriginal and historic cultural heritage / sacred site / archaeological sites.	A qualified archaeologist will be on-site during pegging of the ROW (particularly sections from KP0-260; KP302-360; and KP400-603) and during trenching. Procedures in *Heritage Act* regarding disturbance of archaeological material will be followed.	Construction phase	Chapter 13 (Aboriginal and historic cultural heritage)
Unauthorised access to constructed ROW or access tracks.	Gates or other barriers will be installed at high risk areas.	Construction and operation phase	Chapter 14 (Land Use, Infrastructure and Amenity Chapter)
Infrastructure / interference with Department of Defence Facilities.	Pacific Aluminium will identify appropriate construction and operational personnel to establish and maintain a close working relationship with the RAAF Base Tindal Services Manager, to ensure open and timely engagement to resolve any emerging issues.	Construction phase	Chapter 14 (Land Use, Infrastructure and Amenity Chapter)
Infrastructure / solid waste management.	Where it is not feasible to dispose of solid waste at local facilities in the pipeline region, solid waste will be transported to Katherine or Nhulunbuy for disposal at licensed facilities.	Construction phase	Chapter 14 (Land Use, Infrastructure and Amenity Chapter)
Infrastructure / road maintenance.	Provision will be made for Central Arnhem Road to be maintained during the course of construction. Inspections with road authority pre and post construction to ensure road condition is left at pre-construction condition.	Construction	Chapter 14 (Land Use, Infrastructure and Amenity Chapter)
Socio-economic / local employment.	Pacific Aluminium would develop a Local Employment Plan which would outline the planned approach to sourcing a	Construction phase	Chapter 15 (Social and Economic

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	construction and operations workforce. Pacific Aluminium will engage with the project's primary contractor and local stakeholders to develop local and Aboriginal employment targets for the KGGP Project. These targets would be realistically defined based on the socio-economic context, and previous experience in other remote communities.		Considerations)
Socio-economic / local procurement	A Local Procurement Plan would be developed to ensure that fair and reasonable opportunities were provided for local business, industry and labour.	Construction phase	Chapter 15 (Social and Economic Considerations)
Socio-economic / alcohol and other drugs.	Pacific Aluminium would also implement a workforce Code of Conduct to manage the behaviour of the workforce inside and outside of working hours. This Code will include zero tolerance policies on alcohol and other drugs and would apply to direct and indirect (sub-contracted) employees.	Construction phase	Chapter 15 (Social and Economic Considerations)
Health and safety / general.	Pacific Aluminium would develop a Health Management Plan that will be communicated to the Department of Health and relevant Councils.	Construction phase	Chapter 15 (Social and Economic Considerations) Chapter 16 (Health and Safety)
Open trench / public safety.	Wherever the trench is easily accessible to the public, it would be clearly marked by bunting and hazard lights.	Construction phase	Chapter 2 (Project description)
Health and safety / mosquitos.	Acceptable risk mitigation will be achieved by applying the guidance contained in the medical entomology guideline:	Construction phase	Chapter 16 (Health and

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	'Personal protection from mosquitoes & biting midges in the NT, 2011' produced by the Northern Territory Government.		Safety)
Health and safety / sewage treatment.	Waste water and sewage will be treated by provision of package treatment plant at construction camps.	Construction phase	Chapter 16 (Health and Safety)
Health and safety / pipeline safety and integrity.	The preliminary risk assessment conducted in accordance with requirements of AS 2885.1 will be refined during the design phase. Recommendations have been raised in the preliminary risk assessment will be addressed to further clarify and reduce safety risks.	Design phase	Chapter 16 (Health and Safety)
Health and safety / worker safety.	The project will comply with the latest revisions of AS/NZS 4804 Occupational Health and Safety Management Systems – General Guidelines on Principles, Systems and Supporting Techniques, and AS2885 Pipelines – Gas and Liquid Petroleum. Medical facilities will be established at each construction camp and a medical officer stationed on each spread, with a 4WD ambulance and medical equipment.	Construction phase	Chapter 16 (Health and Safety)
Environment Management Framework.	Project controls will be implemented by both Pacific Aluminium and the construction contractor including: • Independent review of detailed management plans for their conformity with EIS commitments. • Contractor environmental controls. • Inspection and third party auditing of construction of the project (regular inspections and two formal compliance audits).	Construction and operation phase	Chapter 17 (Management Framework)

COMPONENT OF PROJECT OR ASPECT OF ENVIRONMENT TO BE MANAGED	COMMITMENT	TIMING	SECTION OF EIS
	• Third party compliance auditing of project operation (annual).		
Environment Management Framework	All complaints and incidents will be dealt with promptly and efficiently by suitably trained and qualified personnel. All significant environmental incidents, including near-misses, will be reported and investigated immediately by the Construction Contractor using their approved reporting procedure, which will identify appropriate corrective actions. An Incidents and Complaints Register will be maintained, and will be available for inspection as required by the representative of the regulator.	Construction phase	Chapter 17 (Management Framework)
Environment Management Framework.	Pacific Aluminium intends to publicly report on environmental performance through its annual sustainability report.	Construction and operation phases	Chapter 17 (Management Framework)
Environment Management Framework.	Pacific Aluminium will implement a program to enhance Gouldian Finch habitat within the pipeline region. This will be undertaken with the NLC and involve support for indigenous ranger groups to implement the program. The area that would be included in the enhancement program would be located within a broad area in the vicinity of the project area and would be up to ten times the area of potential Gouldian Finch habitat cleared for the KGGP.	Operation phase	Chapter 17 (Management Framework)

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Environment Management Framework	Pacific Aluminium intends to continue or commence voluntary environmental enhancement programs aimed at assisting indigenous landholders manage environmental threats in the region including: • Continued support for the Yellow Crazy Ant eradication program in the Gove region for the Gove mining operations. • Opportunity for Indigenous rangers to participate in project specific environmental controls such as weed management and rehabilitation efforts which integrate into existing ranger programs. • Opportunity for Indigenous rangers to participate in ongoing monitoring of the effectiveness of rehabilitation of areas disturbed during the construction of the KGGP.	Operation phase	Chapter 17 (Management Framework)

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