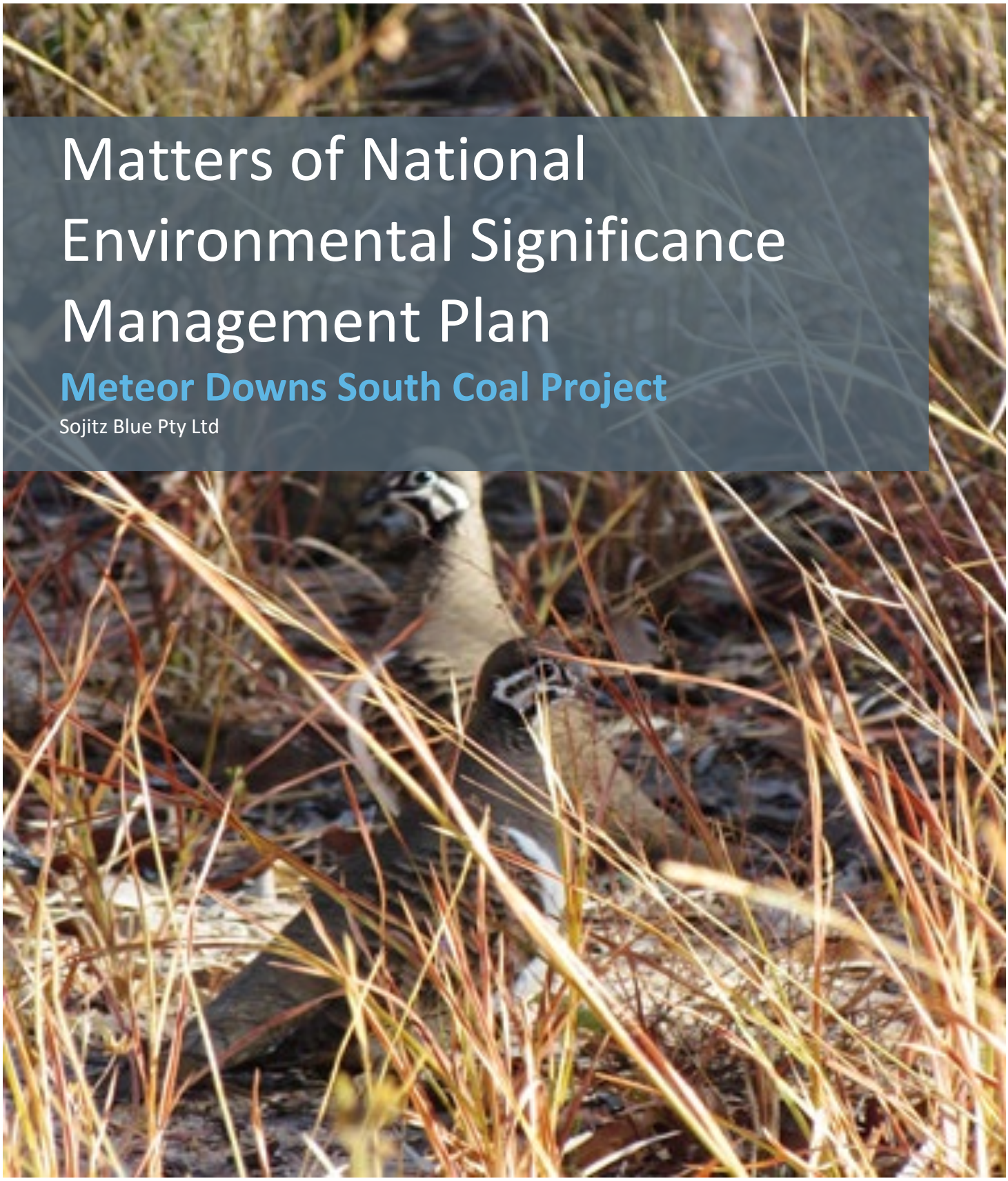
# Matters of National Environmental Significance Management Plan

## Meteor Downs South Coal Project

Sojitz Blue Pty Ltd



# APPROVALS

| Rev | Date | Description |
|---|---|---|
| A | 17 November 2017 | Draft for review by client |
| B | 18 November 2017 | Revised draft for review by client |
| 0 | 20 November 2017 | Final report following feedback from client |
| 1 | 19 December 2017 | Final report following feedback from Australian Government |
| 2 | 9 January 2018 | Final report following feedback from Australian Government |
| 3 | 17 January 2018 | Final report following feedback from Australian Government |
| 4 | 22 March 2019 | Update based on Annual Report 2018 |
| 5 | 9 May 2019 | Update to incorporate additional impacts |
| 6 | 20 June 2019 | Incorporation of feedback from Australian Government |
| 7 | 19 March 2025 | Update to reflect latest impacts and updated survey methodology |

| | Name | Position | Date |
|---|---|---|---|
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# ABBREVIATIONS, ACRONYMS AND DEFINITIONS

| | |
|---|---|
| BBN | Brigalow Belt North |
| BBS | Brigalow Belt South |
| CMSHA | – *Coal Mining Safety and Health Act 1999* (Qld) |
| CMSHR | – Coal Mining Safety and Health Regulation 2017 (Qld) |
| DAF | Queensland Department of Agriculture and Fisheries |
| dBA | A-weighted decibels |
| DCCEEW | Commonwealth Department of Climate Change, Energy, the Environment and Water |
| DEHP | Queensland Department of Environment and Heritage Protection |
| DES | Queensland Department of Environment and Science |
| DoEE | Commonwealth Department of Environment and Energy |
| EA | The Environmental Authority (EPML00559513) for the Meteor Downs South Coal Mine |
| EMS | Environmental Management System |
| Environmental Representative | The person employed on the Meteor Downs South Coal Mine who is responsible for environmental matters |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* (Cth) |
| Glencore | Glencore Coal Queensland Pty Ltd |
| ha | Hectare |
| IBRA | Interim Biogeographic Regionalisation for Australia bioregions |
| Km | Kilometres |
| MDS | Meteor Downs South |
| ML | Megalitres |
| mm | Millimetre |
| mg | Milligrams |
| ML | Mining Lease |
| MNES | Matters of National Environmental Significance |
| MNESMP | Matters of National Environmental Significance Management Plan |
| mtpa | Million tonnes per annum |
| NC Act | *Nature Conservation Act 1992* (Qld) |
| Project footprint | The area to be directed disturbed to facilitate mine infrastructure |
| RE | Regional Ecosystem |
| Rolleston | Rolleston Coal Mine |
| ROM | Run of Mine |
| SHMS | Safety and Health Management System |
| The Project | The Meteor Downs South Coal Mine |
| The Project area | The Project site and nearby local environs |
| The Project site | The area set out in the Mining Lease (ML70452) for the Meteor Downs South Coal Mine. |

| | |
|---|---|
| VM Act | *Vegetation Management Act 1999* (Qld) |
| TEC | Threatened Ecological Community |
| U & D | U & D Mining Industry Australia Pty |

# 1 INTRODUCTION

## 1.1 BACKGROUND

The Project is an open cut coal mining operation located approximately 100 km south of Emerald, between Rolleston and Springsure in the Central Highlands Regional Council local government area, Queensland. The Project is authorised pursuant to mining lease 70452 and the Environmental Authority (EA) EPML00559513.

The Project was referred to the Commonwealth Department of the Environment and Energy (DoEE, now Department of Climate Change, Energy, the Environment and Water[DCCEEW]) and on 26 April 2013 was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth, EPBC Act) (EPBC 2013/6799). U&D Mining Industry (Australia) Pty (U&D) has approval under the EPBC Act to develop and operate the Meteor Downs South Coal Project (the Project) and is in a joint venture with Sojitz Blue Pty Ltd (Sojitz) is to develop and operate the Project.

This document has been prepared to satisfy conditions 2, 3 and 4 of the EPBC Act approval, which relate to the provision of a Matters of National Environmental Significance Management Plan (MNESMP). A delegate of the Minister approved the MNESMP on 19 January 2018.

## 1.2 REQUIREMENTS OF THE MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE MANAGEMENT PLAN

In accordance with the EPBC approval 2013/6799 (conditions 2, 3 and 4), a management plan is required to address direct and indirect impacts of the action on the following MNES:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) threatened ecological community (Brigalow TEC).
- Natural Grasslands of the Queensland Central Highlands and Fitzroy Basin threatened ecological community (Natural Grasslands TEC)
- king blue-grass (*Dichanthium queenslandicum*)
- bluegrass (*Dichanthium setosum*)
- squatter pigeon (southern) (*Geophaps scripta scripta*)
- Australian painted snipe (*Rostratula australis*)

# 2 PROJECT DESCRIPTION

## 2.1 PROJECT LOCATION

The Project is located along the Dawson Highway, approximately 25 km west of Rolleston and 45 km south east of Springsure in Central Queensland as shown in Figure 1. The nearest regional town is Emerald, approximately 110 km to the north. The Project falls within the Central Highlands Regional Council local government area.

Immediately to the east of the Project is the Rolleston Coal Mine (Rolleston), which produced 13 mtpa in 2016 and is currently expanding up to 18 mtpa with the Rolleston Expansion Project. The Rolleston Coal Mine is owned by Glencore Coal Queensland Pty Ltd (Glencore).

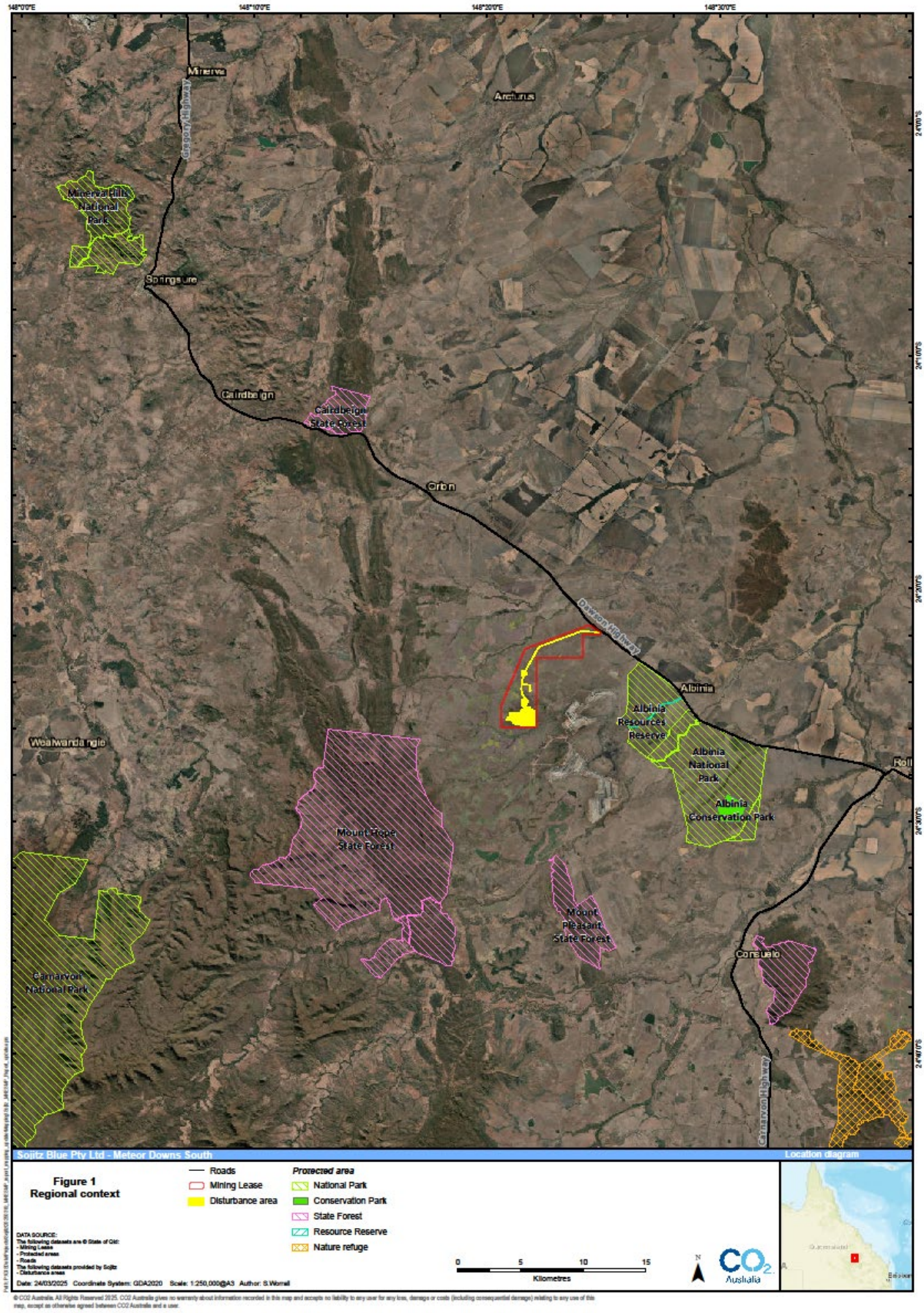


**Figure 1: Regional context**

### 2.1.1 Water Management

All water management for the Project will be undertaken in accordance with all relevant conditions of the Project's EA. A mine water management system has been designed to minimise the potential impacts on the water quality downstream of the Project. The mine water management system will manage water in three types of catchments based on water quality:

- 'Clean' – surface runoff from areas of the Project site where water quality is unaffected by mining operations. Clean water includes runoff from undisturbed areas;
- 'Dirty' – surface runoff water and seepage from the Project site areas that are disturbed by mining operations such as out of pit dump areas, workshop areas and roads. This runoff may contain silt and sediment however does not contain contaminated material or high salt concentrations. As specified in the EA and associated Erosion and Sediment Control Plan, this runoff must be managed to ensure that downstream water quality is within the adopted water quality compliance criteria; and
- 'Mine Affected' – surface water from areas affected by mining operations and potentially containing chemicals of various types used in the mining operations. There are restrictions on the use and release of this water. Contaminated water areas include sumps, stockpile areas, service bays and fuel storage areas. Rainfall and resulting runoff from these areas are also potentially contaminated and therefore must be managed to avoid discharge of potentially contaminated water into the natural water courses.

### 2.1.2 Changes to mine plan and water management system

As a result of continual refinement of design, as well as a determination by the Queensland Land Court, there have been some changes to both the mine plan and the water management system from that described in the preliminary documentation (lodged with the department in May 2014) and since the approval of this MNESMP (January 2018). Changes relate to:

- alteration to the haul road ingress/egress point on the Dawson Highway, based on safety advice from the Queensland Department of Main Roads
- additional areas to channel the surface water flows around the mining operations, to avoid impeding flows to Naroo Dam
- changes to locations of pipeline and access tracks to bores.

The preliminary documentation described how, during mining operations, the open cut pit and out of pit overburden dumps (and associated dams) would capture and retain runoff from areas that would have previously flowed to Spring Creek and Naroo Dam. As described in Appendix E of the preliminary documentation, over the life of the Project, the catchment area draining to Naroo Dam was to be reduced by between 82-90% with the largest loss of catchment occurring in Year 5. Once final landform was complete, the catchment area draining to Naroo Dam was to be reduced by 73.8% in comparison to existing conditions, with inflows to Naroo Dam therefore expected to be significantly reduced. However, as explained in the preliminary documentation, this was based upon the worst-case scenario based on the mine plan at the time of writing, and U&D made a commitment to continuing to refine the design to reduce the impact on Naroo Dam, both in terms of area and water quality, which has since been upheld.

The new mine plan now comprises a single open cut pit which will be developed using a "centre pit basal seam ramp" configuration. As described in the Project EA (see Appendix A), mine affected water cannot be released into Naroo Dam.

In terms of loss of catchment for Naroo Dam, revision of the mine plan has been such that the reduction in the size of the catchment will now be between 6% and 11% over the life of the mine with the largest loss of catchment occurring in Year 10. However, once rehabilitation and final landform is complete, the catchment area draining to Naroo Dam will not be reduced at all, and in fact will be 0.5% larger, due to the increase in the surface area of the catchment as a result of the spoil mounds. As such, inflows to Naroo Dam will not be reduced post mining.

The preliminary documentation described how mining would occur within the portion of Naroo Dam that lies within the Project site, as the resource extends under the dam itself. Since then, the mine plan has been revised such that no mining is proposed in Naroo Dam and a 50 m exclusion zone has been applied to the maximum dam capacity edge.

As part of the revised design, all available catchment will now flow into Naroo Dam without interference. Flows to Naroo Dam will be maintained through the construction of a diversion drain directing flow around the northern Project area into Naroo Dam. Figure 2 shows a typical cross section of the drain, and Figure 3 shows the location of the north diversion drain and discharge point at Naroo Dam. The diversion drain will be designed to maximise benefits to the Australian painted snipe, including the provision of micro-habitat features and the ability for ponding, noting species habitat requirements described in Section 9.2.2.

In addition, U&D have entered into a make good water agreement with Glencore, who use Naroo Dam as a source of water for their Rolleston Coal Mine (which contains the majority of Naroo Dam), immediately adjacent to the Project site. As a result of a determination in the Queensland Land Court, U&D are required to provide make good water to Glencore to make up for any reduction in water flow to Naroo Dam as a result of mining operations on the Project site. Make good water will be calculated as the area of catchment unavailable multiplied by rainfall multiplied by the runoff coefficient.

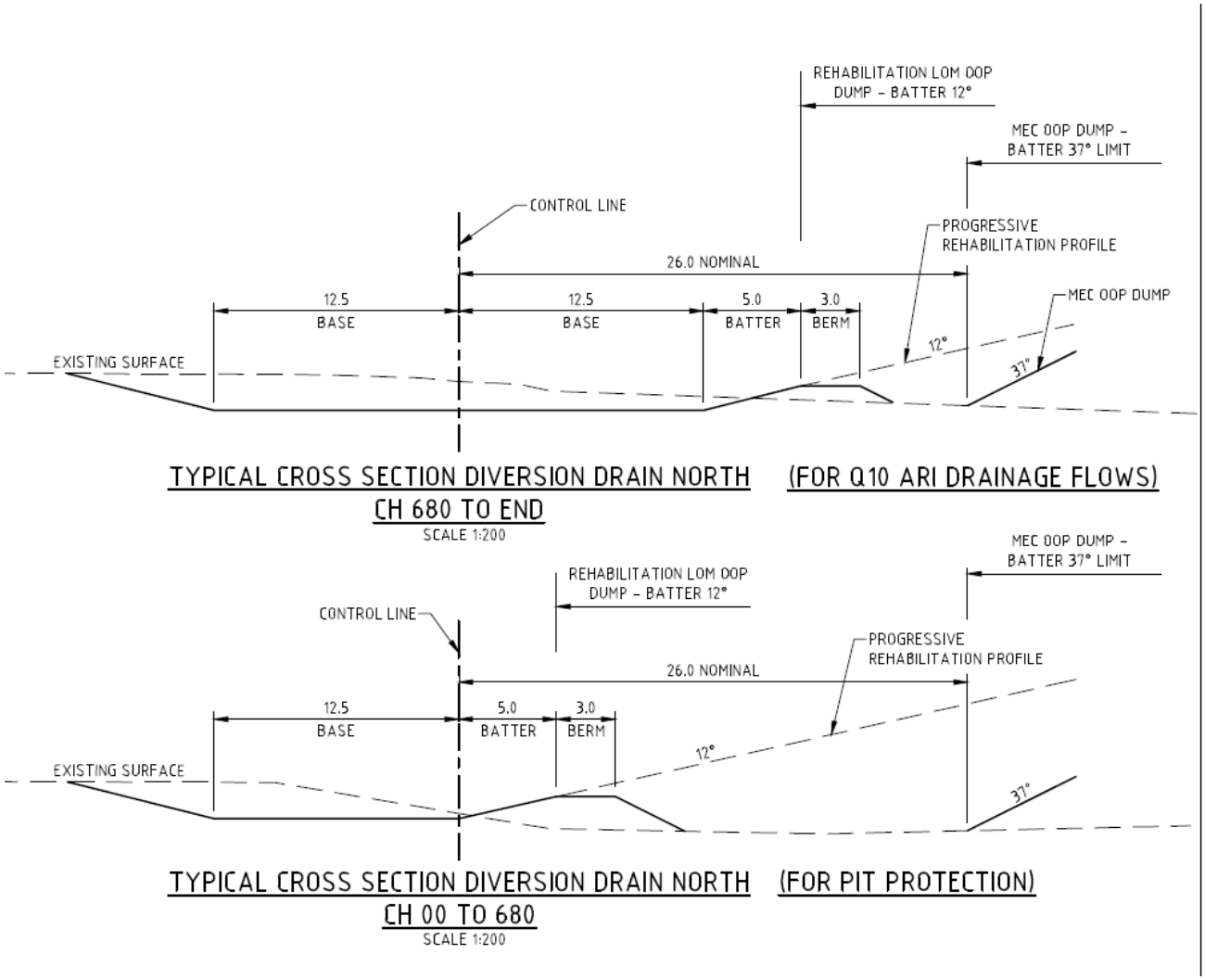


**Figure 2: Typical cross section of the diversion drain north**

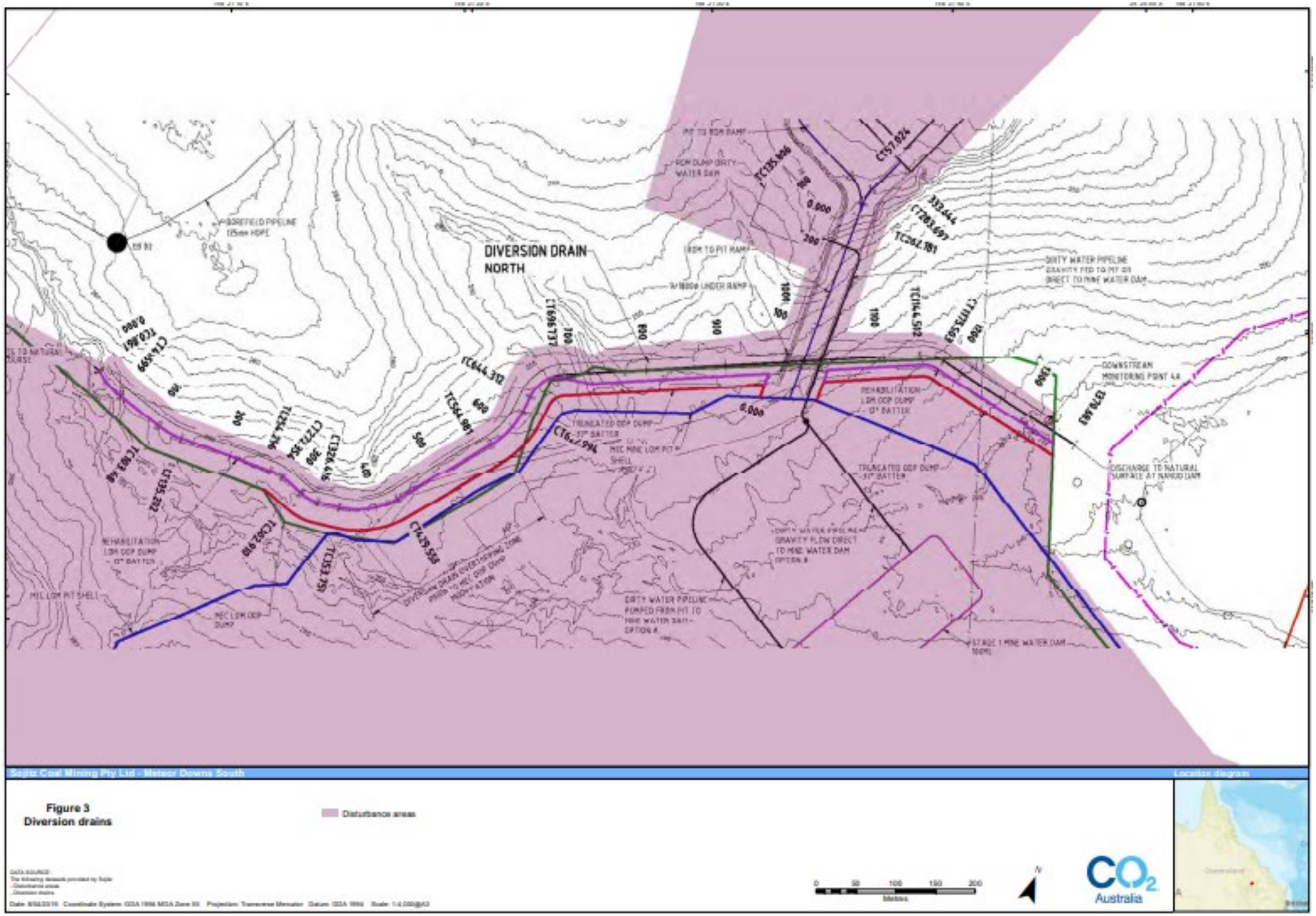


**Figure 3: Meteor Downs South Mine diversion drain north plan and longitudinal section**

# 3 LEGISLATIVE AND REGULATORY FRAMEWORK

### 3.1.1 Commonwealth Approval Process

The Project was referred to the Commonwealth Government on the 22 March 2013. The Project was declared a controlled action on the 26 April 2013 due to potential impacts on listed threatened species and communities and listed migratory species. The Project was granted approval under the EPBC Act by the Commonwealth Government on 25 November 2014 (EPBC 2013/6799). The approval contained 21 conditions with condition 1 relevant to, and conditions 2, 3 and 4 specific to, the provision of a MNESMP.

## 3.2 EPBC ACT APPROVAL CONDITIONS RELEVANT TO MNESMP

Conditions 1 to 3 of the EPBC Act approval are relevant to the development of the MNESMP and are detailed in Section 3.2.1 and 3.2.2.

### 3.2.1 Condition 1

Condition 1 of the EPBC Act approval for the Project relates to the maximum area of habitat for listed threatened species and ecological communities that U&D is permitted to impact on over the life of the mine. These maximum approved disturbance limits for listed threatened species and ecological communities permitted in Condition 1 of the EPBC Act approval are presented in Table 1.

Since the approval was issued and the MNESMP approved, several refinements to the mine design, have been made resulting in a change to the impacts on the threatened species and ecological communities to which Condition 1 applies. As such, the impacts on the threatened species and ecological communities have been recalculated and are presented as the planned disturbance limits in Table 1, remaining well below the maximum disturbance limits permitted in the EPBC Act approval.

**Table 1: Approved Disturbance Limits for MNES**

| Threatened Species | Maximum approved disturbance limits (ha) (EPBC 2013/ 6799) | Planned disturbance (ha) |
|---|---|---|
| Squatter pigeon (southern) (*Geophaps scripta scripta*) | 240.54 | 139.5[1] |
| King blue-grass (*Dichanthium queenslandicum*) | 426.53 | 111.93[1] |
| Bluegrass (*Dichanthium setosum*) | 426.53 | 111.93[1] |
| Australian painted snipe (*Rostratula australis*) | 6.60 | 0.00[2] |
| **Threatened Ecological Communities** | **Maximum disturbance limits (ha) (EPBC 2013/ 6799)** | **Planned disturbance (ha)** |
| Natural Grasslands of the Queensland Central Highlands and Fitzroy Basin Threatened Ecological Community | 186.00 | 111.93[1] |
| Brigalow (*Acacia harpophylla* dominant and co-dominant) Threatened Ecological Community | 2.21 | 0.00[1] |

[1]Provided by Sojitz March 2025.
[2]The actual disturbance limit for the Australian painted snipe habitat was exceeded by 0.03 ha in 2018. This contravention has been addressed and finalised by the Department of the Environment and Energy (DEE; now DCCEEW) in 2018, under CAS3177 (F. Moloney 2019, pers. Comms, 24 June 2019).

### 3.2.2 Condition 2 and 3

Condition 2 and 3 of the EPBC Act approval relate to the requirement to develop a MNESMP for the threatened species and ecological communities listed in Condition 1. These conditions and where they have been addressed in this MNESMP are presented in Table 2.

**Table 2: MDS Project EPBC Act Approval (EPBC 2013/6799) Conditions**

| EPBC Act Condition | Description | Section of MNESMP |
|---|---|---|
| 2 | At least three (3) months prior to commencement of the action, the approval holder must submit to the Minister for approval a Matters of National Environmental Significance Management Plan (MNESMP) for the management of direct and indirect impacts of the action on Matters of National Environmental Significance (MNES), being for the purposes of this approval, the EPBC Act listed species and EBPBC Act listed communities listed in Table 1. The MNESMP must be prepared by, in consultation with, or be reviewed by a suitably qualified ecologist. | This document - complete. |
| 3 | The MNESMP must be consistent with relevant recovery plans, threat abatement plans and conservation advices and must include: | |
| | a) a description of environmental values for each of the MNES addressed in the plan; | Sections 6, 7.2, 8.2, 9.2, 10.2 and 11.2 |
| | b) details of potential impacts from the action, including area of impact, on each of the MNES; | Sections 7.4, 8.4, 9.4, 10.4 and 11.4 |
| | c) measures that will be undertaken to mitigate and manage the impacts on relevant MNES resulting from the action. These measures must include but may not be limited to: | |
| | i. measures to avoid, minimise and mitigate impacts on MNES and their habitat located in the Project Area | Section 12 |
| | ii. measures to control and reduce the overall occurrence and abundance of animal, pest and weed species which could impact the MNES retained in the Project Area | |
| | iii. measures to minimise and mitigate any impacts of the action on MNES and their habitat as a result of changes in hydrology of surface water resources including at Naroo Dam | Sections 4.1, 9.4 and 12 |
| | iv. measures to ensure no net loss of habitat for the Australian Painted Snipe as a result of impacts to Naroo Dam catchment or water quality; and | Section 12 |
| | v. measures to rehabilitate areas of habitat impacted by the action. | Section 12 |
| | d) goals for habitat management for each MNES | Section 12 |
| | e) a program, including monitoring locations, parameters and timing for monitoring the outcomes of mitigation and management measures to minimise direct impacts to MNES and their habitat; a schedule of regular reporting to the Department the details and outcomes of the monitoring program, including the actual impacts of the project on MNES and their habitat; | Section 12<br>Section 13<br>Section 14 |
| | f) corrective and contingency measures in the event monitoring reveals impacts on MNES are not in accordance with predictions in the MNESMP or modelling; | Section 12 |
| | g) details of the timeframe for a regular (at least every three years) review and subsequent updates, of the MNESMP; and | Section 14 |
| | h) Details of the qualifications and experience of persons responsible for undertaking monitoring, review and implementation of the MNESMP, including those of a suitably qualified ecologist. | Section 14 |

## 3.3 RELEVANT PLANS AND GUIDELINES

Table 3 lists the conservation advice and plans relevant to each of the threatened species and ecological communities covered by this MNESMP. These documents have been reviewed in preparing this MNESMP in order to capture measures specific to each of the threatened species and ecological communities.

**Table 3: Relevant Conservation Advice, Recovery Plans and Threat Abatement Plans**

| MNES | Relevant Conservation Advice and Plans |
|---|---|
| Brigalow (*Acacia harpophylla* dominant and co-dominant) Threatened Ecological Community | ▶ Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community (DoE 2013)<br>▶ Recovery Plan for the "Brigalow (*Acacia harpophylla* dominant and co-dominant)" endangered ecological community (Butler 2008a – included as Appendix C)<br>▶ Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (CoA 2011) |
| Natural Grasslands of the Queensland Central Highlands and Fitzroy Basin Threatened Ecological Community | ▶ Approved Conservation Advice for Natural Grassland of the Central Highlands and North Fitzroy Basin (DEWHA 2008c)<br>▶ Draft National Recovery Plan for the "bluegrass (*Dichanthium* spp.) dominant grasslands in the Brigalow Belt Bioregions (north and south)" endangered ecological community (Butler 2008b)<br>▶ Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (CoA 2011)<br>▶ Threat abatement advice for predation, habitat degradation, competition and disease by feral pigs (CoA 2014) |
| Squatter pigeon (southern) (*Geophaps scripta scripta*) | ▶ Approved Conservation Advice for *Geophaps scripta scripta* (squatter pigeon (southern)) (TSSC 2015)<br>▶ Threat abatement plan for predation by feral cats (Commonwealth of Australia 2015)<br>▶ Threat abatement plan for competition and land degradation by rabbits (Commonwealth of Australia 2016)<br>▶ Threat abatement plan for predation by the European red fox (DEWHA 2008a) |
| Australian painted snipe (*Rostratula australis*) | ▶ Commonwealth Listing Advice for *Rostratula australis* (Australian painted snipe) (TSSC 2013b)<br>▶ Approved Conservation Advice for *Rostratula australis* (Australian painted snipe) (DSEWPaC 2013b) |
| King blue-grass (*Dichanthium queenslandicum*) | ▶ Approved Conservation Advice for *Dichanthium queenslandicum* (king blue-grass) (DSEWPaC 2013c)<br>▶ Commonwealth Listing Advice on *Dichanthium queenslandicum* (king blue-grass) (TSSC 2013c)<br>▶ Draft National Recovery Plan for the "bluegrass (*Dichanthium* spp.) dominant grasslands in the Brigalow Belt Bioregions (north and south)" endangered ecological community (Butler 2008b) |
| Bluegrass (*Dichanthium setosum*) | ▶ Approved Conservation Advice for *Dichanthium setosum* (DEWHA 2008b)<br>▶ Commonwealth Listing Advice on *Dichanthium setosum* (bluegrass) (TSSC 2012)<br>▶ Draft National Recovery Plan for the "bluegrass (*Dichanthium* spp.) dominant grasslands in the Brigalow Belt Bioregions (north and south)" endangered ecological community (Butler 2008b)<br>▶ Threat abatement plan for competition and land degradation by rabbits (Commonwealth of Australia 2016) |

# 4 MANAGEMENT APPROACH

## 4.1 AVOIDING AND MINIMISING ENVIRONMENTAL IMPACTS

U&D's overarching approach to environmental management is to avoid, minimise and mitigate potential impacts associated with construction and operation of the Project on MNES and MNES habitat. In accordance with this approach U&D commits to the following:

- Maintaining water flows into Naroo Dam by diverting overland flows around the mine into the dam.
- Restricting vegetation clearing to that which is essential for the development of the Project.
- Authorising vegetation clearing/excavation only in accordance with the Project's clearing/disturbance permitting system (i.e. permit to disturb). This is to ensure that the Environmental Representative has reviewed all proposed clearing/excavation activities throughout operation of the mine.
- Ensuring vegetation connectivity around the mining operation is retained wherever possible.
- Facilitating natural regeneration in non-remnant areas surrounding the Project site, particularly where it improves connectivity of corridors.
- Implementing a monitoring program that provides for 'early control' (that management actions are effective) and 'early warning' (corrective actions are required) functions, to inform timely decisions on corrective actions to ensure performance targets are achieved.
- Adopting an adaptive management approach which involves ongoing assessment of the effectiveness of the management plan in achieving its objectives, and iterative amendments to management actions based on the results and outcomes of the ongoing assessment, including the results of the monitoring program.
- Following disturbance, areas will be rehabilitated and revegetated to be consistent with densities, composition and distribution of native vegetation based on the pre-clearing regional ecosystems.

## 4.2 ADAPTIVE MANAGEMENT

The MNESMP is based on an adaptive management approach which involves 'flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood' (National Research Council 2004).

Adaptive management includes two key phases. The first phase involves the establishment of the key components of a management framework including engaging stakeholders, developing clear and measurable objectives and performance criteria, identification and selection of potential management actions and the development of monitoring protocols which enable the evaluation of progress towards achieving objectives and which will effectively contribute to the adaptive decision-making process. The second phase is an iterative learning phase which involves utilisation of the management framework to learn about the natural resource system and iteratively adapt management strategies and approaches based on what is learned (Williams 2011).

### 4.2.1 Management Process for this MNESMP

Figure 4 below illustrates the overarching management process for this MNESMP which is based on an adaptive management approach. The management process is an ongoing cycle of implementation, learning and review and involves:

- completion of a risk assessment to determine the risk of failure to achieve the objectives of the MNESMP for each MNES (complete – see Appendix D)

- implementation of mitigation and management measures to minimise the impact of the Project on MNES and their habitat
- monitoring to:
  - evaluate performance of the MNESMP against performance criteria
  - identify triggers for further action
  - develop contingency plans and corrective actions if required
  - capture learnings from plan implementation and assess the effectiveness of the management framework
  - inform subsequent reviews and amendments to the MNESMP
- implementation of contingency plans and corrective actions
- review of the MNESMP and management framework
- amending the MNESMP to ensure continuous improvement of the management framework based on learnings obtained.

Notwithstanding amendments made through the adaptive management process, the MNESMP will also be reviewed annually and, if required, amended as described in Section 14. Any new data and information collected will be incorporated into the plan. This data may be obtained as a result of implementing the plan, or from new information derived from external sources.

It is anticipated that through adherence to the adaptive management process, the habitat management goals for each MNES will be maintained for the life of the Project.

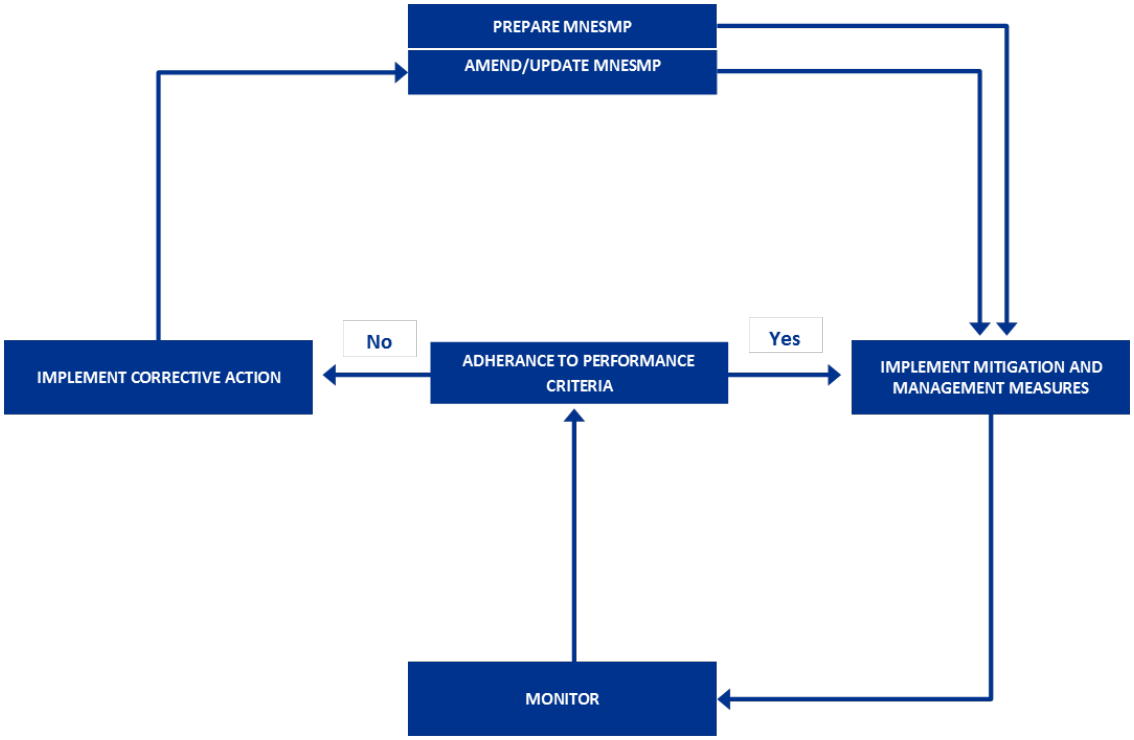


**Figure 4: Management process**

# 5 EXISTING ENVIRONMENT

The following provides a brief overview of the existing environmental conditions and values within the vicinity of the Project.

## 5.1 CLIMATE AND METEOROLOGY

The Project site is in the Central Queensland region which has a sub-tropical climate with hot, moist summers and warm, dry winters, with occasional frost in the south. Rainfall in the Central Queensland region is highly seasonal, with most rain occurring during October to March.

## 5.2 LAND USE

The Project site and surrounding lands have been extensively grazed from 1850 to the present. Much of the area was cleared in the 1960's and in recent decades has been largely used for grazing on native vegetation, with some dryland cropping and minor forestry. Current land uses are pastoral, open cut coal mining and there are also several conservation tenures within 30 km of the Project site (Albinia National Park, Conservation Park and Resources Reserve; Mount Hope, Mount Pleasant and Cairdbeign State Forests; Carnavon National Park – see Figure 1).

## 5.3 GEOLOGY AND TOPOGRAPHY

The Project site is situated on the edge of the Bowen Basin in a tectonic region known as the Denison Trough, in which thick sequences of Permian and Triassic sediments were deposited.

On the Project site itself, the geology comprises Quaternary alluvium and Tertiary basalt overlying Permian sedimentary rocks. Alluvium primarily occurs along major drainage features.

Topography over the Project site is relatively flat to gently undulating, with approximately 50 m of relief across the area. Steeper topography occurs to the west of the Project site.

## 5.4 TERRESTRIAL ECOLOGY

### 5.4.1 Vegetation communities

The Project site lies within Province 6 (Northern Bowen Basin) in the Brigalow Belt Bioregion. Soils of the Project site are described as being associated with Land Zones 3 and 8. These land zones are described as follows:

- Land Zone 3 - Quaternary alluvial systems, including floodplains, alluvial plains, alluvial fans, terraces, levees, swamps, channels, closed depressions and fine textured paleo-estuarine deposits; and
- Land Zone 8 - Cainozoic igneous rocks, predominantly flood basalts forming extensive plains and occasional low scarps. Also includes hills, cones and plugs on trachytes and rhyolites, and associated interbedded sediments, and talus.

Six remnant vegetation communities were identified during ground truthing of the Project site. About one third of the Project site has been previously cleared for grazing, with grazing occurring until 2013. The site also shows evidence of historic logging and more recent ringbarking in the vegetation communities associated with alluvial soils near Naroo Dam. As such, around 510 ha of non-remnant areas are present on the site, including cleared areas and areas of exotic grasses with or without emergent *Eucalyptus* spp. saplings (CQU 2012). The six remnant vegetation communities are described below in Table 4.

**Table 4: Regional ecosystems within the Project site**

| Vegetation Community Description | Regional Ecosystem | Status under the Qld VMA | Area (ha) in Project site |
|---|---|---|---|
| Riverine wetland or fringing riverine wetland. *Melaleuca bracteata* woodland. On alluvial plains. | 11.3.3a | Of Concern | 3 |
| *Eucalyptus orgadophila* grassy open-woodland. With sub-dominant species of *Corymbia erythrophloia* and *E. melanophloia*. Sparse shrubs with a moderately dense to dense ground layer dominated by *Themeda triandra*, *Dichanthium sericeum* and *Heteropogon contortus.* | 11.8.5 | Least Concern | 598 |
| Grassland dominated by *Dichanthium sericeum*, *Heteropogon contortus* and *Aristida* spp. With occasional emergent *Eucalyptus orgadophila*. | 11.8.11 | Of Concern | 424 |
| *Melaleuca bracteata* woodland associated with drainage depressions, over grasslands dominated by *Chloris divaricata* and containing *Dichanthium sericeum, Iseilema vaginiflorum* and *Heteropogon contortus*. | 11.8.11a[1] (subset of 11.8.11) | Of Concern | 50 |
| *Eucalyptus populnea* with occasional small *Acacia harpophylla* (over a grassy ground cover of *Paspalidium caespitosum* and *Chloris divaricata*. | 11.8.15 | Endangered | 513 |
| *Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains. | 11.4.3 | Endangered | 2.21 |

[1]Note that RE 11.8.11a is no longer a recognised regional ecosystem since the release of version 12 of the Regional Ecosystem Description Database (REDD) in March 2021 (Queensland Herbarium 2021). Instead, all areas of RE 11.8.11a are now recognised as RE 11.3.25d. This constitutes not only a change in RE, but a change in land zone. Notwithstanding, all mention of RE 11.8.11a will continue given historical approval incorporating this regional ecosystem.

### 5.4.2 Fauna

One hundred and sixty-one terrestrial vertebrate species were identified during the initial two seasonal surveys of the Project site, undertaken from 1 to 6 November 2011, and 2 to 8 August 2012 (CQU 2012). They were comprised of:

- 110 bird species
- eight amphibians
- 13 reptiles
- 14 non-avian mammals
- 16 bats

The Australian painted snipe was the only EPBC Act listed species recorded during these surveys.

During baseline monitoring surveys undertaken between 7 and 12 December 2017 (see Appendix C), targeted fauna surveys failed to detect the squatter pigeon or Australian painted snipe, however a single Latham's snipe (*Gallinago hardwickii*) - an EPBC-listed migratory species - was observed.

### 5.4.3 MNES Baseline Habitat Condition

Based on the results of the baseline site condition assessments undertaken in December 2017 (refer to Appendix C), habitat quality scores for the six MNES ranged between 4.74 (Australian painted snipe) and 8.04 (Natural grasslands TEC) out of 10 (Table 5). The comparatively low score for Australian painted snipe habitat is in part attributable to the low site condition for RE 11.3.3a habitat (5.25), but also the low fauna species habitat index (2.40), reflecting an absence of appropriate foraging and shelter habitat for the

species. In contrast, Natural Grasslands TEC habitat had the highest habitat quality score (8.04), attributable in large part to greater than benchmark condition species richness for grasses and forbs at each of the contributing RE 11.8.11 sites.

**Table 5: Monitoring sites showing their habitat quality scores contributing to MNES**

| Site | RE | Brigalow TEC | Natural Grasslands TEC | King blue-grass | Bluegrass | Squatter pigeon | Australian painted snipe |
|---|---|---|---|---|---|---|---|
| 01 | 11.8.5 | | | | | 7.02 | |
| 02 | 11.8.11 | | 8.21 | 6.57 | 6.57 | | |
| 03 | 11.8.5 | | | | | 8.14 | |
| 04 | 11.8.11 | | 7.68 | 6.14 | 6.14 | | |
| 05 | 11.8.5 | | | | | 6.19 | |
| 06 | 11.8.11 | | 7.86 | 6.29 | 6.29 | | |
| 07 | 11.4.3 | 7.36 | | | | | |
| 08 | 11.8.11 | | 8.39 | 8.05 | 6.71 | | |
| 09 | 11.3.3a | | | | | | 4.74 |
| 10 | 11.8.5 | | | | | 7.85 | |
| Average score | | 7.36 | 8.04 | 6.76 | 6.43 | 7.30 | 4.74 |

### 5.4.4 Pests and Weeds

The ecological assessments undertaken during the 2011 and 2012 surveys revealed that there was a low abundance of weed cover over most of the Project site. Weed species of environmental and/or biodiversity significance identified at the Project site are presented in Table 6. Four exotic pest species were recorded at the Project site which included the cane toad (*Rhinella marina*), house mouse (*Mus musculus*), European rabbit (*Oryctolagus cuniculus*) and feral pig (*Sus scrofa*). Domestic species such as cattle and horses were also present.

Baseline surveys undertaken in December 2017 identified 16 weed species at the 20 weed monitoring plots, with weed cover averaging 7.1%, and ranging between 0% (Site 08) and 54% (Site 20). Section 3.3 and Figure 7 of Appendix C (MNES baseline monitoring report) describe and depict the baseline data on weeds within each of the weed monitoring plots. During these baseline surveys, the presence of three species of pest animal were identified:

- European hare (*Lepus europaeus*)
- wild dog (*Canis familiaris/lupus*)
- cat (*Felis catus*).

The assessment of overall rabbit/hare impact was noted as 'acceptable' for all sites except site R02 which was denoted as 'monitor closely'. Across all eight pig monitoring plots there was no confirmed evidence of feral pigs.

**Table 6: Weed species identified at the Project site**

| Species | Common name |
|---|---|
| *Acacia farnesiana (Vachellia farnesiana)* | Mimosa bush |
| *Argemone ochroleuca* | Mexican poppy |
| *Asclepias curassavica* | Red-head cottonbush |
| *Aster subulatus* | Bushy starwort |
| *Bidens bipinnata* | Bipinnate beggar's ticks |
| *Bidens pilosa* | Cobbler's peg |
| *Bothriochloa pertusa* | Indian bluegrass |
| *Brassica juncea* | Indian mustard |
| *Cenchrus ciliaris* | Buffel grass |
| *Centaurium tenuiflorum* | |
| *Cirsium vulgare* | Spear thistle |
| *Clitoria ternatea* | Butterfly pea |
| *Crotalaria juncea* | Sunn hemp |
| *Cyclospermum leptophyllum* | Slender celery |
| *Cyperus rotundus* | Nutgrass |
| *Dichanthium annulatum* | Sheda grass |
| *Dichanthium aristatum* | Angleton grass |
| *Emilia sonchifolia* | Purple Emily |
| *Gomphocarpus physocarpus* | Balloon cotton bush |
| *Gomphrena celosioides* | Gomphrena weed |
| *Macroptilium lathyroides* | Phasey bean |
| *Malvastrum americanum* | Spiked malvastrum |
| *Malvastrum coromandelianum* | Prickly malvastrum |
| *Melinis repens* | Red natal grass |
| *Opuntia stricta* | Common prickly pear |
| *Opuntia tomentosa* | Velvety tree pear |
| *Parthenium hysterophorus** | Parthenium |
| *Paspalum dilatatum* | Paspalum |
| *Pennisetum ciliare (Cenchrus ciliaris)* | Buffel grass |
| *Scoparia dulcis* | Scoparia |
| *Senecio madagascariensis** | Fireweed |
| *Sida cordifolia* | Flannel weed |
| *Sida spinosa* | Spiny sida |
| *Solanum americanum* | Glossy nightshade |
| *Sonchus oleraceus* | Common sowthistle |
| *Sorghum halepense* | Johnson grass |
| *Stylosanthes scabra* | Shruby stylo |

| Species | Common name |
|---|---|
| *Verbena litoralis var. litoralis* | |
| *Verbena officinalis* | Common verbena |
| *Xanthium pungens* | Noogoora burr |

**Biosecurity Act 2014* (Qld) Category 3 matter – must not be distributed or released into the environment

## 5.5 AQUATIC ECOLOGY AND HYDROLOGY

The Project is located within the Fitzroy Basin. The watercourses in the vicinity of the Project area form part of the Comet River catchment, a major tributary of the Fitzroy River. Several small drainage paths located on the Project site flow to Spring Creek in the south and Aldebaran Creek in the north, both of which drain into Meteor Creek (Spring Creek via Bootes Creek) which flows to the Comet River approximately 35km downstream of the Project site.

The other major aquatic feature in the vicinity of the Project area is Naroo Dam, situated on the eastern side of the Project area.

Each of the aquatic features on or near the Project site are described below.

### 5.5.1 Spring Creek

Spring Creek is located to the south and east of the Project site. The southern portion of the Project site is situated within the catchment of Spring Creek, comprising 8.5 $km^2$ of the 61.1 $km^2$ Spring Creek catchment. A further 23.8 $km^2$ of the Spring Creek catchment is located within the Rolleston Coal Mine lease.

Spring Creek is an ephemeral creek which flows only after rainfall events. However, some shallow waterholes may persist after the flow ceases. The portion of the Spring Creek channel located adjacent to the Project area is generally clear of vegetation with some small stands of trees located along the banks and within the channel. Significant erosion is present due to stock accessing the creek for water impacting the soils. The dominant land use within this section of the Spring Creek catchment is low intensity grazing (Plate 1). The ecological assessments undertaken for the Project (CQU 2012 and Ecosure 2013) did not identify Spring Creek as potential habitat for any MNES.

**Plate 1: Spring Creek Channel in Vicinity of the Project site**

### 5.5.2 Aldebaran Creek

The northern portion of the Project site, including the access road is situated within the catchment of Aldebaran Creek. Aldebaran Creek is located to the north and east of the Project site and flows in a north-easterly direction, crossing the Dawson Highway, then changing to a south-easterly direction and draining into Meteor Creek approximately 17 km downstream of the highway. Aldebaran Creek is an ephemeral creek which flows only after rainfall events. However, some shallow waterholes may persist after the flow ceases. The Aldebaran Creek channel is well vegetated with a sandy bed. The dominant land use within the Aldebaran Creek catchment is low intensity grazing, with the creek considered a watering point on stockroute PO42, which runs alongside the Dawson Highway (Plate 2). The ecological assessments undertaken for the Project (CQU 2012 and Ecosure 2013) did not identify Aldebaran Creek as potential habitat for any MNES.

**Plate 2: Aldebaran Creek channel at the Dawson Highway**

### 5.5.3 Meteor Creek

Spring Creek and Aldebaran Creek flow into Meteor Creek. Meteor Creek bisects the neighbouring Rolleston Coal Mine lease, flowing in a north-easterly direction draining into the Comet River approximately 14 km from the Dawson Highway. The Meteor Creek catchment area constitutes approximately 9% of the Comet River catchment upstream of the Mackenzie River. Meteor Creek is an ephemeral creek which flows only after rainfall events. However, some shallow waterholes may persist after the flow ceases. The dominant land use within the Meteor Creek catchment is low intensity grazing and conservation (National Park). Meteor Creek has a gravelly bed with well vegetated banks (Plate 3).

**Plate 3: Meteor Creek channel at Dawson Highway**

**Plate 4: Southern Catchment Drainage Path Channel associated with Naroo Dam**

### 5.5.4 Aquatic Flora

Five aquatic plant species were recorded at the Project survey sites. Most of the plants had moderate abundance however there was a high abundance of bulrush (*Typha orientalis*) at the Creek 3 site and water nymph (*Najas tenuifolia*) at Naroo Dam. No aquatic flora of conservation significance was identified within the Project site. No exotic aquatic species were identified.

### 5.5.5 Aquatic Fauna

Three native fish species, one turtle and twenty-two waterbird species were observed during the aquatic survey undertaken from 1 to 6 November 2011 (CQU 2012). No mega-invertebrates (prawns, shrimp or yabbies) were found in the Project site. Naroo Dam had the greatest abundance and species richness of the freshwater sites that were surveyed. No freshwater species were recorded at two of the creek sites.

Of the 110 species of birds recorded, 22 were waterbirds, including the Australian painted snipe, which is addressed in Section 9 of this document.

# 6 BRIGALOW THREATENED ECOLOGICAL COMMUNITY

## 6.1 STATUS AND DISTRIBUTION

Brigalow (*Acacia harpophylla* dominant and co-dominant) Threatened Ecological Community (Brigalow TEC) is listed as endangered under the EPBC Act.

Brigalow TEC occurs in semi-arid areas of Queensland and New South Wales (DoE 2013). It extends from south of Townsville in Queensland to Narrabri in New South Wales, and east of Blackall, Charleville, Cunnamulla and Bourke.

In Queensland it occurs within the Brigalow Belt North, Brigalow Belt South, Darling Riverine Plains and South-east Queensland Interim Biogeographic Regionalisation for Australia (IBRA) bioregions (DoE 2013).

## 6.2 COMMUNITY ECOLOGY

### 6.2.1 Community Description

Brigalow TEC is an open forest to open woodland characterised by the presence of Brigalow (*Acacia harpophylla*) as one of the three most abundant tree species (DoE 2013). It incorporates a range of vegetation structures and composition including species that prefer acidic and salty clay soils (Butler 2008a).

*Acacia harpophylla* is either dominant or co-dominant in the tree layer occurring with other species such as belah (*Casuarina cristata*), *Acacia* sp. and *Eucalyptus* sp. Common Eucalypt species that are associated with Brigalow TEC include Dawson gum, mountain yapunyah, coolibah, Pilliga box, grey box, gum-topped box, Reid River box and Chinchilla whitegum. Common Acacia species that are associated with Brigalow TEC include gidgee (*Acacia cambagei*), blackwood (*Acacia melanoxylon*), myall and yarran (Butler 2008a).

The height of the dominant tree layer varies from approximately 9 m in low rainfall areas averaging 500 mm per annum, up to 25 m in higher rainfall areas averaging 750 mm per annum.

Brigalow TEC generally includes one or more shrub layers below the tree canopy. Common shrub species that are present include wilga (*Geijera parviflora*), false sandalwood (*Eremophila mitchellii*), yellowwood (*Terminalia oblongata*), peach bush, scrub boonaree, western rosewood, small-fruited mock-olive, Ellangowan poison bush, lime bush, wild orange, narrow-leaved bumble and broom bush (Butler 2008a).

Currant bush is often present as a patchy lower shrub layer, as well as a range of climbing plants including small-leaf grape, nipan, native jasmines and northern silk-pod (*Parsonsia lanceolata*).

There is generally a sparse ground layer, with small chenopod sub-shrubs present, and limited presence of grasses and small forbs (Butler 2008a).

Most Brigalow soils are saline, relatively fertile and have a clay field texture throughout the profile (Butler 2008a). In Queensland, the soils are predominantly cracking clays where Brigalow is dominant, but texture contrast soils are common where Eucalyptus species are co-dominant.

### 6.2.2 Regional Ecosystems Associations

In Queensland, Brigalow TEC is defined by 16 regional ecosystems (REs). Regional Ecosystem 11.4.3, which has been identified within the Project site, forms part of the Brigalow TEC. A description of RE 11.4.3 is provided in Table 7.

**Table 7: Regional ecosystems located within the Project site associated with Brigalow TEC**

| RE | VM Status | RE description |
|---|---|---|
| 11.4.3 | Endangered | *Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains. |

### 6.2.3 Condition Thresholds

Brigalow TEC can comprise both remnant and regrowth (i.e. non-remnant) vegetation, particularly regrowth vegetation greater than 15 years old (Butler 2008a). As stated in DoE 2013, remnant REs in poor condition, which would otherwise be considered Brigalow TEC, should be excluded from the listed Brigalow TEC. These include patches where vegetation has been comprehensively cleared in the last 15 years, and/or exotic

perennial plants have a cover of more than 50%, and/or individual patches are less than 0.5 ha in size. Therefore, Brigalow TEC is limited to patches that meet the following condition thresholds (DoE 2013):

- the patch must be greater than 0.5 ha in size
- exotic perennial plants must comprise less than 50% of total vegetation cover of the patch (as assessed over a minimum sample area of 0.5 ha that is representative of the patch).

### 6.2.4 Known Locations within the Project site

As illustrated in Figure 5, a small area of regrowth Brigalow TEC has been mapped within the Project site close to Naroo Dam (Ecosure 2013). The patch is approximately 2.21 ha in size and corresponds to high value regrowth of RE 11.4.3. None of the Brigalow TEC within the Project site will be cleared.

### 6.2.5 Condition within Project site

A BioCondition assessment was undertaken in accordance with Eyre et al (2011) within RE 11.4.3 (Ecosure 2013). The results of the assessment indicate a BioCondition score of 65/100 which corresponds with a BioCondition class of 2. Communities with a BioCondition class of 2 are classified as moderately functional.

Baseline habitat condition assessments undertaken in accordance with the Guide to determining terrestrial habitat quality (DEHP 2017) during December 2017, determined that the patch of Brigalow TEC had a habitat quality score of 7.36 out of 10.


**Figure 5: Location of Brigalow TEC within property boundary**

## 6.3 THREATS

Brigalow TEC once covered an area of more than 7,000,000 ha in semi-arid eastern Australia, however, by 2003 the remnant extent of Brigalow TEC had been reduced to about 560,000 ha (Butler 2008a). The key threats to Brigalow TEC, in order of significance, are described in Table 8. Whilst climate change is an emerging threat (DoE 2013), capacity to address this threat is beyond the scope of this plan

**Table 8: Threats to Brigalow TEC**

| Threat | Description |
|---|---|
| Clearing | The clearing of Brigalow, predominantly post 1960, is the primary reason for its listing as Endangered. The introduction of vegetation clearing laws in Queensland afford some protection, however, clearing is still permitted for certain activities (e.g. routine property maintenance, mining, and energy and transport infrastructure projects) and illegal clearing is also a serious threat (Butler 2008a).<br>Mapping under the Qld *Vegetation Management Act 1999* (VM Act) is used to protect vegetation, however, due to limitations of scale and accuracy, potentially significant patches of Brigalow TEC (i.e. non-remnant or those below the mapping scale) are not afforded protection under the VM Act (Butler 2008a). |
| Fire | Historically, fire has been rare in Brigalow TEC and whilst Brigalow can recover from fire by suckering from the roots, recovery is a slow process and the structure of Brigalow forests can be significantly altered (Butler 2008a).<br>Butler (2008a) states that 'with the exception of clearing, the most important threat to remnant and regrowth Brigalow is fire fuelled by exotic grasses'. Fire exclusion is therefore the recommended fire regime for Brigalow TEC. |
| Invasive species (plants and animals) | Invasive plant and animal species threaten the biodiversity of Brigalow TEC by affecting the ecosystem's suitability as habitat for native species, and they can significantly alter the structure or function of the community (Butler 2008a).<br>Exotic pasture grasses, such as buffel grass, currently pose the greatest threat to Brigalow TEC due to their propensity to increase fire risk, intensity and frequency. However, other weed species also occur in and affect Brigalow TEC, including succulents (e.g. tree pear, prickly pear and Harrisia cactus), mother of millions, climbing weeds (e.g. rubber vine, asparagus and Brazilian nightshade), shrubs and trees (e.g. African box thorn and parkinsonia) and herbaceous weeds (e.g. noogoora burr, inkweed and coal berry). Maintaining an intact and healthy tree canopy cover increases resistance to weeds and reduces the threat from weeds to Brigalow TEC (Butler 2008a).<br>A variety of invasive animal species are present within Brigalow TEC, with feral pigs likely to be the most widespread and problematic (Butler 2008a). Feral pigs can cause significant degradation by impacting young plants and disturbing soil (DoE 2013).<br>Other serious pest animal species affecting Brigalow TEC include cane toads, cats, foxes and goats. All these species are responsible for key threatening processes listed under the EPBC Act (DoE 2013). Although a native species, noisy minors (*Manorina melanocephala*) impact on Brigalow TEC by excluding all small native bird species from the areas they occupy (DoE 2013). |
| Inappropriate grazing | Trampling and grazing by large herbivores can have a detrimental impact on Brigalow TEC. Trampling results in soil compaction and reduces the availability of leaf litter and coarse woody debris, which is likely to degrade fauna habitat values. Trampling can also alter the composition and density of herbs and shrubs in the understorey (DoE 2013). Grazing impacts plant recruitment and growth but is also an important tool for the management of fuel loads, particularly the management of exotic pasture grasses (Butler 2008a). |
| Climate change | While *Acacia harpophylla* and its associated species are considered to be tolerant of a broad range of environments, their ability to cope with the expected unprecedented future climatic conditions is unknown, and the rates of change are expected to be higher than previously experienced (Butler 2008a). |

| Threat | Description |
|---|---|
| | In addition, the landscape within which Brigalow TEC faces climate change is significantly different from those of the past, and this may limit its capacity to adapt to changing conditions. For example, threats posed by exotic pasture grasses and fire may be worsened by increased variability in rainfall (Butler 2008a). |

## 6.4 PROJECT IMPACTS

Table 9 outlines potential impacts to Brigalow TEC that may occur as a result of construction or operation of the Project.

**Table 9: Potential impacts to Brigalow TEC as a result of the Project**

| Threat | Potential Project impacts |
|---|---|
| **Recognised threats as per conservation documents** | |
| Clearing | There will be no clearing of Brigalow within the Project site. |
| Fire | Construction and operation of the Project has the potential to increase fire hazards and fire risk (e.g. storage of fuel, waste laydown areas and scrap tyre storage areas).<br>There is also the potential for increase of fuel loads (e.g. exotic pasture grasses) as a result of the introduction of exotic pasture grasses within Brigalow TEC areas. |
| Invasive species (plants and animals) | Spread of existing, and/or introduction of, invasive plant species through the movement of vehicles and machinery.<br>Increase in pest animal numbers and/or introduction of new invasive animal species through Project construction and operation (e.g. poor mine site waste management practices) has the potential to impact on Brigalow TEC through increased grazing of native plants and soil disturbance. |
| **Other threats** | |
| Dust | Dust emissions from the construction and/or operation of the Project may smother Brigalow TEC and constituent species adjacent to the Project site. |

# 7 NATURAL GRASSLANDS THREATENED ECOLOGICAL COMMUNITY

## 7.1 STATUS AND DISTRIBUTION

Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin Threatened Ecological Community (natural grasslands TEC) is listed as endangered under the EPBC Act.

Natural grasslands TEC is endemic to Queensland. It occurs within the Brigalow Belt North (BBN) and Brigalow Belt South (BBS) IBRA bioregions (DEWHA 2008c), extending from Collinsville in the north to Carnarvon National Park in the south. Natural grasslands TEC occurs within eight IBRA subregions: BBN 6 Northern Bowen Basin, BBN 9 Anakie Inlier, BBN 10 Basalt Downs, BBN 11 Isaac-Comet Downs, BBN 12 Nebo-Connors Range, BBN 13 South Drummond Basin, BBS 1 Claude River Downs and BBS 9 Buckland Basalts.

It mostly occurs within the Fitzroy River Basin; however, it does extend part way into adjacent catchments including where five of the subregions extend into the Burdekin River Basin and where one subregion extends into the Warrego River Basin (DSEWPaC 2013a).

## 7.2 COMMUNITY ECOLOGY

### 7.2.1 Community Description

Natural grasslands TEC are native grasslands characteristically comprising perennial native grasses. They occur on flat or gently undulating rises, on fine textured soils (often cracking clays) derived from either basalt or fine-grained sedimentary rocks. Soils have either formed *in situ* or have been transported to form extensive alluvial plains along watercourses (DSEWPaC 2013a). Natural grasslands TEC occurs in areas with relatively high summer rainfall.

Natural grasslands TEC are dominated by *Dicanthium* spp. (bluegrass), with tropical *Aristida* spp. and *Panicum* spp. (panic grasses) (TSSC 2009b). They lack temperate grasses (e.g. *Austrostipa* spp. and *Austrodanthonia* spp.) which are a more dominant feature of grasslands in the south. Native grasses are the primary indicator of the TEC, however, a range of forbs are also typically present (e.g. *Commelina ensifolia* (scurvy grass), *Corchorus trilocularis* (native jute), *Ipomoea lonchophylla* (cow vine), *Vigna lanceolata* (pencil yam), *Vigna radiata* (mung bean), *Desmodium campylocaulon* (creeping tick trefoil), *Neptunia gracilis* (native sensitive plant), *Psoralea tenax* (emu foot), *Rhynchosia minima* (rhyncho), *Crotalaria dissitiflora* (grey rattlepod), *Glycine latifolia* and *Hibiscus trionum* var. *vesicarius* (bladder ketmia).

A shrub layer is generally a minor component of natural grasslands TEC, however, in some areas there can be a more extensive shrub cover including species such as *Acacia salicina* (Sally wattle) and *Acacia farnesiana* (mimosa) (TSSC 2009b).

A tree canopy is usually absent, but when present, projective crown cover is no more than 10% (TSSC 2009b). Species present may include *Corymbia erythrophloia* (gum-topped bloodwood), *Eucalyptus coolabah* (coolibah), *E. crebra* (narrow-leaved ironbark), *E. melanophloia* (silver-leaved ironbark), *E. orgadophila* (mountain coolibah), *E. populnea* (poplar box), and *Melaleuca bracteata* (black tea-tree).

There can be seasonal variation in the appearance of natural grasslands TEC as many native wildflowers are more visible during spring (DSEWPaC 2013a). In addition, some wildflowers do not appear every year and some species that are sensitive to disturbance may decline or disappear from disturbed sites (e.g. grazing sensitive species may disappear from sites that are intensively grazed) (DSEWPaC 2013a).

### 7.2.2 Condition Thresholds

Condition thresholds have been established to determine when a patch is considered to be part of the ecological community. Condition thresholds aim to focus on the protection of vegetation remnants in relatively good to excellent condition (DSEWPaC 2013a).

Natural grassland TEC is considered to be present and to be of the **best quality** if:

- the patch occurs within any of the subregions of the Brigalow Belt North and Brigalow Belt South bioregions outlined above in Section 7.1.
- trees are absent or sparse such that the projective foliage cover of trees in the patch is 10% or less.
- there are at least 200 native grass tussocks in the patch.
- the patch size is at least 1 hectare.
- there are at least four perennial native grass indicator species present.
- the total projective foliage cover of shrubs is less than 30%.
- perennial non-woody introduced species make up less than 5% of the total perennial projective foliage cover.

Natural grassland TEC is considered to be present and to be of **good quality** if:

- the patch occurs within any of the subregions of the Brigalow Belt North and Brigalow Belt South bioregions outlined above in Section 7.1.
- trees are absent or sparse such that the projective foliage cover of trees in the patch is 10% or less.
- there are at least 200 native grass tussocks in the patch.
- the patch size is at least 5 hectares.
- there are at least three perennial native grass indicator species present.
- the total projective foliage cover of shrubs is less than 50%.
- perennial non-woody introduced species make up less than 30% of the total perennial projective foliage cover.

### 7.2.3 Regional Ecosystems Associations

Natural grassland TEC corresponds closest to 7 regional ecosystems in Queensland. Regional Ecosystem 11.8.11, which has been identified within the Project site, is one of the REs that corresponds with natural grasslands TEC. A description of RE 11.8.11 is provided in Table 10.

**Table 10: Regional ecosystems located within the Project site associated with natural grasslands TEC**

| RE | VM Status | RE Description |
|---|---|---|
| 11.8.11 | Of concern | *Dichanthium sericeum* grassland on Cainozoic igneous rocks. |

### 7.2.4 Known Locations within the Project site

A total of 424 ha of natural grasslands TEC has been identified within the Project site (Gaia 2015). As illustrated in Figure 6, various patches of natural grasslands TEC are located throughout the Project site, particularly in the north-east and south of the Project site.

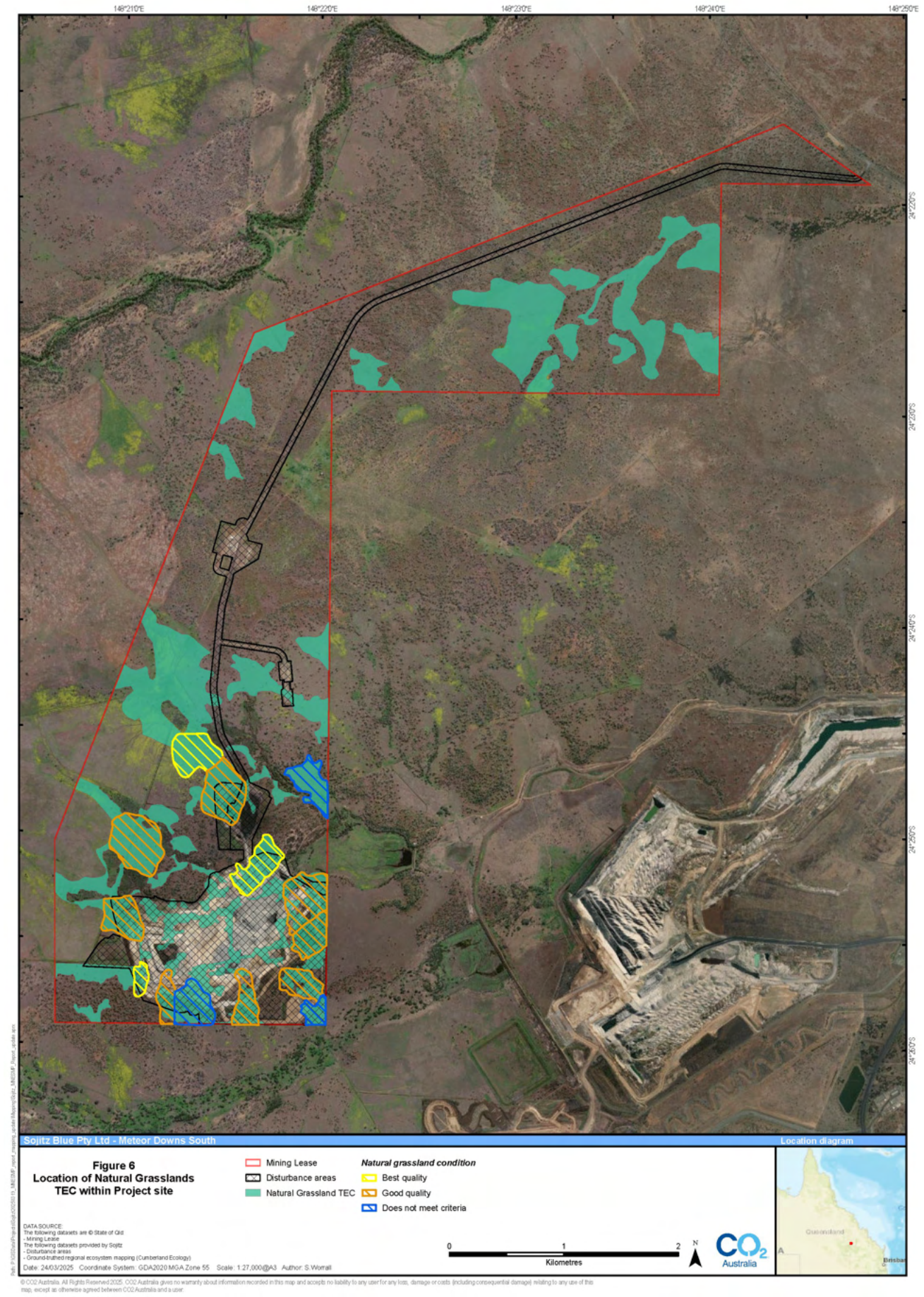


**Figure 6: Location of Natural Grassland TEC within Project site**

### 7.2.5 Condition within the Project site

The natural grasslands TEC within the Project site are generally in good to best condition (Ecosure 2013). Condition assessments concluded that eight natural grassland TEC patches met the good condition class, and three met the best condition class (Figure 6). However, it is important to note that not all patches were assessed to determine their condition class during the surveys.

Within the Project site, four BioCondition assessments were undertaken in RE 11.8.11. The average BioCondition score for RE 11.8.11, based on these results, is 67/100 which corresponds with a BioCondition class of 2 (Gaia 2015). Communities with a BioCondition class of 2 are classified as moderately functional. In some patches, there are signs of heavy grazing and over-sowing with exotic pasture grasses including buffel (*Cenchrus ciliaris*), bambatsi (*Panicum coloratum* var. *makarikariensis*) and Indian blue-grass (*Bothriochloa pertusa*). Whilst buffel was found to be dense in some locations it never comprised more than 50% of the sward (Ecosure 2013).

Of the 424 ha of natural grasslands TEC present, 109.7 ha will be cleared as a result of the Project.

Baseline surveys conducted in December 2017 determined that the habitat quality scores for areas of Natural Grasslands TEC ranged between 7.68 and 8.39 out of 10 (average of 8.04 out of 10). These relatively high scores are attributable in large part to greater than benchmark condition species richness for grasses and forbs at each of the RE 11.8.11 plot sites.

## 7.3 THREATS

Natural grasslands TEC, and other native grasslands and grassy woodlands, were once present in large areas throughout Australia, however, they are now one of the most threatened ecosystems in the country (TSSC 2009b). This is largely due to the conversion of native pastures to improved pastures and cropping and overgrazing by stock. The key known threats to natural grasslands TEC, as listed in the conservation and listing advice, are described below in Table 11.

**Table 11: Threats to Natural Grasslands TEC**

| Threat | Description |
|---|---|
| Grazing, cropping and pasture improvement | Remaining patches of natural grasslands TEC are predominantly subject to grazing (TSSC 2009b). With persistent heavy grazing of these patches, dominant perennial plants are eliminated in favour of annual species, particularly weeds (TSSC 2009b). Grazing also results in soil compaction and loss of ground cover which impacts habitat for grassland fauna species.<br>The expansion of exotic pastures and tree crops impacts natural grassland TEC by replacing the native grassland with introduced species (e.g. buffel grass), or altering the structure of the community through the introduction of a woody over-storey (e.g. leucaena) (TSSC 2009b).<br>Some techniques used to develop and improve pastures exacerbate impacts to the TEC more than other techniques. For example, more intensive preparation of the seedbed and greater soil disturbance increases the impacts on natural grasslands TEC and its constituent species (TSSC 2009b). |
| Invasive species (plants and animals) | Impacts of pest animals on natural grasslands TEC including predation and competition with native animals, grazing of native plants and soil disturbance through burrowing and digging (TSSC 2009b).<br>Pest animals that occur in this community include rabbits, feral cats, European fox, and the house mouse, which is the most abundant pest animal in natural grasslands TEC. House mouse competes with native mammals, reptiles and birds and may also impact upon seed production and recruitment of some plants. |

| Threat | Description |
|---|---|
| | However, this species is also considered an important food resource for common grassland predators such snakes (TSSC 2009b).<br>Invasion of intact grasslands by weeds is typically caused by natural or human induced disturbance. Weeds can affect the integrity of the natural grasslands TEC by altering the vegetation structure through development of a woody shrub layer, affecting the appearance of the community and impacting threatened species (TSSC 2009b).<br>Weeds impacting this community include parthenium (*Parthenium hysterophorus*), parkinsonia (*Parkinsonia aculeata*), prickly acacia (*Acacia nilotica* subsp. *indica*), buffel grass, Columbus grass (*Sorghum* x *almum*), Rhodes Grass, and green Panic *(Megathyrsus maximus*). |
| Mining activities | Mining and associated activities, including development of roads, conveyors and spoil heaps, can result in the physical destruction of natural grasslands TEC. Mining activities can result in the permanent destruction of natural grasslands TEC, as it is often difficult to re-establish the community after mining (TSSC 2009b). |
| Construction and maintenance of roads and other infrastructure | Natural grasslands TEC occurring along road and rail corridors is often of high conservation value due to the low levels of grazing in these areas and the importance of the habitat for flora and fauna. The construction of roads and other infrastructure can directly destroy grasslands, increase weed invasion and increase erosion of sites which further exacerbating weed dispersal (TSSC 2009b). |
| Climate change | Climate change is a potential long-term threat to this community as it has the potential to change the ecology of these environments (TSSC 2009b). It threatens species that cannot adapt and exacerbates existing threats such as invasive species. It may affect species composition, and the extent and distribution of the community (TSSC 2009b). |

## 7.4 PROJECT IMPACTS

Table 12 outlines potential impacts to natural grasslands TEC that may occur as a result of construction or operation of the Project.

**Table 12: Potential impacts to Natural Grasslands TEC as a result of the Project**

| Impacts | Potential impacts associated with the Project |
|---|---|
| **Recognised threats as per conservation documents** | |
| Invasive species (weeds and pest animals) | Spread of existing, and/or introduction of, invasive plant species through the movement of vehicles and machinery.<br>Disturbance associated with Project activities may result in invasion of intact natural grasslands TEC by weeds.<br>Increase in pest animal numbers and/or introduction of new invasive animal species through Project construction and operation (e.g. poor mine site waste management practices, increased transmission via roads) has the potential to impact on natural grasslands TEC through increased grazing of native plants and soil disturbance. |
| Mining activities | Mining activities within the Project site will result in the removal of 109.7 ha of natural grasslands TEC. 314.2 ha of natural grasslands TEC will be retained within the Project site. |
| Construction and maintenance of roads and other infrastructure | Access tracks and roads associated with the Project have been designed to avoid natural grasslands TEC as much as practicable. Only a small area of the TEC will be impacted by the road alignment, this impact area is included in the total disturbance of 109.7 ha. |

| Impacts | Potential impacts associated with the Project |
|---|---|
| **Other threats** | |
| Dust | Dust emissions from the construction and/or operation of the Project may smother natural grasslands TEC and constituent species adjacent to the Project site. |
| Fire | Construction and operation of the Project has the potential to increase fire hazards and fire risk (e.g. storage of fuel, waste laydown areas and scrap tyre storage areas).<br>Natural grasslands TEC may be degraded, and individual plants destroyed through increased fire frequency, as a result of the Project. |

# 8 SQUATTER PIGEON (*GEOPHAPS SCRIPTA SCRIPTA*)

## 8.1 STATUS AND DISTRIBUTION

The squatter pigeon (southern) (*Geophaps scripta scripta*) is listed as vulnerable under both the EPBC Act and the Queensland *Nature Conservation Act 1992* (NC Act). The squatter pigeon (southern) occurs on the inland slopes of the Great Dividing Range. Its known distribution extends north of the Burdekin River, east to Townsville and Proserpine and south to the Queensland-New South Wales Border and as far west as Longreach and Charleville.

The distribution of the southern subspecies overlaps with the distribution of the northern subspecies (*Geophaps scripta peninsulae*) and interbreeding is known to occur where their distributions overlap (DoEE 2017a).

## 8.2 SPECIES ECOLOGY

### 8.2.1 Species Description

The squatter pigeon (southern) is a medium-sized, ground-dwelling pigeon that measures approximately 30 cm long. Adults of both sexes are predominantly grey-brown with conspicuous black and white stripes on the face and throat. The upper wings of the squatter pigeon (southern) are dark-brown, sometimes with patches of iridescent green or violet. The upper breast is light grey-brown grading to blue-grey on the lower breast and centre of the belly while the rest of the belly and flanks are white. The squatter pigeon (southern) has a black bill, dark-brown irises, and dull-purple legs and feet.

The southern and northern subspecies of the squatter pigeon are distinguished by the colour of the skin around the eyes which is predominantly blue-grey in the southern subspecies and yellowy-orange to orange-red in the northern subspecies (TSSC 2015).

### 8.2.2 Species Habitat

Foraging habitat for the squatter pigeon (southern) consists of remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species, on sandy or gravelly soils, within 3 km of a suitable, permanent or seasonal waterbody (Squatter Pigeon Workshop 2011).

Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011).

Ground cover in areas of foraging and breeding habitat for the squatter pigeon (south) consists of native, perennial tussock grasses or a mix of perennial tussock grasses and low shrubs or forbs. Ground cover is often patchy and rarely exceeds 33% of the ground area in areas of suitable habitat (DoEE 2017a).

The squatter pigeon (southern) requires access to suitable waterbodies to drink daily. Permanent or seasonal rivers, creeks, lakes, ponds and waterholes, and artificial dams all provide suitable watering points. The squatter pigeon (southern) prefers to drink where there is gently sloping, bare ground on which to approach and stand at the water's edge. While patchy to moderate ground covering vegetation may occur along the banks of suitable water bodies, a small patch (less than a square metre) of bare ground at the water's edge is all that the bird requires (Squatter Pigeon Workshop 2011).

The squatter pigeon (southern) uses areas of forest and woodland to move between patches of foraging or breeding habitat and suitable waterbodies. They are unlikely to move far from woodland trees which provide protection from predatory birds, however where scattered trees still occur, they may be found foraging in or moving across modified or degraded environments such as pastures, sides of roads and stockyards (Squatter Pigeon Workshop 2011).

### 8.2.3 Movement Patterns

The squatter pigeon (southern) is considered sedentary or locally nomadic (Squatter Pigeon Workshop 2011, Frith 1982). Food resources are likely to be influenced by rainfall patterns from year to year and as such the squatter pigeon (southern) is likely to be sedentary where food and water resources are reliable. Where these resources are unavailable, the subspecies may disperse along vegetated corridors to access permanent water sources elsewhere in the region (Squatter Pigeon Workshop 2011).

### 8.2.4 Breeding Biology

The squatter pigeon (southern) typically breeds from April to October, although this is variable and is dependent on the availability of food resources (Frith 1982, Squatter Pigeon Workshop 2011).

Breeding habitat is found on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011). The squatter pigeon (southern) nests on the ground in depressions scraped beneath tussocks of grass, bush, fallen trees or logs. They usually lay two eggs, which are incubated for approximately 17 days. Chicks remain in the nest for two to three weeks and are dependent on their parents for around four weeks (DoEE 2017a).

### 8.2.5 Feeding Ecology

The squatter pigeon (southern) mainly forages on bare ground between sparse grasses under an open canopy of trees. They feed on seeds from grasses, herbs and shrubs which have fallen to the ground (Chrome 1976, Chrome and Shields 1992).

### 8.2.6 Known Populations within the Project site

The squatter pigeon (southern) has not been recorded from the Project site or surrounds. The closest record of the squatter pigeon (southern) is from 4 km to the south-east of the Project site (Gaia Environmental Consulting 2015).

Targeted surveys undertaken in December 2017 failed to detect the squatter pigeon (see Appendix C).

### 8.2.7 Condition of Habitat within the Project site

Habitat for the squatter pigeon is present across the Project site and consists of areas of grassy woodland (RE 11.8.5 - *Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks and RE 11.8.15 - *Eucalyptus brownii* or *Eucalyptus populnea* woodland on Cainozoic igneous rocks) (Figure 7). BioCondition assessments undertaken in accordance with the methodology prescribed in Eyre et.al (2011) within RE 11.8.5 and RE 11.8.15 indicate a score of 79/100 in which indicates that the REs are in a moderately functional condition.

Additionally, Naroo Dam and several ephemeral pools along creek lines within the Project site provide potential watering points for the squatter pigeon (south).

Baseline surveys (December 2017) used the Guide to Determining Terrestrial Habitat Quality (DEHP 2017) to determine the quality of squatter pigeon foraging and breeding habitat in RE 11.8.5. Habitat quality scores ranged from 6.19 to 8.14 out of 10, with an average score of 7.3 out of 10.

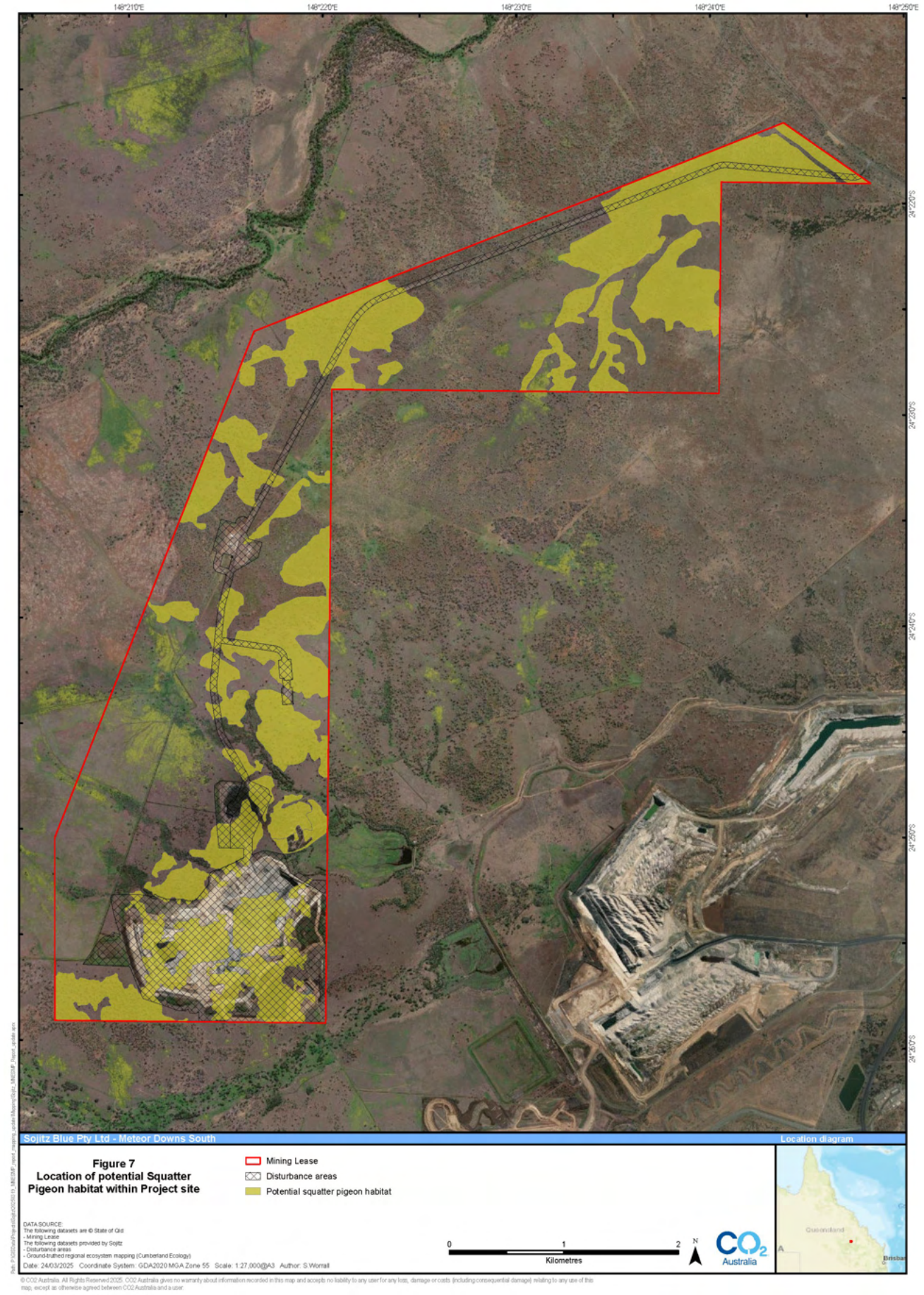


**Figure 7: Location of potential squatter pigeon habitat within Project site**

## 8.3 THREATS

The squatter pigeon (southern) population declined rapidly during the late 19th and early 20th centuries, and it has continued to decline in NSW and southern Queensland where it is now very rare. The species remains relatively common in central Queensland; however, it is under threat from vegetation clearing, overgrazing, invasion of weeds and pasture grasses and predation from feral animals (TSSC 2015).

The key threats to the squatter pigeon (southern) are summarised in Table 13.

**Table 13: Threats to the squatter pigeon (southern)**

| Threat | Description |
|---|---|
| Vegetation clearing and fragmentation | Clearing of vegetation for agriculture and development continues to result in the loss and fragmentation of habitat for the squatter pigeon (southern). |
| Overgrazing and trampling of nests by livestock. | Habitat for the squatter pigeon (southern) has been degraded by overgrazing by domesticated livestock, especially sheep and cattle. Overgrazing often facilitates the proliferation of weeds (e.g. *Cenchrus ciliaris, Parthenium hysterophorus*) and pasture grasses at the expense of native perennial grasses. Livestock may also trample nests. |
| Invasive species (plants and animals) | The squatter pigeon (southern) is subject to predation from feral animals including feral cat (*Felis catus*) and European fox (*Vulpes vulpes*). Overgrazing by feral herbivores such as the rabbit (*Oryctolagus cuniculus*) is also a recognised threat to the squatter pigeon (southern).<br>The invasion of weeds and pasture grasses has resulted in the modification of breeding and foraging habitat for the squatter pigeon. |
| Illegal shooting | The squatter pigeon (southern) has been historically hunted as its tame nature makes it an easy and susceptible target. Despite being protected by both state and Commonwealth legislation, some illegal shooting has continued to occur (Chrome 1976). |

## 8.4 PROJECT IMPACTS

Table 14 outlines potential impacts to the squatter pigeon and its habitat that may occur as a result of construction or operation of the Project.

**Table 14: Potential impacts to the squatter pigeon (southern) as a result of the Project**

| Impacts | Potential impacts associated with the Project |
|---|---|
| **Recognised threats as per conservation documents** | |
| Vegetation clearing and fragmentation | The Project will result in the direct loss 138.4 ha of potential habitat for the squatter pigeon (southern). A total of 468.6ha of squatter pigeon habitat will be retained in the Project site.<br>Indirect impacts may result from the fragmentation and loss of connectivity between areas of remaining habitat in the Project site. |
| Invasive species (plants and animals) | Increased movements of vehicles, machinery and people could result in the introduction and/or spread of weeds throughout the Project site. If weeds are not appropriately controlled and managed this could result in the degradation of habitat quality and reduction in food resources for the squatter pigeon (southern). |
| | If not appropriately controlled, feral herbivores, namely rabbits, may result in overgrazing and the degradation of habitat quality and a reduction in food resources for the squatter pigeon (southern). An increase in predators may result in increased levels of predation on the squatter pigeon (southern). |
| **Other threats** | |

| Impacts | Potential impacts associated with the Project |
|---|---|
| Noise and vibration | Should squatter pigeon occur on site, utilisation of habitat adjacent to the Project may be reduced as a result of noise and vibration impacts from the construction and operation of the Project.<br>Noise modelling undertaken for the Project indicates noise levels close to the Project footprint are likely to be 50dBA or greater (McCollum 2013). A review of available literature by SLR Consulting Australia (2015) indicates noise levels between 50 to 65 dBA result in occasional minor impacts on habitat use for most species while noise levels between 65 and 85 dBA may trigger and alert and alarm response. Studies indicate that noise levels over 85 dBA may result in the avoidance or abandonment of habitat by a species altogether.<br>However, noise and vibration are unlikely to have significant impact on squatter pigeons, given:<br>▶ Squatter pigeons have not been recorded on the Project site to date.<br>▶ Squatter pigeons are known to inhabit noisy disturbed areas, including road and railway corridors, and homesteads.<br>▶ Noise levels are likely to be below levels that result in avoidance or abandonment of habitat. |
| Dust emissions | Dust emissions from the construction and/or operation of the Project may smother vegetation adjacent to the Project site and potentially reduce habitat quality for the squatter pigeon (southern). |
| Changes in hydrological regimes and water quality | Changes in hydrological regimes as a result of the Project could potentially change the distance between water sources and feeding and breeding habitat which may affect the movement of squatter pigeons through the landscape (Reis 2012). |
| Vehicle strike | Squatter pigeons are often recorded along road and vehicle tracks. As such they are at risk of injury or mortality as a result of vehicle strike from Project traffic. |

# 9 AUSTRALIAN PAINTED SNIPE (*ROSTRATULA AUSTRALIS*)

## 9.1 STATUS AND DISTRIBUTION

The Australian painted snipe is listed as Endangered under the EPBC Act and Vulnerable under the Queensland NC Act. It is also listed as a marine species (as *Rostratula benghalensis*) and a migratory species (under the China-Australia migratory bird agreement as *Rostratula benghalensis*) under the EPBC act.

The species is widespread and is not considered to have a limited geographic distribution (TSSC 2013b), having been recorded at wetlands in all states of Australia (DoEE 2017b). However, it is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland, NSW, Victoria and south-eastern South Australia. It has been less frequently recorded from a smaller number of more scattered locations farther west in South Australia, the Northern Territory and Western Australia (DoEE 2017b). It has only been recorded on single occasions in Tasmania and at Lord Howe Island (DoEE 2017b).

## 9.2 SPECIES ECOLOGY

### 9.2.1 Species Description

The Australian painted snipe is a stocky wading bird of between 220–250 mm in length, with a long pinkish bill.

The adult female is brighter in appearance than the adult male and has a chestnut-coloured head, with white around the eye and a white crown stripe, as well as metallic green back and wings, barred with black and

chestnut. There is a pale stripe extending from the shoulder into a V down its upper back. The adult male is similar to the female, but is smaller, duller and greyer than the female, with buff spots on the wings and without any chestnut colouring on the head, nape or throat.

### 9.2.2 Species Habitat

The Australian painted snipe generally inhabits a diverse range of shallow, vegetated, terrestrial freshwater or brackish wetlands; including temporary, infrequently filled or permanent lakes, swamps and claypans (DoEE 2017b, Birdlife Australia 2017).

They are especially known from temporary wetlands with muddy edges and small low-lying islands (Birdlife Australia 2017). However, they also use inundated or waterlogged grassland or saltmarsh, grazing pastures, dams, rice crops, sewage farms, bore drains and irrigation schemes, and occasionally areas that are lined with trees, or that have some scattered fallen or washed-up timber (DoEE 2017b).

Locations where they are typically found include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum *Muehlenbeckia* or canegrass or sometimes tea-tree (*Melaleuca*).

Whilst the Australian painted snipe uses highly modified habitats, such as those mentioned above, they do not necessarily breed in such habitats (DoEE 2017b). The requirements for breeding habitat may be quite specific, being shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands (DoEE 2017b), provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (DoEE 2017b).

### 9.2.3 Movement Patterns

The species is nomadic and dispersive movements have been attributed to responses to local conditions: they will move when an area begins to dry up, becomes flooded or gets too cold (TSSc 2013b, DoEE 2017b). There is increasing evidence that they disperse from the east to central and northern Australia for at least part of the year to exploit favourable seasonal conditions (TSSC 2013b). It is considered likely that a reasonable proportion of the eastern Australian population migrates to tropical coastal Queensland in February to August and also to inundated wetlands in western Queensland when these become available (TSSC 2013b).

### 9.2.4 Breeding Biology

The female is polyandrous. Three to six eggs are laid (usually four), which are incubated by the male in a shallow scrape nest (TSSC 2013b, Garnett & Crowley 2000). The young hatch after 19-20 days. Nesting typically occurs in ephemeral wetlands that are drying out after a recent influx. As mentioned above, the habitat requirements for breeding are thought to be very specific, with continuous reed beds, stands of reed-like vegetation, rice fields and areas with no surrounding low cover avoided, and nesting instead occurring among tall rank tussocks, frequently on small, muddy islands or mounds surrounded by shallow fresh water, sometimes on shores of swamps or on banks of channels (TSSC 2013b).

Breeding occurs from December to May in the north and October to December in the south (TSSC 2013b).

It is thought to primarily breed in the Murray-Darling Basin (TSSC 2013b).

### 9.2.5 Feeding Ecology

The species is mainly nocturnal and crepuscular and sits quietly under reeds or grass during the day.

Feeding occurs at the water's edge and on mudflats. Food consists of seeds and various aquatic and terrestrial invertebrates, including insects, crustaceans, molluscs and worms (TSSC 2013b, Garnett & Crowley 2000). Australian painted snipe generally remains in dense cover whilst feeding, but may also forage over nearby mudflats, ploughed land or grassland (TSSC 2013b). The bill is adapted to probe in soft mud (TSSC 2013b).

### 9.2.6 Known Populations within the Project site

The Australian painted snipe is considered to occur in a single, contiguous breeding population (Garnett & Crowley 2000). The most recent estimates of the current population size of the Australian painted snipe was 2,500 mature individuals (DSEWPaC 2013b).

Two Australian painted snipe were observed on the Project side of Naroo Dam in November 2012 (CQU 2013), however no Australian painted snipe were recorded during 2017 targeted surveys (refer to Appendix C).

### 9.2.7 Condition of Habitat within the Project site

There are several ephemeral drainage lines present in the Project site. Some of these could provide potential habitat for Australian painted snipe after inundation events (Figure 8). The drainage features within the Project site are generally well defined and although modified by access for stock watering, generally have some vegetation along the banks (see Plate 5 to Plate 10). In the upper portions of the drainage feature catchments, the channels are steep, often with exposed rock in the bed (refer to Plate 5). In the lower parts of the catchment, the drainage feature channels are sandy, with signs of significant erosion (refer to Plate 6). The drainage feature channels at the Project site are typically between 5 m and 10 m wide, and up to 1 m deep. There are numerous minor overland flowpaths evident at the Project site, typically characterised by small gullies and rills draining into the major drainage features.

The mine is within the catchment draining to Naroo Dam. Naroo Dam is located on the eastern side of the Project area (Figure 8, Plate 11 and Plate 12). It is a human-made water storage with a capacity of approximately 750 ML. As discussed in Section 3.1.1 no part of the dam is included in the MDS ML, and all the dam, including the embankment and spillway now lie to the east of the Project boundary. The Naroo Dam spillway has a crest level of 243.78 m AHD. The area of inundation due to the dam extends into the Project mining lease when water levels in the dam exceed approximately 242.0 m AHD. Based on available survey information, the crest of the Naroo Dam embankment appears to be approximately 246.0 m AHD. Naroo Dam is approximately 5.78 m deep at the deepest point, however the depth of the inundation area located within the Project site is less than 2m. Naroo Dam is currently used as a mine water supply source by Rolleston Coal Mine.

**Plate 5: Creek 1 Upstream (November 2012, after significant rainfall event)**

**Plate 6: Creek 1 Downstream (November 2012, after significant rainfall event)**

**Plate 7: Creek 2 Upstream (November 2012, after significant rainfall event)**

**Plate 8: Creek 2 Downstream (November 2012, after significant rainfall event)**

**Plate 9: Creek 3 Upstream (November 2012, after significant rainfall event)**

**Plate 10: Creek 3 Downstream (November 2012, after significant rainfall event)**

Plate 11: Naroo Dam edge (November 2012, after significant rainfall event)

Plate 12: Naroo Dam (November 2012, after significant rainfall event)

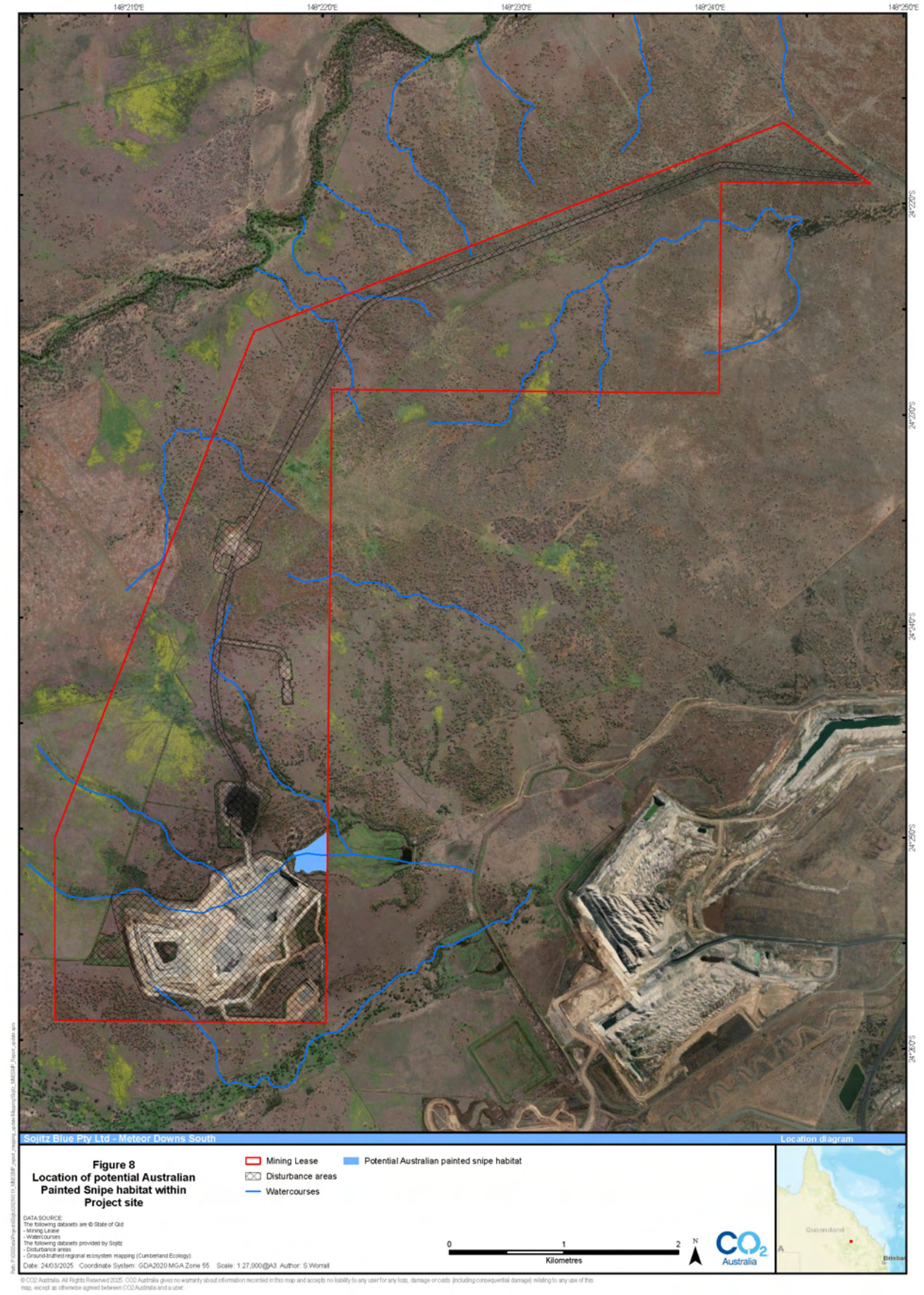


**Figure 8: Location of potential habitat for the Australian Painted Snipe within Project site**

Hydrological regime is an important determinant of habitat for Australian painted snipe. Alteration of hydrological regime in the form of a reduction in the frequency of flooding and/or stabilisation of water levels are key threatening processes for this species. Surveys for Australian painted snipe were undertaken in November 2012 (CQU), and December 2013 (Ecosure). As such, Figure 9 (reproduced from WRM, 2014) provides information regarding dam volumes and rainfall around the time of the November 2012 ecological survey when two Australian painted snipe were seen in the portion of Naroo Dam that lay within the Project site at the time. As discussed in Section 2.1.2 no portion of the Naroo Dam now lies within the MDS ML.

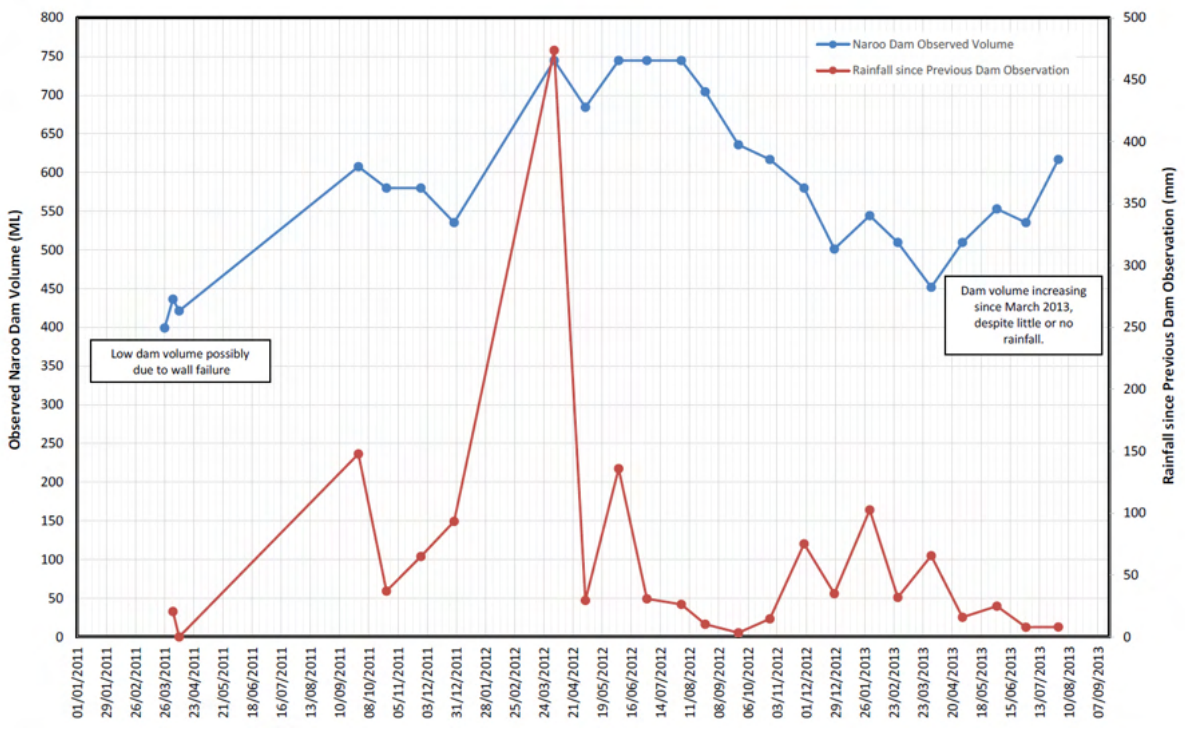


**Figure 9: Observed Naroo Dam Volumes and Rainfall, 26 March 2011 to 31 July 2013**

As can be seen from Figure 9, a significant rainfall event occurred in March/April 2012, resulting in Naroo Dam filling to full capacity. The dam remained full until August, after which water levels began to recede. At the time of the sighting of the two Australian painted snipe within Naroo Dam, in November 2012, the dam was still relatively full (around 610 ML).

The following is also of note with regards to Figure 9:

- Glencore advised that the Naroo Dam embankment failed during January 2011, resulting in the loss of much of the dam contents. The Naroo Dam embankment and spillway were repaired during 2011. It is not known what the spillway and embankment level of Naroo Dam were prior to the wall failure in January 2011.
- The volume of water stored in Naroo Dam typically increases following periods of significant rainfall and catchment runoff and decreases during periods of low rainfall due to evaporation and extraction of water for Rolleston demands – as such the current hydrological regime is varied, and subject to anthropogenic interference.
- The amount of water extracted from Naroo Dam over the data period is unknown.
- Figure 9 shows that the volume of water stored in the dam begins to increase from 31 March 2013, despite no significant rainfall having occurred. The volume of water stored in the dam increased from

451.7 ML on 31 March to 553.0 ML on 2 June, and from 535.5ML on 30 June to 616.9 ML on 31 June. Glencore advised EOC that during this time the pumped excess water from one of their raw water dams into Naroo and that this practice occurs from time to time.

The important point to note is that the water levels in the dam are not just dependent upon rainfall, runoff and evaporation, but are subject to variation as a result of Rolleston's water demands, operations and management of the Dam. It is also important to note that Glencore are authorised to take water from the dam as they wish, even emptying the dam if other water sources or infrastructure fails.

At the time of the Ecosure surveys in December 2013, the level of Naroo Dam had dropped, the shoreline had retreated across exposed mudflats and any original fringing vegetation was dying back (Ecosure 2013). The habitat opportunities for the Australian painted snipe were mainly confined to areas of the dam outside the Project site at that time, although suitable day-time shelter was still considered to be present in a few places within the Project lease at that time (Ecosure, 2013). This suggests that habitat for Australian painted snipe in Naroo Dam changes in response to changes in dam water level.

Baseline surveys undertaken in December 2017 used the Guide to determining terrestrial habitat quality (DEHP 2017) to assess quality of Australian painted snipe habitat within the Project Area. The monitoring site in RE 11.3.3a resulted in a habitat quality score of 4.74 out of 10.

The comparatively low score for Australian painted snipe habitat is in part attributable to the low site condition for RE 11.3.3a habitat (score of 5.25), but also the low fauna species habitat index (score of 2.40), reflecting an absence of appropriate foraging and shelter habitat for the species (refer to Appendix C).

## 9.3 THREATS

The main threat identified for Australian painted snipe is the loss and degradation of wetlands, through drainage and diversion of water for agriculture and reservoirs (DSEWPaC 2013b, TSSC 2013b). Key and listed potential threats to the Australian painted snipe are described in Table 15 (DSEWPaC 2013b, TSSC, 2013b and references therein).

**Table 15: Threats to Australian painted snipe**

| Threat | Description |
|---|---|
| Loss and degradation of wetlands | The main threat identified for Australian painted snipe is the loss and degradation of wetlands, through drainage and diversion of water for agriculture and reservoirs (DSEWPaC 2013b, TSSC 2013b). In particular the loss of breeding habitat in the Murray-Darling Basin has been brought about by a reduction in the frequency of flooding of previously suitable habitat, stabilisation of water levels so that wetlands become too deep or continuous reed beds develop, and changes to vegetation through cropping and possibly altered fire regimes (DSEWPaC 2013b, TSSC 2013b and references therein). These hydrological changes have been exacerbated by occurring in concert with extended drought periods (TSSC, 2013b). |
| Overgrazing | Overgrazing and trampling by cattle have been linked with declines in some regions, particularly in the north where grazing may be concentrated around wetlands in the dry season (DSEWPaC 2013b, TSSC 2013b and references therein). |
| Climate change | Climate changes and the associated reduction in rainfall and runoff in the Murray-Darling Basin may pose a threat to Australian painted snipe in the future. |
| Predation by feral animals | Predation by feral animals (e.g. nest predation by foxes (*Vulpes vulpes*) or cats (*Felis catus*) may be a threat to the Australian painted snipe, however there is no evidence for this. |

| Threat | Description |
|---|---|
| Coastal port and infrastructure development | Coastal port and infrastructure development near the species autumn-winter sites on the central Queensland coast are a potential threat to the species. |
| Shale oil mining | Shale oil mining near the species autumn-winter sites on the central Queensland coast is a potential threat to the species. |
| Invasive weeds | Replacement of wetland vegetation by invasive weeds (for example *Parkinsonia aculeata*) is a potential threat to Australian painted snipe habitat. |

## 9.4 PROJECT IMPACTS

Table 16 outlines potential impacts to Australian painted snipe that may occur as a result of construction or operation of the Project.

**Table 16: Potential impacts to the Australian painted snipe as a result of the Project**

| Impacts | Potential impacts associated with the Project |
|---|---|
| Recognised threats as per conservation documents | |
| Loss of wetlands | The Project will result in a small direct loss of potential habitat for Australian painted snipe. The mine no longer intersects Naroo Dam or the location of the previous sighting of Australian painted snipe. There are several unnamed ephemeral drainage lines on the site. This type of modified habitat is widespread throughout the local area, both on the Project site, and on surrounding properties. These ephemeral drainage lines may possibly provide habitat suitable for Australian painted snipe after periods of inundation. Two of the larger ephemeral drainage lines intersect the mine footprint, and another is crossed by the road within the Project site (see Figure 8). However, these are of marginal habitat quality and it is considered more likely that Naroo Dam would be preferred over these ephemeral drainage lines. A diversion drain will be constructed around the edge of the open cut mine pit to drain the overland flow that would have traversed through the area occupied by the open cut mine. As stated in Section 9.2.2 above, Australian painted snipe are known to utilise a wide range of habitats, including drains. As such, it is considered that the loss of the marginal ephemeral drainage line habitat, is offset by the provision of the diversion drain. |
| Degradation of wetlands | The Project is not expected to lead to the degradation of the wetlands. No mine affected water will be allowed to enter Naroo Dam or any of the drainage lines that run into it. |
| Alteration of hydrological regimes (Reduction in the frequency of flooding, stabilisation of water levels) | ▶ During the ten-year life of the mine there will be a reduction in the size of the catchment for Naroo Dam. This reduction will be, at most, 11% of the catchment (in Year 10 of mining). This may, in turn result in a reduction in the amount of water in Naroo Dam. The water will be provided back in the form of make good water. This may alter the hydrological regime of Naroo Dam dependant on water demands and management practices being implemented for Naroo Dam by Rolleston operations at the time.<br>▶ However, the evidence from the site, as well as the literature on Australian painted snipe, suggests that the habitat for Australian painted snipe within Naroo Dam (and possibly some of the ephemeral drainage lines that flow into Naroo Dam) will become available in response to a significant rainfall event.<br>▶ Given this, it is not considered that a reduction of 6-11 % of the catchment would be likely to affect conditions in the dam to the point where inundation of previously dry areas would not occur in a significant rainfall event.<br>▶ It is also important to note that this will only occur for ten years, and at the end of the mine life there will be no reduction in the size of the catchment. As evidenced by Figure 9, Naroo Dam has been subject to varying hydrological regimes as a result of its use as mine water by Glencore mining and associated water management practices. Given that Glencore is licenced to extract an amount up to all of the water from the Naroo |

| Impacts | Potential impacts associated with the Project |
|---|---|
| | Dam at any time it is certainly the case that operations by Glencore's water demands, operations and management of the dam, will have a far greater influence on water levels within the Dam than the reduction in the size of the catchment due to the Project.<br>▶ So, while there may be alteration of hydrological regimes as a result of the Project, they are not considered to be of a nature or a magnitude that would cause a net loss of habitat for Australian painted snipe.<br>▶ It is also worth noting that given the usage of water in the dam for industrial purposes by Glencore, it would be incredibly difficult if not impossible to determine which of the impacts to habitat, if there were any, are from MDS activities, Glencore activities or natural conditions. |
| Reduction in rainfall and runoff in the Murray-Darling Basin as a result of climate change | ▶ It is beyond the scope of this project and its EPBC approval to directly mitigate the impacts of climate change, however management proposals in this plan will help establish a more resilient ecosystem and habitats for EPBC species and communities. |
| Predation by feral animals | ▶ The Project may lead to an increase in pests due to inappropriate waste management practices and edge effects. Weed and pest management plans will be implemented to mitigate any potential impacts. |
| Replacement of wetland vegetation by invasive weeds (for example *Parkinsonia aculeata*). | ▶ The Project may lead to an increase in weeds through spread by vehicles and machinery. Additionally, altered surface water flows may carry weeds to the wetlands. A weed management plan will be implemented to mitigate any potential impacts. |
| **Other threats** | |
| Changes in the water quality of potential habitat areas | The Project has the potential to result in changes to the water quality of potential habitat areas such as Naroo Dam and ephemeral drainage lines. However, a mine water management system has been designed to minimise the potential impacts on the water quality downstream of the Project. The mine water management system will be undertaken in accordance with the specifications of the make good agreement with Glencore. As such, impacts on habitat due to changes in water quality are considered to be low. |
| Noise and vibration | ▶ Should Australian painted snipe occur on site, utilisation of habitat adjacent to the Project may be reduced as a result of noise and vibration impacts from the construction and operation of the Project. Noise modelling undertaken for the Project indicates noise levels close to the Project footprint are likely to be 50dBA or greater (McCollum 2013). A review of available literature by SLR Consulting Australia (2015) indicates noise levels between 50 to 65 dBA result in occasional minor impacts on habitat use for most species while noise levels between 65 and 85 dBA may trigger and alert and alarm response. Studies indicate that noise levels over 85 dBA may result in the avoidance or abandonment of habitat by a species altogether.<br>▶ However, noise and vibration is unlikely to have a significant impact on Australian painted snipe as they are only likely to utilize the site when suitable conditions exist, for instance:<br>– when hydrological regimes result in the creation of suitable habitat at Naroo Dam<br>– after periods of inundation which may result in the creation of potentially suitable habitat in ephemeral drainage lines.<br>▶ Additionally, should Australian painted snipe be present, noise levels at preferred habitat areas (Naroo Dam) and marginal habitat areas (i.e. ephemeral drainage lines) are likely to be below levels that result in avoidance or abandonment of habitat. |
| Dust emissions | Dust emissions from the construction and/or operation of the Project may smother suitable habitat adjacent to the Project site and potentially reduce habitat quality for the Australian painted snipe. |

| Impacts | Potential impacts associated with the Project |
|---|---|
| Vehicle strike | There is a low risk of injury or mortality by vehicle strike given the preferred habitat on the Project site (Naroo Dam) does not intersect any road corridors. There is the potential risk of injury or mortality by vehicle strike where ephemeral drainage lines are located in proximity to road corridors, although it is important to note that these areas are considered only potential habitat for the Australian painted snipe and would only be utilised after significant rainfall events result in suitable habitat conditions. |

# 10 KING BLUE-GRASS (*DICANTHIUM QUEENSLANDICUM*)

## 10.1 STATUS AND DISTRIBUTION

King blue-grass (*Dicanthium queenslandicum*) is listed as endangered under the EPBC Act and vulnerable under the Queensland NC Act. It is endemic to central and southern Queensland and has a restricted distribution where it occurs in three disjunct populations (DSEWPaC 2013c):

- Hughenden (one record)
- Nebo to Monto and west to Clermont and Rolleston
- Dalby district, Darling Downs

King blue-grass occurs within the following IBRA bioregions: South Eastern Queensland, Brigalow Belt South, Brigalow Belt North, Central Mackay Coast, Desert Uplands, Mitchell Grass Downs and Einasleigh Uplands.

## 10.2 SPECIES ECOLOGY

### 10.2.1 Species Description

King blue-grass is a perennial grass of the Poaceae family growing to 80 cm tall (Plate 13). It has erect, solitary or rarely branched culms. Culms are smooth with a single groove, 4–5-noded with nodes prominently hairy. Leaf sheaths are hairy with the hairs arising from wart-like projections. Leaf blades are 9 to 18 cm long, and 3 to 5 cm wide with the leaf-blade surface indumented (AusGrass2 2017a). Inflorescences are single racemes of paired spikelets to 10 cm long. Spikelets are sessile, bisexual, dorsally compressed, and straw-coloured to pale mauve (DSEWPaC 2013c). Companion spikelets are pedicelled with one in the cluster, male, 6 mm long and straw-coloured to pale mauve. King blue-grass flowers from November to January after sufficient rain.

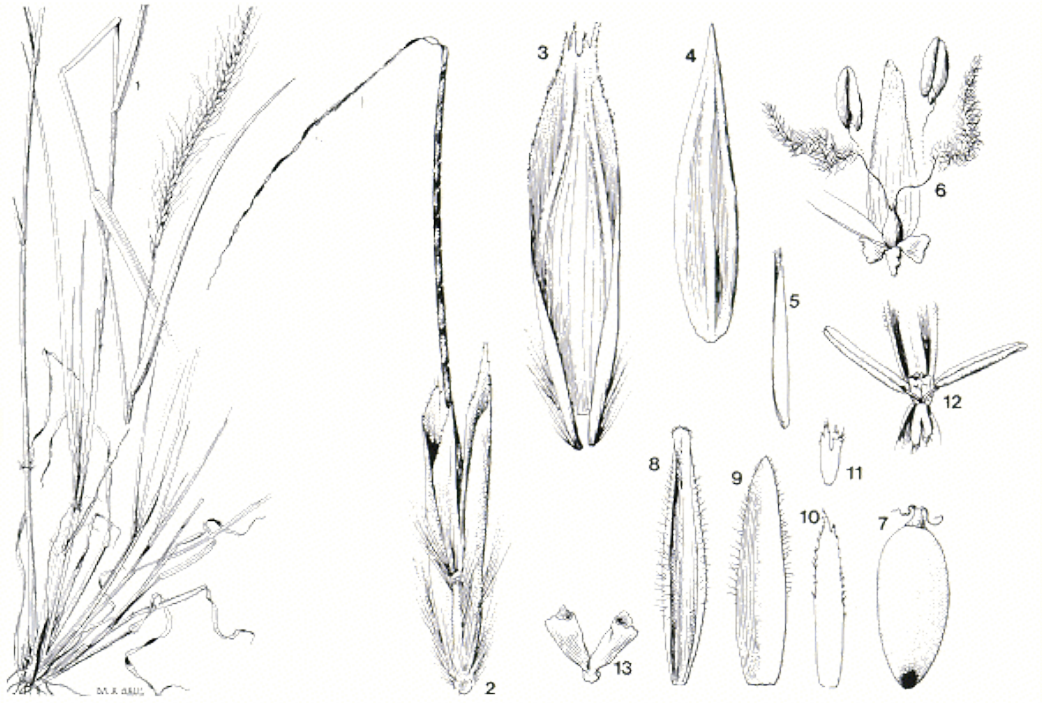


**Plate 13: *Dicanthium queenslandicum* (Source: AusGrass2 2017a)**

King blue-grass occurs on black cracking clay in tussock grasslands (TSSC 2013c). The species is mainly associated with other *Dichanthium* spp. and *Bothriochloa* spp., but also with other grasses restricted to this soil type.

King blue-grass is mostly confined to natural grassland on the heavy black clay soils (basalt downs, basalt cracking clay, open downs) on undulating plains, although it can also be found in *Acacia salicina* thickets in grassland, as well as eucalypt woodlands comprising *Corymbia dallachiana*, *C. erythrophloia* and *Eucalyptus orgadophila*.

### 10.2.2 Known Locations within the Project site

Targeted surveys for king blue-grass were undertaken within the Project site in December 2013, focusing on the southern part of the mining lease where the greatest impacts are likely to occur (Ecosure 2013). One population of approximately 40 plants was located within a 25 $m^2$ area, south of Naroo Dam, in association with RE 11.8.11. Plants were in the early stages of flowering and, based on the results of the survey, additional surveys were undertaken within the Project site in February 2014 at the peak flowering time to establish more accurate distributions and population sizes (Ecosure 2013).

The 2014 survey did not identify any additional locations, outside of the existing known location, where the species occurs. However, the area of the known population was revised from 25 $m^2$ to 2,022.6 $m^2$. This area included a main population of approximately 520 plants within an area of 1,303.6 $m^2$, and a smaller population of approximately 30 individuals located 27 m to the west of the main population (Ecosure 2014). Species detection was also difficult in this survey due to the disarticulation of the seed heads and the presence of other grass species.

It is likely that additional specimens of king blue-grass, which were undetected during targeted surveys, are present within the Project site (Gaia 2015). On this basis, it has been assumed that king blue-grass is associated with 424 ha of natural grasslands TEC within the Project site (mapped as RE 11.8.11), of which 109.7 ha will be cleared.

The location of the known population of king blue-grass (as identified since 2013 surveys), and the extent of RE 11.8.11, is illustrated on Figure 10.

During baseline surveys undertaken in December 2017, incidental surveying was undertaken for king blue-grass (*Dichanthium queenslandicum*) as part of all habitat condition assessments and while traversing the site. From that surveying, approximately four king blue-grass tussocks were positively identified as part of habitat condition assessments at one of the sites (Site 08 – Figure 5 in Appendix C). In addition to these four tussocks, three tussocks were confirmed just outside of the Site 08 habitat condition plot. Since these initial baseline surveys, populations of king blue-grass have now been confirmed at five locations (Figure 10).

### 10.2.3 Condition of Habitat within the Project site

King blue-grass individuals located within the Project site are associated with RE 11.8.11. This RE satisfies the criteria for natural grasslands TEC.

The natural grasslands TEC within the Project site are generally in good to best condition (Ecosure 2013). Condition assessments concluded that eight natural grassland TEC patches met the good condition class, and three met the best condition class.

Within the Project site, four BioCondition assessments were undertaken in RE 11.8.11. The average BioCondition score for RE 11.8.11, based on these results, is 67/100 which corresponds with a BioCondition class of 2 (Gaia 2015). Communities with a BioCondition class of 2 are classified as moderately functional.

In some patches of 11.8.11, there are signs of heavy grazing and over-sowing with exotic pasture grasses including buffel (*Cenchrus ciliaris*), bambatsi (*Panicum coloratum* var. *makarikariensis*) and Indian blue-grass (*Bothriochloa pertusa*). Whilst buffel was found to be dense in some locations it never comprised more than 50% of the sward (Ecosure 2013).

The 2017 baseline surveys (see Appendix C), determined that king blue-grass habitat in the Project area had condition scores ranging between 6.14 and 8.05 out of 10 (average of 6.76 out of 10).

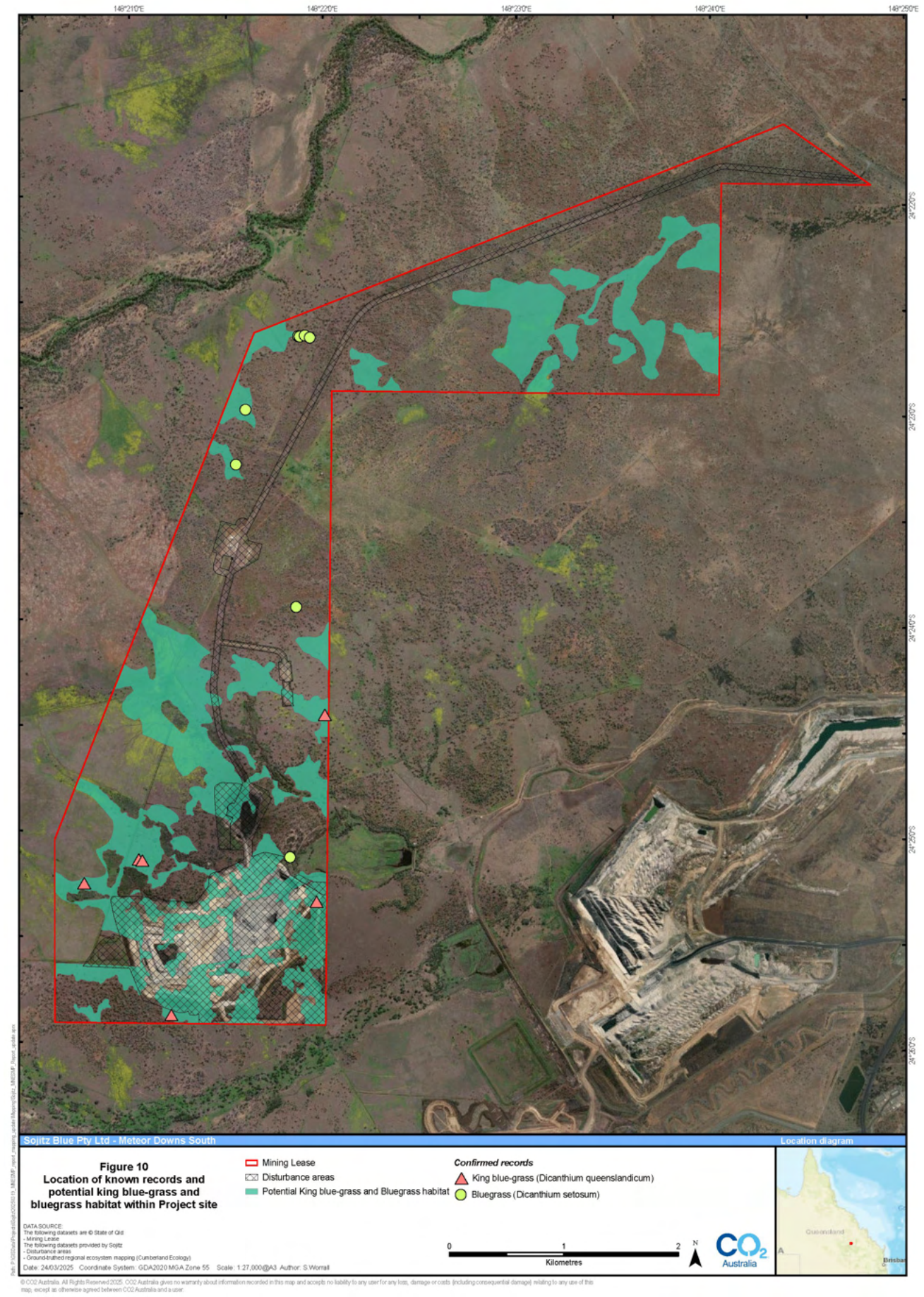


**Figure 10: Location of known records and potential habitat for king blue-grass and bluegrass within Project site**

## 10.3 THREATS

The distribution of endangered blue-grass grassland has been significantly reduced from previous known distributions, with a 64.8 % reduction in extent (TSSC 2013c). Only small remnants of blue-grass grasslands remain. The key threats to king blue-grass, as listed in the listing (TSSC 2013c) and conservation advice (DSEWPaC 2013c) and the draft national recovery plan for the bluegrass endangered ecological community (Butler 2008b), are described below in Table 17.

**Table 17: Threats to king blue-grass**

| Threat | Description |
|---|---|
| Loss of habitat through agricultural and mining activities, road construction and other infrastructure development | Agricultural and mining activities, road construction and other infrastructure development result in the direct loss of individuals and habitat for king blue-grass (DSEWPaC 2013c). |
| Cultivation and crop production | Cultivation and crop production is an ongoing threat to the extent of both blue-grass grasslands and its constituent species, including king blue-grass, as it results in the conversion of native grasslands to cropping land (Butler 2008b). |
| Grazing and heavy stocking regimes | Although highly palatable, king blue-grass is sensitive to grazing and does not tolerate continual heavy stocking regimes (TSSC 2013c).<br>With persistent heavy grazing of bluegrass grasslands, dominant perennial plants, such as king blue-grass, are eliminated in favour of annual species, particularly weeds (TSSC 2009b). |
| Invasive species (weeds) | Invasion from weeds such as a parthenium (*Parthenium hysterophorus*) and parkinsonia (*Parkinsonia aculeata*) is a known threat to king blue-grass (DSEWPaC 2013c). Weed species such as these threaten the species habitat (i.e. bluegrass grassland). Some weeds, including exotic grasses, are disturbance dependent for establishment but aggressively dominate sites following invasion (TSSC 2013c). |

## 10.4 PROJECT IMPACTS

Table 18 outlines potential impacts to king blue-grass that may occur as a result of construction or operation of the Project.

**Table 18: Potential impacts to king blue-grass as a result of the Project**

| Impacts | Potential impacts associated with the Project |
|---|---|
| **Recognised threats as per conservation documents** | |
| Loss of habitat through mining activities and road construction | The Project will result in the removal of 109.7 ha of potential habitat for the king blue-grass. A total of 314.2 ha of potential habitat for king blue-grass will be retained in the Project site.<br>Approximately 550 individuals have been recorded in the Project site. These individuals are located within the Project footprint and will be directly impacted during the construction of the Project. |
| Invasive species (weeds) | Increased movements of vehicles, machinery and people could result in the introduction and/or spread of weeds throughout the Project site. If weeds are not appropriately controlled and managed this could result in the degradation of habitat for king blue-grass.<br>Additionally, disturbance associated with Project activities may result in the invasion of weeds in areas of intact natural grasslands which provide habitat for the king blue-grass. |

| Impacts | Potential impacts associated with the Project |
|---|---|
| **Other threats** | |
| Dust | Dust emissions from the construction and/or operation of the Project may smother king blue-grass and its habitat adjacent to the Project site. |
| Pest animals | Increase in pest animal numbers and/or introduction of new invasive animal species through Project construction and operation (e.g. poor mine site waste management practices) has the potential to impact on king blue-grass through increased grazing of native plants and soil disturbance. |

# 11 BLUEGRASS (*DICANTHIUM SETOSUM*)

## 11.1 STATUS AND DISTRIBUTION

Bluegrass (*Dicanthium setosum*) is listed as vulnerable under the EPBC Act and least concern under the Queensland NC Act. Bluegrass is known to occur in Queensland and New South Wales. In Queensland it has been reported from the Leichhardt, Morton, North Kennedy and Port Curtis regions, and occurs in the Mistake Range, in Main Range National Park, and possibly on Glen Rock Regional Park, adjacent to the national park (TSSC 2012). It occurs within the following Queensland bioregions: Brigalow Belt, Cape York Peninsula, Desert Uplands, Einasleigh Uplands, North West Highlands and South East Queensland bioregions. In New South Wales it is found on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes, extending west to Narrabri.

## 11.2 SPECIES ECOLOGY

### 11.2.1 Species Description

Bluegrass is a perennial grass, of the Poaceae family, that grows up to 1 m in height (Plate 14). Culms are erect, 2 to 4 noded and mid-culm nodes are usually bearded. The leaf sheaths are glabrous, except near the junction with the blade. The ligules are less than 1 mm long. Leaf blades are 7 to 15 cm long, and 2 to 3.5 mm wide with the leaf-blade surface scaberulous or scabrous, glabrous or indumented (AusGrass2 2017b). Racemes (1 to 2) are 3.5 to 8 cm long. Spikelets are sessile, 5 to 6 mm long. Companion spikelets are pedicelled with one in the cluster, male and 5 to 5.5 mm long.

The species commences growing in spring and becomes dormant in late autumn. Flowers are densely hairy and clustered together along a stalk in a cylinder shape, and they typically appear during the summer months (TSSC 2012). Bluegrass can form pure swards or occur as scattered clumps.

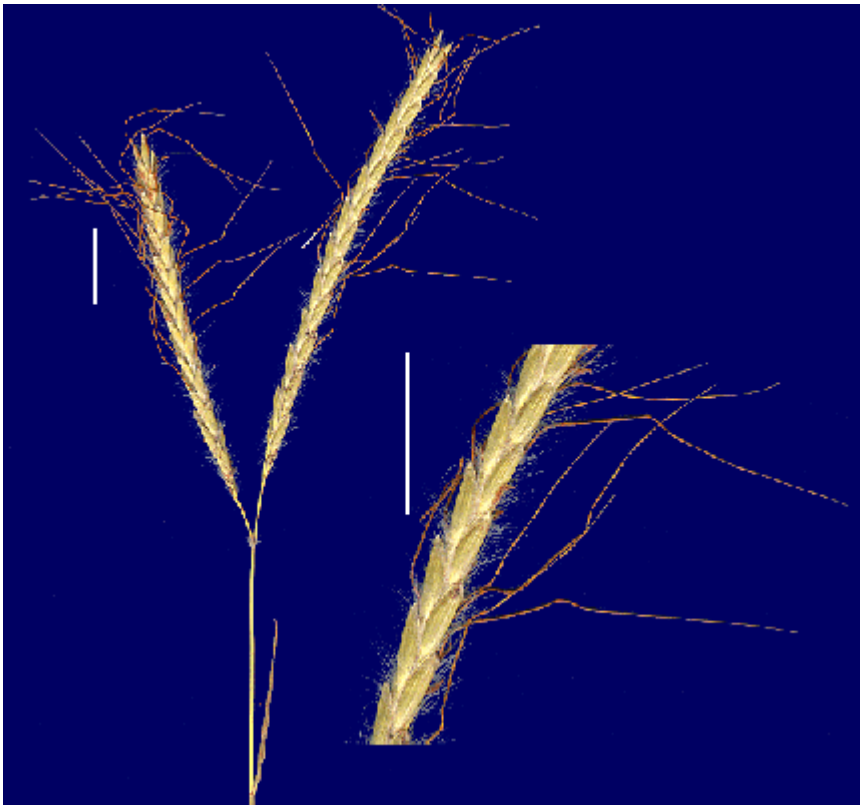

**Plate 14: *Dicanthium setosum* (Source: AusGrass2 2017b)**

Bluegrass occurs in heavy soils (predominantly cracking clays or alluvium, often in gilgai) in woodland or open woodland usually dominated by *Acacia* and/or *Eucalyptus* species, but also with species such as *Eremophila debilis, Aristida ramosa*, *Themeda triandra*, *Bothriochloa* spp., *Brachyscome* spp., *Vittadinia* spp. and *Wahlenbergia* spp. The species is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture.

### 11.2.2 Known Locations within the Project site

Targeted surveys for bluegrass were undertaken within the Project site in December 2013, focusing on the southern part of the mining lease where the greatest impacts are likely to occur (Ecosure 2013). Approximately five individuals, suspected to be bluegrass, were identified, adjacent to Naroo Dam.

As the survey was undertaken early in season, additional surveys were undertaken within the Project site in February 2014. These additional surveys did not reveal any additional locations where the species may occur within the Project site, and no additional individuals were recorded (Gaia 2015).

The individuals recorded in the 2013 survey are associated with RE 11.8.11 which is directly adjacent to an area of RE 11.3.3a (Gaia 2015). The location of the suspected population of bluegrass, and the extent of RE 11.8.11, is illustrated on Figure 10.

It is likely that additional bluegrass individuals, which were undetected during targeted surveys, are present within the Project site (Gaia 2015). On this basis, it has been assumed that bluegrass is associated with 424 ha of natural grasslands TEC within the Project site (mapped as RE 11.8.11), of which 109.7 ha will be cleared.

During baseline surveys undertaken in December 2017, incidental surveying was undertaken for and bluegrass as part of the habitat condition assessments and while traversing the site. No bluegrass individuals

were recorded during these incidental surveys. Since these initial baseline surveys, populations of bluegrass have now been confirmed at five locations (Figure 10).

### 11.2.3 Condition of Habitat within the Project site

Bluegrass individuals located within the Project site are primarily associated with RE 11.8.11. This RE satisfies the criteria for natural grasslands TEC.

The natural grasslands TEC within the Project site are generally in good to best condition (Ecosure 2013). Condition assessments concluded that eight natural grassland TEC patches met the good condition class, and three met the best condition class.

Within the Project site, four BioCondition assessments were undertaken in RE 11.8.11. The average BioCondition score for RE 11.8.11, based on these results, is 67/100 which corresponds with a BioCondition class of 2 (Gaia 2015). Communities with a BioCondition class of 2 are classified as moderately functional.

In some patches of 11.8.11, there are signs of heavy grazing and over-sowing with exotic pasture grasses including buffel (*Cenchrus ciliaris*), bambatsi (*Panicum coloratum* var. *makarikariensis*) and Indian blue-grass (*Bothriochloa pertusa*). Whilst buffel was found to be dense in some locations it never comprised more than 50% of the sward (Ecosure 2013).

The 2017 baseline surveys (see Appendix C), determined that bluegrass habitat in the Project area had condition scores ranging between 6.14 and 6.71 out of 10 (average of 6.43 out of 10).

## 11.3 THREATS

The key threats to bluegrass, as listed in the conservation advice (DEWHA 2008b), are described below in Table 19. It is not known whether these are known, past, current or future threats, and it is also unknown the extent to which the species tolerates disturbance.

**Table 19: Threats to bluegrass**

| Threat | Description |
|---|---|
| Grazing | Bluegrass is at threat from heavy grazing associated with trampling, browsing and grazing by domestic stock (DEWHA 2008b), particularly when grazing is conducted during the growing season (i.e. when plants are fertile). |
| Loss of habitat through clearing for pasture improvement and cropping | Cultivation and crop production is an ongoing threat to the extent of both bluegrass grasslands as it results in the conversion of native grasslands to cropping land (Butler 2008b). |
| Fire | Bluegrass is at threat from frequent fires, especially regular burning for agricultural purposes. A fire frequency of greater than five years is considered appropriate for the species (DEWHA 2008b). |
| Invasive species (weeds) | Bluegrass is at threat from invasion by introduced grasses such as such as Coolatai grass (*Hyparrhenia hirta*), lippia (*Phyla canescens*) and African lovegrass (*Eragrostis curvula*) (DEWHA 2008b). |
| Road widening | Widening of roads and maintenance activities (or other infrastructure or development activities as appropriate) results in the direct loss of habitat for bluegrass. |

## 11.4 PROJECT IMPACTS

Table 20 outlines potential impacts to bluegrass that may occur as a result of construction or operation of the Project.

**Table 20: Potential impacts to bluegrass as a result of the Project**

| Impacts | Potential impacts associated with the Project |
|---|---|
| **Recognised threats as per conservation documents** | |
| Fire | Construction and operation of the Project has the potential to increase fire hazards and fire risk (e.g. storage of fuel, waste laydown areas and scrap tyre storage areas).<br>Bluegrass habitat may be degraded, and individual plants destroyed through increased fire frequency, as a result of the Project. |
| Invasive plants | Increased movements of vehicles, machinery and people could result in the introduction and/or spread of weeds throughout the Project site. If weeds are not appropriately controlled and managed this could result in the degradation of habitat for bluegrass.<br>Additionally, disturbance associated with Project activities may result in the invasion of weeds in areas of intact natural grasslands which provide habitat for the bluegrass. |
| Road widening | Access tracks and roads associated with the Project have been designed to avoid habitat for bluegrass as much as practicable. Only a small area of potential habitat will be impacted by the road alignment, this impact area is included in the total disturbance of 109.7 ha. |
| **Other threats** | |
| Loss of habitat | The Project will result in the removal of 109.7 ha of potential habitat for bluegrass. A total of 314.2 ha of potential habitat for bluegrass will be retained in the Project site.<br>Construction of the Project will not have a direct impact on the five potential specimens of bluegrass that were identified adjacent to Naroo Dam. |
| Dust | Dust emissions from the construction and/or operation of the Project may smother bluegrass and its habitat adjacent to the Project site. |
| Pest animals | Increase in pest animal numbers and/or introduction of new invasive animal species through Project construction and operation (e.g. poor mine site waste management practices) has the potential to impact on bluegrass through increased grazing of native plants and soil disturbance. |

# 12 MITIGATION, MANAGEMENT AND MONITORING

The overarching objectives to be achieved through the implementation of this management plan, and the associated performance criteria related to each objective are presented in Table 21. Based on the potential Project impacts on each MNES as discussed in the sections above, Table 22 outlines the measures that will be undertaken to mitigate, manage and monitor the impacts of the Project on MNES, and achieve the objectives for habitat management.

Habitat management objectives, performance criteria, management and monitoring activities have been developed based on field surveys and in accordance with the key threats and recommended priority actions for each species and community as listed in recovery plans, threat abatement plans and conservation advices.

**Table 21: Objectives for habitat management and performance criteria**

| | |
|---|---|
| 1. Limit or avoid loss of MNES/ habitat for MNES. | ▶ Clearing of MNES/ habitat for MNES does not occur outside of the Project footprint and does not exceed the disturbance limits detailed in Table 1 of this management plan.<br>▶ No clearing of Brigalow TEC.<br>▶ No net loss of habitat for the Australian painted snipe.<br>▶ No loss of permanent water sources for the squatter pigeon, in particular Naroo Dam.<br>▶ Known king blue-grass and bluegrass specimens located outside of the Project footprint will not be cleared as a result of the Project.<br>▶ Rehabilitation of disturbed areas, namely the mine pit and overburden areas, to native ecosystems. |
| 2. Prevent the decline of habitat quality for retained habitat within the Project site. | ▶ Maintain or improve habitat quality score in areas of retained MNES/ habitat for MNES, in relation to baseline scores. |
| 3. Minimise risk of weed introduction and/or spread in areas of MNES/ habitat for MNES. | ▶ No new weed species are established in areas of MNES/ habitat for MNES based on baseline data.<br>▶ No spread of existing weed infestations as determined during baseline surveys. |
| 4. Reduce degradation of MNES/ habitat for MNES by pest animals and reduce potential predation of squatter pigeon and Australian painted snipe by pest animals. | ▶ Reduction in pest animal numbers in areas of MNES/ habitat for MNES below baseline levels.<br>▶ No new pest animal species are established in areas of MNES in comparison to baseline data. |
| 5. Minimise impact of dust deposition on MNES/ habitat for MNES as a result of the construction and/or operation of the Project. | ▶ Dust deposition must not exceed 120 mg per square metre per day, averaged over one month when measured at any sensitive receptor. |
| 6. Minimise degradation of MNES/ habitat for MNES as a result of increased risk of fire due to Project activities and management actions. | ▶ No uncontrolled fire within the Project site.<br>▶ If required, controlled burns in RE 11.8.11 (natural grasslands TEC, potential blue grass and king blue-grass habitat) occur at an interval greater than 5 years.<br>▶ If required, controlled burns in RE 11.8.5 and 11.8.15 (squatter pigeon habitat) occur every 6 – 10 years.<br>▶ No controlled burns within Brigalow TEC. |
| 7. Minimise degradation of habitat for the Australian painted snipe and squatter pigeon as a result of changes to water quality in Naroo Dam. | ▶ Water quality does not exceed trigger levels set out in Table F8 of the Project's EA, at any of the monitoring sites listed in Table F7 of the Project's EA. |
| 8. Minimise noise and vibration impacts in areas of squatter pigeon and Australian painted snipe habitat. | ▶ When measured, noise and vibration levels do not exceed criteria set out in Tables D1 and D2 of the Project EA. |
| 9. Minimise potential for mortality or injury to squatter pigeons and Australian painted snipe as a result of the construction and operation of the Project (e.g. from clearing activities, vehicle strikes etc.). | ▶ No mortalities or injuries of squatter pigeons or Australian painted snipes as a result of the construction and operation of the Project (e.g. from clearing activities, vehicle strikes etc). |

**Table 22: Mitigation, management and monitoring requirements for MNES**

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
|---|---|---|---|---|---|---|
| 1. | Limit or avoid loss of MNES/ habitat for MNES. | Clearing of MNES/ habitat for MNES does not occur outside of the Project footprint and does not exceed the disturbance limits detailed in Table 1 of this management plan. | ▶ Mapping of MNES within the Project site is provided in Figure 5 to Figure 10 (excluding Figure 9) and in Appendix C of this MNESMP. This mapping (and associated GIS shapefiles), will be provided to clearing personnel and/or contractors prior to the commencement of clearing operations.<br>▶ A permit to disturb must be initiated and signed off by the site Environmental Representative prior to any vegetation clearing.<br>▶ Any conditions listed in the permit to disturb must be implemented. For example, clearing extents will be clearly marked and any vegetation or areas to be protected adjacent to the Project footprint will barricaded (for example using safety bunting, pegs or mesh safety fences).<br>▶ Areas to be cleared will be restricted to the minimum area necessary for the construction and operation of the Project.<br>▶ Temporary stockpile sites for soil and equipment, access routes, laydown yards and other associated infrastructure will be in cleared areas and will not be situated in areas of MNES.<br>▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures.<br>▶ All vegetation clearing operations are to be monitored for compliance by a suitably qualified person. | ▶ The Environmental Representative will monitor and record the total area of MNES habitat cleared by the Project every quarter and assess compliance with the actual disturbance limits detailed in Table 1 of this management plan.<br>▶ Auditing of the permit to disturb system will be undertaken quarterly to ensure all disturbance has been undertaken in accordance with the requirements of this MNESMP and the site Environmental Management System (EMS), and to ensure no unauthorised disturbance has occurred. | Clearing of MNES/ habitat for MNES occurs outside of the Project footprint and/or exceeds disturbance limits detailed in Table 1 of this management plan. | Step 1: Contingency Planning<br>▶ Should clearing of MNES/ habitat for MNES occur outside of the Project footprint and/or exceed actual disturbance limits detailed in Table 1 of this management plan, clearing works are to cease immediately and DoEE will be notified of the incident within five business days. The incident will be recorded in the Project's environmental and incident reporting system.<br>▶ Following clearing, the area will be assessed by a suitably qualified ecologist/expert within 15 business days, and appropriate corrective actions will be outlined in a contingency plan and provided to the DoEE.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan and approved by DoEE will be implemented.<br>▶ Potential corrective actions may include:<br>- rehabilitation of habitat for MNES<br>- provision of an offset. |
| | | No clearing of Brigalow TEC. | ▶ Mapping of Brigalow TEC within the Project site is provided in Figure 5 and in Appendix C of this MNESMP. This mapping (and associated GIS shapefiles), will be provided to clearing contractors and/or personnel prior to the commencement of clearing operations.<br>▶ Clearing of Brigalow TEC will not be permitted.<br>▶ All other site clearing can only be undertaken in accordance with the authorised permit to disturb.<br>▶ Prior to vegetation clearing, the extent of Brigalow TEC will be clearly marked or barricaded to prevent/minimise vehicle/machinery access (for example using safety bunting, pegs or mesh safety fences).<br>▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures. | During construction and operation of the Project the Environmental Representative will undertake quarterly visual inspections of the Brigalow TEC within the Project site. | Clearing of Brigalow TEC. | Step 1: Contingency Planning<br>▶ If clearing of Brigalow TEC occurs, clearing is to cease immediately and DoEE notified of the incident within five business days. Incident is recorded in the Project's environmental and incident reporting system.<br>▶ Following clearing, the area is to be assessed by a suitably qualified ecologist/expert within 15 business days, and appropriate corrective actions will be detailed in a contingency plan and provided to the DoEE.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions |

| Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | ▶ All vegetation clearing operations are to be monitored for compliance by a suitably qualified person. | | | ▶ The appropriate corrective actions identified in the contingency plan and approved by DoEE will be implemented.<br>▶ Potential corrective actions may include:<br>- rehabilitation of the TEC<br>- provision of an offset. |
| | – No net loss of habitat for the Australian painted snipe. | ▶ The mine does not intersect with Naroo Dam, which is the preferred habitat area for Australian painted snipe on the Project site.<br>▶ A 50 m exclusion zone has been applied to the maximum dam capacity edge.<br>▶ Water flows into Naroo Dam will be maintained by diverting overland flows around the mine into the dam, through the construction of a diversion drain.<br>▶ The mine does not exceed 11% of the catchment for Naroo Dam. Whilst this may result in a reduction in the amount of water in Naroo Dam, U & D have entered into a Make Good Agreement with Glencore which ensures that make good water is delivered directly into Naroo Dam and ensures that water does not fall below critical storage level.<br>▶ The loss of marginal ephemeral drainage line habitat (i.e. two of the larger ephemeral drainage lines intersect the mine footprint, and another is crossed by the road within the Project site), is offset by the provision of the north diversion drain.<br>▶ The diversion drain will be designed to maximise benefits to the Australian painted snipe including the provision of micro-habitat features and the ability for ponding, noting species habitat requirements described in Section 9.2.2.<br>▶ The size of the Naroo Dam catchment will be restored at the end of the mine life. | The availability of habitat for the Australian painted snipe will be monitored in accordance with the methodology set out in Section 13.5. | Reduction of habitat from baseline or subsequent monitoring event. | Step 1: Contingency Planning<br>▶ Should there be a reduction in Australian painted snipe habitat from baseline surveys or a subsequent monitoring event, the source of the reduction will be investigated immediately after a trigger has been exceeded.<br>▶ If the reduction is related to Project activities, a contingency plan will be developed by a suitably qualified ecologist/expert within 15 business days. The contingency plan will include appropriate corrective actions.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented. These may include:<br>- Review of the Make Good Agreement, and the process for the provision of water to Naroo Dam.<br>- Alteration of diversion drain design.<br>- Additional measures to increase the availability of habitat for Australian painted snipe at the Project site. |
| | – No loss of permanent water sources for the squatter pigeon, in particular Naroo Dam. | ▶ The mine footprint does not directly impact permanent water sources on the Project site.<br>▶ The mine footprint does not exceed more than 11% of the catchment for Naroo Dam.<br>▶ Water flows into Naroo Dam will be maintained by diverting overland flows around the mine into the dam, through the construction of a diversion drain.<br>▶ U & D have entered into a Make Good Agreement with Glencore which ensures that make good water is delivered directly into Naroo Dam and ensures that water does not fall below critical storage level.<br>▶ No other permanent water sources will be indirectly impacted by the Project. | Water level monitoring of Naroo Dam will be in accordance with the methods outlined in Section 13.12. | Loss of permanent water sources. | Step 1: Contingency Planning<br>▶ Should there be a loss of permanent water sources, the cause will be investigated immediately after the trigger has been exceeded.<br>▶ If the loss is related to Project activities, a contingency plan will be developed by a suitably qualified ecologist/expert within 15 business days, and appropriate corrective actions will be outlined in a contingency plan and provided to the DoEE.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed. |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | | | | | Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented.<br>▶ These may include:<br>- Review of the Make Good Agreement, and the process for the provision of water to Naroo Dam.<br>- Alteration of diversion drain design.<br>- Provision of additional permanent watering points suitable for use by the squatter pigeon. |
| | | – Known king blue-grass and bluegrass specimens located outside of the Project footprint will not be cleared as a result of the Project. | ▶ Prior to disturbance targeted surveys will be undertaken for king blue-grass and bluegrass in areas of retained Natural Grassland TEC within 500 m of the Project footprint. These searches will be undertaken by suitably qualified ecologists in accordance with the methodology outlined in Section 13.5.<br>▶ Prior to disturbance, the location of any known king blue-grass and bluegrass specimens outside of the Project footprint will be clearly marked or barricaded (using for example, safety bunting, pegs or mesh safety fences).<br>▶ Should additional king blue-grass and bluegrass specimens be identified outside of the Project footprint, at any time during construction and/or operation of the Project, these areas will be clearly identified on site maps and clearly marked if close to the Project footprint.<br>▶ Clearing outside of the Project footprint will not be permitted.<br>▶ All other site clearing can only be undertaken in accordance with the authorised permit to disturb.<br>▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures. | During construction and operation of the Project the Environmental Representative will undertake biannual visual inspections of the location of known king blue-grass and bluegrass specimens outside of the Project footprint. | Known king blue-grass and bluegrass specimens (identified during baseline and targeted surveys) which occur outside of the Project footprint are cleared. | Step 1: Contingency Planning<br>▶ If known king blue-grass and bluegrass specimens located outside of the Project footprint are cleared, clearing is to cease immediately and DoEE will be notified of the incident. It will be recorded as an incident in the proponent's environmental and incident reporting system.<br>▶ Following clearing, the area will be assessed by a suitably qualified ecologist/expert and appropriate corrective actions will be detailed in a contingency plan and provided to the DoEE.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>▶ Clearing will not re-commence unless agreed to by DoEE.<br>Step 2: Implementation of Corrective Actions<br>▶ Corrective actions will be dependent upon the extent and nature of the incident. Potential corrective actions may include:<br>- Rehabilitation of the impacted area.<br>▶ The appropriate corrective actions identified in the contingency plan and approved by DoEE will be implemented. |
| | | – Rehabilitation of disturbed areas to native ecosystems, namely the mine pit and overburden areas. | ▶ The Project's EA (Appendix A) sets out the conditions for progressive rehabilitation of the Project site.<br>▶ Rehabilitation will establish specified self-sustaining natural vegetation and habitats.<br>▶ Section 15 of this management plan outlines the progressive rehabilitation process proposed, which includes:<br>- Topsoil recovery<br>- Regrading<br>- Drainage construction | As outlined in Section 15, U&D will develop and implement a Rehabilitation Monitoring Program which will focus on completion criteria appropriate to the specific post mining land use. | Rehabilitation fails to meet the rehabilitation indicators and completion criteria set out in Section 15 | Step 1: Contingency Planning<br>▶ Should rehabilitation fail to meet objectives, indicators and completion criteria, the reasons for failure will be investigated.<br>▶ Within 20 business days of a trigger being exceeded, a contingency plan will be developed by a suitably qualified ecologist to address the reason for failure and identify appropriate corrective actions.<br>▶ The contingency plan will include an implementation schedule for the identified |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | | - Topsoil spreading<br>- Seed bed preparation<br>- Seeding, fertilizing and other amelioration<br>- Selection of native seed mixes endemic to the Project site and surrounds, and representative of pre-clearing vegetation communities. | | | corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented. These may include:<br>- Repair of erosion areas.<br>- Supplementary planting of tube-stock.<br>- Additional seeding of key native flora species if required.<br>- Repair of drainage structures. |
| 2. | Prevent the decline of habitat quality for retained habitat within the Project site. | – Maintain or improve habitat quality score in areas of retained MNES/ habitat for MNES, in relation to baseline scores. | ▶ Areas of MNES/ habitat for MNES adjacent to the Project footprint will be clearly marked or barricaded during clearing operations (for example using safety bunting, pegs or mesh safety fences).<br>▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures.<br>▶ No clearing to be undertaken within areas of retained MNES.<br>▶ No unauthorised access into areas of for MNES.<br>▶ Vehicles and other machinery to be driven on designated access tracks only.<br>▶ Pest animals and weeds will be managed in accordance with the Weeds will be managed in accordance with the Project's weed management plan and pest management plan.<br>▶ Implementation of dust suppression techniques in accordance with the CMSHA and the CMSHR.<br>▶ Maintenance of existing fences. | ▶ Annual habitat quality assessments will be undertaken in areas of MNES in accordance with the methodology outlined in Section 13.1 and Appendix C. | The habitat quality score in areas of retained MNES falls below the baseline habitat quality score. | Step 1: Contingency Planning<br>▶ Should there be a decline in the habitat quality scores, the cause of the decline (i.e. failed management action, breach of protocols, external factor from surrounding landscape) will be investigated.<br>▶ Should the decline in the habitat quality score be found to be attributable to Project related activities or activities undertaken by the proponent, a contingency plan will be developed by a suitably qualified ecologist within 20 business days. The contingency plan will include appropriate corrective actions.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ Corrective actions identified in the contingency plan will be implemented. Depending on the cause of the decline in habitat quality score, potential corrective actions may include:<br>- Rehabilitation of MNES or provision of an offset.<br>- Provision of further environmental awareness training to workers regarding access restrictions in areas of MNES.<br>- Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented.<br>- Increasing the frequency of dust suppression techniques, particularly during dry and windy conditions.<br>- Repair of damaged fences, or installation of new fencing. |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| 3. | Minimise risk of weed introduction and/or spread in areas of MNES/ habitat for MNES. | ▶ No new weed species are established in areas of MNES/ habitat for MNES based on baseline data.<br>▶ No spread of existing weed infestations as determined during baseline surveys. | ▶ Weeds will be managed in accordance with the Project's weed management plan. The weed control plan will be developed by suitably qualified ecologists, with implementation commencing within six months from commencement of construction. The plan will include the following:<br>▶ Detailed control measures as recommended by the Queensland Department of Agriculture and Fisheries to eradicate where possible, or otherwise reduce the extent of weeds.<br>▶ A site induction program that provides information to staff, contractors and visitors on weed control issues.<br>▶ Systems for requiring all earthmoving equipment brought onto site to be thoroughly washed down prior to arriving at site and inspected on arrival to ensure all spoil and plant matter has been removed.<br>▶ Targeted weed control/eradication measures that will benefit MNES within the Project Area. As a minimum, control actions will target the following weed species (if present) which pose a threat to MNES:<br>- Brigalow TEC: exotic pasture grasses including buffel grass, Rhodes grass, green panic grass.<br>- Natural grassland TEC: parthenium (*Parthenium hysterophorus*), parkinsonia (*Parkinsonia aculeata*), prickly acacia (*Acacia nilotica* subsp. *indica*), buffel grass, Columbus grass (*Sorghum* x *almum*), Rhodes grass, and green panic *(Megathyrsus maximus*).<br>- King blue-grass: parthenium (*Parthenium hysterophorus*) and parkinsonia (*Parkinsonia aculeata*).<br>- Bluegrass: Coolatai grass (*Hyparrhenia hirta*), lippia (*Phyla canescens*) and African lovegrass (*Eragrostis curvula*).<br>▶ An integrated weed control program including where possible and effective the combination of fire management, biological, chemical and mechanical removal with consideration of suitability for each MNES. | ▶ Weed surveys will be undertaken within the Project site every two years using the methodology detailed in Section 13.8 and Appendix C. | ▶ Outbreak of a weed species that has not been previously recorded in the Project site, respective to baseline surveys.<br>▶ An increase in the mean cover score of weed species from baseline and/or previous monitoring event. | Step 1: Contingency Planning<br>▶ The cause of an increase in weed cover or presence of new weed species will be investigated. This will involve reviewing adherence to weed management plan and an analysis of distribution of weeds within the Project site to identify likely and/or recurrent incursion sources.<br>▶ Based on this review a contingency plan will be developed by a suitably qualified ecologist within 20 business days. The contingency plan will include appropriate corrective actions.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented.<br>▶ Potential corrective actions may include:<br>- Amending weed hygiene restrictions.<br>- Increasing the frequency of weed control efforts.<br>- Investigating and implementing alternative weed management control actions.<br>- Updating the weed management plan. |
| 4. | Reduce degradation of MNES/ habitat for MNES by pest animals and reduce potential predation of squatter pigeon and Australian painted snipe by pest animals. | Reduction in pest animal numbers in areas of MNES/ habitat for MNES below baseline levels.<br><br>No new pest animal species are established in areas of MNES in comparison to baseline data. | ▶ Pest animals will be managed in accordance with the Project's pest management plan which will be developed by suitably qualified ecologists. Implementation of the plan will commence within six months from commencement of construction.<br>▶ Pest management actions detailed in the pest management plan will focus on rabbits, feral pigs, foxes and cats as these pests have been | Monitoring of pest animal activity in areas of MNES/ habitat for MNES will be undertaken using the methodology detailed in Section 13.7 and Appendix C<br><br>Potential predation of squatter pigeon and Australian painted snipe | ▶ An observed increase in the abundance of (or signs of) pest animals in areas of MNES above baseline levels.<br>▶ Observation of (or signs of) a pest animal species not identified during the baseline surveys. | Step 1: Contingency Planning<br>▶ Investigate potential sources or reasons that may have attributed to an increase in pest animal abundance or species (e.g. mine site waste management practices increasing predator prey and predators), or reasons for predation of squatter pigeon or Australian painted snipe. |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | | identified on site and pose a potential threat to MNES and their habitat. However, should any additional pests be identified, these will also be included in the pest management plan as required.<br>▶ Pest management will include a combination of shooting, trapping, fencing and baiting in line with best practice guidelines.<br>▶ The pest management plan will include requirements for:<br>- Appropriate waste management.<br>- Reporting framework to ensure sightings of pest animals are recorded.<br>- Site induction program to include information on pest animal control issues and reporting on pest animals seen during construction and operation activities. | will also be assessed during habitat condition assessments as outlined in Section 13.3. | ▶ Evidence of predation of squatter pigeon or Australian painted snipe by pest animals. | ▶ Review adherence to pest management plan.<br>▶ Within 20 business days, a contingency plan which includes appropriate corrective actions to manage increase in pest animals will be developed by a suitably qualified ecologist.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented.<br>▶ Potential corrective actions may include:<br>- Increasing the frequency and intensity of pest animal control.<br>- Revising the type of invasive pest animal control in accordance with Queensland Department of Agriculture and Fisheries (DAF) guidelines and coordinate with neighbouring land owners to ensure a consistent approach.<br>- Incorporation into the weed and pest animal management plan and implementation of control strategies for any new pest animals recorded on site. |
| 5. | Minimise impact of dust deposition on MNES/ habitat for MNES as a result of the construction and/or operation of the Project. | – Dust deposition must not exceed 120 mg per square metre per day, averaged over one month when measured at any sensitive receptor. | ▶ Dust suppression for coal mining operations in Queensland is governed by the CMSHA and the CMSHR.<br>▶ Dust and dust suppression of mine roads is prescribed in Section 129 of the CMSHR which states that a surface mine must have a standard procedure for maintaining and watering mine roads.<br>▶ Speed limits on mine roads for vehicles, mobile plant and equipment is regulated under the CMSHA and CMSHR.<br>▶ In addition to the rigorous requirements under the CMSHA and CMSHR, the following dust suppression measures will be implemented:<br>- Minimise disturbed areas by limiting clearing to what is necessary.<br>- Progressively rehabilitating disturbed areas.<br>- Removal and dumping of overburden as soon as practicable after blasting (i.e. minimising drying time by retaining as much inherent moisture as possible).<br>- Restrict vehicle access, other than mining machinery on overburden dumps. | Monitoring of dust deposition levels will be undertaken in accordance with the Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited Matter – Gravimetric method, as outlined in Section 13.10.<br>Monitoring of dust deposition will also include regular visual inspection of vegetation adjacent to the Project footprint, as described in Section 13.1. | ▶ When measured at any sensitive receptor, dust deposition levels exceed the guideline of 120 mg per square metre per day, averaged over one month.<br>▶ Visual inspections of vegetation adjacent to the Project footprint indicate visible signs of dust deposition. | Step 1: Contingency Planning<br>▶ Dust will be managed in accordance with Conditions B3 and B4 of the EA., if dust deposition levels exceed the trigger value of 120 mg per square metre averaged over one month, the proponent is required to investigate whether the exceedance is a result of the Project and notify the administering authority of the exceedance within seven days.<br>▶ Should an exceedance of dust deposition levels be found to be attributable to Project related activities, a contingency plan will be developed by a suitably qualified expert within 20 business days. The contingency plan will involve a review of adherence to, and an assessment of the effectiveness of dust suppression techniques. Appropriate corrective actions will be included in the contingency plan.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed. |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | | | | | Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented.<br>▶ Depending on the cause of the exceedance, potential corrective actions may include:<br>- Increasing the frequency of dust suppression techniques, particularly during dry and windy conditions.<br>- Shut down and cover up policy in extreme dry or windy conditions.<br>- Installation of speed limit signage along internal roads.<br>- Lowering speed limits on internal roads. |
| 6. | Minimise degradation of MNES/ habitat for MNES as a result of increased risk of fire due to Project activities and management actions. | No uncontrolled fire within the Project site.<br><br>If required, controlled burns in RE 11.8.11 (natural grasslands TEC, potential blue grass and king blue-grass habitat) occur at an interval greater than 5 years.<br><br>If required, controlled burns in RE 11.8.5 and 11.8.15 (squatter pigeon habitat) occur every 6 – 10 years.<br><br>No controlled burns within Brigalow TEC. | ▶ Fire management for coal mining operations in Queensland is governed by the CMSHA and the CMSHR.<br>▶ One of the major hazards identified to coal mine workers present during coal mining operations is fire and the CMHSR prescribes both prevention, preparedness and management of fire hazards for surface and underground mines.<br>▶ These prescriptions are detailed in Section 37 of the CMSHR, which details amongst other things that a Safety and Health Management System (SHMS) must provide for the following at the mine (where mine is defined as the Mining Lease tenure as a whole):<br>- Fire prevention and control<br>- An effective firefighting capability<br>- The safety of persons fighting fires<br>- A risk assessment to identify all potential fire hazards at the mine.<br>▶ The system must also provide for the following:<br>- The availability at the mine, at all times, of equipment that is appropriate and sufficient to extinguish any potential fire identified in the risk assessment<br>- The location of portable fire extinguishers on or near equipment and installations identified as potential fire hazards by the risk assessment<br>- The compatibility, throughout the mine, of all fire-fighting equipment.<br>▶ The coal mine must have a standard operating procedure for action to be taken when a fire is discovered at the mine. | ▶ Compliance with the SHMS will be monitored in accordance with the requirements of the CMSHA.<br>▶ Biomass monitoring for fire management will be undertaken in accordance with the methodology outlined in Section 13.9. | ▶ An uncontrolled fire occurs.<br>▶ Biomass monitoring indicates risk of fire due to increased fuel loads.<br>▶ A controlled burn in RE 11.8.11 occurs in a five-year period.<br>▶ A controlled burn in RE 11.8.5 and 11.8.15 occurs at a frequency greater than once every 6-10 years.<br>▶ A controlled burn occurs within Brigalow TEC.<br>▶ | ▶ If an uncontrolled fire occurs within the Project site:<br>- The Emergency Response Plan will be enacted, and contingency actions undertaken will be recorded.<br>- Any required changes to fire management as a result of the incident will be in accordance with the requirements of the CMSHA and CMSHR and will be incorporated into the SHMS.<br>▶ If biomass monitoring indicates that there is a risk of an uncontrolled fire occurring:<br>- The fuel control measures will be assessed within 20 business days by a suitably qualified ecologist.<br>- If suggested by a suitably qualified ecologist, a controlled burn or strategic grazing regime may be implemented to reduce fuel loads.<br>- Weed management measures may be modified if deemed suitable by a qualified ecologist.<br>▶ If a controlled burn occurs outside of the specified frequencies:<br>- The cause of the exceedance in frequency will be investigated.<br>- Any required changes to fire management as a result of the incident will be in accordance with the requirements of the CMSHA and CMSHR and will be incorporated into the SHMS. |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | | ▶ Fire management of the site will consider appropriate fire management regimes for the vegetation type including:<br>- no fires in areas of Brigalow TEC<br>- controlled burns in RE 11.8.11 (natural grasslands TEC, potential blue grass and king blue-grass habitat) occur at an interval greater than 5 years<br>- controlled burns in RE 11.8.5 and 11.8.15 (squatter pigeon habitat) occur every 6 – 10 years.<br>▶ Fuel loads will be minimised through weed control as specified in the weed management plan.<br>▶ Weed management actions will target high biomass exotic grasses (e.g. buffel grass). | | | |
| 7. | Minimise degradation of habitat for the Australian painted snipe and squatter pigeon as a result of changes to water quality in Naroo Dam. | – For each quarterly monitoring event, water quality does not exceed the water quality specifications detailed in the make good agreement. | No dirty or contaminated water will be permitted to enter Naroo Dam. | Water quality monitoring of Naroo Dam will be in accordance with the methods outlined in Section 13.12. | Water quality exceeds water quality specifications detailed in the make good agreement | Step 1: Contingency Planning<br>▶ Should water quality exceed specifications detailed in the make good agreement, the source of the change in water quality will be investigated.<br>▶ If the change is related to Project activities, a contingency plan will be developed by a suitably qualified expert within 20 business days. The contingency plan will include appropriate corrective actions.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented in accordance with the make good agreement |
| 8. | Minimise noise and vibration impacts in areas of squatter pigeon and Australian painted snipe habitat. | – When measured, noise and vibration levels do not exceed criteria set out in Tables D1 and D2 of the Project EA. | ▶ All plant and equipment will be regularly serviced and maintained to minimise machinery noise.<br>▶ All engine covers will be kept closed while equipment is operating.<br>▶ Blasting will only occur between 7am and 6pm. | Noise and vibration monitoring will be undertaken in accordance with the methods outlined in Section 13.11. | When measured, noise and vibration levels exceed criteria set out in Tables D1 and D2 of the Project EA. | Step 1: Contingency Planning<br>▶ Should noise and vibration levels exceed the criteria set out in the Project EA:<br>- The source of the exceedance will be investigated.<br>- If the source of the noise or vibration exceedance is attributable to Project activities, a contingency plan will be developed by a suitably qualified expert within 20 business days. The contingency plan will include appropriate corrective actions.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for |

| | Objectives for habitat management | Performance Criteria | Management and Mitigation Measures | Monitoring | Trigger for Further Action | Contingency Response and Corrective Actions |
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| | | | | | | delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented.<br>▶ These may include:<br>- Plant and equipment found to produce excessive noise will be removed from site or stood down until repairs can be made. |
| 9. | Minimise potential for mortality or injury to squatter pigeons and Australian painted snipe as a result of the construction and operation of the Project (e.g. from clearing activities, vehicle strikes etc). | – No mortalities or injuries of squatter pigeons or Australian painted snipes as a result of the construction and operation of the Project (e.g. from clearing activities, vehicle strikes etc). | ▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures, and identification of squatter pigeons and Australian painted snipe.<br>▶ At least one qualified fauna spotter catcher will be present during clearing activities.<br>▶ A wildlife carer will be called to collect any injured fauna.<br>▶ Speed limits (60 km/hour) will be set and enforced on all internal roads.<br>▶ Vehicle movements will be restricted in areas of squatter pigeon and Australian painted snipe habitat. | All personnel will be required to be report any interactions between vehicles/machinery and wildlife, in particular squatter pigeon and the Australian painted snipe, in the Project site. | Injury or mortality of a squatter pigeon or Australian painted snipe. | Step 1: Contingency Planning<br>▶ Should there be a recorded injury or mortality of a squatter pigeon or Australian painted snipe as a result of Project activities, the cause of the injury or mortality will be investigated, and a contingency plan will be developed within 20 business days by a suitably qualified ecologist.<br>▶ The contingency plan will include an implementation schedule for the identified corrective actions, as the timeframes for delivery will be dependent on the corrective actions proposed.<br>Step 2: Implementation of Corrective Actions<br>▶ The appropriate corrective actions identified in the contingency plan will be implemented.<br>▶ These may include:<br>- Lowering speed limits.<br>- Restricting access to areas of known habitat. |

# 13 MONITORING METHODS

## 13.1 MONITORING OBJECTIVES

U&D commits to implementing a monitoring program that provides for 'early control' and 'early warning' functions to enable U&D to demonstrate that management actions are effective and make timely decisions on corrective actions to ensure performance criteria are achieved. In broad terms this will be achieved through the implementation of monitoring methods that are:

- Specific to the performance criteria being assessed. The results of the monitoring program will determine whether the performance criteria have been met, or whether corrective actions need to be implemented. For example, dust monitoring involves the measurement of dust deposition levels. If the results of this monitoring indicate that levels are below 120 mg per square metre per day, averaged over one month then the performance criteria have been achieved and no further action is required.
- Quantitative and repeatable. The data collected will be able to be compared between monitoring events which will allow any changes to be detected. Monitoring will be undertaken prior to the commencement of the Project to establish a baseline against which the results of future monitoring can be compared against.

The overarching objectives of the monitoring program are to:

- evaluate performance of the MNESMP against performance criteria
- identify triggers for further action
- develop contingency plans and corrective actions if required
- capture learnings from plan implementation and assess the effectiveness of the management framework
- inform subsequent reviews and amendments to the MNESMP.

## 13.2 GENERAL SITE INSPECTIONS

General site inspections of retained MNES vegetation and habitat will be undertaken at least biannually to assess:

- condition of fencing
- incidence of erosion of access tracks
- condition of firebreaks
- signs of land degradation
- signs of dust deposition on vegetation located adjacent to the Project footprint
- locations of known king blue-grass and bluegrass specimens outside of the Project footprint
- any additional risks to MNES (i.e. evidence of vehicle strike).

## 13.3 HABITAT CONDITION ASSESSMENTS

Baseline habitat condition assessments were undertaken in December 2017. Subsequent assessments will be undertaken annually, and during the same season, for the life of the Project.

Ten permanent habitat monitoring points were established as part of the baseline assessments (Appendix C). These sites are described in Table 23 below and presented on Figure 11 (northern site) and Figure 12

(southern site). The number and location of monitoring points for habitat condition assessments is based on the requirements of the Guide to Determining Terrestrial Habitat Quality (GTDTHQ) (DEHP 2017), which itself is based on the methodology set out in the BioCondition Assessment Manual and BioCondition benchmarks (Eyre *et. al.* 2015), as developed by the Queensland Herbarium.

Through the application of the GTDTHQ, a habitat quality score is calculated for each MNES based on three key indicators:

- site condition: a general condition assessment of vegetation compared to a benchmark
- site context: an analysis of the site in relation to the surrounding environment
- species habitat index: the ability of the site to support a species

This includes targeted fauna surveys for Australian painted snipe and squatter pigeon (undertaken in accordance with the Survey Guidelines for Australia's Threatened Birds (DEWHA 2010)) and incidental surveys for king blue-grass and bluegrass (habitat quality scores for these threatened flora species will be calculated according to the method outlines in the baseline monitoring report, Appendix C).

Data from habitat condition assessments will be recorded in survey sheets and these will be attached to annual monitoring reports.

**Table 23: Monitoring site locations and purpose**

| Site | Habitat monitoring | | | | | | Photo monitoring | Weed monitoring | Pest animal monitoring | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Brigalow TEC | Natural Grasslands TEC | King blue-grass | Bluegrass | Squatter pigeon | Australian painted snipe | | | Rabbit plot | Feral pig plot | Camera trap – cats, foxes, dogs etc. |
| 01 | | | | | ✓ | | ✓ | ✓ | ✓ | | |
| 02 | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | |
| 03 | | | | | ✓ | | ✓ | ✓ | ✓ | | |
| 04 | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | |
| 05 | | | | | ✓ | | ✓ | ✓ | ✓ | | |
| 06 | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | |
| 07 | ✓ | | | | | | ✓ | ✓ | ✓ | | |
| 08 | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | | |
| 09 | | | | | | ✓ | ✓ | ✓ | ✓ | | |
| 10 | | | | | ✓ | | ✓ | ✓ | ✓ | | |
| 11 – 20 | | | | | | | ✓ | ✓ | | | |
| P01 – P08 | | | | | | | | | | ✓ | |
| T01 – T20 | | | | | | | | | | | ✓ |

## 13.4 PHOTO MONITORING

Photo monitoring will be undertaken at each monitoring location identified in Table 23 to enable visual assessment of habitat changes over time.

Photo monitoring will be undertaken at the same time as habitat condition assessments (see Section 13.1), that is, prior to construction and then annually for the life of the Project. Appendix C includes photo monitoring pictures taken during the 2017 baseline surveys.

Five photos will be taken at each location (from 1.5 m height above ground level) in the direction of magnetic north, south, east and west and ground. The ground show should be chosen to give a representative indication of cover and species composition for the general area if possible. The ground photo will also be used for biomass monitoring (see Section 13.9).

A record of the photographs will be maintained, including GPS co-ordinates, date and time of each photograph, the direction in which the photograph was taken, and the height above the ground at which the photograph was taken.

Data from photo monitoring will be recorded in survey sheets and these will be attached to annual monitoring reports.

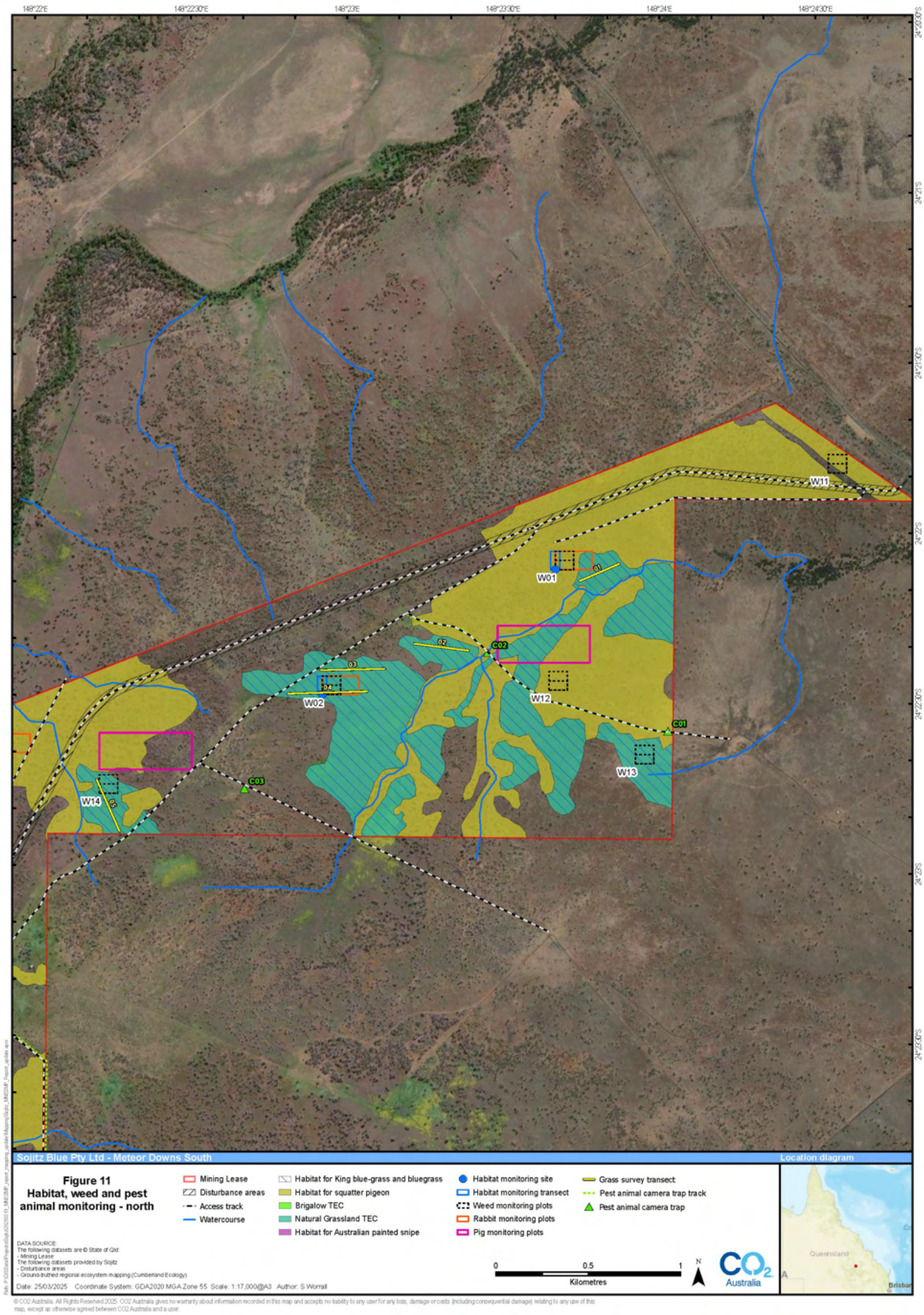


**Figure 11: Habitat, weed and pest animal monitoring - north**

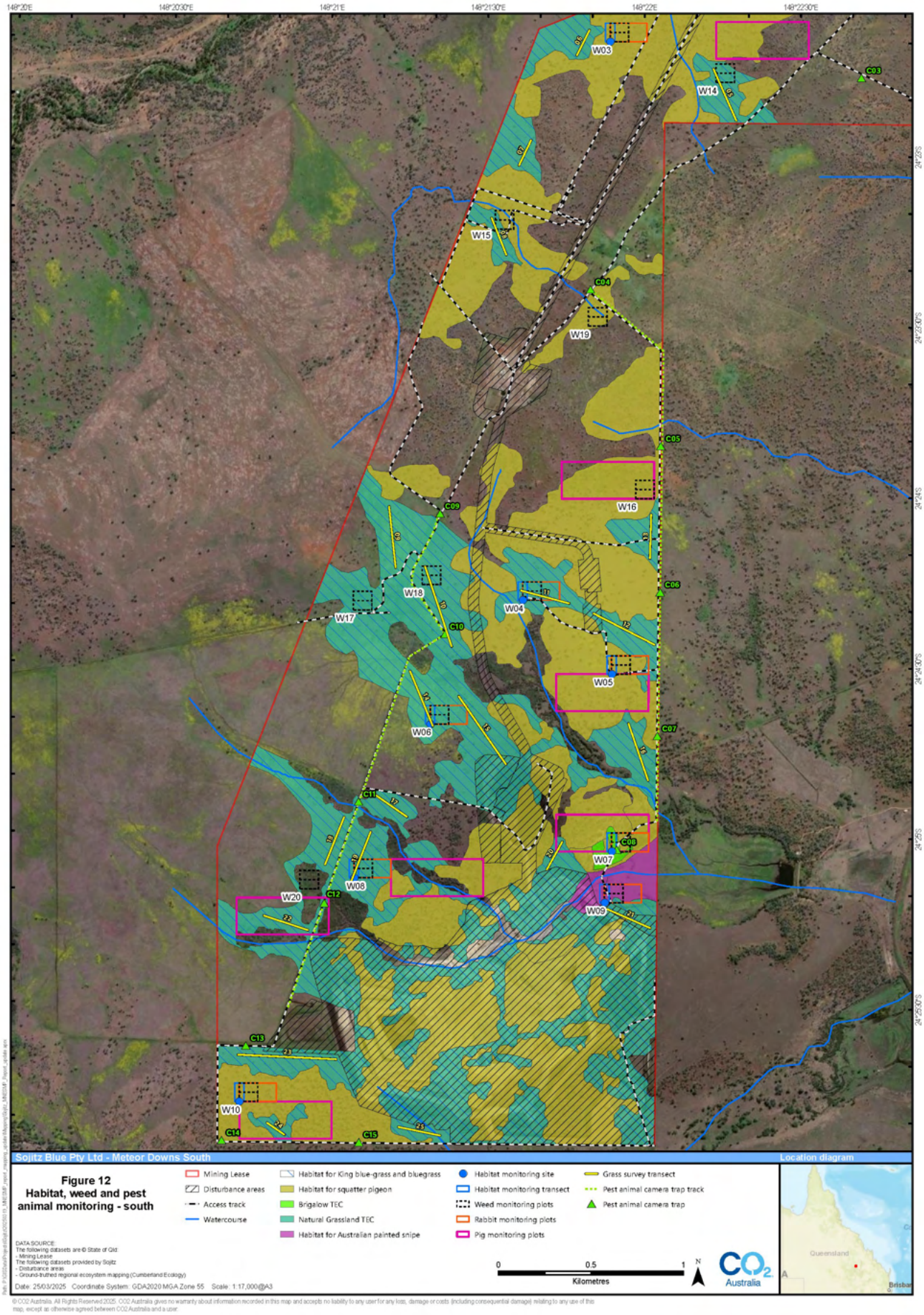


**Figure 12: Habitat, weed and pest animal monitoring - south**

## 13.5 TARGETED SURVEYS FOR KING BLUE-GRASS AND BLUEGRASS

Targeted surveys will be undertaken by suitably qualified ecologists for king blue-grass and bluegrass in areas of retained Natural Grassland TEC within 500 m of the Project footprint. These surveys will be undertaken with reference to the methods detailed in the Queensland Department of Environment and Heritage Protection Flora Survey Guidelines – Protected Plants (DEHP 2016). Baseline surveys were undertaken prior to the commencement of construction with subsequent surveys to be undertaken annually.

Twenty-five targeted transect surveys were established within 500 m of the Project footprint (refer to Figure 11 and Figure 12). For each monitoring event, 10-15 transects should be selected for surveying, always including those that have known king blue-grass and bluegrass populations. Where king blue-grass or bluegrass is encountered within 2 m of the centreline of a transect, an estimate will be made of the number of tussocks of each species considered to be within a contiguous population. A tussock is defined as a tuft or clump of a given species of grass growing from a common origin, whereas a population is defined as a collection of contiguous tussocks of a given species. The number of tussocks comprising a population should still be estimated where populations extend beyond 2 m of the transect centreline. The number of tussocks in a population is estimated by assigning a population size to one of six abundance categories:

- 1 – 2 tussocks
- ≥2 – 5 tussocks
- ≥5 – 20 tussocks
- ≥20 – 50 tussocks
- ≥50 – 100 tussocks
- 100+ tussocks

An estimate of population size of a given species is then calculated by summing the lower range interval of each population's tussock abundance category to represent the minimum estimate of abundance, with the upper range interval of each population's tussock abundance category summed to give an upper estimate of abundance.

## 13.6 HABITAT AVAILABILITY FOR AUSTRALIAN PAINTED SNIPE

Monitoring of habitat availability for Australian painted snipe will be undertaken every two years, preferably during the wet season, or following a large rainfall event and will include:

- systematic surveying by traversing Australian painted snipe habitat areas (where possible) with the aim of detecting by sight or by flushing
- quantification of the area of Australian painted snipe habitat.

Quantification of the area (in hectares) of Australian painted snipe habitat will involve the calculation of the following:

- Shallow water foraging habitat – calculated as the area of open water habitat (on the lease and adjacent lease).
- Muddy substrate foraging habitat – calculated as 10 m buffer adjacent open water habitat (on the lease and adjacent lease).

- Area of appropriate shelter habitat – calculated as areas of rank emergent tussocks of grass, sedges, rushes or reeds, samphire, clumps of lignum, *Muehlenbeckia*, canegrass or *Melaleuca* within 50 m of the boundary of open water habitat.

## 13.7 PEST ANIMAL MONITORING

Pest animal monitoring will be undertaken to monitor and manage pest animal activity in the Project site. Monitoring will be undertaken in accordance with the methods outlined below.

The surveys undertaken in December 2017 (see Appendix C) provided a baseline against which the results of ongoing monitoring will be compared against.

Ongoing surveys will be undertaken every two years, consisting of a survey during the dry season and a survey post wet season. If trigger levels for any pest animal species are met or exceeded, then biannual monitoring will occur in conjunction with appropriate management measures until pest animal presence reduces to baseline levels or below.

Pest animals will also be opportunistically surveyed throughout the year outside of monitoring times, including observations for potential new pest animal species that have not been previously recorded within the Project site, and which are known to impact and degrade the MNES that are addressed in this management plan. Pest animal monitoring will also include observations to identify any evidence of predation of squatter pigeon and Australian painted snipe by pest animals.

Pest animal monitoring sites are identified on Figure 11, Figure 12, and also in Appendix C.

### RABBITS (*ORYCTOLAGUS CUNICULUS*) AND EUROPEAN HARES (*LEPUS EUROPAEUS*)

Assessments of rabbit/hare impacts will be undertaken in accordance with Cooke et al (2008). Ten randomly stratified, permanent monitoring points have been established as part of baseline assessments (see Appendix C) and a 2-ha area will be traversed for 15 to 20 minutes assessing:

- Rabbit abundance – a measure of the presence and number of rabbit warrens and the abundance of any faecal pellets (including 'buck-heaps' or latrines) – measured on a scale of 0 – 5
- Seedling abundance – a measure of the presence and abundance of native vegetation seedlings encountered during the 15-20-minute traverse – measured on a scale of 0 – 5
- Rabbit damage – a measure of seedlings (< 0.5 m height) with evidence of rabbit damage, identified as 45˚ 'secateurs-like' cuts through smaller stems, defoliation and gnawing of bark – measured on a scale of 0 – 5.

From this assessment, a 'corrected regeneration score' is calculated from the seedling abundance and rabbit damage score.

As illustrated in Figure 13, overall rabbit impact is assigned as one of three categories – 'acceptable', 'monitor closely' or 'unacceptable', as determined from a combination of the score for rabbit abundance and the corrected regeneration score. Note that any site with a rabbit abundance score of '0' is assumed to be 'acceptable', irrespective of corrected regeneration score. This is to avoid the situation where, with an absence of rabbits and a corrected regeneration score of ≤ 2 (attributable to no rabbit damage and less than 20 seedlings), a given site may be identified as one to 'monitor closely' only be virtue of the fact that the few seedlings are attributable to the site being a grassland, rather than it reflecting rabbit grazing.

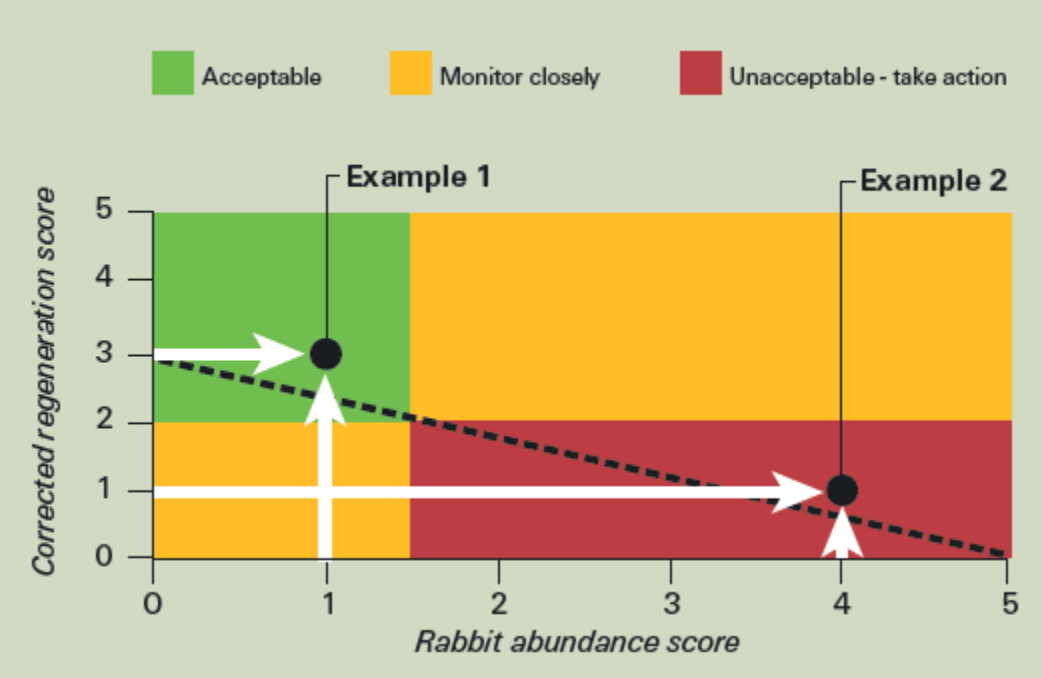


**Figure 13: Assessing overall rabbit impact**

### FOXES (*VULPES VULPES*) AND CATS (*FELIS CATUS*)

Initially, the proposed method of monitoring of pest animal activity was for track counts, based on a modified version of Mitchell and Balogh (2007a) and Fleming et al (1996), whereby track stations are identified and covered with a thin layer of sand in which animal tracks can be identified and counted. However, during the 2018 annual MNESMP monitoring campaign, sand tracks were found to be time consuming to establish and maintain, as well as unreliable following rain or windy conditions when any tracks captured were obscured/erased. Further, tracks were often ambiguous and difficult to attribute to a species. Therefore, in place of sand tracks, camera traps will be established at each of the 20 pest animal monitoring sites. These are quicker to establish, more reliable during adverse weather and enable greater certainty in identification.

An assessment of pest animal presence/activity based on a modified version of Mitchell and Balogh (2007a) and Fleming et al. (1996), will be undertaken as follows:

- select sites to be monitored, along access tracks. At least 15 camera trap stations are required, to be operable across the offset site for at least three nights
- record the location of camera trap stations on GPS so that future surveys can be undertaken at the same locations
- convert to indices via the percentage of station nights with confirmed photographic encounters (Catling index).

### FERAL PIGS (*SUS SCROFA*)

An assessment of the presence or absence of feral pig signs as a measure of feral pig activity in accordance with Mitchell and Balogh (2007b) and Hone (1988), will be undertaken as follows:

- at the eight randomly stratified, permanent 0.5 km x 0.3 km sites across the Project area as decided during baseline surveys and depicted in Appendix C
- at each site, randomly select the start location of 0.5 km transects, and record locations via GPS

- traverse in an east-west direction, surveying for the presence of any feral pig signs 1 m either side of the transect in every 50 m section
- calculate an abundance score for each transect as the percentage of 'present' feral pig signs from the 10 sections along the 0.5 km transect
- calculate the mean abundance score (and variance) across all transects in the Project site. If the variance exceeds 20% of the mean, more sites/transects are required.

Repeat surveys will be undertaken from permanently established transects. The average frequency of occurrence across the Project site can be used as an index of abundance and change over time. Furthermore, changes to scores for individual sites/transects can point to areas to target control activities.

Feral pig signs can include rooting, wallows, dung, footprints, travel pads, plant damage and tree rubs, as well as the physical presence of feral pigs.

## 13.8 WEED MONITORING

The distribution and density of weed infestations will be monitored across the Project site. Baseline data on the abundance and distribution of weed species within the Project Area was determined during the December 2017 surveys (see report at Appendix C). Ongoing weed surveys will be undertaken every two years, with a survey during the dry season and a survey post wet season. If trigger levels for weed cover are met or exceeded, monitoring will occur biannually in conjunction with appropriate management actions in order to reduce weed cover to baseline levels or below.

Twenty permanent 1 ha weed monitoring sites were established as part of baseline surveys (see Appendix C). The sites were located according to the following considerations:

- randomly stratified, permanent monitoring sites and incorporating natural variability such as aspect (e.g. a mix of north-, east-, south- and west-facing monitoring sites) and community type.
- permanent weed monitoring sites at strategic trafficable areas (e.g. entry gates, creek crossings, stock watering points) to monitor potential introduction and/or irruptions of prohibited and restricted weed species.

At each of the permanent weed monitoring sites, monitoring of weeds will be undertaken utilising two approaches:

- Plot-based weed transects – an assessment of weed species richness and relative abundance based on plot-based cover estimates along transects within 1 ha weed monitoring sites
- Photo monitoring – time series analysis of changes in vegetation composition, structure and integrity over time. In areas where active management is being undertaken, photo monitoring offers a simple and effective visual means by which to capture the response of the vegetation to management actions

In addition to permanent weed monitoring sites, incidental observations will be collated as part of general Project site monitoring, noting weed infestations away from permanent weed monitoring sites.

Details of the weed monitoring methodology are presented in Table 24.

**Table 24: Weed monitoring methodology**

| Weed monitoring method | Methodology |
|---|---|
| Plot-based weed transects | An assessment of weed species richness and relative abundance, will be undertaken in accordance with the following method: |

| Weed monitoring method | Methodology |
|---|---|
| | ▶ at a number of randomly stratified, permanent 1 ha sites (100 m x 100 m) across the Project site in environments that are more regularly impacted by weeds (e.g. drainage lines, around swamps/lagoons etc) and high traffic areas<br>▶ at each site, mark out three 100 m transects (traversing in an east-west direction), keeping them parallel to one another, 50 m apart<br>▶ at every 10 m interval along each of the transects, centre a 2 m x 2 m plot frame and record the presence, species and cover of weeds. Weed cover at each 2 m x 2 m survey site will be reported as one of five cover classes: 1 = 0%, 2 = 0-5%, 3 = 6-25%, 4 = 26-50% and 5 = 51-100% (Auld 2009)<br>▶ an average cover score for each weed species for each 1 ha site will be calculated. The average cover score is calculated as the average percentage from the 30 plots surveyed from the three 100 m transects<br>▶ calculate the mean cover score across all weed monitoring sites in the Project site |
| Photo monitoring | A time-series photographic analysis to visually assess changes in vegetation composition (namely, weeds), will be undertaken as follows:<br>▶ at each end of the 20 plot-based weed transects, establish photo-monitoring points<br>▶ at each of the photo monitoring points, take five photos from 1.5 m height above ground level, namely photos facing north, east, south, west and one facing the ground. The ground shot should be chosen to give a representative indication of cover and species composition for the general area. |
| Incidental observations | As part of general Project site monitoring, outside of plot-based weed transects, record details (including location, species and extent) of weeds, species not previously encountered in the Project site, new weed outbreaks and areas of significantly weed cover. |

## 13.9 BIOMASS MONITORING FOR FIRE MANAGEMENT

Biomass monitoring for fire management is required to be undertaken to determine the risk of fire within the Project site.

Biomass will be assessed at the end of each wet season. Biomass should be monitored using appropriate photo standards[1] to determine dry matter yields and subsequently fuel loads. Specifically, the following photo standards should be used for the relevant RE:

- RE 11.8.1 – 'Downs country'
- RE 11.8.5 – 'Eucalypt woodlands'
- RE 11.4.3 – 'Blue grass, wire grass'
- RE 11.3.3a – 'Alluvial'.

Where the observed biomass at a site is mid-way between two photos within a given biomass standard, the middle of the corresponding range should be reported (e.g. observed biomass between 1,800 kilograms per hectare [kg/ha] and 2,500 kg/ha 'Eucalypt woodlands' photo standards should be reported as 2,150 kg/ha).

Biomass monitoring should be undertaken at permanent habitat condition assessment sites and weed monitoring sites at the MNDS Project site.

Representative monitoring locations will also be re-assessed at the end of the dry season to determine if any additional fire management is required to further reduce pasture biomass to reduce the likelihood of widespread wildfire outbreaks.

[1] See https://futurebeef.com.au/resources/pasture-photo-standards/

## 13.10 DUST DEPOSITION MONITORING

Dust deposition will be monitored in accordance with the relevant conditions of the Project's EA (see conditions B1 to B4).

## 13.11 NOISE MONITORING

Noise and vibration generated by mining activities will be monitored in accordance with conditions D1, D2 and D3 of the Project's EA. Monitoring undertaken for the EA will ensure that noise limits are not exceeded at sensitive places. The results of noise monitoring events undertaken during a management period will be recorded in the annual report.

## 13.12 WATER QUALITY AND WATER LEVEL MONITIORING OF NAROO DAM

### 13.12.1 Environmental Authority

Water quality and water level monitoring of the Naroo Dam will be done in accordance with the EA.

## 13.13 MANAGING UNCERTAINTY

The management of natural systems involves uncertainty which can affect the success of the management measures in achieving the performance criteria. To manage this uncertainty an adaptive management approach has been adopted and is described in further detail Section 4.2. It is important, however, to recognise and account for potential sources of uncertainty. Williams (2011 and 2016) identifies four kinds of uncertainty:

- Environmental Variation
  - the most prevalent source of uncertainty, often the dominant influence on natural systems
  - caused by external factors that act upon natural systems, but which are not influenced by the resource conditions and dynamics (e.g. variation in rainfall or temperature may affect habitat quality scores or the availability of Australian painted snipe habitat in the Project site)
  - largely outside of the control of the manager (Williams 2011), however, its influence is considered in the analysis of the effectiveness of the management framework, and in the analysis of the ability to achieve performance criteria.
  - considered when determining the need for corrective actions or amendments to management strategies. For example, it is important to understand if the cause of the trigger for further action is attributable to Project activities or to environmental variation, prior to a decision regarding the appropriate action to be taken.
- Partial Observability
  - Partial observability includes potential uncertainty that arises from variation in the collection of data during monitoring events, and from being unable to completely observe the natural system in its entirety (Williams 2016).
  - managed in this MNESMP through the development of a monitoring program based on scientifically tested and repeatable methods. Furthermore, the persons implementing specific management and monitoring activities are required to have appropriate skills and qualifications in order to minimise the potential for variation.
- Partial Controllability

- relates to difference between the effect of the management measures intended to be implemented as part of this MNESMP and the effect of their actual implementation on the ground (Williams 2016)
- addressed through adherence to an adaptive management approach as outlined in Section 4.2.

- Structural or Process Uncertainty
  - concerns a lack of knowledge or understanding regarding biological and ecological processes and relationships, and differing views regarding how natural systems respond to management (Williams 2016)
  - In contrast to environmental variation, structural or process uncertainty can be reduced largely through an adaptive management approach which incorporates an iterative learning process (Williams 2016), as has been adopted in the development of this MNESMP (further aided by the use of published scientific literature, conservation advices and field data).

## 13.14 DATA MANAGEMENT AND RECORD KEEPING

The requirement for sound data management and record keeping is encapsulated in the conditions of the EPBC Act approval. Condition 15 of the EPBC Act approval for the Project requires U&D to maintain accurate records of all activities associated with or relevant to the conditions of approval, including this MNESMP. This includes records of the management measures undertaken as well as the results of monitoring activities. All records and data associated with the MNESMP will be made available to the Department of the Environment and Energy upon request and are subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act.

it will be the responsibility of the Project's Environmental Representative to oversee and manage all the management and monitoring activities, including compiling, storing and managing all the information and data produced in the company's central database. The Environmental Representative will be responsible for:

- adherence to the internal data and information handling systems, including data storage, protection and extraction
- data quality control
- data analysis and interpretation
- reporting and presentation of data and analysis.

## 13.15 MONITORING SUMMARY

A summary of monitoring activities is provided in Table 25 including the goal/s for habitat management to which the monitoring activity applies to, the parameters to be measured, applicable guidelines/methods, location, timing and an assessment of the reliability of the proposed monitoring activities.

**Table 25: Summary of monitoring activities**

| Monitoring activity | Relevant goal for habitat management | Parameters measured | Relevant survey guidelines/methods | Location | Timing | Reliability |
|---|---|---|---|---|---|---|
| General site inspections | – 2. Prevent the decline of habitat quality for retained habitat within the Project site.<br>– 5. Minimise impact of dust deposition on areas of potential habitat for MNES as a result of the construction and/or operation of the Project.<br>– 9. Minimise potential for mortality or injury to squatter pigeons and Australian painted snipe as a result of the construction and operation of the Project (e.g. from clearing activities, vehicle strikes etc). | ▶ condition of fencing<br>▶ incidence of erosion of access tracks<br>▶ condition of firebreaks<br>▶ signs of land degradation<br>▶ signs of dust deposition on vegetation located adjacent to the Project footprint<br>▶ any additional risks to MNES (i.e. evidence of vehicle strike). | - | All areas of retained habitat for MNES | At least biannually | Visual assessment to identify the need for any maintenance or additional management. |

| Monitoring activity | Relevant goal for habitat management | Parameters measured | Relevant survey guidelines/methods | Location | Timing | Reliability |
|---|---|---|---|---|---|---|
| Habitat condition assessments | – 2. Prevent the decline of habitat quality for retained habitat within the Project site. | Habitat condition | Guide to Determining Terrestrial Habitat Quality (DEHP 2017) | At 10 permanent habitat monitoring points (refer to Table 23, Figure 11 and Figure 12 and Appendix C) | – Annually during December | – Scientific method developed by the Queensland Herbarium. It is a quantitative and repeatable assessment procedure. |
| Photo monitoring | – 2. Prevent the decline of habitat quality for retained habitat within the Project site. | Habitat condition | - | At 10 permanent habitat monitoring points (refer to Table 23, Figure 11 and Figure 12 and Appendix C) | At the same time as the habitat condition assessments | Method based on best practice photo monitoring techniques. |
| Targeted surveys for king blue-grass and bluegrass | – 1. Limit or avoid loss of habitat for MNES. | ▶ Presence of king blue-grass and bluegrass | Flora Survey Guidelines – Protected Plants (DEHP 2016) | In areas of retained Natural Grassland TEC within 500 m of the Project footprint | Annually | Scientific method developed by the Queensland DEHP |
| Habitat availability for the Australian painted snipe | – 1. Limit or avoid loss of habitat for MNES. | ▶ Presence of the Australian painted snipe<br>▶ Quantification of the area of Australian painted snipe habitat | Presence to be assessed in accordance with the Survey Guidelines for Australia's Threatened Birds (DEWHA 2010). | At Naroo Dam and ephemeral drainage lines | Every two years, preferably during the wet season or following inundation event | Evidence based approach, developed based on the known ecology of the species, and method developed by the Australian government |

| Monitoring activity | Relevant goal for habitat management | Parameters measured | Relevant survey guidelines/methods | Location | Timing | Reliability |
|---|---|---|---|---|---|---|
| Pest animal monitoring | – 4. Reduce degradation of habitat for MNES by pest animals. | – Rabbit, fox and feral pig activity and other species opportunistically observed and seen in camera trap data | – Rabbits: Cooke et al (2008)<br>– Foxes: Mitchell and Balogh (2007a) and Fleming et al (1996)<br>– Feral pigs: Mitchell and Balogh (2007b) and Hone (1988) | At pest animal monitoring sites shown on Figure 11 and Figure 12 and in Appendix C | Every two years (surveys during the dry and post wet season) | Based on published scientific methods |
| Weed monitoring | – 3. Minimise risk of weed introduction and/or spread in areas of habitat for MNES. | – Weed distribution and density | – - | At weed monitoring sites shown on Figure 11 and Figure 12 and in Appendix C | Every two years (surveys during the dry and post wet season) | Based on published scientific methods. |
| Biomass monitoring for fire management | – 6. Minimise degradation of habitat for MNES as a result of inappropriate fire regimes. | – Fuel loads | – Comparison of ground photos with Future Beef[1] pasture photo standards to determine dry matter yield | In all areas of retained habitat for MNES | At the end of each wet and dry season | Based on best practice determined by the Queensland Department of Agriculture and Fisheries. |

| Monitoring activity | Relevant goal for habitat management | Parameters measured | Relevant survey guidelines/methods | Location | Timing | Reliability |
|---|---|---|---|---|---|---|
| Dust deposition monitoring | – 5. Minimise impact of dust deposition on areas of potential habitat for MNES as a result of the construction and/or operation of the Project. | – Dust deposition levels | – Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited Matter – Gravimetric method | At sensitive receptors | When requested by the administering authority or as a result of a complaint | Method based on a recognised Australian Standard. |
| Noise monitoring | – 8. Minimise noise and vibration impacts in areas of squatter pigeon and Australian painted snipe habitat. | – Noise and vibration | – - | At sensitive receptors | When measured as per requirements of the Project EA | Methods based on requirements of the Project's EA issued by the Queensland Department of Environment and Heritage Protection. |
| Water quality and water level monitoring of Naroo Dam | – 1. Limit or avoid loss of habitat for MNES.<br>– 7. Minimise degradation of habitat for the Australian painted snipe and squatter pigeon as a result of changes to water quality in Naroo Dam. | – Water quality and quantity | – As per the specifications of the make good water agreement between Glencore and U&D | At Naroo Dam | Water levels: monthly<br>Water quality: daily during the release of water from the Project and quarterly monitoring | Method based on the requirements of the make good water agreement between Glencore and U&D |

[1] See https://futurebeef.com.au/resources/pasture-photo-standards/

# 14 REPORTING, COMPLIANCE AND IMPLEMENTATION

## 14.1 UPDATING THE MNESMP

Notwithstanding amendments made during the adaptive management process, the MNESMP will be reviewed at least every 3 years in accordance with condition 3(g) of the EPBC Act approval.

## 14.2 ANNUAL REPORTS

U&D will prepare an annual report on the implementation of, and adherence to, this MNESMP. The report will be provided to the DoEE by 30 June every year and will contain, (but may not be limited to) the following information:

- EPBC approval number
- Queensland Government EA number
- name and contact details of the proponent
- details of contractors or consultants who have undertaken management and monitoring activities, including skills and expertise of the responsible entity/ies
- a general description of climatic conditions for the management period
- a summary of Project construction and operation activities that occurred during the management period
- the actual impacts of the Project on MNES and their habitat
- a summary of the mitigation, management and monitoring activities, associated with this MNESMP, which were undertaken during the management period
- summary of data collected from previous monitoring events to allow an analysis of trends over time
- data and results of any monitoring events which were undertaken within the management period
- assessment of adherence to performance criteria including any instances where corrective actions were triggered and the details of any corrective actions that have been implemented
- an indication of any potential threats or risks to MNES that have become apparent since the development of the MNESMP, and mitigation and/or management measures to be undertaken to manage these threats and risks
- recommendations for revising the MNESMP including any:
  - proposed changes to mitigation and management actions
  - additional activities (including monitoring activities) to be undertaken to support the attainment of goals for habitat management
  - changes to corrective action triggers or corrective actions
  - additional risks or revisions to the risk register.

## 14.3 ROLES, RESPONSIBILITES AND QUALIFICATIONS

Sojitz, on behalf of U&D, will implement all elements of this plan.

Persons implementing specific management and monitoring activities described in this management plan will have appropriate skills and qualifications, as summarised in Table 26.

Where the identification of a suspected threatened species is not clear, the Queensland Museum will be the first contact for identification confirmation (via photographs and/or detailed description), followed by persons with demonstrable identifications skills for the suspected threatened species.

If injured fauna are encountered, they will be taken to the nearest qualified veterinary practitioner or wildlife carer. Animals with a poor prognosis for survival and that are suffering must be euthanised on site in accordance with the *Code of Practice: Care of Sick, Injured or Orphaned Protected Animals in Queensland*.

**Table 26: Qualification requirements for persons undertaking monitoring activities**

| Monitoring focus | Qualifications required | Demonstrated experience required |
|---|---|---|
| Habitat condition assessment | More than 2 years' experience applying the GTDTHQ in the Brigalow Belt Bioregion<br>Appropriate identification skills for each MNES | |
| Brigalow TEC | Ecologist/botanist | Woodland surveys |
| Natural grasslands TEC | Ecologist/botanist | Grass surveys |
| King blue-grass | Ecologist/botanist | Grass surveys |
| Bluegrass | Ecologist/botanist | Grass surveys |
| Squatter pigeon | Ecologist/ornithologist | Fauna spotter catcher<br>Bird surveys |
| Australian painted snipe | Ecologist/ornithologist | Bird surveys |
| Feral dog | Ecologist | Pest surveys |
| Feral cat | Ecologist | Pest surveys |
| Feral pig | Ecologist | Pest surveys |
| Fox | Ecologist | Pest surveys |
| Rabbit | Ecologist | Pest surveys |
| Invasive weeds | Ecologist | Weed surveys |

# 15 REHABILITATION MEASURES

The Project's EA (Appendix A) and EM Plan set out the conditions and process for rehabilitation of the Project site. The rehabilitation program will aim to restore the landform to a post-mine land use that is stable, self-sustaining and maintenance free. As outlined in the EM Plan:

- Disturbed land will be progressively rehabilitated as it becomes available.
- U&D is committed to the four general rehabilitation goals, i.e. that the rehabilitated landform be:
  - safe to humans, wildlife and stock
  - non-polluting
  - stable
  - able to sustain an agreed post-mining land use.
- The Project's rehabilitation operating philosophy is based on the following concepts:
  - design earthworks and rehabilitate to a predetermined post-mine land use
  - minimise unnecessary land disturbance
  - minimise erosion and its potential off-lease effects
  - protect downstream water quality from contaminated runoff
  - recognise and protect downstream beneficial uses (surface and groundwater)
  - on relinquishment of title, ensure the agreed post-mine land use has been reached.
- All areas significantly disturbed by mining activities will be rehabilitated to a stable landform with a self-sustaining vegetation cover.
- U&D will be responsible for ongoing maintenance of the post-mining landform in accordance with the mining lease conditions.
- Where reasonable and practicable, areas of the site where grazing is nominated as the post mine land use must include grass species endemic to the area.
- U&D will continue to research the most appropriate species mix of native trees, shrubs and grasses for revegetation and determine rehabilitation success criteria using on-site research program and relevant data from other mines. The program will include investigations into vegetation productivity, diversity, and soil fertility.
- The selection and establishment of revegetation will be complementary to nearby remnant vegetation.
- U&D will establish a Rehabilitation Monitoring Program to review progress against rehabilitation indicators and objectives and assist in formulating completion criteria.

## 15.1 PROGRESSIVE REHABILITATION PROCESS

U&D is committed to progressively rehabilitating areas of disturbance at the Project site wherever possible. This will include:

- topsoil recovery ahead of disturbance, with topsoil either stockpiled or, wherever possible, directly used in rehabilitation

- regrading to shape the surface of disturbed areas to conform to the final landform and proposed post mining land use
- construction of drainage features following regrading to reduce erosion and ensure stability of the landform
- topsoil to be spread over the surface of the final landform following regrading and drainage construction
- seedbed preparation involving contour ripping
- seeding, fertilising and adding other soil ameliorants as required as soon as practicable following the preparation of the seedbed
- maintenance where required, including reestablishing erosion prone areas, reseeding, supplementary planting with tube-stock, additional fertiliser or other ameliorant application and repair to drainage structures
- monitoring of rehabilitated areas to be incorporated into the site monitoring program, focusing on key indicators relevant to the proposed post-mine land uses, for example, soil properties and characteristics, soil biota, vegetation and fauna.

### 15.1.1 Topsoil recovery

Where topsoil has been determined as suitable for reuse in the rehabilitation program, it will be recovered ahead of disturbance and either stockpiled or, wherever possible, directly used in rehabilitation. Immediate reuse of recovered topsoil is preferable to stockpiling, as it reduces handling losses and has less impact on the integrity of the topsoil than stockpiling. However, the opportunity to directly reuse topsoil is dependent on mine sequencing and availability of rehabilitation areas within the vicinity of the topsoil recovery operation.

### 15.1.2 Topsoil stockpiling

In cases where topsoil stockpiling is unavoidable, stockpiles will be located as near as possible to the intended reuse destination. To protect the physical, chemical and biological integrity of stockpiled topsoil, stockpiles will be constructed in accordance with the following criteria wherever achievable:

- located clear of potential future disturbance
- located in well drained areas and placed to minimise soil loss off site and sedimentation of watercourses
- constructed to heights below 2m
- maintain irregular surface/s to encourage water infiltration
- seeded with a sterile annual cover crop where future reuse is likely to be in excess of 6 months
- clearly identifiable in the field as a topsoil resource and identified on a site register recording location, volume, soil type, date established and soil source location.

Stockpiles will be regularly inspected as part of the site internal environmental auditing process. Records will be retained on weed status, erosion status, cover crop condition, post construction disturbance and any other information relevant to the integrity of the stockpile.

Where stockpile age exceeds 12 months, additional sampling and analysis prior to spreading on rehabilitation will be undertaken. Results will be assessed against those obtained from the initial recovery operation and where necessary, subsequent changes will be made to stability and amelioration activities.

### 15.1.3 Regrading

Where disturbance results in elevated and or uneven sections of land, regrading will be required. Regrading involves shaping the surface of the disturbed area so that it conforms to the final landform and proposed post-mining land use.

### 15.1.4 Drainage construction

Once regrading is completed, constructed drainage may be required to ensure protection from erosion. For minor regrading areas, drainage would typically be incorporated as part of the regrading process. For regraded overburden dumps, significant drainage structures will be required to ensure stability of the landform.

### 15.1.5 Topsoil spreading

Following regrading and the construction of graded banks and rock lined waterways, topsoil will be spread over the surface of the final landform. The depth at which topsoil will be spread on rehabilitation will average in the order of 120mm, however may be up to 500mm if subsoils are also stripped and re-spread. The average spreading depth has been calculated based on available topsoil (both A and B horizons) for recovery ahead of disturbance and the surface area of the final landform requiring topsoil application.

### 15.1.6 Seed bed preparation

Following the spreading of topsoil on the surface of rehabilitation areas, seedbed preparation will be undertaken. Seedbed preparation will typically involve ripping along the contour using a dozer with three tynes mounted behind the machine. Ripping along the contour reduces the potential for erosion by creating a key between the topsoil and underlying material, promoting infiltration and providing a barrier to down slope runoff. During the ripping process tynes will be lifted at various distances depending on soil type to reduce the potential for channel erosion to develop within rip lines.

Seed bed preparation will be undertaken as soon as practicable following the spreading of topsoil on the rehabilitation area to minimise the potential for topsoil loss through erosion. It is noted that timing of seedbed preparation will be dependent on machinery availability, ground conditions and weather conditions.

### 15.1.7 Seeding, fertilizing and other amelioration

Seeding, fertilising and addition of any other soil ameliorants will be undertaken as soon as practicable following the preparation of the seedbed. Timing will be dependent upon on the selected methodology, machinery availability, ground conditions and weather conditions. There are several methods available for spreading of seed, fertiliser and other ameliorants, which include:

- direct application at the same time as seedbed preparation using appropriately modified machinery
- casting over an area of prepared seedbed using ground-based spreaders, mounted either on conventional agricultural equipment or mining machinery
- aerial application over the prepared seedbed using light aircraft.

### 15.1.8 Seed mix

The seed mix selected for rehabilitation will be primarily dependent on the pre-clearance native vegetation intended to be revegetated. Other factors influencing the seed mixes will be the availability of preferred species and the quality of available species. Composition of seed mixes and application rates will be progressively developed based on trials and rehabilitation success. Early seed mixes and application rates will be determined in consultation with a specialist rehabilitation consultant. Native seed mixes will reflect locally endemic species associated with the pre-clearing vegetation community.

### 15.1.9 Maintenance

During the establishment of vegetation on areas of rehabilitation, erosion or other factors may result in the requirement for maintenance activities. Maintenance activities may include the following:

- repair of erosion areas
- reseeding
- supplementary planting of tube-stock
- additional fertiliser or other ameliorant application on areas of poor establishment
- repair of drainage structures.

The requirement for rehabilitation maintenance will be determined through regular field inspections undertaken as part of the site internal environmental auditing process and rehabilitation monitoring results.

### 15.1.10 Monitoring

U&D will develop and implement a Rehabilitation Monitoring Program which will focus on completion criteria appropriate to the specific post mining land use. Undisturbed (by mining) reference sites will be included in the monitoring program to provide local data and enable progression towards rehabilitation area success to be quantified. Draft rehabilitation completion criteria for areas to be rehabilitated to native ecosystems are presented in Table 27. The program will include the following elements:

- vegetation cover
- plant density
- plant species diversity
- soil profile development
- soil erosion
- faunal colonisation.

## 15.2 REHABILITATION OBJECTIVES, INDICATORS AND COMPLETION CRITERIA

The *EHP Guideline EM1122 Version 1 Rehabilitation requirements for mining projects* has been taken into consideration in the development of rehabilitation criteria for the Project. Table 27 outlines the rehabilitation objectives, indicators and completion criteria for areas to be rehabilitated to native ecosystems in accordance with Appendix A of Guideline EM1122. It is noted that Table 27 is a live table and will be updated throughout the construction and operational phases of the Project, as further information relating to rehabilitation becomes available.

**Table 27: Rehabilitation goals, indicators and completion criteria**

| Rehabilitation Goal | Rehabilitation Objectives | Indicators | Nature of Completion Criteria |
|---|---|---|---|
| Long-term safety | Site is safe for humans and animals now and in the foreseeable future. | ▶ Presence and or absence of physical risk factors which could result in injury or death.<br>▶ Risk assessment documentation. | ▶ A Geotechnical study has been completed within 3 years prior to mine closure to confirm:<br>– that elevated landform slopes are stable and safe<br>– the criteria of 12 degrees (approx. 20%) for landform slopes are achievable and sustainable over the long term.<br>– A safety assessment of elevated sections of the landform has been conducted.<br>– Evidence that landform final landform construction has met the specified design requirements<br>– Risk assessment relative to safety of humans, stock and wildlife completed and risk mitigation measures have been implemented in accordance with relevant guidelines and Australian Standards such as ISO 31000 Risk Management. |
| Long-term safety | Site is safe for humans and animals now and in the foreseeable future. | ▶ Exposure to and availability of heavy metals and other toxic material or other introduced contaminants | ▶ Potential hazardous materials have been identified during mine life and removed or selected capping material has been applied with cover thickness appropriate to the contaminant.<br>▶ Leaching tests have been conducted to complement the analyses undertaken and reported under the Overburden Assessment section of the MDS Soils, Land, Overburden and Process Waste Study; as well as ongoing overburden and reject characterisation programs.<br>▶ Surface water monitoring has been conducted consistent with guidelines derived from ANZECC 2000 for the final 5 years of mine operation and for 3 years post mine operation.<br>▶ Local program of fire control and proscribed weeds and woody weeds control have been conducted. |
| Long-term safety | Site is safe for humans and animals now and in the foreseeable future. | ▶ Adequacy and long-term performance of safety barriers. | ▶ Fencing and appropriate signage is in place to restrict access has been conducted.<br>▶ Cattle are excluded. |

| Rehabilitation Goal | Rehabilitation Objectives | Indicators | Nature of Completion Criteria |
|---|---|---|---|
| | | | ▶ Where risk mitigation measures include fencing and appropriate signage around a perimeter to restrict access, these have been erected in accordance with relevant guidelines and Australian Standards. |
| Non-polluting | – Hazardous overburden materials adequately handled. | ▶ A program of identification of hazardous and benign overburden materials. | ▶ Selective burial of hazardous materials and covering of landforms with benign materials including topsoil has been conducted.<br>▶ If required, a selection of an appropriate "barrier layer" beneath the top capping suitable to the level of sulphides or other contaminants not removed, has been applied.<br>▶ Compliance with the site's Topsoil Management Plan<br>▶ Average broad range topsoil pH range of 6 to 9 and an Electrical Conductivity of less than 1dS/cm. |
| Non-polluting | – Elimination of all permanent water storages on the site outside the final void. | ▶ Polluted water contained on site.<br>▶ Leachate and drainage control. | ▶ Mine water has been transferred to the final mining void at cessation of operations.<br>▶ Surface and groundwater water monitoring has been conducted according to guidelines derived from ANZECC 2000 for 5 years during mine operation and for 3 years post mine operation.<br>▶ Minor drainage works to reinforce and consolidate natural drainage to the north of site as part of final landform have been completed.<br>▶ Evidence in the Rehabilitation Report, as prepared by an appropriately qualified person, that the rock lined drains have remained stable.<br>▶ Average broad range topsoil pH range has been achieved of 6 to 9 and an Electrical Conductivity of less than 1dS/cm with reference to the MDS Soils, Land, Overburden and Process Waste Study. |
| Stable | – Very low probability of subsidence or slope slippage. | ▶ Design criteria.<br>▶ Safety assessment.<br>▶ Erosion rate.<br>▶ Slope stability. | ▶ A Geotechnical study and assessment that the elevated landforms are stable and safe has been conducted by qualified entity.<br>▶ All elevated landforms regraded to 12 Degrees overall where possible. |

| Rehabilitation Goal | Rehabilitation Objectives | Indicators | Nature of Completion Criteria |
|---|---|---|---|
| | | | ▶ Evidence provided in the Rehabilitation Report that the reshaping of elevated sections of the landform<br>▶ have complied with the site's final landform design criteria.<br>▶ Erosion rates from disturbed areas and rehabilitated areas are comparable with reference (undisturbed) areas.<br>▶ Evidence that the reshaping of the upper surface of the elevated landforms has been to a stable gradient to direct runoff to the rock-lined waterway and prevent gully erosion.<br>▶ Slopes on elevated sections of the landform are geotechnically stable enough to maintain covers constructed for containment of hazardous material and for ecosystem support. |
| Stable | – Landform design achieves appropriate erosion rates. | ▶ Slope angle and length. | ▶ All elevated sections of the landform have been graded to 12 Degrees (approximately 20%).<br>▶ Greater than 12 Degree slopes have been subject to a geotechnical assessment and drainage plan.<br>▶ Vertical intervals between slope breaks are 10m so that the length of slope will be approximately 50m.<br>▶ Slope breaks include a waterway and a graded bank constructed at a slope of less than 2%. |
| Stable | Landform design achieves appropriate erosion rates. | ▶ Rate of soil loss. | ▶ A benchmark erosion study has been conducted based on rainfall and sediment run- off rates in undisturbed region (to be conducted by qualified entity).<br>▶ Drainage points have been established approximately every 50 meters on exposed slopes.<br>▶ Spray-on barriers (mulch) have been applied if required.<br>▶ Erosion rates similar to the surrounding undisturbed region have been achieved within 3 years of cessation of mining.<br>▶ Results have shown that significant active erosion features are not present and that any initial erosion has been stabilised by vegetation cover; |

| Rehabilitation Goal | Rehabilitation Objectives | Indicators | Nature of Completion Criteria |
|---|---|---|---|
| | | | ▶ Evidence has been included in Rehabilitation Report. |
| Stable | ▶ Vegetation cover to minimise erosion.<br>▶ Resilience to Disturbance.<br>▶ A perennial, self-sustaining ground cover is maintained that is resilient to environmental stresses such as fire, drought and pest species is extensive enough to control erosion; and contributes to the integrity of constructed covers. | ▶ Vegetation type and density. | ▶ Scarification with direct seeding and fertilizer (primary grasses and legumes) has been completed.<br>▶ Contour ripping has been completed.<br>▶ Revegetation works have been implemented and standard establishment techniques have included contour deep ripping: and<br>- Shrub species have been established; and<br>- Tree species have been established.<br>▶ Desirable grass species comprise at least 60% of total grass cover. Tree density and height of >25 stems per 5ha each being >2m in height have been established.<br>▶ The relevant management programs and completion criteria to be implemented as part of the final rehabilitation plan as outlined in Chapter 5 of the Flora, Fauna and Freshwater Ecology Assessment Report have been conducted.<br>▶ Evidence of utilised revegetation techniques has been included in the Rehabilitation Report. |
| Sustainable land use | Soil properties to support the final land use proposed to be a self-sustaining native ecosystem comprising of local native vegetation assemblages. | ▶ Physical and Chemical properties of surface materials. | ▶ Testing to confirm achievement of pH in range 6.0 to 9.0.<br>▶ Testing to confirm achievement of Electrical Conductivity of less than 1dS/cm. |
| Sustainable land use | Establish specified self-sustaining natural vegetation and habitats. | ▶ Presence of key species.<br>▶ Species type and diversity.<br>▶ Weeds. | ▶ Environmental Audit has been conducted by qualified entity to grade success of:<br>- Erosion mitigation program;<br>- Vegetation program;<br>- Water monitoring program; and<br>- Weed management.<br>▶ The following species forming the vegetation communities referenced in Table 5 of “Flora, fauna and freshwater ecology assessment of the Meteor Downs South Project, near Rolleston, Central Queensland 2012“ |

| Rehabilitation Goal | Rehabilitation Objectives | Indicators | Nature of Completion Criteria |
|---|---|---|---|
| | | | have been introduced into the revegetation seed mix and establishment has been attempted:<br>- *Melaleuca bracteata;*<br>- *Eucalyptus orgadophila;*<br>- *Corymbia erythrophloia;*<br>*E. melanophloia;*<br>- *Themeda triandra;*<br>- *Heteropogon contortus;*<br>- *Aristida* spp*;*<br>- *Chloris divaricata;*<br>- *Iseilema vaginiflorum*<br>- *Eucalyptus populnea; and*<br>- *Paspalidium caespitosum.* |
| Sustainable land use | Establish land use with comparable management requirements to similarly used non-mined land. | ▶ Initial establishment of native species to form the basis of a longer term self-sustaining native ecosystem. | ▶ Baseline Land Suitability Class has been determined in accordance with Technical Guidelines for Environmental Management of Exploration and Mining Queensland (QDME 1995).<br>▶ Environmental audit conducted by appropriately qualified persons to:<br>- Establish progress towards a native ecosystem;<br>- Identify the Land Suitability Class; and<br>- Establish adequacy and predicted long term performance of safety barriers. |

# 16 REFERENCES


Auld, B. (2009), Guidelines for monitoring weed control and recovery of native vegetation. NSW Department of Primary Industries, Orange NSW.

AusGrass2 (2017a), *Dichanthium queenslandicum*. Available at: http://ausgrass2.myspecies.info/content/dichanthium-queenslandicum. Accessed 14 November 2017.

AusGrass2 (2017b), *Dichanthium setosum*. Available at: http://ausgrass2.myspecies.info/content/dichanthium-setosum. Accessed 14 November 2017.

Birdlife Australia, 2017, *Australian Painted Snipe.* Rostratula australis –*Rostratulidae.* Available online: http://www.birdlife.org.au/bird-profile/australian-painted-snipe. Accessed 06 November 2017.

Butler, D.W (2008a), *Recovery plan for the "Brigalow (*Acacia harpophylla) *dominant and co-dominant" endangered ecological community*. Report to the Department of the Environment and Water Resources, Canberra. Queensland National Parks and Wildlife Service, Brisbane.

Butler, D.W (2008b), Draft national recovery plan for the "bluegrass (Dichanthium spp.) dominant grasslands in the Brigalow Belt Bioregions (north and south)" endangered ecological community. Report to Department of the Environment, Water, Heritage and the Arts, Canberra. Environmental Protection Agency, Brisbane.

Central Queensland University (CQU) (2012), *Flora, fauna and freshwater ecology assessment of the Meteor Downs South Project, near Rolleston, Central Queensland.* Centre for Environmental Management.

Crome, F. and J. Shields (1992), *Parrots and Pigeons of Australia*. Angus & Robertson, Sydney.

Crome, F.H.J. (1976), Breeding, moult and food of the Squatter Pigeon in north-eastern Queensland. Australian Wildlife Research. 3:45-59.

Commonwealth of Australia (CoA) (2011), *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads*. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-biological-effects-including-lethal-toxic-ingestion-caused-cane-toads

Commonwealth of Australia (CoA) (2014), *Threat abatement advice for predation, habitat degradation, competition and disease transmission by feral pigs (2013)*. Available from:

http://www.environment.gov.au/biodiversity/threatened/key-threatening-processes/feral-pigs

Commonwealth of Australia (CoA) (2015), *Threat abatement plan for predation by feral cats.* Canberra, ACT: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats.

Commonwealth of Australia (CoA) (2016), *Threat abatement plan for competition and land degradation by rabbits.* Canberra, ACT: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/competition-and-land-degradation-rabbits-2016.

Cooke, B., McPhee, S., and Hart, Q. (2008), *Rabbits: A threat to conservation and natural resources management. How to rapidly assess a rabbit problem and take action.* Bureau of Rural Sciences, Canberra.

Department of the Environment (DoE) (2013a), *Commonwealth Conservation Advice for Brigalow Ecological Community*. Department of the Environment, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/028-conservation-advice.pdf. Accessed 2 November 2017.

Department of Environment and Energy (2017a), *Species Profile and Threats Database for* Geophaps scripta scripta – *squatter pigeon (southern).* Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440

Department of Environment and Energy (2017b), Species Profile and Threats Database. Rostratula australis — *Australian Painted Snipe.* Available online: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=77037. Accessed 02 November 2017

Department of Environment and Heritage Protection (DEHP) (2016) Flora Survey Guidelines – Protected Plants. Department of Environment and Heritage Protection (State of Queensland), Brisbane.

Department of Environment and Heritage Protection (DEHP) (2017), *Guide to determining terrestrial habitat quality.* Department of Environment and Heritage Protection (State of Queensland), Brisbane.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008a), *Threat abatement plan for predation by the European red fox*. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/foxes08.html.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b), *Approved Conservation Advice for* Dichanthium setosum. Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/14159-conservation-advice.pdf. Accessed 14 November 2017.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008c), *Commonwealth Conservation Advice on Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin*. Department of the Environment, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/99-conservation-advice.pdf. Accessed 13 November 2017.

Department of Environment, Water, Heritage and the Arts (2010), Survey Guidelines for Australia's Threatened Birds. Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2013a), Nationally Threatened Ecological Communities: Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland, and Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin [Information Sheet]. Available from: http://www.environment.gov.au/system/files/resources/347c5d4e-cef8-411c-b53c-bed3ed1d3e1c/files/bio237-0512-natural-grasslands-guide.pdf. Accessed 10 November 2017.

Department of Sustainability, Environment, Water, Population and Communities (2013b), *Approved Conservation Advice for* Rostratula australis *(Australian painted snipe)*. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/77037-conservation-advice.pdf.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2013c), *Approved Conservation Advice for* Dichanthium queenslandicum *(king blue-grass*). Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/5481-conservation-advice.pdf. Accessed 13 November 2017.

Ecosure (2013), Meteor Downs South – supplementary ecological surveys. A report prepared for U&D Mining.

Ecosure (2014), *Natural grasslands survey - Survey summary report*. A report prepared for U&D Mining.

Eyre T. J., Ferguson D. J., Hourigan C. L., Smith G. C., Mathieson M. T., Kelly, A. L., Venz M. F., Hogan, L. D. and Rowland, J. (2014), *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland*. Department of Science, Information Technology, Innovation and the Arts, Queensland Government, Brisbane.

Eyre, T.J., Kelly, A.L, Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2011), *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.1*. Department of Environment and Resource Management (DERM), Biodiversity and Ecosystem Sciences, Brisbane.

Eyre, T. J., Kelly, A. L, Neldner, V. J., Wilson, B. A., Ferguson, D. J., Laidlaw, M. J. and Franks, A. J. (2015), *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2*. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts (State of Queensland), Brisbane.

Fleming, P. J. S., Thompson, J. A., Nicol, H. I. (1996*). Indices for measuring the efficacy of aerial baiting for wild dog control in north-eastern New South Wales*. Wildlife Research 23: 665-674.

Frith, H.J. (1982*), Pigeons and Doves of Australia.* Melbourne: Rigby.

Gaia Environmental Consulting (Gaia) (2015), *Meteor Downs South Coal Mining Project EPBC Act Offsets Strategy (March 2015)*. A report prepared for U & D Mining Pty Ltd.

Hone, J. (1988). Feral pig rooting in a mountain forest and woodland. Distribution, abundance and relationships with environmental variables. *Australian Journal of Ecology* **13:** 393-400.

Queensland Herbarium (2021). *Regional Ecosystem Description Database (REDD) Version 12 (March 2021)*. Brisbane, Queensland.

McCollum Environmental Management Services (McCollum) (2013). *Meteor Downs South Environmental Management Plan*. A report prepared for Endcoal Limited.

Mitchell, B. and Balogh, S. (2007a). *Monitoring techniques for vertebrate pests – wild dogs*. NSW Department of Primary Industries, Orange NSW.

Mitchell, B. and Balogh, S. (2007b). *Monitoring techniques for vertebrate pests – feral pigs.* NSW Department of Primary Industries, Orange NSW.

National Research Council (2004). *Adaptive Management for Water Resources Planning*. The National Academies Press, Washington DC.

Threatened Species Scientific Committee (TSSC) (2009b), *Commonwealth Listing Advice on Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin*. Department of the

Environment, Water, Heritage and the Arts, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/99-listing-advice.pdf. Accessed 13 November 2017.

Threatened Species Scientific Committee (TSSC) (2012), *Commonwealth Listing Advice on* Dichanthium setosum *(bluegrass)*. Department of Sustainability, Environment, Water, Population and Communities. Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/14159-listing-advice.pdf. Accessed 14 November 2017.

Threatened Species Scientific Committee (2013b), *Commonwealth Listing Advice on* Rostratula australis (Australian Painted Snipe). Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/77037-listing-advice.pdf. Accessed 2 November 2017.

Threatened Species Scientific Committee (TSSC) (2013c), *Commonwealth Listing Advice on* Dichanthium queenslandicum *(king blue-grass)*. Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/5481-listing-advice.pdf. Accessed 14 November 2017.

Threatened Species Scientific Committee (TSSC) (2015), *Conservation Advice* Geophaps scripta scripta *squatter pigeon (southern).* Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64440-conservation-advice-31102015.pdf. Accessed on 2 November 2017.

Williams, B. (2011). *Adaptive management of natural resources – framework and issues*. Journal of Environmental Management 92: 1346 – 1353.

WRM (2014), *Meteor Downs South Project Surface Water Impact Assessment.* Report prepared for U&D Mining Industry (Australia) Pty Ltd. January 2014.

# APPENDIX A ENVIRONMENTAL AUTHORITY EPML00559513 METEOR DOWNS SOUTH COAL MINE

# APPENDIX B DRAFT NATIONAL RECOVERY PLAN FOR THE "BLUEGRASS (*DICANTHIUM* SPP.) DOMINANT GRASSLANDS IN THE BRIGALOW BELT BIOREGIONS (NORTH AND SOUTH)"

# APPENDIX C MNESMP BASELINE MONITORING REPORT

# APPENDIX D RISK ASSESSMENT

The following risk assessment assesses the risks of failure to achieve the plan's objectives for MNES.

For each risk identified, the potential consequence of the risk (rated from minor to critical; Table D 1) was assessed against the likelihood of that risk occurring (rated from very unlikely to almost certain;

Table D 2) to determine a risk rating. The risk rating was evaluated by using the matrix in

Table D 3.

The consequence and likelihood of each risk was first considered without the proposed management and mitigation measures in place to provide an initial risk rating. The consequence and likelihood of each risk occurring was then reassessed following the implementation of the management and mitigation measures (i.e. control measures) to provide a residual risk rating.

Table D 4 provides the risk register which was used to document the findings of the risk assessment process.

**Table D 1: Consequence classification**

| | |
|---|---|
| **1. Minor** | Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions. |
| **2. Moderate** | Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions. |
| **3. High** | High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions. |
| **4. Major** | The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies. |
| **5. Critical** | The plan's objectives are unable to be achieved, with no evidenced mitigation strategies. |

**Table D 2: Likelihood classification**

| | |
|---|---|
| **5. Almost certain** | Is expected to occur in most circumstances |
| **4. Likely** | Will probably occur during the life of the project |
| **3. Possible** | Might occur during the life of the project |
| **2. Unlikely** | Could occur but considered unlikely or doubtful |
| **1. Very unlikely** | May occur in exceptional circumstances |

**Table D 3: Risk rating matrix**

| **Likelihood** | **Consequence** | | | | |
|---|---|---|---|---|---|
| | 1 - Minor | 2 - Moderate | 3 - High | 4 - Major | 5 - Critical |

| | | | | | |
|---|---|---|---|---|---|
| **5 - Almost Certain** | Medium | High | High | Severe | Severe |
| **4 - Likely** | Low | Medium | High | High | Severe |
| **3 - Possible** | Low | Medium | Medium | High | Severe |
| **2 - Unlikely** | Low | Low | Medium | High | High |
| **1 - Very Unlikely** | Low | Low | Low | Medium | High |

A brief description of each overall possible risk rating is provided below.

Severe

A ranking of extreme represents an unacceptable risk, which is usually critical in nature in terms of consequences and is considered possible to almost certain to occur. Such risks significantly exceed the risk acceptance threshold and require comprehensive control measures, and additional urgent and immediate attention towards the identification and implementation of measures necessary to reduce the level of risk.

High

High risks typically relate to moderate to critical consequences that are rated as possible to almost certain to occur. These are also likely to exceed the risk acceptance threshold, and although proactive control measures are usually planned or implemented, a very close monitoring regime and additional actions towards achieving further risk reduction is required.

Medium

As suggested by the classification, medium level risks span a group of risk combinations varying from relatively minor consequence/likely likelihood to mid-level consequence/likelihood to relatively major consequence/very unlikely likelihood scenarios. These risks are likely to require active monitoring as they are effectively positioned on the risk acceptance threshold.

Low

Low risks are below the risk acceptance threshold and although they may require additional monitoring in certain cases, are not considered to require active management. In general, such risks represent relatively low likelihood, and low to mid-level consequence scenarios.

**Table D 4: Risk register**

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| 1. Limit or avoid loss of MNES/ habitat for MNES. | Clearing of MNES/ habitat for MNES occurs outside of the Project footprint and/or exceeds actual disturbance limits. | ▶ Clearing personnel/contractors are not made aware of the location of areas of MNES habitat.<br>▶<br>▶ | 4 | 3 | H | ▶ Mapping of MNES within the Project site is provided in Figure 5 to Figure 10 (excluding Figure 9). This mapping, and associated GIS shapefiles, will be provided to clearing personnel and/or contractors prior to the commencement of clearing operations.<br>▶ A permit to disturb must be initiated and signed off by the site Environmental Representative prior to any vegetation clearing.<br>▶ Any conditions listed in the permit to disturb must be implemented. For example, clearing extents will be clearly marked and any vegetation or areas to be protected adjacent to the Project footprint will barricaded (using for example safety bunting, pegging or mesh safety fences).<br>▶ Areas to be cleared will be restricted to the minimum area necessary for the construction and operation of the Project.<br>▶ Temporary stockpile sites for soil and equipment, access routes, laydown yards and other associated infrastructure will be located in cleared areas, where possible.<br>▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures.<br>▶ All vegetation clearing operations are to be monitored for compliance by a suitably qualified person. | 1 | 3 | L |
| | Clearing of Brigalow TEC occurs. | ▶ Clearing occurs outside of the Project footprint.<br>▶ Clearing contractors are not made aware of the location of areas of Brigalow TEC. | 2 | 3 | M | ▶ Mapping of Brigalow TEC within the Project site is provided in Figure 5. This mapping and associated GIS shapefiles, will be provided to clearing contractors and/or personnel prior to the commencement of clearing operations. GIS shapefiles can be provided on request.<br>▶ Clearing of Brigalow TEC is not permitted.<br>▶ Clearing outside of the Project footprint is not permitted.<br>▶ A permit to disturb must be initiated and signed off by the site Environmental Representative prior to any vegetation clearing.<br>▶ Any conditions listed in the permit to disturb must be implemented. For example, clearing extents will be clearly marked and any vegetation or areas to be protected adjacent to the Project footprint will barricaded (using for example safety bunting, pegging or mesh safety fences).<br>▶ Prior to vegetation clearing, the extent of Brigalow TEC will be clearly marked or barricaded to prevent/minimise disturbance. | 1 | 3 | L |

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| | Net loss of habitat for the Australian painted snipe. | ▶ Mining occurs at Naroo Dam.<br>▶ Water is not diverted to Naroo Dam.<br>▶ More than 11 % of the catchment is affected by the Project footprint.<br>▶ Diversion drain does not provide suitable habitat for the Australian painted snipe. | 2 | 2 | L | ▶ The mine has been reconfigured such that it does not intersect with Naroo Dam, which is the preferred habitat area for Australian painted snipe on the Project site.<br>▶ Water flows into Naroo Dam will be maintained by diverting overland flows around the mine into the dam, through the construction of a diversion drain.<br>▶ U & D have entered into a Make Good Agreement with Glencore which ensures that make good water is delivered directly into Naroo Dam, and ensures that water does not fall below critical storage level.<br>▶ With regards to ephemeral drainage lines, which may possibly provide habitat suitable for Australian painted snipe after periods of inundation, this type of modified habitat is widespread throughout the local area, both on the Project site, and on surrounding properties.<br>▶ The loss of marginal ephemeral drainage line habitat (i.e. two of the larger ephemeral drainage lines intersect the mine footprint, and another is crossed by the road within the Project site), is offset by the provision of the north diversion drain.<br>▶ The diversion drain will be designed to maximise benefits to the Australian painted snipe including the provision of micro-habitat features and the ability for ponding, noting species habitat requirements described in Section 9.2.2.<br>▶ The size of the Naroo Dam catchment will be restored at the end of the mine life. | 1 | 2 | L |
| | Loss of permanent water sources for the squatter pigeon, in particular Naroo Dam. | ▶ Project footprint removes part of Naroo dam.<br>▶ All or part of the catchment of Naroo Dam is removed by the Project.<br>▶ The Project impacts on other permanent water sources within the Project site (i.e. stock dams). | 2 | 2 | L | ▶ The mine has been reconfigured such that it does not intersect with Naroo Dam.<br>▶ The mine footprint does not exceed more than 11% of the catchment for Naroo Dam.<br>▶ Water flows into Naroo Dam will be maintained by diverting overland flows around the mine into the dam, through the construction of a diversion drain.<br>▶ U & D have entered into a Make Good Agreement with Glencore which ensures that make good water is delivered directly into Naroo Dam, and ensures that water does not fall below critical storage level.<br>▶ No other permanent water sources will be directly impacted by the Project. | 1 | 2 | L |
| | Known king blue-grass and bluegrass specimens located outside of the Project footprint are cleared. | ▶ Clearing occurs outside of the Project footprint.<br>▶ Clearing contractors are not made aware of the location of areas of king blue-grass and bluegrass specimens. | 2 | 3 | M | ▶ Prior to clearing the location of any known king blue-grass and bluegrass specimens, outside of the Project footprint, will be clearly marked or barricaded (using for example, safety bunting, pegging or mesh safety fences).<br>▶ Should additional king blue-grass and bluegrass specimens be identified outside of the Project footprint, at any time during construction and/or operation of the Project, these areas will be clearly identified on site maps and clearly marked if in close proximity to the Project footprint.<br>▶ A permit to disturb must be initiated and signed off by the site Environmental Representative prior to any vegetation clearing.<br>▶ Any conditions listed in the permit to disturb must be implemented. For example, clearing extents will be clearly marked and any vegetation or areas to be protected adjacent to the Project footprint will barricaded (using for example safety bunting, pegging or mesh safety fences). | 1 | 3 | L |

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| | Rehabilitation fails to meet the established objectives, indicators and completion criteria. | ▶ Disturbed areas are not rehabilitated in appropriate timeframes.<br>▶ Topsoil is not appropriately stockpiled and/or used on rehabilitation areas.<br>▶ Species which are not endemic to the area are used in the rehabilitation.<br>▶ Introduction/spread of weed species in rehabilitated areas.<br>▶ Erosion is not managed. | 3 | 3 | M | ▶ The Project's EA (Appendix A) sets out the conditions and process for rehabilitation of the Project site.<br>▶ U & D is committed to progressively rehabilitating areas of disturbance at the Project site wherever possible. This will include:<br>- topsoil recovery ahead of disturbance, with topsoil either stockpiled or, wherever possible, directly used in rehabilitation<br>- regrading to shape the surface of disturbed areas to conform to the final landform and proposed post mining land use<br>- construction of drainage features following regrading to reduce erosion and ensure stability of the landform<br>- topsoil to be spread over the surface of the final landform following regrading and drainage construction<br>- seedbed preparation involving contour ripping<br>- seeding, fertilising and adding other soil ameliorants as required as soon as practicable following the preparation of the seedbed<br>- maintenance where required, including reestablishing erosion prone areas, reseeding, supplementary planting with tube-stock, additional fertiliser or other ameliorant application and repair to drainage structures<br>- monitoring of rehabilitated areas to be incorporated into the site monitoring program, focusing on key indicators relevant to the proposed post-mine land uses, for example, soil properties and characteristics, soil biota, vegetation and fauna.<br>▶ Rehabilitation will establish specified self-sustaining natural vegetation and habitats.<br>▶ Mine pit and overburden dump will be rehabilitated to native ecosystems.<br>▶ Selection of native seed mixes will include species endemic to the Project site and surrounds, and representative of pre-clearing vegetation communities. | 2 | 3 | M |
| 2. Prevent the decline of habitat quality for retained habitat within the Project site. | Habitat quality score in areas of retained MNES/ habitat for MNES falls below the baseline habitat quality score. | ▶ Weeds are introduced and/or spread across the Project site as a result of the movement of vehicles and machinery.<br>▶ Pest animal abundance increases as a result of Project activities.<br>▶ Increased dust deposition as a result of Project activities.<br>▶ Uncontrolled fire as a result of Project activities. | 4 | 3 | H | ▶ Areas of habitat for MNES adjacent to the Project footprint will be clearly marked or barricaded during clearing operations (for example using safety bunting, pegs or mesh safety fences).<br>▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures.<br>▶ No clearing to be undertaken within areas of retained habitat for MNES.<br>▶ No unauthorised access into areas of habitat for MNES.<br>▶ Vehicles and other machinery to be driven on designated access tracks only.<br>▶ Pest animals and weeds will be managed in accordance with the Project's pest and weed management plans.<br>▶ Implementation of dust suppression techniques according to the *Coal Mining Safety and Health Act 1999* (CMSHA) and the Coal Mining Safety and Health Regulation 2017 (CMSHR).<br>▶ Maintenance of existing fences. | 3 | 3 | M |

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| 3. Minimise risk of weed introduction and/or spread in areas of MNES/ habitat for MNES. | ▶ Outbreak of a weed species that has not been previously recorded in the Project site.<br>▶ Spread of existing weed species on site. | ▶ A pest and weed management is not developed and/or implemented for the Project.<br>▶ Vehicles are not washed down prior to arriving on site.<br>▶ Weed infestations on site are not managed. | 4 | 2 | M | ▶ Weeds will be managed in accordance with the Project's weed management plan. The weed control plan will be developed by suitably qualified ecologists, with implementation commencing within six months from commencement of construction. The plan will include the following:<br>▶ Detailed control measures as recommended by the Queensland Department of Agriculture and Fisheries to eradicate where possible, or otherwise reduce the extent of weeds.<br>▶ A site induction program that provides information to staff, contractors and visitors on weed control issues.<br>▶ Systems for requiring all earthmoving equipment brought onto site to be thoroughly washed down prior to arriving at site and inspected on arrival to ensure all spoil and plant matter has been removed.<br>▶ Targeted weed control/eradication measures that will benefit MNES within the Project Area. As a minimum, control actions will target the following weed species (if present) which pose a particular threat to MNES:<br>- Brigalow TEC: exotic pasture grasses including buffel grass, Rhodes grass, green panic grass.<br>- Natural grassland TEC: parthenium (*Parthenium hysterophorus*), parkinsonia (*Parkinsonia aculeata*), prickly acacia (*Acacia nilotica* subsp. *indica*), buffel grass, Columbus grass (*Sorghum* x *almum*), Rhodes grass, and green panic *(Megathyrsus maximus*).<br>- King blue-grass: parthenium (*Parthenium hysterophorus*) and parkinsonia (*Parkinsonia aculeata*).<br>- Bluegrass: Coolatai grass (*Hyparrhenia hirta*), lippia (*Phyla canescens*) and African lovegrass (*Eragrostis curvula*).<br>▶ An integrated weed control program including where possible and effective the combination of fire management, biological, chemical and mechanical removal with consideration of suitability for each MNES. | 3 | 2 | M |
| 4. Reduce degradation of MNES/ habitat for MNES by pest animals, and reduce potential predation of squatter pigeon and Australian painted snipe by pest animals. | ▶ Increase in the abundance of (or signs of) pest animals in habitat for MNES.<br>▶ Observation of (or signs of) a pest animal species not previously recorded in the Project site.<br>▶ Predation of squatter pigeon and Australian panted snipe by pest animals. | ▶ A pest management is not developed and/or implemented for the Project.<br>▶ Inappropriate waste management practices.<br>▶ Pest animals on site are not controlled. | 3 | 2 | M | ▶ Pest animals will be managed in accordance with the Project's pest management plan which will be developed by suitably qualified ecologists. Implementation of the plan will commence within six months from commencement of construction.<br>▶ Pest management actions detailed in the pest management plan will focus on rabbits, feral pigs, foxes and cats as these pests have been identified on site and pose a potential threat to MNES and their habitat. However, should any additional pests be identified, these will also be included in the pest management plan as required.<br>▶ Pest management will include a combination of shooting, trapping, fencing and baiting in line with best practice guidelines.<br>▶ The pest management plan will include requirements for:<br>- Appropriate waste management.<br>- Reporting framework to ensure sightings of pest animals are recorded.<br>- Site induction program to include information on pest animal control issues and reporting on pest animals seen during construction and operation activities | 2 | 2 | L |

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| 5. Minimise impact of dust deposition on MNES/ habitat for MNES as a result of the construction and/or operation of the Project. | ▶ Dust deposition levels exceed the guideline of 120 mg per square metre per day, averaged over one month when measured at a sensitive receptor.<br>▶ Visual inspections of vegetation adjacent to the Project footprint indicate visible signs of dust deposition. | ▶ Disturbed areas are left exposed for long periods of time.<br>▶ Disturbed areas are not watered down regularly.<br>▶ Speed limits along internal roads are not observed.<br>▶ Vehicles drive over disturbed areas (e.g. overburden dumps). | 4 | 1 | L | ▶ Dust suppression for coal mining operations in Queensland is governed by the *Coal Mining Safety and Health Act 1999* (CMSHA) and the Coal Mining Safety and Health Regulation 2017 (CMSHR).<br>▶ Dust and dust suppression of mine roads is prescribed in Section 129 of the CMSHR which states that a surface mine must have a standard procedure for maintaining and watering mine roads.<br>▶ Speed limits on mine roads for vehicles, mobile plant and equipment is regulated under the CMSHA and CMSHR.<br>▶ In addition to the rigorous requirements under the CMSHA and CMSHR, the following dust suppression measures will be implemented:<br>- Minimise disturbed areas by limiting clearing to what is necessary.<br>- Progressively rehabilitating disturbed areas.<br>- Removal and dumping of overburden as soon as practicable after blasting (i.e. minimising drying time by retaining as much inherent moisture as possible).<br>- Restrict vehicle access, other than mining machinery on overburden dumps. | 3 | 1 | L |

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| 6. Minimise degradation of MNES/ habitat for MNES as a result of increased risk of fire due to Project activities and management actions. | ▶ An uncontrolled fire occurs.<br>▶ Biomass monitoring indicates risk of fire due to increased fuel loads.<br>▶ Controlled burns occur outside of the specified frequency for each RE. | ▶ Project activities result in a fire occurring.<br>▶ Fuel loads are not managed in areas of MNES habitat.<br>▶ Guidelines for frequency of controlled burns are not adhered to. | 3 | 2 | M | ▶ Fire management for coal mining operations in Queensland is governed by the *Coal Mining Safety and Health Act 1999* (CMSHA) and the Coal Mining Safety and Health Regulation 2017 (CMSHR).<br>▶ One of the major hazards identified to coal mine workers present during coal mining operations is fire and the CMHSR prescribes both prevention, preparedness and management of fire hazards for surface and underground mines.<br>▶ These prescriptions are detailed in Section 37 of the CMSHR, which details amongst other things that a Safety and Health Management System (SHMS) must provide for the following at the mine (where mine is defined as the Mining Lease tenure as a whole):<br>- Fire prevention and control<br>- An effective fire- fighting capability<br>- The safety of persons fighting fires<br>- A risk assessment to identify all potential fire hazards at the mine<br>▶ The system must also provide for the following:<br>- The availability at the mine, at all times, of equipment that is appropriate and sufficient to extinguish any potential fire identified in the risk assessment<br>- The location of portable fire extinguishers on or near equipment and installations identified as potential fire hazards by the risk assessment<br>- The compatibility, throughout the mine, of all fire- fighting equipment<br>▶ The coal mine must have a standard operating procedure for action to be taken when a fire is discovered at the mine.<br>▶ Fire management of the site will consider appropriate fire management regimes for the vegetation type including:<br>- no fires in areas of Brigalow TEC<br>- controlled burns in RE 11.8.11 (natural grasslands TEC, potential blue grass and king blue-grass habitat) occur at an interval greater than 5 years<br>- controlled burns in RE 11.8.5 and 11.8.15 (squatter pigeon habitat) occur every 6 – 10 years.<br>▶ Fuel loads will be minimised through weed control as specified in the weed management plan.<br>▶ Weed management actions will target high biomass exotic grasses (e.g. buffel grass). | 1 | 2 | L |
| 7. Minimise degradation of habitat for the Australian painted snipe and squatter pigeon as a result of changes to water quality in Naroo Dam. | Water quality exceeds trigger levels set out in Table F8 of the Project's EA. | ▶ Dirty or contaminated water enters Naroo Dam. | 2 | 3 | M | ▶ No dirty or contaminated water will be permitted to enter Naroo Dam.<br>▶ Water quality monitoring is required to be undertaken in accordance with the Project's EA. | 1 | 3 | L |
| 8. Minimise noise and vibration impacts in areas of squatter pigeon and Australian painted snipe habitat. | When measured, noise and vibration levels exceed criteria set out in Tables D1 and D2 of the Project EA. | ▶ Plant and equipment is poorly maintained.<br>▶ Engine covers are left off while engines are in operation.<br>▶ Blasting occurs at night. | 2 | 1 | L | ▶ All plant and equipment will be regularly serviced and maintained to minimise machinery noise.<br>▶ All engine covers will be kept closed while equipment is operating.<br>▶ Blasting will only occur between 7am and 6pm. | 2 | 1 | L |

| Objectives for MNES management | Risk | Event or circumstance | Initial risk rating | | | Control strategies | Residual risk rating | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Likelihood | Consequence | Overall Risk Rating | | Likelihood | Consequence | Overall Risk Rating |
| 9. Minimise potential for mortality or injury to squatter pigeons and Australian painted snipe as a result of the construction and operation of the Project (e.g. from clearing activities, vehicle strikes etc.). | ▶ Injury or mortality of a squatter pigeon or Australian painted snipe. | ▶ Squatter pigeon or Australian painted snipe is struck by vehicle or machinery. | 1 | 1 | L | ▶ Environmental awareness training will be provided to all workers as part of site induction, including specific topics on MNES, risks and protective measures, and identification of squatter pigeons and Australian painted snipe.<br>▶ A fauna spotter catcher will be present during clearing activities.<br>▶ Speed limits on mine roads for vehicles, mobile plant and equipment is regulated under the CMSHA and CMSHR.<br>▶ Vehicle movements will be restricted in areas of squatter pigeon and Australian painted snipe habitat. | 1 | 1 | L |

# DECLARATION OF ACCURACY

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: _____

Full name: _____

Organisation: _____

Date: _____/ _____/ _____