TERRESTRIAL ECOLOGY MNES ASSESSMENT

BMC DRAGLINE MOVE PROJECT

Prepared for
Advisian

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BAAM
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Date: 30/09/2016

Managing Director

EXECUTIVE SUMMARY

Introduction

This report has been prepared by Biodiversity Assessment and Management Pty Ltd (BAAM) for Advisian on behalf of BHP Billiton Mitsui Coal for the purpose of providing an independent terrestrial ecology assessment of Matters of National Environmental Significance (MNES) within a proposed 77 km dragline walk route (the BMC Dragline Move Project 'project area') and surrounds. The route traverses an area between the existing Goonyella and South Walker Creek Mines located outside of Moranbah in central Queensland.

BHP Billiton Mitsui Coal is proposing to utilise the route once only for the purposes of facilitating the dragline move. This assessment of existing terrestrial ecological values is required to inform project planning and approvals.

Methodology

Desktop

Prior to field survey, publicly available information on currently recognised terrestrial ecology values was accessed and reviewed to provide the study team with sufficient background to ensure survey methods were suitably designed to detect and verify the actual values of the study area. Information sourced included: DotEE PMST; Queensland Herbarium Regional Ecosystem (RE) mapping; Regional Ecosystem Description Database (REDD); species profiles and listing advice for MNES; Atlas of Living Australia (ALA) database; Queensland Government WildNet database; and relevant published literature.

Based on the information, an assessment of the likelihood of occurrence of threatened species and communities was carried out to target field assessment for likely or potential species and communities.

Habitat Modelling

The habitat modelling methodology adopted for the project is based broadly on components of the Biodiversity Assessment and Mapping Methodology (BAMM). The components of the BAMM that underpin the habitat mapping methodology of this project are those components that relate specifically to the identification and mapping of habitat of conservation significant species using vegetation units and species records to identify preferred habitat.

The list of REs within the study area was reviewed against the known preferred habitat characteristics of each species, based on a review of the published literature. Any REs not likely to provide preferred habitat for the species were removed from the list. Additional habitat mapping rules were developed for each species where considered relevant, including rules reflecting limits to the species range, sensitivity to habitat fragmentation, differences in likely survey effectiveness between species, and other environmental characteristics related to the ecology of the species that influence its habitat occupancy.

Four habitat type categories were applied to the habitat mapping to reflect habitat: Core habitat; Essential habitat; General habitat; and Unlikely habitat. The model was applied to the existing Regional Ecosystem unit mapping to guide field verification for likely and potential MNES.

Field Surveys

Following the desktop assessment, field surveys were conducted to verify currently recognised terrestrial ecology values, with a particular focus on those values representing the most significant constraints to proposed activities. Field assessments were conducted using best

practice floristic sampling and habitat scoring methodologies, and the survey techniques encompassed community-level vegetation assessments as well as threatened species searches within specific habitats.

Determination of significant species occurrence involved targeted meander searches within each potential habitat type represented within the study area, along with general assessment of habitat features that could potentially support significant species.

Following the field assessments, the vegetation units (REs) on which the fauna habitat modelling and TEC occurrences relied were refined to reflect habitat recorded within the dragline transport route and surrounding areas (500 m either side of the route). The habitat model was then applied using the field-verified mapping.

Results

The study area contains no World Heritage Properties, National Heritage Properties or Wetlands of International Significance. However, from desktop assessment several threatened ecological communities (TECs), threatened species and migratory species are recognised as having potential to occur in the study area.

The presence of seven patches of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC was confirmed in the vicinity of the study area during the field survey.

Despite extensive searches, no signs of potential communities that could represent the Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin were identified during the course of the field surveys within the areas accessed. The extensive impacts of grazing and land management practices encouraging the spread of exotic pasture grasses, including in areas of Cainozoic deposits forming clay pans that would otherwise be suitable for supporting these communities.

The vine thicket TEC was not found in the study area and is considered unlikely to occur.

Following the field survey, no flora species listed as threatened under the EPBC Act are considered known or likely to occur within the study area.

The presence of suitable habitat was confirmed for Squatter Pigeon, Ornamental Snake, Koala and Yakka Skink in the field. Ornamental Snake and Yakka Skink are difficult species to detect outside of intensive field survey effort. As such, the habitat modelling and assessment approach undertaken for this study are designed to identify habitats within which it is predicted the species is present or is likely to be present based on known species distribution, habitat records, available literature and field assessment of the presence of important habitat factors. Habitat quality and condition data were collected at representative locations.

The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala determined a habitat score of 9. As this score is greater than 5, Koala habitat associated with the study area is recognised as ‘habitat critical to the survival of Koala’ under the EPBC Act referral guidelines.

Squatter Pigeon was observed in several locations within or adjacent to the proposed Dragline route during the field surveys and these locations were added to the data informing the habitat model for the species.

Following the field studies, vegetation mapping within the proposed dragline transport route and surrounds (500 m from dragline transport route centreline) was modified to reflect the recorded conditions.

Impact avoidance

The process for the dragline transport route selection has been an iterative one, with an initial route and investigation buffer provided for appraisal in the ecological desktop assessment and habitat modelling. Feedback for avoidance of potential MNES was provided to project planners and the route was adjusted to minimise the need for clearing of remnant habitats.

A dragline relocation project had occurred over part of the alignment approximately 16 years previously and advice was to constrain the new route to these previously cleared areas wherever possible.

Following field assessment and adjustment of the habitat model to reflect the results of ground-truthing, a further route refinement was undertaken to ensure that the disturbance footprint was minimised.

Total disturbance areas

Derived from the field-verified mapping and modelling results the total areas of MNES values expected to be impacted by the proposed dragline move are provided in the following table. Note that there is considerable overlap of the habitat requirements for the subject species, as well as for the Brigalow TEC. In all, a total of 99.45 ha of habitat that is core or essential habitat for one or more of the subject fauna species will be impacted, 9.7 ha of which also represents the Brigalow TEC.

MNES Value	Area (ha)	Area (ha)[1]			
		Core Habitat	Essential Habitat	General Habitat	Unlikely Habitat
Brigalow TEC	9.7				
Koala		5.38	92.62	1.43	545.67
Squatter Pigeon		64.76	24.44	10.24	545.67
Ornamental Snake		0.28	52.05	18.19	574.58
Yakka Skink		0	99.35	0.1	545.67

Impact Mitigation and Management

Environmental Management Plan(s) will be prepared that incorporate measures to reduce direct and indirect impacts of the Project on MNES values during construction, operation and decommissioning.

Impact Assessment

For the purposes of this impact assessment it is assumed that there will only be reinstatement of riparian vegetation at watercourses along the route, and that the remainder of the route will either (i) be maintained by the landholder/s as a permanent access track or (ii) be stabilised and left to be recolonised by native and/or non-native grasses and other groundcover, tree and shrub species from adjacent areas.

Assessment of the proposed project activities against the relevant EPBC Act guidelines for those MNES confirmed or likely to be present (Brigalow TEC, Ornamental Snake, Yakka Skink, Koala, Squatter Pigeon and Migratory species) finds that the project:

- would reduce the extent of the TEC (9.7 ha) and in accordance with the significant impact criteria, would result in a significant impact.
- would fragment a 13 ha patch of the TEC into two smaller patches, likely resulting in a significant impact.

- could potentially lead to a long-term decrease in the size of an important population of Ornamental Snake, resulting in a significant impact.
- could potentially reduce the area of occupancy of an important population of Ornamental Snake.
- could potentially lead to a long-term decrease in the size of an important population of Yakka Skin, resulting in a significant impact.
- could potentially disrupt the breeding cycle of an important population of Yakka Skink, resulting in a significant impact.

No significant impacts were determined for Koala, Squatter Pigeon or Migratory species.

Environmental Offset Requirements

Where significant impacts on matters of national environmental significance cannot be avoided, mitigated or managed, the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) allows compensation for those impacts through the provision of appropriate environmental offsets.

Along the entire dragline transport route the proposed impact areas that have been assessed as representing 'significant impact' in accordance with the EPBC Act Significant Impact Guidelines 1.1 are:

- 9.7 ha of Brigalow TEC.
- 80.05 ha of "core" and "essential" habitat for Ornamental Snake.
- 99.35 ha of "core" and "essential" habitat for Yakka Skink.

BMC advises that native vegetation located on the South Walker Creek mining leases, inclusive of the identified Brigalow TEC area, is not required to be offset given that BMC has pre-EPBC Act authorisations to clear vegetation within the South Walker Creek mining leases 4750 and 70131. The pre-EPBC Act authorisations date from the grants of the "surface areas" within the mining leases in accordance with the Queensland *Mineral Resources Act 1989*. In this case, the grants occurred in September and October 1996, prior to the commencement of the EPBC Act on 16 July 2000. The South Walker Creek mining leases 4750 and 70131 are also noted on the Environmental Authority EPML00712313 issued under the Queensland *Environmental Protection Act 1994*. As a result, state offsets are not required for any native vegetation cleared on these leases. The pre-EPBC Act authorisation only relates to the 8.5 km eastern section of the route.

Outside of the pre-EPBC Act authorisation areas, the proposed impact areas that have been assessed as representing significant impacts in accordance with the Significant Impact Guidelines 1.1 are:

- 21.6 ha of "core" and "essential" habitat for Ornamental Snake would be cleared for the dragline transport route.
- 60.3 ha of "core" and "essential" habitat for Yakka Skink would be cleared for the dragline transport route.

Note that there is considerable overlap of the habitat requirements for the two reptile species in that this portion of the route.

The preparation of an Offset Strategy is required to identify appropriate offset measures for these species.

BMC DRAGLINE MOVE PROJECT TERRESTRIAL ECOLOGY MNES ASSESSMENT

GOONYELLA TO SOUTH WALKER CREEK, MORANBAH

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Table of Terms and Abbreviations

ALA	Atlas of Living Australia
BAAM	Biodiversity Assessment and Management Pty Ltd
BAMM	Biodiversity Assessment and Mapping Methodology
BMC	Billiton Mitsui Coal
DEHP	Department of Environment and Heritage Protection
DotEE	Department of the Environment and Energy
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESP	Ecological Service Professionals Pty Ltd
MNES	Matters of National Environmental Significance
NC Act	Nature Conservation Act 1992
RE	Regional Ecosystem
SAT	Spot Assessment Technique
SEVT	Semi Evergreen Vine Thicket
TEC	Threatened Ecological Community

1.0 INTRODUCTION

This report has been prepared by Biodiversity Assessment and Management Pty Ltd (BAAM) for Advisian on behalf of BHP Billiton Mitsui Coal for the purpose of providing an independent terrestrial ecology assessment of Matters of National Environmental Significance (MNES) within a proposed 77 km dragline walk route (the BMC Dragline Move Project 'project area') and surrounds. The route traverses an area between the existing Goonyella and South Walker Creek Mines located outside of Moranbah in central Queensland (**Figure 1.1**).

BHP Billiton Mitsui Coal is proposing to utilise the route once only for the purposes of facilitating the dragline move. This assessment of existing terrestrial ecological values is required to inform project planning and approvals.

The specific aims of this assessment are to carry out:

- Desktop assessment of the existing terrestrial ecological values of the project area and surrounds (hereinafter referred to as the "study area").
- Field assessments, as required to verify the currently recognised terrestrial ecological values of the study area.
- Description/ reporting of baseline data.
- Evaluation of the potential impacts of the Project on the terrestrial ecological values of the study area, focusing on species and communities of National significance.
- Description of mitigation measures to avoid, minimise or offset the identified impacts.

All following observations and recommendations are based on a review of available literature and site investigations undertaken by Dr Lindsay Popple and Dr Paul Williams on 18–22 August 2016, and Dr Lindsay Popple, Dr Paul Williams, Ms Shelley Trevaskis and Mr Lui Weber on 29 August – 2 September 2016, inclusive.

Lauren Thorburn of Ecological Service Professionals Pty Ltd (ESP) provided advice regarding two EPBC Act listed threatened turtle species. The assessment was made based on a desktop review and previous experience in the study area.

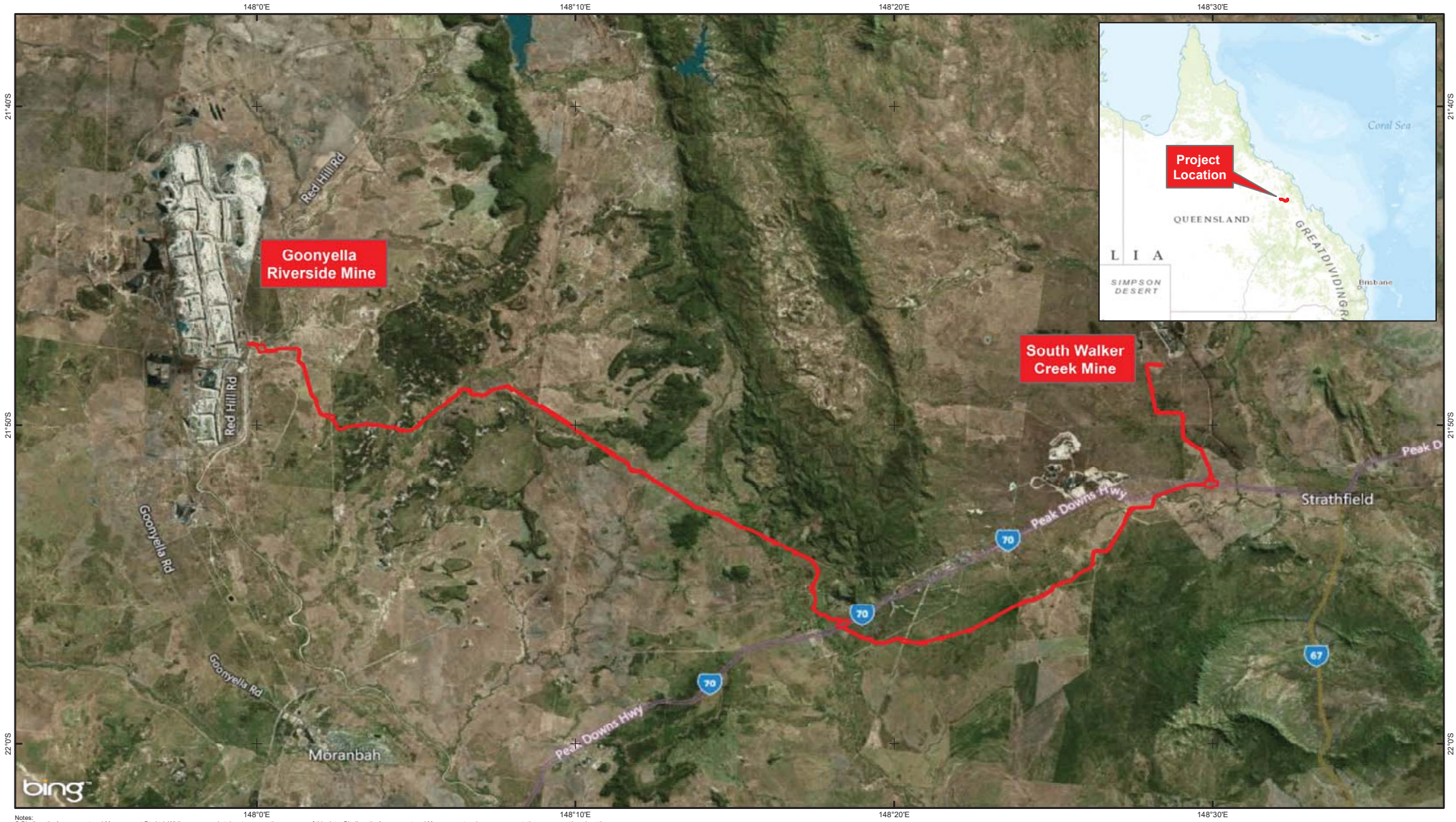
2.0 METHODOLOGY

2.1 DESKTOP REVIEW

Prior to field survey, publicly available information on currently recognised terrestrial ecology values was accessed and reviewed to provide the study team with sufficient background to ensure survey methods were suitably designed to detect and verify the actual values of the study area. As currently recognised terrestrial ecology values and associated constraints to development are defined at the national level by Commonwealth environmental legislation and partially informed by State vegetation mapping, this included:

- Use of the Department of the Environment and Energy (DotEE) EPBC Act Online Protected Matters Search Tool for determining whether any 'Matters of National Environmental Significance' as defined under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) may occur. In terms of terrestrial ecology, this may include:
  - Threatened Ecological Communities; and
  - Threatened and Migratory species.
- Review of Queensland Herbarium's current, certified Region Ecosystem (RE) mapping to determine which remnant and high-value regrowth vegetation communities and associated habitats for significant flora and fauna species may occur in the study area, including REs that are analogous to EPBC Act-listed Threatened Ecological Communities (TECs).
- Review of the Regional Ecosystem Description Database (Queensland Herbarium 2015), to inform site selection and expected species composition.
- Review of relevant species profiles and Listing Advice for TECs and threatened species.
- Searches of Atlas of Living Australia portal (ALA 2016) and the Queensland Government WildNet database to provide records of terrestrial flora and fauna species known from within 20 km of the edges of the study area.
- Relevant published literature on the terrestrial ecology of the study area, where readily available.

A review of aerial photography and study area boundaries was also undertaken to assist in the determination of suitable representative sampling sites for field surveys.



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Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:212,464 at A4
0 1,150 2,300 4,600 6,900 9,200 Meters

LEGEND

Dragline Corridor Revision C

Figure:	1.1
Title:	Locality Map
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Drawn By: MG Reviewed by: AC Date: 20-Sep-16

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2.2 HABITAT MODELLING METHODOLOGY

The methodology adopted for the project is based broadly on components of the Biodiversity Assessment and Mapping Methodology (BAMM). The BAMM was developed by the Queensland Government to provide a consistent approach for identifying and mapping biodiversity values at the landscape scale in Queensland using vegetation mapping data generated or approved by the Queensland Herbarium as a fundamental basis (EHP 2014). The components of the BAMM that underpin the habitat mapping methodology of this project are those components that relate specifically to the identification and mapping of habitat of conservation significant species.

2.2.1 Vegetation Units

Vegetation units are the basic mapping unit for the identification of the spatial distribution of different vegetation types that support habitat for fauna species. A vegetation unit is equivalent to a polygon on an RE map approved by the Queensland Herbarium, or a ground-truthed refinement of such a map. Vegetation units may contain one or more REs, and may be identified as either remnant vegetation or mature regrowth vegetation. REs are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. The Queensland Herbarium has developed a methodology for mapping REs across Queensland (Queensland Herbarium 2015). Mature regrowth vegetation is included in the vegetation units for this habitat mapping project since regrowth vegetation, particularly mature regrowth vegetation, has been shown to support equivalent habitat values for reptiles as remnant vegetation (Bruton *et al.* 2013; Bruton and McAlpine 2014) and some threatened bird species (e.g. Squatter Pigeon) and mammal species (e.g. Koala) also use regrowth vegetation. The map of vegetation units used for the project combined a remnant Regional Ecosystem V8 with a State map of proposed high value regrowth vegetation (Category C).

2.2.2 Species Records

Geo-referenced species records were obtained from the following sources:

- The Queensland Wildlife data API online database (Queensland Government 2016);
- The Atlas of Living Australia online database (ALA 2016);
- Additional records of significant species derived from the Queensland Government Essential Habitat mapping (https://www.dnrm.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form); and
- Records of significant species from the field survey for this study (**Section 4.0**).

With the exception of records derived directly from the Queensland Government Essential Habitat mapping, the following filters were applied to these records to identify a set of records for use in the species habitat model development and mapping:

- Only records with an observation or collection date more recent that 1975 were selected;
- Only records with a spatial precision less than or equal to 2,000 m were selected; and
- Any records that did not have a collection/observation date or precision recorded were excluded.

2.2.3 Identification of Preferred Habitat

The list of REs within the study area was reviewed against the known preferred habitat characteristics of each species, based on a review of the published literature. Any REs not likely to provide preferred habitat for the species were removed from the list. Additional habitat mapping rules were developed for each species where considered relevant, including rules reflecting limits to the species range, sensitivity to habitat fragmentation, differences in likely survey effectiveness between species, and other environmental characteristics related to the ecology of the species that influence its habitat occupancy.

Further details on how REs representing preferred habitat were determined for each species are provided in **Section 4.0**.

2.2.4 Habitat Type Categories

Four habitat type categories have been applied to the habitat mapping to reflect habitat types of different value for the management of the subject species.

Core Habitat

Core habitat comprises vegetation units that have been identified as supporting the preferred habitat characteristics of the species (as per the process outlined in **Sections 2.2.3** and **2.2.4**), or which support essential resources (e.g. suitable shelter, major food sources), and which intersect with a buffered record of the species. The buffer adopted for records varied with species, but the minimum buffer corresponded to the lowest precision of the records used. Core habitat represents known habitat for the species.

Essential Habitat

Essential habitat comprises vegetation units that have been identified as supporting the preferred habitat characteristics of the species (as per the process outlined in **Sections 2.2.3** and **2.2.4**), and either of a size capable of supporting at least one breeding unit or likely to be used as an important resource by the species, but which do not intersect with a buffered record of the species and occur within the current known range of the species. Essential habitat represents potential habitat for the species.

General Habitat

General habitat comprises vegetation units that have not been identified as supporting the preferred habitat characteristics of the species (as per the process outlined in **Sections 2.2.3** and **2.2.4**) but include an RE identified as an essential habitat factor for the species by EHP, or that meet the definition of essential habitat but either (a) have been subject to intensive survey using recommended survey techniques and the species has been determined to be absent; or (b) occur outside the current known range of the species (based on published information or records); or (c) where only vagrant individuals have been recorded in the habitat.

Unlikely Habitat

Unlikely habitat comprises non-remnant areas as well as vegetation units that have not been identified as being associated with the species.

2.3 FIELD SURVEYS

Following the desktop assessment, field surveys were conducted to verify currently recognised terrestrial ecology values, with a particular focus on those values representing the most significant constraints to proposed activities. The surveys were conducted on 18–22 August and from 29 August–2 September. Weather at the time of the surveys was mild and mainly dry, with sporadic, light showers. Significant rainfall (>200 mm, BoM (2016), Moranbah airport weather station) over the two months prior to the surveys had promoted significant vegetation growth and facilitated the widespread flowering of numerous species, particularly grasses.

Field assessments were conducted using best practice floristic sampling and habitat scoring methodologies (Neldner *et al*. 2005; DEHP 2014). Survey techniques encompassed community-level vegetation assessments as well as threatened species searches within specific habitats.

The terrestrial flora surveys focused on the verification of remnant and high-value regrowth vegetation community mapping and the associated distribution of Threatened Ecological Communities under the EPBC Act, as well as determining the actual or potential presence of significant terrestrial flora species.

Vegetation communities were ground-truthed through the use of representative sampling of each RE type within the study area to describe vegetation community structure, floristics and condition according to modified Queensland Herbarium methodologies. Wherever possible, this involved the establishment of at least one comprehensive (Biocondition) survey site within each RE, supported by opportunistic, rapid (quaternary) assessments and occasional secondary sites to confirm remnant or regrowth status across the vegetated areas of the study area. This allowed field-verified mapping to be prepared in combination with aerial photo interpretation and delineation to improve the accuracy of the habitat modelling (**Section 2.2**).

Determination of significant species occurrence involved targeted meander searches within each potential habitat type represented within the study area, along with general assessment of

habitat features that could potentially support significant species.

During the survey, all flora species and communities encountered were recorded and searches for significant native species and significant non-native infestations were conducted continuously while traversing the study area.

Fauna habitat assessments were conducted in at least one representative site within each habitat type that could be accessed during the survey across the length of the study area. Habitat assessment included searches for habitat features for Yakka Skink (coarse woody debris and potential burrows) and Ornamental Snake (gilgais, depressions and gully features on Cainozoic plains). Notes were kept on availability of food resources and shelter for Squatter Pigeon. Finally, Spot Assessment Technique (SAT) sites in accordance with the methodology of Biolink Ecological Consultants (2008), and active observations were made in sites that contained potentially suitable habitat for Koala.

In addition to the habitat assessments, timed bird surveys were conducted continuously throughout the survey, along with opportunistic observations on foot and from a vehicle, for Squatter Pigeon.

The locations of ecological assessment sites are shown on **Figure 2.1**.

3.0 DESKTOP RESULTS

The study area contains no World Heritage Properties, National Heritage Properties or Wetlands of International Significance. However, several threatened ecological communities (TECs), threatened species and migratory species are recognised as having potential to occur in the study area.

3.1 VEGETATION COMMUNITIES

The following TECs are identified by DotEE's Protected Matters Search Tool as having potential to occur in the study area:

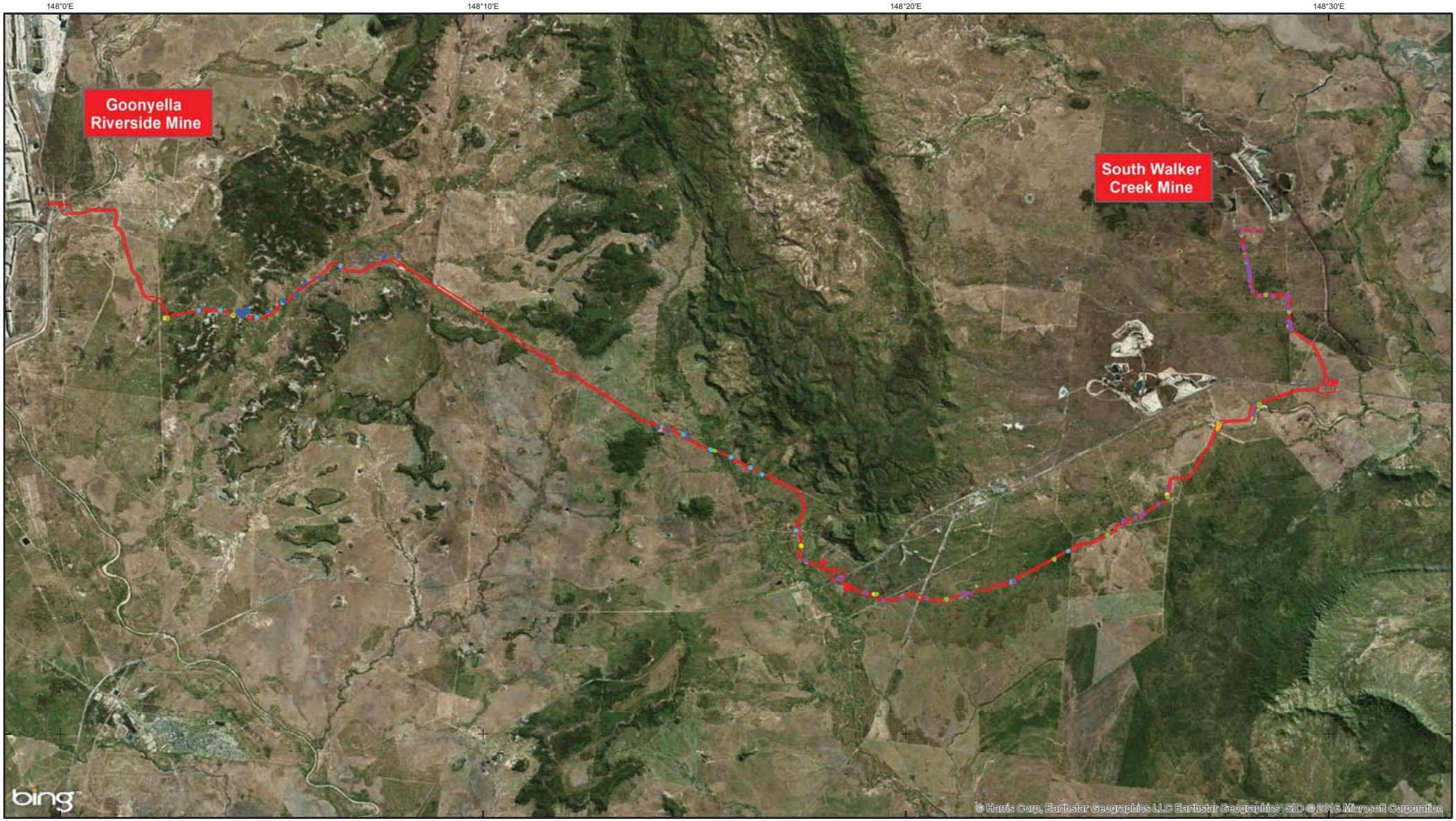
- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions.

Examination of the Queensland Herbarium vegetation mapping and inspection of aerial imagery confirmed the potential for each of the above TECs to occur along the proposed Dragline route. The presence of several REs that equate to the Brigalow TEC, including 11.3.1, 11.9.5 and large instances of 11.4.9, coincide with the proposed route corridor. Notably, areas of unmapped regrowth also have the potential to meet the criteria for inclusion. However, areas of both remnant and regrowth vegetation must also pass the strict condition thresholds to meet the requirements for the TEC, which can only be confirmed by field assessment.

The presence of the Natural Grasslands TEC can be difficult to predict in a desktop assessment. The principal reason for this is that both native and exotic grasslands look virtually identical on aerial imagery and there is a risk that the Queensland Herbarium mapping may have mapped remnant native grasslands as non-remnant for this reason. One grassland RE (11.9.3) that equates to the TEC is mapped within the study area. In addition, the pre-clear mapping indicates this grassland was expected to have been present within the western half of the study area prior to clearing. This highlights the possibility of unmapped remnants being present along the alignment. However, as for the Brigalow TEC, native grasslands must also meet the condition criteria to be recognised as the applicable Natural Grassland TEC.

The Semi-evergreen vine thicket (SEVT) TEC does not have condition criteria. Therefore, any vegetation community that has the necessary structure and species composition for an SEVT community, regardless of its size and condition, would equate to the TEC. Two REs mapped within the study area equate to the SEVT TEC, namely 11.5.15 and 11.9.4. Their presence in the study area required verification as part of the field assessment.

A map showing the location of potential TECs based on Queensland Herbarium mapping of Remnant and High-Value Regrowth is provided in **Figure 3.1**.



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Coordinate System: GCS GDA 1994
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1:162,185 at A4
0 900 1,800 3,600 5,400 7,200 Meters

LEGEND

Ecological Assessment Sites

- Biocondition Survey
- Bird Survey
- MNES Fauna Habitat Assessment
- Quaternary Vegetation Site
- Secondary Vegetation Site
- Threatened Flora Survey

- Dragline_Corridor_RevC
- Temp_Shutdown_Areas

Drawn by: MC Reviewed by: AC Date: 20-Sep-16

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_LegendBelow_Dragline.mxdDate: 20-Sep-16 11:18:43 AM

Figure:	2.1
Title:	Ecological Assessment Sites
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

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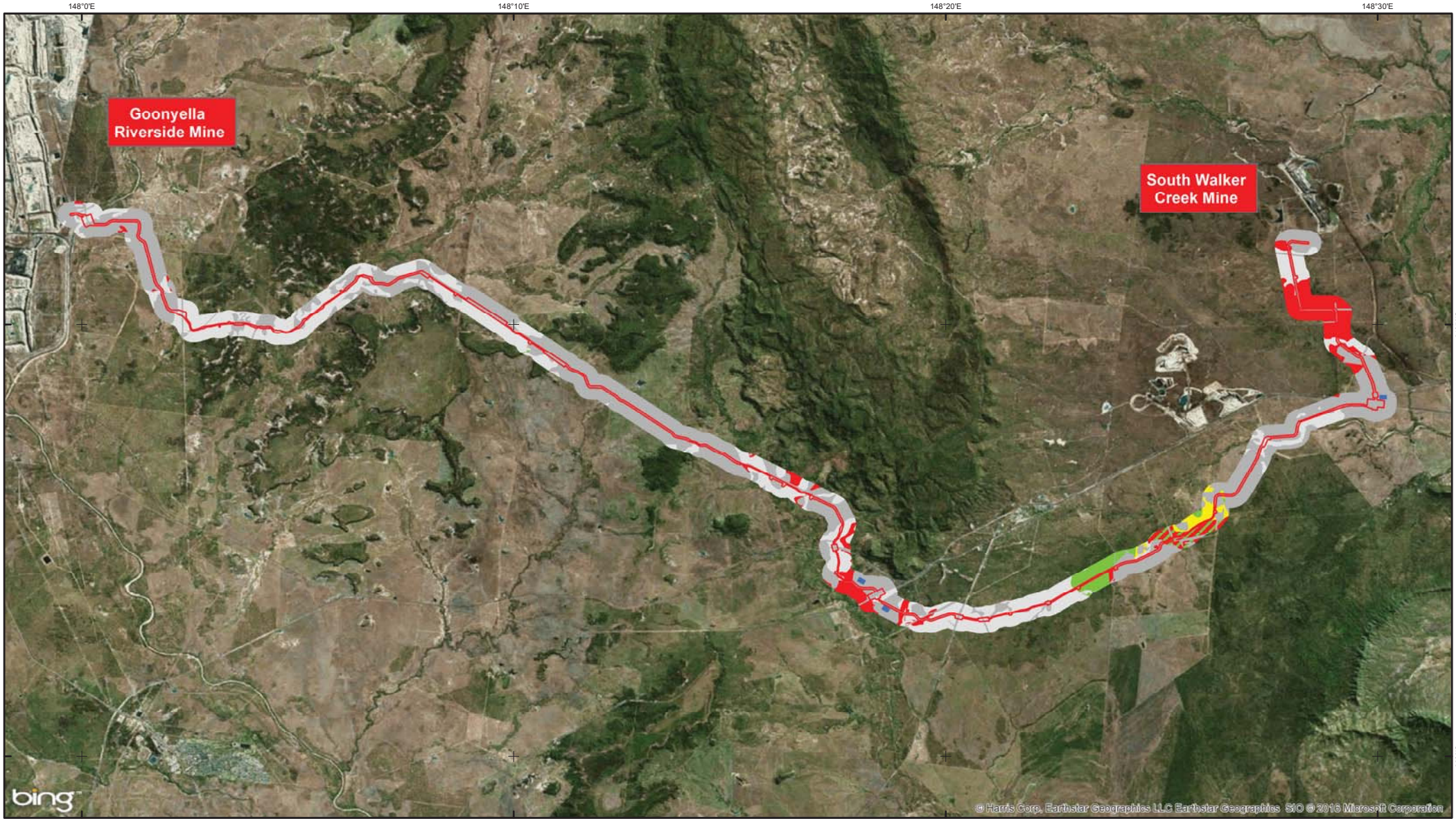

Notes:
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Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:158,835 at A4
0 875 1,750 3,500 5,250 7,000 Meters

LEGEND

Potential Threatened Ecological Community

- Brigalow (Acacia harpophylla dominant and co-dominant)"
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

- Dragline Transport Route
- Temporary Shutdown Areas

Figure:	3.1
Title:	Potential Threatened Ecological Community Locations from DEHP mapping
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Drawn By: MG Reviewed by: AC Date: 22-Sep-16

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3.2 THREATENED FLORA AND FAUNA

The EPBC Act Protected Matters Search Tool identifies four EPBC Act threatened flora and 16 threatened fauna species as having potential to occur in the study area.

After examination of available literature sources, database records, mapped vegetation communities and aerial imagery across the study area, the following three EPBC Act threatened flora species were considered to have potential to occur:

- King Blue-grass *Dichanthium queenslandicum* (Endangered)
- Blue-grass *Dichanthium setosum* (Vulnerable)
- Black Iron-box *Eucalyptus raveretiana* (Vulnerable).

The following four EPBC Act threatened fauna species were considered likely or to have potential to occur:

- Squatter Pigeon *Geophaps scripta* (Vulnerable)
- Ornamental Snake *Denisonia maculata* (Vulnerable)
- Koala *Phascolarctos cinereus* (Vulnerable)
- Yakka Skink *Egernia rugosa* (Vulnerable).

A full assessment of all relevant threatened flora and fauna MNES, including other species assessed as having low potential or being unlikely to occur, is provided in **Appendix A**.

3.3 MIGRATORY FAUNA

The EPBC Act Protected Matters Search Tool identified six migratory fauna as having potential to occur in the study area. There are records of a further 13 migratory fauna in the broader landscape (ALA 2016). After examination of available literature sources, database records, mapped vegetation communities and aerial imagery across the study area, three migratory fauna are considered to be likely or potential to occur. These include:

- White-throated Needletail *Hirundapus caudacutus*
- Fork-tailed Swift *Apus pacificus*
- Oriental Cuckoo *Cuculus optatus*.

A full assessment of these and all other migratory fauna is provided in **Appendix A**.

4.0 HABITAT MODELLING RESULTS

4.1 ORNAMENTAL SNAKE (*DENISONIA MACULATA*)

4.1.1 Species Profile

Distribution: Ornamental Snake is restricted to the Brigalow Belt Bioregion and is distributed south from around Charters Towers to the Dawson River valley in central coastal Queensland (Department of the Environment 2016).

Habitat and Ecology: Ornamental Snake inhabits low-lying areas with deep-cracking clay soils that are subject to seasonal flooding, and adjacent areas of clay and sandy loams. The species is found in woodlands and shrublands in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolibah (*Eucalyptus coolabah*)-dominated vegetation communities associated with moist areas, particularly gilgaied landscapes. It also occurs in pure grassland associated with gilgais, and lake margins and wetlands (Department of the Environment 2016). The most common RE in which the species has been recorded is RE 11.4.3. It has also been commonly recorded in REs 11.4.6, 11.4.8, 11.4.9, and less commonly recorded in REs 11.3.3 (adjacent to an ephemeral wetland) and 11.5.16 (associated with gilgais) (Department of the Environment 2016a).

Ornamental Snake shelters in soil cracks and under fallen timber. It is a secretive and nocturnal species and feeds almost entirely on frogs. Ornamental Snakes are most frequentlyrecorded in areas with a high abundance of burrowing frogs (*Cyclorana* species). Suitable habitat patches are typically greater than 10 hectares in area and are within, or connected, to larger areas of remnant vegetation. When the soil or topography change, the species can change from being abundant to absent over a few hundred metres. During dry periods, the species typically seeks refuge within the soil cracks of gilgai depressions within the habitat area (Department of the Environment 2016a; Wilson and Swan 2008).

In the study area, REs associated with predominantly cracking clay soils that the species is known to use are summarised in **Table 4.1**. The remaining 17 REs do not occur on cracking clay soils and are therefore not identified as preferred habitat.

Table 4.1. Descriptions of Regional Ecosystems (REs) in the study area providing preferred habitat for Ornamental Snake.

RE code	RE short description
Identified as preferred habitat	
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast and cracking clay soils
Not identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on rises on undulating plains with texture contrast or cracking clay soils
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks

4.1.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Ornamental Snake comprises vegetation units of remnant and mature regrowth vegetation of the preferred habitat REs listed in **Table 4.1**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.1**.

The mapping of habitat for Ornamental Snake within the study area was undertaken applying the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species.
- General habitat comprises remnant and mature regrowth vegetation on Land Zone 3 not identified as preferred habitat.
- Unlikely habitat comprises remnant and mature regrowth vegetation of all REs not listed as preferred habitat REs in **Table 4.1** and not identified general habitat, as well as non-remnant areas.

The pre field-verified habitat modelling results (in hectares) for Ornamental Snake habitat categories in the vicinity of the study area are summarised in **Table 4.2**.

Table 4.2. Summary of the total areas of different habitat categories for Ornamental Snake within 500 m of the centerline of the proposed dragline transport route.

Habitat category	Total area (ha)
Core	4
Essential	1231
General	763
Unlikely	6742
Total area (ha)	8740

4.2 SQUATTER PIGEON (GEOPHAPS SCRIPTA SCRIPTA)

4.2.1 Species Profile

Distribution: The southern subspecies of Squatter Pigeon was historically found from the Burdekin River in central Queensland south to the Dubbo region in New South Wales, and as far west as Longreach, Barcaldine and Charleville. There have been no official records in New South Wales since the 1970s and the species has declined greatly in southern Queensland where it is now very localised (Higgins and Davies 1996; NPWS 2003; Curtis *et al*. 2012). Despite the subspecies having experienced limited recent declines, it occurs broadly and is locally abundant across numerous sites in central Queensland (Garnett *et al*. 2011; Curtis *et al*. 2012).

Habitat and Ecology: Squatter Pigeon is largely terrestrial, foraging and breeding on the ground. The southern subspecies occurs mainly in dry grassy eucalypt woodlands, open forests and scrub that are (Department of the Environment 2016b):

- mostly dominated in the overstorey by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species
- remnant, regrowth or partly modified vegetation communities, and
- within 3 km of a suitable, permanent or seasonal waterbody or watercourse.

It was also reported from open plains in its historical southern range (Frith 1982). Dispersal habitat for the species is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies; such patches of vegetation facilitate the local movement of the subspecies between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts (Department of the Environment 2016b).

Most birds live in sandy sites near permanent water and are usually seen in pairs or small groups of up to 20 or more birds (Blakers *et al*. 1984). Although they remain common in heavily grazed country in tropical Queensland (Department of the Environment 2016b) they are typically more common in un-grazed land compared to grazed land (Woinarski and Ash 2002). These birds may occasionally feed in sown grasslands and pastures as they eat mainly seeds, particularly legumes, including those of exotic pasture plants, and some insects (Crome 1976; Higgins and Davies 1996). Squatter Pigeons dust-bathe and are often encountered on dirt tracks and in areas of bare soil denuded of ground cover by livestock (Frith 1982; Higgins and Davies 1996). However, the birds do not move far from woodland trees that provide protection from predatory birds, and do not typically forage further than 100 m from remnant trees or patches of wooded habitat (Department of the Environment 2016b).

Regional Ecosystems in the study area that are identified as Essential Habitat factors by EHP for the species are summarised in **Table 4.3** as preferred habitat REs.

4.2.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Squatter Pigeon (southern) comprises vegetation units of remnant and/or mature regrowth vegetation of the preferred habitat REs listed in **Table 4.3**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.3**.

Table 4.3. Descriptions of Regional Ecosystems (REs) in the study area providing preferred habitat for Squatter Pigeon.

RE code	RE short description
Identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
Not identified as preferred habitat	
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast soils and cracking clays
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks

The study area occurs within the range of Squatter Pigeon, yet the species is only patchily distributed within its range. The species is relatively conspicuous and is therefore generally encountered during field surveys if it occurs within the area surveyed. To account for the greater effectiveness of surveys for the species as well as its patchy distribution, the mapping of essential habitat (i.e. potential habitat) was restricted to within a 10 km radius of confirmed records of the species.

The mapping of habitat for Squatter Pigeon (southern subspecies) within the study area was undertaken using the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species.
- General habitat comprises remnant and mature regrowth vegetation not identified as core or essential habitat.
- Unlikely habitat comprises non-remnant areas.

The pre field-verified habitat modelling results (in hectares) for Squatter Pigeon (southern subspecies) within the vicinity of the study area are summarised in **Table 4.4**.

Table 4.4. Summary of the total areas of different habitat categories for Squatter Pigeon (southern subspecies) within 500 m of the centerline of the proposed dragline transport route.

Habitat category	Total area (ha)
Core	2167
Essential	1187
General	372
Unlikely	5014
Total area (ha)	8740

4.3 KOALA (PHASCOLARCTOS CINEREUS)

4.3.1 Species Profile

Distribution: Koalas are widely distributed throughout north-east, central and south-east Queensland, extending south through New South Wales and Victoria into South Australia and Kangaroo Island.

Habitat and Ecology: Koalas have a distinct association with eucalypt woodland and forest habitat types containing suitable food trees (Hume and Esson 1993; Moore and Foley 2000; Martin *et al.* 2008), particularly those growing on alluvial or other fertile soils (Moore *et al*. 2004, Crowther *et al.* 2009). They are not necessarily restricted to bushland or remnant areas and are known to occur and breed within farmland and the urban environment (Dique *et al.* 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin *et al.* 2008).

Koalas use a variety of trees, including many non-eucalypts, for feeding and resting (Dique *et al.* 2004; Martin *et al.* 2008). They do, however, have distinct, localised feeding preferences throughout their range, selecting some species in preference to others (Pahl and Hume 1990). Tree species preferences vary around Queensland. At the Blair Athol Coal Mine located approximately 100 km south west of the study area within similar vegetation types Melzer *et. al.* (2014) reported Koala pellets associated with juvenile eucalypts, *Eucalyptus crebra* and *Eucalyptus tereticornis* at higher frequencies than other tree species.

In central Queensland, Koalas typically occur at low density and occupy relatively large home ranges, averaging 101 ha in females and 136 ha in males in the Clermont district (Ellis *et al.* 2002). Regional Ecosystems associated with Koala activity in the Brigalow Belt bioregion include REs on alluvial soils (LZ 3) as well as a range of other land zones (Melzer *et al.* 2014).

Regional Ecosystems in the study area were characterised as preferred habitat for Koala if they included the following tree species (known to be preferred Koala food tree species in central Queensland) as common or dominant components of the tree canopy: *E. camaldulensis, E. coolabah*, *E. crebra, E. orgadophila, E. melanophloia, E. populnea, E. tereticornis* or *E. thozetiana*. This resulted in the recognition of 12 of the REs as preferred habitat REs (**Table 4.5**).

4.3.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Koala comprises vegetation units of remnant and/or mature regrowth vegetation of the preferred habitat REs listed in **Table 4.5**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.5**.

Table 4.5. Descriptions of Regional Ecosystems (REs) in the study area providing preferred habitat for Koala.

RE code	RE short description
Identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.5.3	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia +/- E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
Not identified as preferred habitat	
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast soils and cracking clays
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks

The study area occurs within the range of Koala. Therefore, the mapping of habitat for Koala within the study area was undertaken using the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species.
- General habitat comprises remnant and mature regrowth vegetation not identified as core or essential habitat.
- Unlikely habitat comprises non-remnant areas.

The pre field-verified habitat modelling results (in hectares) for Koala in the vicinity of the study area are summarised in **Table 4.6**.

Table 4.6. Summary of the total areas of different habitat categories for Koala within 500 m of the centerline of the dragline transport route.

Habitat category	Total area (ha)
Core	134
Essential	3415
General	143
Unlikely	5048
Total area (ha)	8740

4.4 YAKKA SKINK (*EGERNIA RUGOSA*)

4.4.1 Species Profile

Distribution: Yakka Skink is endemic to Queensland, occurring from Cape York Peninsula to the St George area in the Southern Brigalow Belt (Drury 2001; Wilson 2005; Department of the Environment 2016c).

Habitat and Ecology: Yakka Skink lives in colonies, occupying communal burrows, often in cavities under and between partly buried rocks, logs or tree stumps, root cavities and abandoned animal burrows (Brigalow Belt Reptiles Workshop 2010, Department of the Environment 2016c). The species is extremely cryptic, its presence often confirmed by the presence scat piles (communal latrines) near shelter sites rather than by direct observation, and it may be more common than previously thought, but often overlooked (EPA 2003). The species is patchily distributed, even within extensive areas of apparently suitable habitat. This may result from the species' reliance on either soils suitable for burrowing, availability of large hollow logs for sheltering in and/or presence of rocks and boulders. Furthermore, Yakka Skink is omnivorous, consuming a lot of soft plant materials and fruits, so habitats with diverse shrubs are more suitable than those featuring only grasses (S. Wilson, personal communication). Yakka Skink occurs in a wide variety of vegetation types on a wide variety of Queensland Regional Ecosystem Land Zones (LZ), including alluvium (LZ 3), clay plains (LZ 4), old loamy and sandy plains (LZ 5), ironstone jump-ups (LZ 7), undulating country on fine-grained sedimentary rocks (LZ 9), and sandstone ranges (LZ 10) (Brigalow Belt Reptiles Workshop 2010). It is most commonly associated with woodland and open forest types that include (Brigalow Belt Reptiles Workshop 2010; Department of the Environment 2016c):

- Brigalow (*Acacia harpophylla*)
- Mulga (*A. aneura*)
- Bendee (*A. catenulata*)
- Lancewood (*A. shirleyi*)
- Belah (*Casuarina cristata*)
- Poplar Box (*Eucalyptus populnea*)
- Ironbark (*Eucalyptus* spp.)
- White Cypress Pine (*Callitris glaucophylla*).

Yakka Skink can also occur in cleared non-remnant areas where there are log piles, erosion gullies or rabbit warrens. However, colonies living in cleared non-remnant areas may no longer have access to other colonies, and the potential longevity of individuals may mask the encroaching extirpation of many colonies through genetic isolation.

Regional Ecosystems in the study area were characterised as preferred habitat for Yakka Skink if they included one of the plant species above, along with suitable cover for the species (identified during the field surveys). A conservative approach was applied to habitats identified as being potentially suitable for the species, but which were not visited during the field survey due to access constraints (e.g. RE 11.4.2). These areas were also treated as preferred habitat. This resulted in the recognition of 19 of the REs as preferred habitat REs (**Table 4.7**).

Table 4.7. Descriptions of Regional Ecosystems (REs) associated with Yakka Skink records in the study area.

RE code	RE short description
Identified as preferred habitat	
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (includes *E. coolabah, E. populnea, E. orgadophila* as scattered emergents)
11.3.2	*Eucalyptus populnea* (Poplar Box) woodland on alluvial plains on a variety of soils, including texture contrast, deep uniform clays, massive earths and sometimes cracking clays
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines, on very deep, alluvial, grey and brown cracking clay soils
11.4.2	*Eucalyptus* spp. and/or *Corymbia* spp. grassy or shrubby woodland on Cainozoic clay plains
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains with moderately deep to deep cracking clays
11.5.3	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains and/or remnant surfaces
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces
11.7.2	*Acacia* spp. woodland on scarps and adjacent tops and slopes of dissected tablelands, mesas and buttes formed from chemically altered sediments and duricrusts
11.7.3	*Eucalyptus persistens* low open woodland often with a *Triodia mitchellii* ground layer on stripped margins of Cainozoic lateritic duricrust; other scattered eucalypts such as *Corymbia leichhardtii* or *Eucalyptus melanophloia* may also occur.
11.8.5	*Eucalyptus orgadophila* open woodland on undulating plains, rises, low hills or sometimes flat tablelands on top of mountains, formed from basalt, with generally shallow to moderately shallow soils, often rocky or stony clays (includes *E. melanophloia* and occasionally *E. crebra* as sub-dominants)
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on gently undulating to undulating plains and rises with cracking clay soils derived from fine-grained sediments
11.9.4a	Semi-evergreen vine thicket on fine-grained sedimentary rocks
11.9.1	*Eucalyptus cambageana* or *E. thozetiana* and *Acacia harpophylla* open forest or woodland on slopes and crests of undulating plains and below low ridges and escarpments formed from Cainozoic to Proterozoic consolidated, fine-grained sediments, with predominantly texture contrast soils
11.9.2	*Eucalyptus melanophloia +/- E. orgadophila* woodland on rises on undulating plains with cracking clay or texture contrast soils
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sediments with generally deep texture-contrast soils and cracking clays
11.9.7a	*Eucalyptus populnea, Eremophila mitchellii* shrubby woodland on fine-grained sedimentary rocks
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks.
Not identified as preferred habitat	
11.3.36	*Eucalyptus crebra* and/or *E. populnea* and/or *E. melanophloia* woodland with a grassy ground layer on Cainozoic alluvial plains
11.7.5	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks

4.4.2 Habitat Modelling Assumptions and Rules

The preferred habitat layer for Yakka Skink comprises vegetation units of remnant and mature regrowth vegetation of the preferred habitat REs listed in **Table 4.7**, including mixed polygon vegetation units that include any one of the preferred habitat REs listed in **Table 4.7**.

The mapping of habitat for Yakka Skink within the study area was undertaken using the following assumptions and rules:

- Core habitat comprises preferred habitat located within a 2 km radius of confirmed records of the species, including in vegetation patches smaller than 30 ha.
- Essential habitat comprises preferred habitat located further than a 2 km radius of confirmed records of the species, restricted to vegetation patches greater than or equal to 30 ha in area.
- General habitat comprises remnant and mature regrowth vegetation not identified as preferred habitat REs for the species.
- Unlikely habitat comprises all other areas.

The pre field-verified habitat modelling results (in hectares) for Yakka Skink within the vicinity of the study area are summarised in **Table 4.8**.

Table 4.8. Summary of the total areas of different habitat categories for Yakka Skink within 500 m of the centerline of the dragline transport route

Habitat category	Total area (ha)
Core	0
Essential	3618
General	82
Unlikely	5040
Total area (ha)	8740

5.0 FIELD SURVEY RESULTS

5.1 VEGETATION COMMUNITIES

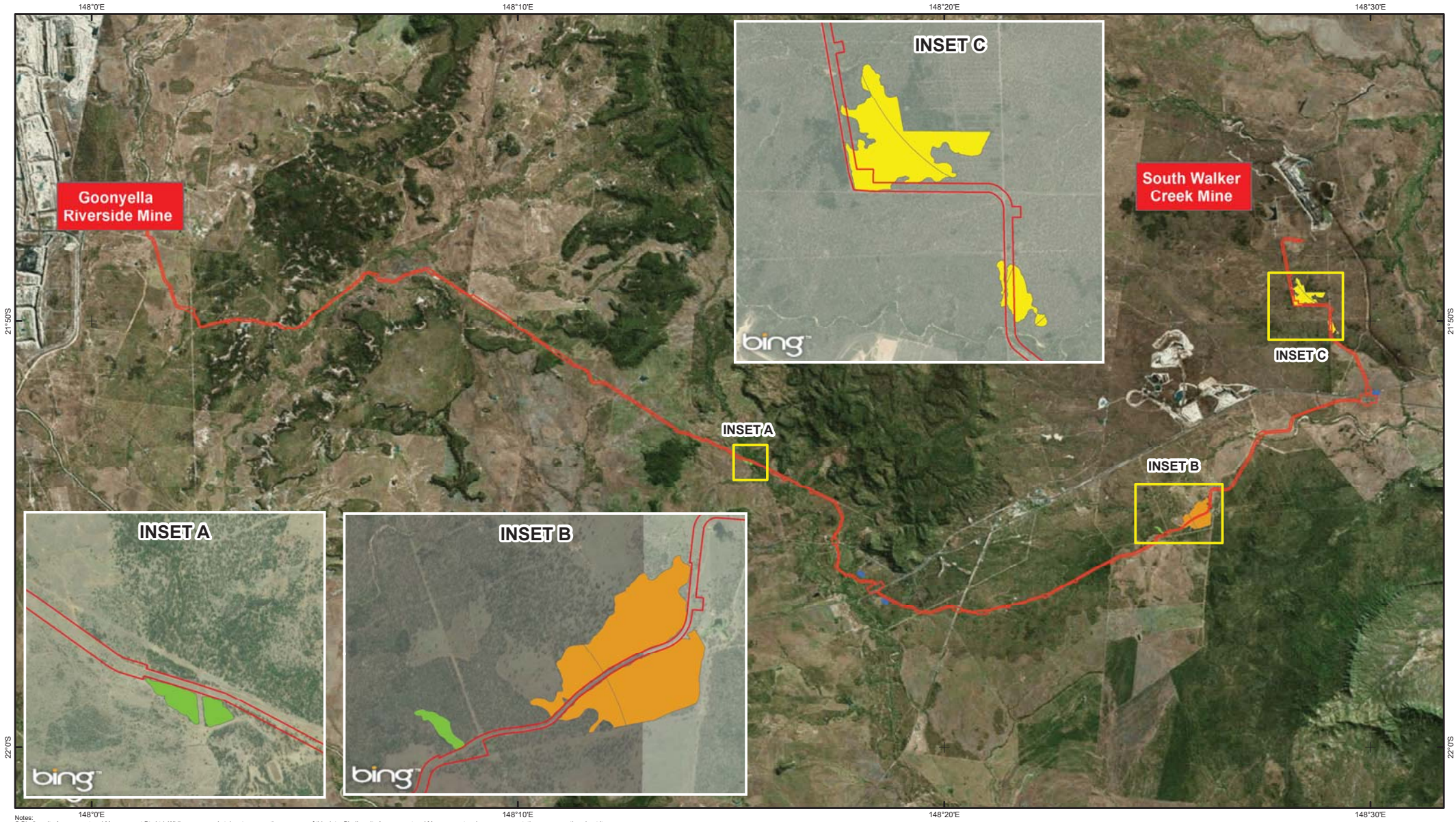
The presence of seven patches of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC was confirmed in the vicinity of the study area during the field survey. This included two patches of RE 11.4.9, two large patches of RE 11.9.1 and three small patches of RE 11.9.5. Each of these patches was >0.5 hectares in size and exhibited the structural and condition characteristics of the endangered community.

Additional patches of RE 11.4.9 and RE 11.9.5/11.9.1 were deemed as not corresponding to the TEC due to the absence of Brigalow as a dominant or codominant component of the community. Another patch of brigalow regrowth of appropriate age (>15 years) was identified; however, this patch was dominated with >50% exotic pasture grasses, which excluded this community from representing the TEC. A total area of 190 hectares of this community was identified within a 500 metre buffer of the centreline of the study area following the field survey and after inspection of aerial imagery (**Figure 5.1**).

Despite extensive searches, no signs of potential communities that could represent the Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin were identified during the course of the field surveys within the areas accessed. The extensive impacts of grazing and land management practices encouraging the spread of exotic pasture grasses, including in areas of Cainozoic deposits forming clay pans that would otherwise be suitable for supporting these communities..

The study area contains vegetation mapped by the Queensland Herbarium as RE 11.5.15 and 11.9.4/11.9.5, which could correspond with the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions community. Ground-truthing of these polygons revealed the former to be RE 11.5.3 (*Eucalyptus populnea* dominated with a subcanopy of *Acacia rhodoxylon*), albeit with some dry rainforest species being successive in the absence of fire in the understorey. Notably, it contained no plants characteristic of RE 11.5.15. The latter was found to contain both RE 11.9.7 (*Eucalyptus populnea* dominated) and RE 11.9.5 (Brigalow community) with no evidence of RE 11.9.4, which could have represented the vine thicket TEC. Therefore, the vine thicket TEC was not found in the study area and is considered unlikely to occur.

Vegetation community assessments for communities that were confirmed as representing a TEC are summarised in **Appendix B**. Sites that were identified as not meeting the criteria for a TEC are summarised in **Appendix C**.



Notes:
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Data Source: Image from ArcGIS Online Bing Maps data (c) 2010 Microsoft Corporation and its data suppliers. Regional Ecosystems V7 and RE Waterways sourced from QLD Government 2012.

Coordinate System: GCS GDA 1994
Datum: GDA 1994
Units: Degree

1:158,835 at A4
0 875 1,750 3,500 5,250 7,000 Meters

LEGEND

Ground-truthed Brigalow TEC

- Brigalow TEC 11.4.9
- Brigalow TEC 11.9.1/11.9.5
- Brigalow TEC 11.9.5

- Dragline Transport Route
- Temporary Shutdown Areas

Drawn By: MG Reviewed by: AC Date: 22-Sep-16

Figure:	5.1
Title:	Occurrence of ground-truthed Brigalow TEC within the Dragline Transport Route
Project:	BMC Dragline Move Project Terrestrial Ecology MNES Assessment
Client:	Advisian

BAAM ECOLOGICAL CONSULTANTS

Document Location: C:\Users\Owner\Documents\Clients\BAAM\Dragline\BAAM_A3_Landscape_5_1_Dragline.mxdDate: 22-Sep-16 4:53:56 PM

5.2 FLORA

Following the field survey, no flora species listed as threatened under the EPBC Act are considered known or likely to occur within the study area (**Appendix A, Table A.1**). Two species, *Dichanthium queenslandicum* and *D. setosum,* were considered to have potential to occur in association with Cainozoic deposits forming clay pans, which occur patchily in the southern central and eastern parts of the study area. However, areas with suitable substrates for these grass species were found to be dominated by pasture grasses. It is considered unlikely that these native grass species would (re)colonise and establish in the study area under existing land management practices.

5.3 FAUNA

The presence of suitable habitat was confirmed for Squatter Pigeon, Ornamental Snake, Koala and Yakka Skink in the field. Ornamental Snake and Yakka Skink are difficult species to detect outside of intensive field survey effort. As such, the habitat modelling and assessment approach undertaken for this study are designed to identify habitats within which it is predicted the species is present or is likely to be present based on known species distribution, habitat records, available literature and field assessment of the presence of important habitat factors. Habitat quality and condition data were collected at representative locations.

The results of a habitat assessment performed in accordance with the EPBC Act referral guidelines for Koala (DotE 2014) have been summarised in **Table 5.1**. The total habitat score from this assessment is 9. As this score is greater than 5, Koala habitat associated with the study area is recognised as 'habitat critical to the survival of Koala' under the EPBC Act referral guidelines.

Squatter Pigeon was observed in several locations within or adjacent to the proposed Dragline route during the field surveys and these locations were added to the data informing the habitat model for the species.

Following the field studies, vegetation mapping within the proposed dragline transport route and surrounds (500 m from dragline transport route centreline) was modified to reflect the recorded conditions. For example, where the composition and/or boundaries of an RE polygon were found to be incorrect on the ground, the boundaries and/or attributes were rectified for inclusion in the model. The results of the field-verified modelling within the dragline transport route are provided in **Table 6.1**.

The extents of the modelled and field-verified habitat for these species within the proposed dragline transport route are depicted on a series of six maps for each species in **Appendix D** as follows:

- Figure 5.2a-f Ornamental Snake
- Figure 5.3a-f Squatter Pigeon
- Figure 5.4a-f Koala
- Figure 5.5a-f Yakka Skink

No migratory fauna species were observed during the survey; however, the field assessment was undertaken over late winter/early spring and was therefore outside of the season where the majority of migratory species would be detected. **Appendix A, Table A.2** provides an assessment of the likelihood of migratory species presence and the potential significance of the study area for the species. The study area is not considered to represent important habitat for any EPBC Act listed migratory species.

Table 5.1. Koala habitat assessment tool results summary.

Attribute	Score	Inland area criteria	Score	Assessment details
Koala occurrence	+2	Evidence of one or more Koalas within the last 5 years	2	**Desktop:** • The EPBC Act Protected Matters Search Tool report identified the Koala or Koala habitat as 'known to occur' in the study area; • Database searches (Wildlife Online and Atlas of Living Australia) revealed a single record of Koala within 2 km of the eastern edge of the study area within the last 5 years. **On-ground:** Vegetation communities within the study area were traversed on foot searching for Koala in trees and for scats at the base of food trees. No signs of Koala were observed during the recent survey despite thorough searches across the site, indicating that the local Koala population may occur at a low density in the local landscape.
	+1	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 10 years		
	0	None of the above		
Vegetation Composition*	+2	Has forest, woodland or shrubland with emerging trees with 2 or more known Koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	2	**Desktop:** • The Queensland Herbarium RE mapping identifies open forest REs dominated by eucalypts occur throughout the study area. **On-ground:** Koala food trees are dominant in the vast majority of remnant vegetation across the study area
	+1	Has forest, woodland or shrubland with emerging trees with only 1 species of known Koala food tree present.		
	0	None of the above		
Habitat connectivity	+2	Area is part of a contiguous landscape ≥ 1000 ha.	2	Parts of the study area are bordered by vast areas of remnant vegetation > 1000 hectares.
	+1	Area is part of a contiguous landscape < 1000 ha but ≥500 ha.		
	0	None of the above		
Key existing threats	+2	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence. Areas which score 0 for Koala occurrence and are likely to have no dog or vehicle threat present.	1	The Peak Downs Highway is prominent in the centre of the study area and many Koala casualties have been recorded to the east (near Nebo). Whilst there is no direct evidence of Koala injury or mortality in the vicinity of the study, this is likely to be an artefact of a low density Koala population in the local landscape providing reduced opportunities for mortality
	+1	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence; **OR** Areas which score 0 for Koala occurrence and are likely to have some degree dog or vehicle threat present.		

Attribute	Score	Inland area criteria	Score	Assessment details
	0	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas with score 0 for Koala occurrence and have a significant dog or vehicle threat present.		
Recovery value **	+2	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DotE 2014).	**2**	In reference to Table 1 of the referral guidelines (DotE 2014), whilst the study area most likely supports a small Koala population, there is ample habitat throughout the study area, which could be considered to contain habitat surrounding habitat refuges and may be important for supporting habitat refuges for Koala to the east. Therefore, the study area is considered likely to be important for achieving the interim recovery objectives for the relevant context as outlined in DotE (2014).
	+1	Uncertain as to whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DotE 2014).		
	0	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the referral guidelines (DotE 2014).		
Total Score			**9**	As the total score is more than 5, Koala habitat within the study area is recognised as 'habitat critical to the survival of Koala' under the EPBC Act referral guidelines.

** Interim recovery objective in inland areas is to 'protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility', and 'maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges' (DotE 2014).

6.0 MNES IMPACTS

6.1 IMPACT AVOIDANCE

The process for the dragline transport route selection has been an iterative one, with an initial route and investigation buffer provided for appraisal in the ecological desktop assessment and habitat modelling. Feedback for avoidance of potential MNES was provided to project planners and the route was adjusted to minimise the need for clearing of remnant habitats.

A dragline relocation project had occurred over part of the alignment approximately 16 years previously and advice was to constrain the new route to these previously cleared areas wherever possible.

Following field assessment and adjustment of the habitat model to reflect the results of ground-truthing, a further route refinement was undertaken to ensure that the disturbance footprint was minimised.

6.2 TOTAL DISTURBANCE AREAS

The total areas of MNES values expected to be impacted by the proposed dragline move are provided in **Table 6.1**. Note that there is considerable overlap of the habitat requirements for the subject species, as well as for the Brigalow TEC. In all, a total of 99.45 ha of habitat that is core or essential habitat for one or more of the subject fauna species will be impacted, 9.7 ha of which also represents the Brigalow TEC.

In addition, there are locations within the route corridor used for this assessment that are wider than the approximately 40 m required for the dragline move. This assessment is based on the worst case scenario in these locations, and final impacted habitat areas may be less than those provided here.

The total disturbance footprint is approximately 645 ha in area. This represents approximately 7.4% of the broad investigation area over which MNES habitat values have been calculated for the purposes of this assessment (approximately 8740 ha). The broad investigation area is defined by a buffer of 500 m around the centreline of the proposed dragline transport route.

Table 6.2 provides a comparison of the MNES habitat areas within the dragline transport route with habitat present within the surrounding 500 m buffer.

Table 6.1 Field-verified MNES fauna habitat modelling results.

MNES Value	Area (ha)[1]	Area (ha)			
		Core Habitat	Essential Habitat	General Habitat	Unlikely Habitat
Brigalow TEC	9.7				
Koala		5.38	92.62	1.43	545.67
Squatter Pigeon		64.76	24.44	10.24	545.67
Ornamental Snake		0.28	52.05	18.19	574.58
Yakka Skink		0	99.35	0.1	545.67

Table 6.2. Comparison of impacted MNES habitat within surrounding habitat extents.

MNES	Estimated habitat extent within 500m of the dragline transport route centreline (ha)	Potential core and essential habitat impacted within dragline transport route (ha)	Estimated habitat remaining within 500m of the dragline transport route centreline (ha)	Estimated % habitat impacted within 500m of the dragline transport route centreline
Endangered Ecological Community				
Brigalow	190	9.7	180.3	5.1
Vulnerable Species[1]				
Koala	3549	98	3451	2.8
Ornamental Snake	1235	52.3	11824.5	4.2
Squatter Pigeon	3354	89.2	3254.8	2.6
Yakka Skink	3618	99.35	3516	2.7

[1] Estimates are the sum area of core and essential habitat (see **Table 6.1**).

6.3 IMPACT MITIGATION AND MANAGEMENT

Environmental Management Plan(s) will be prepared that incorporate measures to reduce direct and indirect impacts of the Project on MNES values.

Specifically, the following measures will be included:

Pre-construction:

- Pre-clear fauna surveys will be undertaken to identify, investigate and flag the following habitat features within the dragline transport route:
  - Fallen timber and burrows, including rabbit burrows that may support Yakka Skink colonies.
  - Areas of cracking clay soils that may support Ornamental Snakes.
  - Squatter Pigeon nests.

Construction:

- Progressive demarcation (by temporary fencing) of remnant vegetation and habitats adjoining the dragline transport corridor within which no construction activity, machinery, stockpiles or equipment storage can occur.
- Presence of a Fauna Spotter/Catcher during clearing activities, with specific focus on habitat features flagged during pre-construction pre-clear surveys and any vegetation that may support Koalas. The activities of the Fauna Spotter/Catcher will be guided by the applicable Environmental Management Plan and a Species Management Program (required under the Queensland *Nature Conservation Act 1992*) designed to minimise impacts on animal breeding places. Clearing and soil disturbance techniques will be outlined to unearth Yakka Skink colonies (if confirmed or suspected to be present), and retrieve sheltering Ornamental Snakes from soil cracks.
- Protection of habitats adjacent to the dragline transport route from:
  - Soil erosion and sedimentation.
  - Dust from disturbed soil and materials stockpiles, to be detailed in an Environmental Management Plan.
  - Weed introduction and or spread, with prevention, management and monitoring detailed in an Environmental Management Plan.
  - Leakages and accidental spills from construction machinery/equipment and refuelling activities, with prevention and management actions to be detailed in an Environmental Management Plan.

Operation:

The operation of the dragline transport roadway will be a once-off move of the dragline from Goonyella Riverside Mine to South Walker Creek Mine. It will take approximately 10 weeks for the move to take place, during which time there is potential for ecological impacts to adjacent habitats from activity along the route during the move. The temporary fencing erected during the construction phase to flag important habitats adjacent to the roadway must remain in place throughout the dragline move and any disturbance within these areas is to be avoided.

Decommissioning:

Once the Dragline move is complete, the route will be decommissioned. Ideally, those areas that currently support remnant vegetation and high value regrowth as mapped by the Queensland Government would be treated and managed to encourage regeneration of the original vegetation community types. As it is not proposed to use infill material for the transportation route, the natural ground surface will remain reasonably intact. Preparation of the ground surface could include removal and stockpiling of topsoil and cleared vegetation for re-spreading in areas identified for restoration. Such actions would encourage the regrowth of the native vegetation from the existing seed bank, although regular monitoring and management of weed infestations would be needed as the disturbed and exposed soil will be susceptible to the establishment of exotic species.

As the route is located predominantly within lands not owned, leased or managed by the proponent, plans for vegetation restoration will be subject to agreement with the various landholders. However, it will be necessary to rehabilitate all waterway crossings, ensuring the reinstatement of riparian vegetation and bank stability. This may include a variety of measures such as:

- Soil ripping followed by seeding
- Planting of seedlings
- Application of erosion control blanket combined with seeding or planting

- Application of propriety erosion control revegetation blankets or similar products.

To increase their effectiveness, revegetation measures should be tailored to the type and density of vegetation existing at each crossing and the medium-term predicted weather patterns.

The details of the rehabilitation and restoration actions for the dragline transportation route will be included within a Rehabilitation and Restoration Management Plan for the Project.

For the purposes of this impact assessment it is assumed that there will only be reinstatement of riparian vegetation at watercourses along the route, and that the remainder of the route will either (i) be maintained by the landholder/s as a permanent access track or (ii) be stabilised and left to be recolonised by native and/or non-native grasses and other groundcover, tree and shrub species from adjacent areas.

6.4 IMPACT ASSESSMENT

An assessment of the potential for the proposed Dragline Move Project to result in Significant Impacts on matters of national environmental significance has been undertaken against the Significant Impact Guidelines 1.1 (Department of the Environment, 2013) and is provided in full in **Appendix E**.

The individual assessments of impacts take into account the short term nature of the project and the implementation of the proposed mitigation and management measures.

6.4.1 Threatened Ecological Communities

Table E.1, Appendix E addresses impacts on the Endangered Brigalow (*Acacia harpophylla* dominant and co-dominant communities) occurring within the dragline transport corridor. The assessment finds that clearing for the Project:

- would reduce the extent of the TEC (9.7 ha) and in accordance with the significant impact criteria, would result in a significant impact.
- would fragment a 13 ha patch of the TEC into two smaller patches, likely resulting in a significant impact.

6.4.2 Ornamental Snake

Table E.2, Appendix E addresses impacts on the Vulnerable Ornamental Snake. Given that the species is patchily distributed in the landscape, it must be considered that there is potential for the population in the study area to be an important population. The assessment finds that clearing for the Project:

- could potentially lead to a long-term decrease in the size of an important population of the species, resulting in a significant impact
- could potentially reduce the area of occupancy of an important population
- could potentially disrupt the breeding cycle of an important population of the species, resulting in a significant impact.

6.4.3 Squatter Pigeon (Southern Subspecies)

Table E.3, Appendix E addresses impacts of the Project on the Vulnerable Squatter Pigeon (Southern Subspecies). It finds that activities associated with the Project would not result in any significant impact for the species when assessed against the significant impact criteria.

6.4.4 Koala

Table E.4, Appendix E provides the results of the assessment of impacts of the Project on the Vulnerable Koala. It finds that activities associated with the Project would not result in any significant impact for the species when assessed against the significant impact criteria.

6.4.5 Yakka Skink

Table E.5, Appendix E provides the results of the assessment of impacts of the Project on the Vulnerable Yakka Skink.

Given that the species is patchily distributed in the landscape, it must be considered that there is potential for the population in the study area to be an important population. The assessment finds that clearing for the Project:

- could potentially lead to a long-term decrease in the size of an important population of the species, resulting in a significant impact.
- could potentially disrupt the breeding cycle of an important population of the species, resulting in a significant impact.

6.4.6 Migratory Species

Table E.6, Appendix E addresses impacts on EPBC Act listed Migratory species. It finds that

activities associated with the Project would not result in any significant impact for Migratory species when assessed against the significant impact criteria.

6.5 ENVIRONMENTAL OFFSET REQUIREMENT

Where significant impacts on matters of national environmental significance cannot be avoided, mitigated or managed, the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) allows compensation for those impacts through the provision of appropriate environmental offsets.

Along the entire dragline transport route the proposed impact areas that have been assessed as representing 'significant impact' in accordance with the EPBC Act Significant Impact Guidelines 1.1 are:

- 9.7 ha of Brigalow TEC.
- 80.05 ha of "core" and "essential" habitat for Ornamental Snake.
- 99.35 ha of "core" and "essential" habitat for Yakka Skink.

BMC advises that native vegetation located on the South Walker Creek mining leases, inclusive of the identified Brigalow TEC area, is not required to be offset given that BMC has pre-EPBC Act authorisations to clear vegetation within the South Walker Creek mining leases 4750 and 70131. The pre-EPBC Act authorisations date from the grants of the "surface areas" within the mining leases in accordance with the Queensland *Mineral Resources Act 1989*. In this case, the grants occurred in September and October 1996, prior to the commencement of the EPBC Act on 16 July 2000. The South Walker Creek mining leases 4750 and 70131 are also noted on the Environmental Authority EPML00712313 issued under the Queensland *Environmental Protection Act 1994*. As a result, state offsets are not required for any native vegetation cleared on these leases. The pre-EPBC Act authorisation only relates to the 8.5 km section at the eastern end of the route.

Outside of the pre-EPBC Act authorisation areas, the proposed impact areas that have been assessed as representing significant impacts in accordance with the Significant Impact Guidelines 1.1 are:

- 21.6 ha of "core" and "essential" habitat for Ornamental Snake would be cleared for the dragline transport route.
- 60.3 ha of "core" and "essential" habitat for Yakka Skink would be cleared for the dragline transport route.

Note that there is considerable overlap of the habitat requirements for the two reptile species in this portion of the route.

The preparation of an Offset Strategy is required to identify appropriate offset measures for these species.

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