SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

Chapter 6
Terrestrial Ecology

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6.0 Terrestrial ecology

6.1 Introduction

BM Alliance Coal Operations Pty Ltd (BMA) is seeking approval to develop the Saraji East Mining Lease Project (the Project) involving a greenfield single-seam underground mine and supporting infrastructure to produce an estimated 110 million tonnes (Mt) of high-quality metallurgical product coal by longwall mining methods over a 20-year life of mine. The Project will be adjacent to, but largely operate independently from, the existing Saraji open cut mining operations located approximately 30 kilometres (km) north of Dysart, Queensland.

This chapter of the Environmental Impact Statement (EIS) provides an assessment of the terrestrial ecological values within and surrounding the Project Site, potential impacts and proposed mitigation measures. The detailed assessment of terrestrial ecology baseline and impacts is presented in **Appendix C-1 Terrestrial Ecology Technical Report**.

6.2 Legislation and policy

6.2.1 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). Amongst other matters, the EPBC Act provides the legal framework to protect and manage Matters of National Environmental Significance (MNES). Nine MNES are currently prescribed and include:

- declared World Heritage properties
- National Heritage places
- declared RAMSAR wetland
- listed threatened species and ecological communities
- listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park (GBRMP)
- nuclear actions
- a water resource, in relation to coal seam gas development or large coal mining development.

Under the EPBC Act, a project or activity that may have an impact on an MNES is deemed to be an ‘action’. Actions that have or are likely to have a significant impact on an MNES require approval from the Minister for the Environment. Whether or not an action is likely to have a significant impact depends on the sensitivity, value, and quality of the environment that is impacted, and the intensity, duration, magnitude and geographic extent of the impact. If the action consists of a series of activities or related activities, the impacts of each activity must be considered as well as the combined (cumulative) impacts of the series of activities. Consideration is also to be given to all impacts that could reasonably be predicted to follow or be facilitated by the action. Impacts may also be directly or indirectly associated with the action.

On 5 October 2016, BMA referred the Project to the Department of the Environment and Energy (DoEE, now DCCEEW) for a decision as to whether the Project constitutes a ‘controlled action’ under the EPBC Act (Referral No. 2016/7791). On 18 October 2016, the Project was determined to be a controlled action under the EPBC Act due to the potential impacts on MNES. The relevant controlling provisions for this Project under the EPBC Act were determined to be:

- nationally listed threatened species and communities (Section 18 and 18A)

- a water resource, in relation to coal seam gas development and a large coal mining development (Section 24D and 24E).

As such, the Project requires assessment and approval under the EPBC Act. The Minister determined that the assessment be conducted in accordance with the bilateral agreement to which both the Australian and Queensland Governments are signatories which accredits the EIS assessment process under the *Environmental Protection Act 1994* (EP Act). This has been acknowledged with ToR issued by the Queensland Department of Environment and Heritage Protection (DEHP) (now the Department of Environment and Science (DES)) on 2 June 2017.

When deciding whether or not a proposed action is likely to have a significant impact on an MNES, the precautionary principle is required to be applied. A lack of scientific evidence as to whether an impact will occur, or to what extent, cannot be used to support or approve an application under the EPBC Act. In addition, beneficial impacts cannot be considered or used to justify other adverse impacts or an approval under the EPBC Act. Through the Matters of National Environmental Significance Significant Impact Guidelines, this principle has been used to determine whether the Project will significantly impact an MNES.

Chapter 21 Matters of National Environmental Significance of this EIS provides a detailed MNES assessment for the Project.

EPBC Act Environmental Offsets Policy

In October 2012, the EPBC Act Environmental Offsets Policy 2012 was published (DSEWPC, 2012). The Environmental Offsets Policy will be applicable to the Project.

There are five key aims of the policy:

- ensure the efficient, effective, timely, transparent, proportionate, scientifically robust and reasonable use of offsets under the EPBC Act
- provide proponents, the community and other stakeholders with greater certainty and guidance on how offsets are determined and when they may be considered under the EPBC Act
- deliver improved environmental outcomes by consistently applying the policy
- outline the appropriate nature and scale of offsets and how they are determined
- provide guidance on acceptable delivery mechanisms for offsets.

An Environmental Offset Strategy has been developed for the Project and is provided in **Appendix C-2 Offsets Strategy** of this EIS. All final offset requirements are subject to the final clearing footprint and assessment and approval from the DCCEEW.

6.2.2 Queensland legislation

Planning Act 2016

The *Planning Act 2016* regulates development in Queensland that is made assessable under the Planning Regulation 2017 or the local government planning scheme and is administered by the Department of State Development, Tourism and Innovation. Development within a mining lease (or other resource tenure as stated in the Planning Regulation 2017) is exempt from provisions of the *Planning Act 2016*. As the Project is within the resource tenure and is associated with mining activity, this exemption applies to the Project.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) prohibits the taking or destruction (without authorisation) of protected flora and fauna species in the wild. All native plants and animals in Queensland are protected under Section 71 of the NC Act. The NC Act also provides for an integrated and comprehensive approach to conserving nature.

The Nature Conservation (Animals) Regulation 2020 (NC (Animals) Regulation) and the Nature Conservation (Plants) Regulation 2020 (NC (Plants) Regulation) lists the plants and animals considered presumed extinct in the wild, endangered, critically endangered, vulnerable, near threatened, least

concern, international and prohibited. The NC Regulation discusses their significance and states the declared management intent and the principles to be observed in any taking and use for each group.

Appropriate authorisations or permits under the NC Act are required prior to clearing of listed conservation significant plant species, interfering with an animal breeding place, or removing protected animals unless the activity is exempt. Fauna and flora species identified during field surveys were assessed against threatened species listed in the NC Regulations. This ensured any impacts from the construction and operation of the Project could be quantified in relation to significant species requirements.

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) regulates the clearing of native vegetation, including remnant (termed Regional Ecosystems (REs)), high-value regrowth (HVR), reef regrowth watercourse vegetation and non-remnant on certain tenures. In Queensland, the VM Act does not apply to mining leases. Although mining is exempt development, the VM Act provides useful guidelines on management including mapping.

Amendments to the VM Act in May 2018 under the *Vegetation Management and Other Legislation Amendment Act 2018* (VMOLA) reinstated the regulation of HVR and reef regrowth watercourse vegetation. HVR areas are those which have not been cleared for over 15 years if the area is an endangered, of concern or least concern regional ecosystem. Reef regrowth watercourse vegetation is native regrowth vegetation on watercourse areas within the Great Barrier Reef Catchments. The clearing of this vegetation has been regulated to increase wetland and watercourse bank stability, and maintain water quality, habitat and landscape stability.

The status of REs and HVRs is based on their pre-clearing and remnant extent, as gazetted under the VM Act and listed in the Regional Ecosystem Description Database (REDD) maintained by the Queensland Department of Natural Resources and Mines and Energy (DNRME). A RE considered to have “Vegetation Management Status” is described as either:

- **endangered RE**:
  - less than ten per cent of its pre-clearing extent remaining, or
  - ten per cent to 30 per cent of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 hectares (ha).
- **of Concern RE**:
  - ten per cent to 30 per cent of its pre-clearing extent remaining, or
  - more than 30 per cent of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha.
- **least** Concern RE:
  - more than 30 per cent of its pre-clearing extent remaining and the remnant vegetation remaining is more than 10,000 ha.

Environmental Protection Act 1994

Under the EP Act and the Environmental Protection Regulation 2019 (EP Regulation), certain environmental features are protected within mining leases. These are termed ‘Environmentally Sensitive Areas’ (ESAs) and include such features as national parks, conservation reserves, wetlands of international importance, heritage places and endangered regional ecosystems (EREs).

All mining and exploration activities in Queensland are conducted under an Environmental Authority (EA) as set out under Section 183 of the EP Act. The EA lists conditions with which the activity must comply in order to mitigate impacts to the environment.

Biosecurity Act 2014

The *Biosecurity Act 2014* commenced on 1 July 2016. It ensures a consistent, risk-based approach to biosecurity in Queensland. The Act provides biosecurity measures to safeguard Queensland's economy, agricultural and tourism industries and environment from:

- pests (e.g. wild dogs and weeds)
- diseases (e.g. foot-and-mouth disease)
- contaminants (e.g. lead on grazing land).

Under the Act, all persons have a general biosecurity obligation to take all reasonable and practical measures to prevent or minimise the biosecurity risk. This includes:

- preventing or minimising adverse effects of a biosecurity risk
- minimising the likelihood of causing a biosecurity event and deal with a biosecurity matter by limiting the consequences of a biosecurity event should one arise
- not exacerbating the effects of a biosecurity matter.

Nature Conservation (Koala) Conservation Plan 2017

The *Nature Conservation (Koala) Conservation Plan 2017* provides for the conservation of the Koala (*Phascolarctos cinereus*) in Queensland and includes provisions for the assessment and management of Koalas (*Phascolarctos cinereus*) during the development approval processes and implementation of projects. Different levels of provisions apply to the three Koala (*Phascolarctos cinereus*) districts that have been mapped across Queensland. The Project is located with Koala (*Phascolarctos cinereus*) District C. This district includes areas where Koalas (*Phascolarctos cinereus*) are found; however, provisions for clearing in Koala (*Phascolarctos cinereus*) District C are less stringent than those in Koala (*Phascolarctos cinereus*) Districts A and B (for example, Districts A and B are subject to sequential clearing conditions).

Environmental Offsets Act 2014 and Environmental Offsets Regulation 2014

The *Environmental Offsets Act 2014* (EO Act) coordinates the delivery of environmental offsets across jurisdictions and provides a single point-of-truth for offsets in Queensland.

The Environmental Offsets Regulation 2014 (EO Reg) provides details of the prescribed activities regulated under existing legislation and prescribed environmental matters to which the EO Act applies. These matters are:

- Matters of National Environmental Significance (MNES)
- Matters of State Environmental Significance (MSES)
- Matters of Local Environmental Significance (MLES).

Environmental Offsets Policy

The Environmental Offsets Policy Version 1.13 (DES 2022) (EO Policy) provides a single, consistent, whole-of-government policy for the assessment of offset proposals to satisfy offset conditions.

The EO Policy outlines seven principles that environmental offsets must meet:

- offsets will not replace or undermine existing environmental standards or regulatory requirements or be used to allow development in areas otherwise prohibited through legislation or policy
- environmental impacts must first be avoided, then minimised, before considering the use of offsets for any remaining impact
- offsets must achieve a conservation outcome that achieves an equivalent environmental outcome
- offsets must provide environmental values as similar as possible to those being lost
- offset provision must minimise the time-lag between the impact and delivery of the offset

- offsets must provide additional protection to environmental values at risk, or additional management actions to improve environmental values
- where legal security is required, offsets must be legally secured for the duration of the impact on the prescribed environmental matter.

For land-based offsets, the suitability of the offset site relative to the impact site and the prescribed environmental matters is measured through undertaking a habitat quality analysis. The Guide to Determining Terrestrial Habitat Quality (Department of Environment and Heritage Protection, 2017) must be used for REs and species offsets (including advanced offsets) to undertake this analysis, unless an alternative approach is approved by DES as being able to measure a conservation outcome.

An Environmental Offset Strategy has been developed for the Project and is provided in **Appendix C-2 Offsets Strategy**. All final offset requirements are subject to the final clearing footprint and assessment and approval from the DES.

6.2.3 Isaac Regional Council Biosecurity Plan 2020-2023

The Isaac Regional Council Biosecurity Plan 2020-2023 aims to minimise biosecurity risk within the local government area by providing a framework to mitigate the impacts of pest animal and weeds on local biosecurity considerations. The Biosecurity Plan identifies five desired outcomes including:

1. strategic Planning and Management - Pest management planning is collaborative, co-ordinated, and risk-based.
2. stakeholder Awareness and Commitment - All stakeholders have an improved working knowledge of regional pest species, understand their biosecurity responsibilities, and hold agency in management goals.
3. effective and Integrated Management Systems - Pest management is based on best practice information and is integrated.
4. proactivity for Prevention and Early Intervention - Timely and collaborative responses diminish pest spread and promotes cost-effective, long-term asset protection.
5. monitoring and Assessment **-** Review processes strive to better understand and improve biosecurity management.

The Operational Guide within the Isaac Regional Council Biosecurity Plan 2020-2023 determines management goals for priority pest animal and weed species within the local government area. Controls will be established in line with the Biosecurity Plan.

6.3 Methodology

6.3.1 Desktop assessment

A desktop review of ecological data and literature was undertaken to characterise ecological values and identify the potential presence of conservation significant species, habitats and vegetation communities within the Project Site. Refer to **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS for a full list of ecological databases and search parameters used.

6.3.2 Field surveys

Both flora and fauna surveys were undertaken to supplement and confirm findings of the desktop assessment. The sampling of vertebrate fauna species including threatened species was undertaken using standard methodologies for the systematic survey of terrestrial fauna in eastern Australia (Eyre et al., 2018) and relevant Commonwealth and species-specific survey guidelines including:

- survey guidelines for Australia's threatened reptiles (Department of Sustainability, Environment, Water, Population and Communities 2011)
- survey guidelines for Australia's threatened birds (Department of the Environment, Water Heritage and the Arts, 2010)

- draft referral guidelines for the nationally listed Brigalow Belt reptiles (Department of Sustainability Environment Water Population and Communities, 2011a)
- survey guidelines for Australia's threatened mammals (Department of Sustainability, Environment, Water, Population and Communities, 2011b)
- survey guidelines for Australia's threatened bats (Department of the Environment, Water, Heritage and the Arts, 2010a)
- industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (Department of the Environment and Energy, 2017)
- species-specific survey guidelines, such as the survey guidelines for the Koala (*Phascolarctos cinereus*) (Department of the Environment, 2014), Painted Honeyeater (*Grantiella picta*) (Rowland, 2012b), Ghost Bat (*Macroderma gigas*) (Hourigan, 2011), and Yakka Skink (*Egernia rugosa*) (Ferguson and Mathieson, 2014).

A summary of these surveys is provided in Table 6-1.

Table 6-1 Summary of flora and fauna surveys undertaken

Year	Company	Target
Flora		
2007	SKM	• mapping the extent of threatened ecological communities (TECs) • targeted survey for the vulnerable King Bluegrass (*Dichanthium queenslandicum*) (protected under the NC Act and EPBC Act) • field checking of RE mapping of the mining lease (ML) (Version 5.0, 2003) • compilation of a flora inventory for the mining lease, based on secondary and quaternary level sampling.
2008	SKM	• survey the extent of remnant brigalow vegetation communities across Mining Lease Application (MLA) 70383. All patches of brigalow within MLA 70383 were ground-truthed, and the boundaries mapped.
2010	SKM	• secondary-level sampling data for each vegetation type in the Project Site • opportunistic traverses of natural grasslands.
2016-2017	AECOM	• ground truthing of REs
2020	AECOM	• TEC assessment (Brigalow (*Acacia harpophylla* dominant and codominant) only)
Fauna		
2007 and 2010	SKM	• systematic fauna survey at primary and secondary sites designed to census terrestrial fauna assemblages and to identify conservation significant species that may occur within the Project Site.
2010	SKM	• targeted survey for the Commonwealth protected Ornamental Snake (*Denisonia maculata*).
2011	SKM	• winter fauna survey including morning bird surveys at wetland habitats, diurnal active fauna searches in Brigalow and Bat call detection (Anabat).
2016 and 2017	AECOM	• targeted the entire Project Site and included observations of terrestrial vertebrate fauna assemblages (birds, mammals, reptiles and amphibians), habitat assessments and Anabat deployment.
2020	AECOM	• targeted survey for the Commonwealth protected species Dunmall's Snake (*Furina dunmalli),* Yakka Skink (*Egernia rugosa*), Ornamental Snake (*Denisonia maculata),* Adorned Delma (*Delma torquata*), Koala (*Phascolarctos cinereus*), Greater Glider (*Petauroides volans*), Latham's Snipe (*Gallinago hardwickii*), Australian Painted Snipe (*Rostratula australis*), Painted Honeyeater (*Grantiella picta*), Red Goshawk (*Erythrotriorchis radiatus*) and Squatter Pigeon (Southern) (*Geophaps scripta scripta*).

In addition, this assessment also drew on previous studies undertaken by EcoServe between 2005 and 2009 at the existing Saraji Mine. Details on these previous studies is provided in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS.

Data acquisition during flora surveys generally has inherent limitations associated with variability of vegetation communities across a site, and changes to the detectability and presence of species with time. A high level of confidence in comprehensiveness is implicit in this study as survey sites were strategically located to capture representative samples of all communities. Further, the seasonal conditions during which this survey was undertaken were conducive to a relatively high degree of detectable floral diversity. However, given the above, it is recognised that field studies with a temporal limitation cannot always account for 100 per cent of potential floral diversity present within a site.

The Queensland Government introduced HVR mapping as Category C in May 2018 under the *Vegetation Management and Other Legislation Amendment Act 2018* (VMOLA). All reference to the extent of HVR within this report is based on Queensland Government mapping and was not ground-truthed. Flora survey sites are shown in Figure 6-1 and fauna survey sites are illustrated in Figure 6-2. While the Project does not require assessment against the VMOLA or VM Act, HVR within the Project Site has been quantified.

6.3.3 Queensland Herbarium Regional Ecosystem Amendment

During the EIS adequacy review process, it was determined that to inform the quantification of offsets, offset calculations should be based on Queensland Herbarium certified RE mapping. Using available information, a RE map amendment request was provided to the Queensland Herbarium regarding the ground-truthed RE mapping developed for the Project. In a letter dated 8th August 2024 the Queensland Herbarium confirmed that the mapping update request has been partially accepted.

The outcomes of the Queensland Herbarium review have been applied in the calculation of impacts to relevant MSES (ie those relating to REs). These results are discussed in Section 6.7 and assessment of significant residual impacts in 6.16.

6.3.4 Likelihood of occurrence assessment

A likelihood of occurrence assessment for threatened and migratory species and TECs identified during the desktop review was undertaken. Targeted searches were undertaken in the field for species identified as either being likely to occur, or having potential to occur, within the Project Site, based on the desktop sources. The methodology was applied again after field surveys to determine the likelihood of occurrence once site-based information became available.

Each species was assessed against the categories defined below.

- known: Species was positively identified and recorded in the Project Site during the field surveys; or previous, reliable records occur within the Project Site.
- likely: Species was not recorded during the field surveys or previously, however there are known records within the nearby surrounding area (i.e. 15 km) and suitable habitat exists in the Project Site.
- potential: Species was not recorded during the field surveys or previously, however known records occur in the surrounding area (i.e. 15 km) and habitat in the Project Site is marginal or degraded.
- unlikely: Habitat in the Project Site might be suitable or marginal; however, species was not recorded during the field surveys, and no known records of the species exist within the surrounding area (i.e. 15 km).
- no: This is usually applied to marine species or seabirds for terrestrial sites.

6.3.5 Conservation significant species mapping

Following the completion of field surveys and the likelihood of occurrence assessment, habitat mapping for the MNES values and additional MSES species known or likely to occur within the Project Site was undertaken. MNES and MSES potential habitat mapping of the Project Site was undertaken to:

- estimate the extent of potential habitat present within the Project Site
- determine the potential impact to MNES and MSES values

- aid the development of specific mitigation measures.

Potential habitat mapping was undertaken in accordance with Central Queensland Threatened Species Habitat Descriptions (Kerswell A, Kaveney T, Evans C and Appleby L, 2020). This covers some of the key threatened fauna species of the Central Queensland region and defines habitat based on three categories – preferred, suitable and marginal habitat. The definitions of each category are provided in Table 6-2 below. Preferred habitat definitions have been provided for all species but not all species have been allocated both a suitable and marginal habitat category. Allocation of these categories was based on the known ecological requirements of the species and the most applicable category that best describes the species habitat.

For species not covered by Central Queensland Threatened Species Habitat Descriptions (Kerswell A, Kaveney T, Evans C and Appleby L, 2020), habitat definitions were developed from information sourced from publicly available databases, including relevant species recovery plans (where available), referral guidelines, approved conservation advice, the Species Profile and Threats database (SPRAT), management plans and peer-reviewed journal articles.

Habitat assessment information collected during the field surveys, species records (previous and survey records), and Project vegetation mapping was used to map the potential habitat according to the habitat definitions.

The habitat definitions are provided in **Appendix C-3 Central Queensland Threatened Species Habitat Description** of this EIS.

Table 6-2 Habitat category definition

Category	Definition
Preferred	Habitats that are most important to the species and contain the features that are crucial for the species' persistence in an area. It includes habitats in which key activities are undertaken e.g. breeding, roosting and/or where high quality/species limiting foraging resources are found. If the species is present in a region, individuals will usually be found in preferred habitat.
Suitable	Habitats that provide resources for the species but is not crucial for its persistence in an area. Individuals may be found in suitable habitat but are not likely to be undertaking key activities such as breeding or roosting. Foraging resources may be lower quality or used opportunistically (rather than being depended upon). If the species is present in a region, individuals may be found in suitable habitat but this habitat type may also remain unoccupied.
Marginal	Habitats that provides limited resources for the species and is not crucial for its persistence in an area. Individuals may be occasionally found in marginal habitat but will not be undertaking key activities such as breeding, roosting or extensive foraging. If the species present in a region, individuals would be found in marginal habitat only rarely and this habitat type is likely to be unoccupied most of the time.

6.3.6 Significant Impact assessment

Significant impact assessments were conducted for MNES and MSES that were assessed as known, likely or having the potential to occur within the Project site. Significant impacts on:

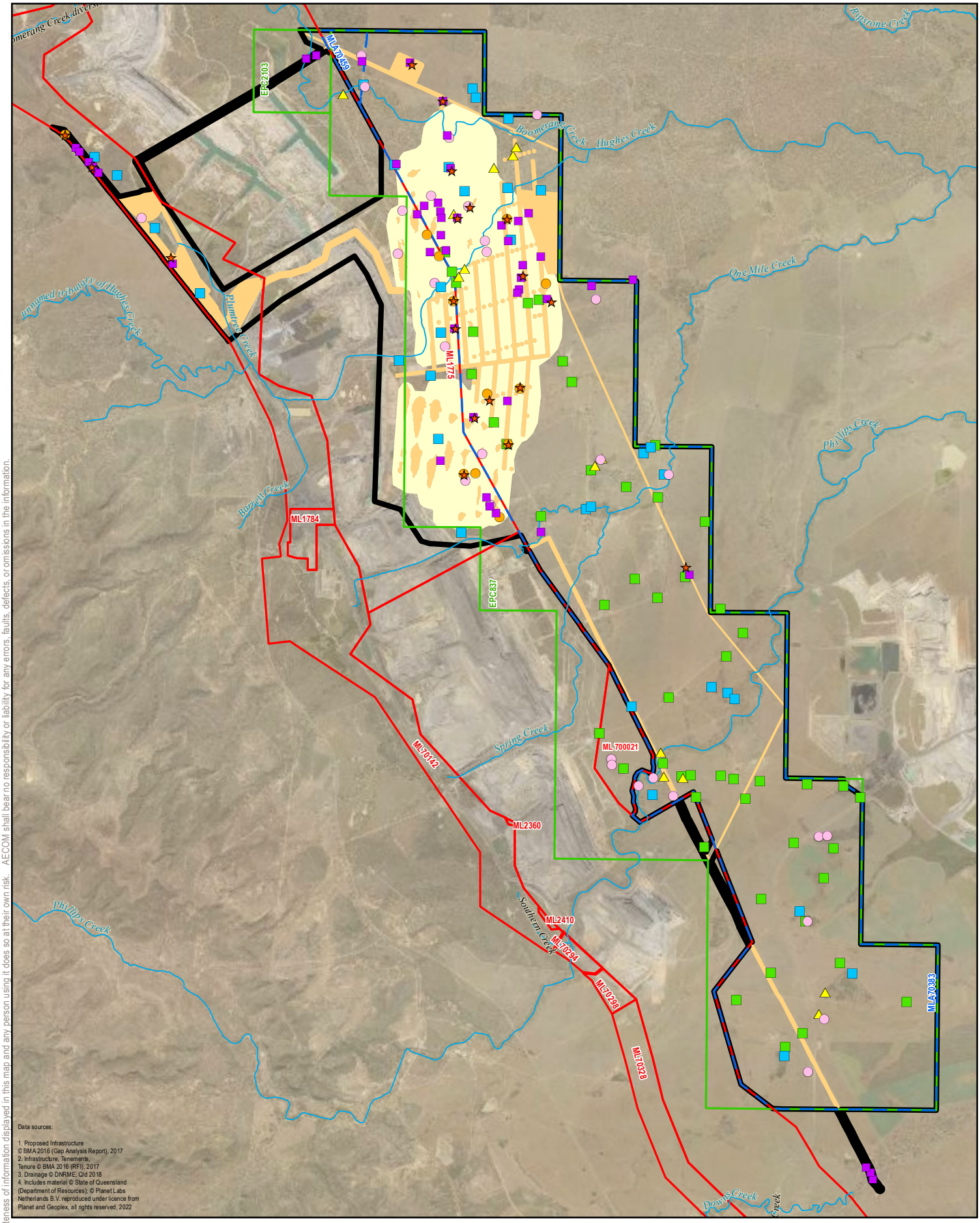
- MNES were evaluated in accordance with the Commonwealth *Environmental Offsets Policy 2012* and *MNES Significant Impact Guidelines* (Department of the Environment (DOTE), 2013).
- MSES were evaluated in accordance with the Queensland *Environmental Offsets Policy Version 1.13* (DES, 2022) and *Significant Residual Impact Guidelines* (Department of Environment and Heritage Protection (DEHP), 2014).

To enable the assessment of potential Project impacts, a conservative maximum disturbance area encompassing both direct and indirect impacts associated with construction and operational phases of the Project has been established (the Project Footprint). The Project Footprint (as shown in Figure 6-3 and Figure 6-4) includes the maximum extent of proposed surface disturbance associated with surface infrastructure and underground mining activities. The total area is 3,348 ha.

The Project Footprint encompasses:

- Direct impact areas associated with:
  - surface infrastructure and indicative IMG drainage network layout
  - temporary ponded areas
- Indirect impact area associated with the Projects predicted subsidence extent.

Significant impact assessments for MNES are described in **Chapter 21** of this EIS. This chapter assessed impacts to MSES.



Data sources:

1. Proposed Infrastructure
© BMA 2016 (Gap Analysis Report), 2017
2. Infrastructure, Tenements, Tenure © BMA 2016 (RFI), 2017
3. Drainage © DNRME, Qld 2018
4. Includes material © State of Queensland (Department of Resources); © Planet Labs Netherlands B.V. reproduced under licence from Planet and Geoplex, all rights reserved, 2022

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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Indirect Impact
- Project Footprint - Direct Impact
- Watercourse

Flora survey sites

- TEC assessment - Brigalow (AECOM 2020)
- Quaternary RE assessment (AECOM 2020)
- Tertiary RE assessment (AECOM 2020)
- Quaternary RE assessment (AECOM 2017)
- Tertiary RE assessment (AECOM 2017)
- Secondary RE assessment (SKM)
- Quaternary RE assessment (SKM)

N

Figure 6-1
Flora survey sites

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

BMA
BHP Mitsubishi Alliance

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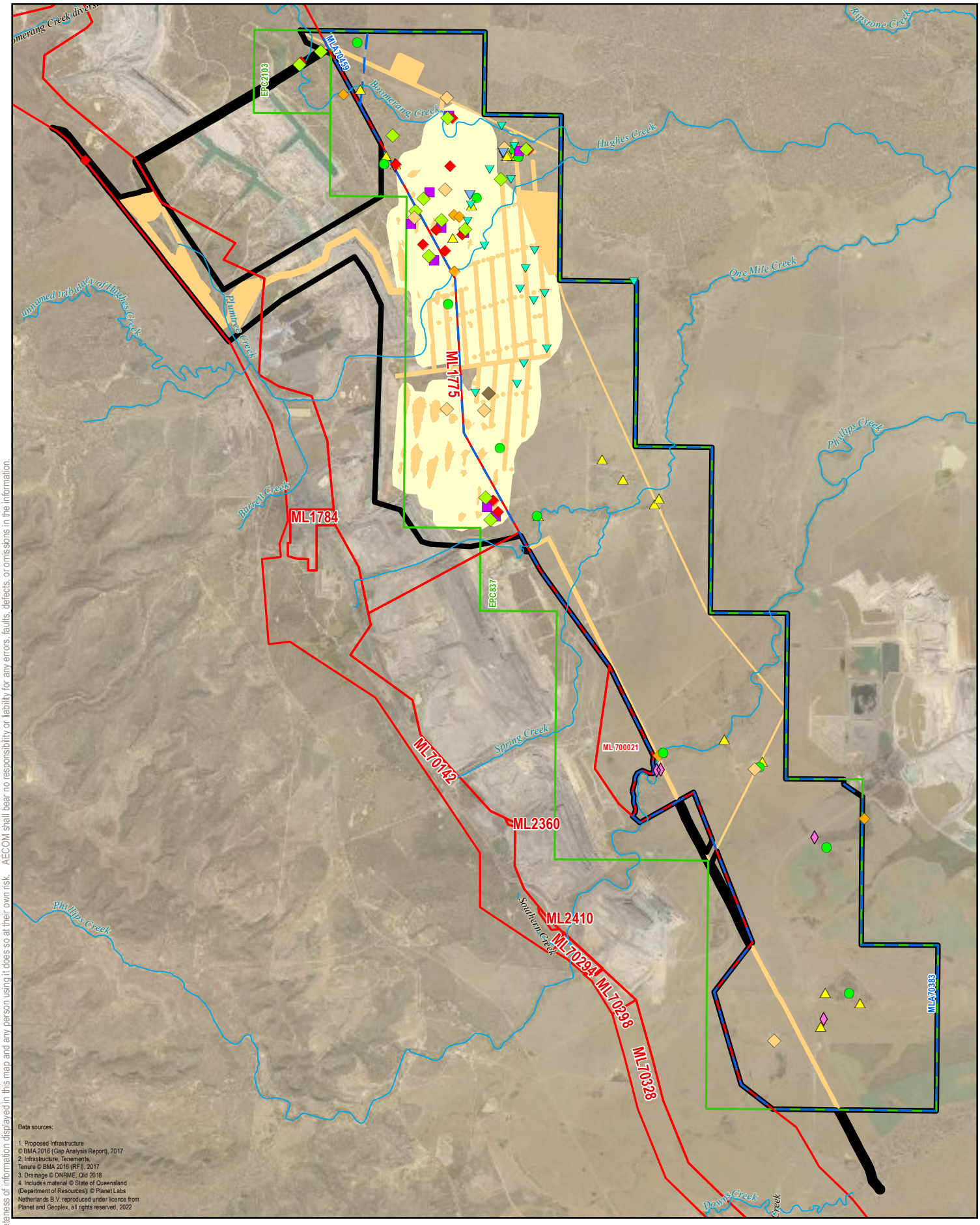

Data sources:

1. Proposed Infrastructure © BMA 2016 (Gap Analysis Report), 2017
2. Infrastructure, Tenements, Tenure © BMA 2016 (RFI), 2017
3. Drainage © DNRME, Qld 2018
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Legend

- Watercourse
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Site
- Project Footprint - Indirect Impact
- Project Footprint - Direct Impact

Fauna survey sites

- General habitat assessment (AECOM 2017)
- Yakka Skink habitat assessment (AECOM 2020)
- Squatter Pigeon habitat assessment (AECOM 2020)
- Greater Glider habitat assessment (AECOM 2020)
- Active fauna search (AECOM 2020)
- Spotlight location (AECOM 2020)
- Spotlight location (AECOM 2017)
- Anabat location (AECOM 2017)
- Winter site (SKM)
- Primary site (SKM)
- Secondary site (SKM)

N

Figure 6-2
Fauna survey sites

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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6.4 Terrestrial flora results

6.4.1 Desktop assessment

Regional context

The Project Site is situated within the northern Brigalow Belt bioregion. Queensland's bioregions are based on landscape patterns that reflect changes in geology and climate, as well as major changes in floral and faunal assemblages at a broad scale and are used as the fundamental framework for the planning and conservation of biodiversity.

Nature conservation of the northern Brigalow Belt bioregion has received increasing attention due to the rapid and extensive loss of habitat that has occurred. Major impacts upon vegetation of the Brigalow Belt include tree clearing, high grazing pressure and the proliferation of exotic species such as the Prickly Pear (*Opuntia spp*.). As a consequence of habitat modification, many flora and fauna species have undergone severe range reductions and localised extinctions have occurred for several fauna species (Sattler and William, 1999).

Vegetation clearing has occurred on most of the lowland landscapes and those formed on shales. The more rugged topography associated with the sandstone and metamorphic ranges remain relatively undisturbed (Sattler and William, 1999).

The Project Site is situated within the Isaac-Comet Downs subregion. The landscape of this bioregion is predominantly undulating country dominated by *Acacia harpophylla* (Brigalow) and *Eucalyptus cambageana* (Dawson Gum) communities on clay soils and *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus populnea* (Poplar Box) open woodland communities on the shallower textured-contrast soils. *Acacia harpophylla* (Brigalow) and *Eucalyptus coolabah* (Coolabah) woodlands are common on alluvium which is commonly encountered in this subregion (Sattler and William, 1999).

Regional ecosystems and high value regrowth

DNRME RE mapping (Version 10.1) was reviewed to determine the extent of REs across the Project Site. Twelve REs are mapped as occurring within the Project Site. These REs are predominantly associated with the creeks that drain across the properties as remaining areas have largely been cleared. The Biodiversity Status of these twelve REs includes three REs listed as endangered, five as of concern and four as no concern at present. Three of the REs are also analogous REs to TECs protected under the EPBC Act.

DNRME mapping was also reviewed to determine the extent of HVR within the Project Site. HVR occurs in several small patches which have not been cleared for greater than 15 years. HVR is mapped for ten REs within the Project Site. The HVR REs generally correspond to mapped remnant REs with the Project Site.

No Essential Habitat for conservation significant flora species is mapped within the Project Site (DNRM, 2016a).

Refer to **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS for full details of REs within the Project Site.

Threatened ecological communities

The following four endangered TECs were identified as potentially occurring within the Project Site:

- Brigalow (*Acacia harpophylla* dominant and codominant), listed as endangered under the EPBC Act
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin, listed as endangered under the EPBC Act
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions, listed as endangered under the EPBC Act
- Weeping Myall Woodlands, listed as endangered under the EPBC Act.

Based on mapped REs within the Project Site, the TEC Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin and the TEC Brigalow (*Acacia harpophylla* dominant and codominant) have the potential to occur within the Project Site.

Flora of conservation significance

A review of the existing databases and literature on terrestrial flora for the region identified seven conservation significant flora species with the potential to occur within the Project Site. These are identified in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS.

6.4.2 Field survey results

Ground-truthed regional ecosystems

Table 6-3 provides a summary of the classification of vegetation communities and REs identified during the flora surveys. Vegetation communities for the survey areas were delineated on the basis of mapped REs. Figure 6-3 presents the observed REs across the Project Site.

Table 6-3 Observed Regional Ecosystems within the Project Site

RE	Community description	Biodiversity status	VM Act class	Analogous RE for TEC?	EPBC Act status for TEC[1]	Project Site Extent (ha)	Project Footprint (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	Endangered	Endangered	Yes - Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered[1]	15.76	6.58
11.3.2	*Eucalyptus populnea* woodland on alluvial plains.	Of Concern	Of Concern	Yes - Weeping Myall Woodlands[2]	Endangered[1]	151.14	65.51
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus spp.* woodland on alluvial plains.	Of Concern	Of Concern	No	-	23.05	0.01
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	Of Concern	Least Concern	No	-	192.08	73.42

[1] EPBC Act conservation status of the TEC when condition thresholds and diagnostic criteria are met.
[2] RE 11.3.2 did not meet the condition class criteria for TEC Weeping Myall Woodlands, since Weeping Myall (*Acacia pendula)* did not dominate the canopy (TSSC, 2008).

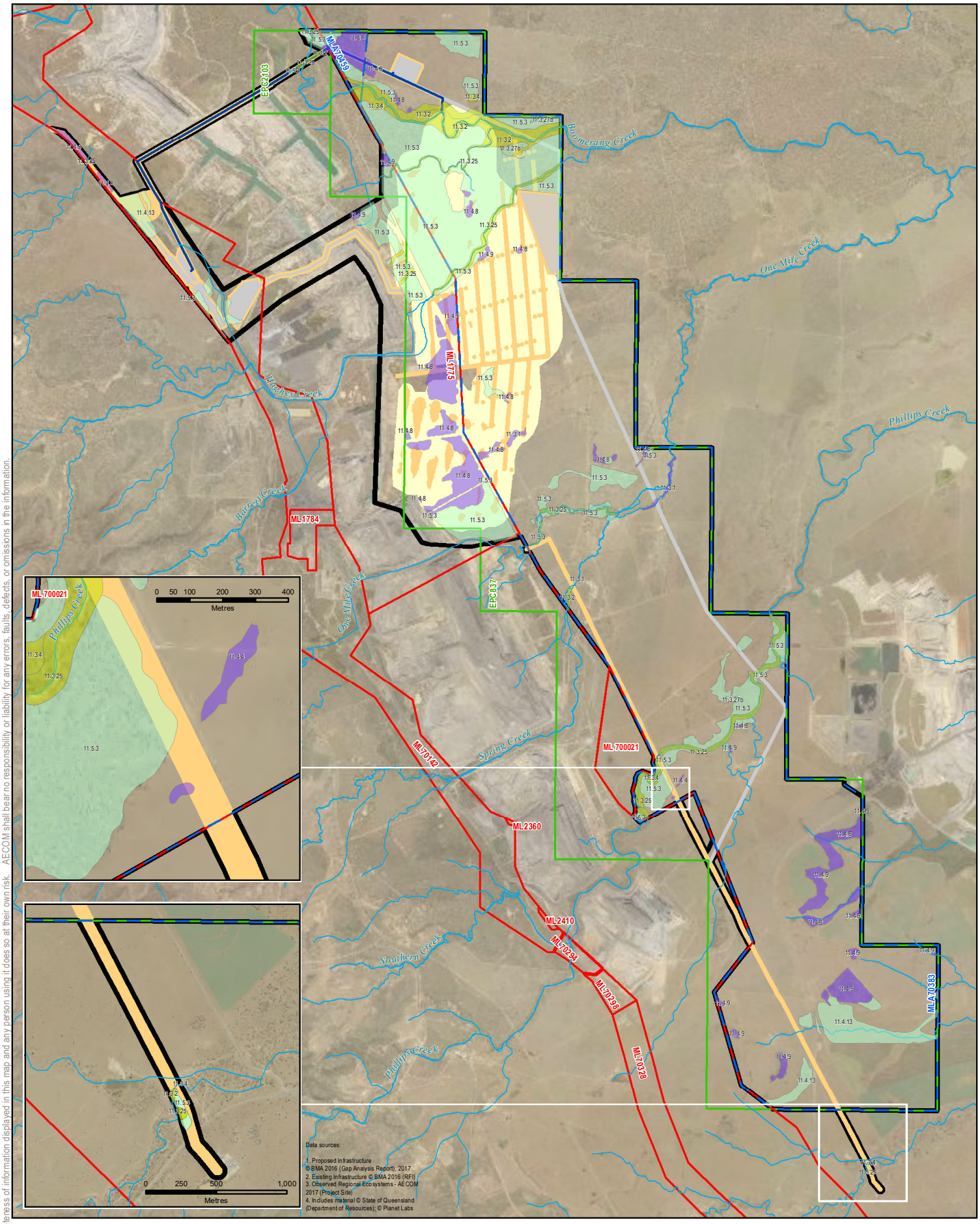
RE	Community description	Biodiversity status	VM Act class	Analogous RE for TEC?	EPBC Act status for TEC[1]	Project Site Extent (ha)	Project Footprint (ha)
11.3.27b	Lacustrine wetland (e.g. lake). Vegetation ranges from open water +/- aquatics and emergents. Occurs on billabongs no longer connected to the channel flow.	Of Concern	Least Concern	No	-	16.64	3.04
11.4.4	*Dichanthium* spp., *Astrebla* spp. grassland on Cainozoic clay plains.	Of Concern	Least Concern	Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered[1]	1.73	0.08
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	Endangered	Endangered	Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered[1]	322.35	222.45
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains.	Endangered	Endangered	Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered[1]	188.57	32.56
11.4.13	*Eucalyptus orgadophila* open woodland on Cainozoic clay plains.	Of Concern	Least Concern	No	-	222.14	38.03

RE	Community description	Biodiversity status	VM Act class	Analogous RE for TEC?	EPBC Act status for TEC[1]	Project Site Extent (ha)	Project Footprint (ha)
11.5.3	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces.	No Concern At Present	Least Concern	No	-	1,480.12	778.66

At the time of the vegetation surveys, HVR was not surveyed as it was not regulated under the VM Act. Legislative amendments in 2018 reverted to regulating HVR as Category C under VMOLA. As such, HVR within the Project Site has been quantified, despite the Project not requiring assessment against the VMOLA or VM Act. State RE mapping (version 10.1) was used to calculate impacts to HVR, with no field verification undertaken. Refer to Table 6-4 for further detail.

Table 6-4 HVR regional ecosystems mapped by State within the Project Site

HVR RE	Community description	Biodiversity status	VM Act class	Project Site (ha)	Area (ha) within Project Footprint
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	Endangered	0.30	0.10
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	Of Concern	Of Concern	1.90	0.65
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Of Concern	Least Concern	26.68	7.01
11.3.37	*Eucalyptus coolabah* fringing woodland on alluvial plains	No Concern at Present	Least Concern	0.06	0.04
11.4.4	*Dichanthium* spp., *Astrebla* spp. grassland on Cainozoic clay plains.	Of Concern	Least Concern	2.23	0.01
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	Endangered	Endangered	37.94	1.21
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains.	Endangered	Endangered	50.67	2.68
11.5.3	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces.	No concern at present	Least Concern	27.13	2.04
11.9.2	*Eucalyptus melanophloia* +/- *E. orgadophila* woodland to open woodland on fine-grained sedimentary rocks.	No concern at present	Least Concern	0.02	-



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Direct Impact
- Project Footprint - Indirect Impact
- Surface Infrastructure
- Watercourse
- Pipeline

Regional Ecosystem biodiversity status

- Endangered
- Of Concern
- No Concern at Present

N

Figure 6-3
Ground-truthed regional ecosystems

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

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Threatened ecological communities

Of the five TEC with potential to occur in the vicinity of the Project, field surveys confirmed the presence of two Commonwealth EPBC Act-listed TECs within the Project Site:

- Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Brigalow (*Acacia harpophylla* dominant and co-dominant).

TECs within the Project Site are identified in Table 6-5 and Figure 6-4. Further details on the specifications of these TECs are provided in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS.

Table 6-5 EPBC Listed Threatened Ecological Communities

TEC	EPBC Act status	Extent (ha) in Project Site	Extent (ha) in Project Footprint
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	396.54	210.31
Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	1.73	0.075

The *Weeping Myall Woodlands* TEC is characterised as open woodlands to woodlands in which *Acacia pendula* (Weeping Myall) is the sole or dominant overstorey species (TSSC, 2009). REs identified as potentially containing *Weeping Myall Woodlands* (i.e. RE 11.3.2), were dominated by *Eucalyptus populnea* (Poplar Box), excluding the communities from the TEC. Similarly, no vegetation communities consistent with the Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions TEC were present within the Project Site. Further information is found in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS.

Flora of conservation significance

The literature review and desktop searches identified seven flora species of conservation significance as potentially occurring in the Project Site. These are identified in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS. Of those seven species, previous field surveys undertaken by SKM confirmed the presence of Bluegrass (*Dichanthium setosum*, listed as vulnerable EPBC Act) within the Project Site.

No threatened flora species were identified within the Project Site during the AECOM field surveys. However, suitable habitat for Bluegrass was confirmed within the Project Site (Figure 6-8). King Bluegrass (*Dichanthium queenslandicum*) was also reported as likely to occur, as this species is known to occur in similar habitat to Bluegrass. The extent of potential habitat for both conservation significant flora totals 1.73 ha within the Project Site, of which 0.075 ha occurs within the Project Footprint.

Based on an assessment of ground-truthed habitats within the Project Site, the remaining five flora species of conservation significance are not likely to occur.

Flora diversity

The field surveys identified the presence of 315 taxa representing 70 families and 190 genera. These are discussed in further detail in **Appendix C-1 Terrestrial Ecology Technical Report.**

Weeds

A total of 40 exotic flora species (weeds) representing 70 families were recorded in the Project Site. Of these 40 weeds, 11 species are a Restricted Matter[3] under the *Biosecurity Act 2014* and eight are Weeds of National Significance (WoNS).

Under the Isaac Regional Biosecurity Plan 2020-2023, a weed is a plant identified in Schedule 1 Part 2 of the *Biosecurity Act 2014* that have, or potentially have, adverse environmental, economic, or social

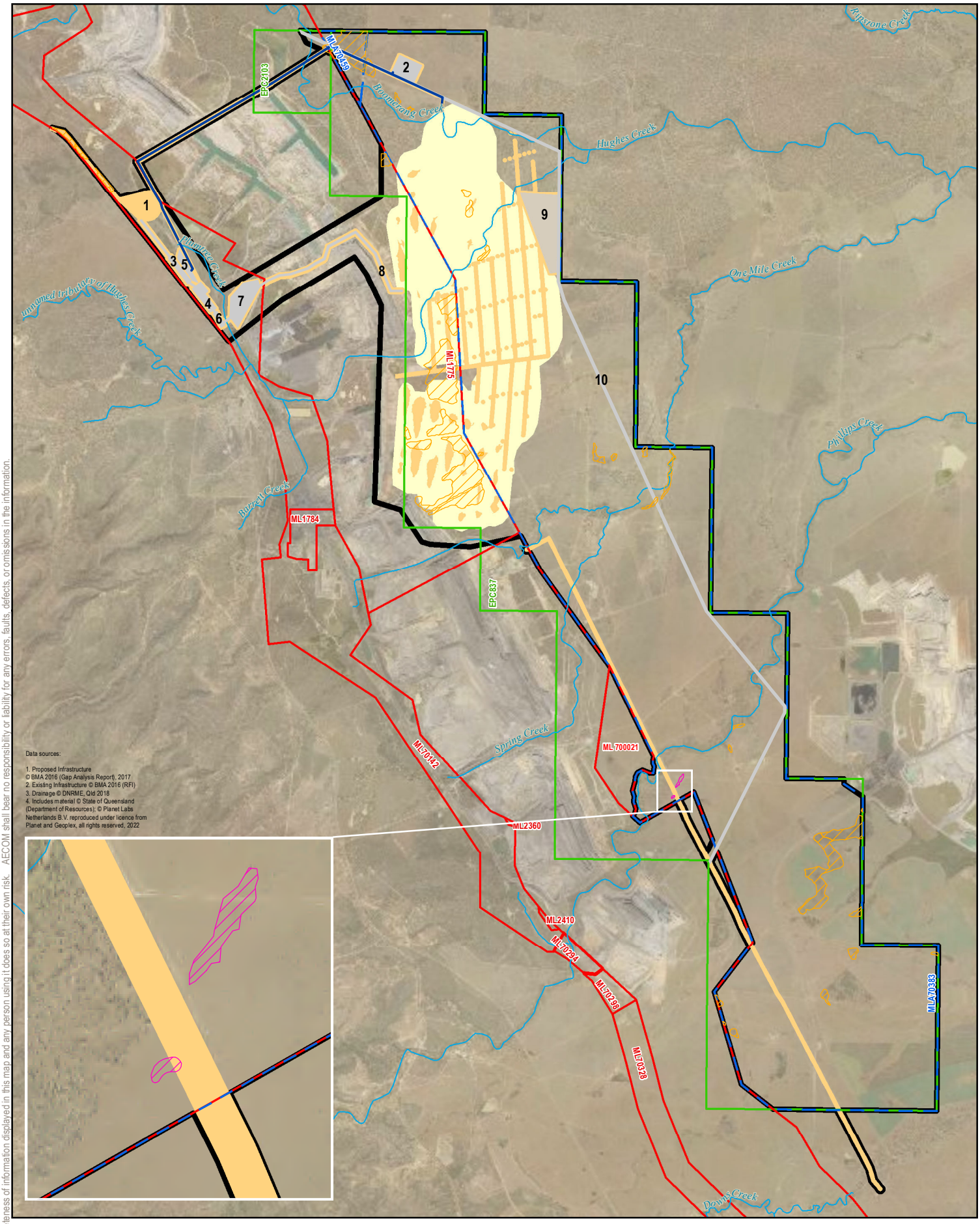
[3] Refers to biosecurity matter found in Queensland which has a significant impact on social, economic, health or environment.

impact in the Isaac region (Isaac Regional Council, 2019). Nine weeds observed during the field survey were identified within the Isaac Regional Biosecurity Plan.

A list of these significant weed species is provided in Table 6-6.

Table 6-6 Declared weed species recorded in the Project Site

Species	Common name	Biosecurity matter	Weeds of National Significance	Isaac Regional Council Biosecurity Plan - Priority Weeds	Source
*Bryophyllum daigremontianum x delagoense**	Mother of Millions Hybrid	Restricted Matter	-	Yes	EcoServe
*Cryptostegia grandiflora**	Rubber Vine	Restricted Matter	Yes	Yes	EcoServe
*Harrisia martinii**	Harrisia Cactus	Restricted Matter	-	Yes	AECOM, EcoServe
*Hymenachne amplexicaulis**	Hymenachne	Restricted Matter	Yes	Yes	EcoServe
*Jatropha gossypifolia**	Bellyache Bush	Restricted Matter	Yes	Yes	EcoServe
*Lantana camara**	Lantana	Restricted Matter	Yes	Yes	AECOM, SKM, EcoServe, Wildlife Online
*Lantana montevidensis**	Creeping Lantana	Restricted Matter	-	-	EcoServe
*Opuntia tomentosa**	Velvety Prickly Pear	Restricted Matter	Yes	-	SKM, EcoServe, Wildlife Online
*Opuntia stricta**	Prickly Pear	Restricted Matter	Yes	Yes	SKM, EcoServe, Wildlife Online
*Parthenium hysterophorus**	Parthenium Weed	Restricted Matter	Yes	Yes	AECOM, SKM, EcoServe, Wildlife Online
*Vachellia nilotica**	Prickly Acacia	Restricted Matter	Yes	Yes	AECOM



LEGEND

- Watercourse
- Project Site
- Surface Infrastructure
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint - Indirect Impact
- Project Footprint - Direct Impact
- Pipeline

Threatened ecological community

- Brigalow (Acacia harpophylla dominant and co-dominant)
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin

Surface Infrastructure

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Transport and Infrastructure Corridor

N

Figure 6-4
Threatened ecological communities observed within the Project Site

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Saraji East Mining Lease Project

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Kilometres

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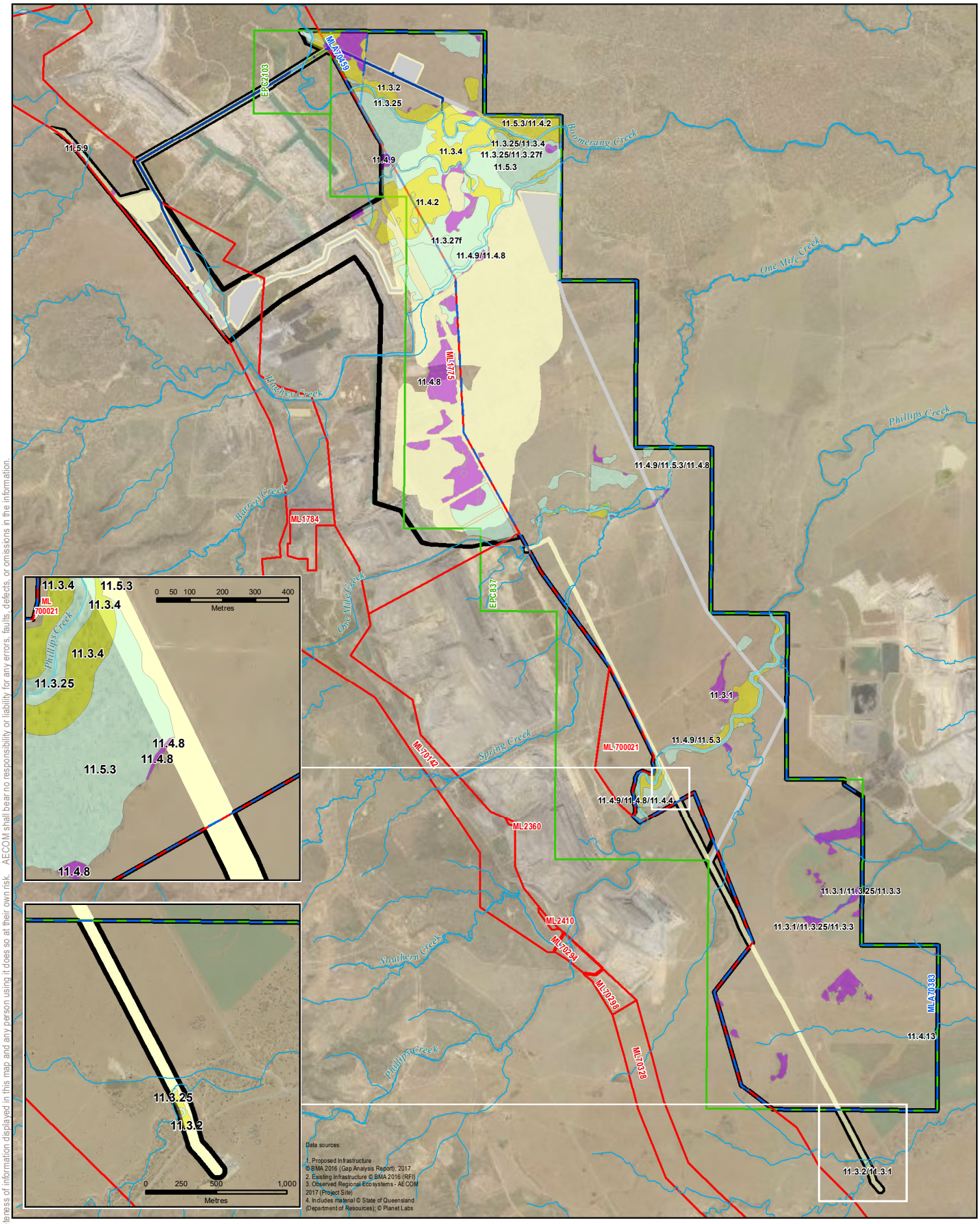
6.4.3 Queensland Herbarium Certification

On 8 August 2024 the Queensland Herbarium partially certified the ground-truthed RE mapping developed during the field survey. For appropriate assessment of significant residual impacts to MSES and identification of offset requirements the certified mapping layer was applied for assessment of regulated vegetation impacts. Figure 6-5 shows the August 2024 certified mapping. The Queensland Herbarium noted in the assessment:

> *'It is not considered that these discrepancies depart significantly from the intent of the map as originally presented and relate to the following:*
>
> 1. *The interpretation, and delineation of Landzones and RE's based on existing and available geological and geophysical information, field information provided, photographic evidence and the broader context of the site….*
> 2. *Re-interpretation of RE allocations and recognition of homogeneous RE polygons within areas previously mapped as heterogeneous mosaics;*
> 3. *Identification and mapping of new areas 11.3.25, 11.3.1, 11.4.3 and 11.3.27f within the area of interest (largely due to finer scale mapping)*
>
> *Where RE codes may differ from those proposed by the proponent, the allocated code was determined in accordance with: V7.0 of the Queensland Herbarium mapping methodology (Neldner et al. 2023); the field evidence provided; interpretation of existing data held in corporate data systems in the broader bioregional context; and the interpretation of the available remotely sensed data (including aerial photography and a range of digital optical/multi-spectral/radiometric data).'*



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Project Footprint
- Surface Infrastructure
- Watercourse
- Pipeline

Regional Ecosystem Vegetation Management class

- Endangered
- Of Concern
- No Concern at Present

N

Figure 6-5
Queensland Herbarium Certified (Aug 2024) Regional Ecosystem Mapping

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

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6.5 Terrestrial fauna results

6.5.1 Literature review and previous survey results

Essential habitat mapping

State Essential Habitat mapping shows vegetation known to support values for conservation significant species, or habitat which surrounds records of conservation significant species. It is based on species habitat models and suitable habitat surrounding previous records of species. State mapping of Essential habitat for Squatter Pigeon (Southern) (*Geophaps scripta scripta*) and Ornamental Snake (*Denisonia maculata*) aligns with both remnant and high-value regrowth vegetation within the Project Footprint and Project Site, as outlined in Table 6-7 and Figure 6-8.

Table 6-7 Essential Habitat mapped within Project Footprint and Project Site.

Vegetation	Project Site (ha)	Project Footprint (ha)
Remnant vegetation	1,989.44	722.95
High-value Regrowth	33.37	1.28
Total	**2,022.81**	**724.23**

Biodiversity values

An analysis of the Biodiversity Planning Assessment (BPA) for the Brigalow Belt shows that 617.90 ha of State significant habitat, 861.21 ha of regionally significant habitat and 41.08 ha of locally significant habitat is present within the Project Footprint. Regional connectivity and biodiversity corridors identified from the BPA within the Project Site are displayed in Figure 6-6.

The Brigalow Belt BPA mapping indicates that the major creek systems within the Project Site (Boomerang Creek, Hughes Creek and Phillips Creek) and their associated riparian vegetation contribute to habitat connectivity from west to east on a state level. Northeast of the Project Site is largely mapped as significant for biodiversity at a state level and several disjunct patches of regional significance for biodiversity are mapped throughout the southern half of the Project Site, generally associated with watercourses.

Fauna of conservation significance

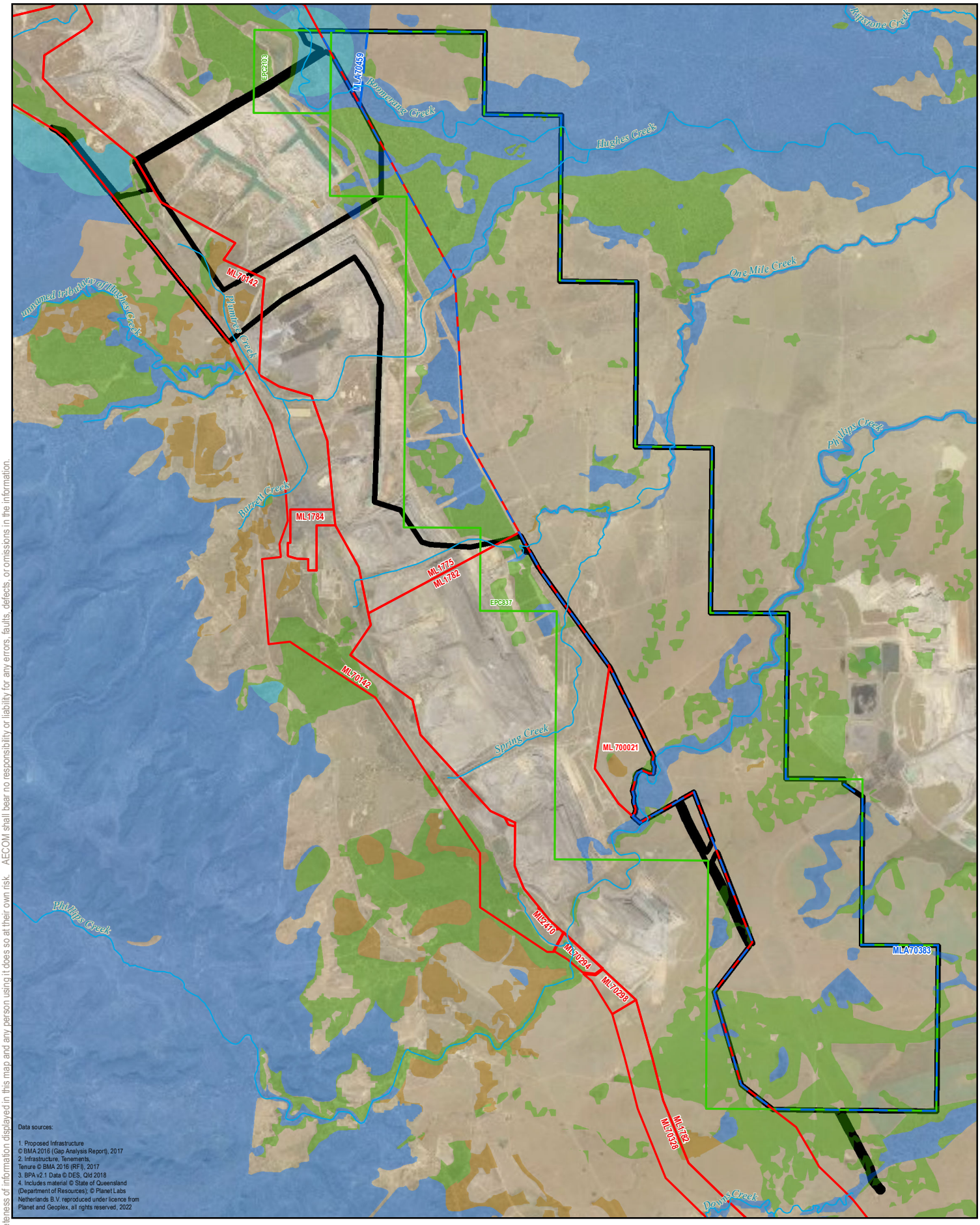
Twenty-one conservation significant fauna species (including migratory species) protected under both State and Commonwealth legislation were identified in database searches and may occur within the Project Site. Conservation significant species assessed with the potential to occur within the Project Site were targeted during field surveys.

Please refer to **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS for further details.

BMA has previously undertaken ecological assessments for development and management of the existing Saraji Mine. Overall, a total of 282 terrestrial vertebrate fauna species have been recorded from the habitats of Saraji Mine from previous studies (WBM 1999; WBM 2002; WBM 2003; EcoServe 2005; EcoServe, 2006), including 47 mammal, 48 reptile, 21 frog and 166 bird species.

Listed migratory species

Fourteen migratory fauna species listed under the EPBC Act were identified in the desktop assessments and literature review for the Project Site. These species were evaluated to determine which species are known, likely, potential, unlikely or no potential to occur within the Project Site based on an understanding of the preferred habitats of the species, knowledge of the type and condition of habitats present at the Project Site, and the results of previous Saraji Mine fauna surveys (e.g. SKM). Out of the fourteen species, four have been previously recorded by EcoServe in 2005 during surveys of the Saraji Mine and are considered to be ‘known’ occurrences. These species included Fork-tailed Swift (*Apus pacificus*), Latham’s Snipe (*Gallinago hardwickii*), White-throated Needletail (*Hirundapus caudacutus*) and Caspian Tern (*Hydroprogne caspia*).



Data sources:

1. Proposed Infrastructure
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2. Infrastructure, Tenements,
Tenure © BMA 2016 (RFI), 2017
3. BPA v2.1 Data © DES, Qld 2018
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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse

Biodiversity significance

- State Mapped Habitat for Endangered, Vulnerable and Near Threatened taxa
- State Values
- Regional Values
- Local or Other Values

N

Figure 6-6
Biodiversity planning assessment mapping within the Project Site

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Saraji East Mining Lease Project

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Kilometres

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6.5.2 Field survey results

Fauna habitats

The habitat landscape within the Project Site has been significantly altered from its original state, and most of the area has been cleared for grazing land and improved pasture. The current habitat landscape comprises cleared grazing land dominated by the exotic grass species Buffel Grass (*Cenchrus ciliaris**) traversed by narrow remnants of riparian woodlands. There are larger patches of remnant woodlands in the northern section of the Project Site, connected to more extensive areas of habitat to the north. Fauna habitat that does persist has been subjected to disturbance from cattle grazing, selective clearing, weeds and pests. This has led to a general lack of native understorey growth in the remnant woodlands. However, thinning has resulted in an accumulation of ground habitats in the form of logs and large branches. Despite signs of habitat degradation, several fauna habitat values exist.

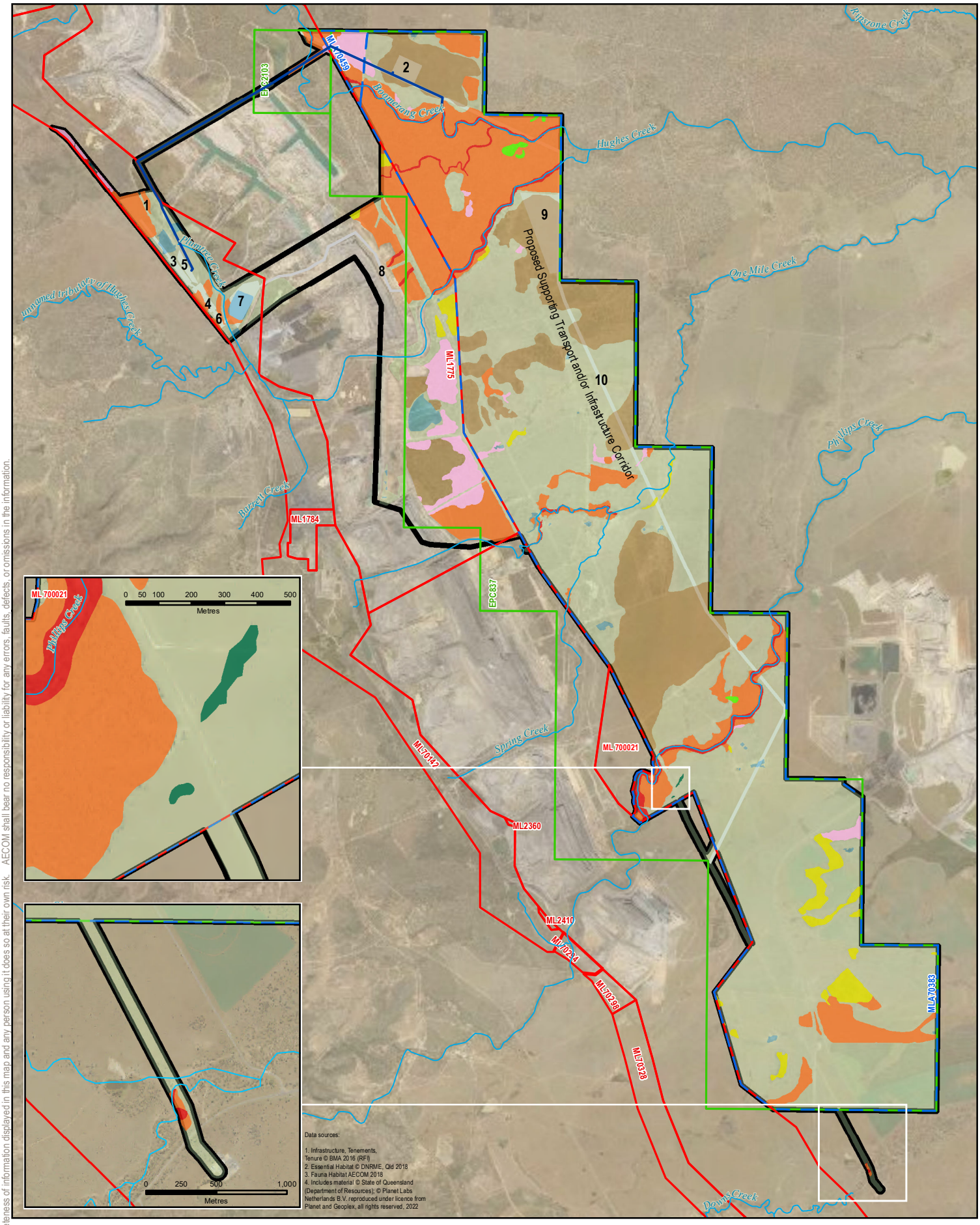
Nine distinct habitat types were recorded within the Project Site (Table 6-8). **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS provides further details on these communities. Figure 6-7 presents the distribution of the fauna habitat types across the Project Site and Project Footprint.

Table 6-8 Fauna habitat types within the Project Site

Habitat type	Habitat summary	Analogous REs	Project Site (ha)	Project Footprint (ha)
1	River Red Gum Riparian Woodland	11.3.25	192.08	73.42
2	Eucalyptus and/or Corymbia Open Woodland	11.3.2, 11.3.4, 11.4.13; 11.5.3	1,876.46	882.21
3	Dawson Gum and Brigalow Woodland	11.4.8	322.35	222.45
4	Brigalow or Belah Woodland	11.3.1, 11.4.9	204.33	39.15
5	Oxbow Wetland	11.3.27b	16.64	3.04
6	Natural Grasslands	11.4.4	1.73	0.075
7	Modified Grasslands	Non-remnant	6,418.86	1,420.13
8	Shrubby Brigalow Regrowth with gilgai	Non-remnant	1,781.99	636.89
9	Dams	Non-remnant	107.66	70.72

Habitat connectivity

The northern portion of the Project Site provides contiguous area of remnant vegetation with faunal dispersal opportunities to the north and east. Riparian corridors associated with Boomerang Creek, Hughes Creek, One Mile Creek, and Phillips Creek provide east–west fauna movement opportunities through the landscape. The functional habitat connectivity in an east to west direction in a regional context is interrupted by the existing Saraji mine directly west of the Project Site. However, to the east and west of the existing Saraji mine, there are opportunities for fauna movement despite the historical clearing of woodland for grazing. The Project Site is bisected by the Lake Vermont Mine Road and railway corridor as well as Golden Mile Road in the southern extent, and movement opportunities for fauna through the landscape north–south are limited.



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Surface Infrastructure
- Pipeline
- Watercourse

Fauna habitat types

- River red gum riparian woodland
- Eucalyptus and Corymbia open woodland
- Dawson gum and brigalow woodland
- Brigalow and belah woodland
- Oxbow wetland
- Natural grasslands

Non-remnant Habitat

- Modified Grasslands
- Shrubby Brigalow Regrowth with Gilgai
- Dams

Surface Infrastructure

1 Rail Loading Balloon Loop
2 Process Water Dam
3 Product Stockpiles
4 CHPP
5 Raw Water Dam
6 ROM Pad
7 Future MIA
8 Conveyor
9 Construction Village
10 Transport and Infrastructure Corridor

N

Figure 6-7
Fauna habitat types within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Fauna species richness

A total of 188 vertebrate fauna species were recorded during the 2007, 2010, 2011, 2016, 2017 and 2020 field surveys (Table 6-1), comprising 14 amphibians (including one exotic species), 24 reptiles, 117 birds and 33 mammals (including seven exotic species). A composite fauna list is provided in **Appendix C-1 Terrestrial Ecology Technical Report.**

Fauna of conservation significance

Seven species listed as threatened under the EPBC Act and/or the NC Act were observed in the Project Site during field surveys from 2006-2020. These species are listed in Table 6-9. Based on available habitats which were assessed within the Project Site, no additional species were considered as likely to occur within the Project Site. Conservation significant fauna observed within Project Site are presented in Figure 6-8.

Table 6-9 Listed threatened species recorded within and adjacent to the Project Site

Common name	Scientific name	EPBC Act	NC Act
Ornamental Snake	*Denisonia maculata*	Vulnerable	Vulnerable
Australian Painted Snipe	*Rostratula australis*	Endangered	-
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	Vulnerable	Vulnerable
Grey Falcon	*Falco hypoleucos*	-	Vulnerable
Greater Glider	*Petauroides volans*	Vulnerable	-
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable
Short-beaked Echidna	*Tachyglossus aculeatus*	-	Special Least Concern

Below is a summary of fauna of conservation significance which were observed within the Project Site. Refer to **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS for further details.

Ornamental Snake

The Ornamental Snake has been recorded in the Project Site on multiple occasions (Figure 6-8):

- in two locations during surveys by AECOM (2020)
- in three locations during surveys by SKM (2010 and 2012)

State-mapped Essential Habitat for the species in the west of the Project Site relates to 11 previous records. The distribution and number of records available within the Project Site suggests a viable population of this species is present. The shrubby Brigalow regrowth with gilgai and fringing modified grasslands within the Project Site provides suitable habitat for this species (as per habitat definition outlined in Kerswell A, Kaveney T, Evans C and Appleby L, 2020). Potential habitat for this species is described in Table 25 and Figure 15 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Australian Painted Snipe

This species was observed from an area of flooded *Acacia harpophylla* (Brigalow) woodland within the Project Site during SKM surveys in 2007 (Figure 6-8). Potentially suitable habitat within the Project Site lacks the required microhabitat features to provide breeding habitat for this species. The species is likely to be an occasional visitor only and may use wetlands in the Project Site on passage to more suitable breeding or foraging grounds. Potential habitat for this species is described in Table 25 and Figure 16 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Squatter Pigeon (Southern)

The Squatter Pigeon (Southern) was observed in the Project Site by SKM (2012) and AECOM (2017) and State-mapped Essential Habitat for the species overlies the north of Project Site surrounding an existing record (Figure 6-8). This species is expected to occur throughout the Project Site, with preferred, suitable and marginal habitat identified (as per habitat definition outlined in Kerswell A, Kaveney T, Evans C and Appleby L,, Kaveney T, Evans C and Appleby L, 2020). Potential habitat for

this species is described in Table 27 and Figure 17 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Greater Glider

One Greater Glider was observed in mature River Red Gum (*Eucalyptus camaldulensis*) woodlands fringing Phillips Creek in the south of the Project Site by SKM (2012). Within similar habitat associated with Boomerang Creek and Hughes Creek in the north of the Project Site, another 18 Greater Gliders were observed by AECOM in 2020 and one additional individual was also found in *Eucalyptus* and/or *Corymbia* open woodland (RE 11.5.3) (Figure 6-8). Preferred, suitable and marginal habitat for the species occurs within the Project Site (as per habitat definition outlined in Kerswell A, Kaveney T, Evans C and Appleby L, 2020). Potential habitat for this species is described in Table 28 and Figure 18 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Koala

The Koala was observed within and adjacent to the Project Site during the following ecological surveys:

- at Downs Creek adjacent to the Project Site during previous ecological surveys
- within riparian vegetation along Lake Lester and Plumtree Creek (EcoServe, 2006, 2008 and 2009)
- at Peak Downs Mine East, directly north of the Project Site (AECOM, 2018)
- northwest of the Project Site within the riparian zone associated with Plumtree Creek by (AECOM, 2020).

A Koala record also occurs for Atlas of Living Australia approximately 4 km west of the Project Site.

Preferred, suitable and marginal habitat for species also occurs within the Project Site (as per habitat definition outlined in Kerswell A, Kaveney T, Evans C and Appleby L, 2020), Potential habitat for this species is described in Table 29 and displayed on Figure 19 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Grey Falcon

This species was not observed within the Project Site during any of the field surveys. However, in 2005 EcoServe observed the species on the adjacent Saraji Mine and as such this species is considered likely to occur. Due to the broad definition of suitable habitat for this species, all vegetation within the Project Site is considered to provide some value for the lifecycle requirements of the Grey Falcon. Preferred, suitable and marginal habitat for the species occurs within the Project Site (as per habitat definition outlined in Kerswell A, Kaveney T, Evans C and Appleby L, 2020), Potential habitat for this species is described in Table 30 and displayed on Figure 20 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Short-beaked Echidna

The Short-beaked Echidna has been observed within the Project Site. Given the very broad utilisation of habitat by this species, all vegetation within the Project Site is considered to provide suitable and marginal habitat (as per habitat definition outlined in Kerswell A, Kaveney T, Evans C and Appleby L, 2020), Potential habitat for this species is described in Table 31 and displayed on Figure 21 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Migratory fauna

No migratory fauna species listed under the EPBC Act were observed from the Project Site during AECOM or SKM surveys. However, four species were recorded by EcoServe in 2005 during surveys of the adjacent Saraji Mine. These species are assessed as known occurrences and are listed in Table 6-10.

Table 6-10 Migratory fauna species occurring within or adjacent to the Project Site

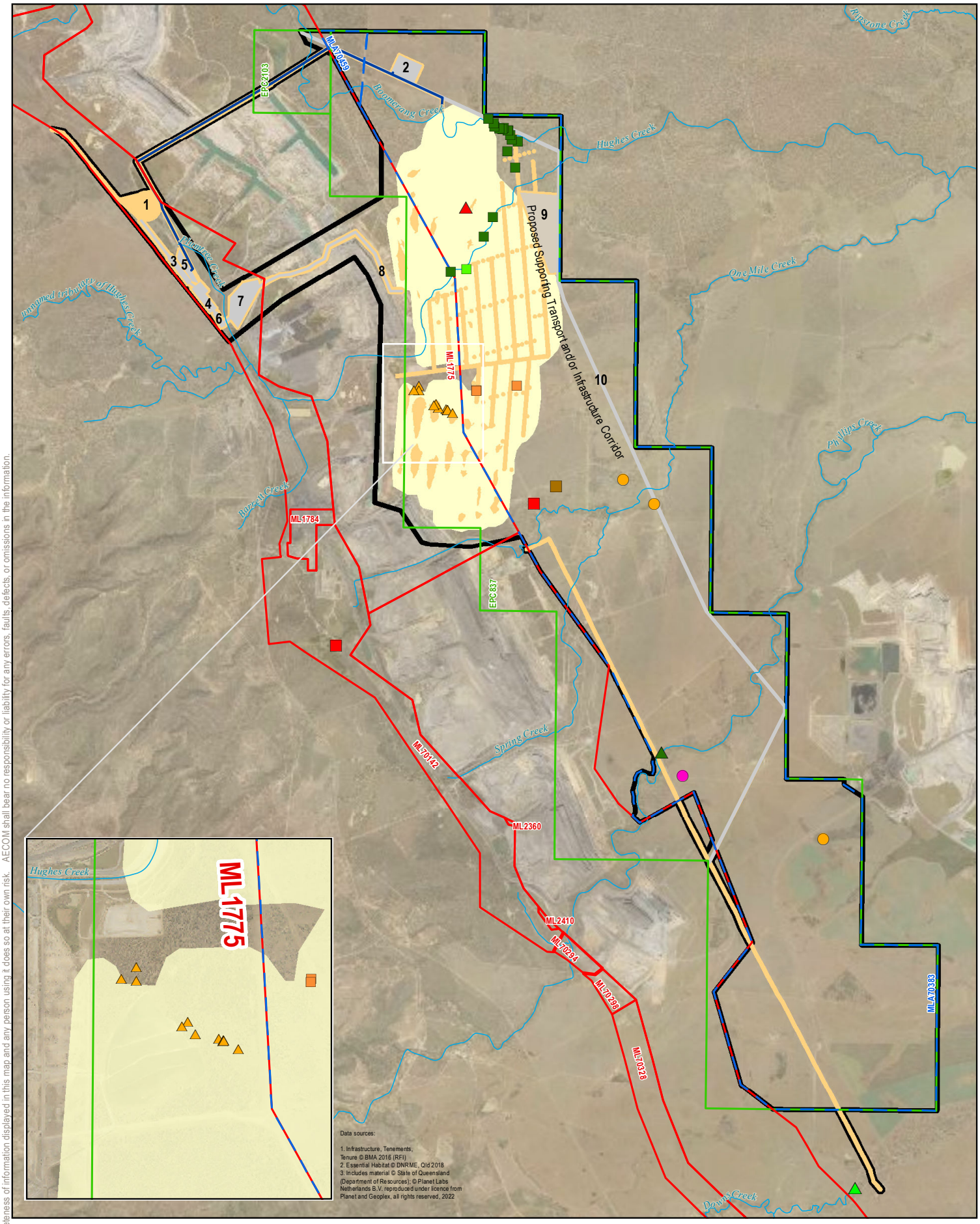
Scientific name	Common name	EPBC Act status	NC Act status	International agreements
Apus pacificus	Fork-tailed Swift	Migratory	Special Least Concern	CAMBA, JAMBA, ROKAMBA
Gallinago hardwickii	Latham's Snipe	Migratory	Special Least Concern	Bonn, JAMBA, ROKAMBA
Hirundapus caudacutus	White-throated Needletail	Migratory	Special Least Concern	CAMBA, JAMBA, ROKAMBA
Hydroprogne caspia	Caspian Tern	Migratory	Special Least Concern	JAMBA

Fork-tailed Swift (*Apus pacificus*) primarily occurs over inland plains but is known to utilise diverse habitat from coastal foothills, cliffs, beaches, urban areas, riparian woodland, heathland, treeless grassland, spinifex covered sandplains, open farmland, dunes, low scrub, heathland, saltmarsh and tea-tree swamps (DoEE, 2016). The species is found across northern Australia and may use the airspace above wooded areas and open plains within Project Site. They are almost exclusively aerial and do not breed in Australia.

Latham's Snipe (*Gallinago hardwickii*) uses a variety of freshwater or brackish wetlands, preferring to be close to protective vegetation cover. Small patches of suitable habitat are available within the Project Site in wetlands in the northeast of the Project Site and ponds to the east of Saraji mine.

The White-throated Needletail (*Hirundapus caudacutus*) is almost exclusively aerial and is known to occur over a variety of habitats. Foraging habitat is at heights of up to cloud level over a variety of habitats. The species may be found in the airspace above all areas within the Project Site.

A pair of Caspian Terns (*Hydroprogne caspia*) were observed foraging over the evaporation dam on the eastern side of Saraji Mine during SKM surveys in 2007. Suitable habitat for this species within the Project Site includes dams and wetlands.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Surface Infrastructure
- Project Footprint - Indirect Impact
- Project Footprint - Direct Impact
- Pipeline
- Watercourse

Threatened Fauna and Flora Records

- Ornamental Snake (SKM 2012)
- Ornamental Snake (Australian Living atlas 2016)
- Ornamental snake (AECOM 2020)
- Koala (URS 2014)
- Koala (AECOM 2020)
- Greater glider (AECOM 2020)
- Greater Glider (SKM 2012)
- Squatter pigeon (AECOM 2017)
- Squatter Pigeon (SKM 2012)
- Painted Snipe (SKM 2012)
- Bluegrass

Surface Infrastructure

1. Rail Loading Balloon Loop
2. Process Water Dam
3. Product Stockpiles
4. CHPP
5. Raw Water Dam
6. ROM Pad
7. Future MIA
8. Conveyor
9. Construction Village
10. Transport and Infrastructure Corridor

N

Figure 6-7

Observed Conservation Significant Fauna and Flora within the Project Site

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Pest animals

Nine introduced vertebrate fauna species were recorded within the Project Site. This included five species considered to be a 'Restricted Matter' under the *Biosecurity Act 2014* and three species noted within Isaac Regional Biosecurity Plan. These species are commonly encountered in central Queensland. These are presented in Table 6-11.

While not identified in the field surveys, feral deer are present across the Isaac Regional Council area and are a priority species for management across the shire.

No other Biosecurity Act listed pest fauna species were identified in the literature review or desktop assessment as previously recorded in proximity to the Project Site.

Table 6-11 Pest animals identified within the Project Site

Scientific name	Common name	Biosecurity matter	Isaac Regional Council Biosecurity Plan - Priority Weeds	Source
*Bos taurus**	Cattle	-	-	AECOM, SKM, EcoServe, Wildlife Online
*Canis lupus dingo/ familiaris**	Wild Dog	Restricted Matter	Yes	EcoServe
*Felis catus**	Feral Cat	Restricted Matter	Yes	EcoServe
*Lepus europaeus**	European Hare	-	-	EcoServe
*Mus musculus**	House Mouse	-	-	EcoServe
*Oryctolagus cuniculus**	European Rabbit	Restricted Matter	-	AECOM, EcoServe
*Bufo marinus**	Cane Toad	-	-	AECOM, SKM, EcoServe, Wildlife Online
*Sus scrofa**	Pig	Restricted Matter	Yes	AECOM, EcoServe
*Vulpes vulpes**	Fox	Restricted Matter	-	AECOM

6.6 Matters of National Environmental Significance

A detailed review of MNES occurring within the Project Site is provided in **Chapter 21 Matters of National Environmental Significance** of this EIS.

6.7 Matters of State Environmental Significance

Matters of State Environmental Significance (MSES) include certain environmental values protected under Queensland legislation including:

- NC Act
- *Marine Parks Act 2004*
- *Fisheries Act 1994*
- EP Act
- *Regional Interests Planning Act 2014*
- VM Act

- EO Act.

MSES values affected by the Project are presented below in Table 6-12.

Table 6-12 MSES values associated with the Project

MSES	Description	Relevance to the Project
Regulated vegetation (Endangered / Of Concern REs)[1]	REs which: • are listed in schedule 1 of the Vegetation Management Regulation 2012 • are listed in schedule 1 of the Vegetation Management Regulation 2012 • occur within a Category B area on the regulated vegetation management map • fit the description for the RE contained in the Regional Ecosystem Description Database	**Yes** Regulated vegetation (Endangered and Of Concern REs) as per the MSES description occurs within the Project Footprint (510.25 ha), including: RE 11.3.1 (1.32 ha) RE 11.4.8 (195.23 ha) RE 11.4.9 (30.48 ha) RE 11.3.2 (14.29 ha) RE 11.4.2 (128.47 ha) RE 11.3.4 (140.46 ha)
Regulated vegetation (within the defined distance of a watercourse)[1]	REs which: • occur within a Category B area on the regulated vegetation management map; and • intersect or occur within a wetland area as identified on the vegetation management wetlands map. • are located within the defined distance from the defining banks of a relevant watercourse or relevant drainage feature (being those that are identified on the vegetation management watercourse and drainage feature map).	**Yes** Regulated vegetation (within defined distance of a watercourse) as per the MSES description occurs within the Project Footprint (83.51 ha), including: RE 11.3.1 RE 11.3.2 (2.26) RE 11.3.4 (11.32 ha) RE 11.3.25 (63.89 ha) RE 11.4.2 (0.25 ha) RE 11.4.8 (0.51 ha) RE 11.4.9 (0.12 ha) RE 11.5.3 (5.15 ha)
Regulated Vegetation (within a Vegetation Management Wetland Area)[1]	REs which: • are mapped as a Category B area on the regulated vegetation management map; and • identified as a wetland on the vegetation management wetlands map	**Yes** Regulated vegetation (within defined banks of a vegetation management wetland) as per the MSES description occurs within the Project Footprint (2.15 ha), including: RE 11.3.4 (0.04 ha) RE 11.3.27f (2.08 ha) RE 11.5.3 (0.03 ha)
Wetland and Watercourses	Means an area shown as a wetland: • in a wetland protection area; or • of high ecological significance on the Map of Referrable Wetlands • or watercourse in high ecological value waters (as defined under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019, schedule 2	**No** No wetland or watercourse protection areas occur within the Project Site

MSES	Description	Relevance to the Project
Connectivity areas[1]	Areas which consist of vegetation mapped as prescribed RE that: are of sufficient size or configured in a way that maintains ecosystem functioning; and will remain despite a threatening process within the meaning of the *Nature Conservation Act 1992*.	**Yes** Connectivity areas occur within the Project Site as per the MSES description (1,054,82 ha)
Protected wildlife habitat	Protected wildlife habitat includes: • an area of essential habitat on the essential habitat map for an animal or plant that is endangered or vulnerable wildlife • a high-risk area on the flora survey trigger map which also contains endangered, vulnerable or near threatened (EVNT) plant species • an area which contains EVNT plants and is not shown on the flora survey trigger map • an area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal that is endangered, vulnerable or a special least concern animal	**Yes** Habitat for state listed species occurs within the Project Site, including: • Koala (*Phascolarctos cinereus*) (1,160.17 ha potential habitat) • Ornamental Snake (*Denisonia maculata*) (including Essential Habitat) (886.02 ha potential habitat) • Greater Glider (*Petauroides volans*) (748.13 ha) • Squatter Pigeon (*Geophaps scripta scripta*) (including Essential Habitat) (1,862.33 ha potential habitat) • Australian Painted Snipe (*Rostratula australis*) (712.97 ha potential habitat) • Grey Falcon (*Falco hypoleucos*) (3,113.57 ha potential habitat) • Short-beaked Echidna (*Tachyglossus aculeata*) (3,113.57 ha potential habitat) Estimated areas for protected fauna have been undertaken through habitat mapping where applicable.
Protected areas	This relates to protected areas as declared under the NC Act, including: • National parks • National parks (Aboriginal land) • National parks (Torres Strait Islander land) • National parks (Cape York Peninsula Aboriginal land) • Regional parks • Nature refuges	**No.** No protected areas as per the MSES definition are present within the Project Footprint.
Fish Habitat Areas and Highly Protected Zones of State marine parks	An area declared under the *Fisheries Act 1994* to be a fish habitat area.	**No** No state marine parks or fish habitat areas occur within the Project Footprint.

MSES	Description	Relevance to the Project
Waterway providing for fish passage	Any part of a waterway providing for passage of fish if the construction, installation or modification of waterway barrier works carried out under an authority will limit the passage of fish along the waterway.	**Yes** Waterways which provide for fish passage are present within the Project Site. The detailed design of the Project will determine if construction, installation or modification of waterway barrier works within these waterways will limit the passage of fish (see **Chapter 7 – Aquatic Ecology**).
Marine plants	A marine plant within the meaning of the *Fisheries Act 1994.*	**No** Marine plants do not occur within the Project Site.
Legally secured offset area under State legislation	An offset area approved by the administering authority associated with a legislative or policy requirement for the provision of an offset.	**No** No legally secured offset areas are present within the Project Site.

[1] Calculations based on Queensland Herbarium certified mapping (as described in Section 6.3.3). Calculations relating to MSES regulated vegetation shown in Appendix C-1 are superseded by the calculations shown above.

6.8 Environmentally Sensitive Areas

This section of the chapter describes the ESAs present within the Project Site and surrounding region. ESAs include national parks, state forests, world heritage areas, Ramsar wetlands and nationally important wetlands. In addition, they feature areas of elevated natural and cultural value such as habitat for conservation significant flora and fauna and places of Aboriginal and European cultural heritage.

6.8.1 Category A ESAs

Category A ESAs, as defined by the EP Regulation, are displayed in Table 6-13. The occurrence of these areas in relation to the Project Site is described below. In Queensland, mining activities may not be undertaken in land comprising Category A ESAs.

Geographic information system (GIS) interpretation was undertaken to determine if Category A ESAs exist within or in proximity to the Project Site. Results determined no Category A ESAs occur in the Project Site. Refer to Figure 6-9 for ESAs mapped within the vicinity of the Project Site.

Table 6-13 Category A ESAs

ESA Category A	Description and legislative context	Occurrence relative to Project Site
National Park	National parks are declared under the NC Act.	Four national parks within 100 km of the Project Site: • Homevale National Park • Junee National Park • Mazeppa National Park • Peak Range National Park
Forest reserves and conservation parks	Conservation parks, as listed under the Nature Conservation (Protected Areas) Regulation 1994 and forest reserves are protected areas under the NC Act.	The Homevale Conservation Park is situated approximately 95 km northeast of the Project Site.
Wet Tropics World Heritage Area	The Wet Tropics World Heritage Area is declared under the *Wet Tropics World Heritage Protection and Management Act 1993* and is administered by the Wet Tropics Management Authority.	The Wet Tropics World Heritage Area is located approximately 400 km north-east of the Project Site.

Great Barrier Reef Marine Park and other marine parks (other than general use zones)	The Great Barrier Reef Marine Park (GBRMP) is declared under the *Great Barrier Reef Marine Park Act 1975*.	The Project is situated approximately 130 km directly west of the GBRMP. However, the Project is situated within the Fitzroy Catchment which discharges into the GBRMP, approximately 490 km downstream of the Project Site.

6.8.2 Category B ESAs

Category B ESAs are defined in the EP Regulation and are presented in Table 6-14. The occurrence of these areas in relation to the Project Site is described below. GIS interpretation was undertaken to determine if the Category B ESAs are situated within or in proximity to the Project Site. The results of this interpretation are provided in Table 6-14. In Queensland, mining activities can be undertaken in Category B ESAs. Refer to Figure 6-9 for Category B ESAs located within and in the vicinity of the Project Site.

Table 6-14 Category B ESAs

ESA Category B	Description and legislative context	Occurrence relative to Project Site
Endangered RE	REs are protected under the VM Act.	Three endangered REs (EREs) are mapped by DES as occurring within the Project Site. AECOM field surveys identified these three EREs during field surveys of the Project Site (total of 526.68 ha). The locality of these EREs is depicted in Figure 6-3 and Figure 6-9.
Coordinated conservation areas and wilderness areas	Coordinated conservation areas and wilderness areas as declared under the NC Act are Category B protected areas.	There are no coordinated conservation areas or wilderness areas within the Project Site or the greater region.
Ramsar wetlands	The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Ramsar wetlands are those that are representative, rare or unique wetlands, or are important for conserving biological diversity (DotE, 2016).	There are no wetlands declared under the Ramsar Convention within the Project Site. The nearest Ramsar wetland (Shoalwater and Corio bays) is approximately 220 km southeast of the Project Site. The Shoalwater and Corio bays occur within a separate catchment (Shoalwater and Waterpark Basin) to the Project.
World heritage and international agreement areas	World heritage is the designation for places on earth that are of outstanding universal value to humanity and, as such, have been inscribed on the World Heritage List (UNESCO 2011). International agreement areas include areas such as internationally significant sites for migratory shorebirds.	As detailed above, the Project occurs within the Fitzroy Basin which discharges into the Great Barrier Reef World Heritage Area (GBRWHA), approximately 490 km adopted middle thread distance downstream of the Project Site.
General use zones of a marine park	General use zones of a marine park are declared under the *Marine Parks Act 2004*.	The Project occurs within the Fitzroy Basin which discharges into the GBRWHA. The GBRWHA borders a general use zone of the GBRMP.

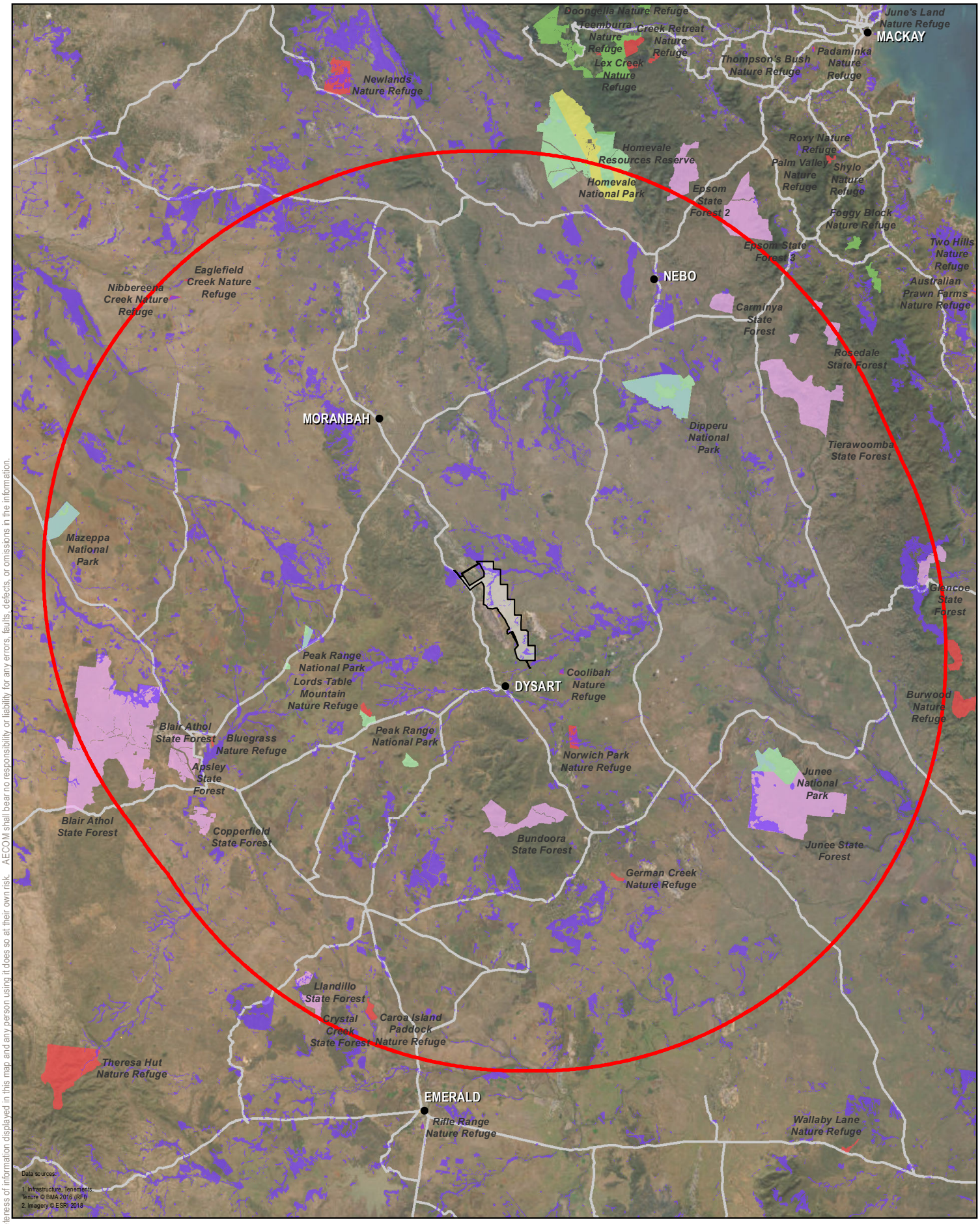
ESA Category B	Description and legislative context	Occurrence relative to Project Site
Places of cultural heritage significance	Places of cultural heritage significance are protected by the *Queensland Heritage Act 1992* and listed on the heritage register. Aboriginal and Torres Strait Islander cultural heritage is protected under the *Aboriginal Cultural Heritage Act 2003* (ACH Act) and the *Torres Strait Islander Cultural Heritage Act 2003*.	Refer to **Chapter 16 Cultural Heritage** for a discussion on cultural heritage values within and surrounding the Project Site.
Special forestry areas	Special forestry areas, including state plantation forests, state forests (scientific) and state parks, are declared under the *Forestry Act 1959*, and are administered by DES.	There are no special forestry areas within the Project Site or the surrounding area.
Fish habitat area and marine plants	A declared fish habitat area (FHA) is an area protected against physical disturbance from coastal development (DAFF, 2012). All marine plants are protected under Queensland law through provisions of the *Fisheries Act 1994*.	No declared FHAs are situated within 100 km of the Project Site. The Fitzroy River FHA extends along the Fitzroy River from the Fitzroy Barrage at Rockhampton to the coast; however, this FHA is considered sufficiently far enough downstream to not be affected by the proposed project. There are no marine plants within a 100 km radius of the Project Site.
Critical habitat	Critical habitat is habitat that is essential for the conservation of a viable population of protected wildlife or community of native wildlife, whether or not special management considerations and protection are required. Critical habitat may include an area of land that is considered essential for the conservation of protected wildlife, even though the area is not presently occupied by the wildlife (NC Act)	There are no declared critical habitats within or surrounding the Project Site.
An area to the seaward side of the highest astronomical tide	Areas that face the seaward side of the highest astronomical tide are a Category B protected area.	No areas within the Project Site meet this criterion.

6.8.3 Category C ESAs

Category C ESAs are defined in the DEHP (now DES) document Eligibility criteria and standard conditions for exploration and mineral development projects– Version 2 (DEHP, 2016a) (Table 6-15). No Category C ESAs were identified within the Project Site. In Queensland, mining activities can be undertaken in Category C ESAs.

Table 6-15 Category C ESAs

ESA Category C	Description and legislative context	Occurrence relative to Project Site
Nature refuges and resource reserves	A nature refuge is a voluntary agreement between a landholder and the Queensland Government that acknowledges a commitment to manage and preserve land with significant conservation values while allowing compatible and sustainable land uses to continue (DEHP, 2017c). A resource reserve is an area of land dedicated under the NC Act, and is administered by DES.	There are no nature refuges or resource reserves within the Project Site. Nine nature refuges and one resource reserve exist within 100 km of the Project Site. The Homevale Resource Reserve is situated approximately 95 km from the Project Site.
State forests	State forests are declared under the *Forestry Act 1959* and administered by DES.	There are no state forests within the Project Site. Thirteen state forests are situated within 100 km of the Project Site.
Declared catchment and irrigation areas	Areas of land that immediately surround water storage areas are termed 'declared catchments. Certain types of development proposed within declared catchment areas are referred to DES during the integrated development assessment system (IDAS) process to ensure the quality of water entering the storage facility is not degraded by proposed development.	Within Queensland there are 20 declared catchment areas administered by DES, none of which are situated within 100 km of the Project Site. There are no declared irrigation areas within the Project Site or downstream of the Project. There are no declared drainage areas within the Project Site.
River improvement areas	River improvement areas (RIA) are areas protected under the *River Improvement Trust Act 1940*.	There are no RIAs within the Project Site.
Designated landscape area – Stanbroke Pastoral Holding	Under the repealed *Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987*, an area was declared a 'designated landscape area' (DLA) if it was deemed necessary or desirable for it to be preserved or to regulate access. DLAs are recorded in accordance with the ACH Act.	The Stanbroke Pastoral Holding designated landscape area does not occur within the Project Site. It is located approximately 60 km to the south of Mount Isa.
Timber reserves	A timber reserve is land set apart and declared or deemed to be set apart and declared under the *Forestry Act 1959* as a timber reserve.	There are no timber reserves in or within 100 km of the Project Site.
Critical areas and public purpose reserves	Critical areas and public purpose reserves are legislated under the *Land Act 1994* and administered by the DNRME.	No critical areas and public purpose reserves were mapped within the Project Site or surrounding region.
Coastal management districts	Coastal management districts occur over all tidal waters and on most land adjacent to tidal waters in Queensland. Coastal management districts are declared under the *Coastal Protection and Management Act 1995*.	There are no coastal management districts within 100 km of the Project Site.
Erosion prone areas	Erosion prone areas are declared under the *Beach Protection Act 1968*.	There are no erosion prone areas within 100 km of the Project Site.
Dams and weirs	Dams and weirs owned and controlled by the Queensland Government are considered Category C ESAs.	There are no dams or weirs controlled by the Queensland Government within the Project Site or the surrounding region.



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LEGEND

- Locality
- Major Road
- Project Site
- 100km Project Area radius

Category A ESA

- National Park
- Conservation Park
- Forest Reserve

Category B ESA

- Endangered Regional Ecosystem (Biodiversity Status)
- Queensland Heritage Register Place

Category C ESA

- Nature Refuge
- Resource Reserve
- State Forest

N

Figure 6-9
Environmentally Sensitive Areas

Environmental Impact Statement
Saraji East Mining Lease Project

0 5 10 20
Kilometres

Scale: 1:1,200,000 (when printed at A4)
Projection: Map Grid of Australia - Zone 55 (GDA94)

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6.9 Potential impacts on terrestrial ecology

6.9.1 Construction phase

Facilities and infrastructure associated with the Project includes the Mine Infrastructure Area (MIA), Coal Handling Processing Plant (CHPP), water management infrastructure, roads, the incidental mine gas (IMG) drainage network, as well as water and power supply to the Project Site. The construction of this infrastructure will occur in three stages:

- site preparation
- civil works including water storage and transport network and powerlines/connections
- MIA building and CHPP construction.

To manage and facilitate the construction of Project infrastructure, temporary facilities, including offices, will be constructed close to the work centres such as the MIA. The facilities will be located within the Project Footprint which may include previously disturbed areas.

The Project Site covers approximately 11,427 ha, within which 2,613.58 ha of remnant, 146.96 ha of high-value regrowth and balance is non-remnant vegetation.

Within the Project Site, mining and the infrastructure required to support the Project will be confined to a much smaller area within the Project Footprint, with direct impacts conservatively assessed as less than 3,348 ha. Of this, 1,220.34 ha of remnant and 13.73 ha of high-value regrowth vegetation within the Project Footprint may be disturbed. Eight of the nine fauna habitat types which were identified in Section 6.4.3, and ten of the ten REs identified in Section 6.4.2, may be impacted by the Project. The potential impacts on terrestrial biodiversity are quantified in Table 6-16 and Table 6-17, and delineated in Figure 6-10 and Figure 6-11.

This includes disturbances from all Project Footprint components, including:

- surface facilities and ancillary infrastructure (construction village, CHPP, run of mine (ROM) pad, MIA, process water dam, raw water dam, proposed product stockpiles, conveyor, 66 kiloVolt (kV) powerline connection, transport infrastructure corridor)
- IMG drainage network (cleared pads for gas wells and conservative allowance for parallel corridors approximately 100 m wide for the pipeline and associated access tracks, however vegetation clearing will be minimised to 20 m to 50 m in the case of vehicle tracks, and 10 m to 20 m for the pipeline with sections of vegetation and habitat, approximately 260 m wide, to be retained between each of these corridors).

6.9.1.1 Potential direct impacts (construction phase)

Flora and vegetation communities

The total area with potential to be disturbed from surface infrastructure and IMG drainage network is 1,149.60 ha, including 180.39 ha of remnant vegetation. Table 6-16 and Figure 6-10 outline the potential direct impacts to vegetation communities and habitat types. Disturbance to each vegetation community is indicated as a percentage of the community found within the Isaac Comet Downs sub-region of the Brigalow Belt Bioregion. It should be noted that the disturbance calculations incorporate an additional buffer of between 50-100 m around the Project Footprint; therefore, the calculations provide a conservative estimate of proposed disturbance. The areas provided in Table 6-16 and Figure 6-10 are considered a worst-case scenario.

Impacts on vegetation and habitat will occur throughout the life of the Project. On commencement of construction, areas required for the proposed infrastructure will be cleared. The IMG drainage infrastructure will be installed as early as possible to allow adequate time to drain gas prior to mining. This is discussed further in **Chapter 3 Project Description** of this EIS. As the footprints of these facilities will be fully developed, 100 per cent of vegetation will be cleared from these areas except the powerline connection where clearing will only be required for towers and a narrow easement.

Surface infrastructure

The Project Footprint intersects ten REs, five of which are listed as least concern, two of concern and three endangered under the VM Act. These endangered REs (RE 11.3.1, RE 11.4.8 and RE 11.4.9) are also analogous with the Brigalow *Acacia harpophylla* (dominant and co-dominant) TEC (Brigalow TEC) when condition thresholds and diagnostic criteria are met. The proposed construction accommodation village will be sited in non-remnant vegetation to reduce impact on REs. Vegetation in these areas is low (approximately 1 m in height) shrubby *Acacia harpophylla* (Brigalow) regrowth.

The CHPP, conveyors, product stockpiles will be located within the existing Saraji Mine area and, while vegetation clearing is required, this vegetation is disturbed and fragmented. The future MIA and the raw water dam are in a highly disturbed area within the Saraji Mine area and will not require removal of remnant vegetation.

It is likely that clearing impacts associated with the powerline connection and the transport and infrastructure corridor will be lower than estimated for the maximised footprint. Clearing for the powerline connection will only be required for footings and a narrow easement; as such high value biodiversity values within the powerline connection footprint will be avoided or impacts minimised. The width of the infrastructure corridor is also expected to reduce during the detailed design process.

Approximately 0.075 ha of Bluegrass and King Bluegrass habitat occurs within the disturbance areas associated with the surface infrastructure (also mapped as *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* TEC). This habitat occurs within and adjacent to the transport infrastructure corridor where the proposed overhead power transmission line is expected to span overhead with limited to no clearing required for its construction. There is low likelihood vehicle traverses during construction will lead to increased or new weed incursions, excessive dust or the contamination of soils and water.

IMG drainage network

The IMG drainage network will disturb remnant vegetation across seven REs, three with endangered status and one of concern status under the VM Act. The endangered REs (i.e. RE 11.3.1, RE 11.4.8 and RE 11.4.9) and analogous Brigalow TEC will experience some clearing for the network, however, the majority of the infrastructure is situated within modified grassland, shrubby *Acacia harpophylla* (Brigalow) regrowth and *Eucalyptus populnea* (Poplar Box) woodland.

Of the endangered REs, approximately 25.06 ha of the analogous Brigalow TEC and listed as endangered under the EPBC Act will be cleared. In terms of total area of remnant Brigalow (*Acacia harpophylla*) vegetation cleared, the largest affected area is of RE 11.4.8, of which 16.89 ha will be cleared. In a regional context, approximately 0.08 per cent of the subregional extent of RE 11.4.8 will be cleared for the Project (Table 6-16).

In addition to reduction in extent of TECs, disturbance to the riparian communities which border Boomerang Creek, Hughes Creek and Plumtree Creek must also be considered. Vegetation communities associated with these creeks include *Eucalyptus* and/or *Corymbia* woodlands on alluvial plains (RE 11.3.2, RE 11.3.25, RE 11.3.4 and RE 11.3.27b). These REs form a west-east corridor within the Project Site. This corridor is recognised as significant at the State level under the Biodiversity Planning Assessment for the Brigalow Belt.

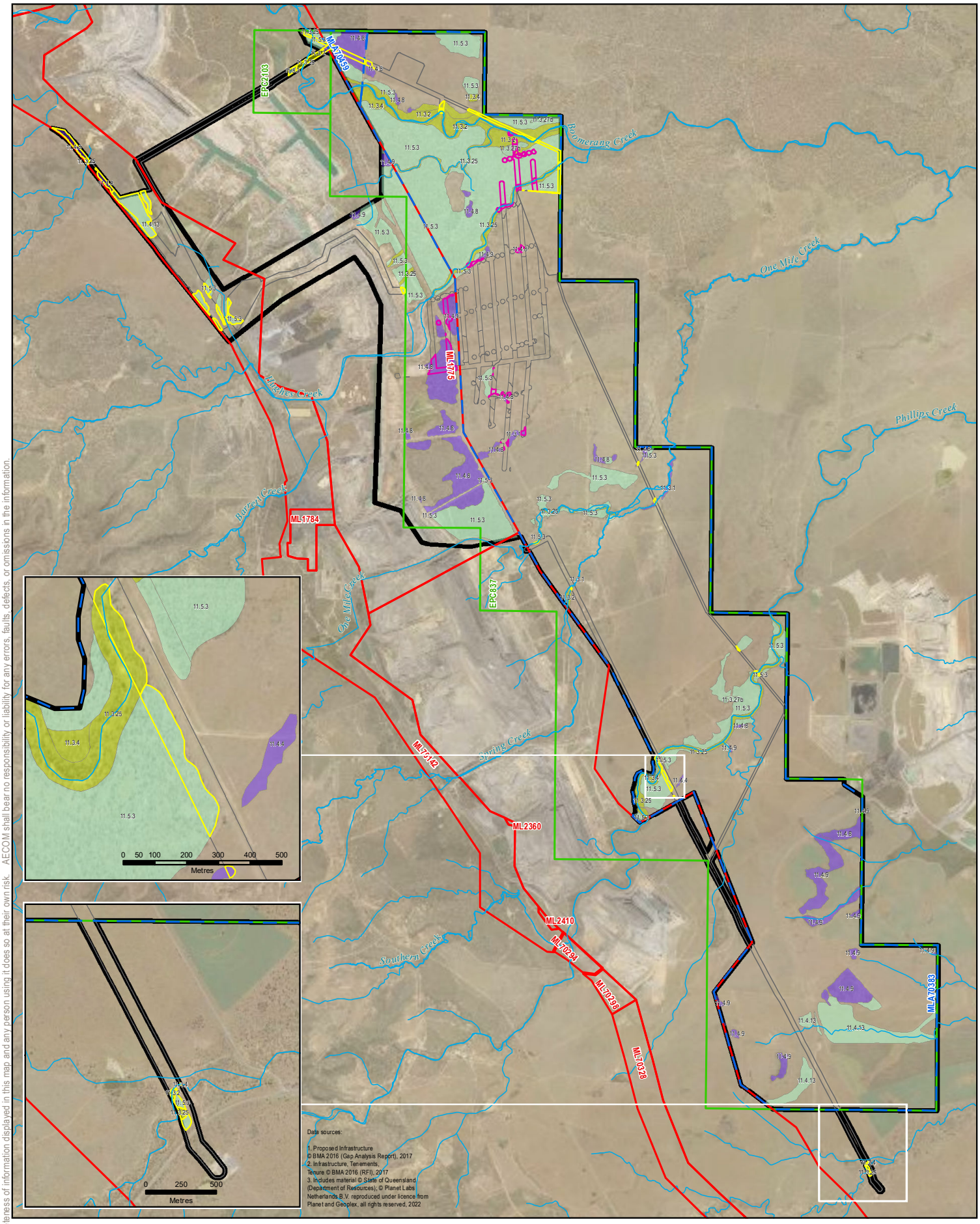
Design of the IMG drainage infrastructure will restrict the number of times that the infrastructure crosses these creeks to minimise direct disturbance to this corridor. Some pipeline crossings will be required, and these will be trenched crossings, with disturbed areas reinstated to stabilise the bed and banks. Wherever possible, the wells required for IMG drainage will be installed outside of the riparian zone. With these design measures in place, riparian vegetation connectivity will largely be retained along these creek systems during construction.

The IMG network will be constructed in a grid like pattern. As a result, vegetation will remain in patches between the network. Most of the IMG drainage network footprint comprises non-remnant vegetation, with minor areas containing REs, including Brigalow TEC. Areas of retained vegetation within the grid formed by the IMG drainage infrastructure, approximately 260 m wide, will be fragmented and subject to potential indirect impacts, such as edge effects and dust deposition from gas management infrastructure construction activities. These impacts are also discussed in Section 6.9.2.

Table 6-16 Potential disturbance to REs

RE	Status			Project areas (ha)				Total extent within subregion	Total Construction Impacts	
	EPBC	Biodiversity	VMA	Project Site	Project Footprint (ha)	Surface facilities	IMG drainage network		Total Construction Impact Area (ha)	% of subregion
RE 11.3.1	E	E	E	15.76	6.58	0.45	1.51	22,355	1.96	0.01
RE 11.3.2	NL	OC	OC	151.14	65.51	16.42	2.70	37,797	19.13	0.05
RE 11.3.4	NL	OC	OC	23.05	0.01	0.01	-	9,062	0.01	<0.01
RE 11.3.25	NL	OC	LC	192.08	73.42	6.49	5.41	47,044	11.89	0.03
RE 11.3.27b	NL	OC	LC	16.64	3.04	-	3.04	976	3.04	0.31
RE 11.4.4	E	OC	LC	1.73	0.075	0.075	-	1,931	0.075	<0.01
RE 11.4.8	E	E	E	322.35	222.45	24.33	16.89	20,023	41.22	0.21
RE 11.4.9	E	E	E	188.57	32.56	-	6.66	23,782	6.66	0.03
RE 11.4.13	NL	OC	LC	222.14	38.03	38.03	-	4,863	38.03	0.78
RE 11.5.3	NL	NCP	LC	1,480.12	778.66	34.75	23.61	71,713	58.36	0.08
Non – remnant	NL	NL	NL	8,823.42	2,127.74	679.08	290.13	NA	969.21	NA
Total				**11,437.01**	**3,348.08**	**799.65**	**349.95**	**NA**	**1,149.60**	**NA**

Note: E: Endangered; OC: Of Concern; LC: Least Concern; NCP: No Concern at Present



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse
- Surface Infrastructure and IMG Drainage Network

Construction Impacts Intersecting Flora Values

- Surface Infrastructure
- IMG Drainage Network

Regional Ecosystem biodiversity status

- Endangered
- Of Concern
- No Concern at Present

N

Figure 6-10
Potential Construction Impacts on Flora and Vegetation Communities

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Fauna and habitat

Impacts on fauna from installation of the surface infrastructure and IMG drainage network may occur from:

- loss of habitat from direct clearing of vegetation, including habitat trees, which will restrict the ability of fauna to move across the Project Site
- injury or mortality to fauna present during vegetation clearing activities and surface infrastructure construction.

Potential impacts on each habitat type across the Project Site and Project Footprint are detailed in Table 41 of **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS. The potential disturbance (worst case scenario) to fauna habitat types is provided in Table 6-17 and Figure 6-11.

Watercourse crossings are listed in Table 3-9 of **Chapter 3 Project Description**.

Surface infrastructure

Clearing for the proposed infrastructure will have direct impacts on fauna and fauna habitat during vegetation clearing activities. Habitat types will be impacted include *Eucalyptus* and/or *Corymbia* Open Woodland, Brigalow or Belah Woodland, River Red Gum Riparian Woodland, Dawson Gum and Brigalow Woodland, modified grasslands, shrubby brigalow regrowth with gilgai, oxbow wetlands and dams (Figure 6-11). The locations for the proposed construction village and proposed operations village have been situated where no remnant vegetation is mapped. However, the area does provide suitable habitat for Ornamental Snake, with gilgai and cracking clay present in both areas. Ground timber, another microhabitat feature which is associated with the occurrence of this species, was absent from these locations. The species is less likely to occur in the proposed operations village area as it is fragmented from remnant vegetation.

The proposed infrastructure to the west of the existing Saraji Mine including the CHPP, MIA, conveyor, ROM pad, stockpiles and dams are located close to existing mining areas and while there is some remnant vegetation in the footprints of these facilities, this vegetation has limited connectivity and habitat value. Clearing associated with these facilities is likely to have minimal impacts on fauna species utilising the Project Site.

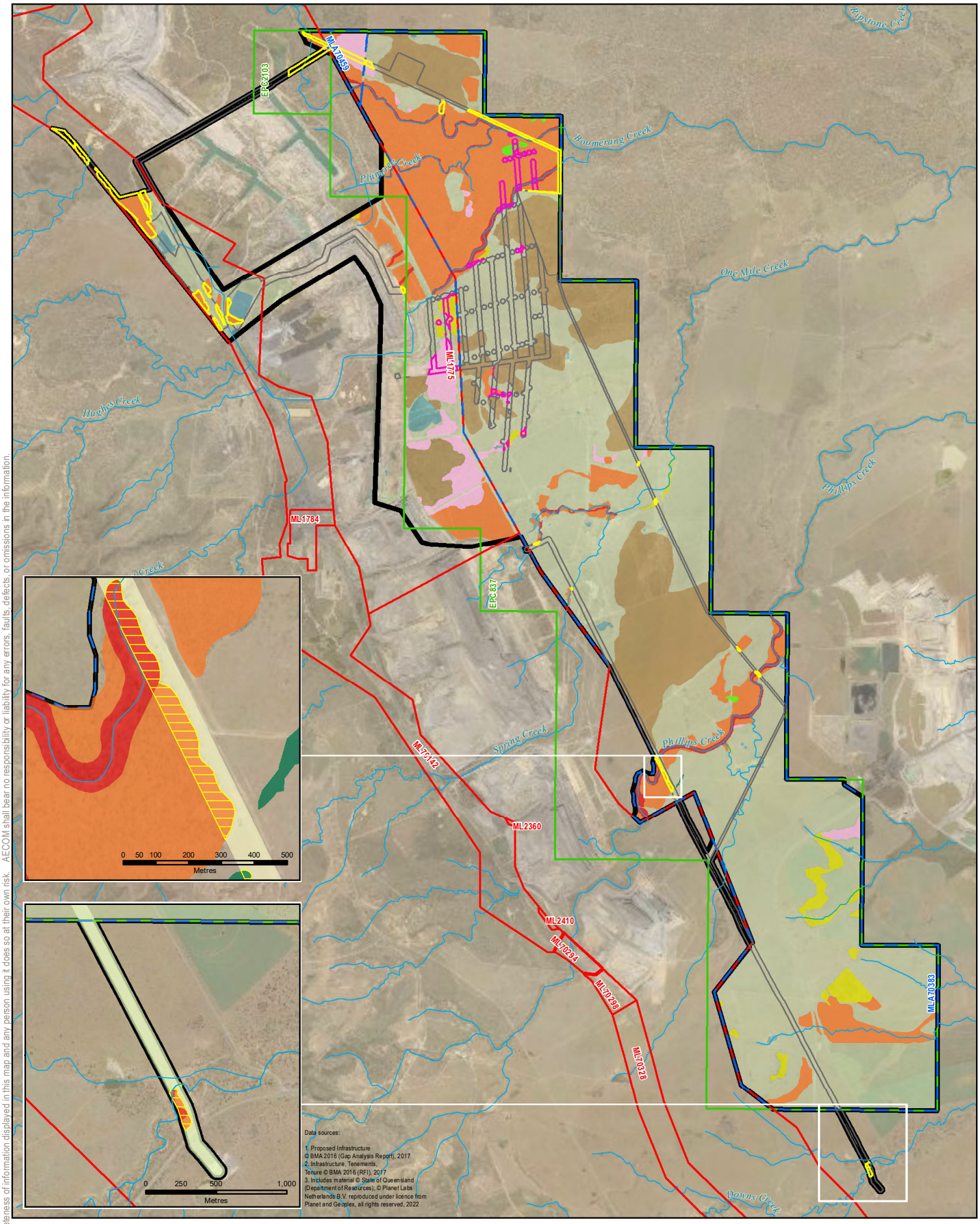
The road alignment passes largely through modified grassland habitat however the alignment will bisect a large patch of Poplar Box woodland and will require crossings over Boomerang Creek, Hughes Creek and Plumtree Creek in the north and Spring Creek and Phillips Creek in the southern portion of the Project Footprint. The riparian communities surrounding these creek crossings have a comparatively high faunal diversity. The proposed transport and infrastructure corridor will be further refined to minimise potential for minor interruption of fauna dispersal opportunities and roosting/nesting resources. Given the width of the proposed clearing, the impact on fauna from the construction of the transport and infrastructure corridor is likely to be minimal.

IMG drainage network

Potential impacts to fauna from the development of the IMG drainage network assumes the maximum extent of disturbance of a conservative footprint for construction of the complete IMG drainage network. However, the design, layout and siting of the gas drainage network components will be further refined and construction will be undertaken progressively such that loss of habitat values will be gradual and there will be opportunities for fauna to move into adjacent habitat or into areas that will have already undergone partial rehabilitation. Competition for resources and territory within these new areas may affect some species; however, most species present on site do not have highly specific habitat preferences. Additionally, an increase in predation may occur as a result of dispersing. Many of the fauna species observed within the Project Site are relatively tolerant to disturbed habitats and may continue to utilise remaining habitat with fragmentation and noise, light and activity disturbance. As installation of the IMG infrastructure progresses, food and shelter resources will be diminished and density of fauna in the area may also diminish. The main west-east corridor associated with Boomerang Creek, Plumtree Creek and Hughes Creek, will be largely retained and fauna use and movement along this corridor should remain possible. Overall, impacts on fauna from the IMG management infrastructure are largely related to loss of habitat trees and reduced connectivity.

Table 6-17 Potential disturbance to fauna habitat types

Fauna Habitat Type	RE associations	Project Site (ha)	Project Footprint (ha)	Construction components		Total direct impacts from construction (ha)
				Surface Facilities (ha)	IMG drainage network (ha)	
River Red Gum Riparian Woodland	RE11.3.25	192.08	73.42	6.49	5.41	11.90
Eucalypt and/or *Corymbia* Open Woodland	RE11.3.2, RE11.3.4, RE11.4.13, RE11.5.3	1,878.46	882.21	89.22	26.31	115.53
Dawson Gum and Brigalow Woodland	RE11.4.8	322.35	222.45	24.33	16.89	41.22
Brigalow or Belah Woodland	RE11.3.1, RE11.4.9	204.33	39.15	0.45	8.17	8.62
Oxbow Wetland	RE11.3.27b	16.64	3.04	-	3.04	3.04
Natural Grasslands	RE11.4.4	1.73	0.075	0.075	-	0.075
Modified Grasslands	NA	6,418.86	1,420.13	458.00	194.71	652.71
Shrubby Brigalow regrowth with gilgai	NA	1,781.99	636.89	190.92	95.22	286.14
Dams	NA	107.66	70.72	30.16	0.20	30.36
Total		**10,922.10**	**3,348.09**	**799.65**	**349.95**	**1,149.60**



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse
- Surface Infrastructure and IMG Drainage Network

Construction Impacts Intersecting Fauna Habitat

- Surface Infrastructure
- IMG Drainage

Remnant Habitat Types

- River red gum riparian woodland
- Eucalyptus and Corymbia open woodland
- Dawson gum and brigalow woodland
- Brigalow and belah woodland
- Oxbow wetland
- Natural grasslands

Non-remnant Habitat Types

- Modified Grasslands
- Shrubby Brigalow Regrowth with Gilgai
- Dams

N

Figure 6-11
Potential Construction Impacts on Fauna Habitat Types

Environmental Impact Statement
Saraji East Mining Lease Project

0 0.5 1 2
Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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6.9.1.2 Potential indirect impacts (construction phase)

Potential indirect impacts associated with the construction phase include:

- erosion and soil loss
- dust impacts
- fragmentation and edge effects
- noise and light impacts
- mortality or injury of fauna from traffic
- pests and feral fauna
- weeds.

Erosion and soil loss

Soil erosion may occur in areas disturbed by activities associated with the Project. Where these activities occur on dispersive soils and/or on slopes, mobilisation of sediment into watercourses can occur. Impacts to aquatic ecosystems can include build-up of sediment in waterholes with a resultant smothering of aquatic plants and substrate and reduction in available macro and microhabitat. Refer to Section 7.6 of **Chapter 7 Aquatic Ecology** of this EIS for further details.

Erosion can remove the most productive part of the soil profile, the topsoil, resulting in a greatly reduced opportunity for natural regeneration of vegetation communities (unless stockpiled). Impacted areas most susceptible to erosion include floodplain areas and riparian vegetation associated with Boomerang Creek, Plumtree Creek, Hughes Creek, One Mile Creek, Spring Creek and Phillips Creek, as well as those vegetation communities associated with erosive sand or silt land zones.

Topsoil resources can be protected by removing topsoil altogether from areas of high disturbance and setting the topsoil aside for reuse in rehabilitation programs. Where topsoil is left in situ in disturbed areas, erosion and sediment control measures are required to minimise loss of topsoil. These mitigation measures are discussed in more detail in **Chapter 5 Land Resources** of this EIS.

Dust

Dust impacts generated during the construction of the Project may negatively affect vegetation.

Localised dust effects are likely to arise during the following activities:

- Vegetation clearing and earthworks associated with construction of surface facilities such as the construction village and access road, the MIA, CHPP, ROM pad, rail balloon loop and conveyor. Dust from these activities will occur over a relatively short duration, typically several months. Dust plumes may affect vegetation adjacent to these areas.
- Vegetation clearing, earthworks and vehicle movements associated with installation of the IMG management infrastructure. This will occur at varying locations across the underground mine footprint throughout the life of the mine and will affect vegetation in the immediate vicinity of works for several months at a time.
- Dust from stockpiles at the MIA, CHPP and train load out. Dust control measures are proposed as specified in **Chapter 11 Air Quality** of this EIS to minimise dust impacts in adjacent areas.

Deposition of airborne dust, sand and soil may have potential impacts on vegetation if excessive levels are sustained over extended periods. When dust settles on plant foliage, it can reduce the amount of light penetration on the leaf surface, block and damage stomata, and slow rates of gas exchange and water loss. Diminished ability to photosynthesise may result in reduced growth rates of vegetation and decreases in floral vigour and overall community health. The potential effects of dust deposition on vegetation are determined by factors including:

- the characteristics of leaf surfaces, such as surface roughness, influencing the rate of dust deposition on vegetation
- concentration and size of dust particles in the ambient air and its associated deposition rates

- local meteorological conditions and the degree of penetration of dust into vegetation.

Some additional localised dust deposition across the proposed underground mine footprint may occur immediately adjacent to access roads, drilling pads and other areas disturbed by the IMG drainage network and surface infrastructure.

The dominant woodland species within the Project Site typically exhibit physiological qualities that limit sensitivity to dust deposition. The sclerophyllous foliage of *Eucalyptus*, *Acacia* and *Corymbia* species is generally pendulous (i.e. points down), with a thick smooth cuticle that does not encourage particulate matter to remain on the surface. The dominant woodland species are also generally hardy and well adapted to adverse conditions such as extended dry conditions and low nutrient soils. Grassland species are generally more tolerant of dust due to the lack of surface area available for dust particles to settle on.

Vegetation situated in proximity to construction activities may become coated with dust and suffer some of the impacts discussed above; however, this will be short term and unlikely to cause any significant damage. Vegetation immediately adjacent to access tracks used for the IMG drainage network may also suffer some dust deposition from vehicle movements, however, will not be continuously exposed to dust. The transport/infrastructure corridor will provide the primary access to the construction village and therefore adjacent vegetation will suffer from more continuous exposure to dust impacts. However, vegetation adjacent to the transport/infrastructure corridor is primarily non-remnant shrubby regrowth and modified grasslands with several disparate patches of remnant vegetation.

Use of water sprays to control dust in exposed areas is likely to be sufficient to prevent any long-term impacts. An Air Management Plan will be developed prior to construction which will consider potential dust related impacts.

Fragmentation and edge effects

Fragmented vegetation communities will be subjected to increased edge effects, which when considered in combination, can reduce the effective size of habitat fragments. The proposed IMG infrastructure will, in particular, lead to creation of a large number of habitat patches which may be subject to edge effects. To a lesser extent, construction of other surface facilities and infrastructure will also create edges adjacent to remnant vegetation patches.

Edge effects can include:

- increased risk of weed invasion from disturbed areas
- increased exposure of fauna to predation due to increased visibility
- microclimatic changes associated with increased sunlight
- increased weed proliferation.

Weeds are already prevalent and distributed across the Project Site. However, there is a risk that disturbance to native vegetation, changes to microhabitat and mobilisation of earthmoving equipment and materials may introduce or exacerbate weeds within the Project Site.

Ground dwelling fauna are most at risk from increased predation around the edges of remnant habitat as fauna are more visible and accessible. Although there is limited ground dwelling fauna present in the Project Site, this may further reduce populations.

As most of the vegetation within the Project Footprint is open woodland to grassland, significant vegetation changes are not likely to occur as a result of increased exposure to sunlight along the edges of remnant vegetation.

Noise and light

Secondary impacts to fauna include disturbance from noise and light during construction of surface infrastructure and IMG management infrastructure. Fauna will generally move away from noise and light sources as these may be perceived as a threat. Acclimatisation by some species is likely to occur over the medium to long term and many of the species identified in the Project Site are known to occur in areas subject to noise, light and general activity.

Construction of the IMG management infrastructure will result in noise disturbance and, in the case of well installation, which will occur as a 24-hour activity, light disturbance. This disturbance will be short term in each location as the infrastructure is installed progressively from west to east across the proposed mine footprint and fauna disturbed by noise or light will be able to temporarily move into adjacent habitat. Fauna present within the mine footprint area is expected to either habituate to the disturbance or temporarily move away.

Some disturbance to fauna is expected from light and noise across the Project Footprint and this may have short term impacts on feeding and resting behaviour which in turn can affect animal health. It is also possible that fauna particularly sensitive to noise and light will become locally extinct within the Project Footprint. Long term effects are not anticipated for most fauna species identified as these species are expected to habituate to higher noise and brighter light levels.

Traffic movements

Conflict between site traffic and fauna is likely to occur, particularly associated with vehicle movements at the construction accommodation village and preparation of the transport and infrastructure corridor. Construction and maintenance activities will be undertaken predominantly during daylight hours. Given this, reptiles are the fauna group most likely to be affected, as they utilise roads to gather warmth and seek prey. Macropods (kangaroos and wallabies) are more likely to be collided with at sunrise, sunset and periodically during the night.

Pests and feral fauna

The Project Site supports populations of European Rabbits, Foxes, Pigs, Feral Cats, Wild Dogs, House Mouse and Cane Toads. Ponds are likely to be created from subsidence impacts and may vary from areas of intermittent inundation to semi-permanent ponds. Ponds will potentially create new habitat opportunities for some of the pest fauna species recorded including Cane Toad and Pig. It is unlikely that the proposed works will significantly result in the further proliferation of the remainder of these species or the introduction of further feral vertebrate species.

The introduction of exotic ant fauna is a risk due to import of construction materials. Yellow Crazy Ants (*Anoplolepis gracilipes**) and Fire Ants (*Solenopsis invicta**) are exotic ants that have the potential to affect native flora, fauna and ecological communities. These ants are capable of being transported from infested sites to new construction sites on equipment or within materials. While efforts to control spread both ant species have been quite effective, the spread of ants to new areas is a potential issue and needs to be monitored. No exotic ants are known to occur within the Project Site.

The construction of water storages and dams has the potential to create conditions suitable for a build-up of biting insects. Biting insects such as mosquitoes can rapidly increase populations when appropriate breeding conditions are provided.

Weeds

A diversity of weeds are already prevalent and distributed across the Project Site, including 40 exotic species, 11 of which are considered to be 'Restricted Matter' under the *Biosecurity Act 2014* and eight of which are WoNS and nine considered weed species under the Isaac Regional Biosecurity Plan. There is a risk that disturbance to native vegetation and mobilisation of earthmoving equipment and materials may introduce or exacerbate weeds within the Project Site.

The most likely causes of weed dispersal will be through the movement of soil and attachment of seed (and other propagules) to construction vehicles and machinery involved with clearing of vegetation and stockpiling mulch and topsoil during earthworks.

6.9.2 Operation Phase

Potential impacts to vegetation and habitat during operation of the Project include:

- subsidence related impacts from longwall mining such as
  - surface cracking
  - changes to topography
  - changes to the surface water drainage characteristics

- groundwater drawdown from water extraction
- other indirect impacts, similar to the construction phase, including:
  - noise and light
  - dust impacts
  - proliferation of weeds and pests.

6.9.2.1 Potential direct impacts (operational phase)

Mining of each longwall is expected to take one to three years, and associated impacts will progress across the Project Footprint as mining advances. As longwall mining progresses, the overlying stratum drops in behind resulting in subsidence effects (Palamara et al. 2006). The magnitude of the subsidence effects largely depends on a range of variables, including the current topography, underlying geology, soils and depth of the longwall mining operations as described in detail in the Project's Subsidence Modelling Report (**Appendix B-2**).

As illustrated in the conceptual model of subsidence in Figure 6-12, direct impacts from subsidence are typically localised and dependent on the location of vegetation in association with the subsided areas, with impacts generally associated with the depressions (troughs) and longwall panel edges (slopes) as opposed to areas not subject to subsidence (i.e. between mined panels). Subsidence may affect isolated trees where ground movements and surface cracking impact root zones, however these impacts are unlikely to materially impact remnant status or habitat values associated with native vegetation (including threatened species and ecological communities). Application of remedial drainage works will ensure a free-draining final landform is permanently established in the final landform avoiding impacts associated with waterlogged areas.

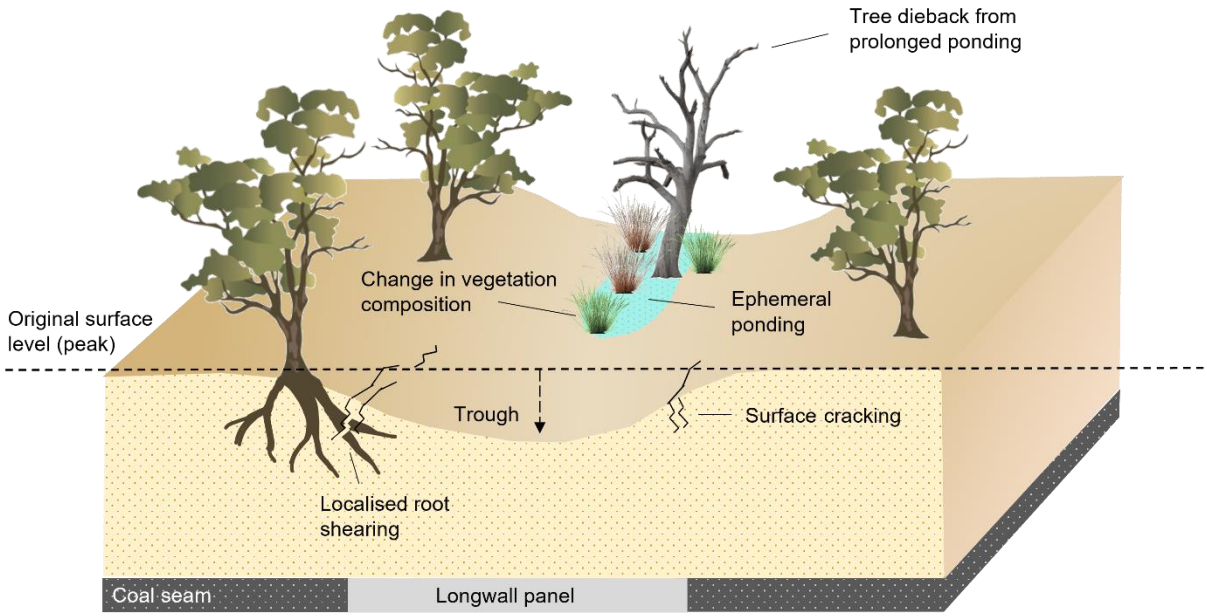


Figure 6-12 Conceptual model depicting potential impacts of subsidence

Potential direct impacts to vegetation and fauna habitat during the operational phase of the Project are identified on Figure 6-13 and Figure 6-14. Potential impacts associated with operation of the Project within the surface infrastructure and IMG drainage network infrastructure have been excluded from the operation impact calculations as these areas have already been captured in association with the direct impacts during the construction phase of the Project.

Flora and vegetation communities

Appendix E-4 Conceptual Ponding Assessment presents modelling and a water balance over the subsided landform, which identified a maximum extent of potential ponded areas comprising 36 discrete ponding areas, spanning 145.66 ha, over the life of the mine. Two-thirds of these areas subject to ephemeral ponding are predicted to develop over the first 10 years of the Project, with the remainder

developing during the second decade of mining. While remedial drainage works are proposed to mitigate persistent ponding areas, maximum extent of potential ponding impacts are depicted in Figure 6-13 and Figure 6-14**.**

Vegetation in ponded areas is modelled to be inundated periodically with potential to contain water from rainfall more than 50 per cent of the time. With minor remedial drainage works ponding will be temporary, with typical floodplain species (such as *Eucalyptus tereticornis, E. camaldulensis*) able to tolerate periodic inundation expected to remain (Jackson, 2005). Without intervention vegetation intolerant to inundation may exhibit tree die back and, in some areas, replaced by more tolerant vegetation, including environmental weeds. These changes in flora species composition can also result in modifications to the vegetation type, with grassy woodland communities replaced with shrublands and grasslands.

Areas subject to modelled subsidence may also experience changes in the hydrology and overland flow due to the changes in localised topography. Impacts of subsidence along riparian corridors can also include changes to stream bed and bank profiles, influencing flow patterns within waterways (NSW Department of Planning, 2008). In the short to medium term, impacted watercourses, particularly Hughes Creek, may become more pond-like in nature, with flows potentially restricted and changes in inundation levels along riparian zones.

Subsidence within Hughes Creek may also result in areas of deeper ponding within the watercourse. These areas are expected to fill with sediment much faster than the land-based ponding areas (i.e. within the life of mine) due to the waterway ponding areas having a much larger upstream catchment area. Over time, ponded areas are likely to gradually fill with sediment settled out of the stored water over time (dependent on volumes and catchments). Otherwise, areas subject to prolonged ponding are assessed as having potential to result in change or loss of species present, particularly woody vegetation sensitive to waterlogging.

While vegetation within the modelled subsidence area (excluding deeper depressions subject to ephemeral ponding) may exhibit isolated occurrences of reduced canopy health or tree loss, surface cracking is considered unlikely to result in materialistic impacts to the composition and structure of native vegetation. This is largely attributed to the characteristic of the soils present (e.g. cracking clays), resilience of native species and the extent and depth of likely subsidence. Ongoing monitoring of the occurrence of and effects of surface cracking will be required to identify any potential change in vegetation condition and composition within subsidence areas and to allow appropriate management measures to be implemented.

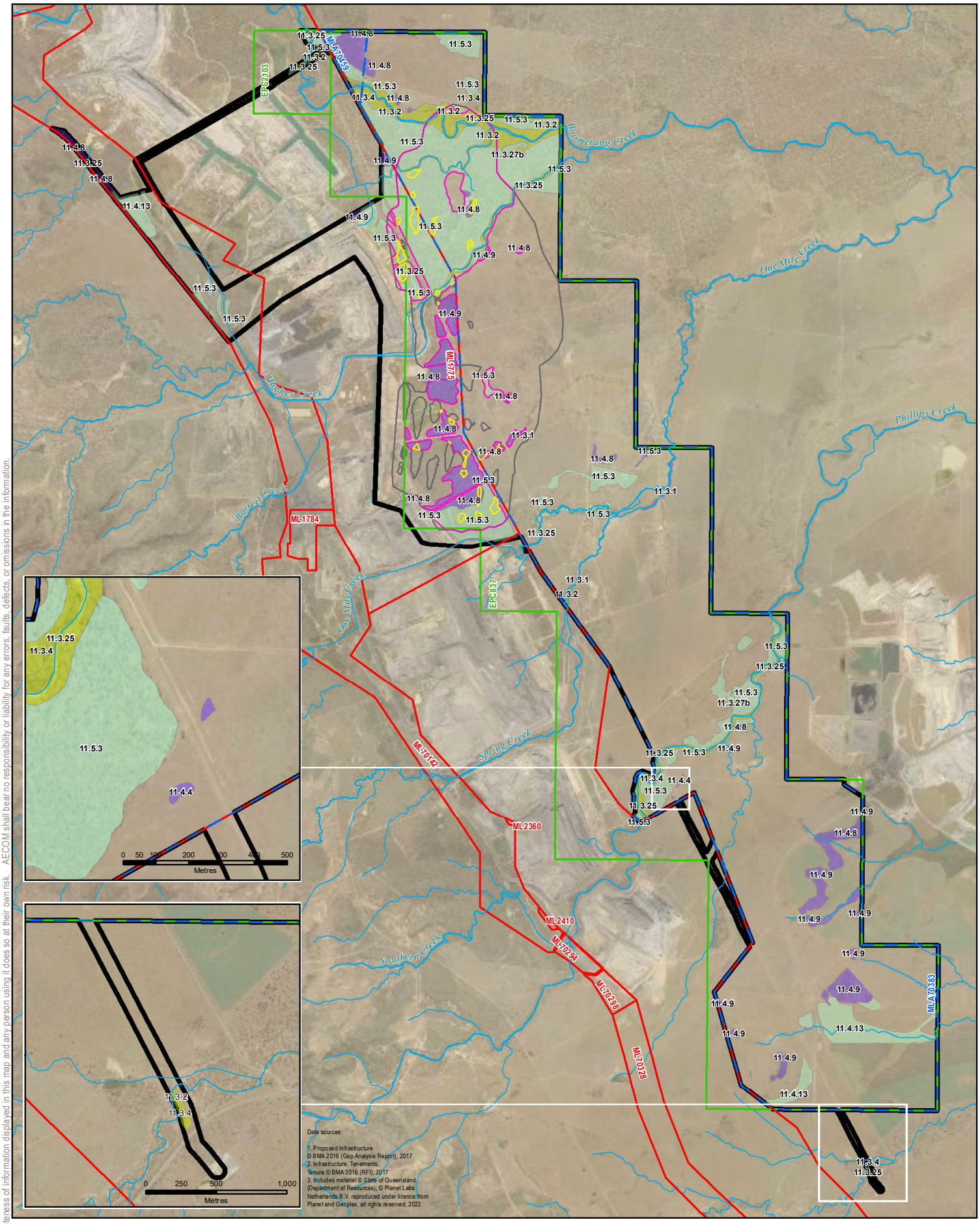
An adaptive management approach is proposed as described in **Appendix K-2 Subsidence Management Plan** of this EIS**.**

Summary of vegetation communities with potential to be directly impacted by ponding is outlined in Table 6-18 and Figure 6-13.

Table 6-18 Vegetation communities potentially subject to ponding

Ground-truthed RE	Status			Project Footprint (ha)	Maximum extent pf ponding areas (ha)
	EPBC Act	Biodiversity	VM Act		
11.3.25	-	OC	LC	73.42	2.94
11.4.8	E	E	E	222.45	12.45
11.4.9	E	E	E	32.56	0.09
11.5.3	-	-	LC	778.66	37.58
Total					**53.05**

Note 1: Status E – endangered; OC – of concern; LC – least concern.



LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse
- Limit Of Subsidence and Ponding Areas

Subsidence and Ponding Areas Intersecting Flora Values

- Subsidence
- Ponding

Regional Ecosystem biodiversity status

- Endangered
- Of Concern
- No Concern at Present

N

Figure 6-13
Potential Operation Impacts on Flora and Vegetation Communities

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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Fauna and habitat

Although some habitat areas within the proposed subsidence footprint will have been cleared or fragmented by IMG infrastructure as discussed in Section 6.9.1.1, it is likely native fauna tolerant to disturbance may still be present. As subsidence occurs, further changes to vegetation and habitats within these areas may occur, including:

- the loss of habitat trees that provide roosting and nesting habitat as well as food resources
- change in habitat types from the conversion of some areas from grassland or woodland to ponded areas.

These changes are gradual and this may provide opportunity for fauna to move to adjacent areas to the north and east as food and nesting resources in the Project Footprint are diminished.

Vegetated areas at risk of subsidence impacts include the *Eucalyptus* and/or *Corymbia* Open Woodlands, River Red Gum Riparian Woodlands and Brigalow communities in the remaining vegetated patches situated between the gas drainage wells and associated infrastructure. As detailed in Section 6.5.2, these habitat areas provide important local habitat for a number of species, especially arboreal mammals, including Koala and the Greater Glider. Brigalow communities including Brigalow or Belah woodland, Dawson gum and brigalow woodland and shrubby brigalow regrowth with gilgai are also potentially subject to subsidence.

A summary of the extent of fauna habitat types potentially impacted by subsidence, including areas subject to ephemeral ponding, are provided in Table 6-19 and depicted in Figure 6-14.

Table 6-19 Impacts to vegetation and fauna habitat during operation

Fauna habitat type	RE associations	Project Site (ha)	Project Footprint (ha)	Operation Impacts (ha)[1]	
				Subsidence (ha)[2]	Maximum extent of ponded areas (ha)
River Red Gum Riparian Woodland	RE11.3.25	192.08	73.42	61.52	2.94
Eucalyptus and/or *Corymbia* Open Woodland	RE11.3.2, RE11.3.4, RE11.4.13, RE11.5.3	1,876.30	882.21	766.68	37.58
Dawson Gum and Brigalow Woodland	RE11.4.8	322.35	222.45	181.24	12.45
Brigalow or Belah Woodland	RE11.3.1, RE11.4.9	204.33	39.15	30.53	0.09
Oxbow Wetland	RE11.3.27b	16.64	3.04	0	-
Modified Grasslands	NA	6,418.86	1,420.13	767.42	27.35
Shrubby Brigalow regrowth with gilgai	NA	1,781.99	636.89	350.74	42.33
Dams	NA	107.66	70.72	40.36	22.93
			Total	**2,198.50**	**145.66**

Note 1: Operation impact areas consisting of indirect impacts from longwall mining. Areas of ponding are also co-located within areas of modelled subsidence.

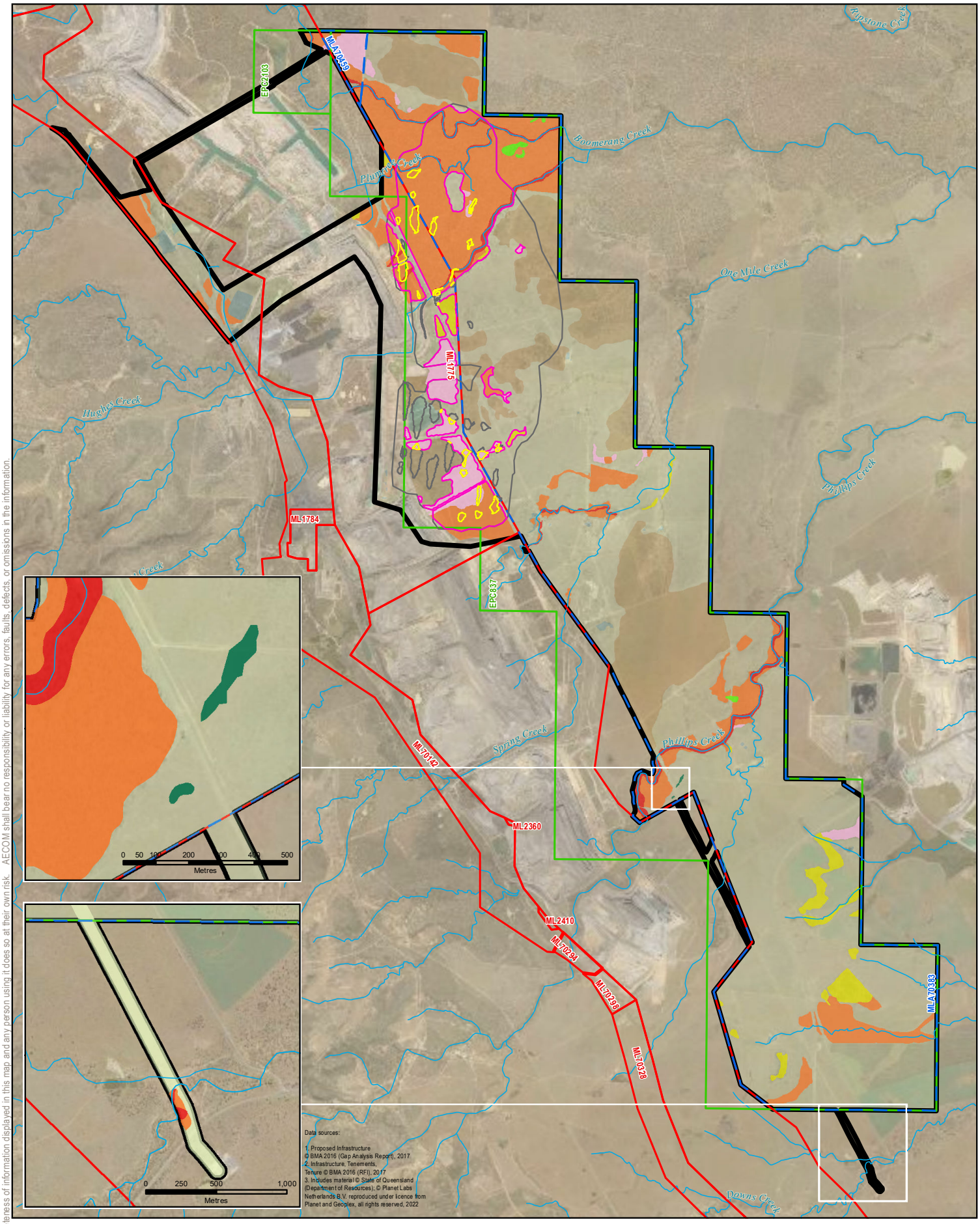
Note 2: As detailed in Section 6.9.2.1, potential impacts within subsidence areas (outside of ponding areas) are likely to be isolated with no likely materialistic change to vegetation present.

The formation of surface cracks from subsidence can lead to the loss of isolated trees and reduce the availability of foraging resources or habitat features, such as hollows and nests. Impacts to habitat trees from surface cracking are largely located adjacent to the pillars where the slope is greatest and unlikely to be widespread over the mined area. As such, the isolated loss of individual habitat features on undulating plains and floodplains is unlikely to result in a material change in the habitat values present and subsidence management will reinstate habitat as per **Appendix K-2 Subsidence Management Plan**.

Ground dwelling fauna are less likely to be affected by subsidence impacts as ground cover is unlikely to be significantly affected. Loss of scattered shade trees may increase ground temperatures which may be problematic for some ground dwelling fauna, although reptiles are not likely to be particularly sensitive to this. Increased exposure of areas caused by vegetation die back may also expose ground dwelling fauna to predation by native and non-native predators.

Generally, bird species are highly mobile and will be able to fly over or through disturbed areas to access alternative habitat. Microchiropteran bats will be able to continue to forage over disturbed areas if their roosts remain unaffected.

Monitoring and adaptive management will be implemented as per **Appendix K-2 Subsidence Management Plan** of this EIS. Implementation of suitable mitigation measures and monitoring over the duration of the Project will assist in assessing any potential changes in habitat values and manage potentially increases in exotic pest fauna.



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LEGEND

- Project Site
- Exploration Permit Coal (EPC)
- Mining Lease (ML)
- Mining Lease Application (MLA)
- Watercourse
- Limit Of Subsidence and Ponding Areas

Subsidence and Ponding Areas Intersecting Fauna Habitat

- Subsidence
- Ponding

Remnant Habitat Types

- River red gum riparian woodland
- Eucalyptus and Corymbia open woodland
- Dawson gum and brigalow woodland
- Brigalow and belah woodland
- Oxbow wetland
- Natural grasslands

Non-remnant Habitat Types

- Modified Grasslands
- Shrubby Brigalow Regrowth with Gilgai
- Dams

N

Figure 6-14
Potential Operation Impacts on Fauna Habitat Types

Environmental Impact Statement
Saraji East Mining Lease Project

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Kilometres

Scale: 1:110,000 (when printed at A4)

Projection: Map Grid of Australia - Zone 55 (GDA94)

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6.9.2.2 Potential indirect impacts (operational phase)

Potential indirect impacts during the operational phase are similar to those described during the construction phase (Section 6.9.1.2) but will primarily relate to activities, maintenance and subsequent vehicle movements associated with the surface facilities and IMG management infrastructure.

Surface facilities such as the future MIA, CHPP, ROM pad and conveyors are in areas that are already highly modified. Noise and light from these areas is unlikely to increase impacts on fauna due to lower densities of fauna utilising these areas and due to noise and light impacts from existing operations.

During operation of the IMG infrastructure there will be some low-level noise from the gas wells; however, fauna are expected to habituate to this noise. There will also be some activity and noise from maintenance activities but, as with construction works, this will be relatively low impact in terms of noise levels and duration. Fauna present within the Project Footprint area are expected to either habituate to the disturbance or temporarily move away.

Once operational, traffic to and from the Project will increase, occurring both day and night. As a result, it is anticipated that mortality or injury to fauna will occur. As above, reptiles and macropods are the fauna groups most likely affected. Some birds, such as the Squatter Pigeon (Southern), the Pheasant Coucal (*Centropus phasianinus*) and raptors feeding on carrion on the roadside may also be involved in vehicle collisions.

Elsewhere on the Project Site, internal roads are already formed and occur within disturbed areas. It is anticipated that fauna mortality from vehicle strikes will not significantly increase in these areas.

Drawdown from water extraction

As discussed in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS, assessment of Groundwater Dependent Ecosystems (GDEs) within the Project Site undertaken by 3D Environmental identified terrestrial GDEs as potentially occurring in association with riparian vegetation along Phillips Creek and Boomerang Creek (3D Environmental, 2022). While similar vegetation (i.e. RE 11.3.25) was observed along Hughes Creek and One Mile Creek, analysis of xylem stable isotope and soil moisture potentially indicates these communities are unlikely to meet the criteria of a terrestrial GDE (3D Environmental, 2022).

Impacts of drawdown in the Tertiary groundwater system may occur within the alluvium where areas of enhanced potential for downward drainage to occur (refer to **Chapter 9 Groundwater** of this EIS). This is most likely associated with sandy sediments with increased hydraulic conductivity or increased density of preferential flow paths (3D Environmental, 2022). Impacts could also manifest in isolated pockets of groundwater within the Quaternary alluvium, or where seasonal water within the alluvium would have enhanced potential for downward flow due to a lower groundwater level within the underlying Tertiary sediments paths (3D Environmental, 2022). As identified by 3D environmental (2022), the impact of this increased drawdown in the alluvium is predicted to be minor to insignificant to identified terrestrial GDEs as:

- the alluvial groundwater system associated with Phillips Creek and Boomerang Creek are discontinuous along the length of the creek channels and riparian trees are facultative phreatophytes which have capacity to utilise moisture from multiple sources including soil moisture, surface water and groundwater to support transpiration.
- the alluvial groundwater system that supports Terrestrial GDEs on these creeks are recharged by surface flows and flooding which provides the dominant driver to support riparian ecological function.

With implementation of management measures, which includes development of a Project Groundwater Dependent Ecosystem Monitoring and Management Plan (GDEMMP), will minimise any potential impacts to terrestrial GDEs identified.

6.9.3 Decommissioning and rehabilitation phase

The decommissioning phase will involve the removal of mine infrastructure and rehabilitation of the landform. As such further direct disturbance is not anticipated during this stage or if required, will be temporary in nature.

There is the potential for indirect impacts to occur if the decommissioning process in not managed appropriately. These indirect impacts can include contaminate release from soil or water into the surrounding environment, dust, noise, light, erosion weed and pest proliferation. However, all proposed decommissioning works will be undertaken in accordance with detailed plans, and as such these impacts are low risk.

As rehabilitation of the post mining land surface is closely connected with subsidence effects, management of ecological impacts from IMG drainage requirements will be closely linked to the overall management approach to subsidence impacts. Remnant vegetation not directly affected by the IMG drainage network will become important in terms of ongoing management of subsidence impacts and rehabilitation. The Rehabilitation and Subsidence Management Plans for this Project can be found in **Appendix K-1 Rehabilitation Management Plan** and **K-2 Subsidence Management Plan** of this EIS. A Progressive Rehabilitation and Closure Plan, detailing the post-mining land uses, any non-use management areas and associated milestones, will also be developed for the Project.

6.10 Potential impacts on conservation significant species

Please note, the following impact assessment provides worst-case scenario disturbance calculations, and there is the potential that disturbance areas can be reduced.

6.10.1 Regional ecosystems

Conservation significant REs have of concern or endangered biodiversity status and those analogous with EPBC Act listed TECs (refer to **Chapter 21 Matters of National Environmental Significance**). Table 6-20 lists the ten conservation significant REs confirmed within the Project Footprint during field surveys with potential to experience direct impacts from the proposed surface activities associated with the construction phase of the Project, including:

- 49.83 ha of impacts to REs with an endangered biodiversity status (REs 11.3.1, 11.4.8 and 11.4.9)
- 72.18 ha disturbance REs with an of concern biodiversity status (REs 11.3.2, 11.3.25, 11.3.27b, 11.3.4, 11.4.13, 11.4.4).

The greatest direct impact (construction and operation) to an individual conservation significant vegetation unit is endangered RE 11.4.8 (53.66 ha). Potential significant impacts for these REs have been assessed in Section 11 of **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS.

Potential direct and indirect impacts to the endangered RE 11.4.8 of approximately 222.45 ha (53.66 ha direct impacts and 168.79ha indirect impacts) constitutes approximately 1.1 per cent of this vegetation community within the Isaac-Comet Downs subregion. Of concern RE 11.3.25, subject to second largest area of total impact of approximately 73.42 ha (14.83 ha direct impacts and 58.59 ha indirect impacts) constitutes 0.2 per cent of this vegetation community found within the Isaac-Comet Downs subregion.

Direct disturbance to RE 11.3.27b is minimal (3.04 ha); however, the occurrence of this RE within the sub-region is similarly sparse and as such this disturbance equates to approximately 0.3 per cent of this community in the Isaac-Comet Downs subregion. RE 11.5.3, which has a biodiversity status of no concern at present will experience much larger areas of total impacts across the site (778.66 ha, comprised of 95.94 ha direct impacts and 682.72 ha indirect impacts). However, this RE is much more widely available in the region and as such the impact only constitutes 1.1 per cent of this community in the subregion.

The area of potential impacts on remaining conservation significant REs in context to the extent in which they occur across the subregion is less than 1 per cent. Summary of RE impacts is presented in Table 6-20.

HVR which is regulated under the VM Act may also be impacted by the Project. A total of 3.98 ha of HVR Endangered RE (RE 11.3.1, 11.4.8 and 11.4.9) is mapped within the Project Footprint.

Table 6-20 Regional Ecosystem Impact Summary

RE	Biodiversity Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Construction		Operation		
			Direct		Direct	Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
11.3.1	E	6.58	0.4	1.5	0	4.6	6.58
11.3.2	OC	65.51	16.4	2.7	0	46.4	65.51
11.3.25	OC	73.42	6.5	5.4	2.9	58.6	73.42
11.3.27b	OC	3.04	0	3.0	0	0.0	3.04
11.3.4	OC	0.01	0.01	0	0	0.0	0.01
11.4.13	OC	38.03	38.0	0	0	0.0	38.03
11.4.4	OC	0.08	0.1	0	0	0.0	0.08
11.4.8	E	222.45	24.3	16.9	12.4	168.8	222.45
11.4.9	E	32.56	0	6.7	0.1	25.8	32.56
11.5.3	NCP	778.66	34.7	23.6	37.6	682.7	778.66

6.10.2 EPBC threatened ecological communities

Within the Project Site, two EPBC TECs have been identified. These communities are:

- EPBC TEC Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (analogous to of concern RE 11.4.4)
- EPBC TEC Brigalow (*Acacia harpophylla* dominant and co-dominant) (analogous to endangered REs 11.3.1, 11.4.8 and 11.4.9).

Potential impacts to these TECs are often associated with the construction and operational phase of mining projects with both direct disturbances and indirect effects, including:

- vegetation clearing and loss
- fragmentation and edge effects
- weed incursion
- dust
- subsidence
- alterations to hydrological regime, including water quality
- erosion and sedimentation.

Development of mining operations within the Project Footprint will involve direct clearing for surface infrastructure as well as direct clearing and fragmentation for the IMG drainage network. Ongoing operational impacts may include subsidence-induced temporary ponding areas due to the development of the Project.

A summary of TEC impacts is presented in Table 6-21. Further assessment of potential significant impacts for these TEC is discussed in **Chapter 21 Matters of National Environmental Significance** of this EIS.

Table 6-21 Threatened Ecological Communities Impact Summary

TEC	EPBC Act Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	E	0.075	0.075	0.00	0.00	0.00	0.075
Brigalow (Acacia harpophylla dominant and co-dominant)	E	210.31	19.21	14.71	9.85	166.55	210.31

6.10.3 Flora species of conservation significance

One significant flora species was recorded within the Project Footprint Bluegrass. One additional conservation significant species, King Bluegrass is considered likely to be present within the Project Footprint, although it was not identified in field surveys.

Direct and indirect impacts to Bluegrass and King Bluegrass often associated with the construction and operational phase of mining projects are:

- vegetation clearing and loss
- fragmentation and edge effects
- weed incursion
- dust
- alterations to hydrological regime, including water quality
- erosion and sedimentation.

Habitat for these species is located in the Project Footprint, within and adjacent to the transport infrastructure corridor where an overhead powerline will be constructed. Approximately 0.075 ha of potential habitat is mapped within the Project Footprint based on overlapping infrastructure, however the proposed overhead powerline is expected to span overhead with limited to no clearing required for its construction. With limited to no ground disturbance required, indirect impacts associated with vegetation clearing such as fragmentation and edge effects, erosion and sedimentation will also be limited. In this area, there is a low likelihood that vehicle traverses during construction will lead to increased or new weed incursions, excessive dust or the contamination of soils and water. Subsidence impacts are unlikely to affect Bluegrass and King Bluegrass habitat, since underground works are proposed to occur to the north.

Summary of conservation significant flora impacts is presented in Table 6-22. Further assessment of potential significant impacts for these flora species have been assessed in **Chapter 21 Matters of National Environmental Significance** of this EIS and Section 11 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Table 6-22 Conservation Significant Flora Impact Summary

Threatened Flora	EPBC Act / NC Act Status	Project Footprint (ha)	Impact area (ha)				Total area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Bluegrass	E / -	0.075	0.075	0.00	0.00	0.00	0.075
King bluegrass	E / V	0.075	0.075	0.00	0.00	0.00	0.075

6.10.4 Fauna species of conservation significance

A number of fauna species of conservation significance were identified from the literature review and field surveys as occurring or likely to occur within the Project Site (Section 6.4 and 6.4.3). Comments on potential impacts to these species are provided below.

Summary of conservation significant fauna impacts is presented in Table 6-23. Further assessment of potential significant impacts for these species are provided in **Chapter 21 Matters of National Environmental Significance** of this EIS. and Section 11 of **Appendix C-1 Terrestrial Ecology Technical Report**.

Table 6-23 Conservation Significant Fauna Impact Summary

Threatened fauna	Habitat	Project Footprint (ha)	Impact area (ha)				Total impact area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
Squatter Pigeon	**Total**	**1,862.34**	**316.57**	**155.04**	**95.38**	**1,295.34**	**1,862.33**
	Preferred	631.24	38.90	33.34	12.22	546.78	631.2
	Suitable	289.87	19.24	1.42	28.30	240.92	289.8
	Marginal	941.22	258.43	120.28	54.86	507.64	941.21
Ornamental Snake	**Total**	**886.02**	**213.40**	**121.81**	**54.22**	**496.58**	**886.02**
	Preferred	0.00	0.00	0.00	0.00	0.00	0.00
	Suitable	886.02	213.40	121.81	54.22	496.58	886.02
	Marginal	0.00	0.00	0.00	0.00	0.00	0.00
Australian-painted Snipe	**Total**	**712.97**	**218.98**	**102.89**	**65.26**	**325.85**	**712.97**
	Preferred	0.00	0.00	0.00	0.00	0.00	0.00
	Suitable	712.97	218.98	102.89	65.26	325.85	712.97
	Marginal	0.00	0.00	0.00	0.00	0.00	0.00
Koala	**Total**	**1,160.17**	**95.77**	**51.49**	**52.33**	**960.58**	**1,160.17**
	Preferred	140.93	21.87	11.15	2.94	104.97	140.93
	Suitable	930.17	15.00	35.98	49.40	829.79	930.17
	Marginal	89.067	58.89	4.36	0.00	25.81	89.07
Greater Glider	**Total**	**748.13**	**34.45**	**33.36**	**20.60**	**659.71**	**748.13**
	Preferred	72.28	5.22	5.41	0.94	60.72	72.28
	Suitable	195.22	16.62	7.26	3.11	168.23	195.22

Threatened fauna	Habitat	Project Footprint (ha)	Impact area (ha)				Total impact area (ha)
			Direct			Indirect	
			Surface infrastructure	IMG network	Maximum extent of ponded areas	Subsidence (balance)	
	Marginal	480.63	12.62	20.69	16.55	430.77	480.63
Grey Falcon	**Total**	**3,113.58**	**692.96**	**348.46**	**116.32**	**1,955.83**	**3,113.58**
	Preferred	76.48	6.50	8.45	2.94	58.59	76.78
	Suitable	961.70	229.83	122.98	54.86	554.03	961.70
	Marginal	2,075.39	456.63	217.02	58.52	1,343.21	2,075.39
Short-beaked Echidna	**Total**	**3,113.58**	**538.90**	**348.46**	**2,072.16**	**116.32**	**1,955.83**
	Preferred	0.00	0.00	0.00	0.00	0.00	0.00
	Suitable	1,854.87	155.04	155.04	1,390.72	95.38	1295.34
	Marginal	1,258.70	383.85	193.42	681.44	20.94	660.50

Squatter Pigeon

A total of 1,862.34 ha of potential habitat for this species is mapped within the Project Footprint. This includes 631.24 ha of preferred habitat, 289.87 ha of suitable habitat and 941.22 ha of marginal habitat. The potential impacts on the Squatter Pigeon (Southern) include up to 72.24 ha of preferred habitat loss and/or fragmentation due to vegetation clearing and 12.22 ha due to temporary ponding, and direct mortality from vehicle strike or destruction of nests.

Ornamental Snake

A total of 886.02 ha of suitable habitat for this species is mapped within the Project Footprint. Project related impacts on the Ornamental Snake may arise from habitat loss due to clearing, mortality or injury during vegetation clearing, subsidence and from vehicle traffic. Although subsidence is likely to alter up to 550.81 ha of suitable habitat, it is expected that much of this area will still retain habitat functionality for this species. This habitat alteration may result in the creation of temporary subsidence ponds which may benefit prey populations within the area, and also support other pest species such as Feral Pigs and Cane Toads. Destruction of wetland habitat by Feral Pigs and lethal toxic ingestion of Cane Toads have been identified as threats to Ornamental Snake.

Australian Painted Snipe

A total of 712.97 ha of suitable habitat is mapped for Australian Painted Snipe within the Project Footprint. This habitat lacks the required microhabitat features to provide breeding habitat for this species. The species is likely to be a vagrant visitor only and may use wetlands in the Project Site on passage to more suitable breeding or foraging grounds. Based on the lack of preferred habitat for this species within the Project Footprint, its highly mobile nature and the availability of suitable habitat within the region, Project related impacts are expected to be minimal.

Koala

A total of 1,160.17 ha of potential habitat for Koala is mapped within the Project Footprint. This includes 140.93 ha of preferred habitat, 930.17 ha of suitable habitat and 89.07 ha of marginal habitat.

Some areas of preferred habitat within the Project site, such as along main watercourses, may be considered habitat critical to the survival of species. However, this habitat is also associated with fragmentation and other threats that may limit carrying capacity and reduce the importance of this habitat in relation to the recovery of the species This habitat is also not considered highly unique and habitat with similar characteristics, quality and condition occurs within the region, which will allow the species to continue to persist within its current distribution, regardless of the presence of habitat within

the Project site. Refer to **Chapter 21 Matters of National Environmental Significance** of this EIS for further detail.

Preferred habitat within the Project Site primarily occurs within narrow riparian corridors, with suitable habitat occurring as fragmented patches which feature limit habitat viability, carrying capacity and buffering abilities. Habitat connectivity across the Project Site has been compromised and is restricted to habitat along main watercourses such as Boomerang Creek and Hughes Creek. This preferred habitat is therefore considered to be the most sensible and valuable to the Koala within the Project Site. While preferred habitat is connected to a substantial area of suitable habitat for Koala to the west (>1,000 ha), the habitat within the wider landscape would be expected to provide a greater extent (in comparison to that within the Project Site) of core habitat, greater abundance of habitat resources and more valuable refuge for the species during drought conditions.

An additional large, contiguous patch of suitable habitat exists between the area of preferred habitats located along the riparian zones of Boomerang and Hughes Creek. This suitable habitat provides connectivity between the two creek systems and their riparian zones, and is likely to be utilised as a movement corridor for Koala. Additional areas of suitable habitat are located in the southern portion of the Project Site and although they are large in size, for the most part they are not connected to preferred habitat.

Small patches of marginal habitat are scattered across the Project Site, with the largest patch located in the north eastern corner of the Project Site. These areas of marginal habitat are isolated from other areas of suitable and preferred habitat, and are unlikely to be of importance to Koala within the Project Site.

Koalas are likely to be present in low densities and may experience the following impacts:

- loss and fragmentation of habitat
- mortality or injury during vegetation clearing and vehicle strikes
- increased predation risk by domesticated and wild dogs.

A fragmented landscape will result in Koalas being required to travel on the ground in order to traverse between habitats. This will increase their risk of predation from wild dogs and increase the potential for mortality from vehicle strikes. Mortality during vegetation clearing may also occur. The use of mitigation measures such as fauna spotter-catchers will assist in reducing impacts during clearing of potential Koala habitat, and is further discussed in Section 6.12.

While Koala will be able to move away from the progressive disturbance arising from the IMG management infrastructure, the overall and cumulative fragmentation, loss of habitat and disturbance as a result of the Project may decrease their likelihood of occurrence.

Indirect impacts resulting from Project activities may include habitat modification from subsidence. This may include localised dieback of Koala food trees or canopy trees that provide connectivity. Increased noise and light, particularly during construction, may have impact on Koalas during the breeding season as they rely on auditory cues to find mates.

Groundwater levels within the upper tertiary sediments are generally deeper than 15 mbGL, which is at a depth with reduced importance to vegetation (Froend and Loomes, 2004). As such, any predicted drawdown within this layer is unlikely to result in indirect habitat degradation impacts (i.e. dieback) on surface habitats, including habitats identified to be potentially utilised by Koala. The creek systems within the Project Site that may provide refuge habitat for the species during drought conditions are ephemeral creeks that do not contain permanent groundwater. Therefore, drawdown impacts as a result of the Project will have little effect on the quality or availability of Koala habitat resources.

Greater Glider

A total of 748.13 ha of potential habitat for Greater Glider is mapped within the Project Footprint. This includes 72.28 ha of preferred habitat, 195.22 ha of suitable habitat and 480.63 ha of marginal habitat.

Within the Project Site, preferred habitat for Greater Glider is located within the riparian zones of creeks, with the habitat supporting a known local population on Boomerang, Plumtree and Hughes Creeks. This habitat provides key denning (hollows) and foraging resources and has been shown to support a number of individuals. Given the presence of denning resources (hollows), connectivity of

habitat and the existence of numerous records of the species, it is considered that the area of preferred habitat are the most sensitive and of most value to Greater Glider within the Project Site.

Suitable habitat is located adjacent to the preferred habitat and follows the same riparian zones of the creek systems within the Project Site. Small portions of marginal habitat are located in the south of the Project Site, in association with Phillips Creek. The area between the Boomerang, Plumtree and Hughes Creeks in the north of the Project contains a large area of contiguous marginal habitat, which connects through to the suitable and preferred habitat.

However, this habitat is not considered highly unique. Habitat with similar characteristics, quality and condition occurs within the region, which will allow the species to continue to persist within its current distribution, regardless of the presence of habitat within the Project site. It is also not considered to provide refuge habitat for the species. Based on these factors, habitat within the Project Site is not considered critical to the survival of Greater Glider (*Petauroides volans*) and is not considered to play a critical role in the long-term maintenance of the species. Refer to **Chapter 21 Matters of National Environmental Significance** of this EIS for further detail.

Potential impacts to Greater Glider include the loss and/or fragmentation of habitat. Fragmentation will occur at creek crossings for the transport and infrastructure corridor and powerline connection and within the IMG drainage network. This may locally restrict movement of the species, particularly where the clearing impact width exceeds the volplane (downwards gliding) distance of the species (greater than 100 m). Given the availability of similar habitat in the region, the expected clearing impact will not typically exceed 100 m.

Indirect impacts as a result of subsidence from the Project, may include localised dieback of denning trees or canopy trees that provide habitat connectivity, particularly along Hughes Creek. Alteration of stream flows may also impact on the health of riparian vegetation and Greater Glider habitat. Increased noise and light, particularly during construction, may also impact on breeding, foraging and dispersal behaviours of the species.

Grey Falcon

A total of 3,113.58 ha of potential habitat for Grey Falcon is mapped within the Project Footprint. This includes 76.48 ha of preferred habitat, 961.70 ha of suitable habitat and 2,075.39 ha of marginal habitat. This species inhabits woodland, shrubland and grassland in arid and semi-arid zones with a preference for wooded riparian habitats. Project related impacts to this species are expected to be minimal, since habitat is widely available for this species throughout the Project Site and the wider region.

Short-beaked Echidna

A total of 3,113.58 ha of potential habitat for this species is mapped within the Project Footprint. This includes 1,854.87 ha of suitable habitat and 1,258.70 ha of marginal habitat. This species has a wide distribution in Australia and can tolerate a broad range of habitats. Habitat for this species includes remnant vegetation throughout the Project Site and can also persist in natural or modified grasslands and regrowth, provided that a suitable food source is available. Impacts to this species are expected to be minimal, since the species is widespread in the region and is a habitat generalist.

Latham's Snipe

The preferred habitat for Latham's Snipe is permanent and ephemeral wetlands of which small areas are available associated with RE 11.3.27b. Watercourses such as Phillips Creek and Boomerang Creek, ephemeral wetlands following heavy rain and artificial dams may provide temporary stopover opportunities during dispersal to preferred habitat. It is possible that disturbance adjacent to wetlands within the Project Site may deter the species from utilising the habitat. However, impacts from the Project to this species in a regional context are considered minimal.

White-throated Needletail

The Fork-tailed Swift is a non-breeding migrant to Australia and exclusively aerial, spending day and night on the wing. This species flies above a wide range of habitats and may potentially occur in the airspace across the Project Site but is not associated with particular habitat types. Similarly, to the White-throated Needletail, this species is not expected to suffer from habitat loss impacts.

Fork-tailed Swift

The Fork-tailed Swift is a non-breeding migrant to Australia and exclusively aerial, meaning that both day and night is spent flying. This species flies above a wide range of habitats and may potentially occur in the airspace across the Project Site but is not associated with particular habitat types. Similarly, to the White-throated Needletail, this species is not expected to suffer from habitat loss impacts.

Caspian Tern

Suitable habitat for this species within the Project Site includes dams and wetlands. This species has a widespread occurrence in both coastal and inland habitats. As such, the Project is not expected to cause significant impacts to the species.

Refer to **Chapter 21 Matters of National Environmental Significance** of this EIS for further detail on impacts to MNES.

6.11 Potential impacts on ESAs

Section 0 details the ESAs within the Project Site and surrounding region. ESAs more than 100 km from the Project Site (not including ESAs downstream) have been excluded from further consideration. Three Category B ESAs were identified as occurring within the Project Site, while additional ESAs were identified as occurring downstream of the Project. Table 6-24 details the ESAs relevant to the Project, and the likelihood that the Project may potentially impact them.

Table 6-24 Likelihood of Impact to Environmentally Sensitive Areas

ESA	Classification	Likelihood of impact	Potential impact
National Parks	Category A	Nil. Impacts on national parks are considered unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
Conservation Park	Category A	Nil. Impacts on conservation parks are considered unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
Great Barrier Reef Marine Park	Category A	Unlikely. The Fitzroy River discharges to the GBRMP 490 km downstream of the Project Site. Water quality impacts are not likely to be detectable.	Nil
World Heritage Areas	Category B	Unlikely. The Fitzroy River discharges to the GBRWHA 490 km downstream of the Project Site. Water quality impacts are not likely to be detectable	Nil
Endangered REs	Category B	Confirmed. Three ERE comprising 261.60 ha exists within the Project Footprint with potential to be directly impacted by surface infrastructure/IMG (49.84 ha) and ponding areas (12.53 ha) with 211.75 ha potentially attributed to indirect impacts.	Direct and indirect
Places of Cultural or Aboriginal Heritage Significance	Category B	Unlikely. There are known Aboriginal cultural heritage sites within the Project Site which includes a combination of recorded places and sites identified during exploration works. This EIS assumed that any Project impacts to Aboriginal cultural heritage will be identified and managed under the existing Cultural Heritage Management Plan (CHMP) between BMA and the Aboriginal Party (CLH012020).	Nil
Nature Refuges	Category C	Unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
Resource Reserves	Category C	Unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
State Forests	Category C	Unlikely due to distance from the Project Site and lack of connective vegetation.	Nil
General Use Zones of a Marine Park	Category C	Unlikely. The Fitzroy River discharges to the GBRWMP 490 km downstream of the Project Site. Water quality impacts are not likely to be detectable Further discussion is provided in **Appendix E-1 Surface Water Quality Technical Report.**	Nil

The potential impacts on these ESAs are discussed in Section 9.2 of **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS.

6.12 Mitigation measures

The following measures outlined below will aim to avoid, minimise, mitigate and manage impacts from the Project on flora, fauna and ESAs. Where impacts are unable to be avoided or mitigated (e.g. clearing of vegetation) offsets may be required. Mitigation measures associated with potential impacts from each Project activity are presented below.

6.12.1 Avoid

Significant mine engineering design has been undertaken in the development of the finalised Project Footprint. The Project location is defined by the nature and scale of the coal deposit. As such, it is constrained by resource, geographic, existing infrastructure and feasibility considerations. While an alternative option to not proceed with the Project would avoid potential environmental impacts, it would also result in substantial socio-economic impacts, including:

- loss of economic benefit
- reduced local, state and nationwide job opportunities
- reduced demand and income for support industries and service suppliers
- resources will not be available to supply high quality coal products to export markets
- missed opportunity for employee opportunities, apprenticeship programs, support of local businesses and financial donations to community groups and local projects.

The finalised layout of the Project aims to optimise mining to access most of the target resource with the smallest footprint to minimise impacts to land, environment, heritage and community values. The Project's target resource is located predominantly in MLA 70383 which is contiguous with leases currently held by BMA for the existing Saraji Mine. The Project location has also been identified to enable an opportunity for strategic growth, as the extent and nature of the resource is well understood due to extensive exploration and historic mining in the area. As such, BMA can bring this Project into production reasonably quickly compared to less well-known resources.

At the proposed location, the Project will intersect Hughes Creek and Boomerang Creek which are already subject to diversions and impacts of mining upstream, with the benefit of being able to avoid introducing mining impacts (including impacts to wildlife corridors) at Phillips Creek, Spring Creek and One Mile Creek to the south. An alternate location will result in new impacts and increased disturbance to land and sensitive environmental values such as wildlife corridors, as well as key infrastructure being further away from existing infrastructure and mining operations leading to increased disturbance as well as higher development and operational costs in accessing and processing the resource.

The Project will adopt an optimised underground mine plan for the Project to integrate with existing Saraji Mine open cut mine and supporting infrastructure, access dipping coal seams and minimise environmental impacts. A maximised mine plan option, comprising 17 longwalls accessed via the existing open cut, was considered in order to maximise mining of the available coal resource within the mining tenure. This larger underground mining footprint was expected to result in greater surface disturbance, particularly subsidence impacts on associated watercourses, surface water flow and vegetation. As a result of greater environmental impacts and capital costs, this option was not considered the most effective use of the coal resource.

Where possible utilisation of the existing Saraji Mine infrastructure has been incorporated into the Project design to minimise the need for additional disturbance. For example, the management of dewatered tailings will be within the existing Saraji Mine in-pit spoil dumps. As a result, the Project will not require new tailings storages. Similarly, the location of surface infrastructure has determined based on the access to existing Saraji Mine infrastructure including the existing CHPP, BMA's existing water pipeline network, telecommunications network and electrical power network.

The optimised mine plan provides ideal capacity to mine the target resource within the Project Site with consideration of resource geology and quality, production rates, site constraints and potential environmental impacts.

6.12.2 Minimise

The Project has been designed to utilise previously disturbed land at Saraji Mine as well as existing mine infrastructure in order to minimise further disturbance and therefore further impact to the environment. Where disturbance to areas is required, this will be restricted to the minimum that is needed.

Use of the underground longwall mining methods will also minimise direct impacts to ecological values in comparison to open-cut mining. As discussed in Section 6.9.2.1, while vegetation within the modelled subsidence footprint may be subject to isolated loss of trees attributed to surface cracking, native

vegetation is unlikely to result in materialistic change to vegetation composition and structure. Modification of vegetation and habitat present will be largely limited to deeper depressions subject to ponding.

Access to the underground working areas will be through a portal developed in the existing open cut highwall on the far eastern side of the existing open cut mining area. This reduces the portal complexity, length and quantity of spoil materials generated compared to an above ground configuration. Locating the portal in the existing open cut also allows for shorter above ground conveyor configuration between the underground mine and CHPP. Use of the existing open cut pit for mine access minimises potential environmental impacts, costs, time and risks involved in construction of a new mine portal from above ground level.

The CHPP, conveyors and product stockpiles are located within the existing Saraji Mine ML and, while vegetation clearing is required, this vegetation is disturbed and fragmented. The proposed MIA and the raw water dam are to be located in a disturbed area within Saraji Mine and are not anticipated to require removal of remnant vegetation.

Clearing for the powerline connection will only be required for footings and a narrow easement. As such, impacts to high biodiversity values within the powerline connection footprint will be minimised. The width of the corridor is also expected to reduce during the detailed design process.

Further detailed design will refine the siting and disturbance associated with surface infrastructure, IMG drainage network, access, pipelines and powerlines, ensuring where disturbance is required, it will be restricted to the minimum footprint necessary. While design of the layout of the IMG drainage infrastructure has not yet been finalised, it is intended to restrict the number of times that the infrastructure crosses these creeks to minimise direct disturbance to this corridor. Wherever possible, the wells required for IMG drainage will be installed outside of the riparian zone and to minimise impacts to wildlife corridors. Required crossings will be selected where natural breaks in vegetation occur where practical. Some pipeline crossings will be required, and these will be trenched crossings, with disturbed areas reinstated to stabilise the riverbed and banks. The required crossings will be reduced to the minimal width required.

6.12.3 Mitigate

6.12.3.1 Surface facilities and infrastructure mitigation measures

Flora and vegetation communities

When clearing vegetation for any of the surface facilities, the following mitigation measures will be implemented:

- areas for clearing will be clearly delineated to avoid inadvertent clearing
- if habitat trees can be retained without compromising safety, these will be identified and clearly marked
- habitat features such as felled trees and logs will be considered for relocation to other areas where practical to provide microhabitat
- vehicles will remain on established tracks and roads. In the event a vehicle must leave established tracks and roads it will be cleaned to remove weed seeds.
- workers will be made aware of mitigation management requirements in induction training.

Throughout construction, the following mitigation measures will be utilised to manage impacts from construction activities:

- vehicles will remain on established tracks and roads. In the event a vehicle must leave established tracks and roads it will be cleaned to remove weed seeds.
- topsoil will be removed and used to rehabilitate existing disturbed areas in accordance with the EA and Regional Interests Development Approval
- erosion and sediment control measures will be installed and maintained to Australian Standards and in accordance with the EA

- dust suppression measures will be utilised to minimise deposition of dust on adjacent vegetation
- bushfire risk will be managed by:
  - vegetation management within the MLAs to maintain safe fuel loads
  - any chemicals used in the Project Site will be handled and disposed of in accordance with the relevant Safety Data Sheet
  - implementing access tracks to be used by Queensland Fire and Rescue Service for emergency purposes
  - implementing an Emergency Response Procedure prepared in consultation with emergency services.

In addition, weed monitoring and management will be ongoing throughout construction and operation and is further discussed Section 6.13.1 of this chapter.

As it will not be possible to avoid impacts on vegetation communities of conservation significance, offsets may be required to mitigate impacts, which are further discussed in Section 6.16 of this chapter.

Fauna

Measures set out above to minimise impacts on flora and vegetation communities will also assist to some extent in minimising impacts on fauna.

Suitably qualified spotter catchers will be required during vegetation clearing, and all spotter catchers will hold appropriate permits under the NC Act. If fauna are injured by vehicles during operations, the RSPCA or local wildlife carers will be contacted for assistance.

Other measures which will be implemented during the construction and operation phase will include:

- induction training and work instructions will provide the workforce with contact details of suitably qualified spotter catchers in the event that fauna is present and needs to be removed, or fauna are accidentally injured
- heavy vehicles (and where practical, light vehicles) will not traverse vegetated areas outside designated construction zones and will be required to remain on existing tracks
- during detailed design, lighting will be designed so that light spill into adjacent habitat areas is minimised.

6.12.3.2 Gas drainage network mitigation measures

Flora and vegetation communities

While the extent of infrastructure required for IMG drainage will mean that impacts on significant vegetation communities and plants are unavoidable, there are a range of measures that will be taken to potentially reduce the level of impact of clearing and manage associated impacts. These include the following:

- avoiding placement of IMG extraction wells and infrastructure within Endangered REs 11.3.1, RE 11.4.8 and RE 11.4.9 and of concern REs 11.3.2, 11.3.25, 11.3.27b, 11.3.4, 11.4.13, and 11.4.4 where practical. Where unavoidable, offsets will be sourced
- designing and constructing IMG management infrastructure to minimise disturbance to riparian zones along the Boomerang Creek, Plumtree Creek, Hughes Creek and oxbow wetlands and avoiding placement of wells within 50 m of these waterways wherever possible
- wherever practical, locating infrastructure alignments and gas drainage wells to avoid remnant vegetation
- minimise creek crossings
- selecting river and creek crossings where natural breaks in vegetation occur where practical
- areas where clearing is planned should be distinctly delineated, so that inadvertent clearing of additional areas does not occur

- vehicles will remain on established tracks and roads. In the event a vehicle must leave established tracks and roads it will be cleaned to remove weed seeds.
- dust suppression measures will be undertaken to minimise dust deposition on vegetation adjacent to tracks and construction areas
- management measures to remove and control any new weed infestations or areas that have exhibited increased densities and/or extents within disturbance areas, including vegetation fragmented by the IMG Network
- utilising erosion and sediment control measures as set out in Australian Standards for all ground disturbance activities and stream crossings.

Fauna

The primary impacts on fauna during construction of the IMG drainage network are the loss of habitat and potential risk of mortality associated with the works. Measures to reduce habitat impacts will include:

- selecting already disturbed areas for crossings of creeks and drainage lines where practical
- minimising the width of clearing required for crossing, and particularly retaining tall trees on either side of crossing locations wherever this is safe to do so
- minimising placement of gas wells in riparian and woodland areas wherever possible.

Suitably qualified spotter catchers will be required during vegetation clearing, and all spotter catchers will hold appropriate permits under the NC Act. If fauna are injured by vehicles during operations, the RSPCA or local wildlife carers will be contacted for assistance. When working remote to spotter catchers, workers will be provided with contact details for the spotter/catchers in the event that fauna is present and needs to be removed or are accidentally injured. This will be covered in the induction training and work instructions.

Vehicles will not be allowed to traverse vegetated areas but will be required to remain on existing tracks. Speed limits will be placed on all roads and tracks associated with the IMG drainage network.

As potential animal breeding places are present within the Project Site, a Species Management Program (SMP) will be obtained for the Project for approval to tamper with animal breeding places (e.g. nests and hollow bearing trees), as required under Section 335 of the NC (Animal) Regulation. The SMP will be developed prior to clearing activities, once a detailed design confirms the relevant species to be managed. As breeding places for least concern species, least concern colonial breeders and wildlife prescribed as threatened under the NC (Animal) Regulation (i.e. Greater Glider) are likely to be present within the Project Footprint, a High Risk SMP will be required.

Where lighting is required, lighting will be directed away from vegetated areas where practical.

6.12.3.3 Subsidence mitigation measures

A subsidence monitoring program and adaptive management approach will be implemented to manage subsidence impacts to vegetation and habitat from the Project and will be documented within associated monitoring reporting. In the event subsidence impacts are identified within the modelled subsidence extents and/or environmental consequences occur, investigation will be undertaken to identify the extent and potential cause of the changes in vegetation/habitat condition.

Adaptive management will involve repairs and implementation of measures to prevent re-occurrence. The extent of direct impacts of subsidence on flora and vegetation communities will be mitigated through monitoring to identify persistent ponding in the landscape, with minor remedial drainage works to ensure free-draining landform. Erosion and surface cracking will also be repaired. Further information is presented in the Subsidence Management Plan (**Appendix K-2 Subsidence Management Plan**).

Where machinery is required to repair surface cracks or construct subsidence pond drainage channels, vehicles and equipment will be cleaned of all weed seeds and other potential contaminants before entering the site. Progressive rehabilitation will be undertaken as detailed in the Rehabilitation Management Plan (**Appendix K-1 Rehabilitation Management Plan**). Priority will be given to restoring

the habitat connectivity associated with riparian wildlife corridors. Rehabilitation of subsidence impacts will include:

- post subsidence inspections and identification of high risk areas, drainage works (to promote drainage and pump areas of persistent ponding
- rehabilitate with suitable species for the post subsidence conditions
- installation of interim control devices to divert surface runoff away from rehabilitated areas, if assessed as necessary, until groundcover is established
- remediation of prolonged surface cracking (greater than 12 months) (ripping, grading, compaction or crack infilling), particularly along ephemeral drainage lines.

As outlined in **Appendix K-2 Subsidence Management Plan**, a subsidence monitoring programme and adaptive management approach would be implemented to manage potential subsidence impacts to vegetation and habitat from the Project and would be documented within associated monitoring reporting. In the event potential subsidence impacts are observed within the modelled subsidence extents and/or environmental consequences occur, further assessment will be undertaken to identify the extent and potential cause of the changes in vegetation/habitat condition. Adaptive management would be undertaken involving the implementation of measures to prevent their re-occurrence. Further information is included as part of the Subsidence Management Plan. Where subsidence impacts to threatened species habitat is observed to negatively affect the viability and persistence of the species within the landscape, additional mitigation (i.e. environmental offset) may be required.

Progressive rehabilitation will be undertaken as detailed in the Rehabilitation Management Plan (**Appendix K-1 Rehabilitation Management Plan)**. A Progressive Rehabilitation and Closure Plan, detailing the post-mining land uses, any non-use management areas and associated milestones, will also be developed for the Project, for approval by the DES prior to commencement.

6.13 Management and monitoring

A number of specific management plans will be prepared to address specific biodiversity impacts and outline mitigation measures to be implemented during the construction and operational phase of the project. This includes:

- Weed and Pest Management Plan (construction and operational phase)
- Rehabilitation Plan (construction and operational phase)
- Topsoil Management Plan (construction and operational phase)
- High Risk Species Management Plan (construction phase only) for threatened fauna, colonial breeding species and NC Act-listed Special Least Concern (non-migratory) species
- Subsidence Management Plan, including vegetation health monitoring (operational phase), see **Appendix K-2**.
- Offset Area Management Plan (operational phase)
- Groundwater Dependent Ecosystem Monitoring and Management Plan (operational phase).

An overarching Construction Environmental Management Plan (CEMP) will also be prepared to mitigation and manage impacts. This plan will be developed to outline and describe the following:

- objectives
- risk assessment
- environmental management activities and mitigation measures
- the timing of actions
- a monitoring program, which will include:
    - performance indicators (clear and concise criteria against which achievement of outcomes are to the measured), which are capable of accurate and reliable measurement

- outcomes (time bound outcomes as measured by performance indicators), which might include milestones (interim outcomes)
- monitoring requirements (timing and frequency of monitoring to detect changes in the performance indicators, to determine if outcomes are being achieved, and to inform adaptive management)
- trigger values for corrective actions.
- potential corrective actions to be implemented if trigger values are reached, and how environmental incidents and emergencies will be managed
- roles and responsibilities (clearly stating who is responsible for activities)
- auditing and review mechanisms.

Monitoring of retained vegetation areas will be undertaken throughout the life of the Project. As the subsidence ultimately changes the hydrology of the area, a floristic change will naturally occur over time in areas of retained vegetation. Monitoring will need to focus on whether this change can occur naturally through regrowth of native vegetation from seed stock, or whether intervention is required to replace plants that die at a greater rate than natural reestablishment.

Remnant vegetation will be monitored for foliar discolouration, partial defoliation, increased pathogenic attack, or tree death as signs of vegetation impacts from subsidence. Tree deaths and regrowth in areas affected by subsidence will be monitored to assess whether rehabilitation is required. In areas where natural regrowth is not sufficient to replace dead trees, replanting will be undertaken.

Further details on weed management measures that will be implemented to reduce impacts is detailed below.

6.13.1 Weed and Pest Management Plan

The Weed and Pest Management Plan will detail specific management measures for construction, operation and rehabilitation for species highlighted in Section 6.4.2 and 6.5.2 of this chapter, and in accordance with BMA weed management and mitigation guidelines, recommended Biosecurity Queensland (BQ) methods (Department of Agriculture and Fisheries 2020) and the Isaac Regional Council Biosecurity Plan 2020-2023 (Isaac Regional Council, 2019).

Control measures that will be outlined within the Weed and Pest Management Plan include:

- management measures to remove and control any new weed infestations or areas that have exhibited increased densities and/or extents within disturbance areas, including vegetation fragmented by the IMG Network
- containment and treatment measures including:
  - managing pests and weeds through documented procedures on new infestations, consultation with stakeholders prior to implementation and removal in accordance with Local Government measures
  - prioritising control programs based on risk levels
  - containing the spread of weeds through best practise controls
  - monitoring for response to controls or future control methods.

The Weed and Pest Management Plan will cover construction, operation and rehabilitation phases and will include:

- requirement for all staff to undergo a site-specific induction including the identification, prevention, minimisation and management requirements of weed and pest species on-site
- maps showing distribution and abundance of weeds
- management methods to control spread of weed species (in particular Parthenium*), in keeping with regional management practice or Queensland Department of Agriculture and Fisheries pest control prescriptions

- ongoing inspection of the Project Site to identify any new incidence of weed infestation or areas that have exhibited increased densities and/or extents within disturbance areas
- provision of information for staff on the identification of WONS, Restricted Matter weed species and their dispersal methods
- vehicle hygiene, including:
  - all vehicles, machinery and equipment accessing landowner properties should be inspected and declared 'weed free' prior to entering
  - no vehicles are to drive over topsoil stockpiles
  - vehicles are to remain on existing access tracks and avoid driving over weed populations
- all rehabilitation materials (e.g. seed, mulch) brought to site should be declared free of weed material and recorded in the site's document management system
- movement of materials, such as sand, gravel, rock, soil and organic matter, must be controlled to ensure that it does not result in contamination by weed seeds or material
- all reasonable efforts should be made to limit the application of topsoil containing weed seeds or material
- methods for weed eradication from the site in accordance with local management practice from the IRC and/or the Queensland Government pest fact sheets. Any weed material removed will be appropriately disposed of.
- promotion of awareness of weed management, by inclusion of weed issues, pictures and procedures into the Project's site induction program.

Details of weed and pest monitoring will be outlined in the Weed and Pest Management Plan. As described in Section 6.4.2 of this chapter, occurrences of pest flora species currently occur across the Project Site, likely attributed to current and historical land use practices (e.g. grazing). Biosecurity monitoring will seek to assess existing population densities and extents as well as any new introductions/infestations along disturbance areas (i.e. access tracks, infrastructure, rehabilitation areas and topsoil stockpiles, etc.). Monitoring will occur throughout the life of the Project to ensure their ongoing effectiveness. Any significant findings, such as new pest or weed species, new outbreaks or any actions resulting from Project activities will be incorporated into a review of the Weed and Pest Management Plan. This will allow the Weed and Pest Management Plan to be adapted if performance criteria are not met.

The monitoring program will include:

- pre-clearance surveys within and directly adjacent to the Project Footprint to record presence and abundance of invasive weeds and pests and to identify weed hot spots
- a schedule and details of methods and data collected during construction audits and ecological condition monitoring in retained vegetation adjacent to the Project Footprint
- details of how results from these monitoring activities may trigger a corrective action
- details of the corrective actions which will be triggered when predetermined weed/pest thresholds are exceeded. These will include but not be limited to:
  - treatment of new weed incursions
  - monitoring of success and treatment
  - review of site procedures for weed management
  - rehabilitate and stabilise disturbed non-operational areas
  - re-educate / train site personnel on management requirements, practices and site rules
  - develop a species-specific control program for pest fauna where require and review as necessary to ensure it remains effective and applicable.

- monitoring for pest plants and fauna within subsided areas where ponding occurs will be undertaken to determine the need for specific management measures
- the monitoring will be undertaken in accordance with QLD state and federal survey guidelines for monitoring weed and pest species.

6.14 Rehabilitation

BMA has prepared a Rehabilitation Management Plan (**Appendix K-1 Rehabilitation Management Plan** of this EIS) in line with the Mined Land Rehabilitation Policy (DES, 2018c). In accordance with the policy, land will be progressively rehabilitated to achieve the following rehabilitation goals:

- safe to humans and wildlife
- non-polluting and does not cause environmental harm
- stable
- able to sustain an agreed post mining land use.

BHP's Queensland Coal Rehabilitation Completion Criteria (BHP, 2018a) outlines the completion criteria for meeting satisfactory rehabilitation for post mining land uses. Post mining land uses may include:

- cattle grazing
- dryland cropping
- woodlands habitat
- watercourses
- water storage.

The completion criteria sets out objectives, indicators and quantitative criteria for achieving acceptable rehabilitation in the post mining land uses. The completion criteria also considers goals of safety, stability, minimal pollution and the ability to sustain an agreed post mining land use. **Chapter 5 Land Resources** of this EIS presents these completion criteria and rehabilitation goals in further detail.

The proposed post mining land use will be an undulating landscape that could be used as grazing land, consistent with the surrounding pastoral land use that dominates the region. Native vegetation outside of the surface infrastructure footprint will be retained in a way that is compatible with the pre-existing land use for biodiversity values. However, where vegetation mortality occurs as result of persistent ponding, associated with subsidence, it will be revegetated with species that are tolerant of inundation. There may be instances in which a mix of native and non-native species will be implemented.

Post mining land uses for the Project will be confirmed prior to construction and rehabilitation milestones and schedules will be defined in the PRCP to be submitted for approval prior to commencement of the Project.

6.15 Bushfire Risk Management

Much of the Project Site is mapped under the State Planning Policy Interactive Mapping System as Medium Potential Bushfire Intensity (Department of State Development, Infrastructure, Local Government and Planning, 2023). As such, bushfire hazard and risk management for the Project will include:

- use of firebreaks along the mine lease boundary and providing adequate setbacks between infrastructure and hazardous vegetation
- allowing access for fire-fighting and other emergency vehicles and maintaining access tracks to permit safe evacuation
- fuel reduction (e.g. slashing and woody vegetation control) within firebreaks implementing an Emergency Response Procedure prepared in consultation with emergency services.

6.16 Significant Impacts and Offsets

For MNES with the potential to be impacted by the Project, the significance of these potential impacts has been assessed against the EPBC Act Significant Impact Guidelines 1.1 (DotE, 2013). A detailed review of MNES including the outcome of impact assessment is provided as a standalone chapter in this EIS (**Chapter 21 Matters of National Environmental Significance**).

As discussed in Section 6.7 of this chapter, the following MSES that relate to terrestrial ecology are found within the Project Footprint:

- Regulated vegetation (Queensland Herbarium Certified (Aug 2024), refer Figure 6-5):
  - Prescribed REs that are listed Endangered and Of Concern under the VM Act
  - Prescribed REs within a Vegetation Management Wetland Area
  - Prescribed REs within the defined distance of a watercourse
- Protected wildlife habitat:
  - Bluegrass (*Dichanthium setosum*)
  - King Bluegrass (*Dichanthium queenslandicum*)
  - Ornamental Snake (*Denisonia maculata*)
  - Squatter Pigeon (*Geophaps scripta scripta*)
  - Koala (*Phascolarctos cinereus*)
  - Greater Glider (*Petauroides volans*)
  - Australian Painted Snipe (*Rostratula australis*)
  - Grey Falcon (*Falco hypoleucos*)
  - Short-beaked Echidna (*Tachyglossus aculeatus*)
- Connectivity areas (Queensland Herbarium Certified (Aug 2024), refer Figure 6-5)
- Waterways providing fish passage.

After all reasonable avoidance and on-site mitigation measures for the Project have been or will be undertaken (Section 6.12.1, 6.12.2 and 6.12.3 of this chapter), the Project may still impact on MSES. Therefore, the Significant Residual Impact Guideline prepared by the Department of the Environment and Heritage Protection (2014) has been used to determine the significance of the impact.

For this assessment, the impact areas associated with the Project will include:

- construction phase impacts associated with surface facilities, ancillary infrastructure and the IMG drainage network
- operational phase impacts associated with deeper depression areas subject to prolonged ponding (materialistic change to vegetation composition and habitat).

As detailed within Section 6.9.2.1, while vegetation within the modelled subsidence footprint may be subject to isolated loss of trees attributed to surface cracking, native vegetation is unlikely to result in materialistic change to vegetation composition and structure. As such, MSES regulated vegetation within the subsidence footprint (not including areas subject to ponding) has been excluded from the significant impact assessment.

It is important to note that the assessments are not to be used to determine if the Project requires assessment for potential impacts on MNES protected by the Commonwealth EPBC Act or if an offset would be required under that Act.

A significant impact was considered likely for impacts to the following MSES values:

- Regulated vegetation – endangered and of concern prescribed REs

- Regulated vegetation – prescribed REs within the defined banks of a vegetation management wetland
- Regulated vegetation – prescribed REs within the defined distance of a watercourse.

The full assessment against the Department of the Environment and Heritage Protection (2014) Significant Residual Impact Guideline is detailed in **Appendix C-1 Terrestrial Ecology Technical Report** of this EIS. A summary of predicted significant impacts to prescribed MSES within the Project Site is provided in Table 6-25.

Table 6-25 Maximum Predicted Significant Impacts on MSES

MSES	Description	Maximum predicted significant impact (ha)			Significant impact	Offset required
		Construction	Operation	Total		
Regulated vegetation (Endangered / Of Concern RE)[1]	**Endangered RE**	**30.7**	**10.93**	**41.62**		Yes
	RE 11.3.1	1.32	0.00	1.32	Yes	
	RE 11.4.8	27.62	9.22	36.84	Yes	
	RE 11.4.9	1.76	1.71	3.47	Yes	
	Of Concern RE	**18.95**	**9.48**	**28.43**		Yes
	RE 11.3.2	8.18	0.00	8.18	Yes	
	RE 11.3.4	6.95	0.00	6.95	Yes	
	RE 11.4.2	3.82	9.48	13.30	Yes	
Regulated vegetation (within the defined distance of a watercourse)[1]	**RE adjacent to watercourses**	**10.63**	**0.95**	**16.18**		Yes
	RE 11.3.1	0.01	0.00	0.01	No	
	RE 11.3.2	0.92	0.00	0.92	No	
	RE 11.3.4	1.70	0.00	1.70	No	
	RE 11.3.25	10.63	0.95	11.58	Yes	
	RE 11.4.2	0.22	0.00	0.22	No	
	RE 11.4.8	0.07	0.00	0.07	No	
	RE 11.5.3	1.68	0.00	1.68	No	
Regulated vegetation (within the defined distance of a wetlands)[1]	**RE adjacent to wetlands**	**2.15**	**0.00**	**2.15**		Yes
	RE 11.3.4	0.04	0.00	0.04	No	
	RE 11.3.27f	2.08	0.00	2.08	Yes	
	RE 11.5.3	0.03	0.00	0.03	No	
Connectivity areas[1]	Connectivity areas	116.48	45.47	161.96	Yes	Yes
Protected wildlife habitat	Squatter pigeon	73.1	40.5	113.6	Yes	Yes (MNES)
	Ornamental snake	332.0	54.2	386.2	Yes	Yes (MNES)
	Koala	84.0	52.3	136.3	Yes	Yes (MNES)

	Greater glider	34.5	4.1	38.6	Yes	Yes (MNES)
	Grey falcon	0.0	0.0	0.0	No	No
	Short-beaked echidna	0.0	0.0	0.0	No	No

[1] Calculations based on Queensland Herbarium certified mapping (as described in Section 6.3.3). Calculations relating to MSES regulated vegetation shown in **Appendix C-1 Terrestrial Ecology Technical Report** are superseded by the calculations shown above.

While mitigation and management measures for impacts on terrestrial ecology focus on maximising retention of vegetation across the underground mine footprint, offsets may be required for those areas where vegetation clearing is unavoidable, and in relation to fragmentation due to IMG management infrastructure and potentially from subsidence effects. On this basis, initial identification of offset requirements is based on offsetting of significant impact to regulated remnant vegetation within the Project Footprint.

The Project will be subject to the EPBC Act Environmental Offsets Policy and the Queensland Environmental Offsets Framework; where significant impacts to MNES are offset under the EPBC Act, offsets will not be duplicated under the State framework. BMA proposes to provide land-based offsets through a staged offset strategy which will be finalised at issue of the environmental authority (mining) for the Project and will be based on determination of actual clearing areas as mining and associated IMG management and subsidence progress. This staged offset strategy will be aligned to BMA's mine planning cycle to allow accurate identification of actual offsets required in each stage of mining. BMA currently conducts mine planning on a five-year cycle.

It is expected that the offsets may be staged as set out in **Appendix C-2 Offset Strategy** of this EIS.

A vegetation condition monitoring program with baseline performance targets will be conducted to support and inform this approach. This program will allow BMA to establish significant biodiversity values prior to clearing and subsidence and then, post subsidence; identify the net loss of values. This will be done on a five yearly cycle as set out in **Appendix C-2 Offset Strategy** of this EIS. As part of this program, BMA will establish the ecological equivalence of state significant biodiversity values prior to any disturbance to inform replacement of these values either through rehabilitation or land-based offsets.

6.17 Summary and conclusion

This chapter has assessed potential impacts on terrestrial ecological values protected under State and Commonwealth legislation. Outcomes of the assessment of MNES in accordance with the Significant Impact Assessment Guidelines 1.1 (Department of the Environment, 2013a) are provided in **Chapter 21 Matters of National Environmental Significance** of this EIS.

Although some areas of remnant vegetation remain intact, most have been modified to some extent by historical and current land management practices. The most common modification is the removal of the shrub and ground layers and replacement with pasture grass species to support grazing.

The following terrestrial flora and fauna values and Environmentally Sensitive Areas relevant to the Project include:

- vegetation communities of conservation significance
- the majority of the fauna habitat within the Project Site is generally of low conservation value
- some habitats such as the riparian zones and alluvial woodland act as a wildlife corridor and the oxbow wetland and the *Acacia harpophylla* (Brigalow) woodland with gilgai possess greater potential for supporting conservation significant fauna.

Flora

The ecological values of the Project Site are considered typical for the northern Bowen Basin with large areas of land historically cleared for grazing.

Systematic flora surveys were carried out for the Project Site during 2007, 2008, 2010 by SKM, and in 2016, 2017 and 2020 by AECOM. Flora surveys were undertaken using guidelines established by the Queensland Government. The aim of the flora study was to document the flora values with reference to the occurrence of conservation significant vegetation communities and species.

The flora survey identified a total of ten REs, including three listed as endangered, six listed as of concern and one listed as 'no concern at present' as per the Biodiversity Status. Of the 40 exotic species recorded during the vegetation surveys, 11 species were identified as being of management concern.

The literature review identified five flora species of conservation significance as potentially occurring in the Project Site. Of the five species, field surveys confirmed the presence of Bluegrass, which is listed as vulnerable under the EPBC Act. King Bluegrass was also identified as possibly being present given its similar habitat requirements to Bluegrass.

Surface infrastructure will be preferentially located within existing disturbed areas; where required, clearing will cause direct loss of some remnant native vegetation as well as fragmentation of some vegetation communities. Of the 1,220.35 ha of remnant vegetation communities occurring within the Project Footprint, 180.37 ha of remnant vegetation has the potential to be impacted by the maximum extent of surface disturbance during construction, including surface infrastructure (120.55 ha) and IMG infrastructure (59.82 ha). During life of mine operations, up to 53.05 ha of remnant vegetation may be impacted by maximum modelled extent of ponded areas in the subsided landscape; however, minor remedial works will establish a permanently free-draining landform in areas of persistent ponding.

Outside the direct disturbance footprint, subsidence may impact landscape including instability and surface cracking affecting isolated canopy trees, which is unlikely to materially impact that remnant status or habitat values associated with this native vegetation (including threatened species and ecological communities).

Disturbance to key biodiversity values including endangered and of concern REs will be avoided and managed wherever possible. However, it is inevitable that some remnant native vegetation will be lost, and offsets are proposed in accordance with the Queensland Environmental Offsets Framework (and the EPBC Act Environmental Offsets Policy for MNES). A significant impact was considered likely for impacts to the following MSES values:

- regulated vegetation – endangered and of concern prescribed REs
- regulated vegetation - prescribed RE within a mapped wetland
- regulated vegetation – prescribed REs within the defined distance of a watercourse.

Fauna

Fauna surveys were conducted by SKM in 2007, 2009, 2010 and 2011. Supplementary fauna assessments were undertaken by AECOM in 2016, 2017 and 2020. The aim of the fauna surveys was to document the terrestrial vertebrate fauna and habitat, with reference to the occurrence of conservation significant fauna and to undertake an assessment of potential impacts.

A comprehensive literature review was undertaken prior to field survey to assist in targeting survey effort. Systematic fauna surveys were then conducted using methods including trapping, systematic searches, animal call recording and incidental sighting.

The desktop and field studies identified a total (including exotic fauna) of 188 fauna species as occurring within the Project Site. This includes 117 bird, 33 mammal, 14 amphibian and 24 reptile species. Eleven conservation significant species were identified during ecological surveys including six conservation significant species, one special least concern species and four migratory species (also listed as special least concern). The literature review identified a further four species listed as threatened or migratory under the EPBC Act and or the NC Act as potentially occurring within the Project Site due to the availability of suitable habitat.

A total of 2,022.81 ha of Essential Habitat is mapped for two conservation significant fauna species (consisting of Squatter Pigeon) (Southern) and Ornamental Snake) within the Project Site.

The BPA for the Brigalow Belt Bioregion identifies the following wildlife corridors within the Project Site:

- Boomerang Creek riparian ecological corridor (state and regional significance); and
- riparian ecological corridors of regional significance associated with:
  - Plumtree Creek and Hughes Creek
  - One Mile Creek
  - Phillips Creek
  - Downs Creek.

These wildlife corridors provide east–west fauna movement opportunities through the landscape and provide suitable habitat for a range of fauna species.

Available habitats within the Project Site were generally degraded by land clearing, introduced pasture grasses and grazing. Nine habitat types were defined; River Red Gum Riparian Woodland, *Eucalyptus* and/or *Corymbia* Open Woodland, Dawson Gum and Brigalow Woodland, Brigalow or Belah Woodland, Oxbow Wetland, Natural Grasslands, Modified Grasslands, Shrubby Brigalow regrowth with gilgai and dams.

Impacts on native animals using the site will include habitat loss and fragmentation from clearing associated with development of surface infrastructure and IMG network, as well as disturbance to animals using remnant habitat from noise, light and general activity and possible mortality during vegetation clearing or from vehicle strike. Mitigation measures are proposed to address these impacts and will be effective in avoiding or minimising impacts.

During the operational phase of the Project, some habitat modification may also occur due to subsidence within areas subject to longwall mining; however, localised topography and surface cracking are unlikely to result in substantial change in habitat values present. Most fauna species using the site are generally resilient to disturbance and do not have highly specialised habitat requirements, and so these animals will be able to adapt to these habitat changes and utilise adjacent similar habitat. Where areas containing deeper depressions may be subject to prolonged ponding, minor remedial drainage works are proposed to ensure a permanently free-draining landform. Based on the maximum modelled extent of habitat loss anticipated from clearing and ponding, the Project has potential to have a significant impact on four conservation significant fauna species:

- Koala
- Ornamental Snake
- Greater Glider
- Squatter Pigeon (Southern).

Species-specific mitigation measures and offsets will be required to mitigate significant impacts to these species.

Offsets are proposed where significant impacts to threatened fauna are likely in accordance with the Queensland Environmental Offsets Framework and the EPBC Act Environmental Offsets Policy for MNES. In addition, subsidence management and rehabilitation will include a focus on retaining riparian corridors to provide opportunities for fauna dispersal.

Environmentally sensitive areas

The review of ESAs determined that there are no Category A ESAs or Category C ESAs within the Project Site; however, they do occur within 100 km of the Project Site. Category B ESAs occur within the Project Site and within 100 km of the Project Site. Three Endangered REs are present within the Project Site. Three ERE comprising 261.60 ha exists within the Project Footprint with potential to be directly impacted by surface infrastructure/IMG network (49.83 ha) and ponding areas (12.53 ha) with 211.77 ha potentially attributed to indirect impacts. Mitigation measures are presented to reduce potential impacts to ESAs.

MSES values are found within the Project Site and may be affected by the Project. After all reasonable avoidance and on-site mitigation measures for the Project have been or will be undertaken, an impact on MSES is still likely to result. Therefore, the Significant Residual Impact Guideline prepared by the

Department of the Environment and Heritage Protection (2014) was used to determine the significance of the impact. The outcome of these assessments was that significant impacts are expected for the following MSES:

- Regulated vegetation – endangered and of concern prescribed REs
- Regulated vegetation – prescribed REs within the defined distance of a watercourse
- Connectivity areas.

Offsets will be required to mitigate significant impacts to these MSES. The Project's proposed offset strategy to mitigate significant impacts to terrestrial ecological values are outlined in **Appendix C-2 Offsets Strategy** of this EIS.