BHP Mitsubishi Alliance

Saraji Mine – Grevillea Pit Continuation

Grevillea Pit Continuation

Preliminary Documentation (EPBC 2023/09757)

Status: Final
Date: 01/04/2026

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Terms Abbreviations and Acronyms

Term	Definition
AEP	Annual exceedance probability
ALA	Atlas of Living Australia
BMA	BM Alliance Coal Operations Pty Ltd
BoM	Bureau of Meteorology
CHPP	Coal handling and preparation plant
CQCA JV	Central Queensland Coal Associates Joint Venture
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australian Government)
DEM	Digital elevation model
DESI	Department of Environment, Science and Innovation (Queensland Government)
DRDMW	Department of Regional Development, Manufacturing and Water (Queensland Government)
DTW	Depth-to-water
EA	Environmental Authority
EMS	Environmental Management System
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Australian Government)
ERA	Environmentally relevant activities
ESD	Ecologically sustainable development
FRREMP	Fitzroy Basin Regional Receiving Environment Monitoring Program
FTE	Full time equivalent
FY	Financial year
GBR	Great Barrier Reef
GDE	Groundwater dependent ecosystem
GL	Gigalitres
ha	hectares
HVR	High value regrowth
IESC	Independent Expert Scientific Committee on Unconventional Gas Development and Large Coal Mining Development

Term	Definition
km	kilometres
km / hr	kilometres per hour
km^2	square kilometres
LGA	Local government area
LoO	Likelihood of occurrence
MAW	Mine affected water
mbgl	metres below ground level
mbcm	Million bank cubic metres
MIA	Mine infrastructure area
ML	Mining Lease
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
Mt	Million tonnes
Mtpa	Million tonnes per annum
NUMA	Non-use management area
PDM	Peak Downs Mine
PEST++	PEST++ refers to a software package and to a suite of utility programs which supports groundwater modelling
PMF	Probable maximum flood
PMLU	Post-mining land use
PMST	Protected matters search tool
PRCP	Progressive Rehabilitation and Closure Plan
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
REMP	Receiving Environment Monitoring Program
ROM	Run-of-mine
SRM	Saraji Mine

Term	Definition
SRMS	Scaled Root Mean Square error
TEC	Threatened ecological community
TERN	Australian Terrestrial Ecosystem Research Network
TGDE	Terrestrial groundwater dependent ecosystem
TLF	Train load-out facility
UWIR	Underground Water Impact Report
VWP	Vibrating Wire Piezometer
Water EPP	Queensland *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*
WBM	Water balance model
WMS	Water management system
WQO	Water quality objective

1 Introduction

This Preliminary Documentation Report has been prepared in support of the environmental approvals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the proposed action, the Grevillea Pit Continuation Project (the Project).

The Project proposes to continue the footprint of the existing Grevillea Pit at the Saraji Mine (SRM). The SRM is owned and operated by BM Alliance Coal Operations Pty Ltd (BMA) on behalf of the Central Queensland Coal Associates Joint Venture (CQCA JV) and is located approximately 25 kilometres (km) northeast of Dysart in the Bowen Basin, Queensland (refer ***Figure 1-1***).

The SRM is an open cut mine that has been in operation since 1974. The mining operation uses dragline and truck / shovel equipment to supply hard coking (steel making/metallurgical) coal product for the export market. The SRM is located primarily within Mining Lease (ML) 1775 and ML 1782, with industrial infrastructure located primarily within ML 1784 and ML 70142. Existing infrastructure includes the coal handling and preparation plant (CHPP) and associated infrastructure, train load-out facility (TLF) and rail infrastructure, tailings storage facilities, coal stockpiles, water management infrastructure (e.g., mine water dams, raw water dams, sediment dams, and drains) and supporting infrastructure (i.e., roads, powerlines, laydown area, workshops and offices). There are also currently eight (8) pits across two MLs at SRM – Acacia, Bauhinia, Coolibah, Dogwood and Jacaranda within ML 1775, and Ebony, Hakea and Grevillea within ML 1782. The proposed action is to maintain the SRM mining operations by continuing the footprint of the existing Grevillea Pit beyond ML 1782 into ML 700021 and utilise existing infrastructure within adjacent tenures. The Project area is defined as the ML 700021 boundary for the purpose of this Preliminary Documentation Report (refer ***Figure 1-2***).

The operations at the SRM, inclusive of the Project (the proposed action), are pursuant to the conditions of Environmental Authority (EA) EPML00862313 issued by the Queensland Government Department of Environment, Tourism, Science and Innovation (DETSI).

The Project was referred to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 21 December 2023 (EPBC 2023/09757) for assessment under the EPBC Act. The delegate of the Minister for the Environment determined on 4 June 2024 that the Project was a Controlled Action with the following controlling provisions:

- Listed threatened species and communities (section 18 and section 18A); and
- A water resource, in relation to coal seam gas development and large coal mining development (section 24D and section 24E).

The Minister's delegate determined the proposed action will be assessed by Preliminary Documentation. The information required for the Preliminary Documentation assessment was provided by the Minister's delegate and is included in ***Appendix A***.

The Grevillea Pit Continuation in the context of other Projects locally is shown in ***Figure 1-1*** and ***Figure 1-3***.

1.1 Information Request

This Preliminary Documentation Report and supporting technical reports provide information for DCCEEW to make an assessment of the potential impacts to Matters of National Environmental Significance (MNES). ***Table 1-1*** identifies where the information requested by the Minister's delegate is contained within this Preliminary Documentation. A detailed cross-reference table is included in ***Appendix B***.

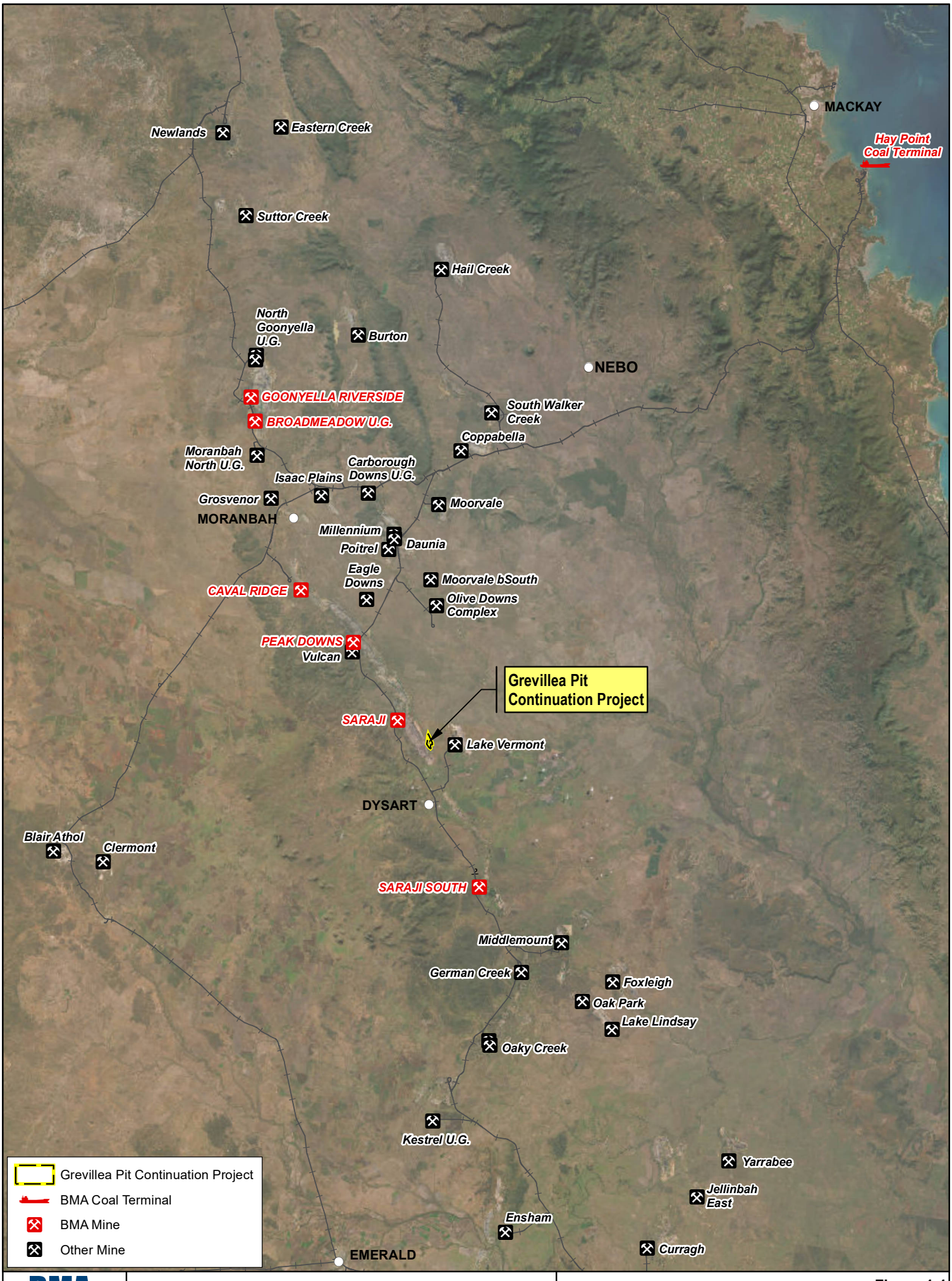

Figure 1-1

PROJECT LOCATION (Context)

PRELIMINARY DOCUMENTATION

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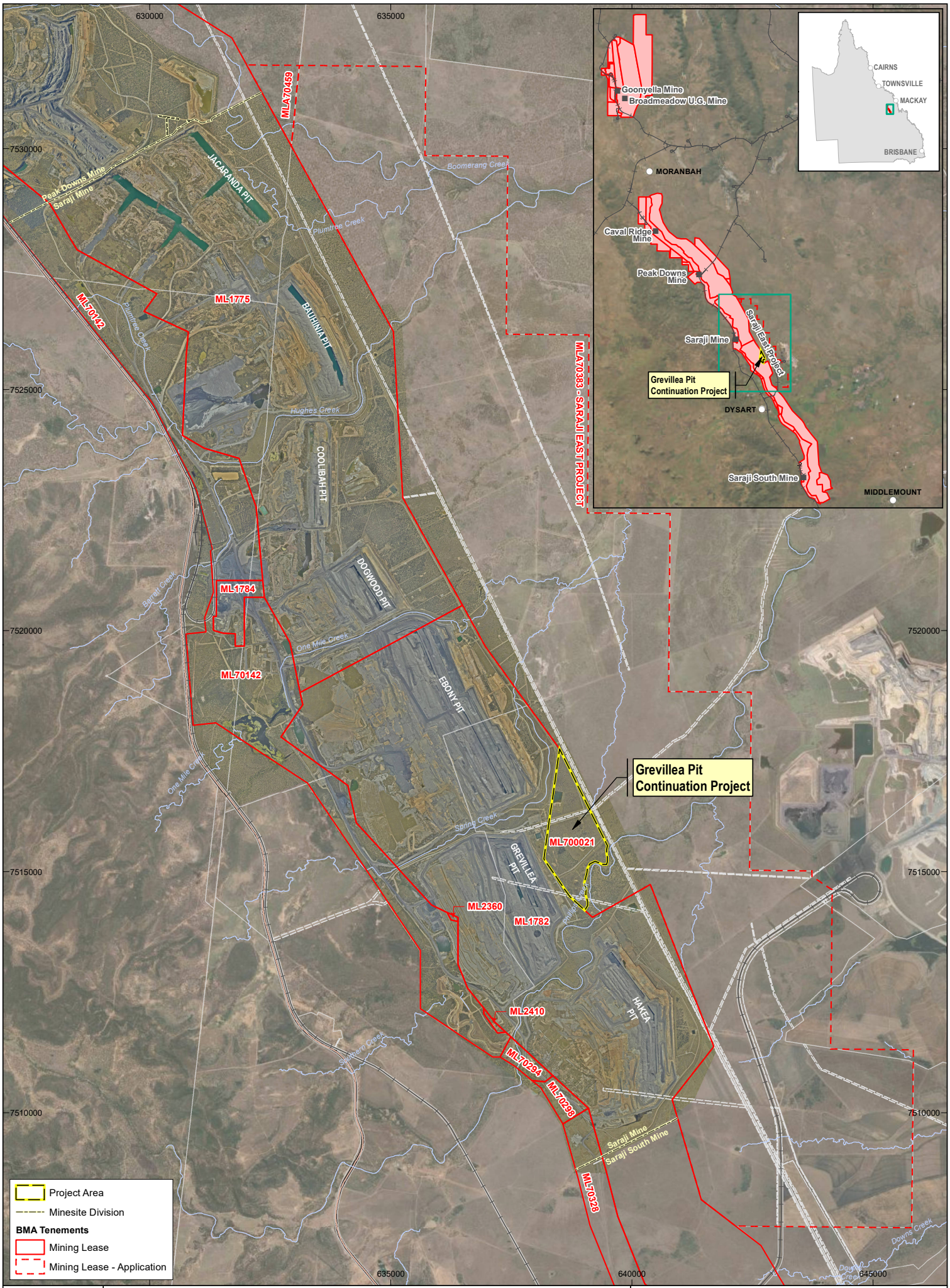
Checked: H. Silcox	Filename: 20250929-4.mxd

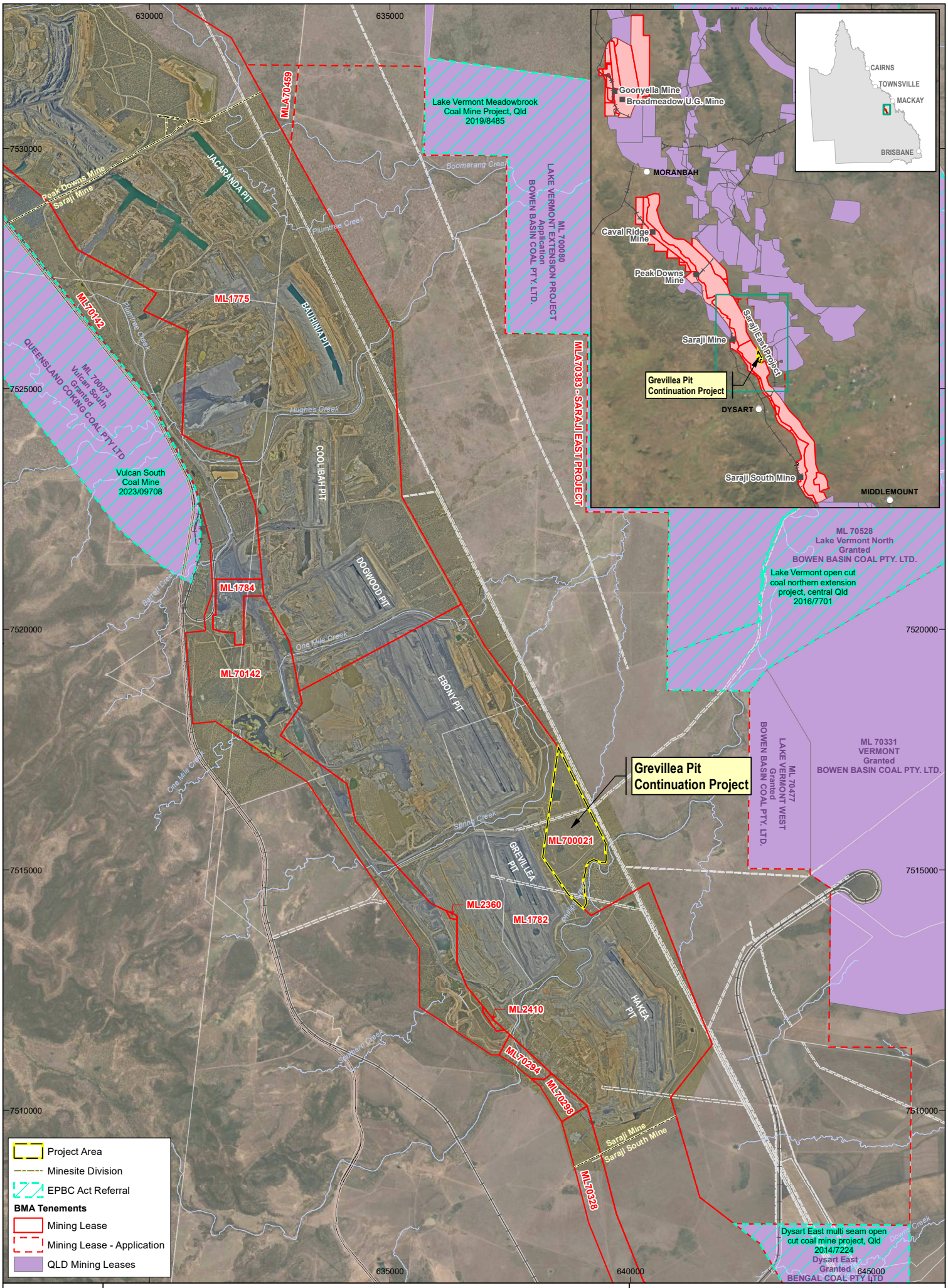


BMA
BHP Mitsubishi Alliance
Geospatial Team
Brisbane

0 1 2 Kilometers
GDA 1994 MGA Zone 55
Transverse Mercator

Figure 1-2
PROJECT LOCATION

Drawn: B. Lang	Date: 7/10/2025	Revision: 1
Checked: H. Silcox	Filename: 20250929-4a.mxd	



BMA
BHP Mitsubishi Alliance
Geospatial Team
Brisbane

0 1 2 Kilometers
GDA 1994 MGA Zone 55
Transverse Mercator

Figure 1-3
PROJECT CONTEXT

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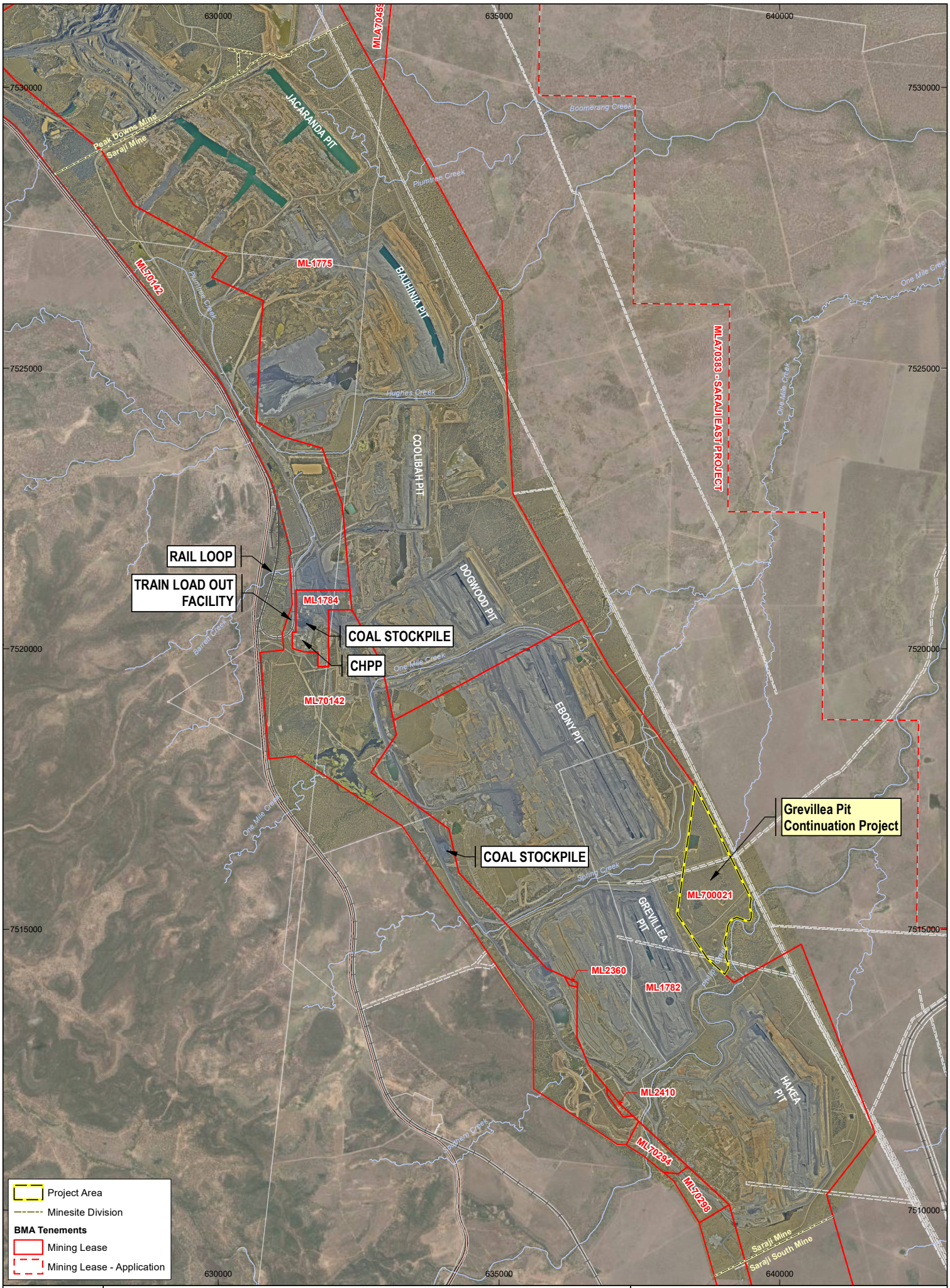
Checked: H. Silcox	Filename: 20250929-4b.mxd	



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0 1 2 Kilometers
GDA 1994 MGA Zone 55
Transverse Mercator

Figure 1-4
EXISTING INFRASTRUCTURE AT SARAJI MINE

Drawn: B. Lang	Date: 7/10/2025	Revision: 1
Checked: H. Silcox	Filename: 20250929-4c.mxd	

Table 1-1: Preliminary Documentation Cross Reference

Further Information Requirement	Preliminary Documentation	Supporting Documentation
Description of the Action	*Section 2*	-
Habitat Assessment	*Section 3*	*Appendix D*
Impact Assessment	*Section 3* *Section 4*	*Appendix D* *Appendix E* *Appendix F* *Appendix H* *Appendix K*
Avoidance, Mitigation and Management Measures	*Section 5*	*Appendix D* *Appendix E* *Appendix F* *Appendix H* *Appendix J*
Rehabilitation Requirements	*Section 6*	*Appendix C* *Appendix L* *Appendix M*
Offsets	*Section 8*	*Appendix I*
Ecologically Sustainable Development (ESD)	*Section 9*	-
Economic and Social Matters	*Section 10*	-
Environmental Record of the Person Proposing to take the Action	*Section 11*	-

2 Description of the Action

2.1 Regional and Local Setting

The Project is located approximately 25 km northeast of the Dysart township in Central Queensland, within the Northern Brigalow Belt bioregion (***Figure 1-1***).

The Project is positioned directly east of ML 1782 where current SRM mining operations are occurring, and is bordered by Spring Creek in the north, Phillips Creek in the south, and power easements for 132kV/66kV electrical transmission lines to the east (***Figure 1-2***). The Project area includes areas which have been historically disturbed from land use activities including agricultural and grazing uses and are currently disturbed by ancillary mining activities (e.g., access roads and tracks, equipment laydown areas and mine water storage areas), as well as areas which are relatively undisturbed.

Further detailed description of the Project regional and local setting is provided in ***Sections 4.2.2***, ***4.3.2*** and ***4.4.1.1***.

2.2 Project Background

The SRM has been in operation since 1974 and currently extracts approximately 16 million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal.

As a result of identifying efficiencies in mine sequencing and planning, mining activities at the SRM are currently scheduled to reach the limit of the existing Grevillea Pit during FY2025. The Project will maintain the mine's operations for approximately 30 years, up to FY2055, protecting jobs and royalties into the future. Exploration activities will be ongoing for the life of the mine.

Specifically, the Project is to continue the footprint of the existing Grevillea Pit eastward beyond ML 1782 into ML 700021 and use the existing SRM supporting infrastructure such as access tracks, internal power supply equipment, and water management infrastructure (***Figure 1-4***:). The project design includes ongoing use of the existing infrastructure and processes (such as the Water Management System (WMS)) which have been assessed as capable of supporting the Project in their current form. Accordingly, the proposed action does not include associated activities and supporting infrastructure outside of ML 700021.

Prior to the Project commencing, the SRM will continue to carry out authorised activities within ML 700021 in accordance with existing or future State and Commonwealth government approvals. These activities are associated with the existing SRM operation and include access tracks, internal power supply infrastructure, survey and demarcation activities, water management infrastructure associated with the existing SRM, exploration activities, works relating to the management or salvage of Aboriginal heritage items, and installation of monitoring equipment.

The Project components, disturbance and timeframes outlined in the EPBC Act Referral Submission remain unchanged at the time of the advertisement and submission of this Preliminary Documentation Report.

2.2.1 SRM Environmental Authority and Progressive Rehabilitation and Closure Plan

The SRM currently operates in accordance with EA EPML00862313 (refer ***Appendix C***) which was amended in 2017 to include the area associated with the Project. The amended EA includes the following Environmentally Relevant Activities (ERAs):

- Schedule 3, ERA 13 – Mining Black Coal
- Ancillary ERA 8 – Chemical Storage
- Ancillary ERA 31 – Mineral Processing
- Ancillary ERA 60 – Waste Disposal
- Ancillary ERA 62 – Resource Recovery and Transfer Facility Operation; and
- Ancillary ERA 63 – Sewage Treatment.

The EA establishes conditions relating to aspects of:

- Overall prevention and/or minimising likelihood of environmental harm.
- Monitoring and reporting (including notifications to Regulators).

- Air quality (particularly odour and dust).
- Noise and vibration.
- Waste management.
- Land management (including topsoil treatment, rehabilitation requirements, closure management).
- Water management (including contaminants, mine affected water (MAW) releases, reuse).
- Structures (including design and construction requirements, operation, certification, storage allowance, decommissioning).
- Sewage treatment.
- Groundwater monitoring and bore construction.

A copy of the current SRM EA is provided in ***Appendix C***.

A Progressive Rehabilitation and Closure Plan (PRCP) has been submitted and approved by DETSI for the broader SRM operation and includes the Project. Refer to ***Section 6.1*** for further information.

Under the *Water Act 2000*, an Underground Water Impact Report (UWIR) has been prepared for ML 700021 and has been submitted to DETSI for approval. Refer to ***Section 5.2.2*** for further information on the UWIR and relevance to this Project.

2.3 Project Area

The Project area in which the proposed action will occur, encompasses approximately 220 hectares (ha) and comprises the entirety of ML 700021. The entire Project area has the potential to be directly impacted, therefore, the total disturbance footprint is also approximately 220 ha. While the Project will be confined to the boundary of ML 700021, existing SRM infrastructure within adjacent MLs will also be utilised as part of the Project and as part of the wider SRM operation.

The Project area is directly adjacent (east) of ML 1782 where current SRM mining operations are occurring. The Project area is bordered by Spring Creek in the north, Phillips Creek in the south, and power easements for 132kV/66kV electrical transmission lines to the east. The Project area and disturbance footprint coordinates are provided in ***Table 2-1*** and outlined on ***Figure 2-1***.

The Project area is located within a region which has historically been intensively utilised for cattle grazing, crop cultivation and mining activities. The Project area and near surrounds includes areas which are currently disturbed by mining activities (e.g. roads and tracks, exploration pads, equipment laydown areas and mine water storage areas), areas which have sustained historical land use activities, such as agriculture, as well as areas which are relatively undisturbed.

Distinct from the Project area, the Study area for each technical assessment differs according to the areas or zones of potential impact and is defined within each technical report and the corresponding section of this Preliminary Documentation Report.

Table 2-1: Project Area Coordinates[1]

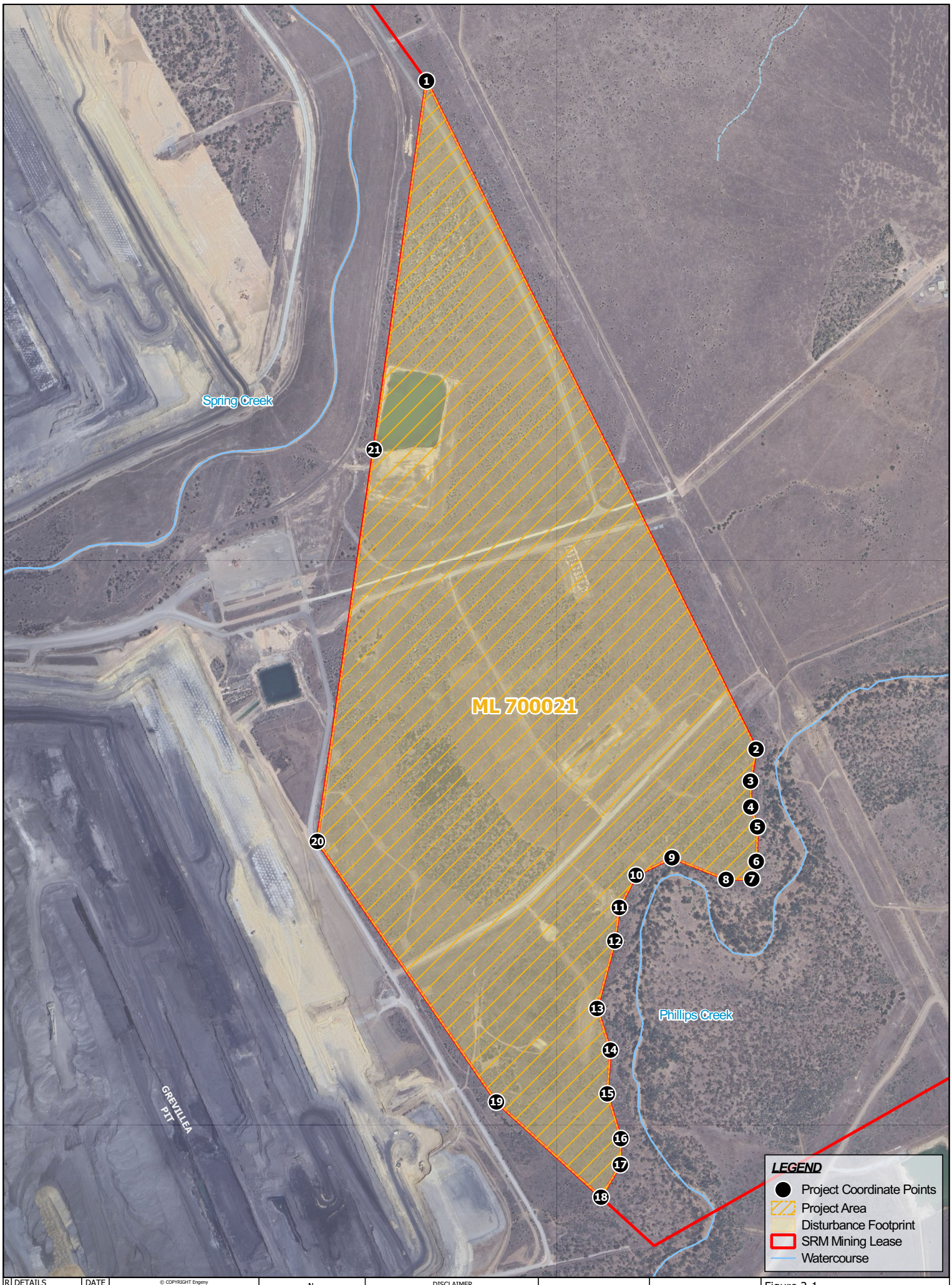
ID	Latitude	Longitude
1	-22.4428	148.3459
2	-22.4608	148.3557
3	-22.4617	148.3555
4	-22.4624	148.3556
5	-22.4629	148.3558
6	-22.4638	148.3557

[1] Coordinate system GDA94 / MGA zone 55

ID	Latitude	Longitude
7	-22.4643	148.3556
8	-22.4643	148.3549
9	-22.4638	148.3533
10	-22.4642	148.3522
11	-22.4651	148.3518
12	-22.466	148.3516
13	-22.4679	148.3511
14	-22.469	148.3515
15	-22.4702	148.3515
16	-22.4714	148.3519
17	-22.4721	148.3519
18	-22.473	148.3513
19	-22.4704	148.3482
20	-22.4634	148.3429
20	-22.4634	148.3429
21	-22.4528	148.3445

2.3.1 Project Alternatives and Design

The location and extent of the Project is constrained by the underlying coal resource. Subsequently, opportunities to avoid impacts, relocate to an alternative location or minimise the Project extent are limited. The Project has achieved avoidance of Phillips Creek and the associated riparian corridor which was found to have higher ecological values during terrestrial ecology field survey effort and assessment (refer to ***Section 3.1*** to ***3.2*** and ***Appendix D***). Strategic project design has incorporated a setback of 100m – 150m between the southern Project area boundary and Phillips Creek and associated riparian corridor. This has ensured that no direct impacts on these comparatively higher adjacent values, will occur as a result of the Project (as discussed in detail throughout this report).



R	DETAILS	DATE
1	Draft Issue	05-06-24
2	Final Issue	27-09-24

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APPROVED	TI	DATE	27-09-24

NOTES:

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GDA94 / MGA Zone 55

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DATA SOURCE
QLD Government Open Data Source

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BHP Mitsubishi Alliance

Figure 2-1

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Preliminary Documentation
Project Area and Disturbance Footprint

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2.4 Project Overview

The Project overview is shown on ***Figure 2-2*** and key elements of the Project are summarised in the following subsections.

2.4.1 Mining Activities

The Project is estimated to extract approximately 55 million tonnes (Mt) ROM coal. The Project will not increase the annual product tonnage output from the SRM, but rather will sustain the current operations of the mine by enabling the Grevillea Pit to continue beyond the current ML1782 boundary and into ML 700021.

The Project will be incorporated into the SRM and will use the existing mine infrastructure and operational and maintenance approaches.

The key elements of the Project are listed below:

- Continuation of vegetation clearing, the removal and stockpiling of topsoil material, drilling and blasting of overburden and interburden material.
- Continuation of open cut mining (dragline, truck and shovel/excavation methods) of ROM coal from the coal measures to the east beyond the current ML 1782 from FY25.
- Continued use of existing SRM infrastructure (e.g., CHPP, ROM and product stockpiles, TLF, WMS, maintenance equipment and other supporting infrastructure) (***Figure 1-4***).
- Continued disposal of rejects and tailings in accordance with the EA.
- Construction and operation of new or relocated infrastructure associated with the proposed action within ML 700021 to facilitate and/or support the continuation of open cut mining (detailed further below under ***Section 2.4.2***).
- Continuation of overburden and interburden material removal (dragline and truck and shovel/excavator methods) to uncover coal, which is placed as back fill in the mined-out pits (in-pit spoil dumps) as mining advances.
- Ongoing exploration activities within ML 700021.
- Progressive rehabilitation of disturbed areas.

2.4.2 Mine Infrastructure

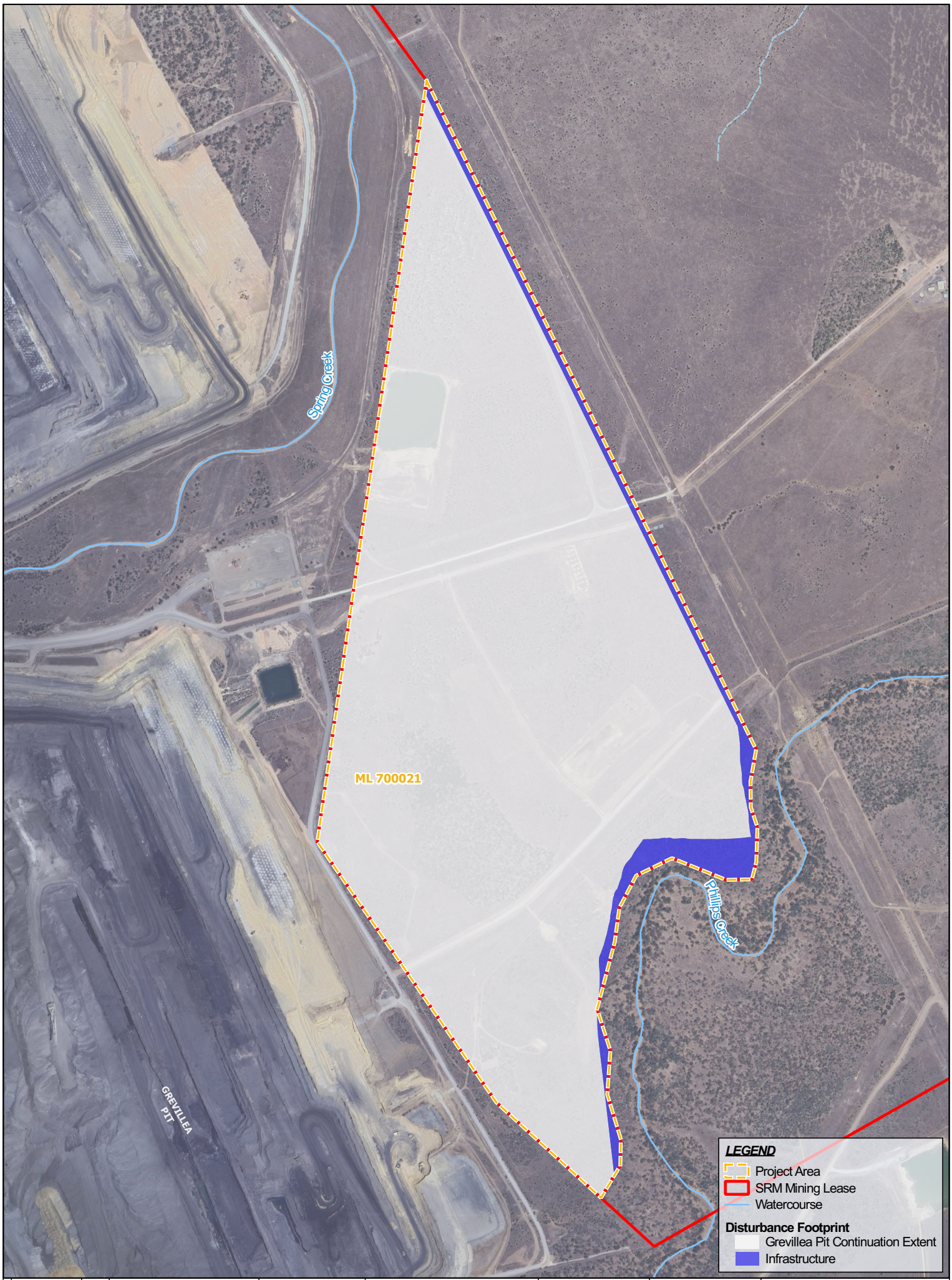
Processing and loading of the coal will occur within the already existing facilities in the SRM mine infrastructure area (MIA), located within ML 1784 (see ***Section 2.6***). Key mine infrastructure currently within ML 700021 will also be utilised. This includes:

- Mine access roads and borrow pits.
- Electrical infrastructure including 66kv overhead power lines and substations.
- Water management infrastructure such as dams, drains and pipelines.
- Earth-moving-equipment build pad.
- Flood protection levees.

Over the life of the SRM, the key mine infrastructure within ML 700021 will likely include but is not limited to:

- Haul roads (heavy vehicles), light vehicle roads and access roads including parking lots.
- Pit infrastructure such as floors, walls, benches, ramps and access roads and spoil stockpiles.
- Flood protection levees.
- Water management infrastructure such as dams, drains and pipelines.
- Relocated earth-moving-equipment build pad and supporting infrastructure.
- Electrical infrastructure including new or realigned stub lines and substations.

During pit progression, infrastructure will be maintained and relocated as required to support the mine operations within ML 700021. A 50m – 100m lead on the high wall will remain to enable positioning of this support infrastructure up to the completion of mining in the pit.



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1	Final Issue	30-09-24

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APPROVED	RK	DATE	30-09-24

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DATA SOURCE
QLD Government Open Data Source

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BMA
BHP Mitsubishi Alliance

Figure 2-2

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Preliminary Documentation
Project Overview

Drg Ref.

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2.5 Mine Planning and Design

2.5.1 Mining Method

The mining method utilised for the Project will be consistent with the current operations at the SRM, i.e., open cut mining methods utilising dragline and truck/shovel equipment. This is a proven mining method at the SRM that operates efficiently with resource geometry and offers operational flexibility. Operations will continue to run seven (7) days per week on a 24-hour basis. As the Project is a continuation of the existing SRM operations, there are no distinct construction and operation phases for the Project.

Mining activities commence with vegetation clearing and topsoil stripping. In general, topsoil is stripped using earthmoving equipment and relocated using front end loaders, trucks and/or scraper fleet, and will be stockpiled in preparation for progressive rehabilitation behind the active dumps. Direct respread will be the preferred method, where practical, to minimise topsoil handling, which reduces loss of viability from damage to soil structure and propagules.

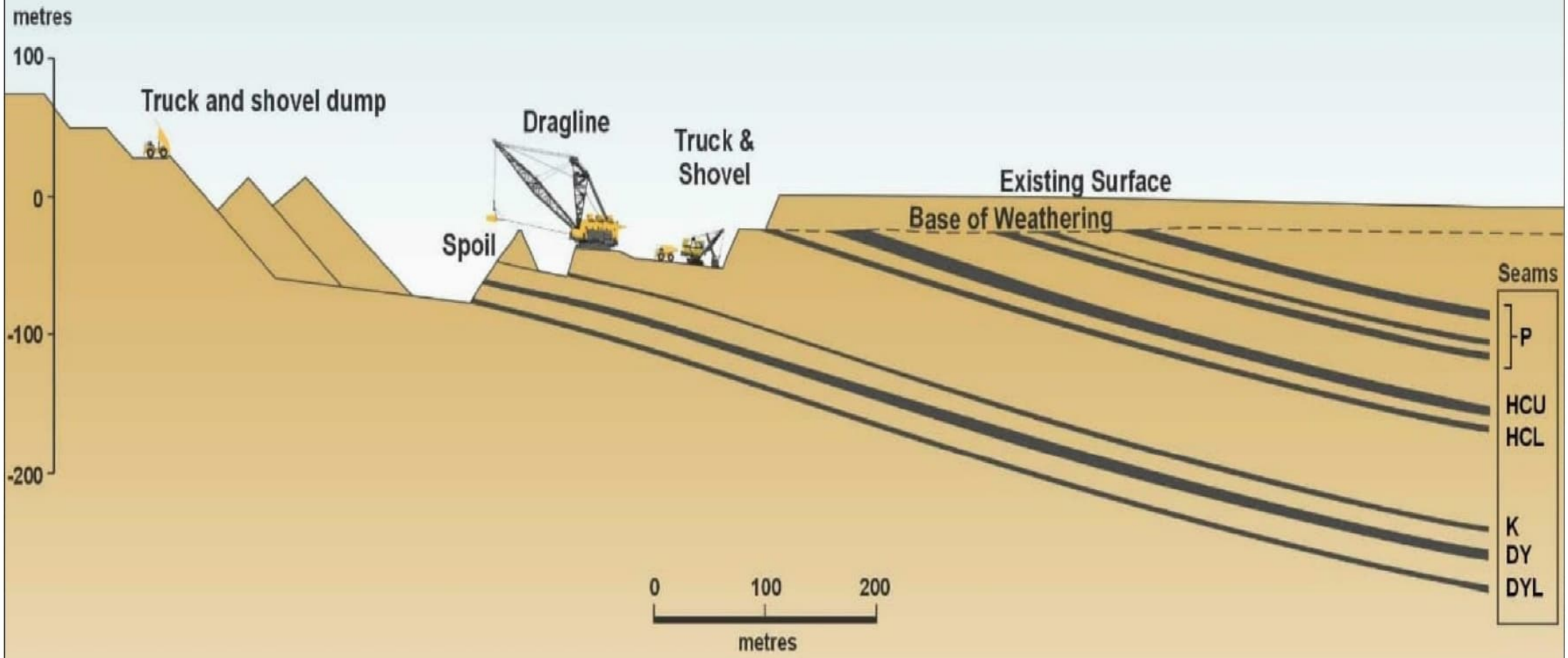
Following topsoil stripping, drilling and blasting will be undertaken to assist in removal of overburden and interburden material. The removal of overburden will continue as per current methods by utilising a combination of truck/shovel fleets, dozers and draglines. Initially, overburden will be primarily removed using truck/shovel fleets. In deeper extents of the pit, overburden material will be removed using draglines. In general, excavated waste material will be placed in mined out voids to the west of active strip as mining operations progress down dip to the east.

The SRM operates and maintains existing ROM stockpiles, CHPP and TLF (***Figure 1-4***:). Coal from the existing Grevillea Pit is currently loaded into rear dump trucks and hauled along a network of mine haul roads located west of the deposit to the existing CHPP for beneficiation. All coal mined as part of the Project will be processed through the existing CHPP located within ML 1784, per existing operations.

The strip-mining technique currently in practice at the SRM will continue for the Project. The strips will be constructed in a north-west / south-east direction along the strike of the coal seams, with pit development progressively working eastwards down dip. The angle of the high wall will be dependent on the nature of the high wall materials and geotechnical conditions. A Coal ramp will extend into the active pit with the surface haul roads connecting to the ROM stockpiles.

The number of strips opened at any given time depends on the coal production schedule and equipment productivity requirements. Coal mining of upper and lower seams will continue to use a combination of excavators and loaders. Once the coal has been exposed, it is loaded by excavators and loaders into trucks for hauling on the network of haul roads to the ROM coal stockpiles. The ROM coal will then be screened, crushed and stored in the raw coal stockyard for processing. Reject material from coal handling and preparation is mixed with dewatered tailings and co-disposed with spoil in in-pit spoil dumps. Final dumps are then capped with clean spoil material. The product coal from the CHPP is stockpiled onsite prior to being transported to the TLF for rail out to the Hay Point Coal Terminal, south of Mackay in Central Queensland and/or Abbot Point Coal Terminal. An aerial image of the operating Grevillea Pit is shown in ***Figure 1-2*** and a schematic of the mining process at the SRM is shown in ***Figure 2-3***.

GREVILLEA PIT CONTINUATION
TYPICAL MINING SECTION



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NOTES:

SCALE AS SHOWN IN FIGURE

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DATA SOURCE
Saraji Mine Grevillea Pit Continuation Project EPBC Referral Attachment B - Proposed Action Description

ENGENY

BMA
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Figure 2-3

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Preliminary Documentation
Grevillea Pit Continuation - Typical Mining Section

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2.5.2 Mine Sequence and Production Schedule

The Project will enable the mining of approximately 55 Mt of ROM coal reserves over approximately 30 years. The Project will not increase the annual product tonnage output from the SRM, but will sustain the current operations of the mine by enabling the Grevillea Pit to continue beyond the current ML 1782 boundary and into ML 700021.

2.5.3 Water Management

The Project will be integrated into the existing SRM WMS. The WMS at SRM is designed to manage the potential environmental risks and impacts of the mining activities on the receiving environment. The water management system has been designed in accordance with BMA's MAW and Erosion and Sediment Control (ESC) Standard (the Standard). The Standard details the basis and application of ESC and MAW control measures across all BMA Queensland operations. The Standard details the legislative context and guidelines for planning, design, construction, operations and maintenance of drainage and sediment control structures.

Appendix J shows the SRM Water Management Plan and SRM Erosion and Sediment Control Plan that will be updated to incorporate the Project area activities.

The SRM WMS is managed by pump and pipeline water infrastructure that dewaters active mining pits through transfer storages to primary water storages. Water is then used to:

- Supply water to the CHPP (from mine dewatering and recover of water from the tailings dam)
- Supply water for dust suppression; and
- Undertake mine water releases in compliance with the SRM EA conditions.

Erosion and sediment control measures are also implemented as part of the WMS. Water management infrastructure such as dams, drains and pipelines will be relocated within ML 700021 as the pit advances ahead of pit progression.

A comprehensive description of the SRM WMS is given below in ***Section 4.2.3***.

2.5.4 Mine Waste Production and Spoil Management

The SRM is expected to produce in the order of 431 million bank cubic metres (mbcm) of overburden / interburden material. Overburden / interburden will be backfilled into the mined-out pit areas where practicable or placed onto existing SRM dumps and rehabilitated as part of the SRM site-wide strategy. There is currently one out-of-pit overburden dump west of the existing Jacaranda Pit, no new out of pit dumps are proposed as part of the Project.

Overburden material will be mined and spoiled within the existing Grevillea Pit in a conventional in-pit dump configuration. Estimates of waste production by horizon have been provided in ***Table 2-2***.

Table 2-2: Overburden and Parting Volumes

Parameter	Unit	Target Seams				Total
		Dysart	Harrow	P Seam	Uppers	
Overburden Volume	Mbcm	-	-	-	236	236
Interburden Volume	Mbcm	5	50	107	-	162
Dragline Volume	Mbcm	33	-	-	-	33
Total Volume	Mbcm	38	50	107	236	431

For the Project, most of the waste movement will occur in the pre-strip horizons using conventional loading units (excavators or electric shovels) with large rear dump trucks to haul into the spoil dumps. The lower extents of the pit will be mined utilising draglines (per ***Figure 2-3***). Coarse reject (non-tailings) will be hauled via rear dump truck into the existing mine waste in-pit dumps across the SRM site.

Appendix J shows the SRM Waste Management Plan that will be updated to incorporate the Project area activities.

2.5.5 Mining Equipment

Initially, the mining equipment/fleet currently utilised at the SRM will continue to be used and maintained for the Project, using open cut mining methods utilising dragline and truck/shovel equipment.

Mining activities commence with vegetation clearing and topsoil stripping. In general, topsoil is stripped using earthmoving equipment and handled using dozers, front end loaders, trucks and/or scraper fleet.

Drilling and blasting operations will continue as per current methods at the SRM to support the Project for overburden, interburden and coal removal to enable the shovels/excavators and draglines to work effectively. The removal of overburden and interburden will continue as per current methods by utilising a combination of truck/shovel/excavator fleets and draglines.

2.5.6 Blasting

Blasting operations will continue for the Project as currently executed at the SRM. The storage, transportation and use of explosives will be in accordance with Australian Standard AS 2187.2-2006 Explosives - Storage and use - Use of explosives, the *Explosives Act 1999*, BMA's policies and procedures, the SRM EA, and all other relevant legislation.

Blasting is carried out on a case-by-case basis. Each blast and the maximum instantaneous charge used is designed in line with the blast management plan and this includes undertaking calculations using equations derived from Australian Standard 2187.2-2006 "Explosives – Storage and use Part 2: Use of Explosives" to ensure that vibration and airblast overpressure rates at receptors are acceptable.

2.5.7 Workforce Requirements and Arrangements

The operational workforce requirements for the Project will remain consistent with current operations for the Grevillea Pit at the SRM. The SRM has approximately 2,400 full time equivalent (FTE) employees, including labour hire and contractors. Construction of infrastructure required to support the Project is not expected to increase the workforce, rather typical 'construction' activities (for example the construction of access tracks) are undertaken by the operational workforce as part of operation activities as needed. The current workforce arrangements at the SRM will remain in place for the Project.

2.5.8 Hours of Operation

Mine operations will continue as per current operations at the SRM, i.e., 24 hours per day, seven (7) days per week, 365 days per year.

2.6 Mine Infrastructure

No additional mine infrastructure areas, CHPP, TLF or tailings storage facilities are to be constructed within the Project area, with the existing SRM providing the necessary support for the Project (***Figure 1-4***:).

The Project design process has determined that the existing SRM infrastructure and processes (such as the WMS) will be able to support the Project in their current form.

2.6.1 Coal Handling and Preparation Plant

As there is no proposed increase to the tonnage output as part of the Project, there is no required upgrade to the CHPP.

Coal from the Grevillea Pit is currently loaded into rear dump trucks and hauled along a network of mine haul roads located west of the deposit to the existing CHPP for beneficiation. All coal mined as part of the Project will be processed through the existing CHPP located within ML 1784. Product coal from the CHPP is stockpiled onsite prior to railing to BMA's port facilities at Hay Point, South of Mackay in Central Queensland and/or Abbot Point Coal Terminal.

2.6.2 Train Load-out Facility

The existing TLF has sufficient installed design capacity to accommodate the product coal production rates for the Project. As such, there is no proposed upgrade to the existing TLF and no additional train movements or supporting rail infrastructure will be required.

2.6.3 Roads and Access Requirements

One road access easement, an unsealed access track that extends from Lake Vermont Road, intersects the SRM. Other existing access tracks and haul roads will be extended into ML 700021 as mining progresses, with existing roads being utilised in the interim.

2.6.4 Powerline Supply

No additional power supply will be required to operate the equipment to be located in the MIA, with all power requirements for the Project to be delivered through existing supply. The existing power easements for 132kV/66kV electrical transmission lines to the east of the Project area will be utilised.

2.6.5 Water Management

Water requirements are generally considered to be low given that water will be required for coal processing, amenities and dust minimisation purposes only. The water supply will be met by the existing SRM WMS (see ***Section 4.2.3***) and water management infrastructure will be required/relocated as necessary within ML 700021 (see also ***Section 2.4.2***).

A GoldSim water balance model (WBM) has been developed for the Project to assess the capacity of the existing WMS. The results confirm that the addition of the Project to the existing WMS would provide sufficient water to operate the mine in periods of extended drought and provide adequate storage to contain MAW during periods of flooding or prolonged wet weather (refer to ***Appendix E***). No new water release points are proposed as part of the Project, with releases to occur as per the SRM EA. Mine water contained within the Project area will be transferred to existing bulk water storages which were assessed to have excess storage capacity (refer to ***Appendix E***).

3 Threatened Species and Ecological Communities Assessment and Impact Assessment

3.1 Assessment Methodology

3.1.1 Desktop Assessment

A desktop assessment was undertaken to characterise and identify ecological values that are protected under Commonwealth legislation that may be supported in the Project area and surrounds that require field validation. This consisted of database searches and a literature review of previous ecological studies across the Project area and surrounds. The literature review also assisted in understanding previous assessment methodology and effort conducted across the Project area and surrounds, and where additional field assessment would be required to supplement previous work.

The following previous ecological assessments and studies were reviewed:

- Saraji Mine Grevillea Back Access Road Ecological Assessment (ELA, 2019a)
- Spring to Phillips Creek Diversion, Assessment of Matters of National Environmental Significance (ELA, 2019b)
- Spring Creek to Phillips Creek Diversion, EPBC Assessment (ESP, 2019)
- Ecological Baseline Assessment: Saraji Mine (BAAM, 2021)
- EPBC Act MNES Self-Assessment: Spring Creek Diversion - Saraji Pit Geometry Optimisation (BMA, 2018)
- Saraji East Mining Lease Project Baseline Environmental Studies, Terrestrial Ecology Technical Report (AECOM, 2023a)
- Saraji Mine Spring Creek Diversion – Stage 1: Ecological Assessment (ELA, 2018)
- Saraji Open Cut Extension Project: Environmental Assessment Report (BMA, 2016)
- Terrestrial Ecology Baseline Report (AECOM, 2016)
- Matters of National Environmental Significance - Significant Impact Assessment, Grevillea Pit Continuation Project (AECOM,)

In addition to this, a number of ecological studies to support Project EPBC Referrals in the broader region are publicly available via the EPBC Act Referrals Lists website. These include the following, which are listed on the Protected Matters Search Tool (PMST) (see Appendix A of ***Appendix D***):

- Arrow Bowen Pipeline: Terrestrial Fauna Assessment (Ecological Survey & Management, 2011)
- BMA Peak Downs Mine, Ecological Assessment of Dysart Road: MC90 Realignment (Aurecon, 2013)
- BMA Peak Downs Terrestrial Ecology Assessment - Interim Memo (Ausecology, 2022)
- Dysart East: EPBC Referral (URS Australia, 2014)
- Ecology Technical Memo, BHP Peak Downs Expansion Project (ERM, 2022)
- Lake Vermont Northern Extension: Flora and Fauna Report (AARC, 2016)
- Olive Downs Project Mine Site and Access Road, EPBC Referral Submission (Pembroke Resources South Pty Ltd, 2017)
- Peak Downs East Mining Lease, Terrestrial Ecology Baseline Report (AECOM, 2020)
- Terrestrial Ecological Assessment for Vulcan South (METServe, 2023)
- Winchester South Project: Terrestrial Ecology Assessment (E2M, 2021)

All abovementioned previous ecological assessments and studies were reviewed as part of the literature review for the purpose of gaining an understanding of values both within and directly surrounding the Project area, as well as identifying any relevant information with regards to the presence of MNES values in the region (including confirmed conservation significant species records). Where appropriate, the findings of previous assessments identified from the literature review process were considered in this ecological assessment and incorporated within the reporting (see ***Appendix D***).

The following databases were also searched as part of the assessment:

- DCCEEW EPBC PMST (DCCEEW, 2024), using a 20km radius.
- Atlas of Living Australia (ALA) (ALA, 2024) using a 60km radius.
- WildNet database (DESI, 2024) using a 20km radius.
- Queensland Department of Resources (DoR) Vegetation Management Regulated Vegetation Management Map - version 7.04 (DoR, 2024a).
- DoR Vegetation Management RE Map - version 13.00 (DoR, 2024b).
- DoR Vegetation Management Pre-clear RE Map - version 13.00 (DoR, 2023a).
- DoR Vegetation Management Essential Habitat Map - version 12.04 (DoR, 2024c).
- DoR Vegetation Management Watercourse and Drainage Feature Map (1:100000 and 1:250000) - Queensland except South East Queensland version 7.00 (DoR, 2023b).
- DoR Vegetation Management Wetlands Map – version 9.04 (DoR, 2024d).
- Map of Great Barrier Reef (GBR) Wetland Protection Areas (DES, 2022a).
- Map of Queensland Wetland Environmental Values (DES, 2022b).
- Wetland Protection Area - GBR High Ecological Significance Wetland (DES, 2022c).
- Flora Survey Trigger Map for Clearing Protected Plants in Queensland - Version 10.0 (DES, 2023).
- Detailed surface geology - Queensland (version 6.13) (DoR, 2023c).

3.1.2 Field Survey

A five-day field survey was conducted by two ecologists across the ecological Project area from 19th March to 23rd March 2024, inclusive. Several comprehensive ecological assessments and surveys targeting the Project area have also been completed between the years of 2007 and 2021, hence the ecological values of the Project area are considered to be well understood. The 2024 field survey focused primarily on ground truthing ecological values present within ML 700021. It also included targeted fauna searches within potential habitat both in the Project area and in association with Phillips Creek. ***Sections 3.1.2.1*** to ***3.1.2.6*** describe the survey techniques employed.

3.1.2.1 Vegetation Community Assessments

Validation of ground-truthed vegetation communities within the Project area was undertaken in accordance with the Methodology for Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland (Methodology for Surveying and Mapping REs) (Neldner *et al*., 2022). This involved traversing the Project area undertaking tertiary-level and quaternary-level assessments.

Tertiary-level assessments are undertaken to collect detailed vegetation data to assist with identifying and subsequently stratifying the Project area into unique vegetation community types or assessment units. Vegetation community types or assessment units are based on a combination of unique floristic composition and structure, as well as condition. Aerial imagery, geology mapping, State vegetation mapping as well as previous ground-truthed RE mapping were used in the field to guide the survey locations and survey effort of tertiary-level assessments.

As per a modified form of the Methodology for Surveying and Mapping REs (Neldner *et al*., 2022), tertiary-level assessments were undertaken within a 10m by 50m quadrat, collecting the following information as well as digital photographs:

- vegetation structure (mean height and cover) and species composition for each structural layer;
- soil type;
- landform;
- disturbance type and severity; and,
- Regional Ecosystem (RE) classification and remnant status.

RE classification was determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the Regional Ecosystem Description Database (REDD). Condition status for woody vegetation was evaluated utilising the definitions of remnant vegetation and high value regrowth (HVR) vegetation under the Queensland *Vegetation Management Act 1999*. For the purposes of this assessment, vegetation was mapped into three categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
- HVR: areas previously cleared or disturbed (e.g., by wildfire) over 15 years ago and containing woody vegetation floristically and structurally consistent with the RE but typically less than 70% of the height and less than 50% density of the RE.
- Regrowth or non-remnant: areas previously cleared or otherwise significantly disturbed and does not meet criteria for remnant or HVR.

Quaternary-level assessments were utilised to delineate the extent and boundaries of the unique vegetation community types identified from the tertiary-level assessment. This was done by confirming dominant species across the vegetation strata's and recording the height and cover of the ecologically dominant layer as per Neldner, *et al*. (2022). RE classification and remnant status were also recorded as part of the quaternary-level assessments.

A total of 128 sites including 14 tertiary-level, 14 quaternary-level, and 57 general observation points were undertaken across the Project area (see ***Figure 3-1***).

3.1.2.2 BioCondition Assessments

BioCondition assessments were conducted to provide additional quantitative data at representative sites across the Project area's vegetation communities. This included more quantitative data particularly on introduced species incursion, presence and abundance of large trees and native perennial grass cover. This data has been utilised as part of offset assessment and calculations (see ***Section 8***).

BioCondition assessments were undertaken in accordance with the Queensland BioCondition Assessment Manual (Eyre, *et al*., 2015) within a 100m x 50m quadrat. The assessment involved the collection of data for 13 attributes, categorised as site-based, including:

- large trees;
- tree canopy height;
- recruitment of canopy species;
- tree canopy cover (%);
- shrub layer cover (%);
- coarse woody debris;
- native plant species richness for four lifeforms;
- non-native plant cover;
- native perennial grass cover (%); and
- litter cover.

A total of seven (7) BioCondition assessments were conducted across the Project area (see ***Figure 3-1***).

3.1.2.3 Targeted Flora Survey

Targeted flora surveys were undertaken where all tertiary, quaternary and BioCondition assessments were conducted (see ***Figure 3-1***). These surveys aimed to confirm the presence or absence of threatened flora species identified through the Likelihood of Occurrence (LoO) assessment, with particular focus on *Dichanthium setosum* and *D. queenslandicum*, due to recent records in the local area.

Vegetation community assessments were first used to validate ground-truthed REs and identify areas of potentially suitable habitat for target species. Habitat suitability was assessed based on species-specific ecological requirements, including land zone classification, soil texture and structure, vegetation composition and condition, and the presence of native grass species. Focus was placed on areas with well-structured clay or loamy soils and native ground-layer vegetation indicative of suitable habitat.

Where potentially suitable habitat was confirmed, targeted searches were undertaken using slow-paced, meandering transects (random meanders) to ensure thorough ground-layer inspection. Observations included identification of native and exotic species, assessment of competition from invasive pasture grasses (e.g., *Cenchrus ciliaris*, *Megathyrsus maximus*), and the presence or absence of indicator species commonly associated with the target threatened flora.

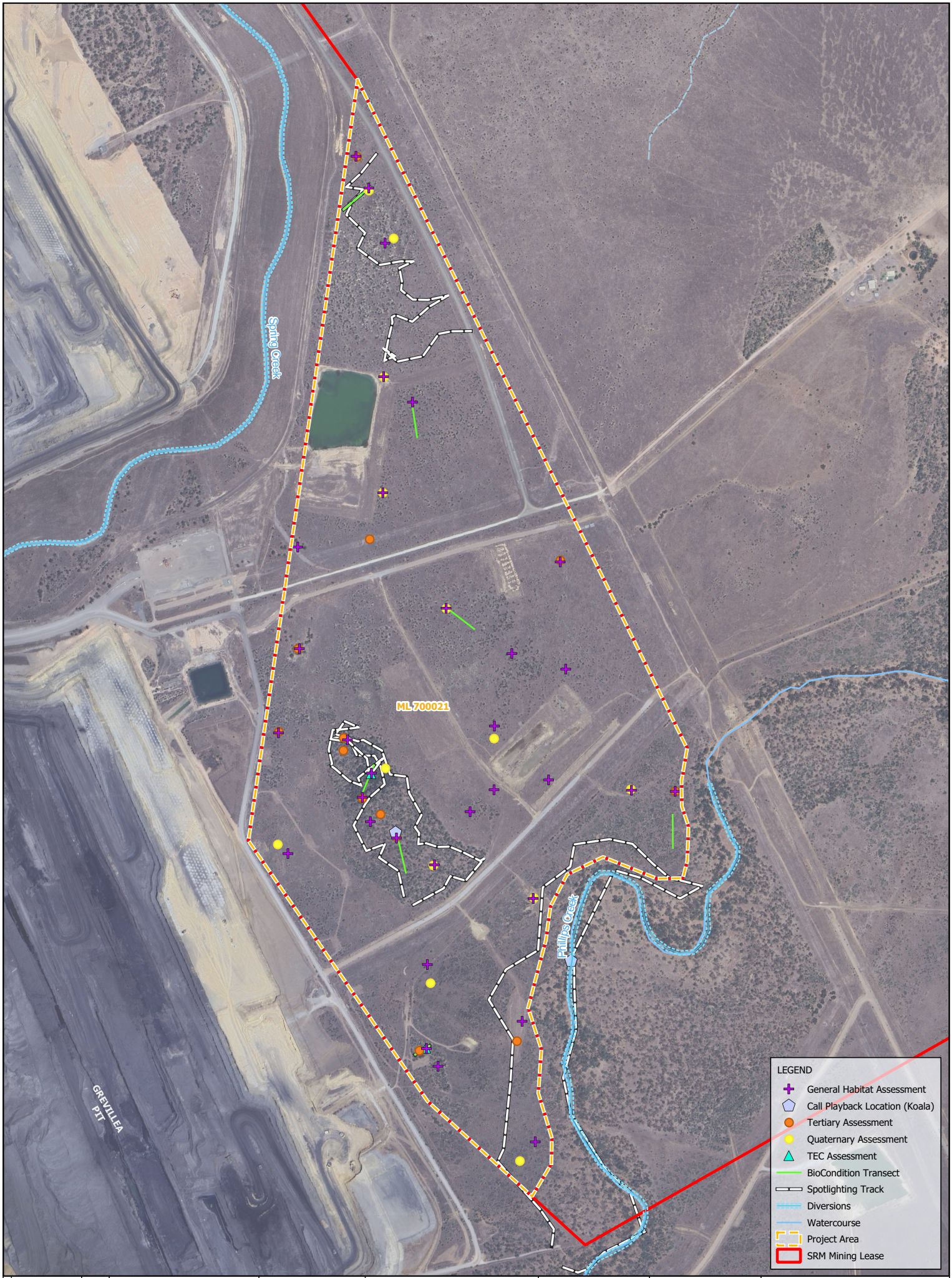
3.1.2.4 Habitat Assessments

Habitat assessments were undertaken to characterise the fauna habitat values supported by each unique vegetation community type identified in the Project area. These assessments provide an indication of likely fauna utilisation (breeding, foraging and dispersal), and suitability for fauna species, including conservation significant fauna. Habitat attributes recorded during the assessment included:

- vegetation structure, including groundcover and composition;
- presence, abundance and diameter (small <10cm, medium 10-20cm, large >20cm) of tree hollows within 0.5 ha plots;
- presence, abundance and diameter (small <10cm, medium 10-20cm, large >20cm) of hollow logs within 0.5 ha plots;
- presence and abundance of stags within 0.5 ha plots;
- flowering or fruiting plants;
- presence and abundance of woody debris such as habitat logs and ground timber;
- cover and depth of leaf litter;
- rocky habitat such as surface rocks, boulders, crevices, overhangs and caves;
- presence and type of water (both permanent and ephemeral);
- disturbance from invasive weeds/pests;
- other disturbances such as grazing pressure, clearing, thinning or fire; and,
- any other significant habitat features, or values present such as mistletoe, gilgai, soil cracks, Koala food trees, decorticating bark.

The presence and abundance of tree hollows was determined via inspections of the presence of dead limbs, trunk or branch scars and hollows from the ground level. This included both live trees and stags. While no tree-climbing or internal inspection techniques were employed, the combination of visual indicators and tree size provides a reliable, conservative estimate of potential hollow availability at a landscape scale. This data was further supplemented through the collection of large tree data as part of the BioCondition assessments.

A total of 34 habitat assessment sites were conducted across the Project area.



R	DETAILS	DATE
1	Draft Issue	24-05-2024
2	Final Issue	30-09-2024

DRAWN	MB	CHECKED	AB
APPROVED	AB	DATE	30-09-2024

NOTES:

N

0 0.1 0.2 km

SCALE @ A3 - 1:10,000
GDA94 / MG Zone 55

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source

ENGENY

BMA
BHP Mitsubishi Alliance

Figure 3-1

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project
Ecology Assessment
Survey Site Locations

Drg Ref.

\\online.com\files\BNEManagement\Projects\QC1000 BHP (BMA)\QC1000_216 Saraji EPBC Approval\05 Design\QGIS\Workspaces\QC1000_216_Saraji EPBC Approval_Preliminary Documentation_NV.qgz

3.1.2.5 Tree Hollow Assessment

Tree hollow presence and abundance were assessed from ground level and included both live trees and stags. Trees were assessed for visible indicators of hollows, such as entrance holes, branch scars, cavities, and dead limbs. Hollow diameters were estimated based on visual inspection and categorised as small (<10 cm), medium (10–20 cm), or large (>20 cm).

In addition to visual indicators, tree size was used as a supporting metric to assess the likelihood of hollow presence. Numerous studies have demonstrated a strong positive correlation between tree diameter and the probability of hollow formation in eucalypt species (Gibbons & Lindenmayer 2002; Mackowski 1984; Lindenmayer et al. 1991). Large, mature trees are more likely to contain hollows suitable for hollow-dependent fauna, particularly arboreal mammals, such as the Greater glider and bats, and hollow-nesting birds.

Accordingly, survey effort specifically targeted large trees and trees with structural features typically associated with hollow formation, such as basal swelling, dead limbs, and fire scars. Observers prioritised mature eucalypt species where diameter at breast height (DBH) exceeded thresholds commonly associated with hollow development (e.g. >50 cm DBH, per Gibbons & Lindenmayer 2002). This approach provided a precautionary and ecologically informed method of identifying likely hollow-bearing trees within the Project area.

While no tree-climbing or internal inspection techniques were employed, the combination of visual indicators and tree size provides a reliable, conservative estimate of potential hollow availability at a landscape scale. The approach aligns with standard ecological survey methodology for broad-scale habitat assessments and is supported by peer-reviewed literature linking tree size and external structural features to the likelihood of hollow presence. It is commonly applied in environmental impact assessments to evaluate potential habitat for hollow-dependent fauna where direct hollow inspection is not feasible.

Habitat data were also supplemented by large tree metrics recorded during BioCondition assessments, further supporting the assessment of structural habitat quality.

3.1.2.6 Targeted Surveys

Target MNES fauna species, flora species and ecological communities, that were identified from the desktop assessment and literature review, were specifically surveyed to detect presence and abundance within the Project area. Refer to ***Section 3.1.2.3*** for the targeted flora methodology. The identified target MNES were:

- Ornamental snake (*Denisonia maculata*);
- Squatter pigeon (*Geophaps scripta scripta*);
- Koala (*Phascolarctos cinereus*);
- Greater glider (southern and central) (*Petauroides volans*); and
- Brigalow (*Acacia harpophylla* dominated and co-dominated) Threatened Ecological Community (Brigalow TEC).

Fauna survey methods to detect target fauna species were in accordance with the species-specific Commonwealth survey guidelines, specified in ***Table 3-1***, and other guidance material, as well as the Queensland Terrestrial Vertebrate Fauna Survey Guidelines (Eyre *et al.*, 2022) and included:

- roaming/meandering diurnal bird surveys throughout the survey;
- spotlighting surveys, including call playback; and
- scat and sign searches.

A description of these surveys for each species, and the survey effort achieved during the field survey and compliance with Commonwealth survey guidelines is outlined in ***Table 3-1***. ***Figure 3-1*** shows the survey locations and methods, while ***Figure 3-3*** to ***Figure 3-7*** show the habitat for identified MNES fauna species.

Guidance to undertake TEC assessments for the Brigalow TEC was taken from the Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) Ecological Community (DoE, 2013a). TEC assessments were undertaken across the Project area, where tertiary-level and quaternary-level assessments identified vegetation communities analogous to the Brigalow TEC.

Table 3-1: Survey Guidelines, Methods and Effort for relevant MNES

Survey Guideline & Requirements	Survey Techniques Employed	Description	Survey Effort	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
Squatter pigeon					
Survey guidelines for Australia's threatened birds (DEWHA, 2010) The guidelines recommend the following survey methods and effort for Squatter pigeon (southern): • road driving during day (driving transects); • active searches: 15 hours over 3 days in areas <50 ha; • flushing surveys: 10 hours over 3 days in areas <50 ha; and • waterhole searches: survey effort not specified. **Seasonal considerations** No evidence of long-distance seasonal movements or seasonal considerations required.	Bird surveys	Roaming/meandering bird surveys using both visual and auditory identification.	Approximately 32 person hours over 4 days. Survey effort focused on flushing surveys, with additional effort including active searches and road driving. Given the area of potential habitat identified for this species (161 ha), 32 hours of flushing-based effort exceeds the minimum recommended survey effort.	**Adequate** The survey included flushing surveys as the primary method, which is considered effective and recommended for detecting this species. The total effort (32 person-hours) exceeded the minimum recommended survey time and was suitable for the 161ha survey area. Timing was appropriate, with no known seasonal restrictions.	**Compliant** Survey methods, effort, and timing are consistent with guideline recommendations and considered appropriate to detect the species within the Study Area.
Greater glider					
With consideration to the Greater glider, no species-specific survey guidelines exist; however, the species is known to be readily detectable by spotlighting.	Spotlighting surveys	Roaming / meandering nocturnal searches were completed on foot in potential habitat using headtorches,	Three-night spotlighting survey (~20 person-hours total) conducted via	**Adequate** No species-specific survey guideline exists for the Greater glider. However, nocturnal	**Compliant** Surveys targeted suitable remnant eucalypt woodland

Survey Guideline & Requirements	Survey Techniques Employed	Description	Survey Effort	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
The following spotlighting methodology outlined in the **Terrestrial Vertebrate Fauna Survey Guidelines for Queensland** (Eyre *et al*., 2022) has been used: • spotlighting transects (100 m x 100 m) per 30 person minutes. Survey effort not specified. **Seasonal considerations** Greater glider is known to have high site fidelity with relatively small home ranges. There are no seasonal considerations for this species.		hand-held spotlights and binoculars for viewing arboreal species.	random meander searches across ~15 ha of potential habitat containing eucalypt woodland communities with hollow-bearing trees identified as present. Surveys for this species were done concurrently with other target species over the same nights.	spotlighting in suitable eucalypt woodland is an accepted survey method for this species. The survey's coverage (~15 ha of habitat) and effort (3 nights) are appropriate given the Greater glider's high site fidelity and year-round detectability (no strong seasonal constraints). Multiple night surveys maximize the chance of detecting any resident gliders, as individuals often remain in a home range.	containing hollow-bearing trees and were conducted over three nights using spotlighting, an accepted method for this species. While no individuals were recorded within the Project area, one was observed in adjacent habitat at Phillips Creek. The effort and timing are consistent with accepted approaches for detecting this species, which has no prescribed minimum effort.
Koala					
Referral guidance for Koala do not prescribe specific survey effort requirements. This is to be dependent on the size and nature of the action and the availability and quality of information already available. However, no single survey method is considered suitable in all situations. The Review of Koala habitat assessment criteria and methods (Youngentob *et al*., 2021) outlines various survey methods for detecting Koala presence, which includes: • diurnal transect and point surveys; • spotlighting;	Spotlighting surveys Call playback Scat and scratch searches	Spotlighting: Roaming / meandering nocturnal searches were completed on foot in potential habitat using headtorches, hand-held spotlights and binoculars for viewing arboreal species. Call playback: An audio recording of a Koala mating call was played using a portable speaker. After playing the recording for 3 minutes, field staff listened for	Spotlighting: Three-night spotlighting survey (~20 person-hours) covering ~15 ha of identified koala habitat (eucalypt woodland). Surveys were done at night using handheld spotlights, with observers moving through the area (random meander) to locate koalas by eye-	**Adequate** Review of Koala habitat assessment criteria and methods (Youngentob, Marsh and Skewes, 2021) confirm that spotlighting is one of several accepted techniques for detecting koalas. While there is no fixed effort requirement in guidelines for koala surveys, conducting repeated night searches in ground truthed habitat is considered good practice. The 3-night effort (total 20 hours) provided thorough survey coverage,	**Compliant** A combination of key survey techniques, as recommended in the review were utilised to determine presence of Koala. Spotlighting with call playback as well as scat surveys were conducted across Eucalypt woodland habitat.

Survey Guideline & Requirements	Survey Techniques Employed	Description	Survey Effort	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
• trained Koala detection dogs; • mark-resight and mark-recapture; • thermal detection drones; • radio tracking; • camera traps; • scat surveys; • call playback; and • passive acoustics. **Seasonal considerations:** Optimal time period for direct observation surveys is between September and January, as this is when Koala activity is generally at its peak and resident breeding females with back-young are most easily observed. Direct observation surveys conducted outside of this period must take into account the potential for lower Koala activity (reduced detectability) and other relevant seasonal considerations. Presence/absence surveys in the inland context, conducted during dry periods, should be centred on riparian areas, upper/mid-slope areas and other dry period refugia in order to maximise detectability.		any return calls or movement for two minutes and then spotlighted surrounding trees. Scats, scratches and other signs: These were searched for during roaming/meandering searches of potential habitat.	shine or silhouette in trees. Call playback: Two (2) call playback sessions were conducted across different habitat areas over 2 nights Scat, scratches and other signs: Opportunistic while conducting other surveys.	increasing the likelihood identifying the species. Importantly, surveys were carried out during the koala's breeding season (approximately spring–summer), which is the optimal period for koala detection.	Replicate spotlighting surveys (i.e. surveyed across multiple nights) were also undertaken within this potential habitat. The survey effort for Koala is not specified, however the effort conducted is considered suitable for detecting the species.

Survey Guideline & Requirements	Survey Techniques Employed	Description	Survey Effort	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
Ornamental snake					
With consideration of the Ornamental snake, the **Survey Guidelines for Australia's Threatened Reptiles** (DSEWPC, 2004) and the **Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (**DCCEEW, 2023) were both reviewed to determine suitable survey techniques. Recommended spotlighting methodology include: • spotlighting suitable gilgai habitat whilst frogs are active, including targeting water-inundated gilgais, wetlands, riparian habitats and the surrounding environment (e.g., roads) and large logs between dusk and early morning hours, • survey over a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species, • survey over a minimum of 3 nights. **Seasonal considerations:** No survey methods are known to reliably detect the Ornamental snake during dry weather/seasons. Surveys should be undertaken during a period where water is present within gilgai and frogs are active as a result. The Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles indicates that surveys should be undertaken between late September to March.	Spotlighting surveys	Roaming / meandering nocturnal searches were completed on foot in potential habitat using headtorches, hand-held spotlights.	Three-night targeted spotlighting survey (~20 person-hours total) across ~133 ha of identified Ornamental Snake habitat. Surveys focused on transects through wet gilgai depressions and riparian zones and also included random meander searches to cover a broad area. Effort was concentrated in cracking clay soil areas where frogs were active.	**Adequate** Survey guidelines for the Ornamental Snake (DSEWPC 2004; DCCEEW 2023) recommend nocturnal spotlight searches in gilgai wetlands and riparian habitats when prey are active. They advise a minimum of ~1.5 person-hours per hectare in average complexity habitat and at least 3 nights of survey for reliable detection. Our survey met the recommended survey duration (3 nights) and was timed during warm, humid conditions (after rainfall), which align with guidance to survey on nights of high frog activity. The total effort (20 hours) spread across 133 ha equates to ~0.15 person-hours/ha overall; however, in practice the team concentrated search effort in high-quality patches (water-inundated gilgais, creeks, and adjacent logs/roadways) rather than uniformly across all hectares. This targeted approach maximized encounter rates in the most likely habitats.	**Compliant** With consideration to Ornamental snake, spotlighting was undertaken across gilgai and cracking clay habitats during a period of high frog activity and surface water presence, consistent with the guidelines (DSEWPC 2004; DCCEEW 2023). The approach focused effort in core microhabitats and resulted in the detection of two individuals within the Project area. The method, timing, and habitat targeting align with survey recommendations.

Survey Guideline & Requirements	Survey Techniques Employed	Description	Survey Effort	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
Brigalow TEC					
The **Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) Ecological Community** (DoE, 2013a) identifies the key diagnostic and condition threshold criteria for the TEC: Key Diagnostic Criteria: • Dominance or co-dominance of Brigalow; AND • meets the Queensland REDD description of 16 Qld REs listed for the TEC; AND / OR • age of community, generally > 15 year regrowth. Condition Thresholds: • Non-native perennial cover <50% of total vegetation cover in a patch (sampled 0.5 ha) that is representative of the area; AND • patch size ≥ 0.5 ha.	TEC Assessments Vegetation Community Assessments BioCondition Assessments	TEC assessments were undertaken across the Project area, where tertiary-level and quaternary-level assessments identified vegetation communities analogous to the Brigalow TEC. Validation of ground-truthed vegetation communities within the Project area was undertaken in accordance with the Methodology for Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland (Neldner *et al.*, 2022). BioCondition assessments were conducted to provide additional quantitative data at representative sites across the Project area's vegetation communities. This included more quantitative data particularly on introduced species incursion, presence and abundance of large trees and native perennial grass cover.	A total of 135 sites including 14 tertiary-level, 14 quaternary-level, 7 BioCondition, and 57 general observation points were undertaken across the Project area.		**Compliant** The survey effort undertaken was sufficient to collect adequate vegetation community data to facilitate TEC assessments on all vegetation analogous with the Brigalow TEC.

3.1.3 Data Analysis

3.1.3.1 Likelihood of Occurrence Assessment

A likelihood of occurrence (LoO) assessment for conservation significant species (refer to Appendix C of ***Appendix D***) identified during the preliminary desktop review was undertaken following the completion of the field survey. The assessment considered known habitat and ecological requirements of the species identified in database results and the vegetation and habitat resources identified during the field survey.

Each species was assessed to determine which of the below categories it fell within:

- Known: Species was positively identified and recorded in the Project area during the field surveys; or previous, reliable records occur within the Project area.
- Likely: Species was not recorded during the field surveys or previously, however there are known records within the nearby surrounding area and suitable habitat exists in the Project area.
- Potential: Species was not recorded during the field surveys or previously, however known records occur in the surrounding area and habitat in the Project area is marginal or degraded.
- Unlikely: Habitat in the Project area might be marginally suitable; however, species was not recorded during the field surveys, and no known records of the species exist within the surrounding area.
- Does not occur: The species will not occur within the Project area (e.g. marine species or seabirds for terrestrial sites).

3.1.3.2 GIS Analysis and Mapping

Vegetation community boundaries were mapped using spatial data collected in the field to produce ground-truthed vegetation mapping.

A ground only digital elevation model (DEM) was generated and interrogated to facilitate clear identification of the landforms within the Project area, specifically including areas of deep gilgai. Results from this DEM, combined with the mapped ground-truthed vegetation mapping following the field survey, were utilised to develop ‘mapping criteria’ for each conservation significant species identified as known, likely or potentially occurring, as a result of the LoO assessment.

This ‘mapping criteria’ is based on the habitat information outlined in the relevant Species Profile and Threat Database, as well as species recovery plans (where available), referral guidelines and approved conservation advice. For the relevant species, the habitat definitions from the Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2023) produced for BHP were utilised for categorising and mapping threatened species habitat.

3.1.4 Habitat Definitions

The habitat assessment has been completed as per BHP’s Central Queensland Threatened Species Habitat Descriptions (Kerswell, *et al*., 2023), which provides a methodology for the categorisation of habitat into ‘Preferred’, ‘Suitable’ and ‘Marginal’. The definitions have been developed based on available data and literature as well as consultation with a variety of leading industry specialists. The report documents the information (and sources) to provide justification for habitat definitions that deviate from the DCCEEW supplied definitions as part of a joint initiative undertaken by the former Commonwealth Department (the Department of Agriculture, Water and Environment) and BMA to develop central Queensland specific definitions.

3.2 Results

The following subsections detail the ecological values and functionality within the Project area and immediate surrounds.

3.2.1 Vegetation Communities

The Project area is predominantly in a disturbed condition and is inclusive of areas which are currently disturbed by mining activities (e.g., roads and tracks, exploration activities, equipment laydown areas and mine water storage areas), as well as areas which have sustained impacts from historical land use activities, such as grazing.

Field surveys (see ***Figure 3-1***) delineated the following six (6) vegetation communities across the Project area:

- *Eucalyptus populnea* open forest on sand plains (RE11.5.3 – remnant);
- *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (RE11.4.9 – remnant);
- *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (RE11.3.1 – HVR);
- *Eucalyptus populnea* low open forest on sand plains (RE11.5.3 – HVR);
- Regrowth Brigalow (non-remnant); and
- Disturbed and impacted areas with grass and forb regrowth lacking woody vegetation (non-remnant).

Non-remnant / regrowth vegetation communities within the Project area were identified as dominant and found to equate to 190.80 ha (86.28%) of the total area. Whereas vegetation communities of remnant and HVR condition were found to total a combined area of approximately 14.02 ha (6.34%) of the Project area.

Vegetation potentially analogous to one (1) potentially occurring TEC was identified within the Project area. These included areas of vegetation that aligned with REs that are listed specifically for the Brigalow TEC. Field survey results for the assessment against the Brigalow TEC condition thresholds and key diagnostic criteria are provided in ***Section 3.2.6***.

See Section 3.2 of the Terrestrial Ecology Survey and Impact Assessment Report in ***Appendix D*** for the full details of the vegetation communities within the Project area.

3.2.2 Flora

The field survey identified the presence of 70 flora species representing 29 families. The most commonly identified families during the field survey were *Poaceae* (17 species), *Leguminosae* (8 species), *Myrtaceae* (5 families), and *Sapindaceae* (4 families) (refer ***Appendix D***).

There was a low diversity of introduced flora species within the Project area, with a total of 16 introduced species recorded during the field survey. However, the coverage of introduced species was found to be high with *Cenchrus ciliaris*, *Bothriochloa pertusa* and *Megathyrsus maximus* often dominating the ground layer of all vegetation communities and *Parthenium hysterophorus* present in dense patches.

A total of five (5) introduced species listed as a 'Restricted Matter' under the Queensland *Biosecurity Act 2014* were also identified within the Project area during the field survey. These included *Cryptostegia grandiflora*, *Parthenium hysterophorus, Harrisia martini, Opuntia tomentosa* and *Lantana camara*. *Cryptostegia grandiflora* and *Parthenium hysterophorus* are also listed as Weeds of National Significance (Australian Government, 2017).

A literature review undertaken as a component of this assessment has identified previous ecological reports which identified potential habitat for *Dichanthium setosum* and *D. queenslandicum* within the Project area. This is primarily attributed to a claimed positive identification of two *D. setosum* records approximately 600m south-east of the Project area, to the south of Phillips Creek by SKM in 2011 (AECOM, 2016). The records were identified within an area ground-truthed by SKM (2011) and later by AECOM (2016) as a grassland vegetation community analogous to RE11.4.4.

The grassland vegetation community was not identified within the Project area by AECOM in 2016. However, given that a similar land zone, land zone 4, occurs across the Project area, the ecological assessment assumed potential occurrence for *D. queenslandicum* and likely occurrence for *D. setosum*. Field surveys undertaken as part of the AECOM 2016 assessment both within the Project area and outside of the Project area where *D. setosum* was previously recorded, did not locate either species despite multiple targeted searches during suitable climatic conditions.

The AECOM 2016 likelihood of occurrence findings for both *D. queenslandicum* and *D. setosum* have been re-iterated in both the BAAM ecological baseline assessment (2021) and the most recent AECOM MNES impact

assessment (2023). The BAAM ecological baseline assessment did not identify the presence of either species during field investigations. However, potential habitat for both species within the Project area was still noted, but further refined in both assessments (BAAM, 2021 & AECOM, 2023) to the central patch of *Acacia harpophylla* shrubby woodland (analogous to RE11.4.9).

Given these findings, this assessment has thoroughly evaluated the potential presence of these species and their habitat within the Project area. Targeted field surveys were undertaken specifically within the 2.73 ha central patch of *Acacia harpophylla* shrubby woodland that has been previously identified as potential habitat for *D. queenslandicum* and *D. setosum*. This included BioCondition sites, tertiary level assessments and quaternary level assessments that target species identification in the ground layer (refer to Section 3.3 of ***Appendix D*** for further survey details).

These survey approaches are consistent with established vegetation and threatened flora survey methodologies outlined in the Commonwealth Survey Guidelines for Australia's Threatened Plants (DCCEEW, 2013), which recommend systematic quadrat-based vegetation sampling and targeted searches within suitable habitat to detect threatened ground layer flora species.

These target surveys did not detect the presence of either *D. queenslandicum* or *D. setosum* within that area. Such surveys were also undertaken across the broader Project area which also did not detect the presence of either *D. queenslandicum* or *D. setosum*. Furthermore, detailed habitat assessments have not identified potential habitat for these species within the Project area. Both species habitat requirements are more associated with clay soils derived from a basalt geology (DCCEEW, 2026a & 2026b) as opposed to 'old' alluvium clay deposited on bedrock, which occurs across the Project area.

Potential occurrence has been repeatedly assumed since 2016 whilst ongoing field survey across the Project area over the last 8 years have not confirmed presence. Based on this and the lack of suitable habitat, this assessment concludes that *D. queenslandicum* and *D. setosum* are unlikely to occur within the Project area. The field survey did not confirm the presence of any threatened flora within the Project area.

See Section 3.3 of the Terrestrial Ecology Survey and Impact Assessment Report in ***Appendix D*** for further information.

3.2.3 Fauna

A total of 62 native fauna species, including 43 birds, eight reptiles, six mammals and five amphibians were recorded opportunistically and during targeted surveys across the Project area. Woodland birds were the most commonly recorded species out of the fauna groups, reflecting the main habitat values across the Project area. Other bird groups such as raptors, waterbirds, nectar-feeding birds, granivorous bird species and smaller woodland birds (wrens and thornbills) represented a lower diversity across the Project area. Targeted spotlighting surveys identified a number of nocturnal bird of prey species, including Australian owlet-nightjar (*Aegotheles cristatus*) and Southern boobook owl (*Ninox boobook*).

A total of three (3) introduced fauna species were recorded during the field survey; being Rabbit (*Oryctolagus cuniculus*), Feral pig (*Sus scrofa*) and Cane toad (*Rhinella marina*). Rabbit and Feral pig are listed as restricted matters under the *Biosecurity Act 2014*. Based on desktop assessment results of introduced fauna identified in the surrounding area, the condition of the Project area identified during the field survey and previous ecological survey results, there is the potential for the area to support other introduced fauna such as Feral dogs (*Canis sp.*), Feral cats (*Felis catus*) and House mouse (*Mus musculus*).

The EPBC PMST report and WildNet online database search (undertaken in February 2024) identified 41 fauna species listed as threatened under the EPBC Act as potentially occurring within the Project area and surrounds (refer to Appendix A of ***Appendix D*** for full details). Of these, one was observed within the Project area, another was observed near the Project area and two more were considered to have the potential to occur:

- Ornamental snake (*Denisonia maculata*) was observed within the Project area during the field survey.
- Greater glider (*Petauroides volans*) was also observed outside of the Project area in vegetation associated with Phillips Creek.

- Squatter pigeon (*Geophaps scripta scripta)* and Koala (*Phascolarctos cinereus)* were considered to have the potential to occur within or close to the Project area.

Ten migratory species were identified from the EPBC PMST report and WildNet online database searches. Based on the LoO assessment, only one species, the Oriental cuckoo, is considered a likely fly-over species only, and therefore not likely to be impacted by the Project. As such, it is not considered in the impact assessment.

See Section 3.5 of the Terrestrial Ecology Survey and Impact Assessment Report in ***Appendix D*** for further information.

3.2.4 Landscape Connectivity

Vegetation associated with Phillips Creek (south of the Project area) is considered to provide connectivity within the local landscape and facilitate dispersal opportunities from the west and towards the Isaac River. Remnant or HVR vegetation within the Project area may provide opportunistic 'steppingstone' connectivity for some mobile fauna moving northward from Phillips Creek, however, it is noted that, given the highly impacted and fragmented nature of vegetation within and north of the Project area, dispersal opportunities are very limited. The Project area is therefore not considered to form an important fauna movement corridor, and it is considered that steppingstone connectivity from Phillips Creek to the within the Project area likely results in a 'dead-end' for most fauna species.

Specific to the Ornamental snake, assessment was undertaken to consider the role of the Project area in providing connectivity to other ornamental snake habitat areas. The assessment, which included the review of previously completed ecological assessments, aerial imagery and a DEM, indicates that gilgai landscapes do occur north-east from the Project area. These gilgai likely provide dispersal opportunities for Brigalow belt specialist reptiles and waterbirds. The assessment also indicates that gilgai do not extend to the southern boundary of the Project area and therefore not providing connectivity to Phillips Creek. Landscape connectivity of large extents of gilgai landscapes located to the north of the Project area connecting up to Spring Creek and the Isaac River floodplain is likely important for providing dispersal opportunities for fauna which utilise gilgai, including the Ornamental snake.

Further detail on landscape connectivity is provided in the Terrestrial Ecology Survey and Impact Assessment Report in ***Appendix D.***

3.2.5 Habitat Types

Habitat types within the Project area are presented below in ***Table 3-2.*** The analogous Regional Ecosystems described in ***Table 3-2*** are shown at ***Figure 3-2***.

Table 3-2: Habitat types within the Project area

Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
Brigalow woodland	RE11.4.9 (remnant condition)	2.73	Centre of the Project area	This habitat type occurs centrally within the Project area, on a gently undulating plain with dark, clay loam soil, and is associated with a vegetation community which has been ground-truthed as remnant RE11.4.9 (*Acacia harpophylla* or *Casuarina cristata* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains). This habitat is considered to be in a relatively good condition, with the only threats to integrity identified as the presence of introduced grasses and forbs within the ground stratum, and the fragmentation of this habitat from nearby remnant vegetation as a result of broadscale vegetation clearing throughout the Project area. Key habitat features identified within this habitat type include: • occasional gilgai identified as diverse in depth, and containing ponded water; • occasional cracking soils identified as diverse in depth; • common occurrence of microhabitat features, including fallen woody debris, hollow logs, and leaf litter; • intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna; and • occasional small, medium and large sized hollow-bearing trees (with small and medium hollows being most prevalent). – tree hollow surveys recorded an average density of 5 per 1ha, comprising small hollows (2 per 1ha), medium hollows (2 per 1ha) and large hollows (1 per 1ha). Overall, this habitat type provides resources primarily for woodland birds, microbats, reptiles and arboreal mammals. Specifically, the presence of gilgai and cracking soils, and the ponded water within, which were identified as providing active habitat for a number of native frog species, are considered to provide habitat for Brigalow belt specialist reptile species, including the Ornamental snake which was recorded within this habitat type during the field survey and is listed vulnerable under the EPBC Act. Frog densities within this habitat type were observed to be low to moderate and spatially variable, with higher activity and abundance associated with water-retaining gilgai and areas supporting moist microhabitats. Native species such as the Broad-palmed rocket frog (*Litoria latopalmata*) and Striped burrowing frog (*Cyclorana alboguttata*) were recorded, indicating that the habitat provides suitable conditions for amphibian use, particularly during wetter periods. Cane toad (*Rhinella marina*) was identified as present within this community (in low densities), potentially posing a threat to the Ornamental snake. The intact canopy status provides sheltering, perching and predator avoidance opportunities for arboreal mammal and bird species. The hollow-bearing tree resources within the canopy also provides nesting and sheltering resources for hollow-dependent fauna. This habitat is considered to provide adequate denning resources for Greater glider (i.e., the frequency of hollow bearing trees per hectare of habitat), however fragmentation from other patches of potential habitat likely excludes this species from utilising this habitat.

Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
				This habitat type was particularly noted to lack or have very low abundance of the following habitat features: • Koala food trees; • native grass species; • mistletoe foraging resources for mistletoe dependent bird species; and • rocky outcrops for rocky-dependent mammals such as quoll. Given the lack of these habitat features, it is not considered to provide sufficient resources to support foraging Koalas, granivorous birds, rocky-dependent mammals and mistletoe feeding specialists. Specifically, whilst ground cover within this habitat is less dense than other communities identified within the Project area (ground cover was determined to be approximately 35% within this habitat), the dominance of introduced species limits foraging suitability for species such as Squatter pigeon. Further, the low abundance (approximately 30%) of Koala food trees, and the fragmented and highly isolated state of the habitat is also likely to reduce utilisation of the habitat patch by Koala.
Eucalypt open forest	RE11.5.3 (remnant condition)	10.87	Centre of the Project area	This habitat type occurs centrally within the Project area, adjoining the Brigalow woodland habitat described above, on a gently undulating plain comprised of light coloured, loamy soils. It is associated with vegetation ground-truthed as remnant RE11.5.3 (*Eucalyptus populnea* open forest on sand plains). Threats to the integrity of this habitat include a moderate incursion of introduced species within the ground stratum and fragmentation from nearby remnant vegetation as a result of historic broadscale vegetation clearing throughout the Project area. Key habitat features identified within this habitat type include: • abundance of Koala food trees; • intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna; • common occurrence of microhabitat features, including fallen woody debris, hollow logs and leaf litter; and • occasional small, medium, and large sized hollow-bearing trees (with small hollows being most prevalent). – Tree hollow surveys recorded an average density of 6 per 1ha, comprising small hollows (3 per 1ha), medium hollows (1 per 1ha) and large hollows (2 per 1ha). Overall, this habitat type provides resources primarily for woodland birds, microbats, reptiles and arboreal mammals.

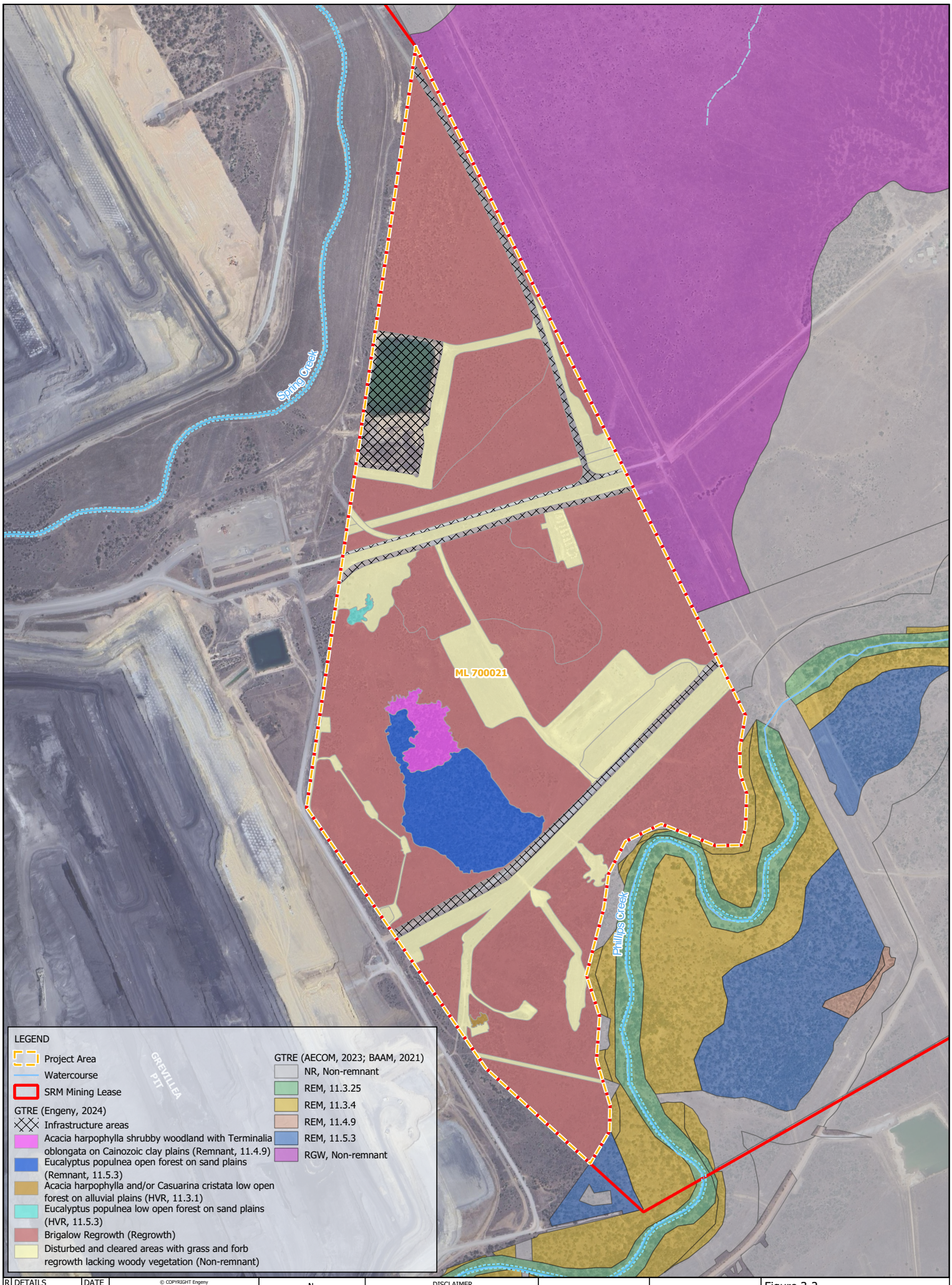
Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
				Specifically, the high abundance of Koala food trees (comprising approximately 34% within the canopy stratum), does indicate that this habitat is suitable for foraging and sheltering. It is noted however, that this habitat patch is highly fragmented and isolated from other habitat areas, including Phillips Creek. Koala would need to overcome significant barriers to access this habitat. As a result, whilst the habitat resources are present within this habitat type, utilisation of the habitat patch by the Koala is considered unlikely. The intact canopy status provides sheltering, perching and predator avoidance opportunities for arboreal mammal and bird species. The hollow-bearing tree resources within this stratum also provides nesting and sheltering resources as well as roosting opportunities for hollow-dependent fauna, including Greater glider (based on the frequency of hollow bearing trees per hectare of habitat). However, fragmentation from other patches of mature, woody vegetation within the locality likely creates barriers in these species accessing, and therefore utilising, this habitat. This habitat type was particularly noted to lack or have very low abundance of the following habitat features: • gilgai and cracking soils; • native grass species; • mistletoe foraging resources for mistletoe dependent bird species; and • rocky outcrops rocky-dependent mammals such as the quoll. Given the lack of these habitat features, it is not considered to provide sufficient resources to support Brigalow Belt reptile species, granivorous birds, rocky habitat and mistletoe feeding specialists. Specifically, the lack of native grass species within the ground layer and the abundance of introduced grass species, limits the foraging resources for Squatter pigeon. It also has a very dense ground layer, which inhibits nesting and dust bathing opportunities for the species. The lack of gilgai and cracking soils also means that the habitat does not provide resources for Ornamental snake. In addition, no frog species were recorded within this habitat type during field surveys, likely due to the absence of water-holding features such as gilgai and cracking soils. This further limits the suitability of the habitat for the Ornamental snake by reducing the availability of key prey resources.
Eucalypt and Brigalow low open forest	RE11.3.1 and RE11.5.3 and 11.3.1 (HVR condition)	0.42	Two small patches in the west of the Project area	This habitat type occurs as two small patches in the west of the Project area on light coloured, loamy soils and is associated with vegetation ground truthed as HVR RE11.3.1 (*Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains) and HVR RE11.5.3 (*Eucalyptus populnea* low open forest on sand plains). The integrity and value of this habitat is considered to be impacted as a result of the incursion of introduced ground cover species in high densities, as well as the small and fragmented nature of the patch due to historical clearing activities. Key habitat features identified within this habitat type include the common occurrence of Koala food trees (comprising approximately 47% of the canopy stratum) and occasional to common fallen woody debris. An overstorey vegetation layer has regenerated, although not fully mature, which would provide structural complexity and predator avoidance opportunities to fauna. Overall, this habitat type provides resources primarily for woodland birds and reptiles.

Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
				The abundance of Koala food trees does indicate that this habitat could be suitable for foraging and sheltering Koalas. However, it is noted, that this habitat occurs as two small and highly fragmented and isolated vegetation patches. Given that low connectivity values, it is considered that access and utilisation by the Koala is unlikely. This habitat type was particularly noted to lack or have very low abundance of the following habitat features: • gilgai and cracking soils; • native grass species; • hollow-bearing trees; • mistletoe foraging resources for mistletoe dependent bird species; and • rocky outcrops rocky-dependent mammals such as quoll. Given the lack of these habitat features, it is not considered to provide sufficient resources to support Brigalow Belt reptile species, granivorous birds, hollow-dependent fauna, rocky habitat and mistletoe feeding specialists. Although other microhabitat features, including fallen woody debris, hollow logs and leaf litter have been identified as occasionally to commonly present within this habitat type, the lack of gilgai and/or soils cracks are considered to limit habitat suitability specifically for Ornamental snake. The high percentage of ground cover (approximately 72%) and lack of native grasses (approximately 85% of ground stratum flora species identified to be introduced) also provides limited foraging opportunity for Squatter pigeon. The infrequency of hollow-bearing trees within this habitat also reduces its suitability for Greater glider.
Brigalow regrowth with frequent gilgai	Non-remnant vegetation.	42.81	Northern half of the Project area	This habitat type occurs in the northern aspect of the Project area and has been identified as situated on clay deposits which have formed gently undulating plains. It is associated with a portion of the vegetation community ground-truthed as Brigalow regrowth. This habitat has been significantly impacted as a result of broadscale vegetation clearing and historical land uses, including cattle grazing and the development of mine associated infrastructure, and the incursion of invasive species. Key habitat features identified within this habitat type include: • abundant to common occurrence of deep gilgai; • occasional cracking soils identified as diverse in depth; and • common occurrence of microhabitat features, including fallen woody debris, hollow logs, and leaf litter. Overall, this habitat type provides resources primarily for woodland birds, foraging raptors, frogs and Brigalow belt reptile species.

Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
				Specifically, the abundant gilgai within this habitat were frequently observed to contain ponded water, aquatic vegetation and a variety of frog species. The depth of these features enables them to retain water for extended periods following rainfall, thereby supporting prolonged breeding opportunities for amphibians. This then enhances the availability of foraging resources for the Ornamental snake, which was recorded within this habitat during spotlighting surveys. Field surveys confirmed the presence of several frog species, including the Broad-palmed rocket frog (*Litoria latopalmata*), Bumpy rocket frog (*Litoria inermis*), Green tree frog (*Litoria caerulea*), and Striped burrowing frog (*Cyclorana alboguttata*). These species were recorded in relatively high densities, predominantly in or near gilgai containing ponded water. The consistent amphibian activity observed indicates that the habitat supports a relatively robust frog population under suitable seasonal conditions, further contributing to its value as foraging habitat for the Ornamental snake. This habitat type was particularly noted to lack or have very low abundance of the following habitat features: • Koala food trees; • intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna; • canopy layer containing hollow-bearing trees; • native grass species; • semi-aquatic vegetation fringing across ephemeral wetland gilgai habitat; • mistletoe foraging resources for mistletoe dependent bird species; and • rocky outcrops rocky-dependent mammals such as the quoll. Given the lack of these habitat features, it is not considered to provide sufficient resources to support Koala, granivorous birds, cryptic wetland and wader bird species, hollow-dependent fauna, rocky habitat and mistletoe feeding specialists. Specifically, the ecologically dominant vegetation layer of the vegetation community comprising this habitat has been identified as the T3 stratum, which is heavily dominated by *A. harpophylla* at approximately 4 m in height. Tree hollows are therefore absent. The low abundance of Koala food trees (accounting for approximately 2% of the vegetation identified), are also young (approximately 3m in height on average). Resultingly, resources for Koala and Greater glider are absent. In addition, ponded water within gilgai does provide foraging habitat for wetland bird species; however, due to the absence of fringing semi-aquatic vegetation and muddy margins, the likelihood of providing potential habitat for threatened and migratory birds species is low, such as the Australian painted snipe (*Rostratula australis*) and Latham's snipe (G*allinago hardwickii*).

Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
				The high percentage of ground cover (approximately 94%) and lack of native grasses (approximately 89% of ground stratum flora species identified to be introduced) also provides limited foraging opportunity for Squatter pigeon. The regenerating T3 stratum could provide some perching opportunities for the species.
Brigalow regrowth with infrequent or absent gilgai	Non-remnant vegetation.	104.83	Central and southern areas of the Project	This habitat type occurs centrally and at the southern aspect of the Project area on clay-loam and silt-loam deposits which have formed gently undulating plains. It is associated with a portion of the vegetation community ground-truthed as Brigalow regrowth. This habitat has also been significantly impacted as a result of broadscale vegetation clearing and historical land uses, including cattle grazing and the development of mine associated infrastructure, and the incursion of invasive species, particularly in the ground stratum (where they comprise approximately 89%). Subsequently, this habitat type provides limited habitat resources to fauna. Rare occurrences of gilgai were identified, generally shallow in depth and infrequently containing ponded water. Gilgai are absent from the southern extent of this habitat, where the soil type is considered to be consistent with sandy alluvium soils (land zone 3). Other macro habitat features, including fallen woody debris, fallen logs and leaf litter, are considered rare to occasional in occurrence. The rare occurrence of gilgai and cracking soils are considered to limit habitat suitability for species reliant on moisture-dependent microhabitats. As a result, frog species were recorded only in low numbers and restricted to isolated, moisture-retaining areas in the northern portion of the habitat. This low amphibian activity further reduces the suitability of this habitat for Brigalow Belt specialist reptile species, such as the Ornamental snake, which relies on amphibians as a primary prey source. Overall, this habitat type is more suited for woodland birds and foraging raptors. Habitat feature found to be in very low abundance or even absent from this habitat type as a result of previous disturbance includes: • Koala food trees; • intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna; • canopy layer containing hollow-bearing trees; • native grass species; • mistletoe foraging resources for mistletoe dependent bird species; and • rocky outcrops rocky-dependent mammals such as the quoll. Given the lack of these habitat features, the habitat type is not considered to provide sufficient resources to support Koalas, granivorous birds, hollow-dependent fauna, rocky habitat, and mistletoe feeding specialists. Specifically, the ecologically dominant vegetation layer of the vegetation community comprising this habitat has been identified as the T3 stratum, which is heavily dominated by *A. harpophylla* at approximately 4 m in height. Tree hollows are therefore absent. The low

Habitat type	Analogous vegetation community	Area (ha)	Location	Key/notable habitat features
				abundance of Koala food trees (accounting for approximately 2% of the vegetation identified), are also young (approximately 3m in height on average). Resultingly, resources for Koala and Greater glider are absent. The foraging opportunity for granivorous birds is limited as a result of the abundance of introduced flora species, which would include species such as Squatter pigeon. The regenerating T3 stratum could provide some perching opportunities for the species.
Non-remnant cleared and disturbed areas with grass and forb regrowth	Non-remnant vegetation.	43.11	Recently cleared and disturbed areas (e.g. powerline easements and laydown areas)	This habitat type is associated with areas which have been recently cleared and disturbed, including powerline easements and laydown areas. Historical impacts including cattle grazing, development of mine associated infrastructure, and incursion of invasive species (comprising approximately 98% of the ground stratum), have severely reduced habitat integrity. Similarly to the Brigalow regrowth habitat with infrequent or absent gilgai, this habitat was found to provide limited habitat resources to fauna. Rare occurrences of gilgai were identified to be shallow in depth and infrequently containing ponded water. No frog species were recorded during field surveys, likely due to the lack of suitable breeding habitat such as persistent ponded water and moist refuges. The rare occurrence of gilgai and cracking soils are considered to limit habitat suitability for Brigalow belt specialist reptile species, including Ornamental snake. Habitat feature found to be in very low abundance or even absent from this habitat type as a result of previous disturbance includes: • Koala food trees. • overstorey woody vegetation for sheltering for most fauna species; • canopy layer containing hollow-bearing trees; • native grass species; • mistletoe foraging resources for mistletoe dependent bird species; and • rocky outcrops rocky-dependent mammals such as the quoll. Given the lack of these habitat features, the habitat type is not considered to provide sufficient resources to support Koalas, granivorous birds such as Squatter pigeon, hollow-dependent fauna such as Greater glider, rocky habitat and mistletoe feeding specialists.



LEGEND

- Project Area
- Watercourse
- SRM Mining Lease

GTRE (Engeny, 2024)

- Infrastructure areas
- Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains (Remnant, 11.4.9)
- Eucalyptus populnea open forest on sand plains (Remnant, 11.5.3)
- Acacia harpophylla and/or Casuarina cristata low open forest on alluvial plains (HVR, 11.3.1)
- Eucalyptus populnea low open forest on sand plains (HVR, 11.5.3)
- Brigalow Regrowth (Regrowth)
- Disturbed and cleared areas with grass and forb regrowth lacking woody vegetation (Non-remnant)

GTRE (AECOM, 2023; BAAM, 2021)

- NR, Non-remnant
- REM, 11.3.25
- REM, 11.3.4
- REM, 11.4.9
- REM, 11.5.3
- RGW, Non-remnant

R	DETAILS	DATE
1	Draft Issue	24-05-2024
2	Final Issue	30-09-2024

DRAWN	MB	CHECKED	AB
APPROVED	AB	DATE	30-09-2024

NOTES:

N

0 0.1 0.2 km

SCALE @ A3 - 1:10,000
GDA94 / MG Zone 55

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source

ENGENY

BMA
BHP Mitsubishi Alliance

Figure 3-2

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Preliminary Documentation
Ground-truthed Regional Ecosystems

Drg Ref.

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3.2.6 Habitat Values

Desktop and field assessments undertaken identified threatened species and ecological communities listed under the EPBC Act as known or having the potential to occur within the Project area or immediate surrounds. The habitat assessment for each MNES identifies the habitat values, based on the habitat definitions in ***Section 3.1.4*** for the Project area.

The information requirements for the Preliminary Documentation includes further assessment requirements for the following MNES:

- Brigalow TEC
- Greater glider (*Petauroides volans*)
- Koala (*Phascolarctos cinereus*)
- Squatter pigeon (*Geophaps scripta scripta*)
- Ornamental snake (*Denisonia maculata*)
- King Bluegrass (*Dichanthium queenslandicum*)
- Bluegrass (*Dichanthium setosum*)

The habitat assessment information requested for these MNES is outlined in the following subsections.

3.2.6.1 Brigalow TEC

Vegetation communities (REs) indicative of the Brigalow TEC were identified within the Project area from the desktop assessment. Field validation surveys within the Project area, undertaken to support this PD, confirmed the presence of REs indicative of the Brigalow TEC, namely RE11.3.1 and RE11.4.9, as well as an extent of Brigalow dominated regrowth vegetation.

Assessments in accordance with the approved conservation advice for the Brigalow TEC were undertaken within identified analogous REs and Brigalow regrowth vegetation to confirm if the Brigalow TEC was present. This assessment was undertaken on the following vegetation communities, which account for approximately 150 ha of vegetation:

- *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (remnant RE11.4.9) – 2.73 ha
- *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (HVR RE11.3.1) – 0.13 ha
- Brigalow Regrowth (non-remnant) – 147.69 ha

To support this assessment, key vegetation attributes were reviewed for each community, including dominant flora species composition, extent of non-native vegetation cover, community age and clearing history, patch size, and overall ecological condition.

Community age and disturbance history were assessed using historical aerial imagery available via QImagery (DNRMMRRD, 2025). While the precise timing of all clearing events could not be determined, due to the non-recurring nature of image capture, the imagery was reviewed to identify the most recent and observable disturbance events. As such, the clearing dates presented in ***Table 3-3*** are considered approximate.

Importantly, the QImagery review clearly indicates that the Brigalow regrowth community has been subject to ongoing disturbance over time. The imagery shows evidence of repeated clearing, slashing, and surface degradation likely associated with grazing and trampling, which has inhibited natural regeneration and structural development.

Field survey results confirm that non-native vegetation cover is present across all three assessed vegetation communities, to varying degrees:

- The *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (RE11.4.9) was assessed as having approximately 25% non-native vegetation cover, with frequently occurring species including *Megathyrsus maximus*, *Cenchrus ciliaris*, and *Bothriochloa pertusa*.
- The *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (HVR RE11.3.1) contained an estimated 50% non-native vegetation cover, dominated by *Megathyrsus maximus*, *Cenchrus ciliaris*, *Bothriochloa pertusa*, and *Chloris gayana*.

- The Brigalow regrowth community is the most heavily degraded, with approximately 84% non-native species cover in the ground layer. Dominant species include *Cenchrus ciliaris*, *Bothriochloa pertusa*, and *Chloris gayana*, with *Melinis repens* present as a sub-dominant. The shrub layer also supports high weed diversity, including *Parthenium hysterophorus* (locally dominant), *Cryptostegia grandiflora*, and *Stylosanthes scabra*. Notably, *Parthenium hysterophorus* and *Cryptostegia grandiflora* are listed as Category 3 Restricted Matter under the *Biosecurity Act 2014*. The high density and diversity of invasive species has substantially reduced the ecological integrity of this regrowth community and limits its capacity to develop the structural complexity required to meet Brigalow TEC condition thresholds.

This information, summarised in ***Table 3-3***, formed the basis for evaluating each community against the key diagnostic characteristics and condition thresholds for Brigalow TEC (results presented in ***Table 3-4***).

Following this assessment, it has been determined that none of the communities meet the criteria to be considered Brigalow TEC. RE11.4.9 did not meet the key diagnostic criteria as *Acacia harpophylla* was absent as a dominant or co-dominant species (see Section 3.4 of ***Appendix D***). HVR RE11.3.1 met the key diagnostic criteria but failed the condition thresholds, primarily due to insufficient patch size and high non-native species cover. Brigalow regrowth, although dominated by *Acacia harpophylla*, is too young (<15 years) and lacks the mature structure, canopy stratification, and ecological complexity typical of remnant Brigalow communities.

In summary, **these assessments indicated that no TECs are present within the Project area** (refer ***Table 3-4***).

Table 3-3: Review of diagnostic criteria per vegetation community

RE	Vegetation Community	Dominant Tree Species	Non-native vegetation cover	Historical Clearing	Patch Approx. Age	Condition Assessment	Ground-truthed patch size (ha)
11.4.9 (Remnant)	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.	Heavily dominated by *Casuarina cristata*. *Eucalyptus populnea* is present as a sub-dominant species.	~25%	Cleared ~1978 as part of broadscale clearing across the wider area.	~47 years.	Fragmented, with disturbance from invasive flora species in the ground layer.	2.73
11.3.1 (HVR)	Acacia *harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains.	Heavily dominated by *Casuarina cristata.* *Acacia harpophylla* identified as a sub-dominant species.	~50%	Initially cleared ~1966; subsequent clearing ~1978 and ~2004.	~21 years.	Small patch of mature regrowth isolated by non-remnant vegetation; disturbance from mining and ground-layer weed incursion.	0.13
Non-remnant	Brigalow Regrowth.	Heavily dominated by *Acacia harpophylla.*	>84%	Broadscale clearing observed in ~1978, ~1985, ~2000, ~2004, and ~2017.	~8 years.	Highly fragmented and degraded by repeated clearing, agriculture, and mining; high weed invasion.	147.69

Table 3-4: Brigalow TEC presence assessment

Criteria	Area of Project area where criteria was met	Area of Project area where criteria was not met
Key Diagnostic Characteristics		
1) The presence of *Acacia harpophylla* as one of the most abundant tree species in the patch. *A. harpophylla* is either dominant in the tree layer, or co-dominant with other species (notably *Casuarina cristata*, other species of *Acacia*, or species of *Eucalyptus*).	147.69 ha (Brigalow regrowth) 0.13 ha (HVR RE11.3.1)	2.73 ha (Remnant RE11.4.9)
2) AND is in the Brigalow Belt, Southeast Queensland or Mulga Lands bioregion and meets the REDD description of 16 Qld REs listed for the TEC. AND / OR age of community, generally > 15-year regrowth.	0.13 ha (HVR RE11.3.1)	147.69 ha (Brigalow regrowth)
KEY DIAGNOSTIC CHARACTERISTICS OUTCOME	**0.13 ha of HVR RE11.3.1 meets all key diagnostic criteria**	**150.42 ha of RE11.4.9 & Brigalow regrowth do not meet all key diagnostic criteria – not further assessed**
Condition Thresholds		
1) The patch is 0.5 ha or more in size.	0.00 ha	0.13 ha (HVR RE11.3.1)
2) AND non-native perennial plants comprise less than 50 % of the total vegetation cover of the patch, as assessed over a minimum sample area of 0.5 ha (100 m by 50 m), that is representative of the patch.	0.00 ha	0.00 ha
CONDITION THRESHOLD OUTCOME	**No areas meet all condition threshold criteria**	**0.13 ha of RE11.3.1 HVR**
OVERALL BRIGALOW TEC OUTCOME	**No areas meet all key diagnostic and condition threshold criteria**	**150.55 ha of RE11.4.9, HVR RE11.3.1 and Brigalow regrowth do not meet criteria.**

3.2.6.2 Greater glider

Eucalypt dominated open forest habitats were ground-truthed to occur within the Project area, in both remnant and HVR conditions. These vegetation communities have been described within this report as the following:

- Eucalypt open forest; and
- Eucalypt and Brigalow low open forest.

These areas comprise a mature canopy layer or emergent mature trees, inclusive of stag trees with medium sized hollows, which may provide shelter, foraging and breeding resources for Greater glider.

Whilst Greater glider habitat resources (i.e. frequent medium to large (>10 cm) sized hollow-bearing trees) are present in the Project area, this assessment has determined that these habitat patches are not considered to

constitute current or potential future habitat for Greater glider as they are too fragmented and isolated from more suitable habitat along Phillips Creek where the species is known to occur (see ***Table 3-5***).

The Greater glider is an arboreal, nocturnal mammal that disperses and moves primarily by tree-to-tree gliding (DCCEEW, 2022a). The species typically glides approximately 30-40m and up to 120m in extreme and uncommon situations (DESI, 2024; ***Figure 3-4***). To move through the landscape, the species requires either continuous or near continuous canopy structure (Eyre et al., 2022b), or the opportunity to glide at greater distances through the presence of adequate launch height, a substantial vertical drop and a landing point, which is provided by very tall canopy trees and/or downslope gliding conditions (Kerle, 2001; Jackson, 2000; NSW Scientific Committee, 2015). Movement between habitat patches is therefore constrained by glide distance, glide trajectory, and the availability of sufficiently tall and connected canopy structure (Kerle, 2001; Jackson, 2000; NSW Scientific Committee, 2015).

'Preferred' Greater glider habitat has been identified as present at Phillips Creek, outside of the Project area, and the species has been previously recorded along the waterway from previous ecological assessments (refer to ***Figure 3-3***). For instance, four (4) records have been identified less than 500m east of the Project area (ELA, 2019b) and a further two (2) records were identified by BAAM (2021) about 200m south of the Project area, all in association with Phillips Creek (***Figure 3-3***). Other known sightings of Greater glider in the broader region also occur along the main waterways, including a further four (4) records upstream along Phillips Creek and one (1) record along One Mile Creek, located approximately 3.1km north of the Project area (ELA, 2018) (***Figure 3-3***). It is noted that the presence of greater glider at One Mile Creek indicates the persistence of the species in habitat located in close proximity to existing mining operations.

The 'preferred' habitat along Phillips Creek is located approximately 247m from the 'Eucalypt open forest' and 'Eucalypt and Brigalow low open forest' within the Project area (***Figure 3-4***). The area between habitat along Phillips Creek and the eucalypt dominated vegetation communities in question within the Project area comprises Brigalow regrowth and Disturbed and Cleared Areas associated with historical clearing, powerline easements and mining-related infrastructure. The vegetation communities in this area lack emergent and canopy strata and are dominated by vegetation of limited height, with the Brigalow regrowth averaging approximately 3.8m in height and the Disturbed and Cleared Areas lacking woody vegetation entirely (***Figure 3-4***). If a Greater glider were to glide north from Phillips Creek toward the Project area, it would land within this disturbed and regrowth vegetation. In the absence of woody vegetation of sufficient height, this intervening vegetation does not provide the elevated substrates required to facilitate further gliding or canopy-based movement toward the eucalypt-dominated vegetation within the Project area. It therefore represents a functional barrier to movement.

Historical aerial imagery indicates that the intervening vegetation between Phillips Creek and the Project area has been maintained in a cleared or regrowth state for several decades under existing land uses and management practices. Therefore, the condition of this vegetation is unlikely to change and fragmentation across the Project area will likely persist regardless of the Project being approved. Even under a scenario where Brigalow regrowth vegetation is allowed to mature within the Project area, Brigalow dominated communities are naturally characterised by relatively low to moderate canopy height, dense structure and low density of tree hollows. Such vegetation does not provide the tall emergent canopy or vertical drop required to facilitate extended gliding. The potential for the Project area to provide future Greater glider habitat is not considered feasible.

Habitat fragmentation and canopy disconnection are identified as key threats to the species (DCCEEW, 2022a). Greater gliders disperse poorly across vegetation that is not native forest and do not readily recolonise isolated habitat patches from which they have been lost (DCCEEW, 2022a). Consistent evidence indicates that isolated and structurally disconnected patches are unlikely to support viable populations or facilitate dispersal (Youngentob et al. 2013). Phillips Creek supports the nearest known Greater glider habitat and provides the structurally connected riparian corridor that facilitates movement and dispersal opportunities for a local population. In contrast, the eucalypt dominated habitat patches within the Project area do not, due to:

1. its separation of a minimum distance of approximately 247m from known habitat at Phillips Creek, which is greater than the species' known maximum gliding distance,
2. the presence of intervening non-remnant Brigalow regrowth averaging approximately 3.8m in height, which provides a much lower launching point for the species to glide effectively,
3. the species' natural movement habits and subsequent constraints on the species' capacity to traverse this intervening landscape via gliding in the absence of continuous or sufficiently tall canopy structure, and
4. the persistence of theses limiting habitat values across the Project area as a result of historic and continuing land uses across the Project area

It is noted that as per BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2023), 'Preferred' Greater glider habitat has been identified as present at Phillips Creek, outside of the Project area, from previous ecological assessments that have occurred in the surrounding area (refer ***Figure 3-3***). Previous assessments also identified 'Suitable' habitat on the upper floodplain areas of Phillips Creek. However, from habitat observations undertaken along Phillips Creek during this current field survey, as well as previous ecological assessment experience in the Central Queensland region, the extent of species utilisation is likely to be more restricted to the fringing riparian zone of Phillips Creek. As such 'Preferred' habitat is considered to be limited to the riparian corridor, with 'Suitable' habitat occurring on the top of banks / adjacent floodplain (i.e. within a 120 m area from the riparian corridor).

Table 3-5: Greater glider habitat definitions

Habitat category	Definition	Area (ha) within Project area
Preferred	Preferred Greater glider habitat in central Queensland is defined as: • Remnant connected eucalypt woodlands containing one or more feed tree species and more than two hollow bearing trees/ ha, with hollows medium-large in size (>10cm entrance), usually on fertile, wetter soils of riparian zones. • In central Queensland, preferred foraging and den trees include *E. camaldulensis, E. tereticornis, E. fibrosa* and *Corymbia citriodora*. The species has also been observed in *Angophora floribunda, E. cambageana, E. coolabah, E. crebra, E. laevopinea, E. moluccana, E. orgadophila, E. populnea, E. melanophloia* and *C. tessellaris* in which it may use for foraging and/ or denning. • This habitat supports denning (breeding), foraging, sheltering, and dispersal across the landscape.	0.00
Suitable	Remnant eucalypt woodlands containing one or more feed tree species connected to areas of denning habitat that does not contain more than two hollow bearing trees / ha, medium-large in size (>10cm entrance). Generally, within about 120m of breeding / denning habitat, reflecting the home range of the species. This habitat category would likely support foraging, shelter and dispersal of the species.	0.00
Marginal	Defined as: • Remnant or HVR eucalypt vegetation adjacent to preferred Greater glider habitat where hollows are small and/ or less frequent. Isolated patches of marginal habitat >100m from adjacent habitat do not provide habitat for the species due to gliding capabilities. • Remnant or HVR eucalypt vegetation on low fertile and low moisture soils, regardless of hollow densities. • This habitat category would likely support foraging and dispersal for the species.	0.00
Total		**0.00**

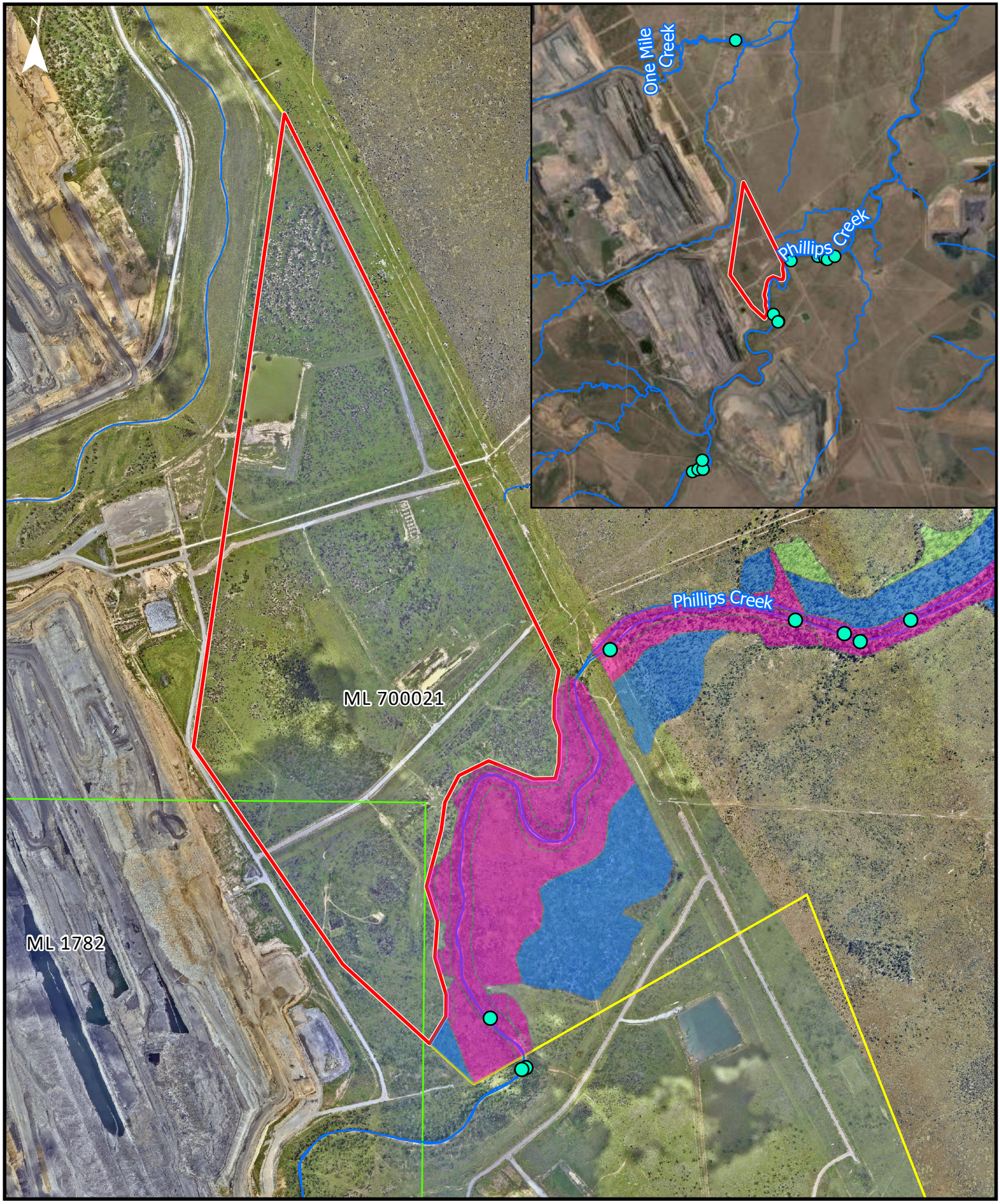


FIGURE 3-3: GREATER GLIDER HABITAT SURROUNDING THE PROJECT AREA

Legend

- Greater Glider Sightings
- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Greater Glider Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred
- Suitable
- Marginal

0 250 500 m

ENGENY

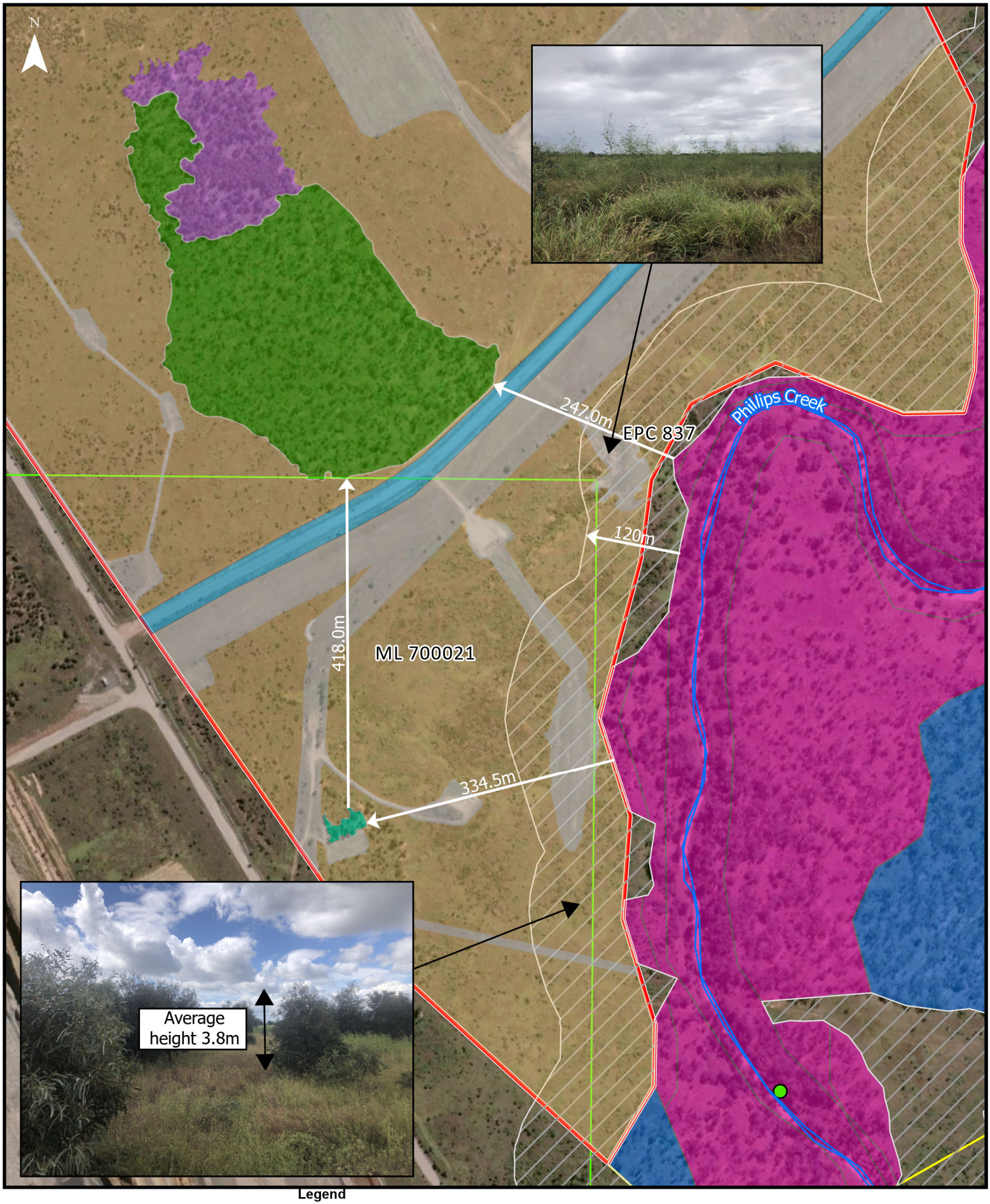


FIGURE 3-4: MAXIMUM POTENTIAL GLIDE DISTANCE OF GREATER GLIDER AND VEGETATION FRAGMENTATION

ENGENY

Legend

- Project Area
- Watercourse
- Maximum Potential Glide Distance

GTRE (Engeny, 2024)

- Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains (Remnant, RE11.4.9)
- Eucalyptus populnea open forest on sand plains (Remnant, RE11.5.3)
- Acacia harpophylla and/or Casuarina cristata low open forest on alluvial plains (HVR, RE11.3.1)
- Brigalow Regrowth (Regrowth)
- Disturbed and cleared areas (Infrastructure)
- Disturbed and cleared areas with grass and forb regrowth lacking woody vegetation (Non-remnant)
- Mining Lease Boundary
- Exploration Permits (Coal)

Previous Sightings

- Greater Glider (BAAM, 2021)

Greater Glider Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred (breeding, foraging, shelter and dispersal)
- Suitable (foraging, dispersal and shelter)

0 50 100 m

3.2.6.3 Koala

Eucalypt dominated open forest communities were ground-truthed to occur within the Project area. Three (3) patches of open forest were delineated into two (2) habitat categories during field survey and are described as:

- *Eucalypt* open forest; and
- *Eucalypt* and Brigalow low open forest.

All eucalypt dominated open forest areas comprise a mature and tall canopy layer, potentially suitable for Koalas to utilise for sheltering and predator avoidance. These forest patches were found to be dominated by Koala food trees and therefore provide limited foraging resources. Koala food trees identified across these habitats were restricted to two species: *Eucalyptus populnea* and *E. cambageana*.

Despite these features, the identified patches are limited in extent, highly fragmented, and significantly isolated from habitat known to support a Koala population along Phillips Creek to the south. Dispersal from Phillips Creek to the eucalypt dominated vegetation patches identified within the Project area would require traversing a distance of 247 m to 1 km through young Brigalow regrowth (approximately 4 m tall) including light vehicle mine access tracks. This would present a high-risk movement opportunity for individuals as the height of Brigalow regrowth is not considered sufficient for predator avoidance. Additionally, it is considered that the motivation for Koalas to move from preferred vegetation along Phillips Creek into this disturbed landscape would be minimal given the marginal quality of the vegetation available.

Additionally, two (2) of the three (3) open forest patches identified by this assessment have been calculated to be less than 1 ha in size. Patches less than 1 ha are considered too small to support the home range of a Koala individual without a well-connected network of supporting habitat patches (Ellis *et al.* 2002). The small patches are isolated and do not lead to other large forested areas to the north of the Project area and therefore do not provide 'stepping stone' habitat value. The potential habitat within the Project area is essentially a 'dead end' for individuals and unlikely to be utilised by the species that are inhabiting Phillips Creek.

Therefore, while the Phillips Creek riparian corridor provides east–west dispersal opportunities for Koalas within the broader locality, there is no viable northward dispersal pathway into the Project area. The Project area is a habitat dead-end for Koalas, and clearing within it will not sever or further fragment existing Koala movement corridors or functional habitat patches. The absence of records north of Phillips Creek reinforces this aspect.

As per BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al*., 2023), areas of identified Koala habitat are categorised into 'Preferred', 'Suitable' and 'Marginal'. As detailed previously, open forest areas within the Project area are highly fragmented and significant barriers restricting Koala dispersal exist, including presence of vegetation communities dominated by low woody vegetation not suitable for predator avoidance as well as introduced flora (i.e., *Panicum effusum*) species in the ground stratum, roads and fence lines. Therefore, open forest areas within the Project area have been classified as sparsely distributed woodlands and therefore meets the definition of 'Marginal' habitat.

Vegetation associated with Phillips Creek (situated outside of the Project area to the south) has been determined from previous assessments in the surrounding area, as 'Preferred' habitat, predominantly within the riparian zone. On the adjacent floodplains, the vegetation has been categorised as 'Suitable'. This previous determination has been based on the findings of previous recorded presence of Koala within this vegetation, and the association of vegetation with the identified waterway of Phillips Creek. This includes 17 records of Koala directly west of the SRM along the tributaries of Phillips Creek and One Mile Creek within a large and contiguous vegetation tract (***Figure 3-5***) (ELA, 2018). Majority of these records occur within 240 m of the mine site.

Known records of Koala across the area also supports this habitat classification. No sightings of Koala or evidence of Koalas were detected in current field survey or in previous ecological surveys across the Project area. All records of Koala across the area occur along Phillips Creek as well as its tributaries and the extensive and contiguous vegetated tract directly west of Saraji Mine (***Figure 3-5***). Majority of these records occur in close proximity (approximately 240 m) to the active mine site.

Table 3-6: Koala habitat within the Project Area

Habitat Category	Definition	Area (ha) within Project area
Preferred	Contiguous remnant and high-value regrowth *Eucalyptus* open forest to woodlands on alluvial and/or cracked rock groundwater where palatable food tree species occur frequently (and are usually dominant). This specifically includes stream-fringing open forest, open forest or woodland on alluvial terraces where *Eucalyptus tereticornis* and/or *E. camaldulensis* are dominant or common subdominant elements. Other important food species on the alluvial terraces can include *E. coolabah, E. crebra, E. melanophloia* and *E. populnea*. These listed Eucalyptus species comprise a subsample of locally important Koala habitat trees in the Brigalow Belt across various geological contexts. These habitats typically provide the full suite of habitat requirements for the Koala, including reliable breeding, foraging, sheltering, and dispersal opportunities. The Project area does not support any vegetation meeting this description.	0.0
Suitable	Remnant and regrowth Eucalyptus open forest to woodlands with more variable aquifers (often seasonal) and that have connectivity to other areas of 'Suitable' or 'Preferred' habitat. Must incorporate one or more palatable food tree species of relative abundance. These areas are connected to broader habitat networks and therefore support foraging, shelter, and dispersal, and may be used by Koalas moving between higher-quality areas. No such habitat has been identified within the Project area.	0.0
Marginal	All other fragmented and sparsely distributed woodlands and open woodlands, shrub lands and forests, with some food trees and which experience significant seasonal water deficits and/or are subject to periodic high intensity fires. These areas may support rare, opportunistic sheltering and dispersal, but are unlikely to support breeding or foraging opportunities due to their small size, isolation, and surrounding barriers.	11.29
Total		**11.29**

The Commonwealth provides species-specific guidance on habitat considered to be critical to the survival of Koala. The 'Marginal' habitat listed in ***Table 3-6*** does not meet the criteria set out in the Commonwealth Conservation Advice (DAWE, 2022a) to be considered critical to the survival of the species. The key limitations of the habitat area within the Project area that led to this conclusion are as follows:

- The fragmented and isolated nature of the habitat patches within the Project area (three patches were identified during field surveys, two of which are less than 1ha in size and one approximately 10.87ha),
- Patch isolation from known Koala habitat by distances ranging from 260 m to 1 km,
- Habitat structure is limited, with canopy trees occurring within fragmented patches of Eucalypt open forest dominated by *Eucalyptus populnea* and *E. cambageana*, which are separated from known Koala habitat by areas of young Brigalow regrowth (approximately 4 m tall), cleared land and light vehicle access tracks that do not provide adequate canopy cover for predator avoidance,
- No functional connectivity to known Koala habitat at Phillips Creek to the south, and
- The presence of threatening processes associated with historical land use, including the clearing, modification and fragmentation of native vegetation, which have reduced habitat quality and connectivity across the Project area.

A structured assessment against the Commonwealth criteria and further details on the conclusions made are provided in Section 4.2.1.4 of ***Appendix D***.

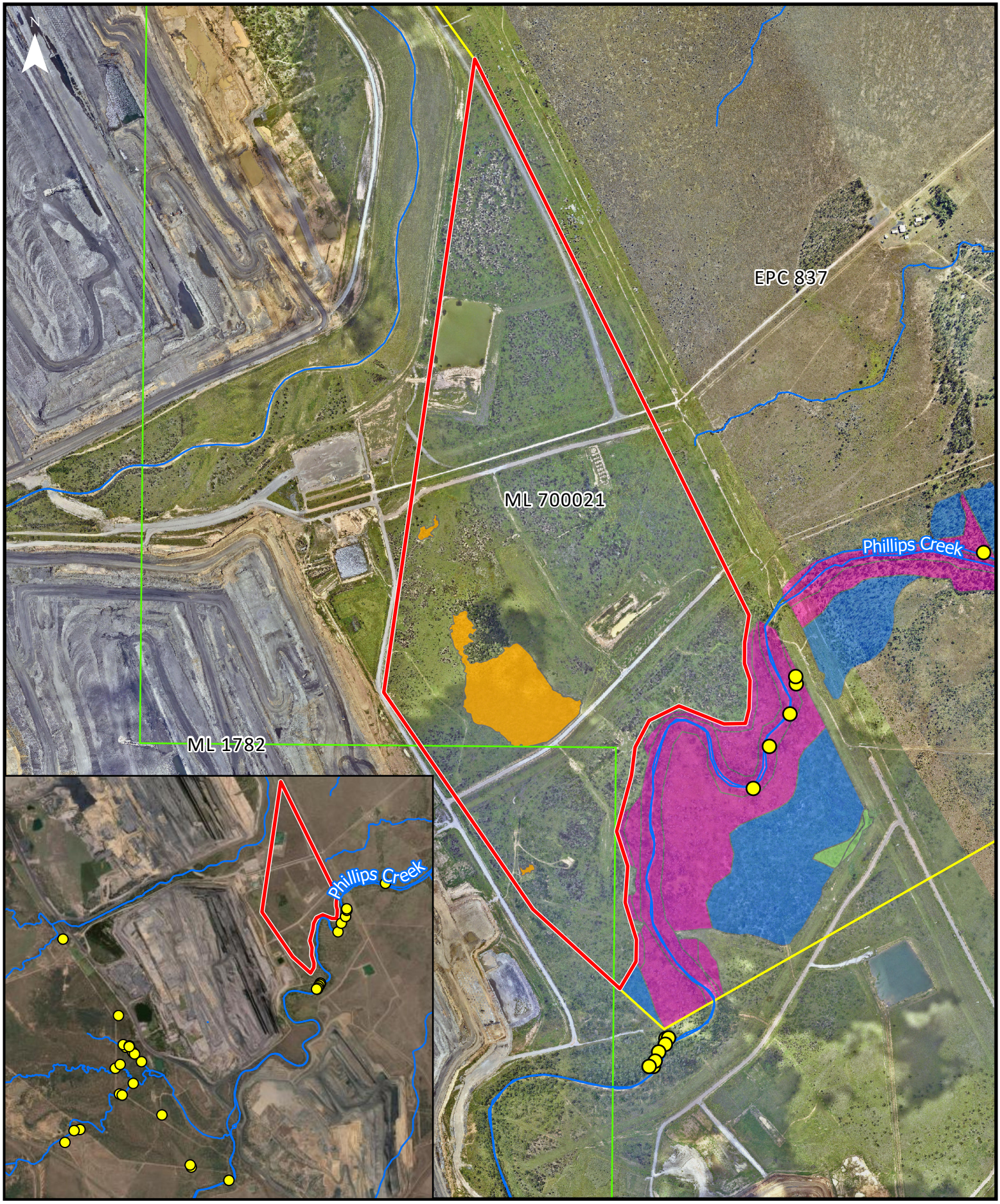


FIGURE 3-5: KOALA HABITAT WITHIN THE PROJECT AREA AND SURROUNDS

Legend

- Koala Sightings
- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Koala Habitat Type

- Marginal

Koala Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred
- Suitable
- Marginal

0 250 500 m

ENGENY

3.2.6.4 Squatter pigeon (southern)

Vegetation areas with a grassy understorey that can be utilised by Squatter pigeon were ground-truthed across the majority of the Project area (i.e., approximately 73% of the total area). One habitat type (marginal) was ground truthed across the Project area (***Figure 3-6***) and comprises multiple ecosystem types including:

- Brigalow woodland;
- Eucalypt open forest;
- Eucalypt and Brigalow low open forest;
- Brigalow regrowth with frequent gilgai; and
- Brigalow regrowth with infrequent or absent gilgai.

Of these, Brigalow woodland, Eucalypt open forest, and Eucalypt and Brigalow low open forest, contain a defined overstorey of trees that provides sufficient roosting and sheltering opportunities for the species. Others are in regrowth form and contain a regenerating tree layer that can still provide some cover for the species in transit.

The areas described as marginal Squatter pigeon habitat (***Figure 3-6***) do not occur within 1km of reliable water sources, which is a typical requirement of fitting 'preferred' habitat classification. A mine water storage dam is situated within the Project area and has been heavily modified by activities associated with its construction. It is surrounded by a dense ground stratum dominated by invasive species, particularly *Parthenium hysterophorus*, and is bound by steep banks limiting access. These factors indicate that the dam is unlikely to be utilised by Squatter pigeon and does not provide a suitable or accessible water source. Further, while Phillips Creek is within 1km of these areas, it is a highly ephemeral and seasonal system that is not a reliable water source. Beyond these limited water sources, no permanent waterbodies or watercourses occur within 3 km of the disturbance footprint that could support foraging habitat.

No areas meet the combined vegetation structure, soil and water criteria required for 'Preferred' or 'Suitable' habitat under Kerswell *et al.* (2020). A detailed assessment against each habitat criterion and the reasoning behind the marginal habitat classification for Squatter pigeon is provided in Section 4.2.2.3 of ***Appendix D***.

The classification of habitat as 'Marginal' reflects:

- The absence of reliable and accessible permanent water sources within 1km of the Project area, a requirement for breeding and nesting activities aligned with 'Preferred' habitat; and
- Consistently dense ground cover (>33%), dominated by non-native grasses, resulting in ground vegetation composition and structure that does not provide breeding, foraging and dust-bathing opportunities that align with either 'Preferred' or 'Suitable' habitat criterion.

Marginal habitat within the Project area is therefore considered to provide resources primarily for sheltering and dispersal. Squatter pigeon may utilise the Project area while moving between higher value habitats in the surrounding landscape, including habitats associated with the Isaac River to the east, Spring Creek to the north and the Harrow Ranges to the west. This finding is consistent with previous ecological assessments undertaken in the broader area (AECOM, 2016; BAAM, 2021).

Vegetation associated with Phillips Creek, located directly south of the Project area, has previously been mapped by BAAM (2021) and AECOM (2016) as supporting Preferred and Suitable habitat for Squatter pigeon (***Figure 3-6***). The habitat mapped within the Project area as Marginal occurs immediately adjacent to this previously mapped habitat. The difference in habitat classification across this boundary reflects differences in ground truthed vegetation structure at the time of each survey and land management history between the two areas.

The Project area has been subject to historical disturbance including vegetation clearing, exploration activities, vegetation slashing and the installation of mine infrastructure. These activities have altered the vegetation structure and ground layer composition across the Project area. Field survey results identified dense ground cover dominated by introduced grasses across much of the site, with ground cover consistently exceeding the <33% threshold required for Preferred and Suitable habitat under Kerswell et al. (2020). This modified ground structure reduces the suitability of the habitat for Squatter pigeon, particularly for foraging and nesting activities which require relatively open ground conditions.

In contrast, the Phillips Creek corridor has not been cleared or subject to the same land management activities that have occurred within the Project area. The creek and associated riparian zone are extant communities that have

been retained within a property utilised for cattle grazing. As a result, vegetation structure and ground layer composition within the creek corridor have developed under different disturbance regimes.

Unlike the Marginal habitat within the Project area, the Preferred and Suitable habitat along Phillips Creek also comprises of all three habitat characteristics that are of preference to Squatter pigeon, namely that habitat:

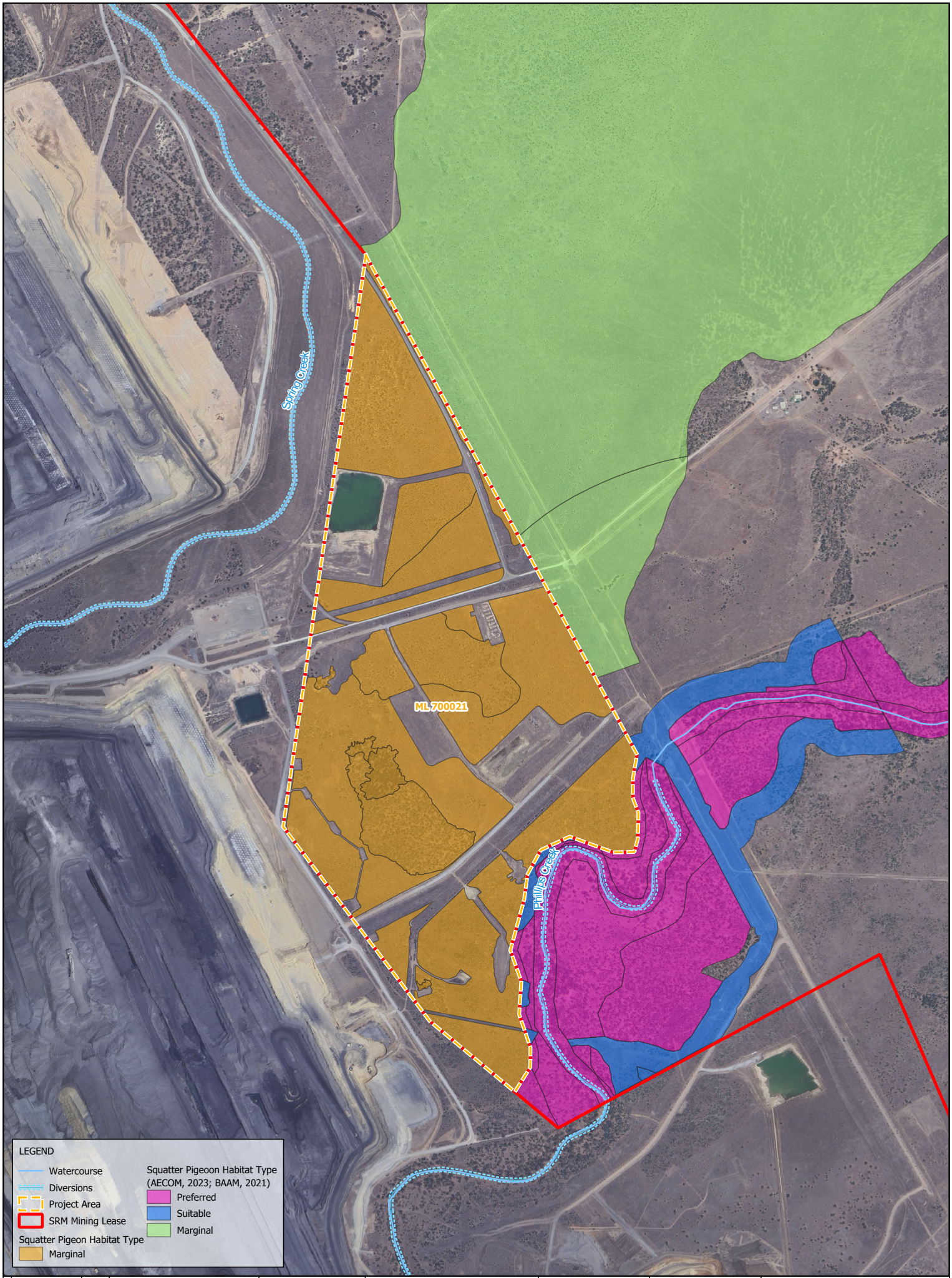
- occurs on land zone 3 soils;
- is in close proximity to a suitable water source provided by the watercourse system; and
- has the appropriate vegetation structure.

Notwithstanding the above, observations made during the current field survey indicate that sections of the Phillips Creek corridor now supports a dense ground cover dominated by introduced grasses, suggesting that parts of the area may no longer satisfy the sparse ground cover criterion required for Preferred habitat. However, the Phillips Creek corridor was not subject to the same detailed ground truthing and quantitative vegetation assessment undertaken within the Project area. A review of the analysis of the potential Squatter pigeon habitat at Phillips Creek is included in Section 4.2.2.3 of ***Appendix D***.

Accordingly, the previously mapped Preferred and Suitable habitat associated with the Phillips Creek corridor has been retained and has not been revised as part of this assessment.

Table 3-7: Squatter pigeon habitat within the Project area

Habitat category	Definition	Area (ha) within Project area
Preferred	Remnant or high-value regrowth grassy open forest to woodland dominated by *Eucalyptus, Corymbia, Callitris* or *Acacia* species, with sparse shrub layers and open groundcover (<33% cover), on well-draining sandy, loamy or gravelly soils. Located within 1 km of a suitable permanent waterbody, these habitats provide the optimal structure and soil conditions for breeding, foraging, sheltering, and dispersal. Preferred habitat may occur on land zones 3, 5, 7, 8, 9 and 10. No preferred habitat was recorded within the Project area.	0.00
Suitable	Remnant or regrowth grassy open forest or woodland dominated by Eucalyptus, Corymbia, Callitris or Acacia species, with relatively sparse groundcover vegetation (<33 % cover), on well-draining sandy, loamy or gravelly soils. Located 1-3 km from a permanent or seasonal waterbody, or within 100 m of preferred habitat. Suitable habitat may be located on land zones 3, 5, 7, 8, 9 and 10, and will support foraging, sheltering, and dispersal, but provide limited opportunity for breeding due to distance from water or slight deviations in structure. No suitable habitat was identified within the Project area.	0.00
Marginal	Non-remnant areas, regrowth and remnant woodland or forest areas more than 3 km from a permanent or seasonal waterbody that facilities the movement of the species between patches of 'Preferred' or 'Suitable' habitat. This habitat category is considered sufficient to support shelter and dispersal opportunities but are unlikely to support foraging or breeding.	161.71
Total		**161.71**



R	DETAILS	DATE
1	Draft Issue	24-05-2024
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DRAWN	MB	CHECKED	AB
APPROVED	AB	DATE	30-09-2024

NOTES:

N

0 0.1 0.2 km

SCALE @ A3 - 1:10,000
GDA94 / MG Zone 55

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DATA SOURCE
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Figure 3-6

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Preliminary Documentation
Squatter Pigeon habitat

Drg Ref.

\\online.com\files\BNEManagement\Projects\QC1000 BHP (BMA)\QC1000_216 Saraji EPBC Approval\05 Design\QGIS\Workspaces\QC1000_216_Saraji EPBC Approval_PD Figures.qgz

3.2.6.5 Ornamental snake

Ornamental snakes prefer wetter areas with gilgai and cracking soils that provide both shelter and prey in the form of frogs. Gilgai landforms and cracking soils have been identified across the majority of the Project area, where soil consists of a dark clay-loam. The field survey identified that the frequency and depth of gilgai is variable across the Project area, with gilgai generally occurring most frequently, and at a greater depth, towards the northern parts of the Project area. This trend was also identified for soil cracks (with depth and frequency identified as greater towards the north). Microhabitat features, including fallen woody debris and leaf litter, were additionally variable across the field survey, and identified to occur at a greater frequency within remnant and HVR vegetation, as compared to non-remnant vegetation patches.

It is considered that the occurrence and nature of habitat features, specifically gilgai, soil cracks and microhabitat features, is highly consequential to identify the ecological value of potential Ornamental snake habitat patches. As a result, a detailed analysis, which included review of field survey data and a rigorous desktop assessment, has been undertaken to accurately define areas of the Project area where gilgai, cracking soils and microhabitat features are rare, occasional or common.

Due to the varying quality and availability of microhabitat features across the Project area as discussed above, the habitat values for Ornamental snake differ. As such, this assessment has identified three (3) habitat categories within the Project area. In accordance with BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al*., 2023) these habitats have been defined as 'Preferred', 'Suitable' and 'Marginal'. The areas of each within the Project area are identified within ***Table 3-8*** and are shown in ***Figure 3-7***.

'Preferred' habitat within the Project area has been identified within the Brigalow regrowth with frequent gilgai habitat type, located at the northern and central aspect of the site. This habitat contains common, diverse-to-deep gilgai, which were identified both during the field survey and through analysis of the DEM. During the field survey it was determined that these gilgai frequently contained ponded water and provided breeding and foraging habitat for numerous native frog species. Given the depth of these gilgai and their ability to hold ponded water for a substantial period, it is considered that they will facilitate foraging resources for a prolonged period following precipitation events. Resultingly, these gilgai are considered to provide good, reliable foraging habitat for Ornamental snake.

Diverse-to-deep cracking soils were additionally identified as common within this habitat, providing sheltering and breeding habitat for the species. The field survey identified Ornamental snake as present within this 'Preferred' habitat, actively hunting frogs in wet gilgai and utilising cracking soils for shelter.

Microhabitat features, including fallen woody debris and leaf litter, occurred occasionally throughout the 'Preferred' habitat and it is noted that introduced grass species were relatively abundant, including within gilgai. Whilst it is considered that the abundance of invasive flora species within the ground stratum may reduce the overall ecological value of the habitat for Ornamental snake, the species is still currently persisting in this habitat with an abundance of foraging resources and availability of breeding and sheltering resources.

In addition, regrowth vegetation directly to the north-east of this 'Preferred' habitat, and outside of the Project area, has been identified by previous assessments as containing habitat values for Ornamental snake. Previous ecological assessments (AECOM, 2023; BAAM, 2021) mapped this area as supporting 'Suitable' habitat for the species, with the mapped habitat forming part of a larger contiguous band extending further north-east of the Project area. Review of LiDAR data indicates that this landscape supports a high density and frequency of gilgai landforms, which create depressions capable of retaining seasonal surface water following rainfall events. These conditions support frog breeding habitat and therefore provide reliable foraging resources for Ornamental snake.

However, only a relatively small patch (i.e., 2.73 ha) of 'Suitable' Ornamental snake habitat has been identified to occur within the Project area and associated with the Brigalow woodland habitat. This habitat patch has been ground-truthed as RE11.4.9 and contains occasional gilgai which range in depth. As compared to the 'Preferred' habitat, this habit patch contains gilgai which occur at a lesser frequency and are generally shallower, however ponded water in gilgai does occur and prey (e.g. native frog species) were found to be present. It is noted that, as compared to 'Preferred' habitat, the depth of these gilgai will result in a shorter period of ponded water following precipitation, and therefore shorter periods of good foraging habitat for the Ornamental snake.

The soil of this community is a dark clay loam, and cracks are present at a lower abundance and depth than within the Brigalow regrowth with frequent gilgai habitat. Despite this finding, it was determined that this value is compensated by a higher abundance of fallen woody debris and leaf litter, providing sheltering and breeding habitat for the species. One (1) Ornamental snake was identified as utilising cracking soils for shelter within this 'Suitable' habitat during the field survey. As compared to the three (3) non-remnant habitats identified within the Project area, this remnant habitat patch contains a lower abundance of introduced grass species and therefore less threatening processes for Ornamental snake.

Remaining gilgai areas within the Project area have been identified as 'Marginal' habitat, which consists of two (2) habitat types:

- Brigalow regrowth with infrequent or absent gilgai; and
- Non-remnant cleared and disturbed areas with grass and forb regrowth.

'Marginal' habitat has been identified on dark clay-loam soil (i.e., land zone 4) with a lower frequency and depth of gilgai, as compared to 'Preferred' habitat, which was determined through analysis of the DEM and field survey data. It is noted that the shallower nature of the gilgai present within this habitat will reduce the period of ponding of water following precipitation events, reducing the availability of foraging habitat to only during periods when rainfall has been high. In such instances, higher quality foraging habitat would be available regardless in the 'Preferred' and 'Suitable' habitat. Individuals would therefore preferentially inhabit the 'Preferred' and 'Suitable' habitat that provide more frequent and deeper gilgai areas. Additionally, other snake species have not been recorded in these habitats and review of the field data indicates that the 'Marginal' habitat contains a higher density and abundance of introduced ground stratum species, resulting in an increased threat to the habitat value of this area.

The marginal habitat mapped within the Project area occurs directly adjacent to the more extensive areas of 'Suitable' habitat identified outside the Project area to the north-east (***Figure 3-7***). While these habitats appear contiguous, review of LiDAR data and field observations indicates that the marginal areas within the Project area support very different ground conditions with a lower density and frequency of gilgai compared with the adjoining suitable habitat. This reduction in gilgai density reduces the persistence and spatial extent of seasonal ponding habitat and therefore limits the availability of reliable frog prey resources within these areas.

This marked difference in gilgai depth and abundance may be associated with natural soil variation and/or due to differing land management practices across this boundary. A BMA boundary fence separates the Project area from land immediately to the north-east, and review of historical aerial imagery indicates that these areas have been subject to different management regimes. Areas outside the Project area appear to have retained the current ground conditions i.e. more intact gilgai topography and regrowth vegetation structure over the last 20 years, whereas the Project area has been subject to disturbances over this period that are associated with exploration activities, vegetation slashing and the establishment of mine infrastructure. These disturbances may have contributed to localised modification of soil structure and gilgai expression within the Project area.

Accordingly, the difference in habitat classification between the marginal habitat within the Project area and the suitable habitat mapped outside the Project area reflects variation in the density and distribution of gilgai landforms and associated habitat function for Ornamental snake.

The water storage dam located at the north-western aspect of the Project area, as well as the associated access tracks and construction pad, is not considered to provide suitable habitat for the Ornamental snake. The landform in this area has been substantially modified to facilitate dam construction, resulting in highly compacted and disturbed soils that lack the natural cracking or gilgai formations critical to the species. The steep slopes surrounding the dam and the depth of permanent water further limit the formation of seasonal wet microhabitats, such as shallow gilgai or ephemeral frog-breeding areas. In addition, dense shrub encroachment, including the presence of *Parthenium hysterophorus*, reduces habitat suitability by limiting ground-level structural complexity and impeding snake movement. As a result, this area is not considered to meet the structural requirements of Ornamental snake habitat.

A record of Ornamental snake was identified in 2019 during pre-clearance fauna spotter-catcher surveys undertaken prior to construction of the dam. Although this record now appears to fall within the current dam footprint, it reflects habitat conditions that existed prior to the area being inundated. The presence of this historical record does not indicate that the existing dam and its modified landform provide habitat for the species. Accordingly, the dam area is not considered to support suitable or functional Ornamental snake habitat.

Table 3-8: Ornamental snake habitat within the Project area

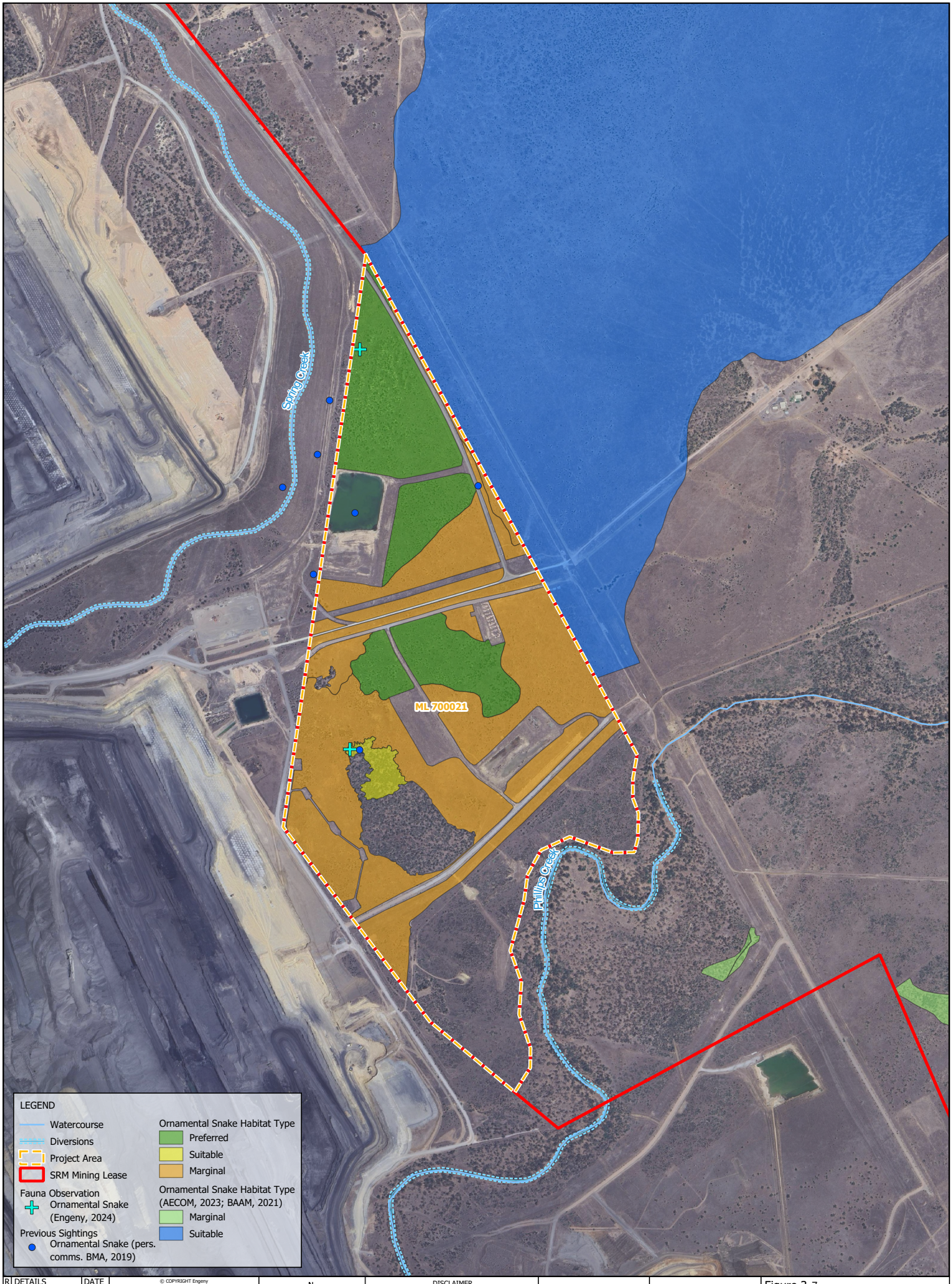
Habitat category	Definition	Area (ha) within Project area
Preferred	Gilgai depressions (with or without the presence of Brigalow or other canopy vegetation), mounds and wetlands on cracking clays (predominantly land zone 4) where essential microhabitat features are present. These include an abundance of deep and diverse soil cracks, which provide sheltering and breeding opportunities, and seasonal inundation that supports frog prey availability for foraging. Other features such as fallen woody debris and	42.83

Habitat category	Definition	Area (ha) within Project area
	leaf litter may also be present, further contributing to shelter and thermal buffering. This habitat type offers the full suite of requirements for breeding, foraging, shelter and dispersal.	
Suitable	Dispersal areas within 1 km of preferred habitat, which are currently or previously dominated by Brigalow or coolibah communities where gilgais or soil cracks are infrequent and/or shallow, including non-remnant areas. Given shallow/ infrequent nature of gilgais and / or cracking soils, this habitat is not considered to provide opportunity for breeding and provides reduced shelter opportunities. This habitat is considered to support foraging following rainfall due to temporary frog presence. Occasional woody debris and litter may offer some sheltering potential, and proximity to preferred habitat increases the likelihood of use for dispersal.	2.73
Marginal	Areas currently or previously dominated by Brigalow or coolibah communities where gilgais or soil cracks are infrequent or are shallow or non-remnant areas where threats are high (high abundance of weed incursion and cattle compacting soils) but the species still have potential to occur, especially in times where water is present and prey abundance (frogs) is high. Some movement may occur through these patches, providing limited value for dispersal only.	86.76
Total		**132.32**

3.2.6.6 Threatened Flora: *Dichanthium setosum* and *Dichanthium queenslandicum*

A literature review undertaken as a component of this assessment (see ***Section 3.1.1***) has identified previous ecological reports which identified potential habitat for *Dichanthium setosum* and *D. queenslandicum* within the Project area and recorded two (2) occurrences of *D. setosum* approximately 600 m south-east of the Project area, to the south of Phillips Creek.

Given these findings, this assessment has thoroughly evaluated the potential presence of these species and their habitat within the Project area. Targeted field surveys, including BioCondition, tertiary, and quaternary assessments, did not detect the presence of either *D. queenslandicum* or *D. setosum* within the Project area. Refer to ***Sections 3.1.2.2***, ***3.1.2.1*** and ***3.2.2,*** for details on the survey effort and ***Figure 3-1*** for the location of surveys. Furthermore, detailed habitat assessments have not identified potential habitat for these species within the Project area due to the absence of heavy black, clay soils that are derived from basalt geology. Therefore, this assessment concludes that ***D. queenslandicum* and *D. setosum* are unlikely to occur within the Project area.**



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NOTES:

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DATA SOURCE
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Figure 3-7

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Preliminary Documentation
Ornamental Snake habitat

Drg Ref.

\\online.com\files\BNEManagement\Projects\QC1000 BHP (BMA)\QC1000_216 Saraji EPBC Approval\05 Design\QGIS\Workspaces\QC1000_216_Saraji EPBC Approval_PD Figures.qgz

3.3 Impact Assessment

Based on the results of the desktop assessment and field surveys, for any MNES considered known or likely to occur within the Project area or surrounding area, a significant impact assessment was undertaken in accordance with the Significant Impact Guidelines Policy Statement 1.1 – Matters of National Environmental Significance (DoE, 2013b).

This section presents the direct and potential indirect impacts and the significant impact assessment, for each of the four MNES threatened species considered known, likely, or with the potential to, occur in and around the Project area, being Greater glider, Koala, Squatter pigeon and Ornamental snake. The Terrestrial Ecology Survey and Impact Assessment Report is provided in ***Appendix D***.

3.3.1 Greater glider

3.3.1.1 Direct Impacts

No Greater glider habitat has been identified within the Project area, therefore no direct impacts to the species will occur.

3.3.1.2 Indirect Impacts

Potential Greater glider habitat occurs between 100m – 150m of the southern Project area boundary along Phillips Creek. Consequently, the Project has the potential to indirectly impact on this habitat, which is of higher quality and has been evaluated as 'Preferred' habitat for Greater glider. Indirect impacts may arise as a result of altered hydrology, pest and weed incursions, noise, dust, light, or uncontrolled burning.

However, numerous existing SRM procedures and protocols are in place to manage indirect impacts associated with proliferation of introduced pest species and dust emissions.

With reference to changed hydrological conditions, the impact assessment for surface water indicated only minor changes in the hydrological characteristic and flooding extents of Phillips Creek. As no changes to surface water hydrology / quality are anticipated and the ecological function of Groundwater Dependent Ecosystem (GDE) indicator species is not anticipated to be impacted, no impacts are anticipated as a result of changes to surface or groundwater hydrological conditions.

Greater glider has been assessed to be susceptible to potential noise and light impacts associated with the Project. This is due to its nocturnal nature, smaller home range (naturally remains in a smaller area rather than utilising a larger area across the landscape), lack of tolerance to disturbance and utilisation of Phillips Creek for all critical behaviours including refuge in hollow-bearing trees, of which are a finite resource in the broader landscape.

For potential indirect lighting impacts, all lighting for the Project will occur within the pit, with only temporary lighting periodically utilised along the boundary of the Project area including along the interface of adjacent habitat areas. With lighting restricted within pit, light impacts will be lower than the natural ground level and shielded by the pit walls and flood levee bunds. This may create an ambient light glow above the Project area; however, natural darkness within surrounding habitats should be maintained. For the use of any temporary lighting along the interface of Phillips Creek, mitigation measures are available to effectively reduce the risk of impact to the species.

Indirect noise impacts are likely to occur on a more frequent and permanent basis due to the Project's 24-hour operating period. Noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. In addition, mining noise is generally described to be non-tonal, which reduces the audibility of mining related noise. As such, the Project is not considered to substantially elevate noise above the current background levels along Phillips Creek. Blasting will also only occur periodically, during the day and for a short duration. In addition, uncontrolled burns have the potential to indirect impact the Greater glider. While an uncontrolled burn could have weighted ecological consequences, the likelihood of such an event occurring is low and effective mitigation measures are in place. This includes proactive fire prevention protocols and rapid response procedures which significantly reduce both the risk and potential severity of impact. It is therefore considered that potential indirect impact of uncontrolled burns is a low impact in respect to the Project.

3.3.1.3 Significant Impact Assessment

The Greater glider is listed as Endangered under the EPBC Act. Targeted surveys, including spotlighting of Eucalypt dominated woodland, were undertaken to detect species presence which confirmed the presence of Greater glider within remnant vegetation south of the Project area, associated with Phillips Creek. The survey did not confirm the presence of the species within the Project area.

No Greater glider habitat has been identified within the Project area, and therefore no direct impacts to the species will occur.

It is recognised that potential Greater glider habitat occurs 100m – 150m of southern Project area boundary along Phillips Creek. Consequently, the Project has the potential to indirectly impact on this habitat, which has been evaluated as 'Preferred' habitat for the species via an increase in weeds and pests, and elevated dust, noise and light disturbances.

Most of these indirect impacts are expected to be of low significance due to their infrequent, temporary, and localised nature. The numerous existing SRM procedures and protocols that are in place will specifically manage these indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, the likelihood of any incidents resulting in an indirect impact would be low and should be quickly rectified through standard inspections.

Due to the potential for altered behaviours by this species in relation to noise impacts, responses such as changes to foraging behaviours or habitat utilisation could be possible, but most likely temporarily as species habituate. Measures to mitigate this potential impact will be undertaken in the form of monitoring Greater glider presence in areas adjacent to the Project area, specifically along Phillips Creek. The relevant management measure is further discussed in ***Section 5***. Overall potential noise impacts on the species are considered to be low. This low level of impact is demonstrated by previous records occurring in close proximity to mining operations. In particular, fauna management activities conducted at Goonyella Riverside Mine have also recorded Greater glider inhabiting areas within 150m of active on-site construction operations (pers. comms. BMA, 2024). Details of sightings recorded over time proximal to the Project area are discussed in ***Section 3.2.6.2*** and ***Figure 3-3***.

A full assessment of the significance of impacts to this species under the 'Significant Impact Guidelines Policy Statement 1.1 – Matters of National Environmental Significance' (DCCEEW, 2013b) is provided is provided in Section 7.4.2 of ***Appendix D***. The outcome of the assessment is that **the Project is unlikely to result in a significant impact to Greater glider.**

3.3.2 Koala

3.3.2.1 Direct Impacts

All potential direct impacts, including habitat loss, fauna mortality and fragmentation are considered low because the woodland patches within the Project area for Koala consists only of relatively small, highly fragmented, patches (less than 1 ha) and hence provides marginal value. Such areas are considered to play a very limited role in maintaining the species. The poor habitat, coupled with significant barriers, including large tracts of cleared areas, fences, roads and tracks, is also likely to severely compromise the ability for the Project area to be utilised as any important movement corridor for Koalas.

With these factors combined, the overall risk of direct impacts on the species is considered very low.

3.3.2.2 Indirect Impacts

Indirect Project impacts have the potential to affect Koala habitat adjacent to the Project area, particularly at Phillips Creek. This habitat is located 100m – 150m from the Project area boundary, is of higher quality and has been evaluated as 'Preferred' habitat for the species. Indirect impacts to Koala utilising the Phillips Creek habitat are possible as a result of altered hydrology, incursion of pest species, noise, dust, light or uncontrolled burns.

However, numerous existing SRM procedures and protocols are in place to specifically manage these indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, incidents resulting in an indirect impact would most likely be associated with a breach in site practices and are hence unlikely. Given the anticipated infrequent, temporary, and localised nature of indirect impacts in the form of dust, weed and pest species, there is not expected to be any significant impacts to Koalas utilising the Phillips Creek habitat. Similarly, potential indirect lighting impacts are able to be managed through Project design, which will include that lighting for the Project be confined to within the pit, with only temporary lighting periodically utilised along the boundary of the Project area including along the interface of adjacent habitat areas. With lighting restricted within pit, light impacts will be lower than the natural ground level and shielded by the pit walls and flood levee bunds. This may create an ambient light glow above the Project area; however, natural darkness within surrounding habitats should be maintained. Given

these mitigation and management measures it is considered unlikely that the Project will create light impacts that would impact significantly upon Koala.

With reference to changed hydrological conditions, the impact assessment for surface water indicated only minor changes in the hydrological characteristic and flooding extents of Phillips Creek. Therefore, no impacts to riparian vegetation are anticipated as a result of changes to hydrological conditions.

Uncontrolled burns can indirectly impact Koalas through loss of canopy, thermal injury and displacement due to fire. While an uncontrolled burn could have weighted ecological consequences, the likelihood of such an event occurring is low and effective mitigation measures are in place. This includes proactive fire prevention protocols and rapid response procedures which significantly reduce both the risk and potential severity of impact. It is therefore considered that potential indirect impact of uncontrolled burns is a low impact in respect to the Project.

Indirect noise impacts are considered to present a slightly higher risk to Koala as these are likely to occur on a more frequent and permanent basis due to the Project's 24-hour operating period. Noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. In addition, mining noise is generally described to be non-tonal, which reduces the audibility of mining related noise. As such, the Project is not considered to substantially elevate noise above the current background levels along Phillips Creek. Blasting will also only occur periodically, during the day and for a short duration. Whilst level of tolerance of Koala for higher noise levels is not fully known, some degree of tolerance is expected given previous species records occurring in close proximity to existing mining operations at SRM, and being well documented in many disturbed locations, such as urban areas near roads. In addition, Koala is a relatively nomadic species, moving throughout its range to utilise habitat and is therefore not restricted to Phillips Creek.

Given the Koala's level of tolerance to some noise disturbance and its natural behaviour to regularly move through the landscape, these potential impacts are more likely to result in a minor disruption of foraging behaviours and vocalisation within a limited area of habitat rather than a complete avoidance or displacement along Phillips Creek. The species is likely to still disperse along Phillips Creek to access foraging and refuge habitat available beyond any potential impact zone, if impacts arise. Therefore, possible minor impacts to Koala as a result of noise is anticipated, but overall, the potential for indirect impacts to significantly affect this species are considered to be low.

3.3.2.3 Significant Impact Assessment

The Koala is listed as endangered under the EPBC Act. Despite this assessment involving targeted searches, including spotlighting of Eucalypt dominated woodlands and multiple instances of call playback within potential habitat areas, presence of the Koala was not detected during the field survey (i.e., no evidence was recorded of Koala individuals, scats, or scratches). This finding is supported by multiple ecological assessments completed over the period from 2007 to 2021 which also did not identify the Koala within the Project area, despite targeted searches being undertaken (see ***Section 3.1.1***).

This assessment has reviewed historical sightings and mapped potential Koala habitat associated with remnant vegetation at Phillips Creek (outside the Project area). This includes records observed less than 150m south (BAAM, 2021) and about 200m east (ELA, 2019b) from the Project area, as well as confirmed scat recordings in association with Phillips Creek. Many other records occur in proximity to the Project area. This includes 17 records of Koala directly west of the SRM along the tributaries of Phillips Creek and One Mile Creek within a large and contiguous vegetation tract (***Figure 3-5***) (ELA, 2018). Majority of these records occur within 240 m of the mine site.

Given these historical habitat assessments and Koala records, it is considered that Koala is likely to consistently utilise and inhabit vegetation along Phillips Creek for activities including foraging, breeding, sheltering and dispersal.

The Project is anticipated to have both direct and indirect impacts on Koala. All potential direct impacts, including habitat loss, fauna mortality and fragmentation are considered to be low due to the presence of relatively small patches of highly fragmented and isolated woodland within the Project area that provides marginal value. Such areas are considered to play a very limited role, if any, in maintaining the species and / or a population of the Koala.

Existing movement barriers within the Project area (such as fence lines, roads, tracks, and large cleared areas devoid of woody vegetation) severely compromises the ability for the Project area to be utilised by Koala. Given the historical fragmentation of potential Koala habitat to the north and west of the Project area, the Project area is not considered to be an important movement corridor for Koalas. In fact, any steppingstone connectivity that could be provided by the Project area from Phillips Creek or the One-mile Creek diversion is likely to lead to a 'dead-end' for Koalas attempting to disperse north or west. As such, in addition to having a low-level consequence of impact on the species, the likelihood of the Project having a direct impact due to the very low utilisation rates is considered to be extremely low.

With these factors combined, the overall risk of direct impacts on the species, whilst permanent, is considered to be very low.

Indirect Project impacts have the potential to affect Koala habitat adjacent to the Project area, particularly at Phillips Creek and along the associated riparian corridor. This habitat is located between 100m – 150m from the Project area boundary, is of higher quality and has been evaluated as 'Preferred' habitat for the species.

Indirect impacts are expected to be of low significance due to their infrequent, temporary, and localised nature. This is because numerous existing site procedures and protocols are in place to specifically manage these indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, the likelihood of any incidents resulting in an indirect impact would be low.

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (DCCEEW, 2013b) is provided within Section 7.1.2 of ***Appendix D***. The outcome of this assessment is that **the Project is unlikely to result in a significant impact to the Koala**.

3.3.3 Squatter pigeon (southern)

3.3.3.1 Direct Impacts

All potential Project impacts to Squatter pigeon are considered minimal given that the Project area and surrounds supports only marginal habitat which limits the Project area to providing only dispersal habitat for vagrant individuals. There is an abundance of similar dispersal habitat across the region in the same degraded regrowth condition that occurs in the Project area. As such, dispersal habitat is not considered to be a vital habitat component for this species or play an important role in maintaining the species in the region. Direct impacts in the form of mortality are also likely to be low given the marginal nature of the habitat means there is a lower chance of encountering individuals, and the presence of nests and/or fledglings is unlikely.

3.3.3.2 Indirect Impacts

All indirect impacts on the species are considered to be negligible. The species is unlikely to be present in adjacent areas to the Project, as these areas also only provide marginal habitat for this species. However, it is noted that indirect impact of uncontrolled burns could result in destroyed or degraded habitat features at ground-level. With the implementation of proactive fire prevention protocols and rapid response procedures, the risk and severity of this indirect impact is significantly reduced. Therefore, there are unlikely to be any significant indirect impacts upon this species as a result of altered hydrology, noise, dust or light.

3.3.3.3 Significant Impact Assessment

The Squatter pigeon is listed as vulnerable under the EPBC Act. Targeted surveys to identify presence of this species indicate absence from the Project area. Notwithstanding the apparent absence of the species, habitats with a grassy understorey which provide habitat value for the Squatter pigeon were ground-truthed across the majority of the Project area (i.e., approximately 73% of the total area). Squatter pigeon habitat was identified to be comprised of multiple fauna habitat types stratified by the ecological assessment, including:

- Brigalow woodland,
- Eucalypt open forest,
- Eucalypt and Brigalow low open forest,
- Brigalow regrowth with frequent gilgai, and
- Brigalow regrowth with infrequent or absent gilgai.

Of these, Brigalow woodland, Eucalypt open forest, and Eucalypt and Brigalow low open forest, contain a defined overstorey of trees that provides sufficient roosting and sheltering opportunities for the species. Others are in regrowth form and contain a regenerating tree layer that can still provide some cover for the species in transit. Introduced grasses were also abundant across the Project area, with *Cenchrus ciliaris* and *Megathyrsus maximus* in particular occurring at high densities. Due to the incursion of these, and other invasive species, none of these habitat patches comprise the sparse open structure that the Squatter pigeon prefers. Additionally, it is considered that these invasive species are outcompeting native grasses which the Squatter pigeon prefers for foraging. Therefore, whilst remnant and regrowth habitats with a grassy understorey occur within the Project area and in proximity to suitable water sources, the habitat across the Project area has been determined to meet the 'Marginal' habitat definition as per Kerswell *et al*. (2023).

This 'Marginal' habitat (which equates to approximately 161.71 ha) is not considered to provide habitat resources only for roosting and sheltering. The species is likely to only utilise the Project area for dispersal purposes whilst in transit to 'Preferred' habitat in the surrounding area, such as the Isaac River (east), Spring Creek (north) or Harrow Ranges (west). This finding is considered consistent with previous ecological assessments.

All potential Project impacts, including habitat loss and fauna mortality on Squatter pigeon are considered to be low due to the presence of only marginal habitat, limiting the Project area's functionality to providing only dispersal habitat for vagrant individuals. Particularly for this relatively mobile species and its ecological requirements to disperse, the availability of dispersal habitat across the region is not limited in extent, especially dispersal habitat in the same degraded regrowth condition that occurs in the Project area. Therefore, the habitat is not considered to be a vital habitat component for this species or play an important role in maintaining the species in the region.

All indirect impacts on the species are considered to be negligible. The lack of good quality adjacent habitat precludes the species from being at risk to a higher level of impact as a result of potential indirect Project impacts.

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (DoE, 2013b) is provided within Section 7.2.1 of ***Appendix D***. The outcome of this assessment is that **the Project is unlikely to result in a significant impact to the Squatter pigeon.**

3.3.4 Ornamental snake

3.3.4.1 Direct Impacts

The main potential impacts on Ornamental snake are the direct loss of habitat and high risk of fauna mortality during mining activities. The Project will result in the removal of 45.56 ha of Ornamental snake habitat, comprised of:

- 42.83 ha of 'Preferred' habitat
- 2.73 ha of 'Suitable' habitat

3.3.4.2 Indirect Impacts

Ornamental snake habitat occurs east of the Project area boundary within gilgai brigalow regrowth habitat (see ***Figure 3-7***). Any potential indirect impacts that could affect this species, such as an increase in weeds and pests, erosion and sedimentation of waterways, soil and water contamination and light disturbance are predominantly considered to present a low risk to the species as they are likely to only occur infrequently or periodically as a result of the Project and, in the event that they do occur, are likely to be temporary and localised, due to the controls and procedures in place to manage such impacts.

Indirect noise and vibration impacts are considered to present a slightly higher risk to the species as these are likely to occur on a more frequent and permanent basis due to the Project's 24-hour operating period. Noise and vibration levels along the edge of the Project area and the interface with the adjacent gilgai Brigalow regrowth habitat are anticipated to be above normal background levels. As adjacent habitat is north to north-east of the Project area and development of the Project area and the pit is proposed to progressively move east across the Project area, the associated higher noise and vibration levels near surrounding Ornamental snake habitat will occur in the more final stages of the Project.

Whilst the tolerance of this species for higher noise and vibration levels is not fully known, some degree of tolerance is expected given previous species records occurring in close proximity to existing mining operations at SRM, as well as records from other, more degraded environments. It should also be noted that, as they lack eardrums, snakes are only able to detect low frequency sounds and vibrations through the ground, so it is only disturbances within this range (i.e. not high frequency sounds) that may constitute a disturbance to them.

It is noted that indirect impact of uncontrolled burns could result in destroyed or degraded habitat features at ground-level. With the implementation of proactive fire prevention protocols and rapid response procedures, the risk and severity of this indirect impact is significantly reduced.

For Ornamental snake and its likely tolerance to disturbance, these potential impacts are more likely to result in a disruption of foraging behaviours within a defined area of habitat rather than a complete avoidance or displacement. Again, this level of impact would occur more in the final stages of the Project when the pit is closer to adjacent Ornamental snake habitat. A large extent of foraging habitat is available beyond this potential impact zone, which the species can disperse and utilise if impacts arise. Therefore, at most, low impacts to Ornamental snake as a result of noise and vibration are anticipated.

3.3.4.3 Significant Impact Assessment

Ornamental snake is listed as vulnerable under the EPBC Act. Targeted surveys (i.e. spotlighting surveys) undertaken in March 2024 to detect species presence confirmed two (2) individuals within the Project area in areas of identified habitat.

Gilgai landforms and cracking soils have been identified across the majority of the Project area, where soil consists of a dark clay-loam. The field survey identified that the frequency and depth of gilgai is variable across the Project area, with gilgai generally occurring most frequently, and at a greater depth, towards the northern parts of the Project area. This trend was also identified for soil cracks (with depth and frequency identified as greater towards the north). Microhabitat features, including fallen woody debris and leaf litter, were additionally variable across the field survey, and identified to occur at a greater frequency within remnant and HVR vegetation, as compared to non-remnant vegetation patches.

Due to the varying quality and availability of microhabitat features across the Project area, as discussed above, the habitat values for Ornamental snake within the Project area differ. As such, this assessment has identified three (3) habitat categories within the Project area: 'Preferred', 'Suitable' and 'Marginal' (Kerswell *et al.*, 2023). Areas of 'Preferred' and 'Suitable' habitat are considered to meet the definition for important habitat for Ornamental snake, which is a surrogate used to define important populations for this species.

'Preferred' habitat within the Project area has been identified within the Brigalow regrowth with frequent gilgai habitat type, located at the northern and central aspect of the site (approximately 42.83 ha of 'Preferred' habitat has been identified). Diverse-to-deep cracking soils were additionally identified as common within this habitat, providing sheltering and breeding habitat for the species. During the field survey it was determined that these gilgai frequently contained ponded water and provided breeding and foraging habitat for numerous native frog species. Given the depth of these gilgai and their ability to hold ponded water for a substantial period, it is considered that they will facilitate foraging resources for a prolonged period following precipitation events. Resultingly, these gilgai are considered to provide good, reliable foraging habitat for Ornamental snake

The field survey identified Ornamental snake as present within this 'Preferred' habitat, actively hunting frogs in wet gilgai and utilising cracking soils for shelter.

A relatively small patch (i.e., 2.73 ha) of 'Suitable' Ornamental snake habitat has been identified to occur within the Project area and associated with the Brigalow woodland habitat type. This habitat patch has been ground-truthed as RE11.4.9 and contains occasional gilgai which range in depth. As compared to the 'Preferred' habitat, this habit patch contains gilgai which occur at a lesser frequency.

'Marginal' habitat (approximately 86.76 ha) has been identified on dark clay-loam soil (i.e., land zone 4) with a lower frequency and depth of gilgai, as compared to 'Preferred' habitat. It is noted that the shallower nature of the gilgai present within this habitat will reduce the period of ponding of water following precipitation events, reducing the availability of foraging habitat to only during periods when rainfall has been high.

The main potential impacts resulting from the Project to the Ornamental snake are the direct loss of habitat and high risk of fauna mortality during clearing activities. Direct impacts to this species are considered to be associated with the removal of 'Preferred' and 'Suitable' habitat (approximately 45.46 ha in total area). The severity of the impact associated with the clearing of this marginal habitat is considered to be low due to the limited value and role that these areas play in maintaining this species.

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (DoE, 2013b) is provided is provided in Section 7.3.2 of ***Appendix D***. The outcome of this assessment is that **the Project is likely to result in a significant impact to the species based on the clearing of 45.56 ha of 'Suitable' and 'Preferred' habitat within the Project area**.

4 Water Resource Assessment and Impact Assessment

4.1 Defining the Project Water Resources and Values for Assessment

Water resources are defined under the under the Commonwealth *Water Act 2007* as:

- Surface water or groundwater
- A watercourse, lake, wetland or aquifer (whether or not it currently has water in it), and includes all aspects of the water resource (including water, organisms and other components and ecosystems that contribute to the physical state and environmental value of the water resource) (as per the Commonwealth *Water Act 2007*).

The significance of the impact of the development on the water resource must be assessed in accordance with the 'Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources' (DoE, 2013b).

The Guideline explains that, for the purpose of the assessment of impacts on a water resource, the only relevant activities that should be considered are those that form part of the process of extracting coal.

The Guideline also states that the values of the water resource must be considered when assessing the significance of the impacts. The Guideline states that 'the key factor that will be relevant in determining the value of a water resource will be its utility for all third party uses, including environmental and other public benefit outcomes'. This includes provisioning services (e.g. use by other industries), regulating services (e.g. stabilisation of coastal systems), cultural services (e.g. recreation and tourism) and supporting services (e.g. maintenance of ecosystem function). Ecosystem function includes support for the biological diversity or species composition of the water resource.

The 'value' of the water resource is a key component in determining whether the impacts of a proposed action are likely to be significant.

Water resources associated with the Project are the:

- existing surface waterways and local catchments as described in ***Section 4.2.1*** and
- groundwater of the Project Area as described in ***Section 4.3.1.3***.

The key values associated with these water resources which are considered in this assessment include:

- The values of local surface waters, including flora and fauna species and their habitats, and associated biological diversity.
- Terrestrial Groundwater Dependent Ecosystems (TGDEs) as described in ***Section 4.4***.
- Human users described in ***Section 4.2.2.6*** and ***4.3.2.4***, including:
  - existing surface water entitlement holders and
  - groundwater bores used for stock watering, domestic or industrial / farm use.

4.2 Surface Water

4.2.1 Assessment Methodology

The method of assessment of each potential impact to surface waters is given in ***Table 4-1***, along with a cross-reference to the relevant sections of this report where they are addressed. Full assessment is provided in the Surface Water Assessment Report contained in ***Appendix E***.

For the purposes of the surface water assessment, the surface water Study area is defined as waterways adjacent to the Project area and extending to the Isaac River. For the flood impact assessment, the flood Study area is defined by the regions illustrated in ***Figure 4-1***.

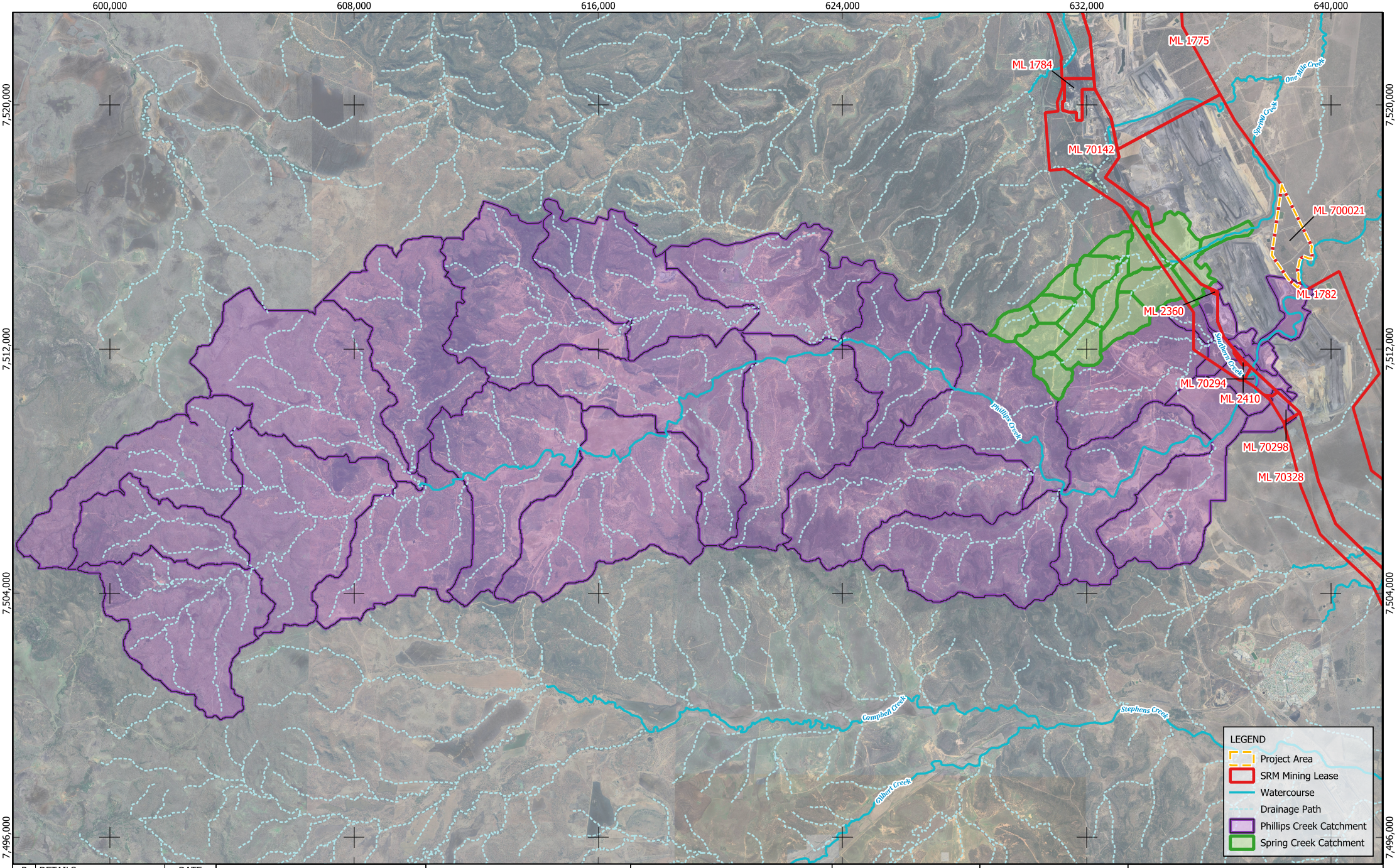
Climate change has been considered as part of the model development and in accordance with the BHP corporate strategy and Climate Change Adaptation in Mine Water Planning and Hydrologic Assessments Guideline (BMA, 2023a). A comprehensive study was undertaken by BMA Water Planning to understand climate change science and quantify climate projections in mine water planning and hydrologic assessments. The study includes extensive literature review and projects completed by CSIRO, Bureau of Meteorology (BoM) and DETSI as well as numerous academic publications.

The data used for the climate change assessment was based on Australian Terrestrial Ecosystem Research Network (TERN) data. TERN is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy. The data used includes the changes in both rainfall and evaporation trends for a range of climate models. The overall trend predicted an overall reduction in annual rainfall and an increase in evaporation. These factors combined overall has the outcome of reduced site predicted inventories, indicating climate change will not materially impact the outcomes of the Project.

The surface water assessment for the Project considered the existing SRM (Grevillea Pit – ML 1782) and Lake Vermont Mine operations in the assessment of water quality and streamflow impacts as well flooding impacts in One Mile Creek and Phillips Creek. The assessed impacts on water resources (for streamflow, water quality and flooding) were localised to areas immediately adjacent the proposed action and expected to have negligible contribution to the cumulative impact from existing mining operations on water resources in the Isaac River.

Table 4-1: Impact Assessment Methodology for Surface Water

Area	Potential Impact	Assessment Methodology	Report Section
Water Resources	Potential impacts to water users and environmental flow conditions due to reduced catchment runoff from the Project footprint affecting downstream streamflow characteristics.	Potential Changes in streamflow behaviour downstream of the Project assessed using a nodal link hydrology model of One Mile Creek and Phillips Creek to quantify the change in streamflow duration and volumes due to loss of the Project area. The streamflow model was used to undertake long-term continuous simulations for the Base Case and Project Case (reduced catchment area) scenarios to quantify changes in streamflow volumes and duration at various locations downstream of the Project. Cumulative streamflow volumes of Phillips Creek were considered as part of the assessment.	***Section 4.2.4.2***
Flooding	Increased flood levels and velocities in Phillips and Spring Creek from landforms constructed within the floodplain in the Project Area.	Potential Changes in flood behaviour in Spring Creek and Phillips Creek assessed using hydrology and hydraulic models of the areas surrounding the Project. Flooding impacts quantified from the change in peak flood height and velocity between the Base Case and Project Case scenarios. Two-dimensional flood models of Spring Creek and Phillips Creek were used to quantify changes in flood behaviour associated with the Project footprint. Models were developed to represent Base Case and Project Case scenarios and simulated for design flood events ranging from the 10% AEP to the probable maximum flood (PMF). Climate change scenarios for the 1% and 0.1% AEP events were also included in the modelling. Potential flooding impacts relating to the Project were quantified from the change in flood model results between the Base Case and Project Case scenarios. The Base Case flood results show where flood interactions with the planned mining is likely to occur. A break line was used in the flood model along the planned extent of mine activity to represent the Projects encroachment on the floodplain to assess potential flooding impacts. These locations can be used to infer where levees will likely be required to maintain pit flood immunity.	***Section 4.2.4.3***
Environmental Values	Impacts to surface water values from the Project's impact on the existing SRM WMS and the containment of MAW.	Potential changes to the SRM WMS containment performance due to the Projects increase in overall catchment area was assessed using a WBM. The WBM was used to compare mine water inventory forecast results for the Base Case and Project Case scenarios, with Climate change considered as part of the model development.	***Section 4.2.4.4***



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1	Draft Issue	07-05-2024
2	Draft Issue	24-05-2024
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APPROVED	AB	DATE	30-09-2024

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Figure 4-1

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Surface Water Assessment
Flood Impact Assessment Study Area

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4.2.2 Description of existing surface water environment

4.2.2.1 Catchment

The Project is located between Spring Creek and Phillips Creek (***Figure 4-2***) which are situated within the Isaac River catchment, which has an area of approximately 22,325 square kilometres (km^2). The Isaac River flows southeast from the confluence with Phillips Creek for approximately 130 km to join the Mackenzie River, which flows onwards for approximately 150 km to the Fitzroy River, a major river with a total catchment of 142,900 km^2, which discharges to the Coral Sea, southeast of Rockhampton.

4.2.2.2 Waterways

The SRM is located approximately 20 km upstream of the main Isaac River channel and outside of the Isaac River floodplain. The key hydrologic features in and around the SRM consist of a series of ephemeral creek systems originating in the range immediately to the west of SRM and flowing from west to east across the mine site. The following creeks systems and their interactions with the current SRM are shown in ***Figure 4-2***.

- Hughes Creek (including Barrett Creek and Plum Tree Creek)
- One Mile Creek
- Spring Creek
- Phillips Creek (including Southern Creek).
- Spring Creek borders the Project area to the north and Phillips Creek borders the Project area to the south.

Spring Creek is located immediately to the north of the Phillips Creek catchment. The Spring Creek catchment area upstream of the SRM is approximately 20 km^2. Two existing permanent water course diversions convey Spring Creek flows from west to east through the SRM. Spring Creek joins One Mile Creek approximately 2 km downstream of the SRM, with the combined system then joining Boomerang Creek and Ripstone Creek (another 13 km and 5 km downstream respectively) before ultimately discharging into the Isaac River.

The Project area is located immediately south of the Spring Creek diversion and drains to a tributary of One Mile Creek that reports to the main creek, 1.3 km downstream of the Spring Creek and One Mile Creek confluence.

Phillips Creek (including Southern Creek) intersects the SRM near the southern end of the current open cut workings. Phillps Creek is the largest waterway intersecting the SRM, with an upstream contributing catchment area at the Project area of approximately 380 km^2. An existing watercourse diversion (Phillips Creek Diversion) conveys Phillips Creek through the SRM mining areas, between Grevillea and Hakea Pits. Phillips Creek joins the Isaac River approximately 10 km downstream of the SRM.

Southern Creek is a minor tributary of Phillips Creek, with an overall contributing catchment area (to the confluence with Phillips Creek) of 14 km^2. An existing diversion channel (Southern Creek Diversion) on Southern Creek diverts Southern Creek flows into Phillips Creek upstream of the SRM pits.

4.2.2.3 Wetlands

There are no wetlands within close proximity to the Project area (***Figure 4-3***). The closest wetlands are two Matters of State Environmental Significance high ecological significance wetlands outside of the Project footprint located adjacent to:

- One Mile Creek, approximately 2.2 km downstream of the Project, and
- Phillips Creek, approximately 16 km downstream of the Project.

There are also several General Ecological Significance wetlands and Vegetation Management Wetlands downstream of the Project, and outside of the Project area, on One Mile Creek and Phillips Creek.

As none of these wetlands are within close proximity to the Project, there are not expected to be any impacts to these areas (refer to ***Appendix E***).

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1	Draft Issue	22-04-2024
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APPROVED	AB	DATE	30-09-2024

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Figure 4-2

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Surface Water Assessment
Regional Context

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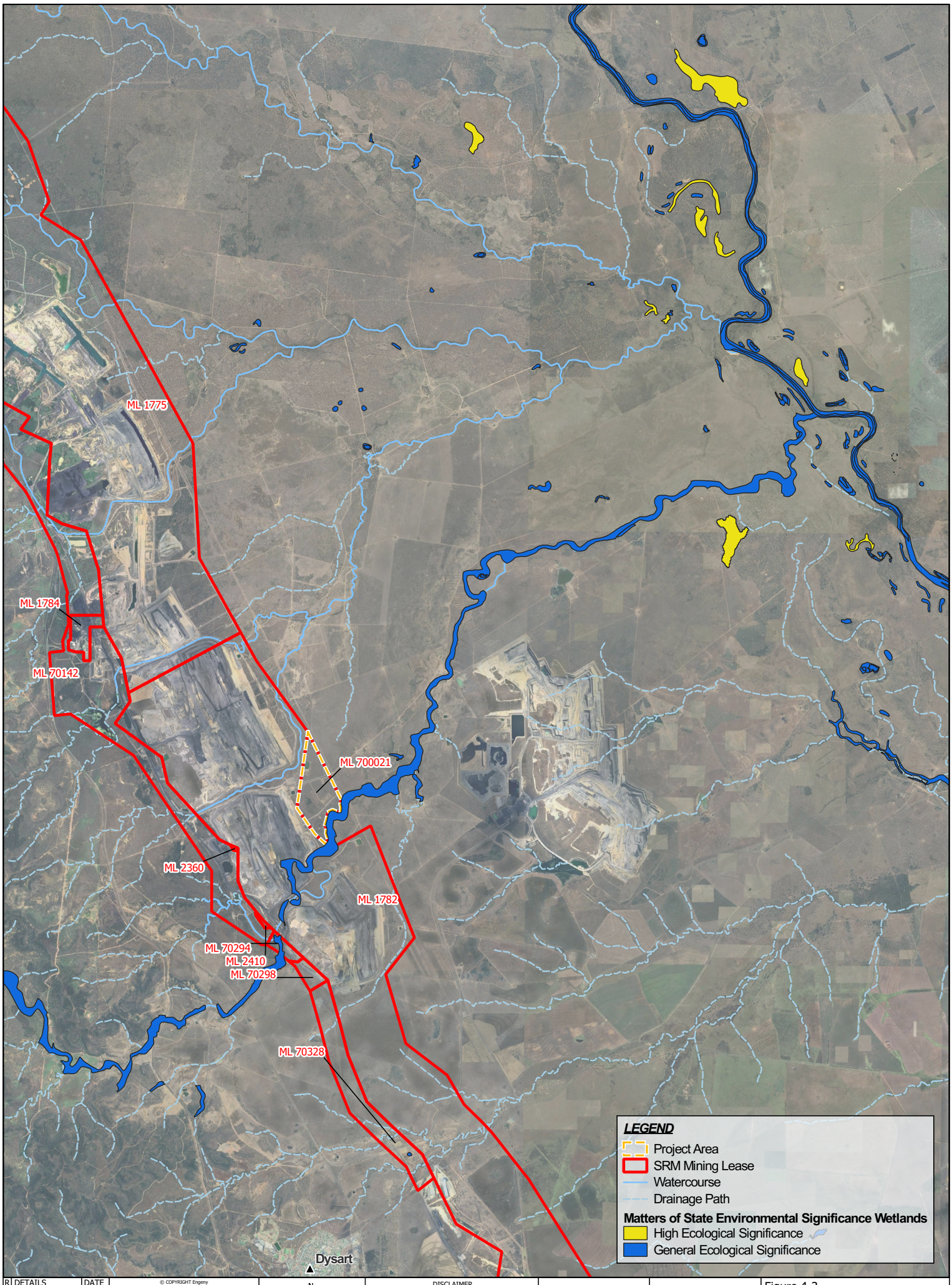

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1	Draft Issue	07-05-2024
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3	Final Issue	30-09-2024

DRAWN	MB	CHECKED	AB
APPROVED	AB	DATE	30-09-2024

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Figure 4-3

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Project Surface Water Assessment
Matters of State Environmental Significance Wetlands

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4.2.2.4 Water Quality

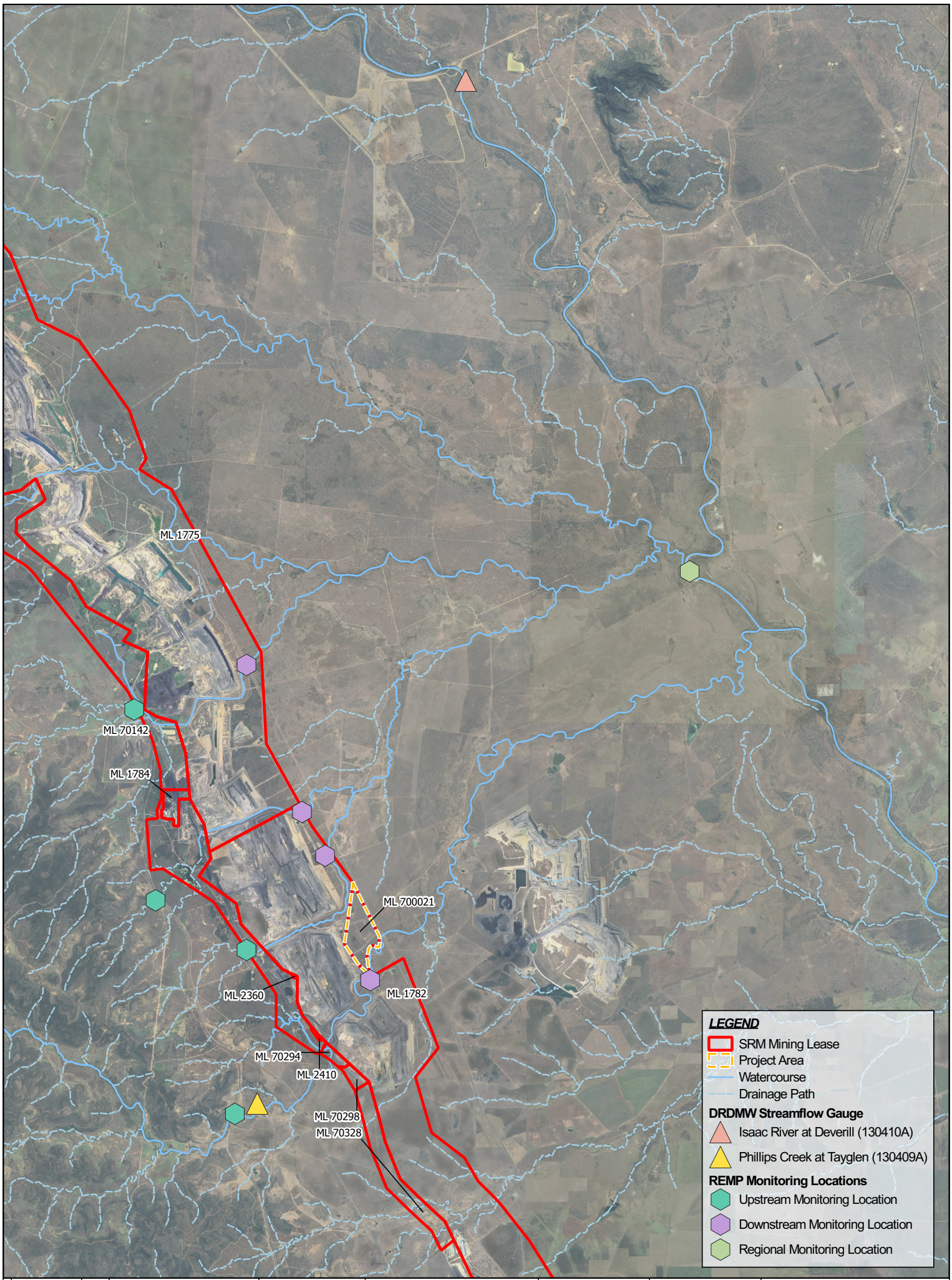
Water quality in Phillips Creek and the Isaac River has been monitored at Department of Regional Development, Manufacturing and Water (DRDMW) operated streamflow gauging station 130409A (Phillips Creek at Tayglen) and 130410A (Isaac River at Deverill). Station 130409A was operational between 1968 and 1988, while station 130410A has been operational since 1968.

Water Quality Objectives (WQOs) are set for the SRM under the Queensland *Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (Water EPP).* Water quality monitoring for waterways near SRM is undertaken as part of the Fitzroy Basin Regional Receiving Environment Monitoring Program (FRREMP), with the most recent reporting completed in 2023. Prior to FY2022, monitoring was undertaken as part of the SRM Receiving Environment Monitoring Program (REMP). Monitoring sites on the waterways include control or reference sites upstream of SRM and test sites downstream of SRM as required by the EA.

Water quality monitoring locations are illustrated on ***Figure 4-4.***

The water quality data shows:

- Turbidity, Dissolved Oxygen and Suspended Solids consistently exceed the WQOs at all monitoring locations.
- Aluminium occurs naturally in elevated concentrations in the Isaac River, Phillips Creek, One Mile Creek and Spring Creek with 80th percentile dissolved concentrations exceeding the WQO at all locations.
- Iron and Manganese occur naturally in elevated concentrations with most samples exceeding the WQO at all locations.
- The historical water quality data captured for Phillips Creek and the Isaac River by the DRDMW show similar WQO exceedances to the SRM data captured by the FRREMP.
- The FRREMP monitoring data does not show a clear trend between upstream and downstream water quality indicating no material impact by the current mining operations.



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1	Draft Issue	30-09-24

DRAWN	MB	CHECKED	NM
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Figure 4-4

BM Alliance Coal Operations Pty Ltd
Saraji Mine
Grevillea Pit Continuation Preliminary Documentation
Water Quality Monitoring Locations

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4.2.2.5 Baseline Streamflow Regimes

Streamflow gauging stations operated by the DRDMW, located near the Project area, are summarised in Table 2.2 shown in Figure 2.8 of ***Appendix E***. The closest flow gauge is the closed Tayglen station (130409A), located 4.5 km upstream of SRM on Phillips Creek. The next closest is the Isaac River at Deverill (130410A) gauging station, located upstream of the confluence of Phillips Creek and One Mile Creek with the Isaac River. Both of these stations are illustrated on ***Figure 4-4***. Flow duration curves for these gauging stations are shown on ***Figure 4-5***.

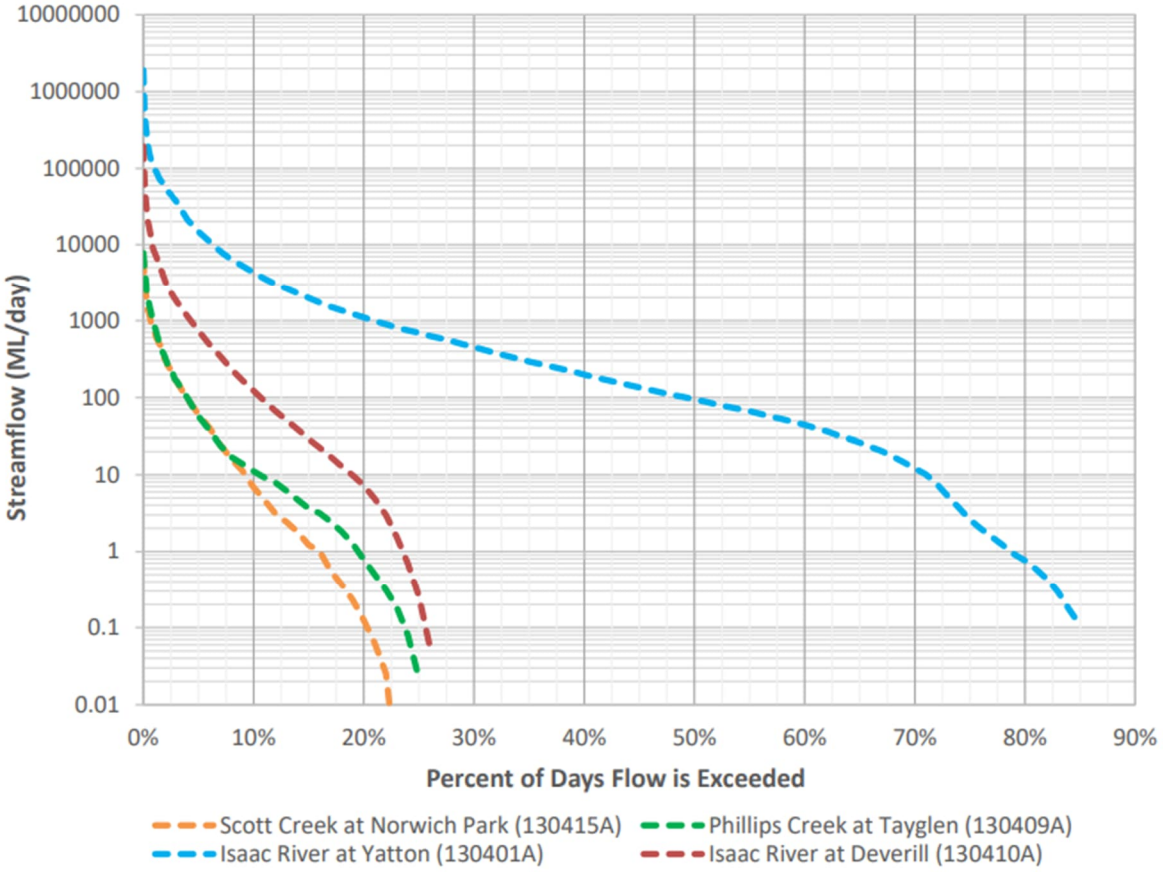


Figure 4-5: Current Flow Duration Curves

4.2.2.6 Water Use

Agricultural users dominate the land nearby the Project. Many utilise small farm dams for collection of overland flow and water licences under the *Water Plan (Fitzroy Basin) 2011*.

There are several mines located to the north, south, and east of the Project. Coal mines that interact with waterways flowing past the Project include Lake Vermont Mine (5 km east), Peak Downs Mine (PDM) (18 km north), Olive Downs Mine (20 km northeast) and Norwich Park Mine (29 km south). There are no significant population centres within 200 km downstream of the Project. There are three (3) un-supplemented water licences from the Isaac River and tributaries of the Isaac River near the Project. Details of these water licences are presented in ***Table 4-2*** and illustrated in Figure 2.13 of ***Appendix E***. The area in which the water licences overlay is considered to be grazing native vegetation, and there are no mine sites, population centres or industrial areas within the water licence extents. There are no existing water licences on Phillips Creek or One Mile Creek between SRM and the Isaac River.

Table 4-2: Third party water uses of water resources near the Project

Authorisation Number	Authorisation Type	Authorisation Purpose	Location Lot / Plan	Attached Lot / Plan	Name of Water Entity	Nominal Entitlement per Water Year
619255	Licence to Take Water	Agriculture	9/KL97	9/KL97	Isaac River	1,250 ML
619183	Licence to Take Water	Any	11/KL135; 9/CNS98	11/KL135; 9/CNS98	Isaac River	100 ML
619184	Licence to Take Water	Any	11/KL135; 9/CNS98	11/KL135; 9/CNS98	Isaac River	15 ML

4.2.3 SRM Surface Water Management

The Project will be integrated into the existing SRM WMS.

The SRM WMS is managed by pump and pipeline water infrastructure that dewaters active mining pits through transfer storages to primary water storages. The primary water storage at SRM is currently the Jacaranda pit. Water from the Jacaranda pit is used to:

- Supply water to the CHPP (from mine dewatering and recover of water from the tailings dam)
- Supply water for dust suppression; and
- Undertake mine water releases in compliance with the SRM EA conditions.

SRM also has several other storages used to capture and contain mine affected water runoff and sediment laden water. Water in these storages is transferred via the pipeline network to supply CHPP and dust suppression water demands or to the primary water storages. The SRM WMS has a total available storage capacity of 51 gigalitres (GL), which is mostly within bulk water storage pits.

Erosion and sediment control measures are also implemented as part of the WMS and include the following management actions:

- Minimise and mitigate erosion and sedimentation as well as erosion impacts associated with clearing of vegetation along banks of drainage lines;
- Prevent the degradation of water quality resulting from erosion and sedimentation through continued monitoring and improvement measures;
- Separation of runoff from disturbed and undisturbed areas where practicable;
- Diversion of water from disturbed catchments into mine water storages or sediment dams;
- Diversion of clean water away from areas of existing or planned disturbance.
- Rehabilitation of disturbed areas to allow vegetation propagation and regrowth;
- Improvement to the integrity of areas prone to erosion through temporary and permanent erosion control techniques; and,
- The provision of information necessary to implement effective erosion control measures (BMA, 2020).

The current catchment areas reporting to the SRM WMS are shown in ***Figure 4-6***, and a schematic of the mine WMS is provided in ***Figure 4-7***.

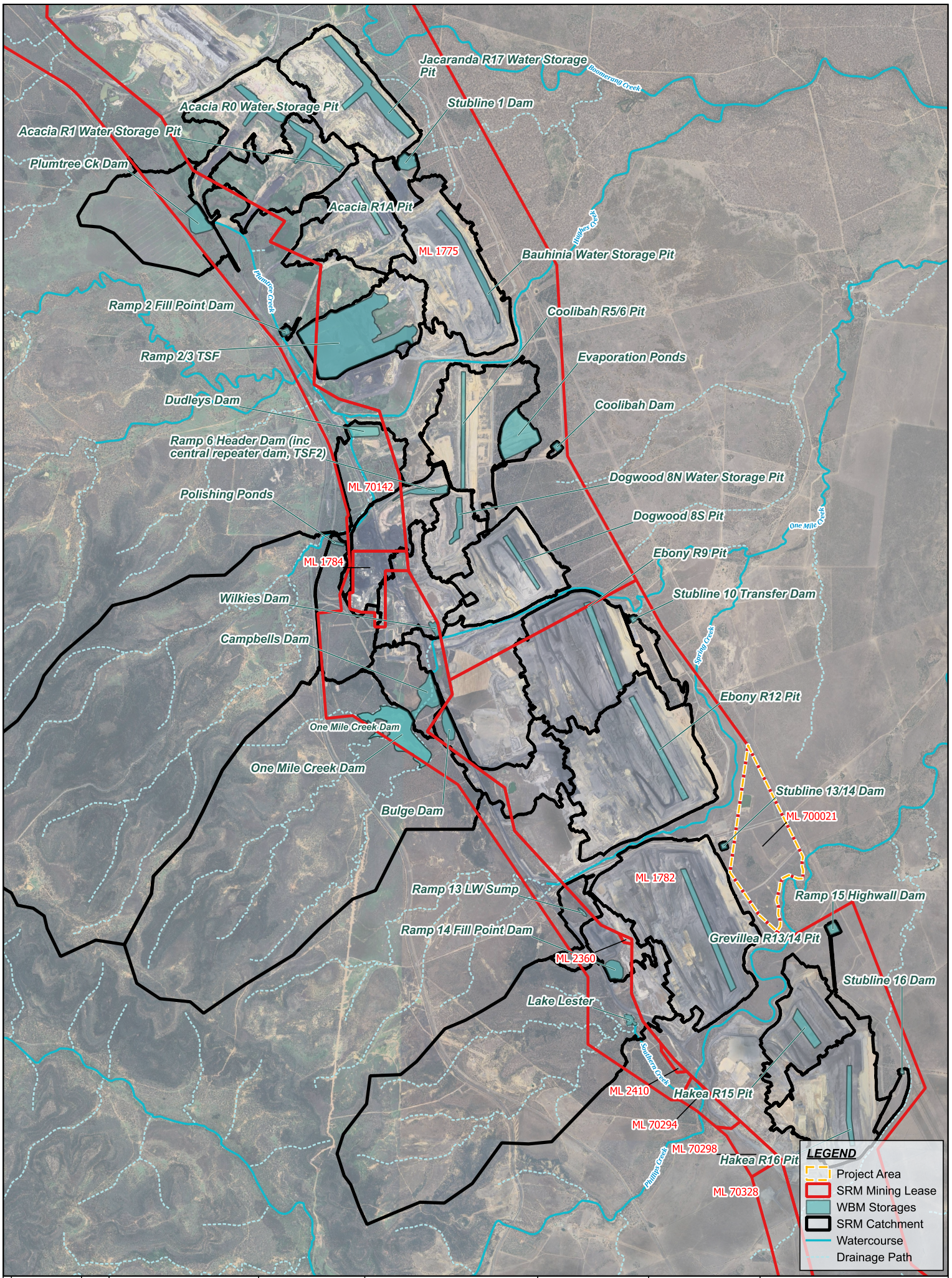
The Project will initially continue to dewater to Jacaranda Pit via the existing pipeline and highwall staging dam network. As mining advances, it is expected the pit dewatering system will be progressively relocated west of the advancing pit to maintain ability to dewater. There are no known significant changes to the SRM WMS that will occur over the life of the Project.

The Project will increase the catchment area reporting to the WMS with the progression of Grevillea Pit by a maximum of approximately 220 ha over the Project life. This accounts for less than 2.3% of the total SRM WMS catchment

area. The water balance assessment (***Appendix E***) shows the Project has negligible impact to the SRM WMS operation and containment risk.

Flood protection levees along the southern boundary of the Project area and at the breakout flow path location on the existing Spring Creek diversion will be introduced as part of the Project to prevent flood ingress in a 0.1% annual exceedance probability (AEP) event. The flood levee on the southern boundary will prevent ingress to the future pit extent and flood levee on the existing diversion will prevent ingress to the existing Grevillea pit.

No new water release points are proposed as part of the Project, with releases to occur as per the SRM EA. Mine water contained within the Project area will be transferred to existing bulk water storages which were assessed to have excess storage capacity.



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BHP Mitsubishi Alliance

Figure 4-6

BM Alliance Coal Operations Pty Ltd
Saraji Mine Grevillea Pit Continuation Project
Surface Water Assessment
Water Balance Model Storages and Catchments

Drg Ref.

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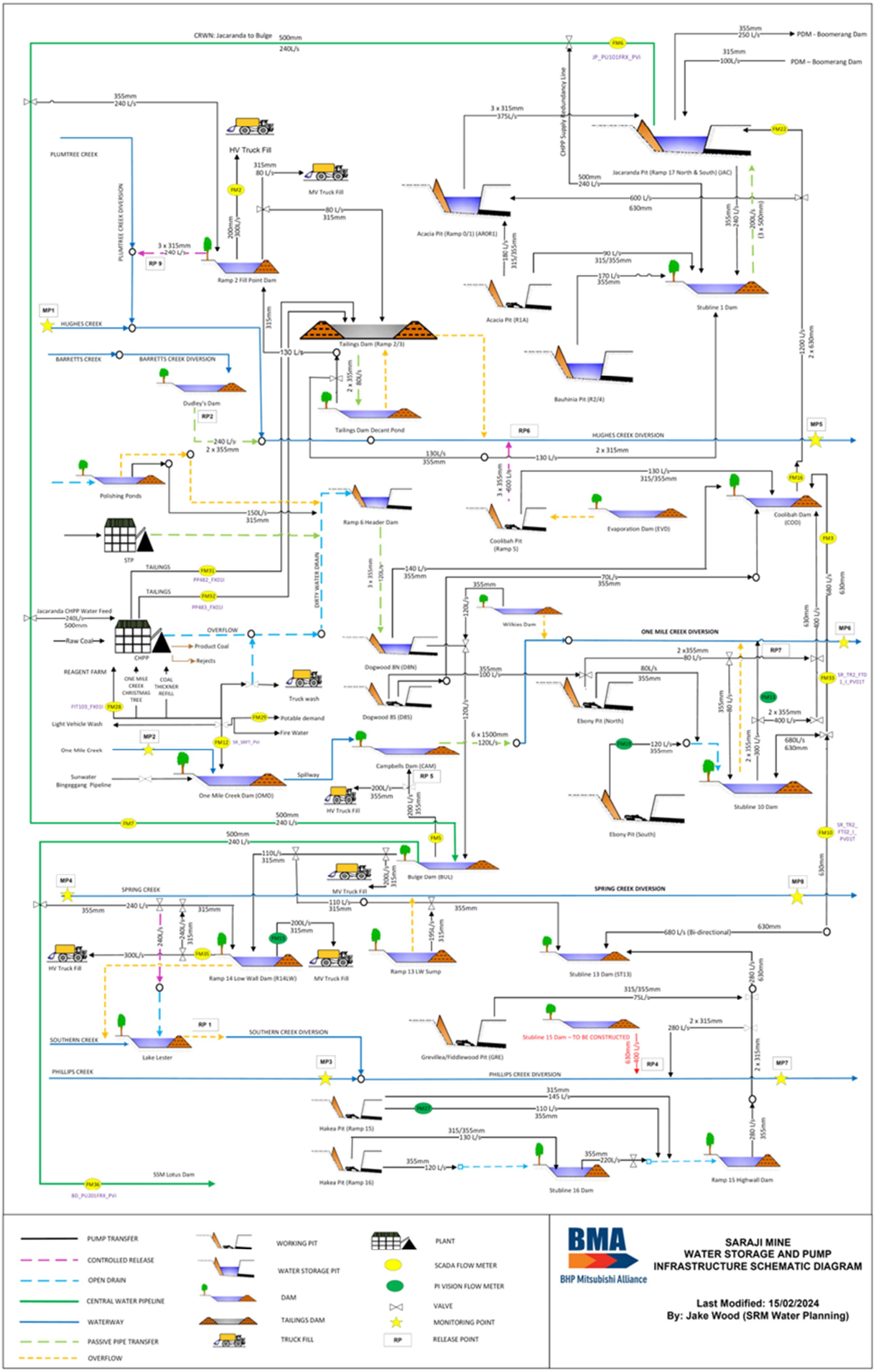


Figure 4-7: Water Management System Schematic

4.2.4 Impact Assessment

The potential impacts of the Project upon existing surface water resources, nearby water-dependent assets (e.g. wetlands, rivers, and lakes), flooding and surface water values were determined to be negligible. The following sections provides a summary of the identified impacts.

4.2.4.1 Potential Impacts to Surface Water

The Project will change the landform of the Project area and will increase the overall catchment area reporting to the SRM WMS.

As such, the Project has the potential to bring about impacts to:

- Water Resources – Potential impacts to water users and environmental flow conditions due to reduced catchment runoff from the Project footprint affecting downstream streamflow characteristics.
- Flooding – Increased flood levels and velocities in Phillips and Spring Creeks from landforms constructed within the floodplain in the Project area.
- Environmental values – Impacts to surface water values from the Projects impact on the existing SRM WMS and the containment of MAW.

4.2.4.2 Streamflow Impacts

Potential streamflow impacts were assessed using a nodal link hydrology model of One Mile Creek and Phillips Creek to quantify the change in streamflow duration and volumes due to loss of the Project area catchment (see Section 5 of ***Appendix E***). The assessment of streamflow impacts identified the following:

- At the point where runoff from the Project area enters the main waterways, the catchment area reduction due to the Project for One Mile Creek is 1.8% and 0.3% for Phillips Creek.
- Streamflow volume and duration at the same locations were determined to reduce by 2.0% to 2.66% in One Mile Creek and 0.29% in Phillips Creek.
- Streamflow impacts were shown to diminish downstream as the receiving waterway catchment increased, with One Mile Creek having a reduction in streamflow volume of 1.1% upstream of the One Mile Creek confluence with Boomerang Creek and a 0.24% reduction downstream of the confluence.
- Phillips Creek was expected to have a reduction in streamflow volume of 0.23% upstream of its confluence with the Isaac River.
- There are no existing water licences on Phillips Creek or One Mile Creek between SRM and the Isaac River and therefore no impacts to water resource users are expected.
- The reduction in stream flow duration in both creek systems is minor and expected to have negligible impact on streamflow dependant riparian ecology.
- The total Project area of 2.21km^2 represents less than 0.04% of the Isaac River catchment area at the Phillips Creek confluence (5,648km^2) which is expected to correspond to a similar reduction in streamflow, demonstrating negligible impact on the Isaac River or existing water licences.
- No wetlands are within close proximity to the Project, and as such, any impacts to these water dependent assets are considered negligible.

The streamflow impacts identified for the Project represent the maximum potential impact based on containing the entire Project area within the SRM WMS which could only occur towards end of the Project life. The assessed impacts can only occur during the operational phase of the Project as rehabilitation and reshaping of the final void for closure will return the catchment to the surrounding creek systems. As such, given the minor and short-lived nature of the impacts, mitigation or management measures are not considered to be required for the changes to streamflow.

4.2.4.3 Flooding Impacts

Two-dimensional flood models of Spring Creek and Phillips Creek were used to quantify changes in flood behaviour associated with the Project footprint (see Section 6 of ***Appendix E***). Models were developed to represent Base Case and Project Case scenarios and simulated for design flood events ranging from the 10% AEP to the PMF. Flood modelling was completed using recent surveys and calibrated to the most recent flood events. Climate change scenarios for the 1% and 0.1% AEP events were also included in the development of the model to assess the effects

of climate change. Potential flooding impacts relating to the Project were quantified from the change in flood model results between the Base Case and Project Case scenarios. The assessment of flooding impacts identified the following:

- Frequent flood events do not inundate the Project area, with flooding in Phillips Creek only beginning to inundate the Project area in a 1% AEP event at the southern boundary and then only inundating less than 2.8% of the Project area.
- The Project area is unaffected by flooding in Spring Creek up to the 1% AEP flood event.
- Minor flooding of the Project area from a 0.1% AEP flood event in Spring Creek due to a breakout flow path from the upstream diversion that also results in overtopping to the existing Grevillea Pit.
- The Project does not affect flooding in Phillips Creek in all flood events up to and including the 1% AEP flood event.
- The Project is shown to increase peak flood depths in Phillips Creek by up to 300 mm in the 0.1% AEP flood event in very isolated locations immediately adjacent the Project boundary.
- The Project peak flood velocities in the 0.1% AEP flood event are expected to increase by a maximum 0.2 m/s in the Phillips Creek channel adjacent to the Project area. This increase in peak flood velocity is not expected to have a significant impact on the waterway condition considering the very rare frequency of the event and the resultant velocity remaining below 3 m/s where impacts occur.
- Flood impacts in the Phillips Creek 0.1% AEP flood event are isolated to areas immediately adjacent the Project boundary and are not expected to create impacts to third parties or the Phillips Creek channel condition.
- The Project does not impact flooding in Spring Creek in all flood events up to the 0.1% AEP flood event.
- A PMF event in Spring Creek and Phillips Creek results in 44% of the Project area being inundated.
- Potential impacts during a PMF event show flooding increases that would need to be considered as part of the closure planning and design for the surrounding SRM final voids.
- No wetlands are within close proximity to the Project, and as such, any impacts to these water dependent assets are considered negligible.
- Flood protection levees along the southern boundary of the Project area and at the breakout flow path location on the existing Spring Creek diversion will be introduced as part of the Project to prevent flood ingress in a 0.1% AEP event. The flood levee on the southern boundary will prevent ingress to the future pit extent and flood levee on the existing diversion will prevent ingress to the existing Grevillea Pit.

The flooding assessment represents the maximum potential flooding impact associated with the Project as the full planned disturbance extent was represented in the Project Case scenario flood model to assess impacts. The flooding impacts for the Project are considered negligible however will be present for both the operational phase of the Project and post closure. Grevillea Pit will be reshaped and rehabilitated for closure and incorporate flood protection landforms to maintain void flood immunity in accordance with the SRM EA conditions. Final void flood protection landforms will remain within the Project area and not produce additional flooding impacts than those determined from this assessment.

The 0.1% AEP flood extent for the Base Case and Project Case scenarios for Phillips Creek are shown in ***Figure 4-8*** as well as locations along the southeast extent of the Project area where levees are required to provide 0.1% AEP pit flood protection immunity. The levees can be constructed progressively as the mine progresses.

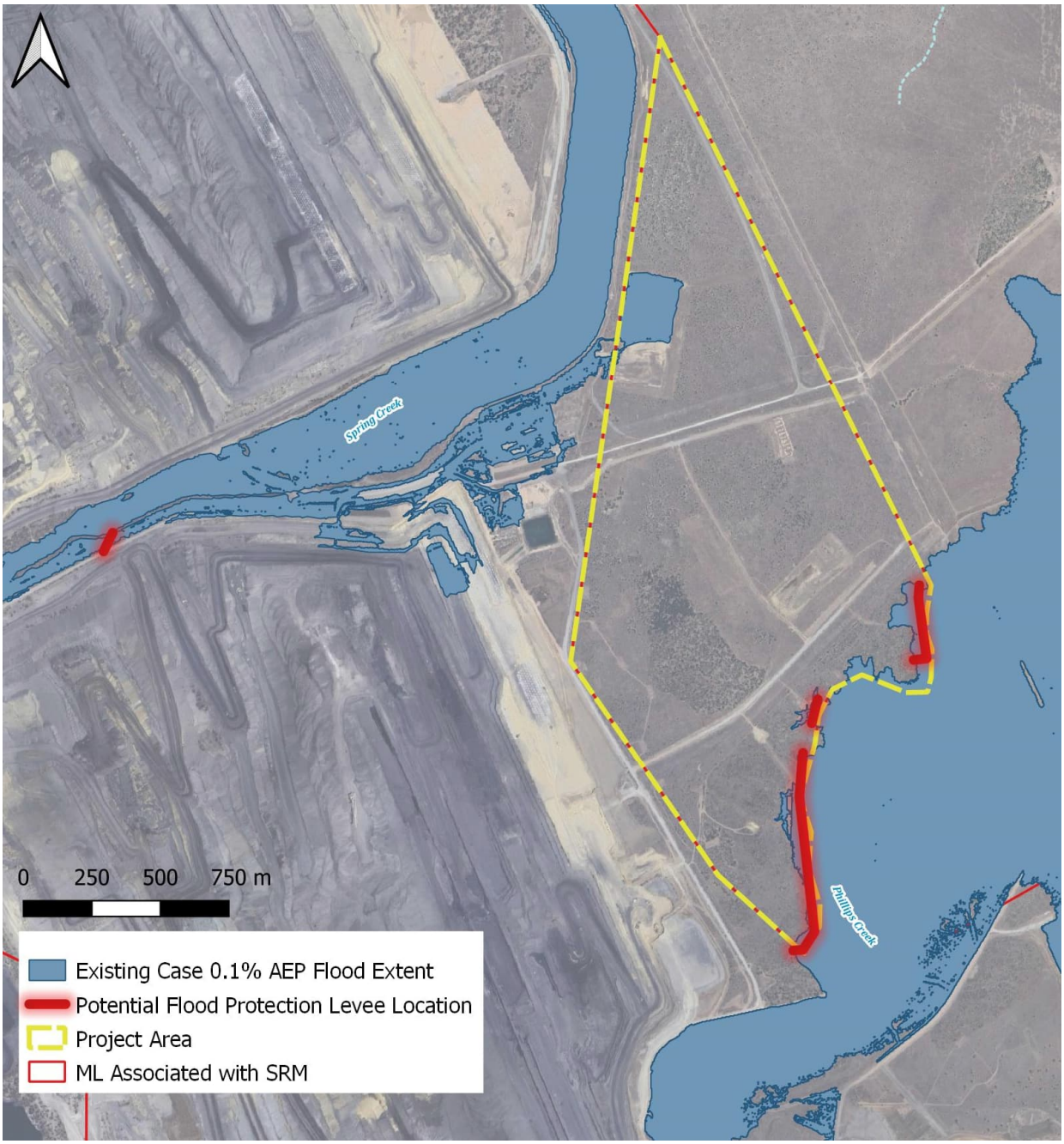


Figure 4-8: Flooding Interactions with the Project area

4.2.4.4 Water Management System Impacts

Potential changes to the SRM WMS containment performance due to the Project's increase in overall catchment area was assessed using a WBM which was modelled using the Central Region WBM (see Section 7 of ***Appendix E***). The WBM was used to assess the Base Case and Project Case scenarios to quantify any changes to containment performance. The assessment of impacts on the SRM WMS identified the following:

- The Project will increase the catchment area reporting to the WMS with the progression of Grevillea Pit by a maximum of approximately 220ha over the Project life, accounting for less than 2.3% of the total SRM WMS catchment area.
- The Base Case results show the total site inventory is expected to decrease under all climate scenarios with the median inventory fluctuation around 12.5 GL after 2037.

- The Project is expected to result in marginally higher total system water inventories, however under 95th percentile climate conditions both the Base Case and Project Case total system inventory is expected to reduce below 25 GL, showing no risk of exceeding the system storage capacity.
- The results show the Project will have negligible impact on the overall WMS performance and not result in an accumulation of stored MAW or sediment laden water.
- Diverting the additional catchment area to the existing SRM WMS was determined to have a negligible increased risk of an unauthorised mine water release that could affect downstream water quality.
- No new water release locations are expected to be implemented as part of the Project. Mine water releases will continue to be undertaken in compliance with the SRM EA conditions. The risk of impact on surface water quality from uncontrolled releases is expected to be low.
- The potential for increased erosion risk that may impact surface water values is minimal and the existing erosion and sediment control measures currently implemented within SRM are considered sufficient for managing erosion and sediment control for the Project without significant modification.

Use of the existing SRM water management measures will provide sufficient mitigation of any potential impacts of the Project on the SRM water management system through annual updates requiring review of the system performance and any improvements to prevent environmental harm. Inclusion of the Project in the SRM WMS was assessed to result in very minor reductions in Phillips Creek and Spring Creek streamflow. The diverted catchment area is negligible compared to the overall catchment areas, and the catchment reduction is not expected to have a noticeable impact to existing streamflow or ecological condition. The existing FRREMP will monitor and assess any adverse impacts to surface water values and ensure the water management measures are effective.

4.2.4.5 Significant Impact Assessment for Water Resources – Surface Water Assessment

As outlined in the 'Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources' (DCCEEW, 2022), a significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Assessment of the significance of the impact must consider the sensitivity, value, and quality of the water resource, and the intensity, duration, magnitude and geographic extent of the impacts.

The general criteria of the Guideline states that, '*an action is likely to have a significant impact on a water resource if there is a real or not remote chance or possibility that it will directly or indirectly result in a change to the hydrology of a water resource or the water quality of a water resource, that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring.*' The significant impact assessment should also consider any avoidance and mitigation measures that have been used to reduce potential adverse impacts on a water resource, as well as any cumulative impacts and the scale and timing of the impacts.

An assessment of the significance of the impact on the water resources with regard to the environmental and other third-party users/uses has been undertaken in accordance with the Guidelines. The assessment of changes to hydrological characteristics is presented in ***Table 4-3***.

Table 4-3: Surface Water Assessment of Changes to Hydrological and Water Quality Characteristics

Assessment Criteria	Surface Water Assessment – Changes to Hydrological Characteristics	Significant Impact?
Discussion in relation to the significant impact criteria		
A significant impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action: • changes in the water quantity, including the timing of variations in water quantity • changes in the integrity of hydrological or	A detailed impact assessment for the surface water resource is presented in the Surface Water Assessment in ***Appendix E***. A summary of this assessment in relation to the relevant criteria presented in ***Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources*** is provided below. **Changes in water quantity (including flow regimes)** During mining operations, the mine WMS will capture runoff from areas that would normally have flowed to creek systems. An assessment of changes to streamflow as a result of the catchment excision has been undertaken. At maximum development the total Project area will be 2.21 km^2. At the point where runoff from the Project area enters the main waterways, the catchment	**No**

Assessment Criteria	Surface Water Assessment – Changes to Hydrological Characteristics	Significant Impact?
hydrogeological connections, including substantial structural damage (e.g. large-scale subsidence) and • changes in the area or extent of a water resource. The following aspects may need to be considered when assessing changes in hydrological characteristics: • flow regimes (volume, timing, duration and frequency of surface water flows) • recharge rates to groundwater • aquifer pressure or pressure relationships between aquifers • groundwater table and potentiometric surface levels • groundwater-surface water interactions • river-floodplain connectivity • inter-aquifer connectivity and • coastal processes including changes to sediment movement or accretion, water circulation patterns, permanent alterations in tidal patterns, or substantial changes to water flows or water quality in estuaries.	area reduction due to the Project for One Mile Creek is 1.8% and 0.3% for Phillips Creek; and less than 0.04 % of the Isaac River catchment area at the Phillips Creek confluence. The assessment concludes that the impact of catchment reductions on surface water flow regimes will be negligible and there will be no material impact on the volume of flow or the number of days that flow occurs in the receiving waters. **Changes in the integrity of the hydrological connections and in the area or extent of a water resource** Increases in flood levels were found to be minor as the Project does not affect flooding in Phillips Creek in any flood events up to and including the 1% AEP flood event with consideration of climate change scenarios. The Project is shown to increase peak flood depths in Phillips Creek by up to 300 mm in the 0.1% AEP flood event in very isolated locations immediately adjacent the Project boundary. Peak flood velocities in the 0.1% AEP flood event are expected to increase by a maximum 0.2 m/s in the Phillips Creek channel adjacent to the Project area. This increase in peak flood velocity is not expected to have a significant impact on the waterway condition considering the very rare frequency of the event and the resultant velocity remaining below 3 m/s where impacts occur. Flood impacts in the Phillips Creek 0.1% AEP flood event are isolated to areas immediately adjacent the Project boundary and are not expected to create impacts to third parties or the Phillips Creek channel condition. The Project will be reshaped and rehabilitated for closure and incorporate flood protection landforms to maintain void flood immunity in accordance with the SRM EA conditions. Final void flood protection landforms will remain within the Project area and not produce additional flooding impacts than those determined from this assessment. The pit and dumps will be rehabilitated with vegetation species appropriate for the post-mining land use, and include slopes designed to achieve the final land use as detailed in the PRCP. Therefore, it is concluded that there will be no significant impact on the hydrological characteristics of any surface water resource.	
Will there be a **cumulative impact** on the hydrological characteristics of the water resource, when considered with other developments, whether past, present or reasonably foreseeable developments?	The surface water assessment for the proposed action considered the existing Saraji Mine including (Grevillea Pit - ML1782) and Lake Vermont Mine operations in the assessment of water quality and streamflow impacts as well flooding impacts in One Mile Creek and Grevillea Creek. The assessed impacts on water resources (for streamflow, water quality and flooding) were localised to areas immediately adjacent the proposed action and expected to have negligible contribution to the cumulative impact from existing mining operations on water resources in the Issac River.	**No**
Over what **timeframe** will the impacts occur?	The negligible predicted impacts to the hydrological characteristics of surface waters will occur over the life of the Project, which is 30 years. Changes to catchment areas as a result of the Project vary over time as mining progresses. Following closure and decommissioning there will no further impacts to the hydrological characteristics of the surrounding waterways and they will not be substantially different to pre-mining condition.	**N/A**
What is the **scale** of the impact?	The scale of any impacts to hydrological characteristics as a result of the Project are very minor and are limited to the catchments of Phillips Creek and One Mile Creek, downstream of the mine, with negligible follow-on	**N/A**

Assessment Criteria	Surface Water Assessment – Changes to Hydrological Characteristics	Significant Impact?
	impacts to the Isaac River. As described above, the magnitude of impacts to the hydrological characteristics will be minor. Therefore, the scale of the impact is minor and very localised.	
Assessment of the impact of changes in the hydrological characteristics of the water resource on the values reliant on the water resource		
Are the changes outlined above of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including **Terrestrial Groundwater Dependent Ecosystems (TGDE)**?	Not applicable – changes to the hydrological characteristics of surface waters are negligible and not considered likely to have any impact upon TGDEs, as such, no further assessment of impacts on TGDEs required.	**No**
Are the changes outlined above of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, **including the environmental values of the local surface waters?**	Surface waters values within the vicinity of the Project area include common aquatic flora and fauna. Hydrological modelling found that the Project will not influence the existing hydrological conditions of local waterways. Impacts to the SRM water management system containment performance due to the Projects increase in overall catchment area was assessed using a water balance model (refer to Section 7 of ***Appendix E***). The results show the Project will have negligible impact on the overall water management system performance and not result in an accumulation of stored mine affected water, hence the existing SRM management measures will provide sufficient mitigation of potential impacts. Therefore, there will be no impacts to water quality above those currently allowed by the EA. While some runoff will be captured on site in mine infrastructure, the small size of the water volumes involved, in relation to the surrounding catchment, means that no measurable changes to the hydrological conditions of the Project Area will occur. Reductions on surface water flow regimes will be negligible and there will essentially be no impact on the volume of flow or the number of days that flow occurs in the receiving waters. Changes to the hydrological characteristics of surface waters is not considered to be of a scale or intensity as to reduce the current or future utility of the water resource for the local surface water values.	**No**
Are the changes outlined above of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including any **existing surface water entitlement holders, or bores used for stock watering, domestic or industrial farm use**?	The changes to the streamflow and water quality of surface waters will be negligible. Furthermore, there are no existing water licences on Phillips Creek or One Mile Creek between SRM and the Isaac River. Therefore, there will not be any reduction in the current or future utility of the water resource for any third-party user with surface water entitlements.	**No**
Mitigation and management		
What mitigation and management will be implemented to reduce any potential adverse impacts as described above?	The identified surface water impacts for the Project were determined to be negligible on existing surface water resources, flooding and surface water values. The Project involves continuation of mining in an existing pit and existing controls in the SRM EA are suitable for managing potential surface water impacts. The existing ***SRM water management measures*** will provide sufficient mitigation of potential impacts of the Project on the SRM WMS	**N/A**

Assessment Criteria	Surface Water Assessment – Changes to Hydrological Characteristics	Significant Impact?
	through annual updates requiring review of the system performance and any improvements to prevent environmental harm. Based on the impact assessment the following mitigation and management measures will be implemented as part of the Project: • Flood protection levees to prevent ingress to the mining pit during the operational phase of the Project. • Continued implementation of the existing ***SRM Water Management measures*** to allow annual review of the WMS effectiveness for preventing adverse impacts to surface water values. • Continued implementation of the existing SRM erosion and sediment control measures to manage erosion and containment of sediments for disturbance areas. • Continued implementation of the existing FRREMP to monitor and assess any adverse impacts to surface water values and ensure the water management plan is effective.	
Significance of the Impact		
Will the Project result in a significant impact on the water resource and its values?	As described above, the Project will not result in a significant reduction in surface water quantity or a significant change in flow regimes under different climate change scenarios. The negligible impact on the hydrological characteristics of surface waters will be local and short-lived (30 years) and will not affect any third-party users. Following closure and decommissioning there will no further impacts to the hydrological characteristics of the surrounding waterways and they will not be substantially different to pre-mining condition. As such the Project will not result in a significant impact on the hydrological characteristics of the surface water resource.	**No**

The assessment concludes that the Project will not result in a significant impact on the surface water resource because:

- The Project will not result in a significant reduction in surface water quantity or a significant change in flow regimes.
- The negligible impact on the hydrological characteristics of surface waters will be local and short-lived (30 years) and will not affect any third-party users.
- Following closure and decommissioning (i.e. after 30 years) there will no further impacts to the hydrological characteristics of the surrounding waterways, and they will not be substantially different to pre-mining condition.
- The risk of impact on surface water quality from accidental spills and uncontrolled releases is expected to be low.
- The existing SRM water management measures and controls in the SRM EA are suitable for managing any potential surface water impacts.
- Climate change will not materially impact the outcomes of the Project.

4.3 Groundwater

For the purposes of the groundwater assessment, the groundwater Study area has been defined as the groundwater model domain area, which extends approximately 15 km around the Project area. The groundwater Study area is the regional area surrounding the Project necessary to inform the understanding of the regional scale groundwater system in which the Project lies. The groundwater Study area is illustrated in ***Figure 4-9*** as the model boundary extent.

4.3.1 Assessment Methodology

To evaluate potential impacts associated with the mining activities of the Project a groundwater impact assessment was completed (refer to ***Appendix F***).The groundwater impact assessment comprised two components, a description of the existing hydrogeological environment, and an assessment of the impacts of mining on that environment using predictive modelling. Table 2 of ***Appendix F*** identifies where the requirements of the Independent Expert Scientific Committee on Unconventional Gas Development and Large Coal Mining Development (IESC) information guidelines have been addressed within the groundwater impact assessment.

The existing model was developed on a conceptualisation of the geology and groundwater resources and assessed mine dewatering impacts (groundwater ingress and groundwater level drawdown) considering the existing SRM open cut workings with and without the Project. The predictive model simulations included predictions of groundwater levels at the end of mining, predictions of groundwater ingress and predictions of groundwater level recovery with and without the Project.

The existing BMA regional groundwater model was updated as part of the groundwater assessment to include known local hydrogeologic features and mining operations (historic, approved and proposed) in the vicinity of the Project, in order to provide estimates of potential impacts to groundwater and relevant receptors. The existing regional scale model has been reviewed and accepted twice by State agencies and once by the Commonwealth for other project approval applications. BMA has also used the model to support various State mining compliance reporting requirements.

The full details of the model development are presented in the Groundwater Modelling Technical Report contained in ***Appendix F*** and a summary of the salient features is described below. Further to the technical report additional supplementary information has been compiled in response to questions raised by the IESC during the PD Request for Information process. The supplementary information is collated in ***Appendix K***.

4.3.1.1 Groundwater model design

The model is a regional scale model with the domain extent designed to meet environmental approvals application requirements for cumulative impact assessment, (i.e., the domain is large enough to appropriately consider all potential overlapping groundwater impacts from resource operations in the Bowen Basin).

The model domain is intended to place boundary conditions sufficiently distant from the Grevillea Pit, surrounding SRM pits and nearby Bowen Basin mines to allow the extent of potential impacts from mining activities on the groundwater system to be assessed. At its widest extents, the model is approximately 62 km west-east by 95 km north-south.

Fault mapping and site-specific geology models from earlier versions of the regional model were incorporated as well as local fault displacements derived from the PDM and SRM/Grevillea geological models.

To allow stable numerical modelling of the large spatial area of the model domain, an unstructured grid with varying Voronoi cell sizes was designed using AlgoMesh (HydroAlgorithmics, 2014).

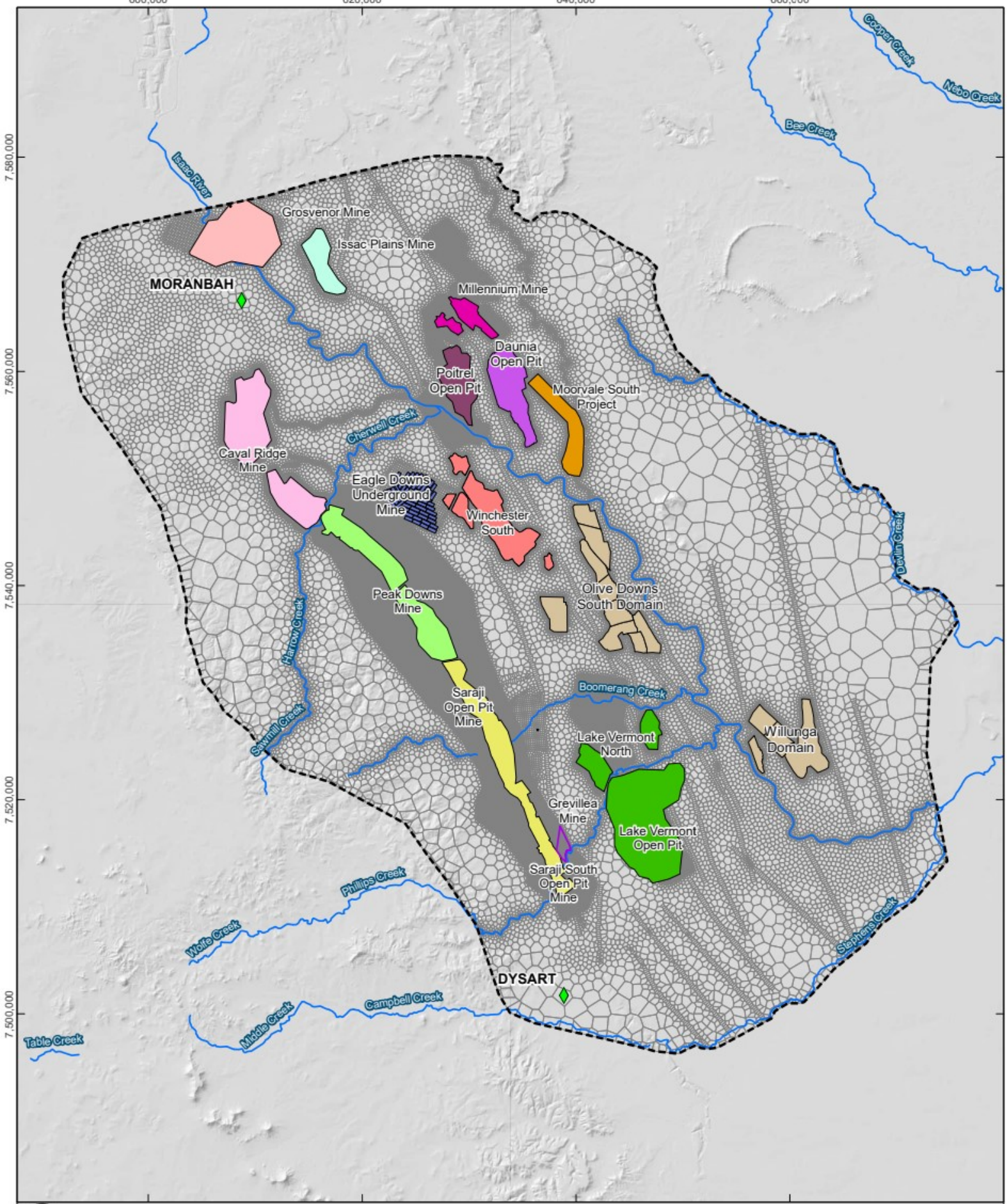
The model domain was vertically discretised into 19 layers, each layer comprising a cell count up to 121,225. The total number of cells in the model is 1,362,485.

4.3.1.2 Model calibration

The previous version of the model was calibrated using PEST++ and, upon review of model calibration statistics after the updates for the Project, was still considered reasonably calibrated. Therefore, the calibration methodology adopted for the Project numerical model involved running the model numerous times using different parameter sets and investigating which model produce the best calibration statistics.

After running 550 calibration realisations, the calibration statistics were then calculated for each realisation and the realisation that produced the lowest Scaled Root Mean Square error (SRMS) was considered to be the best calibrated model for the purposes of the Project groundwater assessment. The remaining 549 realisations were then used to quantify the model uncertainty with respect to simulated heads and predictive variables.

The best calibrated model achieved a SRMS error of 5.9%.



0 5 10 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:470,757 at A4
Project Number:	620.040484.00001
Date Drawn:	11-Sep-2024
Drawn by:	RB

LEGEND

- Town
- Major Drainage System
- Model Boundary
- Model Grid
- Project Area

SARAJI MINE GREVILLEA PIT CONTINUATION PROJECT MODELLING TECHNICAL REPORT

MODEL DOMAIN

FIGURE 4-9

SLR

4.3.1.3 Model Performance and Limitations

The latest version of the 'IESC Explanatory Note for Uncertainty Analysis' (IESC, 2023) was utilised to assess model confidence.

The latest version of the 'IESC Explanatory Note for Uncertainty Analysis' (IESC, 2023) defines a model fit for purpose when model results are usable, reliable and feasible. In order to assess these three points, the four sources of scientific uncertainty (structural, parametrisation, measurement error, predictions) were qualitatively assessed with regards to key aspects of the groundwater model.

The findings were that, overall, the model captures depressurisation due to active mining. The model is numerically stable with no mass balance error. The model shows a reasonable fit between observed and modelled groundwater levels. A depth dependence function was used for hydraulic conductivity, with the calibrated values showing a good fit to observed data. Overall, the model is considered fit for purpose to achieve the project objectives based on the data provided and the project timeframe.

4.3.1.4 Model Predictions

Transient predictive modelling was used to simulate the proposed mining for the Project as well as mining at other approved and foreseeable mines within the model domain. The predictive part of the model comprises annual stress periods, starting from 2024 until 2054.

Transient predictive models were developed for three model scenarios:

- No Mining.
- Approved mining without proposed Grevillea Pit (SRM Approved).
- Approved mining with proposed Grevillea Pit (SRM Approved+Grevillea).

Consideration of climate change was not considered warranted within the predictive modelling through to the end of mining given the relatively short lifespan of the Project.

Predicted Groundwater Interception

The predicted inflows to the Project were obtained by calculating the differences between the "SRM Approved" case and the "SRM Approved+Grevillea" case. The difference between the two cases represents the inflows to the Grevillea Pit.

Maximum predicted drawdown

Maximum incremental drawdown for the Grevillea Project only was obtained by comparing the difference in predicted aquifer groundwater levels for the "SRM Approved" scenario and the "SRM Approved+Grevillea" scenario at matching times.

Incidental Water Impacts

The change in alluvial water resources was assessed by comparing water budgets for alluvial zones using the "SRM Approved+Grevillea" and "SRM Approved" scenarios of the predictive model.

The change in surface water drainage leakage to groundwater due to the Project was assessed by comparing the River cell flow budgets for the Isaac River in the "SRM Approved+Grevillea" scenario against the "SRM Approved" scenario.

The cumulative drawdown, representing the total impact to modelled groundwater levels from all mining within the model domain, was obtained by comparing the maximum difference in aquifer groundwater levels for the "SRM Approved+Grevillea" model scenario with those in the theoretical "no mining" scenario, for all times during the predictive model period. The vast majority of these predicted cumulative drawdown impacts are not related to the Grevillea but result from existing mining activities represented in the model.

Uncertainty Analysis

A Type 3 Monte Carlo uncertainty analysis (IESC, 2018) was undertaken to estimate the uncertainty in the future impacts predicted by the model. The full description of the uncertainty analysis is provided in Appendix A of the Groundwater Impact Assessment Report contained in ***Appendix F***.

4.3.1.5 Water Quality

To understand the groundwater resources within the SRM and hydrogeological Study Area, available water quality data were compared to the:

- Australian Drinking Water Guidelines (NHMRC, 2011).
- Australian and New Zealand Environment and Conservation Council 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality' (ANZECC & ARMCANZ, 2000) guidelines for irrigation (long-term and short-term), stock water supply, and 95% level of protection for aquatic ecosystems in slightly-moderately disturbed systems.
- Fitzroy River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Fitzroy River Sub-basin, Fitzroy Basin Zone 34 WQOs for groundwater resources (aquatic ecosystem protection) for deep and shallow groundwater (DEHP, 2011a).

4.3.1.6 Independent Peer Review

An independent peer review has been completed by Dr. Noel Merrick (HydroAlgorithmics Pty Ltd) for the Groundwater Impact Assessment (refer to ***Appendix F***). The independent peer review outcomes are provided in ***Appendix G***.

4.3.2 Description of existing groundwater environment

4.3.2.1 Geological setting

Regional Context

The SRM is located in the northern part of the Bowen Basin, within the Collinsville Shelf.

The basin is Permo-Triassic aged and runs along a north-northwest to south-southeast orientation, overlapping with the Surat Basin at its southern end. A variable cover of Quaternary and Tertiary period sediment and basic volcanic rocks (basalts) is present within the Bowen Basin. Three major coal measures are present in the northern basin including the Moranbah coal measures (MCM) that underlies the groundwater Study area.

The Permian and Triassic units are covered by a thin veneer of unconsolidated to semi-consolidated Cainozoic sediments (Tertiary to Quaternary alluvium and colluvium). The alluvial sediments are localised along rivers and creeks (i.e., Isaac River, Hughes Creek, One Mile Creek and Phillips Creek). Volcanic extrusions (i.e., basalt) are also present within the region but are absent within the SRM.

Local Geology

The stratigraphic profile within the SRM comprises two distinct units (refer to Section 3.4.2 of ***Appendix F*** for further information on the local geology):

- Cainozoic sediments (alluvium, colluvium, and regolith that includes weathered Permian strata); and
- Permian coal measures.

4.3.2.2 Hydrogeology

Based on the understanding of the geological setting presented above, the hydrogeological regime relevant to SRM comprises the following key hydrogeological units:

- Cainozoic sediments:
  - Quaternary alluvium – unconfined aquifer (sporadically water-bearing strata of permeable unconsolidated sand or gravel) localised at and near to SRM along Hughes Creek, One Mile Creek and Phillips Creek, and regionally along the Isaac River where it is particularly well developed; and
  - Quaternary to Tertiary non-alluvial sediments and weathered units (collectively termed 'regolith' in many recent relevant regional studies) – unconfined unit with limited saturation at SRM and in the Study Area.
- Permian coal measures with:
  - Low permeability interburden units with aquitard properties; and
  - Coal seams that exhibit water bearing properties associated with secondary porosity through cracks and fissures.

The coal seams within the MCM are the primary aquifer at SRM. The coal seams can be characterised as confined aquifers, with the Q Seam, P Seam, H Seam and D Seam forming the main aquifer units locally. The MCM overburden and interburden act as aquitards and are typically dry, or very low yielding.

A detailed description of each of the hydrogeological units relevant to SRM, covering hydraulic properties, groundwater occurrence, hydraulic gradients, recharge, discharge, groundwater quality, and water use is presented in Section 3.5 of the Groundwater Impact Assessment Report contained in ***Appendix F***.

4.3.2.3 Water Quality

The Water EPP (DEHP, 2011b) provides WQO's for Isaac Groundwaters of the Isaac River Sub-basin of the Fitzroy Basin water plan (WQ1310). The Water EPP also provides limited WQOs specifically for underground aquatic ecosystem protection in Fitzroy Basin groundwaters. These WQOs vary across the Fitzroy Basin and are defined on the basis of groundwater Chemistry Zones. The applicable Chemistry Zone for the SRM is Isaac Groundwater (Zone 34; Sodic Sequence - Saline: Na, Cl). These WQOs are classified by groundwater depth ('shallow' being <30 m depth, and 'deep' being >30 m depth). The management intent of Zone 34 WQOs is to "maintain each of 20th, 50th and 80th percentile values", i.e. that there should be no change to existing water quality (no statistical change in the natural range of values) (DES, 2022).

The results of sampling from the SRM groundwater monitoring network (detailed in ***Section 4.3.2.5*** indicate that:

- Groundwater within the Phillips Creek alluvium generally meets the WQOs for all relevant groundwater values, however Fe concentrations do occasionally exceed guideline criteria for long term irrigation and Fitzroy Basin Zone 34 aquatic ecosystem protection (Shallow)
- Hughes Creek alluvial groundwater generally exceeds guideline levels for stock water supply, (SO4, TDS), aquatic ecosystem protection (Al, Cu, Ni, Mn, Zn), drinking water (TDS, Cl and Na), and long-term irrigation (B and Fe), but records concentrations of EC, dissolved major ions and dissolved Mn above the Fitzroy Basin Zone 34 WQOs (Shallow) for aquatic ecosystem protection.
- Where groundwater is present within the Tertiary sediments, it exhibits similar quality compared to the Hughes Creek alluvium and exceeds guideline values for stock watering (SO4), 95% level of protection for aquatic ecosystems (Cu, Ni and Zn), long term irrigation (Bo, Co and Mo), and drinking water (TDS, Na and Cl). The groundwater within Tertiary sediments was also found to exceed the Fitzroy Basin Zone 34 WQOs (Shallow and Deep) for aquatic ecosystem protection (EC, HCO3, Cl, Ca, Na, hardness, Mg, SO4, Cu and Mn).
- The Moranbah Coal Measures (interburden and coal) generally exceed guideline criteria for irrigation, drinking water and aquatic ecosystems.
- Groundwater within the Permian coal measures variably meets the WQOs for stock water supply, with guideline exceedances most common for TDS and SO4.
- Groundwater within the Permian coal measures coal seams has concentrations of:
  - SO4 (H Seam), Al (H Seam and D Seam), Cr (D Seam), Cu (P Seam), Ni (P Seam) and Zn (P Seam and D Seam) above the WQO for 95% level of protection for aquatic ecosystems;
  - HCO3 (D Seam) and Na (D Seam) above the Fitzroy Basin Zone 34 WQO (Deep); and
  - EC (H Seam and D Seam), Mg (H Seam and D Seam), Na (H Seam and D Seam), Cl (H Seam and D Seam), SO4 (H and D seams), Fe (H Seam and D Seam) and pH (D Seam) above the Fitzroy Basin Zone 34 WQO (Shallow and Deep).
- Total petroleum hydrocarbon concentrations and aromatic (BTEX) hydrocarbons were mostly below the laboratory detection limits.

4.3.2.4 Groundwater use

Anthropogenic

AECOM (2023c) undertook a search of the Queensland Government's Groundwater Bore Database and identified 90 registered groundwater bores within and adjacent to the existing SRM. Of these, six were identified as water supply bores within and adjacent to the existing SRM.

A field bore census was undertaken by AGE as part of the Saraji East Mining Lease Project in 2007. This identified 12 bores within 15 km of SRM on four separate landholder properties. All 12 bores were found to not correlate with the registered bore database and as such were deemed unregistered bores for the purpose of the groundwater assessment. Six (6) of the 12 bores have known depth information. Five of these six bores access groundwater from depths of less than 80 m. Of the six, two are likely to intercept water from the regolith while the remaining four likely access water from the Fort Cooper Coal Measures.

Figure 4-10 shows the bores that are located within the predicted maximum incremental drawdown. A key element of the Water Resources MNES in the EPBC Act is the potential for impacts to third party uses of a water resource. Within a Queensland context this can be assessed using the *Water Act 2000* (Qld) which provides bore drawdown threshold triggers of 2 m for unconsolidated aquifers, and 5 m for consolidated aquifers. These are thresholds that are provided to aid in the assessment of the potential for impacts to bores that may be of a magnitude significant enough to warrant consideration of make good measures to restore water supply.

There are no known privately-owned supply bores within any areas predicted to experience a drawdown that would exceed the *Water Act 2000* triggers. Furthermore, the uncertainty analysis results showed no water supply bores are predicted to experience 90th percentile maximum incremental drawdowns.

See Section 3.5.5.1 and 5.1.1 of ***Appendix F*** for more detail on anthropogenic groundwater users.

Environmental use

Environmental use by GDEs is described below in ***Section 4.4***.

4.3.2.5 SRM Groundwater Management and Monitoring

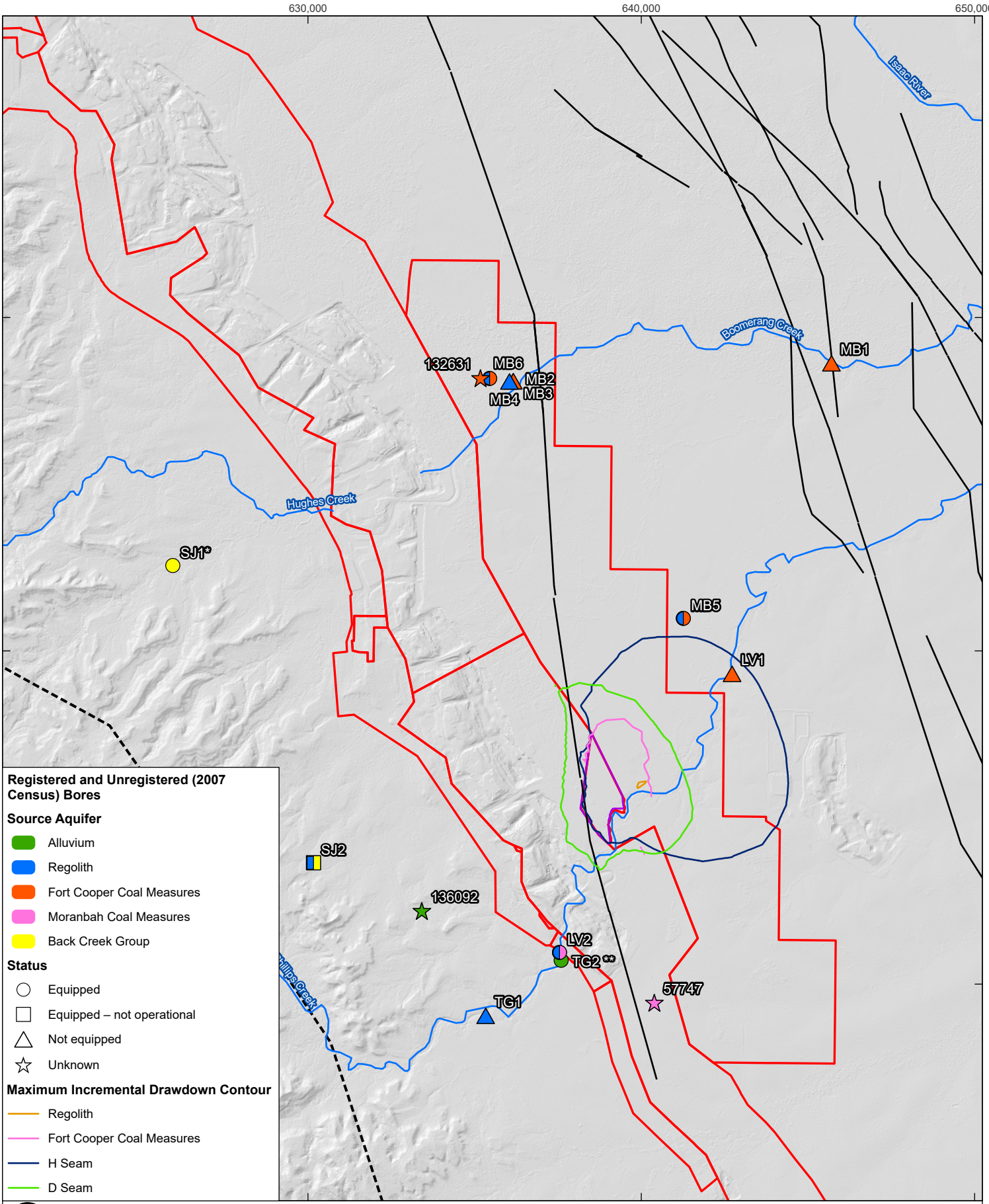
Groundwater inflows from the Permian coal measures to SRM's active pit voids are generally small in volume and do not typically need to be actively managed via advanced dewatering or other groundwater management methods, with evaporation from the pit void walls and floors accounting for most of the groundwater. Small volumes of groundwater inflow requiring management, when they occur, are generally managed via the use of in-pit sumps to capture water that is then used for dust suppression purposes or circulated via the Mine water management system for use in coal washing.

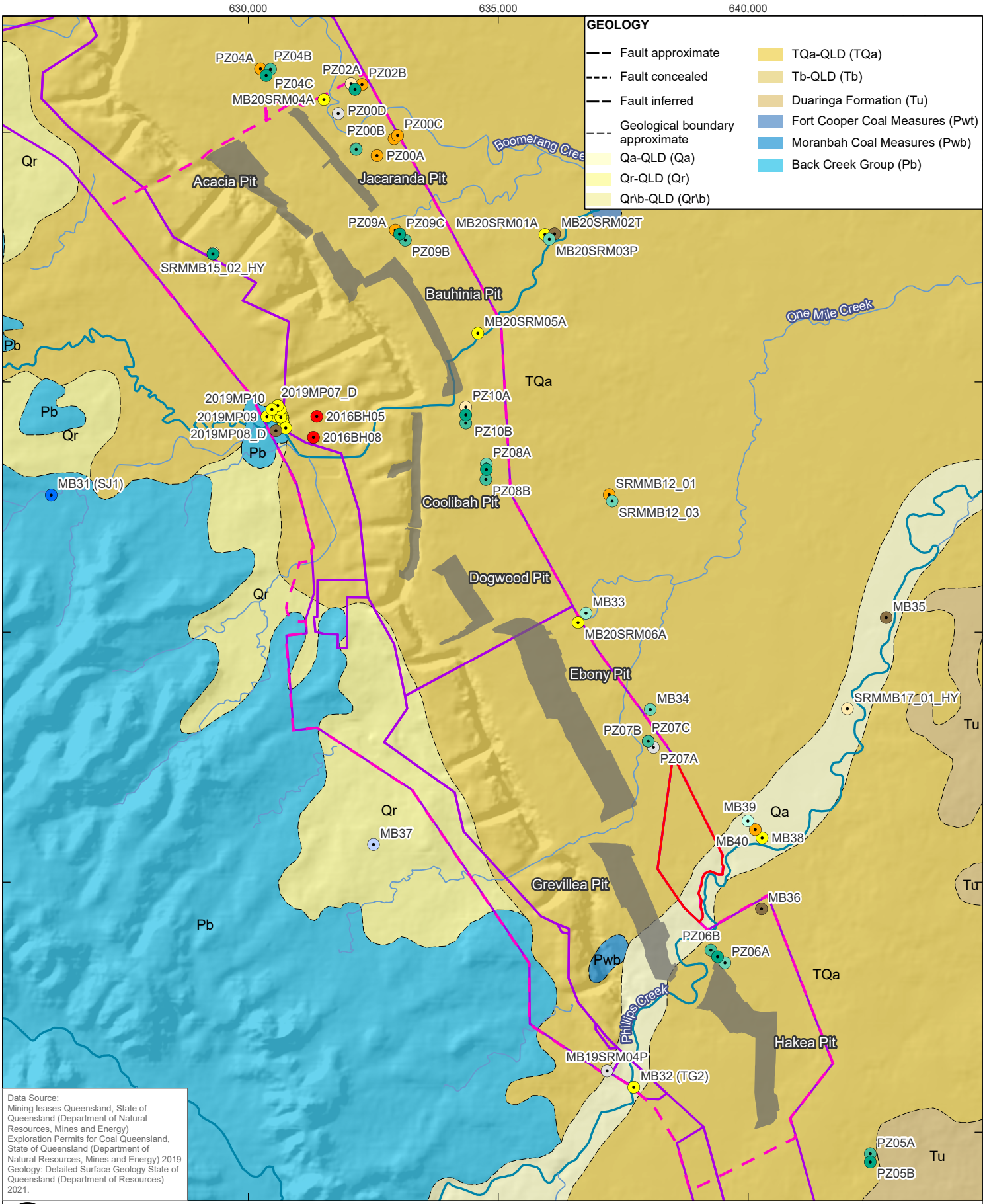
The SRM groundwater monitoring network comprises a total of 45 monitoring sites consisting of 36 monitoring bores (29 active and seven decommissioned) and three Vibrating Wire Piezometer (VWP) arrays.

The network's monitoring bores intersect a range of hydrostratigraphic units, including:

- Quaternary Alluvium (17 monitoring bores);
- Fill material (two monitoring bores);
- Tertiary sediments (including regolith) (13 monitoring bores);
- Fort Cooper Coal Measures (four monitoring bores);
- the R seam of the Moranbah Coal Measures (one monitoring bore);
- the Q seam of the Moranbah Coal Measures (one monitoring bore);
- the P Seam of the Moranbah Coal Measures (three monitoring bores and two VWP sensor);
- the H Seam of the Moranbah Coal Measures (five monitoring bores and three VWP sensors);
- the D seam of the Moranbah Coal Measures (six monitoring bores and three VWP sensors);
- interburden of the Moranbah Coal Measures (three monitoring bores); and
- Back Creek Group (two monitoring bores).

Groundwater data collection from the groundwater monitoring network has been undertaken since 2008. The locations of the current monitoring network are shown in ***Figure 4-11***.


630,000
640,000
650,000
7,530,000
7,520,000
7,510,000
Isaac River
Boomerang Creek
Hughes Creek
Phillips Creek
132631
MB6
MB2
MB3
MB4
MB1
SJ1*
MB5
LV1
SJ2
136092
LV2
TG2**
TG1
57747
Registered and Unregistered (2007 Census) Bores
Source Aquifer
Alluvium
Regolith
Fort Cooper Coal Measures
Moranbah Coal Measures
Back Creek Group
Status
Equipped
Equipped – not operational
Not equipped
Unknown
Maximum Incremental Drawdown Contour
Regolith
Fort Cooper Coal Measures
H Seam
D Seam
0
2.5
5
km
LEGEND
Modelled Fault
Major Drainage System
Mining Lease
Model Boundary
Project Area
Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:150,000 at A4
Project Number: 620.040484.00001
Date Drawn: 12-Sep-2024
Drawn by: RB
SARAJI MINE GREVILLEA PIT CONTINUATION PROJECT GROUNDWATER ASSESSMENT
MAXIMUM INCREMENTAL DRAWDOWN, WATER SUPPLY BORES AND UNREGISTERED (2007 CENSUS) BORES
SLR
DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.
FIGURE 4-10
Path: H:\Projects-SLR\620-BNE\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADGIS\GIS\ArcPro\GW Assessment\GW Assessment.aprx\620040484 F57 Bores located within the predicted maximum incremental drawdown



Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)
Exploration Permits for Coal Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2019
Geology: Detailed Surface Geology State of Queensland (Department of Resources) 2021.

0 1 2 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:100,000 at A4
Project Number:	620.040484.00001
Date Drawn:	12-Sep-2024
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Active Pit
- SRM EA Boundary
- SRM Mine Lease
- Project Area

Monitoring Locations - Aquifer Unit

- Alluvium
- Fill
- Tertiary Sediments
- Regolith
- FCCM
- MCM – Interburden
- R Seam Group
- Q Seam Group
- P Seam Group
- H Seam Group
- D Seam Group
- BCG - Interburden
- BCG – Coal Seam

SARAJI MINE GREVILLEA PIT CONTINUATION PROJECT GROUNDWATER ASSESSMENT

SRM GROUNDWATER MONITORING NETWORK

SLR

FIGURE 4-11

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADGIS\GIS\ArcPro\GW Assessment\GW Assessment.aprx\620040484 F16 GW Monitoring Network

4.3.3 Impact Assessment

4.3.3.1 Potential Impacts to Groundwater

During mining, a cone of depression will develop around the pit footprint due to incidental pit dewatering. This will cause changes to the existing groundwater regime (noting that it is already experiencing the effects of mining from the SRM) and has the potential to bring about impacts to:

- Privately owned supply bores
- GDEs
- Surface drainage via a reduction in baseflow
- Groundwater quality

The Project will dewater the coal and result in changes to the existing groundwater regime in the Project area and surrounds.

4.3.3.2 Predicted Groundwater Interception

The assessment of groundwater drawdown identified that during mining, a cone of depression will develop around the pit footprint due to incidental pit dewatering. This will result in localised groundwater flow towards the pit.

The model predicts that the void will exhibit some variability in the predicted groundwater inflows over the first 100-years post-mining, with periods of outflow from the void lakes to the groundwater within the first 50-years post-mining. The predicted void lake outflows are primarily to the in-pit placed backfill spoil and predominantly occurs in the first 20-years post-mining prior to the groundwater levels in the spoil recovering and the initial void lake level decreasing to closer to long-term averages. Due to the existing groundwater levels/gradient and lower permeability of the natural geological units, groundwater outflows are not expected to be significant beyond those to the spoil. As groundwater levels in both the spoil and natural geological units recover to elevations above the void lake, the direction of flow between the groundwater and void lakes is modelled to establish long-term groundwater inflows to the void lakes, with inflow conditions generally prevailing within all residual voids after approximately 50-years post-mining.

Inflows for the entire SRM including the Project are predicted to reach a maximum peak in year 2039 with 1900 ML/yr (5.2 ML/day).

This is approximately 500 ML/yr higher than inflows for SRM excluding the Project, indicating the maximum inflow to Grevillea is approximately 1.34 ML/day.

The inflows for all of SRM including the Project then decrease gradually and remain predominantly between 200 ML/yr (0.56 ML/day) and 1200 ML/yr (3.29 ML/day) until 2095.

See Section 4.3 of the Groundwater Impact Assessment Report contained in ***Appendix F***.

4.3.3.3 Groundwater drawdown

Predicted drawdown figures (Figures 39-44 in the Groundwater Impact Assessment Report contained in ***Appendix F***) show that:

- no incremental drawdown is predicted for the Quaternary alluvium as a result of the Project.
- Incremental drawdown within the regolith occurs mostly northeast of the Project area. The 1 m drawdown influence is predicted to extend 2.6 km northeast of the Grevillea mine extent.
- The Permian coal seams of the Moranbah Coal Measures are the primary groundwater bearing strata at the Project and will experience drawdowns up to 5 km north and 6 km southeast of the Project mine extent. Drawdowns propagate further within the shallower coal seams (i.e., Q and P seam) when compared to the D seam (i.e., coal seam target).

See Section 4.4 of the Groundwater Impact Assessment Report contained in ***Appendix F***.

Pre-mining groundwater elevations are not well understood, as mining operations at SRM commenced in 1974, prior to consistent and regular groundwater monitoring being undertaken. Groundwater elevations in the immediate vicinity of the residual voids are predicted to maintain long-term inwards groundwater flow gradients post-mining, with the groundwater elevations remaining below estimated pre-mining levels. The reduction in groundwater elevation is driven by the on-going groundwater inflows to the residual voids and the loss of water from the void lakes through evaporation. Steep water table gradients are predicted to occur on the northern end of the of the Ebony/Grevillea

void, along the coal seam strike, whereas gradients east and west of the residual voids are somewhat shallower, particularly to the west of the residual voids within the spoil.

The reduction in the water table to the east of SRM is modelled to extend up to 2km from the edge of the Ebony/Grevillea void. The groundwater table is predicted by the model to remain close to predicted pre-mining groundwater elevations in the areas along Hughes, Boomerang and Phillips creeks east of SRM as a result of the recharge rates from the creeks.

The modelled groundwater levels as a result of the entire SRM mine for the Q, P, H and D seams of the Permian (i.e. containing the target coal measures) indicate the following:

- Groundwater levels in the Permian sequence are predicted to remain below the estimated pre-mining groundwater elevations in the long-term. This is driven by the ongoing groundwater discharge to the residual void lakes.
- The Q Seam is predicted to remain 'dry' in the long-term across SRM, where it is not mined, with non-saturation present up to approximately 1 km east of SRM.
- The P Seam is predicted to remain unsaturated across much of the SRM, however remains saturated in areas along Phillips Creek and Ebony / Grevillea and Hakea voids.
- The H Seam is predicted to have similar patterns to the P Seam in the south of SRM, and levels approximately 60 m lower in the northern part of SRM.
- D Seam is predicted to be similar to the H Seam, with the reduction in groundwater elevations extending to the east of SRM.

4.3.3.4 Changes to groundwater quality

There will be no chemicals or compounds used and an inward hydraulic gradient towards the pit will be developed during mining. Pit water from groundwater ingress will be removed as part of the mine water management system. Hence, the potential for changes and impacts to groundwater quality including existing environmental values are considered low.

See Section 5 of the Groundwater Impact Assessment Report contained in ***Appendix F*** for further details.

4.3.3.5 Groundwater users

There are no known privately-owned supply bores within any areas predicted to experience a drawdown that would exceed the *Water Act 2000* triggers.

See Section 5.1 of the Groundwater Impact Assessment Report contained in ***Appendix F***.

Potential impacts to GDEs are detailed in ***Section 4.4.3***.

4.3.3.6 Incidental Water Impacts

Alluvium

Over the extent of Phillips Creek alluvium, the predicted loss of water from alluvium due to the Project is predicted to be less than 0.01 ML/day. With regards to the Isaac River alluvium, the model predicts that the alluvium take due to Grevillea is less than 0.003 ML/day.

Groundwater – Surface Water Interaction

Over the life of the Project, the change in the Isaac River net flow attributable to the Project is less than 0.0003 ML/day.

Cumulative

Figure 45 to Figure 52 of the Groundwater Impact Assessment Report contained in ***Appendix F*** show the maximum cumulative drawdown in proximity to the Project. Maximum cumulative drawdown predictions covering the entire hydrogeological Study area are provided in Appendix E of the Groundwater Modelling Technical Report (refer Appendix A of ***Appendix F***).

The vast majority of the predicted cumulative drawdown impacts are not related to the Project but result from existing mining activities represented in the model.

There are small amounts of cumulative drawdown impacts (not Project related) predicted for the Quaternary alluvium within or around the Project.

Cumulative impacts within the regolith can be seen connecting the Project-related drawdown to the drawdown impacts at the PDM and SRM open cuts (Figure 46 of ***Appendix F***).

For the Leichhardt and Vermont coal seams of the Rangal Coal Measures, there was no drawdown interaction between the Project area and the neighbouring mines as these seams are not present in the Project area.

Figure 49 to Figure 52 of ***Appendix F*** show the maximum predicted cumulative drawdown in Q, P, H and D seams in the Moranbah Coal Measures. As shown in the figures, the cumulative drawdown is predicted to interact with zone of impact from the PDM and SRM open cuts.

Figure 52 of ***Appendix F*** shows that drawdowns occur along the north-south trending fault located on the east of SRM.

4.3.3.7 Significant Impact Assessment for Water Resources – Groundwater Assessment

The general criteria of the Guideline states that, '*an action is likely to have a significant impact on a water resource if there is a real or not remote chance or possibility that it will directly or indirectly result in a change to the hydrology of a water resource or the water quality of a water resource, that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring.*' The significant impact assessment should also consider any avoidance and mitigation measures that have been used to reduce potential adverse impacts on a water resource, as well as any cumulative impacts and the scale and timing of the impacts.

An assessment of the significance of the impact on the water resources with regard to the environmental and other third-party users/uses has been undertaken in accordance with the Guidelines. The assessment of changes to hydrological characteristics is presented in ***Table 4-4***.

Table 4-4: Groundwater Assessment of Changes to Hydrological and Water Quality Characteristics

Assessment Criteria	Groundwater Assessment – Changes to Hydrological Characteristics	Significant Impact?
Discussion in relation to the significant impact criteria		
A significant impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action: • changes in the water quantity, including the timing of variations in water quantity • changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage (e.g. large-scale subsidence) and • changes in the area or extent of a water resource. The following aspects may need to be considered when assessing changes in hydrological characteristics: • flow regimes (volume, timing, duration and	A detailed impact assessment for the groundwater resource of the Project area is presented in Groundwater Impact Assessment in ***Appendix F***. A summary of this assessment in relation to the relevant criteria presented in ***Significant impact guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources*** is provided below. **Changes in water quantity** Groundwater inflows into the open cut area are predicted to reach a maximum peak in year 2039 of 1900 ML/yr (5.2 ML/day). This indicates that the maximum inflow to the Project is approximately 1.34 ML/day. The key component of the groundwater assessment is associated with drawdown within the pit and how it affects surrounding aquifers. Groundwater modelling shows that: • No incremental drawdown is predicted for the Quaternary alluvium as a result of the Project. • Incremental drawdown within the regolith occurs mostly northeast of the Project area, with the 1 m drawdown influence predicted to extend 2.6 km northeast of the Grevillea mine extent. • The coal seams of the Moranbah Coal Measures are the primary groundwater bearing strata at the Project and will experience drawdowns extending up to 5 km north and 6 km southeast of the Grevillea mine extent. Drawdowns propagate further within the shallower coal seams (i.e., Q and P seam) when compared to the D seam (i.e., coal seam target). As expected, drawdown amount at the Project boundary is highest and ranges from 50-100m in the Q seam to between 200-500m in the D seam (Figures 41 to 44 in ***Appendix F***). These seams are not	**No**

Assessment Criteria	Groundwater Assessment – Changes to Hydrological Characteristics	Significant Impact?
frequency of surface water flows) • recharge rates to groundwater • aquifer pressure or pressure relationships between aquifers • groundwater table and potentiometric surface levels • groundwater-surface water interactions • river-floodplain connectivity • inter-aquifer connectivity and • coastal processes including changes to sediment movement or accretion, water circulation patterns, permanent alterations in tidal patterns, or substantial changes to water flows or water quality in estuaries.	recognised to discharge into the down gradient Isaac River, in addition the drawdown cone does not extend to the Isaac River to the east. **Changes in the integrity of the hydrogeological connections** and **in the area or extent of a water resource** The final landform will comprise the pit, which will have been progressively backfilled to the greatest extent feasible as part of the mining operations, leaving a final void. Groundwater levels in the Permian sequence are predicted to remain below the estimated pre-mining groundwater elevations in the long-term. This is driven by the ongoing groundwater discharge to the residual void lake. However, this is not considered to constitute a significant impact as there are no known supply bores that tap Permian waters nor are any GDEs dependent upon the groundwater in the Permian. An inward hydraulic gradient towards the pit will be developed during mining. Pit water from groundwater ingress will be removed as part of the mine water management system. Hence, the potential for changes and impacts to groundwater quality including existing environmental values are considered low. **Changes to Surface Water – Groundwater Interaction** Reduction in stream flow due to a reduction of groundwater inflows would be negligible as over the extent of Philips Creek alluvium, the predicted loss of water from alluvium due to the Project is predicted to be less than 0.01 ML/day. With regards to the Isaac River alluvium, the model predicts that the alluvium take due to the Project is less than 0.003 ML/day. The largest predicted drawdown occurs within the target coal seams, which are not recognised to discharge into the down gradient Isaac River, in addition the drawdown cone does not extend to the Isaac River to the east. Therefore, it is concluded that there will be no significant impact to the hydrological characteristics of any groundwater resource.	
Will there be a **cumulative impact** on the hydrological characteristics of the water resource, when considered with other developments, whether past, present or reasonably foreseeable developments?	Given the proximity of the Project to the mining already existing in the larger SRM as well as the nearby Peak Downs and Caval Ridge Mines, cumulative impacts cannot be avoided, and already occur due to the aforementioned mining. The Project will contribute to cumulative impacts within the regolith which connect the Project-related drawdown to the drawdown impacts at the PDM and SRM open cuts. Drawdown as a result of the Project will cumulatively interact with the zone of impact from the PDM and SRM open cuts. However, the vast majority of these predicted cumulative drawdown impacts are not related to the Project, but instead result from existing mining activities represented in the model (see *Section 4.5.3* of the Groundwater Assessment Report in ***Appendix F***).	**No**
Over what **timeframe** will the impacts occur?	The numerical groundwater modelling predicts groundwater effects both during mining and post-closure. Post-closure, a single void will remain in the Project area. The model predicts that the void will exhibit some variability in the predicted groundwater inflows over the first 100-years post-mining, with periods of outflow from the void lakes to the groundwater within the first 50-years post-mining. The predicted void lake outflows are primarily to the in-pit placed backfill spoil and predominantly occurs in the first 20-years post-mining prior to the groundwater levels in the spoil recovering and the initial void lake level decreasing to closer to long-term averages. Due to the existing groundwater levels/gradient and lower permeability of the natural geological units, groundwater outflows are not expected to be significant beyond those to the spoil. As groundwater levels in both the spoil and natural geological units recover to elevations above the void lake, the direction of flow between the	**N/A**

Assessment Criteria	Groundwater Assessment – Changes to Hydrological Characteristics	Significant Impact?
	groundwater and void lakes is modelled to establish long-term groundwater inflows to the void lakes, with inflow conditions generally prevailing within all residual voids after approximately 50-years post-mining.	
What is the **scale** of the impact?	The **numerical** groundwater modelling predicts groundwater effects and potential impacts primarily to the coal seams of the Moranbah Coal Measures, which are the primary groundwater bearing strata at the Project. These will experience drawdowns extending up to 5 km north and 6 km southeast of the Project extent. Drawdowns propagate further within the shallower coal seams (i.e., Q and P seam) when compared to the D seam (i.e., coal seam target). As expected, drawdown amount at the Project boundary is highest and ranges from 50-100m in the Q seam to between 200-500m in the D seam. Drawdown in these seams will not affect any third-party user, and given that they are relatively localised, they are not considered to present significant impacts at a macro scale.	**N/A**
Assessment of the impact of changes in the hydrological characteristics of the water resource on the values reliant on the water resource		
Are the changes outlined above of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including **TGDEs**?	The GDE Technical Report (***Appendix F***) predicted no changes to potential TGDEs at Phillips Creek as a result of drawdown as no incremental drawdown is predicted for the Quaternary alluvium, which, based on known rooting depths and the thickness of the strata, is the groundwater that all potential TGDE species except for *Eucalyptus camaldulensis* would be accessing. *Eucalyptus camaldulensis* has deeper roots than the other potential TGDEs species known from Phillips Creek and could be accessing water from within the regolith, however, it is considered more likely to be utilising the shallower alluvial water along with the other potential TGDE species. Regardless, the predicted drawdown of around 1 m within the regolith would not affect this species as groundwater levels will remain above the maximum root depth for this species.	**No**
Are the changes outlined above of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, **including the environmental values of the local surface waters?**	As described above, changes to baseflow of surface waters as a result of groundwater drawdown is negligible. As such there is no potential for consequential impacts on the values of the local surface waters as a result of changes to hydrological characteristics of groundwater.	**No**
Are the changes outlined above of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including any **existing surface water entitlement holders, or bores used for stock watering, domestic or industrial farm use**?	There are no known privately-owned supply bores within any areas predicted to experience a drawdown of greater than 1m as a result of the Project. There are two unregistered landholder bores within the predicted extent of Project related drawdown. However, one is considered likely to access the Fort Cooper Coal Measures, which is not the target coal measures of the Project. There is no source aquifer or bore depth information for the other unregistered bore, but it is considered possible that it accesses either the regolith or Fort Cooper Coal Measures.	**No**
Mitigation and management		

Assessment Criteria	Groundwater Assessment – Changes to Hydrological Characteristics	Significant Impact?
What mitigation and management will be implemented to reduce any potential adverse impacts as described above?	The existing groundwater monitoring network will continue to be monitored, to gain understanding of the magnitude and distribution of actual changes to groundwater resources in response to the approved Project and to provide early detection of any unforeseen impacts to groundwater levels or groundwater quality. This will inform the review and updating of SRM's existing groundwater monitoring and management measures as required to ensure relevancy, detail and scale for detecting any marked changes to groundwater due to the Project. The implementation of the SRM's existing groundwater monitoring and management measures will evolve and respond to the various stages of the Project including pre-mining, operations, and post-mining activities.	**N/A**
Significance of the Impact		
Will the Project result in a significant impact on the water resource and its values?	As described above, the Project will result in some permanent localised impacts to the hydrological characteristics of groundwater, primarily in the form of drawdown impacts within the coal bearing Permian aquifers. However, this will not affect any third-party users, including GDEs. As such, given that impacts are localised and do not affect any third-party users, they are not considered to present significant impacts at a macro scale and the Project will not result in a significant impact on the hydrological characteristics of the groundwater resource.	**No**

The assessment concludes that the Project will not result in a significant impact on the groundwater resource because:

- There are no expected impacts on potential TGDEs as a result of groundwater drawdown.
- There are no known privately-owned supply bores within the predicted extent of Project related drawdown greater than 1 m.
- The groundwater model has predicted a negligible reduction in water flow in Phillips Creek (i.e., <0.01 ML/day) and the Isaac River (<0.0003 ML/day) over the lifetime of the Project.
- Due to the movement of groundwater towards the pit, there is a low risk of contaminants from waste rock stockpiles and leachate from mine water dams, and adopting standard practices for containment of fuels, oils and chemicals, no reduction in groundwater quality as a result of mining is expected to occur.
- Furthermore, groundwater quality will be protected through the implementation of a number of interrelated management plans and strategies set out in the SRM EA, as well as the SRM's existing groundwater monitoring and management measures.

4.4 Groundwater Dependent Ecosystems

This section describes the impact assessment of the Project on GDEs which are known, likely or have the potential to occur within the Project area and surrounding areas. It is supported by the associated GDE Impact Assessment Technical Report (***Appendix H***).

For the purposes of the GDE assessment, the GDE Study area is the aggregate of the Project Area (i.e. ML 700021) and the Predicted Drawdown Extent of the regolith strata (as modelled by SLR, 2024) which is considered to potentially impact GDEs (refer Section 02.4 in ***Appendix H***). As described further in ***Section 4.4.1.1*** the Project drawdown extent is spatially distinct from the Project footprint, as is illustrated in ***Figure 4-12***.

GDEs are those that require access to groundwater on a permanent or intermittent basis to meet the biological requirements of assemblages that comprise them (i.e. communities of plants and animals) and maintain their ecological processes and services (Richardson *et al*. 2011). Spatial and temporal variation of groundwater flow, influenced by factors such as geological formations, climate patterns, and land management practices, contribute to the formation of diverse GDEs within a landscape.

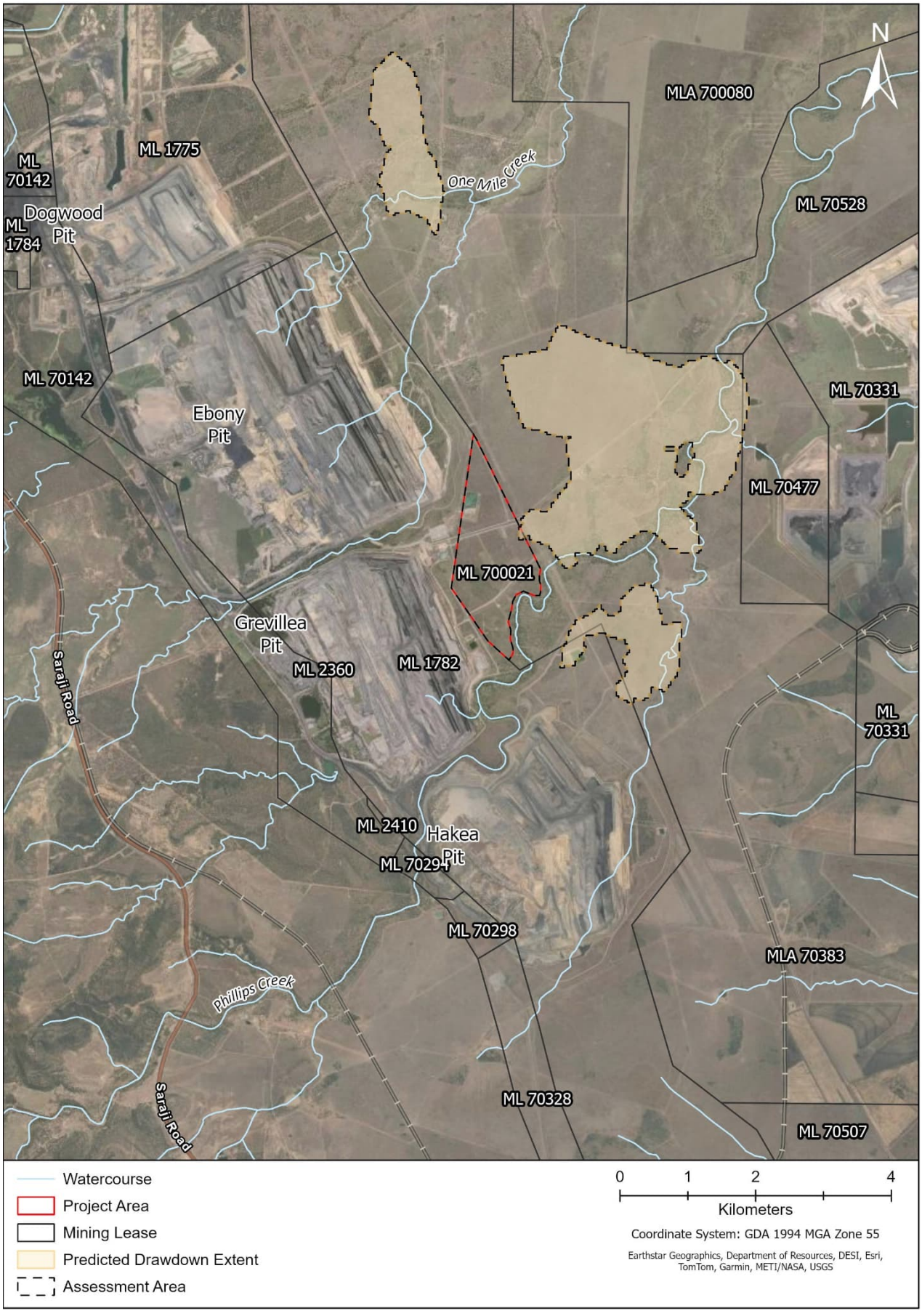


Figure 4-12: GDE Assessment Study Area

Eamus *et al.* (2006a) identifies three main types of GDEs:

- **Subterranean GDEs** that comprise caves or aquifers. GDEs within caves have some degree of connectivity with groundwater and typically have high moisture content and exhibit the presence of stygofauna. All aquifers are GDEs by their nature and are inhabited by micro species (i.e. stygofauna between rock formation and sediments within the aquifer);
- **Aquatic GDEs** are ecosystems that rely on the surface expression of water to maintain their processes and services. These ecosystems can be river baseflow systems (including aquatic and riparian ecosystems in or adjacent to streams and which rely on groundwater), wetlands that receive groundwater discharge, or ecosystems that rely on submarine discharge of groundwater for nutrients and/or physio-chemical attributes; and
- **Terrestrial GDEs** are those reliant on sub-surface presence of groundwater. In these ecosystems, vegetation uses root structures to access the capillary fringe located between the regional groundwater table and the vadose (unsaturated) zone.

The nature of an ecosystem's reliance on groundwater depends on their location within the landscape and the ecology of species within them. Trees found in riparian zones and floodplains rely heavily on consistent access to water sources, including surface flows, soil moisture, and groundwater (Kath *et al*. 2014). Plant species that need continuous access to groundwater have an obligate groundwater dependency (Eamus *et al.* 2006b). These species typically succeed in areas where groundwater is readily accessible, such as the lower banks of water bodies.

Conversely, there are species that have adapted to intermittent groundwater access, typically utilising the resource during periods of flooding, when groundwater levels rise. Referred to as facultative groundwater-dependent species, these plants can utilise groundwater when it's available but can also survive without it (Eamus *et al.* 2006a). Facultative species are typically situated on the upper banks and floodplains of water bodies, though groundwater use can vary with specific landscape / ecosystem context.

4.4.1 Assessment Methodology

This impact assessment has been undertaken via the following process:

- Identification of potential GDEs using multiple lines of evidence, including:
  - A desktop assessment of available information relevant to the identification of GDEs (e.g. BoM GDE Atlas, State Surface Geology Mapping, DES Potential GDE Aquifer mapping);
  - Analysis of relevant field surveys in and across the GDE Study area[2] (e.g. Baseline Ecological Assessments at Saraji Mine – BAAM, 2021; 3D Environmental, 2023; Engeny, 2025) (refer to ***Appendix D***) to garner an understanding of the ecohydrological setting; and
  - A literature review into the presence and ecology of potential GDE indicator species known to occur within REs found across the GDE Study area.
- Examination of TGDE likelihood through the application of diagnostic and non-diagnostic criteria. This involved identification via:
  - Groundwater diagnostic criteria (i.e. Depth-to-water (DTW) and groundwater quality); and
  - Vegetation non-diagnostic criteria (i.e. the presence of REs containing species known to utilise groundwater).
- Application of the Groundwater Dependant Ecosystem Mapping (GEM) method, endorsed by the IESC, which uses satellite imagery to compare vegetation greenness and moisture in wet and dry seasons.
- Analysis of potential impacts to TGDEs including:
  - Direct disturbance of vegetation comprising a GDE;
  - Altered TGDE access to groundwater via predicted groundwater drawdown (as modelled by SLR, 2024) (refer ***Appendix F*** and ***Appendix H***);
  - Changes in groundwater quality as a result of the Project; and
  - Changes in surfaces water hydrology / quality as a result of the Project.

[2] Note that the Study Area for GDEs is the aggregate of the Project Area (i.e. ML700021) and the Predicted Drawdown Extent of the regolith strata (as modelled by SLR 2025) which is considered to potentially impact GDEs (refer Section 02.5 in Appendix H)

- Assessment of the significance of impacts on TGDEs with respect to the Significant impact guidelines 1.3: Coal seam gas and large coal mining development – impacts on water resources (DCCEEW, 2022).

This process is detailed in full within the associated GDE Impact Assessment Technical Report contained in ***Appendix H***. A summary of this process (and outcomes) is provided in the following sub-sections.

4.4.1.1 Identification of Groundwater Dependent Ecosystems

Groundwater Modelling

To support the implementation of the Project, SLR (2024) have undertaken groundwater modelling (***Appendix F***). One the basis of feedback from the IESC, SLR (2025) have further refined their 2024 model to improve predictions of groundwater impacts relative to the hydrogeological conceptualisation of the local area[3]. The new model:

- Estimates the groundwater inflow to the Grevillea Project as a function of mine position and timing.
- Simulates and predicts the extent of groundwater level drawdown due to the Project (of specific relevance to this report).
- Identifies areas of potential environmental risk, where groundwater impact management measures may be necessary.

Appendix K specifically addresses the feedback from the IESC regarding the groundwater modelling. Per the model (SLR, 2025), potential groundwater drawdown is split relative to water bearing strata (i.e. alluvium, regolith, coal seams). With respect to GDE assessment, application of the model predictions has been limited to alluvium and regolith layers, with GDEs considered unlikely to access groundwater in Permian hydrostratigraphic units due to the following (refer Section 02.5 of ***Appendix H***):

- The thickness of alluvium and regolith sediments.
- Modelled DTW and relative rooting depth of GDE indicator species.
- Heavy clay soils in tertiary sediments restricting effective rooting depth of GDE indicator species.
- A lack of vertical movement between Permian and upper layers (i.e. due to low hydraulic conductivity of interburden and presence of other aquitards).

As drawdown in Permian strata is not considered relevant to GDEs, and no drawdown is predicted within alluvium as a result of the Project (SLR, 2024), the Predicted Drawdown Extent is defined by the maximum predicted drawdown within the regolith (related to the Project). The Predicted Drawdown Extent and Project area collectively form the GDE Study area (refer ***Figure 4-12***). Refer to ***Appendix F*** for further detailed information pertaining to the predicted groundwater drawdown within varying strata and spatial separation of the occurrence of predicted drawdown relative to the Project area.

It should also be noted that the Project contributes negligibly to cumulative drawdown within the region. The context of this contribution, and relationship to GDEs within the Study area, is discussed in the associated GDE SIA (***Appendix H***). For the purposes of the assessment, however, only groundwater drawdown associated with the Project is considered. This is termed 'incremental' drawdown (SLR 2025).

Eco-hydrological Overview

A review of available eco-hydrological information identified that the landscape of the GDE Study area (and general surrounds) is characterised by gently undulating plains and is incised by ephemeral drainage features that flow towards the Isaac River to the east (e.g. Phillips Creek) (3D Environmental, 2023 (refer to ***Appendix H***)). Quaternary alluvium (Qa) (clay, silt, sand and gravel) is concentrated along rivers and creeks, including that which intersect the GDE Study area (i.e. Phillips Creek). Alluvium along Phillips Creek features a localised, unconfined aquifer (sporadically water-bearing strata of permeable unconsolidated sand or gravel) (SLR, 2024). The surrounding plains are lifted by thick sequences of Pleistocene to tertiary age cracking clay and residual silts and loams to the north of Phillips Creek (including across ML 700021) (3D Environmental, 2023), with Tertiary-Quaternary alluvium (TQa) present across some of the GDE Study area. Surficial strata overlay Permian coal measures, though any groundwater in these layers is unlikely to be accessed by surface GDEs (i.e. aquatic and terrestrial) due to depth

[3] This work utilises the refined groundwater model (SLR 2025) as a basis for GDE impact assessment; however, references to previous work provided by SLR (2024), including the characterisation of groundwater at SRM, are maintained where appropriate and valid.

and the presence of low permeability interburden units with aquitard properties (i.e. between tertiary layers and coal measures).

Vegetation communities in the GDE Study area have been identified using the Queensland Government's RE classification methods and have been ground-truthed as part of numerous field surveys within the broader SRM (refer ***Table 4-5*** (Engeny, 2025; 3D Environmental, 2023; BAAM, 2021). The REs are typical of those within the Brigalow Belt North Bioregion and include Acacia species and/or eucalypt open forests to woodlands. GDE indicator species associated with REs ground-truthed within the GDE Study area and surrounds have also been identified. A discussion of each species' relevant morphology and ecology is provided in the associated GDE Impact Assessment Technical Report (refer Section 03.2.2 in ***Appendix H***).

Table 4-5: Ground-truthed REs in the GDE Assessment Area

RE	GDE Indicator Species	Extent (ha) within Assessment Area	
		Project Area	Predicted Drawdown Extent
11.3.1 - *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains	*Acacia harpophylla*	0.1	14.4
11.3.25 - *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	*Eucalyptus camaldulensis* *Eucalyptus tereticornis* *Corymbia tessellaris* *Corymbia clarksoniana* *Casuarina cunninghamiana*	Nil	36.3
11.3.27f - *Eucalyptus coolabah* and/or *E. tereticornis* open woodland to woodland fringing swamps.	*Eucalyptus tereticornis*	Nil	1.2
11.3.4 - *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains	*Eucalyptus camaldulensis* *Eucalyptus tereticornis* *Corymbia tessellaris* *Corymbia clarksoniana*	Nil	42.4
11.4.8 - *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	*Acacia harpophylla*	Nil	5.0
11.4.9 - *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	*Eucalyptus populnea* *Acacia harpophylla*	2.22	1.22
11.4.9/11.4.8 - *Acacia harpophylla* shrubby woodland AND *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla*	*Eucalyptus populnea* *Acacia harpophylla*	Nil	0.1
11.4.9/11.5.3 - *Acacia harpophylla* shrubby woodland AND *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland	*Eucalyptus populnea* *Acacia harpophylla* *Corymbia clarksoniana*	Nil	0.3
11.5.3 - *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces	*Eucalyptus populnea* *Corymbia clarksoniana*	11.7	23.0
Total		**14.0**	**123.9**

GDE Mapping

A variety of desktop sources were used to determine if GDEs potentially occur within the GDE Study area (refer Section 02.2 of the GDE Impact Assessment Technical Report – ***Appendix H***). The most pertinent of these is the BoM GDE Atlas (2024), as it classifies ecosystems based on the potential for dependence on groundwater through desktop collation of multiple lines of scientific evidence. Included in this dataset are the three identified GDE classifications (per Eamus, 2006a):

- **Subterranean GDEs** – comprise caves or aquifers;
- **Aquatic GDEs** – rely on the surface expression of groundwater to maintain ecological function; and
- **TGDEs** – reliant on sub-surface presence of groundwater.

High and moderate potential aquatic GDEs are identified within the GDE Study area, primarily in association with drainage line REs (i.e. RE 11.3.25) and a patch of RE 11.3.27b. High potential TGDEs (nationally assessed) are also mapped along the alluvium of Phillips Creek with moderate and low potential for TGDEs on elevated plains within the Predicted Drawdown Extent. No subterranean GDEs are mapped locally in the GDE Study area. Figure 03-5 of ***Appendix H*** provides an overview of the BoM GDE mapping across the GDE Study area. Significantly, the BoM GDE Atlas identifies no GDEs as potentially occurring within the Project Area.

Subterranean GDEs (stygofauna)

No known subterranean GDEs have been identified within the GDE Study area as per the BOM GDE Atlas. Bore monitoring from within tertiary and Permian units during 2011 (to support the adjacent Saraji East Mining Lease Project detected no stygofauna (ISEA 2011a&b cited in SLR, 2024). Previous studies from the broader SRM and within the Bowen Basin have provided no indication that stygofauna are present in coal seams across the region (AECOM, 2023c).

Where stygofauna have been detected in the Bowen Basin, they were within shallow (<29 metres below ground level (mbgl)), unconsolidated sediments (i.e. alluvium), with salinities below 2,000 µS/cm and pH levels of 6.5–8.5 (AECOM, 2023c); though studies suggest that stygofauna preferentially occur in groundwater where salinities <5,000 µS/cm. Considering the generally brackish to saline nature of groundwater in tertiary and Permian sediments in the GDE Study area, it is likely that stygofauna are not present in these units. Alluvial groundwater typically provides more favourable environments for stygofauna, though contemporary investigation of this biota is absent within the GDE Study area. Investigations by Glanville et al. (2016) show a greater diversity of stygofauna in Alluvium, than other lithologies in Queensland. The authors report that five families of stygofauna are present in the Isaac-Comet Downs sub-bioregion (within which lies the Assessment Area) (Glanville et al. 2016). However, as the alluvium present along Phillips Creek is discontinuous, likely ephemeral (i.e. in times of drought), and no studies have identified stygofauna presence in the GDE Study area, it is considered unlikely that stygofauna (i.e. subterranean GDEs) are present.

To verify the above conclusion, BMA proposes to undertake a stygofauna pilot survey; to be delivered as part of a GDE Monitoring and Management Plan (GDEMMP) (refer ***Appendix J***). If stygofauna are identified during the pilot survey, long-term monitoring and management of stygofauna will be detailed under the GDEMMP. Further details are available in the associated GDE Impact Assessment Technical Report – ***Appendix H***.

Aquatic GDEs

The BoM GDE Atlas maps high and moderate potential aquatic GDEs present along the length of Phillips Creek, including within the GDE Study area (BoM, 2024). However, recent work from 3D Environmental (2023) notes that there is no indication that this system represents an aquatic GDE. Aquatic ecology studies by FRC environmental (2018 cited in SLR 2024) suggest that there are no aquatic GDEs within the SRM or surrounds. Wetland ecosystems are limited in the GDE Study area (i.e. RE 11.3.27f) but are mapped more broadly within the area of the SRM (e.g. at Boomerang Creek – outside of the GDE Study area). These ecosystems do not exhibit hydrological connectivity between surface waters and groundwater (3D Environmental, 2023). Baseline ecological surveys from SKM in 2007 & 2010 (FRC environmental 2018 cited in SLR 2024) denote that natural aquatic habitats typically comprise shallow and small disconnected pools. Considering both the ephemeral nature of drainage features within the SRM, and the modelled DTW, it is unlikely that aquatic GDEs occur within the GDE Study area.

Terrestrial GDEs

Potential TGDEs have been mapped across various parts of SRM (BoM, 2024). Within the GDE Study area, high and moderate potential TGDEs are mapped primarily in association within Phillips Creek with low potential TGDEs indicated along One Mile Creek. National mapping does not identify any TGDEs as occurring within the Project area.

Recent field investigations (3D Environmental, 2023) suggest vegetation communities associated with Phillips Creek function as TGDEs in certain areas. 3D Environmental (2023) note the presence of perched aquifers within alluvial sediments, which are likely to provide intermittent access of groundwater to species. Where the drainage channel is deeply incised, and where those species sit sufficiently deep within the channel, some plants may also potentially access deeper groundwater resources within tertiary sediments (3D Environmental, 2023). Vegetation communities exhibiting GDE-indicator species are also present outside of mapped alluvium within the GDE Study area. However, the presence of heavy clay soils (i.e. outside of sandy creek sediments) suggests that species that may be capable of reaching the standing water level (SWL) (~20 m) in tertiary sediments are unlikely to do so; as such soils likely reduce effective rooting depth (Dupuy *et al*. 2005; Wilson and Taylor 2012).

4.4.1.2 Likelihood of TGDEs in Assessment Area

As determined above, the only type of GDE relevant to the impact assessment are TGDEs.

To identify potential or likely TGDEs within the GDE Study area diagnostic criteria have been used. The overall approach to identification is described here and summarised in ***Figure 4-13*****.** This approach builds upon information within the Australian groundwater-dependent ecosystems toolbox (Richardson *et al*., 2011), the Information guidelines for proponents preparing coal seam gas and large coal mining development proposals (IESC 2018) and its associated explanatory note on assessing GDEs (Doody, Handcock & Pritchard 2019), as well as prior information obtained through direct discussion with experts.

Specific criteria used in this assessment include:

- Groundwater diagnostic criteria (i.e. DTW and groundwater quality); and
- Vegetation mapping (i.e. presence of REs containing species known to utilise groundwater); and
- Groundwater Dependant Ecosystem Mapping (GEM) class.

In order to assess the likelihood of TGDEs being present, the sequential application of the criteria is required.

Groundwater depth and quality are both limiting factors for the potential presence of TGDEs. Per the approach, conservative exclusionary thresholds for groundwater depth and quality (measured via salinity) have been respectively set at[4]:

- >30 mbgl; and
- >55,000 µS/m (electrical conductivity).

Where groundwater depth and quality criterion are met, identification of TGDEs then involves the collation of vegetation mapping to determine if relevant species have the requisite physiology to access and use groundwater. Once these vegetation communities are identified, and the presence of possible groundwater-dependent species confirmed, an analysis of satellite imagery is undertaken, utilising multi-spectral indices to track changes in vegetation greenness and moisture. Data from the analysis is used to categorise likelihood of groundwater dependence where previous diagnostic criteria support its conclusions.

Categories of TGDEs include:

- Likely TGDEs.
- Potential TGDEs.
- Unlikely TGDEs.

A full description of the above process can be found in Section 4.2 of ***Appendix H***.

[4] Rationales for exclusionary thresholds are described in Section 04.2 of the Groundwater-Dependent Ecosystem Impact Assessment Saraji Mine Grevillea Pit Continuation Project Technical Report (2rog 2025).

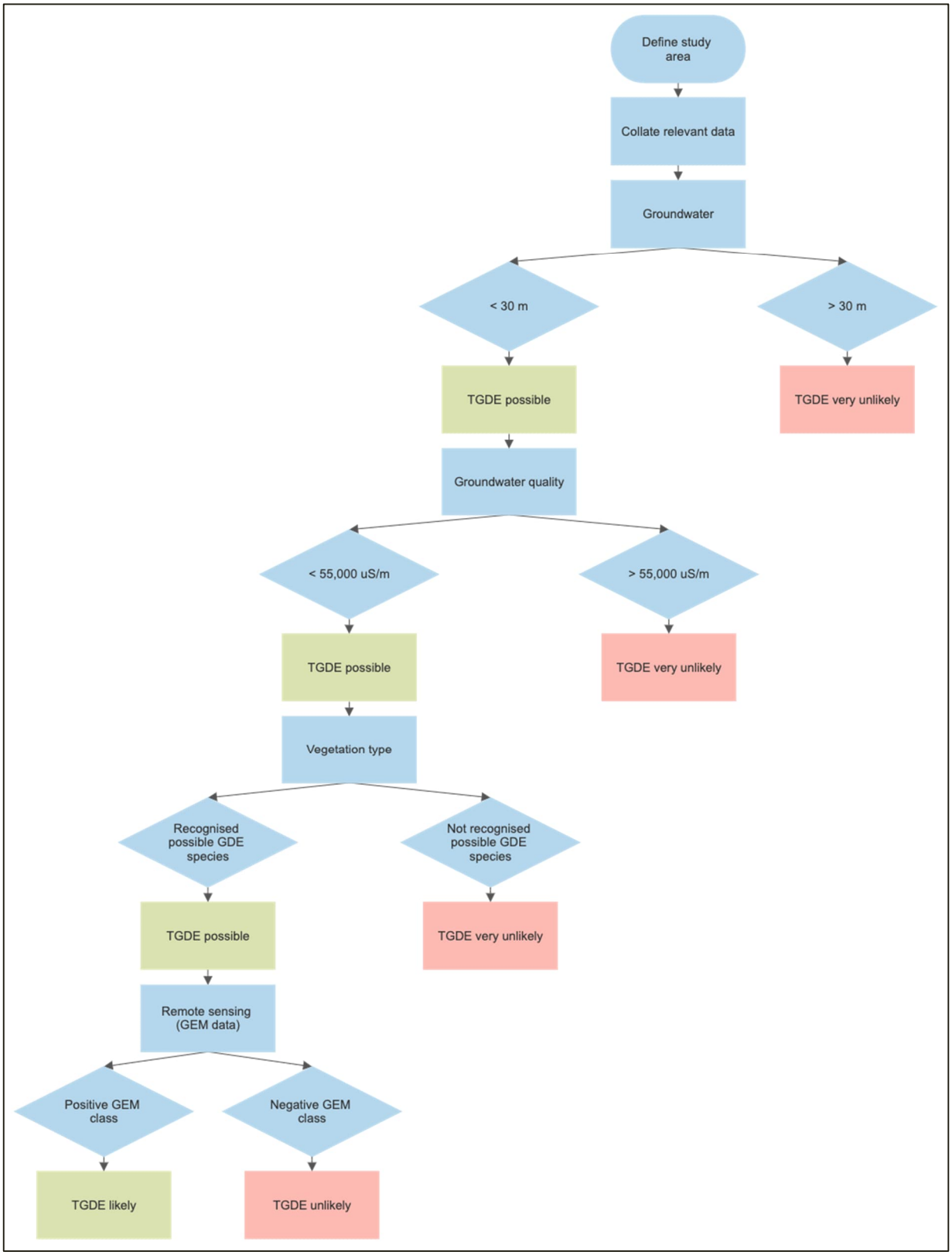


Figure 4-13: TGDE Identification Approach Summary

Groundwater diagnostic criteria in the Assessment Area

DTW modelling, undertaken by SLR (2025), identified that within the Predicted Drawdown Extent, groundwater is typically between 20–30 mbgl, with an area ≤20 m present in association with Phillips Creek. Across the Project area, DTW extends from ~20 m up to a depth of >250 m within the mining pit. DTW model contours and identified REs within the GDE Study area are presented in Figure 04-1 of ***Appendix H.***

Where REs occur and DTW is ≥ 30 mbgl, no TGDEs are considered likely to occur.

Where depth contours indicate DTW of <30 mbgl within the Predicted Drawdown Extent, this DTW criterion is met and TGDEs may be present. Field data from 3D Environmental (2023) shows that DTW sits shallower within the channel incision of Phillips Creek (which is >8 m), indicated by the presence of groundwater during auger sampling at a site immediately adjacent to the GDE Study area.

Groundwater quality within the GDE Study area is unlikely to prohibit function of TGDEs. Monitoring bores present within alluvial and tertiary sediments nearby the GDE Study area indicate that salinity does not exceed 2,500 µS/m, with alluvial groundwater more fresh, reflective of surface water recharge (refer Table 03-3 in ***Appendix H***).

Vegetation diagnostic criteria

Vegetation communities present within the GDE Study area, (per ground-truthed survey data (3D Environmental, 2023; BAAM, 2021; Engeny, 2025)), are summarised in Table 03-4 of ***Appendix H*.**

The GDE indicator species discussed in this section are derived from a review of available literature and are considered the most likely candidates to utilise groundwater within the GDE Study Area. To understand if these species have the requisite physiology to access and use groundwater , relevant research into species specific salinity tolerance and rooting depth has been collated in ***Table 4-6.***

Table 4-6: GDE species specific diagnostic criteria

GDE-indicator species	Salinity tolerance (µS/cm)	Rooting depth (mbgl)	REs in the GDE Study area
Acacia harpophylla (Brigalow)	-	>3[1]	11.3.1, 11.4.8, 11.4.9
Eucalyptus camaldulensis (River red gum)	4,000–8,000[2]	7–22.6	11.3.4, 11.3.25
Eucalyptus populnea (Poplar box)	-	12.6–26.7[3]	11.4.9, 11.5.3
Eucalyptus tereticornis (Forest red gum)	4,000–40,000[4]	9.3	11.3.4, 11.3.25, 11.3.27f
Corymbia clarksoniana (Clarkson's bloodwood)	2,000–4,000 based on other *Corymbia* spp.[5]	10	11.3.4, 11.3.25
Corymbia tessellaris (Moreton Bay ash)		4	11.3.4, 11.3.25
Casuarina cunninghamiana (River she-oak)	4,000–8,000[6]	-	11.3.25

[1] Per Coaldrake (1967). However, most of the root mass of the species occurs within the upper soil profile. Little evidence for deep rooting is noted within SRM (3D Environmental 2023).

[2] Per Marcar and Crawford (2004)

[3] Rooting depth taken from Kath *et al*. (2014), who identified distinct DTW thresholds beyond which canopy condition declined abruptly, in the range of 12.6–26.6 m for *E. populnea*. It is noted by Fensham and Fairfax (2007) that poplar box are shallower rooted than bloodwoods in central Queensland savanna. Kath *et al.* (2014) theorised depth is taken as a conservative estimate.

[4] Upper limit taken from Mensforth *et al.* (1994)

[5] Sun & Dickinson (1995)

[6] Van der Moezel et al. (1989)

From this information, it is understood that most species are unlikely to access groundwater as a consequence of their rooting depths and the DTW established per SLRs (2025) modelling. However, as 3D Environmental (2023) notes: perched groundwater exists within the alluvium of the highly incised (i.e. > 8 m from bed to bank) Phillips Creek, with pockets found ~1.15 m below the bed.

Therefore, it is possible that where species are present within the banks of Phillips Creek (i.e. in RE 11.3.25) (refer to ***Table 4-5***), and where they are capable of rooting to ~10 m (refer ***Table 4-6***), such species may access

groundwater where it is intermittently / seasonally available, within the sandy substrate of the alluvium. *Eucalyptus camaldulensis* (which occurs along the banks of Phillips Creek), has been known to invest in both extensive lateral roots and tap roots to reach water tables (up to 20 m) (Bacon *et al*. 1993; Burgess *et al*. 2001; Steggles *et al*. 2017). It is possible that this species may also access groundwater resources within tertiary sediment below the Phillips Creek alluvium. Theoretically, *E. Populnea* may also root to regolith groundwater. However, the capacity for any individual trees to reach groundwater in the regolith is likely to be restricted by the heavy clay soil profile present in Tertiary sediments.

Remote sensing analysis

A remote sensing analysis was used, consistent with the Groundwater Dependant Ecosystem Mapping (GEM) Method. This is the preferred approach to identify TGDEs as described by the ISEC. The method involved:

- The collation of seasonal satellite imagery (and other contextual data) over a five-year period;
- Derivation of NDVI and NDMI indices for each relevant satellite image;
- A process of data classification to produce a single TGDE layer against index threshold values. From this, three categories of TGDE were identified:
  - Likely TGDE – *persistent greenness and higher moisture values through dry seasons*.
  - Potential TGDE – *persistent greenness and higher moisture values through wet seasons*.
  - Unlikely TGDE – *thresholds not met*.

The analysis provided a mapped quantum of area in which vegetation communities across the GDE Study area are likely to, unlikely to, or have the potential to function as TGDEs (***Appendix H***) and this has been used to support the impact assessment.

4.4.2 Description of existing Groundwater Dependent Ecosystems

Considering the above, (including modelled DTW, groundwater salinity, vegetation characteristics and the mapped GEM classes) the following conclusions have been drawn:

- Likely TGDEs occur in association with the riparian zone of Phillips Creek (in RE 11.3.25), and limited extents of ecosystems immediately adjacent – consistent with classification by remote sensing criteria
- REs outside the Phillips Creek riparian zone (noting the above exclusions) are less likely to function as TGDEs, factoring the modelled DTW across the GDE Study area, the limited rooting depth for known GDE indicator species, and the presence of heavy clay soil restricting deep root architecture. Some REs have been categorised as potential TGDEs.
- REs present within the Project Area are not considered to function as TGDEs due to the excessive DTW.

The area of GDE classes (likely, potential and unlikely) has been tabulated within ***Table 4-7***, corresponding mapping is shown in ***Appendix H*****.** Collectively the following quantum of TGDEs have been determined:

- Likely TGDEs – 1.1 ha.
- Potential TGDEs – 14.9 ha.
- Unlikely TGDEs – 121.9 ha.

Table 4-7: Likely, potential and unlikely TGDEs in GDE Study area

RE	GDE indicator species present	TGDE likelihood	Area (ha)
11.3.1	*Acacia harpophylla*	Unlikely	14.5
11.3.25	*Eucalyptus camaldulensis* *Eucalyptus tereticornis* *Corymbia tessellaris* *Corymbia clarksoniana* *Casuarina cunninghamiana*	Likely	1.0
		Potential	10.9
		Unlikely	24.4
11.3.27f	*Eucalyptus tereticornis*	Potential	0.2
		Unlikely	1.0

RE	GDE indicator species present	TGDE likelihood	Area (ha)
11.3.4	*Eucalyptus camaldulensis* *Eucalyptus tereticornis* *Corymbia tessellaris* *Corymbia clarksoniana*	Likely	0.1
		Potential	3.5
		Unlikely	38.9
11.4.8	*Acacia harpophylla*	Unlikely	5.0
11.4.9	*Eucalyptus populnea* *Acacia harpophylla*	Unlikely	3.4
11.4.9/11.4.8	*Eucalyptus populnea* *Acacia harpophylla*	Unlikely	0.1
11.4.9/11.5.3	*Eucalyptus populnea* *Acacia harpophylla* *Corymbia clarksoniana*	Unlikely	0.3
11.5.3	*Eucalyptus populnea* *Corymbia clarksoniana*	Likely	<0.1
		Potential	0.3
		Unlikely	34.3
TOTAL:			137.9

4.4.3 Impact assessment

Potential impacts to likely TGDEs within the GDE Study area as a result of the Project are related to:

- Direct disturbance – clearing of GDE vegetation (i.e. within the Project area);
- Groundwater drawdown – reduced access to water at the root depth for some species within the vegetation communities which occur within the Predicted Drawdown Extent;
- Changes in groundwater quality – for example, if there is a spill event that leads to contamination of groundwater; and
- Changes in surface water hydrology / quality – noting the facultative nature of indicator species identified, an event that leads to a deterioration of surface water quality (e.g. via erosion and sedimentation), or altered reduced access to surface water, also has potential to impact TGDEs.

The associated GDE Impact Assessment Technical Report (refer ***Appendix H***) includes a formal risk assessment, detailing the likelihood of an impact occurring and the consequence associated with each impact to TGDEs. Based on the risk assessment outcomes, residual risk rating is 'Low' or 'Insignificant' following application of appropriate management and mitigation measures.

4.4.3.1 Direct disturbance / clearing

Direct clearing will remove remnant and high-value regrowth vegetation (14 ha total – refer ***Table 4-5***) within the Project area. Present vegetation communities (REs 11.3.1, 11.4.9 and 11.5.3) contain known GDE indicator species including *Eucalyptus populnea* and *Corymbia clarksoniana.* However, where ground-truthed REs occur within the Project area, modelled DTW exceeds 30 mbgl. Thus, these communities are not considered to function as TGDEs, and no direct clearing of TGDEs will occur. This impact pathway is not considered further.

4.4.3.2 Groundwater drawdown

Groundwater drawdown has the potential to impact TGDEs where drawdown reduces the accessibility of the water from the root zone for the applicable TGDE, potentially impacting maintenance of ecosystem function. A drawdown of any magnitude has potential to impact TGDEs differently based on the species present, the standing level of groundwater and the extent to which drawdown will move groundwater beyond the zone in which it is accessible to vegetation. Rate of drawdown may also impact upon species' that utilise groundwater, with phreatophytes setting their maximum rooting depth at the capillary fringe of a seasonally consistent water table. This assessment uses the following to determine potential impact of groundwater drawdown:

- Impacts to TGDEs are not considered to occur where groundwater remains >1 m above root zone after maximum drawdown.
- Where groundwater level remains within 1 m of the root zone, there is potential for impacts.
- Where maximum drawdown pulls groundwater below the root zone, there will likely be impacts to indicator species.

The Predicted Drawdown Extent is defined as drawdown only associated with the regolith (refer ***Section 4.4.2***). Drawdown in this stratum (refer to ***Figure 4-14*** <1m, with >85% of the Predicted Drawdown Extent limited to <0.09m of drawdown. Likely and potential TGDEs are, however, identified within the Predicted Drawdown Extent (refer ***Figure 4-14***), in association with REs 11.3.25, 11.3.4 and 11.5.3. Therefore, an impact assessment has been undertaken relative to the GDE indicator species present within these ecosystems.

Table 4-8 outlines the potential for impacts to the species as a result of groundwater drawdown.

Table 4-8: Potential impacts to TGDE indicator species in Predicted Drawdown Extent

GDE indicator species	Rooting depth (mbgl)	Groundwater level prior to drawdown (mbgl)	Drawdown (m)	Potential Impact?
Eucalyptus camaldulensis River red gum	7–22.6	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium
		≤20 (Regolith)	<1	Unlikely– maximum depth of groundwater after drawdown is 21 mbgl, which is within theorised rooting depth. Rate of drawdown likely very slow
		20-30 (Regolith)	<1	Possible – where water table is set close to maximum rooting depth, drawdown may move capillary fringe beyond access.
Eucalyptus populnea Poplar box	12.6 – 26.7	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium
		≤20 (Regolith)	<1	Unlikely– maximum depth of groundwater after drawdown is 21 mbgl, which is within theorised rooting depth. Rate of drawdown likely very slow
		20-30 (Regolith)	<1	Possible – where water table is set close to maximum rooting depth, drawdown may move capillary fringe beyond access.
Eucalyptus tereticornis Forest red gum	9	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium
Corymbia clarksoniana Clarkson's bloodwood	10	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium
Corymbia tessellaris Moreton Bay ash	4	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium
Casuarina cunninghamiana River she-oak	-	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium
Acacia harpophylla Brigalow	3	2–10 (Alluvium)	0	No – no drawdown predicted in Alluvium

The conclusions in ***Table 4-8*** are a consequence of several factors:

- Per the modelled predictions provided by SLR (2025), no groundwater drawdown is expected to occur within alluvium;
- Where drawdown occurs in regolith and likely/potential TGDEs overlay this, drawdown is predicted to be <1 m over the predicted modelling period (2024–2063) (SLR, 2024, 2025);
- Species[5] within vegetation communities along Phillips Creek (with exception to *Eucalyptus camaldulensis* and *E. populnea*) are likely to only utilise alluvial groundwater (as a function of rooting depth, edaphic controls (i.e. the presence of heavy clay in tertiary sediments) and DTW), and as such, will not be impacted by groundwater drawdown; and
- Species that can root beyond 20m (i.e. *E. camaldulensis* and *E. populnea*) may potentially utilise groundwater resources in tertiary sediments. Such species are unlikely to be impacted where DTW is ≤ 20, though may possibly be impacted where the water table sits at their maximum rooting depth (between 20-30m).

With respect to possible impacts to TGDEs, the following is noted:

- The rate of any drawdown in tertiary sediments is likely to be very slow, as aquitards present below the regolith strata exhibit low hydraulic connectivity to such a degree that the tertiary sediments effectively form a perched groundwater system above the Permian strata (SLR 2024).
- It is understood that *E. camaldulensis* is known to be adapted to intermittent availability of groundwater. Where it sits in appropriate positions within the banks of Phillips Creek, there is the possibility that individual trees exhibit a dimorphic root architecture, and potentially access water within alluvial and regolith aquifers, as well as via soil moisture. Doody et al. (2015) demonstrated that soil moisture alone can sustain *E. camaldulensis* individuals for six years before a decline in tree health becomes evident, while the species is also known to self-regulate and adjust their transpiration rates to match the average flood return interval (Colloff 2014 cited in 3D Environmental 2023).
- Where *E. populnea* is found in RE 11.5.3 adjacent to Phillips Creek, groundwater use is likely to be from the alluvium, rather than regolith, due to lesser depth and restrictive sediment types (i.e. heavy clay).
- Where potential and likely TGDEs occur, the actual extent of drawdown in the regolith is expected to be less than 10cm (refer ***Figure 4-14***). This magnitude of drawdown is highly unlikely to impact species who utilise groundwater, especially considering facultative nature of the present species and the availability of groundwater in shallower strata (i.e. the alluvium).

Considering the above, it have been assessed that there is no anticipated change to the functionality of the ecosystem as a result of groundwater drawdown. Therefore, no significant impacts to likely TGDEs are expected as a result of groundwater drawdown.

[5] The use of groundwater by species in RE 11.3.25 is likely dependent on their position within the incision of Phillips Creek (i.e. distance to creek bed) and the potential rooting depth of individual species

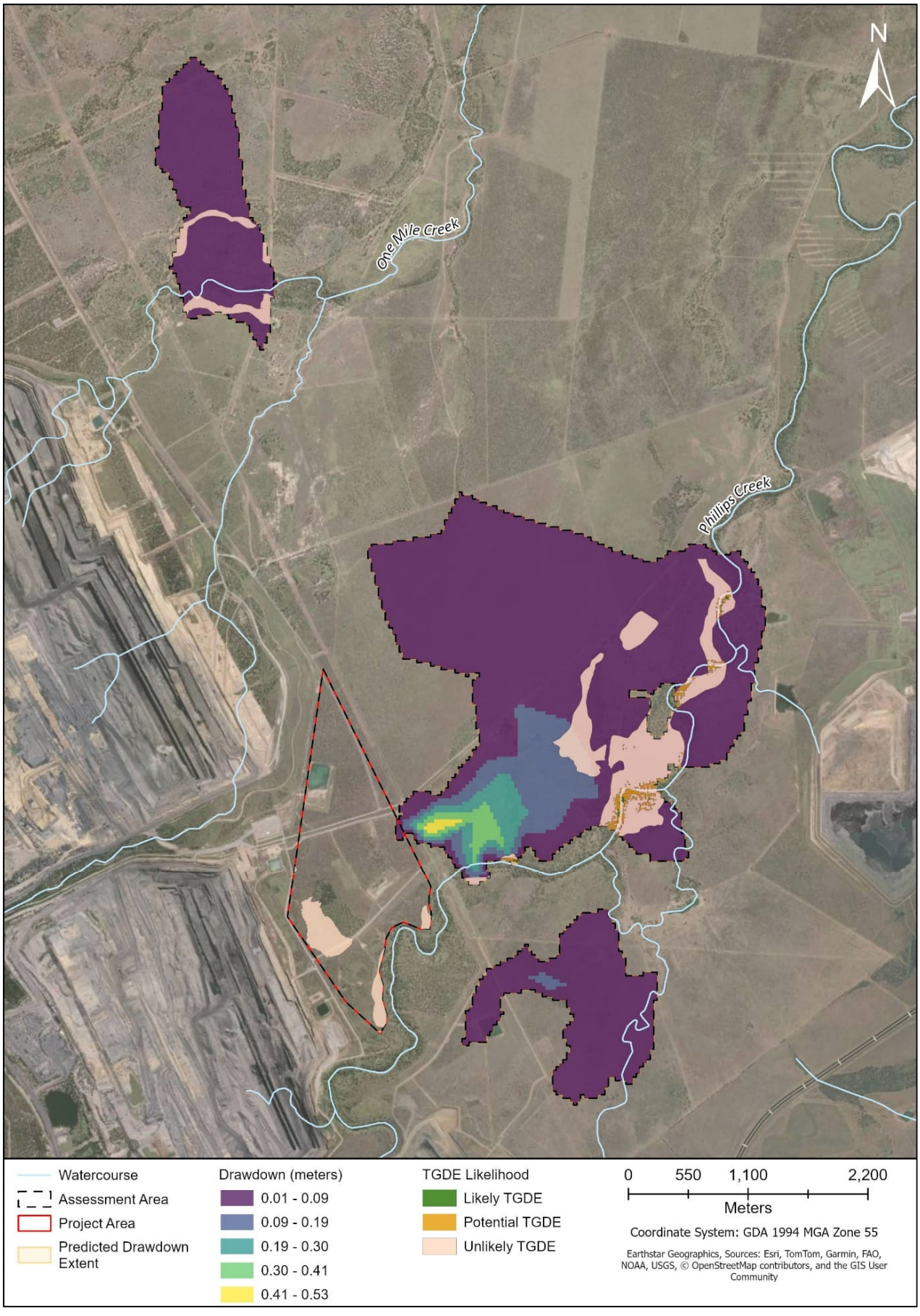


Figure 4-14: Predicted groundwater drawdown the GDE Study area

4.4.3.3 Changes in groundwater quality

Determining the impact of changes in groundwater quality is undertaken by identifying if there will there be any changes in groundwater quality that impact the ability of the groundwater to sustain TGDEs. The primary limiting factor for groundwater quality to sustain TGDEs is salinity, and the assessment criterion is:

- Impacts to TGDEs are considered to potentially occur where changes in salinity exceed tolerance range for species within likely TGDEs.

It is understood that, as a consequence of the Project, a cone of depression will develop around the pit footprint due to incidental pit dewatering (SLR 2024). This will result in localised groundwater flow towards the Grevillea mining pit, limiting potential for impact on surrounding groundwater including the existing groundwater quality (SLR, 2024). Further, limited hydraulic connectivity between the coal measures and upper strata (i.e. alluvium / tertiary sediments), coupled with ongoing recharge via surface flows and rainfall, indicates that salinity is unlikely to change as a result of the Project.

Additional to salinity considerations, potential impacts on groundwater quality may exist where leaks, spills and improper disposal of wastes, including waste rock, leads to the leaching of compounds into the groundwater following rainfall events, potentially affecting the health and function of TGDEs. However, such impacts are considered unlikely to occur with appropriate mitigation and monitoring measures outlined within the associated Groundwater Monitoring and Management Program (GMMP) and the Fitzroy Regional Receiving Environment Monitoring Program (FRREMP).

As no changes in groundwater quality are predicted, there is no anticipated change to the functionality of likely TGDEs. Consequently, there will be no significant impacts to likely TGDEs as a result of changes in groundwater quality.

4.4.3.4 Changes in surface water hydrology

Additional to groundwater drawdown and changes in groundwater quality, other potential impact considerations should be noted:

- The relationship between groundwater and subsoil moisture (i.e. water held in riverbanks).
- Impacts to TGDEs from changes to surface water hydrology or quality.
    - Alteration of natural environment and topography due to mining operations.
    - Controlled release of mine affected water (i.e. MAW).
    - Uncontrolled release of contaminants.
    - Erosion and sedimentation of waterways.

It is understood that the flow from Phillips Creek (as the primary drainage feature of interest to the GDE Study area) will be maintained over the Project lifetime (i.e. no alteration to pathway / diversion), with only a minor reduction in potential run-off area (relative to creek catchment) and removal of minor inflows (i.e. due to the cut out of ML 700021 over the course of the Project). Changes to streamflow volumes are considered to have a negligible effect on volume and duration characteristics in Phillips Creek (Engeny 2025). Groundwater recharge in Phillips Creek alluvial deposits associated with seasonal flooding conditions are therefore not likely to change as a result of the Project. Further, due to the limited predicted drawdown in upper strata (SLR 2025) and the likely slow rate of drawdown in these layers, recharge of alluvial deposits via surface flows is unlikely to be significantly altered due to drawdown.

Controlled released of MAW presents another potential impact pathway. Releases are expected to occur at an incrementally increased volume as a result of the Project. However, strict release conditions, ongoing monitoring (per FRREMP) and specific downstream triggers are expected to manage risk to surface water associated with MAW. Release of contaminants (i.e. uncontrolled releases) is unlikely to occur where mitigation measures are applied as per established standards and guidelines. Further to this, no vegetation clearing will occur on floodplains and/or near drainage lines; therefore, no impacts from erosion and/or sedimentation are considered likely to occur. The Project will also apply appropriate mitigation measures per the Erosion and Sedimentation Control Plan, as required by relevant EA conditions.

4.4.3.5 Significant Impact Assessment for TGDEs

The EPBC Act Significant Impact Guidelines 1.3 – Impacts on water resources (DCCEEW, 2022) provide overarching guidance on determining whether an action which involves a coal seam gas or a large coal mining development will

or is likely to have a significant impact on a water resource. An action is likely to have a significant impact[6] on a water resource if …

> *… there is a real or not remote chance or possibility that it will directly or indirectly result in a change to:*
>
> *the hydrology of a water resource;*
> *the water quality of a water resource…*
>
> *…that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring.*

All GDEs fall under the cursor of water resources (even those who use groundwater occasionally) as they comprise both ecosystems and organisms that contribute to the environmental value of groundwater. The 'value' of the water resource is a key component in determining whether the impacts of a proposed action are likely to be significant. In relation to TGDEs, the value is linked to the environment, which is itself considered to be a 'third party user' of the water resource (DCCEEW, 2022). The main utility of the TGDE to the environment is that of 'supporting services' e.g. the maintenance of ecosystem function. The ecosystem function of a water resource includes the ecosystem components, processes and benefits of services that characterise the water resource, including support for the biological diversity of species composition of the water resource. Changes in the hydrological characteristics of a water resource (i.e. quantity, quality, connection, flow) need to be considered when assessing significant impact on the value of a water resources (e.g. how it maintains function of a GDE).

Due to the following will be no significant impacts to TGDEs within the GDE Study Area:

- No clearing of TGDEs will occur
- Groundwater drawdown is not anticipated to change the functionality of the ecosystem
- No changes in groundwater quality are predicted
- No changes to surface water hydrology / quality are anticipated

[6] A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the water resource, which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. Guidance around significance in provide in the IESC explanatory note on assessing groundwater-dependent ecosystems (Doody, Handcock & Pritchard 2019).

5 Avoidance, Management and Mitigation Measures

BMA has implemented the hierarchy of management principles in the planning for and development of the proposed action. These principles and the order in which they have been applied is as follows.

1. Avoid: locating activities to avoid direct and indirect impacts on MNES.
2. Minimise: minimising direct and indirect impacts where they cannot be completely avoided.
3. Mitigate: implementing mitigation and management measures to reduce direct, indirect and cumulative impacts.
4. Remediate and rehabilitate: remediate and rehabilitate impacted areas progressively post-mining to promote long-term recovery.

The location and extent of the Project is constrained by the underlying coal resource and therefore opportunities to avoid impacts, relocate to an alternative location, or minimise the Project extent and impacts are limited. The Project has achieved avoidance of MNES values associated with Phillips Creek riparian corridor through providing a setback of 100m – 150m from the Project area boundary. This has ensured that no direct impacts on water resources or upon the ecological values associated with Phillips Creek will occur as a result of the Project.

A full discussion of the mitigation and management measures for each MNES is provided in the following subsections. Rehabilitation measures applicable to the wider SRM are discussed in ***Section 6***.

In general, given the Project will utilise the existing SRM infrastructure, it will also continue to implement the relevant operational management plans currently in use at SRM for the duration of the Project. Following completion of mining, and progressively as required, the SRM PRCP will also be implemented across the Project area. It should be noted that activities required as part of the SRM PRCP relevant to the Project area are not being considered as mitigation efforts that would reduce expected offset requirements that are detailed in ***Section 8*** as a result of the Project. The provision of this information is to illustrate the progressive rehabilitation requirements to be implemented across the wider SRM in accordance with the SRM EA.

In respect to the Project operations, management plans relating to weed and feral animals, erosion and sediment control, GDE management, water management and waste management are most relevant to MNES. ***Appendix J*** contains the existing SRM Sediment and Erosion Control Plan, SRM Waste Management Plan, SRM Water Management Plan, Weed and Feral Animal Management Procedure, and Groundwater Monitoring and Management Plan. It also includes the GDEMMP developed specific for this Project. These plans are designed, updated and reported against in accordance with the standard and requirements of the SRM EA.

The implementation of the mitigation and management measures detailed in the following subsections will be managed in accordance with the PLAN-DO-CHECK-ACT Model that is used in the overarching BMA Environmental Management System (refer ***Figure 5-1***). The accountability for implementation of the framework will lie with BMA; however, for some aspects a suitably qualified person will be appointed and held accountable to BMA to deliver the necessary outcomes.

Plans provided in ***Appendix J*** establish the objectives and key performance indicators (KPIs), consider risks and develop management actions and monitoring requirements (PLAN). Implementation timing and responsibility (DO) is detailed throughout this section. A key aspect of the model is the feedback cycle facilitated by CHECKing:

- Outcomes of monitoring, investigating contributing factors to results not considered in line with milestones or KPIs (ACT);
- Adapting approaches to management (informed by experts where appropriate) with the aim of improving likelihood of success (ACT); and
- Circling back to updating documentation and work plans (PLAN) to ensure improved actions are then incorporated and implemented (DO) in the future.

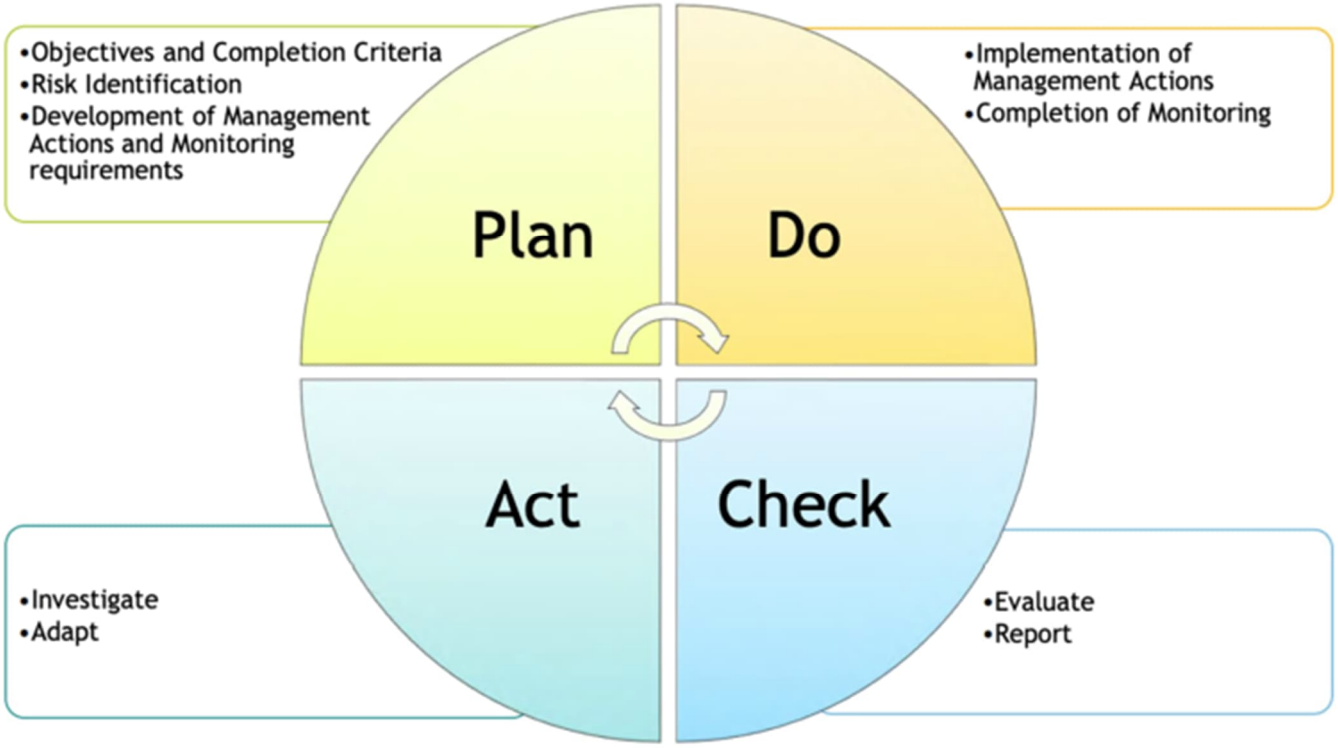


Figure 5-1: PLAN, DO, CHECK, ACT Model

5.1 Threatened Species and Ecological Communities

In accordance with the conditions of the EA (***Appendix C***), a suite of mitigation and management measures that will reduce the likelihood of impacts upon threatened fauna and their habitat already occur as part of the day-to-day operations of the SRM. These will be extended to apply to the Project. In addition, a number of further mitigation and management measures are proposed to provide for the amelioration of likely impacts during the Project.

The measures detailed in the following subsections relate to all MNES assessed within this report, including Koala, Greater Glider, Ornamental Snake and Squatter Pigeon.

Indirect impacts associated with bushfire risk are considered unlikely given the bushfire prevention and management measures to be implemented for the Project consistent with SRM current operations.

The full details of the mitigation and management measures relevant to the ecological values of the Project are presented in Section 6.2 of the Terrestrial Ecology Survey and Impact Assessment Report in ***Appendix D.***

5.1.1 Vegetation Clearing and Habitat Loss

Table 5-1 details mitigation and management measures to minimise impacts to all threatened species and ecological communities relevant to the Project, including Koala, Greater glider, Squatter pigeon and Ornamental snake.

Table 5-1: Management measures for vegetation clearing and habitat loss

Vegetation Clearing and Habitat Loss	
KPI	No unauthorised clearing of vegetation or MNES habitat.
Timing for Implementation	Implementation will be prior to disturbance activities and for the duration of the Project.

Vegetation Clearing and Habitat Loss	
Responsibility	The Site Supervisor is responsible for the implementation of the proposed controls. The Site Environment representative is responsible for inspections and reporting.
Mitigation measures / controls	• Areas of vegetation and habitat adjacent to the Project area (i.e. Phillips Creek and Brigalow regrowth to the north-east) is to be demarcated prior to disturbance for the duration of land disturbing activities to avoid accidental disturbance. This is to be done with temporary fencing (or barrier tape or similar) and/or signage as necessary. • Microhabitat features such as large fallen logs that may occur within the Project area are be relocated to adjacent areas of undisturbed vegetation prior to ground disturbance where practicable. • Topsoil is to be stockpiled from the time of stripping and appropriately managed until required for future use. Topsoil will be managed in accordance the existing procedures and protocols at SRM and in accordance with EA requirements. • Vegetation clearing to be undertaken in a sequential manner to allow fauna to relocate under their own accord towards areas of surrounding retained habitat. • BMA's internal permit to disturb procedure to be followed for all disturbance activities to ensure all vegetation clearing works are undertaken across the designated footprint and appropriate measures have been put in place. The BMA Permit to Disturb is a key control that helps the Project appropriately manage vegetation clearing requirements. • Progressive rehabilitation to be undertaken in accordance with the SRM EA and in particular in accordance with the requirements of the SRM PRCP schedule.
Monitoring for effectiveness	The Site Environment representative will complete daily inspections during vegetation / MNES habitat clearing activities to ensure demarcation remains in place and clearing has occurred within authorised areas.
Corrective Actions	1. In the event demarcation effectiveness is compromised, the Construction Supervisor will immediately repair. Clearing in immediately adjacent areas will be paused while repair occurs. 2. In the event of unauthorised clearing, action will be taken immediately to avoid further unauthorised clearing. An incident investigation by the Site Environment representative will commence within 48hrs of being made aware of the event, and will: 1. identify and describe any potential unauthorised harm to MNES; and 2. evaluate actions that led to the incident occurring. Through the investigation process, corrective actions will be identified within one month of the event that commensurate with the cause identified and scale of harm. Specific corrective actions will be dependent on the nature of an incident and specialist subject matter expert input may be required (for example qualified Ecologists). Examples include: - Consider if impact to MNES values requires provision of an offset. - Remediation works. - Revise demarcation procedures or techniques (e.g., implementation of alternative demarcation tools). The outcomes of the investigation will document the impact to MNES and identify the required corrective actions, responsibility and timeframes for completion. Reporting to the relevant Regulators may be required.

5.1.2 Fauna Injury and Mortality

Table 5-2 details mitigation and management measures to minimise impacts to fauna species, and specifically to Koala, Greater glider, Squatter pigeon and Ornamental snake.

Table 5-2: Management measures for fauna injury and mortality

Fauna Injury and Mortality	
KPI	No fauna mortality during vegetation clearing or vehicle movements.
Timing for Implementation	Prior to and during vegetation / MNES habitat clearing. Speed limits to be implemented for the duration of the Project.
Responsibility	Site Supervisor, Site Environment Team and Fauna Spotter Catcher.
Mitigation measures / controls	• Pre-clearance surveys are to be undertaken by suitably qualified personnel to detect the presence of fauna species prior to the commencement of disturbance within the Project area. Any fauna detected are to be relocated to a suitable and undisturbed location prior to clearing commencing. • All vegetation clearing and ground disturbance work within the Project area is to be conducted under the supervision of a suitably qualified fauna spotter catcher. The spotter catcher will be present for the duration of clearing activities. • The suitably qualified fauna spotter catcher will be responsible for the identification, relocation and management of impacted fauna detected during clearing activities, with the authority to cease work where MNES species individual/s, such as the ornamental snake, are directly at risk of being injured or killed. Spotter-catchers are standard industry practice during clearing activities, and are highly effective at minimising harm to impacted fauna. • Speed reduction measures will be implemented during all activities for the Project (for example preparation activities and throughout operations) to avoid fauna mortality on internal roads, particularly within areas traversing or adjacent to known threatened fauna habitat. Speed reduction measures are currently implemented at SRM and will continue to be adhered to for the life of the Project. These measures are effective in reducing vehicle speed, and include the provision of fauna crossing signs to warn drivers and speed reduction measures (i.e. speed humps), where practical.
Monitoring for effectiveness	Confirmation of pre-clearance surveys for any planned vegetation clearing activities to occur during pre-start meetings prior to clearing. During the progression of clearing works, monitoring of the clearing front will be included in daily environmental inspections. Weekly checks of speed limit signage by Site Supervisor during progressive vegetation clearing activities.
Corrective Actions	1. No clearing activities to be undertaken (stop work) where no pre-clearance survey found to have taken place. Site Supervisor to arrange for survey to be completed prior to commencement of vegetation clearing activities. 2. Should fauna mortality occur, Site Environment Team and Fauna Spotter Catcher to review processes and confirm all reasonable measures were undertaken. If deemed additional processes are required, these are to be implemented before clearing activities recommence. Reporting to the relevant Regulators may be required. 3. Should reports of vehicle-wildlife collision occur, Site Supervisor and Site Environment Team to review location and type of collision to identify any high-risk areas for further speed reduction and make changes to locations of implementation within one month of incident. Other corrective measures will be specific to the location and type of event such as increased signage or increased awareness education for Construction personnel.

5.1.3 Weed and Pest Incursion

Table 5-3 details mitigation and management measures to minimise potential indirect impacts to flora and fauna, and specifically to Koala, Greater glider and Ornamental snake.

Table 5-3: Management measures for weed and pest incursion

Weed and Pest Incursion	
KPI	No incursion of a novel weed species or proliferation of existing weed species.
Timing for Implementation	For the duration of the Project.
Responsibility	Site Supervisor, Site Environment Team, and all employees and contractors.
Mitigation measures / controls	• Vehicle hygiene for the life of the Project: – all vehicles, machinery and equipment shall be cleaned at designated wash down bays/pads – When moving around onsite, vehicles, machinery and equipment should be re-inspected when: i. Entering undisturbed areas of vegetation; ii. Entering vegetated areas within proximity to rehabilitated areas; and iii. Leaving areas with known established weed populations. • Disturbance and topsoil management: – during rehabilitation any amendments (e.g., seed, straw and hay) brought to site will be declared weed free and recorded in the site's document management system; – any movement of sand, gravel, rock, soil and organic matter must be controlled to ensure that it does not result in contamination by weed seeds; • Weed monitoring, treatment and reporting: – conduct biannual weed monitoring of disturbed areas to identify new weed outbreaks as well as verify the effectiveness of ongoing weed management controls; – when required to be undertaken weed treatment chemical controls and herbicide application rates are conducted by an appropriately licensed person; – when detected as part of monitoring or other observations weed infestations will be recorded using GIS/mapping to ensure effective management can be planned and achieved; – weed material disposed appropriately; • Feral animals: – the feral animal control program will continue to be implemented when monitoring results confirm there is an increasing trend in population (e.g., increase in the number of sightings), there is evidence feral animals are impacting on threatened species or neighbouring landholders raise valid concerns in regard to feral animals; – feral animal monitoring will reflect suitable survey locations such as water sources (pigs) or crib huts (cats), suitable time of day (e.g. diurnal/nocturnal species) and the location of indirect sign of feral animal activity (e.g., scats, diggings); – feral cat and pig populations will be controlled using traps in accordance with the existing BHP Weed and Feral Animal Management procedure; and – feral dog and pig populations will be controlled in accordance with the existing BHP Weed and Feral Animal Management procedure.
Monitoring for effectiveness	Evidence of vehicle washdowns of any vehicles new to the site provided to Site Supervisor upon entry to the Project area (or SRM). Routine inspections to be undertaken in accordance with the Weed and Feral Animal Procedure (***Appendix J***).
Corrective Actions	Vehicles without evidence of washdown to be refused entry until appropriate evidence can be provided to the Site Supervisor.

Weed and Pest Incursion	
	Where inspections detect weed invasion where previously not occurring, targeted weed management will commence within one month of discovery. The management approach will be dependent on the type of weed (and recommended species-specific management approaches) and scale of invasion.

5.1.4 Erosion and Sediment Control

Table 5-4 details the mitigation and management measures to minimise indirect impacts to receiving waterways, particularly where changes to habitat may impact the Ornamental snake.

Table 5-4: Management measures for erosion and sediment control

Erosion and Sediment Control	
KPI	Minimise erosion and sediment release to receiving waters, having the potential to impact threatened species habitat.
Timing for Implementation	Implemented at the commencement of land disturbance and for the duration of the Project. The SRM EA conditions of operation require the Erosion and Sediment Control Plan, including Implementation Plan, to be implemented for the duration of mining activities.
Responsibility	Site Supervisor is responsible for the implementation of actions within the Erosion and Sediment Control Plan, including routine inspections and monitoring for the effectiveness of the plan.
Mitigation measures / controls	• Erosion and sediment control devices are to be installed along the interface of the Project area boundary and Phillips Creek prior to disturbance activities and maintained for the duration of the Project operations. • Progressive rehabilitation of disturbed areas becoming available in accordance with the requirements of the SRM PRCP schedule (refer ***Appendix L*** for the PRCP Schedule applicable to the SRM). • Ensure implementation of conditions outlined in the SRM EA (and detailed within the Erosion and Sediment Control Plan – ***Appendix J***), specifically including the following controls: – Implement erosion, drainage and sediment control design standards and catchment separation standards are incorporated as part of the Project design and subsequently implemented and maintained for the duration of their installation. – Inspection, monitoring and maintenance protocols are implemented across the Project area. • All refuelling, chemical storage and maintenance activities to occur within the designated areas at SRM.
Monitoring for effectiveness	Routine inspections of the erosion and sediment control and mine affected water infrastructure (minimum post-wet season inspections prior to May, and pre-wet season inspections prior to November). Event-based inspections will occur per the Erosion and Sediment Control Plan.
Corrective Actions	In the event of emergencies, exceptions or incidents, all reasonable actions will be taken by operations to minimise potential or actual environmental harm and notification will be given to the administering authority in accordance with the requirements of the SRM EA (***Appendix C***). Any events relating to erosion and sediment impacts shall be managed in accordance with the SRM EA.

5.1.5 Proliferation of Dust, Noise and Light

5 details the mitigation and management measures to minimise indirect impacts caused by elevated dust, noise disturbance and/or light disturbance from the Project.

Table 5-5: Management measures for proliferation of dust, noise and light

Proliferation of Dust, Noise and Light	
KPI	Mitigate indirect impacts to MNES species and habitat occurring along Phillips Creek.
Timing for Implementation	For the duration of the Project, unless specified within this table.
Responsibility	Site Supervisor and Site Environment Team.
Mitigation measures / controls	• Dust suppression (water carts) will be undertaken over roads within the Project area when and where required for the life of the Project. • All equipment and machinery to be regularly maintained and in good working order to avoid unnecessary noise. • Any artificial lighting required along the Project area boundary is to be: – directed downwards, fitted with light shields and away from adjacent habitats; – the minimum number and height required to illuminate the area for access purposes; and – consist of the minimum lumen required to sufficiently illuminate the area for access purposes.
Monitoring for effectiveness	Routine inspections and monitoring will occur in accordance with the SRM EA (***Appendix C***). Specific to Greater glider and Koala demonstration of ongoing presence within the Phillips Creek riparian corridor, the monitoring program presented in ***Section 5.1.5.1*** will be undertaken.
Corrective Actions	Through management of noise, light and dust to meet SRM EA conditions (***Appendix C***), it is expected that potential disturbances to threatened species and communities can be managed. Where the technical standards aren't met specific investigations will be undertaken and mitigation measures designed. Refer to ***Section 5.1.5.1*** for corrective actions specific to monitoring Koala and Greater glider.

5.1.5.1 *Koala and Greater Glider monitoring*

As detailed in ***Sections 3.2.6***, ***3.3.1*** and ***3.3.2***, sightings of Koala and Greater glider have been consistently recorded in habitat directly adjacent to active operational areas at SRM. Several sightings of the two species have been recorded between 2018 to 2024 during ecological field surveys along the Phillips Creek riparian corridor (refer to Sections 4.2 and 5.2 of ***Appendix D*** for further details and associated ecological reporting). The documented persistence of both Koala and Greater glider in habitat immediately adjacent to active mining operations supports the conclusion that behavioural disturbance is likely to be minor and temporary, with local populations capable of utilising adjacent habitat despite ongoing operational noise, light and dust.

To mitigate potential indirect impacts from mining activities, and to understand if either species is demonstrating avoidance, the following will be completed:

- Survey along Phillips Creek riparian corridor in the areas immediately adjacent to the Project area to occur every 2 years and are to record presence of Koala and Greater glider. The monitoring effort will commence 2 years from commencement of the Project and will continue for the duration of mining as part of the Project.
- Surveys are to be conducted in accordance with the survey guidelines listed in ***Table 3-1***.

In the event no observations of Koala and Greater glider be recorded either during the survey or opportunistically within a 2-year period, survey intensity is to be increased and completed annually until species are detected. In conjunction suitably qualified subject matter experts will be consulted to assess whether results are due to the Project or other factors. At this stage reporting to DCCEEW may be required.

5.2 Water Resources

The SRM currently operates in accordance with the SRM EA EPML00862313 (***Appendix C***). The SRM EA was specifically amended in 2017 to include the area associated with the Project. To minimise potential impact on groundwater and surface water, existing mitigation measures outlined in the SRM EA conditions will continue to be implemented for the Project, including:

- Implementation of the Groundwater Monitoring and Management Plan – Conditions I2 and I3;
- Monitoring of groundwater quality to identify trends and changes over time – Condition I4;
- Fuel, dangerous good and hazardous chemical will be managed by current standards and guidelines – Condition E14;
- Participation in the FRREMP, and the implementation of a Water Management Plan (Condition F29) and Erosion and Sediment Control Plan (Condition F33); and
- Release of MAW only from specified release points and ongoing monitoring of any releases – Condition F2, F3 and F4.

The frequency at which monitoring effectiveness of water-related measures is listed in the abovementioned management plans that are also provided in ***Appendix J***, along with associated corrective actions.

The persons responsible to implement the relevant management plans listed within this section and following subsections is the Environment Team (including Site Environment and Corporate Technical Teams).

The mitigation measures are to be implemented for the duration of the Project.

In addition to these, the measures detailed in ***Sections 5.2.1***, ***5.2.2*** and ***5.2.3*** will be implemented.

5.2.1 Surface Water Measures

The identified surface water impacts as a result of the Project on existing surface water resources, flooding and values were determined to be negligible. In addition to the controls detailed in the SRM EA, based on the impact assessment the following mitigation and management measures will be required:

- To prevent ingress in a 0.1% AEP event to the mining pit during the operational phase of the Project, install flood protection levees:
  - along the southern boundary of the Project area to prevent ingress from Phillips Creek into the future pit extent; and
  - at the breakout flow path location on the existing Spring Creek diversion to prevent ingress to the existing Grevillea Pit.

  This will be required prior to mining commencing within the Project area and the structures will be maintained until alterations are required by progressive rehabilitation activities for closure.
- Continued implementation, annual review and updating, of existing water management measures to ensure maintenance of water infrastructure and water resources, and hence minimisation of potential impacts to the local and regional environment.
- Continued implementation of the existing erosion and sediment control measures to manage erosion and containment of sediments in disturbance areas, which is considered sufficient for managing erosion and sediment control for the Project without significant modification due to the negligible increase in impacts.
- Continued implementation and review of the existing FRREMP to monitor and assess any adverse impacts to surface water values as a result of authorised mining activities.

5.2.2 Groundwater Measures

Underground water rights and obligations upon ML 700021 are regulated through the Queensland *Mineral Resources Act 1989*, *Water Act 2000* and approved EA conditions.

Under the *Water Act 2000*, an UWIR is required to provide information on the potential decline in water levels in aquifers due to the passive groundwater extraction during mining within ML 700021.

The main purpose of a UWIR is to describe, make predictions about and manage the impacts of underground water extraction by the resource tenure holder.

Accordingly, an UWIR has been prepared that provides, among other things:

- an assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights.
- a water monitoring strategy – including monitoring the quantity of water taken and changes in the water level and quality of affected aquifers.

Groundwater monitoring and management measures are already in place for SRM, these measures are of an appropriate detail and scale for detecting any marked changes to groundwater due to the Project.

The purpose of the groundwater monitoring is to detect the magnitude and distribution of actual changes to groundwater resources due to existing operations at SRM and to provide early detection of any unforeseen impacts to groundwater levels or groundwater quality.

Currently, changes to water management actions from current arrangements are not deemed necessary based on groundwater impact assessment results for the Project. The implementation of the monitoring program will evolve and respond to the various stages of the Project including pre-mining, operations, and post-mining activities.

During the life of the Project, data collected will be used to review and if deemed necessary update and refine the Project groundwater model and its impact predictions, to reflect the actual activities undertaken on site (e.g. mine development) and the results of regular groundwater monitoring.

5.2.3 GDE Measures

Management measures and monitoring described throughout ***Section 5*** will aid in minimising the potential risk to GDEs associated with the Project activities. This includes monitoring of surface and groundwater and implementation of adaptive management in the event that actual impacts to surface water or groundwater levels / quality differ from predicted impacts. This will include the investigative process and corrective actions implementation. Where required, an action plan to mitigate any potential environmental changes or harm to values (including TGDEs) will be developed by an appropriately qualified person.

The GDE Impact Assessment Technical Report (refer ***Appendix H***) concluded that no significant impacts to GDEs are likely, however, in line with the precautionary principle to validate that conclusion and respond to any unforeseen outcomes, a Groundwater Dependent Ecosystem Monitoring and Management Plan (GDEMMP) will be implemented.

The GDEMMP objectives are to:

- Validate the identification and characterisation of GDEs in the Projects GDE Study Area.
- Confirm no significant impacts are likely to materialise, consistent with the outcomes of the GDE SIA (***Appendix H***).
- Identify and facilitate implementation of appropriate monitoring and management in the event adverse impacts to GDEs, as a result of the Project, are greater than those predicted.

The GDEMMP pertains to two types of GDES: terrestrial GDEs and subterranean GDEs. The GDEMMP is provided in ***Appendix J*** and includes details on mitigations measures, responsibility of implementation, and corrective actions.

6 Rehabilitation Requirements

In Queensland, mines are required to rehabilitate land disturbance caused by their activities in accordance with the EA for the site. Conditions prescribed in EAs require coal mine operators to complete progressive rehabilitation in accordance with an approved PRCP (planning part and schedule) that includes, but not limited to, rehabilitation milestone criteria and management strategies. The SRM EA issued by the Queensland DETSI, authorises the activities undertaken at the mine and conditions BMA to carry out progressive rehabilitation of disturbed land in accordance with the approved PRCP schedule P-PRCP-100734616 for this EA.

It should be noted that activities required as part of the SRM PRCP relevant to the Project area are not being considered as mitigation efforts that would reduce expected offset requirements (detailed in ***Section 8***) to compensate impacts to MNES. The provision of the information presented in the following subsections is to illustrate the progressive rehabilitation requirements to be implemented across the wider SRM, as required under the SRM EA.

6.1 Progressive Rehabilitation and Closure

The *Mineral and Energy Resources (Financial Provisioning) Act 2018* amended the *Environmental Protection Act 1994* to introduce the requirement for each EA holder to prepare a PRCP.

The PRCP requires the EA holder to plan for how and where activities will be carried out on the land in a way that maximises the progressive rehabilitation of the land to a stable condition. It consists of two (2) parts: a rehabilitation planning component, and a schedule.

The rehabilitation planning part includes site information, rehabilitation methodologies, and justification of the post mining land uses (PMLUs), non-use management areas (NUMAs) and rehabilitation timings. The PRCP schedule includes maps that identify the PMLUs and rehabilitation areas, NUMAs and improvement areas, as well as rehabilitation and management milestones, milestone criteria, schedule timings, and conditions imposed by DETSI.

BMA has prepared and submitted a transitional PRCP for the SRM which was approved by DETSI and is reflected in the most recent SRM EA (effective 28 May 2025). The PRCP includes the Project (refer ***Appendix M***).

Now approved and in place, operations at the SRM will undertake rehabilitation in accordance with the approved PRCP schedule (***Appendix L***). Like an EA, a PRCP may be amended for a site in accordance with an amendment approval process by DETSI.

6.1.1 Post Mining Land Uses

The location and extent of each PMLU are developed based on a variety of parameters including but not limited to:

- Post-mining landform
- Available topsoil quantity and quality
- Pre-mining land use and current adjacent land uses
- Existing vegetation and ecological values
- Relevant watercourses

The PRCP (described above) includes maps and schedules identifying each of the PMLUs and the schedule for progressive rehabilitation. The PMLU for the SRM is dominated by woodland habitat PMLU with other areas for cattle grazing and watercourses maintained across the landscape. The SRM will have residual voids as NUMAs, including one at the eastern extent of Grevillea Pit (covering most of the Project area).

The SRM milestone criteria for the relevant PMLUs are detailed within the approved PRCP schedule (***Appendix L***) and broadly include:

- Cattle grazing:
  - Achieve >50% vegetation groundcover
  - At least 60% of pasture dry matter yield consists of preferred, palatable and productive (3P) grasses with a minimum composition of three 3P grass species present per hectare (averaged)Appropriate management of restricted invasive plants

  - Appropriate management of surface water runoff and erosion
  - Establishment of cattle grazing pasture with land suitability class ≤3
- Woodland habitat:
  - Achieve groundcover ≥50% on slopes ≤15% or ≥80% on slopes >15%
  - BioCondition score of ≥35/60 based on the averaged benchmarks for the representative regional ecosystems
  - Appropriate management of restricted invasive plants
  - Appropriate management of surface water runoff and erosion
- Watercourse:
  - Achieve riparian vegetation index score ≥ upstream and downstream values
  - Establishment of watercourse vegetation with species richness of native trees and shrubs, tree canopy cover and recruitment
  - Appropriate management of restricted invasive plants
  - Appropriate management of surface water runoff and erosion

There are no revegetation objectives for the planned NUMAs.

Areas adjoining undisturbed Endangered or Of Concern regional ecosystems, or threatened fauna species habitat, will be rehabilitated to a woodland habitat PMLU wherever possible. This approach will connect existing habitat values for threatened fauna species, including koala, greater glider, squatter pigeon and ornamental snake, to larger areas of woodland habitat or riparian vegetation. Maintaining waterways through landscape allows for connectivity values provided by these corridors to be upheld across the landscape. Outcomes relating to threatened species are discussed in ***Section 6.3***.

6.1.2 Non-use Management Area

As outlined in Section 754 (3) of the *Environmental Protection Act 1994* and Section 6.3.2 of the PRCP Guideline '*a NUMA will be taken to be pre-approved if a land outcome, the same or substantially similar to a NUMA, is contained in a 'land outcome document*' (DESI, 2024). This was the case for SRM due to residual voids being authorised under Schedule E of the land outcome document (the EA prior to it being amended in May 2025). BMA has transitional arrangements for residual voids as pre-approved NUMAs.

The SRM NUMAs include the residual voids of Jacaranda/Bauhinia, Coolibah/Dogwood, Ebony/Grevillea and Hakea pits (see

Figure 6-1). Due to the pit progression down dip, the residual voids are located along the eastern boundary of ML 1775, ML 1782 and ML 700021 (the Project area).

The extent of the NUMAs is designed to achieve an area that is safe and structurally stable and includes: residual void high-wall and end-wall below natural ground level and the associated wall set-backs at natural ground level to achieve a factor of safety (FoS) of 1.5; the residual void low-wall from 20m below ground level and the associated wall set-backs to achieve FoS of 1.5; the residual void floor; and a safety bund and fence.

The total approved NUMA area across SRM is 1,838ha. This NUMA area has been minimised by reducing the number of ramp voids through backfilling during the mining operations, backfilling sections of the final voids at the end of mining and extending the PMLU on the low-wall into the residual void, 20m below ground level.

The NUMAs will incorporate safety features to prevent access, including:

- A safety bund and fencing constructed at the NUMA extents to prevent human and livestock access.
- Signage at regular intervals along the fence.

Specific to the Project, this safety bund will be along the eastern extent of the ML 700021 boundary.

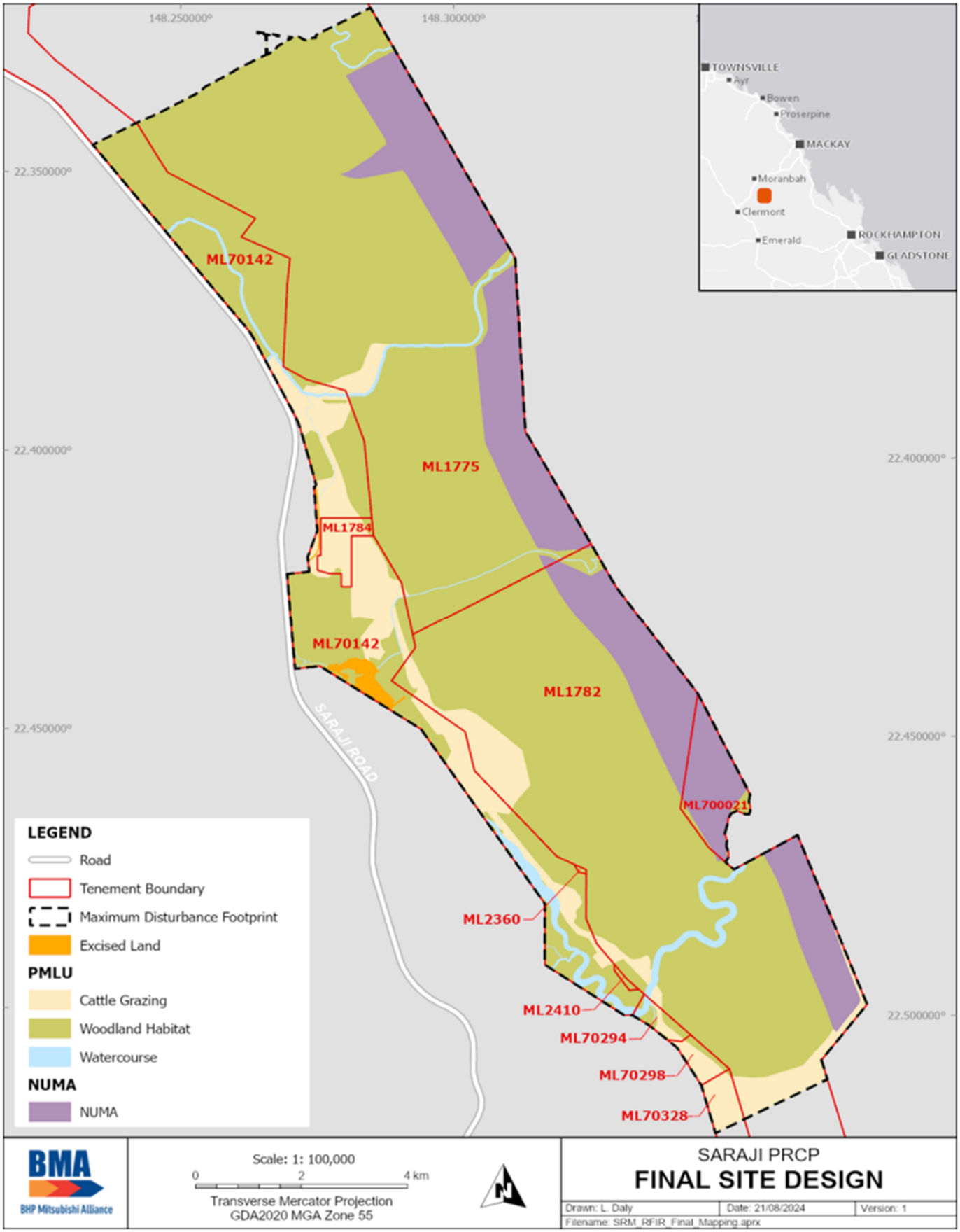


Figure 6-1: SRM PRCP Final Design

6.2 Rehabilitation Procedures and Achieving Acceptance Criteria

Appendix L provides the PRCP schedule which details the conditions that progressive rehabilitation is required to comply with. Specific milestone dates of when rehabilitation activities must be commenced and completed by are provided within the PRCP schedule.

Routine rehabilitation monitoring will continue to be implemented to identify any maintenance/corrective actions required to ensure rehabilitation areas are tracking to achieve the rehabilitation milestones. Rehabilitation monitoring data will be collected and analysed by an appropriately qualified person and assessed against the milestone criteria. The data will be analysed to identify changes and trends, as well as map the trajectory of rehabilitation to identify whether it is on track to achieve the milestone criteria or requires corrective actions or maintenance. Milestone achievement time after revegetation differs pending the type of PMLU being targeted – these are detailed in Section 8.8.1 and Section 8.8.2 of ***Appendix M***.

Maintenance will be implemented when monitoring identifies issues with the rehabilitation, or when milestone criteria are not being met. To select the most appropriate corrective actions, rehabilitation monitoring data will be analysed to identify the likely cause(s). Required maintenance/corrective actions will be entered into BMA's work management system for actioning and record management.

Corrective actions will include (where appropriate) erosion remediation (re-grading slopes, rock armouring), topsoil amendment (re-applying topsoil, addition of lime/organic matter), and revegetation improvement (re-planting/re-seeding, weed control). The timing of implementation and monitoring is in accordance with Section 8 of ***Appendix M***.

The quality assurance and quality control (QA/QC) process to be followed as part of SRM ongoing rehabilitation monitoring is illustrated in ***Figure 6-2***. Designs will be completed for each rehabilitation area prior to execution of the rehabilitation activities and earthworks, and included as part of the rehabilitation workpack, or current work process, at the time of execution. The process provides for initial execution of the rehabilitation in accordance with the rehabilitation plan/workpack developed for each area prior to execution, followed by verification of the execution against the rehabilitation plan. Based on the verification outcomes, allowance is made for implementation of corrective actions, as needed. All rehabilitated areas then undergo rehabilitation monitoring; and subsequent execution of maintenance actions identified through the monitoring and improvements to the rehabilitation methodology. This process allows for a repetitive execution-verification-corrective action-monitoring QA/QC approach, to ensure rehabilitation areas progress on a trajectory towards achievement of milestone criteria and eventual certification.

Figure 6-2: Rehabilitation monitoring quality assurance/quality control process

6.3 Potential Environmental Outcomes for Threatened Species

Rehabilitation activities will focus on delivering a safe, structurally stable land that does not cause environmental harm, and is able to sustain an agreed post-mining land use. PMLUs planned for the SRM include cattle grazing, woodland habitat and watercourse.

Given the change in landform as a result of mining, there is potentially alternative ecosystem functions and microhabitats to that currently known within the Project area to be established, hence the concept of predicting suitability for threatened species is challenging. Through assessment of the goals of the PMLUs planned, some features may be known as suitable habitat values for threatened species. ***Table 6-1*** shows potential linkages between the post-mining land use features and threatened species habitat requirements. The realisation of these features as habitat for threatened species will be dependent on a variety of factors.

Table 6-1: Summary of Potential Environmental Outcomes for Threatened Species

Post-mining land use	Features	Potential linkage with threatened species habitat requirements

Woodland habitat	• Groundcover:
	  - >15% slopes must achieve ≥80% groundcover, consisting of at least 50% vegetation groundcover[1]
	  - ≤15% slopes must achieve ≥50% groundcover, consisting of at least 50% vegetation groundcover[1].
	• BioCondition score of ≥35/60 based on the averaged benchmarks for the representative regional ecosystem
	• Proven native tree and shrub species used for seed mix
	• Recommended seed mix includes Eucalyptus, Corymbia and Acacia species
		Potential habitat values for:
		• Squatter pigeon;
		• Ornamental snake.

[1] Vegetation groundcover**:** Means plants, plant litter, tree leaf litter, twigs and woody debris that protect the soil surface from erosion.

Due to the changes in landform and biotic/abiotic factors (e.g. soil composition and nutrient) resulting from disturbance activities associated with mining activities, the effectiveness of rehabilitation efforts in providing habitat values for threatened species following closure of the SRM is difficult to determine. The milestone criteria described in ***Section 6.1.1***and revegetation plan details in ***Table 6-1*** will assist in re-instating foraging resources (e.g. native species composition, water quality) and microhabitat features (e.g., ground cover, litter cover, coarse woody debris etc.) for local fauna and flora assemblages previously impacted from the Project. These rehabilitation efforts are also likely to be beneficial to listed species impacted by the Project. Rehabilitation and revegetation associated with woodland habitat and cattle grazing areas are likely to provide potential foraging resources for native species, including the EPBC Act-listed squatter pigeon (southern subspecies). Due to the specific microhabitat requirements for some listed species, such as ornamental snake, the return of suitable breeding habitat within areas of previous disturbance (e.g. areas adjacent to the residual void) may take a longer period of time to re-establish (if at all).

Rehabilitation and landform stabilisation following closure of the SRM will also improve habitat connectivity and fauna movement opportunities within the landscape. Although key movement corridors associated with Phillips Creek (a major watercourse within the landscape which has been retained within the existing SRM lease and will be avoided by the Project) are present, existing mining activities within the adjacent areas have created potential barriers to movement within the landscape. Landform stabilisation and rehabilitation of disturbance areas to PMLUs identified within the PRCP will assist in improving permeability and reduce fauna reliance on narrow ‘bottlenecks’ associated with these retained riparian corridors.

7 Overview of Impacts to MNES

MNES present within or surrounding the Project area are limited to threatened species and water resources.

Table 7-1 summarises the significant impact assessments for each of the species identified as known, likely or with the potential to occur within the Project area, and relevant water resources. The outcome of the assessment is that the Project is likely to result in a significant impact to the Ornamental snake.

Table 7-1: MNES known, likely or potentially present within the Project area

MNES	Significant Impact	Explanation
Threatened Species and Ecological Communities		
Squatter pigeon (*Geophaps scripta scripta*)	No	Squatter pigeon is listed as vulnerable under the EPBC Act. The species was not detected during the field survey, however, potential habitat was identified within the Project area. All potential Squatter pigeon habitat within the Project area is in marginal condition, predominantly due to its degraded state which results from historical clearing practices and exotic pasture grass incursion. The Project area does not support the habitat characteristics or resources to provide areas for the species to breed or forage. The function of potential habitat is limited to dispersal only. Given that potential utilisation of the Project area by the Squatter pigeon is restricted to dispersal, and that the habitat is in a degraded state and is not suitable for breeding and foraging, occurrence of the species is likely to be in the form of a few transient individuals. Given that Squatter pigeon is a relatively mobile species and migrates across the landscape utilising a variety of habitats with ranging connectivity values, marginal habitat for dispersing is not considered to be a vital habitat component for this species. Based on these factors, potential Project impacts on the species, including habitat loss and fragmentation are considered to be low as this marginal habitat is not considered to be a vital habitat component for this species or play an important role in maintaining the species in the region. Furthermore, due to its marginal condition providing only dispersal habitat for vagrant individuals, the risk of direct impacts in the form of mortality from fauna strike is low, with low number of individuals likely to be encountered and interact from operational activities. As a result, the outcome of the assessment by Engeny (***Appendix D***) is that the Project is unlikely to result in a significant impact to the species.
Ornamental snake (*Denisonia maculata*)	Likely	Ornamental snake is listed as vulnerable under the EPBC Act. Targeted surveys (i.e., spotlighting surveys) undertaken in March 2024 to detect species presence confirmed two (2) individuals within the Project area, within areas of identified habitat. Gilgai landforms and cracking soils have been identified across the majority of the Project area, where soil consists of a dark clay-loam. Gilgai's are habitat features for Ornamental snake. The field survey identified that the frequency and depth of gilgai is variable across the Project area, with gilgai generally occurring most frequently, and at a greater depth, towards the northern parts of the Project area. This trend was also identified for soil cracks (with depth and frequency identified as greater towards the north). Due to the varying quality and availability of microhabitat features across the Project area, the habitat values for Ornamental snake within the Project area differ. As such, this assessment has identified three (3) habitat categories within the Project area: 'Preferred', 'Suitable' and 'Marginal' (Kerswell *et al.*, 2023). Areas of 'Preferred' and 'Suitable' habitat are considered to meet the definition for important habitat for Ornamental snake, which is a surrogate used to define important populations for this species. It is likely that the 'Suitable' and 'Preferred' habitat areas within the Project area function as 'sink habitat' (Sinclair *et al.*, 2005), providing foraging and possible

MNES	Significant Impact	Explanation
		breeding resources for an overflow of individuals from the core source habitat further to the north-east of the Project area, in the gilgai Brigalow regrowth habitat that extends to the Isaac River floodplain. This core habitat is also considered important habitat based on the definition in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DCCEEW, 2023), and therefore represents an important population in the area. A total of 45.56 ha of important habitat will be cleared as a result of the Project. It is considered that all potential indirect impacts present a low risk and therefore are not considered to have an impact that could reduce population size. However, the outcome of the assessment by Engeny (***Appendix D***) is that the Project is likely to result in a significant impact to the species based on the clearing of 45.56 ha of 'Suitable' and 'Preferred' habitat within the Project area.
Koala (*Phascolarctos cinereus*)	No	Koala is listed as endangered under the EPBC Act. Species presence was not detected during the field survey (i.e., no evidence was recorded of Koala individuals, scats, or scratches). However, foraging and sheltering habitat resources have been identified within the Project area. Whilst foraging and sheltering resources are considered to be present within the Project area, these habitats are fragmented and highly isolated from more preferrable habitat along Phillips Creek, where the species is known to occur and likely to utilise for breeding, foraging and dispersal. Dispersal from Phillips Creek to these potential habitat patches within the Project area is considered unlikely given that it would require traversing a distance of 247 m to 1 km through young Brigalow regrowth (approximately 4 m tall) and across light vehicle mine access tracks. This would present a high-risk movement opportunity for individuals as the height of Brigalow regrowth is not considered sufficient for predator avoidance. All potential direct impacts, including habitat loss, fauna mortality and fragmentation are considered to be low due to the presence of relatively small patches (less than 1 ha) of highly fragmented habitat within the Project area that provide very marginal value. Such habitat is considered to play a very limited role, if any, in maintaining the species and therefore the potential outcome of impacting such low valued habitat is not considered to be noteworthy. Existing movement barriers within the Project area (such as fence lines, roads, tracks, and large cleared areas devoid of woody vegetation) severely compromises the ability for the Project area to be utilised by Koala. Given the historical fragmentation of potential Koala habitat to the north and west of the Project area, the Project area is not considered to be an important movement corridor for Koalas. In fact, any steppingstone connectivity that could be provided by the Project area from Phillips Creek or the One-mile Creek diversion is likely to lead to a 'dead-end' for Koalas attempting to disperse north or west. As such, in addition to having a low-level consequence of impact on the species due to the low habitat value, the likelihood of the Project having a direct impact due to the very low utilisation rates is considered to be extremely low. Indirect Project impacts have the potential to affect Koala habitat adjacent to the Project area, particularly at Phillips Creek and along the associated riparian corridor. The level of these potential indirect impacts is expected to be of low significance due to their infrequent, temporary, and localised nature. This is additionally because numerous existing SRM procedures and protocols are in place to specifically manage indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, the likelihood of any incidents resulting in an indirect impact would be low and likely to be quickly rectified through standard inspections. As a result, the outcome of the assessment by Engeny (***Appendix D***) is that the Project is unlikely to result in a significant impact to the Koala.
Greater glider (*Petauroides volans*)	No	Greater glider is listed as Endangered under the EPBC Act. Targeted surveys, including spotlighting of Eucalypt dominated woodland, were undertaken and confirmed the presence of Greater glider within remnant vegetation south of the

MNES	Significant Impact	Explanation
		Project area, associated with Phillips Creek. The survey did not confirm the presence of the species within the Project area. No Greater glider habitat has been identified within the Project area, therefore no direct impacts to the species will occur. Potential Greater glider habitat occurs between 100m – 150m of the southern Project area boundary along Phillips Creek. Consequently, the Project has the potential to indirectly impact on this habitat, which has been evaluated as 'Preferred' habitat for the species. Most of these indirect impacts are expected to be of low significance due to their infrequent, temporary, and localised nature. The numerous existing SRM procedures and protocols that are in place will specifically manage these indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, the likelihood of any incidents resulting in an indirect impact would be low and should be quickly rectified through standard inspections. Given that indirect noise impacts are likely to occur on a more frequent and permanent basis due to the Project's 24-hour operating period, particular attention has been given to this impact by this assessment. Due to the susceptibility of the species to noise impacts, responses such as changes to foraging behaviours or habitat utilisation could be possible, but most likely temporarily as species habituate. Overall, potential noise impacts on the species are considered to be low. The outcome of the assessment by Engeny (***Appendix D***) is that the Project is unlikely to result in a significant impact to the species.
Water Resources		
Surface Water	No	Detailed studies have been undertaken in relation to water resource impacts. The assessment by Engeny (***Appendix E)*** concludes that the Project will not result in a significant impact on surface water resources because: • The Project will not result in a significant reduction in surface water quantity or a significant change in flow regimes. • The negligible impact on the hydrological characteristics of surface waters will be local and short-lived (30 years) and will not affect any third-party users. • Following closure and decommissioning (i.e. after 30 years) there will be no further impacts to the hydrological characteristics of the surrounding waterways, and they will not be substantially different to pre-mining condition. • The risk of impact on surface water quality from accidental spills and uncontrolled releases is expected to be low. • The existing SRM water management measures and controls in the SRM EA are suitable for managing any potential surface water impacts. • The effects of climate change will not materially impact the outcomes of the Project.
Groundwater	No	The detailed groundwater assessment by SLR (***Appendix F***) including quantitative modelling, concludes that the Project will not result in a significant impact on the groundwater resource because: • No anthropogenic third-party users will be affected - there are no known privately-owned supply bores within the predicted extent of Project related drawdown that will be affected by greater than 1 m alteration. • No environmental users will be significantly affected - the groundwater model has predicted a negligible reduction in water flow in Phillips Creek (i.e. <0.01 ML/day) and the Isaac River (<0.0003 ML/day) over the lifetime of the Project and there are no expected impacts on potential TGDEs as a result of groundwater drawdown (see below). • Due to the movement of groundwater towards the pit, there is a low risk of contaminants from waste rock stockpiles and leachate from mine water dams.

MNES	Significant Impact	Explanation
		• Adoption of standard practices for containment of fuels, oils and chemicals reduces the risk of changes in groundwater quality as a result of mining. • Groundwater quality will be protected through the implementation of a number of interrelated management actions and strategies set out in the SRM EA, as well as the SRM's existing groundwater monitoring and management measures.
GDEs	No	No aquatic or subterranean GDEs exist within the drawdown extent (***Appendix H***). The limited presence and extent of TGDEs combined with the anticipated minimal effects of groundwater drawdown will result in there being no impact to the functionality of TGDEs within or surrounding the Project area. Consequently, there will be no significant impacts to TGDEs as a result of changes to groundwater hydrology / quality.

7.1 Potential Unknown, Unpredictable or Irreversible Impacts

The potential environmental impacts associated with the Project are well understood following a comprehensive ecological and GDE study, groundwater and surface water modelling and impact assessments, and the nature of the Project being a continuation of an existing, operational mine. Hence, there are no direct impacts that are likely to be unknown or unpredictable. Through the implementation of mitigation measures and the SRM PRCP (outlined in ***Sections 5*** and ***6***), this will assist in identifying any unpredicted variation in the levels of potential threats to the receiving environment during the Project. No irreversible impacts have been identified as a result of the Project.

8 Offsets

Section 3.3 presents an assessment of the potential significant residual impacts of the Project on MNES. The assessment identified the Project is likely to have a significant residual impact (SRI) on:

- Ornamental snake (*Denisonia maculata)*

The impacts to the Ornamental snake trigger offset requirements under the EPBC Act Environmental Offsets Policy (Commonwealth Offsets Policy) (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2012).

To account for this, an Offset Management Plan (OMP) has been developed to guide management and monitoring within an appropriate Offset Area (refer to ***Section 8.1***). The OMP has been developed with respect to the aforementioned Commonwealth Offset Policy, and the BMA Offset Management Framework (i.e. based on the PLAN, DO, CHECK, ACT Model used within BMA Environmental Management System (EMS)).

This section summarises key material from the OMP regarding both the Offset Area and the offset delivery required to compensate for the likely significant residual impacts to ornamental snake.

The nomenclature used throughout this Chapter refers to:

- **Croydon Station** – 58,669 ha of leasehold land in association with Lot 4 on Plan KL210 (~100 km north of Marlborough) housing an operational cattle station.
- **Study Area** – An approximate 845 ha area located in Croydon Station; which has been subject to the necessary ecological assessment to determine potential offset suitability (refer *Croydon Station Offset Suitability Report* (E2M, 2023)).
- **Offset Area** – The section of 'Croydon Station' (formally Lot 4 on Plan KL210); located within the Study Area proposed to provide the necessary offset for the Project.

8.1 Offset Area Description

8.1.1 Croydon Station

The Offset Area is located within a section of the property known as Croydon Station (formally Lot 4 on Plan KL210), a 58,669 ha cattle station ~100 km north of Marlborough. It sits at the western edge of the Station among branches of the Connors River. It is located within the Isaac-Comet Downs biogeographic subregion and is bordered by the Connors Ranges to the east.

Two existing offset areas are also present within Croydon Station:

- *Third Party Offset Area* – A third party hold an existing 360.54 ha Offset Area (Category A) secured within Croydon Station
- The *Croydon Offset Area* – Approved offset site for BMA's Horse Pit Extension Project (EPBC 2021/9031) at Caval Ridge Mine.

An additional offset is planned to be established to acquit significant impact liability associated with the Peak Downs Mine (PDM) Power Line Project (EPBC 2024/09983). This offset will also occur within the Study Area and is located adjacent and to the east of the Offset Area (to which this chapter refers).

An overview of the existing and planned offset sites within Croydon Station is provided in ***Figure 8-1*** and ***Figure 8-2***:.

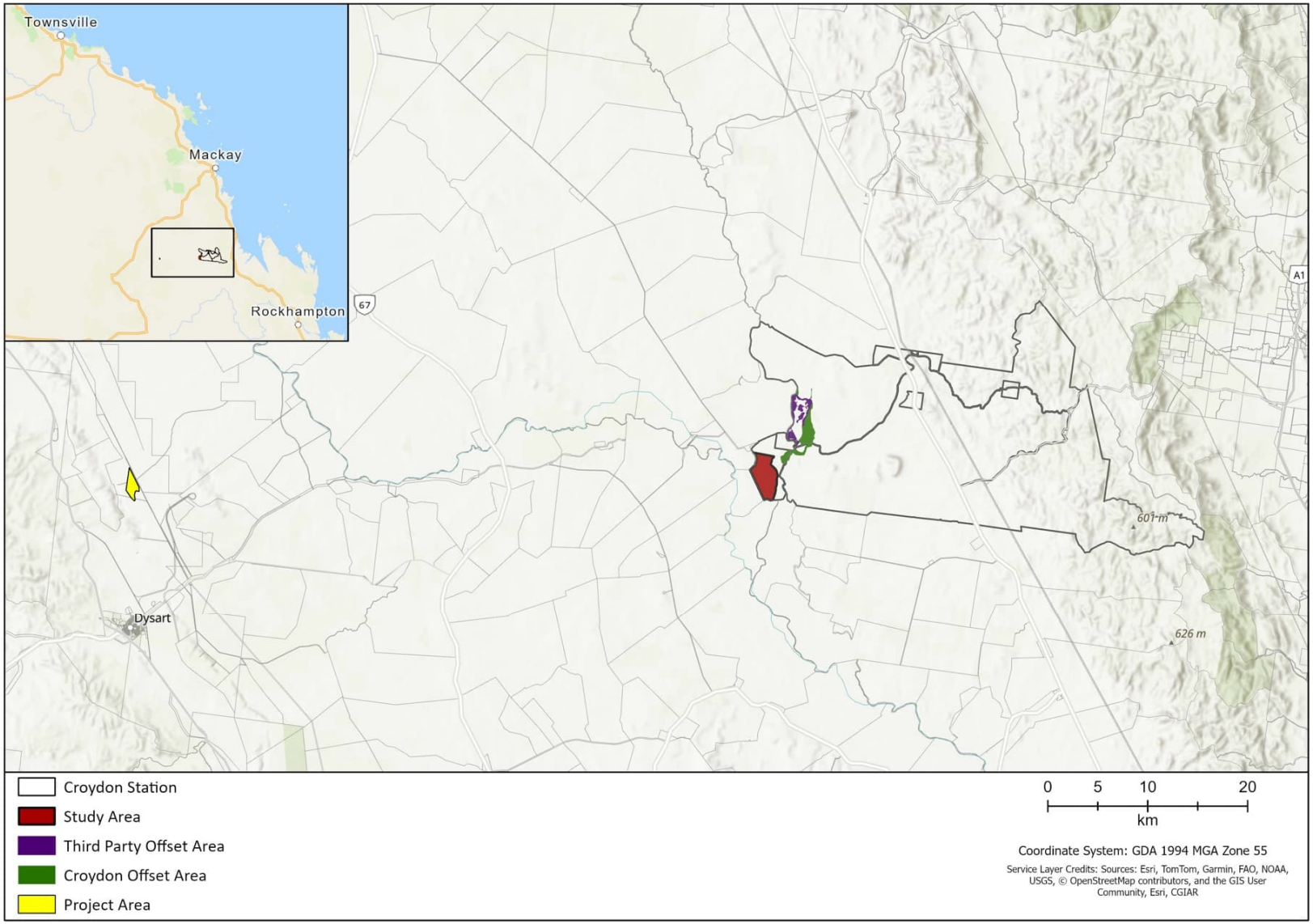


Figure 8-1: Regional context of Croydon Station

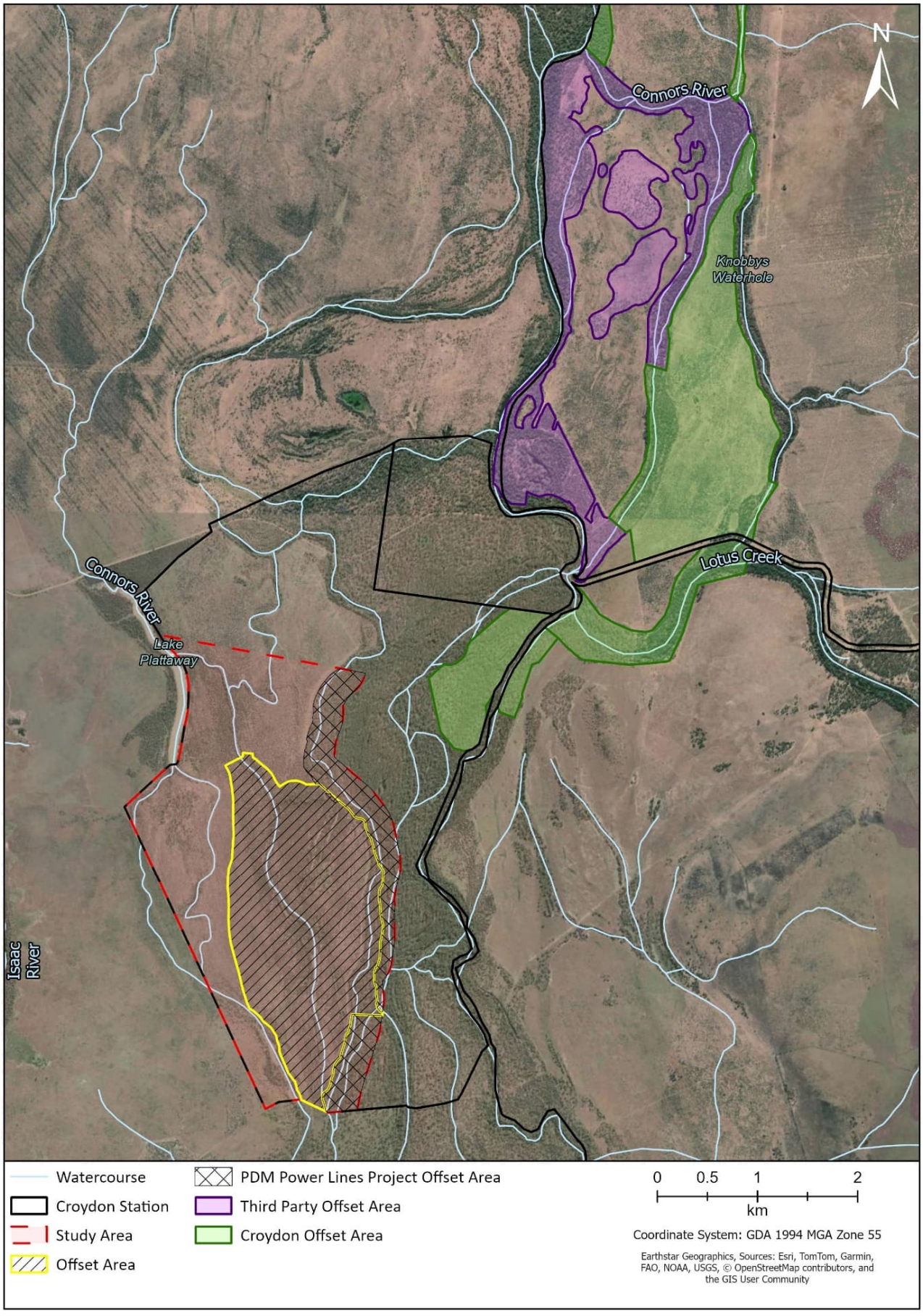


Figure 8-2: Offset Area and adjacent offset sites

8.1.2 Existing Environment

A summary of the existing environment of the Offset Area is provided below. Further information is available in the Croydon Station Offset Suitability Report (E2M, 2025).

Survey Conditions

Two field surveys were undertaken by qualified ecologists within the Study Area, encompassing the proposed Offset Area (E2M, 2025:

- Survey One was conducted from 6-10 April 2022. The area had received below-average rainfall (95.4mm vs. the average 251.7mm) from January to March of that year, with just 4mm in the two weeks before the survey. Most water sources were dry, except for parts of Connors River and its anabranches. Conditions were dry and warm (31-34°C). Due to water (and subsequently prey / frog) scarcity, survey conditions were suboptimal for detecting the ornamental snake. These drier conditions are considered unusual for the survey period (i.e. late wet season), with the timing of the survey chosen specifically to be consistent with advice from the Commonwealth Survey guidelines for Australia's threatened reptiles (DSEWPaC, 2011).
- Survey Two was conducted from 17–22 March 2025. The area had mixed rainfall prior to the survey, with heavy rain in January 2025 and lower totals in February and December. Most creeks and waterbodies held significant water. The Connors River was flowing and gilgai habitats within the Study Area were largely inundated. The temperature ranged from 27.5–31.9°C, forming favourable conditions for the detection of the ornamental snake. However, site access during Survey Two was constrained due to rainfall throughout the field assessment period. Safe vehicle access to and within the Study Area was limited, and as a result, some areas could not be surveyed. Nocturnal spotlighting was restricted to two nights due to wet weather and flooding preventing site access. When spotlighting could occur, relatively high nighttime visibility associated with moon phases was observed which is often associated with reduced fauna activity due to higher risk of predation (DCCEEW 2023). Further, due to recent rainfall, ground cover in non-remnant areas was high, thus further reducing likelihood of ornamental snake detection during spotlighting surveys. Notably, prey abundance was limited; however, a variety of suitable prey species were observed including the striped burrowing frog (*Cyclorana alboguttata*), Australian green treefrog (*Litoria caerulea*), *Limnodynastes* spp. and *Litoria* spp.

Vegetation Communities

The land within Offset Area has been primarily used for cattle grazing. The vegetation condition reflects this, with historically cleared area and remnant vegetation largely restricted to riparian corridors. Review of available aerial photography indicates vegetation was first cleared during the late 1960s or early 1970s and has been periodically re-cleared to manage regrowth (Department of Resources (DoR), 2024).

Surveys have identified six REs of varying condition (E2M 2025). These REs, and their extent within the Offset Area, are described in ***Table 8-1*** and presented in ***Figure 8-3***:.

Table 8-1: Regional Ecosystems in the Study Area

RE	Description	Condition	Study Area (ha)	Offset Area (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Remnant	1.95	Nil
		High Value Regrowth (HVR)	38.55	Nil
		Non-remnant	551.55	304.2
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	Remnant	149.41	55.8
11.3.4	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains	Remnant	28.89	8.3
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Remnant	26.21	Nil
11.3.27b	Freshwater wetlands - Vegetation ranges from open water +/- aquatics and emergents. Often with fringing	Remnant	27.54	9.6

RE	Description	Condition	Study Area (ha)	Offset Area (ha)
	woodland, commonly *Eucalyptus camaldulensis* or *E. coolabah*			
11.8.4	*Eucalyptus melanophloia* woodland to open woodland on Cainozoic igneous rocks.	HVR	10.99	Nil
		Non-remnant	9.93	Nil

8.2 Offset Area Suitability

The Commonwealth Offsets Policy requires that offsets must deliver an overall conservation gain which compensates for the SRIs associated with the Project. The Commonwealth Offset Policy is accompanied by the Offsets Assessment Guide (OAG), a practical tool that uses a balance sheet approach to compare impacts to offsets for threatened species and ecological communities. Conservation gain is typically measured as a quantifiable improvement in the quality of an area of habitat (i.e. Offset Area) relative to a baseline, and to that of the habitat impacted within the Project Area. Habitat quality has been quantified within the Project and Offset Areas using the Queensland Guide to Determining Terrestrial Habitat Quality (Habitat Quality Guide) (DES, 2020).

The availability and extent of MNES values at the proposed offset site has been interrogated within the Croydon Station Offset Suitability Report (E2M, 2025).

A total 768ha of ornamental snake habitat is available in the Study Area, within which, 100% of the offset obligation may be delivered. As per the OAG, a quantity of 356ha has been established as the necessary extent of habitat needed to acquit the offset obligations of the Project and counterbalance the 45.56ha of ornamental snake habitat impacted within the Project Area. The area of ornamental snake habitat impacted has a baseline habitat quality score of 6 as determined using the Habitat Quality Guide (DES, 2020). The baseline habitat quality score of the Offset Area is also 6. ***Table 8-2*** below summarises these values.

Table 8-2: Study Area suitability - habitat extent and quality

MNES	Project Area			Study Area	
	SRI (ha)	Habitat required for offset (ha) – per the OAG	Habitat Quality Score	Habitat available (ha)	Baseline Habitat Quality Score
Ornamental snake	45.56	356	6	768[1]	6

[1] Rounded to whole number as per Commonwealth Offset Assessment Guide calculator format

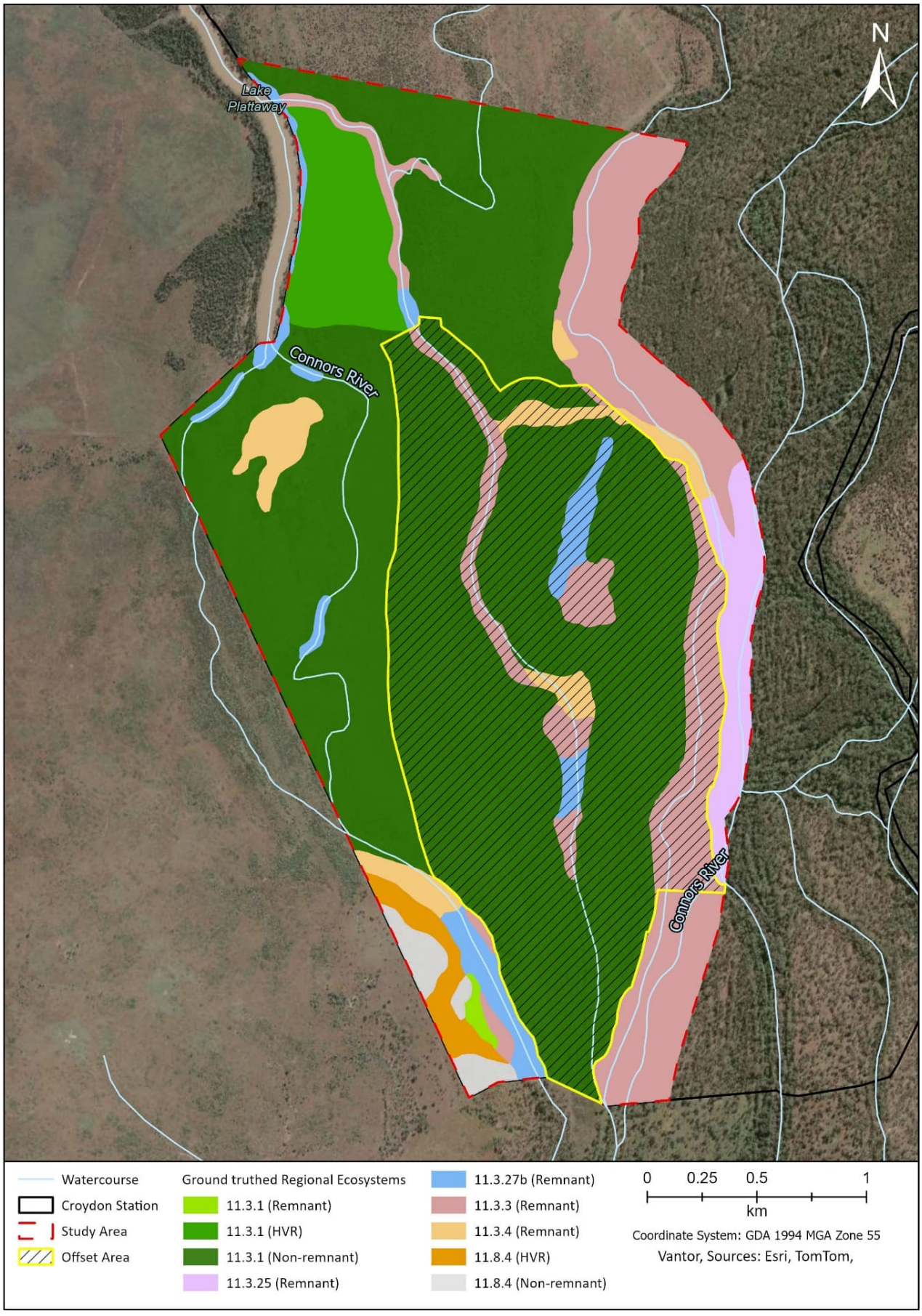


Figure 8-3: Ground truthed Regional Ecosystems within the Study Area

8.2.1 Species presence and habitat

Within the Study Area, ornamental snake habitat has been extensively mapped, in accordance with the Central Queensland Threatened Species Habitat Descriptions (Version 5) (Kerswell et al., 2023). This is described in ***Table 8-3*** and present in ***Figure 8-4***. The total habitat area considered viable for offsetting is the sum of 'preferred' and 'suitable' habitat types (752.02ha).

Table 8-3: Ornamental snake habitat in the Offset Area

Habitat type	Extent (ha)	Description
Preferred	Study Area – 149.40 Offset Area – 55.8	Associated with remnant RE 11.3.3 located along ephemeral watercourses. These areas provide moderate abundance of deep soil cracks, coarse woody debris and litter. Areas containing deep, undulating depressions are also likely to provide breeding opportunities for native frogs (i.e., prey). Additional areas of preferred habitat are considered likely to occur to the east of the Study Area in association with remnant communities of the adjacent floodplains.
Suitable	Study Area – 602.62 Offset Area – 304.2	Associated with non-remnant areas and patches of remnant and HVR RE 11.3.1 located within 1km of preferred habitat. These areas are considered suitable habitat due to reduced abundance of deep soil cracks and gilgai formations. Additionally, historical clearing and burning of areas containing 11.3.1 has substantially reduced the amount of coarse woody debris available for shelter. While lacking suitable shelter and breeding habitat, these areas may provide foraging opportunities for the species during wet periods.
Marginal[7]	Study Area – 15.64 Offset Area – 0.0	Associated with non-remnant RE 11.3.1 located >1km from preferred habitat. These areas also contained lower abundance of deep soil cracks and gilgai. Historical clearing and burning have also substantially reduced the amount of coarse woody debris available for shelter. There is potential for these areas to qualify as suitable habitat depending on the proximity to preferred habitat outside of the Study Area (i.e. to the west).

Within the selected Offset Area, 55.8ha of 'preferred' habitat and 304.2ha of 'suitable' habitat is present (359.9ha of ornamental snake habitat total). Unsuitable habitat mapped across the Offset Area does not contribute to the proposed offset.

The extent of 'preferred' and 'suitable' habitat available provides sufficient capacity to undertake management actions (i.e. to improve habitat quality) for the species (refer ***Section 8.2.2***).

Targeted surveys, consistent with advice from the Commonwealth Survey guidelines for Australia's threatened reptiles (DSEWPaC, 2011) have been completed within the Study Area; however, the species has not been recorded. However, it is considered likely that the species would utilise habitat in the Study Area due to the following:

- Considerable extent of preferred habitat availability (~56 ha), which encompasses essential microhabitats, including an abundance of deep soil cracks within / among gilgai.
- Presence of a variety of key prey (i.e. frog) species.
- Previous species observation in nearby habitat (~5.7 km northeast of the Study Area – including observation during 2016 surveys – refer E2M (2025). Satellite imagery and Queensland RE mapping indicates that high value habitat for ornamental snake also provides connectivity between the proposed Offset Area, neighbouring offset sites (***Figure 8-1***) and prior species record locations (***Figure 8-4***).
- Reduced probability of detection as a result of the species' cryptic nature, suboptimal survey conditions during Survey One, and limitations on nocturnal survey effort during Survey Two.

To confirm the species' presence, targeted ornamental snake surveys will be undertaken as part of ongoing monitoring. The OMP notes species observation in the Offset Area as a KPI. Further, the presence of the species within the Offset Area should be maintained over the lifespan of the offset. The requirement of presence is explicitly stated in completion criteria of the OMP.

[7] Unsuitable habitat located within the Offset Area boundary does not contribute to proposed offset.

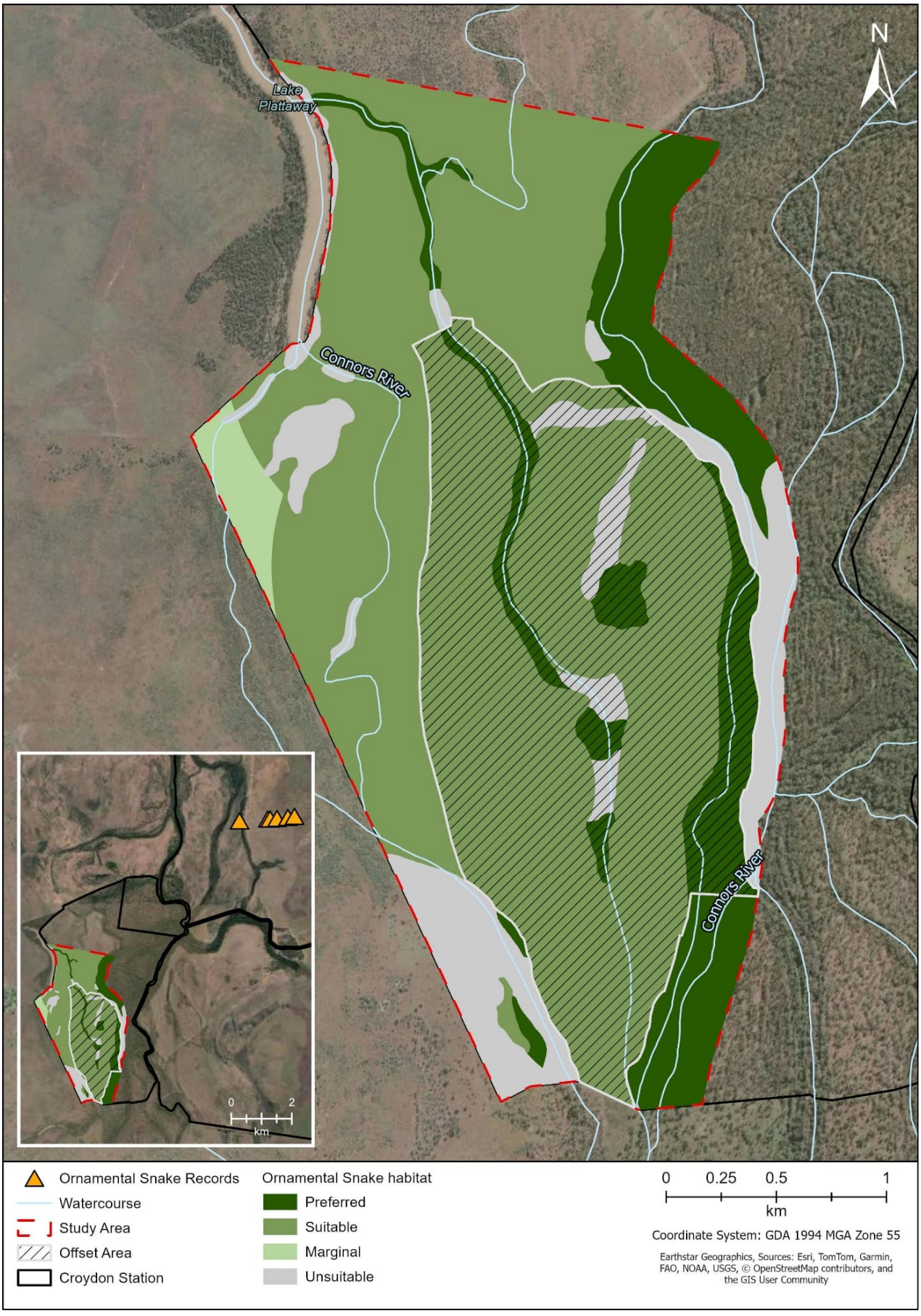


Figure 8-4: Ornamental snake habitat within Offset Investigation Area

8.2.2 Achieving a conservation gain

As per the Commonwealth Offsets Policy (DSEWPaC, 2012), a conservation gain is the benefit that a direct offset delivers to a protected matter, which maintains or increases its viability, or reduces any threats of damage, destruction, or extinction. A conservation gain may be achieved by:

- Improving existing habitat for the protected matter;
- Creating new habitat for the protected matter;
- Reducing threats to the protected matter; and
- Averting the loss of a protected matters or its habitat that is under threat.

The Offset Area seeks to achieve a conservation gain for Ornamental snake via the following objectives:

- The protection and improvement of Ornamental snake habitat within the Offset Area to a level at which:
  - the habitat over time provides greater conservation value than its current form; and
  - the habitat over time provides at least that same conservation value as the current impact site.
- The management and reduction of threats to ornamental snake within available habitat.
- The improvement of the condition and extent of regrowth vegetation providing / increasing connectivity values.

The OMP identifies specific management actions that will, collectively, enable the above objective/s. The management actions have been designed to:

- Restore degraded areas so that they provide greater habitat value for Ornamental snake.
- Reduce / remove key threats across the entire Offset Area.
- Focus management efforts on the components of habitat quality where there is the most opportunity for improvement for the impacted species.

These actions fall under five key categories:

1. Securing the Offset Area.
2. Habitat improvement
   i. Natural regeneration of habitat
3. Land use management
   i. Controlled livestock grazing
   ii. Vegetation clearing restrictions
4. Weed and pest management
   i. Control and monitoring of weeds
   ii. Control/reduction of feral pigs and other pests
5. Other management
   i. Fire management
   ii. Infrastructure maintenance

Specific management actions have been developed to facilitate the management objectives. Actions are consistent with the component requirements of the BMA Offset Management Framework (refer Section 4.1 of the OMP in ***Appendix I***) and have been drafted to meet the S.M.A.R.T. principle.

The management actions have been developed with respect to relevant management objectives and priorities identified in the Approved Conservation Advice for Denisonia maculata (ornamental snake) (DoE, 2014), and relevant Threat Abatement Plans (TAPs). ***Table 8-4*** provides an overview of conservation priorities / objectives and how the offset meets or supports these actions.

Full details on management actions are available in Section 4 of the OMP (***Appendix I***).

Table 8-4: Offset alignment with published conservation priorities

Theme	Objective or priority	How the OMP aligns to these objective or priorities
Approved Conservation Advice for *Denisonia maculata* (Ornamental snake) (2014)		
Habitat loss, disturbance and modification	Identify populations of high conservation priority.	Baseline surveys failed to record the species as present within the Offset Area (E2M, 2025); however, survey records from 2016 did note the species' presence approximately 5.7 km to the northeast, proximal to the *Croydon Offset Area.* Targeted species surveys will be conducted annually for the first five years of the offset, then once every five years until completion. Considering the Vulnerable status of the species, and its restricted distribution in Australia, all observations of the species assist in identifying 'populations of high conservation priority'.
	Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate inclusion in reserve tenure if possible.	The proposed Offset Area will be legally secured via Voluntary Declaration under the provisions of the Queensland *Vegetation Management Act 1999* in the short-term, pursuing a nature covenant under the *Land Act 1994* for long-term conservation security. Together with other BMA assets in Croydon Station (e.g., *Croydon Offset Area*), Ornamental snake habitat is likely to be under formal management arrangements, preventing habitat loss and disturbance in those areas.
	Minimise adverse impacts from land use at known sites.	Cattle grazing is currently ongoing within the Offset Area. A grazing regime will be implemented that is low-intensity and restricted to the dry season only, provided that native perennial grass cover benchmarks are achieved/maintained in grazed areas. Changes to livestock densities will be considered following significant rainfall events to minimise compaction and disturbance of soil cracks.
Animal impacts	Control introduced pests such as pigs to manage threats at known sites.	Numbers and location of pest animals present within the Offset Area will be recorded during quarterly inspections. Pest control will be in accordance with the Queensland *Biosecurity Act 2014* and through the development of property based feral animal management. Annual baiting within Croydon Station will continue for the duration of the offset. Baiting employs the use of recommended toxins from the Qld Government (i.e. Sodium fluoroacetate (1080)) and is adherent to methods described by the State. If an annual increase in pig activity is noted during routine monitoring, an annual aerial shooting program is to be instigated until the increased activity has ceased.
	Develop and implement a management plan for the control of Cane Toads in the region.	Not directly applicable to the Offset Area or proponent.
Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (2017)		
Animal impacts	Prioritise key species, ecological communities, ecosystems and locations across Australia for strategic feral pig management.	The destruction and degradation of wetland habitat by Feral pigs (*Sus scrofa*) impacts the availability of habitat for the ornamental and its prey (i.e. native frogs) – this is recognised within the species' approved conservation advice. The integration of management triggers (for ornamental snake) into ongoing feral pig management across Croydon Station assists in the maintenance of a regional approach to the transient species. Management actions adopted under the OMP are consistent with those recommended / used across the State.
	Encourage the integration of Feral pig management into land management activities at regional, state and territory, and national levels.	
	Encourage further scientific research into Feral pig impacts	Not directly applicable to the Offset Area or proponent.

Theme	Objective or priority	How the OMP aligns to these objective or priorities
	on nationally threatened species and ecological communities, and feral pig ecology and control.	
	Record and monitor feral pig control programs, so their effectiveness can be evaluated.	Numbers, location and impacts of Feral pigs present within the Offset Area will be recorded during inspections including: • Gilgai assessment (in concert with habitat quality assessment) • Relative abundance of feral pigs during quarterly inspections and comparison with previous monitoring periods Review of monitoring data against KPIs (refer ***Appendix I***) will allow for necessary evaluation of management, and adaption where needed. This information will be made available to DCCEEW on request.
	Build capacity for Feral pig management and raise feral pig awareness amongst landholders and land managers.	The landholder (and / or suitably qualified person) will be responsible for the implementation and monitoring of feral pig management within the Offset Area. Review of monitoring data against KPIs (refer ***Appendix I***) will allow for necessary evaluation of management, and adaption where needed. Potential for the implementation of an integration control strategy with the adjacent existing offset sites (e.g. *Croydon Offset Area*) and Croydon Station landholder at a future date.
Stakeholder engagement	Improve public awareness about Feral pigs and the environmental damage and problems they cause, and the need for the feral pig control.	Not directly applicable to the Offset Area or proponent.
Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (2011)		
Animal impacts	Identify priority native species and ecological communities at risk from the impact of cane toads.	Ingestion and poisoning from cane toads has been identified as a threat to the Ornamental snake (DoE, 2014). The effective control of Cane toads in Australia is problematic with limited effective broadscale methods currently available (DEWHA, 2010). Numbers and location of pest animals present within the Offset Area will be recorded during quarterly inspections. This information will be made available to DCCEEW on request.
	Reduce the impact on populations of native species and ecological communities.	
Stakeholder engagement	Communicate information about cane toads, their impacts and the TAP.	Not directly applicable to the Offset Area or proponent.

8.2.3 Risk of Loss

Associated risk of loss (ROL) has been determined as 0% both for 'with' and 'without' offset, (supported by a 95% confidence in the results) (refer OMP in ***Appendix I***).

Associated risk of loss with and without the offset has been determined in accordance with Guidance for deriving 'Risk of Loss' estimates when evaluating biodiversity offset proposals under the EPBC Act (the Guidance) (Maseyk et al., 2017). ROL has been calculated as 0%, based on (a) the presence of Ornamental snake habitat (b) credible evidence of development in the foreseeable future and (c) that such development would trigger an offset requirement under the EPBC Act (refer to Maseyk et al., 2017).

8.3 Offset Delivery

The offset for Ornamental snake will be implemented via the successful delivery of the OMP (refer ***Appendix I***).

8.3.1 Timeframes and legal security

BMA anticipates that implementation of the OMP will be a condition of the Project's EPBC Act approval.

The Offset Area will be legally as a Category A area via a Voluntary Declaration under the provisions of the Qld *Vegetation Management Act 1999*, as well as via covenant pursuant to the *Land Act 1994* for long-term securement, following approval of the Project and the OMP. The offset shall be in place per the conditioned period of approval, ensuring completion criteria of the offset are satisfied (refer to Appendix B of the OMP in ***Appendix I***).

8.3.2 Offset Management Plan

The OMP has been developed to guide management and monitoring of the Ornamental snake within the Offset Area. Its objective is to deliver an overall conservation gain which compensates for the significant residual impacts to Ornamental snake associated with the Project.

The OMP provides:

- A description of the Offset Area, including location, size, condition, environmental values present and surrounding land uses.
- Details of how the Offset Area will provide connectivity with other habitats and biodiversity corridors and/or will contribute to a larger strategic offset for the relevant listed threatened species and communities.
- Maps to clearly define the location and boundaries of the Offset Area.
- Specific offset completion criteria derived from the Habitat Quality Guide (DES, 2020) to demonstrate the improvement in the quality of habitat in the Offset Area over a 20-year period.
- Details of the management actions, and timeframes for implementation, to be carried out to meet the offset completion criteria.
- Interim milestones that set targets at 5-yearly intervals for progress towards achieving the offset completion criteria.
- Details of the nature, timing and frequency of monitoring to inform progress against achieving the 5-yearly interim milestones (noting that the frequency of monitoring must be sufficient to track progress towards each set of milestones, and sufficient to determine whether the Offset Area is likely to achieve those milestones in adequate time to implement any / all necessary corrective actions).
- Proposed timing for the submission of monitoring reports which provide evidence demonstrating whether the interim milestones have been achieved.
- Timing for the implementation of corrective actions if monitoring activities indicate the interim milestones will not be / have not been achieved.
- Risk assessment and a risk management and mitigation strategy for all risks to the successful implementation of the OMP and timely achievement of the offset completion criteria.
- Evidence of how the management actions and corrective actions take into account relevant approved Conservation Advices and are consistent with relevant TAPs.
- Details of the legal mechanism for legally securing the proposed Offset Area, such that legal security remains in force over the Offset Area for at least 20 years to provide enduring protection for the Offset Area against development incompatible with conservation.

8.3.3 Offset Monitoring

As is described in the OMP (***Appendix I***), monitoring will be required for the duration of the offset to measure the success of the management actions implemented under the OMP. Monitoring will provide a record of progress towards offset completion criteria and a mechanism for review of the OMP and development of alternative management (corrective) action/s where performance targets are not being met.

Offset monitoring activities will comprise the following:

- Baseline assessments, including:

  - Targeted species presence – Ornamental snake surveys to determine current presence and relative abundance.
  - Biocondition assessments to determine habitat quality at Year 0.
  - Weed and pest survey.
- Ongoing monitoring, comprising:
  - Targeted ornamental snake presence and relative abundance monitoring.
  - Habitat quality monitoring for assessment of progress toward completion criteria.
  - Feral pig presence monitoring.
  - Weed presence and distribution monitoring.
  - Livestock impact monitoring (via native perennial grass cover indicators).
  - Infrastructure maintenance inspections.

Monitoring will be carried out over the duration of the offset to ensure that offset completion criteria is achieved and maintained (should criteria be attained ahead of time). Refer to Section 6 of the OMP at ***Appendix I*** for further details on monitoring.

8.3.4 Reporting

BMA will prepare a report on the implementation of the OMP at Year 1, Year 2 and Year 5, and then every five years for the remaining offset lifespan (i.e. for a minimum of 20 years). Compliance reports submitted to DCCEEW by BMA will detail progress towards KPIs, performance targets and completion criteria. Reports will be made publicly available where required.

9 Ecologically Sustainable Development

This section outlines the Project's compatibility with the principles defined in Section 3A of the EPBC Act. An outline of the Project against the Ecologically Sustainable Development (ESD) requirements of Section 3A of the EPBC Act is provided in ***Table 9-1***.

Table 9-1: Project Compatibility with Section 3A of the EPBC Act

Section 3A, EPBC Act	Project Compatibility
The following principles are principles of ecologically sustainable development:	BMA is committed to the principles of sustainable development, including the wellbeing of its employees and communities. BMA is also committed to developing, implementing and maintaining management systems for health, safety, environment and the community that are consistent with best practices. This commitment is given practical effect by BMA's Environmental Management System (EMS) which is aligned to ISO14001, and the procedures and operational protocols through which these systems are applied at a site level. Through these systems, BMA seeks to achieve its stated company goal of "zero harm to people and the environment".
a) Decision making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	The Project will provide immediate and long-term benefits to the economic and social fabric of Queensland and in particular the Isaac Regional Council. The Project will contribute to the local, state and Commonwealth economies, including economic growth through sustained employment at the local and regional levels (primarily through local employment and business opportunities). In addition, the Project will provide sustained employment and wealth for the region. Issues of community interest and concern will be addressed through BMA's ongoing engagement with key stakeholders throughout the life of the Project as an extension of its existing key stakeholder program. The management of the Project will align with the current approach of the SRM and the BMA EMS. The Project will achieve an ongoing minimisation of the activity's environmental harm through the existing environmental management plans, monitoring programs and emissions control measures in place at the SRM. In addition, BMA is committed to providing a safe, inclusive and diverse workplace.
(b) If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be *used as a reason for postponing measures to prevent environmental degradation.*	The 'precautionary principle' is defined in Section 391 (2) of the EPBC Act, that being: *The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.* To address this principle, BMA has undertaken an assessment of the risk of unacceptable environmental harm consistent with the precautionary principle. These findings have been incorporated into the development of appropriate environmental control strategies/mitigation strategies which have been assessed by third-party peer reviewers. These strategies are outlined in ***Section 5***. Further, BMA has the technical and financial support and resources to establish and maintain the proposed environmental protection controls/mitigation measures proposed for the Project. The National Strategy for Ecologically Sustainable Development (Australian Government, 1992) defines ESD as: *using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.* To address this principle, the Project has been designed to retain, where practicable, areas of ecological value and to minimise impacts on environmental values. Biodiversity offsets will also be provided for the Project where significant impacts are identified and are unable to be avoided (refer to ***Appendix I***). The Project footprint has also been minimised through the use of existing SRM and regional infrastructure in an effort to conserve community resources and maintain ecological processes.

Section 3A, EPBC Act	Project Compatibility
c) The principle of inter-generational equity – that the present generation should ensure that the heath, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Project addresses the welfare of future generations while realising economic benefits. The welfare of future generations has been considered through minimising disturbance, building beneficial infrastructure and planning a post-mining landform. The Project aims to preserve, where possible, the ecological value areas and has designed the Project footprint to minimise impacts as reasonably practicable. The use of existing infrastructure will improve the overall project efficiency and resource utilisation. Building intergenerational equity requires that the Project consider the long-term use of the land and community impacts. The Project seeks to safeguard the welfare of future generations and achieve intergenerational equity by achieving a post-mining landform consistent with the former landscape recognising that mining has been undertaken in and around Dysart since the early 1970's, when the town was established to support the SRM. This will be achieved through project design, operational management (including sound rehabilitation techniques), and environmental monitoring and reporting. The coarse rejects and tailings from the CHPP will be disposed of as per ongoing operations at the SRM. This is designed to minimise erosion and is in line with proposed progressive rehabilitation techniques. BMA may also seek progressive "sign-off" on successfully rehabilitated landforms once they have met the requirements of the final land use success criteria. A PRCP for the SRM incorporating the Project has been approved by DETSI. Water management practices within the Project area will ensure that water quality in Spring and Phillips Creeks is not adversely affected by the Project. The Project has been designed to avoid direct impacts on MNES, in particular, the comparatively higher ecological values of Phillips Creek and the associated riparian corridor have been avoided and a setback of between 100m – 150m has also been provided between the Project area boundary and the watercourse and vegetation. This has ensured that no direct impacts on water resources or ecological values associated with Phillips Creek will occur due to the Project. Biodiversity offsets for Ornamental snake will be provided as a counterbalance for the unavoidable significant impacts upon these species as a result of the Project (refer to ***Appendix I***). The use of existing SRM and regional infrastructure improves the overall Project efficiency and resource utilisation and minimises the Project footprint. In summary, through the continued use of sound management practices (currently implemented) and monitoring of the impacts of the Project on the local environment, the Project will not significantly reduce, or fail to maintain, the health, diversity and productivity of the regional environment or affect future generations.
d) The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making	Key decisions for the Project support the protection of biological diversity. Specifically, limiting the overall footprint of the Project (to the extent that is reasonable and practicable) by utilising existing infrastructure to avoid further clearing has protected ecological processes. The comparatively higher ecological values of Phillips Creek and the associated riparian corridor have been avoided and a setback of 100m – 150m has also been provided between the Project area boundary and the watercourse and vegetation. This has ensured that no direct impacts on water resources or ecological values associated with Phillips Creek will occur as a result of the Project. The approved SRM PRCP incorporates progressive rehabilitation of disturbed areas to minimise environmental harm. The rehabilitation strategy will allow BMA to proactively measure the success of the rehabilitation in line with the PRCP. In addition, the Project area has historically been subject to habitat degradation caused by agricultural activities, erosion and mining operations. Very little vegetation remains in the Project area. The vegetation that does exist is largely regrowth brigalow and eucalypt woodland communities. Much of the regrowth brigalow community occurs on soils with a heavy clay content and has a capacity to hold water creating local depressions. A desktop assessment and a five-day field survey targeting threatened/protected wildlife and wildlife habitat, regulated vegetation, ecosystem function and other MNES and MSES was conducted to supplement this EPBC Act Approval. Several ecological assessments and surveys targeting the Project area have also been completed between the years of 2007 and 2021, with these assessments summarised above in ***Section 3.2***. Despite the Project area being highly modified, it was found to support a diversity of wildlife, habitat features and vegetation communities.

Section 3A, EPBC Act	Project Compatibility
	The following conservation-significant ecological values were recorded within the Project area during the 2024 field survey effort: • Two (2) Ornamental snake observations • Habitat for threatened fauna species: - Squatter pigeon - Koala In addition, Greater glider (listed as endangered under the EPBC Act) was recorded outside (to the south) of the Project area within remnant vegetation associated with Phillips Creek. As mentioned above, direct impacts to Phillips Creek have been avoided via Project design. Management and mitigation measures will be implemented during the life of the Project as a demonstration of sound environmental practice. The measures to be implemented are captured in ***Section 5***.
e) Improved valuation, pricing and incentive mechanisms should be promoted	The Project will be managed in accordance with relevant Queensland and Commonwealth Government policies and standards.

9.1 Consistency of the Project with international conventions and species recovery plans

The proposed action will not be inconsistent with Australia's obligations under:

The Biodiversity Convention

- Under this convention, Australia is required to have a national biodiversity strategy and action plan – the current version is 'Australia's Strategy for Nature 2024-2030' (the Strategy). The Strategy is the overarching framework for all national, state and territory and local strategies, legislation, policies and actions that target nature.
- While there are several targets committed to within the Strategy, the below targets within the Strategy are most relevant to the Project:
  - Protect and conserve 30% of Australia's landmass and 30% of Australia's marine areas by 2030 (Goal 2).
  - No new extinctions (Goal 2).
  - Eradicate or control invasive species in priority landscapes and further minimise their introduction by 2030 (Goal 2).

  The above targets are not directly relevant to the scale of the Project. However, through the implementation of avoid, mitigate and management measures the Project's impact to the environment are not inconsistent with the Strategy. BMA will secure land-based offsets for impacts to MNES as part of this Project, aligning with the target to protect and conserve Australian land. Weed and Feral Animal Management Procedure will be implemented at the Project area and the land-based offset, aligning with the target to eradicate or control invasive species.
- Given the above and that the Project will be regulated by the EPBC Act and will operate under an EA under the Queensland *Environmental Protection Act 1994*, the Project will not be inconsistent with any of the goals or targets of 'Australia's Strategy for Nature 2024-2030'.

The Convention on Conservation of Nature in the South Pacific (Apia Convention)

- This conservation obliges member States to create and maintain protected areas to safeguard representative samples of ecosystems and places of scenic, geological, aesthetic, historical, cultural, or scientific importance. The main objective of the Convention is to commit the Parties to take action for the conservation, utilisation, and development of the natural resources of the South Pacific region. The commitments of Parties' to meet the objective are:

  - undertake to create protected areas to safeguard representative samples of natural ecosystems, superlative scenery, striking geological formations and regions and objects of aesthetic, historic, cultural or scientific value;
  - commit to not alter national parks so as to reduce their area except after the fullest investigation; their resources are not to be subject to commercial exploitation; hunting and collection of species are to be prohibited and provision is to be made for visitors;
  - agree to maintain lists of indigenous fauna and flora in danger of extinction and to give such species as complete protection as possible; and
  - provision may be made as appropriate for customary use of areas and species in accordance with traditional cultural practices.

  It is noted that many of these commitments have been superseded by the Parties' commitments under the Biodiversity Convention. The Project therefore is not inconsistent with the Apia Convention, as demonstrated under the Biodiversity Convention heading above.

- Given that the Project will be regulated by the EPBC Act and will operate under an EA under the Queensland *Environmental Protection Act 1994*, the Project will not be inconsistent with any of the commitments under the APIA convention.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES agreement) was entered into force in 1975. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species.
- No CITES listed species occur within or near the Project, nor does the Project require any international trade in wildlife. The Project is therefore not inconsistent with the CITES agreement.

A recovery plan or threat abatement plan

- The Terrestrial Ecology Survey and Impact Assessment Report has assessed whether the Project will be inconsistent with the recovery plans for the targeted MNES species (see Section 7 of ***Appendix D***). The assessment has revealed that the Project will not interfere with the recovery of, or enhance threatening processes to, Koala, Squatter pigeon, Ornamental snake or Greater glider.

10 Economic and Social Matters

10.1 Economic and Social Impacts

BMA's operations provide significant benefits to the local communities in which it operates, the broader Central Queensland region and to the Queensland economy as a whole. BMA is the largest employer in the Central Queensland region and plays a key role in its economic development. The substantial economic contribution BMA made in FY 2024 is demonstrated by the following:

- A$1.6bn spent with more than 900 local businesses, with over $80M spent with more than 50 Indigenous businesses.
- A$11.8M voluntarily invested in education and training, Indigenous, environmental, economic development, and health and wellbeing projects in Queensland.
- A$4.3bn in state royalties and other payments to the governments.

In addition, BMA employs approximately 9,500 people directly (including contractors) in Central Queensland.

The SRM represents about 19% of BMA's operations measured on a saleable coal basis. The Project, if approved, will prolong the life of the SRM and play an important role in extending the positive economic benefits outlined above.

The Project will make a considerable positive economic impact in terms of the ongoing challenge involved in delivering supplies to meet growing world demand for metallurgical coal. Forecasting organisations such as Wood MacKenzie (2021) expect considerable growth in Australian seaborne metallurgical exports in coming decades. Analysis by Wood MacKenzie in 2021 led the organisation to conclude that "We expect Australian seaborne metallurgical exports to grow from 170 Mt in 2021 to 271 Mt by 2050. The 52% growth in total trade is substantial and is principally attributable to India's persistent expansion through the period". Given the characteristics of Australian metallurgical coal reserves including those associated with the SRM, Wood MacKenzie (2021) expects "the country's dominance within the metallurgical coal sector will continue, despite the near-term effect of the November 2020 import ban imposed by China. Australia is in prime position to benefit once the ban is lifted given its high quality and competitive delivered costs". According to Wood MacKenzie (2021), in addition to growing demand as outlined above, projected ongoing reserve exhaustion for hard coking coals, particularly after 2030, will drive the need for new projects. The SRM is an established mine producing high quality export hard coking coal that is required to stay in operations until the 2050s to meet the demand indicated above in conjunction with other existing and new projects.

Potential negative social and economic impacts associated with the SRM operations were recently identified in the 'Environmental Impact Statement for the Saraji East Mining Lease Project (BMA, 2023b)'. Negative social impacts holding some relevance to this Project include potential competition for labour hire during mine construction and pressure on accommodation and housing in Dysart or Moranbah. Economically, this could result in increased labour costs. However, these impacts have been mitigated through the ongoing employment of a labour force that are already working within the wider SRM.

Overall, community sentiment in the Isaac region is that new mining operations are supported, with the availability of local employment, business supply opportunities and potential population growth driving this support. The Project's location mitigates direct negative impacts on nearby communities, and a range of positive impacts relating to employment opportunities, population growth and reinforcement of Isaac local government area (LGA) communities' identity and sustainability are likely.

The EA for the Project provides for the management of potential impacts to living amenity matters such as dust, noise, vibration and traffic.

10.1.1 Consultation

BMA maintains ongoing dialogue and consultation with key stakeholders regarding its actions and future plans at its operations in Central Queensland. Consultation and engagement with relevant stakeholders to date has focused on providing an overview of BMA operations at SRM, this has included both targeted and public consultation during the ML application. Public notification for the mining lease application occurred in March 2017 and BMA followed the required process of responding to submissions.

BMA's intention to continue mining the Grevillea Pit is well understood by stakeholders. The following stakeholders are frequently consulted at various stages of operation development:

- local landholders
- community groups
- Isaac Regional Council
- Native Title parties (Barada Barna People)
- Queensland DETSI
- Queensland DoR
- Commonwealth DCCEEW including the IESC
- Queensland DRDMW
- overlapping tenure holders
- worker accommodation village service providers
- infrastructure service providers.

10.1.2 Economic Costs and Benefits

Benefits from the SRM occur through the continuity of employment, expendable income, export earnings and government revenue. BMA is the largest employer in the Central Queensland region and provides local jobs for its direct employees with an employment flow-on effect in the Isaac Regional LGA.

The SRM has approximately 2,400 FTE employees, including labour hire and contractors. These jobs are reliant on maintaining continuity of mining operations at the SRM through the proposed action. Should the Proposed action not be approved, the workforce will continue to be enlisted across SRM operations, being shifted to alternate locations, until the end of mine life. However without the approval of the Proposed action the economics of the mine would need to be reassessed which could ultimately reduce the mine life and therefore continuity of employment.

The local and regional community has established itself to service the existing SRM, and is therefore accustomed to the benefits, costs and demands associated with mining operations. Development of the proposed action will provide continued direct employment opportunities to the regional communities, and long-term flow-on social and economic benefits in the form of royalty payments to the State, taxes, expenditure with regional businesses and continuation of employment of the significant SRM workforce.

Further, loss of ecosystem services is identified as a potential negative economic impact. The supporting technical reports detail the ecological and water resource values within and proximal to the Project area. They also detail the proposed avoidance and mitigation measures that will be implemented to reduce potential impacts to ecosystem function, particularly in association with Phillips Creek riparian corridor. These mitigation measures are discussed in ***Section 5***. Notably, offsets will be delivered to compensate the identified likely significant impacts to MNES. These will be delivered within the wider locality, per the OMP (refer ***Section 8*** and ***Appendix I***). The potential economic impact of the Project is considered to be offset through the proposed avoidance and mitigation measures, and through the provision of offsets.

10.2 Indigenous Engagement

BMA, in consultation with the Native Title holders of the area - the Barada Barna People - maintains and implements a Cultural Heritage Management Plan at SRM. The Cultural Heritage Management Plan provides consultation opportunities and outlines required processes to be used in the identification and management of cultural heritage values. The Cultural Heritage Management Plan holds sensitive information and therefore is not provided as part of this PD. Additionally, a Native Title Project Agreement is in place between BMA and Barada Barna Aboriginal Corporation, on behalf of the Barada Barna people which covers SRM. The Native Title Agreement has clear agreed processes for ongoing engagement with the Barada Barna People and consent pathways for major projects.

The Project is included within the 2024 Saraji Cultural Heritage Management Plan and the 2024 Indigenous Land Use Agreement between BMA and the Barada Barna Aboriginal Corporation. The Cultural Heritage Management Plan and Indigenous Land Use Agreement extend over the entirety of the SRM EA boundary, which includes the Project area.

BMA have consulted with the Barada Barna People historically regarding activities within the SRM (including this Project). Provision of the discussions are not possible due to sensitivities. The mechanism for ongoing consultation

regarding cultural heritage management is the fortnightly meetings between BMA Heritage and Winnaa, and other matters is the Relationship Committee between BMA and Barada Barna Aboriginal Corporation which meets quarterly in accordance with the Native Title Project Agreement.

11 Environmental Record of the Person Proposing to take the Action

BMA has an excellent record of responsible environmental management and a strong commitment to the communities and the environments in which it operates. BMA has no convictions for breaches of environmental management requirements and regularly reviews environmental performance and publicly reports on progress.

BMA has been the subject of environmental related proceedings in the Queensland Magistrates Court for matters related to State legislation. In 2019, BMA pleaded guilty to one charge of unlawfully causing serious environmental harm and three counts of unlawfully contravening a condition of the environmental authority, under the *Environment Protection Act 1994* (Qld). The offences related to an unauthorised release of mine affected water from BMA's Goonyella Mine in 2017. A fine was imposed and paid by BMA. No conviction was recorded. To the best of our knowledge and enquiries, there have been no further proceedings against BMA under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources. The proposed action will be undertaken in accordance with the BMA's environmental policy and framework.

BMA has been responsible for multiple referrals and/or actions under the EPBC Act, including (but not limited to):

- 2024/09983 – BM Alliance Coal Operations Pty Ltd, Peak Downs Mine Power Line Realignment Project (draft received)
- 2023/9757 – BM Alliance Coal Operations Pty Ltd, Saraji Mine Grevillea Pit Continuation Project (assessment commenced)
- 2022/9350 – BM Alliance Coal Operations Pty Ltd, Peak Downs Mine Continuation Project (assessment approach determined)
- 2021/9031 – BM Alliance Coal Operations Pty Ltd, Caval Ridge Mine Horse Pit Extension (reconsideration request received)
- 2019/8576 – BM Alliance Coal Operations Pty Ltd, Saraji Mine Spring Creek to Phillips Creek Diversion (approved).
- 2016/7791 – BM Alliance Coal Operations Pty Ltd, Saraji East Mining Lease proposed action (reconsideration request received)
- 2013/6868 – BM Alliance Coal Operations Pty Ltd on behalf CQCA JV, Dysart Road Relocation (approved)
- 2013/6865 – BM Alliance Coal Operations Pty Ltd, Red Hill Mining Proposed action (approved)
- 2012/6268 – BM Alliance Coal Operations Pty Ltd, M Block 3D Seismic Survey Program (approved)
- 2009/4759 – BM Alliance Coal Operations Pty Ltd, Hay Point Coal Terminal Expansion (approved)
- 2008/4659 – BM Alliance Coal Operations Pty Ltd, Vessel-based Seismic and Hydrographic Sonar Survey (approved)
- 2008/4417 – BM Alliance Coal Operations Pty Ltd on behalf CQCA JV, Caval Ridge Open Cut Coal Mine Proposed action (approved)
- 2005/2248 – BM Alliance Coal Operations Pty Ltd, Goonyella Riverside Coal Mine Expansion (project withdrawn)
- 2005/2211 – BM Alliance Coal Operations Pty Ltd, Hay Point Services Coal Terminal Offshore Expansion (approved)
- 2004/1447 – BM Alliance Coal Operations Pty Ltd, Norwich Park Coal Mine - Development of East Pit (approved).
- 2004/1733 - BM Alliance Coal Operations Pty Ltd on behalf CQCA JV, Expansion of the Hay Point Coal Terminal (approved).

BMA has a strong commitment to continual improvement of environmental performance. BMA has environmental procedures and plans in place to avoid breaches and where required incorporate corrective actions. Where breaches have occurred, BMA has followed the relevant regulatory notification requirements and has responded immediately to apply the appropriate corrective actions to rectify the relevant breaches and to avoid environmental harm.

BHP's approach to environmental management is incorporated in the Charter, which outlines 'an overriding commitment to health, safety, environmental responsibility and sustainable development'. BHP strives to achieve the

efficient use of resources, including reducing and preventing pollution, and enhancing biodiversity protection by assessing ecological values and land use in our activities. Our stewardship approach is designed to ensure that the lifecycle health, safety, environment and community impacts associated with resources, materials, processes and products related to our businesses are minimised and managed.

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13 Appendices

Appendix A

DCCEEW Information Requirements for the Grevillea Pit Continuation Project Preliminary Documentation

Appendix B

Information Requirements for the Preliminary Documentation – Cross Reference Table

Appendix C

Saraji Mine Environmental Authority (EPML00862313)

Appendix D

Terrestrial Ecology Survey and Impact Assessment Report

Appendix E

Surface Water Assessment Report

Appendix F

Groundwater Impact Assessment Report, including Groundwater Modelling Technical Report

Appendix G

Third Party Groundwater Peer Review

Appendix H

Groundwater-Dependent Ecosystem Impact Assessment Report

Appendix I

Offset Management Plan

Appendix J

Management plans (including existing SRM Erosion and Sediment Control Plan, SRM Waste Management Plan, SRM Water Management Plan, Weed and Feral Animal Management Procedure, and SRM Groundwater Monitoring and Management Plan; and Groundwater Dependent Ecosystem Monitoring and Management Plan)

Appendix K

Supplementary information in response to IESC Comments

Appendix L

PRCP schedule P-PRCP-100734616

Appendix M

SRM Progressive Rehabilitation Closure Plan (dated 5 November 2024)