BHP

CA-0000-ENV-REP-1038

CARRAPATEENA OPERATION

PEPR Compliance Report 2023

Issue Date: March 2024

ML 6471 MINERAL LEASE

MPL 149 AIRSTRIP AND WORKERS' ACCOMMODATION VILLAGE

MPL 152 WESTERN INFRASTRUCTURE CORRIDOR

MPL 153 EASTERN RADIAL WELLFIELD

MPL 154 SOUTHERN ACCESS ROAD AND RADIAL WELLFIELD

MPL 156 NORTHERN WELLFIELD

ACKNOWLEDGEMENTS

Acknowledgements go to all staff across the Carrapateena Operation for their contributions to the overall report and for undertaking all activities in a safe and effective manner. We also acknowledge the Kokatha People for their ongoing support and assistance provided.

DOCUMENT CONTROL

CA-0000-ENV-REP-1038

Version	Description	Author	Approval	Date
1	PEPR 2023 Compliance Report	Luke Boehm Advisor – Environment Trent Anderson Advisor – Environment Josh Allen Senior Advisor – Environment	Matthew Kidner Manager – Safety, Health, Hygiene, Environment, Approvals & Social Performance	28/03/24

EXECUTIVE SUMMARY

BHP Carrapateena submits this Program for Environment Protection and Rehabilitation (PEPR) Compliance Report for the period January 2023 to December 2023 (Compliance Report); as required by the *Mining Act 1971* (SA) and associated regulations and conditions of the Carrapateena Mining Lease (ML 6471), and Miscellaneous Purposes Licences (MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156). This Compliance Report demonstrates compliance with the ML and MPL conditions, Environmental Outcomes and Outcome Measurement Criteria committed to in the PEPR. This Compliance Report has been completed in general accordance with the Determination Terms of Reference 009 (TOR009) – Mining Compliance Reports (DEM 2020).

The tenement MPL 149 was granted on 15 September 2017, tenements ML 6471, MPL 152, MPL 153 and MPL 154 were granted on 3 January 2018, and MPL 156 was granted 11 December 2018.

PEPR2017/028 was approved on 15 September 2017 for MPL 149. PEPR2018/019 was approved on 5 July 2018. PEPR2018/019 covered all works proposed in the Mining Lease Proposal and included ML 6471, MPL 152, MPL 153 and MPL 154. PEPR2019/001 was approved 13 February 2019 for MPL 156.

MPEPR2019/026 was approved on 12 November 2020, which consolidated the three aforementioned PEPRs into a single document encompassing ML 6471, MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156. This Compliance Report addresses compliance for tenements listed under MPEPR2019/026.

On 2 May 2023 BHP Group Limited completed the acquisition of OZ Minerals Limited. The Carrapateena operation has been developed and operated by OZM Carrapateena Pty Ltd and OZ Minerals Carrapateena Pty Ltd, wholly owned by OZ Minerals Limited. The Carrapateena site has been integrated into the BHP Copper South Australia (SA) asset, also incorporating BHP's Prominent Hill mine, Olympic Dam mine and Oak Dam exploration sites. Copper SA falls under the BHP Minerals Australia business portfolio which also incorporates Western Australia Iron Ore, Nickel West, Coal, Mt Arthur Coal and Operations Services.

At Carrapateena development of a decline to support future block cave mining operations commenced in 2023, with the aim of unlocking the mine's potential to be a multi-generational, low quartile cash cost producing province. Significant progress was also made during the year on enabling underground infrastructure such as crushers and ventilation. The tailings storage facility main embankment Stage 2 lift was completed and a new regrind mill was commissioned (BHP 2023).

One non-compliance was recorded against the Outcome Measurement Criteria (OMC) which triggered regulatory reporting to the Government of South Australia's Department for Energy and Mining (DEM). No non-compliances with lease conditions were recorded during the reporting period.

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1 INTRODUCTION

BHP Carrapateena submits this Program for Environment Protection and Rehabilitation (PEPR) Compliance Report (Compliance Report) as required by the *Mining Act, 1971* (SA) and associated Regulations, conditions of the Carrapateena Mining Lease (ML) (ML 6471) and Miscellaneous Purposes Licences (MPL) (MPL 149, MPL 152, MPL 153, MPL 154 and MPL 156). This Compliance Report demonstrates compliance with the ML and MPL conditions and Environmental Outcomes committed to in the approved PEPR for the associated tenements (OZ Minerals 2020). Proponent details are provided in Table 1.1.

Table 1.1: Proponent details

<table>
<tr><td rowspan="2">Mine name</td><td rowspan="2">Carrapateena</td><td rowspan="2">ML 6471
MPL 149
MPL 152
MPL 153
MPL 154
MPL 156</td><td>MPEPR2019/026</td></tr>
<tr><td>Date approved: 12/11/2020</td></tr>
<tr><td>Lease holder</td><td colspan="3">OZ Minerals Carrapateena Pty Ltd (42%) and OZM Carrapateena Pty Ltd (58%)</td></tr>
<tr><td>Operator</td><td colspan="3">BHP Carrapateena</td></tr>
<tr><td>Mining lease approval date</td><td colspan="3">3 January 2018</td></tr>
<tr><td>Tenements</td><td colspan="3">ML 6471 Mineral Lease
MPL 149 Airstrip, Workers’ Accommodation Village, Access Road and Ancillary Infrastructure
MPL 152 Western Infrastructure Corridor
MPL 153 Eastern Radial Wellfield
MPL 154 Southern Access Road and Radial Wellfield
MPL 156 Northern Wellfield</td></tr>
<tr><td>Approval document</td><td colspan="3">PEPR: MPEPR2019/026</td></tr>
<tr><td>Ministerial determination</td><td colspan="3">The Compliance Report has been completed in general accordance with the Determination Terms of Reference 009 (TOR009) – Mining Compliance Reports (DEM 2020) and associated Mineral Regulatory Guideline (MG3) (DEM 2021)</td></tr>
<tr><td rowspan="3">Site contact</td><td colspan="3">Elton Peebles, General Manager, Carrapateena</td></tr>
<tr><td>Email</td><td colspan="2">elton.peebles@bhp.com</td></tr>
<tr><td>Phone number</td><td colspan="2">08 8422 3713</td></tr>
<tr><td>Site location details</td><td colspan="3">Located approximately 160 km north of Port Augusta, in close proximity to the Carrapateena Arm on the western boundary of Lake Torrens. Nearby townships include Woomera (approximately 65 km west) and Roxby Downs (approximately 90 km north-west). Refer to Figure 1.1.</td></tr>
<tr><td>Reporting period</td><td colspan="2">From: 1 January 2023</td><td>To: 31 December 2023</td></tr>
<tr><td colspan="3">Date of compliance report preparation</td><td>March 2024</td></tr>
</table>

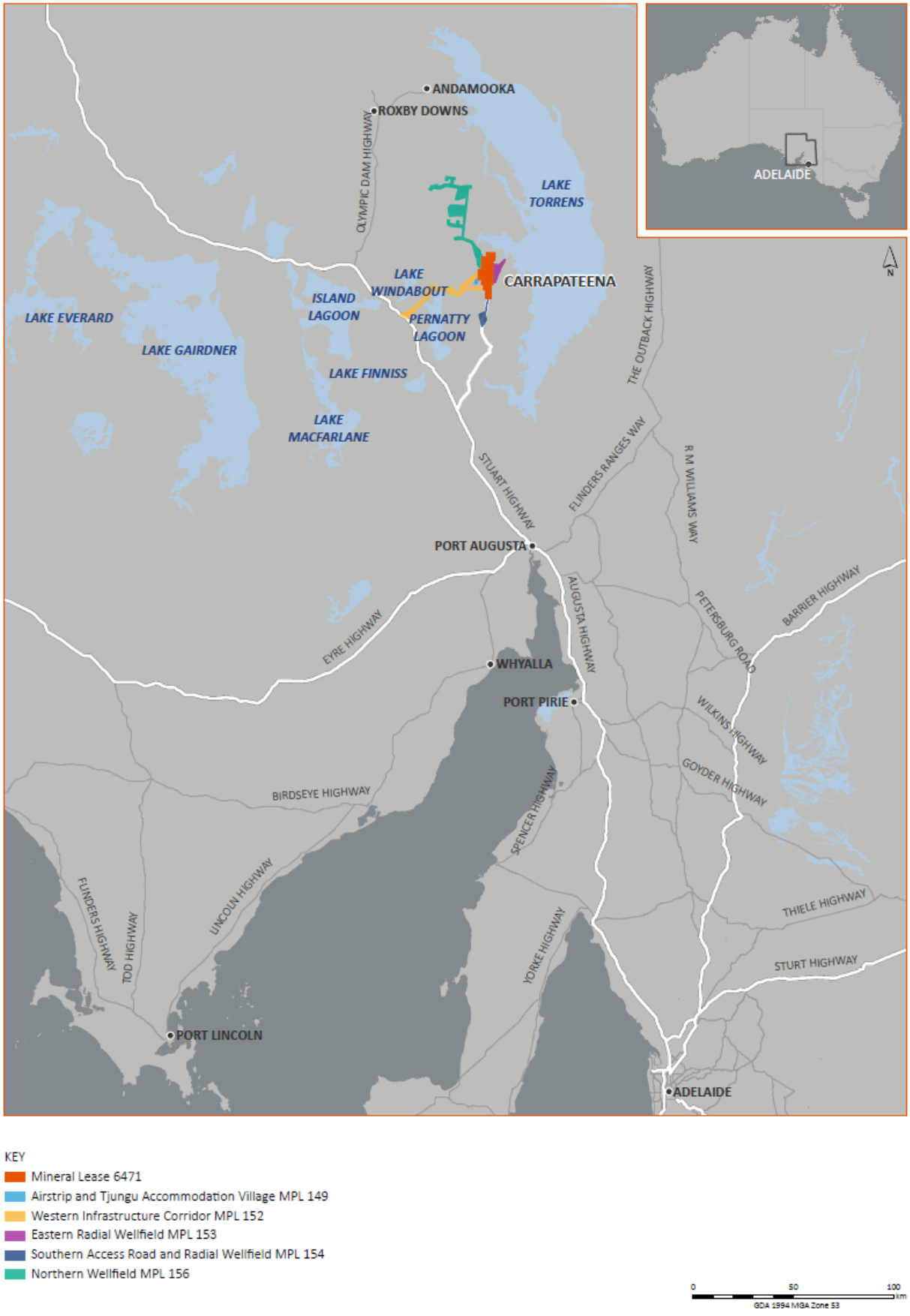

Figure 1.1: Operation location

2 DECLARATION OF ACCURACY

Person responsible for the preparation of the Compliance Report			
This document has been prepared to fulfil the requirement under sub-regulation 77(3)(b) of *Mining Regulations 2020* (SA) for the tenements listed herein. The information contained in this report is to the best of my knowledge a true and accurate record of the mining activities and compliance status for the reporting period.			
Name	**Position or Agent**	**Signature**	**Date**
Elton Peebles	General Manager – Carrapateena Operation		28/03/24
Company/Agent			
Report prepared by tenement holder			
Summary of steps undertaken to review the compliance report to ensure report accuracy			
This report has been prepared by the Carrapateena Environment Team. Information and judgment pertaining to compliance in the areas of ecology, air quality and radiation have been provided by external subject matter experts.			

3 PUBLIC LIABILITY INSURANCE

Details of the public liability insurance for the Carrapateena Operation are provided in Table 3.1. A copy of the cover note for the public liability insurance and/or a copy of the policy of insurance is included in Appendix A.

Table 3.1: Public liability insurance details

Certificate of currency general liability	
Principal insured	BHP Group Limited and all subsidiaries' companies and all/or related and/or affiliated and/or controlled, managed, administered and associated companies or corporation and/or related joint ventures and/or partnerships and other entities
Start date	1 July 2023
Finish date	30 June 2024
Limits of liability	$20,000,000

4 TENEMENTS

A summary of the existing tenements for the Carrapateena Operation is provided in Table 4.1. The locations of these tenements are shown on Figure 4.1.

Table 4.1: Tenement Summary

Tenement	Tenement number	Tenement grant date	Tenement expiry date	Status of currency
Carrapateena Mining Lease	ML 6471	3 January 2018	2 January 2039	Current
Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure	MPL 149	5 July 2017	4 July 2038	Current
Western Infrastructure Corridor	MPL 152	3 January 2018	2 January 2039	Current
Eastern Radial Wellfield	MPL 153	3 January 2018	2 January 2039	Current
Southern Access Road and Radial Wellfield	MPL 154	3 January 2018	2 January 2039	Current
Northern Wellfield	MPL 156	11 December 2018	2 January 2039	Current

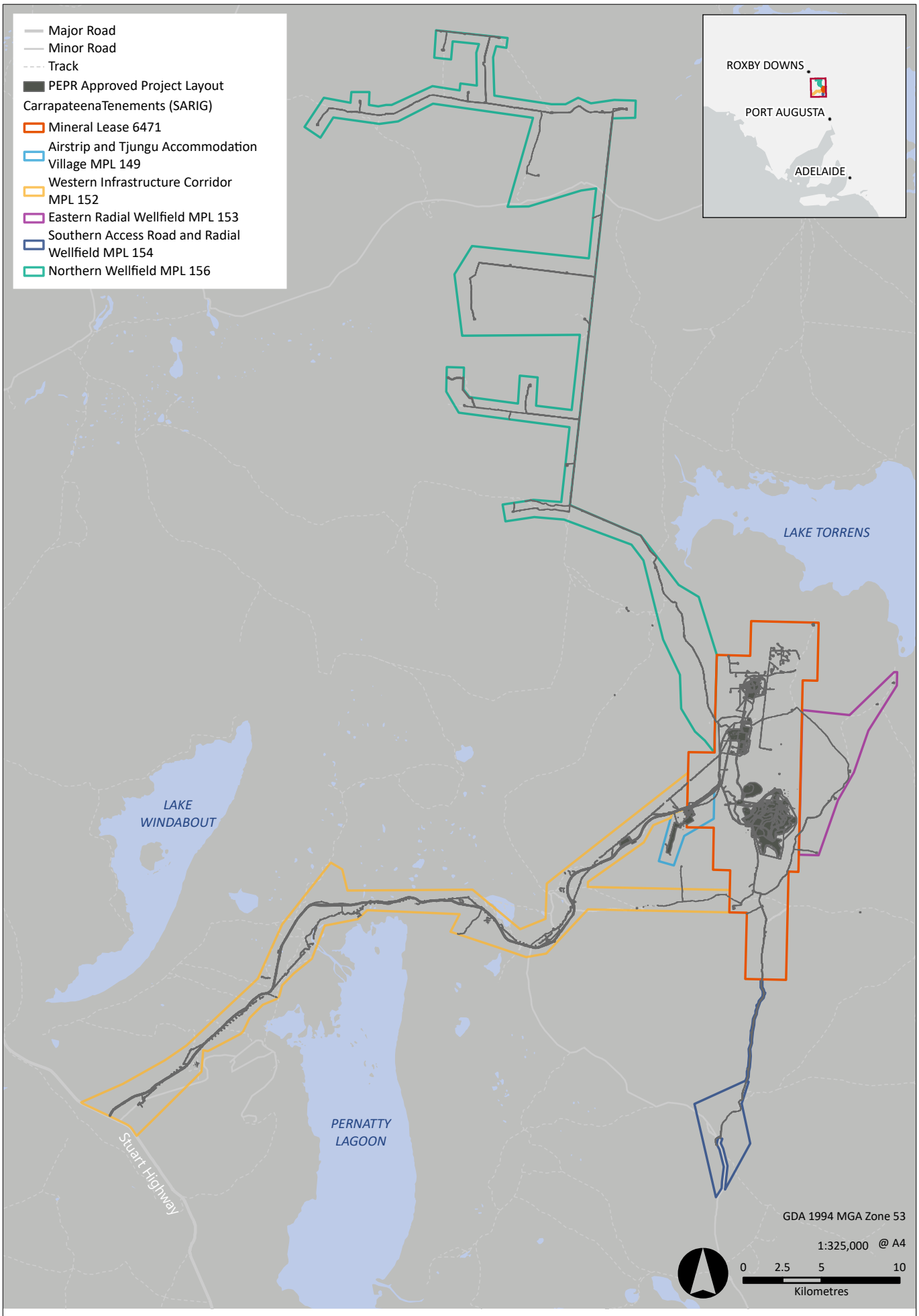

Figure 4.1 | Plan of Mining Operation Showing all Tenements Covered by Approved PEPR

Carrapateena BHP

5 OTHER APPROVALS, LICENCES, PERMITS, WAIVERS, NATIVE TITLE AND AGREEMENTS

Table 5.1: Other Approvals, Licences, Permits, Waivers, Native Title and Agreements

Approval document	Regulatory authority or other	Supporting document	Relevant Outcome or tenement condition	Status of currency
Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) CA-APR-NOT-1008 Approval of a controlled action Ref: 2017/7895	Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW)	CA-ENV-PLN-1009 Biodiversity Management Plan CA-ENV-PLN-1004 Native Vegetation Management Plan CA-0000-ENV-PLN-1004 EPBC Offset Management Plan	NV1, NV2, NV3, WP1, WP2, WP3, WP6, NF1, EPBC1, EPBC2, EPBC3	Expires on 31 December 2056
Government of South Australia's Environment Protection Authority (EPA) CA-ENV-LIC-1001 Works Approval to commence construction activities on ML 6471 (Ref: 50463)	EPA		LS1, LS2, LS3, LS4	Expired on 28 February 2020
EPA MPL 149 Carrapateena Airstrip and Tjungu Village (Ref: 50369) Licence to Undertake Prescribed activities: • 3(2)(c) Sewage treatment works or septic tank effluent disposal schemes (discharge other than to marine waters or a Water Protection Area) • 8(2)(a) Fuel burning not coal or wood • 8(6a)(b) Desalination plant that discharges waste to a waste lagoon	EPA	CA-APR-CRT-1000	LS1, LS2, LS3, LS4	Expired on 28 February 2020
EPA CA-APR-CRT-1001 Works Approval to commence construction activities on MPL 149 (Ref: 50462)	EPA		LS1, LS2, LS3, LS4	Surrendered 18 November 2018
EPA CA-ENV-LIC-1001 Licence to Undertake Prescribed Activities (Ref: 50463)	Environment Protection Authority	CA-ENV-REP-1023	LS1, LS2, LS3, LS4	Expires on 30 April 2028

Approval document	Regulatory authority or other	Supporting document	Relevant Outcome or tenement condition	Status of currency
• 1(1) Chemical storage and warehousing facilities • 1(2)(a)(i) Chemical works (inorganic) • 2(1) Abrasive blasting (mobile) • 2(5) Concrete batching works • 2(9) Mineral works • 3(4)(b) Wastewater treatment works (outside MLR WPA) • 3(5)(a) Activity producing listed waste • 7(7) Extractive industries • 8(2)(a) Fuel burning not coal or wood • 8(6a)(b) Desalination plant that discharges wastewater to a wastewater lagoon				
Radiation Licence CA-APR-LIC-1010 Carry Out Mining or Mineral Processing – Construction (Ref: 51113)	EPA	CA-ENV-PLN-1002 Radiation Management Plan CA-ENV-PLN-1003 Radioactive Waste Management Plan	RAD1, RAD2, RAD3, RAD4	Expires on 31 March 2024
Deed and S.221 Authorisation Development Approval – Permit Alteration of a Road(s) for Short Term Works South Gap and Pernatty Homestead Access Roads	Department for Infrastructure and Transport	CA-APR-AGR-1018		Expired on 14 May 2022
Registration and Approval of a Risk Management Plan under the *Safe Drinking Water Act 2011* (SA) OZ Minerals Carrapateena Pty Ltd (Exploration Village)	Department for Health and Wellbeing (SA Health)	CA-4120-OHS-LET-0001 CA-6920-ENV-PLN-003 Drinking Water Risk Management Plan	NA	For the life of the system
Registration and Approval of a Risk Management Plan under the *Safe Drinking Water Act 2011* (SA) OZ Minerals Carrapateena Pty Ltd (Tjungu Village)	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1112 CA-6920-ENV-PLN-003 Drinking Water Risk Management Plan	NA	For the life of the system
Registration and Approval of a Risk Management Plan under the *Safe Drinking Water Act 2011* (SA) OZ Minerals Carrapateena Pty Ltd (Mineral Processing Plant (MPP))	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1171	NA	For the life of the system

Approval document	Regulatory authority or other	Supporting document	Relevant Outcome or tenement condition	Status of currency
Wastewater Treatment Plant (WWTP) Licence 2013-04020 Exploration Camp WWTP	Department for Health and Wellbeing (SA Health)	CA-7130-ENV-LET-0008	NA	For the life of the system
WWTP (Licence WWI-10557) Exploration Camp Phase 2 Part A Upgrade	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1139	NA	For the life of the system
WWTP (Licence WWI-10603) 24 Person Temporary Rooms at Exploration Village	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1157	NA	Expired 19 February 2020
WWTP (Licence WWI-10613) 52 Person Temporary Camp at Tjungu Village	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1158	NA	Expired 19 March 2020
WWTP Licence WWI-10185 Tjungu Village WWTP	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1066	NA	For the life of the system
Upgrade installation of the Tjungu Village WWTP (Licence WWI-11154) Incorporating a Membrane Bioreactor (MBR) system	Department for Health and Wellbeing (SA Health)	CA-APR-LET-1190	NA	Works completed 2023
Agreement to Supply Recycled Wastewater to Pernatty Station	Department of Primary Industries and Regions, SA (PIRSA)	CA-APR-LET-1126	NA	For the life of the operation
Water Affecting Activity – Permit to Construct Structure in a Watercourse Tailings Storage Facility (TSF)	Department for Environment and Water (DEW)	CA-APR-PER-1000 CA-ENV-PLN-1007 Surface Water Management Plan	SWES1, SWES2, SWES3, SWES4, SWES5, SWES7, SWES9, SWES10, SWES11, SWES12, SWRF1, SWRF2, SWRF3, SWRF4, TSF3, TSF4, TSF30, AMD1, SW1, SW2, SW3, SW4, SW7	Expired on 6 June 2020 Works completed 2019
Water Affecting Activity – Water Permit to Drill Various purposes (water supply, investigation and monitoring)	DEW	Documents recorded in the Carrapateena Well Register CA-ENV-REG-1001	GW1, GW2, GW3, GW4, GW5	Well Permits are active for a period of three (3) years

Approval document	Regulatory authority or other	Supporting document	Relevant Outcome or tenement condition	Status of currency
Water Affecting Activity – Permit to Drain or Discharge IS4	DEW	CA-ENV-LIC-1003 Permit to undertake a water affecting activity	GW1, GW2, GW3, GW4, GW5	Expired on 22 March 2021
Water Affecting Activity – Permit to Drain or Discharge (Licences 341129, 341130 and 341131)	DEW	CA-APR-LET-1170 CA-APR-PER-1312 CA-APR-PER-1313 CA-APR-PER-1314	GW1, GW2, GW3, GW4, GW5	Expired on 11 October 2022
Water Affecting Activity – Permit for the Erection, Construction or Placement of any Building or Structure in a Water Course Elizabeth Creek and Yeltacowie Creek (Western Access Road) (Licences SAAL000014, SAAL000015 and SAAL000016)	Landscape SA	CA-APR-NOT-1052 CA-APR-NOT-1053 CA-APR-NOT-1054 CA-ENV-PLN-1007 Surface Water Management Plan	SW1, SW2, SW3, SW4, SW7, SWES1, SWES2, SWES3, SWES4, SWES5, SWES7, SWES9, SWES10, SWES11, SWES12, SWRF1, SWRF2, SWRF3, SWRF4	Expired on 19 February 2022 Works completed February 2022
Water Affecting Activity – Permit for the Erection, Construction or Placement of any Building or Structure in a Water Course Waste rock dump (WRD) to TSF Haul Road (Licences SAAL000020 and SAAL000021)	Landscape SA	CA-ENV-LIC-1011 CA-ENV-LIC-1012 CA-ENV-PLN-1007 Surface Water Management Plan	SW1, SW2, SW3, SW4, SW7, SWES1, SWES2, SWES3, SWES4, SWES5, SWES7, SWES9, SWES10, SWES11, SWES12, SWRF1, SWRF2, SWRF3, SWRF4	Expired on 8 October 2022 Works completed January 2022
Licence for Security Sensitive Substances (AN – SCER000379)	SafeWork SA	CA-MIN-LIC-1004 Licence for Security Sensitive Substances – Ammonium Nitrate (AN) Quantity: 50 tonnes	NA	Expires on 30 April 2024
Licence for Magazine (675245)	SafeWork SA	CA-MIN-LIC-1008 Licence for Magazine Quantity 1: 10,000 kg Blasting Explosives (HE and ANFO)	NA	Expires on 30 June 2024

Approval document	Regulatory authority or other	Supporting document	Relevant Outcome or tenement condition	Status of currency
Licence for Magazine (741074)	SafeWork SA	CA-MIN-LIC-1006 Licence for Magazine Quantity 1: 5,000 kg packaged HE Quantity 2: 160 kg detonators (equivalent to 10,000 #8 size detonators) Total Qty: 5,000 kg packaged HE and 160 kg detonators	NA	Expires on 30 November 2024
Licence for Magazine (716210)	SafeWork SA	CA-MIN-LIC-1009 Licence for Magazine Quantity 1: 640 kg detonators (equivalent to 40,000 #8 size detonators) Total Qty: 640 kg detonators	NA	Expires on 30 November 2024
Dangerous Substance Licence (698371) – Liquefied Petroleum Gas	SafeWork SA	CA-0000-OPS-LIC-1000 Quantity: 15 kL LPG	NA	Expires on 29 December 2024
Native Title Mining Agreement (NTMA) between OZ Minerals Carrapateena Pty Ltd and Kokatha Aboriginal Corporation	Kokatha Aboriginal Corporation	CA-CRL-LET-1003 NTMA – Confidential	Schedule C1. The Lessee must, in constructing and operating the Lease, ensure that there is no disturbance to Aboriginal or European sites, objects or remains unless prior approval under the relevant legislation is obtained.	Active for the life of the Carrapateena Operation
Pernatty Pastoral Access and Compensation Agreement	Billa Kalina Pastoral Pty Ltd, Colin and Jillian Greenfield	CA-APR-AGR-1033 – Confidential	NA	Active for the life of the Carrapateena Operation
Arcoona Pastoral Access and Compensation Agreement	Handbury Asset Management Pty Ltd	CA-APR-AGR-1042 – Confidential	NA	Active for the life of the Carrapateena Operation

Approval document	Regulatory authority or other	Supporting document	Relevant Outcome or tenement condition	Status of currency
Bosworth Pastoral Access and Compensation Agreement	Handbury Asset Management Pty Ltd	CA-APR-AGR-1035 – Confidential	NA	Active for the life of the Carrapateena Operation
Oakden Hills Pastoral Access and Compensation Agreement	Nutt Bros Nominees Pty Ltd	CA-APR-AGR-1054 – Confidential	NA	Active for the life of the Carrapateena Operation
BHP Access and Consent Deed (Western Infrastructure Corridor)	BHP Billiton Olympic Dam Corporation Pty Ltd	CA-CPS-AGR-1083	NA	Active for the life of the Carrapateena Operation

6 ORE RESERVES AND MINERAL RESOURCES

6.1 ORE RESERVES

The 2023 Mineral Resources and Ore Reserves can be found in BHP Annual Report 2023, Additional Information; Section 5, which can be found on the BHP website at bhp.com/investors/annual-reporting (BHP 2023).

6.2 ESTIMATED MINE LIFE

The underground decline development continued to advance throughout 2023 within the decline now over 1 km vertically below the surface. Crusher 2, which will enable increased operational and cost efficiencies for the sub-level cave (SLC), was commissioned in February 2024. The estimated life-of-mine (LoM) for the SLC is 20 years. Any expansion works to increase the LoM are subject to regulatory approval.

6.3 EXPLORATION ACTIVITIES

Exploration activities which have occurred on the tenements during this reporting period are summarised in Table 6.1. Further details are provided in Appendix B.

Table 6.1: Exploration Activity Summary

Exploration activity	Tenement/s	Summary of activity
Geological exploration	MPL 156	One diamond drillhole at the prospect, Wirraway, was completed in Q1 2023. Subsequent rehabilitation was completed in May 2023.

7 MINING, PROCESSING AND WASTE STORAGE ACTIVITIES

7.1 ORE MINING

Ore mined – mine life (t)	Ore mined – reporting period (t)	Expected quantity of ore to be mined during next reporting period (Mt)	Quantity of ore stockpiled on the tenement at the end of the reporting period (t)
14,838,824	3,981,551	5.4 – 5.6	~58,642

7.2 ORE PROCESSING

Ore processed – mine life (t)	Ore processed – reporting period (t)	Expected quantity to be processed during next reporting period (t)
16,732,335	4,879,514	Refer to BHP Operational Review for FY24 guidance (BHPa 2023)

7.3 CONCENTRATE OR OTHER PRODUCT EXPORTED

Concentrate or other product exported – mine life (dmt)	Amount of concentrate or other product exported – reporting period (dmt)	Expected amount of ore to be processed during next reporting period (t)
353,264	144,387	Refer to BHP Operational Review for FY24 guidance (BHPa 2023)

7.4 OVERBURDEN/WASTE

Overburden mined – mine Life (t)	Reporting period – overburden mined (t)	Next reporting period – overburden to be mined (t)
5,096,766	155,833	1,032,644

Production notes:

Overburden is defined as any material that is not processed by the mill. All raisebore waste is trucked to surface to minimise the risk of a potential cutter head through the crusher. Some development waste will be trucked to surface during crusher downtimes (planned/unplanned shuts). Underground mining during the reporting period comprised of 13,767 metres of lateral advance.

Volume of PAF and NAF material mined during reporting period (t)	Remaining capacity of current waste facilities or planned future waste facilities as per approved PEPR
Potentially-acid forming (PAF): 0* Non-acid forming (NAF): 155,833 t *In CY22, change management was implemented to ensure PAF waste is blended with ore and processed though the mill (OZ Minerals 2023)	Current WRD has a LoM capacity of 7,358,994 t based on current height (20 m) and footprint constraints

Will the remaining quantities of overburden to be mined be accommodated in the current or planned waste facilities (WRD, TSF)? If not included, what future work?

During 2021, regulatory approval was gained under TSF Stage 2 Embankment Design Amendment Program Notification (CA-APR-LET-1184) to utilise run-of-mine (ROM) waste rock as a surrogate for weathered rock in construction of Stage 2 of the TSF, which was completed in 2022. Where available, LoM ROM waste rock will be used in future TSF lifts and closure activities (e.g. subsidence zone abandonment bund and backfill of boxcuts).

Are your waste facilities sufficient to deal with the volume of PAF material generated annually? If not include what future work is required? *(Include any identification of PAF and NAF in the preceding reporting period and strategies to minimise the environmental impacts of this material.)*

Currently most waste including PAF/NAF is being sent through the mill and processed as part of a debottlenecking strategy for underground material movement. Processes remain in place to identify areas of PAF. Change management has been implemented to ensure PAF waste is blended with ore and processed though the mill.

8 COMPLIANCE SUMMARY

One non-compliance was recorded against the Outcome Measurement Criteria (OMC) and no non-compliances to lease conditions were recorded during the reporting period. A brief summary of the reported incident is provided Table 8.1 with rectification of the non-compliance summarised in Section 11.

Table 8.1: Summary of non-compliances reported in 2023

Licence permit tenement	Type of non-compliance Notes: e.g. lease condition or OMC	Brief description Notes: e.g. Noise limits exceeded on four occasions	Status Notes: 'rectified' or 'currently being addressed'	Section of report for further detail
ML 6471	Non-achievement of OMC OMC – TSF1, GW1, TSF2, GW2	Groundwater and surface water OMCs associated with the TSF have not been achieved largely due to higher than predicted lateral and vertical seepage from the TSF during early operation. Standing water levels in groundwater monitoring locations within the TSF seepage zone are outside of OMC Achievement Values determined from the assessment of the Updated Groundwater Model (OZ Minerals 2017b; Appendix H) and water quality at these monitoring locations is in exceedance of OMC Achievement Values determined from the assessment of the TSF Surface Water and Groundwater Geochemical Effects Assessment (OZ Minerals 2017b; Appendix F).	Currently being addressed	Section 11. Reported to DEM.

9 COMPLIANCE TABLES

Compliance for the 2023 reporting period is summarised from Section 9.1 to Section 9.19. Regarding the column headings for each table, the following explanations or assessment drivers apply:

- **Environmental Outcome:** provides a copy of the regulatory outcome provided in the relevant tenement document.
- **Sixth Schedule lease conditions:** provides the tenement number and pertinent condition number associated with the Sixth Schedule Environmental Outcome. Where the condition is related to a different schedule that detail is also provided.
- **Regulatory commitment:** provides the OMC, Leading Indicator, Strategy or Future Works commitment related to the Environmental Outcome.
- **Compliance status:** provides the status of the regulatory commitment as one of the following:
  - Compliant (to OMC or Leading Indicator)
  - Non-compliant
  - Unable to determine
  - No longer relevant to risk profile of Operation.
- **Evidence:**
  - For each criterion, states what measurements have been taken to monitor compliance and provides an interpretation of the results (i.e. compliant or non-compliant).
  - Provides a summary of the key measurements (using a graph to summarise data where possible) and refers to a summary of the detailed/raw data (if necessary) in an appendix but only to the extent necessary to verify the compliance conclusion reached.
  - Where graphs are used to illustrate compliance, the relevant compliance limits are clearly included on the graph.
  - Evidence where applicable document control number of the report or technical memo is included.
- **Forward work plan:**
  - If non-compliant, Leading Indicator triggered or any alterations to Outcomes or OMC are recommended, with a summary of actions being undertaken to rectify the non-compliance.
  - If unable to demonstrate compliance, states reasons and relevance of the OMC to the current risk profile of the Operation or current stage of the Operation.
  - States whether OMC or lease condition amendments are required.
  - Quantifies the risks associated with the non-compliance if applicable.
  - States whether the Leading Indicator is adequate to pick up the non-compliance or if it needs to be amended.

9.1 ABORIGINAL HERITAGE

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure that there is no damage, disturbance or interference to Aboriginal heritage sites, objects or remains unless it is authorised under the relevant legislation	ML 6471 Condition 1 MPL 149 Condition 7 MPL 152 Condition 1 MPL 153 Condition 1 MPL 154 Condition 1 MPL 156 Condition 1	**Outcome Measurement Criteria – AH1** Annual audit of land disturbance permits demonstrate that infrastructure locations are within approved work areas, cultural heritage survey report conditions and have authorisation in accordance with the *Aboriginal Heritage Act 1988* (SA) prior to any ground disturbance occurring	Compliant	• All land disturbance is spatially audited against Land Disturbance Permit (LDP) boundaries using survey data, drone and satellite imagery in ArcGIS to ensure works were completed within approved work areas, cultural heritage survey report conditions and have authorisation in accordance with the *Aboriginal Heritage Act 1988* (SA). • One minor unauthorised land disturbance occurred in 2023. No damage, disturbance or interference to Aboriginal heritage sites occurred as a result of this breach. A 5Y investigation was completed and corrective actions implemented and logged in INX InControl. Kokatha Aboriginal Corporation informed of the land disturbance.
		Outcome Measurement Criteria – AH2 Annual audit of cultural heritage survey records demonstrate that upon discovery of new Aboriginal heritage sites, objects or remains at infrastructure locations were treated in accordance with the Cultural Heritage Management Plan until authorisation under the *Aboriginal Heritage Act 1988 (SA)* was obtained	Compliant	New aboriginal heritage sites discovered were treated in accordance with the Cultural Heritage Management Plan (CA-CRL-PLN-1016). Existing sites are demarcated to ensure operations don't encroach.
		Leading Indicator – AH3 Monthly inspection (ground survey, drone flyover or suitable alternative method) of a selected infrastructure location during construction demonstrates land clearing has not been undertaken outside of areas defined in the associated land disturbance permit[#] # Alternative locations must be selected until all locations have been complete. Or on a demonstrated risk-based approach	Compliant	Regular capture of drone imagery and on-ground inspections were undertaken on active LDP areas. One minor unauthorised land disturbance occurred in 2023. No damage, disturbance or interference to Aboriginal heritage sites occurred as a result of this breach. A 5Y investigation was completed and corrective actions implemented and logged in INX InControl.

9.2 PUBLIC NUISANCE

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction and operation ensure that there are no public nuisance impacts from dust and noise generated by mining operations or mining-related traffic	ML 6471 Condition 4 MPL 149 Condition 5* MPL 152 Condition 4 MPL 153 Condition 4 MPL 154 Condition 4	**Outcome Measurement Criteria – PN1** Audit of stakeholder engagement records undertaken quarterly demonstrates that all traffic related dust and noise concerns associated with access roads are responded to in accordance with the Local Area Agreement - Operating Protocols within 24 hours upon notification and any corrective actions are closed out within 14 days or as agreed with the Director of Mines (or other authorised officer)	Compliant	An audit of stakeholder engagement records in Borealis shows that no noise or dust concerns were formally raised. Operational stakeholder consultation meetings were formally conducted in 2023 and covered all aspects of the stakeholder land access agreements which required tabling at a face-to-face meeting.
	ML 6471 Condition 4 MPL 149 Condition 5*	**Outcome Measurement Criteria – PN2** Annual laboratory analysis of continuous dust deposition collected quarterly at monitoring site adjacent to Pernatty Homestead (ERML09) demonstrates dust deposition rates do not exceed 4 g/m^2/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales	Compliant	Annual deposition dust at Pernatty Homestead (ERML09) ceased in May 2022 following the cessation of use of the Southern Access Road.
		Leading Indicator – PN3 Continuous dust deposition rate monitoring undertaken at Pernatty Homestead (ERML09) is analysed monthly during construction and demonstrates a trend of continual exceedances of baseline levels of 1.6 g/m^2/month	Compliant	Monthly deposition dust at Pernatty Homestead (ERML09) ceased in May 2022 following the cessation of use of the Southern Access Road.

* Intent of MPL 149 PEPR

9.3 TRAFFIC

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction and operations, ensure that there are no traffic accidents involving members of the public and mine related traffic that could have been reasonably prevented by the Tenement Holder	ML 6471 Condition 5 MPL 149 Condition 5* MPL 152 Condition 5 MPL 153 Condition 5 MPL 154 Condition 5	**Construction and Operation Criteria** **Outcome Measurement Criteria – INC1** Investigation and corrective actions triggered as a result of an accident associated with mine related traffic demonstrates that the incident could not have been reasonably prevented and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer)	Compliant	No traffic accidents involving members of the public or surface interaction were reported.

* Intent of MPL 149 PEPR

9.4 PUBLIC SAFETY

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction and operation ensure that unauthorised entry to the Land does not result in public injuries and or deaths that could have been reasonably prevented.	ML 6471 Condition 2 MPL 149 Condition 3 MPL 152 Condition 2 MPL 153 Condition 2 MPL 154 Condition 2	**Construction and Operation** **Outcome Measurement Criteria – PS1** Investigation and review of incident report records triggered as a result of an incident associated with unauthorised entry to infrastructure locations demonstrates that the incident could not have been reasonably prevented and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer)	Compliant	No occurrences of unauthorised access by members of the public resulting in public injury or death were recorded during the reporting period.
	ML 6471 Condition 3	**Completion** **Outcome Measurement Criteria – PS2** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender including a review of the underground caving system, geotechnical data and other relevant data from the Cave Monitoring Plan demonstrates that at cessation of operations, the underground mine has been operated within design parameters and the predicted vertical and lateral extent of the Sub level cave Subsidence Zone is validated and the abandonment bund is adequately located outside of the subsidence zone	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.
		Outcome Measurement Criteria – PS3 Electronic and hard copies of a topographical survey of the sub level cave subsidence zone are provided to the Director of Mines (or other authorised officer) prior to application of lease surrender to confirm the extent of the surface expression at mine completion	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.
		Outcome Measurement Criteria – PS4 Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit that the decline portals and box cut have been closed in accordance with the basis of design	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.
		Outcome Measurement Criteria – PS5 Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit of the vent rise plug against the design Vent rise and confirms vent rise closure has been undertaken in accordance with the basis of design	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.
		Outcome Measurement Criteria – PS6 Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit that the abandonment bund around the subsidence zone and quarries have been constructed in accordance with Western Australia Department of Industry and Resources Guideline 'Safety Bund Walls Around Abandoned Open Pit Mines'	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.
		Outcome Measurement Criteria – PS8 Construct to design audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms that the Mine Area Borrow Pit has been closed in accordance with a closure design endorsed by DEM. The closure design will be provided to DEM through a future PEPR update, prior to completion.	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.
The Tenement Holder must demonstrate that post completion, the risks to the health and safety of the public so far as it may be affected by mining-related activities are as low as reasonably practicable	MPL 149 Condition 4* MPL 152 Condition 3 MPL 153 Condition 3 MPL 154 Condition 3	**Closure** **Outcome Measurement Criteria – PS7** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates that all infrastructure is removed or left in-situ as agreed with stakeholders (Outcome Measurement Criteria – LUP2) in a manner that risks to the health and safety of the public so far as it may be affected by mining-related activities are as low as reasonably practicable	Not relevant	Carrapateena Operation is in the early stages of operation, this is a completion criteria, and as such, is not relevant.

* Intent of MPL 149 PEPR

9.5 NATIVE VEGETATION

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
Tenement Holder must, during construction and operation, ensure that there is no permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities unless a significant environmental benefit has been approved in accordance with the relevant legislation	ML 6471 Condition 11 MPL 149 Condition 9* MPL 152 Condition 11 MPL 153 Condition 11 MPL 154 Condition 11 MPL 156 Condition 8	**Construction and Operation** **Outcome Measurement Criteria – NV1** Annual audit (reconciliation) of land disturbance register for infrastructure locations demonstrates native vegetation clearance does not exceed the significant environmental benefit approved under the *Native Vegetation Act 1991* (SA) and plains mouse habitat clearance does not exceed that approved under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth)	Compliant	Total disturbance is less than the amount approved in Native Vegetation Management Plans. See Figure 12.1 to Figure 12.5. Gateway 1: • 476.1 ha approved • 283.8 ha disturbed (2013–2018)* Gateway 2: • 708.2 ha approved • 708.1 ha disturbed Gateway 3: • 989.9 ha approved • 370.8 ha disturbed Northern Wellfield: • 236.0 ha approved • 159.0 ha disturbed • Total Operation footprint as of 31 December 2023: **1,521.77 ha** • *Minor increase of G1 associated with reallocation of the WRD footprint from G2 as per approved disturbance activity under the RL Native Vegetation Management Plan.
		Leading Indicator – NV2 Following completion of land clearance, inspections (ground survey, drone flyover or suitable alternative) demonstrates land clearing has not been undertaken outside of areas defined in the associated land disturbance permit	Compliant	A combination of drone imagery captured at site and satellite imagery was utilised to verify ground disturbance footprint. One minor unauthorised land disturbance occurred in 2023. No permanent loss of abundance and/or diversity of native vegetation resulted from the incident.
	MPL 156 Condition 9 and 9.1	**Outcome Measurement Criteria – EC01** Baseline ecological surveys must be undertaken at water dependent ecosystems including, but not limited to SW-6 and SW-7 prior to the impact of mining operations or mining-related activities on the existing environment	Compliant	Baseline vegetation health surveys (Rangeland Assessment Methodology) completed during October 2019 at SW6, SW7 and SW15. Refer to 2019 Annual Compliance Report, Appendix E Bosworth Creek Baseline Assessment (CA-0000-ENV-REP-0013).

* Intent of MPL 149

9.6 WEEDS AND PESTS

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement holder must during construction and operation ensure no introduction of new species of Weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land as a result of mining operations or mining-related activities	ML 6471 Condition 6 and Schedule 2 Condition 28 MPL 149 Condition 10* MPL 152 Condition 6 MPL 153 Condition 6 MPL 154 Condition 6 MPL 156 Condition 3	**Construction and Operation** **Outcome Measurement Criteria – WP1** Annual spring flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations demonstrates no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mining-related activities when compared to previously recorded weed species and introduced fauna	Compliant	One new weed species were recorded in 2023. Stinging nettle (*Urtica urens*) was recorded for the first time in the operational survey area. A few small clusters were recorded in the Exploration Village Effluent Irrigation Area (surveyed from boundary only). This is an annual herb favouring high nutrient (especially nitrogen rich) habitats. *Urtica urens* is not Declared or listed under relevant legislation. No increase in abundance was measured for any previously recorded weed species. The existing populations of two Weeds of National Significance are in the process of being controlled. Both populations have been contained and reduced. The isolated population of Prickly Pear (*Opuntia* sp.) near the Yeltacowie Homestead has been actively managed by biological control (cochineal) since 2021. Harvest and re-distribution of cochineal to unaffected areas is ongoing. Control of Athel Pine (*Tamarix aphyalla*) is occurring at Yeltacowie Homestead, with most trees dead or dying. In 2023, no new populations were recorded, and only three mature trees remained. Control of the remaining live trees is ongoing. Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036)
		Outcome Measurement Criteria – WP2 Annual spring flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations demonstrates no increase in the abundance of existing weeds or pest species in the land compared to previous survey records as a result of mining-related activities	Compliant	Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036)
		Leading Indicator – WP3 Monthly inspection (including photographic evidence of a selected infrastructure location identifies weeds listed in the Weed Red Alert List and triggers a review of the effectiveness of management strategies[#] # Alternative locations must be selected until all locations have been complete. or on a demonstrated risk-based approach	Compliant	Weed inspections were routinely completed as inspection criteria within the LDP Inspection and General Environmental Inspection template. During the reporting period thirty-two (32) General Environmental Inspections were completed. No new Priority Weed (formerly Red Alert) species were identified in 2023. Monitoring of cochineal deployed on two existing populations of prickly pear on Pernatty Station (off tenure) continued in 2023. Cochineal remains active on both specimens and most of the plants in this small population appeared to be dying, however some parts of the plants were still alive and numerous potentially viable propagules were on the ground. Management of weeds is ongoing in these areas.
	ML 6471 Condition 6 and Schedule 2 Condition 28	**Leading Indicator – WP4** Quarterly audit of inspection records (including photographic evidence) maintained at the site by the waste contractor demonstrate that prior to collection food waste containers that service the accommodation village kitchen are closed to prevent feral animal scavenging	Compliant	Inspections of waste handling areas are routinely undertaken by the camp contractor and routine inspections are completed by BHP Carrapateena personnel. Bin/skip lids are mandatory across the Carrapateena Operation and any non-conformance is addressed when identified; as evidenced in INX InControl.
		Leading Indicator – WP5 Quarterly audit of inspections records (including photographic evidence) maintained at the site by the waste contractor demonstrate that the tip face has been covered at the end of each day to prevent feral animal scavenging	Not relevant	Landfill not constructed.

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
	ML 6471 Condition 6 and Schedule 2 Condition 28 MPL 149 Condition 10* MPL 152 Condition 6 MPL 153 Condition 6 MPL 154 Condition 6 MPL 156 Condition 3	**Leading Indicator – WP6** Quarterly audit of records maintained at the site by all contractors demonstrates that all incoming vehicle, plant and equipment have been subject to weed hygiene procedures	Compliant	Weed hygiene certificates are completed as a compulsory deliverable within the General Induction before new vehicles are permitted to mobilise. Targeted inspections are also undertaken at the Western Access Road on entry to the site focusing on ground disturbing equipment and vehicles that leave the main mine and NPI footprint. During the reporting period monthly weed hygiene audits were undertaken with no gaps identified. Two hundred and twenty-nine (229) inspections were completed on vehicles entering site during the reporting period.

* Intent of MPL 149 PEPR

9.7 NATIVE FAUNA

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must ensure during construction, operation and post completion that there are no native fauna injuries or deaths due to mining-related activities that could reasonably have been prevented. Provide data from any future sightings and records of the Plains Mouse to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions	ML 6471 Condition 13 MPL 149 Condition 8* MPL 152 Condition 12 MPL 153 Condition 12 MPL 154 Condition 12 MPL 156 Condition 10	**Construction and Operation** **Outcome Measurement Criteria – NF1** Investigation and review of incident report records triggered as a result of serious harm or death of native fauna at infrastructure location demonstrates that the incident could not have been reasonably prevented, animal welfare was handled in accordance with the *Animal Welfare Act 1985* and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or authorised officer)[#] # serious harm is defined in the Animal Welfare Act 1985	Compliant	BHP Carrapateena use a site firearm to humanely euthanise sick or injured fauna in accordance with the *Animal Welfare Act 1985* (SA). All fauna interactions (sighting, mortality and/or relocation) are recorded in a register maintained by BHP Carrapateena environment personnel: • One hundred and thirty-four (134) fauna interactions, including ninety-two (92) mortalities, nineteen (19) animals euthanised, fifteen (15) relocations and eight (8) sightings. • Fauna mortalities were nearly all related to vehicle strikes on kangaroos. BHP Carrapateena is of the view that none of the ninety-two (92) fauna mortalities could have been reasonably prevented. A higher rate of fauna mortalities recorded in 2023 was likely due to increased activity onsite and continued nightshift heavy haulage. Throughout the year site communications are distributed when fauna are most active (e.g. summer) to raise awareness of the increased likelihood of interactions and to inform of correct procedures when interactions occur.
	MPL 149* Schedule 6 Condition 8	**Outcome Measurement Criteria – NF4** Monthly inspections (ground survey) of the wildlife and stock control fence surrounding the airstrip demonstrates that the integrity of the fence is maintained	Compliant	Aerodrome inspections are undertaken by the Aerodrome Reporting Officer prior to the arrival of all incoming flights to ensure that no wildlife have entered the fenced complex and pose a risk of interaction with landing aircraft. No occurrences of fauna identification within the fenced aerodrome compound were recorded in 2023. Inspections were documented and retained on file.
	MPL 152 Condition 12	**Leading Indicator – NF2** Audit of the Transmission Line undertaken at the completion of construction and signed by construction manager demonstrates infrastructure has been constructed in accordance with the transmission line design including: • Line spacing between phase and ground conductors greater than 150 cm • Insulation of phase and/or ground conductors where necessary • Installation of perch discourages	Compliant	Transmission line completed with: • 1,593 mm line spacing and 2 m spacing to Optical Ground Wire • Insulation installed where required • Perch discouragers deemed not required under design review due to adequate line spacing.
		Leading Indicator – NF3 Audit of the Western Access Road undertaken at the completion of construction and signed by construction manager demonstrates speed limit signage has been installed at entry points and at a minimum of 5 km intervals in accordance with the design plans	Compliant	Construction of Western Access Road was completed in December 2021. Signage was installed as per NF3 following completion. Evidenced by Western Access Road – Inspection and Test Plan (ITP) 017 Road Furniture (CA-5410-QAC-ITP-1017).
	MPL 149*	**Leading Indicator – NF5** Airstrip clearance and foreign object inspections prior to the landing and take-off of aircraft identify a rising trend in kangaroo, emu and stock access to the internal perimeter of the wildlife and stock control fence surrounding the airstrip.	Compliant	Aerodrome inspections are undertaken by the Aerodrome Reporting Officer prior to the arrival of all incoming flights to ensure that no wildlife have entered the fenced complex and pose a risk of interaction with landing aircraft. No occurrences of fauna identification within the fenced aerodrome compound were recorded in 2023. Inspections were documented and retained on file.
	ML 6471 Schedule 2 Condition 28.2 Schedule 2 Condition 28.3 Schedule 2 Condition 28.4 MPL 149 Condition 6* MPL 152 Schedule 2 Condition 13.2 Schedule 2 Condition 13.3 Schedule 2 Condition 13.4 MPL 153	**Operations** **Outcome Measurement Criteria – EPBC1** Records of the Thick-billed Grasswren are to be provided to the Biological Database of South Australia (BDSA) to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites[#] # Linked to MNES Condition (Schedule 2 Condition 28.2)	Compliant	Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036).
		Outcome Measurement Criteria – EPBC2 Records of the Plains Mouse are to be provided to the Biological Database of South Australia (BDSA) to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites[#] # Linked to MNES Condition (Schedule 2 Condition 28.4)	Compliant	Plains Mouse observation records were reported to the BDBSA by Nature Foundation on behalf of BHP Carrapateena as a data submission in their annual report to enable effective monitoring and record keeping, as per the Recovery Plan Actions. 2023 South Gap Offset Annual Report (CA-0000-ENV-REP-1043) Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036).

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
	Schedule 2 Condition 13.2 Schedule 2 Condition 13.3 Schedule 2 Condition 13.4 MPL 154 Schedule 2 Condition 13.2 Schedule 2 Condition 13.3 Schedule 2 Condition 13.4	**Outcome Measurement Criteria – EPBC3** Records of the Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites[#] # Linked to MNES Condition (Schedule 2 Condition 28.3)	Compliant	Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036).

* Intent of MPL 149 PEPR

9.8 LAND USE AND PROPERTY

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction and operation ensure there are no impacts to third-party land use or property on or off the Land as a result of mining-related activities other than those agreed between the Tenement Holder and the affected user or determined by an appropriate court as evidenced in its order(s) (and the Tenement Holder must provide the Director of Mines (or other authorised officer) with a copy of the order(s), which shall be placed on the Mining Register). Before Completion, the Tenement Holder must satisfy the Director of Mines (or other authorised officer) that where practicable, the pre-Tenement land use of the Land can be recommenced post Completion The Tenement Holder must ensure that the Land is progressively and finally rehabilitated to support the future land use	ML 6471 Condition 7 MPL 149* MPL 152 Condition 7 MPL 153 Condition 7 MPL 154 Condition 7 MPL 156 Condition 4	**Construction and Operation Criteria** **Outcome Measurement Criteria – LUP1** Audit of stakeholder engagement records undertaken quarterly demonstrates that concerns associated with agricultural productivity of Pernatty, Arcoona or Bosworth Pastoral Lease or adjacent pastoral leases as a result of ML-activities are responded to in accordance with the Local Area Agreement - Operating Protocol within 24 hours and any corrective actions are closed out within 14 days or as agreed with the Director of Mines (or other authorised officer)	Compliant	No records in Borealis of formal concerns raised relating to pastoral productivity. Stakeholder consultation meetings continued in 2023 with no formal complaints or impacts to pastoral productivity raised. BHP Carrapateena has committed to working closely with local and regional stakeholders. All communications are recorded in the communication register Borealis.
	ML 6471 Condition 8 and Condition 9 MPL 149* MPL 152 Condition 8 and Condition 9 MPL 153 Condition 8 and Condition 9 MPL 154 Condition 8 and Condition 9 MPL 156 Condition 5 and Condition 6	**Completion** **Outcome Measurement Criteria – LUP2** Audit undertaken prior to application of lease surrender of all infrastructure locations against any relevant third-party liability legal transfer agreements and Government agreements demonstrates that all infrastructure have been removed, unless otherwise agreed with Government or signed legal documentation to transfer on going liability of the infrastructure to third parties is provided prior to the relinquishment of the tenement(s)	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.
		Outcome Measurement Criteria – LUP3 Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender verifies at infrastructure locations the Landscape Function Analysis (LFA) monitoring results indicate that the LFA curve has moved above, or is likely to move above the critical threshold of sustainability at infrastructure locations	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.
		Leading Indicator – LUP4 Rehabilitation trials shall be undertaken at infrastructure locations no longer required and ongoing assessment at LFA monitoring at sites (CEF1 – CEF7) are assessed annually demonstrating development of trends and annual improvement of rehabilitation through LFA methodology. Should the data indicate rehabilitation not trending towards sustainability route cause investigations will be undertaken and rectification methods be identified and implemented	Compliant	Baseline LFA data established from analogue sites. Site rehabilitation commenced in 2019. LFA sites established at two locations (LFA01-AL1 and LFA02-VOL1). Use of Point Centred Quarter (PCQ) method and Established Method enabled. Two new sites were established in spring 2022, both on the Western Access Road, one adjacent the Midway Quarry and one near the Tjungu Village. The current status and trend in landscape function measured at the four rehabilitation sites indicated a positive trend in the number and area of plants per hectare. Plant colonisation is currently dominated by short-lived perennial specials although several longer-lived perennials were also recorded. OMC LUP4 is considered to be in-progress/compliant. Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036).
		Leading Indicator – LUP6 Airstrip clearance and foreign object inspections prior to the landing and take-off of aircraft identify a rising trend in kangaroo, emu and stock access to the internal perimeter of the wildlife and stock control fence surrounding the airstrip	Compliant	Aerodrome inspections are undertaken by the Aerodrome Reporting Officer prior to the arrival of all incoming flights to ensure that no wildlife have entered the fenced complex and pose a risk of interaction with landing aircraft. No occurrences of fauna identification within the fenced aerodrome compound were recorded in 2023. Inspections are documented and retained on file.

* Intent of MPL 149 PEPR

9.9 LAND AND SOIL

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must ensure that there is no contamination of land and soils either on or off the Land as a result of mining operations or mining-related activities The Tenement Holder must ensure that no contamination of land and soils either on or off the Land post Completion occurs as a result of mining operations or mining-related activities	ML 6471 Condition 10.1 MPL 149 Schedule 2 Condition 9* MPL 152 Condition 10.1 MPL 153 Condition 10.1 MPL 154 Condition 10.1 MPL 156 Condition 7.1	**Construction and Operation** **Outcome Measurement Criteria – LS1** Investigation and corrective actions triggered as a result of an accidental spill at infrastructure locations that triggers the notification provisions of Part 9 of the *Environment Protection Act 1993* (SA) demonstrates that the spill was reported to the Director of Mines (or other authorised office) as soon as reasonably practicable after becoming aware of the harm or threatened harm, all risks were minimised so far as is reasonably practicable and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer) # # Material and Serious Environmental Harm are defined in the *Environment Protection Act 1993* (SA), Section 5(3). The act does not apply a definition for 'trivial', which is included within the definitions. Therefore, for the purpose of this criteria, any spills below 250 L are considered to be trivial or unlikely to result in material or serious environmental harm	Compliant	Zero (0) spills triggered notification requirements to DEM during the reporting period.
		Leading Indicator – LS2 Annual audit of waste disposal records, maintained at the site demonstrates that commercial and/or industrial wastes have been disposed of to an EPA licenced facility	Compliant	Monthly waste disposal records are provided by Cleanaway Pty Ltd for BHP Carrapateena and site contractors for all waste leaving the Carrapateena site. Transport certificates are generated by BHP Carrapateena personnel for waste types listed in Schedule 1 of the *Environment Protection Act 1993* (SA).
		Leading Indicator – LS3 Monthly audit of chemical storages at a selected infrastructure location demonstrates they have been constructed and are operating in accordance with the SA EPA Guideline 080/16 Bunding and Spill Management (2016)# # Alternative locations are to be selected until all locations have been completed or on a demonstrated risk-based approach	Compliant	• Thirty-two (32) general environmental compliance inspections were undertaken at selected infrastructure locations in 2023. • Actions raised during the year pertained to operational hygiene and were closed out within prescribed deadlines: o hazardous/chemical waste storage o vehicle wash pad hygiene o fuel bay cleanliness o waste segregation o housekeeping practices.
		Leading Indicator – LS4 Monthly audit of chemical storages at a selected infrastructure location demonstrates that all chemicals are recorded (including volumes) in the chemical database# # Alternative locations are to be selected until all locations have been completed or on a demonstrated risk-based approach	Compliant	BHP Carrapateena tracks the location and volumes of chemicals via the ChemWatch Database. Chemical storage areas are routinely audited as part of the environment inspection process to ensure that storage is acceptable and that safety data sheets (SDS) are maintained on file within the immediate area. Evidence is stored within INX InControl.
	ML 6471 Condition 10.2 MPL 149 Schedule 2 Condition 9* MPL 152 Condition 10.2 MPL 153 Condition 10.2 MPL 154 Condition 10.2 MPL 156 Condition 7.2	**Completion** **Outcome Measurement Criteria – LS5** Audit of rehabilitation activities at infrastructure locations and waste disposal records prior to application of lease surrender demonstrates that commercial and/or industrial wastes have been disposed of to an EPA licenced facility and no soil contamination (as defined in the National Environment Protection (assessment of Site Contamination) Measure 2013) remains in areas used for the handling and storage of hazardous materials	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.

* Intent of MPL 149 PEPR

9.10 AIR QUALITY

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the environment as a result of particulate emissions and/or dust generated by mining operations or mining-related activities	ML 6471 Condition 14	**Construction and Operation** **Outcome Measurement Criteria** – **AQ1** Quarterly gravimetric analysis and review of continuous dust deposition collected quarterly at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates dust deposition rates do not exceed 4 g/m^2/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005)	Compliant	The average rate of dust deposition at ERML16 to ERML19 (inclusive) in 2023 was 1.0 g/m^2/month. This is significantly below the OMC value of an annual average of 4 g/m^2/month in accordance with DEC 2005 guidance. In 2023, dust deposition rates generally continued the downward trend observed in the latter half of 2022 following the completion of TSF Stage 2 embankment construction works. Dust deposition rates at ERML16 (TSF North) were highly variable throughout the year and peaked in the last quarter at 4.2 g/m^2/month, with an annual average of 2.5 g/m^2/month at this monitoring location. This is considered likely to be the result of material movements related to local construction and maintenance activities associated with the TSF and decant dam embankment and the installation of additional local seepage control measures. Refer to Section 2.2 of Appendix E 2023 Air Quality Monitoring Report (CA-000-ENV-REP-1041)
		Outcome Measurement Criteria – **AQ2** Annual (spring) surveys undertaken by a suitably qualified and experienced expert demonstrates no adverse impact on the diversity and abundance of native vegetation at monitoring sites directly attributed to dust deposition from mining operations or mining-related activities when compared to baseline native vegetation conditions	Compliant	Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036)
		Outcome Measurement Criteria – **AQ3** Audit (TSF Closure Strategy Verification Report) undertaken by an independent suitably qualified expert approved by the Director of Mines (or other authorised officer) demonstrates#: • that data has been collected for the calibration of the Air Quality Model and Landform Evolution Model as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 • that data collected as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 (and any other relevant data) demonstrates that the TSF closure strategies set out in the PEPR (Section 4.17.3), specifically the requirement for no TSF cover system, would be effective in achieving the relevant environmental outcomes. The audit must also include the following information in each TSF closure strategy verification report: • recommendations for any changes to existing TSF closure strategies to ensure achievement of the relevant environmental outcomes; and • recommendations for any new TSF closure strategies to ensure achievement of the relevant environmental outcomes; The audit will be provided to the Mining Regulator at the following frequencies: • an initial report at 6 years after lease grant (allowing for 2 years to reach first tailings deposition, and 4 years to conduct the relevant scientific investigations); and • 8 years after lease grant; and • 10 years after lease grant; or • any other timeframe as agreed between the Tenement Holder and Director of Mines (or other authorised officer) Demonstration of achievement of the outcome will be met through the independent and suitably qualified expert verifying the requirement for no TSF cover system at any of the time intervals stated above. If the independent and suitably qualified expert can not verify the requirement for no TSF cover system, demonstration of achievement of the outcome will be met through: • PEPR review which details the changed and/or new TSF closure strategies; and • payment of a Bond (or top up to the existing Bond) to reflect the rehabilitation liability of the changed and/or new TSF closure strategies. # The scope of the audit will be agreed by the Tenement Holder and the Director of Mines (or other authorised officer) at an appropriate time ahead of delivery of the initial report.	Not relevant	Carrapateena is within an operational phase, initial report to be provided in 2024.

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
		Leading Indicator – **AQ4** Annual laboratory analysis of continuous metals in dust at sites adjacent to the Tailings Storage Facility (ERML16 –ERML19) demonstrates a rising trend in metals concentrations when compared to previous monitoring results (ERML1–ERML15)	Compliant	Metals in deposited dust concentrations were generally similar to the previous reporting period. Measured concentrations of metals are typically consistent with pre-operations baseline concentrations with the exception of chromium, copper and nickel. Whilst these metals concentrations are elevated compared to those recorded during baseline monitoring, they remain consistent with previous reporting periods, and no clear trends regarding rising concentrations are observed. Metals in dust from sites ERML16 to ERML19 inclusive were compared to long-term average metal in dust concentrations and baseline concentrations from ERML01 to ERML15. Metals concentrations at sites around the TSF continue to be, in general, elevated compared to other monitoring sites across the operation. Refer to Section 2.2 of Appendix E 2023 Air Quality Monitoring Report (CA-000-ENV-REP-1041)
		Leading Indicator – **AQ5** Calibration of the air quality model (Air Quality Modelling and Assessment of Effects, PEPR Appendix C1) is undertaken at years 6/8/10 of the Tailings Storage Facility operation with operational monitoring data and dust threshold lift data established in the tailings beach trials and validates modelling outputs (Table 8.3 PEPR).	Not relevant	Stage 1 of the TSF commenced operation on 25 February 2020. Calibration of the air quality model occurred in 2024.
		Leading Indicator - **AQ6** Annual audit by an independent and suitably qualified expert of dust threshold lift data from the tailings beach trials at the Tailings Storage Facility is compared to the Air Quality Model (Appendix C1) dust threshold lift speed of 5.4m/s. Should the threshold lift speed is <5.4m/s an assessment will be undertaken by an independent and suitably qualified expert to determine if there is a material deviation expected on modelling outputs that triggers a model calibration. #Linked to Outcome Measurement Criteria – AQ3	Not relevant	Operation of the TSF continued in its fourth year of operation during 2023. During the reporting period BHP Carrapateena commissioned an in-field dust lift off study in conjunction with Engineer of Record, WSP. The study was completed in March 2024 and included the deployment of a portable in-situ wind erosion laboratory (PI-SWERL) at the TSF to characterise wind erosion emissions parameters. The Air Quality Model was updated in 2024 and in-field validation of wind erosion parameters can be reincorporated into future air quality assessments.
		Leading Indicator – **AQ7** Annual soil sampling and laboratory analysis undertaken at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates a rising trend in metals concentrations when compared to previous monitoring results[#] # Linked to Land and Soil Outcome (Schedule 6 Condition 10.1)	Compliant	The average concentration of metals in soil sediments was presented in Appendix B1 to the MLP (OZ Minerals 2017a), with sites SED2, SED6 and SED8 occurring in the Eliza Creek catchment. Comparison against monitoring undertaken during 2023 is presented within Appendix E 2023 Air Quality Monitoring Report (CA-000-ENV-REP-1041) This demonstrates that measured concentrations at the ERML sites are consistent with previous reporting periods. The measured concentrations remain (generally) orders of magnitude less than the relevant National Environment Protection (Assessment of Soil Contamination) Measure guidelines for commercial/industrial environments. The 2019 values are considered to represent baseline conditions at the ERML sites as no tailings deposition occurred prior to the soil sampling in 2019. Refer to Section 2.2 of Appendix E 2023 Air Quality Monitoring Report (CA-000-ENV-REP-1041)
		Leading Indicator – **AQ8** Quarterly iso-kinetic sampling of the Flash Steam Heat Recovery Stack, Plant Extraction Scrubber Stack and Nonox Vent Scrubber Stack at the Concentrate Treatment Plant demonstrates compliance with Schedule 1 of the Environment Protection (Air Quality) Policy 2016 (SA) (Table 8.3 PEPR)# # Linked to CTP Condition (Schedule 2 Condition 15)	Not relevant	CTP is no longer under consideration
		Leading Indicator – AQ9 Monthly analysis of the trends associated with the Concentrate Treatment Plant scrubber efficiencies (continuous data logging) indicates a decrease in the performance of the scrubbing systems when compared to previous months[#]	Not relevant	CTP is no longer under consideration

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
		# Linked to CTP Condition (Schedule 2 Condition 15)		
		Leading Indicator – AQ10 Quarterly audit of inspection records (including photographic evidence) maintained at the site by the transport contractor demonstrate the integrity of containers have been checked prior to departure to ensure no release of concentrate to the environment[#] # Linked to Concentrate Transport Condition (Schedule 2 Condition 16)	Not relevant	CTP is no longer under consideration
		Completion **Outcome Measurement Criteria – AQ11** Laboratory analysis of continuous dust deposition collected monthly at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) post completion for a period of no less than one (1) year (dry weather cycle and tailings must be of a moisture content and crust thickness as per the air quality model inputs) demonstrates dust deposition rates do not exceed 4 g/m^2/month as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005)	Not relevant	CTP is no longer under consideration
		Outcome Measurement Criteria – AQ12 An ecological risk assessment including soil sampling at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) undertaken in accordance with NEPM (Assessment of Site Contamination 1999) by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender verifies concentrations of metals are within the site specific Ecological Investigation Levels. Ecological Investigation levels to be derived based on the ecological risk assessment framework detailed in Schedule B5a "Guideline on Ecological Risk Assessment[#] # Linked to Land and Soil Outcome (Schedule 6 Condition 10.2)	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.

9.11 RADIATION

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder, must during construction, operation and post Completion ensure no public health or environmental impacts from radionuclides (including radon) as a result of mining operations or mining-related activities	ML 6471 Condition 16	**Operations** **Outcome Measurement Criteria – RAD1** Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations (ERML1–ERML19) demonstrates total radiation doses do not exceed 1mSv/annum for members of the public (Appendix C7 PEPR Radioactive Waste Management Plan)	Compliant	Average annual dose to the public was 0.0612 mSv. When referring to the 'public' it pertains to a scenario where the public were able to access the mining lease after institutional control. Quarterly monitoring for radon, gamma and radionuclides in dust was undertaken in 2023. The annual monitoring period July 2022 – June 2023 is compliant. Refer to Section 3 of Appendix F 2023 Environmental Radiation Impact Assessment (CA-000-ENV-REP-1042).
		Outcome Measurement Criteria – RAD2 Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates total radiation doses do not exceed 10 µGy/hour for non-human biota (Appendix C7 PEPR Radioactive Waste Management Plan)	Compliant	Quarterly monitoring for radon, gamma and radionuclides in dust was undertaken in 2023. The annual monitoring period July 2022 – June 2023 is compliant. Total dose rate per organism fell well below the 10 µGy/hour no effect threshold: • Red Kangaroo (*Macropus rufus*) – 6.82E-02 µGy/hour • Emu (*Dromaius novaehollandiae*) – 8.78E-03 µGy/hour • Sand Goanna (*Varanus gouldii*) – 2.59 µGy/hour. Refer to Section 2 of Appendix F 2023 Environmental Radiation Impact Assessment (CA-000-ENV-REP-1042).
		Completion **Outcome Measurement Criteria – RAD3** Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations adjacent to the Tailings Storage Facility (ERML16–ERML19) post completion for a period of no less than one (1) year (dry weather) cycle and tailings must be of a moisture content and crust thickness as per the air quality model inputs) demonstrates total radiation doses do not exceed 1 mSv/annum for members of the public (Appendix C7 PEPR Radioactive Waste Management Plan)	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.
		Outcome Measurement Criteria – RAD4 Annual audit undertaken by an independent and suitably qualified expert of radon and radionuclides data (methods outlined Appendix E Radioactive Waste Management Plan) at monitoring locations (ERML1–ERML19) post completion for a period of no less than one (1) year (dry weather cycle and tailings must be of a moisture content and crust thickness as per the air quality model inputs) demonstrates total radiation doses do not exceed 10 µGy/hour for non-human biota (Appendix C7 PEPR Radioactive Waste Management Plan)	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.

9.12 SURFACE WATER – EROSION AND SEDIMENTATION

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities	ML 6471 Condition 17 MPL 149* MPL 152 Condition 13 and 14 MPL 153 Condition 13 and 14 MPL 154 Condition 13 and 14 MPL 156 Condition 11	**Construction and Operation** **Outcome Measurement Criteria – SWES1** Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) at surface water sampling sites (SW05–SW09) at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (whichever is greater) (PEPR Table 8.7; pH, EC, SS and hydrocarbons) whichever is greater	Compliant	Surface water monitoring was undertaken on two (2) occasions in the reporting period (January 2023 and December 2023). The requirement of sampling within seven days of a rain event that creates flows was not met during the January sampling event as the sites were inaccessible due to flooding of access tracks. Four (4) hydrocarbon exceedances were recorded in 2023. Minor hydrocarbon concentrations may be sourced from the environment (biogenic), pastoral activities, mining or contamination during sampling. Refer to Section 1.1 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water) (CA-0000-ENV-REP-1040)
	ML 6471 Condition 17 MPL 152 Condition 13 and 14 MPL 153 Condition 13 and 14 MPL 154 Condition 13 and 14 MPL 149*	**Leading Indicator – SWES2** Audit of surface water management infrastructure undertaken annually (prior to summer) demonstrates surface water management infrastructure is as constructed and have been maintained in accordance with the design and corrective actions closed out within 14 days	Compliant	Annual surface water management infrastructure audit completed in September 2023 (INX #21894). A combination of drone imagery captured by BHP Carrapateena personnel and on-ground inspection were utilised to assess the integrity of surface water infrastructure: • Subsidence zone diversion drain • WRD containment ponds (A, B, C) • Aerodrome diversion drains and • MPP and non-process infrastructure (NPI) event ponds. Observations are summarised below: • No major damage to key infrastructure which would impact the ability to manage flows • Minor erosion observed within internal drains • No seepage/lateral expression of water in WRD containment ponds • Negligible silting of WRD containment ponds • Event pond outfall intact, no evidence of scouring • Minor sedimentation from diversion drain outfall (aerodrome/subsidence zone).
		Leading Indicator – SWES3 Audit of surface water management infrastructure undertaken at least once a year within seven days of a rainfall event required to create flows demonstrates surface water management infrastructure have performed in accordance with the design and corrective actions closed out within 14 days	Compliant	One audit of surface water infrastructure was completed in January following rain events recorded in late December 2022 (INX #25730) Key infrastructure surface water infrastructure inspected: • TSF (embankment, decant dam and internal bunds). • WRD to TSF Haul Road • Western Access Road
	ML 6471 Condition 17	**Outcome Measurement Criteria – SWES4** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender confirms by a construct to design audit that the abandonment bund around the subsidence zone and the Tailings Storage Facility Final Embankment have been rock armoured in accordance with the identification of material types identified in detailed design[#] # Linked to strategies SWES13 and SWES14	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.
	ML 6471 Condition 17 MPL 149* MPL 152 Condition 13 and 14 MPL 153 Condition 13 and 14 MPL 154 Condition 13 and 14	**Outcome Measurement Criteria – SWES5** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates that all culverts, fords, and surface water management infrastructure that is not required post completion is removed in a manner to ensure long term physical stability in consideration of potential erosion and sedimentation and natural flow regimes have been restored	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
	ML 6471 Condition 17	**Outcome Measurement Criteria – SWES6** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates waste rock, ore stockpiles and soil stockpiles have been removed from the ground surface	Not relevant	Carrapateena is within an operational phase, this is a completion criteria and as such, is not relevant.
	MPL 156 Condition 11 and 12	**Outcome Measurement Criteria – EC01** Baseline ecological surveys must be undertaken at water dependent ecosystems including, but not limited to SW-6 and SW-7 prior to the impact of mining operations or mining-related activities on the existing environment	Compliant	Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036).

* Intent of MPL 149 PEPR

9.13 SURFACE WATER – REDUCED FLOWS

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities	ML 6471 Condition 17	**Operations** **Outcome Measurement Criteria – SWRF1** Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems at Eliza Creek monitoring attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (PEPR Appendix C6 - Ecological Baseline) unless a significant environmental benefit has been approved in accordance with the relevant legislation # # Linked to Native Vegetation Outcome (Schedule 6 Condition 11) – If surveys show that there is a permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities, a significant environmental benefit must be established approved in accordance with the relevant legislation)	Compliant	Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036)

9.14 SURFACE WATER – TAILINGS STORAGE FACILITY

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities	ML 6471 Condition 17	**Construction and Operation** **Outcome Measurement Criteria – TSF1** Quarterly sampling and laboratory analysis of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1S–TSFMB4S) and analysis of pH, Metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.11; pH, EC and metals) whichever is greater	Non-compliant	TSFMB3s held groundwater during the reporting period, which was also the case in the 2022 reporting period. Exceedances of electrical conductivity (EC), aluminium, barium, cobalt, copper, lead, strontium, uranium and iron were recorded at TSFMB3s which may be influenced by shallow lateral seepage occurring from the TSF. EC, copper, cobalt, lead and iron maximum concentrations were above the relevant default guideline values, with the remaining parameters falling outside the range for baseline data of shallow alluvial weathered Proterozoic. Moisture was reported in the bottom of TSFMB1s however there was not enough water to collect a representative sample. BHP Carrapateena engaged a consultant in Q4 2022 to review, refine and designate site-specific baseline ranges for the Leading Indicator and Compliance Wells. A report is anticipated in Q2 2024. Refer to Section 1.2.1 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040).
		Outcome Measurement Criteria – TSF2 Quarterly monitoring of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1S–TSFMB4S) demonstrates that the standing water 'levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well'	Non-compliant	Shallow monitoring wells downstream of the TSF remained dry, with the exception of TSFMB3s, which recorded standing water levels between 24.23 mTOC and 26.23 mTOC throughout the reporting period. Standing water level (SWL) has shallowed slightly since water was initially detected in 2019. Given the water was detected prior to deposition of tailings to the TSF, it is unlikely to be shallow lateral seepage. Water quality is typically of better water quality than the Tent Hill Aquifer (THA). It may be due to a previously unidentified shallow perched aquifer which are known to occur in the area, or inflow from a nearby borrow pit (BP3). Refer to Section 1.2.1 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040).
		Outcome Measurement Criteria – TSF3 Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek (SW05–SW09) at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.7; pH, EC and metals) whichever is greater	Compliant	Outcome Measurement Criteria TSF3 states that opportunistic surface water sampling is required at Eliza Creek monitoring locations (SW05 – SW09). As previously discussed in the 2021 and 2022 Groundwater and Surface Water Monitoring Reports, only sites SW05, SW06 and SW07 are reported under OMC TSF3 as SW08 and SW09 are within Salt Creek, not Eliza Creek. Throughout the monitoring period, surface water sampling was possible in South Eliza Creek due to >20 mm rainfall events resulting in streamflow. Analytical results are available for SW05, SW06 and SW07. All three sites are below both ANZECC Freshwater and baseline data for pH, suspended solids, Al, As, Ba, Co, Cu, Pb, Mn, Se and St. Analytical results for Uranium at all three sites are at the Limit of Reporting (LOR) and are negligible. BHP Carrapateena is currently establishing site specific guideline values (SSGVs) to replace Leading Indicator baseline ranges for groundwater at TSF wells, surface water and sediment monitoring locations. This work will be finalised in 2024 and incorporated into the 2025 PEPR revision. Refer to Section 1.2.2 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water) (CA-0000-ENV-REP-1040).
		Outcome Measurement Criteria – TSF4 Annual sediment sampling and laboratory analysis for metals shall be undertaken within Eliza Creek (IT01–IT03) and demonstrates sediments meet ANZECC/ARMCANZ (2000) Sediment Quality Guidelines or baseline ranges (determined prior to commencement Stage 1 Tailings commissioning) whichever is greater	Compliant	Sediment sampling was undertaken at sites IT01 to IT03 within Eliza Creek in March 2023. One sample was collected and analysed for each site. Metals concentrations for all sites were within the relevant guideline value or baseline ranges, except for uranium at locations IT02. Refer to Section 1.2.3 of 2023 Environmental Monitoring Report Ground and Surface Water (CA-0000-ENV-REP-1040)

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
		Outcome Measurement Criteria – TSF5 Reporting, investigation and corrective actions triggered as a result of an accidental spill from Tailings Delivery Infrastructure or seepage from the Tailings Storage Facility as identified through Leading Indicators TSF7, TSF10 or TSF11 that relate to serious or material environmental harm demonstrates that spills are reported to the Director of Mines (or other authorised office) as soon as reasonably practicable after becoming aware of the harm or threatened harm, all risks were minimised so far as is reasonably practicable and that any corrective actions are closed out within 30 days or as agreed with the Director (or other authorised officer)	Compliant	Construction of TSF Stage 1 was completed in September 2019. Tailings deposition commenced in February 2020 as the MPP was gradually ramped up to nameplate capacity in the latter stages of the year. Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. No spillage or release of tailings outside of the TSF or plant footprint was recorded in 2023.
		Outcome Measurement Criteria – TSF6 Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems at Eliza Creek monitoring sites attributed to tailings seepage when compared to baseline conditions (PEPR Appendix C6 – Ecological Baseline) [#] # Linked to Native Vegetation Outcome (Schedule 6 Condition 11) – If surveys show that there is a permanent loss of abundance and/or diversity of native vegetation on or off the Land as a result of mining-related activities a significant environmental benefit must be established approved in accordance with the relevant legislation	Compliant	Refer to Table 4-1 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036).
		Outcome Measurement Criteria – TSF7 Audit (TSF Closure Strategy Verification Report) undertaken by an independent suitably qualified expert approved by the Director of Mines (or other authorised officer) demonstrates[#]: 1. that data has been collected for the calibration of the Air Quality Model and Landform Evolution Model as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 2. that data collected as per Leading Indicators AQ5, AQ6, TSF8 and TSF9 (and any other relevant data) demonstrates that the TSF closure strategies set out in the PEPR (Section 4.17.3), specifically the requirement for no TSF cover system, would be effective in achieving the relevant environmental outcomes. The audit must also include the following information in each TSF closure strategy verification report: 3. recommendations for any changes to existing TSF closure strategies to ensure achievement of the relevant environmental outcomes; and 4. recommendations for any new TSF closure strategies to ensure achievement of the relevant environmental outcomes; The audit will be provided to the Mining Regulator at the following frequencies: 5. an initial report at 6 years after lease grant (allowing for 2 years to reach first tailings deposition, and 4 years to conduct the relevant scientific investigations); and 6. 8 years after lease grant; and 7. 10 years after lease grant; or 8. any other timeframe as agreed between the Tenement Holder and Director of Mines (or other authorised officer) Demonstration of achievement of the outcome will be met through the independent and suitably qualified expert verifying the requirement for no TSF cover system at any of the time intervals stated above. If the independent and suitably qualified expert can not verify the requirement for no TSF cover system, demonstration of achievement of the outcome will be met through: 9. PEPR review which details the changed and/or new TSF closure strategies; and 10. payment of a Bond (or top up to the existing Bond) to reflect the rehabilitation liability of the changed and/or new TSF closure strategies. # The scope of the audit will be agreed by the Tenement Holder and the Director of Mines (or other authorised officer) at an appropriate time ahead of delivery of the initial report.	Not relevant	Construction of TSF Stage 1 was completed in September 2019. Tailings deposition commenced in February 2020 as the MPP was gradually ramped up to nameplate capacity in the latter stages of the year. Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. TSF Closure Strategy Verification Report to be delivered in 2024.
		Leading Indicator – TSF8 Calibration of the Landform Evolution Model is undertaken at years 6/8/10 of the Tailings Storage Facility operation with erosion field study data and validates modelling outputs (PEPR Appendix B1 Tailings Storage Facility Design (Landform Evolution Modelling)[#] #Linked to Outcome Measurement Criteria – TS7	Not relevant	Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. Calibration of the TSF LEM was executed in 2022 using TSF Stage 2 embankment construction material and refined tailings properties. Key findings included:

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
				• The water storage capacity of the closed TSF would be reduced over time, but it is unlikely the TSF would spill during extreme storm events. • It would not result in tailings discharge to the environment. • It would result in minor erosion of the embankment. • The next calibration of the TSF LEM will occur in 2025 (Year 6).
		Leading Indicator – TSF9 Annual audit by an independent and suitably qualified expert of laboratory and field data including rainfall intensity, tailings particle sizes, in-channel lateral erosion parameters, 'm' from the tailings beach trials at the Tailings Storage Facility is compared to the Landform Evolution Model (PEPR Appendix B1 – Tailings Storage Facility Design (Landform Evolution Modelling)) input assumptions. Should values deviate outside of the sensitivities in Table 8.2 an assessment will be undertaken by an independent and suitably qualified expert to determine if there is a material deviation expected on modelling outputs that model calibration[#] #Linked to Outcome Measurement Criteria – TS7	Compliant	Golder Associates reviewed the Landform Evolution Model (LEM) inputs as described within TSF9 as a deliverable within the scope of the Annual Dam Safety review conducted in January 2022 (CA-3630-PRM-REP-1516). Key findings include: • Future updates to the LEM should also consider less frequent and higher intensity rainfall events. • A review of tailings Particle Size Distribution (PSD) data shows consistency between the adopted PSD (the annual average was slight lower (3.12 g/m^3) compared with the 2020 period (3.29 g/m^3). • Conservative assumption that PSD of rockfill diminishes over time to that of tailings. The long-term performance of the coarse rockfill on the downstream slope of the decant dam embankment and future TSF Stage 2 embankment should be reviewed. This will be addressed through implementation of the infield erosion trial following construction of TSF Stage 2 embankment in 2022.
		Leading Indicator – TSF10 Inspection (including photographic evidence) of the Eliza Creek bed (IT01–IT03) undertaken quarterly demonstrates visual evidence of shallow lateral seepage surface expressions (salt crystals, salinisation or water logging) and triggers further investigation (Outcome Measurement Criteria TSF5)	Compliant	Quarterly inspections of the Eliza Creek bed (IT01–IT03) were undertaken using both drone and on-ground methodology. No evidence of seepage/salt expression at surface was observed during the reporting period.
		Leading Indicator – TSF11 Audit undertaken by a suitably qualified expert approved by the Director of Mines (or other authorised officer), including quality assurance inspections undertaken during construction prior to commissioning of Stage 1 of the Tailings Storage Facility and signed by construction manager demonstrates that seepage design controls and TSF and Decant embankment foundation preparation have been constructed in accordance with the design (PEPR Appendix B1 – Tailings Storage Facility Design)[#] # Tailings Storage Facility Audits (Schedule 2 Condition 4.1). The expert reports for the audits of Stage 1 of TSF embankment construction must address all items as specified in Schedule 2 Condition 10	Compliant	Works completed in accordance with the design and documented in TSF Stage 1 and Stage 2 construction reports: • CA-3630-CIV-REP-1018 (TSF Stage 1) • CA-3630-CIV-REP-1054 (TSF Stage 2). Independent audit completed by ATC Williams prior to operation: • CA-3630-QAC-REP-2016 (TSF Stage 1) • CA-3630-PRM-REP-1524 (TSF Stage 2).
		Leading Indicator – TSF15 Audit undertaken by a suitably qualified expert approved by the Director of Mines (or other authorised officer), including quality assurance inspections undertaken during construction prior to commissioning of Stages 2, 3, 4 and 5 of the Tailings Storage Facility and signed by construction manager demonstrates embankment foundation preparation have been constructed in accordance with the design (PEPR Appendix B1 – Tailings Storage Facility Design)[#] # Tailings Storage Facility Audits (Schedule 2 Condition 4.2). The expert reports for the audits of Stages 2, 3, 4 and 5 of TSF embankment construction must address all items as specified in Schedule 2 Condition 10	Not relevant	Construction of TSF Stage 2 was completed in May 2022 under the technical guidance from Engineer of Record WSP Golder.
		Leading Indicator – TSF16 Audit undertaken by a suitably qualified expert approved by the Director of Mines (or other authorised officer), including quality assurance inspections and audit of records of the Operations, Maintenance and Surveillance Manual of the Tailings Storage Facility undertaken every 3 months during Stage 1 and 2 every 6 months for Stage 3, 4, 5 and 6 demonstrates that the TSF is being operated in accordance with design (PEPR Appendix B1 – Tailings Storage Facility Design) and the Operations, Maintenance and Surveillance Manual[#] # Tailings Storage Facility Audits (Schedule 2 Condition 4.3 and 4.4)	Compliant	During 2023, prescribed TSF audits were undertaken at the required frequency outlined within the TSF Operations, Maintenance and Surveillance Manual (CA-3630-CIV-MNL-1000). Five inspections were undertaken pertaining to operation of the TSF during the reporting period: • Tailings Storage Facility, Q1 2023 Site Visit and Monitoring Report, June 2023 (WSP) (CA-3630-CIV-REP-1065) • Tailings Storage Facility, Q2 2023 Site Visit and Monitoring Report, September 2023 (WSP) (CA-3630-CIV-REP-1075) • Tailings Storage Facility, Q3 2023 Site Visit and Monitoring Report, December 2023 (WSP) (CA-3630-CIV-REP-1081) • Tailings Storage Facility, Engineer of Record Annual Inspection Report, January 2023 to January 2024 (WSP) (CA-3630-CIV-REP-1094)

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
				• ATC Williams annual independent audit completed in February 2023, final report pending.
		Leading Indicator – TSF21 Monthly water sampling and laboratory analysis from the TSF supernatant pond and lined decant pond of pH, EC, and, metals validates geochemical modelling predictions (PEPR Table 8.10; pH, EC and metals). Should values deviate by +/- 10% an investigation will be undertaken and seepage model re-run[#] # Surface Water Strategy (Schedule 6 Condition 22) and Groundwater Strategy (Schedule 6 Condition 26.2)	Non-compliant	Monthly samples were obtained as per the frequency prescribed by TSF21. During the reporting period supernatant/decant water deviated outside of the 10% modelled range (notably copper, uranium and molybdenum); triggering TSF21. BHP Carrapateena engaged LWC during the reporting period to review supernatant water quality composition and determine whether there is any materiality with respect to the original assessment formulated by LWC in 2019. The 2023 work was completed and an updated affects assessment will be presented in future PEPR and impact assessments. Refer to Section 11 for rectification of non compliance.
		Leading Indicator – TSF23 Quarterly water sampling in the seepage cut-off drain (SCD1) and analysis of pH, EC and metals is compared to geochemical modelling prediction (PEPR Table 8.10; pH, EC and metals). Should values deviate by +/- 10% an investigation will be undertaken and seepage model re-run[#] # Groundwater Strategy (Schedule 6 Condition 26.2)	Non-compliant	Quarterly samples were obtained as per the frequency prescribed by TSF21. Geochemical composition of downstream toe seepage differed by magnitudes in comparison to supernatant/decant. Maximum uranium concentration recorded was 0.020 mg/L compared to 1.34 mg/L in supernatant water, whilst the annual average was 0.017 mg/L. Copper, the other element of interest, was measured (0.054 mg/L maximum value) in magnitudes less than supernatant (1.25 mg/L maximum value) and averaged 0.022 mg/L for the reporting year. LWC were engaged to re-run the seepage model with observed supernatant water quality data. The review was completed and an updated geochemical affects assessment will be presented in future PEPR and impact assessments. Refer to Section 11 for rectification of non compliance.
		Leading Indicator – TSF24 Water sampling and analysis of pH, metals and EC in the seepage cut-off drain after a rainfall event that results in the activation of the flood storage area of the decant dam will be undertaken and compared to geochemical modelling prediction (PEPR Table 8.10; pH, EC and metals). Should values deviate by +/- 10% an investigation will be undertaken and seepage model re-run	Non-compliant	Significant rain events accumulating >20 mm were recorded four times throughout 2023 however the flood storage area of the TSF Decant Dam was only activated following 50 mm in December 2023. A sample was collected and dispatched to a NATA-accredited laboratory for analysis. The only accessible sampling location was near the decant outflow pipe therefore water quality was generally not representative of runoff. High salinity (106,000 µS/cm) aligned with typical levels observed in the supernatant. An updated geochemical assessment of effects will be presented in future PEPR and impact assessments. Refer to Section 11 for rectification of non compliance.

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
		Completion **Outcome Measurement Criteria – TSF35** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) after the final discharge of tailings into the TSF and prior to commencement of final rehabilitation, closure and decommissioning of the TSF and Decant Dam including a review of the operational TSF audit reports and other relevant information and demonstrates that the Tailings Storage Facility has been operated within design (PEPR Appendix B1 – Tailings Storage Facility Design) or any operational deviations from design parameters have been assessed and addressed appropriately and therefore can be expected function in the long term as per the design[#] # Tailings Storage Facility Audits (Schedule 2 Condition 4.5). The expert reports for the audits of Stage 1 of TSF embankment construction must address all items as specified in Schedule 2 Condition 10	Not relevant	TSF is within operational phase.
		Outcome Measurement Criteria – TSF36 Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) after the final TSF and Decant Dam rehabilitation, closure and decommissioning works have been completed, demonstrates that the Tailings Storage Facility embankment and spillways have been constructed to design (PEPR Appendix B1 – Tailings Storage Facility Design) to ensure long term physical stability in consideration of potential erosion and sedimentation of the downstream environment[#] # Tailings Storage Facility Audits (Schedule 2 Condition 4.6). The expert reports for the audits of Stage 1 of TSF embankment construction must address all items as specified in Schedule 2 Condition 11	Not relevant	TSF is within operational phase.
		Outcome Measurement Criteria – TSF37 Quarterly sampling of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1S– TSFMB4S) at the cessation of tailings discharge for a period of no less than one (1) year and analysis of pH, Metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.15; pH, EC and metals) whichever is greater	Not relevant	TSF is within operational phase.

9.15 SURFACE WATER – ACID AND METALLIFEROUS DRAINAGE

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities	ML 6471 Condition 17	Construction and Operation **Outcome Measurement Criteria – AMD1** Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.9; pH, EC and metals) whichever is greater	Compliant	Throughout the reporting period, surface water sampling was conducted in South Eliza Creek due to >20 mm rainfall events resulting in streamflow. The requirement of sampling within seven days of a rain event that creates flows was not met on either occasion as the sites were inaccessible due to flooding of access tracks. All three sites are below both ANZECC Freshwater and baseline data for pH, suspended solids, Al, As, Ba, Co, Cu, Pb, Mn, Se and St. Analytical results for Uranium at all three sites are at the LOR and are negligible. During 2023 there was no evidence of a PAF reaction within tailings water, both supernatant and decant, with pH remaining constant and near neutral. In late 2022, Egi Pty Ltd were commissioned to undertake a program of kinetic test work to confirm the NAF classification of tailings. Refer to Section 1.3 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water.
		Leading Indicator – AMD2 Audit of the production stockpile pad undertaken at the completion of construction and prior to the placement of material above the sulphur cut-off grade and signed by construction manager demonstrates the production stockpile pad has been constructed in accordance with the basis of design	Compliant	Construction of the pre-production stockpile pad was completed to design (CA-2800-CIV-GAR-1005). As-built pavement layout includes 400 mm layer of quartzite overlaying, 400 mm layer of Woomera Shale (NAF – acid consuming) overlaying, 450 mm CBR 45 and a 300 mm re-worked clay subgrade base. Completion and handover to BHP Carrapateena is evidenced in CA-2800-QAC-CRT-1001.
		Leading Indicator – AMD3 Annual audit of the block model maintained at the site with updated geological and sulphur assay data to determine the sulphur distribution of all waste for the forward year to estimate the distribution and estimation of volume of AMD material using the sulphur cut-off grade and develop or adjust management requirements if needed	Compliant	The block model is maintained and continually updated to identify areas of PAF which are delineated, handled and reported in accordance with the Carrapateena Acid and Metalliferous Drainage Management Plan (CA-ENV-PLN-1013) and associated procedures. PAF waste is currently blended with ore and sent to the mill for processing.
		Leading Indicator – AMD4 Audit of waste rock and ore stockpiles at the surface including reconciliation of volumes undertaken annually demonstrates that all potential AMD material has been handled in accordance with the management requirements determined by the annual block model review and in accordance with the AMD Management Plan	Compliant	Regular audits are undertaken to ensure material identified as PAF is sent to the mill for processing and not to the waste rock dump. Delineation, handling and reporting of PAF waste is undertaken in accordance with the Carrapateena Acid and Metalliferous Drainage Management Plan (CA-ENV-PLN-1013) and associated procedures.
		Completion **Outcome Measurement Criteria – AMD5** Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender demonstrates ore stockpiles have been removed from the ground surface[#] # Surface Water Strategy (Schedule 6 Condition 21.12)	Not relevant	Carrapateena is in an operational phase.
		Outcome Measurement Criteria – AMD6 Audit undertaken by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) prior to application of lease surrender including a review of mine block model records, reconciliation records, geological and sulphur assay data, updates of sulphur cut-off grade and other relevant information demonstrates that waste rock and ore stockpiles have been managed appropriately to prevent AMD	Not relevant	Carrapateena is in an operational phase.

9.16 GROUNDWATER – TAILINGS STORAGE FACILITY

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure that there is no adverse change to groundwater quality within aquifers outside of the TSF seepage zone of influence area delineated by the groundwater model as a result of mining operations or mining-related activities.	ML 6471 Condition 24	**Construction and Operation** **Outcome Measurement Criteria – GW1** Quarterly sampling and laboratory analysis of THA Wells downstream of the Tailings Storage Facility (TSFMB1D – TSFMB4D) and analysis of pH, EC and metals demonstrates water quality are within the site groundwater baseline composition ranges (PEPR Table 8.15)[#] # Groundwater Criteria (Schedule 6 Condition 27.2)	Non-compliant	Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. Monitoring was conducted at a quarterly frequency as per GW1. Electrical Conductivity of TSF1D continued to demonstrate increasing salinity over the reporting period from 65,900 to 90,900 µS/cm and correlates with hydraulic loading (mounding) and seepage from the TSF. EC of TSF 3D increased from 31,100 to 44,600 µS/cm. EC of TSF 4D increased from 31,900 to 40,500 µS/cm. BHP Carrapateena will continue to monitor groundwater at the prescribed frequency in 2024. Refer to Section 11 for rectification of non compliance Refer to Section 2.1.1 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040)
		Outcome Measurement Criteria – GW2 Quarterly monitoring of THA monitoring wells downstream of the Tailings Storage Facility (TSFMB1D – TSFMB4D) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well. # Groundwater Criteria (Schedule 6 Condition 27.1)	Non-compliant	Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023. Monitoring was conducted at a quarterly frequency as per GW2. The standing water level recorded at all three bores is higher than the groundwater modelled prediction and has continued to increase in elevation (mAHD) over the reporting period. These observations imply hydraulic loading of the THA aquifer in the immediate vicinity of the TSF. Standing water levels are shallower (closer to ground level) in all three wells. TSF1D gained 4.26 m to 82.76 mAHD, TSF3D increased 3.23 m to 78.03 mAHD and TSF4D increased 4.31 m to 82.58 mAHD. Throughout the monitoring period all three bores recorded further recharge (mounding) as predicted, in groundwater modelling, with the greatest increase recorded of 4.31 m at TSF4D. The THA wells will continue to be monitored quarterly and compared to the groundwater model predicted hydrograph. Refer to Section 11 for rectification of non compliance Refer to Section 2.1.2 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040)

9.17 GROUNDWATER – DRAWDOWN

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure that there is no adverse change to groundwater quantity within aquifers outside of the predicted extent of groundwater drawdown delineated by the groundwater model as a result of mining operations or mining-related activities.	ML 6471 Condition 25 and 26 MPL 152 Condition 15 and MPL 153 Condition 15 MPL 154 Condition 15 MPL 156 Condition 14	**Construction and Operation** **Outcome Measurement Criteria – GW3** Quarterly monitoring of groundwater compliance monitoring wells demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (PEPR Table 8.12).	Compliant	Groundwater compliance wells comprise ENV S2, ENV W3, ENV N4, ENV N8, MS2, MS3 and MD3. All the compliance wells fulfilled the quarterly monitoring requirement of OMC GW3, commonly monitored more frequently. Compliance with OMC GW3 for these wells is also assessed by comparing groundwater model predicted SWLs against actuals during the 2023 reporting period. Refer to Section 2.2.1 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040)
		Leading Indicator – GW4 Quarterly analysis of groundwater abstraction volumes from flow meter reading confirms abstraction is not trending to exceed the predicted water demand (12.9 ML/d) and no more than an average of 7 ML/d was abstracted from the Northern Wellfield.	Compliant	Total abstraction below MPEPR2019/026 (OZ Minerals 2020) predicted demand (12.9 ML/day). Refer to Table 13 in Section 2.2.3 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040)
		Leading Indicator – GW5 Quarterly monitoring of groundwater leading indicator monitoring wells demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (Table 8.13) and demonstrate that no evidence of a trend in standing water levels over three consecutive quarters.	Compliant	Three wells exhibited steady or less drawdown than predicted (MD1, ENV 6 and ENV 7). Three shallow wells are still dry (SC Piezo, YC Piezo 1 and YC Piezo 2). Wells MS4, PS6, PI12, MS6 and PI8 Obs showed either no deviation from modelled, or minor fluctuations through the year. Section 2.2.2 of Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water (CA-0000-ENV-REP-1040)

9.18 GROUNDWATER – CONTAMINATION

Environmental Outcome	Sixth Schedule lease conditions	Regulatory commitment	Compliance status	Evidence and forward work plan
The Tenement Holder must during construction, operation and post Completion ensure that there is no adverse change to the Environmental Values of the groundwater within the shallow perched aquifer within the Land as a result of chemicals or hydrocarbons from mining operations or mining-related activities	ML 6471 Condition 23 and 17 MPL 149*	Construction and Operation **Outcome Measurement Criteria – GW7** Investigation and corrective actions triggered as a result of an accidental spill at infrastructure locations that triggers the notification provisions of Part 9 of the *Environment Protection Act 1993* (SA) relating to serious or material environmental harm demonstrates that the spill was reported to the Director of Mine (or other authorised officer) as soon as reasonably practicable after becoming aware of the harm or threatened harm, and all risks were minimised so far as is reasonably practicable and that any corrective actions are closed out within 30 days or as agreed with the Director of Mines (or other authorised officer)[#] # Material and Serious Environmental Harm are defined in the Environment Protection Act 1993 (SA), Section 5(3). The act does not apply a definition for 'trivial', which is included within the definitions. Therefore, for the purpose of this criteria any spills below 250 L are considered to be trivial or unlikely to result in material or serious environmental harm Refer to Section 9.9 Land and Soil relating to the transport, storage and handling of hydrocarbons and chemicals and associated Leading Indicator – LS2, Leading Indicator – LS3, Leading Indicator – LS4 and Outcome Measurement Criteria – LS5	Compliant	No spills required reporting to DEM in 2023.

* Intent of MPL 149 PEPR

9.19 EFFECTIVENESS OF DESIGN AND MANAGEMENT STRATEGIES

Environmental aspect	Design and management strategy	Effectiveness of existing control strategies
Aboriginal Heritage	**Design Strategies** • Avoidance of sites of cultural heritage significance as determined in consultation with the Kokatha People **Management Strategies** • Cultural heritage surveys with the Kokatha People • Cultural Heritage Obligations Register and supporting GIS information (shape files) to record/identify clearance areas and status • Land disturbance approval process • Cultural respect training • Area-specific and site inductions and training • Employment of suitably qualified people • Cultural Heritage Management Plan, including new discovery reporting procedures* • Identification and fencing of sites of cultural heritage significance • Monthly (construction) or annual (operations) land disturbance reconciliation*	Cultural heritage sites are identified through cultural heritage surveys prior to the commencement of any work, all known sites are recorded and issued in Cultural Heritage Survey Reports with associated GIS data. The Cultural Heritage Reports are document controlled and the master cultural heritage spatial shapefile is updated upon receipt of reports identifying all ground that has been culturally surveyed, sites identified as culturally cleared, sites identified as not culturally cleared and any specific obligations. Prior to works commencing, the master cultural data is used to plan works to avoid any cultural sites. Any cultural sites deemed at risk due to proximity of works are flagged off and identified on an LDP and within area-specific cultural heritage management plans. LDPs are not approved or issued until the cultural heritage aspects have been reviewed by the BHP Carrapateena Heritage Advisor. Kokatha Aboriginal Corporation Cultural Monitors are present during initial land disturbance. Site specific cultural heritage plans have been developed for each construction area. There has been no disturbance of these sites since commencement of mining operations in 2016, including and throughout 2023.
Public Nuisance	**Design Strategies** • Pernatty Station Homestead bypass road **Management Strategies** • Maintenance of unsealed roads. • Dust suppression on unsealed roads* • Speed limit restrictions at homestead* • Operating Protocols • Heavy vehicle transport movements adjacent to the Pernatty Homestead limited to hours between 7 am and 7 pm without prior agreement	Use of the Southern Access Road ceased in 2022 following the opening of the Western Access Road. Speed limits adhered to as evidenced by fixed speed cameras. Offending vehicles are notified of any breaches and an incident is logged in INX InControl. Road opening and closing times enforced by Access Road controllers based at gatehouse. In 2023, one (1) report of alleged speeding was lodged with the gatehouse but not verified by a speed detection camera. The driver was issued with a formal warning. Evidence of visual dust was minimal and no complaints due to dust were reported as outlined in Section 16.
Traffic	**Design Strategies** • Intersections with the Stuart Highway constructed in accordance with appropriate standards and other requirements established in consultation with DPTI **Management Strategies** • Traffic Management Plans and speed limits • Area-specific and site inductions and training	Stuart Highway – Western Access Road turn off construction completed in December 2021. No incidents of vehicle interactions recorded on the Southern Access Road or Western Access Road.
Public Safety	**Design Strategies (Schedule 6 Condition 2)** • Access area gatehouse and signage at site access points • Exclusion fencing around mine compounds • Livestock fencing around TSF • Security gatehouse would be established at the entry to the proposed Mining Lease area • Signage at mine access points **Design Strategies** (Schedule 6 Condition 3) • Design measures to minimise risks at closure (e.g. SLC abandonment bund, decline portal plug, boxcut backfilled, ventilation raises capped) **Management Strategies** • Decommissioning and Rehabilitation Plan • Removal of infrastructure • Cave Monitoring Plan	No unauthorised access to site past gatehouse or to active areas. Fences established around the Mine and MPP, Airstrip and Tjungu Village.
Native Vegetation	**Design Strategies** • Avoidance of critical habitat during site selection	One (1) minor unauthorised land disturbance occurred in 2023 with no impact to native vegetation. Avoidance of critical and preferred habitat of Plains Mouse, Thick-Billed Grasswren and Night Parrot is checked off during generation of an LDP. Spatial data for vegetation association is interrogated to ensure that proposed disturbance avoids potential Plains Mouse, Thick-Billed Grasswren and Night Parrot habitat where possible. No populations of Plains Mouse, Thick-Billed Grasswren and Night Parrot identified during pre-clearance surveys.

Environmental aspect	Design and management strategy	Effectiveness of existing control strategies
	• Completing pre-construction 'clearance' surveys to identify any critical and preferred habitat of Plains Mouse (e.g. cracking clays on run-ons, drainage channels or gilgais), Thick-Billed Grasswrens (e.g. patches of taller and dense shrubland habitat, often associated with drainage channels) and Night Parrots (e.g. spinifex hummock grasslands) by a suitably qualified and experienced ecologist • Flag off any populations or preferred habitat identified in close proximity to the disturbance footprint identified during the pre-construction 'clearance' surveys • Access track upgrade or construction will include flow disruptors and diversion drains to minimise erosion **Management Strategies** • Land disturbance approval process* • Area-specific and site inductions and training • Monthly (construction) or annual (operations) land disturbance reconciliation* • Land Disturbance Register and supporting GIS information (shape files) to record/identify clearance areas and status* • Including awareness training regarding the conservation significance of flora and fauna species in the area as part of the induction process	Installation and maintenance of flow disruptors and/or diversion drains will be undertaken during operations where high risk areas are delineated.
Weeds and Pests	**Management Strategies** • Vehicle inspections and wash-down procedures* • Weed inspection program within disturbance footprint* • Weed "Red Alert" List for quick identification • Weed and pest eradication programmes* • Waste Management Plan and practices • Landfill Environment Management Plan • Pest eradication program • Waste Management Plan and practices • Daily cover of landfill face	Vehicle wash down bay operational for entire period. Vehicle inspections prior to commencement of works identifies any potential for weeds/seeds. Vehicles sent straight to wash down bay if required. New populations of Bathurst Burr (Priority Weed species) were identified in 2019, one (1) which is believed to be a result of mining activities. This population (~20 stems) was destroyed by OZ Minerals personnel (CA-ENV-REP-1103). Cat trapping continued throughout 2023 to manage numbers on mining tenure. Landfill not established on site.
Native Fauna	**Management Strategies** • Traffic Management Plan and speed limits • Area-specific and site inductions and training • Wherever possible, open excavations and drill holes will be covered as soon as practicable or managed to ensure no entrapment can occur through the use of ramps • Incident reporting procedures • Land disturbance approval process* • Land Disturbance Register and supporting GIS information (shape files) to record/identify clearance areas and status* • Area-specific and site inductions and training • Monthly (construction) or annual (operations) land disturbance reconciliation* **Design Strategies** • Avoidance of critical habitat during site selection	Two (2) kangaroos were found deceased in separate turkey's nests in February 2023 and April 2023. It was determined that the kangaroos had entered through gaps under the fence which were subsequently repaired to prevent reoccurrence. BHP Carrapateena personnel monitor scour pits and turkey's nests infrastructure (including fences) on a fortnightly basis and identified issues are rectified.
Land Use and Property	**Design Strategies** • Rehabilitation of land to achieve a landscape function equivalent to the surrounding landscape • Separation of overland surface water flows originating from undisturbed areas of the Operation Area from the surface water run-off that has interacted with stockpiles and access roads • Provision of sediment basins/ponds and appropriate drainage on roadways adjacent to surface water bodies or catchments for the collection of sediments in surface water transported along the roadway (longitudinal flows) • Fords, culverts, diversion drains, bunding and sedimentation/event basins designed and installed in accordance with Best Practice Operating Procedures endorsed by the SA Arid Lands Natural Resources Management Board or a Water Affecting Activity Permit under the Natural Resources Management Act 2004 (SA) • Infrastructure designed with consideration to facilitating closure and permitting progressive rehabilitation (e.g. layout of temporary and permanent site infrastructure, placement of stockpiles, design of plant and equipment modules etc.) **Management Strategies** • Local Area Agreement - Operating Protocol	Operating protocols established with Pernatty, Bosworth, Arcoona and Oakden Hills. Negotiations with South Gap ongoing, draft operating protocol in operation. Regular operational updates provided to local Pastoralist stakeholders. Waivers of exemption in place and evidenced in LDPs, exempt land barricaded off if waiver not in place. Northern Wellfield trunk line buried at major creek crossings (Salt Creek and Bosworth Creek) to preserve flows. Northern Wellfield bore pads rehabilitated back to infrastructure boundaries (where possible).

Environmental aspect	Design and management strategy	Effectiveness of existing control strategies
	• Regular meetings with pastoral land managers • Waivers in place for any water point infrastructure in close proximity to Operation activities • Destocking infrastructure locations • Traffic Management Plan • Area-specific and site inductions and training • Decommissioning and Rehabilitation Plan • All commercial or industrial waste is disposed of in an EPA licensed facility • Rehabilitation procedures* • Rehabilitation trials • Stockpile management procedures to ensure quantity and quality is maintained	
Land and Soil	**Design Strategies** (Schedule 6 Condition 10.1) • Hydrocarbon and chemical storage facilities designed in accordance with Australian Standards. • Storages bunded in accordance with EPA Bunding Guidelines and/or relevant Australian Standards* **Management Strategies** • All commercial or industrial waste is disposed of in an EPA licensed facility • Licenced chemical and waste transporters • Establishment of Chemical Database including copies of SDS and storage, handling and disposal requirements* • Contaminated land register • Contracts contain conditions relevant to the bringing of chemicals and hydrocarbons onto site • Induction contains process for bringing chemicals and hydrocarbons onsite including requirements for storage, handling and disposal • Contracts contain conditions relevant to design, management of the storage and handling of chemicals and hydrocarbons • Spill and emergency response procedures • Equipment maintenance to prevent spills • Incident reporting procedures • Regular inspection programs where bunding either temporary or permanent is installed to ensure appropriate use, placement of spill kits, clean up procedures and handling procedures **Design Strategies** (Schedule 6 Condition 10.2) • Landfill is constructed and operated in accordance with EPA Guidelines and is appropriately licensed under the *Environment Protection Act 1993* (SA). **Management Strategies** • All commercial or industrial waste is disposed of in an EPA licensed facility, which is closed in accordance with relevant EPA Guidelines* • Licenced chemical and waste transporters* • Establishment of Chemical Database including copies of SDS and storage, handling and disposal requirements • Induction contains process for bringing chemicals and hydrocarbons onsite including requirements for storage, handling and disposal • Landfill Environmental Management Plan • Waste Management Plan and practices, including daily covering of the landfill face	Standards for Hydrocarbon Storage and fuel facilities included in all contracts. Environmental Inspection template addresses compliance to EPA guidelines and Australian Standards. Consignment Authority and Tracking Certificates generated for removal of all listed Schedule 1 wastes on site. No landfill onsite. Chemical Request Form and Risk Assessment process established for operations.
Air Quality	**Design Strategies** • Buffer applied to disturbance footprint to account for edge effects on native vegetation and habitat. • 25 km distance to homestead and water tanks. • Progressive rehabilitation of disturbed areas (primary, secondary rehabilitation and/or revegetation). • Enclosure of concentrate storage and handling facilities • Copper concentrate transport containers*	Vegetation condition assessed annually to determine when and where buffer for land disturbance is to be applied. Audit of copper concentrate haulage container inspections completed throughout reporting period at a quarterly frequency. Third-party independent audit of concentrate haulage containers completed.

Environmental aspect	Design and management strategy	Effectiveness of existing control strategies
	Design Strategies for TSF • Rock armouring of final landforms external slopes • Progressive rehabilitation of disturbed areas (primary, secondary rehabilitation and/or revegetation) • No-cover capping for TSF surface	Construction of Stage 1 (starter embankment) of the TSF completed in September 2019. Construction of Stage 2 (downstream raise) was completed in May 2022 and constitutes the final rock armoured embankment. Construction of TSF Stage 2 embankment was completed in May 2022 with tailings deposition commencing on 22 March 2023.
	Design Strategies for Disturbed Operational Areas • Progressive rehabilitation of disturbed areas • All disturbed areas rehabilitated except for TSF top surface and subsidence zone crater	Rehabilitation of TSF borrow pits, haul roads and surplus open areas completed post construction Stage 1. Progressive rehabilitation of disturbed areas completed during construction of Stage 2. Infrastructure associated with construction of the Western Access Road including the Tjungu temporary access road and Midway Quarry stockpile areas were rehabilitated in 2022.
	Design Strategies for CTP • Acid mist scrubbers fitted to the CTP flash steam discharge vents* (Fundamental Design Control) **Management Strategies** • Dust suppression on disturbed land and unsealed roads • Dust suppression systems on crushing operations • Dust suppression at conveyor transfer points • Maintenance of unsealed roads • Dust suppression water sprays on Course Ore Stockpile • Destocking infrastructure areas • Waivers will be in place for any water point infrastructure in close proximity to Operation activities • Field trials to confirm outputs of the air quality modelling outputs* • Acid mist scrubber maintenance and monitoring program including • Continuous monitoring of scrubber performance through the site Process Control System (PCS) • Implementation of preventative maintenance and/or condition monitoring processes Regular verification of scrubber performance through third-party isokinetic sampling of the stack vent gases (pre- and post-scrubber) • Copper concentrate transport container maintenance and monitoring program including regular visual inspection of the containers, including the sealing of the lids • Establishing container filling procedures, with appropriate training and supervision for personnel involved in this task, and the use of container weighing/load information to inform loading activities	Not applicable
Radiation	**Design Strategies** • Buffer applied to disturbance footprint to account for edge effects on native vegetation and habitat • Progressive rehabilitation of disturbed areas (primary, secondary rehabilitation and/or revegetation) • Enclosure of concentrate storage and handling facilities • No mineralised material left on the surface post closure • No-capping for TSF surface	Radiation risks managed in accordance with Radioactive Waste Management Plan (000793)
Surface Water – Erosion and Sedimentation	**Design Strategies** • Separation of overland surface water flows originating from undisturbed areas of the Operation area from the surface water run-off that has interacted with stockpiles, MPP and Mining infrastructure • Provision of sediment basins/ponds and appropriate drainage on roadways adjacent to surface water bodies or catchments for the collection of sediments in surface water transported along the roadway (longitudinal flows)* • TSF embankment and decant collection dam and ponds • Fords, culverts, diversion drains, bunding and sedimentation/event basins design and installed in accordance with Best Practice Operating Procedures endorsed by the SA Arid Lands Natural Resources Management Board or a Water Affecting Activity Permit under the Natural Resources Management Act 2004 (SA) • Rehabilitation of land to achieve a landscape function equivalent to the surrounding landscape **Management Strategies** • Best Practice Operating Procedures • Temporary sediment and erosion controls (e.g. mobile sediment booms, sediment fencing) • Surface water management infrastructure maintenance and inspection programs • Culvert and ford maintenance and inspection programs	Life of Mine surface water management infrastructure completed at the end of 2020. All key management features include: • Subsidence zone diversion drain • MPP and NPI internal drain network and event ponds • Pre-production stockpile drainage • WRD environmental ponds (x3) • Aerodrome diversion drain. Construction of a network of internal (dirty water) swale drains traversing north/south between the pre-production stockpile and the quartzite stockpile was completed in 2021. This catchment is contained within an internal footprint, therefore the risk of contaminated water leaving this area is negligible.

Environmental aspect	Design and management strategy	Effectiveness of existing control strategies
	• Rehabilitation procedures and inspection program	
Surface Water – Reduced Flows	**Design Strategies** • TSF site selection considered 12 sites with the minimisation of footprint and catchment disturbance of Eliza Creek a key consideration • Diversion Infrastructure	Construction of Stage 1 of the TSF completed in September 2019 in the upper reaches of Eliza Creek catchment. Diversion infrastructure around cave established before the cave breakthrough in December 2022.
Surface Water - TSF	**Fundamental Design Control*** • TSF embankment and decant collection dam and ponds* • Final detailed TSF design in accordance with ANCOLD design criteria* • Flood storage capacity (1-in-100 AEP Rain Event including wave freeboard)* • Freeboard capacity (1-in-1000 AEP critical duration event)* • A central compacted clay core, extending into a cut-off key trench where in situ soil is present* • Dental concrete on fractured bedrock at the contact of the central clay core with the watercourse i.e., where in situ soil is not present* • An upstream sloping zone of compacted clay in the Stage 1 (and Stage 2) TSF embankment, extending into a cut-off key at the toe, where in situ soil is present* • A geosynthetic lined cell in the Decant Dam, at the upstream toe of the embankment to manage seepage and decant water from the TSF* **Design Strategies** • A clay liner in the drainage channel where exposed bedrock exists. Approximately 3500 m by 1 m thick by 30 m wide in the Stage 1 Footprint. Extra disturbance footprint around the TSF has been included to allow additional extraction of material* • A seepage cut-off drain at the downstream toe of the embankment. A geosynthetic liner on the upstream slope of the Stage 1 TSF embankment* • Decant outfall pipe extension from the TSF embankment to the lined decant cell* **Management Strategies** • Embankment foundation assessments* • Embankment stability assessment* • Dam Safety Monitoring Program* • QA/QC Procedures* • Daily inspections* • Alarmed pressure indicators • Remote isolation valves on delivery infrastructure* • QA QC Procedures* • Auditing of critical stages* • Detailed final design* • Seepage collection and volume monitoring in cut-off drain • Continual characterisation of chemical and physical properties of the tailings*	Construction of TSF Stage 1 completed in September 2019, in accordance with the design (OZ Minerals 2020; Appendix B1 Tailings Storage Facility Design), evidenced in: • Construction Report for Tailings Stage 1 Works, Golder Associates (CA-3630-CIV-REP-1018) • TSF Stage 1 – Final Independent Auditor Report, ATC Williams (CA-3630-QAC-REP-2016). TSF Stage 2 Construction Reports prepared by the Engineer of Record (WSP Golder) and Independent Auditor (ATC Williams) are evidenced in: • WSP Golder TSF Stage 2 Construction Report (CA-3630-CIV-REP-1054) • ATC Williams TSF Stage 2 Construction Independent Audits of Tailings Storage Facility (CA-3630-PRM-REP-1524).
Surface Water - AMD	**Design Strategies** • Pre-Production stockpile pad* • Separation of overland surface water flows originating from undisturbed areas of the Operation area from the surface water run-off that has interacted with stockpiles, MPP and Mining infrastructure. **Management Strategies** • PAF material (marginal ore) would be preferentially left underground where possible if brought to surface, marginal ore would be stored on the ROM stockpile (ex-Development Pre-Production Ore Stockpile)* • Block modelling of ore and waste units* • Sulphur cut-off grade determined*	Life of Mine surface water management completed at the end of 2020. All key management features completed: • Subsidence zone diversion drain • MPP and NPI internal drain network and event ponds • Pre-production stockpile drainage • WRD environmental ponds (x3) Acid and Metalliferous Drainage Management Plan (CA-ENV-PLN-1013) and associated procedures provide framework for handling PAF material.

Environmental aspect	Design and management strategy	Effectiveness of existing control strategies
	• QA/QC procedures and record keeping* • Development of an AMD Management Plan	Geological block model underpins delineation non-desirable waste (PAF) using an AMD Classification System: sulphur (>0.3wt%) and copper (<0.2wt%) assay data. Further interrogation of the Classification System is being undertaken through (QA/QC) sampling in accordance with CA-PRO-ENV-1002 Operational Characterisation. In 2023, sixty-one (61) development headings were sampled and analysed for Acid-Base-Accounting (ABA) at a NATA accredited laboratory. Net Acid Producing Potential (NAPP kgH2SO4/t) for all waste samples returned a negative value validating classification parameters. (Noting this last comment that within the 61 development headings, many locations were taken as two cuts of waste and two cuts of ore, therefore not all samples of the 61 development headings are classified as waste). Sampling to supplement a geochemical assessment of tailings, ore and waste rock review commenced in 2022 with a report anticipated in mid-2024.
Groundwater – TSF	**Design Strategies** • Lining of water-holding ponds and barren liquor evaporation ponds. • Design of a thickened tailings disposal system (65% w/w solids). • TSF located upstream of the sub level cave subsidence zone. **Management Strategies** • TSF Water balance to be updated in accordance with Life-Of Mine Plan and verified against modelling inputs. • Continued tailings physical and geochemical characterisation undertaken and verified against modelling inputs. • Flow and sump meters to monitor tailings inputs and outputs. • Ongoing calibration of the groundwater model using data obtained from groundwater monitoring	Stage 1 of the TSF was completed in September 2019 and commenced operation on 25 February 2020. Construction of TSF Stage 2 embankment was completed in May 2022 and deposition commenced on 22 March 2023. Thickened tailings disposal averaged ~61% density (w/w, %) continuing in a steady state during the reporting period. Whilst this falls below the predicted 65% (w/w, %), dry density averaged 2 t/m^3 which aligned to the 1.9 t/m^3 adopted during early operation of TSF Stage 2. Decant return pumps were operational throughout the reporting period (average rate of return 87 ML per month).
Groundwater - Drawdown	**Design Strategies** • Site Water Balance based on modelling inputs and LoM plan* • Production wellfield and mine dewatering will not exceed maximum daily abstraction rate (PEPR Table 4.67)* • Abstraction rates designed to sustainable yields • Telemetric controls/headwork engineering and flow meters to monitor abstraction rates **Management Strategies** • Water balance to be updated in conjunction with Life of Mine Plans • Flow/sump meters to monitor abstraction and mine dewatering rates • Ongoing calibration of the groundwater model using data obtained from groundwater monitoring*	Installed capacity of pumping infrastructure is below maximum daily abstraction rate. Current mine inflows are within modelled parameters, this dataset is collated and reported internally within Aquifer Resource Assessment Reports. Water transactions are metered with data reporting to Pi Historian via telemetry. Quarterly aquifer resource assessment reports issued by site environmental team assessing pumping data, SWL and projected drawdown against hydrographs. Groundwater model was revised in 2023 as per two-yearly requirement.
Groundwater - Contamination	**Design Strategies** • Hydrocarbon and chemical storage facilities designed in accordance with relevant Australian Standards • Landfill is constructed and operated in accordance with EPA Guidelines and is appropriately licensed under the Environment Protection Act 1993 (SA) • Storages bunded in accordance with EPA Bunding Guidelines and/or relevant Australian Standards **Management Strategies** • Spill and emergency response procedures • Equipment maintenance to prevent accidental releases • Licenced chemical and waste transporters • Incident reporting procedures • Regular inspection programs where bunding either temporary or permanent is installed to ensure appropriate use, placement of spill kits, clean up procedures and handling procedures • Induction contains process for bringing chemicals and hydrocarbons onsite including requirements for storage, handling and disposal • Contracts contain conditions relevant to design, management of the storage and handling of chemicals and hydrocarbons • Establishment of Chemical Database including copies of SDS and storage, handling and disposal requirements	Standards for Hydrocarbon Storage and fuel facilities included in all contracts. Environmental Inspection template addresses compliance to EPA guidelines and Australian Standards. Waste Tracking Forms provided by waste management contractor for all listed Schedule 1 wastes. No landfill onsite. Chemical Request Form and Risk Assessment process established for operations.

* If there is a high reliance on a control or management strategy to prevent or minimise an impact a Leading Indicator has been proposed

10 NON-OUTCOME BASED LEASE CONDITIONS

This section reports against all non-outcome based Second Schedule lease conditions for each tenement.

Tenement / Schedule 2 Licence Condition #	Tenement Condition	Compliance Status	Evidence demonstrating compliance with tenement condition
ML 6471, MPL 149 MPL 152, MPL 153, MPL 154, MPL 156 Cond 1	The Tenement holder must during construction, operation and post Completion ensure there is no damage, disturbance or interference to Aboriginal heritage sites, objects or remains unless it is authorised under the relevant legislation.	Compliant	All land disturbance is spatially audited against LDP boundaries using survey data, drone and satellite imagery in ArcGIS to ensure works were completed within approved work areas, cultural heritage survey report conditions and have authorisation in accordance with the *Aboriginal Heritage Act, 1988* (SA). One (1) unauthorised land disturbance incident occurred during the reporting period but it did not result in any impact to cultural sensitive areas.
ML 6471 Cond 2	The Tenement Holder must ensure that post Completion, all final mine landforms (including the TSF) will be chemically and physically stable in the long term.	In progress	Carrapateena is in the early stages of operation, this is a completion criteria. TSF design provided as Appendix B1 of Mining Lease PEPR (OZ Minerals 2020). Kinetic test work to be delivered for ore, waste and tailings in CY24.
ML 6471 Cond 3	Following completion of detailed design of the TSF and Decant Dam, the following documentation for the TSF and Decant Dam must be developed and maintained: 3.1 Construction documentation; 3.2 Design drawings and quantity schedule; 3.3 Technical specifications; 3.4 Construction Quality Assurance (CGA) Manual; 3.5 Operations, Maintenance and Surveillance (OMS) Manual; and 3.6 Dam Safety Emergency Plan (DSEP)	Compliant	TSF Stage 1 completed construction. Conditions 3.1, 3.2, 3.3 and 3.4 provided to DEM via email dated 12/11/18. TSF design provided as Appendix B1 of Mining Lease PEPR (OZ Minerals 2020). Final copies of OMS (Condition 3.5) (CA-PRO-MNL-1001) and DSEP (Condition 3.6) (CA-PRO-PLN-1000) provided to DEM 13/12/2019, prior to commissioning.
ML 6471 Cond 4	The TSF and Decant Dam construction, operation and closure must be audited against (i) the design, the design criteria and plans that have been adopted for the TSF and Decant Dam construction, operation and closure, (ii) all of the documentation listed in Second Schedule Condition 3 and (iii) the most recent version of the ANCOLD Tailings Dam Guideline: 4.1 For the Stage 1 TSF and Decant Dam embankment foundation preparation and embankment construction; and 4.2 For each subsequent stage of the TSF and Decant Dam embankment construction; and 4.3 On a three (3) monthly basis during Stages 1 and 2 of TSF and Decant Dam operations or at a frequency as the Director of Mines (or other authorised officer) may specify in writing; and 4.4 On a six (6) monthly basis during Stages 3, 4, 5 and 6 (and any subsequent stages) of TSF and Decant Dam operations or at a frequency as the Director of Mines (or other authorised officer) may specify by notice in writing; and 4.6 After the final TSF and Decant Dam rehabilitation, closure and decommissioning works have been completed.	Compliant (4.1) Complaint (4.3) Not relevant (4.2), (4.4) and (4.6)	TSF Stage 1 completed construction and in operation Suitably qualified expert (ATC Williams), endorsed by DEM, engaged for Construction Quality Assurance as required by Condition 4.1. Final version of Stage 1 Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]). Final version of Stage 2 Construction Independent Audit Report provided to DEM on 20/03/23 (CA-3630-PRM-REP-1524) Five (5) audits were undertaken pertaining to operation of the TSF during the reporting period, which meet the requirements of ML 6471 Condition 4: • Tailings Storage Facility, Engineer of Record Q1 Inspection Report, May 2023 (Golder Associates) (CA-3630-CIV-REP-1065) • Tailings Storage Facility, Engineer of Record Q2 Inspection Report, September 2023 (Golder Associates) (CA-3630-CIV-REP-1075) • Tailings Storage Facility, Engineer of Record Q3 Inspection Report, November 2023 (Golder Associates) (CA-3630-CIV-REP-1081) • Tailings Storage Facility, Engineer of Record Annual Inspection Report, March 2023 to February 2024 (WSP) (CA-3630-CIV-REP-1094) • ATC Williams annual independent audit completed in February 2024, final report pending.
ML 6471 Cond 5	Following audit of the Tailings Storage Facility the expert must prepare reports of the findings of each audit.	Compliant	Refer to ML 6471 Condition 4 for relevant documents.
ML 6471 Cond 6	The initial expert report for the audit of the Stage 1 TSF and Decant Dam foundation preparation and embankment construction must be provided to the Director of Mines (or other authorised officer) prior to the placement of tailings and waste into the TSF.	Compliant	Final version of Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]).
ML 6471 Cond 7	The expert report for the audit which occurs after the final discharge of tailings into the TSF must be provided to the Director of Mines (or other authorised officer) prior to the commencement of final rehabilitation of the TSF and Decant Dam.	Not relevant	Tailings Storage Facility is within operational phase.

Tenement / Schedule 2 Licence Condition #	Tenement Condition	Compliance Status	Evidence demonstrating compliance with tenement condition
ML 6471 Cond 8	All other expert reports must be provided to the Director of Mines (or other authorised officer) within forty-five (45) days or such longer period approved by the Director of Mines (or other authorised officer) of completion of the audit.	Compliant	Final version of Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]).
ML 6471 Cond 9	All expert reports will be made publicly available.	Compliant	BHP Carrapateena is formalising an outward looking platform for final reports.
ML 6471 Cond 10	The expert reports for the audits of Stage 1 and each subsequent stage of TSF embankment construction must address the following matters (but not limited to): 10.1 Demonstrate that sufficient freeboard has been achieved to ensure flood storage capacity for a 1-in-100 AEP rainfall event including wave freeboards (1 in 10 AEP winds) and contingency freeboard of 0.5m; 10.2 Demonstrate emergency spillways for each stage of the operation have the capacity for flow resulting from 1-in-100 AEP critical duration event including wave freeboard; 10.3 Demonstrate that tailings properties in operations are consistent with the adopted tailings properties, including density and strength as specified in the detailed final design: 10.3.1 Should tailings density or strength be inconsistent, undertake an assessment of the potential impact on the TSF (including, but not limited to, TSF storage capacity) and propose any remediation to the design if deemed necessary; 10.4 Liquefaction assessment based on in-situ test work of the tailings prior to upstream raises; 10.5 A seismic hazard assessment (SHA) to provide site-specific peak ground acceleration (PGA) parameters for stability assessments; 10.6 The geometry of upstream raises and foundation treatment has been confirmed prior to each upstream raise; 10.7 The suitability and compatibility of the various embankment fill materials has been assessed; and 10.8 Assessment of all of the documentation listed in Second Schedule Condition 3 to ensure that the content of the documents is appropriate for the next stage of TSF embankment construction.	Compliant	Final version of Construction Independent Audit Report provided to DEM on 6/12/19 (CA-3630-QAC-REP-2016[2]). ATC Williams Tailings Storage Facility (TSF) Stage 2 Construction Independent Audits of Tailings Storage Facility (CA-3630-PRM-REP-1524).
ML 6471 Cond 11	The expert report for the audit which occurs after the final TSF and Decant Dam rehabilitation, closure and decommissioning works have been completed must address the following matters (but not limited to): 11.1 Spillway designed for the seventy-two (72) hour PMP critical duration event and in accordance with ANCOLD; 11.2 Decant system is decommissioned in accordance with the design; and 11.3 Reshaping of the TSF embankment in accordance with the design to provide a profile that is resistant to erosion.	Not relevant	The TSF is within early stages of operation.
ML 6471 Cond 12	The audits required by Second Schedule Conditions 4.1, 4.2, 4.5, 4.6 and associated reports required by Second Schedule Condition 5 must be conducted and provided by an independent and suitable qualified expert approved by the Director of Mines (or other authorised officer).	Compliant	Suitably qualified expert (ATC Williams), endorsed by DEM, was engaged for Operation Quality Assurance as per Condition 4.1.
ML 6471 Cond 13	The audits required by Second Schedule Conditions 4.3, 4.4 and associated reports required by Second Schedule Condition 5 must be conducted and provided by an independent and suitably qualified expert approved by the Director of Mines (or other authorised officer) at least once for each twelve (12) month period.	Compliant	Suitably qualified expert (ATC Williams), endorsed by DEM, was engaged for Operation Quality Assurance as per Condition 4.1.
ML 6471 Cond 14	An audit required by Second Schedule Conditions 4.3, 4.4 and associated reports required by the Second Schedule Condition 5 may be conducted and provided by a suitably qualified Tenement Holder employee previously approved by the Director of Mines (or other authorised officer). To apply for approval the Tenement Holder must: 14.1 Apply in writing; and 14.2 Provide the employee's Curriculum Vitae showing their academic qualifications, publications (if any) and practical experience.	Not relevant	BHP Carrapateena is not using a Tenement Holder employee to undertake relevant audits
ML 6471 Cond 15	The Tenement Holder must during operations ensure that any CTP constructed on the Land is equipped with scrubbers which are designed appropriately to prevent acid mist emissions.	Not relevant	CTP is no longer under consideration.

Tenement / Schedule 2 Licence Condition #	Tenement Condition	Compliance Status	Evidence demonstrating compliance with tenement condition
ML 6471 Cond 16	The Tenement Holder must during operations ensure that copper concentrate is transported in fit for purpose sealed containers to prevent copper concentrate release to the environment	Compliant	Haulage of copper concentrate is undertaken utilising dedicated purpose-built trailers by a suitably qualified contractor.
ML 6471 Cond 17 MPL 149 Cond 2 MPL 152 Cond 3 MPL 153 Cond 2 MPL 154 Cond 3 MPL 156 Cond 2	The Tenement Holder must ensure that all commercial or industrial waste (which does not include CTP process residue, tailings and waste rock) is disposed of in an EPA licenced facility.	Compliant	Monthly waste disposal records are provided by Cleanaway Pty Ltd for BHP Carrapateena and site contractors for all waste leaving the Carrapateena site. Waste Tracking Forms are provided for wastes listed in Schedule 1 of the *Environment Protection Act, 1993* (SA).
ML 6471 Cond 18 MPL 149 Cond 2 MPL 152 Cond 4 MPL 153 Cond 3 MPL 154 Cond 4 MPL 156 Cond 3	The Tenement Holder must ensure that all mining related infrastructure is decommissioned and removed from, the Land at Completion unless the Director of Mines (or other authorised officer) has approved, in writing, for the infrastructure to remain.	Not relevant	Carrapateena is in the early stages of operations.
ML 6471 Cond 19 MPL 149 Cond 4 MPL 152 Cond 5 MPL 153 Cond 4 MPL 154 Cond 5 MPL 156 Cond 4	The Tenement Holder agrees to the Approved PEPR and any compliance reports and reportable incident reports, submitted in accordance with the Regulations, being made available for public inspection.	Compliant	Detail of all reportable incidents are provided in Section 8 and Section 11.
ML 6471 Cond 20 MPL 149 Cond 2 MPL 152 Cond 6 MPL 153 Cond 5 MPL 154 Cond 6 MPL 156 Cond 5	Within thirty (30) days of becoming aware of any event or decision which is likely to give rise to the cessation of mining operations or mining related activities for a period of more than seven (7) days and where possible prior to the cessation of mining operations or mining related activities, the Tenement Holder must notify the Director of Mines in writing of the event or decision. The notice must specify the date upon which the mining operations or mining related activities are expected to cease or have ceased, an estimate of the period of cessation and an outline of the steps to develop any required DRP under Second Schedule	Not relevant	
ML 6471 Cond 21 MPL 149 Cond 6 MPL 152 Cond 7 MPL 153 Cond 6 MPL 154 Cond 7 MPL 156 Cond 6	The Tenement Holder must comply with a Decommissioning and Rehabilitation Plan (DRP) approved in accordance with Second Schedule when decommissioning or rehabilitating the Mining Tenement.	Not relevant	
ML 6471 Cond 22 MPL 149 Cond 7 MPL 152 Cond 8 MPL 153 Cond 7 MPL 154 Cond 8 MPL 156 Cond 7	Unless the Director of Mines (or other authorised officer) otherwise directs, a DRP must be submitted to the Director of Mines (or other authorised officer) for approval within sixty (60) days or such longer period which is approved by the Director of Mines (or other authorised officer) of any notification provided to the Director of Mines in relation to the notification of cessation of operations under Second Schedule, and that DRP must: Set out the activities and scheduling required for the carrying out of the rehabilitation works specified in the Approved PEPR; Be prepared in accordance with any guidelines provided by the Director of Mines (or other authorised officer).	Not relevant	

Tenement / Schedule 2 Licence Condition #	Tenement Condition	Compliance Status	Evidence demonstrating compliance with tenement condition
ML 6471 Cond 23 MPL 149 Cond 8 MPL 152 Cond 9 MPL 153 Cond 8 MPL 154 Cond 9 MPL 156 Cond 8	If, in the opinion of the Director of Mines (or other authorised officer), mining operations or mining related activities on the mining Tenement have substantially ceased for two (2) consecutive years or more, the Director of Mines (or other authorised officer) may: Require that the Tenement Holder submit a DRP for approval dealing with the requirements set out in Second Schedule; and/or Direct the Tenement Holder to rehabilitate the Mining Tenement in accordance with the Approved PEPR and/or any DRP.	Not relevant	
ML 6471 Cond 24 MPL 149 Cond 6 MPL 152 Cond 10 MPL 153 Cond 9 MPL 154 Cond 10 MPL 156 Cond 9	The Tenement Holder must develop (in consultation with the owners of land and to the satisfaction of the Director of Mines (or other authorised officer)) a communication and operating protocol, or an agreement incorporating such a protocol, between itself and owners of land adjacent to and on the Land prior to the commencement of mining operations and mining related activities that includes, unless the Director of Mines (or other authorised officer) is otherwise satisfied, the following matters: • Interaction with landowner operations; • emergency procedures; • Communications and issue management processes; • Land management; • Dispute resolution; • Ongoing communication about the Tenement Holder's operations; • Receiving and considering feedback; • safety procedures; • Access protocols; and • Any matters identified by the Director of Mines (or other authorised officer) in writing.	Compliant	Protocols developed and agreed to in 2018. Protocols submitted to DEM March 2019. Refer also to Community Engagement in Section 22 for details of consultation undertaken with landowners.
ML 6471 Cond 25 MPL 149 Cond 7 MPL 152 Cond 11 MPL 153 Cond 10 MPL 154 Cond 11	The Tenement Holder must: Provide the protocol(s) to the Director of Mines (or other authorised officer) within six (6) months of the grant of the Mining Tenement or such longer period that the Director of Mines (or other authorised officer) may allow; and	Compliant	Protocols developed and agreed to in 2018. Protocols submitted to DEM March 2019.
ML 6471 Cond 25 MPL 149 Cond 7 MPL 152 Cond 11 MPL 153 Cond 10 MPL 154 Cond 11 MPL 156 Cond 10	Maintain and adhere to the protocol(s) to the satisfaction of the Director of Mines (or other authorised officer) for the term of the Mining Tenement.	Compliant	The protocols are managed through the obligation management database (LandFolio) and the Social Performance team at Carrapateena ensures the obligations are adhered to. BHP Carrapateena Event Management system (INX InControl) is used to record any non-compliance with the protocols.
ML 6471 Cond 26 MPL 149 Cond 11 MPL 152 Cond 12 MPL 153 Cond 11 MPL 154 Cond 12 MPL 156 Cond 11	A notification required by regulation 98(1) must be in writing.	Compliant	No notifications required under regulation 98(1).
ML 6471 Cond 27	For the purpose of this Additional Condition: • 27.1 'Plains Mouse' means *Pseudomys australis*; • 27.2 'Existing population' means an area of suitable habitat for Plains Mouse where the species has been observed/recorded; • 27.3 'Existing habitat' means an area of suitable habitat for the Plains Mouse;	Compliant	EPBC 2017/7895 Compliance Report 2022. Refer to Section 14.

Tenement / Schedule 2 Licence Condition #	Tenement Condition	Compliance Status	Evidence demonstrating compliance with tenement condition
	• 27.4 'Suitable habitat' means large open gypseous cracking clay areas associated with minor drainage features, and depressions within gibber stony plains (National Recovery Plan for the Plains Mouse *Pseudomys australis* 2012). • 27.5 To compensate for the residual impact from mining operations on the existing Plains Mouse habitat, the Tenement holder must provide an environmental offset that: • 27.5.1 Contains suitable habitat for the Plains Mouse or is known to have existing population of Plains Mouse; • 27.5.2 Contains no less than 750ha of suitable habitat to offset the permanent loss of the existing Plains Mouse habitat; • 27.5.3 The quality of suitable habitat must be at least equal to that of the quality of existing habitat that will be permanently lost; • 27.5.4 Is connected to existing habitat of Plains Mouse by biodiversity corridors to ensure the Plains Mouse can utilise the environmental offset; • 27.5.5 Is direct on-ground offset located on land using an appropriate legal mechanism (to the satisfaction of the Director of Mines (or other authorised officer)) that ensures the environmental offset is secured for conservation purposes for the life of the Mining Tenement or longer; • 27.5.6 Is located as close as practical to the existing habitat that will be permanently lost; • 27.5.7 The implementation of which is commenced either before, or at the same point in time as, the impact to the Plains Mouse habitat arising from the mining operations; and • 27.5.8 Is managed for the life of the Mining Tenement or longer to maintain or improve the existing suitable habitat quality.		
ML 6471 Cond 28 MPL 152 Cond 13 MPL 153 Cond 12 MPL 154 Cond 13	To ensure the protection of Matters of National Environmental Significance, the Tenement Holder must: • 28.1 Develop, implement and maintain appropriate management actions to ensure the control of feral animal populations, including cats and foxes; • 28.2 Provide data from any future sightings and records of the Thick-billed Grasswren to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the National Recovery Plan Actions; • 28.3 Provide data from any future sightings and records of the Night Parrot to the Night Parrot Recovery Team; and • 28.4 Provide data from any future sightings and records of the Plains Mouse to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions.	Compliant	Weed inspections were routinely completed as inspection criteria within the LDP Inspection and General Environmental Inspection template. No new Priority Weed species were identified in 2023. Annual ecology survey targets sightings of species of National Environmental Significance, namely Thick-Billed Grasswren, Plains Mouse, Night Parrot and Curlew Sandpiper. Refer to Sections 3.3.7 of Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report (CA-0000-ENV-REP-1036)
ML 6471 Cond 29 MPL 149 Cond 8 MPL 152 Cond 14 MPL 153 Cond 13 MPL 154 Cond 14 MPL 156 Cond 12	The Tenement Holder must comply with all State and Commonwealth legislation and regulations applicable to the activities undertaken pursuant to the Mining Tenement.	Compliant	All State and Commonwealth legislation is identified in the PEPR and Environment and Social Performance Management Plans. All licenses, permits and agreements are tracked through the obligations management database (LandFolio). The Carrapateena Environment department ensures compliance with all State and Commonwealth legislation and Mining Tenement regulations. A subscription to the online service Environment Essentials is available to all staff at Carrapateena to support and inform compliance to State and Commonwealth legislation. BHP Carrapateena's Event Management system (INX InControl) is used to record any non-compliance with the protocols.

11 RECTIFICATION OF NON-COMPLIANCE

Table 11.1: Rectification of Non-Compliances

Tenement	Date of incident	Detected by operator or DEM	Reportable under Regulation 79?	Date reported to Minister	Date written report to Minister	Non-compliance Environmental outcome or tenement condition breached	Cause of non-compliance, OMC or lease condition breach	Status	Further Work Planned	
									Actions to rectify non-compliance and prevent reoccurrence	Action Status
ML 6471	N/A	Operator	Yes	Comprehensive incident report submitted 09 October 2023	09/08/23	Non achievement of Outcome Measurement Criteria **OMC – TSF1, GW1, TSF2, GW2**	Groundwater and Surface Water OMCs associated with the TSF have not been achieved largely due to higher than predicted lateral and vertical seepage from the TSF during early operation. Standing water levels in groundwater monitoring locations within the TSF seepage zone are outside of OMC Achievement Values determined by the Updated Groundwater Model and water quality at these monitoring locations is in exceedance of OMC Achievement Values determined by the TSF Surface Water and Groundwater Geochemical Effects Assessment. It is important to note that the Outcome is still anticipated to be achieved and this reflects the OMC being established with limited data at the time of the original PEPR development. The monitoring wells are located within the zone of influence (the outcome relates to groundwater outside of the zone of influence) and therefore a review of the location of the OMC monitoring locations may be required and the monitoring locations inside the zone of influence may be better suited for a leading indicator. This is supported by information that demonstrates that that the operation is and will continue to have the ability to achieve the Environmental Outcomes.	Ongoing	• update the assumptions and inputs in the Tailings Storage Facility: Surface Water and Groundwater Geochemical Effects Assessment 2017 to determine if there is likely to be any ongoing change to the predicted effects and impacts and to derive new water quality targets in shallow and deep TSF monitoring wells. • review seepage modelling with observed rates, new assumptions and new parameters from Stage 2 operations. • review the Seepage Fate Analysis to confirm that vertical seepage still reports to the subsidence zone. • review relevant OMC's to determine suitability of existing monitoring locations and achievement values. • develop site specific guideline values for groundwater and surface water as an alternative to ANZECC/ARMCANZ (2000) freshwater and limited baseline ranges to update relevant leading indicators. • update PEPR to reflect new controls, Leading Indicators and OMCs where relevant.	Ongoing – present in future PEPR
ML 6471	N/A	Operator	No	Leading Indicator Report submitted 10 February 2022	N/A	Breach of Leading Indicator **Leading Indicator TSF21, TSF23 and TSF24**	Monthly operational monitoring of tailings water, specifically supernatant and decant, saw metal composition continue to trend outside of the +/- 10% range adopted within MPEPR 2019/026 throughout 2023. BHP Carrapateena engaged LWC to review the data and comment on the whether the risk profile adopted in development of the MPEPR2019/026 had changed. Three metals (uranium, copper and molybdenum) were recorded in concentrations above limits established within the current PEPR (OZ Minerals 2020; Table 8.9). Elevated concentrations of these elements against predicted composition are due to model input limitations. Observed tailings water quality is deemed to be representative of steady state operations.	Ongoing	Key assumptions of an Assessment of Effects was reviewed and a preliminary impact assessment has been completed which determined to not represent an increased risk of actual or potential harm. The concentrations of tailings water metals as determined and assessed are not considered to represent a risk of actual or potential based on the nature and magnitude of reported concentrations and Tier 2 toxicology considerations. No significant elevation of risk profile is evident relative to previous works, notably (CA-ENV-REP-1120). Seepage model has been revised and an updated geochemical assessment of effects will be presented in a future PEPR and impact assessments.	Ongoing – present in future PEPR

12 DISTURBANCE AND REHABILITATION ACTIVITIES

The current PEPR includes a Native Vegetation Management Plan (NVMP) (OZ Minerals 2020; Appendix D) for disturbance under three gateways, Gateway 1 (approved in 2013) allows for 476.2 ha of vegetation, Gateway 2 (approved March 2019) allows for 708.2 ha of disturbance and Gateway 3 allows for 989.9 ha of disturbance. Gateway 1 covers works associated with Retention Lease 127, MPL 149 and Mining Lease 6471 through to approval of PEPR2018/007 in March 2019, some credits have been allocated in kind from this Gateway to disturbance undertaken outside the RL 127 boundary.

During 2021, OZ Minerals engaged Nature Foundation to assign Significant Environmental Benefit (SEB) points for 203 ha of Gateway 3 to accommodate remaining construction activities associated with the Carrapateena SLC. Following significant delay finalising the application due to a range of issues associated with the pastoral lease for Witchelina, which the relevant Government Departments were seeking to resolve, the assignment of credits was completed in June 2022.

Throughout the reporting period, approximately 1 ha of land was rehabilitated on ML 6471 at Exploration Camp.

In December 2022 and December 2023, BHP conducted an internal audit of the land disturbance database to review and reconcile existing data which included removal of overlapping areas, inclusion of small slivers of area between cleared and non-cleared ground and reviewed Gateway assignment. During the 2022 audit it was found that disturbance within the EPBC Footprint had been previously overreported by including the Advanced Exploration Activities and Northern Wellfield areas. Similarly, the Plains Mouse habitat had been overreported as the Advanced Exploration Activities was also not excluded. As a result, in 2022 the actual disturbance of the two footprints were reduced by 317.2 and 198.3, respectively.

Updated land disturbance areas for this reporting period can be found in Table 12.1 with land disturbance areas over the NVMP Gateway stages provided from Figure 12.1 to Figure 12.5.

Table 12.1: Land Disturbance Summary

Area where disturbance and rehabilitation activity occurred (ha)	Description of rehabilitation works carried out in the reporting period (ha)	Amount of land disturbed during the reporting period (ha)	Estimated amount of land to be rehabilitated in the next reporting period (ha)	Total amount of land where rehabilitation works are completed (ha)
RL 127, off lease, or now accounted for on MPL 152, MPL 153, MPL 154 and MPL 156	0	0 (Gateway 1: 2013–2018)	0	0
ML 6471, MPL 152, MPL 153 and MPL 154	0	0.20 (Gateway 2: 2019–2020)	0	61.8
ML 6471, MPL 152, MPL 153 and MPL 154	1.1 At Exploration Camp carpark	27.86 (Gateway 3)	~5	11.2
MPL 156	0	40.09 (Gateway Northern Wellfield)	0	0
All Tenements (TOTAL)	**1.1**	**68.15**	**~5**	**73.0**

Strategies implemented to avoid or minimise disturbance:
Land Disturbance Permitting process ensures that work areas are safely minimised, and already disturbed land is used for new works as much as reasonably possible. For temporary works the stripping of topsoil is avoided. Land Disturbance Areas are surveyed and barricaded to avoid any disturbance outside of the allowed area.
Summary of any potential improvements learned from previous rehabilitation activities:
Rehabilitation trials under the Retention Lease have indicated that no additional treatment is necessary to achieve successful rehabilitation. Formal trials will commence in early stages of ML 6471 to confirm methodology. Two LFA transects are being monitored with additional sites installed on the temporary access road from Tjungu Village to the Southern Access Road as well as at Midway Quarry in August 2022.

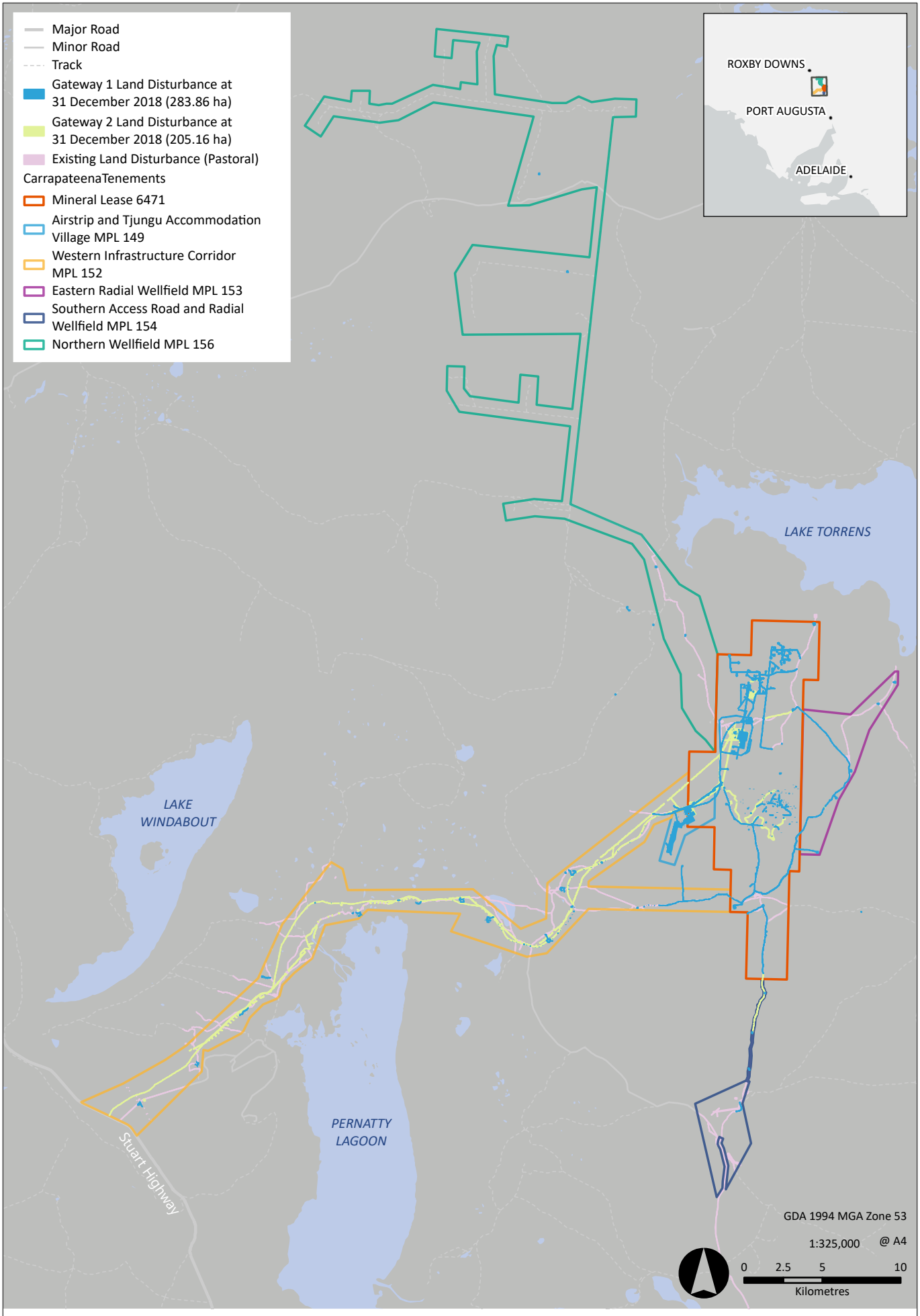

Figure 12.1 | Land Disturbed Under NVMP Gateway 1 and 2 (March 2013 - December 2018)

Carrapateena BHP

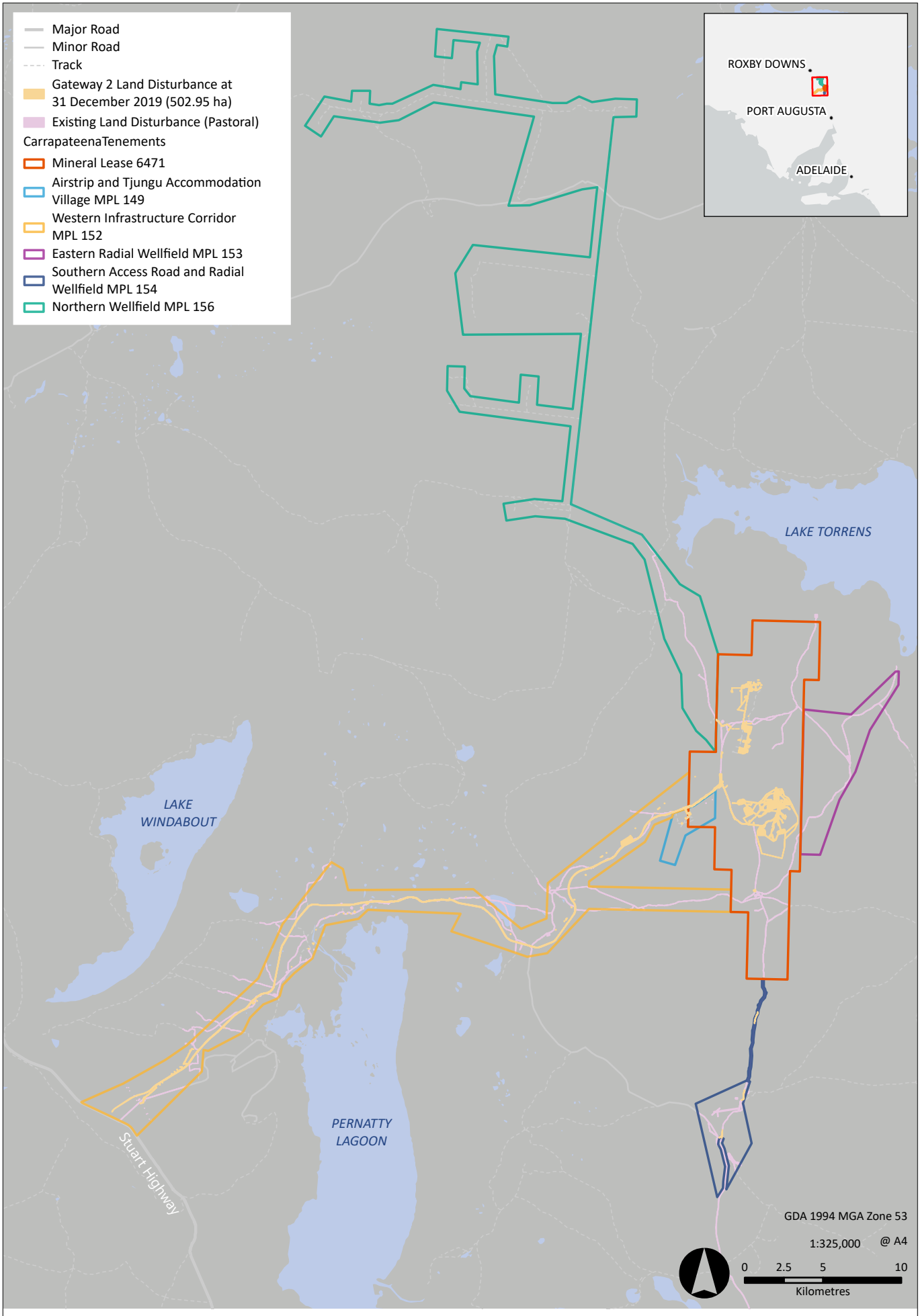

Figure 12.2| Land Disturbed Under NVMP Gateway 2 (January 2019 – December 2019)

Carrapateena BHP

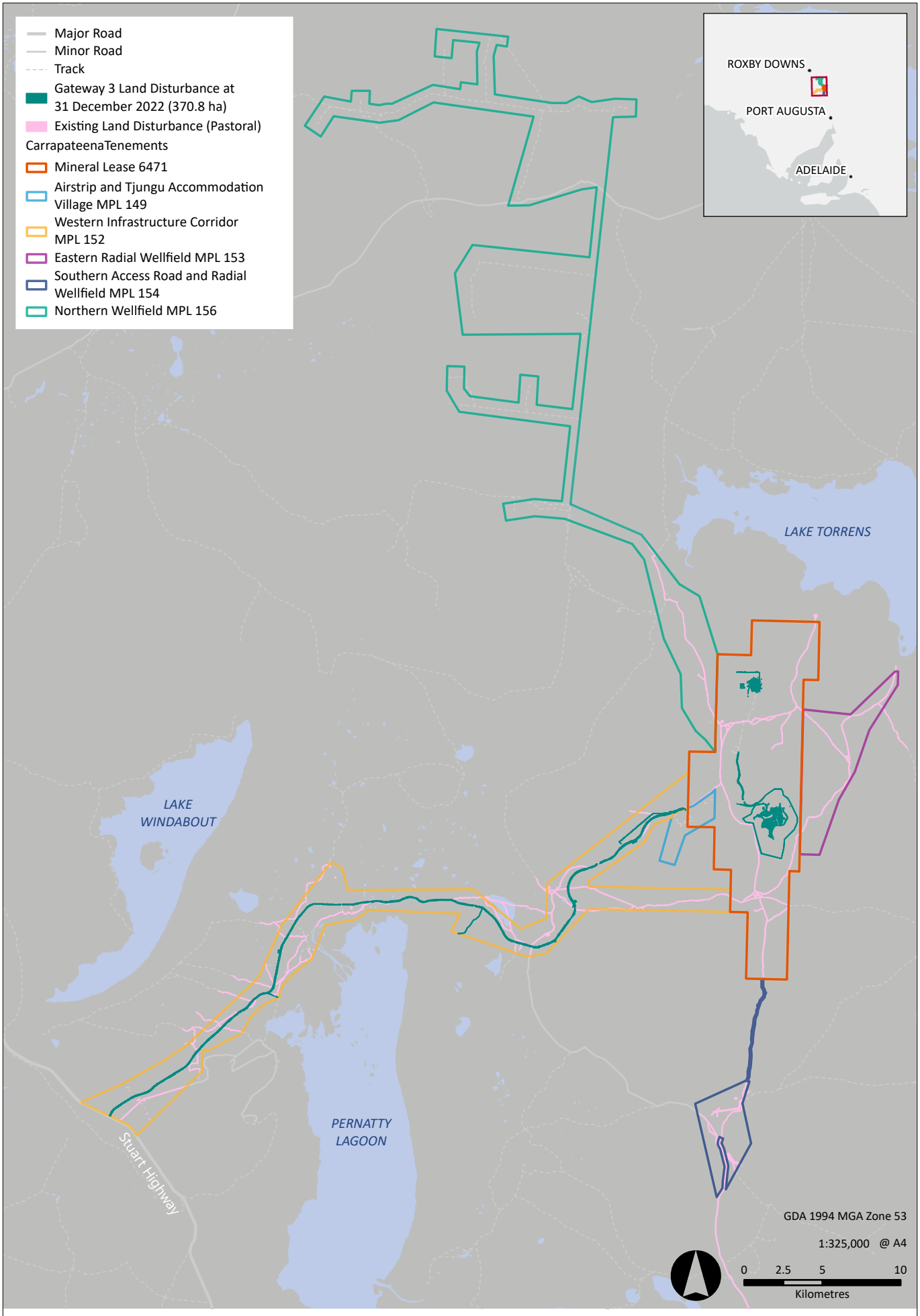

Figure 12.3 | Land Disturbed Under NVMP Gateway 3 (January 2020 – December 2023)

Carrapateena BHP

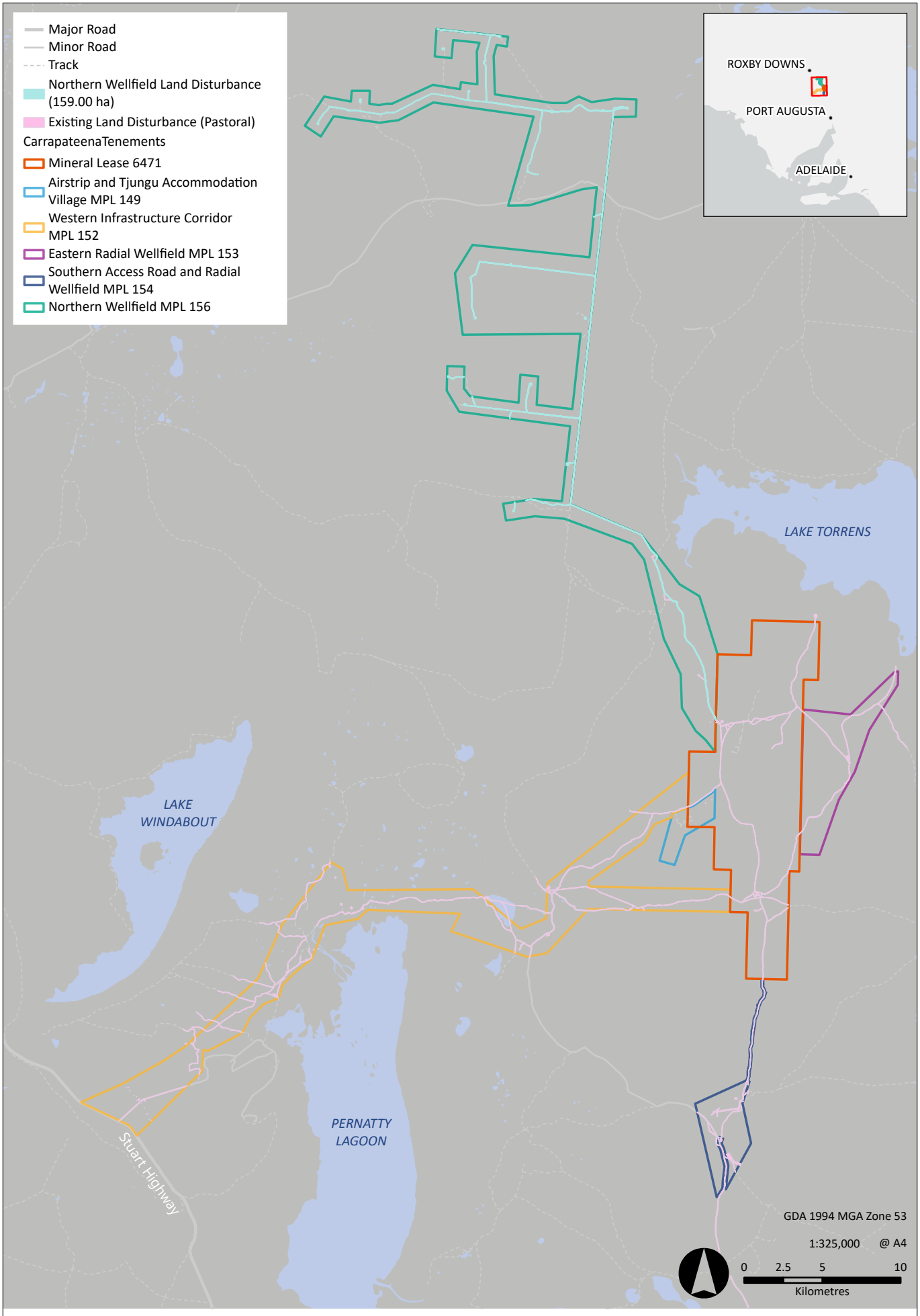

Figure 12.4 | Northern Wellfield Gateway Land Disturbance NVMP (Jan 2019 – Dec 2023)

Carrapateena BHP

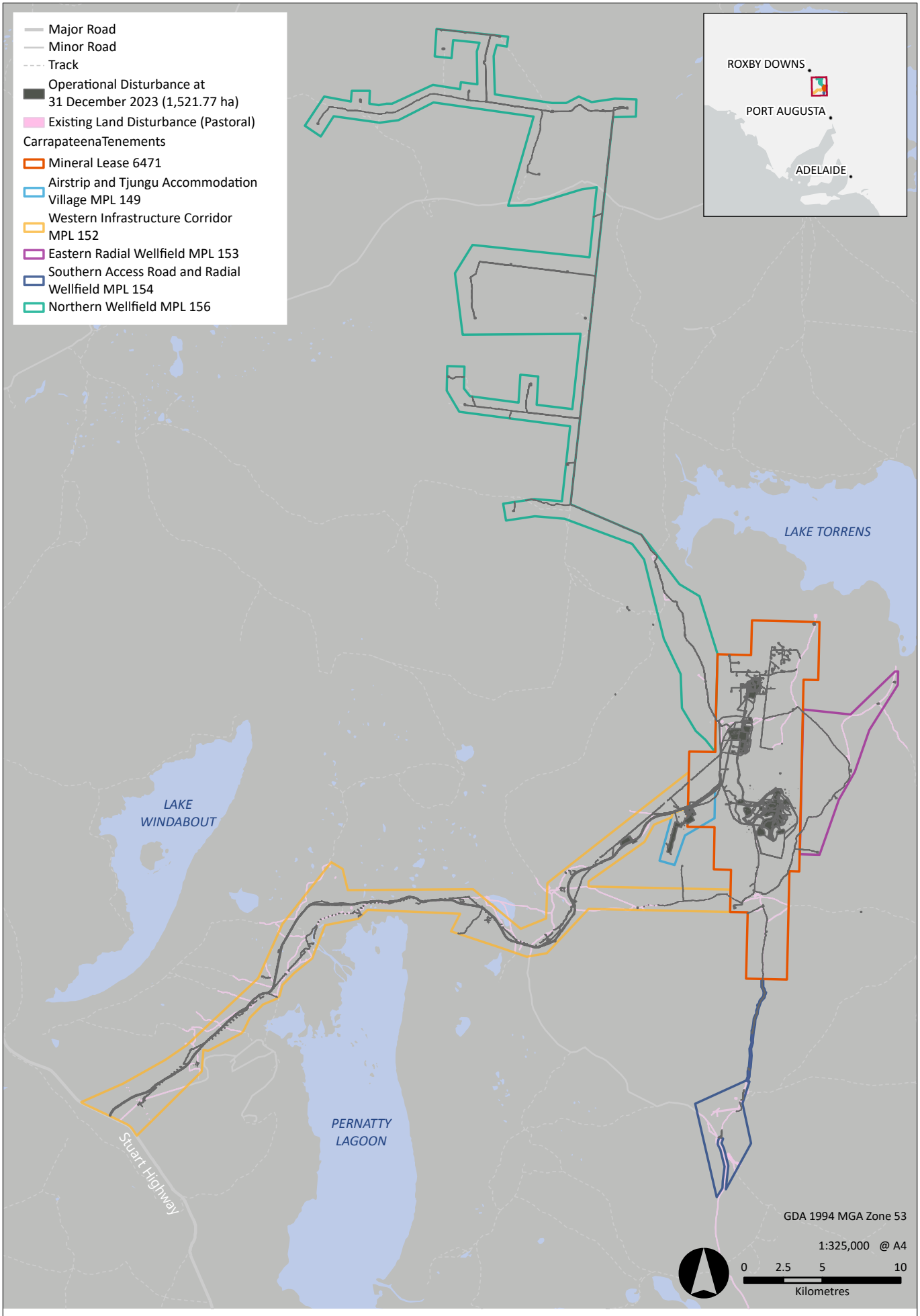

Figure 12.5 | Operational Disturbance Footprint (2013 – December 2023)

Carrapateena BHP

13 RECONCILIATION OF NATIVE VEGETATION CLEARANCE

Table 13.1: Land Disturbance NVMP Gateways

Gateway	Tenement	Approval	Approved maximum clearance (ha)	Total amount cleared in the reporting period (ha)	Total amount cleared to date (ha)	Estimated amount to be cleared in the next reporting period (ha)
1	RL 127, MPL 149, ML 6471	MPEPR2013/003 MPEPR2016/007 PEPR2017/028 PEPR2017/028 PEPR2018/003	476.15	0	283.86	0
2	MPL 149, ML 6471, MPL 152, MPL 153, MPL 154	PEPR2017/003 PEPR2018/007 PEPR2018/019	708.23	0	708.11	0
3	MPL 149, ML 6471, MPL 152, MPL 153, MPL 154	MPEPR2019/026	983.93	27.86	370.80	~20
Northern Wellfield NVMP	MPL 156	MPEPR2019/026	236.00	40.09	159.0	~5

Table 13.2: Disturbance by Vegetation Association (Gateway 3)

Veg Association	Description	Area Approved NVMP (ha)	Area Disturbed Gateway 2 (ha)	Area Disturbed Gateway 3 (ha)	Area Disturbed NW (ha)
1	*Atriplex vesicaria* (Bladder Salt Bush) +/- *Tecticornia medullosa* (Samphire) Low Open Shrubland	1,847.2	506.31	236.06	135.55
2	*Acacia ligulata* (Umbrella Bush) / *Dodonaea viscosa* var. *angustissimus* (Narrow-leaf Hop Bush) Low Open Shrubland +/-*Zygochloa paradoxa* (Sandhill Canegrass)	0	29.81	18.11	6.78
3	*Acacia aneura* (Mulga) Open Woodland over *Maireana sedifolia* / *Maireana pyramidata* / *Maireana astrotricha* / *Atriplex vesicaria*	47.2	15.79	18.71	NA
4	*Acacia papyrocarpa* (Western Myall) Woodland over *Maireana astrotricha* (Low Bluebush)	67.4	23.26	22.07	NA
5	*Acacia aneura* (Mulga) +/- *Dodonaea viscosa* ssp. *angustissimus* (Narrow-leaf Hop Bush) Shrubland over *Maireana pyramidata* (Black Bluebush), *Maireana astrotricha* (Low Bluebush)	26.2	10.79	10.34	NA
6	*Atriplex vesicaria* (Bladder Saltbush) / *Maireana astrotricha* (Low Bluebush) Low Open Shrubland	182.5	53.26	44.48	NA
7	*Acacia papyrocarpa* (Western Myall ssp.) Vey Low Woodland over *Atriplex vesicaria* (Bladder Saltbush) +/- *Ptilotus obovatus* (Silver Mulla Mulla), *Dodonaea lobulata* (Lobe-leafed Hop Bush), *Acacia tetragonophylla* (Dead Finish) and *Eremophila* spp. (Emu Bush) in drainage depressions	95.7	47.66	6.17	16.71
8	*Eucalyptus camaldulensis* var. (River Red Gum) +/- *Acacia papyrocarpa (*Western Myall ssp.*)* Low Woodland	16.3	4.47	1.56	NA
9	*Zygochloa paradoxa* (Sandhill Canegrass) Grassland	20.5	6.51	5.60	NA
10	*Casuarina pauper* (Black Oak) Open Woodland on calcrete outcrops and sand dune rises	4	1.62	0.84	NA
11	*Atriplex vesicaria* (Bladder Saltbush) Shrubland +/- *Dodonaea viscosa* var. *angustissimus* (Narrow-leaf Hop Bush) Open Shrubland	8.4	3.05	1.30	NA
12	*Acacia papyrocarpa* (Western Myall) Woodland over *Maireana pyramidata* (Black Bluebush) / *Callitris gracilis* (Native Pine)	10.2	1.18	3.48	NA
13	*Tecticornia pergranulata* (Black Seed Samphire) +/- *Melaleuca xerophila* (Boree) Low Shrubland	0	0.27	0.14	NA
14	*Eragrostis australasica* (Swamp Canegrass) Tussock Grassland	2.2	0.20	0.26	0.00
15	*Duma florulenta* (Lignum) *Tecticornia pergranulata* (Black Seed Samphire) *Maireana pyramidata* (Black Bluebush) Shrubland in flood out zones and alluvial fans	0.4	0.13	NA	NA
16	*Dodonaea viscosa* ssp. *angustissimus* (Narrow-leaf Hop Bush) / *Acacia ligulata* (Umbrella Bush) Low Shrubland in drainage channels	88.9	0.00	0.00	NA
17	*Callitris glaucophylla* (Native Pine) Woodland	0.6	0.62	0.32	NA
18	*Acacia papyrocarpa* (Western Myall ssp.) / *Eucalyptus camaldulensis* (River Red Gum) Low Woodland	0.3	0.00	0.00	NA
19	*Melaleuca xerophila* (Boree) Shrubland	0	0.00	0.00	NA
20	*Tecticornia medullosa* (Samphire) Low Open Shrubland	0.5	0.00	0.00	NA
21	Claypan	0	1.82	1.06	NA
-	No data	38.3	1.36	0.30	NA
Total		**2,456.8**	**708.11**	**370.80**	**159.00**

14 *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* (EPBC)

Condition number	Condition	Compliance status	Evidence demonstrating compliance with condition
1	To manage the impacts of the action on the environment, the person taking the action must implement the conditions of the SA approval.	Compliant	The Compliance Report associated with the granting of the Carrapateena Tenements under the *Mining Act 1971* (SA) will be submitted to DEM on 31 March 2024 indicating compliance with the conditions of the SA approval. This Compliance Report will be publicly available on the DEM website at: http://www.energymining.sa.gov.au/minerals/mining/mines_and_quarries/carrapateena
2	The person taking the action must not impact more than 1,740 hectares of Plains Rat habitat within the disturbance footprint.	Compliant	Total disturbance since the commencement of the referred action is 1,521.77 ha, including 269.5 ha of Plains Rat habitat, as shown in Figure 14.1 and Figure 14.2, respectively.
3	Prior to commencement of the action, to compensate for residual impacts to the Plains Rat, the person taking the action must acquire an offset property which must contain: a. a population of the Plains Rat b. no less than 1,740 hectares of Plains Rat habitat c. habitat quality equal to that of the Plains Rat habitat within the disturbance footprint.	Compliant	Following on from an 'Agreement to Underlease' (CA-APR-AGR-1037) with the Pastoral Lessee of South Gap Pastoral Station two offset areas, OZ Minerals established two individual Underlease Agreements, one for each offset area, securing a total of 3,251 ha of suitable Plains Rat habitat (Northern Offset Underlease Agreement 1,882 ha and Southern Offset Underlease Agreement 1,369 ha (CA-APR-LET-1178). The Underlease Agreements have a 10-year expiry term, with successive Agreements to be established totalling the required duration as per the approval conditions. The offset areas consist of Arcoona Tablelands habitat that is similar in quality and structure to the land disturbed at Carrapateena and are considered to represent equally viable Plains Rat habitat. Historical observations of Plains Rats have been recorded nearby the northern offset, and within the same stretch of continuous tablelands habitat connecting disturbed Plains Rat habitat at Carrapateena, to the offset areas on South Gap Station.
4	The person taking the action must maintain or improve the habitat quality of the existing Plains Rat habitat at the acquired offset property for the life of this approval.	Compliant	BHP Carrapateena has developed an Environmental Offset Management Plan (CA-0000-ENV-PLN-1004) (the Plan) which aims to: • Establish baseline conditions, including the distribution and condition of Plains Rat habitat, the presence and distribution of target species, and the identification and prioritisation of local threats. • Define the potential presence, distribution and abundance of other target species within the offset (i.e. Thick-billed Grasswren and Night Parrot). • Manage total predation pressure (Fox, Cat, Wild Dog/Dingo). • Enhance the condition of habitat for the benefit of Plains Rat, through the management of total grazing pressure (i.e. stock exclusion) and invasive weeds. • Improve knowledge of local target species populations including an understanding of how they respond to management locally. The Plan presents fourteen (14) individual objectives grouped under eleven (11) management strategies to address EPBC Act offset liability, and associated legislative and policy obligations, for the first ten (10)-year period of management.
5	Within 2 years from commencement of the action, the person taking the action must change the tenure of the offset property for conservation purposes using an appropriate legal mechanism for long term protection.	Compliant	Underlease agreements signed, executed and back-dated from to 21 April 2020 (2 years from the commencement of the action) for the Northern Offset Area and the Southern Offset Area. The areas have been officially registered with the Lands Titles Office: two registrations as associated with each offset area. The Agreements to Underlease clearly define that the areas are to be set aside for environmental offset purposes. The change in land use will apply for ten (10) years, after which the change in land use will need to be renewed (permission granted from the Commonwealth to manage as rolling terms to achieve the total required tenure).
6	Prior to the commencement of the action, the person taking the action must engage a suitably qualified expert to undertake a Night Parrot survey within the development envelope. The Night Parrot survey must be undertaken in' accordance with the EPBC Act Night Parrot survey guidelines. Within three months of the Night Parrot survey being completed, the person taking the action must provide the Department with the Night Parrot survey results.	Compliant	OZ Minerals completed a targeted Threatened Species Survey for Night Parrot in March 2018 (CA-ENV-REP-1040). There were no Night Parrots or evidence of Night Parrots detected during the survey. The results of the survey were forwarded to the DoEE in April 2018 (DOE: CA-APR-EML-1077). Night Parrot has not been reconfirmed as locally extinct within South Australia.
7	Should the Night Parrot or evidence of the Night Parrot be recorded during the survey, the person taking the action must submit for the Minister's approval, a Night Parrot Management Plan that must include: a. Details of the Night Parrot survey results, including the methodology, timing and area surveyed. b. An assessment of the impacts to the Night Parrot that will result from the action. c. Management actions that will avoid, minimise and/or offset both the immediate and long-term impacts of the action on the Night Parrot. d. Monitoring and reporting requirements that demonstrate the management actions are effectively being implemented and achieve the intended results. This should include the frequency, intensity and duration of monitoring. The person taking the action must not commence the action prior to the Minister approving the Night Parrot Management Plan. The approved Night Parrot Management Plan must be implemented.	Not Applicable	The targeted survey (CA-ENV-REP-1040) did not find evidence of the Night Parrot in the Operation area. Night Parrot has not been reconfirmed as locally extinct within South Australia.

Condition number	Condition	Compliance status	Evidence demonstrating compliance with condition
8	Prior to the commencement of the action, the person taking the action must engage a suitably qualified expert to undertake a *Frankenia plicata* survey within the development envelope. The *Frankenia plicata* survey must be undertaken in accordance with contemporary survey methods. Within three months of the *Frankenia plicata* survey being completed, the person taking the action must provide the Department with the *Frankenia plicata* survey results.	Compliant	OZ Minerals completed a targeted Threatened Species Survey for *Frankenia plicata* in March 2018 (CA-ENV-REP-1040). *Frankenia plicata* was not detected during the survey. The results of the survey were forwarded to DoEE in April 2018 (CA-APR-EML-1077). Follow-up work by the engaged consultant uncovered the incorrect classification of locally collected *Frankenia* samples lodged with the South Australian Herbarium. Consultation with the SA Herbarium coupled with extensive survey work within the Carrapateena tenements and more broadly within the region has failed to detect this species, which is more likely to occur much further north of the Operation.
9	Should the *Frankenia plicata* be recorded during the survey, the person taking the action must submit for the Minister's approval, a *Frankenia plicata* Management Plan that must include: a. Details of the *Frankenia plicata* survey results, including the methodology, timing and area surveyed. b. An assessment of the impacts to the *Frankenia plicata* that will result from the action. c. Management actions that will avoid, minimise and/or offset both the immediate and long-term impacts of the action on the *Frankenia plicata*. d. Monitoring and reporting requirements that demonstrate the management actions are effectively being implemented and achieve the intended results. This should include the frequency, intensity and duration of monitoring. The person taking the action must not commence the action prior to the Minister approving the *Frankenia plicata* Management Plan. The *approved Frankenia plicata* Management Plan must be implemented.	Not Applicable	The targeted survey (CA-ENV-REP-1040) did not find evidence of *Frankenia plicata* in the operational area. Follow-up work by the engaged consultant uncovered the incorrect classification of locally collected *Frankenia* samples lodged with the South Australian Herbarium.
10	Within 3 months following the change of tenure referred to in condition 5) the person taking the action must provide the Department with written evidence that the offset property has been secured for conservation purposes using an appropriate legal mechanism.	Compliant	Written evidence provided to DoEE via letter dated 16 December 2020 (CA-APR-LET-1178).
11	Within 30 days after the commencement of the action, the person taking the action must advise the Department in writing of the actual date of commencement.	Compliant	OZ Minerals advised DoEE of the commencement of the action on 21 April 2018 (CA-ENV-LET-1001).
12	The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.	Compliant	BHP Carrapateena maintains and Environmental Management System that includes electronic data management systems for document control (Aconex), obligations management and land access (LandFolio) and consultation/correspondence (INX InForm). Data collected during Carrapateena monitoring is recorded on the site environmental data management system (MonitorPro) or within ArcGIS. Data collected for the environmental offsets on South Gap pastoral station will be collected, managed and reported on by a third party engaged to manage the offset (Nature Foundation) with select information captured back into the Carrapateena systems.
13	Within 30 days after completion of the action, the person taking the action must advise the Department in writing of the actual date of completion and provide a map clearly defining the date, location and actual impact within the Disturbance footprint of the action and be accompanied with a shape file.	Not Applicable	BHP Carrapateena is currently undertaking the action.
14	The approval holder must prepare a compliance report for each 12-month period following the date of commencement of the action, or as otherwise agreed to in writing by the Minister. The approval holder must: a. publish each compliance report on the website within 60 business days following the relevant 12-month period; b. notify the Department by email that a compliance report has been published on the website within five business days of the date of publication; c. keep all compliance reports publicly available on the website until this approval expires; d. exclude or redact sensitive ecological data from compliance reports published on the website; and e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within 5 business days of publication. NOTE: The first compliance report may report a period less than 12 months so that it and subsequent compliance reports align with the similar requirement under state approval.	Compliant	The EPBC 2017/7895 Compliance Report is posted annually in April to BHP's website where copies of previous Compliance Reports can also be located.
15	Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.	Not Applicable	BHP Carrapateena has not been directed by the Minister to commission an independent audit of compliance with the conditions of approval associated with EPBC 2017/7895.

Condition number	Condition	Compliance status	Evidence demonstrating compliance with condition
16	If, at any time after 5 years from the date of this approval, the person taking the action has not commenced the action, then the person taking the action must not commence the action without the written agreement of the Minister.	Not Applicable	OZ Minerals commenced the action in late March 2018, as communicated to DoEE in April 2018 (CA-ENV-LET-1001).
17	The approval holder must notify the Department in writing of any: incident; non-compliance with the conditions; or non-compliance with the commitments made in plans. The notification must be given as soon as practicable and no later than two business days after becoming aware of the incident or non-compliance. The notification must specify: a. the condition which is or may be in breach; and b. a short description of the incident and/or non-compliance.	Compliant	There were no non-compliances with the EPBC 2017/7895 conditions of approval, nor non-compliances with commitments described in any plans required therein during the reporting period. There were no incidents associated with the action during the reporting period that caused, or had the potential to cause, significant impacts to matters of national environmental significance.
18	The approval holder must provide to the Department details of any incident or non-compliance with the conditions or commitments made in plans as soon as practicable and no later than 30 days after becoming aware of the incident or non-compliance, specifying: a. Any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future; b. the potential impacts of the incident or non-compliance; and c. the method and timing of any remedial action that will be undertaken by the approval holder.	Compliant	There were no non-compliances with the EPBC 2017/7895 conditions of approval, nor non-compliances with commitments described in any plans required therein during the reporting period. There were no incidents associated with the action during the reporting period that caused, or had the potential to cause, significant impacts to matters of national environmental significance.

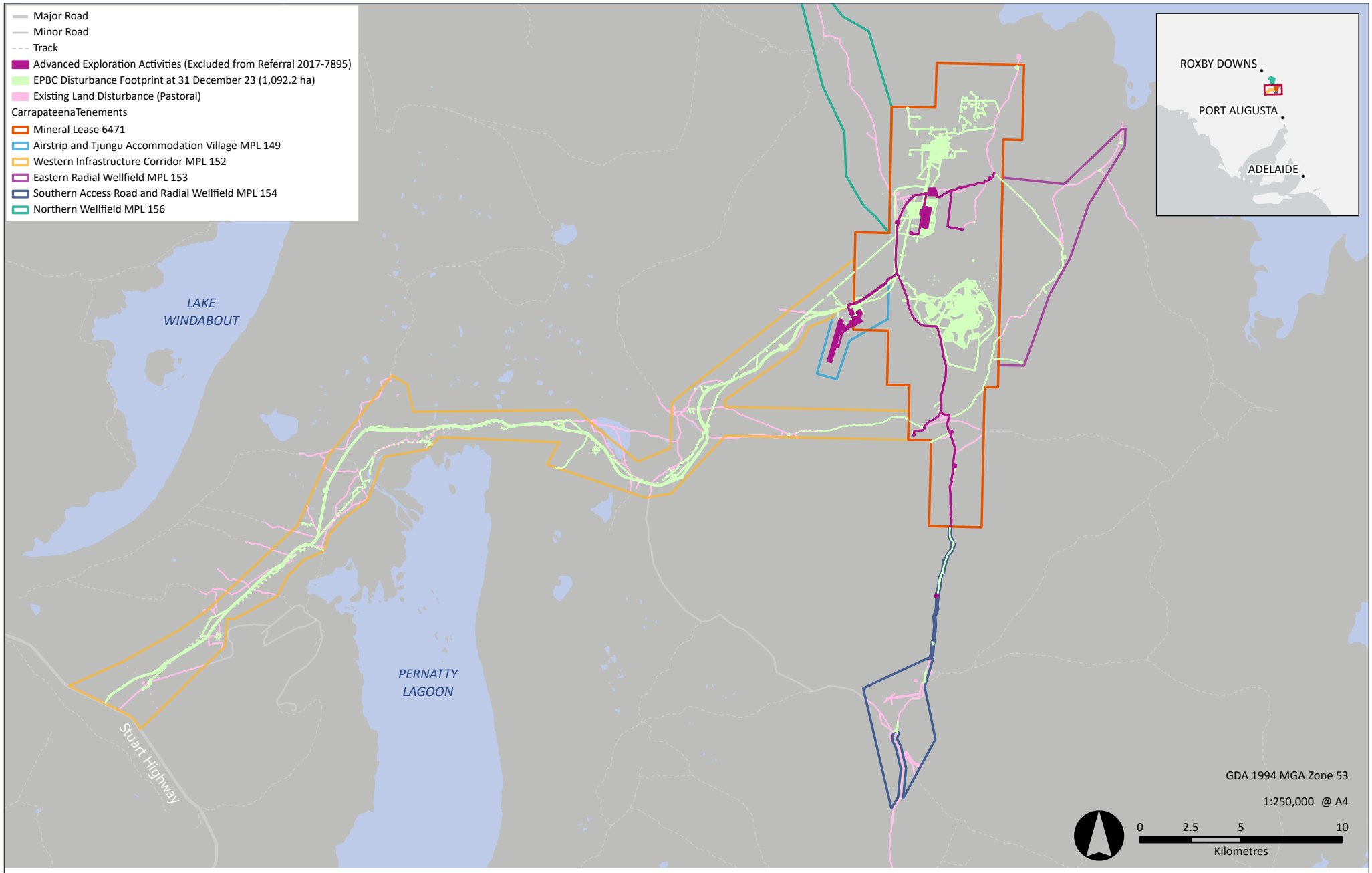

Figure 14.1 | EPBC Disturbance Footprint (December 2023)

Carrapateena BHP

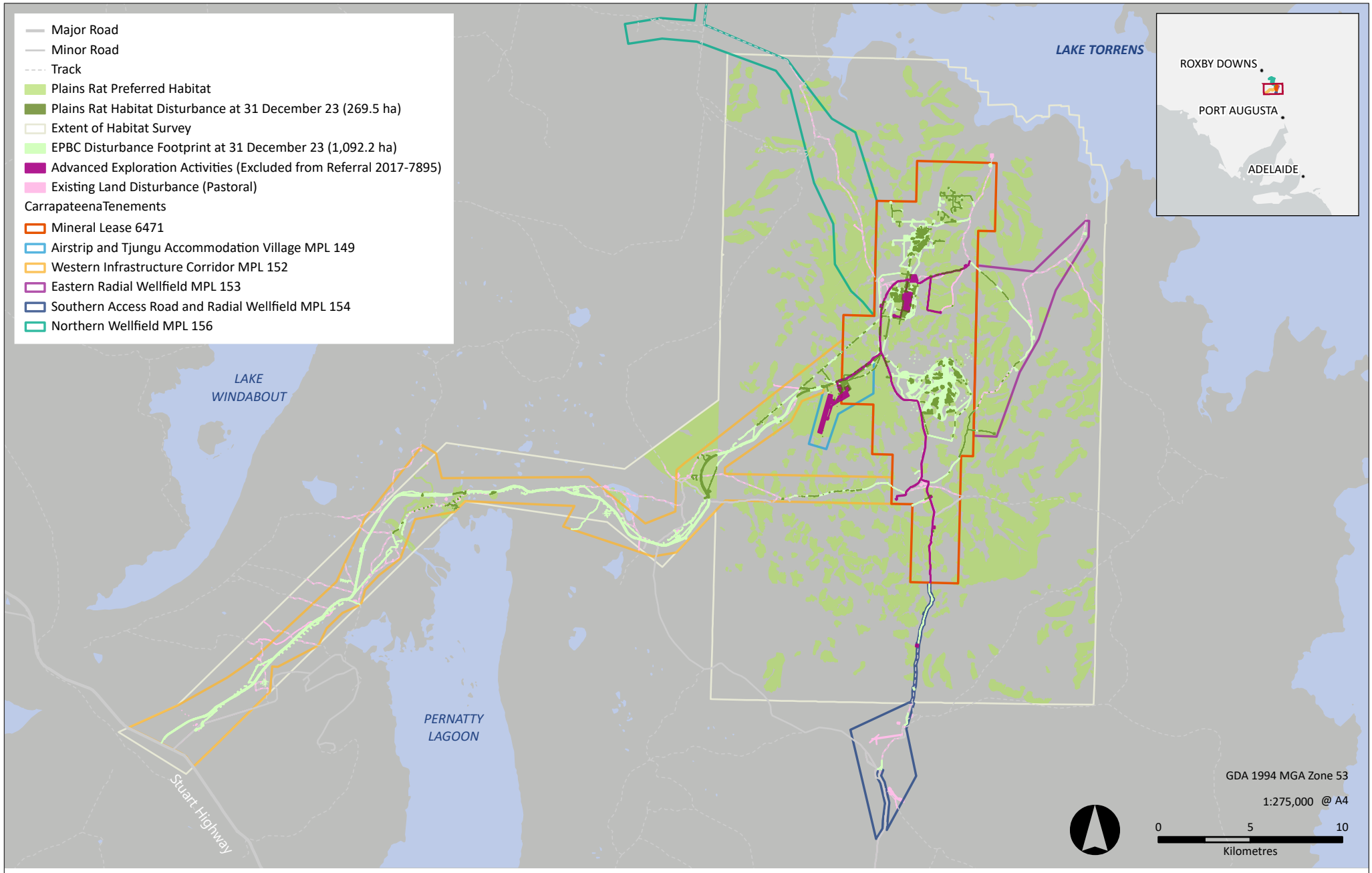

Figure 14.2 | Plains Rat (*Pseudomys australis*) Habitat Disturbance at 31 December 2023

Carrapateena BHP

15 EXEMPT LAND

It is required that a statement is provided that all waivers for land relevant to the mining operations are in place and compliant with exempt land provisions in accordance with Section 9 of the *Mining Act, 1971* (SA). These statements are provided below.

All required waivers of exemption required for the work undertaken during the compliance period are in place as summarised in Table 15.1 to Table 15.5 and all exempt land is shown on Figure 15.1.

Table 15.1: Mineral Lease 6471 Exempt Land

ID	Person entitled to exemption	Structure	Area of exemption (ha)*	Date waiver registered/ obtained	Reason	Relevant conditions
CL1330/26						
1	Pernatty Pastoral Lease	South Eliza Hut and Dams	27.5	16/7/2018	Located within 150 m of existing Southern Access Road and bore field road and pipeline.	Contained in land access and compensation agreement CA-APR-1033
2		Stockyard	10.1		Located within 150 m of access road and common services trench near the MPP and mine surface infrastructure. Location of infrastructure is required in this location to provide mines access and services.	
3		North Eliza Dam	19.7	Not required	Distance between mining operations and structure is greater than 150 m.	Not applicable
4		Well	7.6			
5		Well or borehole	7.7			
6		Dawson Dam	15.5			

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

Table 15.2: Western Infrastructure Corridor MPL 152 Exempt Land

ID	Person Entitled to Exemption	Structure	Area of exemption (ha)*	Date waiver registered / obtained	Reason	Relevant conditions
CL1330/26						
16	Pernatty Pastoral Lease	Parkes Dam	13.1	16/7/2018	Location optimised to take advantage of existing pastoral tracks.	Contained in land access and compensation agreement CA-APR-1033
17		Camel Dam	18.2		Located within 150 m of existing pastoral track within tenement.	
18		Cattle Yard, Shed and Dam	25.2			
19		Kyolia Dam	14.4		Located within 150 m of Western Access Road.	
20		Elizabeth Dam	14.3			
21		Yeltacowie Racecourse Dam	18.2	Not required	Located inside tenement but distance between mining operations and structure is greater than 150 m.	Not applicable
22		Cattle yard and sheds	14.0			
23		Canegrass Dam and Trap Yard	15.6			
24		Stockyard	9.4			
25		Cement Bank	8.4			
26		Wilsons Tank	7.6			
27		Pressure tank	7.6			
28		Yeltacowie Homestead and outbuildings	105.5			
29		Surface Waterhole 9	11.1			
30		Elizabeth Catch Waterhole	11.9			

ID	Person Entitled to Exemption	Structure	Area of exemption (ha)*	Date waiver registered / obtained	Reason	Relevant conditions
CL6178/725						
31	Oakden Hills Pastoral Lease	Electrical transmission pole	104.9	In progress	Located within 150 m of mining operations.	To be provided in relevant land access and compensation agreement
32		Borrow pit	10.4		Western Access Road and 132 kV transmission intersects Electrical transmission line – ElectraNet.	
33		Electrical transmission line - ElectraNet	11.6			
34		Solar Monitoring Station	7.3	Not required	Distance between mining operations and structure is greater than 150 m.	Not applicable
35		Tower	7.3			
CT6135/25						
36	WMC (Olympic Dam Corp) Pty Ltd	Substation	10.3	In progress	Location optimised next to existing transmission infrastructure (within 150 m).	To be provided in relevant land access and compensation agreement
37	WMC (Olympic Dam Corp) Pty Ltd	Electrical transmission line - WMC	115.3		Western Access Road and 132 kV transmission intersects Electrical transmission line – WMC.	

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

Table 15.3: Eastern Radial Wellfield MPL 153 Exempt Land

ID	Person entitled to exemption	Structure	Area of exemption (ha)*	Date waiver registered/ obtained	Reason	Relevant conditions
CL1330/26						
7	Pernatty Pastoral Lease	Anzac Dam and stock yard	21.4	16/7/2018	Located within 150 m of existing pastoral track and existing groundwater supply wells.	Contained in land access and compensation agreement CA-APR-1033
8		Tadpole Waterhole	14.7	16/7/2018	Located outside the tenement and distance between mining operations and structure is greater than 150 m.	Not applicable

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

Table 15.4: Southern Access Road and Radial Wellfield MPL 154 Exempt Land

ID	Person Entitled to Exemption	Structure	Area of exemption (ha)*	Date waiver registered/ obtained	Reason	Relevant conditions
CL1330/26						
9	Pernatty Pastoral Lease	Airstrip	87.2	16/7/2018	Located within 150 m of existing pastoral track and existing groundwater supply wells.	Contained in land access and compensation agreement CA-APR-1033
10		Pernatty Homestead and outbuildings	83.8			
11		Accommodation, stock yard and sheds	75.9			
12		Waterhole	15.6	Not required	Distance between mining operations and structure is greater than 150 m.	Not applicable
13		Pernatty Dam	60.0			
14		Tank	7.5			
15		Pernatty Well and tanks	18.6			

* Area of exemption includes the footprint of the structure and the buffer of exemption as per Part 9(d) of the *Mining Act 1971* (SA)

Table 15.5: Northern Wellfield MPL 156 Exempt Land

ID	Person entitled to exemption	Structure	Area of exemption (ha)*	Date waiver registered/ obtained	Reason	Relevant conditions
CL 6213/627						
38	Pernatty Pastoral Lease	Hogan Dam	25.87	16/7/2018	Proposed well access/pipeline near Hogan Dam	Contained in land access and compensation agreement CA-APR-1033
CL 6211/35						
39	Arcoona Pastoral Lease	Bosworth Hut, Stockyard, Tank and Well NC	18.11	13/12/2018	Proposed well access/pipeline near Bosworth Hut, stockyard, tank, Well NC	Contained in land access and compensation agreement CA-APR-1046
40		Hilda Tank and Infrastructure	7.76		Proposed well access/pipeline near Hilda Tank/ Infrastructure	
41		Alexander Tank	8.36		Proposed well access/pipeline near Alexander Tank	
42		White Dam, Stockyard, Tank and Pipeline	37.58		Proposed well access/pipeline near White Dam, stockyard, tank, pipeline	

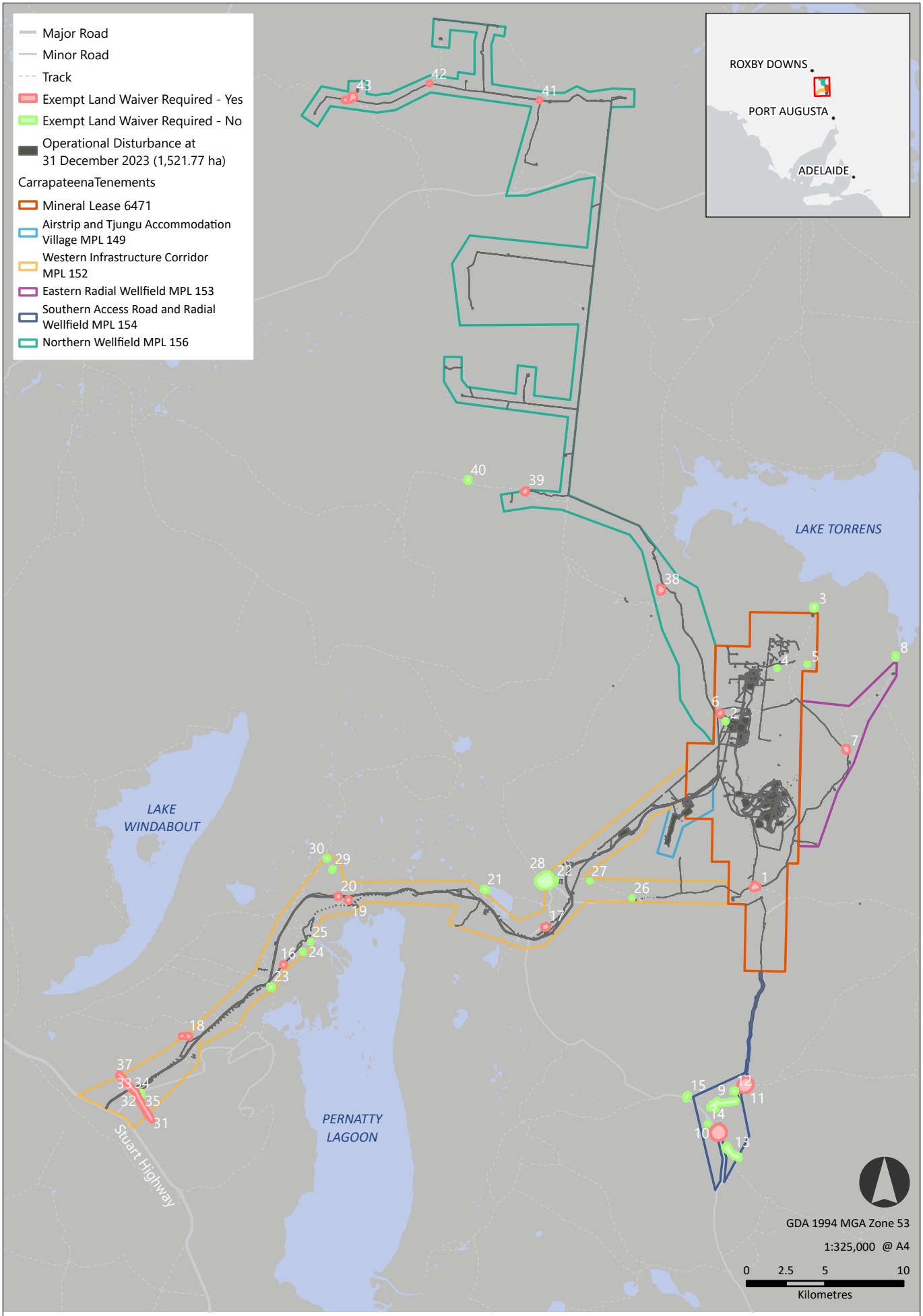

Figure 15.1 | Exempt Land and Operational Disturbance Footprint 2023

Carrapateena BHP

16 COMPLAINTS

No complaints were received throughout the reporting period.

17 MANAGEMENT SYSTEM REVIEWS

The following table outlines the management system reviews undertaken at Carrapateena for the reporting period.

Aspect Audited Note: What aspects of the management system was audited or reviewed	Date of audit	Auditor	Issues raised Notes: What issues or recommendations for improvements were noted	Corrective Action Note: What corrective action that has or will be taken to address the issue
Environmental Management System Review and associated environmental management plans	2023	Lathwida Environmental	Review of environmental management system and associated environmental management plans was completed by external consultant (Lathwida Environmental) in February 2024	N/A

18 VERIFICATION OF UNCERTAINTIES

Note that the references to figures, tables and appendices in the Strategies below relate to the MPEPR2019/026 (OZ Minerals 2020).

Description of assumption or uncertainty	Estimated date to resolve	Progress in reporting period	Confirmed	Forward work plan
Air Quality - Modelling **Strategy – AQ13** Develop an appropriate tailings beach trial methodology (air quality) to the satisfaction of the Director of Mines (or other authorised officer) prior to Stage 1 of the Tailings Storage Facility to establish dust threshold lift off speed for tailings including monitoring of tailings change over time and representation of final landform including modelling input assumptions of moisture content, crust thickness, wind speed, and particle size (Appendix C1 Air Quality Modelling and Assessment of Effects)[#] # Air Quality Strategy (Schedule 6 Condition 15) **Strategy – AQ14** Implement the tailings beach trial to the satisfaction of the Director of Mines (or other authorised officer) during Stage 1 of the Tailings Storage Facility to establish dust threshold lift off speed including monitoring of tailings change over time including modelling input assumptions of moisture content, crust thickness, wind speed, and particle size (Appendix C1 Air Quality Modelling and Assessment of Effects)[#] # Air Quality Strategy (Schedule 6 Condition 15)	December 2023	BHP Carrapateena developed an in-field dust lift off trial methodology in conjunction with Engineer of Record, WSP Golder, which was completed in March 2024. Originally developed for a similar study at Glencore's Integrated Nickel Operation in Sudbury, Ontario Canada, The Carrapateena study includes deployment of a PI-SWERL at the TSF to characterise wind erosion emissions parameters. Preliminary data was presented to the DEM and EPA in January 2024 and a final reported will be submitted in H1 2024. The Air Quality Model was updated in 2024 and in-field validation of wind erosion parameters can be reincorporated into future air quality assessments.	Yes	Implementation of field trial to commence during Stage 1 and Stage 2 of the TSF.
Surface Water - Design Detail **Strategy – SWES7** Detailed design of the surface water management infrastructure (Figure 4.40) undertaken by a suitably qualified expert is undertaken prior to the commencement of construction and demonstrates the surface water management infrastructure basis of design (Section 4.12) has been achieved and will adopt strategies to ensure erosion and sedimentation is suitably managed[#] # Surface Water Strategy (Schedule 6 Condition 19.1, 19.2 and 19.3)	Completed	Detailed design of the MPP and above-ground mining infrastructure completed by a suitably qualified expert.	Yes	NA
Topsoils **Strategy – SWES8** During land clearing activities topsoil must be stockpiled and measure adopted to preserve stockpiled materials until the material is reused or determined to be no longer required[#] # Surface Water Strategy (Schedule 6 Condition 19.4)	Ongoing	Topsoil is progressively stockpiled near infrastructure and mapped in spatial database. LFAs progressing	Ongoing	Updated locations as operations progress. LFA will determine future need of topsoil.
Surface Water Modelling **Strategy – SWRF2** Develop an appropriate methodology for the ongoing review and calibration of the surface water model (Appendix C3 Surface Water Monitoring and Assessment of Effects) associated with reduced flows in Eliza Creek as a result of the Sub Level Cave Subsidence Zone and Tailings Storage Facility (Figure 4.1) prior to the commencement of construction activities to address modelling uncertainty including long-term site-specific rainfall and evaporation data[#] # Surface Water Strategy (Schedule 6 Condition 18) **Strategy – SWRF3** Implement the surface water model Appendix C3 Surface Water Monitoring and Assessment of Effects) calibration methodology from the commencement of construction activities associated with reduced flows in Eliza Creek as a result of the Sub Level Cave Subsidence Zone and Tailings Storage Facility (Figure 4.1) to establish long-term site-specific rainfall and evaporation data[#] # Surface Water Strategy (Schedule 6 Condition 18) **Strategy – SWRF4** Calibration of the surface water model (Appendix C3 Surface Water Monitoring and Assessment of Effects) undertaken at year 2022 using site specific rainfall and evaporation data and validates modelling outputs associated with reduced flows in Eliza Creek as a result of the Sub Level Cave Subsidence Zone and Tailings Storage Facility (Figure 4.1 and Table 8.1). Any significant variations in surface water modelling during operations from those must result in a review of the effectiveness of surface water strategies to demonstrate that the outcomes are achievable [#] # Surface Water Strategy (Schedule 6 Condition 18)	Completed	BHP completed SWRF2 in 2018 and subsequently engaged a suitably qualified consultant to update the Eliza Creek Surface Water Model in 2020. In alignment with SWRF4 a stream gauge was installed in Eliza Creek in November 2021 to reduce modelling uncertainty and validate outputs. BHP engaged EMM to update the Eliza Creek Surface Water Model in 2022 (Calibration Methodology for Eliza Creek Models), as referenced in Appendix H of the 2022 Carrapateena PEPR Compliance Report.	Yes	N/A

Description of assumption or uncertainty	Estimated date to resolve	Progress in reporting period	Confirmed	Forward work plan
Tailings Storage Facility - Design Update **Strategy – TSF30** The design (Appendix B1 Tailings Storage Facility Design) of the Tailings Storage Facility (Figure 4.1) must be updated prior to the commencement of construction and address the various items. Also related to strategies identified in SWES9, SWED10, SWES11, SWES12	Completed	Updated TSF Design was provided on 17 July 2018 addressing the design items listed in Strategy TSF30. The Tailings Pipeline Detailed Design, Construction Quality Assurance Plan, Seepage Assessment and TSF Design Independent Peer Review undertaken by ATC Williams were sent to DEM on 12 November 2018 to support the design. One matter remains unresolved relating to the size of the lined decant cell. Updated seepage modelling was provided to support the current size of the decant cell and DEM have identified residual uncertainty. Detailed design to increase the size of the lined decant cell completed in February 2019 and construction completed before end of 2019. DEM approved the design via approval of the 2020 PEPR (OZ Minerals 2020).	Yes	Detailed design to increase the size of the lined decant cell completed in February 2019 and construction completed before end of 2019. DEM to formally respond to design through 2024 PEPR review.
Tailings Storage Facility - Landform Evolution Modelling **Strategy – TSF33** Develop an appropriate erosion field study methodology to the satisfaction of the Director of Mines (or other authorised officer) prior to Stage 1 of the Tailings Storage Facility for the Stage 2 embankment surface and isolated areas of the tailing beach to establish run-off and sediment load including modelling input assumptions of embankment geometry, rock armouring, particle sizes, and rainfall intensity (Appendix B1 Tailings Storage Facility Design (Landform Evolution Modelling))# # Surface Water Strategy (Schedule 6 Condition 19.5) **Strategy –TSF34** Implement the erosion field study during Stage 2 of the Tailings Storage Facility to establish run-off and sediment load including modelling input assumptions of embankment geometry, rock armouring, particle sizes, and rainfall intensity (Appendix B1 Tailings Storage Facility Design (Landform Evolution Modelling))# # Surface Water Strategy (Schedule 6 Condition 19.5)	December 2022	Draft methodology developed by SRK Consulting. Model parameters to be validated using TSF Stage 2 Embankment construction material and operational tailings parameters. Update of the Landform Evolution Model was undertaken in 2022 and presented as Appendix G to the 2022 Carrapateena PEPR Compliance Report. Engagement with DEM and EPA to be undertaken to confirm adequacy of the methodology. Implementation of methodology during TSF Stage 2.	Ongoing	Engagement with DEM and EPA to be undertaken to confirm adequacy of the methodology. Implementation of methodology during Stage 2 TSF.
Acid and Metalliferous Drainage **Strategy – AMD7** Develop an appropriate AMD Management Plan for stockpile locations (Figure 4.32) prior to the commencement of construction activities that includes the following: • Develop a program to investigate the potential for metalliferous drainage to be generated by NAF material which contains sulphides# # Surface Water Strategy (Schedule 6 Condition 21.4.2) • Refine the sulphur cut-off grade for PAF material through further testing of waste units# # Surface Water Strategy (Schedule 6 Condition 21.4.3) • Develop an ore, waste rock and sulphur block model# # Surface Water Strategy (Schedule 6 Condition 21.4.4) • Develop the block model to include the sulphur distribution of all waste and ore to be mined for the purpose of determining the distribution and estimating the volume of NAF and PAF using the sulphur cut-off grade# # Surface Water Strategy (Schedule 6 Condition 21.4.5) • Regular updating of the block model with new geological and sulphur assay data in the course of operations and aligning to the materials handling program# # Surface Water Strategy (Schedule 6 Condition 21.4.6) • Develop a QA/QC process for validation of Acid Base Accounting (ABA) characteristics# # Surface Water Strategy (Schedule 6 Condition 21.4.7) • Develop a QA/QC process for the waste rock block model and testing to ensure the correct rock is placed in the correct destination# # Surface Water Strategy (Schedule 6 Condition 21.4.8) • Segregation of PAF waste rock, NAF waste rock, and waste rock with the potential for metalliferous drainage (based on a classification process) and a mining schedule for each# # Surface Water Strategy (Schedule 6 Condition 21.4.9) • Ensure stockpiles containing PAF material are appropriately located# # Surface Water Strategy (Schedule 6 Condition 21.4.10) • Develop appropriate stockpile management strategies# # Surface Water Strategy (Schedule 6 Condition 21.4.11) • Confirm final end uses for waste rock and marginal ore based on geochemical classification# # Surface Water Strategy (Schedule 6 Condition 21.4.12)	July 2019	AMD Management Plan amended following review in 2023.	Completed	Continuous review of AMD Management Plan and remove uncertainty around low potential for metalliferous drainage of NAF to simplify stockpile management.

Description of assumption or uncertainty	Estimated date to resolve	Progress in reporting period	Confirmed	Forward work plan
Groundwater Modelling **Strategy – GW6** Calibration of the Groundwater Model (Appendix C5 Groundwater Modelling and Assessment of Effects) is undertaken in year 2022 with operational monitoring data from monitoring sites (Figure 8.7) and validates modelling outputs. If modelling outputs vary an assessment will be undertaken to consider whether strategies are still appropriate[#]	Completed	Monitoring well network installed and continuation of groundwater monitoring data collection. Groundwater model reviewed by CDM Smith in 2021 using groundwater abstraction/monitoring data. As per GW6 another review was undertaken by EMM and reported as Appendix I to the 2022 PEPR Compliance Report.	Yes	Monitoring of established groundwater well network
Tailings AMD Geochemistry **Strategy – TSF31** Undertake stage two geochemical assessment program involving kinetic testing of the tailings prior to the commencement of construction of the Tailings Storage Facility (Figure 4.1) and update the Tailings Storage Facility Design (Appendix B1 Tailings Storage Facility Design) and Geochemical model (Appendix C4 Tailings Discharge and Seepage Geochemical Model) in the event that tailings properties and solute parameters vary when compared to Appendix B2 Geochemical Characterisation of Tailings[#] # Surface Water Strategy (Schedule 6 Condition 21.1 and 21.4.1)	Completed	Updated surface water and geochemical assessment of effects was provided on 18 December 2019.	Yes	NA
Seepage and Discharge **Strategy – TSF32** Review the Geochemical model (Appendix C4 Tailings Discharge and Seepage Geochemical Model) prior to the commencement of construction of the Tailings Storage Facility (Figure 4.1) and address the following items[#]: • Review the input concentrations for elements and metals used. • Based on the review provide an updated or revised solute transport geochemical model. • Revise strategies associated with seepage and discharge if required. # Surface Water Strategy (Schedule 6 Condition 20.5) and Groundwater Strategy (Schedule 6 Condition 26.2)	Completed	Updated surface water and geochemical assessment of effects was provided on 18 December 2019.	Yes	NA

19 CHANGES TO MINING OPERATIONS

Description of change to existing mining operation	Significance level (1–4)	Date submitted to DEM	Date endorsed by DEM	Current status at the end of the reporting period
Miscellaneous Purposes License Management Plan – Airstrip, Workers' Accommodation Village and Ancillary Infrastructure	4	December 2016	15/09/2017 (PEPR)	PEPR2017/028 approved for MPL 149
TSF Stage 1 Construction Sequencing Amendment (April 2018), CA-APR-REP-1001	4	05/07/2018	16/08/2018	Approved – Completed
Updated TSF Design Report, CA-APR-REP-1003	4	05/07/2018	16/08/2018	Approved – Completed
Tenement Reduction ML 6471, MPL 149, MPL 152, MPL 153 and MPL 154, CA-APR-REP-1008	4	12/12/2018	14/12/2018	Approved – Completed
Minor Change Notification – Mine Water Storage Damns and Pipeline to the TSF. OZ Minerals sought approval to construct a pipeline from the mine water storage dams to the TSF to utilise surplus mine dewater for construction activities. CA-APR-NOT-1028	4	08/12/2018	14/12/2018	Approved – Completed
Minor Change Notification – TSF Borrow Pit Excavation Depth. OZ Minerals sought approval to expand the excavation depth at the TSF Borrow Pit from 3 m to 8 mBGL for the purpose of winning suitable material for construction of the TSF Stage 1 embankment. CA-APR-NOT-1032	4	07/02/2019	08/02/2019	Approved – Completed
TSF Stage 1 Temporary Sprinkler Farm CA-APR-NOT-1038	4	15/04/2019	9/5/2019	Approved – Activity completed and decommissioned
Injection Well Water Management CA-APR-NOT-1041	4	8/05/2019	28/5/2019	Approved – Secondary approval gained, not yet implemented
TSF Lined Decant Cell Expansion and Borrow Pit 1 Expansion CA-APR-NOT-1044	4	26/06/2019	12/11/2020	Approved – Completed
TSF Second Sprinkler Bed CA-APR-NOT-1045	4	12/07/2019	15/8/2019	Approved – Completed
Temporary Concentrate Haulage CA-APR-NOT-1047	4	9/09/2019	11/10/2019	Approved – Completed
Sourcing clay for Mine Water Environmental Dam	4	5/08/2019	12/08/2019	Approved – Completed
Program Notification Temporary Accommodation Camp at Yeltacowie – MPL 152	4	28/10/2020	26/11/2020	Approved – Completed
Program Notification Extension to Midway Quarry	4	30/10/2020	26/11/2020	Approved – Completed
Program Notification Midway Quarry Temporary Batch Plant CA-ENV-LET-1022	3	21/01/2021	04/02/2021	Approved – Completed
Program Notification Midway Quarry Eastern Stockpile Extension	3	20/04/2021	7/05/2021	Approved – Completed
Program Notification Stage 1 Tailings Storage Facility Interim Bund Works	3	30/04/2021	24/05/2021	Approved – Completed
Program Notification Waste Dump to Tailings Storage Facility Haul Road & TSF Stage 2 Design Amendments	3	17/08/2021	28/09/2021	Approved – Completed
Program Notification Temporary Concentrate Storage Pad	3	22/02/2022	22/03/2022	Approved – Completed

Provide a description of any new or emerging environmental hazards that apply, or appear to be arising, in relation to mining operations
No new or emerging environmental hazards have been identified that relate to mining operations

20 TECHNICAL REPORTS

The following table lists all technical data, studies and report generated during the reporting period that support the achievement of tenement conditions and environmental outcomes in the approved PEPR.

Report Title	Authors
Appendix C 2023 Environmental Monitoring Report (Groundwater and Surface Water)	BHP Carrapateena
Appendix D 2023 Carrapateena Autumn Ecology Monitoring Report	Jacobs
Appendix E 2023 Air Quality Monitoring Report	Lathwida Environmental, David Winterburn
Appendix F 2023 Environmental Radiation Impact Assessment	Radiation Consulting Australia, Daniel Emes
Appendix G 2023 South Gap Offset Annual Report	Nature Foundation

21 VOLUNTARY INFORMATION

Item	Description
Operation footprint	1,521.77 ha
Greenhouse gas emissions	BHP triggers reporting thresholds for greenhouse gas emissions under the *National Greenhouse and Energy Reporting (NGER) Act 2007* (Cth). Carrapateena's energy and emissions are included in the total emissions and energy published for BHP, available at Corporate emissions and energy data (cleanenergyregulator.gov.au)
No. of employees (company and contractors)	**Tjungu Village** Average personnel on site per day for the 2023 reporting period totalled 574 employees and contractors (peaking at 655 in November 2023 during a shutdown of the MPP). An additional 152 of 216 new units are online at Tjungu Village with the remainder scheduled for installation in Q2 CY24. Total rooms being 788. **Exploration Village** Average personnel on site per day for the 2023 reporting period totalled 133 employees and contractors (peaking at 165 in February 2023). Personnel on-site is expected to average ~100 per day in 2024, peaking every quarter for MPP shutdowns.
Resource development	The 2023 Mineral Resources and Ore Reserves are reported in the BHP Annual Report 2023, Additional Information; Section 5, which can be found on the BHP website at bhp.com/investors/annual-reporting (BHP 2023)
Community or wider environment support activities	BHP Carrapateena provides extensive sponsorship opportunities for local community groups particularly for those with an educational and/or sustainable focus. BHP Carrapateena works closely with the Kokatha Aboriginal Corporation (KAC) and as part of our NTMA obligations to oversee education, training and employment opportunities via the Partnering Management Committee (PMC). The PMC made up of BHP Carrapateena employees, KAC Board members and staff and meets quarterly. In 2016 a Partnering Agreement was signed between KAC and OZ Minerals. The agreement states that KAC and OZ Minerals will work together to create suitable benefits by leveraging, developing and building on ours shared values aspirations, whilst protecting and respecting country and culture. Carrapateena is represented on numerous government, industry and community groups within the area including the Gawler Ranges District Landscapes Australia Group as well as being a major sponsor for the Royal Flying Doctor Service (RFDS), Clontarf Foundation, Shooting Stars, Uni Hub Spencer Gulf and the Remote and Isolated Childrens Exercise activity days.
Community engagement activities	The operation has immediate neighbours on Pastoral Land and has ongoing communication with them. BHP Carrapateena participates in presentations with community groups and provides formal and informal updates to local councils and industry chambers groups. Operational and local sourcing opportunity updates were given at various conferences and events throughout the reporting period.
Environmental research information	Activities have been ongoing at site as part of our monitoring to improve our understanding of the natural environment. We continue to collect data around air quality, flora and fauna, surface water flows and groundwater. This will further support our understanding of the environment and further expand on the baseline data collected in previous years.

22 COMMUNITY ENGAGEMENT

The following table summarises community engagement activities during the reporting period.

Community or wider environment support activities	Description
Pernatty consultation	Operating Protocol annual meeting 21/02/2023
	Ad hoc and regular emails and phone calls recorded into Borealis
South Gap Pastoral Station consultation	Meetings in field relating to Western Access Road and other operational matters.
	Ongoing meetings and in-person engagements across 2023
Arcoona/Bosworth Pastoral Station consultation	Operating Protocol annual meeting 15/03/2022 Ad hoc and regular emails and phone calls to provide operational and updates Recorded in Borealis
Regular (~monthly) email updates to all Pastoralists connected to Carrapateena	Email to pastoralists providing an update on each work element of the operation and other additional relevant information
Regular Kokatha Operations (LEAN) meetings	Regular (~monthly) meetings with Kokatha operational personnel
Kokatha PMC – Quarterly	Review of compliance with NTMA including business development, employment and training, heritage safety and environment for Kokatha corporation. PMC numbers 22, 23, 24 and 25 held in 2023
Kokatha Partnering Health Check	Partnering Health Check held with Kokatha members in May 2023. Various site inspections (including the TSF, Western Access Road and subsidence zone) undertaken
Local Supply Engagements	Continued strategic relationship with Global Maintenance Upper Spencer Gulf (GMUSG), now Tactic. Conducted local suppliers tour for camp services provider ISS which resulted in onboarding 12 new local suppliers. Sponsored and attended the annual GMUSG Conference and Trade Expo in Port Augusta in August.
Local Government Engagements	Two visits with Port Augusta City Council and Whyalla City Council delegates to discuss the Northern Water Project, local economic conditions, industry developments (particularly hydrogen) and community issues.
Remote and Isolated Children Exercise and Conference	Ongoing support of events for 2023
Quorn Cup	Sponsors of community event 2023
Caltowie Music Festival	Sponsors of community event 2023
Glendambo Gymkhana	Sponsors of community event 2023
Steel City Nats (Whyalla)	Sponsors of community event 2023
Carrieton Rodeo	Sponsors of community event 2023

23 FORWARD WORKS PLAN

The following table summarises the actions raised throughout this Compliance Report. These actions will form the basis of the forward work plan for BHP Carrapateena during the 2024 reporting period. These actions are the responsibility of BHP Carrapateena Operations Departments.

Action No.	Action description	Proposed completion date	Compliance Report reference
1	Undertake Expert Audits of TSF every 3 months as per ML 6471 Second Schedule Condition 4.3 (in accordance with conditions 12, 13 and 14)	Ongoing	Section 10
2	Present tailings beach trial methodology (air quality) to establish dust threshold lift off speed for tailings to DEM and EPA As per MPEPR2019/026 **Strategy AQ13**	Completed 2024	Section 18
3	Implement tailings beach trial methodology (air quality) to establish dust threshold lift off speed for tailings to DEM and EPA As per MPEPR2019/026 **Strategy AQ14**	2024	Section 18
4	Present methodology for the ongoing review and calibration of the surface water model associated with reduced flows in Eliza Creek as a result of the SLC Subsidence Zone and TSF Strategy to DEM and EPA as per MPEPR2019/026 **Strategy SWRF2**	Completed 2022	Section 18
5	Implement methodology for the ongoing review and calibration of the surface water model associated with reduced flows in Eliza Creek as a result of the SLC Subsidence Zone and TSF Strategy as per MPEPR2019/026 **Strategy SWRF3**	Complete	Section 18
6	Calibrate surface water model as per MPEPR2019/026 **Strategy SWRF4**	Completed 2021	Section 18
7	Present methodology for erosion field study for the Stage 2 embankment surface and isolated areas of the tailing beach to establish run-off and sediment load including modelling input assumptions of embankment geometry, rock armouring, particle sizes, and rainfall intensity as per MPEPR2019/026 **Strategy – TSF33**	Completed 2023	Section 18
8	Implement methodology for erosion field study for the Stage 2 embankment surface and isolated areas of the tailing beach to establish run-off and sediment load including modelling input assumptions of embankment geometry, rock armouring, particle sizes, and rainfall intensity as per MPEPR2019/026 **Strategy – TSF33**	Completed 2023	Section 18
9	Calibration of the Groundwater Model with operational monitoring data from monitoring sites and validate modelling outputs. If modelling outputs vary an assessment will be undertaken to consider whether strategies are still appropriate as per MPEPR2019/026 **Strategy – GW6**	Completed 2022	Section 18
10	Submission of a revised MPEPR 2019/026, which will capture Block Cave enabling activities, archive conditions which pertain to the construction phase and CTP	2024	N/A

24 MINISTERIAL DETERMINATION CHECKLIST

Section	Included? Or N/A
1. Public liability insurance	
Provide a copy of the cover note	Section 3
2. Identification	
Tenement number(s)	Section 4
Name of the mine operation	Section 1
General location details	Section 1
Name(s) of the mine owner and mine operator(s)	Section 1
Site Contact	Section 1
Reference and approved date of relevant PEPR being reported against	Section 1
Dates of the reporting period for the report	Section 1
Date of preparation of the report.	Section 1
3. Tenements	
Summary table of all tenements including ML, MPL, EML etc.	Section 4
Plan of the mining operations showing all tenement boundaries covered by the approved PEPR	Section 4
4. Other Licences, Permits, Waivers, Native Title and Agreements	
Summary table of all licences, permits, waivers, native title and other agreements relevant to the PEPR.	Section 5
5. Ore reserves and mineral resources	
Summary of mineral resource and ore reserves	Section 6
New delineation or exploration drilling activities on or off the lease (if required)	Section 6
Estimated mine life	Section 6
***6.* Mining processing and waste storage activities**	
Quantity of ore mined and stockpiled	Section 7
Amount of overburden / waste	Section 7
Volumes of concentrate produced	Section 7
7. Compliance with environmental outcomes and leading indicators	
Provide a summary of compliance for each environmental outcome specified in the tenement conditions or approved PEPR	Section 8/Section 9
Summarise data relating to any leading indicator criteria in the approved PEPR	Section 8/Section 9
8. Compliance with non-outcome based tenement conditions	
If you have any lease conditions which do not have an outcome measurement criteria relating to it please list the compliance status and evidence against each condition in a summary table	Section 10
9. Rectification of non-compliance	
If a 'not complied' is recorded, the following must be included:	Section 11
Date of the incident	Section 11

Section	Included? Or N/A
What environmental outcome or tenement condition was breached	Section 11
The date of incident was reported under Regulation 87 of the Mining Regulation	Section 11
The cause of non-compliance	Section 11
Actions taken to rectify the non-compliance	Section 11
Where non-compliance under Regulation 86 or initial incident reports under Regulation 87 of the Mining Regulations have previously been reported in compliance reports and not fully rectified at the time of reporting, a progress report must be included to assess the effectiveness of rectification	Section 11
10. Disturbance and rehabilitation activities	
The amount of land disturbed and activity that created disturbance in the reporting period	Section 12
Rehabilitation worked carried out in the reporting period	Section 12
The amount of land where rehabilitation works are completed	Section 12
An estimated amount of land to be rehabilitated in the next reporting period	Section 12
Any potential improvements learned from previous rehabilitation activities	Section 12
11. Reconciliation of native vegetation clearance	
Where the PEPR includes an approved native vegetation management plan for clearance of native vegetation under the Native Vegetation Act 1991, include:	Section 13
The approved maximum vegetation clearance	Section 13
The amount of native vegetation cleared in the reporting period	Section 13
The total amount cleared to date	Section 13
An estimated amount proposed to be cleared in the next reported period	Section 13
Provision of information, including annual monitoring and progress reports to demonstrate compliance with the NVMP where Significant Environmental Benefit (SEB) is being provided	Section 13
12. Environment Protection and Biodiversity Conservation Act 1999 reporting	
Demonstration of compliance with EPBC conditions (if required)	Section 14
13. Exempt land	
Provide a statement that waivers for land relevant to the mining operation are in place and compliance with exempt land provisions in accordance with Section 9 of the Mining Act	Section 15
The status of exempt land, including name of person entitled to exemption, certificate of title, reason for exemption, area of exemption, date waiver registered and any relevant conditions	Section 15
A plan showing all exempt land relevant to the mining operations	Section 15
14. Complaints	
Summary table of complaints made by members of the public during the reporting period and include: • the date of complaint • the nature of complaint • whether or not it related to non-compliance • what action was taken to address the complaint • the date the complaint was resolved	Section 16

Section	Included? Or N/A
15. Management system reviews	
Provide a summary of any management system review undertaken during the reporting period in order to ensure compliance with relevant tenement conditions and environmental outcomes, including:	Section 17
When the audit ore review was undertaken	Section 17
Who undertook the audit or review	Section 17
What aspect(s) of the management system was/were audited/reviewed	Section 17
What issues, or recommendations for improvement, were noted	Section 17
An assessment of the potential for any issues identified in the audit/ review to lead to a noncompliance with approved environmental outcomes	Section 17
What corrective action that has or will be taken to address any issues.	Section 17
16. Verification of uncertainties	
Provide a description and status of works undertaken during the reporting period or proposed undertaken to address any identified uncertainties made in the approved PEPR (or any additional uncertainties or assumptions identified since PEPR approval)	Section 18
17. Technical Reports	
Summary of technical data studies and reports generated in reporting period	Section 20

25 REFERENCES

Australian and New Zealand Guidelines for Fresh & Marine Water Quality, 2018. Default Guideline Values, https://www.waterquality.gov.au/anz-guidelines/guideline-values/default.

BHP. 2023. Annual Report 2023. https://www.bhp.com/investors/annual-reporting.

BHPa. 2023. BHP Operational Review For The Year Ended 20 June 2023. 230720_bhpoperationalreviewfortheyearended30june2023.pdf

DEM. 2020. Determination Terms of Reference 009 (TOR 009) Mining Compliance Reports. Notice under Regulation 77 of the Mining Regulations 2020. Dated 11 December 2020. Government of South Australia's Department for Energy and Mining, South Australia, Adelaide.

DEM. 2021. Preparing a mining compliance report. Mineral Regulatory Guidelines MG3, Mineral Resources Division. Dated August 2021. Government of South Australia's Department for Energy and Mining, South Australia. Adelaide.

OZ Minerals. 2017a. Carrapateena Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans. May 2017. OZ Minerals, South Australia, Adelaide.

OZ Minerals. 2017b. Carrapateena Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans Response Document. September 2017. OZ Minerals, South Australia, Adelaide.

OZ Minerals. 2020. Carrapateena Project Program for Environment Protection and Rehabilitation. ML 6471 Mineral Lease, MPL 149 Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure, MPL 152 Western Infrastructure Corridor, MPL 153 Eastern Radial Wellfield, MPL 154 Southern Access Road and Radial Wellfield, MPL 156 Northern Wellfield, MPEPR2019/026. Dated February 2020. OZ Minerals, South Australia, Adelaide.

OZ Minerals. 2023. Carrapateena Operation. PEPR Compliance Report 2022. Issue date March 2023. Dated 31 March 2023. OZ Minerals, South Australia, Adelaide.

ABBREVIATIONS AND UNITS OF MEASURE

DEFINITION OF ACRONYMS

Acronym	Expansion
ABA	Acid Base Accounting
AMD	Acid Mine Drainage
BDSA	Biological Database of South Australia
CTP	Concentrate Treatment Plant
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEM	Department for Energy and Mining
DEW	Department for Environment and Water
DPTI	Department of Planning, Transport and Infrastructure
DSEP	Dam Safety Emergency Plan
EC	electrical conductivity
EL	Exploration Lease
EPA	Government of South Australia's Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
ERML	Environmental Radiation Monitoring Location
GMUSG	Global Maintenance Upper Spencer Gulf
ITP	Inspection and Test Plan
KAC	Kokatha Aboriginal Corporation
LWC	Land and Water Consulting
LDP	Land Disturbance Permit
LEM	Landform Evolution Model
LFA	landscape function analysis
LoM	Life of Mine
LOR	Limit of Reporting
MBR	Membrane Bioreactor
ML	Mining Lease
MPL	Miscellaneous Purposes Licence
MPP	mineral processing plant
MNES	Matters of National Environmental Significance
NAF	non-acid forming
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NAPP	Net Acid Producing Potential
NPI	non-process infrastructure

Acronym	Expansion
NTMA	Native Title Mining Agreement
NVMP	Native Vegetation Management Plan
OMC	Outcome Measurement Criteria
OMS	Operations, Maintenance and Surveillance
PAF	potentially-acid forming
PCQ	Point Centred Quarter
PEPR	Program for Environment Protection and Rehabilitation
PIRSA	Department of Primary Industries and Regions, SA
PMC	Partnering Management Committee
PSD	Particle Size Distribution
QA/QC	Quality Assurance/Quality Control;
RFDS	Royal Flying Doctor Service
RL	Retention Lease
ROM	run-of-mine
SAR	Southern Access Road
SDS	safety data sheet
SEB	Significant Environmental Benefit
SLC	sub-level cave
SSGV	site specific guideline values
SWL	Standing Water Level
THA	Tent Hill Aquifer
TSF	tailings storage facility
WRD	waste rock dump
WWTP	Wastewater Treatment Plant

UNITS OF MEASURE

Abbreviation	Expansion of Unit
$	Australian dollars(s)
%	percent
µGy	microgray
µS	microsiemen
cm	centimetre
d	day
dmt	dry metric tonne
g	gram
h	hour
ha	hectare
kg	kilogram
kL	kilolitre
km	kilometre
m	metre
mAHD	metres Australian Height Datum
mBGL	metres below ground level
mTOC	metres below top of casing
mg	milligram
ML	megalitre
m^2	square metre
m^3	cubic metres
mm	millimetre
mSv	microsieverts
Mt	million tonnes
pH	measure of acidity or basicity
s	second
t	tonnes
W	watts

APPENDICES

Appendix A. Public liability insurance

A copy of the cover note for the public liability insurance and/or a copy of the policy of insurance is attached on the following page.

STEIN INSURANCE COMPANY LIMITED

PO Box 230
Heritage Hall
Le Marchant Street
St Peter Port
Guernsey GY1 4JH
Telephone +44 (0) 1481 737100
Fax +44 (0) 1481 729046

29 June 2023

To Whom It May Concern

Certificate of Placement – Public & Products Liability

This certificate is issued as a matter of information only and confers no rights upon the holder. It does not amend, extend or alter the coverage afforded by the policy/policies listed. It is issued as a summary only of the cover provided and is current only at the date of issue. For full particulars reference should be made to the current policy wording.

Named Insured:	BHP Group Limited and all subsidiary companies and all related and/or affiliated and/or controlled, managed, administered and associated companies or corporations (now existing or hereinafter acquired, formed or incorporated) and/or related joint ventures and/or partnerships and other entities named or described herein for their respective rights and interests.
Insurer(s):	Stein Insurance Co. – a Captive Insurance Company and wholly owned subsidiary of BHP Group Ltd currently rated A- by Standard & Poor's
Policy Number:	PL/0001/23
Period of Insurance:	1st July 2023 to 30th June 2024, both days inclusive, local standard time at the location of the property, operations or activities insured.

STEIN INSURANCE COMPANY LIMITED

Interest Insured: The Insurers will indemnify the Insured up to the Limit of Liability for all amounts which the Insured shall become legally liable to pay by way of compensation (including claimants' costs and expenses) for and/or arising out of Personal Injury and/or Property Damage occurring during the Period of Insurance in connection with the Business of the Insured and/or the Insured's Products and/or Completed Operations.

Situation and/or Premises: Anywhere in the world but the Insurers shall not be liable to pay any claim or indemnity hereunder to the extent that payment of such would expose the Insurers to any sanction, prohibition or restriction under any United Nations resolutions or any trade or economic sanctions, laws or regulations of any applicable jurisdiction.

Limit of Liability: US$20,000,000 any one occurrence in respect of Public Liability

US$20,000,000 any one occurrence and in the annual aggregate in respect of Products Liability

US$20,000,000 any one occurrence and in the annual aggregate in respect of Medical Malpractice

US$20,000,000 any one occurrence and in the annual aggregate in respect of Professional Indemnity

Notice of Occurrence: The Insured shall promptly furnish the Insurers with all information available respecting any Claim, and the Insurers shall have the right to appoint adjusters, assessors or surveyors and to control all negotiations, adjustments and settlements in connection with such Claim, subject always to the terms and conditions of the policy wording.

All other terms and conditions as per the full policy wording.

Signed for and on behalf of
Stein Insurance Company
J. Stewart - Manager

Appendix B. Exploration on ML 6471

Appendix B1. Exploration liabilities

Has Exploration, Exploration Rehabilitation, or Do Outstanding Exploration Liabilities Exist on the Mining Lease?

Have any exploration activities been conducted during the current reporting period?	No/**Yes**	<If yes, complete all sections of form.>
Have rehabilitation activities been undertaken during the reporting period?	**No**/Yes	<If yes, complete all sections of form.>
Is there any outstanding rehabilitation from current or previous reporting periods to be undertaken?	**No**/Yes	<If yes, complete all sections of form.>
	If NO to all of above, no further information on exploration activities required.	

Appendix B2. Exploration activities

Table B2.1: Summary of exploration program notifications

Tenement	Program notification acceptance date	Proposal description
5835	10/08/2022	3 DD holes originating from 2 drill pads, Winjabbie Target, targeting IOCG deposit modelled of gravity/magnetic anomaly. 1 DD hole was drilled in late 2022.
5863	10/08/2022	2 DD holes, Wirraway prospect, targeting IOCG deposits modelled off gravity anomalies. 1 DD hole was drilled in late 2022/early 2023.
6528	10/08/2022	2 DD holes originating from 1 drill pad, Sirocco prospect, targeting IOCG deposits modelled from passive seismic results. This prospect was not drilled during 2022/2023 as land access is still being negotiated.
6685	10/08/2022	2 DD holes originating from 1 drill pad, Glenside prospect, targeting IOCG deposits modelled from ground gravity anomaly. 1 DD hole was drilled in late 2022/early 2023.
6528	12/07/2022	2 waterbores (NT-37& 39) RC conventional down the hole hammer (RAB) for groundwater drilling. NT-39 was completed on the 17/02/2023 and rehabilitated on the 19/03/2023. NT-37 is to be developed into a production water bore.
5863	12/07/2022	1 waterbore (NT-41) RC conventional down the hole hammer (RAB) for groundwater drilling. NT-41 is to be developed into a production water bore.
6685	12/07/2022	1 waterbore (NT-42) RC conventional down the hole hammer (RAB) for groundwater drilling. Not yet drilled.

Table B2.2: Summary of exploration activities during the current reporting period

Tenement	Program notification Submit date	Drill holes	Type of drilling	Total metres drilled	Cleared drill pads created	Number of new drill lines/access tracks	New drill line/access track length (km)	Ancillary exploration activities	Costeans	Comments/other approved activities
5863 (MPL 156)	2018-059	1	DD	538.2	-	-	-	-	-	Completed over 1st Dec 2022 to 24th Jan 2023. Pads and tracks cleared, created in 2022. For further details on DD22WIR001 please see the exploration Annual Technical and Compliance Reports for 2023. This drillhole is not included in the below table (appendix B4.1 & B4.3) as the compliance is managed by exploration under EL 5863 and included the exploration ECR.
6685	2018-059	1	DD	1355.8	-	-	-	-	-	Completed over 17th Dec 2022 to 26th Feb 2023. Pads and tracks cleared, created in 2022. This hole is entirely on the EL and reported in the exploration ECR.
6528	2018-059	2	RAB	1100	1	1	0.86	-	-	NT-39 started drilling in 2022 and completed in 2023. Only one pad and track created as pad and track for NT-39 was created in 2022. This hole is entirely on the EL and reported in the exploration ECR.
5863	2018-059	1	RAB	550	1	1	1.7	-	-	This hole is entirely on the EL and reported in the exploration ECR.
TOTAL		5		3544	2	2	2.56	-	-	

Appendix B3. Compliance with approved programs

Section 9 indicates if operations were, or were not, compliant with each environmental outcome stated within approved PEPR(s) and compliance criteria data that clearly demonstrates whether the outcome was (or was not) fully achieved.

Appendix B4. Rehabilitation

Table B4.1 summarises the rehabilitation status of all exploration sites during the current and previous reporting period.

Table B4.1: Cumulative summary of exploration activities

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 3688	12/07/2011	5/02/2012	DD12CAR078						Site rehabilitated, collar not cut below surface
EL 4903	12/07/2011	25/08/2012	DD12CAR078W1						Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	16/10/2011	DD11CAR074						Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	12/12/2011	DD11CAR075						Site rehabilitated, collar not cut below surface
EL 4903	12/07/2011	9/11/2013	DD13CAR75W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	5/08/2012	DD12CAR096	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	13/12/2011	DD11CAR076	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	11/03/2012	DD12CAR081	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	16/02/2012	DD11CAR077	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	26/08/2012	DD12CAR077W1	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	31/03/2012	DD12CAR083	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	25/03/2012	DD12CAR084	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	26/03/2012	DD12CAR084W1	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	21/04/2012	DD12CAR084W2	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	12/05/2012	DD12CAR087	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	16/06/2012	DD12CAR091	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	19/04/2012	DD12CAR085	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	31/01/2012	DD12CAR079	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	8/02/2012	DD12CAR080	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	24/03/2012	DD12CAR082	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	23/04/2012	DD12CAR086	-					Site rehabilitated, collar not cut below surface
EL 4903	12/07/2011	3/10/2013	DD13CAR118	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	8/05/2012	DD12CAR090	-					Site rehabilitated, collar not cut below surface

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 4903	20/05/2012	11/06/2012	DD12CAR090W1	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-						Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	15/08/2012	DD12CAR097	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	12/07/2012	DD12CAR095	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	3/07/2012	DD12CAR092	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	17/06/2012	DD12CAR092W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	13/07/2012	DD12CAR092W2	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	6/08/2012	DD12CAR092W3	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	24/06/2012	DD12CAR094	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	18/07/2012	DD12CAR094W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	15/09/2012	DD12CAR100	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	4/02/2013	DD12CAR108	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	21/11/2012	DD12CAR108W1	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	23/09/2012	DD12CAR107	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	16/11/2012	DD12CAR107W1	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	17/05/2012	DD12CAR088	-					Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	13/06/2012	DD12CAR093	-					Site rehabilitated, collar not cut below surface

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 3688	12/07/2011	16/05/2012	DD12CAR089	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	8/09/2012	DD12CAR105	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	8/10/2012	DD12CAR105W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	9/11/2012	DD12CAR105W2	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	6/02/2013	DD12CAR114	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	-	-					Not drilled, site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	15/10/2012	DD12CAR106	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	5/12/2012	DD12CAR106W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	10/12/2012	DD12CAR106W2	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	20/01/2013	DD12CAR106W3	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	31/01/2013	DD12CAR113	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012		-	-					Site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	25/07/2012	DD12CAR098	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	30/07/2012	DD12CAR099	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	-	-					Not drilled. Pad not disturbed. Track still in use.
EL 4903	20/05/2012	23/08/2012	DD12CAR104	-					Site rehabilitated, collar not cut below surface
EL 4666	20/05/2012	8/11/2012	DD12CAR109	-					Site rehabilitated, collar not cut below surface
EL 4666	20/05/2012	9/11/2012	DD12CAR110	-					Site rehabilitated, collar not cut below surface
EL 4666	20/05/2012	10/11/2012	DD12CAR111	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	23/11/2012	DD12CAR112	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	7/12/2012	DD12CAR115	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	16/12/2012	DD12CAR116	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	11/01/2013	DD12CAR116W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	21/01/2013	DD13CAR117	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	5/02/2013	DD13CAR117W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	14/05/2014	DD12FDR004	03/03/2015					Hole drilled in 2012 and extended in 2014. Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	17/05/2013	DD13FDR005	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	3/09/2014	DD14FDR005W1	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	14/10/2014	DD14FDR005W2	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	3/09/2012	DD12FDR003	-					Site rehabilitated, collar not cut below surface

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 4903	20/05/2012	18/05/2014	DD14FDR006	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	21/11/2014	DD14FDR014	-					Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	-	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	-	-	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	26/07/2014	DD14FDR009	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	31/08/2014	DD14FDR011	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	28/07/2014	DD14FDR008	-					Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	Feb-2015	14DDFDR019	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	-	-	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	-	-	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	18/10/2014	DD14FDR013	-					Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	Feb-2015	14DDFDR020	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	18/08/2014	DD14FDR010	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	26/06/2014	DD14FDR007	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	23/10/2014	DD14FDR016	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	11/12/2014	DD14FDR017	-					Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	March-2015	15DDFDR017W1	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	3/10/2014	DD14FDR012	-					Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	8/12/2014	DD14FDR015	-					Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	Feb-2015	DD14FDR018	-					Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013		DD16CAR119	-					Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013		DD16CAR121	-					Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013		DD16CAR122	-					Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013		DD16CAR120	-					Site rehabilitated, collar not cut below surface
EL 3688	-	1/10/2006	CAR001	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	2/10/2006	CAR002	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	12/05/2007	CAR003	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	22/05/2006	CAR004	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	19/06/2007	CAR005	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	8/06/2006	CAR006	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	15/06/2006	CAR007	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	19/06/2006	CAR008	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	21/06/2006	CAR009	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	27/06/2006	CAR010	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	12/07/2006	CAR011	-					Rehabbed by Teck in 2010, collar not cut below surface

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 4903	9/04/2014	-	-	-					Attempted re-entry by OZ Minerals in 2014. Re-entry failed - Pad disturbed but no drilling.
EL 3688	-	3/07/2006	CAR012	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	1/08/2006	CAR013	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	15/07/2006	CAR014	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	1/07/2006	CAR015	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	10/08/2006	CAR016	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	25/07/2006	CAR017	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	23/07/2006	CAR018	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	9/03/2007	CAR019	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	2/08/2006	CAR020	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	7/08/2006	CAR021	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	7/10/2006	CAR022	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	23/10/2006	CAR023	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	14/08/2006	CAR024	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	22/08/2006	CAR025	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	23/08/2006	CAR026	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	29/08/2006	CAR027	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	12/09/2006	CAR028	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	30/08/2006	CAR029	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	21/08/2006	CAR030	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	3/10/2006	CAR031	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	24/09/2006	CAR032	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	3/09/2006	CAR033	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	10/10/2006	CAR034	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	4/09/2006	CAR035	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	8/10/2006	CAR036	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	26/09/2006	CAR037	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	10/06/2014	CAR037	-					Pad re-disturbed and hole re-entered by OZ Minerals in 2014.
EL 3688	-	20/09/2006	CAR038	-					Rehabbed by Teck in 2010, collar not cut below surface

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 3688	-	22/10/2006	CAR039	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	13/10/2006	CAR040	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	18/11/2006	CAR041	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	29/10/2006	CAR042	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	18/10/2006	CAR043	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	30/10/2006	CAR044	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	5/11/2006	CAR045	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	1/12/2006	CAR046	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	3/03/2007	CAR047	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	10/11/2006	CAR048	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	22/11/2006	CAR049	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	7/12/2006	CAR050	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	3/12/2006	CAR051	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	25/01/2007	CAR052	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	12/12/2006	CAR053	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	12/01/2007	CAR054	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	13/01/2007	CAR055	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	13/01/2007	CAR056	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	14/12/2006	CAR057	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	10/02/2007	CAR058	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	3/02/2007	CAR059	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	19/02/2007	CAR060	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	10/02/2007	CAR061	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	19/03/2007	CAR062	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	27/02/2007	CAR063	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	15/12/2007	CAR064	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	4/03/2007	CAR065	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	22/03/2007	CAR066	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	10/03/2007	CAR067	-					Rehabbed by Teck in 2010, collar not cut below surface

Tenement number	PEPR Approval or Program Notification acceptance date	Drill hole completion date	Drill Holes	Rehabilitated drill sites	Drill lines / access tracks	Drill lines / access track length (km)	Costeans	Costeans rehabilitated	Comments
EL 3688	-	31/03/2007	CAR068	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	28/03/2007	CAR069	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	1/05/2007	CAR070	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	16/04/2007	CAR071	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	18/01/2008	CAR072	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	18/02/2008	CAR073	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	12/06/2007	FD001	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	-	-	-					Re-disturbed by OZ in 2014 for possible re-entry.
EL 3688	-	2/05/2007	FD002	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	-	-	-					Re-disturbed by OZ in 2014 for possible re-entry.
EL 3688	-	21/05/2007	BF001	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	27/05/2007	BF002	-					Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	13/03/2013	2012	PS3						Now referred to as RP-2. G1 SEB Credits applied and transferred to ML 6471
EL 4666	13/03/2013	2013	IS4						Established as Injection Well IS4. G1 SEB Credits applied and transferred to ML 6471
EL 4666	13/03/2013	2012	PS8						Now referred to as RP-4. G1 SEB Credits applied and transferred to ML 6471
EL 4666	13/03/2013	2012	PS10						Now referred to as RP-7. G1 SEB Credits applied and transferred to MPL 154
EL 4666	13/03/2013	2012	MD4, MS4						Rehabilitated. Well remains open for PEPR Monitoring of ML 6471
ML 6471	20/03/2018	2018	DD18SAD001 DD18SAD001W1	DD18SAD001					Site fully rehabilitated
ML 6471	20/03/2018	2018	DD18SAD002	DD18SAD002					Site fully rehabilitated
ML 6471	20/03/2018	2018	DD18FDR021	DD18FDR021					Site rehabilitated, collar not cut below surface.
ML 6471	20/03/2018	2018	DD18FDR022	DD18FDR022					Site fully rehabilitated
ML 6471	20/03/2018	2018	DD18FDR023 DD18FDR023W1 DD18FRD023W2	DD18FDR023					Site fully rehabilitated
MPL 156	13/02/2019	2019	NT-20 NT-21 NT-24	NT-21	NT-21	9.13	-	-	NT-21 rehabilitated to DEM specification (pad/track), NT-20 and NT-24 sumps were backfilled but pads and access tracks will remain open as the holes will be re-entered for development.

Table B4.2 to Table B4.4 below summarise location and rehabilitation status of all exploration sites during the current reporting period and un-rehabilitated sites from previous reporting periods.

Table B4.2: Cumulative Area of Disturbance

Tenement number	Program notification submit date	Total area of disturbance – drill holes /sites (ha)	Total area rehabilitated – drill holes /sites (area ha)	Total area of disturbance - drill lines/ access track (ha)	Total area rehabilitated - drill line/access track (ha)	Total area of disturbance - Costeans (ha)	Total area rehabilitated – costeans (ha)	Comments

Table B4.3: Drill Hole/Site Rehabilitation Status

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 3688	-	CH001	1/01/2007	D	650.6	-		732375	6528950	53	-	PR	2010	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR078	1/09/2011	D	1604.4	6 (9x2x1.5)		738174	6543358	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	12/07/2011	DD12CAR078W1	1/09/2011	D	1518.2	6 (9x2x1.5)		738174	6543358	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD11CAR074	1/09/2011	D	142.6	6 (9x2x1.5)		737600	6543375	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD11CAR075	1/09/2011	D	1795.1	6 (9x2x1.5)		737607	6543373	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	12/07/2011	DD13CAR75W1	1/09/2011	D	1629.9	6 (9x2x1.5)		737607	6543373	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR096	1/09/2011	D	1583	6 (9x2x1.5)		737607	6543369	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD11CAR076	1/09/2011	D	1800	6 (9x2x1.5)		737518	6543448	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR081	1/09/2011	D	1624.9	6 (9x2x1.5)		737518	6543448	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD11CAR077	1/09/2011	D	1549	6 (9x2x1.5)		737501	6543273	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR077W1	1/09/2011	D	1626.6	6 (9x2x1.5)		737501	6543273	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR083	1/09/2011	D	1705	6 (9x2x1.5)		737495	6543272	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR084	1/03/2012	D	569.7	6 (9x2x1.5)		737598	6543423	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR084W1	1/03/2012	D	559.8	6 (9x2x1.5)		737598	6543423	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR084W2	1/03/2012	D	1798.2	6 (9x2x1.5)		737598	6543423	53	-	PR	14/03/2015	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR087	1/03/2012	D	1683.3	6 (9x2x1.5)		737498	6543184	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR091	1/03/2012	D	1585.1	6 (9x2x1.5)		737498	6543184	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR085	1/03/2012	D	1360	6 (9x2x1.5)		737927	6543300	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR079	1/03/2012	D	137	6 (9x2x1.5)		737899	6543697	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR080	1/03/2012	D	269.5	6 (9x2x1.5)		737899	6543700	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR082	1/03/2012	D	1934.2	6 (9x2x1.5)		737900	6543685	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR086	1/03/2012	D	1474.1	6 (9x2x1.5)		737896	6543683	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 4903	12/07/2011	DD13CAR118	1/03/2012	D	1410	6 (9x2x1.5)		737893	6543687	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737640	6543700	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737640	6543700	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	DD12CAR090	1/04/2012	D	620.7	6 (9x2x1.5)		738042	6543708	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR090W1	1/04/2012	D	2101.3	6 (9x2x1.5)		738042	6543708	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737700	6543600	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737798	6543601	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		738083	6543599	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737693	6543503	53		PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR097	1/04/2012	D	1382.9	6 (9x2x1.5)		737693	6543503	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR095	1/04/2012	D	1320.2	6 (9x2x1.5)		737701	6543499	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737400	6543400	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		738116	6543400	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		738214	6543397	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR092	1/04/2012	D	1413.5	6 (9x2x1.5)		738214	6543397	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR092W1	1/04/2012	D	1325.1	6 (9x2x1.5)		738214	6543397	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR092W2	1/04/2012	D	838.3	6 (9x2x1.5)		738214	6543397	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR092W3	1/04/2012	D	1437.8	6 (9x2x1.5)		738214	6543397	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		738285	6543266	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	DD12CAR094	1/04/2012	D	594.3	6 (9x2x1.5)		738285	6543266	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR094W1	1/04/2012	D	1642.1	6 (9x2x1.5)		738285	6543266	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR100	1/04/2012	D	1575.9	6 (9x2x1.5)		738290	6543263	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR108	1/04/2012	D	2459	6 (9x2x1.5)		738278	6543260	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR108W1	1/04/2012	D	2105.7	6 (9x2x1.5)		738278	6543260	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737307	6543173	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	DD12CAR107	1/04/2012	D	527.5	6 (9x2x1.5)		737307	6543173	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 4903	20/05/2012	DD12CAR107W1	1/04/2012	D	2185.4	6 (9x2x1.5)		737307	6543173	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		737700	6543200	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	-	1/04/2012	-	-	6 (9x2x1.5)		738000	6543200	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 3688	12/07/2011	DD12CAR088	1/04/2012	D	982.1	6 (9x2x1.5)		737800	6543100	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR093	1/04/2012	D	1344.8	6 (9x2x1.5)		737805	6543085	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 3688	12/07/2011	DD12CAR089	1/04/2012	D	1269.7	6 (9x2x1.5)		737895	6543102	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR105	1/04/2012	D	638.6	6 (9x2x1.5)		737898	6543100	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR105W1	1/04/2012	D	1453.2	6 (9x2x1.5)		737898	6543100	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR105W2	1/04/2012	D	1410.9	6 (9x2x1.5)		737898	6543100	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	SADB	20/05/2012	D	-	4 (9x2x1.5)		739500	6544700	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR114	21/12/2012	D	2320.9	6 (9x2x1.5)		737898	6542902	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	21/12/2012	-	-	6 (9x2x1.5)		738200	6543700	53	-	PR	05/06/2017	Not drilled, site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	DD12CAR106	21/12/2012	D	1981	6 (9x2x1.5)		737801	6542899	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR106W1	21/12/2012	D	2353	6 (9x2x1.5)		737801	6542899	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR106W2	21/12/2012	D	661	6 (9x2x1.5)		737801	6542899	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR106W3	21/12/2012	D	1414	6 (9x2x1.5)		737801	6542899	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR113	21/12/2012	D	2044.2	6 (9x2x1.5)		737632	6543979	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	21/12/2012			6 (9x2x1.5)		738000	6543800	53	-	PR	05/06/2017	Site rehabilitated, historic collar not cut below surface
EL 4903	20/05/2012	DD12CAR098	2/07/2012	D	241.5	6 (9x2x1.5)		736169	6545233	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR099	2/07/2012	D	157.4	6 (9x2x1.5)		736762	6544787	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	2/07/2012	-	-	-		736242	6544808	53	-	PR	05/06/2017	Not drilled. Pad not disturbed. Track still in use.
EL 4903	20/05/2012	DD12CAR104	2/07/2012	D	64.7	6 (9x2x1.5)		736630	6543997	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4666	20/05/2012	DD12CAR109	21/10/2012	D	26	6 (9x2x1.5)		736687	6538998	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4666	20/05/2012	DD12CAR110	21/10/2012	D	21	6 (9x2x1.5)		736682	6538998	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4666	20/05/2012	DD12CAR111	21/10/2012	D	21	6 (9x2x1.5)		736693	6538996	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR112	21/10/2012	D	402.7	6 (9x2x1.5)		736831	6539704	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR115	21/10/2012	D	585.3	6 (9x2x1.5)		736988	6540507	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 4903	20/05/2012	DD12CAR116	21/10/2012	D	326.7	6 (9x2x1.5)		737099	6541025	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12CAR116W1	21/10/2012	D	791.1	6 (9x2x1.5)		737099	6541025	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD13CAR117	21/10/2012	D	351.8	6 (9x2x1.5)		737149	6541695	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD13CAR117W1	21/10/2012	D	871.1	6 (9x2x1.5)		737149	6541695	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12FDR004	8/08/2012	D	1819.7	7 (9x2x1.5)		739648	6545005	53	03/03/2015	PR	05/06/2017	Hole drilled in 2012 and extended in 2014. Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD13FDR005	8/08/2012	D	1894	7 (9x2x1.5)		739633	6544994	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD14FDR005W1	8/08/2012	D	2182.8	7 (9x2x1.5)		739633	6544994	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD14FDR005W2	8/08/2012	D	2273.3	7 (9x2x1.5)		739633	6544994	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD12FDR003	9/07/2012	D	1167.1	6 (9x2x1.5)		739202	6545498	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD14FDR006	9/07/2012	D	1501.0	6 (9x2x1.5)		739204	6545498	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	DD14FDR014	9/07/2012	D	1897.5	6 (9x2x1.5)		739198	6545498	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	20/05/2012	-	31/09/2012	-	-	4 (9x2x1.5)		739500	6544700	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	-	5/05/2014	-	-	6 (9x2x1.5)		739660	6544820	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR009	27/05/2014	D	1729.0	8 (9x2x1.5)		739020	6545294	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR011	27/05/2014	D	1678.5	8 (9x2x1.5)		739024	6545291	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR008	27/05/2014	D	1837.7	6 (9x2x1.5)		738825	6545106	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	14DDFDR019	27/05/2014	D	2114.3	6 (9x2x1.5)		738823	6545112	53		PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	FD-1	25/06/2014	-	-	6 (9x2x1.5)		739879	6545229	54	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	FD-2	5/05/2014	-	-	6 (9x2x1.5)		739985	6544969	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR013	25/06/2014	D	1774.1	7 (9x2x1.5)		740040	6545629	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	14DDFDR020	2014	D	1975.4	6 (9x2x1.5)		740049	6545626	53		PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	SAD-1	5/05/2014	D	-	6 (9x2x1.5)		739660	6544820	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR010	5/05/2014	D	1917.2	6 (9x2x1.5)		739063	6545744	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR007	5/05/2014	D	1666.0	6 (9x2x1.5)		739066	6545745	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR016	8/07/2014	D	110.5	6 (9x2x1.5)		739300	6546043	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR017	8/07/2014	D	1900.0	6 (9x2x1.5)		739301	6546042	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	15DDFDR017W1	2015	D	2095.1	6 (9x2x1.5)		739302	6546042	53		PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR012	8/07/2014	D	1891	8 (9x2x1.5)		740038	6545399	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	9/04/2014	DD14FDR015	8/07/2014	D	1993.3	8 (9x2x1.5)		740037	6545393	53	-	PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	04/02/2015	DD14FDR018	2014	D	2281.3	6 (9x2x1.5)		739500	6545618	53		PR	05/06/2017	Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013	DD16CAR119	2016	D	1037.1	6 (9x2x1.5)		737785	6543963	53		PR	2016	Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013	DD16CAR121	2016	D	1248.5	6 (9x2x1.5)		737260	6542800	53		PR	2016	Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013	DD16CAR122	2016	D	509.3	6 (9x2x1.5)		737270	6544000	53		PR	2016	Site rehabilitated, collar not cut below surface
EL 4903	13/03/2013	DD16CAR120	2016	D	1154.1	6 (9x2x1.5)		738355	6542916	53		PR	2016	Site rehabilitated, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 3688	-	CAR001	2006	D	560.8	-		738105	6544003	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR002	2006	D	984.3	-		738102	6543492	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR003	2006	D	823.7	-		737998	6543413	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR004	2006	D	810.7	-		737996	6543603	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR005	2006	D	1393.4	-		738200	6543600	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR006	2006	D	732.7	-		738204	6543406	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR007	2006	D	783.4	-		737999	6543800	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR008	2006	D	780.2	-		738201	6543799	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR009	2006	D	752.2	-		737802	6543799	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR010	2006	D	756.5	-		738001	6544198	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR011	2006	D	742.9	-		739103	6544598	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	-	10/05/2014	D	-	6 (9x2x1.5)		739103	6544598	53	-	PR	05/06/2017	Attempted re-entry by OZ Minerals in 2014. Re-entry failed - Pad disturbed but no drilling.
EL 3688	-	CAR012	2006	D	771.1	-		738389	6543578	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR013	2006	D	759.4	-		738196	6544001	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR014	2006	D	756.2	-		738000	6543993	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR015	2006	D	729.2	-		737800	6543986	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR016	2006	D	906.4	-		737798	6543601	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR017	2006	D	939.4	-		738116	6543402	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR018	2006	D	747.4	-		738083	6543599	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR019	2006	D	894.2	-		738049	6543700	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 3688	-	CAR020	2006	D	774.3	-		737899	6543799	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR021	2006	D	765	-		738111	6543802	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR022	2006	D	774.3	-		737096	6543203	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR023	2006	D	759.8	-		736900	6543500	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR024	2006	D	1224.2	-		738002	6543199	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR025	2006	D	1212.2	-		738115	6543197	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR026	2006	D	1119.2	-		738193	6543200	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR027	2006	D	888.2	-		738006	6542992	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR028	2006	D	699.2	-		738134	6543003	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR029	2006	D	882	-		737998	6542800	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR030	2006	D	921.2	-		738203	6542802	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR031	2006	D	1308	-		737796	6543396	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR032	2006	D	1359.4	-		737803	6543198	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR033	2006	D	735.2	-		737897	6543965	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR034	2006	D	828.3	-		737697	6543601	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR035	2006	D	864.4	-		738084	6542837	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR036	2006	D	738.5	-		739278	6544426	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR037	2006	D	801.9	-		738927	6544406	53	-	PR	-	Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	CAR037	24/03/2014	D	1681.7	6 (9x2x1.5)		738927	6544406	53	-	PR	05/06/2017	Pad re-disturbed and hole re-entered by OZ Minerals in 2014.
EL 3688	-	CAR038	2006	D	853.8	-		738977	6544765	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR039	2006	D	1173.4	-		737699	6543200	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR040	2006	D	804.1	-		737601	6543397	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 3688	-	CAR041	2006	D	1005.5	-		737640	6543700	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR042	2006	D	957.2	-		737499	6543200	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR043	2006	D	749.9	-		737298	6543200	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR044	2006	D	799.2	-		737396	6543403	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR045	2006	D	720.2	-		737501	6543600	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR046	2006	D	1020.4	-		738296	6543273	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR047	2006	D	1059.6	-		737828	6543508	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR048	2006	D	1404.4	-		737901	6543104	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR049	2006	D	1202.5	-		738110	6543101	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR050	2006	D	1392.4	-		737797	6543300	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR051	2006	D	1245.9	-		737898	6543301	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR052	2006	D	786.2	-		737799	6543699	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR053	2007	D	1032.3	-		737703	6543303	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR054	2007	D	1182.2	-		738097	6543301	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR055	2007	D	1395.1	-		737897	6543205	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR056	2007	D	1079.2	-		737794	6543496	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR057	2007	D	1047.2	-		737698	6543402	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR058	2007	D	1236.3	-		738199	6543499	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR059	2007	D	1232	-		738020	6543295	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR060	2007	D	1011.2	-		737793	6543100	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR061	2007	D	1293.2	-		737900	6543399	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR062	2007	D	1320.6	-		737899	6543502	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 3688	-	CAR063	2007	D	1114.3	-		737949	6543704	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR064	2007	D	765.2	-		737699	6543503	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR065	2007	D	1308.2	-		738002	6543099	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR066	2007	D	993.2	-		738198	6543101	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR067	2007	D	1090.5	-		738197	6543701	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR068	2007	D	978.2	-		738297	6543701	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR069	2007	D	823.3	-		738001	6543900	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR070	2007	D	942.2	-		738316	6543095	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR071	2007	D	1371.1	-		738002	6543497	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR072	2007	D	1509.1	-		737798	6543250	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	CAR073	2007	D	1473.8	-		737799	6543348	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	FD001	2007	D	1070.9	-		739670	6545556	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	-	12/11/2014	-	-	6 (9x2x1.5)		739670	6545556	53	-	PR	05/06/2017	Re-disturbed by OZ in 2014 for possible re-entry.
EL 3688	-	FD002	2007	D	816.6	-		739618	6545787	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	9/04/2014	-	11/10/2014	-	-	6 (9x2x1.5)		739619	6545788	53	-	PR	05/06/2017	Re-disturbed by OZ in 2014 for possible re-entry.
EL 3688	-	BF001	2007	D	666.3	-		740197	6541809	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 3688	-	BF002	2007	D	669.3	-		740201	6541693	53	-	PR	05/06/2017	Rehabbed by Teck in 2010, collar not cut below surface
EL 4903	13/03/2013	PS3	2012	RC	126	1 (30x15x1.5)		740197	6541804	53		N	-	Operating abstraction site for exploration camp now referred to as RP-2, SEB Credits applied and transferred to ML 6471
EL 4666	13/03/2013	IS4	2013	RC	126	1 (30x15x1.5)		738867	6539265	53		N	-	Established as Injection Well IS4. G1 SEB Credits applied and transferred to ML 6471
EL 4666	13/03/2013	PS8	2012	RC	140	1 (30x15x1.5)		736478	6529109	53		N	-	Now referred to as RP-4. G1 SEB Credits applied and transferred to ML 6471
EL 4666	13/03/2013	PS10	2012	RC	119	1 (30x15x1.5)		737629	6521141	53		N	-	Now referred to as RP-7. G1 SEB Credits applied and transferred to MPL 154

Tenement	PEPR Approval or Program Notification acceptance date	Drill Holes	Date Land Disturbed	Drill Method	Hole Depth	Number of sumps and dimensions	Drill pad size (m^2)	Easting (GDA94)	Northing (GDA94)	Zone	Rehab date	Status	Planned rehab date	Comments
EL 4666	13/03/2013	MD4, MS4	2012	RC	401	1 (30x15x1.5)		737405	6518834	53		PR		Rehabilitated. Well remains open for PEPR Monitoring of ML 6471
ML 6471	20/03/2018	DD18SAD001 DD18SAD001W1	Jul-18	D	1828 and 1213	6 (9x2x1.5)	640	739510	6544281	53	17/02/2023	C	Mar-19	Site fully rehabilitated, collar cut/capped below surface and buried.
ML 6471	20/03/2018	DD18SAD002	Jul-18	D	1665.8	6 (9x2x1.5)	640	738390	6544555	53	17/02/2023	C	Mar-19	Site fully rehabilitated, collar cut/capped below surface and buried.
ML 6471	20/03/2018	DD18FDR021	May-18	D	2022	6 (9x2x1.5)	640	739571	6545294	53	17/02/2023	C		Site fully rehabilitated, collar cut/capped below surface and buried.
ML 6471	20/03/2018	DD18FDR022	Jun-18	D	1763	6 (9x2x1.5)	640	740039	6545626	53	17/02/2023	C		Site fully rehabilitated, collar cut/capped below surface and buried.
ML 6471	20/03/2018	DD18FDR023 DD18FDR023W1 DD18FRD023W2	Apr-18	D	1732 and 1000	6 (9x2x1.5)	640	738828	6545101	53	17/02/2023	C		Site fully rehabilitated, collar cut/capped below surface and buried.
MPL 156	13/02/2019	NT-20	Sept-19	RAB / DHH	500	1 x (30x30x1.5)	10000	718168	6563118	53		PR		Sumps backfilled, pad and track will remain open as hole will be re-entered to develop into production well.
MPL 156	13/02/2019	NT-21	Sept-19	RAB / DHH	500	1 x (30x30x1.5)	10000	719223	6561318	53	Nov-19	C		
MPL 156	13/02/2019	NT-24	Sept-19	RAB / DHH	504	1 x (30x30x1.5)	10000	722330	6554509	53		PR		Sumps backfilled, pad and track will remain open as hole will be re-entered to develop into production well.

* AC = air core/vacuum, RM = rotary mud, RC = reverse circulation, RAB = rotary air blast, D = diamond, P = percussion, V = vibra core, O = other.
† C = drill site completely rehabilitated, N = no rehabilitation completed, PR = partial rehabilitation (specify remaining rehabilitation to be completed within the comments section).

Table B4.4: Access Track/Drill Line Rehabilitation Status

Tenement	Program notification submit date	Track identification	Tracks/lines created (km)	Rehabilitated tracks/lines (km)	Area of disturbance (ha)	Rehabilitation date	Rehabilitation method	Tracks/lines to be rehabilitated (km)	Planned rehab date	Comments
								-	-	

Table B4.5 demonstrates how drill holes that intersect a single confined aquifer, multiple aquifers or artesian aquifers were abandoned in accordance with DEM Earth Resources Information Sheet M21.

Table B4.5: Open Drill Hole Summary

Tenement	Drill hole	Aquifer(s) intersected (yes or no)	Hole Status	Comment
ML 6471	BF001	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	BF002	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR001	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR002	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR003	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR004	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR005	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR006	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR007	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR008	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR009	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR010	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR011	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR012	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR013	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR014	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR015	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR016	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR017	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR018	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR018A	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR019	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR020	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR021	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR022	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR023	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR024	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR025	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR026	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR027	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR028	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR029	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR030	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR031	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR032	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM

Tenement	Drill hole	Aquifer(s) intersected (yes or no)	Hole Status	Comment
ML 6471	CAR033	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR034	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR035	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR036	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR037	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR038	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR039	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR040	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR041	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR042	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR043	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR044	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR045	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR046	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR047	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR048	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR049	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR050	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR051	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR052	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR053	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR054	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR055	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR056	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR057	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR058	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR059	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR060	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR061	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR062	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR063	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR064	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR065	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR066	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR067	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR068	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR069	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM

Tenement	Drill hole	Aquifer(s) intersected (yes or no)	Hole Status	Comment
ML 6471	CAR070	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR071	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR072	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	CAR073	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD11CAR074	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD11CAR075	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD11CAR076	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD11CAR077	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR078	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR079	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR080	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR081	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR082	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR083	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR084	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR085	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR086	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR087	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR088	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR089	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR090	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR091	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR092	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR093	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR094	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR095	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR096	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR097	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR098	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR099	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR100	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR105	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR106	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR107	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR108	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR112	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR113	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM

Tenement	Drill hole	Aquifer(s) intersected (yes or no)	Hole Status	Comment
ML 6471	DD12CAR114	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR115	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR116	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12CAR116W1	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12FDR003	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD12GIL001	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD13CAR117	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD13CAR117W1	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD13CAR118	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD13FDR005	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	DD14FDR017	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	FD001	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM
ML 6471	FD002	Yes	Open	Drill hole to be rehabilitated based on risk to be determined with input from DEM

Appendix C. 2023 Environmental Monitoring Report (Groundwater and Surface Water)

BHP

CARRAPATEENA OPERATION

2023 Groundwater and Surface Water Monitoring Report

BHP

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1 SURFACE WATER

1.1 EROSION AND SEDIMENTATION

The OMC below relates to surface water sampling to monitor the potential for erosion and sedimentation downstream of the mine.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – SWES1	Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) at surface water sampling sites (SW01 to SW12, SW-1 to SW-7, SW-14 to SW-17, Gorge Spring and Euro Spring) at least once a year within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (whichever is greater) (PEPR Table 8.9; pH, EC, SS, and hydrocarbons).	A total of 37 monitoring locations were sampled throughout the monitoring period. Six electrical conductivity exceedances above ANZECC, but below/ correlates with Baseline or regional watercourse/ shallow groundwater compositions. Four hydrocarbon exceedances No pH results outside of guidelines. No SS results out of baseline.

Opportunistic surface water sampling is required at least once a year at surface water monitoring locations SW01 to SW12, SW-1 to SW-7, SW-14 to SW-17, Gorge Spring and Euro Spring (Figure 2). As a guideline, surface water collection is possible when rainfall intensity is >20mm as this can induce overland & streamflow into ephemeral creek systems, tributaries, culverts and dams.

Significant rain events accumulating >20mm were recorded four times throughout 2023 (the monitoring period) and summarised in Table 1. In general, the rainfall was received over multiple days. Rainfall at the TSF All Weather Station (AWS) in 2023 was observed in late-January (26.8 mm), between 11 & 15 April (26.4 mm), late June (33.4 mm) and in mid-December (49 mm) (Figure 1). Total rainfall for the reporting period was 169.6 mm.

The requirement for sampling within seven days of a rain event to create flow was not possible for the January, April and June events as pooled surface water from rainfall was dispersed rapidly and sites were

initially inaccessible due to flooding of access tracks. However sampling was successfully undertaken within seven days of a significant rainfall in December.

All samples were submitted to and analysed by a NATA accredited facility (Australian Laboratory Services). A minimum of one sample was collected from each major surface drainage.

Monitoring locations SW05, SW06 & SW07 are in Eliza Creek and were sampled with no breaches to pH and suspended solids (SS) (Table 2). Both SW06 & SW07 reported the presence of minor hydrocarbons and future sampling will determine whether it is likely biogenic, mine or pastoral origin. Electrical conductivity (EC) of 5720 uS/cm recorded at SW05 is slightly elevated above the adopted threshold of 5000 uS/cm and will be closely monitored at future streamflow events.

Water quality analytical results from site SW02 (Table 3) were not obtained due to the scarceness of pooled water.

Sampling occurred in the Salt Creek tributaries with one selection (SW03) submitted for analysis (Table 4). The reported water quality analytical results from Salt Creek Tributary locations did not exceed either the ANZECC Freshwater or baseline ranges except for minor levels of hydrocarbon.

Electrical conductivity results returned from four water samples (SW08, SW09, Euro Spring & Gorge Spring) taken from the Salt Creek monitoring locations all exceeded the maximum uS/cm for ANZECC Freshwater (Table 5 & Table 6). High electrical conductivity (salinity) has historically been recorded and are typical of the downstream water quality and catchment hydrology of Salt Creek.

There are no exceedances of variables pH, Suspended Solids (SS) or Hydrocarbons in Salt Creek, its Tributaries or Watercourse Spring Monitoring Locations (Table 5 & Table 6).

Two samples were taken from the Yeltacowie Creek monitoring locations in 2023. No exceedances of pH, EC or SS in relation to ANZECC or baseline range was reported. Minor hydrocarbon levels were detected at SW12.

Site SW-16 in Bosworth Creek did not exceed the ANZECC Freshwater or baseline ranges and aligns with results obtained from neighbouring ephemeral creek systems (Table 8).

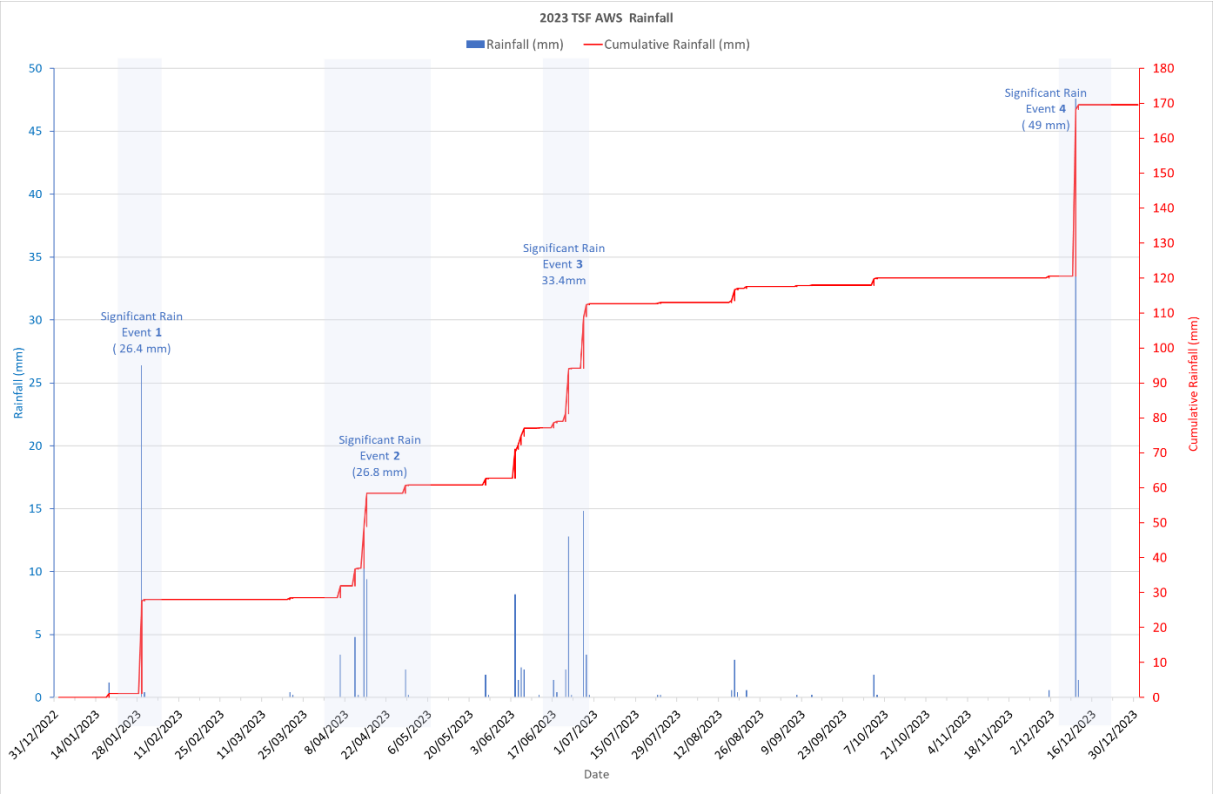

Figure 1: Carrapateena Rainfall TSF AWS – 2023

Table 1: Summary of Significant Rainfall Events 2023 (TSF AWS)

Date	Significant Rainfall Event #	Rainfall (mm)	Total Rainfall per Event (mm)
29/01/2023	1	26.4	26.8* (*sampling and analysis performed)
30/01/2023		0.4	
11/04/2023	2	4.8	26.4
12/04/2023		0.2	
14/04/2023		12	
15/04/2023		9.4	
21/06/2023	3	2.2	33.4
22/06/2023		12.8	
23/06/2023		0.2	
27/06/2023		14.6	
28/06/2023		3.6	
10/12/2023	4	47.6	49* (*sampling and analysis performed)
11/12/2023		1.4	

Table 2: Water quality results from Eliza Creek monitoring locations

Variable	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline range	SW05	SW06*	SW07
No. of samples	-	-	1	1	2
pH (units)	6.5 – 9	-	6.91	6.98	6.93 – 7.76
EC (µS/cm)	100 – 5,000	-	**5720**	2400	223 - 573
Suspended solids (mg/L)	-	26 - 164	15	<5	7 – 37
Hydrocarbons (>C10 - C40 fraction) (µg/L)	0	Not tested	-	**170**	**140**

*Data sourced from nearby surface water monitoring location EC-2 (RSS2 Grab)

Table 3: Carrapateena surface water monitoring locations (2020 PEPR Figure 8.5)

Variable	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline range	SW02
No. of samples	-	-	0
pH (units)	6.5 – 9	-	(unable to sample)
EC (µS/cm)	100 – 5,000	-	
Suspended solids (mg/L)	-	26 – 164	
Hydrocarbons (>C10-C40 fraction) (µg/L)	0	Not tested	

Table 4: Water quality results from Salt Creek tributaries monitoring locations

Variable	ANZECC / ARMCANZ (2000) Freshwater Guidelines	Baseline range	SW01	SW03
No. of samples	-	-	0	1
pH (units)	6.5 – 9	7.6 – 10.3	(unable to sample)	6.8
EC (µS/cm)	100 – 5,000	265 – 24,800		3600
Suspended solids (mg/L)	-	8 - 604		8
Hydrocarbons (>C10-C40 fraction) (µg/L)	0	Not tested		**140**

Table 5: Water quality results from Salt Creek monitoring locations

Variable (mg/L)	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline range	SW08	SW09
No. of samples	-	-	2	2
pH (units)	6.5 – 9	7.6 – 10.3	7.26 – 8.23	7.24 – 8.17
EC (µS/cm)	100 – 5,000	265 – 24,800	4740 – 23,600	5560 – **75,900**
Suspended solids (mg/L)	-	8 - 604	14 - <100	14
Hydrocarbons (>C10 - C40 fraction) (µg/L)	0	Not tested	<5 - <100	<5

Table 6: Water quality results from Salt Creek monitoring locations

Variable (mg/L)	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline range	Euro Spring	Gorge Spring
No. of samples	-	-	1	1
pH (units)	6.5 – 9	7.6 – 10.3	8.08	7.73
EC (µS/cm)	100 – 5,000	265 – 24,800	**65,500**	**60,600**
Suspended solids (mg/L)	-	8 - 604	26	5
Hydrocarbons (>C10 - C40 fraction) (µg/L)	0	Not tested	-	-

Table 7: Water quality results from Yeltacowie Creek monitoring locations

Variable (mg/L)	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline range	SW10	SW11	SW12
No. of samples	-	-	0	1	1
pH (units)	6.5 – 9	-	(unable to sample)	6.97	7.48
EC (µS/cm)	100 – 5,000	-		563	279
Suspended solids (mg/L)	-	25 - 350		35	179
Hydrocarbons (>C10 -C40 fraction) (µg/L)	0	Not tested		<100	**140**

Table 8: Water quality results from Bosworth Creek monitoring locations

Variable (mg/L)	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline range	SW-15	SW-16
No. of samples	-	-	0	1
pH (units)	6.5 – 9	-	(unable to sample)	7.63
EC (µS/cm)	100 – 5,000	-		296
Suspended solids (mg/L)	-	-		27
Hydrocarbons (>C10 - C40 fraction) (µg/L)	0	-		<100

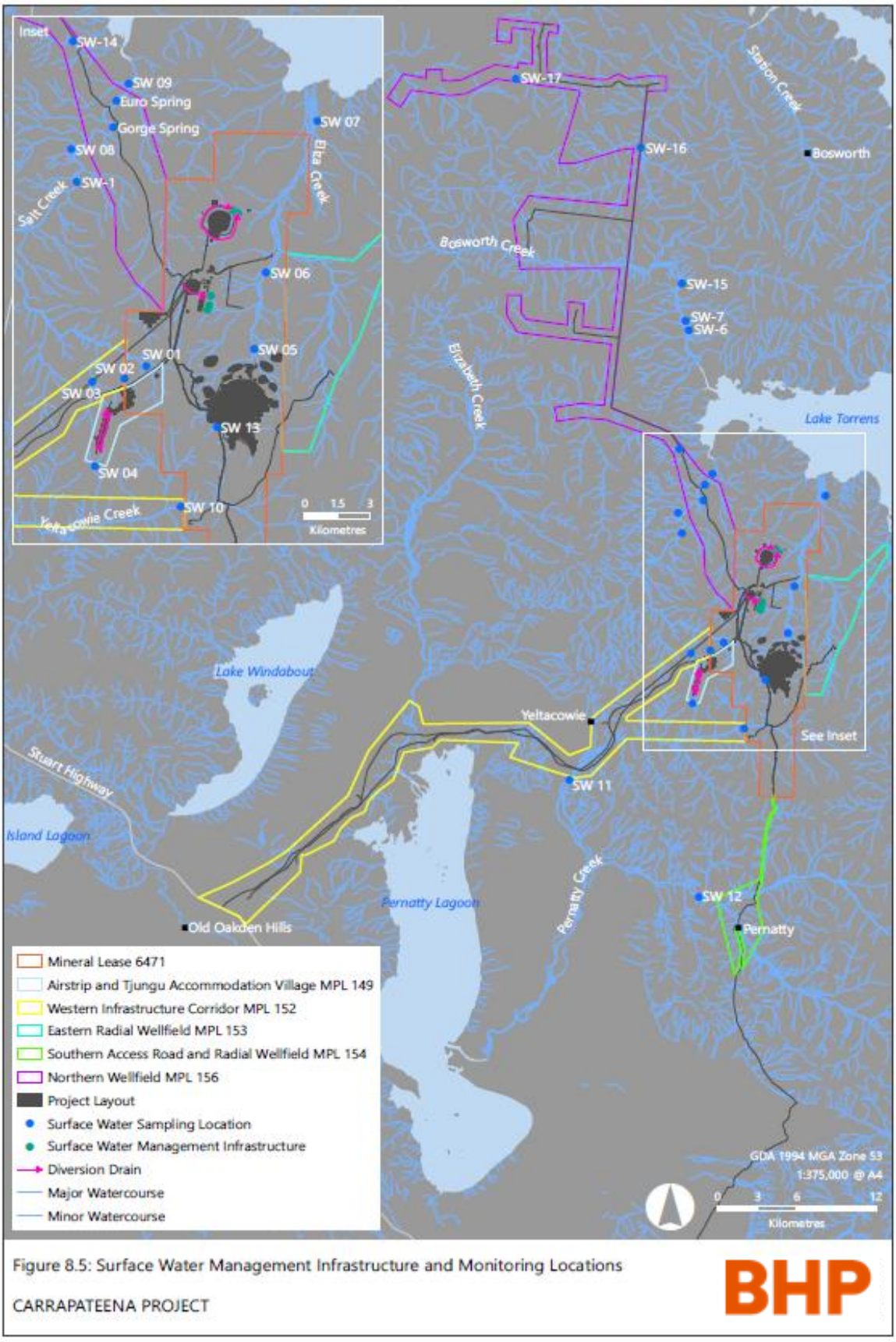

Figure 2: Carrapateena Surface Water Monitoring Locations (2020 PEPR Figure 8.5)

1.2 TAILINGS STORAGE FACILITY

1.2.1 SHALLOW MONITORING WELLS

The three OMCs below relate to groundwater monitoring at shallow monitoring wells downstream of the Tailings Storage Facility (TSF) to monitor the potential for shallow lateral seepage.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – TSF1	Quarterly sampling of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s – TSFMB4s) and analysis of pH, Metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.15; pH, EC and metals) whichever is greater.	Exceedance of EC in the absence of baseline data. EC, aluminium, barium, bobalt, copper, iron, lead, strontium and uranium (Table 8) were above the ANZEC/ARMCANZ (2000) or baseline guidelines for shallow alluvial weather Proterozoic groundwater. TSFMB1s, TSFMB2s and TSFMB4s continue to present as dry & unable to be sampled.
Outcome Measurement Criteria – TSF2	Quarterly monitoring of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s – TSFMB4s) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (PEPR Table 8.14).	Standing water level (SWL) not trending in accordance with predictions at TSFMB3s which is influenced by water levels and recharge by rainfall prior to operation of the TSF. TSFMB1s, TSFMB2s and TSFMB4s continue to present as dry & unable to be sampled
Outcome Measurement Criteria – TSF37	Quarterly sampling of shallow monitoring wells downstream of the Tailings Storage Facility (TSFMB1s – TSFMB4s) at the cessation of tailings discharge for a period of no less than one (1) year and analysis of pH, metals and EC demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.15; pH, EC and metals) whichever is greater.	Not relevant to Construction or Operations phases.

Shallow monitoring wells downstream of the TSF were installed in April and May 2019 (TSFMB1s – TSFMB4s) (Figure 4). The wells screen the shallow alluvium at depths ranging from 14 to 46 metres below ground level (mbgl) and do not intercept the water table, except for TSFMB3s. No baseline groundwater quality or SWL data was able to be collected, as following well construction and development all four wells were reported as dry. However, TSFMB3s intercepted shallow alluvial

groundwater and these results are presented in Table 8. The groundwater modelled predicted head for the shallow monitoring wells ranges from around 60 to 88 mAHD which significantly exceed the depth of the wells. Detection of tailings seepage within any of the shallow wells would indicate non-compliance.

Quarterly sampling and laboratory analysis of the shallow monitoring wells as required by Outcome Measurement Criteria TSF1 occurred at TSFMB3s in all quarters throughout the monitoring period however was not possible at three of these sites (TSFMB1s, TSFMB2s, TSMB4s) due to the wells remaining dry.

EC, aluminium, barium, cobalt, copper, iron, lead, strontium and uranium were above the ANZEC/ARMCANZ (2000) or baseline guidelines for shallow alluvial weather Proterozoic groundwater (Table 9).

Groundwater SWLs in TSFMB3S are displayed in Figure 3 and indicate a slight shallowing. This inferred recharge of the unconfined and shallow alluvial aquifer correlated with rainfall events in January & October 2022, however, more recently has been considered the effects of lateral seepage and hydrostatic loading from the TSF embankment and/or unlined portion of the Decant Dam.

Due to paucity of data, baseline comparisons in shallow TSF bores is limited. BHP continues to closely monitor TSFMB3S ensuring supernatant seepage is controlled from TSF and to increase our understanding of the groundwater characteristics at this monitoring location.

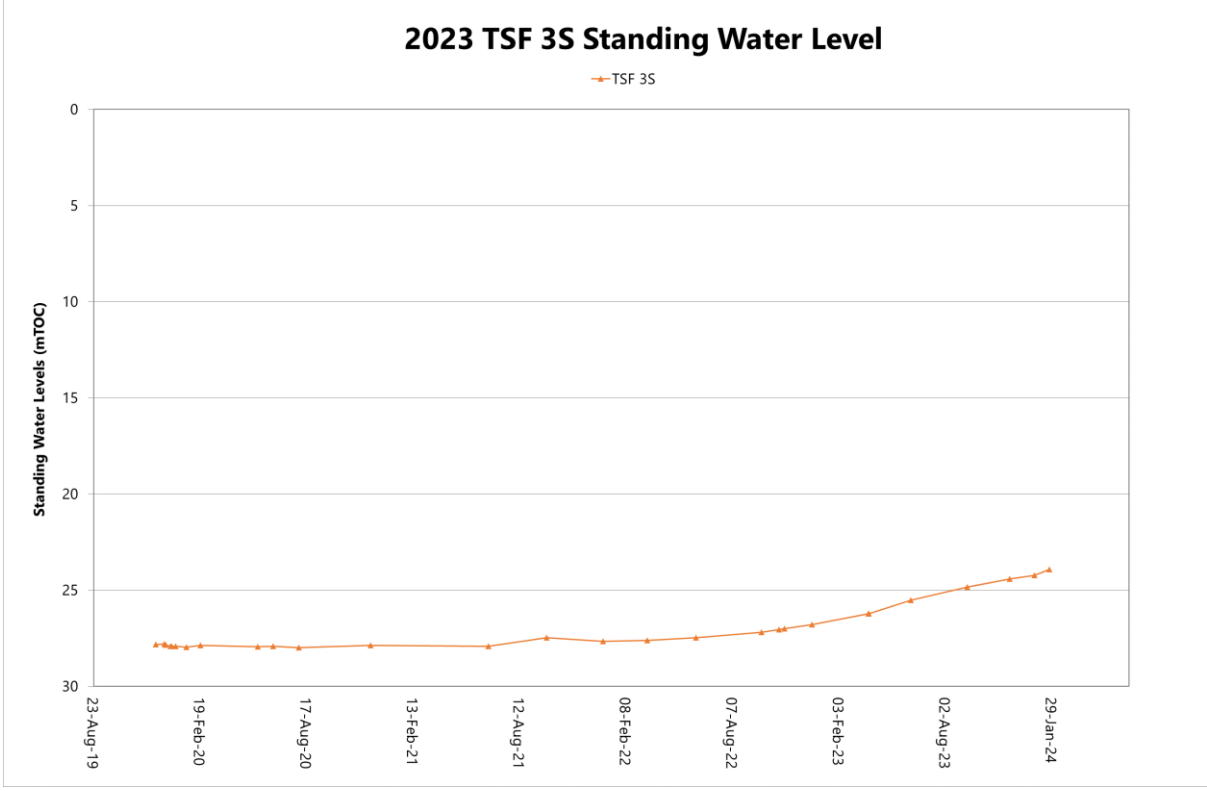

Figure 3: TSFMB3s Standing Water Level

Table 9: TSFMB 3S shallow monitoring well groundwater quality data

Parameter	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline data for shallow alluvial and weathered Proterozoic (HSU1)	TSFMB3s
pH	6.5 – 9	7.25 – 7.9	7.24 – 7.69
EC	100 – 5,000	-	**19,500 – 27,000**
Suspended Solids	*no threshold*	-	26 - 827
Aluminium	-	0.02 – 3.33	0.25 – **12.8**
Arsenic	0.024	-	0.005 – 0.013
Barium	-	0.043 – 0.067	0.029 – **0.235**
Cobalt	0.0028	0.001 – 0.003	0.023 – **0.079**
Copper	0.013	0.005 – 0.016	0.004 – **0.058**
Iron	0.3	0.05 – 2.22	0.24 – **19.8**
Lead	0.0034	0.001 – 0.004	**0.005 – 0.011**
Manganese	1.9	0.073 – 0.091	0.005 – 0.261
Selenium	0.011	0.01 – 0.04	0.03 – 0.04
Strontium	-	1.15 – 1.7	**7.32 – 9.78**
Uranium	0.0005	0.014 – 0.026	**0.032 – 0.046**
Zinc	0.008	0.046 – 0.69	0.042 – 0.364

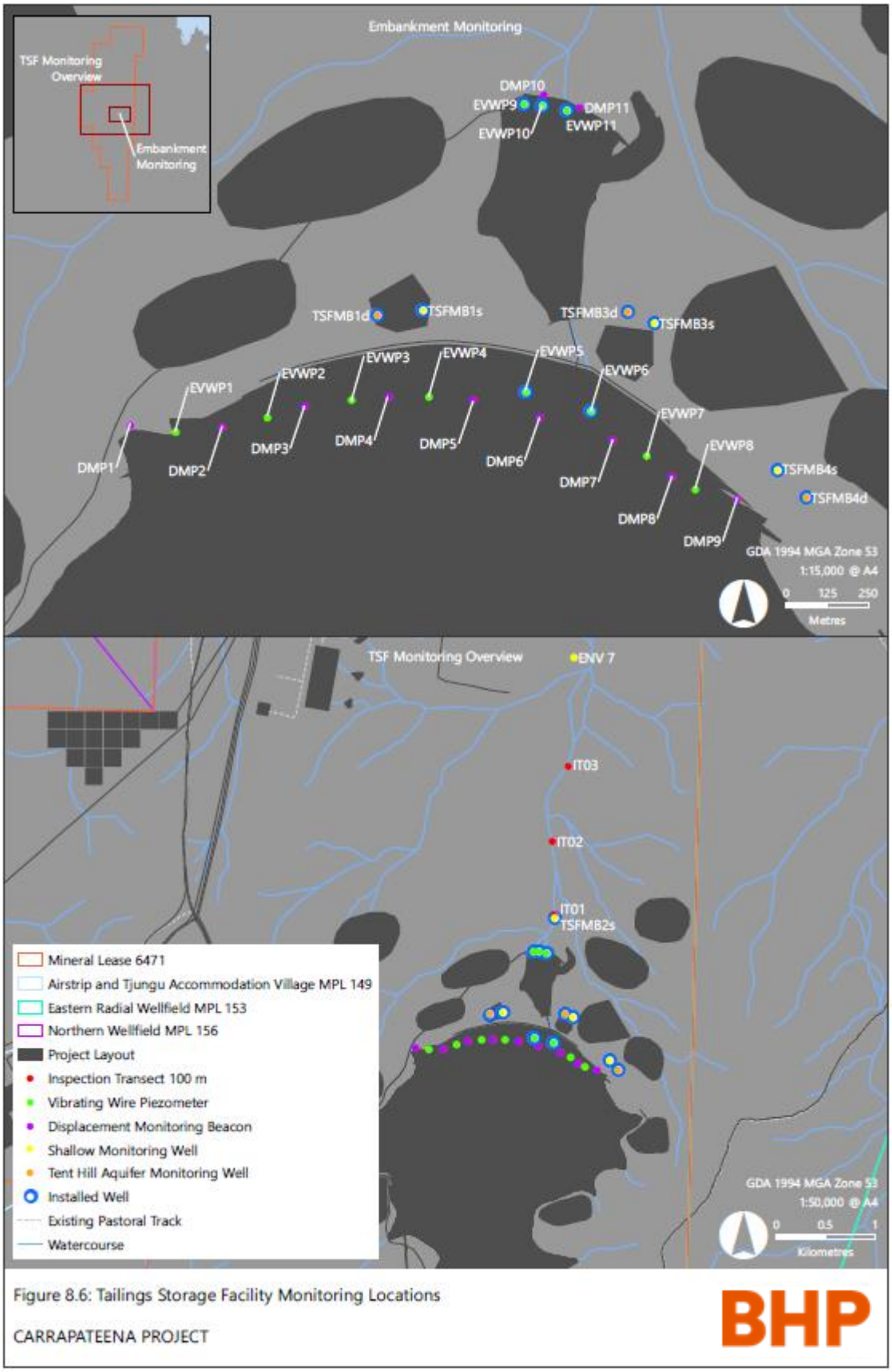

Figure 4: Tailings Storage Facility monitoring locations (PEPR Figure 8.6)

1.2.2 SURFACE WATER QUALITY

The OMC below relates to surface water monitoring in Eliza Creek downstream of the TSF to monitor the potential for shallow lateral seepage.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – TSF3	Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek (SW05 – SW09) within seven days of a rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.9; pH, EC and metals) whichever is greater.	SW05 exceeds EC, barium & uranium (note U is at LOR) SW06 exceeds exceeds barium, zinc & uranium (note U is at LOR) SW07 exceeds zinc & uranium (note U is at LOR) All sites below ANZECC Freshwater pH, SS, Al, As, Ba, Co, Cu, Pb, Mn, Se & St

Outcome Measurement Criteria TSF3 states that opportunistic surface water sampling is required at Eliza Creek monitoring locations (SW05 – SW09) (Figure 2). As previously discussed in the 2021 Groundwater and Surface Water Monitoring Report, only sites SW05, SW06 and SW07 are reported under OMC TSF3 (Table 9) as SW08 and SW09 are within Salt Creek, not Eliza Creek.

Throughout the monitoring period surface water sampling was possible in South Eliza Creek due to >20mm rainfall events resulting in streamflow (Figure 1) however analytical results are available for SW05, SW06 & SW07 (Table 10). All three sites are below both ANZECC Freshwater and Baseline Data for pH, SS, Al, As, Ba, Co, Cu, Pb, Mn, Se and St. Analytical results for uranium at these sites are at the limit of reporting (LOR) and are negligible. BHP Carrapateena is currently finalising establishing site-specific guideline values (SSGVs) to replace leading indicator baseline ranges at TSF monitoring wells, groundwater, surface water and sediment. This review will support a future PEPR update.

SW05 marginally exceeded ANZECC EC at 5720 uS/cm and will be closely monitored in 2024. The exceedance is likely related to seepage and migration of supernatant into Eliza Creek when the Decant Dam operated outside the lined portion throughout early 2023 following significant rainfall in late 2022. Both SW06 & SW07 exceeded baseline range for hydrocarbon and this will be further investigated to delineate it's proposed biogenic origins. Hydrocarbon is unlikely to be sourced from mine activities due to remoteness and the sites early maturity.

Quarterly drone surveillance inspections continued within Eliza Creek (IT-01 to IT-03) and demonstrated leakage directly downstream of the Decant Dam embankment. To date the leakage has not migrated or presented further than IT01 and monitoring well TSFMB2S remains dry. Field analysis, pumping and monitoring of the downstream pool continues as required.

Table 10: Surface water quality results from Eliza Creek monitoring locations

Variable	ANZECC / ARMCANZ (2000) Freshwater Guideline	Baseline Range	SW05	SW06	SW07
No. of samples	-	-	1	1	2
pH (units)	6.5 – 9	-	6.91	6.98	6.93 – 7.76
EC (µS/cm)	100 – 5,000	-	**5720**	2400	223 – 573
Suspended solids	-	26 - 164	15	<5	7 – 37
Aluminium	-	0.72 – 1.67	-	-	1.01
Arsenic	0.024	-	< 0.001	0.002	0.002
Barium	-	0.095 – 0.11	**0.278**	**0.308**	0.051 – 0.082
Cobalt	0.0028	-	< 0.001	< 0.001	0.001
Copper	0.013	-	0.013	0.009	0.008 – 0.009
Iron	0.3	0.5 – 0.86	-	-	0.8
Lead	0.0034	-	< 0.001	< 0.001	0.001
Manganese	1.9	-	0.044	0.075	0.044 – 0.085
Selenium	0.011	-	< 0.01	< 0.01	0.01
Strontium	-	0.12 - 0.157	-	-	0.138
Uranium	0.0005	-	**< 0.001**	**< 0.001**	**< 0.001**
Zinc	0.008	0.015 - 0.029	0.005	**0.015**	**0.015 – 0.032**

1.2.3 SEDIMENT QUALITY

The OMC below relates to sediment quality monitoring in Eliza Creek downstream of the TSF to monitor the potential for shallow lateral seepage.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – TSF4	Annual sediment sampling and laboratory analysis for metals shall be undertaken within Eliza Creek (IT01 - IT03) and demonstrates sediments meet ANZECC/ARMCANZ (2000) Sediment Quality Guidelines or baseline ranges (PEPR Table 8.8), whichever is greater.	IT02 Uranium exceeds baseline range All sites within ANZECC trigger values except for uranium at IT02

Sediment sampling was undertaken at sites IT01, IT02 & IT03 within Eliza Creek in March 2023 (Figure 2). With one sample collected and analysed for each site. Sediment quality results for contaminants of interest are presented in Table 11. Metals concentrations for all sites are within the relevant ANZECC trigger values value except for uranium at location IT02.

Table 11: Baseline sediment quality results for Eliza Creek

Total Metals (mg/kg)	Baseline range (mg/kg dry weight)[1]	ANZECC / ARMCANZ (2000) Sediment Quality Guidelines		CSIRO revision of ANZECC / ARMCANZ (2000) Guideline[4]		2023 monitoring results (mg/kg)		
		ISQG-Low (Trigger Value)[2]	ISQG-High[3]	Guideline Value	SQG-High	IT01	IT02	IT03
Cadmium	<0.1	1.5	10	1.5	10	< 0.1	< 0.1	< 0.1
Chromium	8.6 – 10.7	80	370	80	370	11.9	21.2	9.1
Copper	5.8 – 7.6	65	270	65	570	8.6	17.5	6.3
Lead	4.6 - 8	50	220	50	220	4.4	8	3.7
Silver	<0.1 – 0.1	1	3.7	1.0	4.0	-	-	-
Zinc	14 – 20.2	200	410	200	410	15.9	36.6	14
Uranium	0.1 – 0.2	-	-	-	-	0.2	**0.4**	0.2

[1] Baseline ranges taken from 2019 results for IT01 – IT03

[2] ANZECC/ARMCANZ (2000); interim sediment quality guideline (ISQG) – lowest effect value

[3] ANZECC/ARMCANZ (2000); ISQG – median effect value

[4] Simpson SL et al (2013); revision of ANZECC/ARMCANZ Sediment Quality Guidelines

1.3 ACID AND METALLIFEROUS DRAINAGE

The OMC below relates to surface water monitoring in Eliza Creek downstream of the TSF to monitor the potential for acid and metalliferous drainage.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – AMD1	Opportunistic surface water sampling and laboratory analysis (rising stage samplers or grab samples) within Eliza Creek (SW06, SW07 and SW09) at least once a year within seven days of rainfall event required to create flows demonstrates water quality does not exceed the ANZECC/ARMCANZ (2000) Freshwater Guidelines or baseline ranges (PEPR Table 8.9; pH, EC and metals), whichever is greater.	SW05 exceeds Al, Ba, Fe & Sr SW06 exceeds Al & Sr baseline SW07 exceeds Sr All sites below ANZECC Freshwater pH, EC, SS, As, Co, Cu, Pb, Mn, Se, U & Zn

During 2023 there was no evidence of a PAF reaction within tailings water, both supernatant and decant, with pH remaining constant and near neutral. In late 2022, BHP commissioned EGi Pty Ltd to undertake an ongoing program of kinetic test work to confirm the NAF classification of tailings.

Samples were split from daily composite samples (day and night shift) between October 2022 and November 2023. Results from the test work indicated the total sulphur content of the tailings to be relatively consistent, varying between 0.11 and 0.33% with an average value of 0.2%. There was no apparent increasing or decreasing trend across the monitoring period. The neutralising capacity of tailings was also relatively consistent across the same period, ranging from 10 kg H2SO4/t to 39 kg H2SO4/t with a possible, but not significant, increase across the test period.

All tailings samples were NAPP negative (-4 to -32 kg H2SO4/t) with a possible, but not significant, decrease across the test period. ANC/MPA ratios varied between 1.5 to 10.1, with only 6 samples (<10%) giving an ANC/MPA ratio below 2 and none below 1, indicating most samples contained a significant excess of neutralising capacity. All but one sample gave a NAG pH <7, and for this one sample the NAG to pH 7 was only 1 kg H2SO4/t.

Taken together, results from weekly testing show that all tailings samples analysed between October 2022 and November 2023 can be classified as NAF, with little variation and no significant trends in their acid forming characteristics (EGi 2024).

2 GROUNDWATER

2.1 TSF

2.1.1 GROUNDWATER QUALITY

The OMC below relates to groundwater quality monitoring of Tent Hill Aquifer (THA) wells downstream of the TSF.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – GW1	Quarterly sampling of Tent Hill Aquifer Wells downstream of the Tailings Storage Facility (TSFMB 1D, TSFMB 3D and TSFMB 4D) and analysis of pH, EC and metals demonstrates water quality are within the site groundwater baseline composition ranges (PEPR Table 8.15).	TSFMB1D increased EC from 65,900 to 90,900 uS/cm. TSFMB3D increased EC from 31,100 to 44,600 uS/cm. TSFMB4D increased EC from 31,900 to 40,500 uS/cm. Exceedances of arsenic & iron at all wells. Exceedance of aluminium, manganese, stronium & uranium at one wells. Exceedance of copper at one well.

Groundwater monitoring wells TSFMB1D, TSFMB3D & TSFMB4D were installed in May 2019 for the purpose of monitoring the potential for vertical & lateral seepage of tailings solutes to the underlying aquifer. The wells screen the Tent Hill Aquifer at depths ranging from 84 to 150 mBGL. Baseline groundwater quality data (pH, EC and metals) was processed following well installation in September 2019 and throughout 2020. Results of groundwater sampling and laboratory analysis of pH, EC and metals from within the monitoring period are presented in **Error! Reference source not found.**

Electrical conductivity of TSFMB1D has continued to demonstrate increasing salinity over the reporting period from 65,900 to 90,900 uS/cm and correlates with hydraulic loading (mounding) and leakage of the TSF. EC of TSFMB 3D increased from ~31,100 to 44,600 uS/cm. EC of TSFMB4D increased from ~31,900 to 40,500 uS/cm

In all three wells, pH, barium, cobalt, lead, selenium, & zinc are within the adopted groundwater baseline ranges.

Arsenic & iron has been exceeded at all wells whilst TSFMB1D reported a minor exceedance in aluminium, manganese, strontium & uranium and TSFMB3D reported a minor exceedance in copper.

Table 12: TSF monitoring wells groundwater quality data

Parameter (mg/L)	Tent Hill Aquifer Baseline*	TSFMB1d, TSFMB3d, TSFMB4d Baseline**	TSFMB 1D Monitoring Bore	TSFMB 3D Monitoring Bore	TSFMB 4D Monitoring Bore
No. Of Samples			5	5	5
pH	6.31 – 8.05	7.44 – 7.88	6.77 – 7.24	7.04 – 7.47	7.05 – 7.38
EC (uS/cm)	-	-	**65,900–90,900**	31,100 – **44,600**	31,900 – **40,500**
TDS (avg)	12900 – 33500	22000 – 24100	**45,200–61,700**	22,700 – **29,400**	22,400 – **29,700**
Aluminium	0.01 – 0.02	<0.01	<0.05 - **0.08**	0.01 - <0.10	<0.01 – 0.02
Arsenic	-	0.002 – 0.005	**0.02 – 0.07**	**0.02**	**0.014 – 0.019**
Barium	0.025 – 0.161	0.027 – 0.030	0.05 – 0.06	0.03 – 0.04	0.025 – 0.029
Cobalt	0.001 – 0.0029	<0.001 – 0.001	0.01 – 0.02	<0.001 - <0.005	<0.001 - <0.005
Copper	0.001 – 0.013	<0.001	0.01	<0.002 – **0.022**	<0.002 – 0.004
Iron	0.05 – 5.58	<0.05	4.42 – **24.9**	**7.42 – 11.5**	**8.14 – 11.8**
Lead	0.0005 – 0.004	<0.001	<0.005	<0.05	<0.001 - <0.005
Manganese	0.192 – 1.03	0.629 – 0.690	**1.68 – 2.32**	0.85 – 0.93	0.897 – 0.957
Selenium	0.01 – 0.02	<0.01	<0.05	<0.01 - <0.05	<0.01 - <0.05
Strontium	15.6 – 25.7	20.5 – 20.9	**47.1 – 54.2**	20.9 – 25.7	20.2 – 24.2
Uranium	0.005 – 0.016	<0.001 – 0.006	**0.026 – 0.030**	<0.001 - <0.005	<0.001 - <0.005
Zinc	0.005 – 0.636	<0.005	0.030 – 0.048	<0.005 – 0.026	<0.005 – 0.026

* As presented in PEPR Table 8.15 – Baseline concentrations based on two sampling rounds from the THA beneath the Mineral Lease (19 wells)

** Baseline concentrations based on one round of sampling from TSF1D, TSF 3D, TSF 4D (formerly referred to as THA1 to THA3)

2.1.2 STANDING WATER LEVELS

The OMC below relates to groundwater levels monitoring of THA wells downstream of the TSF.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – GW2	Quarterly monitoring of Tent Hill Aquifer monitoring wells downstream of the Tailings Storage Facility (TSFMB 1D, TSFMB 3D and TSFMB 4D) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed maximum predicted drawdown at each well (PEPR Table 8.14). Groundwater Criteria (Schedule 6 Condition 27.1).	All three wells have a shallower SWL (mBGL) than the previous reporting period, suggesting hydraulic loading of the THA aquifer in the immediate vicinity of the TSF. Standing Water Levels do not follow modelled predictions. TSFMB1D gained 4.26 m TSFMB3D gained 3.23 m TSFMB4D gained 4.31 m

Figure 5 to **Error! Reference source not found.** presents the standing water level data in comparison to the predicted head for THA wells TSFMB1D, TSFMB3D and TSFMB4D.

The SWL recorded at all three bores is higher than the groundwater modelled prediction and have continued to increase in elevation (mAHD) over the reporting period. These observations imply hydraulic loading of the THA aquifer in the immediate vicinity of the TSF.

Standing water levels are shallower (closer to ground level) in all three wells. TSFMB1D gained 4.26m to 82.76 mAHD, TSFMB3D increased 3.23m to 78.03 mAHD and TSFMB4D increased 4.31m to 82.58 mAHD (Figures 5, 6 and 7).

Throughout the monitoring period all three bores recorded further recharge (mounding) in contradiction to the groundwater modelling with the greatest increase recorded of 4.31m at TSFMB 4D. The THA wells will continue to be monitored quarterly and compared to the groundwater model predicted hydrograph.

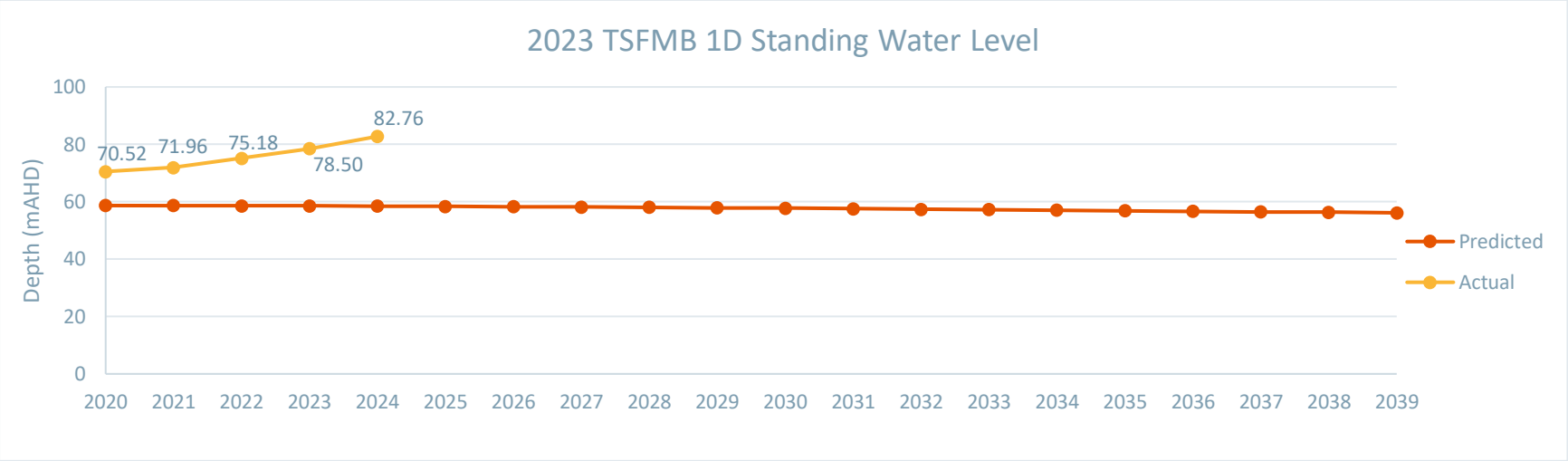

Figure 5: Predicted vs actual standing water levels for monitoring well TSFMB 1D

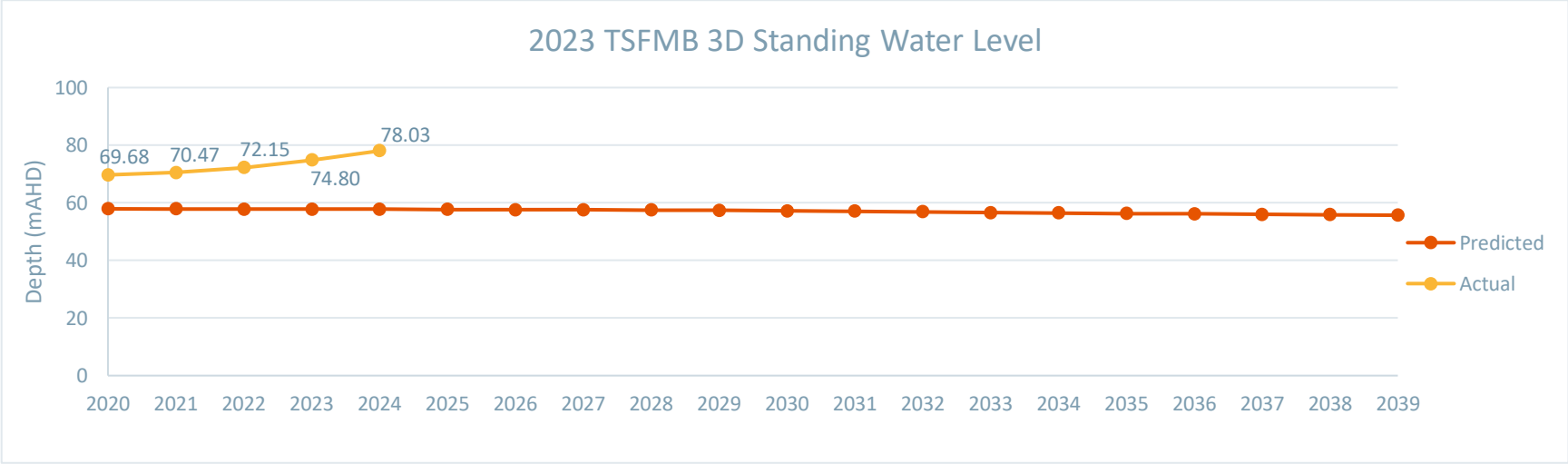

Figure 6: Predicted vs actual standing water levels for monitoring well TSFMB 3D

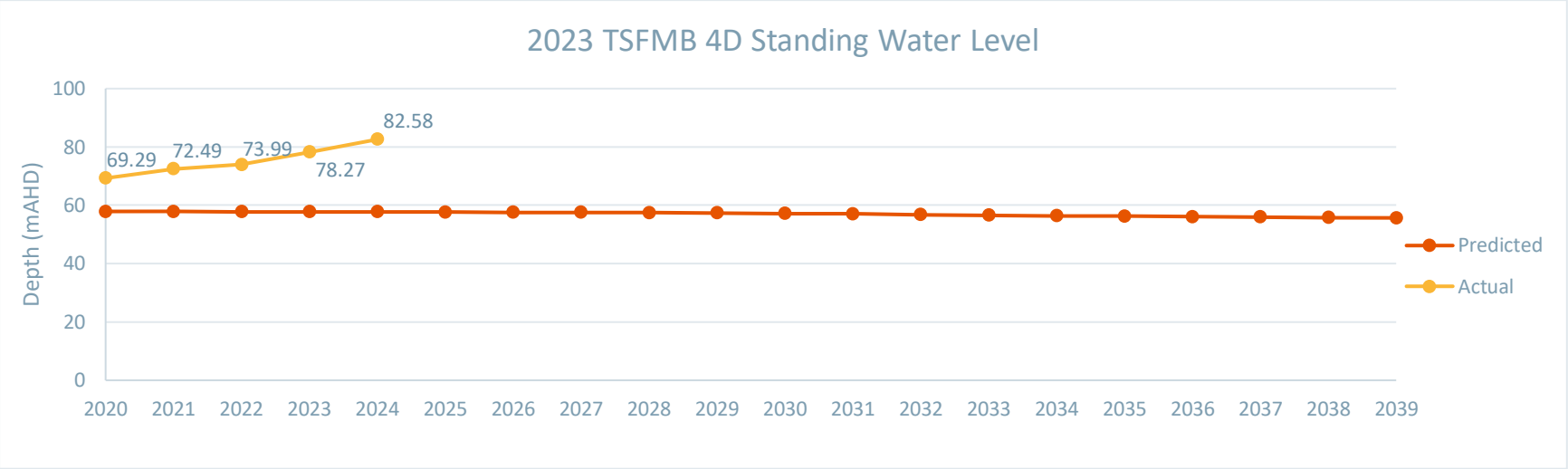

Figure 7: Predicted vs actual standing water levels for monitoring well TSFMB 4D

2.1 DRAWDOWN

2.2.1 COMPLIANCE GROUNDWATER LEVELS

The OMC below relates to regional groundwater level monitoring at compliance wells to monitor groundwater drawdown.

ID	Outcome Measurement Criteria	Result
Outcome Measurement Criteria – GW3	Quarterly monitoring of groundwater compliance monitoring wells in the groundwater model (MS2, MS3, MD3, ENV S2 and ENV W3) demonstrates that the standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well (PEPR Table 8.12) and quarterly monitoring of groundwater compliant monitoring wells not simulated in the groundwater model (ENV N4, ENV N8) demonstrate no evidence of a trend in standing water levels over three consecutive quarters.	Groundwater levels at MS2 are now trending in accordance with the predicted hydrographs (Figure 10). Wells ENV N4 & ENV N8 Stable groundwater levels.

The seven groundwater compliance wells consist of five wells simulated in groundwater modelling (ENV S2, ENV W3, MS2, MS3, MD3) and two wells not simulated in modelling (ENV N4 and ENV N8).

Outcome Measurement Criteria GW3 was compliant in 2023. Compliance with Outcome Measurement Criteria GW3 for these wells is assessed through comparison of groundwater model predicted standing water levels against actual during the reporting period.

Groundwater levels at ENV S2 and ENV W3 continue to demonstrate stability and are trending better than the predicted hydrographs. Negligible drawdown has been observed (Figure 8 & Figure 9) and groundwater levels remain similar to that reported at well construction.

Groundwater levels at MS2 are now trending in accordance with drawdown as per the predicted hydrograph (Figure 10). Total drawdown is ~2.5 m since construction.

The groundwater level at MS3 is not demonstrating drawdown with performance better than the predicted hydrograph. Stable SWLs were recorded throughout 2023. (Figure 11). Groundwater level at MD2 is demonstrating a similar rate of drawdown against the predicted hydrographs (Figure 12)

Predicted standing water levels for ENV N4 and ENV N8 are un-simulated in the model, but both wells are reported as stable (Figure 13) and showed no evidence of a declining trends in SWLs due to the operation.

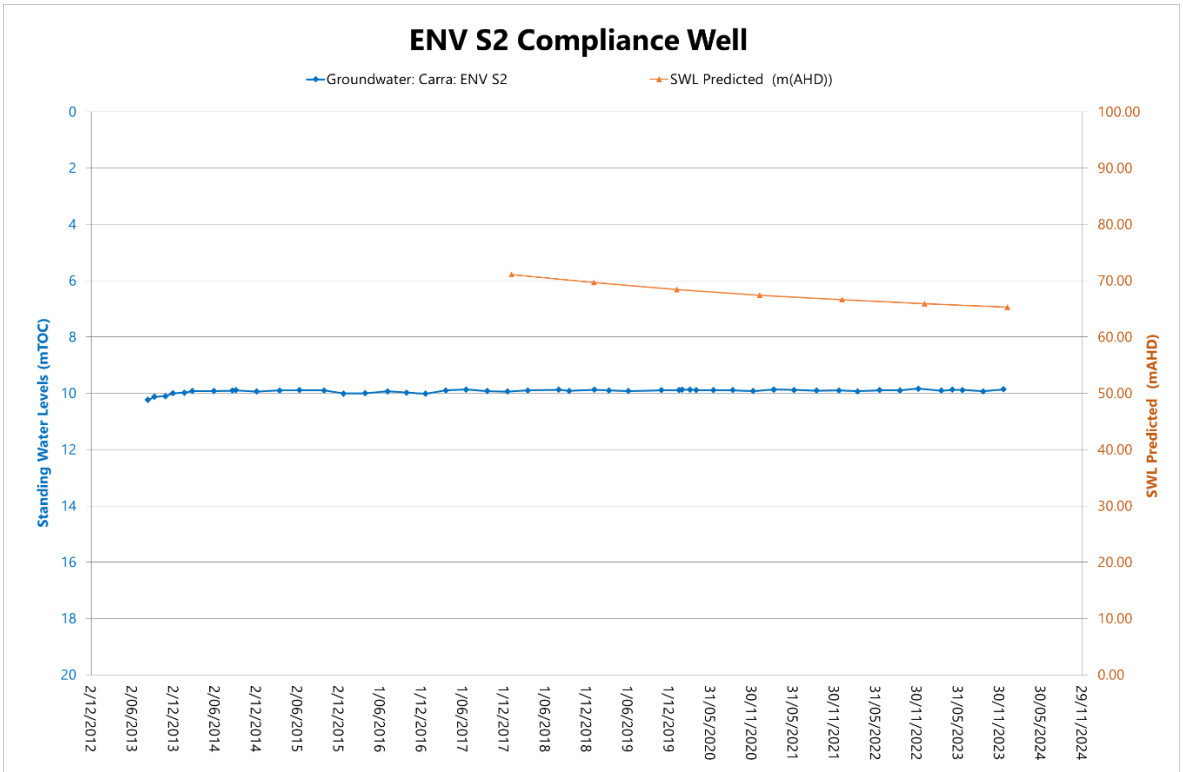

Figure 8: Standing water level for Compliance Well ENV S2

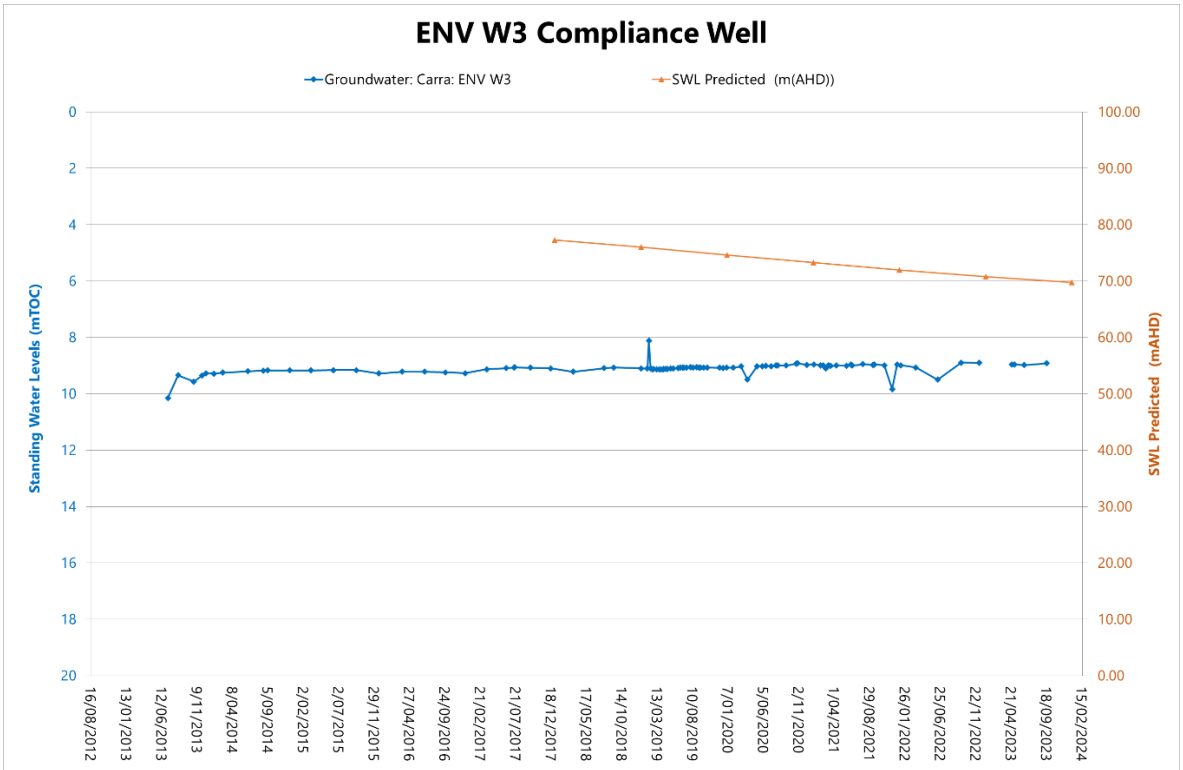

Figure 9: Standing water level for Compliance Well ENV W3

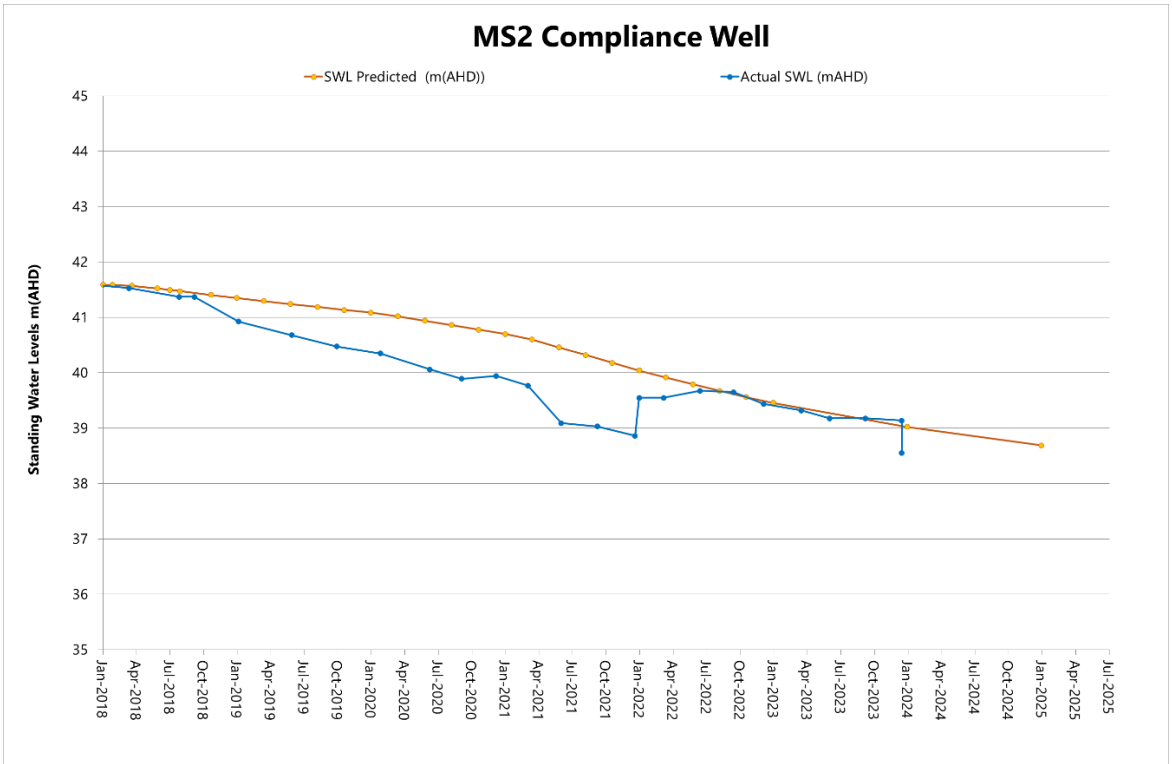

Figure 10: Standing water level for Compliance Well MS2

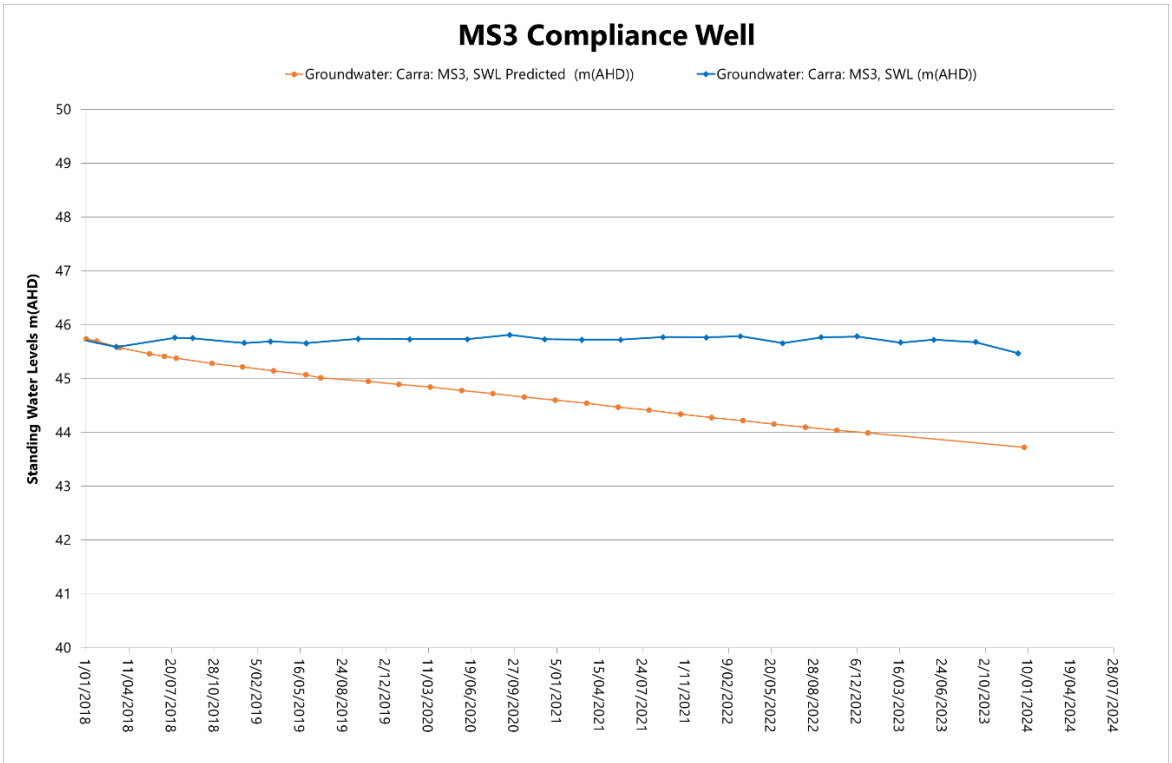

Figure 11: Standing water level for Compliance Well MS3

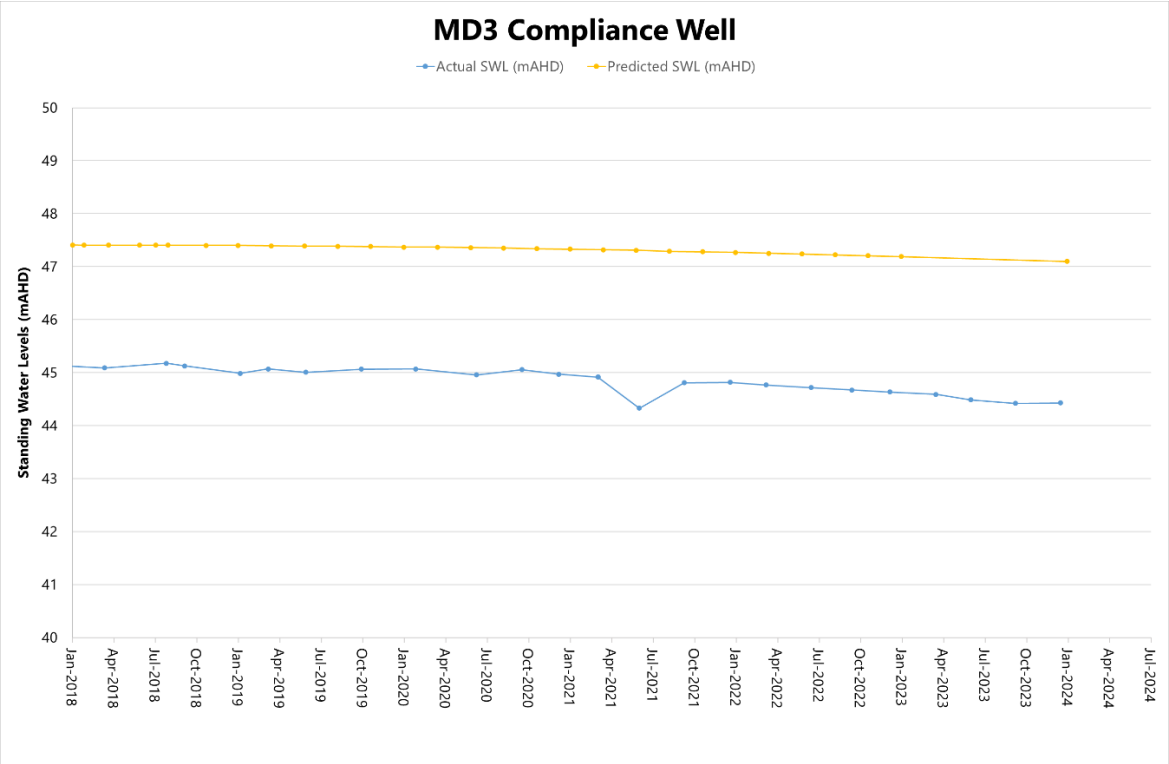

Figure 12: Standing water levels for Compliance Well MD3

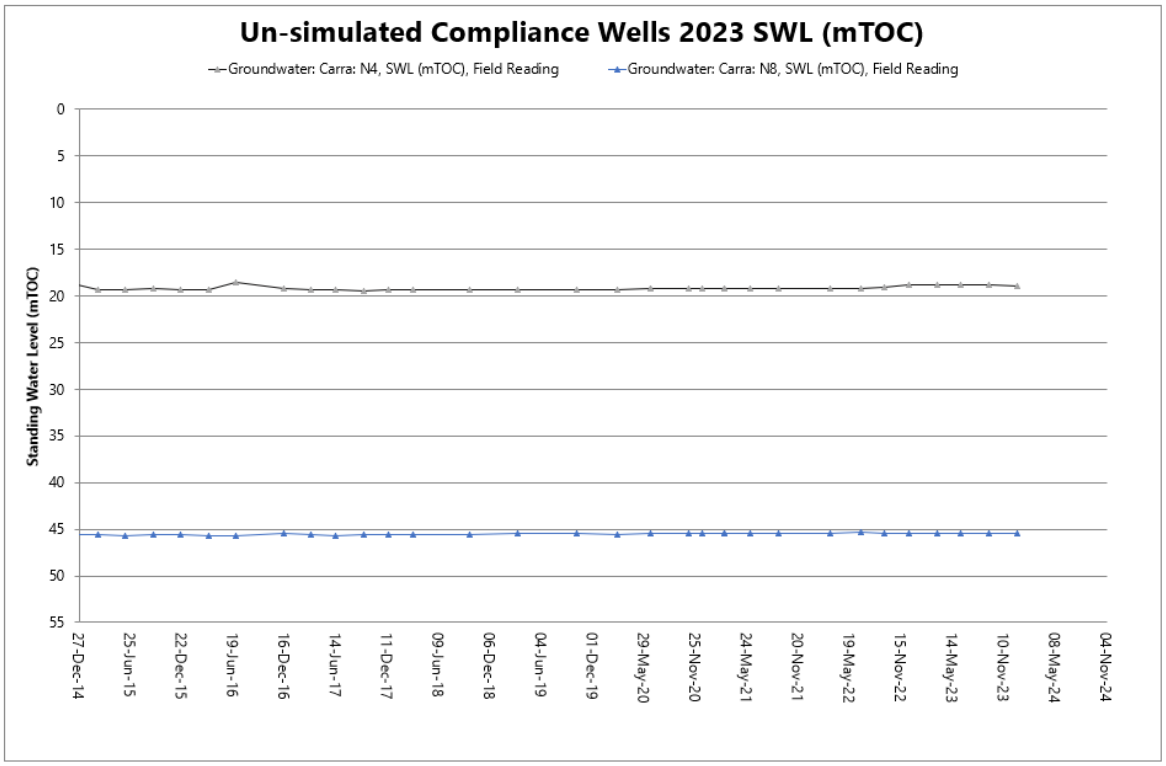

Figure 13: Standing water levels for Compliance Wells ENV N4 & ENV N8

2.2.2 LEADING INDICATOR GROUNDWATER LEVELS

The Leading Indicator below relate to regional groundwater level monitoring at leading indicator wells to monitor groundwater drawdown.

ID	Outcome Measurement Criteria	Result
Leading Indicator – GW5	Quarterly monitoring of groundwater leading indicator monitoring wells simulated in the groundwater model (PEPR Figure 8.8, Table 8.13) demonstrates that standing water levels are trending in accordance with modelled predictions and do not exceed the maximum predicted drawdown at each well. Quarterly monitoring of groundwater leading indicator monitoring wells not simulated in the groundwater model (PEPR Figure 8.8, Table 8.13) shows no evidence of a trend in standing water levels over three consecutive quarters.	Three wells exhibited less drawdown than predicted (MD1 ENV 6 & ENV 7). Three shallow wells are still dry (SC Piezo, YC Piezo 1,2). Remaining wells trending in accordance with modelled predictions.

Groundwater leading indicator wells comprise ENV 6, ENV 7, ENV S1, ENV W4, MS4, MD4, PS6, MS6, YC Piezo 1, YC Piezo 2, SC Piezo, PI12, MS1, MD1, PI8-Obs, BI 6 THA, BI 6 PAN, ENV N-10, ENV N 11, Bosworth THA and Bosworth Alluvium.

Leading indicator wells were monitored quarterly throughout 2023 which fulfills the quarterly monitoring requirement of Leading Indictor GW5.

SC-Piezo, YC-Piezo 1 and YC-Piezo 2 were not able to be monitored due to the piezometers being dry.

ENV 6 (Figure 14) monitors the Tent Hill Aquifer to the south of the mine. The well is stable and demonstrates less drawdown than predicted.

Leading indicator wells MD1 and ENV 7 recorded steady water levels throughout the reporting period which conflicts with the modelled data that predicted continual drawdown (Figure 15 & 22).

The following Wells MS4, PS6, PI12, MS6 and PI8 Obs showed either no deviation from modelled or minor fluctuations through the year ending with water levels closely following those simulated (Figures 16, 18, 19, 20 & 23).

The rate of change for drawdown observed at MD4 does not match that predicted however in 2023 the actual & predicted SWL met. It is assumed that drawdown in MD4 is influenced by recharge and abstraction boundary conditions of the pumping infrastructure of the Southern Wellfield (Figure 17) and is reported slightly deeper than the predicted hydrograph for 2023.

Leading indicator wells un-simulated in the numerical groundwater model (BI-6 THA, ENV N-10 & Bosworth THA) showed no evidence of a declining trends in SWLs due to operations. Standing water levels at BI-6 PAN decreased by approximately 3 m in 2023, which is attributed to a slow recovery following development and well construction modifications in 2019. Standing water level at the shallow

Bosworth Alluvium well demonstrates cyclical changes due to rainfall and recharge, pastoral stock use and evapotranspiration, but is not impacted by the Northern Wellfield Operations. ENV N11 standing water level indicates ~5 m decrease since construction (Figure 24).

The shallow well ENV S1 at Pernatty Homestead is steady (Figure 25).

ENV W4 at Yeltacowie Homestead is a Shallow Alluvial completed well and demonstrates unconfined response to rainfall and pastoral pumping activities. Depth to water is stable (Figure 26).

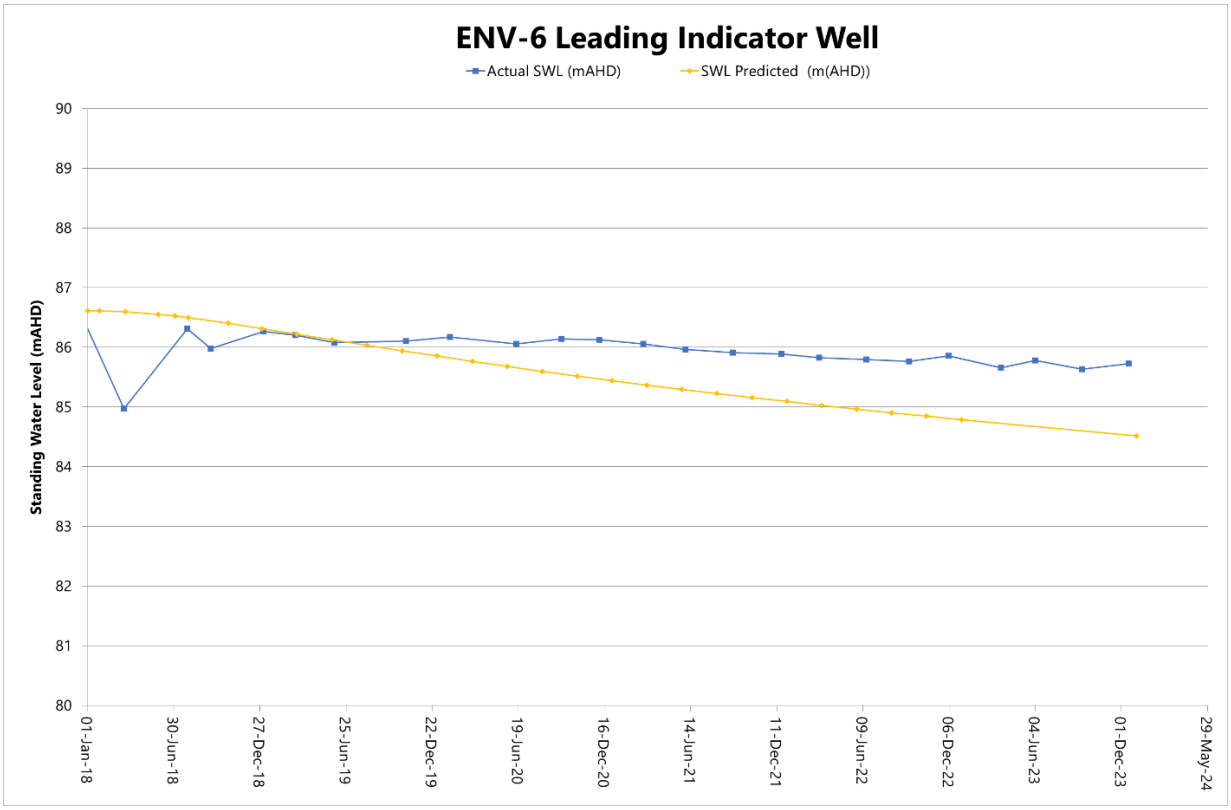

Figure 14: Standing water level for Leading Indicator Well ENV6

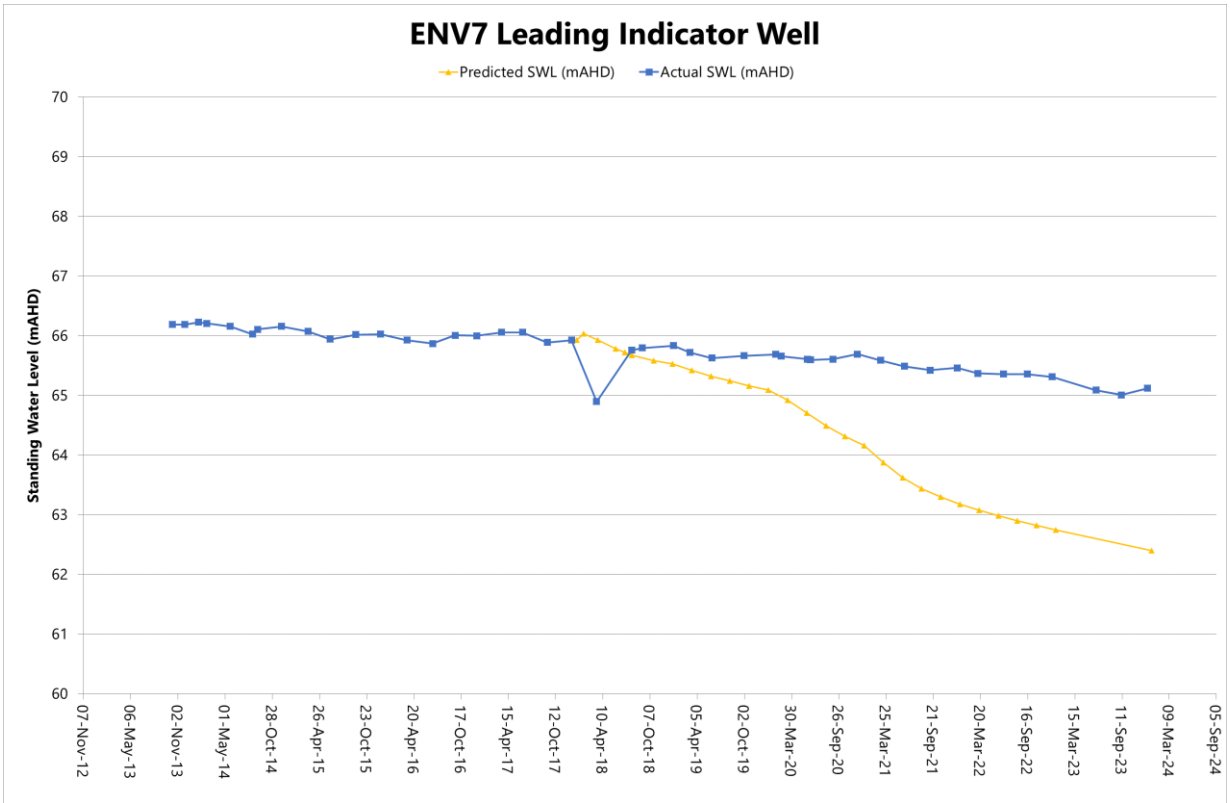

Figure 15: Standing water level for Leading Indicator Well ENV7

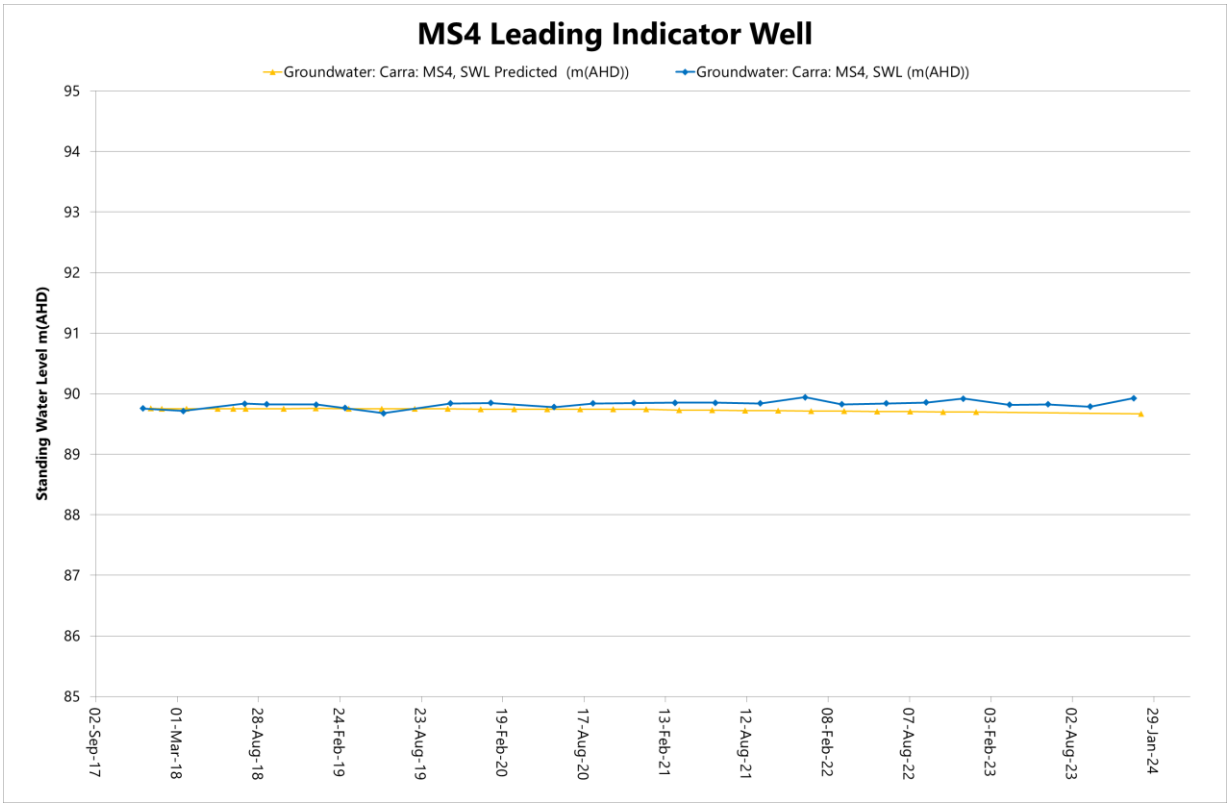

Figure 16: Standing water level for Leading Indicator Well MS4

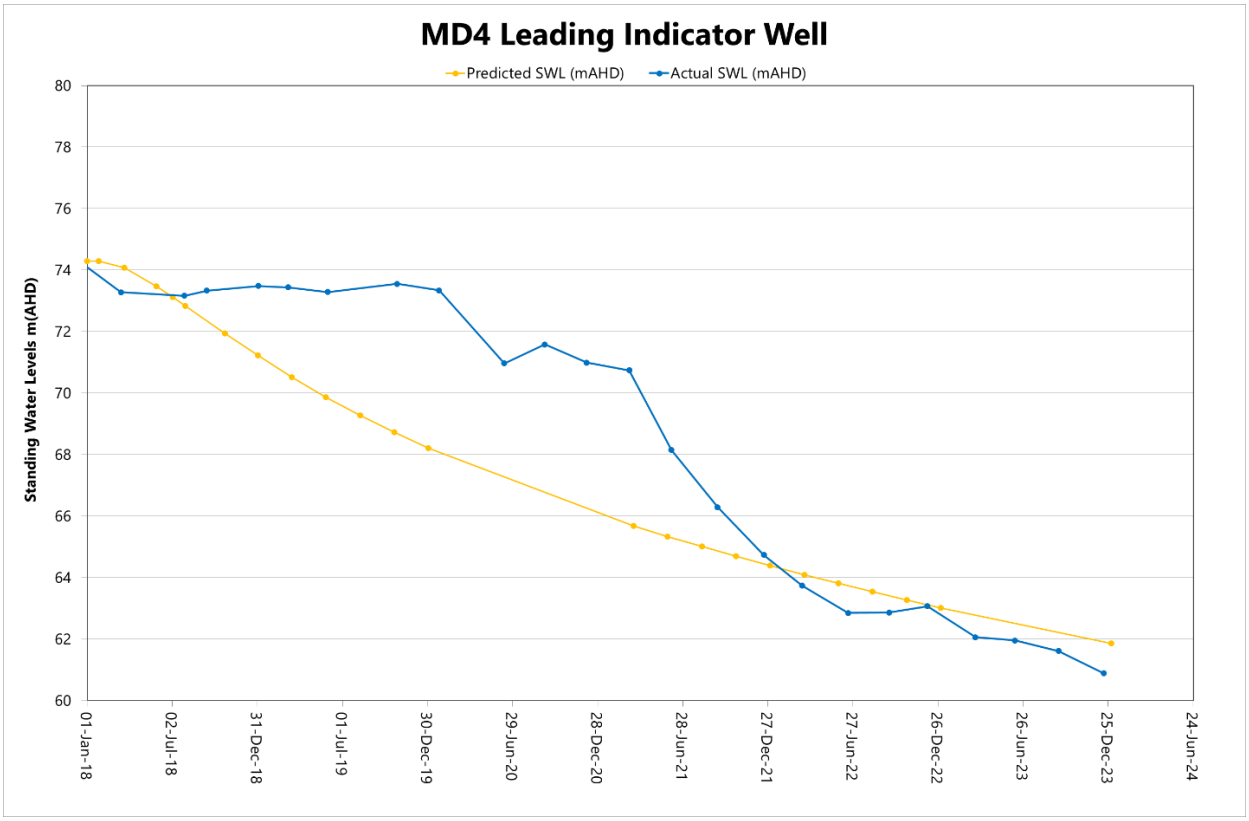

Figure 17: Standing water level for Leading Indicator Well MD4

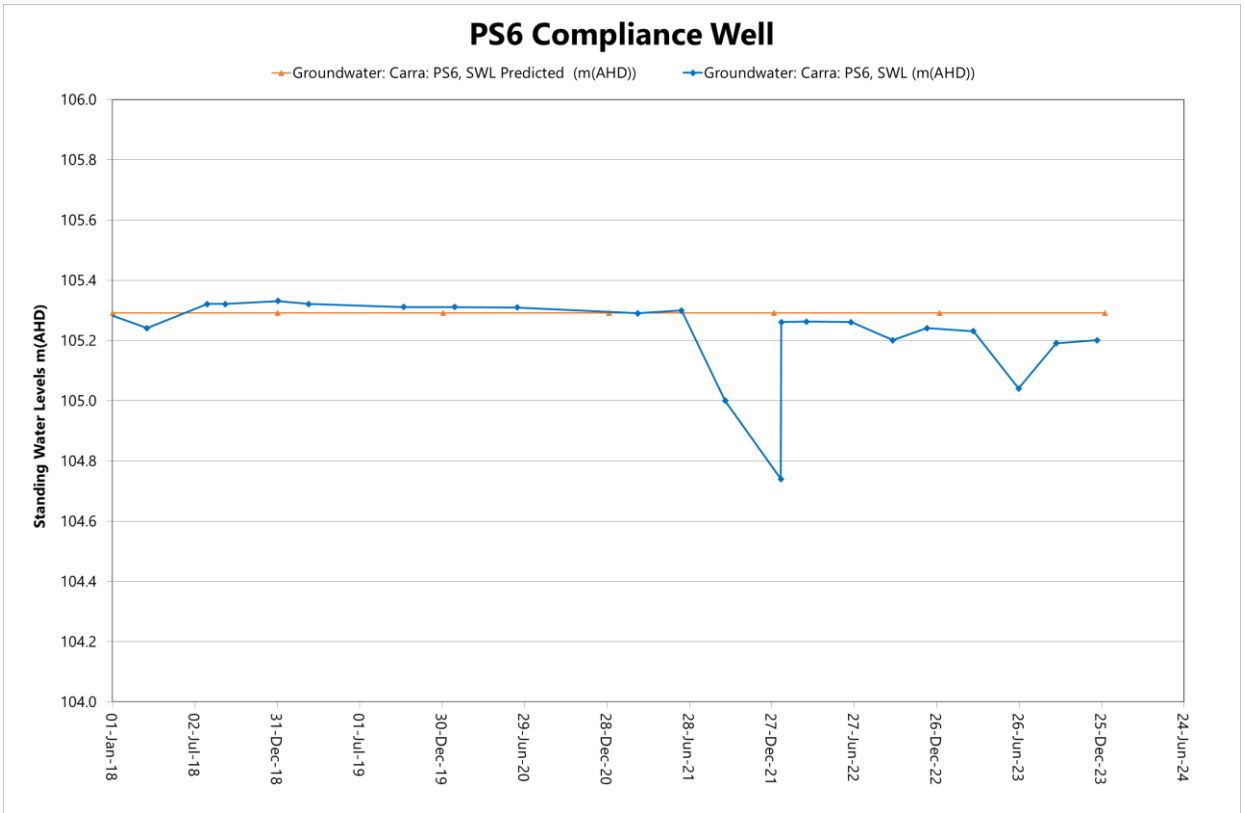

Figure 18: Standing water level for Leading Indicator Well PS6

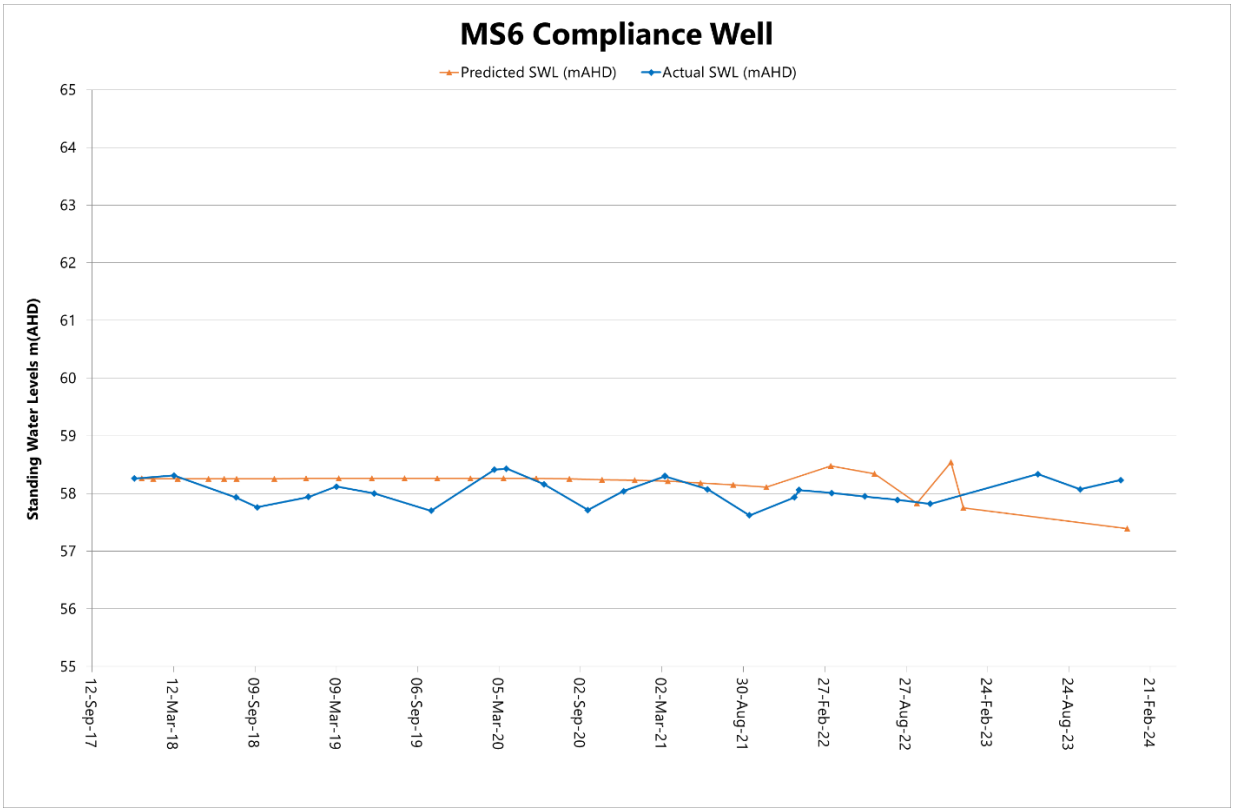

Figure 19: Standing water level for Leading Indicator Well MS6

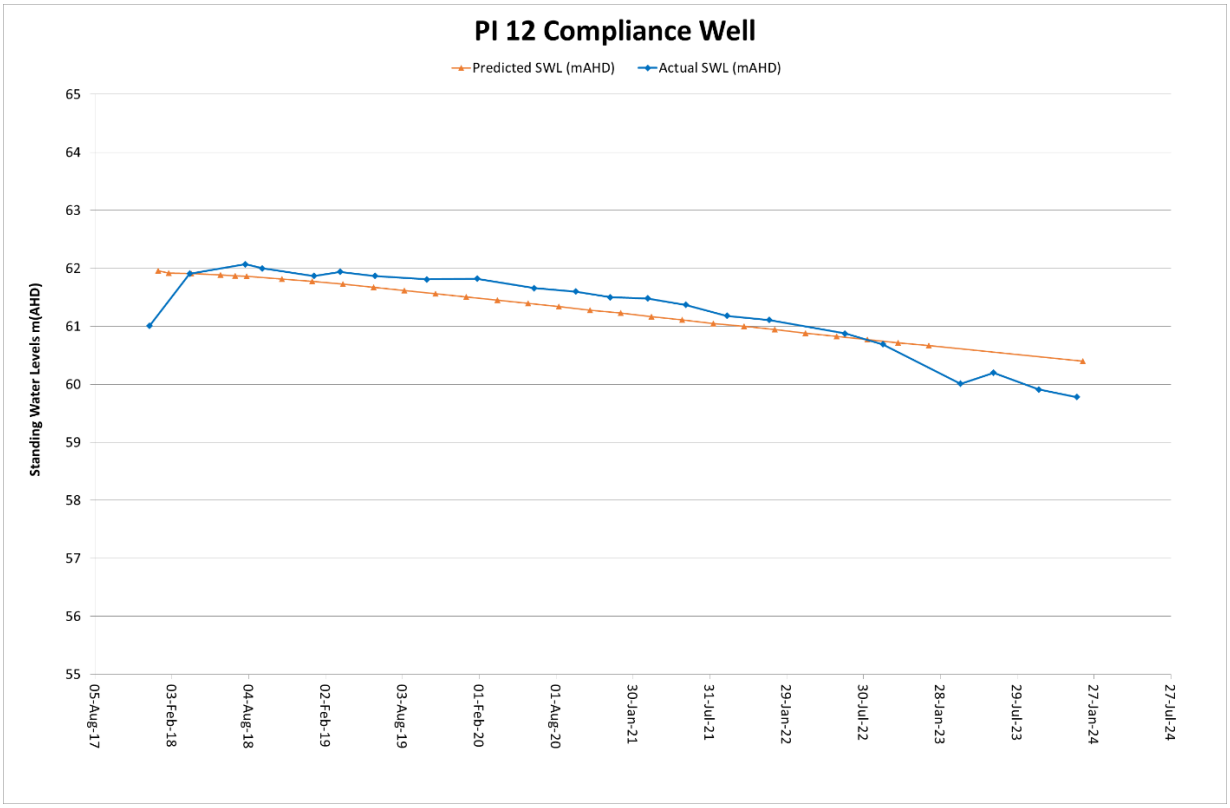

Figure 20: Standing water level for Leading Indicator Well PI12

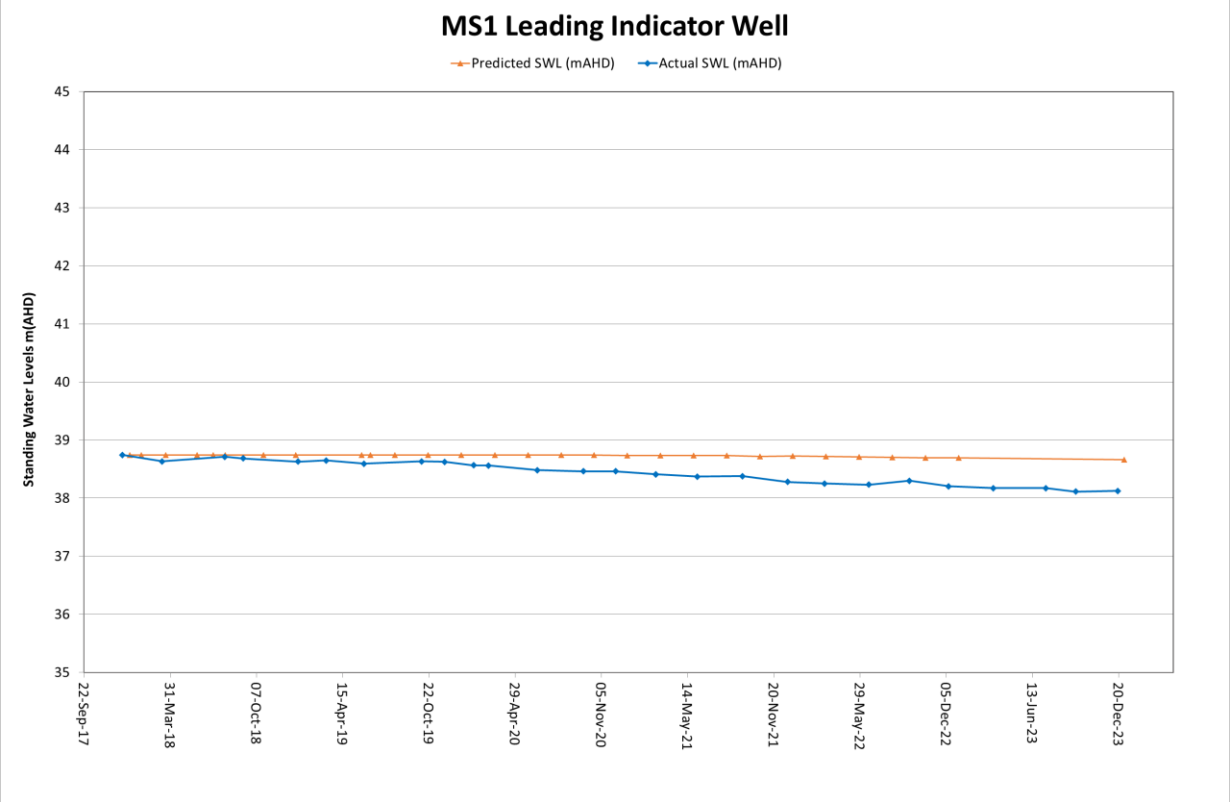

Figure 21: Standing water levels for Leading Indicator Well MS1

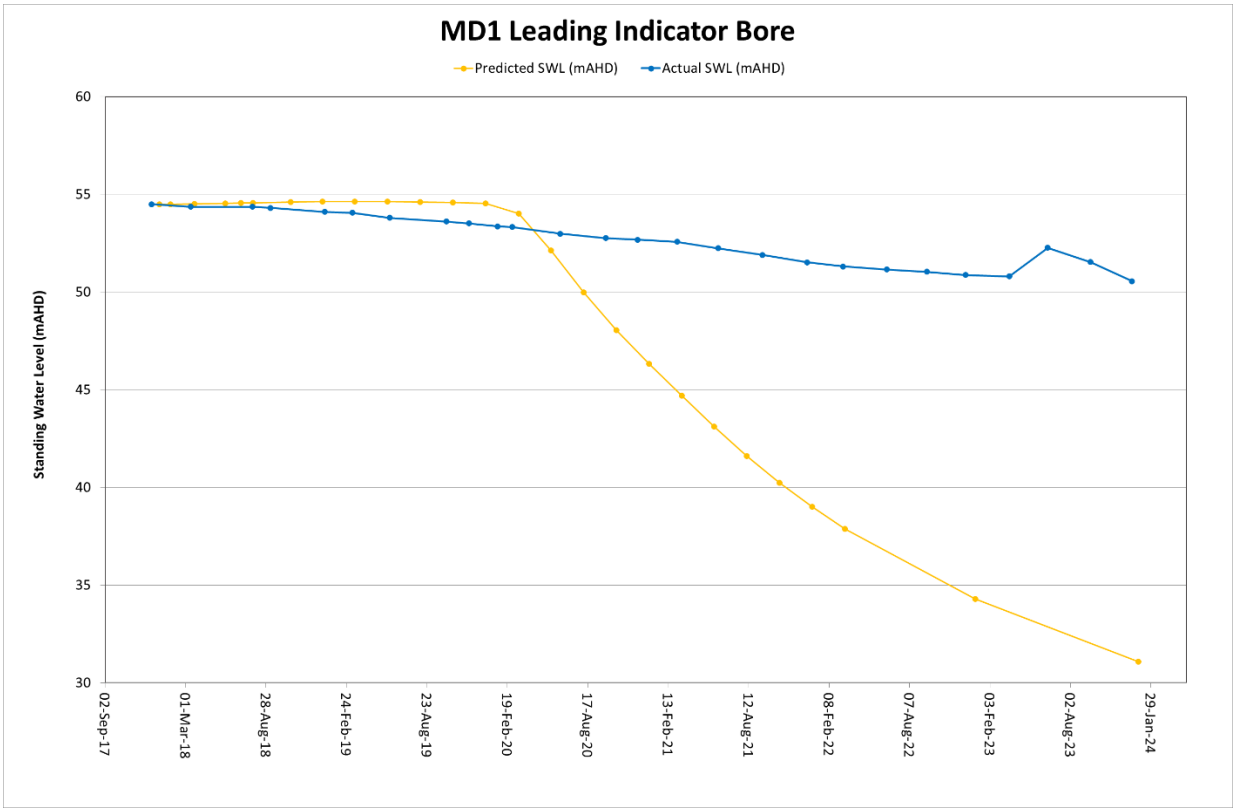

Figure 22: Standing water levels Leading Indicator Well MD1

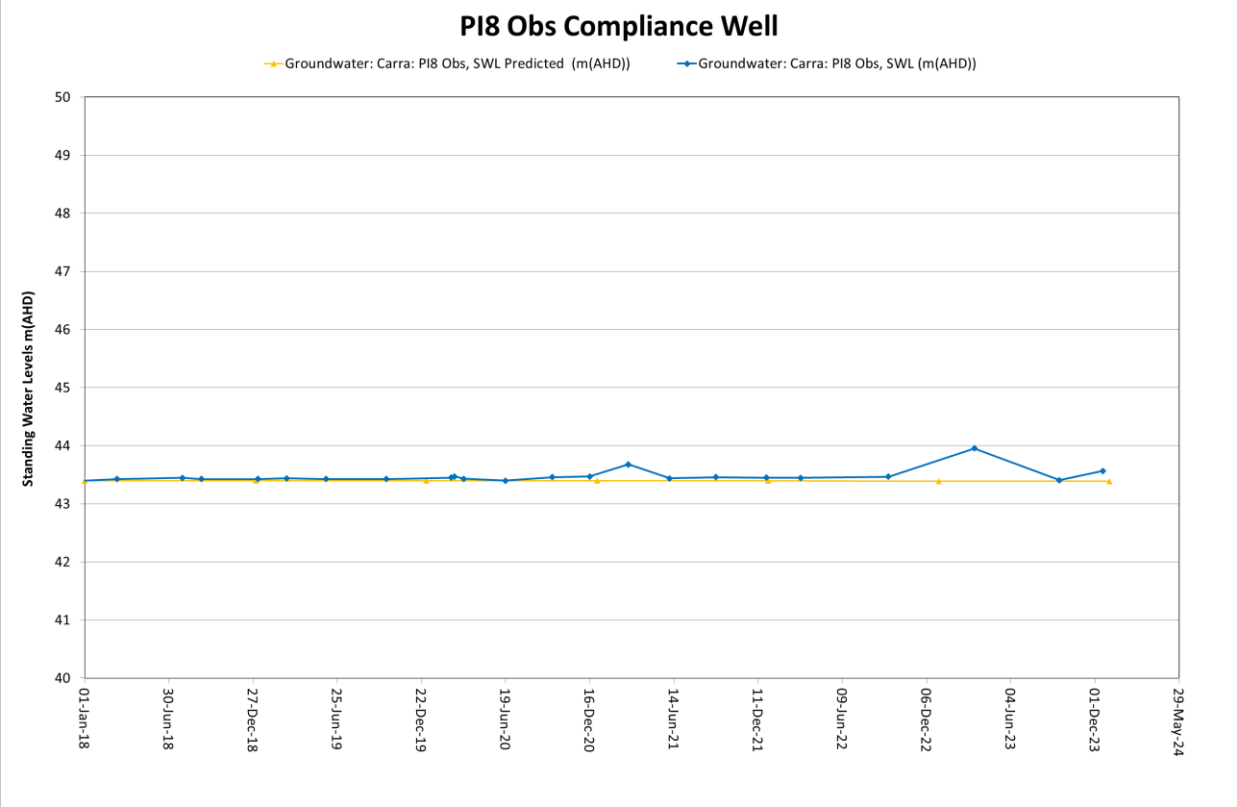

Figure 23: Standing water levels for Leading Indicator Well PI8-Obs

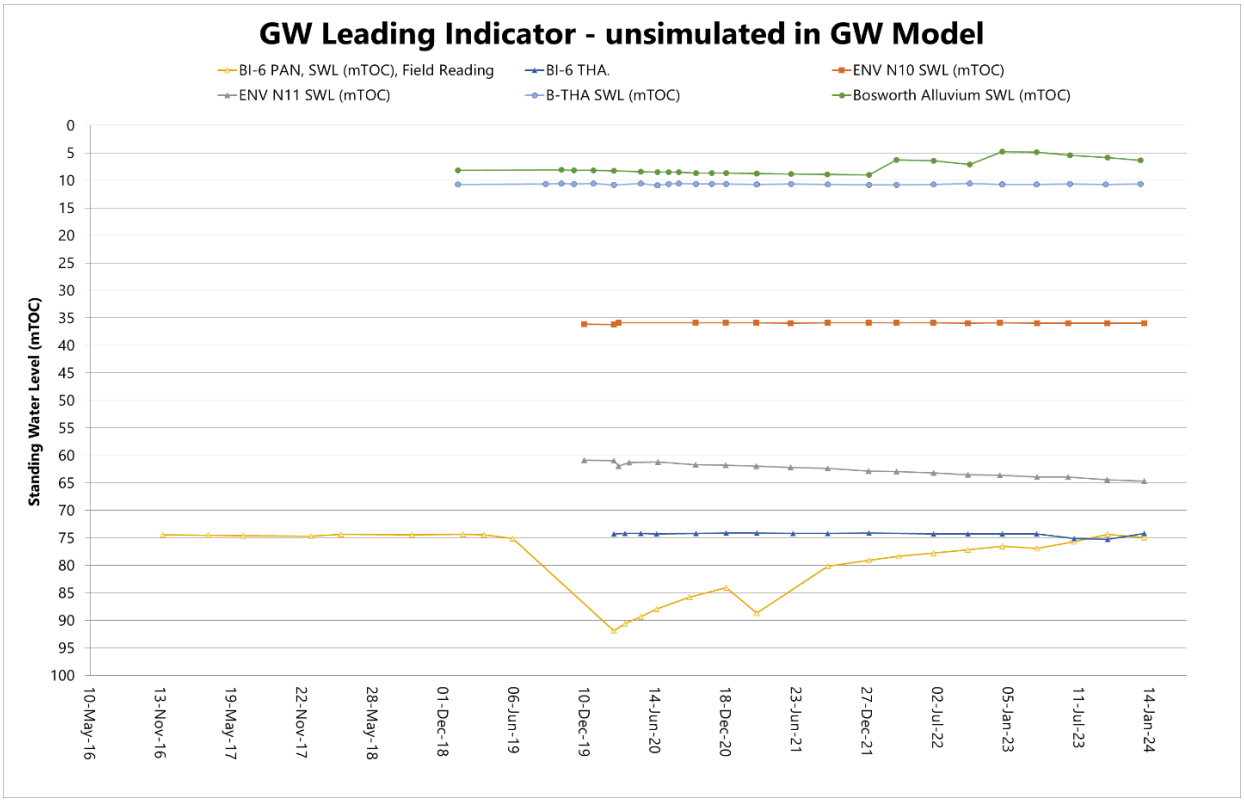

Figure 24: Standing water levels Leading Indicator Well – Un-simulated

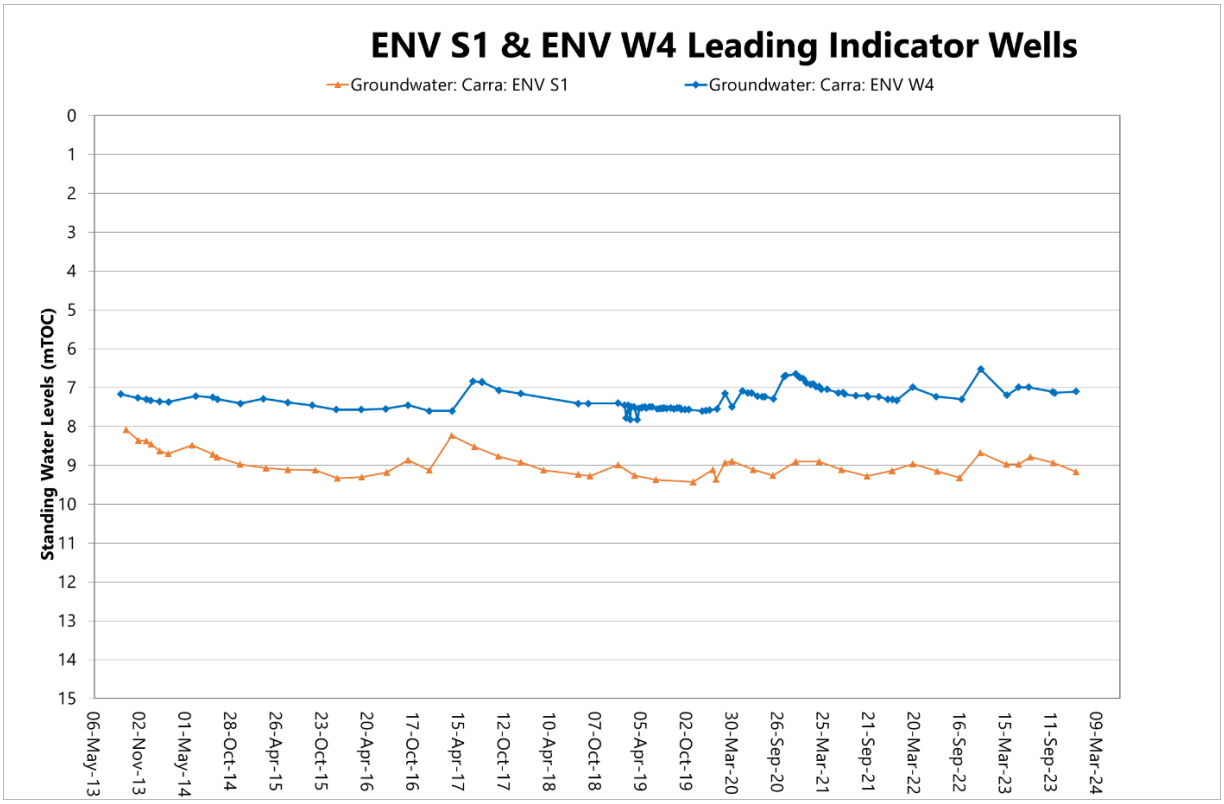

Figure 25: Standing water levels for Leading Indicator Wells ENV S1 & ENV W4

2.2.3 ABSTRACTION VOLUME

The Leading Indicator below relates to groundwater abstraction monitoring to monitor groundwater drawdown.

ID	Outcome Measurement Criteria	Result
Leading Indicator – GW4	Quarterly analysis of groundwater abstraction volumes from flow meter records at groundwater production wells demonstrate that trends do not exceed the predicted water demand (12.9 ML/d) and show that no more than average of 7 ML/d was abstracted from the Northern Wellfield	Abstraction volumes did not exceed predicted water demand or abstraction limits.

Production bores in the Radiation Wellfield (RP3, RP4, RP5, RP6 & RP7), Northern Wellfield (NT-2P, NT-4P THA, NT-4P PFA, NT-5P, NT-8P, NT-10P, NT-17P) and miscellaneous production bores (PS13, PS14, WAT-3 & WAT-17) were used for groundwater abstraction during the reporting period.

The groundwater abstraction volume for the reporting period in the Radial Wellfield was 4.12 ML/day; the abstraction volume for the same reporting period in the Northern Wellfield was 5.17 ML/day (Table 13).

Table 13: Carrapateena groundwater abstraction volumes for 2023

Source	PEPR (ML/day)	2023 Groundwater Abstraction Volume (ML/day)
Radial Wellfield	-	4.12
Northern Wellfield	7	5.17
Miscellaneous Production Bores	-	.33
TOTAL	12.9	9.29*

*Excludes mine dewatering volumes and **WAR Bores

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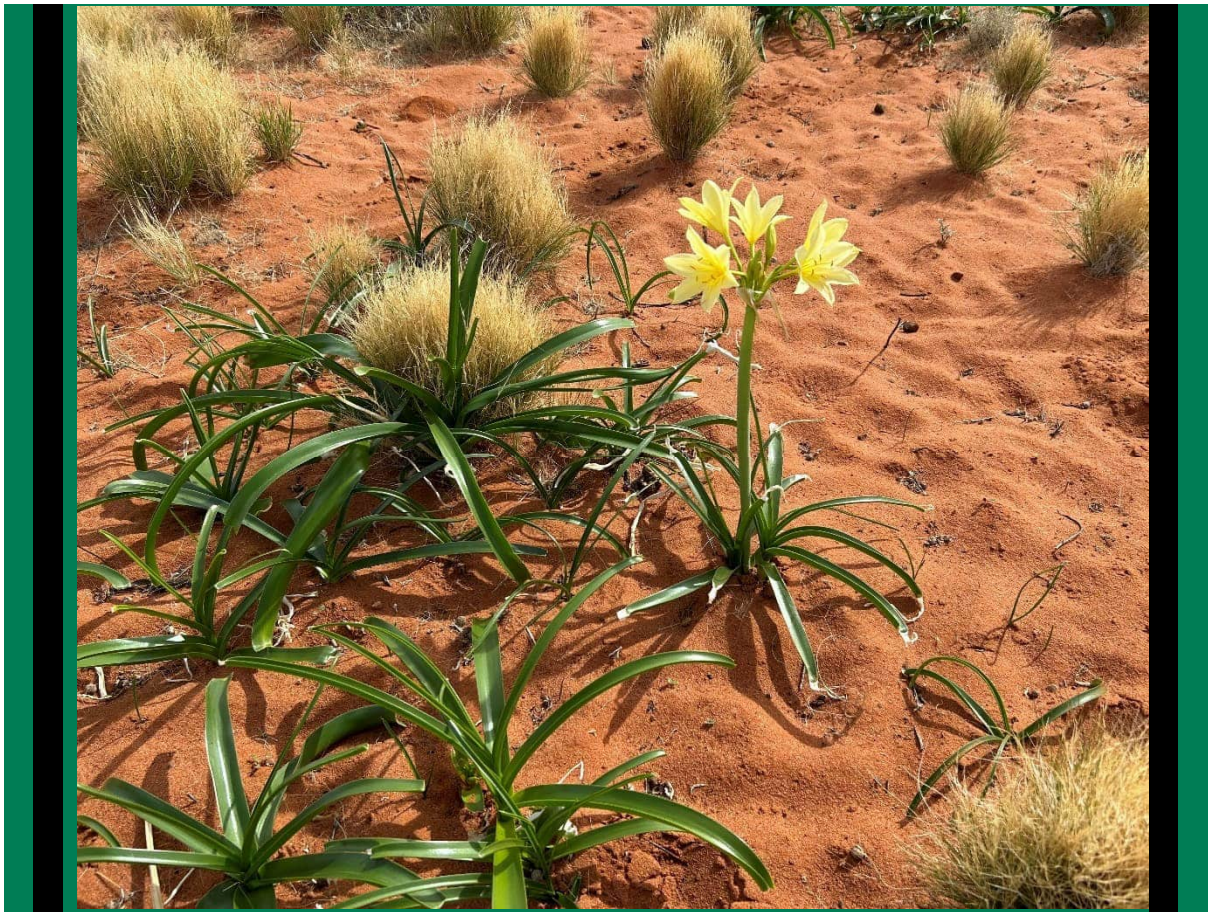
Appendix D. 2023 Carrapateena Autumn Ecology Monitoring Report

Flora and Fauna Survey 2023

Document no: IS346900-900-NE-RPT-CAR-ECOL AUTUMN 2023
Revision no: 0

BHP Carrapateena
4500080587

Carrapateena Mine Site Autumn Ecology Survey
25 July 2023



Flora and Fauna Survey 2023

Client name:	BHP Carrapateena		
Project name:	Carrapateena Mine Site Autumn Ecology Survey		
Client reference:	4500080587	**Project no:**	IS346900
Document no:	IS346900-900-NE-RPT-CAR-ECOL AUTUMN 2023	**Project manager:**	Zeta Bull
Revision no:	0	**Prepared by:**	Zeta Bull, Sonia Croft,
Date:	25 July 2023	**File name:**	IS346900-900-NE-RPT-CARRA - Flora and Fauna Survey 2023_Rev_0

Document history and status

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A	18/07/23	Draft for external review	ZB, SC	ZB	LB (BHP)	ZB
0	25/07/2023	Final	ZB,SC	ZB	ZB	AF

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Revision	Issue approved	Date issued	Issued to	Comments
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0	Final	25/07/23	JA / LB (OZ)	Final

Front Cover Photo: *Crinum flaccidum* (Murray Lily / Andamoooka Lily), Carrapateena 2023

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Executive summary

Carrapateena is a copper-gold mining operation located in South Australia approximately 160 km north of the regional centre of Port Augusta. BHP (previously OZ Minerals) have an approved Program for Environment Protection and Rehabilitation (PEPR) for the Carrapateena Mineral Lease (ML 6471), and associated Miscellaneous Purposes (MPLs) 149, 152, 153, 154 and 156, which satisfies section 70B of the *Mining Act 1971* (SA) (Mining Act). Under the Mining Act Part 10A, a compliant program must be in force before carrying out operations as defined in the PEPR.

BHP engaged Jacobs to conduct annual or biannual surveys to demonstrate approval conditions and outcomes as per the PEPR ML 6471. The relevant approval conditions focus on flora and fauna survey to monitor the following: plant diversity and abundance, plant health, evidence of new weed species that are declared under legislation, increases in abundance of existing (non-declared) weed species and evidence of pathogens or feral animals as a result of the mine operation or mine related activities. In addition, approval conditions require BHP to report records of fauna species with a National Conservation Rating (e.g. relevant species to the site listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)); Plains Mouse (*Pseudomys australis*), Night Parrot (*Pezoporus occidentalis*) and Thick-billed Grasswren (*Amytornis modestus indulkanna*). The PEPR outlines specific Outcome Measurement Criteria (OMC) which BHP are required to report against.

This report provides the outcomes of the autumn 2023 survey, which builds upon the previous ecological monitoring surveys undertaken since the commencement of construction in autumn 2018. Since September 2018 surveys have been undertaken during spring but given the change in rainfall in the preceding years, an autumn survey was conducted with the intention of detecting a different suite of flora and fauna and potentially capture the EPBC listed Plains Mouse. Flora survey methods undertaken here are generally consistent with methods that have been used at the site for baseline studies undertaken prior to construction (2012-2017), with minor modifications to align data collection with the outcomes and mine approval conditions. Flora methods include Jessup transects, Rangeland Assessment Methodology (RAM), canopy cover assessments and weed transects. These methods provide a combination of data that informs current native and exotic (weed) plant diversity and abundance at the site, whilst canopy cover data provides an indication of tree health (and stress) within creeklines. Results are compared to baseline survey data where applicable data is available. Landscape Functional Analysis (LFA) was conducted at two existing sites (established 2020) that have begun rehabilitation, and two new LFA sites that were established in 2022. LFA uses field assessment of physical, chemical and biological processes to determine the degree to which the land system is self-sustaining, and in particular, assesses the capture or loss of resources from the system. The results of the spring 2023 LFA were compared with 2019 - 2022 results and baseline data from corresponding representative 'analogue' sites. However, in future new analogue sites should be established immediately adjacent the LFA sites, now that the location is set, and the rehabilitation is evident.

Fauna survey methods followed a modified version of the biological survey methods (as per Owens 2000), with a focus on pitfall trapping to address the lease area condition relating to small mammal and reptile diversity, including the EPBC listed as Vulnerable Plains Mouse (*Pseudomys australis*). A single trap line was installed at eight established fauna sites, and bird surveys and active reptile searches were undertaken at 20 sites, aligning with vegetation survey sites. Two un-baited camera traps were also installed at each trap line site. Opportunistic observation / capture of all vertebrate species across the site was also recorded to provide information about overall species diversity at Carrapateena, which is comparable with previous surveys.

Flora results

The conditions of the PEPR require native vegetation condition surveys that assess native plant species abundance and diversity. In 2023, total species diversity recorded across all flora sites was the highest recorded during compliance monitoring, due to a very high diversity of short-lived species being recorded. During construction monitoring, variation in total species diversity within the mining lease has largely been due to variation in diversity of short-lived species that germinate in response to sufficient rainfall, such as the well above average rainfall received in November 2022. Grazing impact continued to be low in 2023, following widespread destocking across the mining lease, which also likely influenced short-lived species diversity and widespread increased abundance of palatable species (e.g. Bladder Saltbush, Cunningham's Daisy and Plains Lantern Bush). The population abundance of the five most abundant and/or widespread long-lived perennials declined during 2018 to 2020, but have all increased since 2021 (Bladder Saltbush, Samphire, Sea Heath) / 2022 (Plains Lantern-bush, Cunningham's Daisy). The declines and increases in long lived perennial species are

attributed to yearly and long- term rainfall totals rather than mining impacts (e.g. the 50% increases in Plains Lantern Bush and Cunningham's Daisy abundance in 2022 and/or 2023 have been particularly striking). In 2023 the mean total species diversity for impact sites and for control sites was not significantly different. These mean diversities were within the baseline range, and comparable with mean total species diversities recorded in 2018. Further, total species diversity at each control site and at each impact site in 2023 was within the baseline range. Based on the above, mining activities are not considered to be impacting either short-lived or long-lived species diversity at the mineral lease. Hence, results suggest there are no impacts on species diversity and abundance from mining activities, satisfying Sixth Schedule Condition 12 of the PEPR and OMC SWRF1.

Impacts in Eliza Creek have the potential to occur as a result of reduced surface water flows, reduced groundwater flows and / or groundwater contamination attributed to tailings seepage from the Tailings Storage Facility (TSF), or flood water released through activation of the decant dam spillway in a 1 in 100-year 72 AEP rain event. Since 2018, there has been no distinct trend in species diversity for any of the Eliza Creek sites, with both small increases and decreases occurring yearly at each site. There are also no distinct differences in species diversity between sites. There is no clear pattern emerging in species diversity data relating to the time since the TSF establishment and the distance from the TSF. Ten of the most abundant long-lived woody perennials recorded at the Eliza Creek Jessup transects were separately analysed. All 10 species have shown yearly fluctuations, but no downward population trends at any of the Eliza Creek sites since 2018. The Eliza Creek Jessup transects have shown an increase in total perennial species abundance. Western Myall trees have shown an increase in foliage and recruitment and Red Gums have regained canopy losses, but no recruitment of Red Gums was recorded along transects. No impact from mining activities is considered evident (based on diversity, abundance and canopy cover assessments) at the formal Eliza Creek sites. Based on the results of the formal monitoring sites results would suggest there are no impacts on Eliza Creek vegetation arising from the TSF and associated mining activities, satisfying Sixth Schedule Condition 12 of the PEPR and OMC NV3, SWRF1, TSF6. However, downstream of the TSF there has been a seepage incident at the Decant Dam, resulting in the death of Western Myall trees and understorey shrubs upstream of site 17. This is currently considered non-compliant until the extent of impact is determined, and Significant Environmental Benefit (SEB) offset is accounted for. A follow up survey in spring 2023 is recommended to assist with finalising the SEB offset requirement under the *Native Vegetation Act 1991 (*refer Separate memo).

Weed species were surveyed at existing Flora sites; at designated weed transects, and at opportune locations throughout the lease area, including the exploration camp and effluent irrigation areas. Most weeds recorded were annual herbs or grasses. Most annual weed records were from dams or drainage lines, areas naturally susceptible to weed invasion, and from the dune habitats, and their presence is unrelated to mining activities. Sow thistle was the only weed recorded at gibber habitat flora sites. Changes in the abundance and/or locations of annual weed species were small, and for all but Stinging Nettle, a reflection of weather conditions preceding the survey rather than from mining related activities. The presence of the annual herb, Stinging Nettle (a non-declared weed) at the Exploration Village Effluent Irrigation area is a new record for the Operational survey area, and its occurrence is likely due to mining activities. However, because it is unlikely to expand beyond this highly confined nutrient rich habitat, it is recommended that it be controlled only if it begins to spread into other environments.

Although the population of Bitter Melon along the Western Access Road does not appear to have increased in 2023, the large and extensive population is likely due to construction of the Western Access Road, and environmentally sensitive control is recommended.

The small population of Tobacco Bush at Dawsons Dam is a newly recorded population, and its control is highly recommended. The extensive population of Tobacco Bush (*Nicotiana glauca*) persists at South Eliza. Due to high rate of fruit and seed set, high viability of seeds and successful survival of seedlings, it forms dense stands (CABI 2022). Control is recommended to prevent potential spread in South Eliza Creek. These fluctuations reflect seasonal rainfall patterns rather than mining impacts. No new species of declared weeds were recorded during spring 2022, indicating compliance with the Sixth Schedule Condition 6, Second Schedule Condition 28, and OMC WP1 and WP2.

No flora species with a National or State Conservation Rating were recorded during the 2023 survey.

LFA results

The current status and trends at four rehabilitation sites (Aerodrome laydown, Ventia laydown, Midway Quarry and Tjungu) were again measured by landscape function analysis (LFA), using the Established Method and Point Centre Quarter (PCQ) method for all sites. The LFA and PCQ show a positive trend in the number and area of

plants per hectare (ha) at all four rehabilitation sites. Plant colonisation across sites is currently dominated by short-lived perennial species (*Sclerolaena* spp.) although several longer-lived perennials were also recorded and some distant from the transects. The short-lived species are an important colonising component of the naturally occurring vegetation in the stony tableland habitat, and all plants improve soil stability and function. As plants (patches) establish and increase in size, the potential for resource capture and nutrient cycling improves leading to ongoing increased potential for recruitment of native species. Developed patches also provide cover and habitat opportunities for native fauna species and reduce soil loss and erosion. Although recording increased patches at site 2 (Ventia), re-establishment has been relatively slow.

Although LFA monitoring is in its early stages, some differences are apparent between application of different rehabilitation techniques which may be affecting recruitment. These include deeper contour ripping and application of rocky surface strew at the Aerodrome, Midway Quarry and Tjungu sites compared with shallow contour ripping at the Ventia site. The addition of hand seeding has also likely accelerated establishment of plants at the Tjungu site. The absence of resource trapping patches (troughs) at the Ventia site is likely to substantially limit the speed with which the site rehabilitates. However, additional intervention or restoration activities may further enhance site rehabilitation for all sites, including applying native woody debris (e.g. old Myall fence posts, fallen branches), planting local groundcovers and low shrubs, and providing supplementary watering during critical periods of plant establishment. Ongoing monitoring will assist in informing trends and the benefit of additional intervention such as deeper or repeat ripping and seeding.

Currently, LFA data is compared with data from a series of 'analogue sites' which were collected prior to construction at the site. Whilst this analogue data is considered broadly representative of the vegetation communities around the mine lease, and therefore a useful indicator of rehabilitation success, a more precise reference would be to establish LFA sites adjoining each rehabilitation site.

Overall, OMC LUP4 is considered to be in-progress / compliant.

Fauna results

The 2023 autumn fauna survey identified a total of 93 vertebrate species from the eight survey sites and opportunistically across the study area. Capture rates for small mammals and reptiles were much lower than all previous construction and compliance monitoring surveys (primarily undertaken in spring), slightly lower than autumn 2018 and slightly below the range reported during autumn baseline surveys. Mammal, reptile and bird diversity, and total species diversity across the whole of Carrapateena, was however within or above the range of diversity that has been recorded across the site during baseline surveys, meaning construction and early operational activities do not appear to have resulted in a loss of species across the site. Compared to recent years, lower capture numbers were most likely influenced by cooler temperatures at night and during the days, compared with previous spring surveys, noting that temperatures were not extreme for the region or time of year. Similar to the other compliance monitoring surveys, the reduced survey effort (reduced trap lines) compared with baseline surveys did not appear to influence capture rates per trap line in 2023. Higher capture rates may occur in the future under better site conditions with average or above rainfalls in preceding months, and warmer daily temperatures during autumn or spring. Reduced trapping effort compared with baseline surveys appears sufficient to capture information that is required for the mine conditions and PEPR outcomes, which focus on habitat quality and species presence or absence (diversity) rather than abundance, as well as comparison between control and impact sites. Species diversity and diversity of fauna families was comparable to baseline data, and birds and reptiles showed evidence of breeding via plumage, multi-sex groupings and presence of juveniles, suggesting that mining related construction activities are not negatively impacting fauna at the site. It was noted that Stripe-faced Dunnarts and native Forrest's Mouse were present in various age classes and that breeding season had already commenced. Whilst capture numbers were lower than previous years, they were skewed towards Stripe-faced Dunnarts (*Sminthopsis macroura*). This may suggest conditions were more favourable for Stripe-faced Dunnarts compared to Fat-tailed Dunnarts (*Sminthopsis crassicaudata*) at the time of the survey. Regardless, all regular small mammals were detected during the survey, with Forrest's Mouse detected in larger numbers and at more trapping sites than previously recorded during compliance monitoring.

The approval conditions of the PEPR (Second Schedule Condition 28) require that any records of three EPBC Act listed as threatened species (Night Parrot *Pezoporus occidentalis*, Thick-billed Grasswren *Amytornis modestus*, and Plains Mouse *Pseudomys australis*) are documented and provided to the Biological Databases of South Australia (BDBSA), if they are recorded during ecological surveys at site, or during regular site activities. None of these EPBC listed threatened or any migratory fauna species were detected throughout the autumn 2023 survey, however there newly EPBC listed Blue-winged Parrot (*Neophema chrysostoma*) was detected via

song meter at three locations (CAR005, CAR007, CAR016) and observed flying over one of these locations (CAR016).

During the autumn 2023 survey, fauna species were detected that were not previously recorded within the lease during baseline and construction monitoring (State rated species Western Major Mitchell's Cockatoo *Lophochroa leadbeateri mollis*, Western Gerygone *Gerygone fusca*, Restless Flycatcher *Myiagra inquieta,* Musk Duck *Biziura lobata*) and others that had not been detected since baseline surveys (Eyrean Skink *Ctenotus taeinatus*, Stubble Quail *Coturnix pectoralis* and Grey Fantail *Rhipidura albiscapa*). The common Spotted Crake (*Porzana fluminea*), was also a new record for the site (detected in the Tjungu Effluent Irrigation Area). The site occurs within or on the edge of the known range of these species and there are historic BDBSA records for these species within the broader region (i.e. > 50km from the study area).

Important note about your report

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client; BHP, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and BHP. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

The sole purpose of this report and the associated services performed by Jacobs is to document results of the spring flora and fauna survey for 2023. This document and associated data will support EPBC compliance and ongoing regional baseline knowledge to meet PEPR ML 6471 approval conditions for the Carrapateena Operation in South Australia. The report is based on a desktop review of available data and documents and a detailed flora and fauna survey. The scope of services, as described in this report, was developed with the Client, BHP.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs collected and reviewed data and information available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project area and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

Contents

Appendices

Tables

Figures

1. Introduction

1.1 Operation / Site Background

OZ Minerals has been purchased by BHP Group Limited (BHP) and are now part of the BHP family. Whilst the integration occurs, both entities are collectively operating businesses as usual. Noting that OZ Minerals tenements, relate to OZ Mineral PEPR, are now part of BHP (colloquially called the Client within, where relevant).

Carrapateena is a copper-gold mine located in South Australia on the eastern margin of the Gawler Craton, approximately 160 km north of the regional centre of Port Augusta (Figure 1-1). Construction on Carrapateena was complete late 2019 – early 2020, and the site was in a steady state of operation. The Carrapateena operation is an underground copper gold mine using a sub-level cave mining method. Onsite there is the Tjati and materials handling declines, process plant, ancillary infrastructure, Tailings Storage Facility, Tjungu village and Aerodrome. An exploration village that was temporary is also likely to be retained and updated given expansion that is happening at the site.

BHP have an approved Program for Environment Protection and Rehabilitation (PEPR) for the Carrapateena Mineral Lease (ML 6471), which satisfies section 70B of the Mining Act 1971 (SA) (Mining Act). Under the Mining Act Part 10A, a compliant program must be in force before carrying out operations as defined in the PEPR. OZ Minerals was granted the ML 6471 on 3 January 2018. The PEPR was updated in 2020 and will be updated again in 2023. In addition to the ML, the PEPR includes the following Miscellaneous Purposes Licence (MPLs):

- Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure (MPL 149), granted 5 July 2017
- Western Infrastructure Corridor (MPL 152), granted 3 January 2018
- Eastern Radial Wellfield (MPL 153), granted 3 January 2018
- Southern Access Road and Radial Wellfield (MPL 154), granted 3 January 2018
- Northern Wellfield (MPL 156), granted 11 December 2018.

BHP previously engaged Jacobs to develop a field survey plan, and then to conduct ecological surveys in autumn and spring of 2018, spring 2019, spring 2020, spring 2021 and spring 2022 in order to meet approval conditions as per the PEPR ML 6471. This report represents the findings from the autumn 2023 survey. The approval conditions focus on:

- surveying native plant species to ensure there is no decline in diversity and abundance,
- monitoring of plant health to demonstrate there are no detrimental impacts on plants as a result of mining activities (including impacts from raised dust levels, contaminated ground water and/or declines in surface water flow),
- monitoring to demonstrate that no new weed species declared under legislation have been introduced to the site, and no increase in abundance of existing (non-declared) weed species, pathogens or feral animals, and
- reporting of any future records of fauna species with a national conservation rating, including migratory species.

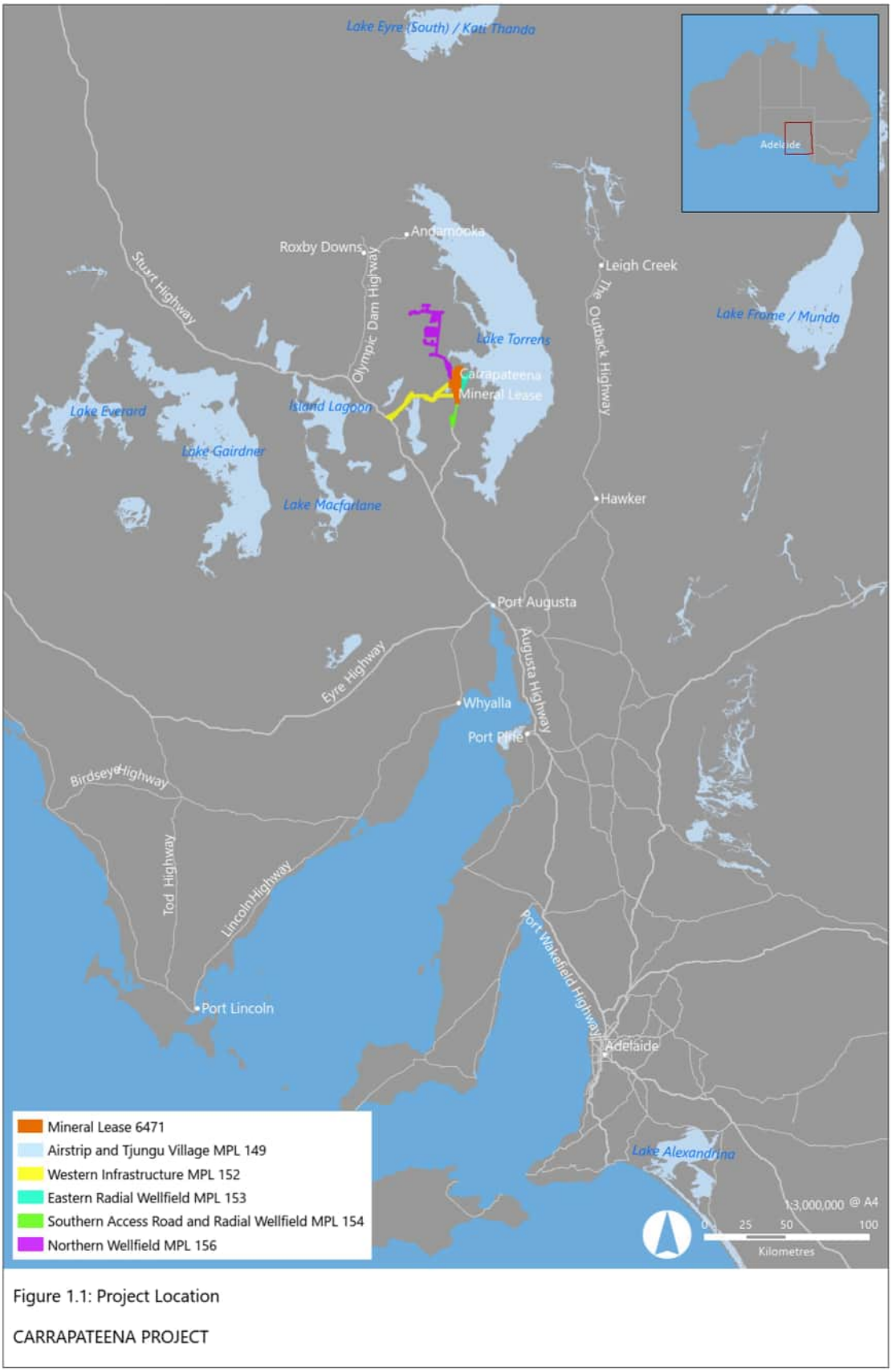


Figure 1-1 Operation location

1.1.1 Relevant conditions of approval

As stated in the initial operational compliance monitoring report (Carrapateena Ecology autumn 2018 survey, Jacobs 2018a), the approval conditions of the PEPR Mineral Lease (ML) 6471 and Miscellaneous Purposes Licence (MPL) 156 define a number of conditions relating to fauna and flora values that occur within the lease, which are summarised in Table 1-1 below. The PEPR for ML 6471 and MPL 156 also outlines the monitoring program including Outcome Measurement Criteria (OMC), Leading Indicators and Strategies to demonstrate compliance with the defined and agreed Outcomes, which are summarised in Table 1-2. Given the PEPR was updated in January 2020 (to cover ML and MPL 156 as well as other MPLs), this table has been modified to broadly align with the updated PEPR as per spring 2022 reporting, and has not been updated to reflect the status in autumn 2023. It is noted the PEPR is being updated for submission in 2023, and updates have not been incorporated below.

Table 1-1 Mineral Lease 6471 and Miscellaneous Purposes Licence 156 fauna and flora conditions

Mineral Lease 6471 Conditions Reference no.	Condition
Second Schedule Condition 28 (ML)	To ensure the protection of Matters of National Environmental Significance, the Tenement Holder must: 28.1. Develop, implement and maintain appropriate management actions to ensure the control of feral animal populations, including cats and foxes; 28.2. Provide data from any future sightings and records of the Thick-billed Grasswren to the Biological Databases of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions; 28.3. Provide data from any future sightings and records of the Night Parrot to the Night Parrot Recovery Team; and 28.4. Provide data from any future sightings and records of the Plains Mouse to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions
Sixth Schedule Condition 6 (ML), Condition 3 (MPL).	The Tenement holder must during construction and operation ensure no introduction of new species of Weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land as a result of mining operations or mining related activities.
Sixth Schedule Condition 12 (ML)	The Tenement Holder is required to address the following matters for the purposes of Regulation 65(2)(d) in relation to the Native Vegetation Outcome in Sixth Schedule Clause 11: 12.1. Where baseline native vegetation condition (abundance and diversity) is required as a component of the measurement criteria, baseline native vegetation surveys must be undertaken prior to the impact of mining operations or mining related activities on the existing environment.
Additional MPL 156 Condition Reference no.	
Sixth Schedule Condition 8	The Tenement Holder must during construction, operation and post Completion ensure that there is no loss of

Mineral Lease 6471 Conditions Reference no.	Condition
	abundance and/or diversity of native vegetation on or off the Land unless a Significant Environmental Benefit has been approved in accordance with the relevant legislation. OMC NV1, Leading Indicator NV2.
Sixth Schedule Condition 9.1	Where baseline native vegetation condition (abundance and diversity) is required as a component of the measurement criteria, baseline native vegetation surveys must be undertaken prior to the influence of mining operations or mining related activities on the existing environment. Linked to Vegetation Strategy.

Table 1-2 Outcome Measurement Criteria (OMC) / Leading Indicator / Strategies

Outcome Measurement Criteria (OMC) Code	Relevant Environmental Outcomes	OMC / Leading Indicator / Strategy	Achievement Values
SWRF1	**ML 6471** **Schedule 6 Condition 17** The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities	Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring attributed to reduced surface water flows caused by mining operations when compared to baseline conditions	No adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (Appendix C4 of PEPR - Ecological Baseline) unless a significant environmental benefit has been approved in accordance with the relevant legislation Linked to Native Vegetation Outcome (Schedule 6 Condition 11)
TSF6	**ML 6471** **Schedule 6 Condition 17** The Tenement Holder must during construction, operation and post Completion ensure no adverse impact to surface water quality and water dependent ecosystems (excluding surface water in the mine subsidence zone), on or off the Land, as a result of contamination and sedimentation caused by mining operations or mining-related activities	Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring sites attributed to tailings seepage when compared to baseline conditions (Appendix C6 Ecological Baseline and surveys for new sites undertaken prior to commencement Stage 1 Tailings commissioning)	No adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems attributed to tailings seepage when compared to baseline conditions (Appendix C4 of PEPR - Ecological Baseline) unless a significant environmental benefit has been approved in accordance with the relevant legislation
WP1	The tenement holder must during construction and operation ensure no introduction of new species of weeds declared or listed under relevant legislation,	Annual flora and fauna surveys undertaken by suitably qualified and experienced ecologists at flora (including weeds) and fauna monitoring locations	No introduction of: new species of weeds declared or listed under relevant legislation plant pathogens, pests (including feral animals) when compared to

Outcome Measurement Criteria (OMC) Code	Relevant Environmental Outcomes	OMC / Leading Indicator / Strategy	Achievement Values
	plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land as a result of mining activities.	demonstrates no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mining related activities when compared to previously recorded weed species and introduced fauna.	previously recorded weed species and introduced fauna.
WP2	The tenement holder must during construction and operation ensure no introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land as a result of mining activities.	Annual flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations demonstrates no increase in the abundance of existing weeds or pest species in the land compared to previous survey records as a result of mining related activities	No increase in the abundance of existing weeds or pest species in the land compared to previous survey records.
AQ2	The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the air quality environment as a result of particulate emissions and/or dust generated by mining operations or mining-related activities	Annual surveys undertaken by a suitably qualified and experienced expert demonstrates no adverse impact on the diversity and abundance of native vegetation at monitoring sites (Figure 8.3 Flora) directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions	No adverse impact on the diversity and abundance of native vegetation at monitoring sites (Fig 2) directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions (Appendix C6 Ecological Baseline)
EPBC1	Provide data from any future sightings and records of the Thick-billed Grasswren to the Biological Databases of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions.	Future records of the Thick-billed Grasswren are to be provided to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites	Records of the Thick-billed Grasswren provided to the Biological Database of South Australia (BDBSA) if observed. #Linked to MNES Condition (Schedule 2 Condition 28.2).
EPBC2	Provide data from any future sightings and records of the Plains Mouse to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions.	Future records of the Plains Mouse are to be provided to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites	Records of the Plains Mouse, provided to the Biological Database of South Australia (BDBSA) if observed. #Linked to MNES Condition (Schedule 2 Condition 28.4).

Outcome Measurement Criteria (OMC) Code	Relevant Environmental Outcomes	OMC / Leading Indicator / Strategy	Achievement Values
EPBC3	Provide data from any future sightings and records of the Night Parrot to the Night Parrot Recovery Team	Future records of the Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites	Records of the Night Parrot provided to the Night Parrot Recovery Team if observed. #Linked to MNES Condition (Schedule 2 Condition 28.3)
LUP4	The Tenement Holder must ensure that the Land is progressively and finally rehabilitated to support the future land use.	Rehabilitation trials shall be undertaken at infrastructure locations no longer required (Figure 4.1) and ongoing assessment at (annual) LFA monitoring at sites are assessed annually demonstrating development of trends and annual improvement of rehabilitation through LFA methodology. Should the data indicate rehabilitation not trending towards sustainability root-cause investigations will be undertaken and rectification methods be identified and implemented	Rehabilitation has achieved, or is likely to achieve, a landscape function equivalent to that of adjacent analogue LFA sites
ECO1	Where baseline native vegetation condition (abundance and diversity) is required as a component of the measurement criteria, baseline native vegetation surveys must be undertaken prior to the influence of mining operations or mining related activities on the existing environment.	# Linked to Native Vegetation Strategy (Schedule 6 Condition 9.1 and 13.1 for MPL 156)	Whilst the content of this information is covered in this report, the PEPR conditions have been updated (January 2020). This OMC is not specifically discussed further in this report.
ECO1	Baseline ecological surveys must be undertaken at water dependent ecosystems including, but not limited to SW6 and SW7, prior to the impact of mining operations or mining-related activities on the existing environment.	(Schedule 6, condition 13.1 for MPL 156)	Not addressed in this report

Note: OMC presented here are for ML 6471 (except ECO1); only ECO1, WP1, WP2, LUP2 and LUP3 are relevant to MPL 156; *SW6 and SW7 are surface water monitoring sites.

1.2 History of monitoring at Carrapateena

The history of ecological monitoring at Carrapateena was summarised in the Carrapateena Ecology autumn 2018 survey report (Jacobs 2018a), representing the first of the compliance monitoring reports following commencement of construction. Briefly, baseline flora and fauna surveys were undertaken by EBS Ecology within and surrounding the Carrapateena Mineral Lease (ML 6471), biannually between autumn 2012 and

spring 2016 / 2017 (references provided in Jacobs 2018). The surveys covered a range of seasonal and yearly climatic conditions and therefore collectively provide a robust baseline data set describing the fauna and flora values present at the site, against which impacts from the Carrapateena construction and operation can be compared.

A summary of baseline ecological monitoring (2012 to 2017, EBS Ecology 2017b), is provided in previous monitoring reports (Jacobs 2018a,b; 2019, 2020, 2021, 2022, 2023a). The autumn and spring 2018, and spring 2019, 2020, 2021, 2022 and 2023 surveys (conducted by Jacobs) are considered to represent the commencement of, and ongoing construction and operational compliance monitoring associated with the mining operation approved under ML 6471. It is noted that whilst baseline surveys were conducted in 2017, some raw data (primarily floristic data) was not available for comparison with the compliance monitoring phase.

1.3 Climate at Carrapateena

The nearest weather station to Carrapateena Mine that provides detailed temperature and rainfall data is the Woomera Aerodrome (station number 16001, Commonwealth of Australia Bureau of Meteorology (BoM) 2023a), approximately 70 km to west of the Operation area. Long term climatic statistics are available for this site (1949 to current) providing an insight to the region's climatic trends. The Operation area is located in an arid environment, with a hot, dry climate, and average rainfall of approximately 180 mm per year (BoM 2023a). Long-term mean monthly rainfall shows no distinct seasonal variation, whereas mean monthly temperature maximums vary from the mid to low 30s in the summer months to below 20 in the winter months (Figure 1-2).

In the 12 months preceding the autumn 2023 survey the Woomera region recorded above average yearly rainfall (258 mm compared with 184 mm) (Figure 1-3, Figure 1-3and Figure 1-4). However, this was due largely to 137 mm rainfall received in October 2022 - 120 mm above average. All other months received within 20 mm of mean long term totals, and monthly totals in eight months being below long-term means. Further detail about trends in rainfall at the site are discussed in Section 3.

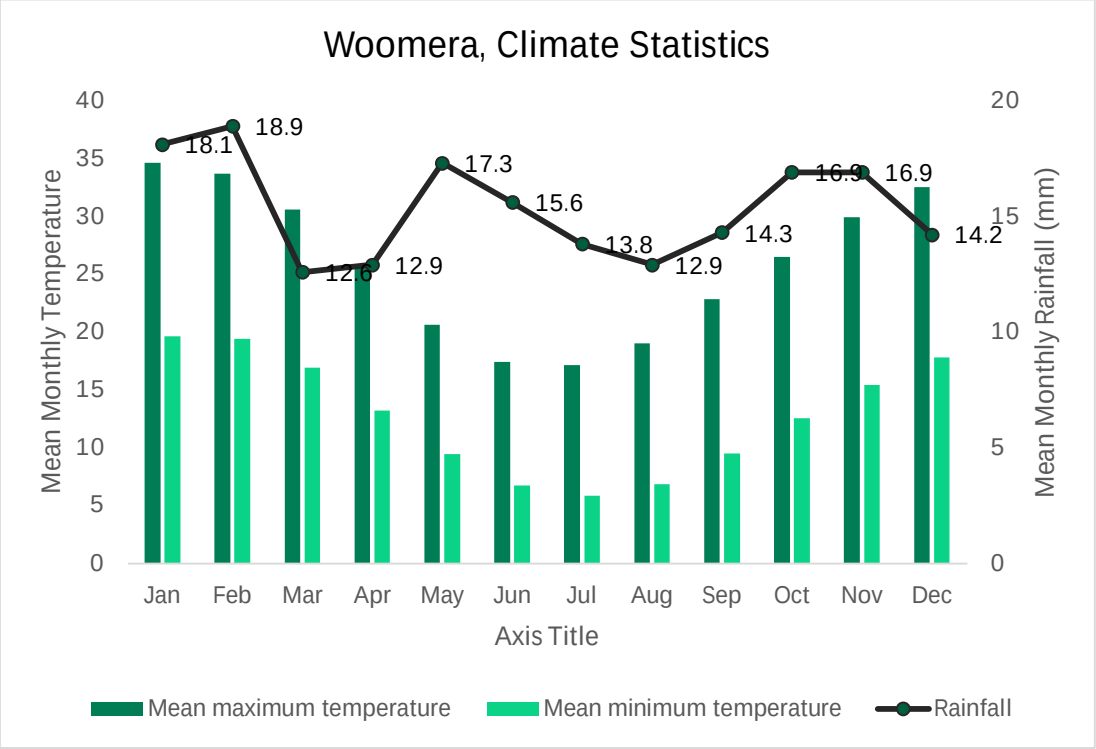


Figure 1-2 Climate averages for regional long-term Weather station nearest to Site, Woomera Aerodrome.

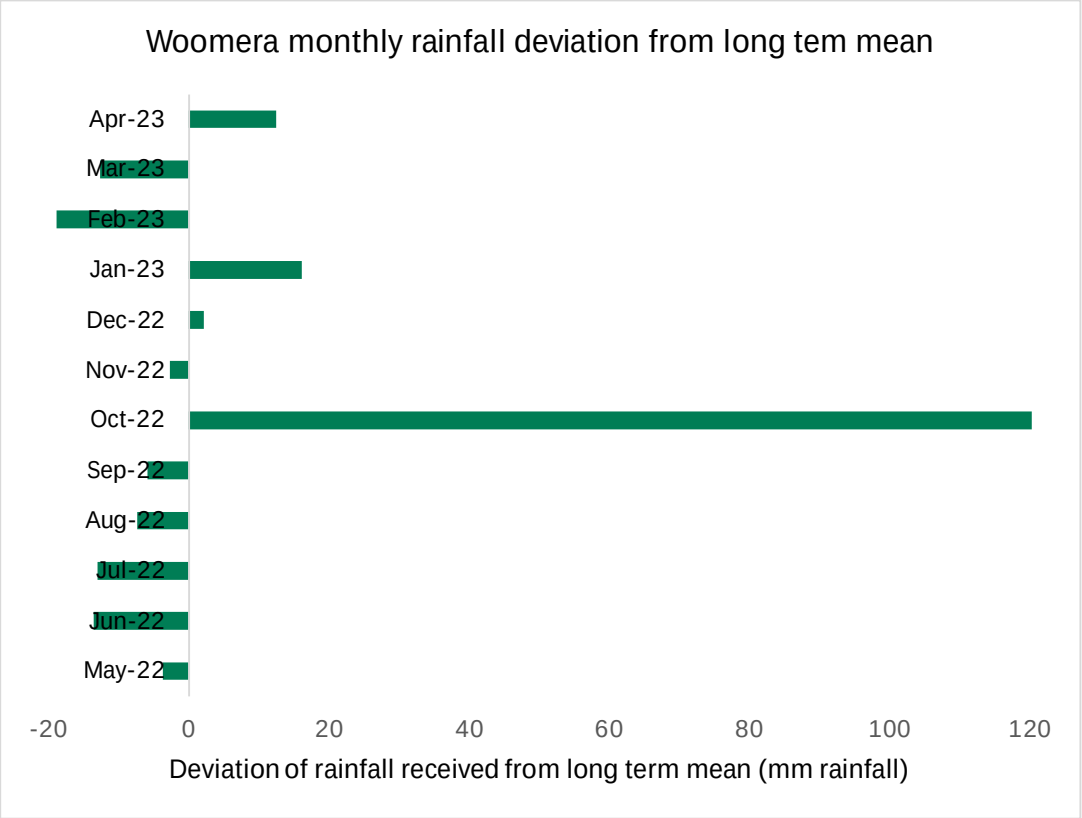


Figure 1-3 Deviation of rainfall received compared with long-term monthly means for Woomera weather station, for the 12 months preceding the survey

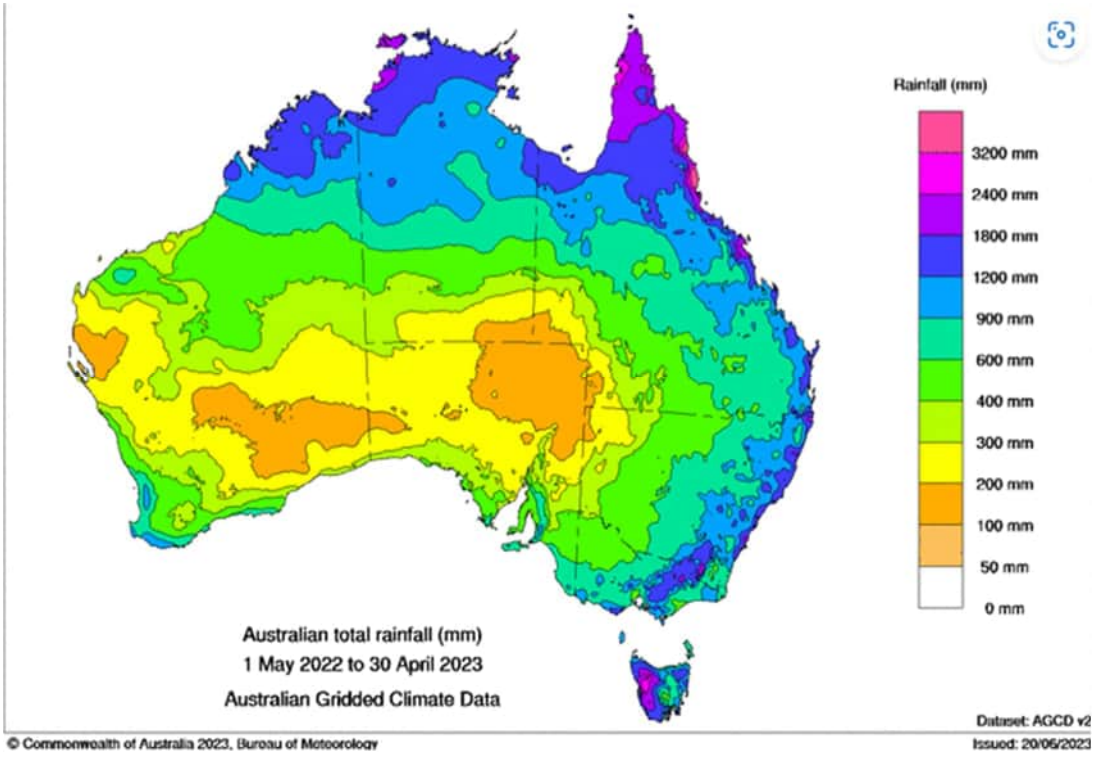


Figure 1-4 Total rainfall over 12 months preceding the survey extrapolated over Australia (BoM 2023b).

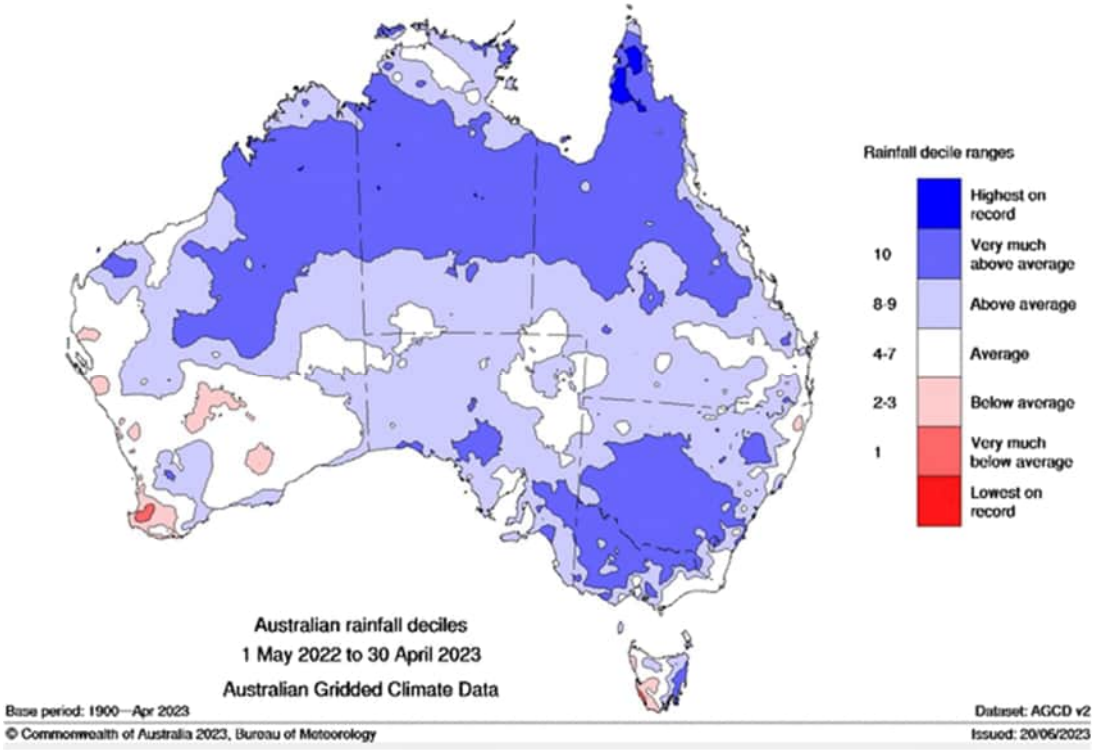


Figure 1-5 Rainfall deciles across Australia, 12 months preceding the autumn 2023 survey (BoM 2023b)

2. Methods

2.1 Survey Details

Jacobs undertook the spring flora and fauna surveys at the site between 15 and 23 May 2023. The survey team included the following suitably qualified personnel:

- Senior Ecologist Chris Watson undertook trap installation, morning and afternoon trap checks, terrestrial mammal identification, bird survey, assisted with flora survey, trap removal. Chris specifically surveyed men only cultural sites;
- Senior Ecologist Dr Sonia Croft undertook trap installation, morning and afternoon trap checks, flora survey, bird survey, trap removal;
- Senior Associate Ecologist Dr Zeta Bull undertook trap installation, morning and afternoon trap checks, bird survey and reptile identification lead, flora survey assistant, museum voucher, trap removal.
- Graduate Ecologist Kale Szajer undertook trap installation, assisted with morning and afternoon trap checks, flora survey, mammal, reptile identification, bird survey and trap removal. Kale assisted with survey of men only cultural sites.

BHP Environmental personnel Josh Allen, Nicholas Kruger and Bob Starkey assisted with various logistics associated with the survey.

2.2 Permitting

Undertaking ecological research and handling/trapping of animals in South Australia can only legally be undertaken with relevant permits and licences in place. Relevant permits and licences were obtained prior to field survey commencement. All works were undertaken in accordance with permit and licence conditions; details as below.

- Operation specific Permit to Undertake Scientific Research:
- Permit # U26759-6 Expiry: 14/09/2023
- Operation Specific Wildlife Ethics Committee Approval:
- Application number Bull 38-2022, approval period 01/09/2022 to 01/09/2025
- Permit to Undertake Scientific Research for State-wide Vegetation Surveys:
- Permit # C25361-16 Expiry: 31/07/2023
- Licence for 'teaching, research or experimentation involving animals':
- Licence # 228 Expiry: 13/10/2024
- Licence to 'possess and administer Prescription Drug[1]:
- Licence # 2017-84646 Expiry: 10/08/2024

[1] A condition of Scientific Research Permits is that 'best practice' for biological survey work is undertaken, including vouchering of specimens of interest for the South Australian Museum (SAM). This condition is included on permits as a means of maximising value obtained from survey work across the State, to enable taxonomic specialists the chance to verify field identification, and to encourage survey records to be included in the Biological Database of South Australia for broader knowledge. As such, the project team liaised with the SAM prior to undertaking the survey to ascertain whether the Museum had particular interest in the region being surveyed. In this case, the curator of mammals and curator of reptiles requested voucher specimens and liver tissue samples be collected for target species. Pentobarbitone sodium is used to euthanize specimens, however, was not required on this survey as no animals were euthanized. Two mammal trap deaths were vouchered and provided to the museum.

2.3 Survey Sites

2.3.1 Nomenclature

Survey site naming conventions remain as per previous spring surveys (Jacobs 2019a, 2020a, 2021, 2022, 2023a). Noting that throughout the report the simplified version of site names is primarily used e.g. Site 1, where CAR001 is a code used for data permit (refer Section 2.7), Carrapateena database and OZ Minerals databases.

2.4 Autumn 2023 sites

The objective of the survey monitoring program is to demonstrate compliance against the conditions of the Mineral Lease and the approved outcomes during the mine construction, operations and rehabilitation. Table 2-1 below includes a summary of previous monitoring sites against autumn 2023 survey sites and an explanation for any changes. Table 2-2 provides a summary of the autumn 2023 survey site details. Refer spring 2019 report (Jacobs 2020a) for further details. The locations of survey sites undertaken in autumn 2023 are indicated on Figure 2-1 for flora and canopy cover, Figure 2-2 for fauna sites and Figure 2-3 for weed transects as part of the operational monitoring.

Table 2-1 Sites surveyed in spring 2023, compared with baseline survey sites

Baseline Survey Sites (2012-2017)	Compliance sites	Construction / Operational (Compliance) Monitoring Survey Sites (autumn 2023)
Flora		
Jessup transects (x 16 sites) (Flora Site 1 to Flora Site 16)	20-22 Jessup Sites	Baseline (2012-2015, EBS) Jessup sites (Flora Site 1 to Flora Site 16), plus additional Eliza Creek sites (Flora Sites 17 to 20, Jacobs / OZ), and new sites along the WAR in sand dune habitat (e.g. site 21, 22). *Note spring 2019 / 2020, 2021 site 8 and 14 were removed from the program given proximity to stock impact areas, interfering with assessment of mining impacts **Refer Jacobs Spring 2019 for additional detail (Jacobs 2020a). ***Note Jessup sites not undertaken at site 21, 22 sand dune habitat as per Section 2.4
Flora sites (x 16 sites) (Flora Site 1 to 16)	20-22 Flora Sites (Rangeland)	Each Flora Site, a Rangeland Assessment (NVC 2020/2021) survey was undertaken with data recorded on grazing impact and plant species cover information. Baseline sites (Flora Site 1 to 16), Eliza Creek sites (Flora Sites 17 to 20) and dune habitat sites (Flora Sites 21 and 22). ** Refer Jacobs Spring 2019 for additional detail (Jacobs 2020a).
Flora cover sites (x 33 sites) (CFL01 to CFL33)	NA	Baseline surveys only, not continued. ** Refer Jacobs Spring 2019 for additional detail (Jacobs 2020a).
Canopy cover (x 11 transects). 7 Eliza Creek transects, 4 Yeltacowie Creek transects (CCC01 to CCC11)	8 sites in Eliza Creek	Baseline Yeltacowie Creek canopy cover sites (2016-2017, EBS) and Eliza Creek canopy cover (CCC01 to CCC06, CCC11, EBS) were not assessed as per 2018, 2019. Eliza Creek Canopy Cover transects (site17AB, 18AB, 19AB and 20AB)), were surveyed in spring, 2018 to 2022, and also in autumn, 2018, 2019. ** Refer Jacobs Spring 2019 for additional detail (Jacobs 2020a).
Weed Monitoring (x 4 transects) (CWM01 to CWM04)	10 weed transects	Baseline weed transects repeated (CWM01 CWM02 CWM03 and CWM04), CWM06, CWM07 established in 2018 and CWM05 established in 2022. Northern Wellfield MPL 156, transects NWM01, NWM02 and NWM03 were assessed.

Baseline Survey Sites (2012-2017)	Compliance sites	Construction / Operational (Compliance) Monitoring Survey Sites (autumn 2023)
		Opportunistic observations of declared weed species or species listed under legislation are also recorded (e.g. dams, villages and effluent irrigation areas, spill areas).
Fauna		
Reptiles and Mammals (x 8 sites) Fauna Sites 1 – 6, 15, 16)	8 sites	Semi permanent pit line sites as per baseline surveys (Fauna Site 1 to 6, Fauna Site 15 to 16). As per 2018, 2019, 2020, 2021 and 2022 only one pitfall line was opened at each site and only 6 pits per line. No Elliott traps as per baseline (2015-2017), and compliance 2018-2019, 2020, 2021, 2022, 2023. This methodology will be continually reviewed based on an analysis of compliance monitoring trapping data for small rodents (e.g. Plains Mouse). Camera traps have also been used (2 per line) since 2021
Bats	NA	As per 2018, 2019, 2020, 2021 and 2022. Common bat audible to humans (Dennis Mathews, pers. com.) assessed during spotlighting. No bats likely to be present at the site have a conservation rating. In 2023 song meters were deployed to detect birds and bats.
Bird Sites (x 16 sites - Fauna Site 1 – 16), opportunistic surveys at water points	20-22 sites, opportunistic at water points / irrigation areas	Bird surveys at 14 of the baseline sites (e.g. Fauna Site 1 to 6, 15 and 16, Flora site 7, 9, 10, 11,12,13, 17,18,19, 20, 21, 22. Opportunistic surveys were also undertaken at water points (e.g. farm dams), and effluent irrigation areas, camps to capture diversity across the site as per baseline surveys. Survey of water points also enables opportunistic observations of seasonal of migratory shorebirds. Song meters were deployed to detect bird species by call at all fauna sites (except site 3 adjacent admin), one dam and in an Eliza creekline site (site 10)
LFA		
Landscape Functional Analysis (CEF01 to CEF07)	4 sites, each with 2 transects	As per 2019, two Landscape Functional Analysis sites (LFAAL1, LFAVOL2), each with two transects labelled A and B (e.g. LFAAL1A, LFAAL1B) were assessed. In addition, as of 2022, two new sites were established (LFAQUA3, LFATJU4), each with two transects labelled A and B (e.g. LFAQUA3A, LFAQUA3B). Two new sites established in 2022, assessed in 2022 and 2023.

Refer to Jacobs Spring 2019 report for additional detail (Jacobs 2020a).

Table 2-2 Summary of survey sites, codes and coordinates

Survey Techniques at Site	Site Code	BDBSA Site Code	Start / End	Easting	Northing
Weed Transect	CWM01	CWM01	Start	737108	6517520
			End	736871	6516550
	CWM02	CWM02	Start	737842	6530179
		CWM02	End	738177	6529435
	CWM03	CWM03	Start	733610	6535627
		CWM03	End	732611	6535266
	CWM04	CWM04	Start	735912	6540184
		CWM04	End	736548	6540963
	CWM05	CWM05	Start	700638	6518508
		CWM05	End	701466	6519078
	CWM06	CWM06	Start	717686	6529628
		CWM06	End	718673	6529505
	CWM07	CWM07	Start	743694	6539567
		CWM07	End	743410	6540518
	NWM01	NWM01	Start	726014	6554920
		NWM01	End	726937	6554923
	NWM02	NWM02	Start	726955	6569623
		NWM02	End	725963	6569751
	NWM03	NWM03	Start	720606	6580675
		NWM03	End	720551	6581674
Rangeland, Jessup, Fauna Trapping, Birds	Flora / Fauna 1	CAR001	Start	731707	6550590
	Flora / Fauna 2	CAR002	Start	734223	6545185
	Flora / Fauna 3	CAR003	Start	736001	6540156
	Flora / Fauna 4	CAR004	Start	736251	6534615
	Flora / Fauna 5	CAR005	Start	729131	6532955
	Flora / Fauna 6	CAR006	Start	739732	6531207
Rangeland, Jessup, Birds	Flora / Fauna 7	CAR007	Start	732755	6548730
	Flora / Fauna 9	CAR009	Start	746788	6544253

Survey Techniques at Site	Site Code	BDBSA Site Code	Start / End	Easting	Northing
Rangeland, Jessup, Birds	Flora / Fauna 10	CAR010	Start	740538	6541973
	Flora / Fauna 11	CAR011	Start	734655	6536360
	Flora / Fauna 12	CAR012	Start	740402	6532837
	Flora / Fauna 13	CAR013	Start	745093	6528963
Rangeland, Jessup, Fauna Trapping, Birds	Flora / Fauna 15	CAR015	Start	737123	6538106
	Flora / Fauna 16	CAR016	Start	732472	6535805
Rangeland, Jessup, Birds, Canopy Cover	Flora / Fauna 17, CC17A	CAR017	Start	739269	6536920
	CC17B	NA	Start	739265	6536929
	Flora / Fauna 18, CC18A	CAR018	Start	739350	6537556
	CC18B	CAR018	Start	739345	6537556
	Flora / Fauna 19, CC19A	CAR019	Start	739621	6539504
	CC19B	CAR019	Start	739676	6539434
	Flora / Fauna 20, CC20A	CAR020	Start	739950	6541083
	CC20B	CAR020	Start	739959	6541060
Rangeland, Birds	Flora / Bird 21	CAR021	Start[4]	722657	6531233
	Flora / Bird 22	CAR022	Start[5]	718006	6529448
Landscape Function Analysis	LFA Aero (Aerodrome) Laydown Area	LFAAL1A	Start	733020	6534295
		LFAAL1A	End	733063	6534316
		LFAAL1B	Start	733052	6534277
		LFAAL1B	End	733068	6534319
	LFA Ventia (Office) Laydown	LFAVOL2A	Start	736070	6540339
		LFAVOL2A	End	736069	6540392
		LFAVOL2B	Start	736103	6540338
		LFAVOL2B	End	736103	6540391
	LFA Midway Quarry Laydown	LFAQUA3A	Start	729264	6533139
		LFAQUA3A	End	729291	6533097

Survey Techniques at Site	Site Code	BDBSA Site Code	Start / End	Easting	Northing
		LFAQUA3B	Start	729307	6533163
		LFAQUA3B	End	729335	6533123
	LFA Tjungu to WAR	LFATJU4A	Start	734595	6536191
		LFATJU4A	End	734631	6536219
		LFATJU4B	Start	734631	6536219
		LFATJU4B	End	734673	6536252

Refer Jacobs Spring 2019 for additional detail (Jacobs 2020a).

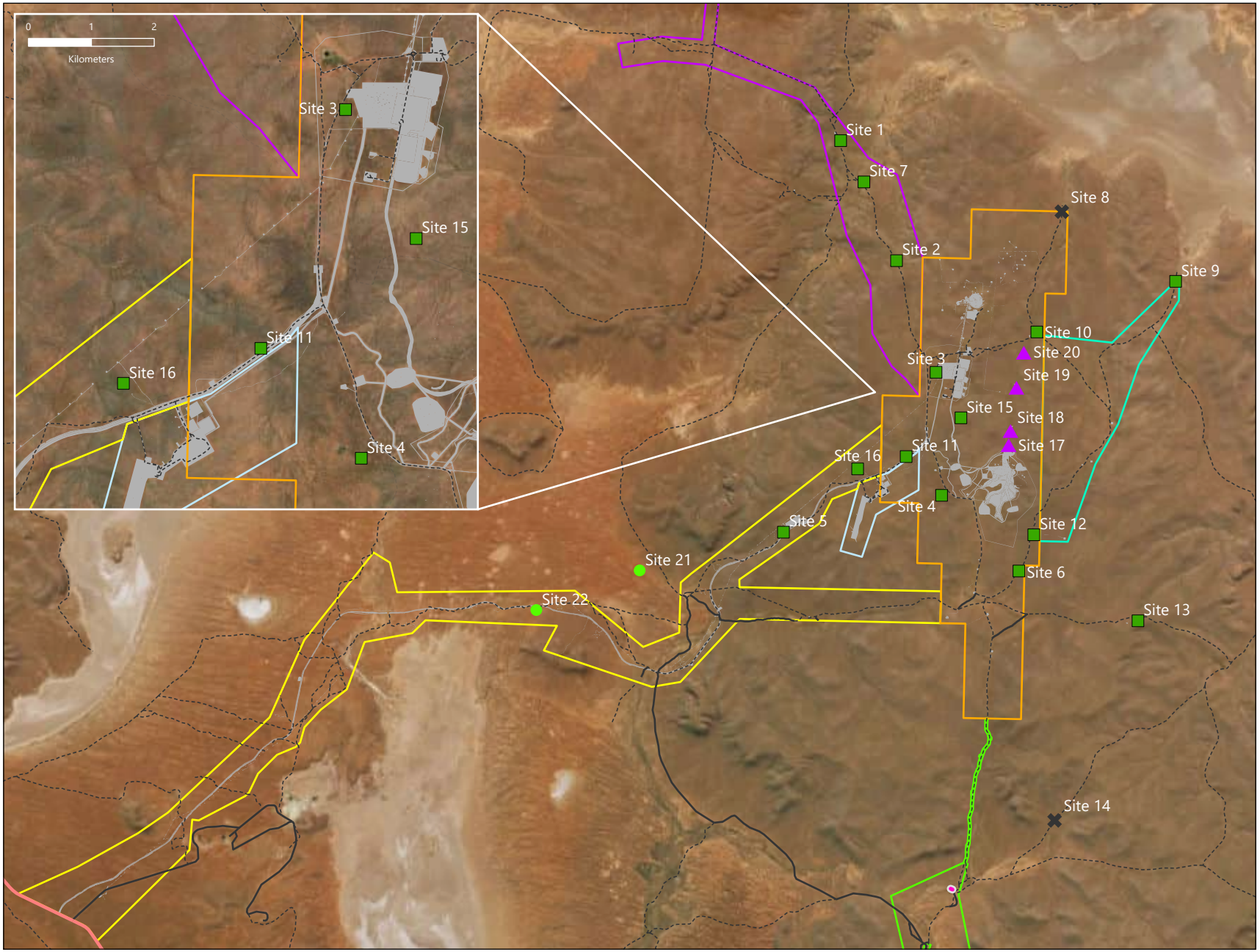
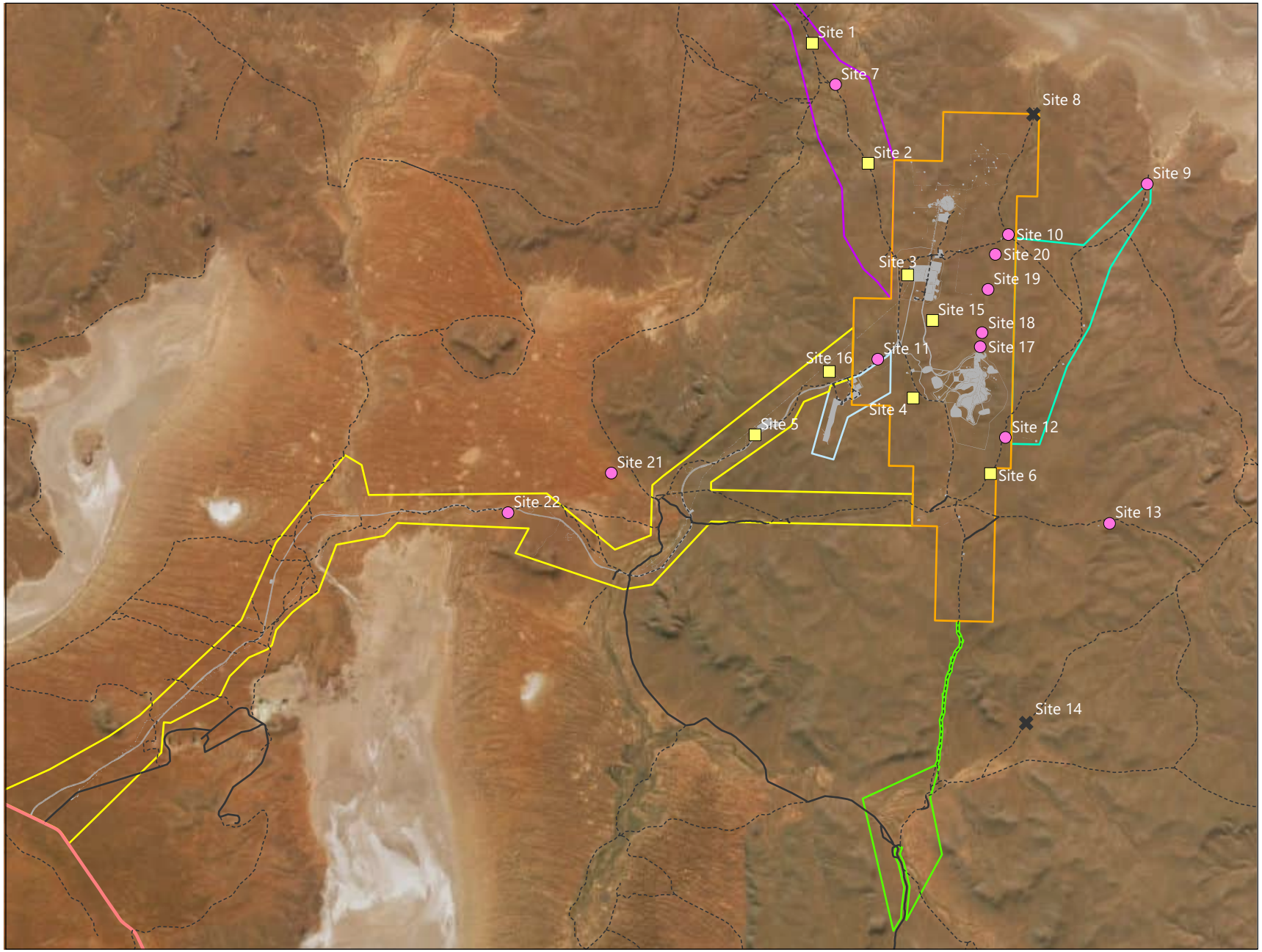


Figure 2-1: Location of Flora Sites

CARRAPATEENA - ECOLOGICAL ASSESSMENT AUTUMN 2023

Jacobs



Fauna Survey Sites 2023
- Birds
- Birds, Vertebrate Trapping
- Monitoring Ceased 2019
- Project Disturbance Footprint at 2022

OZ Minerals Tenement
- Mineral Lease 6172
- Airstrip and Tjungu Accommodation Village MPL 149
- Western Infrastructure Corridor MPL 152
- Eastern Radial Wellfield MPL 153
- Southern Access Road and Radial Wellfield MPL 154
- Northern Wellfield MPL 156

N

MGA54 Zone 53

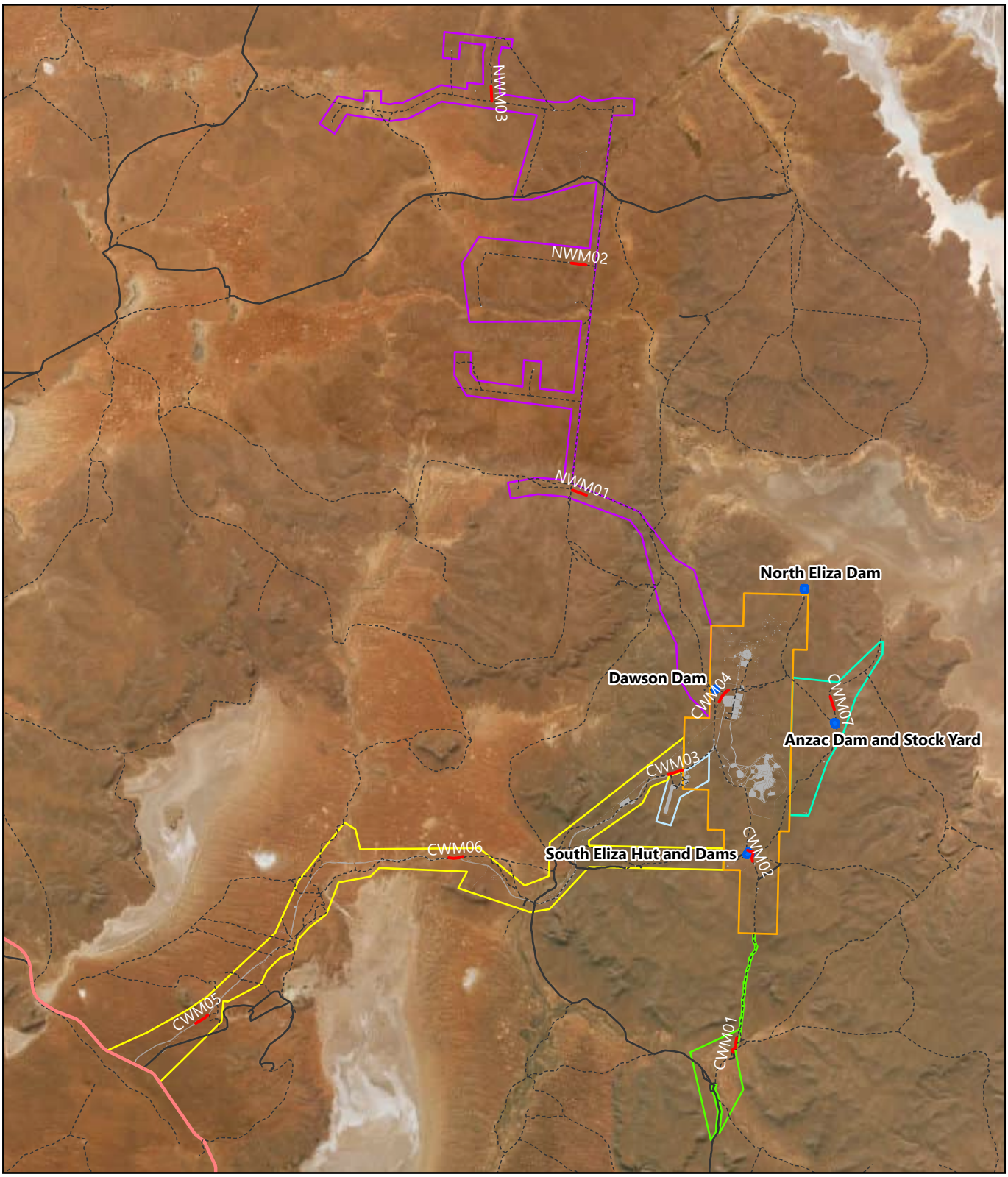
A4 Scale: 1:250,000

0 1 2 3 4 5

Kilometers

Figure 2-2: Location of Fauna Sites

CARRAPATEENA - ECOLOGICAL ASSESSMENT AUTUMN 2023



Weed Monitoring Transects
Project Disturbance Footprint at 2023
OZ Minerals Tenement
Mineral Lease 6172
Airstrip and Tjungu Accommodation Village MPL 149
Western Infrastructure Corridor MPL 152
Eastern Radial Wellfield MPL 153
Southern Access Road and Radial Wellfield MPL 154
Northern Wellfield MPL 156
Dam Locations

GDA 1994 MGA Zone 53
A4 Scale: 1:375,000

0 2 4 6 8
Kilometers

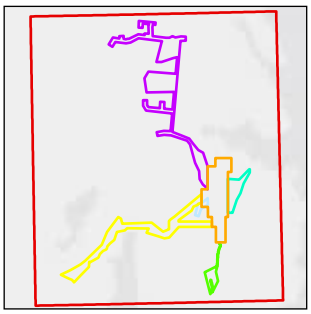


Figure 2-3: Weed Transect Locations (ML and MPLs)
CARRAPATEENA - ECOLOGICAL ASSESSMENT AUTUMN 2023

Jacobs

6:42 PM 2/16/2023 LIMBT \\AUSYD0VS01\GISProj\SA_IS346900_Carrapateena_Spring_Survey\Incoming\20210909_Jacobs_SpringSuveyReport_package\b009c6df-a297-4b31-bd92-f0356f4e3b8d\Ecology_Figures_01022022.aprx
Created by: KF
Reviewed by: SC

2.4.1 Designation of control and impact sites

Survey sites are assigned to be either a control site (no detectable impact from mining considered likely) or an impact site (impacts on flora and/or fauna from mining activities considered possible). All sites on Eliza Creek, downstream of the tailings dam, were considered to be possible impact sites, due to potential changes in groundwater and / or surface water impacting vegetation, and the analysis of potential impacts here will be a comparison of results over time, and with distance from the TSF embankment.

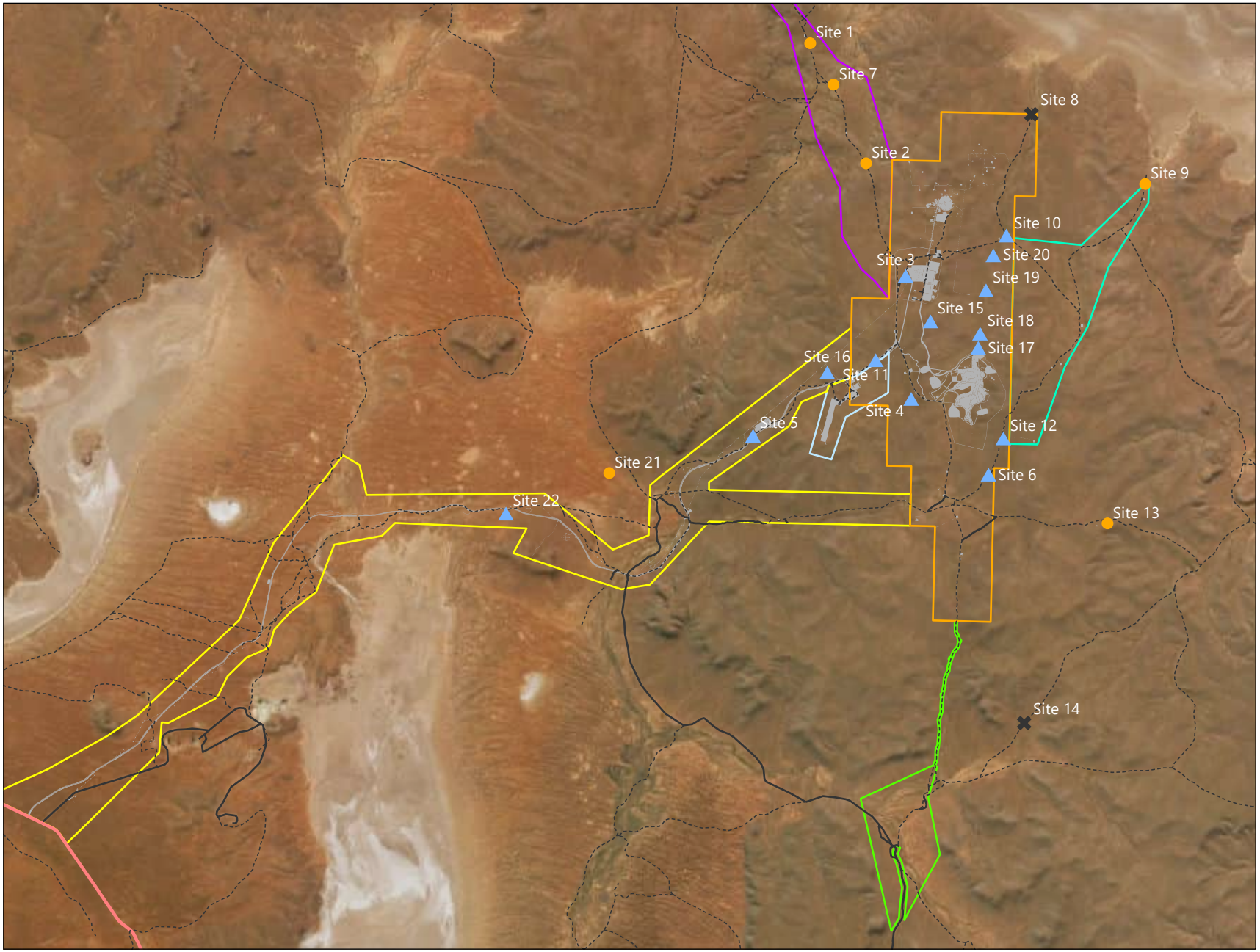
For other sites, impacts on flora and / or fauna were considered to be most likely due to increased dust, noise and / or increased vehicle presence, and for sites near the airstrip, also aerial collision of birds with aircraft. For non-Eliza Creek sites, there were considered to be potential impacts from mining activities if the site was < 2 km from infrastructure. Distances > 2 km were considered unlikely to be impacted by possible raised dust (e.g. based on air quality modelling), noise and / or increased vehicle presence, and as such, sites located > 2 km from infrastructure (including roads) were designated as control sites for future comparison.

Note; this designation in 2018 assumed the Western Access Road (WAR) would be a major thoroughfare, which at the time of the 2022 and 2023 surveys the WAR was complete, the Midway Quarry was adjacent site 5 and the WAR (but is being progressively rehabilitated) and site 22 (sand dune site) is also adjacent the WAR. Site 6 located 1.5 km off the Southern Access Road (1.5 km from South Eliza Dam), but 2.4 km from the south-eastern edge of the TSF may be considered a control site in the future due to the Southern Access Road no longer being widely used. However, compliance monitoring has shown that sites 1.5 km from roads have not been impacted by mining activities and no change in flora of fauna is expected due to the lower vehicle activity on the SAR. Similarly site 4 is < 300 m from the Southern Access Road and former gatehouse, but also remains 1.5 km from the TSF. Again, compliance monitoring demonstrated no impact from mining activities on flora and fauna at this site and no changes are anticipated in future, due to reduced vehicle use of the SAR.

A site summary, including distance from infrastructure and designation as control or impact, is provided in Table 2-3 below. Control sites were sites 1, 2, 7, 9, 13 and 21. Impact sites were sites 3, 4, 5, 6, 10, 11, 12, 15, 16, 17,18, 19, 20 and 22. Site locations relevant to infrastructure, including roads are provided in Figure 2-4 below. It is noted that degree of impact varies and all sites are close to roads or tracks, but some have lower levels of traffic (e.g. site 12 and 13). Regardless data is assessed for trends and if trends emerge further analysis is undertaken where necessary.

Two rehabilitation sites were assessed in 2022 as per spring 2019, 2020, 2021 (LFAAL1A-B and LFAVOL2A-B), with two transects at each site. Two new sites were established prior to the 2022 spring survey (LFAQUA3A-B and LFATJU4A-B) and re-assessed in autumn 2023. The rehabilitation sites had the soil surface scarified to create patches for nutrients and water to accumulate and allow regeneration to begin. As per the PEPR, the objective of this survey was to gather Landscape Function Analysis (LFA) data at the rehabilitation sites and, over time, measure the success of returning the site to sustainable pre-impact levels of landscape function (refer 2.6 for further information).

Weeds have been recorded at standard flora sites, designated weed transects, targeted sites (dams and villages), and opportunistically. Details of weed transect relative locations and habitat are provided in Table 2-4.



Ecology Survey Sites 2023
- Control
- Impact
- Monitoring Ceased 2019
- Project Disturbance Footprint at 2022

OZ Minerals Tenement
- Mineral Lease 6172
- Airstrip and Tjungu Accommodation Village MPL 149
- Western Infrastructure Corridor MPL 152
- Eastern Radial Wellfield MPL 153
- Southern Access Road and Radial Wellfield MPL 154
- Northern Wellfield MPL 156

N

MGA54 Zone 53

A4 Scale: 1:250,000

0 1 2 3 4 5

Kilometers

Figure 2-4: Control and Impact Sites

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Table 2-3 Summary of survey sites, and designation as control or impact

Site	Vegetation Association	Landform	Distance from Infrastructure	Control Site or Impact Site
Flora / Fauna Site 1 (CAR001)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland with shallow drains	7 km from Drill pad, and outside lease area, adjacent northern wellfield road (Khamzin)	Control
Flora / Fauna Site 2 (CAR002)	Bladder Saltbush (*Atriplex vesicaria*) Low Very Open Shrubland	Stony Tableland	Approximately 2 km west of Drill Pad, adjacent northern wellfield road (Khamzin). Depending on future traffic volume these sites may need to be considered impact in the future.	Control
Flora / Fauna Site 3 (CAR003)	Bladder Saltbush (*Atriplex vesicaria*) - Samphire (*Tecticornia medullosa*) Low Open Shrubland	Stony Tableland	Southern Access Road, adjoining western edge of Processing Plant and approximately 2 km SW of Village.	Impact
Flora / Fauna Site 4 (CAR004)	Bladder Saltbush (*Atriplex vesicaria*) +/– Samphire (*Tecticornia medullosa*) Low Open Shrubland	Stony Tableland	Approximately 1.5 km west of tailings dam. Approximately 300 m from Southern Access Road. With the completion of the WAR, the SAR now receives very little vehicle use. Further it is hydrogeologically disconnected from the TSF. Hence consideration should be given to assigning site as a control site.	Impact
Flora / Fauna Site 5 (CAR005)	Bladder Saltbush (*Atriplex vesicaria*) +/- Samphire (*Tecticornia medullosa*) Low Open Shrubland	Stony Tableland	Western Access Road. Site begins about 40 m from WAR. Site is at least 3.5 km from airstrip	Impact
Flora / Fauna Site 6 (CAR006)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland	1.5 km east of South Eliza Dam / SAR. 2.4 km from south-eastern edge of tailings dam. With the completion of the WAR the SAR now receives very little vehicle use. Further it is hydrogeologically disconnected from the TSF. Hence consideration should be given to assigning site 6 as a control site.	Impact
Flora / Bird Site 7 (CAR007)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland	100 m west of Hilson Creek and 3 km south of Lake Torrens. 5 km north-west of Drill Pad	Control

Site	Vegetation Association	Landform	Distance from Infrastructure	Control Site or Impact Site
Flora / Bird Site 9 (CAR009)	Western Myall (*Acacia papyrocarpa*) Tall Open Shrubland on minor drainage line over Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Minor drainage line (150m west of junction with Tadpole Creek) / adjoining stony plain. Approximately 1.5 km from Lake Torrens	12 km north-east of tailings dam. 600 m from Radial Pipeline.	Control
Flora / Bird Site 10 (CAR010)	Northern River Red Gum (*Eucalyptus* camaldulensis) Low Open Woodland	Eliza Creek, junction with major tributary. 8 km south of Lake Torrens	Approximately 5.5 km downstream of tailings dam	Impact
Flora /, Bird Site 11 (CAR011)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland fringed by *Acacia papyrocarpa* (Western Myall)	Stony Tableland and Minor Drainage Line	Approximately 1.5 km from Southern Access Road junction. 200 m west of lay down area, and 40 m from Western Access Road. 2 km north east of Tjungu Accommodation Village.	Impact
Flora /, Bird Site 12 (CAR012)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland	Approximately 0.8 km east of the Tailing Dam's mid-eastern boundary	Impact
Flora / Bird Site 13 (CAR013)	Bladder Saltbush (*Atriplex vesicaria*) +/- Samphire (*Tecticornia medullosa*) Low Open Shrubland	Stony Tableland	Adjoining minor vehicle track, approximately 15 km SE of mining village. Approximately 6 km SE of Tailings Dam and 6 km from Radial Pipeline.	Control
Flora / Fauna Site 15 (CAR015)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland	Approximately 1.5 – 2 km south of processing plant and 650 m from Explosives Magazine.	Impact
Flora /, Fauna Site 16 (CAR016)	Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland	Approximately 1 km north west of Tjungu Accommodation Village and airstrip and 500 m north of Western Access Road.	Impact
Flora / Bird Site 17 (CAR017)	Western Myall (*Acacia papyrocarpa*) Low Open Woodland)	Major Drainage Line / Eliza Creek	230 m north of the Tailings Storage Facility Decant Dam Embankment	Impact
Flora / Bird Site 18 (CAR018)	Western Myall (*Acacia papyrocarpa*) Low Open Woodland)		870 m north of the Tailings Storage Facility Decant Dam Embankment	Impact
Flora / Bird Site 19 (CAR019)	*Eucalyptus camaldulensis* ssp. *arida* (Red Gum) low Open Woodland		3 km north of northern bank of tailings dam on Eliza Creek. 730 m from Injection Well.	Impact

Site	Vegetation Association	Landform	Distance from Infrastructure	Control Site or Impact Site
Flora / Bird Site 20 (CAR020)	*Eucalyptus camaldulensis* ssp. *arida* (Red Gum) low Open Woodland		5 km north of northern bank of tailings dam on Eliza Creek and 470 m from Injection Pipeline.	Impact
Flora / Bird Site 21 (CAR021)	Umbrella Bush (*Acacia ligulata*) Tall Shrubland	Sand Dune	>2 km from WAR	Control[1]
Flora / Bird Site 22 (CAR022)	Umbrella Bush (*Acacia ligulata*) shrubland over Canegrass (*Zygochloa paradoxa*) Hummock Grassland		150 m from Western Access Road	Impact
LFA Aero LFAAL1(A&B)	Formerly Bladder Saltbush (*Atriplex vesicaria)* low open shrubland	Stony Plain	10 m from airport road, 100m from airport	Impact
LFA Ventia LFAVOL2(A&B)	Formerly Bladder Saltbush (*Atriplex vesicaria*) - Samphire (*Tecticornia medullosa*) Low Open Shrubland	Stony Tableland	5 m from road, 100m from processing plant	Impact
LFA Midway Quarry LFAQUA3(A&B)	Formerly Bladder Saltbush (*Atriplex vesicaria*) +/- Samphire (*Tecticornia medullosa*) Low Open Shrubland	Stony Tableland	Western Access Road (40m in), west of Mid-way Quarry	Impact
LFA Tjungu LFATJU4(A&B)	Formerly Bladder Saltbush (*Atriplex vesicaria*) Low Open Shrubland	Stony Tableland	Western Access Road, approximately 1.5 km from Southern Access Road junction. 2 km north east of Tjungu Accommodation Village.	Impact

[1]Refer Jacobs 201 9 for additional detail about change of site location

Table 2-4 Weed Transects location and habitat

Transect	Road	Habitat
CWM01	Southern Access Road	Gibber stony tableland is dominant, but the transect also includes creeks and culverts
CWM02	Southern Access Road	Gibber stony tableland is dominant, but the transect also includes creeks and culverts
CWM03	Western Access Road	Gibber stony tableland
CWM04	Access Road west of Administration and Processing area	Gibber stony tableland, includes “Ventia” Landscape Functional Analysis site
CWM05	Western end of Western Access	*Acacia aneura* woodland on sandy loam

CWM06	Western Access Road	Gibber stony tableland, dunes and minor creek
CWM07	Minor road, north-east of Anzac Dam	Gibber stony tableland
NWM01	Northern Wellfields Road	Gibber stony tableland
NWM02	Northern Wellfields Road	Gibber stony tableland
NWM03	Northern Wellfields Road	Drainage Line

2.5 Flora Survey Methods

Table 2-5 below summarises the survey techniques used in autumn 2023 to assess each outcome measurement criteria. More detailed descriptions of each method (Jessup, Rangeland, Photopoints, Canopy Cover, Weeds) are provided in the spring 2018 -2021 reports (Jacobs 2018a, 2019a, 2019b, 2020a, 2021a, 2022a, 2023a).

At each Flora site where a Rangeland Assessment (NVC 2021) was undertaken, it was within a 1 ha area. For the stony tableland sites (1 – 7, 9, 11–13, 15 and 16) this was a survey of 100 m x 100 m plot, 50 m either side of the line joining the start and end of the Jessup transect. For the Eliza Creek sites (Flora Site 10, Flora sites 17 – 20) the one-hectare survey was confined to vegetation considered to be under the influence of the creek landform and water regime.

As per spring 2019 – 2022 surveys, Jessup survey were not undertaken at site 21 and 22 (sand dunes), given the sand dune sites were not marked in the field (due to potential heritage values). The Rangeland survey area at sites 21 and 22 is an area centred on the site coordinate, with a 55 m radius (namely a circular area of approximately 1 ha).

As per spring 2021, it should be noted that Canopy Cover results report on data from spring 2018 onwards, given alterations in transect alignment from initial establishment in autumn 2018. For canopy cover sites Densitometer results are reported on for individual transects at each sites, as well as mean data results for the two transects at a site. Canopy cover intactness index is calculated as the extent and density of the individual tree's live canopy at the time of the survey.

Table 2-5 Survey techniques used in autumn 2023 to address Outcome Measurement Criteria

OMC Code	Outcome Measurement Criteria (OMC)[1]	Technique / data collection strategy to determine if obligations are being met
NV3	Baseline native vegetation surveys must be undertaken at Eliza Creek monitoring sites (Figure 8.3 Flora of the PEPR) associated with SWRF1 and TSF6 prior to the impact of mining operations or mining related activities on the existing environment and updated into Appendix C6 Ecological Baseline*	Rangeland Assessment (NVC 2020) x 4 sites on Eliza Creek (0.5 km, 1 km, 7 km and 10 km) at increasing distance from the northern bank the TSF dam. Results will assist with distinguishing grazing impacts from other causes of defoliation / plant damage. Also provides inventory of species present, detection of any loss of diversity, with repeat monitoring. Abundance data allows detection of changes in native and introduced species, with repeat monitoring. Jessup and canopy cover transects at the same location as Rangeland Assessment Sites, i.e. located on Eliza Creek, 0.5 km, 1 km, 7 km and 10 km north of the northern bank of the TSF dam. Jessup Transects (DENR 2011) on Eliza Creek (1 transect at each of the 4 sites). Provides information on population structure of long-lived perennials, including recruitment. 8 Canopy Cover Site (2 transects at each of the 4 sites) To assess possible impacts on tree health due to potential higher watertable, reduced surface water flows and / or tailing seepage. Comparing the total number of densitometer foliage records along a transect over time provides an indication of changes in total canopy volume. The transects recorded canopy data from 100 points at each location. Two transects parallel at each of the 4 locations, 1 representing instream habitat and 1 representing bank habitat. Using GRS densitometer (for canopy cover).

		In summary, Jessup, Rangeland Assessment and Canopy Cover Assessment provides detailed information on plant species diversity, abundance and health at each site: vegetation structural layers, population data for woody perennials (number of adults and number of juveniles), and grazing impacts on woody perennials, plus notes on existing disturbance agents at each site.
SWRF1	Annual surveys undertaken by an independent and suitably qualified expert **demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring** (Figure 8.2 Fauna and Figure 8.3 Flora of the PEPR) **attributed to reduced surface water flows** caused by mining operations when compared to baseline conditions (Appendix C6 Ecological Baseline and surveys for new sites undertaken prior to commencement Stage 1 Tailings commissioning).	4 Rangeland Assessment sites, 4 Jessup transects and 8 Canopy Cover transects (same locations as per NV3) to enable comparisons of changes in plant species composition (namely, diversity and abundance of each species) that may be attributed to reduced surface water flows and / or tailings seepage.
TSF6	Annual surveys undertaken by an independent and suitably qualified expert demonstrates no adverse impact on the diversity and abundance of native vegetation and water dependent ecosystems at Eliza Creek monitoring sites (Figure 8.2 Fauna and Figure 8.3 Flora of the PEPR) **attributed to tailings seepage** when compared to baseline conditions (Appendix C6 Ecological Baseline and surveys for new sites undertaken prior to commencement Stage 1 Tailings commissioning)	As above
WP1	Annual flora and fauna surveys undertaken by suitably qualified and experienced ecologists at flora (including weeds) and fauna monitoring locations (Figure 8.2 and Figure 8.3 of the PEPR) **demonstrates no introduction of new species of weeds** declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mining related activities when compared to previously recorded weed species and introduced fauna.	The 4 Weed Transects surveyed during baseline from 2013 to 2016 re-surveyed (CMW01-CMW04). Namely, for each weed transect, the abundance and cover of all weeds recorded at 5 locations (250 m intervals, 50 m radius) along a 1000 m transect). Additional weed transects established along the WAR (CMW05, CWM06) and near Anzac Dam (CWM07) to monitor potential impacts along the WAR and the eastern wellfield. Opportunistic records of all weed species made whilst moving around the whole mine site in general. Weed location, habitat, and weed population size and extent recorded. In addition, active searches of areas with a high potential for weed establishment also undertaken (e.g. dams, spill areas, and effluent irrigation areas adjacent the exploration camp and the Tjungu Village).
WP2	Annual flora and fauna surveys undertaken by independent and suitably qualified ecologists at flora (including weeds) and fauna monitoring locations (Figure 8.2 Fauna and Figure 8.3 Flora of the PEPR) demonstrates **no increase in the abundance of existing weeds or pest species in** the land compared to previous survey records as a result of mining related activities	
AQ2	Annual surveys undertaken by a suitably qualified and experienced expert **demonstrates no adverse impact on the diversity and abundance of native vegetation** at monitoring sites (Figure 8.3 Flora of the PEPR) **directly attributed to dust deposition from mining operations or mining related activities w**hen compared to baseline native vegetation conditions (Appendix C6 Ecological Baseline).	Jessup Transects x 14 sites, Rangeland Assessment x 14 sites with the addition of collecting species cover and abundance information using both the Crown Separation Ratio scale. Jessup transects and Rangeland Assessment Sites at the same location. Undertaken at the existing 14 of the 16 baseline flora site locations to enable comparison. Additional sites along the Western Access Road within dune habitat that was not covered by the existing baseline data (e.g. sites 21 and 22, Rangeland Assessment only)

EPBC1	Future records of **Thick-billed Grasswren** are to be provided to the Biological Database of South Australia BDBSA to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites (Figure 8.2 and Figure 8.3 of the PEPR)	Bird surveys conducted at 14 of the 16 baseline bird monitoring sites, as well as at the 4 Eliza Creek flora sites and the 2 Western Access Road dune sites. Opportunistic records of Thick-billed Grasswren to be recorded. All records of Thick-billed Grasswren will be forwarded to Department for Environment and Water (DEW) as part of the Permit reporting requirements, which will then be uploaded into the BDBSA.
EPBC2	Future records of **Plains Mouse** are to be provided to the Biological Database of South Australia BDSA to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites (Figure 8.2 and Figure 8.3 of the PEPR)	Fauna surveys conducted at each of the eight baseline sites as per autumn 2017. Pitfall traps and un-baited cameras used to detect any Plains Mouse captures in spring 2022, aligning with the later years of the baseline surveys. (none detected to date during compliance monitoring).
EPBC3	Future records of **Night Parrot** are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping if observed during annual flora and fauna surveys at monitoring sites (Figure 8.2 and Figure 8.3 of the PEPR)	Bird surveys are undertaken as part of annual survey. All records of the Night Parrot will be forwarded to the Night Parrot Recovery team, which will then be uploaded into the BDBSA.
LUP4	Rehabilitation trials shall be undertaken at infrastructure locations no longer required (Figure 4.1 of the PEPR) and ongoing assessment at LFA monitoring at sites (Figure 8.3; CEF1-7 of the PEPR) are assessed annually demonstrating development of trends and annual improvement of rehabilitation through LFA methodology. Should the data indicate rehabilitation not trending towards sustainability root-cause investigations will be undertaken and rectification methods be identified and implemented	Following site rehabilitation, Landscape Functional Analysis is being undertaken within rehabilitation zones, and comparable data from these sites is being compared with baseline data, and future more relevant control sites will be established. 4 LFA sites established.

Refer spring 2019 report (Jacobs 2020a) for additional detail about species classification and long-lived and short-lived, flora taxonomy and identification.

2.6 Landscape Function Analysis (LFA)

2.6.1 LFA sites

To meet the requirements of Outcome Measurement Criteria (OMC) LUP4 in the PEPR (Table 1-2), Landscape Function Analysis (LFA) monitoring was conducted at four sites in May 2023 (two existing two newly established). LFA measures a subset of processes that contribute to the formation of self-sustaining ecosystems and can be used to monitor site revegetation post-impact (Tongway & Hindley 2005). The data collected during the May 2023 survey represents the fifth year of data collection for the two sites established in 2019 and second year for sites established in 2022.

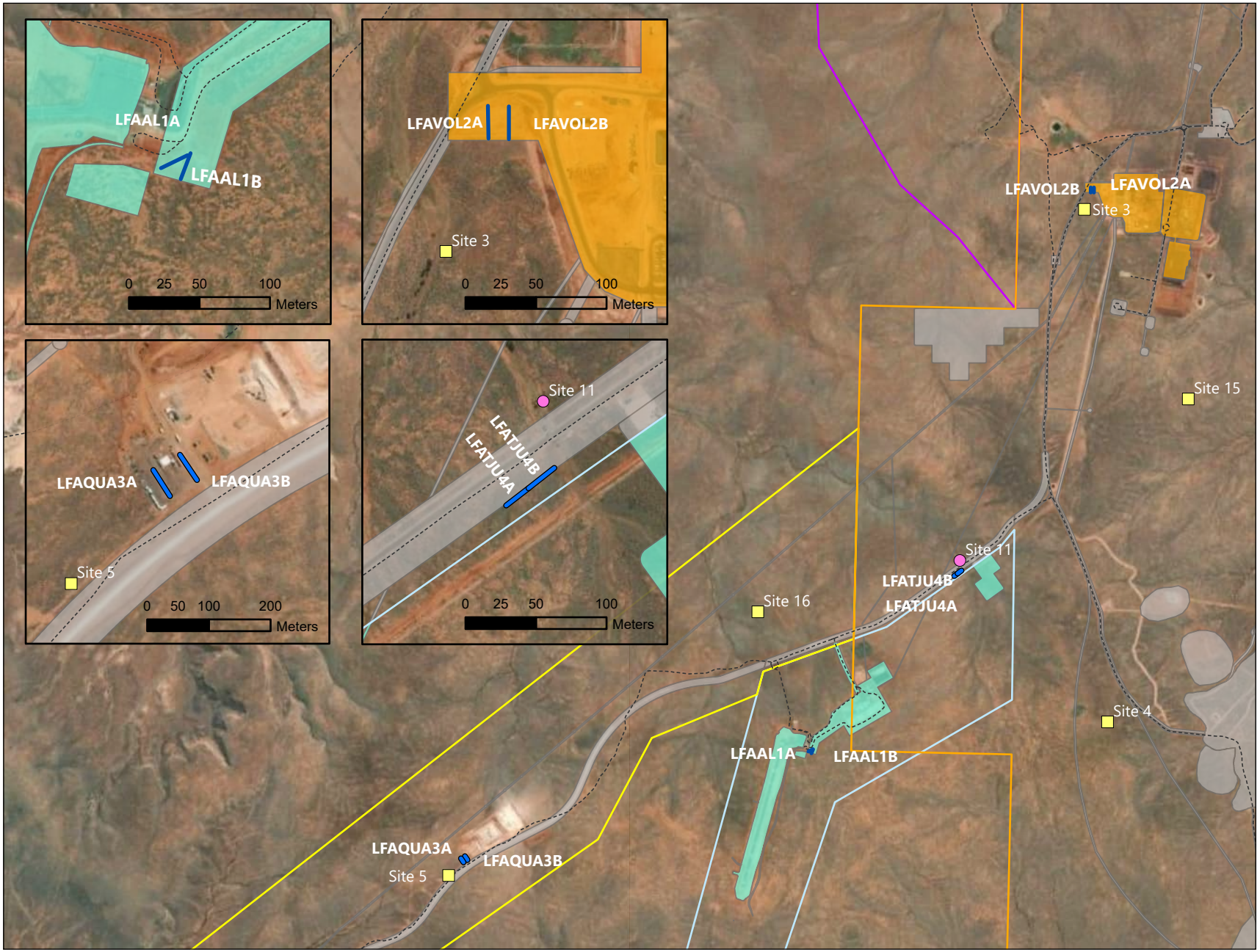
Initially, two rehabilitation areas were selected by BHP for LFA assessment prior to the 2019 survey: an area adjacent to the operational Carrapateena airport (referred to as the Aerodrome laydown site in this report) and a second area adjacent to the Carrapateena Mine Processing Plant (referred to as the Ventia laydown site in this report). Prior to the Spring 2019 survey, the rehabilitation sites were contour ripped to create troughs ('patches') for nutrients and water to accumulate and facilitate regeneration and revegetation; Aerodrome – June 2018, Ventia Laydown August-September 2019. The objective of subsequent LFA surveys (2019 to present) was to measure the success of returning the sites to sustainable pre-impact levels of landscape function. The two sites established in spring 2022 are both on the Western Access Road, one adjacent the Mid-way quarry that was used for WAR construction and one near the Tjungu Village (adjacent CAR011).

The Midway Quarry site is situated west of the WAR on a northwest facing gentle slope with two transects (3a and 3b) installed in a north west facing direction (perpendicular to the WAR) with site 3a slightly southwest of and parallel to transect 3b. The Tjungu village site is situated on the eastern side of the WAR on a north facing moderate slope which extends down to a minor drainage line. Both sites were deeply ripped prior to the 2022 survey. The Tjungu site had been hand seeded three months prior to the September 2022 survey, whilst the Midway Quarry site was not seeded, trialling natural recruitment / regeneration. The surface at both sites comprises large flat broken rock in deeply ripped contours, more irregular at the Midway Quarry site.

In 2022, the LFA Bank and Trough assessment method was undertaken for the new sites as they comprised only non-vegetated rip lines. With the Bank and Trough method, the troughs are recorded as patches, as they act as nutrient sinks, and the inter-trough areas are recorded as inter-patches. Point-centred Quarter (PCQ) was not undertaken as the sites were devoid of plants. In May 2023, these two sites however, were surveyed using the Established method. The Established method measures each plant, or other organic matter, as a patch (rather than the ripped troughs). For the Midway Quarry site, the bank and trough method was no longer applicable because the troughs had levelled out and were no longer clearly distinct from inter-trough areas. For the Tjungu site, a sufficient number of plants had established to validate the transition to the Established method.

Section 2.6.2 below provides a summary of the methodologies applied and reasoning for the change. Table 2-6 provides a summary of where the different approaches have been applied to date. For LFA transect coordinates refer Table 2-2 above and Figure 2-5.

The successful rehabilitation of the four areas is monitored using two complementary methods: the Landscape Function Analysis (LFA) following the established method, supplemented by the Point-centred Quarter (PCQ) method during the early phase of colonisation and succession (Tongway and Hindley 2005).



Survey Sites 2023
- Birds
- Birds, Vertebrate Trapping
- Landscape Function Analysis (LFA)

OZ Minerals Tenement
- Mineral Lease 6172
- Airstrip and Tjungu Village
- Mine Process Plant (ML 6471)
- Carrapateena Project Footprint
- Airstrip and Tjungu Accommodation Village MPL 149
- Western Infrastructure Corridor MPL 152
- Northern Wellfield MPL 156

N

MGA54 Zone 53

A4 Scale: 1:60,000

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Kilometers

Figure 2-5: LFA Sites, Aero Laydown (LFAAAL), Ventia Laydown (LFAVOL), Midway Quarry Laydown (LFAQUA), Tjungu to WAR Laydown (LFATJU)
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Jacobs

2.6.2 Rehabilitation assessment types

Landscape function monitoring methods

The successful rehabilitation of the four areas is monitored using two complementary methods: the Landscape Function Analysis (LFA) following the established method, supplemented by the Point-centred Quarter (PCQ) method during the early phase of colonisation and succession (Tongway and Hindley 2005).

The Landscape Function Analysis (LFA)

The LFA Established Method monitoring approach measures a subset of landscape processes that contribute to the formation of self-sustaining ecosystems, and can be used to monitor the recovery of a site following impact (Tongway and Hindley 2004). This method is recommended during the intermediate stages of rehabilitation where the topography of the contour mounds has eroded, whilst in the earlier stages of rehabilitation the LFA Bank and Trough Method is more appropriate (refer Appendix I). The method applied to each of the monitoring sites is indicated in Figure 2-6. The method comprises two components: an established method of patch/interpatch sampling and a soil surface assessment.

At each site, two fixed transects have been established, 50 m in length (Table 2-2). Directly beneath the transect line, the zones that occur are classified as a patch (represented by a plant/s with overlapping canopies or other resource-accumulator such as litter or logs), or interpatch (e.g. rocky surface, or bare ground) (Figure 2-6) (Tongway and Hindley 2005).

For each transect, five indices can be summarised and compared over time, including: Number of patch zones/10 metres, Total Patch area, Patch Area Index (total patch area/maximum area if all the transect was patch (transect length * 10)), Average inter-patch length, Landscape Organisation Index (derived by dividing the sum of the patch zones by the length of the transect line) (Tongway and Hindley 2005). It is anticipated these indices will converge on those estimated from along the baseline (analogue) sites.

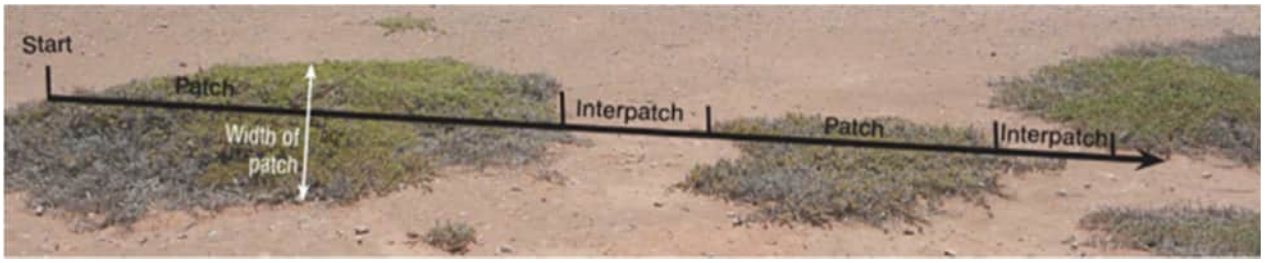

Figure 2-6 Example of how to collect Landscape Organisation data for the Established method (as per data collection by EBS at the Analogue benchmark sites) (DMITRE 2013).

The soil surface assessment encompasses 11 indicators that assesses soil surface processes. These indicators are consolidated into three measures of landscape function: Stability, Infiltration and Nutrient cycling. These three measures can be used to assess the improvement of a site towards sustainability (Tongway and Hindley 2005).

Within the patch and interpatch zones sampled along the 50 m fixed transects, soil surface characteristics are sampled from randomly located 1 m transects. As the rehabilitation sites are relatively small, homogeneous and undergone further mechanical disturbance and mixing, and the SSA categories are relatively coarse, only a single sample was surveyed within each zone. Parameters were measured as per DMITRE 2013.

Along each transect, the soil surface assessment indicators are used to calculate soil stability, infiltration and nutrient cycling indices that can be summarised and compared over time (Tongway and Hindley 2004). It is anticipated these indices will converge on those estimated from along the baseline (analogue) sites.

Supplementary vegetation sampling using the Point-Centred Quarter (PCQ) method

Rehabilitation in semi-arid Australia is expected to be slow. In the early phase, plants may colonise the site in low abundance, or a clumped pattern, making it difficult to representatively sample using a fixed transect. To supplement the LFA Established Method, the Point-centred Quarter (PCQ) method was used (Tongway and Hindley 2004).

The fixed transects were dived into regular intervals: 10 m, 20 m, 30 m, 40 m and 50 m. At each point, the nearest perennial and biennial plant up to 10 m away was located within each of four quadrants (Figure 2-7). No data was recorded for a quarter where there were no perennial or biennial plants within 10 m of the sample point that had not already been sampled for a prior quadrant (Tongway and Hindley 2005).

For each transect, three additional indicators can be calculated and compared over time, including: the mean distance between plants, plant density per 100 m^2, and plant volume. It is anticipated that the mean distance between plants would decrease (as more plants become established), while the plant density and plant volume would increase (as established plants grow in size).

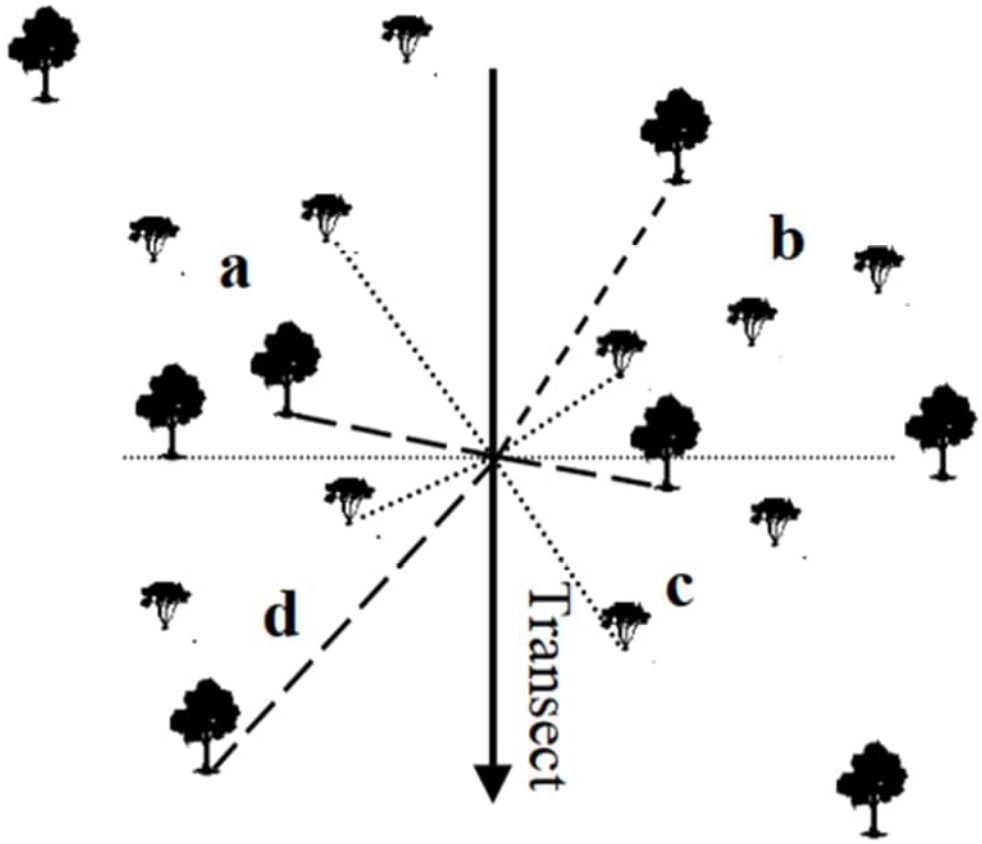

Figure 2-7 The Point-centred Quarter method of sampling from a single point (Figure 53 in Tongway and Hindley, 2005).

A summary of the different methods of data collection that have been applied for Landscape Function Analysis at the Carrapateena site is presented below in Table 2-6.

Table 2-6 Summary of methods used to date for Landscape Function Analysis at Carrapateena

Survey	Sites	LFA Bank & Trough method	LFA Established Method	LFA Soil Surface Assessment (SSA)	Point Centered Quarter (PCQ) method
2013 /2014 Baseline (EBS)	6 sites within analogue vegetation		All 6 sites	X	
September 2019 survey (Jacobs) (newly ripped soil)	2 sites with 2 transects each 2 sites with 2 transects	1a, 1b, 2a, 2b		1a, 1b, 2a, 2b	
September 2020 survey (Jacobs) (1-2 year post rehabilitation)		2a	1a, 1b, 2b	1a, 1b, 2a, 2b	Site 1a, 1b Site 2a, 2b
September 2021 survey (Jacobs)			1a, 1b, 2a, 2b	1a, 1b, 2a, 2b	1a, 1b, 2a, 2b
September 2022 survey (Jacobs)	4 sites with 2 transects each	3a, 3b, 4a, 4b	1a, 1b, 2a, 2b	1a, 1b, 2a, 2b	1a, 1b, 2a, 2b
May 2023 (Jacobs)	4 sites with 2 transects each		1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b	11a, 1b, 2a, 2b, 3a, 3b, 4a, 4b	1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b

2.7 Fauna Survey Methods

2.7.1 Fauna trapping

As per 2018-2022 monitoring, fauna trapping was undertaken at eight sites, with groups of four sites monitored over two consecutive trapping periods. Each site was monitored for four days and four nights between 15 and 23 May 2023. Two sites were opened on 15 May, and two sites on the 16 May which were closed on 19 and 20 May respectively, and a second round of sites was opened on 19 May closed on 23 May. All equipment and flagging tape was removed from each site at the end of each survey, except for semi-permanent pits which remained in-situ with lids re-established, and screwed in with 'hex' screws to prevent animals entering the pits post monitoring. Trench lines for drift fencing between pit traps were backfilled.

The configuration at each site was as follows:

- A single pitfall line was opened from one of four semi-permanent baseline pit lines that are established at the eight fauna site (i.e. sites 1-4, 15, 16), noting site 5 only has three semi-permanent pit lines remaining, one being removed in 2019 due to a number pits with decreased integrity / holes in bases.
- Six pitfall traps were opened at each site, as required by the SA Vertebrate Survey Guidelines (Owens 2000).
- Each drift fence line, was approximately 80 m x 0.3 m, dug into the ground approximately 5-10 cm depth. Lines running across semi-permanent pitfall traps, 10 m apart (fence extending approximately 5 m either side of the first and last pitfall trap).

- The semi-permanent pitfall traps were 240 mm diameter (standard PVC 225 / 250 mm pipe - internal diameter 240mm) and 600 mm deep with a mesh base to allow water drainage were used to target small to medium sized mammals and reptiles.
- Two funnel trap pairs were placed evenly along each line.
- Two camera traps were established facing each trap line at open locations, with minimal vegetation to avoid accidental triggers (as per 2021).
- No Elliott traps, cage traps, HARP traps or ANABAT recorders were used.
- One song meter was established at a suitable location away from the trapping line, with the exception of site three which is immediately adjacent the noisy processing plant. A song meter was established at Dawson Dam which is 0.5 km from site 3.
- Refer spring 2019 report (Jacobs 2020a) for additional details.

2.7.2 Bird / bat detection

As per previous monitoring (2018, 2019, 2020, 2021, 2022), bird surveys were undertaken at least once at each of the 20 survey sites (Flora sites 1-7, 9-13, 15-16, plus sites 17, 18, 19, 20, 21 and 22), for 30 minutes at each site within 2 hours of dawn. If weather conditions or timing were not considered optimal, repeat surveys were undertaken. Bird data was also collected opportunistically during multiple visits to the fauna trapping sites and when driving between sites, during flora surveys, at four dams, camps and at the two effluent irrigation areas.

In addition, in 2023 song meters were established at all fauna trapping sites, one dam and one creek site, in order to detect additional species that were not detected during the day or nocturnal / crepuscular species. Song meters were deployed for a minimum of 24 hours at each site. Desktop analysis was undertaken post field to determine whether any additional species were present. Such analysis involves ecologists reviewing images of bird calls and bat calls and verifying species against recognised images.

Four Autonomous Recording Units (ARUs), of the Song Meter Mini Bat model (Wildlife Acoustics, 2022), were fitted with an acoustic stub microphone to enable recording of vocal bird species in the audible frequency range (Professional Trapping Supplies, 2022). They were deployed within areas of habitat considered suitable for detection of birds approximately 100-200m from fauna trapping lines. ARUs were configured to record in the acoustic mode: for one hour either side of both sunset and sunrise. In this configuration, for every 24 hours of deployment, each ARU captured 4 hours of acoustic recordings (birds) and 1 hour of ultrasonic records (bats).

Each ARU was affixed to a stake or other stable object using cable ties. All cable ties were clipped short to avoid the potential for whistling interference in high winds. This model of ARU is synchronised with the GPS reading from the user's smartphone to correctly set sunrise and sunset times. The location of each deployment was also marked using a GPS unit (IPAD).

Acoustic Analysis

ARUs recorded all data to Secure Digital (SD) cards. The data was then transferred to a laptop computer and backed-up to internal servers. All recordings were processed using Raven Lite 2 bioacoustics analysis software (K. Lisa Yang Center for Conservation Bioacoustics at the Cornell Lab of Ornithology, 2022).

Analyses for these deployments followed the procedure of analysing all recordings for the presence of any fauna species by first detection using a combination of listening through in real time and high-speed visual spectrogram scanning. All audible taxa were noted in the order in which they appear in recordings. Any unidentified signals were noted and, if they could not be identified by consultation with other ecologists, were documented in analysis notes.

2.7.3 Active reptile, track and scat searches

As per previous monitoring undertaken (Jacobs 2018a, 2019a, 2020a, 2021, 2022a, 2023a).

2.7.4 Spotlighting

As per previous monitoring (2018 - 2022), nocturnal searches were conducted at a subset of sites that were easier to safely access at night (e.g. Site 10 - Eliza Creek). Survey involved spotlighting with head-torches (LED), active searching and listening for nocturnal vertebrate species including Night Parrot and a bat species that are audible to the human ear (e.g. White-striped Free-tail Bat). Searches were undertaken for a minimum of 30 minutes at site 10 and 20 minutes at the next drainage line by 4 observers / spotters. Noting the Camera Traps (two per site), and song meters were also collecting nocturnal images for four /one trap nights (respectively) at each of the eight fauna sites (sites 1-4, 15, 16).

2.7.5 Opportunistic observations

Opportunistic observations make up an important component of a fauna survey and constitute any observations made while travelling around the Operations area, targeted searches at likely locations for fauna (e.g. dams), or between the survey sites. Any animals identified opportunistically, either via direct observation or by evidence, were recorded on data sheets with location and any useful notes. These species were added to site species lists if identified at a survey site, or to a general survey species list if from the broader Operations area (if not attributed to a particular habitat type).

Location details for the key opportunistic observation locations are provided below and on Figure 2-3.

Location	Easting	Northing
Exploration Camp	737500	6541120
Exploration Village Effluent Irrigation Area (EV EIA)	733550	6535200
Anzac Dam	743880	6539300
Tjungu Village EIA (TV EIA)	733700	6535306
Dawson Dam	735690	6541028
North Eliza Dam	741682	6547790
South Eliza Dam	737960	6529976
Yeltacowie Homestead	724430	6530245

*MGA zone 53. GDA1994

2.7.6 Identification

The following reference material and taxonomic keys were used for species identification and classification:

Reptiles and Amphibians

- A Complete Guide to Reptiles of Australia 2nd edition (Wilson and Swan 2008)
- Reptiles and Amphibians of Australia (Cogger 2000, 2014)
- Key to the Geckos of South Australia (Hutchinson and Williams 2023)
- Key to the Skinks of South Australia (Hutchinson and Williams 2023)
- Key to the Snakes of South Australia (Hutchinson and Williams 2023)
- Key to the Dragons of South Australia (Hutchinson and Williams 2023)
- Key to the Goannas of South Australia (Hutchinson and Williams 2023)
- Checklist of the Reptile and Frogs of South Australia (Hutchinson 2023).

Birds

- The Field Guide to the Birds of Australia, 9th edition (Pizzey and Knight 2012)
- Field Guide to the Birds of Australia, 8th edition (Simpson and Day 2010)
- eGuide to Birds of Australia, application (Morcombe 2011-2019, Version 1.6.2)
- The Australian Bird Guide. (Menkhorst et al. 2017)
- Annotated List of the Birds of South Australia (Horton et al. 2020)
- The compact Australian Bird Guide (Davies et al. 2022).

Mammals

- A Field Guide to the Mammals of Australia (Menkhorst and Knight 2004)
- Mammals of Australia (Strahan 1995)
- Tracks, Scats and Other Traces (Triggs 1996)
- Key to Dasyuridae of SA (Kemper and Stokes 2020)
- Key to Muridae of South Australia (Kemper and Stokes 2021)
- Australian Bats (Churchill 2008).

In addition, identification for some species was made via liaison with SA Museum current and retired staff (David Stemmer – mammals, Mark Hutchinson – reptiles and amphibians). Bob Starkey assisted with identification of reptile evidence (e.g. goanna tracks, scats and burrows / diggings).

Plants

- Electronic Flora of South Australia (Eflora 2022). http://www.flora.sa.gov.au/id_tool.shtml. Accessed May/ June 2023
- Eric Jackson Reference Herbarium, State Herbarium, Government of South Australia
- https://spapps.environment.sa.gov.au/seedsofsa/. Accessed May / June 2023.
- New South Wales Flora Online. PlantNET - NSW FloraOnline - Introduction. Accessed May/June 2023.
- Cunningham GM, Mulham WE, Milthorpe PL, Leigh JH (1992) Plants of Western New South Wales. Melbourne Inkata Press
- Kutsche, F and Lay, B (2003). Field Guide to the Plants of Outback South Australia. Government of South Australia.

2.7.7 Vouchering

Vouchering of species was undertaken in line with Ethics Permit as per 2.2 above. Only two trap-deaths (two native rodents) were provided to the museum. Reporting is provided as Appendix J.

Flora vouchering was undertaken as per permits (2.2.2).

2.7.8 Fauna survey limitations

The limitations associated with this fauna survey, consistent with most fauna surveys, are as follows:

- The results of the fauna surveys are only a 'snapshot' in time and cannot describe seasonal variation or migrations on their own.
- Scats could not always be correctly attributed to species, however where they could be confidently identified, they provide an accurate indication of the presence and habitat preferences of certain species (Triggs 1996).
- Detection of nocturnal species by spotlighting potentially does not detect all of the animals present and is affected by environmental factors (Wayne et al. 2005).
- Read & Moseby (2001) concluded that environmental factors affected the capture rates of small reptiles. Unfortunately, planning logistics for fauna surveys around specific environmental conditions is very difficult. Planning to survey when weather conditions are generally favourable (as was done here) allows the best chance of favourable conditions during a survey and species identification. It is noted that daily conditions were considered favourable for reptiles during this survey.
- Conditions for birds were highly suitable as the survey was undertaken in late autumn and there was much less wind compared with spring, however there were cooler conditions on some mornings. Bird detection was also enhanced at each individual site with song meter deployment, and opportunistic observations from across the broader Operation site (e.g. dams, tracks, camp, creeks, irrigation areas). Bird numbers were well represented by a number of families (see 3.3.4 below).
- Similar to recent surveys, for camera traps, facing the camera towards open areas, without vegetation, or roads in the field of view are noted to produce less false triggers. One song meter deployment (site 15) did not have any records which may have been related to battery or SD card failure.

3. Results

3.1 Climate During and Preceding Survey

3.1.1 Rainfall preceding survey

The mean yearly rainfall totals for the region are approximately 180 mm (Woomera Aerodrome mean is 182 mm and means for both Pernatty Station and South Gap are 179 mm) (BOM 2023b). The mean monthly rainfall totals are relatively evenly spread over the year, with a slight decrease generally observed during the winter months.

In the 12 months preceding the survey (14 May 2022 to 14 May 2023), the Carrapateena weather station recorded 239 mm, 33% above the regional yearly average, due largely to a well-above average spring rainfall totals. In particular, 118 mm rainfall was in October 2022 (50% of the yearly average), and with a combined autumn 2022 rainfall total of 150 mm (> 80% of long term annual rainfall totals). Rainfall in January and April 2023 was also above average (approximately 2x average).

Rainfall totals for 2020, 2021 and 2022 have been close to long term regional averages (high summer rainfall totals balanced out by low winter rainfall). Yearly rainfall totals in 2018 and 2019 were both well below average.

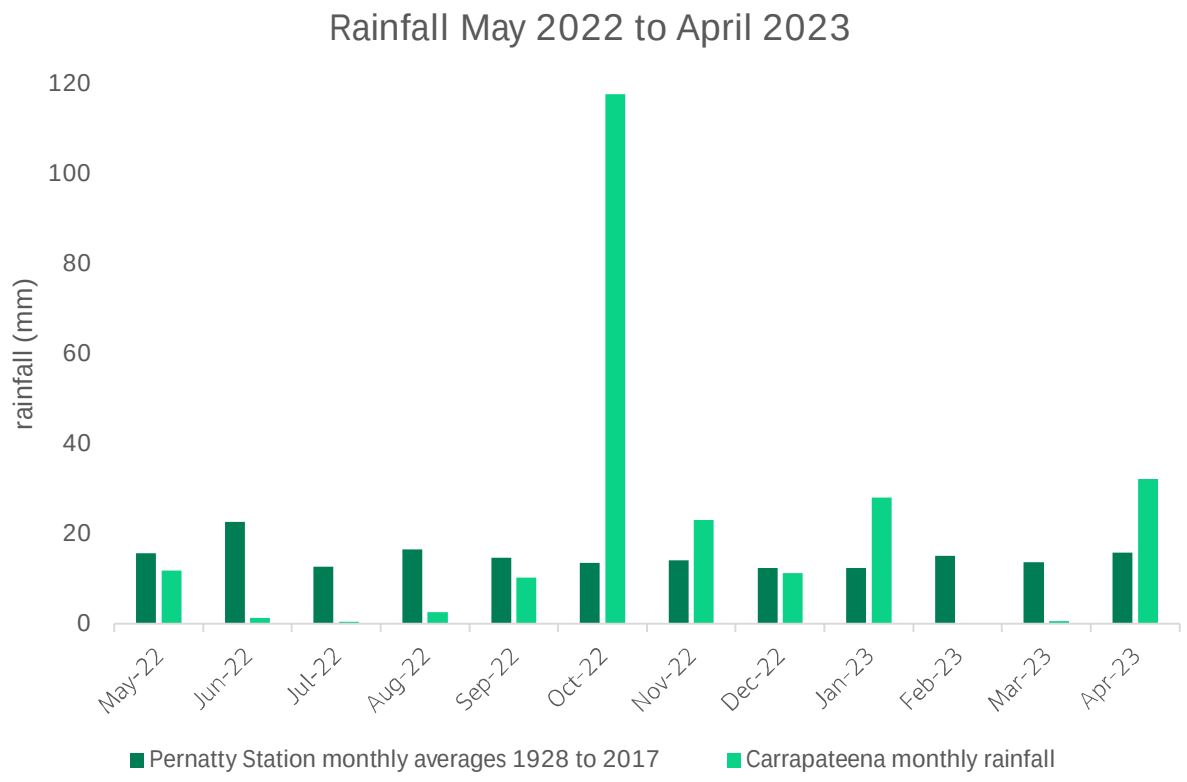

Figure 3-1 Climate at Carrapateena Mine Site preceding the survey (OZ unit - Vaisala WXT520) compared with long-term totals for Pernatty Station.

3.1.2 Site weather

The weather conditions during the survey are summarised by Table 3-1 below, presenting data from the on-site weather station located near the Tailings Storage Facility (a Vaisala WXT520). Conditions (including overnight temperatures) were cool to mild, with the maximum daily temperatures ranging between 16.2°C to 22.0°C, and an average of 19°C for the survey period. Daily maximum temperatures averaged 4 degrees Celsius cooler than the September 2022 survey. These temperatures are comparable to the average regional long-term maximum daily temperatures for May of 20.6°C (Woomera Aerodrome, BoM 2023a).

Minimum overnight temperatures were relatively cool and ranged from 7.1°C to 15.2°C, with an average of 10°C, just above the long-term mean minimum temperature of 9.4°C for May (Woomera Aerodrome, BOM 2023a). Daily minimum temperatures averaged two degrees cooler than the September 2022 survey.

During the autumn survey, wind speeds were light to almost calm each day, and considered optimal for bird surveys and song meter deployment. Overall conditions were considered generally suitable for fauna survey, although the cooler nights and days likely reduced reptile activity and small mammal capture numbers.

Table 3-1 Field survey weather (Carrapateena All Weather Data spring 2022)

Observation	19-Sept	20-Sept	21-Sept	22-Sept	23-Sept	24-Sept	25-Sept	26-Sept	27-Sept	28-Sept	Survey Average
Maximum temp (℃)	22.9	21.8	18.4	16.2	16.9	18.2	18.7	18.6	19	22.9	21.8
Minimum temp (℃)	15.2	12.4	10.6	7.1	7.7	8.4	8.4	11.9	10	15.2	12.4
Total rainfall (mm)	0	0	0	0	0	0	0	0	0	0	0

3.2 Flora

3.2.1 Plant diversity

A general floristic description of each site is provided in the Carrapateena Ecology Survey – Autumn 2018 report (Jacobs 2018a). Photographs of each site during the autumn 2023 survey are provided in Appendix A.

3.2.1.1 Total species diversity: compliance monitoring

In autumn 2023, a cumulative total of 148 native flora taxa was recorded at all the one-hectare Rangeland Assessment flora sites across the Carrapateena Operation area (Flora Sites 1-7, 9 – 13,15 – 22). This was the highest diversity recorded during the "construction and operation" (compliance) monitoring, that began in autumn 2018. During compliance monitoring, the total plant species diversity recorded at the flora survey sites has ranged from 111 species in spring 2018 to 148 species during the current survey. The high species diversity recorded in autumn, 2023 was due to the very high diversity of short-lived species: in 2023, the total of 90 short lived species was the highest recorded during the operation monitoring, while the long lived species diversity was within the range recorded during the previous operational surveys.

Since 2018, the variation in total species diversity is almost entirely due to variations in short-lived species diversity, with long lived perennial species diversity remaining stable (Table 3-1). Since 2018, short-lived species diversity has varied by 55% (58 to 90 species) and long-lived species diversity has varied by just 6% (58 to 62 species). Pre-construction comparisons are not possible as sites 17 – 22 were established in 2018. A list of all species recorded in autumn 2023, their frequency and their long-lived status is contained in Appendix B. A list of all species at each site, their abundance and grazing impact is contained in Appendix F.

Table 3-2 Total species diversity recorded at rangeland sites during compliance monitoring (construction and operation) phase

Long-lived/ short-lived	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
Long-lived perennial[1]	58	59	61	59	62	60	58
Short-lived	58	52	75	80	57	74	90
TOTALS	116	111	136	139	119	134	148

[1]long-lived woody perennials and long-lived grasses.

3.2.1.2 Total species diversity: baseline and compliance comparison

Flora sites 1-7, 9-13 and 15-16 were surveyed in all years both during pre-construction and during construction/operation phase. Hence these sites can be used to compare species diversity during these periods. For all but site 7, total species diversity recorded in autumn was greater than for spring 2022. Total species diversity at all sites in 2023 was within the baseline range and exceeded or equalled the baseline mean at 11 of the 14 sites (Table 3-3) Total species diversity in 2023 was also the highest during the compliance monitoring period for 11 of the 14 sites.

In 2023, the mean total species diversity for impact sites and control sites were 29.8 and 28.8, respectively, and not significantly different (t test, t = 0.62). The 2023 mean diversity for all impact sites of 29.8 exceeded the baseline mean of 26.6. The 2023 mean diversity for all control sites of 28.8 was very similar to the baseline mean of 29.1.

Table 3-3 Total native species diversity, baseline vs compliance monitoring

One-hectare flora site[1]	Site type	Baseline (2012 to 2016)		Compliance Monitoring Diversity							
		Min. diversity	Max. diversity	2018 A	2018 S	2019 S	2020 S	2021 S	2022 S	2023 A	Mean
1	Control	18	40	24	17	23	18	25	27	31	32
2		9	35	14	15	21	21	14	19	21	21
7		20	46	30	24	30	17	32	33	25	36
9		21	42	21	18	30	34	31	34	40	34
13		10	34	14	22	30	20	18	19	27	23
3	Impact	16	41	23	22	29	21	17	25	34	26
4		15	38	21	14	25	19	17	23	25	26
5		13	41	22	20	25	20	18	21	26	23
6		15	32	22	15	28	23	16	18	21	25
10		26	56	28	35	40	42	45	43	50	40
11		18	49	32	25	37	28	26	31	37	34
12		9	32	17	14	29	22	16	25	30	20
15		10	36	18	16	31	23	16	19	21	24
16		10	36	17	16	27	15	17	16	24	23

[1]Rangeland sites; as per previous reporting, excluding sites 8 and14. Note: Comparable data for 2017 was not available. A = autumn, S = spring

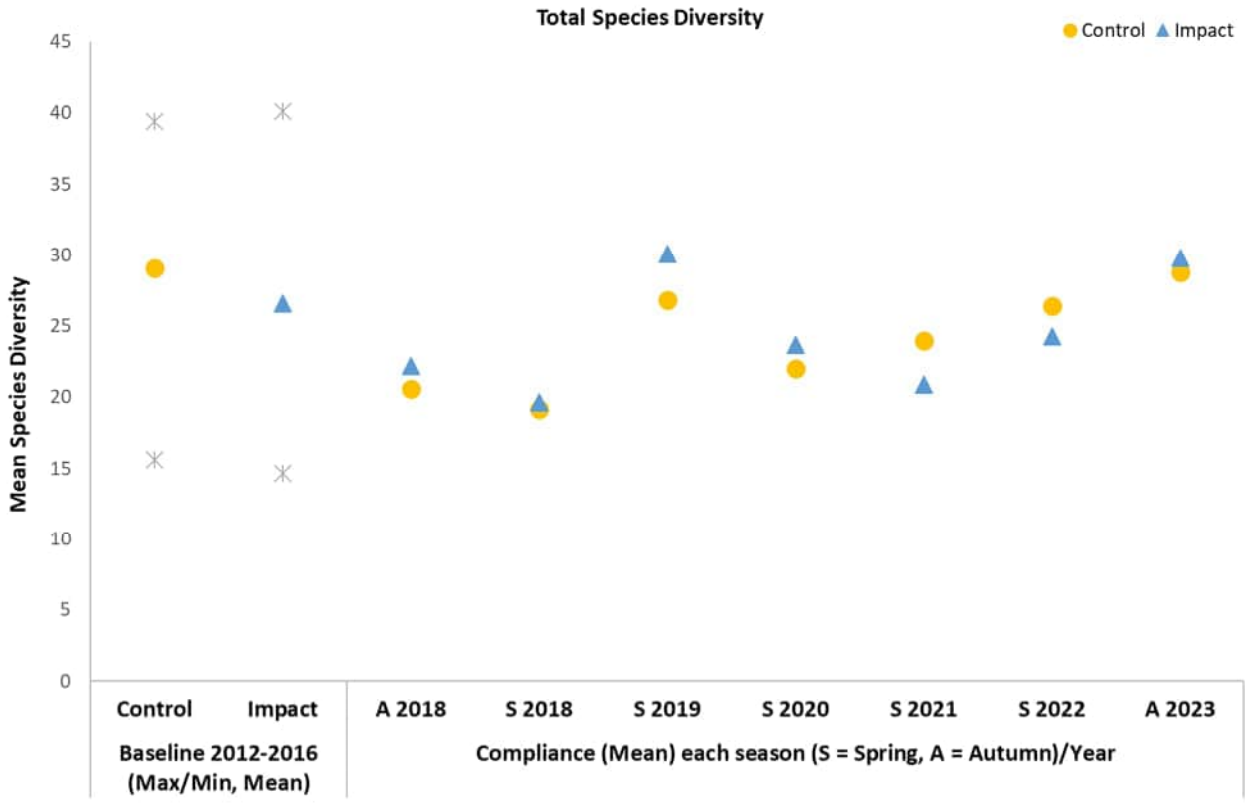

Figure 3-2 Mean diversity of native flora at control and impact sites during baseline and construction/operation phases at Sites 1-16 (excluding sites 8 and 14).

3.2.1.3 Long-lived perennial species diversity: baseline and compliance comparison

Figure 3-3 and Table 3-4 show the range in native species diversity of long-lived perennials at sites surveyed in common during baseline (autumn 2012 to 2016) and during the construction and operation phase / compliance monitoring (autumn 2018 to autumn 2023). Species diversity of long-lived perennials during the autumn 2023 survey was within the range recorded during baseline surveys, 2012 -2016 for all sites.

Mean perennial species diversity for all impact sites combined, and for all control sites, combined has remained within a very narrow range. The mean perennial species diversity for impact and control sites in 2023 were 11.1 and 11.2, respectively; both being mid to upper range for the compliance/construction monitoring period.

Control and impact sites have recorded similar directional changes in perennial species diversity during compliance monitoring. Namely, both control and impact sites recorded increases in mean perennial diversity in 2018, 2019, 2021 and 2022, and a decrease in mean perennial species diversity in 2020. In 2023, the mean diversity for control sites declined slightly, and the mean for impact sites increased slightly.

At individual impact and control sites, perennial species diversity has been very consistent between surveys, for all sites except impact site 12, which has recorded an increasing trend and control sites 1 and 2. The latter have fluctuated between survey period but show no obvious trends.

Table 3-4 Total native species diversity of long-lived perennials, baseline vs compliance monitoring

Site type	One-hectare flora site[1]	Baseline 2012 to 2016		Compliance Monitoring Diversity						
		Min. diversity	Max. diversity	2018 A	2018 S	2019 S	2020 S	2021 S	2022 S	2023 A
Control	1	10	14	12	10	13	7	15	12	11
	2	4	8	4	7	9	6	3	7	7
	7	11	19	16	17	20	10	16	19	11
	9	13	21	15	14	19	16	18	16	19
	13	4	8	4	6	6	6	6	8	8
Control Means		*11.5*		*10.2*	*10.8*	*13.4*	*9.0*	*11.6*	*12.4*	*11.2*
Impact	3	5	10	9	10	10	7	8	9	10
	4	5	10	7	7	8	7	7	8	7
	5	8	14	10	10	11	8	9	11	10
	6	4	8	7	6	7	7	6	6	6
	10	17	29	22	26	26	21	27	25	24
	11	11	16	18	16	17	14	15	17	19
	12	3	7	4	8	8	6	4	10	9
	15	6	10	6	7	8	10	7	7	6
	16	6	10	6	7	7	5	5	7	9
Impact Means		9.7		9.9	10.6	11.3	9.4	9.8	11.1	11.1

[1]Rangeland sites. as per previous reporting, excluding sites 8 and14. Note: Comparable data for 2017 was not available. A= autumn, S = spring

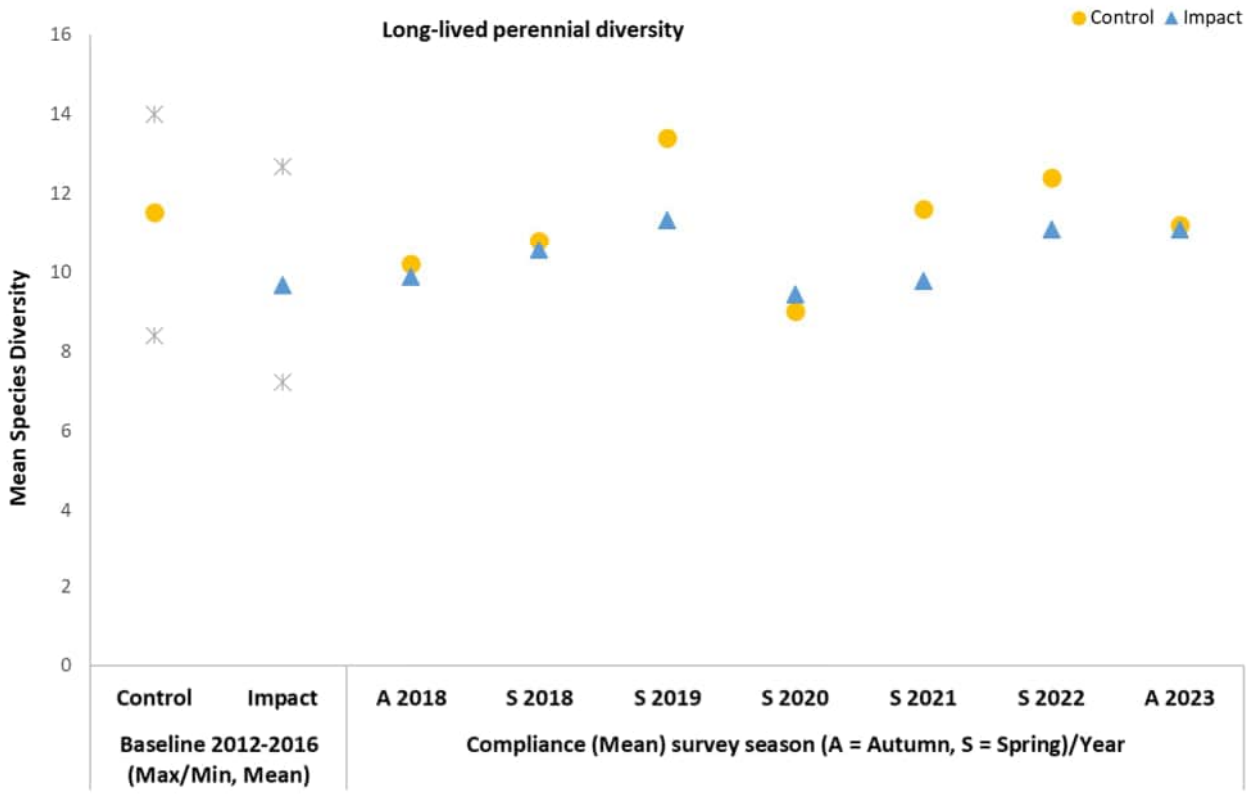

Figure 3-3 **Mean diversity of long-lived flora at control and impact sites, baseline and construction/operation (Site 1-16, excluding site 8 and 14)**

3.2.1.4 Short-lived species diversity: baseline and compliance comparison

During compliance monitoring, the mean short-lived species diversity for both control and impact sites has fluctuated yearly, largely in response to fluctuations in rainfall patterns. In autumn 2023, mean short-lived species diversity for control sites (17.6 species) and for impact sites (18.7 species) was the highest recorded during compliance monitoring, and equal or higher than during baseline monitoring.

For individual sites, 8 sites (both control and impact) recorded highest short-lived species diversity tallies for the compliance/operational period (Table 3-5).

Table 3-5 Total native species diversity of short-lived species, baseline vs compliance

Site type	One-hectare flora site[1]	Baseline (2012 to 2016)		Compliance Monitoring Diversity						
		Min. diversity	Max. diversity	2018 autumn	2018 spring	2019 spring	2020 spring	2021 spring	2022 spring	2023 autumn
Control	1	6	28	12	7	10	11	10	15	20
	2	4	31	10	8	12	15	11	12	14
	7	8	28	14	7	10	7	16	14	14
	9	2	25	6	4	11	18	13	18	21
	13	5	27	10	14	24	14	12	11	19
Control Means				*10.4*	*8*	*13.4*	*13*	*12.4*	*14*	*17.6*
Impact	3	10	35	14	12	19	14	9	16	24
	4	8	29	14	7	17	12	10	15	18
	5	4	32	12	10	14	12	9	10	16
	6	11	24	15	9	21	16	10	12	15
	10	8	28	6	9	14	21	18	18	26
	11	7	33	14	9	20	14	11	14	18
	12	6	25	13	6	21	16	12	13	21
	15	4	29	12	9	23	13	9	12	15
	16	4	30	11	9	20	10	12	9	15
Impact Means				*12.3*	*8.9*	*18.8*	*14.2*	*11.1*	*13.2*	*18.7*

[1]Rangeland sites. as per previous reporting, excluding sites 8 and14. Note: Comparable data for 2017 was not available.

3.2.1.5 Comparison of Long-lived Species Diversity by Habitat Type

Four distinct habitats were recognised at the Flora Rangeland sites: Eliza Creek (major drainage line) sites, Sand Dune sites, Gibber sites (no drainage line) and Gibber sites (with minor drainage line). Trends in perennial species diversity were compared between sites of similar habitat. This was done to:

(i) Determine the magnitude of inherent variation between sites of similar habitats, and

(ii) Detect potential changes in plant diversity associated with a particular habitat, regardless of distance from mining infrastructure; namely if there were any stressors specifically impacting species diversity in sites of similar habitat.

Long-lived species diversity at Eliza Creek sites.

The Eliza Creek sites 17, 18, 19 and 20 were established in autumn 2018, specifically to monitor the potential impacts of the tailings dam embankment on downstream vegetation. In addition, Flora Site 10, established in 2012, is located on Eliza Creek, approximately 2 km downstream from the Tailings Storage Facility (TSF) and is therefore also a potential impact site from the TSF. The Tailings Storage Facility construction began in 2018 and commenced operations during February 2020. As such, the 2018 and 2019 survey data represent the best 'baseline' data available for Eliza Creek survey sites 17-20, noting natural variations in species diversity due to differences in seasonal and yearly rainfall totals, and slight variations in area surveyed at each site.

Since 2018, there has been no distinct trend in species diversity for any of the Eliza Creek sites, with both small increases and decreases occurring at each site (Table 3-6, Figure 3-4). Mean species diversity for each site post construction has either been greater than construction means or decreased by 5 – 10%. There are also no distinct differences in species diversity between sites, species diversity ranging from 21 at site 18 to 25 at site 20 in 2023. In summary there is no clear pattern emerging in species diversity data relating to the time since TSF establishment and the distance from the TSF (sites 17 being the closest and site 10 being the furthest away).

Table 3-6 Total native species diversity of long-lived perennials at Eliza Creek sites during compliance monitoring (all sites considered potential impact sites)

One-hectare flora (rangeland) site*	Construction species diversity				Operational Compliance species diversity				
	2018 autumn	2018 spring	2019 spring	2018 – 2019 mean diversity	2020 spring	2021 spring	2022 spring	2023 autumn	2020-2022 mean diversity
17	19	20	24	21	18	20	27	24	22
18	22	22	25	23	21	20	23	21	21
19	18	16	19	18	23	24	25	24	24
20	24	21	26	24	20	21	23	25	21
10	22	26	26	25	21	27	25	24	24

*displayed by increasing distance from TSF, where flora site 17 = CAR017, 18 = CAR018 and so on.

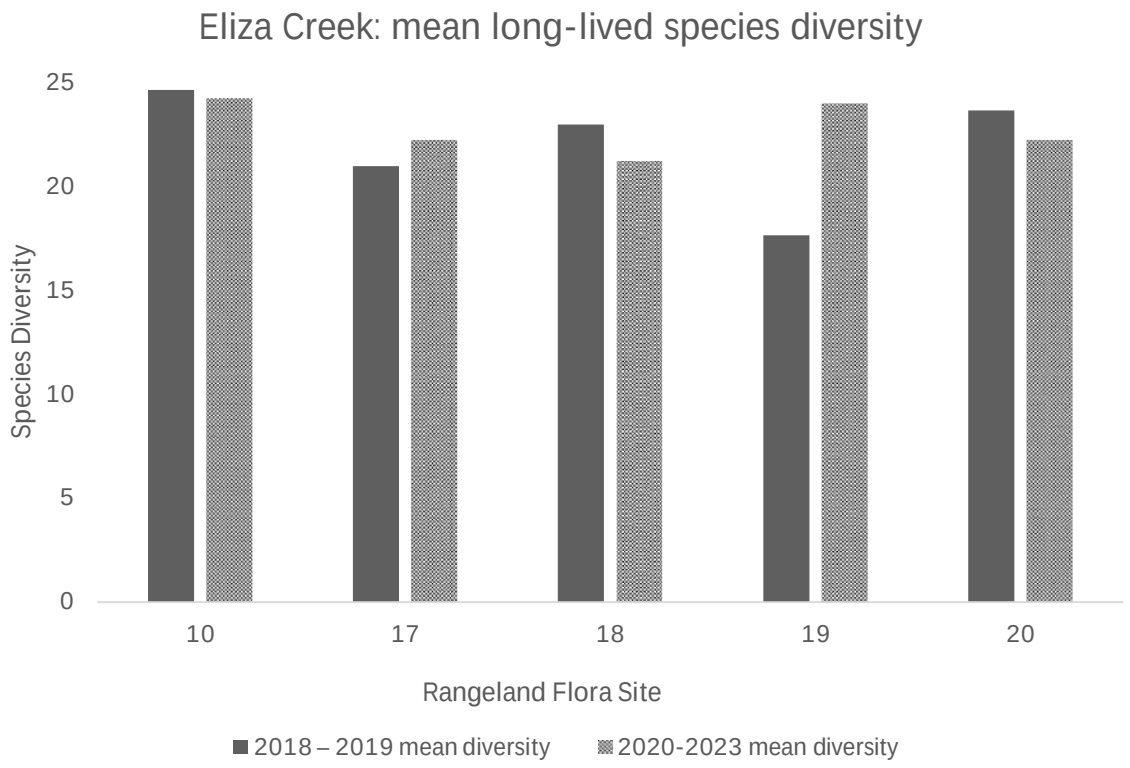

Figure 3-4 Mean diversity of native long-lived species diversity at Eliza Creek Sites (2018 and 2019 = pre-construction, 2020 - 2023 =post-construction)

Long-lived species diversity at Sand Dune habitats

Flora Sites 21 and 22 were established in May 2018 on sand dunes, a previously un-monitored habitat within the Carrapateena Operation area, but the control site was relocated in spring 2018 given proximity to proposed infrastructure. For both sites, perennial species diversity has fluctuated yearly (Table 3-7) without any clear trend emerging in either long-term increases or declines.

Several species are present as isolated individuals only. Due to the undulating nature of the dunes and the absence of on-ground survey markers, it is possible that some perennial species of low abundance, are present but not recorded each year.

Table 3-7 Total native species diversity of long-lived perennials at sand dune habitats during compliance monitoring

One-hectare flora (rangeland) site[1]	Site type	Compliance Monitoring Diversity					
		2018 spring	2019 spring	2020 spring	2021 spring	2022 spring	2023 autumn
21	Control[1]	10	8	7	9	8	12
22	Impact	7	8	10	5	5	7

[1]Flora Site 21 was relocated to a new site in October 2018. Note: The sand dune sites are not defined on the ground. A central point is designated by an easting and northing coordinate and the site is surveyed by walking within an area defined by a 55 m radius from the central coordinate (namely an area equivalent to a 10 000 m2 rangeland site).

Long-lived species diversity at Gibber Habitats with No Drainage Line

Gibber habitat sites that contained no drainage line were control sites 2 and 13, and impact sites 3, 4, 5, 6,12,15 and 16. The results show that there has been no obvious trend in long-lived perennial species diversity at these sites. Mean diversity at all sites during compliance monitoring has remained within the baseline range, and been similar to baseline diversity (Table 3-8 and Figure 4).

Post-construction long lived species diversity has fluctuated slightly at all sites with no consistent trend evident at any site, regardless of distance from mining infrastructure. Post construction, sites 3 and 5 have recorded the highest mean perennial species diversity, noting that these are impact sites closest to major mining infrastructure.

Table 3-8 Long-lived plant species diversity at gibber sites (with no minor drainage line)

Site type	Site #	Long-lived plant species diversity								
		Mean 2012-2016	Mean 2018-2023	2018 autumn	2018 spring	2019 spring	2020 spring	2021 spring	2022 spring	2023 autumn
Control	2	5.3	6.1	4	7	9	6	3	7	7
Impact	3	7.3	9.0	9	10	10	7	8	8	10
Impact	4	7.6	7.3	7	7	8	7	7	9	7
Impact	5	9.7	9.9	10	10	11	8	9	8	10
Impact	6	6.3	6.4	7	6	7	7	6	11	6
Impact	12	4.7	7.0	4	8	8	6	4	6	9
Control	13	6.6	6.3	4	6	6	6	6	10	8
Impact	15	7.9	7.3	6	7	8	10	7	7	6
Impact	16	6.7	6.6	6	7	7	5	5	7	9

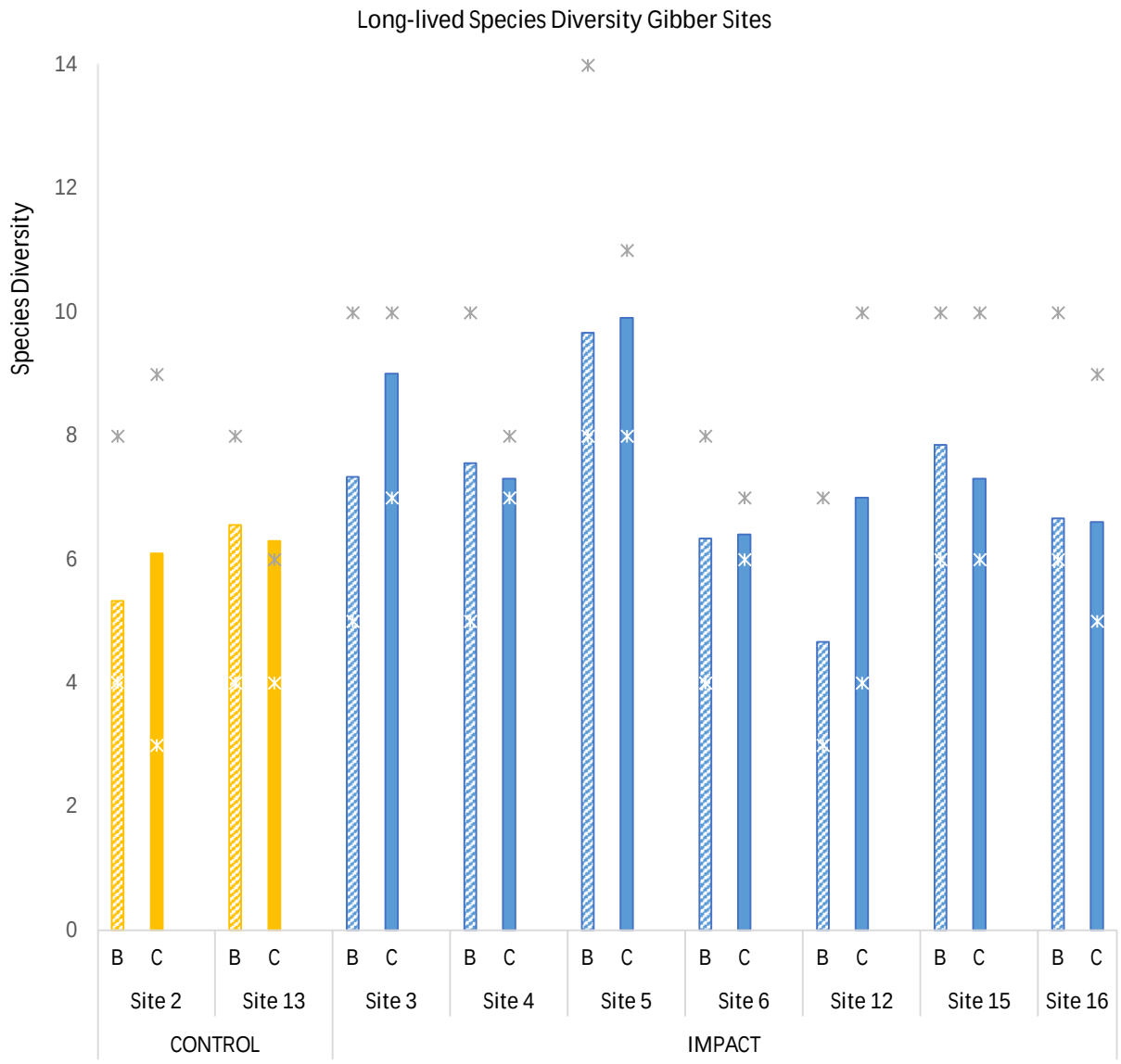

Figure 3-5 **Mean long lived species diversity at gibber sites (no minor drainage line in sites); stars show maximum and minimum species diversities. B= Baseline, C= Compliance.**

Long-lived species diversity at Gibber habitats that include a Minor Drainage line

Flora sites were categorised into different habitats to determine if there were any stressors acting upon sites of similar habitat which may be impacting on species diversity, regardless of distance from mining infrastructure. One of these habitats included gibber sites that contained a minor drainage line. These were control sites 1, 7 and 9, and impact site 11.

The results show that there has been no obvious trend is long-lived perennial species diversity at these sites. Mean diversity at all sites during post-construction monitoring has remained within the baseline range and been similar to baseline means (Table 3-9 and Figure 3-6).

Mean diversity at these sites has ranged from 12.2 to 18 during the pre-construction baseline monitoring and from 11.4 to 16.6 post construction compliance monitoring. Post construction species diversity has fluctuated quite widely at control sites 1 and 7, and to a lesser extent at sites 9 and 11, but overall has shown no clear

trends at these sites (Table 8). Variations in long-lived species diversity at these sites is thought to be largely due to slight variations in area surveyed at each site.

Table 3-9 Species diversity at gibber sites with a minor drainage line

Site type	Site #	Long-lived plant species diversity								
		Mean 2012-2016	Mean 2018-2023	2018 autumn	2018 spring	2019 spring	2020 spring	2021 spring	2022 spring	2023 autumn
Control	1	12.2	11.3	12	10	13	7	15	12	11
Control	7	15.4	15.5	16	17	20	10	16	19	11
Control	9	18.0	17.0	15	14	19	16	18	16	19
Impact	11	14.4	16.3	18	16	17	14	15	17	19

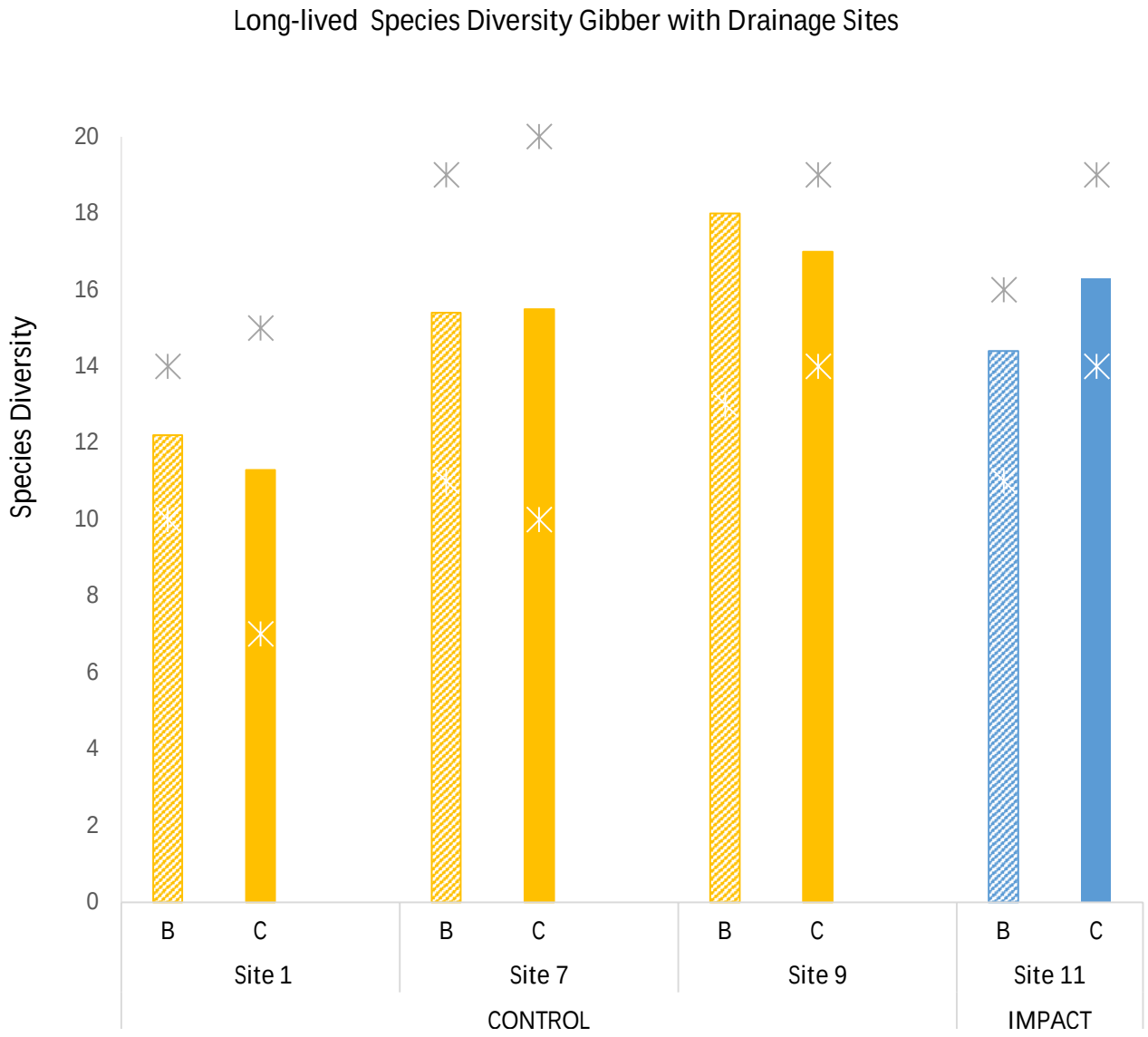

Figure 3-6 Mean long lived species diversity at gibber sites that include a minor drainage line; stars show maximum and minimum. B= Baseline, C= Compliance.

3.2.2 Jessup transects – population structure of long-lived woody perennials.

Jessup transects were conducted at all 13 gibber habitat flora sites (sites 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 15 and 16) and at the five Eliza Creek flora sites (sites 10, 17, 18, 19, 20). Raw data for all Jessup transects is presented in Appendix D2).

3.2.2.1 Gibber Habitat Jessup Transects

Jessup data (Appendix D2) shows the total number of adults and juveniles of long-lived woody perennials for the flora sites, recorded in autumn 2023. Bladder Saltbush (*Atriplex vesicaria*) dominates the Jessup transects, scoring approximately eight times more individuals than the next most abundant species; Samphire (*Tecticornia medullosa*) and Plains Lantern Bush (*Abutilon halophilum*).

Since construction monitoring in autumn 2018, the cumulative total number of adult and juvenile *Atriplex vesicaria* from all gibber sites was highest in spring 2018 (3455 individuals), and lowest in spring 2020 (2175 individuals). The total abundance recorded in 2023 (2491 individuals) was approximately mid-range for tallies recorded spring 2018 to autumn 2023. In 2023 the number of juveniles recorded (191) was second only to spring 2018 (243), since construction monitoring began.

Due to a large increase in abundance in 2023, Plains Lantern Bush (*Abutilon halophilum*) was the next most abundant species recorded in 2023: 369 individuals were recorded across seven sites compared with 272 individuals in 2022, which in turn was up from 184 individuals across 5 sites in 2021 and 224 individuals in 2020).

Samphire (*Tecticornia medullosa*) was the next most abundant species recorded, with a combined total of 334 individuals recorded from 10 survey sies, very similar to the 330 individuals recorded in 2022 (compared with 369 individuals in 2021, and 303 individuals in 2020.

A fourth long-lived perennial species, Sea Heath (*Frankenia serpyllifolia*) was also widespread in the gibber habitat, with a total of 169 individuals across 10 sites, compared with 181 in 2022 and 118 individuals at 9 sites in 2021.

Further interrogation of the presence of these four species at control and impact sites, is provided below.

3.2.2.2 Bladder Saltbush (*Atriplex vesicaria*)

Bladder Saltbush is a long-lived woody perennial, and the dominant plant species at the gibber habitat Jessup Transects (sites 1 to 9 and 11 to 16).

At control sites, the mean number of Bladder Saltbush plants declined by 10% between 2022 and 2023. However, this was largely due a 43% reduction in abundance at Site 1, all other control sites recording variations in abundance ranging from 1 to 7% (two sites increasing and two sites decreasing in abundance).

At impact sites the mean number of Bladder Saltbush plants was similar to 2022 (a mean of 252 plants in 2022 compared with 246 plants per site in 2023). However, the magnitude and direction of change in abundance was highly variable between sites, ranging from a decline of 27% at site 11 to an increase of 32% at site 12.

Previously during construction monitoring at the impact sites, the mean number of Bladder Saltbush plants declined by 25% between 2018 and 2020, before increasing by 14% in 2021 and 8% in 2022, back to approximately 2018 abundance levels (Figure 1). At control sites, the mean number of Bladder Saltbush plants recorded a 65% decline between 2019 and 2021 but increased by 29% in 2022.

At impact sites, the mean number of Bladder Saltbush individuals during all compliance monitoring surveys has remained within the range recorded during baseline surveys (2012 – 2015 for Jessup data). However, at control sites, the mean number of Bladder Saltbush in 2020, 2021, 2022 and 2023 were all below the baseline range (Figure 3-7).

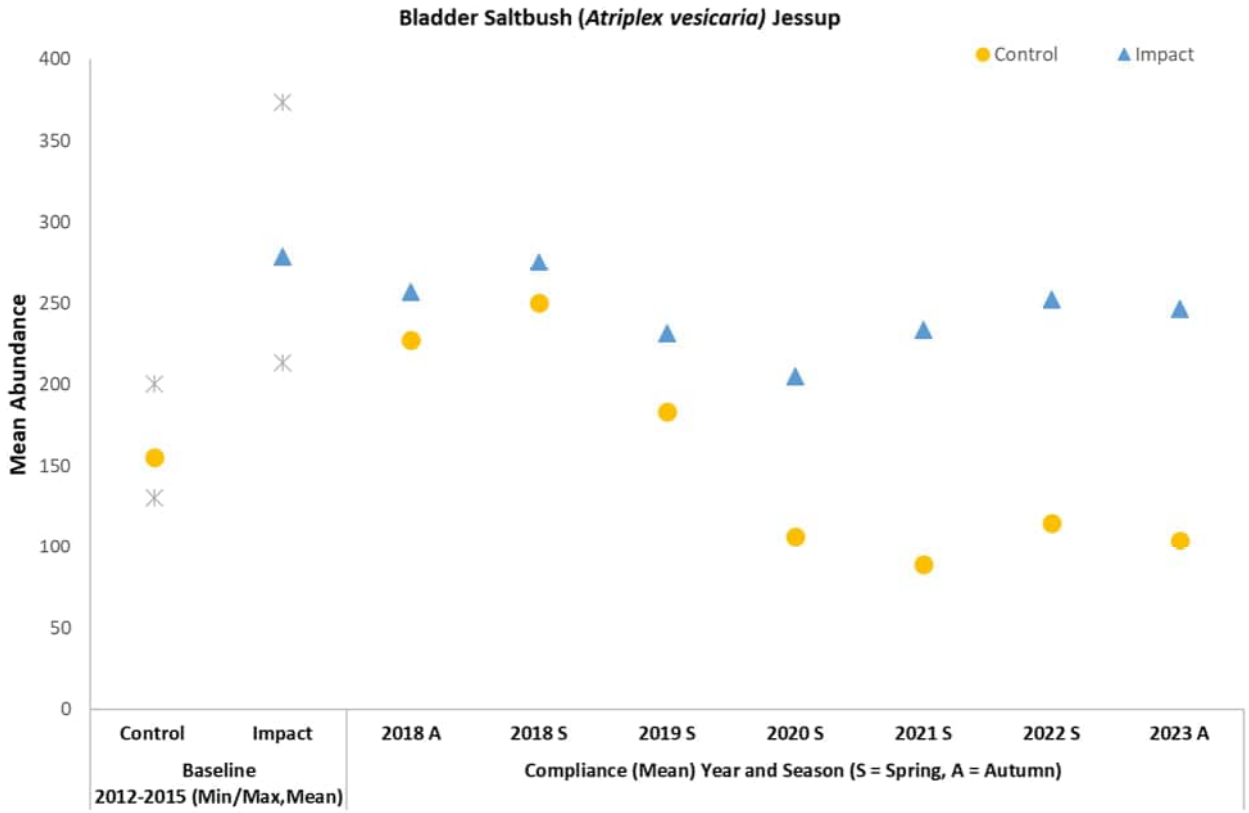

Figure 3-7 Mean abundance of Bladder Saltbush (adults and juveniles combined) at control and impact sites, baseline versus compliance monitoring.

3.2.2.3 Samphire (*Tecticornia* species)

All Samphire species were analysed collectively. The most widespread Samphire species is *Tecticornia medullosa*, with *T. pergranulata* and *T. tenuis* being present at a few sites only. At Jessup transects, Tecticornia species were present at five control sites and at eight impact sites.

In 2023, the mean number of Tecticornia individuals declined by 13% at control sites - but remained within the baseline range. This decline followed a 50% increase in 2022. At the five control sites, Tecticornia abundance remained the same at two sites, increased at one site and declined at two sites.

Since 2018, the mean number of Tecticornia individuals at control sites has been within, or exceeded, the baseline range except in 2021, when the mean number of Tecticornia plants was 24.6, compared with the baseline minimum of 25.6.

In 2023, the mean number of Tecticornia individuals increased by 11% at impact sites, and was within the baseline range of abundance. Tecticornia abundance declined at three sites and increased at five sites.

The mean number of Tecticornia for impact sites was within the baseline range in 2018, 2019 but slightly below the baseline range in 2020, 2021 and 2022- namely, 28.6, 30.8 and 29.9 plants, respectively, compared with the baseline minimum of 31.8. In 2023, the mean number of Tecticornia individuals at impact sites returned to being within the baseline range (Figure 3-8).

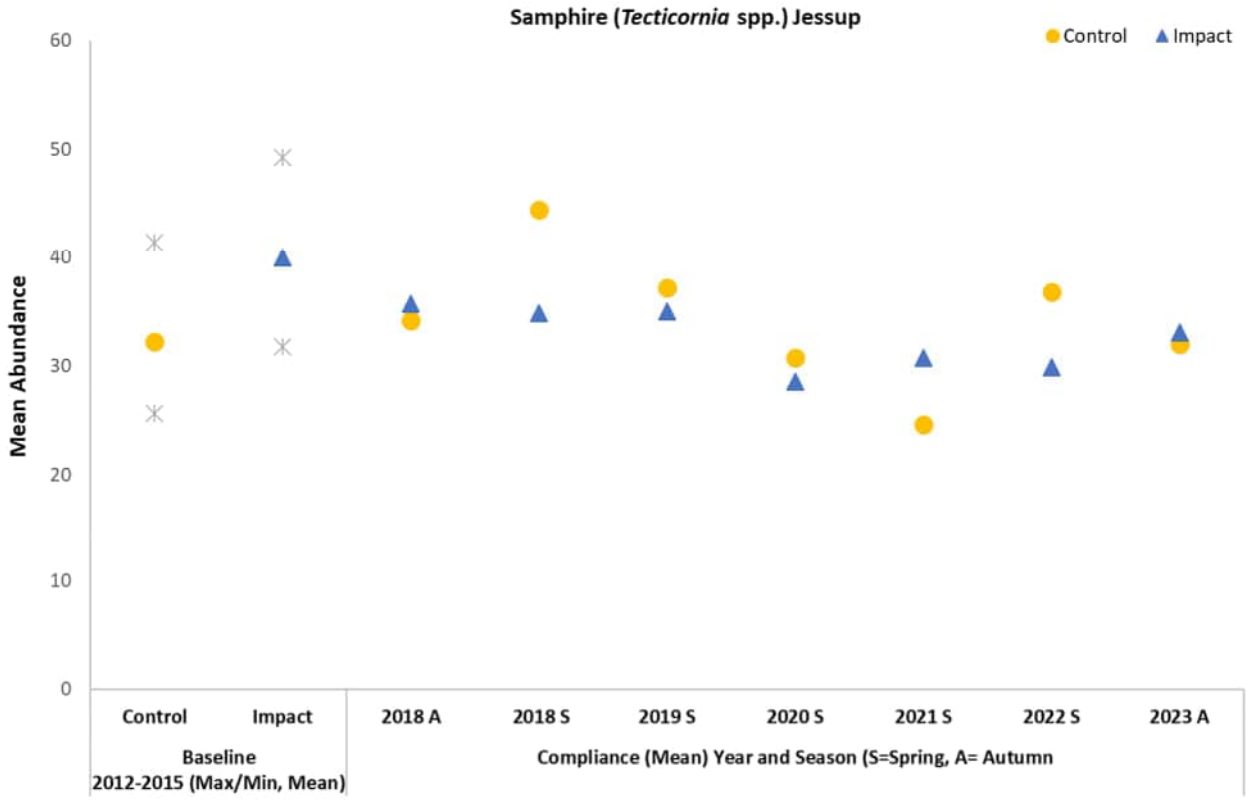

Figure 3-8 Mean number of Samphire (*Tecticornia sp.*) at Jessup control and impact sites, baseline (2012-2015) vs compliance monitoring (autumn 2018 to autumn 2023).

3.2.2.4 Sea Heath (*Frankenia serpyllifolia*)

In 2023, there was a 10% increase in the mean number of plants recorded at control sites, and a 12% decline recorded at impact sites. However, at most control and impact sites, the abundance of Sea Heath is less than 10 plants and absolute changes in individual numbers per site varied by less than 3 individuals at ten sites.

Over 85% of all Sea Heath at control sites are present at sites 3 and 5 (102 individuals), with the remaining six control sites tallying 18 individuals. Hence the relatively large fluctuations in numbers at site 5 have strongly influenced control means.

At control sites, the mean number of Sea Heath has been within the baseline range for all survey periods except Spring 2021. At impact sites, the mean number of Sea Heath has remained within the baseline range during all compliance phase surveys.

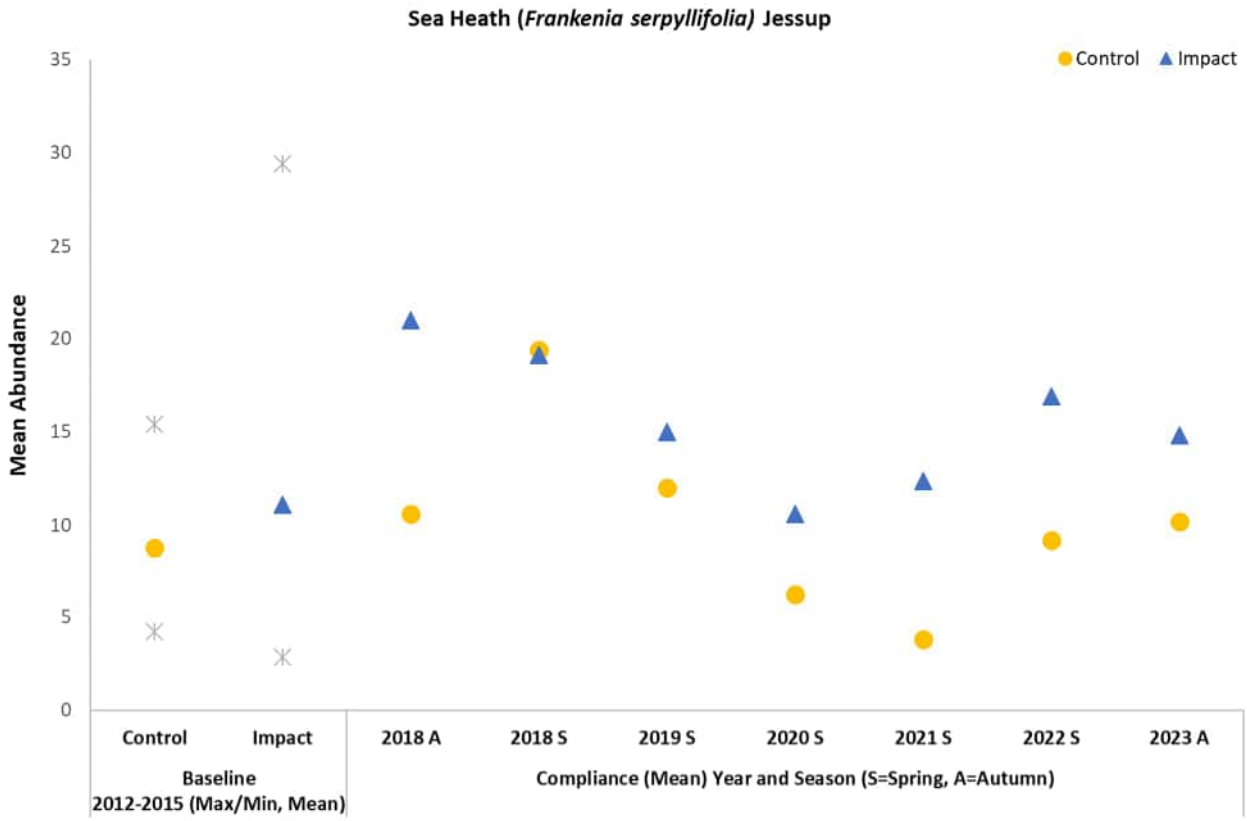

Figure 3-9 Mean number of Sea Heath at Jessup control and impact sites, baseline versus compliance monitoring.

3.2.2.5 Plains Lantern Bush (*Abutilon halophilum*)

Due to large increases in abundance, Plains Lantern Bush (adults and juveniles combined) was the second most abundant long-lived perennial plant at gibber habitats (following a ranking of 4th in 2022). When only adult plants are considered, Plains Lantern Bush ranked third behind *Tecticornia medullosa* in 2023.

In 2023, a total of 369 individuals (294 adults, 75 juveniles) were recorded across seven sites compared with 272 individuals in 2022 (251 adults, 21 juveniles), which in turn was up from 184 individuals across 5 sites in 2021 (all adults, no juveniles) and 224 individuals in 2020.

Figure 3-10 shows that the mean number of Plains Lantern Bush individuals recorded large increases in 2023, following similar increases in 2022. These increased followed declines in 2019, 2020 and 2021.

At the control sites in 2023, Plains Lantern Bush recorded an almost 3-fold increase in abundance at two of the three control sites (at the third control site, Plains Lantern bush abundance has varied between nil and one individual since spring 2018). At the impact sites, Plains Lantern Bush increased between 10% and 200% at four sites, remained at zero plants at two sites, and increased from zero to four plants at the final site. Juveniles comprised approximately 20% of all *Abutilon halophilum* individuals.

At impact sites, the mean number of Plains Lantern Bush during all compliance monitoring surveys has remained within the range recorded during baseline surveys (2012 – 2015) and has equalled or exceeded the baseline mean. At control sites, the mean number of Plains Lantern Bush was below the baseline range in both 2020 and 2021 but returned to within baseline levels in 2022 and 2023. The 2023 abundance levels were above the baseline mean.

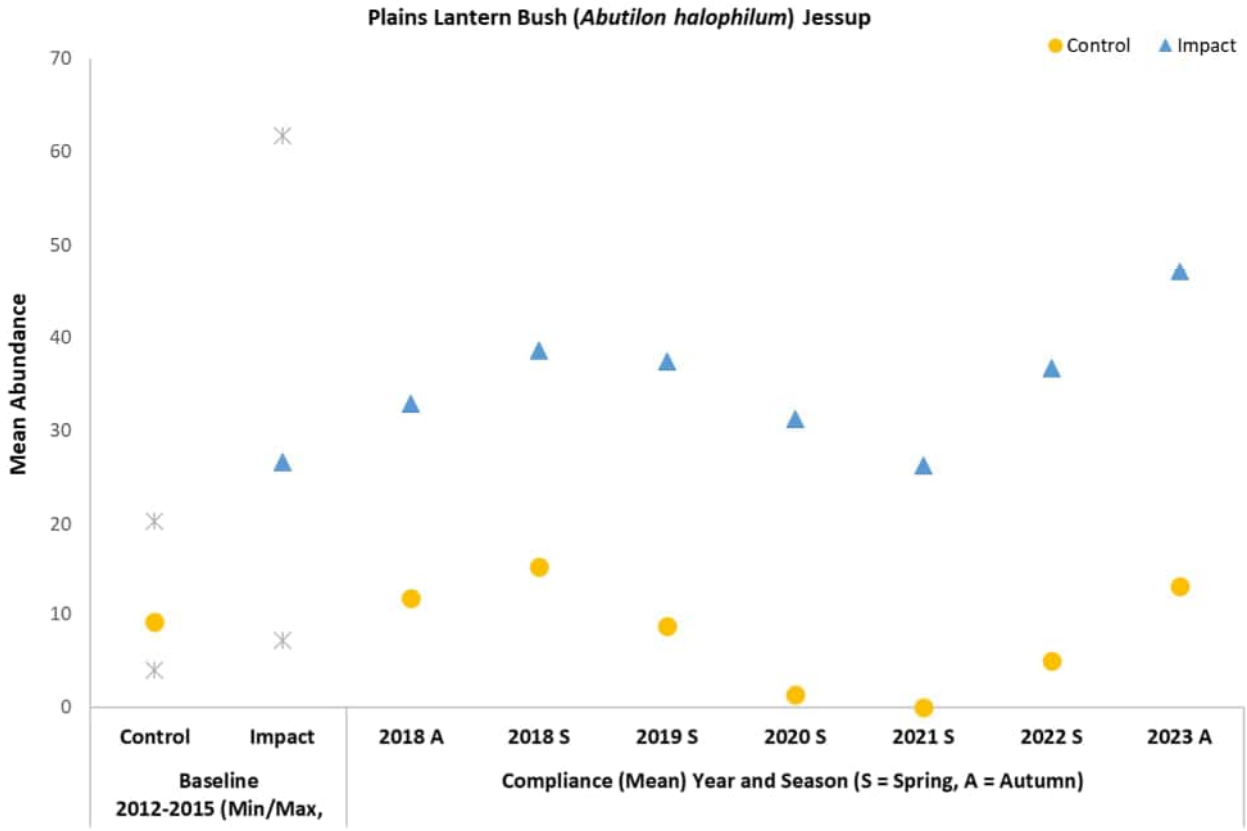

Figure 3-10 **Mean number of Plains Lantern Bush (*Abutilon halophilum*) at Jessup control and impact sites, baseline versus compliance monitoring.**

3.2.2.6 Cunninghams Daisy (*Minuria cunninghamii*)

During the construction monitoring period, *Minuria cunninghamii* abundance declined (or remained at very low levels) in 2020 and 2021. In 2022, the abundance increased at four sites, and remained the same at the remainder. In 2023, *Minuria cunninghamii* increased on average by at least 200% at all sites.

During the baseline period, *Minuria cunninghamii* abundance from eight sites averaged 4.6, with a weighted average (taking into account abundance at each site) of 5.5. During construction, the average abundance from eight sites was 4.8, and with a weighted average of 9.9. At sites 6 and 11 (both impact sites), the maximum number of *Minuria* was recorded at a site during the whole of the baseline and construction period (Table 3-10.

Table 3-10 Summary of *Minuria cunninghamii* abundance, baseline and construction

Site (adults)	Mean 2012 - 2015	Mean 2018-2023	Max 2012 - 2015	Max 2018-2023	Min 2012-2015	Min 2018-2023
7	3.8	2.3	7	6	0	0
3	3.8	4.3	11	13	0	0
4	4.0	1.1	8	3	0	0
5	5.2	1.4	19	6	0	0
6	7.8	13.3	17	26	1	4
11	7.0	13.1	15	58	0	0
12	4.3	2.1	17	14	1	0
16	1.2	0.6	3	4	0	0
Mean	4.6	4.8	12.1	16.3	0.3	0.5
Weighted Average	5.5	9.9	14.6	31.8	0.4	1.4

3.2.2.7 Jessup transects Eliza Creek sites

To assess potential impacts on vegetation downstream of the Tailings Storage Facility, four sites were established in autumn 2018 progressively downstream from the TSF embankment within Eliza Creek. In addition, Site 10 was an existing site, established during baseline surveys, located downstream from site 20 (furthest from the TSF). At each site, the survey methods included a Jessup transect, which is a count of all adult and juvenile woody long-lived perennial species. In 2023, sites 10 and 18 recorded 24% and 5% increases in the total number of long-lived woody perennials, and sites 17, 19 and 20 recorded 10% - 19% declines. However, all sites have recorded a net increase in the total number of long-lived woody perennials since 2018 (Table 3-11).

Table 3-11 Summary of Eliza Creek Jessup Results, counts of woody perennial plants

Site	Distance from TSF	Year (spring)	Total # perennials[1]	Yearly Change	Change 2018-2023
CAR017	270 m	2018	287	NA	+13%
		2019	274	-5	
		2020	308	+12	

		2021	315	+2.3	
		2022	399	+26	
		2023	325	-18	
CAR018	930 m	2018	391	NA	+28%
		2019	371	-5	
		2020	356	-4	
		2021	339	-5	
		2022	477	+40	
		2023	500	+5	
CAR019	3,000 m	2018	211	NA	+34%
		2019	224	+6	
		2020	232	+5	
		2021	299	+28	
		2022	313	+5	
		2023	283	-10	
CAR020	4650 m	2018	83	NA	+17%
		2019	118	+42	
		2020	97	-17	
		2021	106	+8.5	
		2022	118	+11	
		2023	97	-18	
CAR010	> 5 km	2018	269	NA	+43%
		2019	167	-38	
		2020	273	+64	
		2021	272	+0.4	
		2022	312	+15	
		2023	386	+24	

[1]Total number of adults and juveniles from long-lived woody perennial species

3.2.2.8 Abundance of selected long lived perennials at Eliza Creek sites

To further analyse population trends in long-lived species at the Eliza Creek transects, the total number of individuals recorded for the most widespread and/or abundant species are presented in Figure 3-11 **to** Figure 3-20

The results show no distinct downward trends in the abundance of any species at any survey site. *Ptilotus obovatus* has recorded an upward trend at sites 10, 17 and 19. *Acacia tetragonophylla* is showing a very slight downward trend at site 10, but no distinct trends at other sites. *Acacia papyrocarpa* abundance has widely fluctuated at site 18, thought largely due to fluctuations in seedling abundance (seedlings germinating but not surveying beyond a year). *Myoporum montanum* abundance has also fluctuated widely between survey periods at site 10. The reason is not immediately apparent, but may be due to slight differences in transect alignment (vegetation along this transect is densely spaced).

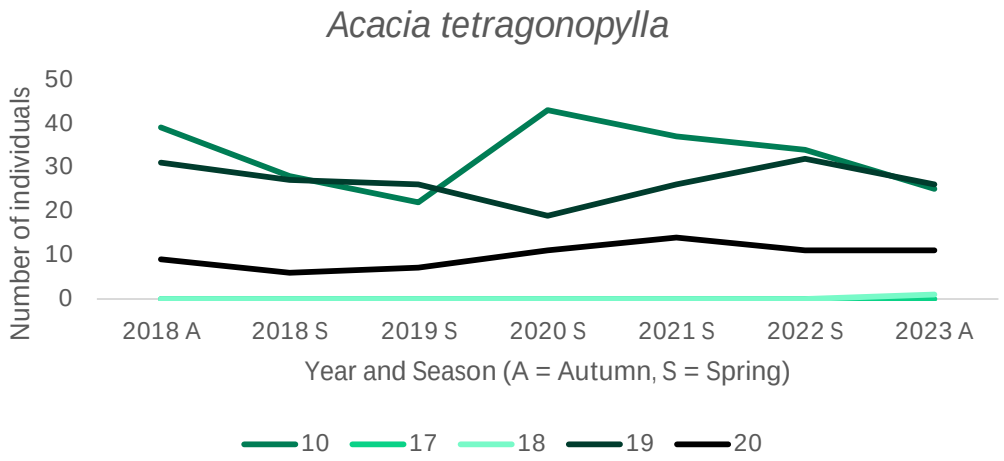

Figure 3-11 Abundance of *Acacia tetragonophylla* (adult and juveniles) recorded along Eliza Creek Jessup transects (2018 – 2023).

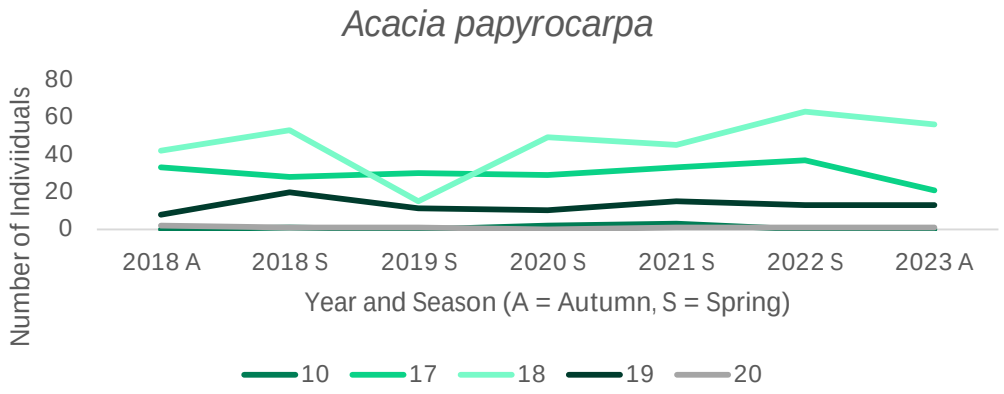

Figure 3-12 Abundance of *Acacia papyrocarpa* (adult and juveniles) recorded along Eliza Creek Jessup transects (2018 – 2023).

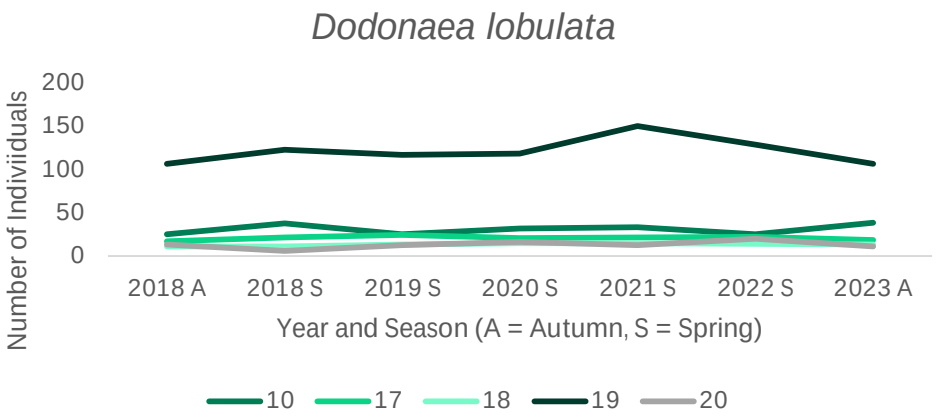

Figure 3-13 Abundance of *Dodonaea lobulata* (adult and juveniles) recorded along Eliza Creek Jessup transects 2018 – 2023.

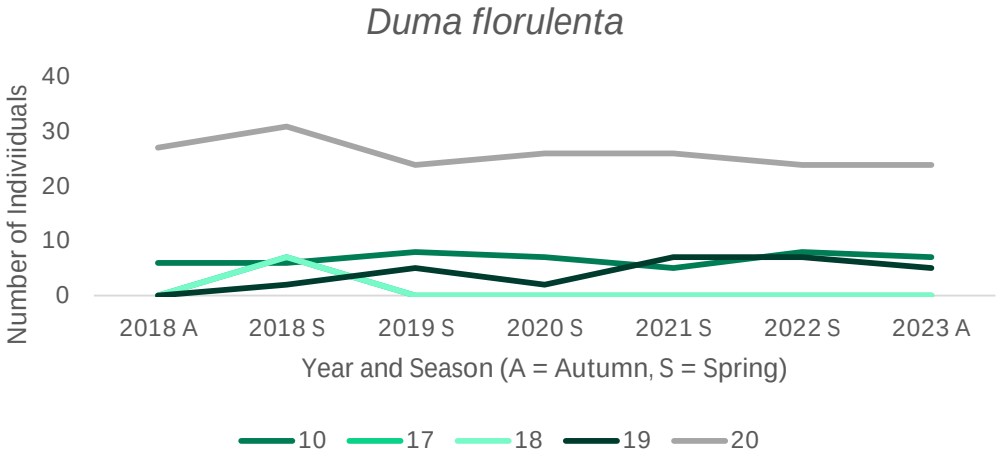

Figure 3-14 Abundance of *Duma florulenta* recorded at Eliza Creek Jessup transects 2018 – 2023.

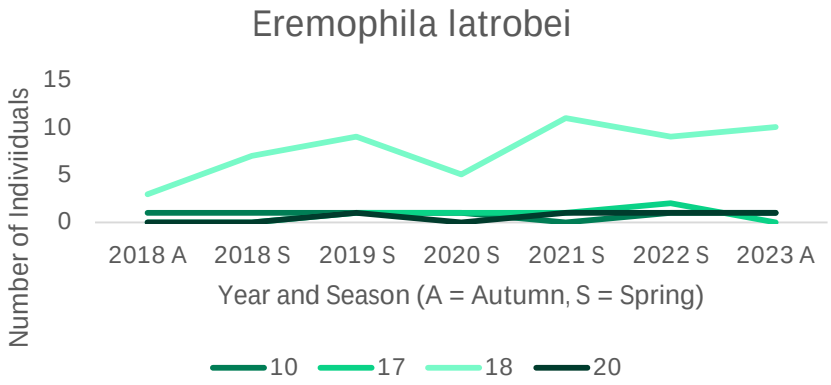

Figure 3-15 Abundance of *Eremophila latrobei* (adult and juveniles) recorded along Eliza Creek Jessup transects (2018 – 2023).

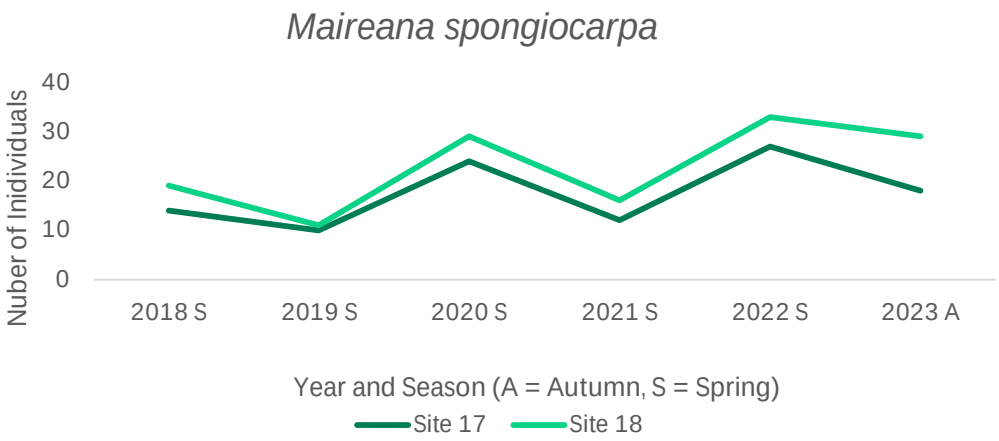

Figure 3-16 Abundance of *Maireana spongiocarpa* (adult and juveniles) recorded along Eliza Creek Jessup transects (2018 – 2023).

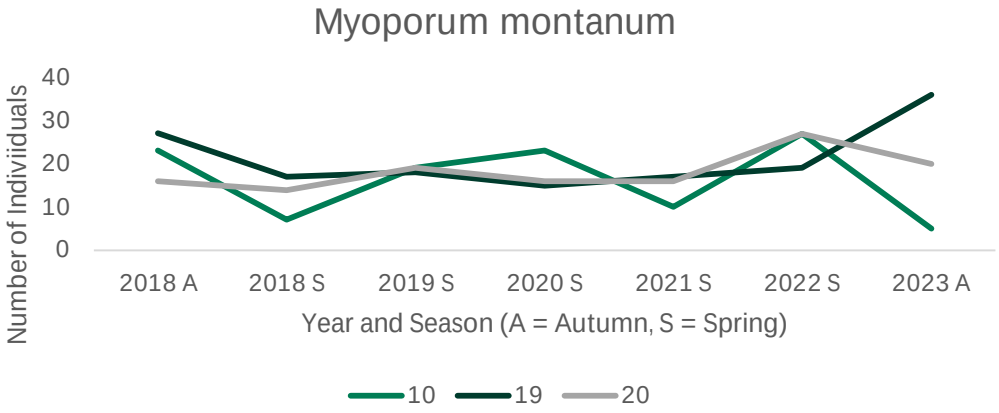

Figure 3-17 Abundance of *Myoporum montanum* (adult and juveniles) recorded along Eliza Creek Jessup transects 2018 – 2023.

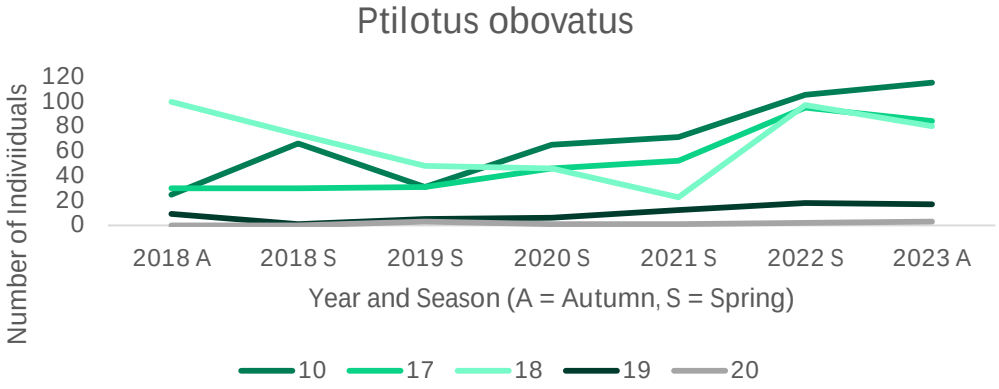

Figure 3-18 Abundance of *Ptilotus obovatus* (adult and juveniles) recorded along Eliza Creek Jessup transects (2018 – 2023).

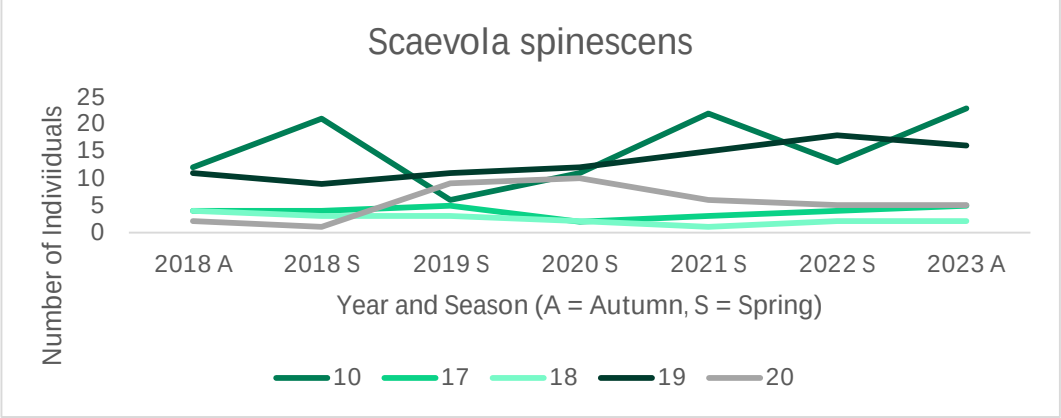

Figure 3-19 Abundance of *Scaevola spinescens* (adult and juveniles) recorded at Eliza Creek Jessup transects (2018 – 2023).

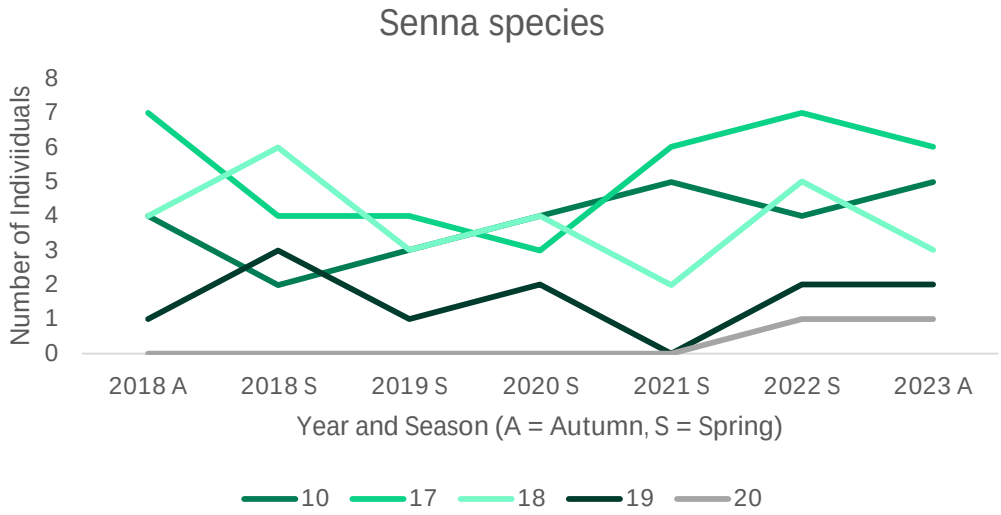

Figure 3-20 Abundance of Senna species (adult and juveniles) recorded along Eliza Creek Jessup transects (2018 – 2023).

3.2.3 Canopy cover tree health

In addition, to Jessup transects, Canopy Cover was also assessed at transects in the Eliza Creek sites to assess potential impacts on tree health due to seepage from the Tailings Storage Facility or reduced water flows down the catchment. Noting that sites 17 and 18 are Western Myall sites and sites 19 and 20 are Red Gum-dominated (refer Table 3-12 for approximate distance from TSF).

3.2.3.1 Summaries of Canopy Cover Changes 2020 to 2022

Table 3-12 summarises trends in canopy cover along each transect, using two techniques: the densitometer, and visual estimates of individual canopy extent.

Table 3-12 Summary of canopy changes 2020 to 2023

Transect, Landscape position, tree species[1]	Changes 2022 to 2023	Trends 2018/2019 to 2023
CC17A Channel (270 m from TSF) WM: 11 live, 0 dead	No discernible change in canopy intactness of existing trees; 10 of the 11 trees remain with complete or near complete canopies. One tree with an estimated 40% canopy loss. No loss or addition of trees	Slight increase in already very high levels of canopy intactness. Gradual increase in percentage of within-canopy records that are foliage. Increase in total foliage records from 43 to 55. Increase in number of live trees intercepted along transects from a combined total of 14 to 19. Increase in total foliage records (densitometer) from 43 to 55. No tree deaths.
CC17B Bank (270 m from TSF) WM: 8 live 0 dead	No discernible change in canopy intactness of existing trees. All 8 trees remain with complete or near complete canopies. No loss or addition of trees	
CC18A Bank (930 m from TSF) WM: 18 live,1 dead	No tree deaths. 5 additional trees (juveniles) recorded along alignment. 50% increase in total foliage (densiotometer) records. Average canopy intactness increased from 80 to 89%, due to all additional trees having no canopy loss. 12 of the 13 trees with near intact or intact canopies, one tree remains in very poor health.	Densitometer results show an increasing trend in the number of live foliage recordings along the transect, reflecting in part the increased number of healthy trees along the transect. Also accompanied by a large increase in percentage of densiotometer records that were live foliage. One tree with very low canopy intactness died in 2021. But there has been an increase from 12 trees in spring 2019 to 18 live trees in 2023.
CC18B Channel (930 m from TSF) WM: 3 live, 2 dead	Death of one tree (recorded in 2022 with 99% canopy loss). Two of the remaining threes have increased in canopy intactness. One tree has decreased canopy intactness. No obvious change in densitometer total number of foliage records.	No obvious trends total foliage (densiotometer) records but the % of within-canopy foliage records has shown an increasing trend, reflecting increased canopy health. Decline from 5 live trees in 2019 to 3 live trees in 2023. The three remaining trees have all increased canopy intactness. No new trees recorded along transect.
CC19A Channel (3km from TSF) RG: 6 live, 2 dead WM: 7 live, 1 dead	No obvious change in densiotometer foliage records for Red Gums or for Myalls. Five of the six Red Gums recorded 10-30% increases in visual estimates of canopy intactness. No change in one tree. The seven existing Western Myall retained complete canopies. No loss or additional trees recorded.	No obvious trends. Densitometer results showed a decline in total foliage records in 2019 and 2020 before increasing in both 2021 and 2022 and no change in 2023. The percentage of within-canopy foliage records remained stable from 2018 to 2021, but increased significantly in 2022 and 2023. Visual estimates of Red Gum canopy extent show an increase in canopy intactness since 2019 for five trees and no

Transect, Landscape position, tree species[1]	Changes 2022 to 2023	Trends 2018/2019 to 2023
		change for two trees. Canopy intactness for the Myall trees has remained at or near 100%.
CC19B Channel Edge (3 km from TSF) RG: 5 live, 1 dead WM: 6 live, O dead	No obvious change in densiotometer foliage records for Red Gums or for Myalls. Large increases in visual estimates of canopy intactness for Red Gums; no change in two trees. No death or additional Red Gums. One new Myall intercepted and no loss of Myalls. No obvious change in visual estimates of Western Myall canopy completeness (all but one with no obvious canopy loss).	Densitometer results showed no distinct trends between 2018 and 2023. Since 2019, all Red Gums but one recovered canopy extent from about 30 – 70% to now almost complete canopies. One tree remains with > 90% canopy loss. Trends in visual estimates of canopy extent have been highly variable between Red Gum trees and between survey periods, but no overall trend in mean canopy extent. One Red Gum has died and one new Red Gum recorded. Increase from 3 to 6 Western Myalls. All but one retaining near complete canopies and no change in remaining tree with high canopy loss.
CC20A Channel Edge (4.65 km from TSF) RG: 9 live; 0 dead WM: 1 live, 0 dead	All Red Gums recorded increases in visual estimates of canopy intactness, or retained near complete canopies. No loss or addition of Red Gums. No loss or addition of Myalls. No obvious changes in densitometer foliage records	The number of densitometer records has varied yearly, but overall no distinct trends apparent between 2018 and 2023. No loss or addition of Red Gums. One Myall tree has been recorded each survey, and has retained a complete canopy.
CC20B Channel (4.65 km from TSF) RG: 4 live, 0 dead WM: nil	Three of the four Red Gums recorded large increases in visual estimates of canopy extent. The remaining tree retained a near complete canopy. No new Red Gums or loss of Red Gums. No obvious changes in densitometer foliage records.	No new Red Gums and no loss of Red Gums. The four Red Gums have increased canopy intactness from 20 – 80% in 2019 to 70 – 100% in 2023. The number of densitometer records has varied yearly, but no distinct trends apparent between 2018 and 2023.

[1]WM = Western Myall (*Acacia papyrocarpa*), RG = Red Gum (*Eucalyptus camaldulensis subsp. arida*), CC = Canopy cover

3.2.3.2 Percentage of transect under live foliage (densitometer data)

Comparing the total number of densitometer foliage records along a transect over time provides an indication of changes in total canopy volume along the transect. Potential changes in total canopy volume may be a combination of canopy expansion of individual trees (natural growth, improved canopy health), dieback; and/or recruitment of trees.

Western Myall

For each site the mean number of Western Myall foliage records for the two transects has varied between survey periods, but sites 17 (Western Myall) and 18 (Western Myall) have trended strongly upwards (Figure 3-21). This applies to both of the canopy cover transects at Site 17 (bank and channel locations). Since spring 2018, the total number of foliage records at site 18 have doubled, without declining in any year. At site 17, there was a decline in spring 2019, remained stable in 2020, and has increased each recorded period since then.

At the Red Gum dominated site 19, where Western Myalls are fewer than at sites 17 and 19, there has also been an increasing trend in the total number of foliage records for Myalls, albeit not as strong as at sites 19 and 20. At site 20, there has been only one Western Myall tree intercepted at all recording periods, and the foliage records have been relatively constant.

Results for Western Myall foliage for each site are presented in Figure 3-21 (showing the sum of foliage records for the two transects) and Figure 3-22 (showing results for individual transects).

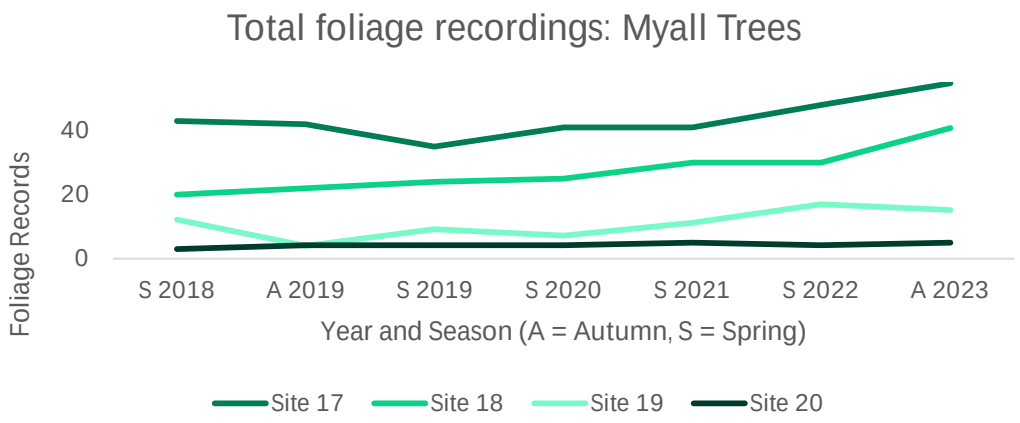

Figure 3-21 Total number of Western Myall foliage records 2018 to 2023 at each site (both transects combined)

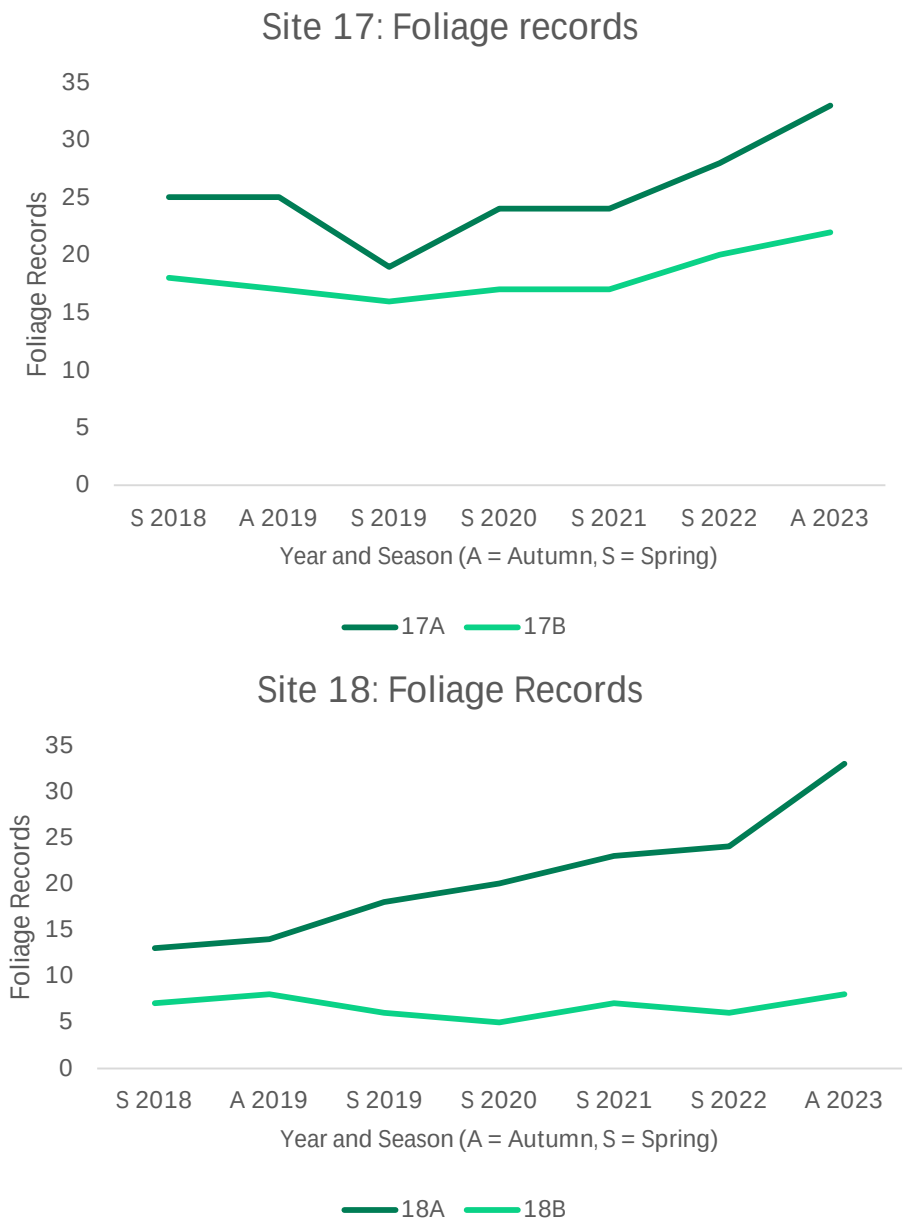

Figure 3-22 Number of foliage hits along individual transects, 2018 to 2023 (Western Myall only)

River Red Gums

The number of foliage records for sites 19 and 20 (for both transects combined at each site) has fluctuated, often quite markedly, between survey periods. However, there has been no trend apparent at site 19 (nor for each individual transect at site 19), and an upward trend in total foliage records at site 20 (and also for each individual transect at site 20). Results for Red Gum foliage records for each site are presented in Figure 3-23 (showing the sum of foliage records for the two transects at each site) and Figure 3-24 (showing results for individual transects).

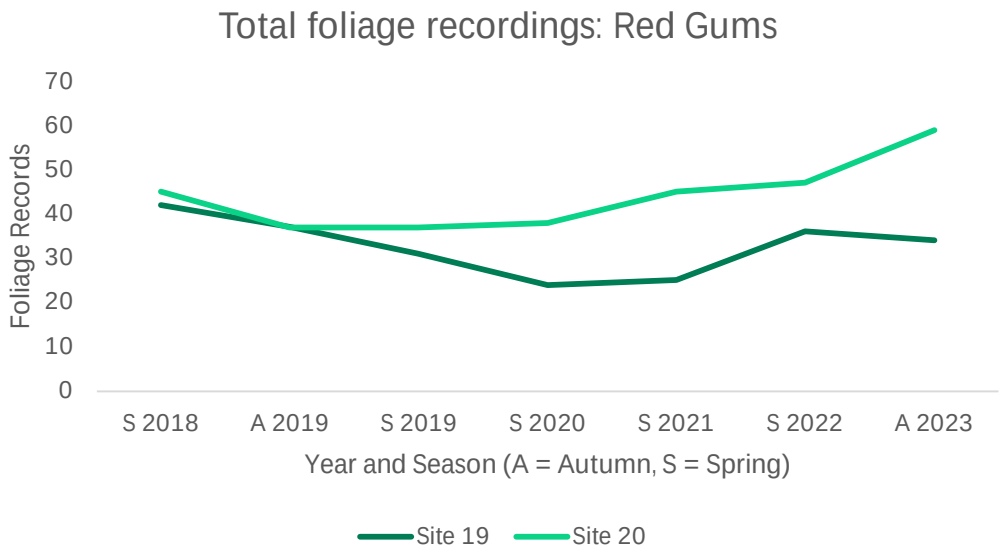

Figure 3-23 Total number of River Red Gum foliage records for each site at surveys autumn 2018 to autumn 2023 (both transects combined).

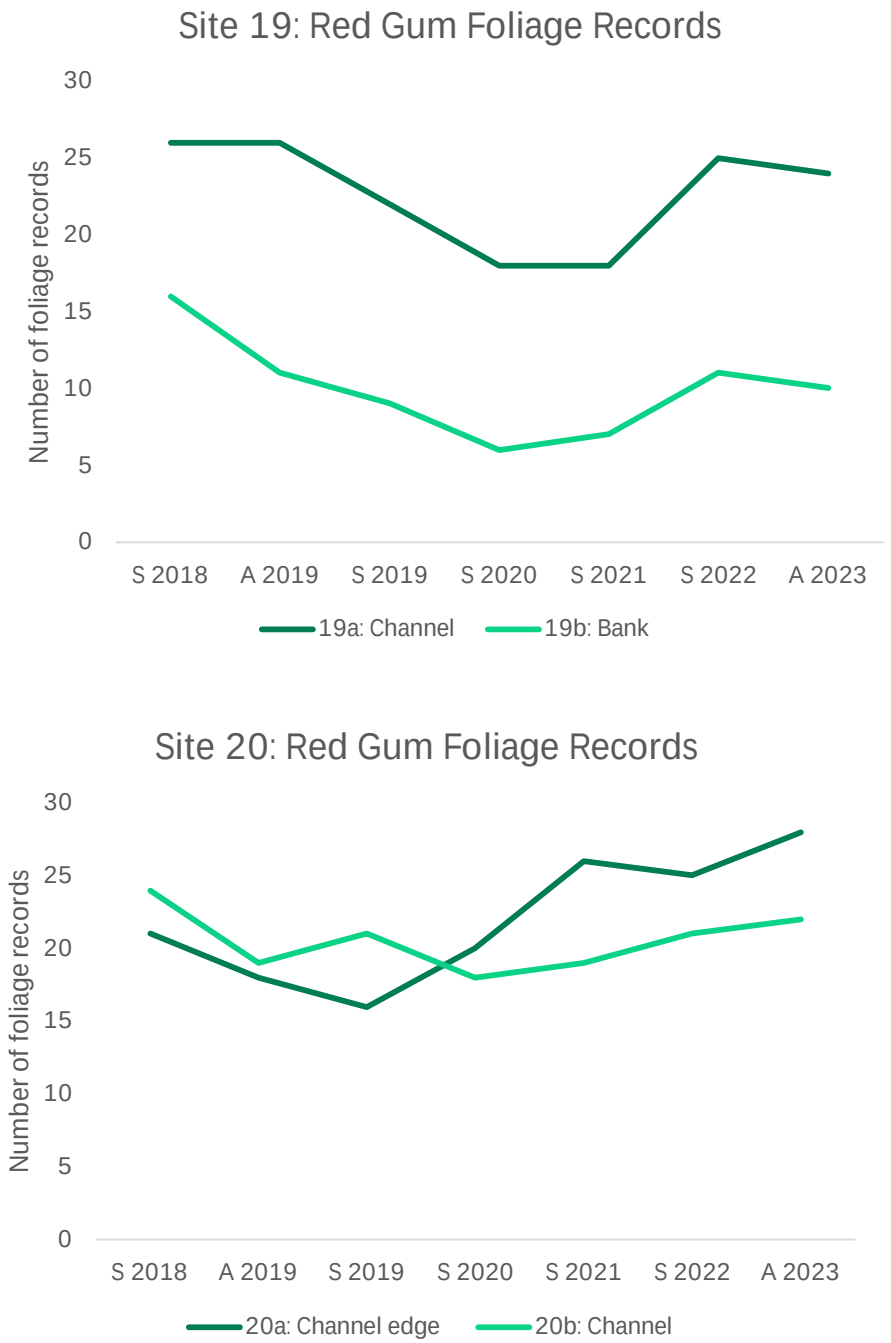

Figure 3-24 Number of foliage hits along individual transects, 2018 to 2023 (River Red Gums only).

3.2.3.3 Percentage of within-canopy records (densitometer data)

Along each transect, major changes in the number of within-canopy records that are foliage can indicate potential trends in canopy intactness of each species (Red Gums and/or Western Myalls) along the transect.

Western Myall Trees

Although there is some variability between recording periods, since 2018 the percentage of within-canopy records that are foliage, has shown an upward trend. (Figure 3-25). This upward trend has been particularly evident since 2021 at sites 17 and 18, where there has been a total of 11 new juveniles intercepted along transects, all with healthy canopies. At site 20, there is only one new Western Myall tree intercepted, which has recorded 100% of within canopy records as foliage during all survey periods. The results indicate that the average health / intactness of Western Myall canopies has increased at Sites 17 and 18.

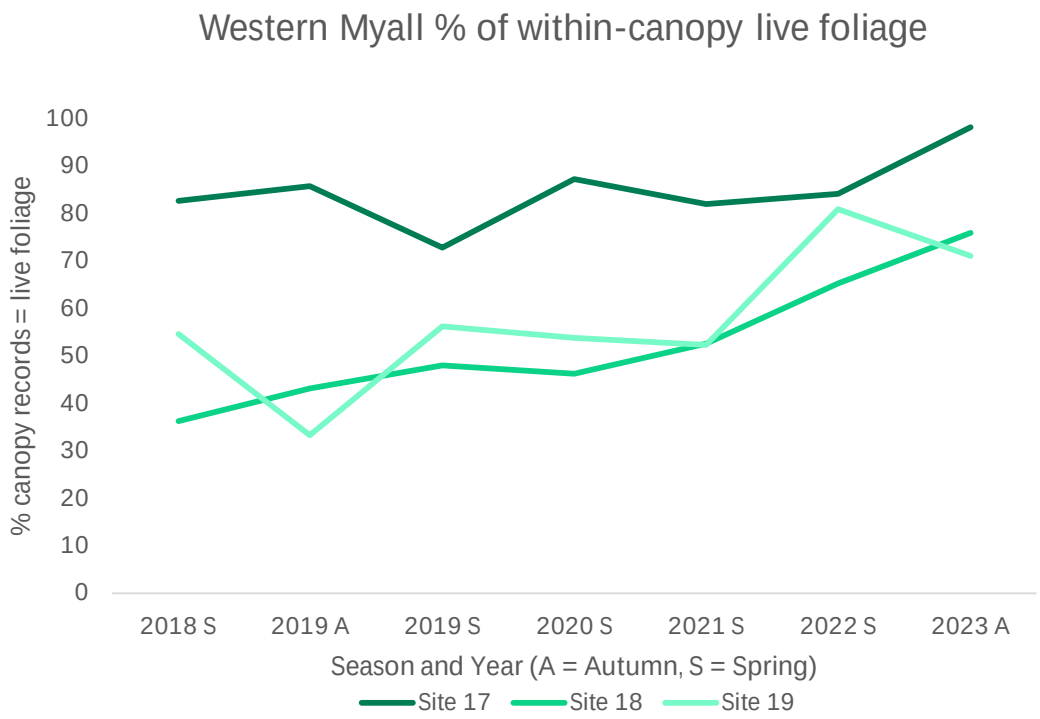

Figure 3-25 Percentage live foliage cover of Western Myall (site transects combined)

Red Gum Trees

After an initial decline in spring 2019, there has been an increasing trend in the percentage of Red Gum canopy records that are foliage for both sites 19 and 20 (Figure 3-26) indicating improved canopy intactness.

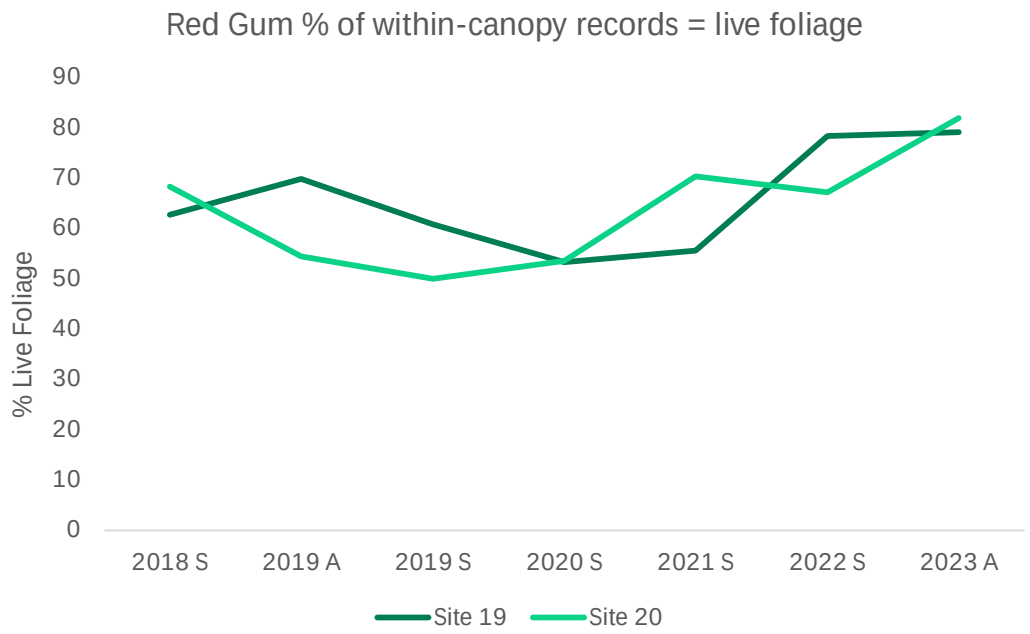

Figure 3-26 Percentage of within-canopy live foliage for Red Gums (site transects combined)

3.2.3.4 Tree Death and New Trees

Given the surveyed trees are individually numbered along each transect (initiated in 2019), it is possible to identify: individual tree death, canopy loss resulting in trees no longer being recorded along the alignment, and tree canopies that are intercepted along the alignment for the first time. New trees are recorded as a result of expansion of mature tree canopies onto the transect alignment and/or younger trees that newly meet the survey criteria for densitometer recordings (i.e. minimum plant height of 1 m and intercepting the transect).

Western Myall

In 2023, there were six new Western Myall trees that were recorded along the transects (five from site 18 and one from site 19) and one tree had died (at site 18) since the previous survey in spring 2022 (Figure 3-27).

Since 2018, there have been three Western Myall tree deaths and 19 new Western Myall trees recorded along all transects. The three deaths all occurred at site 18. These trees were estimated to retain < 10% of their canopy prior to the operation of the TSF (see Jacobs 2020 report for full details). There have been no Western Myall deaths at sites 17, 19 or 20. The great majority of new trees intercepted along transects have been juveniles that have increased in size, namely whose canopy had expanded to a sufficient degree to be intercepted along the alignment and/or whose height of canopy above the ground met the survey criteria (as above).

The number of existing, new and dead Western Myall trees recorded at each site and at each transect is shown in Figure 3-27 and Appendix E, respectively, noting that site 17 is closest to the TSF.

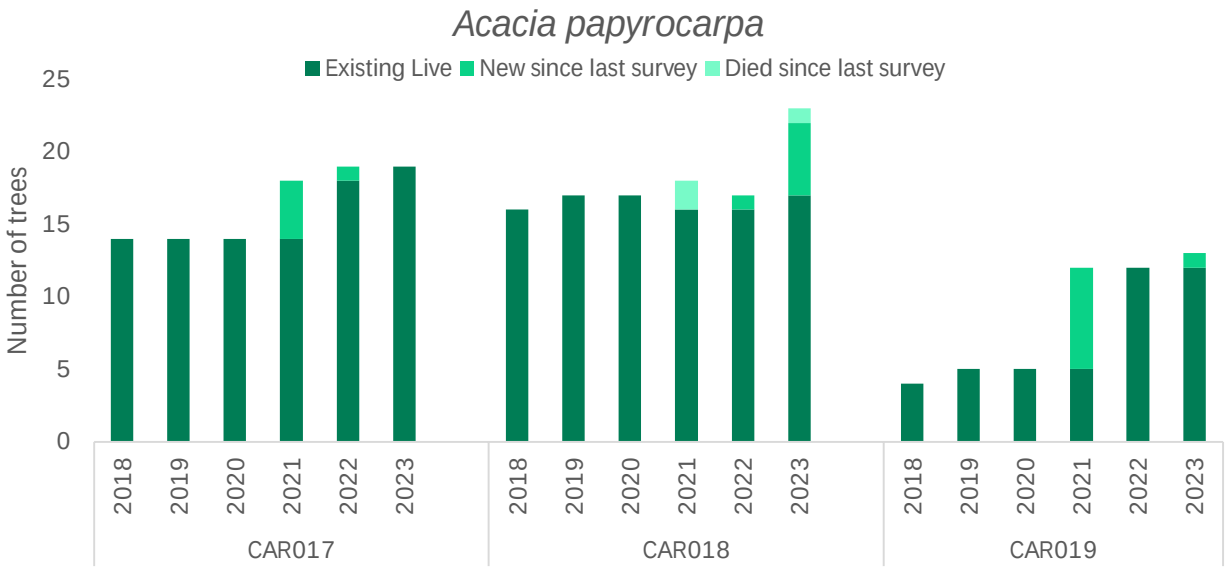

Figure 3-27 Change in Western Myall abundance (alive, dead, new = meets criteria) at each site (transects combined).

River Red Gums

In 2023 there were no Red Gum deaths, and no new trees recorded along the transects since the previous (2022) survey.

Since 2018, one Red Gum died (CAR19, in 2021) and no new trees have been intercepted along the transects at sites 19 and 20. The dead tree at site CAR19 had a visually estimated canopy extent of approximately 50% in 2019 and 3% in 2020. Transect 19 is 3,000 m downstream of the TSF. In 2020, loss of a large branch resulted in one tree not intercepting the transect. However, by 2022, this tree had regained canopy, resulting in it once again being intercepted along the transect, and recorded in 2022 and 2023.

Changes in the numbers of live trees at each site are shown in Figure 3-28. Changes in the number of live trees along each transect are shown in Appendix E.

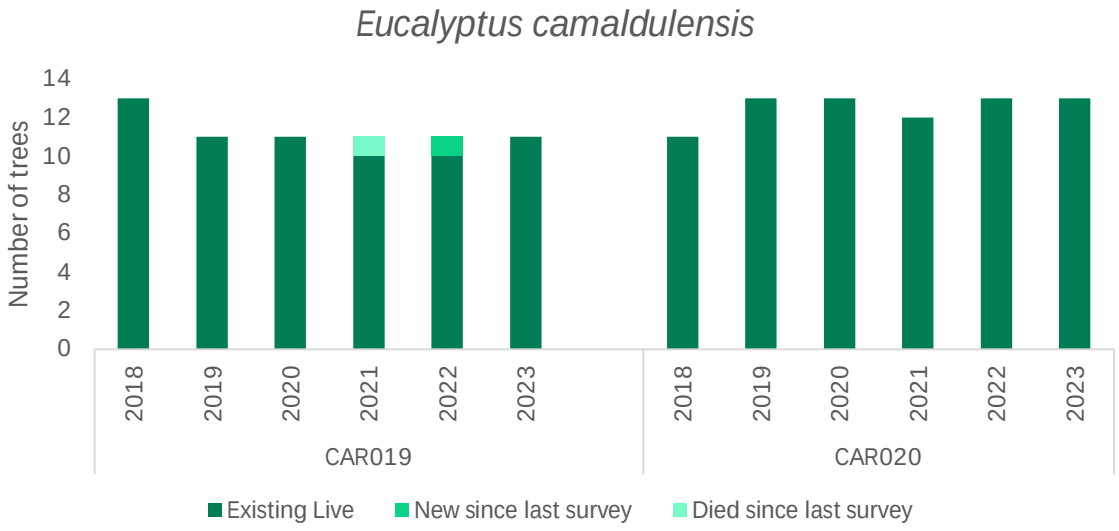

Figure 3-28 Change in Red Gum abundance (alive, dead, new = met criteria) at each site; data combined for both transects.

3.2.3.5 Visual Estimates of Canopy Intactness

Visual estimates of canopy intactness for individual trees commenced in 2019. Results for all trees are shown in Appendix E. Mean canopy intactness for each transect is shown in Table 3-13, Table 3-14, Figure 3-29 and Figure 3-30.

Western Myall

In 2023, visual estimates of mean canopy intactness increased at sites 17, 18 and 19 (and remained at 100% for the sole Western Myall tree at site 20). At transects 17a, 17b, 18a and 19b, there has been a slight increasing trend, for canopies with already very high intactness levels. The Western Myalls are in very good health with canopy intactness averaging > 90% at these sites. Mean canopy intactness has remained at close to 100% at transect 19a and has remained stable (from a relatively low base) at transect 18b.

Table 3-13 Visual estimates of canopy intactness for Western Myall trees

Transect	% Canopy Intact					
	autumn 2019	spring 2019	spring 2020	spring 2021	spring 2022	Autumn 2023
17a		86	87	94	90	92
17b		90	92	93	91	97
18a		81		72	80	89
18b		42		18	28	35
19a	97	100	100	96	99	100
19b	70	69	68	75	77	86
20a	100	100	90	77	100	100

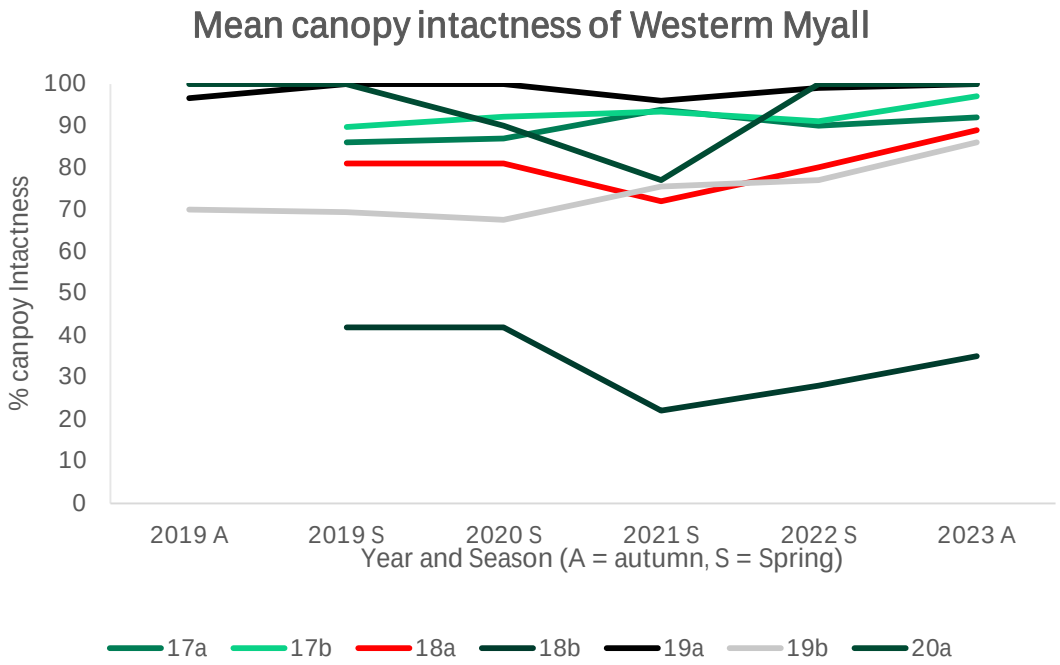

Figure 3-29 Visual estimates of canopy intactness for Western Myall trees

[Canopy intactness not recorded in 2020 for transects 18a and 18b. In the above graph, 2019 values have been used for transects 19a and 18b transects].

River Red Gum

Canopy intactness for all transects declined in 2019 and remained relatively stable in 2020. However since 2021 canopy intactness levels have increased from approximately 50% to over 90% at the Red Gum transects (Table 3 and Figure 10).

Table 3-14 Visual estimates of canopy intactness for River Red Gum trees

Transect	% Canopy Intact					
	autumn 2019	spring 2019	spring 2020	spring 2021	spring 2022	autumn 2023
19a	59	70	63	60	72	87
19b	41	54	47	43	42	67
20a	39	49	40	47	80	91
20b	51	63	46	46	75	85

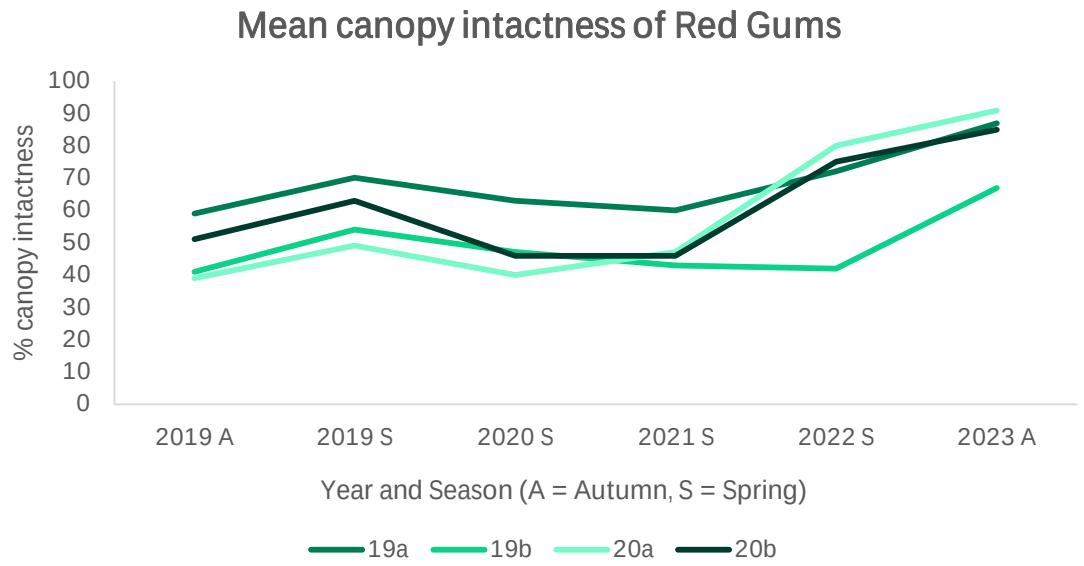

Figure 3-30 Visual estimates of canopy intactness for Red Gum trees

3.2.4 Weed diversity and abundance

Weeds were surveyed at standard flora sites, designated weed transects, targeted sites (dams and villages), and opportunistically. All weed species recorded during baseline surveys (2012 to 2016) and compliance monitoring (2018 to 2023) are summarised in Appendix G.

Although Eliza Creek, Dawsons Dam and Anzac Dam are outside of existing mineral leases, weed species are documented at these locations to:

- Identify potential sources of new weed infestations into the mineral leases and/or
- Document potential spread of weeds from the mineral leases into dams

3.2.4.1 New Weed Species

Stinging Nettle (*Urtica urens*) was recorded for the first time in the Operational survey area. A few small clusters were recorded in the Exploration Village Effluent Irrigation Area (surveyed from boundary only). This is an annual herb favouring high nutrient (especially nitrogen rich) habitats. *Urtica urens* is not Declared or listed under relevant legislation. Further information is provided in the Discussion.

3.2.4.2 Increase in abundance

In May 2023, no increase in abundance was recorded for any weed species.

3.2.4.3 Species recorded at previously unreported locations

Five weed species were recorded in 2023 at previously unreported locations:

- Bitter Melon (*Citrullus sp.*): Sparsely scattered individuals were recorded within the Tjungu Effluent Irrigation Area (viewed from outside boundary fence).
- Mallow (*Malva parviflora*): A few small clumps were recorded at South Eliza Dam
- Tree Tobacco (*Nicotiana glauca*) – recorded at Dawson Dam. A few juveniles were recorded behind the dam embankment, suggesting that this is a new population in this location.
- Sow Thistle (*Sonchus oleraceus*) – one plant recorded at site CAR012
- Smooth Heliotrope (*Heliotropium curassavicum*) – a few plants recorded along Weed Transect CWM06.

Except for *Nicotiana glauca*, the above species are all annuals and have been consistently and widely recorded during baseline and/or construction surveys. Their occurrence at any particular location is likely to vary from year to year. Refer Appendix G for details.

A few juveniles of *Nicotiana glauca* were recorded at Dawsons Dam. This is outside of existing mineral leases. However, these plants are recommended as high priority for control as this species can establish rapidly and form relatively dense stands (as occur as South Eliza Dam).

3.2.4.4 Weeds recorded at Rangeland Flora Sites (Control and Impact)

Only four species of weeds were recorded at Rangeland sites:

- Maltese Thistle (*Centaurea melitensis*) – small isolated clusters at Eliza Creek sites 18 and 20
- Smooth Mustard (*Sisymbrium erysimoides*) - recorded at both dune sites (21 and 22) scattered plants to locally common
- Bitter Melon (*Citrullus sp.*) - isolated small clusters recorded at both dune sites (21 and 22)
- Sow Thistle (*Sonchus oleraceus*) – one or two plants recorded at sites 12 (designated as impact site) and 13 (designated as a control site).

These results are very similar to previous surveys during compliance (operational) monitoring (dune sites and Eliza Creek sites not surveyed during pre-operational monitoring). Maltese Thistle, Smooth Mustard and Bitter Melon have been consistently recorded at the dune and Eliza Creek sites, and at similar levels of abundance since 2018. Sow Thistle occurs infrequently and sporadically at Rangeland sites, and at very low levels of abundance.

3.2.4.5 Northern Wellfields lease area

Within the Northern Wellfield Lease area, post-construction monitoring sites are weed transects NWM01, NWM02, NWM03, and Flora (Rangeland) sites CAR001, CAR002, CAR007. These were all surveyed in autumn 2023 by Jacob's ecologists, and no weeds were recorded (following no weeds recorded at these sites in September 2020, September 2021 and September 2022).

3.2.4.6 Weeds of National Significance

Prickly Pear (*Opuntia sp*)

The isolated population of Prickly Pear (*Opuntia sp*.) near the Yeltacowie homestead has been actively managed (poisoning with cochineal) since 2021.

A cluster of *Opuntia sp*. was first observed during operational monitoring in 2018 near the Yeltacowie homestead, occurring within an area of approximately 10 m x 10 m (Easting 724000 Northing 6530688 Zone 53). In 2022, all live plants were confined to an area of approximately 10 m x 4 m, within which 70% appeared dead and 30% were still alive. In 2023, all live plants were confined to an area of approximately 5 m x 5 m.

Although all plants appear to have been poisoned, there remains some parts of plants that are alive, with potentially viable propagules on the ground. Ongoing control is recommended.

Plate 3-1 Patch of remaining live and dead Opuntia (May 2023)

Athel Pine (*Tamarix aphylla*)

Athel Pine has only been recorded as clustered trees around Yeltacowie Homestead and the nearby dam. These trees are being actively controlled with numerous dead trees and/or cut trees. In 2022, only three live trees were recorded (fewer than in 2021), due to ongoing control. Numerous trees have been cut down and others are standing dead trees. In 2023, three mature trees live trees were recorded and have not yet been controlled. However, resprouting of previously cut trees was also recorded. It is recommended that existing control efforts be consolidated by lopping or otherwise killing remaining trees and trees that have resprouted.

Plate 3-2 Athel Pine resprouting to 1.8 m tall, after previously lopping. Approximately 90 m east of Homestead.

Plate 3-3 Two large Athel Pine remain just south of dam.

3.2.4.7 Declared Weeds

Bathurst Burr (*Xanthium spinosum*)

In 2023, Bathurst Burr was recorded only at previously recorded locations: Dawsons Dam, South Eliza Dam, and weed transects CWM01 (including Whittata Creek) and CWM02 both transects adjoining the Southern Access Road. No new populations, and no expansion of existing populations, were recorded.

Dawsons Dam

The population of Bathurst Burr at Dawsons Dam remains extensive, and similar to that recorded in 2021 and 2022. The 20 m wide drainage line north, north-east and west of the dam walls contain dense stands over approximately 300 m (possibly 1000's of individuals). Bathurst Burr was also present within the dam itself. In May 2023, the plants were alive and heavily in fruit. It is noted that Dawsons Dam resides within ML6471 but is managed by the landholder and management and control is ongoing.

Whittata Creek and Weed Transect 1

Bathurst Burr was recorded along and near Whittata Creek in 2021, which intercepts Weed Transect 1. In 2022, Whittata Creek was not surveyed. In 2023, however, Bathurst Burr was again recorded as small clusters along Weed Transect 1 in the vicinity of Whittata Creek.

Weed Transect CWM02

Batthurst Burr was recorded along CWM02 in 2021, but not in 2022. However, approximately 10 plants were recorded in May 2023, adjoining the Southern Access Road in the vicinity of South Eliza Creek.

South Eliza Dam complex

Bathurst Burr remains widespread and moderately dense to dense in the drainage lines to the west, north and south of the dams.

3.2.4.8 Other weeds of high environmental threat

Although not a Declared Weed, an extensive population of Tobacco Bush (*Nicotiana glauca*) persists at South Eliza Dam (in the drainage channels behind the dam). Due to is high rate of fruit and seed set, high viability of seeds and successful survival of seedlings, it forms dense stands. As noted above, a few juveniles were also recorded at Dawsons Dam in 2023.

3.2.5 Assessment of grazing impacts

An indication of grazing impact at each site was obtained to enable potential mining and/or climate related impacts to be separated from baseline impacts due to grazing. Grazing was first reported on in 2018 when the operation survey area was still being widely grazed by domestic stock. Since 2018, the operation area has been largely destocked. However, ongoing grazing continues at some sites, including the dunes. Although total grazing pressure has been reduced since 2018, ongoing grazing occurs largely through kangaroos and feral animals.

The Rangeland Assessment Method (NVC 2020) provides a single index of grazing impact called the Site Utilisation Score and is based on a combination of the proportion of a species' population that is grazed (either heavily or severely) and the palatability of a species, and whether juveniles are present. In 2023, at all sites (excluding the dune sites CAR021 and CAR022), the majority of plants including palatable species, were not impacted by grazing. For the stony tableland and creek sites, heavy grazing is largely restricted to only a few highly palatable species (*Maireana spongiocarpa, Eremophila oppositifolia*), and native grasses. However, there has been no loss of these species at any site, nor decline in population recorded at Jessup transects. Given the widespread destocking of Rangeland sites, apparently low kangaroo, goat and rabbit numbers, the impact of grazing is considered minimal.

The decreasing trend in grazing impact since 2018 is shown in Figure 3-31. This reflects the widespread destocking in the surveyed area. At most sites, grazing impact on palatable species is either negligible or low (refer Appendix F). The mean site utilisation score decreased slightly in 2023 (meaning a slightly higher grazing impact). This was largely due to lower scores (higher grazing) at both the dune sites.

The mean site utilisation score for impact sites was 13.95 and for control sites was 12.38, and not significantly different (two tailed t-test assuming equal variance, p = 0.08) Table 3-15 also shows site utilisation scores for each site. Apart from the two dune sites, the scores for each site are similar, with no site showing an increasing grazing impact (declining scores) trend.

In summary, grazing impact on all sites was low, and grazing is unlikely to have caused any negative impact on long lived woody perennials. If there were negative impacts detected on plant diversity and/or abundance, grazing is unlikely to be a factor. This is supported by 2022 and 2023 Jessup results (refer 3.2.2) that indicated a widespread increased abundance of widespread palatable species (e.g. *Atriplex vesicaria, Minuria cunninghamii and Abutilon halophilum*) including an increase in abundance of juveniles.

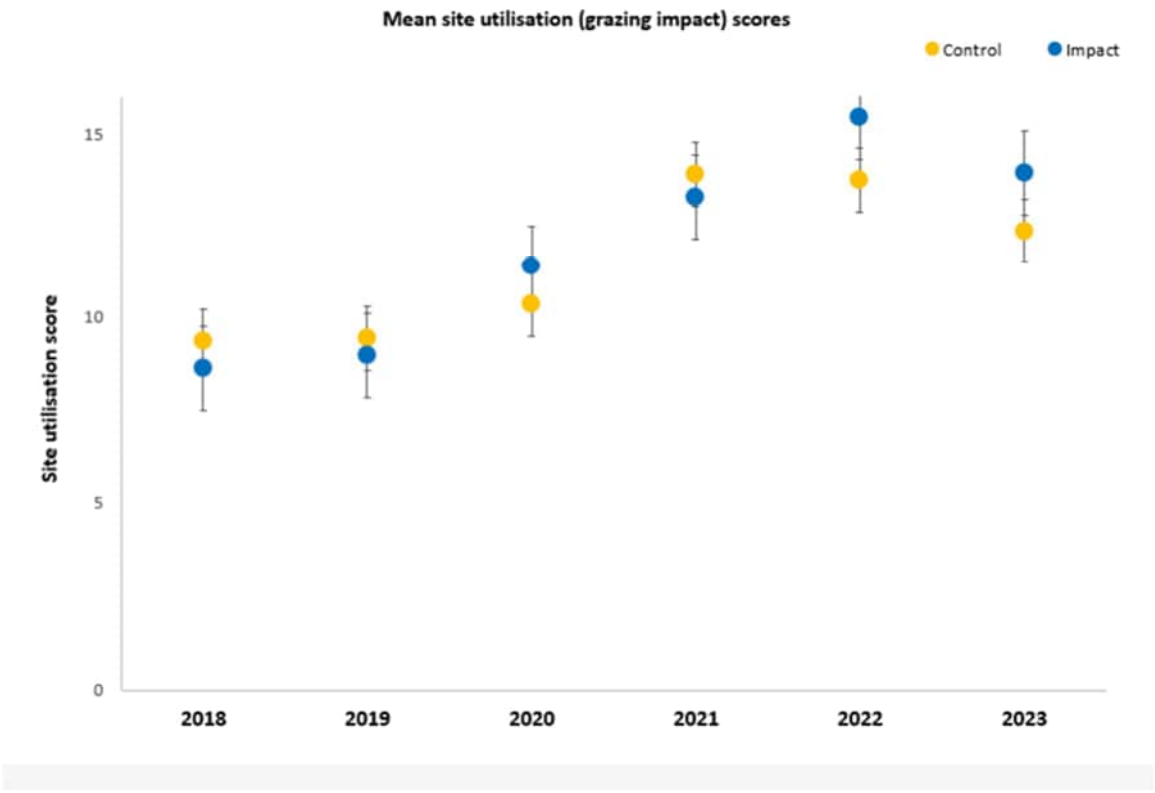

Figure 3-31 Mean site utilisation scores for control and impact sites during compliance monitoring, 2018 - 2023

Table 3-15 Grazing intensity rating (based on site utilisation scores) for each flora site

Control / Impact	Landform	Site	Site Utilisation Score[1]					
			2018	2019	2020	2021	2022	2023
Control	Minor drainage line & gibber plain	1	10.5	9.6	12.0	12.7	12.0	11.45
	Gibber plain	2	7.3	8.2	15.8	14.6	15.8	14.79
	Minor drainage line & gibber plain	7	11.5	11.0	13.5	14.5	13.5	11.64
	Minor drainage line & gibber plain	9	8.3	8.1	12.5	14.0	12.5	13.66
	Gibber plain	13	11.4	11.4	14.0	14.3	14.0	12.42
	Sand dune	21	7.2	8.4	14.9	13.4	14.9	10.3
Mean			**9.4**	**9.4**	**10.3**	**13.9**	**13.8**	**12.4**
SD			**2.0**	**1.5**	**0.9**	**0.7**	**1.4**	**2.6**
Impact	Gibber plain	3	5.0	7.0	17.6	14.1	17.6	15.9
	Gibber plain	4	9.5	8.7	16.6	11.7	16.6	13.5
	Gibber plain	5	6.7	7.8	12.9	12.8	12.9	13.75
	Gibber plain	6	7.2	8.9	14.5	14.4	14.5	14
	Eliza Creek	10	9.6	8.9	15.8	13.3	15.8	14.34
	Minor drainage line & gibber plain	11	7.3	8.2	13.6	13.7	13.6	12.49
	Gibber	12	7.5	7.5	14.6	14	14.6	13.25
	Gibber	15	9.4	9.1	15.0	14.0	15.0	12.15
	Gibber	16	9.8	10.7	15.6	16	15.6	16.56
	Eliza Creek	17	8.7	9.3	16.7	10.8	16.7	14.45
	Eliza Creek	18	9.6	9.3	16.5	12.1	16.5	15.76
	Eliza Creek	19	12.8	12.6	16.8	13.9	16.8	14.19
	Eliza Creek	20	10.1	9.9	15.4	12.4	15.4	15.52
	Sand dune	22	7.8	7.7	14.6	12.9	14.6	9.5
Mean			**8.6**	**9.0**	**11.4**	**13.3**	**15.5**	**13.9**
SD			**1.9**	**1.4**	**1.7**	**1.3**	**1.3**	**3.2**
Unpaired t-test value2			0.78	0.65	-1.36	1.11	-2.54	-1.8
P value (if > 0.05 then NOT significantly different the 5% level)			0.44	0.53	0.19	0.28	0.02	0.08

[1]Based on the sum of all Plant Utilisation Scores – which incorporates grazing intensity and presence of regeneration, scores rounded; [2]Two-tailed T-test assuming equal variances.

3.2.6 Landscape Function Analysis

3.2.6.1 State of rehabilitation sites in May 2023

The following provides a summary of changes in key parameters – plant density and diversity. Photos taken at the start and end of each transect are contained in Appendix I2.

Site 1: Aerodrome Laydown (LFAAL1)

Transect 1A

This transect continued to show increases in vegetative cover, including the emergence of several plants each of long-lived plant species; Samphire (*Tecticornia medullosa*), Bladder Saltbush (*Atriplex vesicaria*), and Plains Lantern Bush (*Abutilon halophilum*). Patches of vegetation had increased in both abundance and size.

Landscape Functional Analysis

Transect 1A comprised two zones including one patch type 'plant/s (plant) and interpatch (rocky/bare soil). The number of patches (plants) increased from nine in 2021, 18 in 2022 to 30 in 2023. Patch extent increased from comprising 21% of the linear transect in 2022 to 29% in 2023 (the remainder being rocky inter patch).

The mean patch width also increased from 73 cm in 2022 to 135 cm in 2023. Ninety percent of patches were short-lived perennial species but three patches were longer-lived perennial species (*Tecticornia medullosa* and *Abutilon halophilum*), up from two long-lived patches in 2022.

Point-Centred Quarter

In both 2022 and 2023, the mean distance between plants was 1.2 m with an average of 0.75 plants per m^2, a slight increase on the 2022 density of 0.67 plants per m^2.

In both 2022 and 2023, *Sclerolaen*a species were dominant. In 2023, *Sclerolaena ventricosa* (16 records) and *Sclerolaena divaricata* (3 records) comprised 19 of the 20 recordings.

Plate 3-4 Transect 1a showing establishment of extensive patches of vegetation near the end of the transect

Transect 1B

Transect 1B also comprised two zones: patch (plant/s) and interpatch (rocky/bare soil).

Landscape Functional Analysis

Although there has been a net increase in vegetative cover since 2021, plant cover declined slightly between 2022 and 2023, with reductions on number of patches, mean patch width and percentage of transect comprised of plants.

In 2023, nine patches were recorded, compared with 10 patches in 2022 and seven patches in 2021. Mean patch width, had declined from 117 cm in 2022 to 47 cm. Patches comprised just 4.5% of the transect length in 2023, a reduction from 14.7% in 2022

As in 2021 and 2022, patches were formed by short-lived perennials (*Sclerolaena* species and *Atriplex holocarpa*).

Point Centred Quarter

The mean distance between plants has decreased from 2.2 m in 2021 to 0.83 m in 2023 (1.9 plants in 2022), indicating an increased density of plants. The number of plants per m^2 has also increased from 0.2 plants per m^2 2021 to 1.4 plants per m^2 in 2023 (1.9 plants per m^2 in 2022).

Plate 3-5 Transect 1B. From 0 m facing end

Site 2: Ventia Laydown (LFAVOL2)

Transect 2A

Landscape Functional Analysis

The number of plants along the transect increased in 2023, with a corresponding decline in mean distance between plants.

Transect 2A comprised two zones including one patch type 'plant/s (plant) and interpatch (rocky). There were nine plant patches recorded in 2023 compared with three in 2022 and none in 2021. There was a corresponding decline in the mean distance between plants from 11.5 m to 4.9 m. As in 2022, the patches comprised plants of short-lived perennial species only. Mean patch width declined from 48 cm in 2022 to 27 cm in 2023, the combined length of patches along the transect declined from 8.4% to 3.1%.

Point-centred Quarter

Species diversity and plant density continued to increase in 2023. As with the LFA, the PCQ records comprised only short-lived perennial species – in this case, all *Sclerolaena* species, and in particular *Sclerolaena divaricata* and *Sclerolaena intricata*.

In 2023, the PCQ recorded a continued increase in plant density with mean distances between plants decreasing from 7.8 m in 2021, to 3.5 m in 2022 to 2.4 m in 2023. The mean number of plants per m^2 was 0.17 in 2023, a doubling of the 0.08 plants per m^2 recorded in 2022.

Species diversity increased from three species in 2021, five in 2022 and seven species in 2023.

Plate 3-6 Transect 2A. From 0 m facing end

Transect 2B

Transect 2B comprised two zones including one patch type ‘plant/s (plant) and interpatch (rocky).

Landscape Functional Analysis

The number of patches has increased from none in 2021, three in 2022 and five in 2023. Mean patch width also increased from 17 cm in 2022 to 22 cm in 2023. Patches made up 1.3% of the linear transect with a mean distance between plants of 4.6m.

Point-centred Quarter

The PCQ recorded only short-lived perennials, all *Sclerolaena* species, and in particular *Sclerolaena ventricosa*.

The mean distance between plants was 2.3 m, compared with 1.86 m in 2022, 5.2 m in 2021 and 5.3 in 2020. There has been a net increase in plant density since 2020, although 2023 results indicated a slight decline in density from 2022. Similarly, the mean number of plants per m^2 has recorded a net increase since 2020 (0.03 to 0.18), but a slight decline between 2022 and 2023.

Plate 3-7 Transect 2B plant re-establishment has been largely confined to the northern end where ponding of water occurs

Site 3: Midway Quarry (LFAQUA3)

Transect 3A and 3B

Transects 3A and 3B are located adjacent each other on relatively flat deeply ripped ground and were both classified into two zones 'bare rocky trough' and 'bare rocky bank'.

Landscape Functional Analysis

In 2022, the sites were assessed using the LFA Bank and Trough Method whereby the trough is equivalent to a patch (e.g. collects deposited materials and nutrients to encourage recruitment). The deep-ripped troughs comprised the majority of the transects in 2022 (72% for 3A and 60% for 3B). By 2023, however, the troughs had eroded and were no longer deep enough to be considered effective patches, and was assessed using the established LFA method.

No plants were intercepted along Transect 3A, hence the entire transect was inter-patch (compared with 28% being inter-patch in 2022). However, because the PCQ survey recorded plant colonisation near the transect, patches are expected to emerge along the LFA transect in the short-term. Transect 3B recorded four patches along the transect all of which had emerged since 2022. The three patches comprised 1.1% of the linear transect, and had a mean width of 28 cm.

Point-centred Quarter:

In 2022 the PCQ method was not conducted due to the transect and adjoining 10 m being devoid of plants. By May 2023, however, plants were recorded in 16 of the 20 quadrants along transect A and 17 of the 20 quadrants along transect B (namely, plants within 10 m of each 10 m interval along the tape). For both transects, the same four native species were recorded, including one long-lived perennial *Atriplex vesicaria*. Hoary Scurf Pea (*Cullen cinereum*) was the most frequently recorded, followed by Pop Saltbush (*Atriplex holocarpa)* (transect A) or *Sclerolaena ventricosa* (transect B).

In May 2023, the mean distance between plants was 4.1 m for Transect A, and 2.9 m for Transect B. There was a mean of 0.06 plants per m^2 along Transect A, and 0.12 plants per m^2 along Transect B.

Plate 3-8 *Cullen cinereum*, a short-lived perennial herb was the most frequent species recorded at 3A

Plate 3-9 At site 3, the contours have levelled out, now < 10 cm deep and plants have sparsely revegetated.

Site 4: Tjungu to WAR (LFATJU4)

Transect 3A and 3B

Landscape Function Analysis

Transects 4A and 4B are in one linear transect sloping toward a creek. Due to the deep troughs and almost complete absence of plants, in 2022 the sites were assessed using the LFA Bank and Trough Method whereby the trough is equivalent to a patch (e.g. collects deposited materials and nutrients to encourage recruitment). In 2022, the troughs (patches) comprised 64% and 61% for transects 4A and 4B, respectively.

However, between spring 2022 and autumn 2023, there had been prolific plant establishment along both transects. Transects A and B comprised very similar plant densities and extent. Transect 4A recorded 26 patches and Transect B, 28 patches. Patches comprised 15% of Transect 4A and 16% of Transect B. Mean patch width was 43 cm and 42 cm for Transects A and B, respectively. Average inter patch length was 1.57 m and 1.45 m for Transects A and B.

Point-centred Quarter

In 2022 the PCQ method was not conducted due to the transect and adjoining 10 m being devoid of plants. By May 2023, however, high density regeneration had occurred with plants recorded in all 20 PCQ quadrants along each transect. A total of nine species was recorded along both transects

Transect 4A

Five native species were recorded with *Atriplex holocarpa* most frequent but including six records of the long-lived *Atriplex vesicaria* and one record of the long-lived grass, *Eragrostis setifolia*. This is the first grass species recorded along any of the four rehabilitation sites.

Transect 4B

Seven native plant species recorded with *Atriplex holocarpa* again the most frequent but including three long-lived species: *Atriplex vesicaria* (3 records), (Desert Goosefoot) *Chenopodium desertorum* and *Tecticornia medullosa*.

In May 2023, the mean distance between plants was 0.5 m for both Transect A and B, and a mean of 3.9 plants per m^2 for both Transects.

Plate 3-10 From 0 m facing end

Plate 3-11 Transect 4B Close up

Emergence of species used in hand-seeding

The following species were hand-seeded at sites 3 and 4: Pop Saltbush (*Atriplex holocarpa*), a Saltbush (*Atriplex lindleyi*), Lagoon Saltbush *(Atriplex suberecta*) Sandhill Saltbush (*Atriplex velutinella*), Bladder Saltbush (*Atriplex vesicaria*), Cotton Bush (*Maireana appressa*), Fleshy Bluebush (*Maireana erioclada*), Blackbush (*Maireana pyramidata*), Nitrebush (*Nitraria billardierei*), Thorny Saltbush (*Rhagodia spinescens*), Desert Cassia (*Senna artemisioides*) and Shrubby Twinleaf (*Roepera aurantiacum*.

Of these species only *Atriplex holocarpa* and *Atriplex vesicaria* were recorded during the LFA and/or PCQ surveys in 2023 (Table 1 and Table 2).

Table 3-16 **Species frequency at PCQ surveys**

Species	Number of survey quadrants in which recorded (out of 20 quadrants)							
	1a	1b	2a	2b	3a	3b	4a	4b
No species within 10 m of recording point			3		4	3		
Atriplex holocarpa					5	3	10	
Atriplex vesicaria					1	1	6	
Chenopodium desertorum ssp.								3
Cullen cinereum					8	8		
Eragrostis setifolia							1	
Sclerolaena brachyptera							1	
Sclerolaena divaricata	3	4	7	1			3	3
Sclerolaena intricata			1	2			1	1
Sclerolaena ventricosa	16	16	9	17	2	5	3	3
Tecticornia medullosa	1							1

Table 3-17 Species detected along and adjoining the fixed transects monitoring at the rehabilitation sites*

Species / description	LFAAL1		LFAVOL2		LFAQUA3		LFATJU4	
	2022	2023	2022	2023	2022	2023	2022	2023
Long-lived woody perennials								
Abutilon halophilum, Plains Lantern-bush	x	x						
Atriplex vesicaria, Bladder Saltbush[HS]	x	x				x		x
Chenopodium desertorum ssp., Desert Goosefoot								x
Eragrostis setifolia, Neverfail								X
Tecticornia medullosa, Samphire	x	x	x	x				x
Short-lived biennial species								
Atriplex holocarpa, Pop Saltbush[HS]	x	x		x		x		x
Cullen cinereum, Hoary Scurf Pea		x				x		
Dissocarpus biflorus var., Two-horn Saltbush	x	x	x					
Dissocarpus paradoxus, Ball Bindii	x	x	x	x				

Species / description	LFAAL1		LFAVOL2		LFAQUA3		LFATJU4	
	2022	2023	2022	2023	2022	2023	2022	2023
Sclerolaena brachyptera, Short-wing Bindyi	x	x	x	x				x
Sclerolaena divaricata, Tangled Bindyi	x	x	x	x			x	x
Sclerolaena intricata, Poverty Bush	x	x		x				x
Sclerolaena ventricosa, Salt Bindyi	x	x		x		x		x
Sida fibulifera, Pin Sida		x						

*Includes species observed within 10 m of transect and not necessarily recorded in PCQ or LFA data.

[HS] Species included in the hand-seeding mix at sites 3 and 4.

Further details on individual sites are presented in Appendix I.

Table 3-18 LFA Established Method total site function indices (landscape scale contribution) (Rounded to nearest whole numeral)

Stability											
	1A	1B	2A	2B	3A	3B	4A	4B	Analogue sites mean	Std dev (upper	Std dev (lower)
2020	38	45	50	50					46	67	26
2021	46	43	43	43							
2022	45	45	45	45	40	41	36	37			
2023	42	39	41	41	47	47	45	46			
Infiltration											
	1A	1B	2A	2B	3A	3B	4A	4B	Analogue sites mean	Std dev (upper	Std dev (lower)
2020	19	18	16	16					29	43	15
2021	23	34	27	27							
2022	24	31	21	26	32	29	38	53			
2023	33	27	24	24	20	20	22	22			
Nutrients											
	1A	1B	2A	2B	3A	3B	4A	4B	Analogue sites mean	Std dev (upper	Std dev (lower)
2020	14	14	12	12					19	27	10

Nutrients											
2021	18	19	16	16							
2022	20	26	15	15	14	14	17	16			
2023	26	16	10	9	9	9	15	15			

**higher percentage reflects better function*

3.2.6.2 Indices of rehabilitation success

To evaluate landscape function recovery, the values of a variety of LFA indices since 2020 (when sites were assessed using the established method).

Results for 2019 when the Bank and Trough Method was used are detailed in Jacobs (March 2023). As discussed above, the Bank and Trough method was used immediately following ripping of the sites and prior to plants re-establishing. The results in essence showed no plants were present along transects, and that the sites were a combination of troughs and rock soil inter-troughs.

The following results compare data at the rehabilitation sites, surveyed using the established method (2020 to present) with “analogue” (reference) sites that were also surveyed using the established method. Six analogue sites were surveyed prior to the construction period (by EBS). The indices reviewed include:

- LFA: five indices derived from the Landscape Function Analysis established Method (number of patches, total patch area, patch area index, interpatch length and landscape organisation). The landscape organisation index is the total length of patches/length of the transect. This is considered a key parameter as it encapsulates vegetation cover, and results are presented below.
- LFA SSA: three indices derived from the Surface Soil Assessment (stability, infiltration and nutrients; and
- PCQ: two indices were derived from the Point-centred Quarter method (distance between plants, plants per ha).

Indices derived using the Landscape Functional Analysis (LFA) ‘established method’ indicate that revegetation has been substantial at the Aerodrome and Tjungu sites, and sparse revegetation is occurring at Ventia and Midway Quarry Transect 2B. At the Aerodrome site, most re-establishment to date occurred between 2021 and 2022, with a slight decline recorded in 2023. This reflects the majority of re-establishment to date comprises short-lived perennial species, and hence there will be year to year fluctuations, but with an expected long term trend of increasing plant matter. The two LFA indices - patches/10 m, and Landscape Organisation Index are shown in Figure 3-32 and Figure 3-33. Results for sites 3 and 4 (Midway Quarry and Tjungu) are shown for 2023 only (2022 data is not comparable at the Bank and Trough method was used).

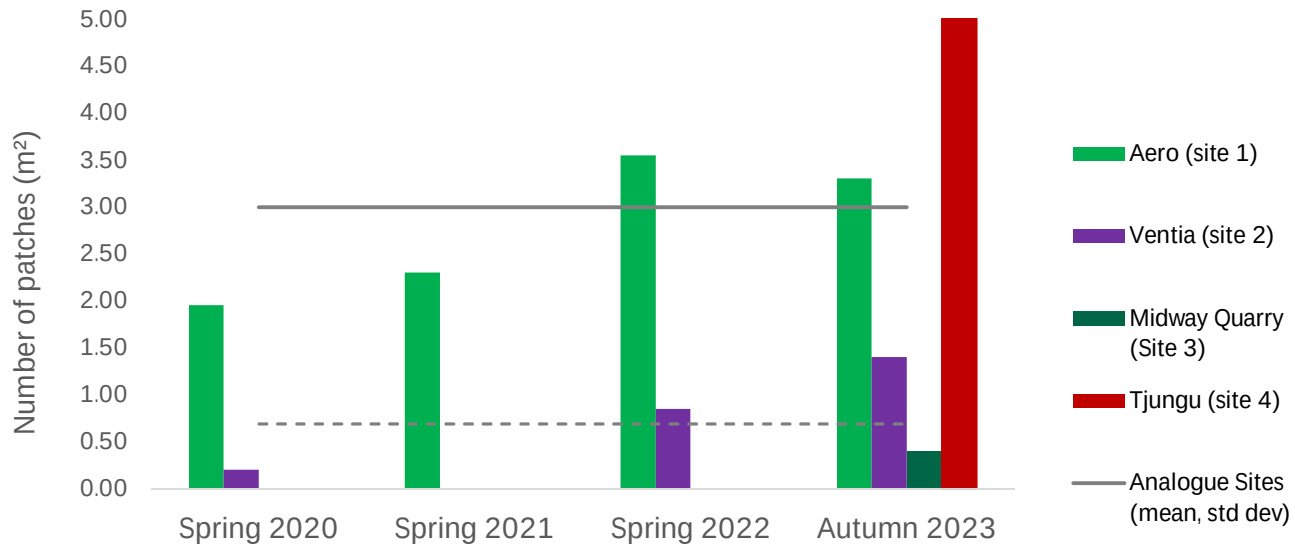

Figure 3-32 Mean number of patches per 10m (transect average for site) based on LFA Established Method (combined patch and interpatch) at rehabilitation sites from 2020 to 2023. Mean number of patches per 10m² for analogue sites with standard deviation shown in grey.

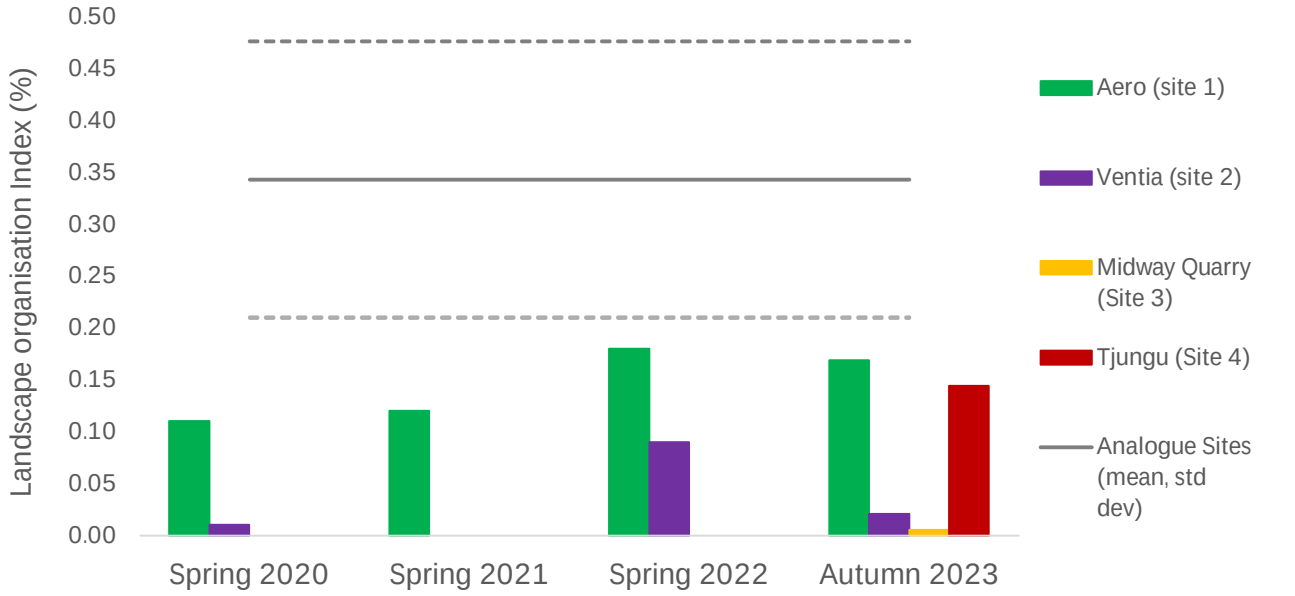

Figure 3-33 **Mean total patch area (transect average for site) based on LFA Established Method (combined patch and interpatch) at rehabilitation sites from 2020 to 2023.** Data from analogue sites shown in grey.

Soil Stability

Soil stability index is derived from the following parameters scored in the field: soil cover, litter cover, cryptogram cover, crust broken-ness, erosion, deposited materials, surface resistance to disturbance and slake test.

The results show that soil stability is approaching or reached the analogue sites, even in the early stages of rehabilitation. The Midway Quarry and Tjungu sites recorded the greatest increase in soil stability since 2020, largely due to the great increase in plant (patch) cover and formation of a litter layer.

Soil Infiltration

The soil infiltration is derived from the following parameters scored in the field: vegetation cover, litter cover, surface roughness, surface resistance to disturbance, slake test and soil texture. For sites 1 and 2, soil infiltration rates have shown a slight upward trend since 2020. The site infiltration index remains slightly below the analogue mean but above the analogue minimum standard deviation (namely, well within the range of values recorded for the six analogue sites). For the newly established quarry and Tjungu sites, the infiltration index has declined from 2022, but remains above the analogue minimum standard deviation. High 2022 values are likely due to the high surface roughness values following the recent ripping. A reduction in infiltration may be due to the banks levelling out in 2023.

Nutrient Cycling

The nutrient cycling index is derived from the following parameters scored in the field: vegetation cover, litter cover, cryptogram cover and surface roughness. The results show that site 1 has scored close to the analogue mean since 2021. Results for sites 2, 3 and 4 remain below the analogue mean and have been variable between survey periods. The sites with the highest vegetation cover (sites 1 and 3) have recorded the highest Nutrient Cycling index.

Because the index is based dependent variables, which have different projectories (e.g. vegetation cover is likely to increase whereas surface roughness is likely to decrease), longer term data is likely needed to determine trends.

Given the variability of results, the establishment of plants and patches may be a more effective early measure of improvement, whilst the SSA may provide more value of long term function over future years of monitoring (provided there is no drastic loss of function observed during monitoring or anecdotally).

Values for stability, infiltration and nutrient cycling for all sites (1-4) compared with mean values for analogue sites (and standard deviation) are presented in Figure 3-34, Figure 3-35 and Figure 3-36 below.

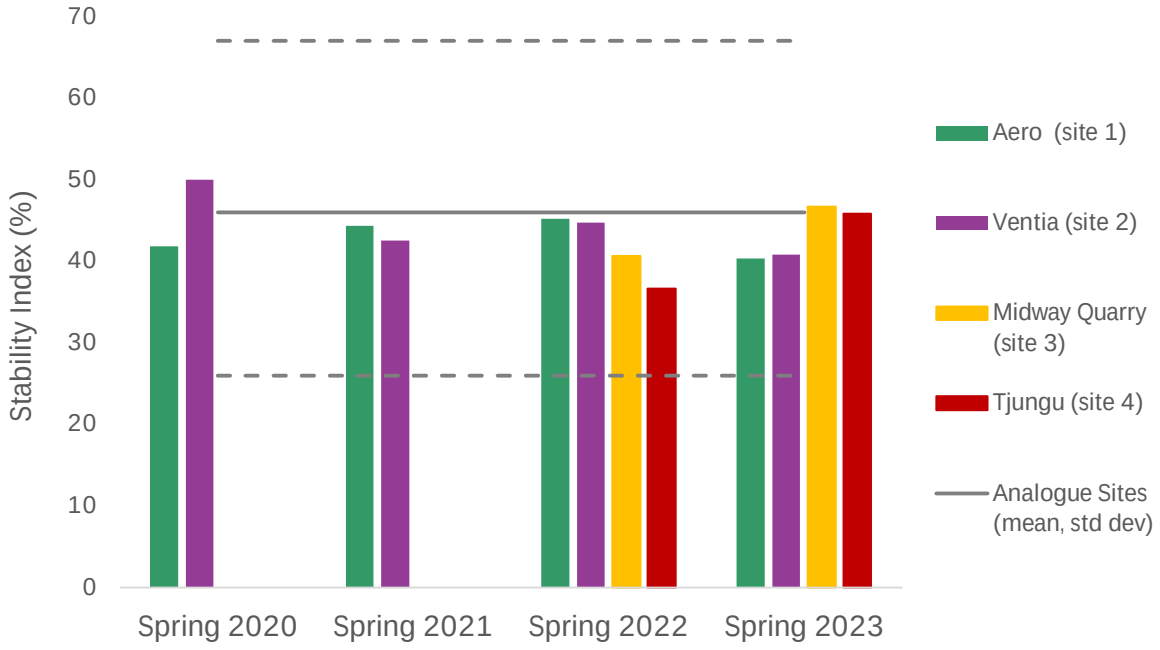

Figure 3-34 Mean soil stability index of transect (transect average for site) based on combined patch and interpatch at rehabilitation sites from 2020 to 2023. Mean soil stability index of analogue sites with standard deviation shown in grey.

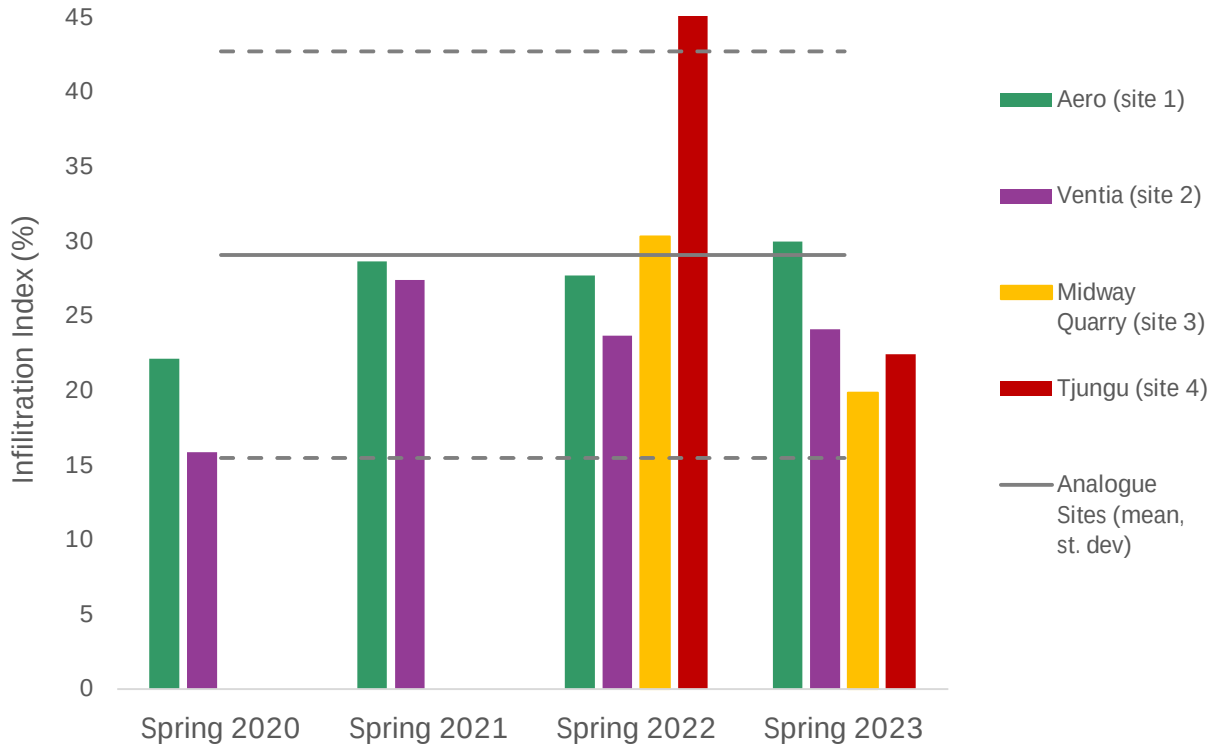

Figure 3-35 Mean soil infiltration index of transect (transect average for site) based on SSA (combined patch and interpatch) at rehabilitation sites from 2020 to 2023. Mean soil infiltration index of analogue sites with standard deviation shown in grey.

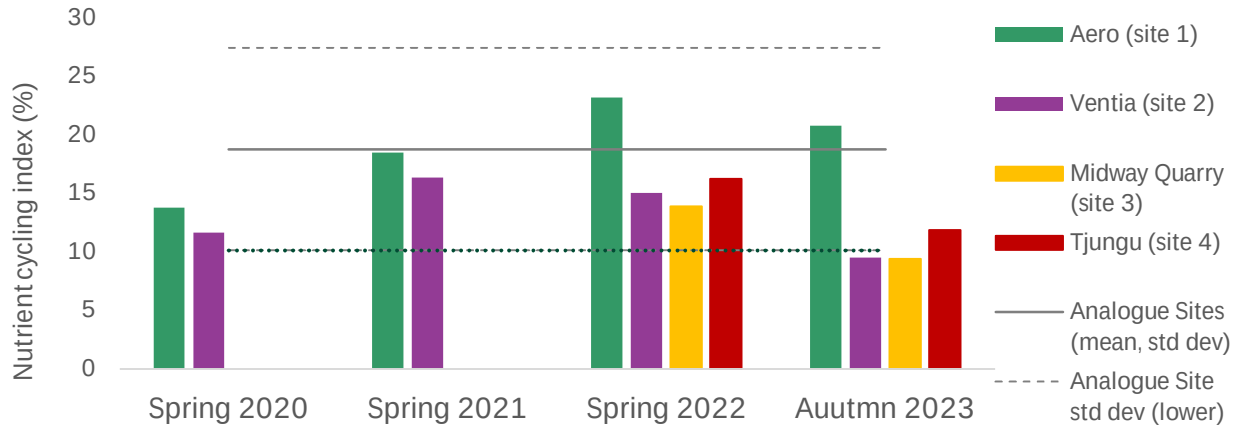

Figure 3-36 Mean nutrient cycling index of transect (transect average for site) based on SSA (combined patch and interpatch) at rehabilitation sites from 2020 to 2023. Mean soil infiltration index of analogue sites with standard deviation shown in grey.

Point-centred Quarter (PCQ)

The PCQ data indicates positive trends in plant establishment for the Aerodrome site and Ventia sites. At both sites the number of plants per ha is showing an upward trend since site establishment (Figure 3-37), whilst the distance between plants is showing a decreasing trend (Figure 3-38), indicating recruitment events.

PCQ analysis was not undertaken at the new Midway Quarry or Tjungu sites as the sites were almost devoid of vegetation and the distance to plants exceeded 10m in almost 100% of cases. However, in 2023, PCQ results for the Midway Quarry showed the mean distance between plants was already less than both the longer-established Aerodrome and Ventia sites (indicating greater plant density) (Figure 3-37). More strikingly, the number of plants per ha at the Tjungu site far exceeded the Aerodrome and Ventia sites (Figure 3-38).

For PCQ there is currently no data available from analogue sites to compare against.

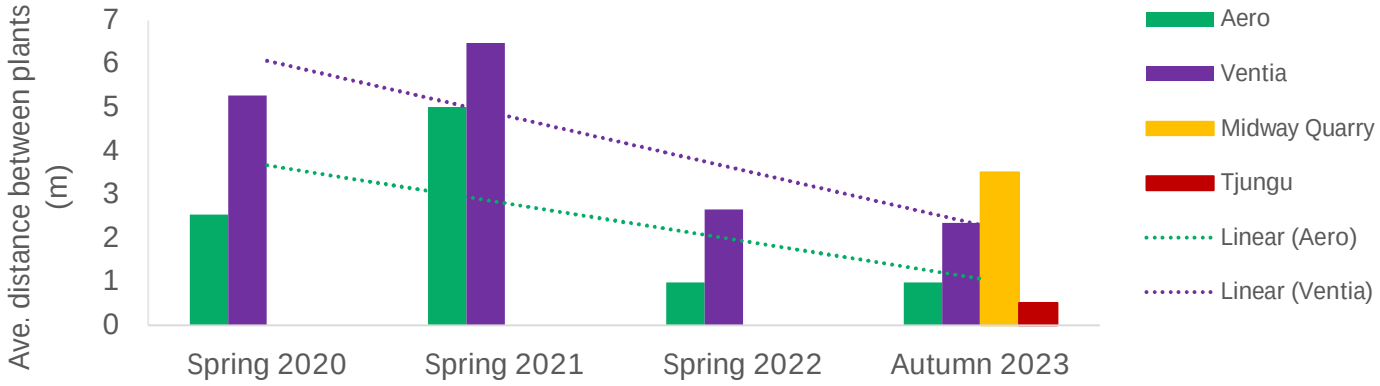

Figure 3-37 Mean distance between plants using Point-centred Quarter method.

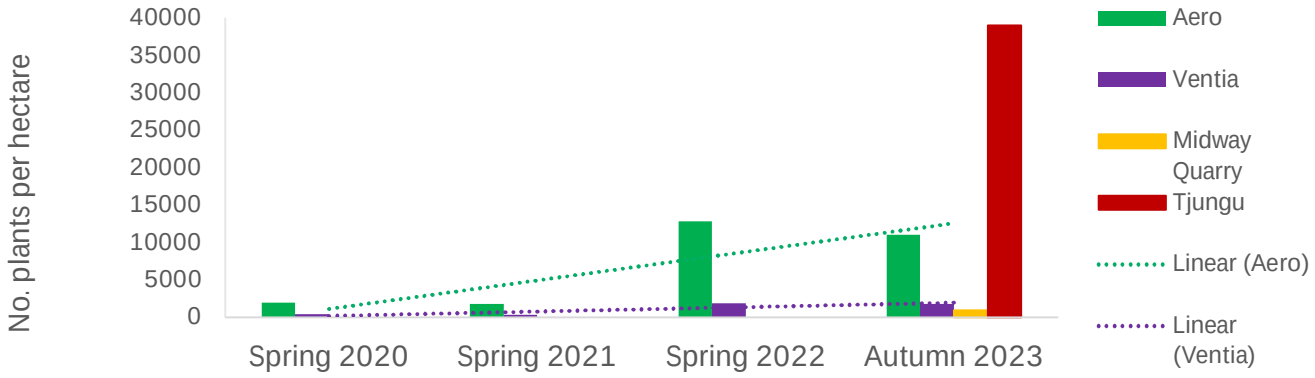

Figure 3-38 Mean number of plants per hectare Point-centred Quarter method.

3.3 Fauna

3.3.1 Survey effort and capture rates

As per Section 2.5, fauna survey methods during the construction/operational phase monitoring broadly followed the SA Vertebrate Survey guidelines (Owens 2000), with minor modifications aligning with the objectives of this survey. The broadly accepted guidelines recommend a minimum of four trapping nights to ensure sufficient trapping effort for the purposes of documenting key faunal assemblages across a study area.

Table 3-19 provides a summary of total trapping effort across the autumn 2023 survey. Survey effort has been calculated by number of trapping nights (number of traps multiplied by the number of nights the traps were set for) and the total number of active surveys and searches. Active reptile searches / opportunistic observations and bird surveys were undertaken at all eight fauna sites, the four sites in Eliza creek, the dune Flora sites (21 and 22) and at opportunistic sites. Spotlighting was undertaken at sites 10 (creekline / drainage line), camera survey and song meter deployment at fauna trapping sites also provided opportunity for capture nocturnal activity. Camera traps were generally set for 4 nights, however on the last night cameras from site 3, and site 6 were used at site 12 (with two other cameras, around gilgais which showed surface evidence of mammal activity, aiming to capture Plains Mouse activity), however no fauna activity was detected via those cameras.

Plate 3-12 Site 5 fauna trapping set up

Table 3-19 Fauna Survey Effort, autumn 2023

Site	# of Trap nights		Total Trap effort per site
	Funnel Trap	Pit Trap	
Fauna Site 1	16	24	40
Fauna Site 2	16	24	40
Fauna Site 3	16	24	40
Fauna Site 4	16	24	40
Fauna Site 5	16	23	39
Fauna Site 6	16	24	40
Fauna Site 15	16	24	40
Fauna Site 16	16	24	40
Total	**128**	**191**	**319**

Note one pit was closed on the last night at site 5, due to a large hole in base, hence fewer pit trap nights.

3.3.1.1 Capture rates

The autumn survey returned a total of 507 observations / evidence of mammal and reptiles (excludes exact numbers for sheep, kangaroos, goats, rabbits and birds which were not counted). This included 360 detections / observations of birds, 104 of mammals and 43 of reptiles. Of the 500 observations, 36 were pit or funnel trap captures. The highest capture rates were made in pitfall traps (33) and there were 3 captures in funnel traps. Capture rates for the number of pits and funnels deployed at each site are summarised in Table 3-20.

Total spring trapping capture rate for funnel and pit traps was calculated by dividing total captures by total trap effort (36/319 = 0.113). The total trapping capture rate was below the 2018-2020 spring capture rates (~0.23). The 2023 total capture rate is also below the range reported during baseline surveys (0.14 to 0.97), where the lowest rates were recorded in autumn 2013 (0.139), 2014 (0.128) and the highest rate was recorded in spring 2016 (EBS 2017b). As mentioned earlier, these numbers likely reflect the cooler autumn conditions, and should not cause concern, particularly given the diversity for both small mammals and reptiles is on par with baseline and previous construction monitoring surveys. Specific results per animal group and diversity results are presented further below.

As per above, both funnel and pit captures decreased greatly from the 2022 spring survey, and there were no recaptures recorded. When reviewing trends across the control and impact site, as well as including captures and observations of additional species (active reptile, spotlighting, bird surveys) there are no clear trends emerging between control and impact sites. It is noted that impact site 4 (on SAR near TSF) had the lowest overall species detection and impact site 16 had the highest species detection (near Tjungu Village / Airport /WAR). Impact sites had variable numbers of bird species, varying levels of mammal / reptile captures and there are no clear trends when compared with 2022 results (Figure 3-39). Noting less comparable data is available for autumn and this comparison primarily relates to point of time comparison across the sites.

A summary of total fauna capture by site for the different survey methods (funnel, pitfall, active reptile search, opportunistic observation and spotlighting) is provided in Appendix H.

Table 3-20 Fauna (trapping only) capture rates per site, autumn 2023

Site	Funnel Trap		Pit		Total Capture Rate	Total Capture Rate Comparison to 2022
	Capture	Capture rates	Capture	Capture rate	Capture rates	
Control						
Fauna Site 1	0	0	6	0.25	0.15	decrease
Fauna Site 2	0	0	5	0.21	0.13	decrease
Impact						
Fauna Site 3	0	0	3	0.13	0.08	decrease
Fauna Site 4	0	0	2	0.08	0.05	decrease
Fauna Site 5	0	0	1	0.22	0.03	decrease
Fauna Site 6	0	0	3	0.13	0.08	decrease
Fauna Site 15	1	0.06	8	0.33	0.23	decrease
Fauna Site 16	2	0.13	5	0.21	0.18	decrease
Total combined	**3**	**0.02**	**33**	**0.17**	**0.11**	**large decrease**

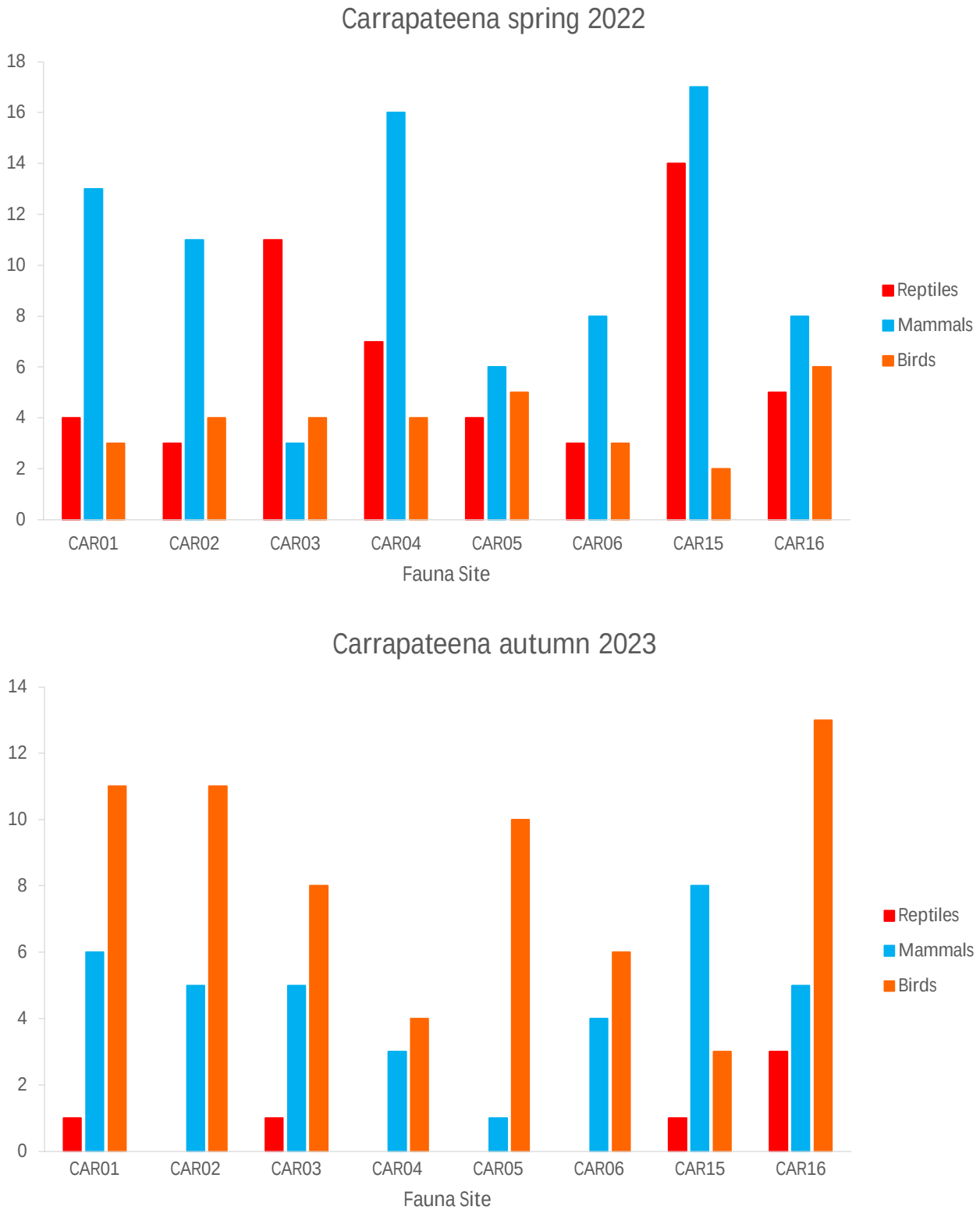

Figure 3-39 Total fauna capture / observation (birds are species only), spring 2022 and autumn 2023

3.3.2 Fauna diversity summary

The 2023 autumn fauna survey identified a total of 93 vertebrate species from the 8 fauna survey sites, 20 bird survey sites and opportunistically within the study area. Of these 93 species, six species were observed / detected that was not previously been recorded at the site during baseline surveys (2012-2017), or the construction/operation phase monitoring program (2018 to current); Major Mitchells / Pink Cockatoo (*Lophochroa leadbeateri mollis*), Musk Duck (*Biziura lobata*), Western Gerygone (*Gerygone fusca*), Australian Spotted Crake (*Porzana fluminea*), Restless Flycatcher (*Myiagra inquieta*) and Chirruping Wedgebill (*Psophodes cristatus*). The site occurs within the known range for these species, with the exception of the Western Gerygone, but there are BDBSA / ALA records for these species within the broader region > 50 km (Davies et al. 2022, BDBSA data NatureMaps 2023). In addition, a number of species were recorded that have not been recorded since baseline; Stubble Quail (*Coturnix pectoralis*) and Blue Winged Parrot (*Neophema chrysostoma*). The vertebrate species detected in the study area are summarised below:

- 68 bird species (52 at fauna sites and bird sites, 16 at opportunistic locations)
- 13 reptile species (3 fauna trapping captures, 10 active search / spot lighting / opportunistic observation)
- 12 mammal species (5 fauna trapping captures, 6 opportunistic including 3 exotic species, 2 bat species), An old Camel Skeleton was also found at Yeltacowie Homestead, excluded from total numbers in graphs / analysis.

Of the 93 species of fauna observed /detected during the survey, four hold conservation significance at a national or state level; Nationally Vulnerable Blue Winged Parrot, State Rare Pink Cockatoo (western Major Mitchell's), Musk Duck and Western Gerygone. All dams in proximity to the site were full, hence water birds and resident shorebirds were present, and a high number of parrot species were detected. The resident shorebirds included the Banded Lapwing at South Eliza Dam and near Site 21 and Black-fronted Dotterel at several dams.

Introduced birds or mammals observed at the site included, House Sparrows (in similar numbers than previous years), live European Rabbit (observed at site 15 and North Eliza Dam and track / scats at 3 other locations) and Feral Cats (on camera at site 3 and live at site 11). Rock Doves (Feral Pigeon) were not detected.

The following sections provide detail on each faunal group identified, including summary tables of species. Appendix G presents a comprehensive list of all fauna observed within the site, as well as capture rates.

Given the nature of fauna data from individual surveys, movement of species, the variations in weather conditions between surveys, variations in trapping effort (to baseline) and capture rates across surveys and sites, fauna data is reflective of high level trends over time only. Broadly, Figure 3-40 shows the total species diversity for mammals, birds, reptiles / frogs that were captured, recorded during dedicated bird surveys and recorded opportunistically across the Carrapateena site during spring baseline (2012 - 2017) surveys compared with data from the construction/operation period (2018 - 2023). Results indicate similar trends for some fauna and increasing trends for other, with 2023 total diversity falling above the spring range reported from previous years, and snap shot autumn surveys from early baseline (2012), late baseline (2017) and early compliance monitoring (2017) (Figure 3-40). Similar to spring 2022, in autumn 2023 dams were full, waterbirds were present, however there were increases in detection of bird species and families, likely as a result of preceding rainfall in summer as well as song meter detection and less windy days than during spring.

Similar to previous years, there was evidence of breeding activity across the site, given the arid environment, many animals breeding is stimulated by climate conditions, hence they don't just breed in spring, but breed throughout the year. The small mammals showed some evidence of breeding, however sample sizes were small for some species (e.g. Fat-tailed Dunnart). Female Forest's Mice were detected for the first time since 2021 and in slightly increased numbers, Stripe-faced Dunnart captures were 50% male and female and juvenile first season individuals were present. Stripe-faced Dunnarts were captured in higher numbers than Fat-tailed Dunnarts. Over 10 bird species were in breeding pairs / groups or had young present, which is a notable sign that species are persisting within the Operation area environment. Fauna with evidence of recent breeding included: multiple family groups of three fairywren species, numerous juvenile reptiles (Earless Dragon, Bynoes geckos, Tree Dtella), various parrots in pairs or flocks or pairs (e.g. Mulga Parrots, Australian Ringneck, Bourke's Parrots, Blue Bonnets) and pairs of Wedge-tailed Eagles. No evidence of a significant reduction in species

diversity was observed in 2023, with autumn species numbers similar or greater than baseline and compliance monitoring spring results with only the capture numbers reflective of climate conditions during the survey (refer 3.1.2). House Mouse were captured in small numbers at control site 1 and observed at South Eliza Dam during the survey.

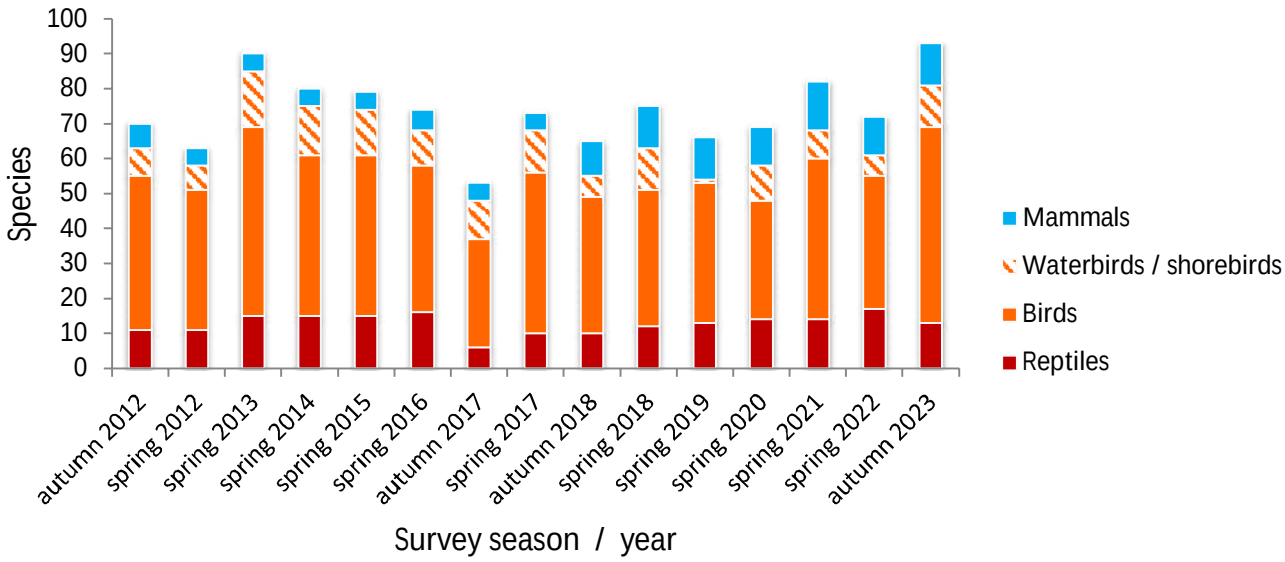

Figure 3-40 Vertebrate total species diversity, baseline (2012-2017), and compliance (2018 – autumn 2023).

Note only a representative portion of autumn data include from across the monitoring program (early baseline, end baseline, compliance monitoring).

Plate 3-13 Western Major Mitchell / Pink Cockatoo (*Lophochroa leadbeateri mollis*) near CWM05

3.3.2.1 Bird diversity

A total of 68 bird species were identified during the autumn 2023 survey across the Carrapateena site (see Appendix G). Of these species, 52 were recorded during dedicated bird surveys across 20 sites and 16 additional species were recorded opportunistically when driving along tracks, around camp, effluent irrigation areas, during weed surveys and at dams. At the time of the autumn survey all of the dams had water including coffer dams, and waterbirds and resident shorebirds were still present, similar to previous years when all the dams were full. No EPBC listed migratory species were detected, however one EPBC listed threatened species was detected during the 2023 autumn survey; Blue-winged Parrot (observed at site 16 and detected on song meter at site 5,7 and 16, four different days). A number of State listed species were recorded, some with previous records (e.g. Peregrine Falcon), some were new records.

There were six new records for the site; Musk Ducks (State listed Rare) detected at dams, Western Gerygone (site 19, State listed Rare), Major Mitchell's Cockatoo (State listed Rare), Restless Flycatcher (State listed Rare) (South Eliza Dam and site 7), Chirruping Wedgebill and Spotted Crake (Tjungu Effluent Irrigation Area).

Bird families were well represented, with birds from 34 different families observed (increased from 22 in spring 2022), where many families (172) were only represented by one species. Psittacidae (parrots) were the most well represented (6 species), with Meliphagidae (honeyeaters and chats) and Anatidae (ducks) both represented by five species. The next most common species detected included Acanthizidae (thornbills and warblers), Artamidae (woodswallows, butcherbirds, magpies), Cacatudiae (cockatoos), Falconidae (raptors), Hirundinidae (swallows and martins) and Maluridae (fairy-wrens). Another seven families were represented by 2 species.

The species detected at the most fauna sites during site targeted bird surveys were the Singing Honeyeater (14 sites), Australasian Pipit (13 sites), Australian Raven (13 sites), White-winged Fairywren (12 sites), Black-faced Woodswallow (11 sites), Spiny-cheeked Honeyeater and Zebra Finch (both with 9 sites).

Groups of three different types of Fairy Wren (White-winged, Purple-backed (Variegated) and Splendid) were present at a number of sites, including site 21 where groups of all three species were present). White-winged

Fairywren groups (males and females) were commonly observed across the Carrapateena Operation area in Chenopod habitats close to Western Myall Creeklines (e.g. Impact site 3 adjacent the admin). Of note, Splendid Fairywrens have not been detected at the site since 2018. Other species also showed breeding plumage, had juveniles present, were in breeding groups or nesting (e.g. Black-faced Woodswallows, Pipits, Chats, Singing Honeyeater). In addition, Grey Fantail had also not been recorded since early compliance surveys, and was detected from song meter data analysis in Eliza Creek at site 10.

The House Sparrow (*Passer domesticus*) was observed around both site camps in 2023, as per previous years, but also present at South Eliza Dam and site 3 near the administration building. Both males and females were present, in similar numbers than previously, numbers are not declining. No Rock Dove (feral pigeon) (*Columba livia*) were detected.

Plate 3-14 Restless Flycatcher (*Myiagra inquieta*) South Eliza Dam

3.3.2.1.1 Comparison with baseline data - Birds

Mean bird species diversity per bird site in autumn 2023 was 9.65 (increased from 5.6 spring 2022), with total diversity per site ranging from 4 to 20 species, with more species generally observed in creekline sites, or sites with Western Myall Woodland nearby (i.e. sites with a tree canopy in addition to shrubland understorey) or dune sites. Mean diversity per site in autumn 2023 was well over the mean diversity observed in 2018-2022 (5-6.15), (6.15 from 2021). Species diversity per bird site was also well above the range recorded for baseline surveys (e.g. ranging from 4.1 in 2016, to 7.9 in 2013). This is likely related to the optimal conditions to detect

birds (very few windy days, cooler day temperature and presence of water in dams), as well as the use of Song Meters to compliment bird surveys. Noting that the lowest number of species detected were detected as site 15, where the Song Meter data was not available.

Total autumn 2023 (68) bird species diversity across the site was above the range of diversity reported during baseline surveys (e.g. species diversity ranged from 42 in autumn 2017 to 70 in spring 2013; EBS 2017), and well above compliance monitoring numbers observed to date (2018 autumn to spring (46-51), 2019 (45), 2020 (44), 2021 (54), 2022 (37)). Total number of bird families (34) represented across the site within the range recorded during baseline survey results (e.g. families recorded ranged from 29 in spring 2012 to 38 in spring 2014 (EBS 2017)), and above results during compliance monitoring to date (e.g. 2018 (28-26), 2019 (21), 2020 (26), 2021 (29), 2022 (22). Given the presence of water in all of the dams, good conditions preceding the survey, less windy days during the survey, and use of Song Meters it is not unexpected that increased diversity of species and families were detected. In addition, a variety of nomadic species were detected that had not been detected since baseline or early compliance monitoring (e.g. Rufous Fieldwren, Splendid Fairy Wren, Peregrine Falcon). The variety of species and families of different types detected in 2023 and the ongoing evidence of numerous species breeding reflects stable conditions for an arid environment. In addition, the detection of state and national listed bird species is a good indicator of improving conditions. Regardless, there is no evidence to suggest mining activities are impacting bird presence across the site.

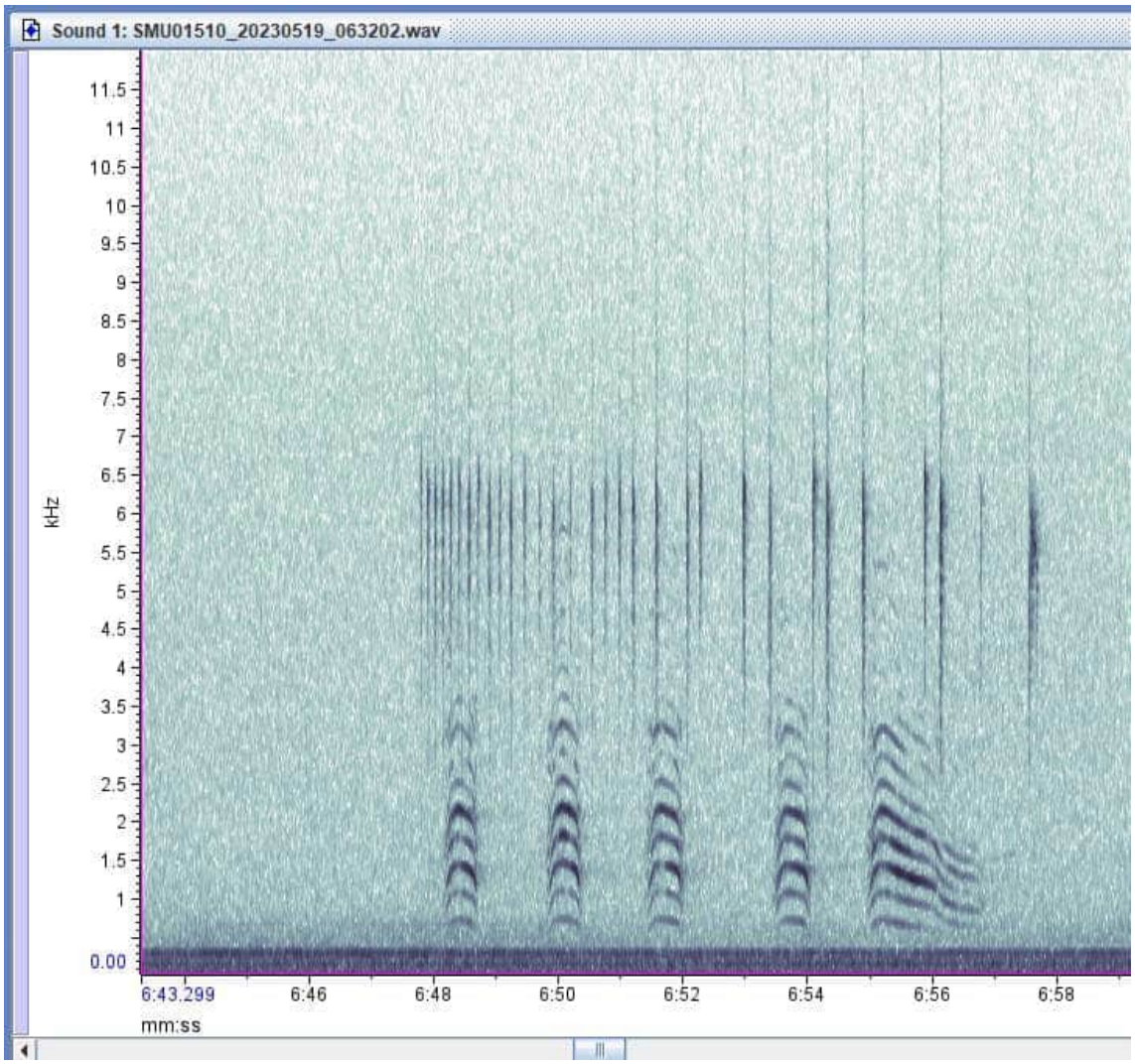

Plate 3-15 Blue-winged Parrot (above) and Australian Raven (below) harmonics from song meter site CAR007

3.3.2.2 Reptile diversity

Thirteen reptile species were recorded across the sites during the autumn 2023 survey (Table 3-21). During 2023, 85% of reptile captures/observations recorded were through active reptile searches, spotlighting and opportunistic observation / capture and 15% were through trapping. Similarly, in terms of diversity, 77% of species were detected via active reptile, spotlight and opportunistic searches and only 23% of species were detected via pit / funnel captures. The main species recorded in traps was the Salt-bush Ctenotus (*Ctenotus olympicus*) with the greatest numbers being detected site 15. The very low number of trap captures is likely due to the cooler temperatures during late autumn (refer Table 3-21).

Despite the low number of reptile captures (6) and reptile detections (39), four common reptile families were well represented; including six skink species, four dragon species (Plate 3-17) and two gecko species. Juveniles of several species were detected during the survey (e.g. Bearded Dragon, Earless Dragons, Bynoes Gecko, Salt-bush Ctenotus) indicating ongoing breeding activity.

A new species that has not been detected since baseline surveys was the Eyrean Skink (*Ctenotus taeniatus*) captured at site CAR016. There has been some taxonomic revision of this species, previously recorded from the site during baseline surveys as *Ctenotus taeniatus* (2007) and *Ctentous brooksi* (2012) (refer Plate 3-19). The site is well within the species known range, and is a refreshing detection during autumn.

Plate 3-16 Eastern Pebble Dragon (*Tympanocryptis intima*)

Plate 3-17 Peninsula Dragon (*Ctenophorus fionni*) at CAR007 near song meter deploy (Chris Watson)

Plate 3-18 Juvenile Curl Snake (*Suta suta*), Yeltacowie Homestead

Table 3-21 Reptiles observed at Carrapateena autumn 2023

Family Name	*Scientific Name*	Common Name	Site								OP / AS / SP[1]	Total
			1	2	3	4	5	6	15	16		
Agamidae	*Tympanocryptis tetraporophora*	Eyrean Earless Dragon								OP	S12	2
Agamidae	*Tympanocryptis intima*	Eastern Pebble Dragon	1									1
Agamidae	*Pogona vitticeps*	Central Bearded Dragon									S20[3], S21[4]	2
Agamidae	*Ctenophorus fionni*	Peninsula Dragon									S7(1) Plate 3-7	1
Elapidae	*Suta suta*	Curl Snake									YHS	1
Elapidae	*Pseudonaja sp.*	Brown Snake									YHS (skin)	1
Gekkonidae	*Gehyra versicolor*	Eastern Tree Dtella									S10 x 2 (SP)[4]	2
Gekkonidae	*Heteronotia bynoei*	Bynoe's Gecko			OP						S3 (2), SED[4] (10), S18 (1), YHS[4] (9)	22
Scincidae	*Ctenotus olympicus*	Salt-bush Ctenotus							4	1	1	6
Scincidae	*Menetia greyii*	Common Dwarf Skink									YHS	1
Scincidae	*Ctenotus taeniatus*	Eyrean Ctenotus								1	1	1
Scincidae	*Tiliqua rugosa*	Shingle Back Lizard									S20[3]	1
Scincidae	Morethia boulengeri	Common Snake-eye									S17	1
	Totals detected	42	1	0	1	0	0	0	4	3	31	
	Total species	13	1	0	1	0	0	0	1	3	12	

[1]SP = spotlighting; OP = Opportunistic SED = South Eliza Dam, YHS - Homestead; WAR = Western Access Road, MC = Western Myall Creek, S2 = CAR002, S7 = CAR07, S10 = Site CAR010, S11 = CA011, S17 = CAR017, S20 = CAR020, S21 = CAR021, S22 = CAR022; Shedd Skin only[2], Carcass under Wedge-tail Eagle nest[3], Juvenile detected[4]

3.3.2.3 Comparison with baseline data - Reptiles

Total reptile captures / observations for autumn 2023 (39) was well below spring 2022 (88), but within the range for baseline autumn surveys (e.g. 2012 (97), 2013 (53), 2014 (30), 2015 (56), 2016 (28)), and well above the construction monitoring total (2018 (19 captures / observations).

Results in 2023 were within and the baseline monitoring range, and likely comparatively low as a result of the reduction in trapping effort and the number of trap lines since 2017 (i.e. only one trap line per site). Cooler daytime and overnight temperatures during the 2023 survey likely contributed the most. Regardless, detection of juveniles and species not recorded since baseline, suggests mining is not impacting reptile fauna at the site.

Total reptile species diversity across the Carrapateena site in 2023 (13 species) was below spring of 2022 (17 species), but within the range of the previous construction / operational monitoring spring surveys in 2018, 2019, 2020, 2021 (12 / 13 / 14 / 14 species) and within the range of total species diversity reported during all baseline surveys between 2012 – 2017 (which ranged between 10 to 16 species, EBS 2017). Families that were not detected in 2023 included Diplodactylidae, Varanidae and Carphodactylidae. In addition, similar to 2022 no representatives of the Pygopodidae were observed in 2023, but only one individual has previously been recorded at the site during the 2013 baseline survey (EBS 2013a) whilst spotlighting (*Pygopus nigriceps,* Black-headed Scalyfoot). The Pernatty Knob-tailed Gecko (Carphodactylidae family) and Centralian Blind Snake (Typhlopidae family) remain undetected since 2014, but these species were only previously reported during spotlighting (presumably in dune habitats, which are not part of the construction / monitoring program).

Similar to 2023 compliance monitoring, detection of species that have not been detected since baseline is always great news for the monitoring program. In 2023 the species not detected since baseline was the Eyrean Skink (*Ctenotus taeniatus*) (refer Plate 3-19). The species was detected at site CAR016 close to the Tjungu village, also a site that is adjacent an ephemeral drainage line. This site also had the greatest reptile species diversity for 2023.

Mean reptile species diversity per fauna site was not calculated in 2023 given 50% of the sites did not detect any reptiles species. Reduced species diversity per site on the whole is likely attributable to a combination of reduced trapping effort since baseline (e.g. reduced pit lines and pits per line), and local climatic effects favouring certain species, but primarily the cooler temperatures of late autumn. This is not considered to be a concern for individual sites given the total reptile species diversity across the site was on par with baseline surveys. The variation since baseline could also reflect differences in calculation (e.g. baseline numbers for 'richness' may include active reptile results at fauna sites, and a different level of survey effort). In addition, it should be noted that at site CAR003 a cat was captured waking the fauna line, which may also contribute to reptile captures. It is assumed the cat could not access the animals in the 60cm deep pits, with toilet rolls, vegetation and a piece of fabric towel, however cats may have been able to catch fauna (e.g. geckos at night, skinks / dragons during the day) that were running along the fence line towards pit and funnel traps.

Plate 3-19 Eyrean Skink (*Ctenotus taeniatus*), captured in pitfall trap at site 16

3.3.2.4 Mammal diversity

Thirteen mammal species were detected across the Carrapateena site during the autumn 2023 survey (refer Table 3-22). Five mammal species were captured via trapping; Fat-tailed Dunnart, Stripe-faced Dunnart, Forrest's Mouse, Narrow Nosed Planigale and House Mouse. Compared to previous years a mix of male and female Forrest's mice were captured. Forrest's Mouse and Narrow-nosed Planigale were recorded in lower numbers (8 and 3 respectively), but higher than previous construction monitoring and at more sites (Forrest's mice at all sites except 5 and 15 Plate 3-21). Juvenile Planigales were captured at impact sites 3 and, but not at control sites. Other animals detected include pest fauna and microbats (at least two species detected).

Similar to 2021/2022, the Stripe-faced Dunnart was the most abundant small mammal captured at all sites but in lower numbers (16 compared with 18 in 2021, 46 in 2022); both males and females, and range of age classes and there was little evidence of recent pouch activity. However, both young new Stripe-faced Dunnart females with no tail condition and older larger females with good tail condition were captured, suggesting breeding for the season had commenced. In contrast to previous years Fat-tailed Dunnarts were not the next highest number recorded, with only one animal detected via trapping (site 15) and the other two detected during spotlighting.

The White-striped Free-tail Bat is the only bat in South Australia that is audible to the human ear. This larger micro bat was heard during spotlighting in Eliza Creek (site 10) and regularly at night at both Villages in larger numbers than previously. Given the lack of wind (autumn) and the increased insect activity likely associated with rainfall preceding the survey, detection of this species was simplified in 2023. Song meter results also indicated the species presence at CAR001, and in Eliza Creek (CAR010).

Minimal evidence of pest fauna species was observed at the fauna trapping sites and as mentioned in Section 3.2.5 evidence of grazing was limited at flora sites. Goats were not observed during this survey, but a small group is known to occur at the site. Rabbits scats, diggings and live animal were detected opportunistically, an active warren was recorded on the track to site CAR015. Foxes have been recorded on the site previously (2012, 2013, 2015, den in Eliza Creek 2019, dead fox at Anzac Dam in 2019). Foxes were not detected during 2023. Cats are known to occur at the site and have increased slightly in recent times, particularly around administration areas, and management is ongoing. A live cat was observed at CAR011 during the day, and another captured on nocturnal camera at site CAR003 (near administration) (Refer Plate 3-20). It is also noted that three cats were destroyed by environmental staff prior to the autumn survey and a number of kittens have also been removed from the site.

Of note an old Camel skeleton was noted at Yeltacowie Homestead, no other camels have been recorded with 50 km of the Carrapateena site (BDBSA 2023), or in the database for previous baseline / construction surveys. The skeleton is likely related to the historical activities at the homestead and has no relevance to current mining activities and potential impacts.

Grazing management has changed across the site, with less areas under grazing and more fencing delineating grazed areas; small flocks of sheep were only observed / detected (song meter) at site 5 and site 9. As a result, kangaroos are also being managed more effectively across the site and there is likely less competition for resources. Red Kangaroos and Euros were observed across the study area and were noted to be in excellent health, Euros in similar smaller numbers than previous years and similar numbers of Red Kangaroos.

Table 3-22 Mammals recorded at Carrapateena during autumn 2023 survey

Scientific Name	Common Name	Site								OP[1]	Total[2]
		1	2	3	4	5	6	15	16		
Leggadina forresti	Forest Mouse	2	2	1	1	0	1[3]	0	1	0	8
Sminthopsis crassicaudata	Fat-tailed Dunnart							1		2 (SP, near S10)	3
Sminthopsis macroura	Stripe-faced Dunnart	2	3	1	1	1[3]	2	4	2	0	16
Planigale tenuirostrisi	Narrow Nosed Planigale			1					2	0	3
Mus musculus	House Mouse	1[3]								SED	2
Oryctolagus cuniculus	European Rabbit							2[6]		S21[4], S22[4]; S19[4], NED	3
Macropus rufus	Red Kangaroo		1[2]	1[2,3]				1[2,3]			
Capra hircus	Goat									S12[2]	NA[2]
Osphranter robustus	Euro									Track to NED (2)	2
Felis catus	Cat			1[3]						S11	
Austronomus australis	White-striped Freetail Bat	SM								TJ V, EV, S10[7]	2 records, multiple
Chalinolobus sp. (gouldii or morio)	Gould's Wattled Bat or Chocolate Wattled Bat[8]									SM	
Camelus dromedarius	Camel									YHS[5]	1 (very old)
Total trap captures		5	6	3	2	1	3	5	5		NA
Total species detection	13	3	3	5	2	1	2	4	3	7	

[1]OP = Opportunistic, EV = Exploration village; S21 = site CAR021, S22 = site CAR022, S11 = CAR011; [2]Not Accurate given kangaroos / sheep were not always counted, 1 denotes presence; [3]CT – also recorded on Camera Trap. [4] fresh tracks / scats. [5] Dead / old carcass.[6]Warren, [7]Confimred via song meter, SM = Song meter; [8] Acoustic Results could not separate calls between *Chalinolobus gouldii* and *C. morio,* Most likely *C. gouldii* which has been detected previously during baseline surveys, however *C. morio* could occur at the site (Churchill 2008, C. Watson pers. Com).

Plate 3-20 Cat captured via camera trap walking fauna line at site 3

Plate 3-21 Forrest's Mouse (*Legadinna foresti*) (site 1)

3.3.2.4.1 Comparison with baseline data - Mammals

Mammal species diversity from trapping effort alone during autumn 2023, was comparable with baseline spring 2017 (5 small mammal species) and baseline autumn 2017 (6 small mammal species), with the exception of Plains Mouse not detected (as per 2017, three captures). No House Mice were caught in traps in 2022. The Narrow-nosed Planigale was recorded in previous surveys in low numbers, and is an elusive species that is more active during warmer temperatures. This species was detected at two sites (3 and 16) and juveniles were present.

In general, mammal species diversity did not differ notably from previous surveys. Red Kangaroos were present across the site, and similar to 2022, remain in good health compared to previous years, and in moderate numbers (not counted). Evidence of feral goats was present (scats) and other feral animals still present in slightly greater numbers, but with a cat via camera traps and detected in a Myall Creekline near site 11. There were ongoing signs / evidence of rabbits and also live sightings at an established warren near site 15 (Plate 3-22).

Mean small mammal species diversity per fauna site was 2.4 (down from 2.75 spring 2022), ranging from 1 to 3 species observed per site. These numbers are greater than previous construction/monitoring surveys (small mammal species only) and within the baseline surveys presented in EBS (2017). These results are considered satisfactory given the low number of small mammal captures for the autumn 2023 survey. There was very little difference between small mammal species diversity and captures across sites, the highest number of captures was at control and impact site (site 1,2, 15 and 16; 5-6 captures, 2-3 species detected), and the lowest numbers at sites 4 and 5 (1-2 captures, 1-2 species detected).

Total diversity of mammals (12) observed or captured throughout the survey was above the range of mammal diversity reporting from autumn baseline surveys, which ranged from 4 to 8 (small mammals only), with 5 small mammals detected during 2023 (refer Figure 3-40). Noting that baseline surveys did not regularly report on presence of Kangaroos, Fox, Cow, Euro, Bat, but occasionally recorded rabbit (e.g. spring 2014). Males and females and younger animals were present for at least three species (Stripe-faced Dunnart, Forrest's Mouse and Narrow-nose Planigale), suggesting that at least one round of breeding may have occurred prior to the survey.

Plate 3-22 Active Rabbit Warren near site 15

3.3.3 Control versus Impact

Results from autumn 2023 indicate that when combining total diversity of bird species observed, mammal species captured and reptile species captured / observed at fauna trapping sites, the mean species diversity is slightly higher for control sites than impact sites. These results are summarised below in Table 3-23. A comparison of the mean total fauna diversity between control and impact sites using un-paired t-tests indicated no statistically significant difference (Control Mean / Standard Error (SE) = 14 /0.0, Impact Mean / SE = 11.33 / 5.79, P = 0.5590).

Similarly, average total captures were slightly higher at control sites than impact sites (Table 3-23). Mean total fauna capture (reptiles and mammals only) between control and impact sites using un-paired t-tests indicated no statistically significant difference (Control Mean / SE = 5.5 / .5, Impact Mean / SE = 4.17 / 3.13, P = 0.5897).

These results provide no evidence that mining activity is impacting fauna diversity or trap capture rates. Whilst the differences for both diversity and captures were not statistically significant, they were very close. Additional control sites would provide greater confidence in the analysis.

Variance in diversity and capture rates between sites may be influenced by a range of factors, e.g. Khamsin Road traffic, Northern Wellfield activities, change in activity near some of the Western Access Road (WAR) sites (site 5, 16). Interestingly, the results from 2023 differ from 2021 where the diversity is slightly higher at impact sites, but this is likely influenced by the number control versus impact. It will be useful to monitor these trends over time and also review the purpose of control and impact designation against the type of ‘impact’ and distance to impact at each site (e.g. active mine / admin, completed transmission line, Western Access Road / quarry, Northern Wellfield and road, gatehouse move). Regardless, overall diversity (birds, mammals and reptiles) and capture rates at sites in close proximity to the mine site (e.g. site 3, 15 and 16) and camps provide good evidence that fauna impacts as a result of mining activity are not currently evident at Carrapateena.

Table 3-23 Comparison of fauna diversity and captures at control and impact sites

Site	Treatment	Diversity: Number of bird, reptile, small mammal captures / observed[1]	Average Diversity at Fauna sites	Captures: Number of reptile, small mammal captures / observed[1,2]	Average Captures at Fauna sites1
1	control	14		6	
2	control	14	**14**	5	**5.5**
3	impact	12		3	
4	impact	6		2	
5	impact	12		1	
6	impact	9		3	
15	impact	7		9	
16	impact	22	**11.33**	7	**4.17**

([1]Excludes kangaroos, goat, rabbit, [2]bird species only counted once)

3.3.4 EPBC Act Protected Matters

The conditions of the PEPR require that records of three EPBC listed threatened species are reported if they a recorded during ecological surveys at site, namely Thick-bill Grasswren, Plains Mouse and Night Parrot. In addition, observations of the Migratory / Critically Endangered Curlew Sandpiper are to be noted as per EPBC referral commitments.

3.3.4.1 EPBC1 - Thick-billed Grasswren (Vulnerable)

No evidence of the Thick-billed Grasswren (TBGW) (*Amytornis modestus indulkanna*) (calls, direct observations) were observed during the 2023 survey, including bird surveys at 20 sites, or during opportunistic observations at dams and other likely habitat during the survey. In addition to previous years song meters were deployed at all dedicated fauna sites, a pastoral dam (Dawsons Dam), Eliza Creek (CAR010) and a small patch of potentially suitable Thick-bill Grasswren habitat within the Carrapateena Wellfield Expansion area (NWERAM02). No evidence of the distinctive high pitch calls were evident on the Sonoogram outputs, but Splendid Fairywrens were detected (along with White-winged Fairywrens detected on the initial site visit) (C. Watson pers. Com).

A total of 67 bird species were observed throughout the survey including other similar sized species, such as three species of Fairy-wren (White-winged, Purple-backed and Splendid) and the Rufous Fieldwren.

Whilst captures for reptiles and mammals were reduced given cooler temperatures during the autumn survey, bird detection was increased due to both song meter deployment and a lack of windy days usually experienced during spring surveys.

3.3.4.2 EPBC2 - Plains Mouse (Vulnerable)

No evidence of Plains Mouse was recorded during pitfall and camera trapping at eight fauna sites during the autumn 2023 survey, despite trapping effort within proximity to isolated patches of cracking clay habitat. However, it is noted that many gilgais showed much larger cracks and crevices than previously and fauna runs into these cracks (refer Plate 3-23 below). Rodents (likely Forrest's Mice were captured on nocturnal cameras at several sites in late April and during the May survey. As per 2023, Plains Mice have been detected at the SouthGap offset area (NatureMaps 2022) and inside / outside the arid recovery area and are known to be in an irruptive phase given increased summer autumn rains. It was suggested the increase in detection at the SouthGap offset site was related to increased rainfall, reduced feral predators and reduced competition from herbivores (e.g. sheep, goats, rabbits, kangaroos) within the perimeter fence area (Nature Foundation 2023).

Previously the population was assumed to be undergoing a population low, due to absence of detection at South Gap, however detection in 2021 and again in 2022 suggests the population is expanding (Nature

Foundation 2023). Whilst the South Gap results are encouraging, they do not suggest the species is undergoing a boom as occurred in 2012 where 31 individuals were captured at Carrapateena. The species was most recently caught at Carrapateena in 2017 (only 3 captured) prior to the construction and operational monitoring and drought conditions. Detection at South Gap, but not at Carrapateena may also be related to additional factors (greater rainfall than Carrapateena, reduced impacts from grazing and predators compared with Carrapateena). In addition, detection may also have been affected by the cooler temperatures, however it is noted that whilst captures were low, all of the regular common small mammals were detected in 2023. Five common small mammal species were active during the Carrapateena 2023 survey and captured during trapping, all in pitfall traps (and some also on camera traps); Fat-tailed Dunnart, Stripe-faced Dunnart, Forrest's Mouse, Narrow-nosed Planigale and House Mice (only at site CAR001 and South Eliza Dam) were detected at trapping sites. Similar to 2022 Stripe-tailed Dunnarts were the dominant species that were captured, however Forrest's Mouse were second highest (16 and 8 respectively). Capture rates between control and impact sites were not statistically significant, although trended towards slightly higher rates at control sites, as would be expected.

Plate 3-23 **Gilgai with evidence of small mammal activity**

Plate 3-24 **Rodent (likely Forrest's Mouse) captured on camera at CAR001 in late May**

Plate 3-25 **Large gilgai crevice with fauna run**

3.3.4.3 EPBC3 - Night parrot records (Endangered)

During the annual flora and fauna survey (autumn 2023) at the Carrapateena mine site, there was no evidence of Night Parrot (calls, direct observations or distinct feathers) at eight flora and fauna monitoring sites, 20 bird survey sites and a number of opportunistic observations at dams, during spotlighting. There was also no detection via song meter at the fauna sites or other opportunistic locations deployed (e.g. Dawson Dam, Eliza Creek, WERAM02 near site 21). A total of six parrot species were detected throughout the survey including four common parrot species (Bourke's Parrot, Blue Bonnet, Mulga Parrot, Australian Ringneck) and two threatened species.

EPBC listed Blue-winged Parrot was observed at CAR016 and detected via song meter at CAR005 (Plate 3-26), CAR007, CAR016 and a flock of SA rare subspecies Major Mitchells' / Pink Cockatoo were also observed during the autumn survey (Western Access Road). The Pink Cockatoo has not previously been recorded within 50 km of the Carrapateena site.

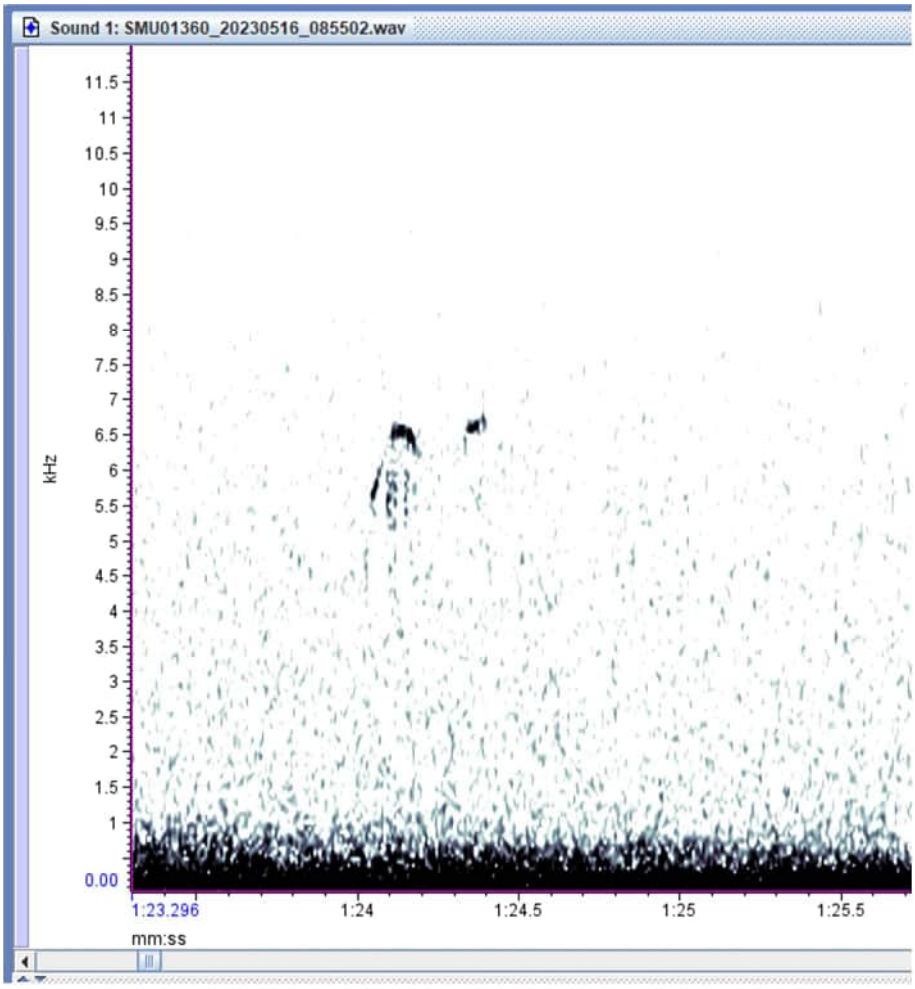

Plate 3-26 Acoustic image of Blue-winged Parrot at site CAR005

3.3.4.4 Curlew Sandpiper (Critically Endangered)

The EPBC listed Critically Endangered and Migratory Curlew Sandpiper (*Calidris ferruginea*) is not covered by PEPR conditions, but is one of the four EPBC species that was considered in the Operation's EPBC referral. Whilst it was considered unlikely to occur at the site, there is potential the shorebird could visit water habitats at the site.

No evidence of Curlew Sandpiper (calls, direct observations) were observed during the team's presence at site during the 2023 autumn survey, whilst undertaking bird surveys at 20 sites, or during opportunistic observations at dams or on song meter outputs. All dams contained water during the survey period, and were quite full with little exposed mud areas. A total of 68 bird species was observed throughout the survey; no migratory shorebirds were detected this year. A number of water bird species, some that have not been recorded since baseline were also recorded in water habitats (resident shorebirds Banded Lapwing and Black-fronted Dotterels), and water birds (Australasian Grebes, Grey Teals, Australian Wood Duck and Australian Pied Cormorant). Black-tailed Native Hens and Australian Spotted Crake were also observed (e.g. in Tjungu Effluent Irrigation Area).

3.3.5 Vouchers

For the spring survey two trap deaths were provided to the museum (two native mouse) were provided as voucher specimens to the SA Museum as required.

The Trap Death incident report provided to the Wildlife Ethics Committee is provided in Appendix J.

3.3.6 Pitfall line integrity

As mentioned earlier, the trapping effort at the site has been reduced over recent years from four pit lines to one pit line per site being opened during each survey. The reduction in number of lines was undertaken to align the survey effort undertaken with the requirements of the PEPR (i.e. focus on species diversity and not focus on measures of abundance or a need for high capture rates). There has been some flexibility in the pits and lines opened during the construction/operational phase monitoring to date, using only 6 of the 7 pits in a line, and potentially using different pit lines at a site over different surveys. Previously some of the pit lines contained pits that required maintenance or permanent removal as the integrity of the pit bases did not meet ethics standards. These holes were likely related to historical Planigale presence and potentially extraction of small skinks that had managed to get under the base liner. In 2019 it was recommended that one whole line be removed from site 5 which was completed by site environmental staff. In 2019 it was also recommended that other lines either have existing semi-permanent pits reinstated or maintenance of pit bases be added to the site enviro maintenance program which was undertaken. Initially, site environmental staff have replaced metal mesh bases (previously attached with large rubber bands / gaffer tape prior to inserting pit tube into the hole) with a similar size plastic mesh that could be attached with hot glue / selastic. This was required given the effort to extract the pit tubes which are wedged into the clay holes. The upgraded bases worked well in 2021 and 2022, but some still require further maintenance given Planigales and House Mice presence in traps on occasion pits were left open with rocks to allow animals to escape, prior to maintenance. Following the 2023 survey, the site environmental team will replace damaged pit bases with stainless steel wire mesh soil sifting bases, which will reduce ongoing maintenance and improve pitfall trap integrity across the site. It is noted that at the time of reporting maintenance of the pits by BHP is underway (e.g. replacement of damaged pit liners in semi-permanent traps).

As per above regarding pit maintenance, data on lines that still need new bases is provided to the BHP environment team at the end of the survey and maintenance is undertaken in the warmer months. During the maintenance schedule the pit lid should also be checked to ensure that they are secure and there are no gaps where animals (particularly very small skinks, geckos, juvenile mammals) that can squeeze into cracks can get in and become trapped outside of the survey period. The process involves: digging around the top of the pit below the lip of the pit lid (e.g. ~10cm), then aligning pit lid, banging down the lid and inserting the hex screw through the lip of the lid and the pit liner. Prior to this process the pit should be checked that it is free of any fauna, particularly if pits are left open for a short time for maintenance. These steps are required because the site has been allowed to close pits with a tech screw rather than filling the pitfall traps with rocks, sand or sandbags at the end of the survey, as is the protocol in the Wildlife Ethics Guideline (DEW 2019) associated with the permit

for this Operation. Ethics require photos of the closed pits be provided in the annual Wildlife Ethics Report (due February / March each year - Jacobs prepares on behalf of OZ Minerals), for the Permit requirements.

4. Discussion

4.1 Summary of Autumn 2023 Results

4.1.1 Assessment of mining impacts

Potential impacts from mining activity on vegetation would be represented by a decline in the number of native species present; a decline in the abundance of individuals within a species; and a decline in plant health (e.g. due to potential raised dust settling on plants) and an increase in weed presence. The discussion below outlines why the results do not indicate impacts on vegetation from mining at the Carrapateena site.

4.1.2 Native plant species diversity (rangeland assessment)

Monitoring of perennial species diversity provides an indication of long-term trends in plant populations. Long-lived perennial species diversity has remained within the baseline range at all sites, short-lived plant diversity at the upper end of the range recorded during construction monitoring. Given post-construction monitoring results have not shown clear trends emerging in long-lived or short-lived species diversity, it is considered that there has been no impact on perennial species diversity from mining.

In autumn 2023, a cumulative total of 148 native flora taxa was recorded at the one-hectare Rangeland Assessment flora sites across the Carrapateena Operation area. This was the highest diversity recorded during the "construction and operation period" (compliance) monitoring, which began in autumn 2018. The high species diversity was due to the very high diversity of short-lived species: the total of 90 short lived species was the highest recorded during the operation monitoring, while the long lives species diversity was within the range recorded during the previous operational surveys.

During construction monitoring, variation in total species diversity within the mining lease has largely been due to variation in diversity of short-lived species that germinate in response to rainfall. During construction monitoring long-lived perennial diversity has been very stable, with yearly totals ranging from 58 to 62 since autumn 2018, and 58 species recorded in 2023. The very high number of short-lived species recorded in 2023 is likely to be the result of well above average rainfall received in November 2022, when approximately 50% of the long term mean rainfall was received. In 2023 the mean total species diversity for impact sites and for control sites was not significantly different (30 and 29 species, respectively). These mean diversities were within the baseline range. Hence mining activities are not considered to be impacting either short-lived or long-lived species diversity at the mineral lease.

Flora site 10 was the only flora survey site on Eliza Creek to be established during the baseline survey period. To provide additional data against which to monitor potential impacts of the TSF dam embankment on downstream Eliza Creek habitats, flora sites 17, 18, 19 and 20 were established in autumn 2018. Since 2018, there has been no distinct trend in species diversity for any of the Eliza Creek sites, with both small increases and decreases occurring yearly at each site. There are also no distinct differences in species diversity between sites. In summary there is no clear pattern emerging in species diversity data relating to the time since the TSF establishment and the distance from the TSF.

Similarly, flora sites 21 and 22 were established to determine potential impacts from mining on sand dune habitat. Site 21 being a control site (> 2 km from mining infrastructure) and Site 22 a potential impact site (< 2 km from mining infrastructure). Since 2018, no clear trend in long-lived species diversity has emerged at either site, hence species diversity is not considered to have been impacted by mining activities.

As at autumn 2023, there were also no trends emerging in species diversity at either control or impact sites in gibber (stony tableland) habitats, the dominant habitat within the mining lease.

4.1.3 Long-lived woody perennial species diversity and abundance (Jessup transects)

To analyse population trends in long-lived perennials, Jessup transects have been surveyed during baseline and construction monitoring. Since 2018, the population of the four most abundant and widespread species have been analysed in detail, namely: Bladder Saltbush (*Atriplex vesicaria*) (the dominant plant species at the gibber

habitat sites). Sea-heath (*Frankenia serpyllifolia*), Samphire (*Tecticornia* species), and Plains Lantern Bush (*Abutilon halophilum*).

Following declines in the populations of all four species in 2018, 2019 and 2020, total population abundance across all sites has increased or remained stable since 2021 (and since 2022 for Plains Lantern Bush). The widespread declines were associated with several years of well-below average rainfall, with widespread dieback of shrubs noted. The increases in population abundance since 2021 have been associated with average or above-average long term rainfall totals. In 2023, the populations of these four species is within the baseline range.

For Bladder Saltbush, the 2022 and 2023 total population size for all sites combined were similar, with some sites recording increases and some recorded decreases. Widespread regeneration of Bladder Saltbush was recorded in 2023, with the number of juveniles recorded being second highest since construction monitoring began, and hence a factor in the recovery of Bladder Saltbush populations since 2020. During compliance monitoring at impact sites, the mean number of Bladder Saltbush has remained within the baseline range, but at control sites, the mean number of Bladder Saltbush has remained below the baseline range, with recent increases not yet offsetting losses in 2018-2020. The correlation of population size with rainfall and the greater recovery at impact sites (compared with control sites) indicates that rainfall totals rather than mining have influenced Bladder Saltbush populations.

Following the drought-induced decline of Samphire plants, the population means for both impact and control sites have returned to within baseline ranges in 2022 for control sites and 2023 for impact sites. This was despite a small decline in the mean population of Tecticornia at control sites. As with Bladder Saltbush, the greater recovery at impact sites rather than control sites indicates the population has not been affected by mining related activities.

During compliance monitoring, the population of Sea Heath also declined during the below average rainfall years of 2018 – 2020 and has increased since 2021 with increased rainfall. The total population of Sea Heath is relatively small. During compliance monitoring the mean population at impact sites has remained within the baseline range, while control sites have been within the baseline range for all years except 2021. In 2023, there was a 10% increase in the mean number of plants recorded at control sites, and a 12% decline recorded at impact sites. However, at most control and impact sites, the abundance of Sea Heath is less than 10 plants and absolute changes in individual numbers per site varied by less than 3 individuals at ten sites.

Samphire and Sea Heath are both unpalatable species not being grazed by kangaroos. Hence changes in these populations are potentially due to mining activities or climate changes. Impact sites have either shown similar trends to control sites, or even increased population trends. Changes also show a strong correlation with rainfall totals with increased populations recorded since 2021. Hence this suggests changes in these two species are related to impacts from climatic changes rather than impacts from mining.

Of the four species referred to above, Plains Lantern bush has shown the greatest increases since 2021 – recording population increases of approximately 50% in both 2022 and 2023. Due to these large increases in abundance, in 2023 Plains Lantern Bush (adults and juveniles combined) was the second most abundant long-lived perennial plant at gibber habitats (following a ranking of 4th in 2022). These increases have been accompanied by large increases in juveniles. During compliance monitoring, the mean number of Plains Lantern Bush at impact sites has remained within, or exceeded, the baseline range for all surveys. The mean number at control sites was below the baseline range in 2020 and 2021, but returned to within baseline levels in 2022. The 2023 abundance levels were above the baseline mean. *Abutilon halophilum* is moderately palatable and its increased abundance may be due to both increased rainfall and widespread destocking across the lease area.

In 2023, a fifth species was also highlighted for analysis in the Jessup data; Cunningham's Daisy (*Minuria cunninghamii*,). Although relatively resistant to dry periods, it is moderately palatable, and normally found in the protection of woody shrubs such as Bladder Saltbush. During the construction period, *Minuria* abundance declined (or remained at very low levels) in 2020 and 2021. In 2022, the abundance of the daisy remained stable, but in 2023, increased on average by at least 200% at all sites. As with Plains Lantern Bush, the recovery of Cunningham's Daisy coincided with increased rainfall and widespread destocking.

In summary, the population abundance of the five most abundant and/or widespread long-lived perennials declined during 2018 to 2020 but have all increased since 2021. At control sites, the declines were either similar or greater than at impact sites. This indicates that the declines were due to factors other than mining impacts. The declines and increases in long lived perennial species are attributed to yearly and long- term

rainfall totals rather than mining impacts. Exceptionally dry conditions in 2018 and 2019 are likely to have caused widespread dieback and decline of long-lived perennial species. Samphire and Sea Heath are non-palatable, removing grazing as a cause of the decline experienced in these species. Grazing impact has declined across all the study sites since 2018 (refer Section 3.2.5) which removed grazing as a possible cause of reduced abundance of the more palatable long-lived perennials (Bladder Saltbush and Plains Lantern Bush).

Although yearly rainfall totals in 2021 and 2022 were near average, both years recorded well above-average summer rainfall. In November 2022, Carrapateena recorded approximately 50% of its mean yearly rainfall. It is likely that this rainfall event, combined with reduced grazing pressure, enabled many of the long-lived perennial individuals to recover, or continue to recover from losses in 2019 and 2020, including Bladder Saltbush, Plains Lantern Bush, Samphire, Sea-Heath and Cunningham's Daisy. In 2023, the abundance of all these species is within the baseline range. The 50% increases in Plains Lantern Bush and Cunningham's Daisy abundance in 2022 and/or 2023 have been particularly striking. It is considered that the most likely reason for changes recorded in palatable and non-palatable perennials, is due to short- and medium-term rainfall, rather than mining impacts.

To provide data against which to assess potential impacts on vegetation downstream of the TSF, four sites were established in autumn 2018 progressively downstream from the TSF embankment within Eliza Creek. A fifth site was established during baseline surveys, located furthest from the TSF on Eliza Creek. At all sites, the total number of long-lived woody perennials have increased since 2018. Ten of the most abundant long-lived woody perennials recorded at the Eliza Creek Jessup transects were separately analysed. All 10 species have shown yearly fluctuations, but no downward population trends at any of the Eliza Creek sites since 2018. The Eliza Creek Jessup transects have shown an increase in total perennial species abundance. Hence, no impact from mining activities is considered evident at the Eliza Creek sites.

4.1.4 Plant health

During the survey, there was no dust layer noted on plants. This aligns with findings of the Dust Impact study (Jacobs 2020b) which recorded no significant decline in plant health or vigour at distances greater than 10 m from roads. No new impact on plant health due to salinity was recorded. Following well above average rainfall in January and November 2022, dieback of plants noticeable in 2020 and 2021, was not evident.

In summary, 2023 survey results indicate that there are no current detectable impacts from mining on flora, i.e. no long-term decline in the number of native species present; no differential decline between control and impact sites in the abundance of individuals within a species; and no decline in plant health (e.g. due to potential raised dust settling).

4.1.5 Tree health (canopy cover)

The canopy health of the dominant tree species at Eliza Creek sites (17, 18, 19 and 20) has been assessed since 2018 using both a GRS densitometer and visual estimates of canopy intactness. Canopy Cover was also assessed at transects in the Eliza Creek sites to assess potential impacts on tree health due to seepage from the TSF or reduced water flows down the catchment. Comparing the total number of densitometer foliage records along a transect over time provides an indication of changes in total canopy volume. Potential changes in total canopy volume may be a combination of canopy expansion of existing trees; recruitment of trees and/or canopy decline of existing trees. At each Eliza Creek site, there are two nearby parallel transects. Along each 100 m transect, readings were taken every metre, hence the number of readings showing canopy cover equates to the percent canopy cover along the transect. Additionally, visual estimates were made (with no tool) of the entire canopy to assess the extent and density of foliage compared to the potential extent and density of foliage expected of a tree in good health.

For each site, the mean number of foliage records for the two parallel transects, has varied between survey periods, but in 2023, all sites recorded increases in foliage cover.

4.1.5.1 Western Myall Trees

At Site 17, which is 270 m from the TSF, densiotometer and visual estimates of canopy health recorded no discernible change in the already very high levels of canopy intactness, and no loss or addition of trees along the survey transect. At sites 18, 930 m from the TSF, there was an increase in foliage recorded from the densiotometer method and from visual estimates. This was due to existing trees retaining high levels of canopy

intactness, and five additional trees being recorded along the transect. One tree died, but this was a tree with pre-existing very high levels of canopy loss prior to operation monitoring.

In summary, since 2018, there has been an increase in Western Myall foliage recorded along the transects, with a loss of one tree, but 6 new trees recorded, and very high levels of canopy intactness of existing trees.

4.1.5.2 River Red Gums

During the operational monitoring (2018 to present), the canopy intactness levels of Red Gums has varied considerably, both within individual trees, transects and between survey periods. Declines in foliage were recorded during the low rainfall years of 2018 and 2019, followed by gradually increasing trends, which accelerated in 2023. Well-below average rainfall was recorded in 2018 - 2020, followed by two years of average rainfall, but which included exceptional rainfall events in spring and summer.

Site 19 is 3 km from the TSF, and the first occurrence of Red Gums downstream from the TSF. Site 20 is 460 from the STSF. For both sites, between 2022 and 2023, there were no obvious changes in foliage as recorded by the densiotometer, but visual estimates recorded large increases in canopy intactness for Red Gums. There were no losses or new Red Gums recorded. The Western Myalls on these transects also retained very high levels of canopy intactness. Since 2018, the number of densitometer records has varied yearly, but no distinct trends apparent between 2018 and 2023. There have been no losses or additions of Red Gums along the transects.

The variation in Red Gum canopies since operation monitoring is likely to reflect seasonal conditions, and other unquantified variables such as age of tree (which will determine root depth and access to water). The impact of well above average or well below average rainfall on Red Gums seems to be apparent within 12 months, and possibly within 6 months. By 2023, the Red Gums had regained canopy losses in 2018-2020. However, there has been no recruitment of Red Gums recorded along the transects.

In contrast, the canopy intactness of the mature Western Myall trees has been relatively stable during this period at all transects. But there have also been high levels of Western Myall recruitment along the transects.

To date, no potential impacts resulting from the construction of the TSF to the dominant trees within Eliza Creek are evident.

4.1.6 Weed diversity and abundance

4.1.6.1 Weed species declared or listed under legislation (Landscape South Australia Act 2019)

Declared weed species previously recorded during construction surveys were Bathurst Burr (*Xanthium spinosum*), Athel Pine (*Tamarix aphylla*) and Prickly Pear (*Opuntia sp.*). Athel Pine and Prickly Pear species are also considered to be Weeds of National Significance (WoNS).

To date, Athel Pine and Prickly Pear have only been recorded in the Yeltacowie homestead vicinity. The population of these species has not expanded since construction monitoring began in 2018. Cochineal has been deployed at the Yeltacowie population of Prickly Pear, which covered an area of approximately 10 m x 10 m in 2018. In 2023 the population extent had diminished, with all live plants confined to an area of approximately 5 m x 5 m. Although all plants appear to have been poisoned, there remains some parts of plants that are alive, with potentially viable propagules on the ground. Ongoing control is recommended.

The population of Athel Pine is being actively managed by the Pernatty Station owner, with support from BHP (where required). In 2022, only three live trees were recorded (fewer than in 2021), due to ongoing control. Numerous trees have been cut down and others were standing dead trees. In autumn 2023, three mature live trees remained, plus resprouting of previously cut trees was also recorded. Follow-up monitoring, and if necessary ongoing control on the remaining live trees is recommended. The Carrapateena station falls within the Kingoonya group of the South Australian Arid Land landscape board. Land managers are required to control Athel Pine within 100 m of watercourses and waterholes (the three large live trees are within 100 m of a watercourse, the trees at the homestead are just beyond 100 m), but land managers are encouraged to monitor success of control and carry out follow up control of all trees, as necessary.

In 2023, no new populations of Bathurst Burr, and no expansion of existing populations were recorded. In 2023, Bathurst Burr was recorded only at previously recorded locations: Dawsons Dam, South Eliza Dam, and weed

transects CWM01 (including Whittata Creek) and CWM02 both transects aligning the Southern Access Road. The population at Dawsons Dam remains extensive, and similar to that recorded in 2021 and 2022. Similarly, Batthurst Burr remains widespread and moderately dense in the drainage lines of the South Eliza Dam complex. It should be noted that the Dams are outside of the Mining leases. In 2023 approximately 10 plants of Batthurst Burr were noted along Weed Transect CWM02, adjoining the Southern Access Road, in the vicinity of South Eliza Creek. Small clusters were noted along Weed Transect CMW01 in the vicinity of Whittata Creek. Hence all populations are associated with drainage lines culverts, or dams, habitats where Bathurst Burr is most likely to invade (Government of South Australia 2022), and the above Bathurst Burr populations are likely to have been present prior to the commencement of mining operations.

In South Australia, Bathurst Burr is Declared under the Landscape South Australia Act 2019. In the SA Arid Lands, control is not enforced but landholders are encouraged to manage infestations (Government of South Australia (2021). Bathurst Burr is mainly a summer-growing annual plant growing to about 1 m high and dying off each year. Each plant produced up to 150 burrs per plant, and seeds remain viable for at least three years (Lloyd 2000). In autumn 2023, all plants were alive with a high fruit load. The registered chemical control methods are highly effective on growing plants, but Bathurst Burr will survive as a seed bank for several years (Government of South Australia 2022). For this reason, it is recommended that BHP continue to control Bathurst Burr at known populations along the Southern Access Road for several years and/or until populations are substantially controlled. Weed transect CWM02 occurs within Mineral Lease 6172 and CWM01 falls within the Southern Access Road and Radial Wellfield MPL 154. It is recommended that BHP work with the station owner to manage infestations at Dawson Dam and South Eliza Dam.

4.1.6.2 Non Declared Weeds

New Weeds

Stinging Nettle (*Urtica urens*) was recorded for the first time in the Operational survey area. A few small clusters were recorded in the Exploration Village Effluent Irrigation Area (surveyed from boundary only). This is an annual herb favouring high nutrient (especially nitrogen rich) habitats. Nearest publicly documented records are east of Lake Torrens in the Leigh Creek township. Other records in South Australia's arid zone are sparse and are associated with human habitation or high moisture microhabitats. It is a prolific seeder - up to 1500 seeds per plant and seeds can remain viable for several decades (Coleman, Kristiansen, Sindel and Fufe 2018).

The Effluent Irrigation Area provides optimal habitat for Stinging Nettle, namely moist soils rich in nitrogen. Its origin in the EIA is unknown, but its presence in the Operational survey area is likely directly attributable to mining operations. Although it is unlikely to spread outside of the EIAs, it is recommended that occurrences within the EIA are controlled in an environmentally sensitive manner. Stinging Nettle is not Declared or listed under relevant legislation.

Increases in abundance of existing weeds

In May 2023, no increase in abundance was recorded for any weed species. Bitter Melon (Citrullus sp.), however, remained prolific at all recording points along weed transect CWM005 (western end of the Western Access Road). As noted in the Jacobs (2023) report for the spring 2022 survey, the construction of the WAR is likely to have increased the abundance of Bitter Melon.

Changes to species at known locations / extents

By far the majority of weeds recorded were annual herbs or grasses. Most annual weed records were from dams or drainage lines, areas naturally susceptible to weed invasion, and from the dune habitats.

Five weed species were recorded in 2023 at previously unreported locations: Bitter Melon in the Tjungu Effluent Irrigation Area, Mallow (*Malva parviflora*), at South Eliza Dam, Sow Thistle (*Sonchus oleraceus*), at Rangeland site CAR012, Smooth Heliotrope (*Heliotropium curassavicum*) at Weed Transect CWM06 and Tree Tobacco (*Nicotiana glauca*), at Dawson Dam.

Except for Tree Tobacco, the above species are all annuals and have been consistently and widely recorded during baseline and/or construction surveys.

Annuals may persist in the soil seed bank and only germinate when conditions are favourable. Hence, in 2023, some widespread annual weeds were recorded at new locations, and conversely some annual weeds were absent from previously recorded locations. Since monitoring began, there have been yearly fluctuations in the

locations of annual herbs or grasses, including Sow Thistle, Bitter Melon, Mallow and Heliotrope. These fluctuations reflect seasonal rainfall patterns rather than mining impacts. Their occurrence at any particular location is likely to vary from year to year and un-related to mining activities.

Nicotiana glauca, however, is a perennial and capable of rapidly spreading. In May 2023, a few juveniles were recorded behind the Dawson Dam embankment, likely a new population in this location. Although Dawson Dam is outside of the existing operations footprint these plants of *Nicotiana glauca* are recommended as high priority for control. This species can establish rapidly and form relatively dense stands (as occur as South Eliza Dam). Long-distance seed dispersal is most effectively by water movement. Germination is often prolific after flooding events and its occurrence at Dawson Dam may be related to the very high rainfall received in October 2022.

Weed species recorded at Rangeland Flora Control and Impact Sites:

Only four species of weeds were recorded at Rangeland sites. These were confined to Maltese Thistle at Eliza Creek sites CAR018 and CAR020 (impact sites), and Smooth Mustard (Sisymbrium erysimoides) and Bitter Melon (Citrullus sp.) recorded at both the dune sites (a control and an impact site), and Sow Thistle at gibber sites CAR012 (impact) and CAR013 (control site).

All are annual species, their occurrence related to habitat rather than mining impact. Smooth mustard, Bitter Melon and Sow Thistle are widespread in the pastoral of South Australia. Maltese thistle is widespread throughout the agricultural region and the southern half of the pastoral region. Their occurrence and abundance is related to seasonal conditions and habitat rather than mining activities.

Summary

By far most weeds recorded were annual herbs or grasses. Most annual weed records were from dams or drainage lines, areas naturally susceptible to weed invasion, and from the dune habitats, and their presence is unrelated to mining activities. Sow thistle was the only weed recorded at gibber habitat flora sites. Changes in the abundance and/or locations of annual weed species were small, and for all but Stinging Nettle, a reflection of weather conditions preceding the survey rather than from mining related activities. The presence of the annual herb, Stinging Nettle at the Exploration Village Effluent Irrigation area is a new record for the Operational survey area, and its occurrence is likely due to mining activities. However, because it is unlikely to expand beyond this highly confined nutrient rich habitat, it is recommended that it be controlled only if it begins to spread into other environments.

Although the population of Bitter Melon along the Western Access Road did not seem to have increased in 2023, the large and extensive population is likely due to construction of the Western Access Road, and environmentally sensitive control is recommended.

The small population of Tobacco Bush at Dawsons Dam is a newly recorded population, and its control is highly recommended. The extensive population of Tobacco Bush (*Nicotiana glauca*) persists at South Eliza. Due to is high rate of fruit and seed set, high viability of seeds and successful survival of seedlings, it forms dense stands (CABI 2022). Control is recommended to prevent potential spread in South Eliza Creek.

4.1.7 Landscape Function Analysis

Plant Re-establishment

The autumn 2023 survey was the fifth assessment of Landscape Function at two sites prepared for rehabilitation in 2019 (Aero and Ventia sites), and the second assessment at two sites (Midway Quarry and Tjungu) prepared for rehabilitation in 2022. All sites were devoid of plants when initially prepared for rehabilitation and were on sites that would have formerly supported Bladder Saltbush (+/- Samphire) low shrubland on stony tableland. The point-centred quarter (PCQ) method has been used to complement the LFA survey, to additionally record plant density and diversity in the early stages of rehabilitation when plant density along the LFA transect line is sparse. PCQ monitoring began in 2020 for the Aerodrome and Ventia sites, and in 2023 for the Midway Quarry and Tjungu sites.

For all sites the first year recorded the extent and depth of troughs, as vegetative cover was not present along the transects, a method referred to as Bank and Trough (refer Methods). By the second year of assessments, all sites were surveyed using the “Established LFA Method” – when the troughs have levelled out and no longer acting as significant nutrient sinks and/or plants have begun to establish along the transect line. Instead of banks and troughs, the LFA Established Method focuses more on zones of interest (e.g., patches of vegetation).

The Aerodrome laydown site was deep ripped in June 2018, and the Ventia site was prepared with shallow ripping in August 2019. The Midway Quarry sites was deep-ripped in 2022. The Tjungu site was also deep ripped (prior to the Midway Quarry site) in 2022, but additionally was hand seeded, hence trialling the benefits of hand-seeding in addition to natural regeneration. The Aerodrome, Midway Quarry and Tjungu sites all comprised large flat broken rock in deeply ripped contours, more irregular at the Midway Quarry site. The Ventia site comprised shallow ripped contours and little rock. Results to date show that all sites have progressively re-established vegetation cover, but at different rates, and which has been related to preparation method.

At the Ventia site (shallow ripping), plant cover is still sparse and is dominated by short-lived perennial species, and especially *Sclerolaena* species. These species, however, comprise a large percentage of vegetive cover in the adjoining naturally occurring Bladder Salthbush low shrubland. These short-lived shrubs will play an important part in trapping water and nutrients and contributing to further plant regeneration. To date, the majority of plant re-establishment has occurred downslope at the Ventia site, where water, nutrients and plant seeds naturally accumulate. The site is in the early stages of rehabilitation.

The Aerodrome site has recorded increased species density and cover recorded each survey (from both the LFA and PCQ methods). In 2023, patches of vegetation had increased in both abundance and size. This site was deep-ripped and plant re-establishment has been widespread and at a greater density than the Ventia site. As with the Ventia site the majority of plants are short-lived perennial species (and especially *Sclerolaena* species) but 2023 recorded the emergence of several plants each of long-lived perennials; Samphire (*Tecticornia medullosa*), Bladder Saltbush (*Atriplex vesicaria*), and Plains Lantern Bush (*Abutilon halophilum*). Bladder Saltbush and Samphire are the dominant species of the stony tableland habitat in the Operation survey area, and Plains Lantern Bush is also a common and widespread species. The high plant cover and diversity of species at the Aerodrome site indicates it is well-advanced in a low shrubland community being re-established.

The Midway Quarry site has been most recently prepared for rehabilitation (just prior to September 2022). However, within a year, plants are sparsely emerging. In 2023, four plants were intercepted along one transect (and none along the other transect). The PCQ method recorded plants in 16 of the 20 quadrants along transect A and 17 of the 20 quadrants along transect B (namely, plants within 10 m of each 10 m interval along the tape). For both transects, the same four native species were recorded, including one long-lived perennial Bladder Saltbush. The other species were short-lived perennials, Hoary Scurf Pea (*Cullen cinereum*), Pop Saltbush (*Atriplex holocarpa*) and Salt Bindyi (*Sclerolaena ventricosa*). The Midway Quarry site is in the very early stages of rehabilitation, but already contains species that are widespread and typical of the stony tableland habitat.

The Tjungu site was also prepared for rehabilitation in 2022 but has already achieved greater plant density than either the Ventia or Aerodrome sites, prepared in 2019/2019. The combination of deep-ripping, hand-seeding (and perhaps greater slope), with exceptional autumn rainfall following establishment, are likely to have contributed to the rapid establishment of plants. The two 50 m transects recorded 26 and 28 vegetation patches. Species diversity was also greater than the other three rehabilitation sites, with a total of nine native species recorded, and including the two dominant long-lived perennials of Stony tableland habitat: Bladder Saltbush and Samphire.

Of the hand-seeded species, two were recorded in 2023 at the Tjungu site: Pop Saltbush and Bladder Saltbush. These species were also present at other rehabilitation sites, but they were more abundant at the Tjungu site. Although all of the hand-seed species have been recorded within the Operation survey area, in the rehabilitation habitat (stony tableland) the hand-seeded species most likely to naturally occur are: Pop Saltbush, *Atriplex lindleyi*, Bladder Saltbush, Cotton Bush and Shrubby Twinleaf. Within the Operation survey area, the remaining hand-seeded species are more commonly associated with major creek lines, floodouts/clay depressions and/or dunes.

Soil Properties

The LFA method also reports on soil stability, infiltration and nutrients. Since the first LFA assessment at each site, the four rehabilitation sites have all recorded a soil stability index similar to the reference (analogue) sites means. This is due to the heaver soil texture (high clay component) of the sites, and the unevenness of the soil surface, the latter largely due to the soil ripping.

For the infiltration index, site 1 (Aerodrome) has reached the analogue sites means, and sites 2, 3 and 4 are at about 65 – 75% of the analogue sites means. Site 1 has improved approximately 50% since 2020, with the 2023 mean index for both transects being the same as the analogue sites mean. Site 2 infiltration index

increased by about 50% between 2020 and 2021, and has remained relatively stable since then, and almost approaching the analogue site means. For sites 3 and 4, the infiltration index was above the analogue site means, but decreased to about 65% of the analogue site means in 2023.

The nutrient index for each site has been highly variable between surveys, without showing a distinct trend. This index is heavily influenced by leaf litter which currently is highly patchy. However, in 2023, the nutrient index for site 1 (Aerodrome) and 4 (Tjungu) were similar to the analogue site means, reflecting the high vegetative cover at these sites. At sites 2 and 3, the nutrient index was approximately 50% of the analogue site means, reflecting the sparse vegetative cover at these sites.

In summary, soil stability is similar to analogue means, infiltration is 65 to 100% of analogue means, and nutrients is 50 to 100% of analogue means.

LFA Summary and Recommendations

In summary, the LFA and PCQ show a positive trend in the number and area of plants per hectare (ha) at all four rehabilitation sites. Plant colonisation across sites is currently dominated by short-lived perennial species (*Sclerolaena* spp.) although several longer-lived perennials were also recorded and some distant from the transects. The short-lived species are an important colonising component of the naturally occurring vegetation in the stony tableland habitat, and all plants improve soil stability and function. As plants (patches) establish and increase in size, the potential for resource capture and nutrient cycling improves leading to ongoing increased potential for recruitment of native species. Developed patches also provide cover and habitat opportunities for native fauna species and reduce soil loss and erosion. Although recording increased patches at site 2 (Ventia), re-establishment has been relatively slow.

Although LFA monitoring is in its early stages, some differences are apparent between application of different rehabilitation techniques which may be affecting recruitment. These include deeper contour ripping and application of rocky surface strew at the Aerodrome, Midway Quarry and Tjungu sites compared with shallow contour ripping at the Ventia site. The addition of hand seeding may also have accelerated establishment of plants. The absence of resource trapping patches (troughs) at the Ventia site is likely to substantially limit the speed with which the site rehabilitates. However, additional intervention or restoration activities may further enhance site rehabilitation for both sites, including applying woody debris, planting local groundcovers and low shrubs, and providing supplementary watering during critical periods of plant establishment. Ongoing monitoring will assist in informing trends and the benefit of additional intervention such as deeper or repeat ripping and seeding.

Currently, LFA data is compared with data from a series of 'analogue sites' which were collected prior to construction at the site. Whilst this analogue data is considered broadly representative of the vegetation communities around the mine lease, and therefore a useful indicator of rehabilitation success, a more precise reference would be to establish LFA sites adjoining each rehabilitation site.

Overall, OMC LUP4 is considered to be in-progress / compliant.

4.1.8 Fauna diversity

The 2023 autumn fauna survey identified a total of 93 vertebrate species from the eight survey sites and opportunistically within the broader study area. Total species diversity (birds, mammals and reptiles) was generally within/ above the range of baseline survey results. Conversely, capture rates for small mammals and reptiles were below the range reported during baseline surveys, but primarily related to a decline in reptile captures, related to cooler daytime temperatures in late autumn.

Whilst the site has previously experienced ongoing drought conditions and below average rainfall, above average rainfall events in spring 2022 and summer of 2023 and cooler temperatures during the autumn survey likely contributed to these results. Presence of water in all of the dams would have contributed to bird, mammal and reptile diversity across the site, mild conditions during the survey likely influenced lower captures than previously. Regardless, there was evidence of birds breeding, small mammal captures of species regularly detected and reptile diversity was detected primarily during opportunistic search effort. In addition, a number of species were detected that were either a new record (including several state listed species) or species had not been detected since baseline / early compliance monitoring. Overall, these results are promising and suggest that the reduced survey effort compared with baseline surveys has not influenced the capture rates or diversity, particularly for small mammals and reptiles. Hence the refinements to the trapping effort made during the

course of the baseline survey work (2012 – 2017), and at the commencement of the operational (construction) monitoring in 2018 to align with the requirements of the PEPR and mine lease conditions is sufficient.

The diversity rates observed in 2023 were on the higher end of those recorded during the construction / monitoring period and well within the range reported during baseline. The diversity of families across birds, reptiles and mammals was also comparable with baseline. Reptile diversity showed stability and likely aligns with fewer reptile captures. The presence of species that have not been recorded since baseline or earlier in construction monitoring (e.g. Eyrean Skink) is also promising. It is noted that birds and reptiles each had species with juveniles present and / or were present in breeding groups or pairs. Whilst evidence of small mammal breeding was not present, both sexes and several age classes were present, juveniles were present. It is likely that some of the small mammals were breeding in response to recent climate conditions (e.g. Stripe-faced Dunnarts, Planigales and Forrest' s Mouse had already bred at least once this year). Fat-tailed Dunnarts are known to continue to breed for to up 6 months without breaks once the breeding season commences, whereas Stripe-faced Dunnarts are more influenced by weather and habitat conditions and may have breaks or fewer litters. Stripe-faced Dunnarts also prefer habitats with greater plant diversity and healthier (denser) understorey (Animalia 2018, OEH 2020). Stripe-faced Dunnarts were present in several age classes and larger numbers, whereas Fat-tailed Dunnarts were present in much lower numbers and may not have commenced breeding. Both female and male native Forrest's Mouse were detected. Similar to previous years, small mammals are likely influenced by preceding climate. It is well known that there are varying responses to climate and trapping response for small mammals in arid areas (Read 1988). For example, Pseudomys species have been shown to respond to significant weather events 3-10 months after the event, with the variability in response dependent on pre-existing population abundance and resource availability (Dickman et. al., 1999, cited in EBS 2017). Similarly, dunnarts are known to use daily torpor to thrive in adverse environmental conditions and exploit resource poor environments and they are known to adjust the breeding period depending on climatic conditions. There is no evidence to suggest mining is impacting small mammal presence across the site.

Comparisons between mean species diversity and capture rates between control and impact sites showed slightly higher diversity and capture rates for control sites, though differences were not statistically significant. It is likely that statistical rigour is influenced by the number of control sites (2) compared with impacts sites (6), however it is noted that similar to 2022, site 15 (impact) had the highest capture rates. Future considerations could be given to revisiting the delineation of control and impacts sites (previously related to dust contour monitoring, distance to infrastructure), particularly during the operations phase, now that the WAR has been completed, and / or establishing additional 'control' sites. Regardless, significant mining related impacts to fauna are not evident from the 2023 data or when making comparisons to previous baseline and compliance data.

Only one EPBC listed threatened fauna was detected throughout the autumn 2022 survey; Blue-winged Parrot. This species has been recorded at the site previously, but not since baseline monitoring. EPBC listed Plains Mouse were not detected (via trapping or camera), but there was increased evidence of surface activity around gilgais. This species has not been detected since 2017 (via standard fauna trapping), and is detected typically following a prolonged period of good rainfall. No EPBC listed as Migratory species were recorded. As per the 2022 survey results, Plains Mouse were detected during baited camera trapping at the South Gap offset site in 2022; cameras deployed 27th February until 14th December. The offset area, located southeast of the mine site on the banks of Lake Torrens, received the highest rainfall in 30 years in 2022 (>252 mm), with most falling in October. A total of 26 Plains Mouse were detected via baited camera trapping between May and September 2022 at South Gap, an increase on the previous year in extent and numbers. Of the 26 detections, 17 were between May and August and 9 were in September, of which 3 aligned with the timing of the spring survey at Carrapateena. It was suggested the increase was related to increased rainfall, reduced feral predators and reduced competition from herbivores (e.g. sheep, goats, rabbits, kangaroos) within the perimeter fence area (Nature Foundation 2023). Based on this it would be expected that Plains Mouse may begin to be detected at the Carrapateena site in future monitoring, but likely in lower numbers given the site still has mine activity (potential noise and vibration deterrent), and competition from herbivores. Whilst the autumn survey in 2023 was considered promising, and much lower numbers were expected than the offset area, given the location of the mine site and the ongoing mining activity (i.e. if detected, likely only at control sites 1 and 2). However, no Plains Mouse were detected, with the exception of increased surfaced activity observed at gilgais across the Carrapateena site. Whist Plains Mice were originally detected via annual pitfall trapping, future consideration could be given to establishing a bait camera trap program, similar to South Gap to increase detection. In addition, review of rainfall conditions preceding the next annual survey should be considered, prior to deciding whether the annual 2024 survey should be in autumn or spring. If in autumn, early to mid autumn may be a better option for increased reptile captures (although less of a focus than Plains Mouse).

Splendid Fairywrens were absent from bird surveys between 2019 to 2022, however they were detected in the sand dune habitats and nearby during the autumn survey. Similarly, they were also recorded during baseline surveys during better years (e.g. 2012, 2014 and 2016) and during early compliance monitoring (2018). Whilst White-winged Fairywrens and Purple-backed (Variegated) Fairywrens were generally detected every year during baseline and compliance monitoring, Splendid Fairywrens were not recorded every year, suggesting transient presence, or population fluctuations.

In contrast to 2020 and 2021, and similar to 2022 water was present in all the dams, which did however result in records for waterbirds / shorebirds across the site in water and non-water habitats e.g. dotterel species, grebes. Two new waterbirds were however detected using the site (e.g. State-listed Musk Duck, Spotted Crake). The total number of bird species was increased in 2023, and within the upper range of baseline, and is likely reflective of milder weather conditions during the survey, less windy days, presence of water across the site, preceding beneficial rainfall impacts on vegetation and song meter detection at some sites.

Whilst evidence of pest species was noted (House Sparrows at camps, rabbits at several locations), there was no major increase in presence of pest fauna species was observed as part of the survey, i.e. observations of rabbits, sparrow numbers and cats was maintained and house mice were detected in low numbers (captured and on camera at site 1, observed at South Eliza Dam (off lease). No Feral Pigeons or foxes were detected. All of these species have been recorded previously, in low numbers and hence does not constitute an increase in pest species present, therefore the site is considered generally compliant against OMC criteria related to pests.

4.2 Compliance Against Obligations

As indicated in Section 1.1.1 above, the approved PEPR for ML 6471 outlines a number of monitoring commitments required to demonstrate compliance against the mine lease 6471 conditions (Table 1-1) and the approved environmental outcomes (Table 1-2) for the Operation. Table 4-1 below provides a summary of compliance against the conditions and outcomes based on the results of the autumn 2023 survey.

All mine lease conditions and outcomes are currently being met.

Table 4-1 PEPR ML 6471 Compliance Reporting, autumn 2023

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
May 2023 (autumn)	ML 6471 Sixth Schedule, Condition 6 MPL 149 Sixth Schedule, Condition 3, OMC WP1 OMC WP2	No introduction of new species of weeds declared or listed under relevant legislation, plant pathogens or pests (including feral animals) as a result of mine related activities when compared to previously recorded weed species and introduced fauna. No sustained increase in abundance of existing weed or pest species in the Land as a result of mining operation or mine related activities.	Weed monitoring transects CWM01 CWM02 CWM03 CWM04 CWM05, CWM06, CWM07 NWM01, NWM02, NWM03 Baseline condition from CWM01 – CWM04 Flora sites 1- 7; 9 – 13; 15 - 22 Baseline condition: Flora sites 1 – 16. See Figure 2-1. Opportunistic and targeted observations across Operation area	Compliant	No weeds declared or listed under relevant legislation, or plant pathogens were recorded at flora survey sites, within weed transects or opportunistically in autumn 2023. No new populations of Bathurst Burr recorded, although existing known populations remain high. New locations of all but one existing weed were confined to annual herbaceous and grass species, already common and widespread across the lease. New locations were coincident with the non-occurrence of species at previously recorded sites and no net increase in existing weeds. A new location of non declared Nicotiana glauca (Tree Tobacco) was recorded at Dawsons Dam (a perennial species previously recorded only	Ongoing weed monitoring at flora sites 1-22 and weed transects CWM01 - CWM07, and opportunistic and targeted observations (camp, effluent irrigation areas, spill areas, dams). Ongoing opportunistic observations, including revisiting sites where weeds have been identified in autumn 2023. Weed management by OZ Minerals / BHP in response to data reported here, in particular continued ongoing management of Bathurst Burr. Any new individuals to be controlled by environmentally sensitive methods, including manual grubbing and disposal of vegetative matter or spraying where appropriate and will not impact drainage lines / water habitats.

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					at South Eliza Dam). These locations are outside of mining leases and that their occurrence is habitat related rather than due to mining activities. The population of Nicotiana glauca remains high at South Eliza dam, with potential to increase due to the disturbed and higher soil moisture habitat of the dam (rather than due to mining related activities). An extensive population of Bitter Melon (*Citrullus lanatus*) was recorded in 2022 along Weed Transect CWM05 adjacent newly constructed Western Access Road shoulder. In 2023, a large population remains. It is likely that the population increased due to soil disturbance during the WAR construction. Elsewhere, Bitter Melon is widely present at disturbed and/or moist habitats in	Continue control of *Tamarix aphylla* (support station owner) and monitoring of Opuntia at homestead. Bitter Melon be environmentally controlled along the exposed shoulder of the WAR. Ongoing monitoring of birds, including House Sparrows. Monitoring of rabbit / cat population and control as required.

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					the mining lease, but at low densities. (Stinging Nettle) *Urtica urens* was recorded in the Exploration Village Effluent Irrigation Area (EIA), and not previously recorded during baseline or compliance monitoring. An annual species that favours high nutrient environments. Although its occurrence is likely mining-related, it is not a declared or listed species, and unlikely to spread beyond the EIA. Its occurrences within the mining lease area should however be monitored. Apart from a new location of one weed recorded outside of the mining leases (Tree Tobacco) and a new non-declared weed (Stinging Nettle), no net or sustained increases in the population of any weed species was recorded. The existing populations of two WoNS have	

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					reduced since the start of compliance monitoring. Cochineal has been used at Yeltacowie to control Prickly Pear, but some adult plants remain alive in 2023. Follow-up control is recommended. The population of Athel Pine at Yeltacowie Homestead has been controlled in recent years and only 3 mature trees remained uncontrolled in both 2022 and 2023. In 2023 some previously cut trees were re-sprouting. House Sparrow numbers remain increased at the exploration camp, where worker occupancy was high at the time of survey. House Sparrow recorded previously during baseline. Rabbit presence observed at more sites. Cats detected at several locations.	

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
May 2023 (autumn)	ML 6471 Sixth Schedule, Condition 12 OMC NV3	Establish baseline data in Eliza Creek monitoring locations prior to commencement of Stage 1 tailings commissioning. Baseline Ecological database updated to reflect new data.	Flora Sites 17-20 (which overlap with Canopy Cover Sites 17-20). See Figure 2-1. Remote sensing vegetation cover trial was undertaken in 2019, downstream of the TSF embankment. Data collected represents a baseline condition for future comparison.	Compliant	Flora Sites 17-20 (established in autumn 2018) monitored in Eliza Creek at increasing distance from the proposed TSF dam wall, covering both Western Myall and Red Gum habitat. Rangelands, Jessup Transects and Canopy Cover data collected, and photos taken at all four sites, representing current condition, species diversity, abundance and tree health. Visual canopy health % estimates also recorded as per 2019. No long-term trends detected in tree canopy health. In the past two years Red Gums have regained canopy foliage lost during below-average rainfall years of 2019 and 2019. Western Myall canopies remain healthy with low levels of foliage dieback. In the past two years, there has been a net increase in foliage	Ongoing vegetation monitoring at Flora Sites 17-20 (A and B transects at each site) for Rangelands, Jessop transects and Canopy Cover (reflecting a leading indicator of tree health).

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					recorded, due largely to growth of juvenile trees. No loss of species diversity or changes in abundance of perennial species at any of Flora Sites 17 – 20.	
May 2023 (autumn)	OMC AQ2	No adverse impacts on the diversity and abundance of native vegetation at monitoring sites directly attributed to dust deposition from mining operations or mine related activities when compared to baseline native vegetation conditions	Flora sites 1-22 See Figure 2-1	Compliant	Previously existing flora survey sites (1-16, excluding 8 and 14, plus 17- 22) were monitored for native plant species diversity (Rangeland Transects) and abundance (Jessup transects) in autumn 2023 and data collected was compared with baseline data. Results indicate a trend in species diversity that correlates with seasonal conditions. While the diversity of long-lived drought-resistant species has remained stable since 2018, and in line with baseline data, short-lived species diversity has correlated with seasonal rainfall but has remained within the baseline range. In autumn 2023, the	Ongoing vegetation monitoring at control and impact sites, with vegetation data comparison with baseline data continued. Ongoing analysis of control vs impact sites as construction activities are completed, and operational effects come into play.

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					highest short-lived species diversity during compliance monitoring was recorded. There is no clear difference in species diversity between control and impact sites.	
May 2023 (autumn)	OMC TSF6 OMC SWRF1	No adverse impact on the diversity and abundance of native vegetation at Eliza Creek sites attributed to tailing seepage when compared to baseline native vegetation condition. No adverse impact on the diversity and abundance of native vegetation and water dependant ecosystems attributed to reduced surface water flows caused by mining operations when compared to baseline conditions (Appendix C4 Ecological Baseline) unless a significant environmental benefit has been approved in accordance with the relevant legislation.	Flora Sites 17-20 (which overlap with Canopy Cover Sites 17-20). See Figure 2-1. Remote sensing vegetation cover trial undertaken in 2019, downstream of the TSF embankment. Data collected represents a baseline condition for future comparison.	Non-Compliant until SEB approved	In autumn, adverse impact on native vegetation immediately downstream of the TSF was recorded. In late 2022 / early 2023 saline seepage from the TSF extended beyond the approved impact zone. The area impacted by the saline seepage was surveyed in May 2023 and damage to native vegetation (death and dieback) was recorded over an area of approximately 0.4 ha beyond the approved impact zone. The impacted vegetation was compared with the nearby monitoring site, CAR017. No impact on vegetation was noted at CAR017, 270 m downstream from the	Ongoing vegetation monitoring at Flora Sites 17-20 for Rangelands, Jessop transects and Canopy Cover (reflecting a leading indicator of tree health) to enable detection of trends in data. Ongoing vegetation monitoring at Flora Sites 17-20 for Rangelands, Jessop transects and Canopy Cover (which reflects a leading indicator of tree health) to enable monitoring of potential impacts. Adaptive management of monitoring program as required if leading indicators indicate potential impacts (e.g. canopy cover measures

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					TSF and within 100 m of the impacted vegetation. In May 2023, further damage to Eliza Creek habitat was likely to continue for some months. Elsewhere within Eliza Creek, there has been no adverse impact on the diversity and abundance of native vegetation within Eliza Creek due to mining activities. Vegetation is monitored at Flora Sites 17-20 established in Eliza Creek at increasing distance from the proposed TSF dam wall, covering both Western Myall and Red Gum habitat. Rangelands, Jessop Transects and Canopy Cover data collected at all four sites, representing current (baseline) condition, species diversity, abundance and tree health prior to TSF construction. Jessup transect results record no obvious trends	in close proximity to tailings dam wall). Consideration of repeat of remote sensing vegetation cover estimates on a periodic basis, as a cost-effective way to track changes in vegetation cover downstream of the TSF embankment. Given the Decant Seepage incident it is recommended additional canopy cover monitoring of at least site 17 (e.g. in spring 2023), prior to the next annual monitoring event, which may occur in autumn or spring of 2024. It is also recommended that the area of saline seepage be re-surveyed in spring 2023 to determine the full extent of potential impact on vegetation. And if necessary, determine the SEB offset required under the Native Vegetation Act 1991.

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					in abundance of long-lived perennial species, Rangeland sites record no obvious trends in total flora species diversity; Canopy Cover transects record no obvious trends in canopy cover of dominant species. Tailings dam storage facility Stage 1 construction completed just prior to spring 2019 survey, and now operational. Eliza Creek has not flowed since pre TSF construction, there was however a controlled release from the decant dam in June 2019, with flow only recorded to 600m downstream of the TSF and no adverse impact on flora at the downstream monitoring sites has resulted from this controlled release. In 2023, there have been localised pools of water in Eliza Creek, but > 10 km north of Tailings Dam and	

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					unrelated to TSF storage. Baseline vegetation condition data of all Eliza Creek monitoring sites saved within baseline database for future comparison.	
May 2023	OMC EPBC1	Any records of sightings and recordings of the Thick-billed Grasswren are provided to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions.	Bird monitoring sites 1-22 (which overlap with Flora Sites 1-22, and include Fauna sites 1-6, 15, 16). See Figure 2-2. Opportunistic observations across project area.	Compliant	EPBC1: No records of the Thick-billed Grasswren were reported during the autumn 2023 survey at any of the 20 bird survey locations or opportunistically, including sites where song meters were deployed, so no records were provided to the BDBSA to facilitate effective population monitoring and record keeping. Song meters were deployed at 7 fauna sites (excluded site 3), Dawsons Dam, sites 7 in Bosworth creek and in low suitability patch of Blackbush near site 21 (NWERAM02). Noting a newly EPBC listed species Blue-winged Parrot was detected and results will	Ongoing bird surveys across all flora sites 1-22 and opportunistically to establish trends with construction now underway. Report any future records of Thick- billed Grasswren to the BDBSA.

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					be provided to the BDBSA.	
May 2023	OMC EPBC 2	Any records of sightings or captures of the Plains Mouse are provided to the Biological Database of South Australia (BDBSA) to enable effective monitoring and record keeping, as per the Recovery Plan Actions.	Fauna sites 1-6, 15, 16 for fauna trapping. See Figure 2-2.	Compliant	EPBC2: No records of the Plains Mouse were reported during the autumn 2023 survey at any of the 8 established fauna trapping sites, so no records were provided to the Biological Database of South Australia BDSA to facilitate effective monitoring and record keeping.	Ongoing pitfall trapping at 8 established fauna trapping sites to demonstrate species ongoing presence at site during periods of irruptive population growth and that refuge habitat continues to be effective despite mine operation. Report any future records of Plains Mouse to the BDBSA.
May 2023	OMC EPBC 3	Any records of sightings or recordings of the Night Parrot are provided to the Night Parrot Recovery Team to enable effective monitoring and record keeping.	Bird monitoring sites 1-22 (which overlap with Flora Sites 1-22, and include Fauna sites 1-6, 15, 16). See Figure 2-2. Opportunistic observations across project area.	Compliant	EPBC3: No records of the Night Parrot were reported during the autumn 2023 survey at any of the 20 bird survey locations or opportunistically or via song meter, so no records were provided to the Night Parrot Recovery Team to facilitate effective monitoring and record keeping. Noting a newly EPBC listed species Blue-winged Parrot was	Ongoing bird surveys across all flora sites 1-22 and opportunistically to establish trends with construction now underway. Report any future records of Night Parrot to the BDBSA.

Date	Monitoring Requirement/s	Achievement Value	Locations	Compliant / Non-Compliant	Evidence	Actions / Recommendations
					detected and results will be provided to the BDBSA.	
May 2023	OMC LUP4	Demonstrated development of trends and annual improvement of land rehabilitation through Landscape Function Analysis (LFA) methodology.	Baseline LFA data from sites CEF1-CEF7 (shown in Figure 8-3 of the Carrapateena PEPR). Rehabilitation monitoring at four locations (Airport Laydown and Ventia Laydown, Midway Qaurry, Tjungu).	Compliant	Baseline LFA data established from analogue sites. Site rehabilitation monitoring continued in autumn 2023.LFA sites established at four locations (LFAAL1, LFAVOL2, LFQUA3, LFATJU4) with two transects at each site. LFA trends are established and show improvement at all sites. With the original airport site (deep ripped) and new Tjungu site (deep ripped and hand seeded), showing the best results. Use of PCQ method and Established Method enabled.	Continue LFA monitoring at rehabilitation sites. Given demonstration of positive trends, plan to establish new analogue sites adjacent sites that are perfoming well (e.g. airport, Tjungu).

4.3 Suitability of Data for Informing Compliance

4.3.1 Overview

The data collected during the autumn 2023 survey is considered to provide meaningful data to determine compliance against the mine conditions and approved outcomes. The survey methods employed enabled comparison between impact and control sites, as well as comparison with baseline data. Construction / operational compliance monitoring data has now been collected since 2018. Results have been presented as text, tables and graphs, enabling demonstration of compliance against the established outcomes and measurement criteria, and representation of initial construction/operational compliance data trends.

4.3.2 Rangelands quadrats

The rangelands data provided quantitative data on species diversity present within each of the Flora Survey sites assessed. Further details added to the data here regarding woody long-lived perennial species enables a more thorough examination of the difference between climate and/or grazing impacts against potential impacts from mining operations. Comparison with the range of species diversity values collected during the baseline survey period has enabled an easy visual indication of current site diversity. Well defined survey sites have meant the survey area has been accurately repeatable, providing consistent results. Long-lived perennial diversity has been very stable, while short-lived species diversity has shown a very strong correlation with yearly rainfall totals, indicating the survey method provides accurate and meaningful data. Since 2021, data has been further explored further by comparing species diversity for sites of similar habitat, regardless of distance to mining infrastructure. This was done to determine if there were any trends in species diversity emerging regardless of distance to mining infrastructure.

4.3.3 Jessup transects

The Jessup transects provided quantitative data on the number of adults and juveniles present for long-lived perennial shrubs. This provides information on the health and vitality of individuals within a population, for example, it indicates if recruitment is occurring, or whether the population is declining, increasing, or staying the same. Combined with qualitative observations made on plant health (including defoliation and/or presence of dust on foliage) this will help inform if there has been an adverse impact on the diversity and abundance of long-lived woody native vegetation directly attributed to dust deposition from mining operations or mining related activities when compared to baseline native vegetation conditions. Results from these surveys enables reporting against compliance conditions. In 2020, the number of species analysed increased from two (Bladder Saltbush and Plains Lantern Bush) to four species (additionally, Samphire and Sea Heath), in response to widespread foliage loss of the two dominant species (Bladder Saltbush and Samphire) at the Stony Tableland sites. In 2021, 2022 and 2023, these four species were again analysed, providing insightful data on trends in population abundance in both palatable and non-palatable species, and species that are widespread across the lease. In 2023, the population trends during compliance monitoring of a fifth species Cunningham's Daisy, (*Minuria cunninghamii*), were also analysed. Qualitative observations suggested high variability of this moderately palatable and moderately drought-resistant species between survey periods, including apparent declines in 2019 and 2020. The results showed that the four most common and widespread species have continued to increase since 2020, following declines in 2019. Similarly, the Jessup data has been very effective in reflecting population changes of Cunningham's Daisy due to climate.

Prior to the 2021 survey, at the Eliza Creek sites, analysis was confined to comparison of net perennial species diversity between recording periods, which had remained relatively stable between 2018 - 2020. In 2021, the analysis was expanded to compare trends in the abundance of individual perennial species, namely the nine most abundant species at Eliza Creek Jessup transects. This analysis was continued in 2022 and further expanded in 2023 to include a total of 10 species. This has proven a valuable tool for determining potential trends in populations of individual species, rather than simply comparing total species diversity.

4.3.4 Canopy cover transects

The canopy cover transects record the presence of canopy foliage along a fixed 100 m transect. Within individual canopies, there may be from 1 to 10 or more recordings, depending on the width of the canopy. The technique is objective and does not rely on observer estimations of individual tree canopy intactness. By

repeating the survey along a fixed transect, it is estimated that the technique can detect changes in both individual canopy "completeness" and canopy cover for the whole tree stand, where there is a change in foliage extent of as little as 20%. Tree stress or death is expected to show up in densitometer results.

The technique is considered suitable for informing whether there has been a change in the health of the dominant trees on Eliza Creek and is seen as a leading indicator of tree stress. Results from these surveys will therefore contribute to the reporting against compliance conditions related to impacts in Eliza Creek.

Since 2019 visual estimates of canopy cover are also undertaken to complement the densitometer canopy cover assessments. Visual estimates of individual tree canopies enable identification of individual tree canopy health and provide a time frame for potential canopy loss. Results to date show that the densitometer results are broadly in alignment with visual estimates.

Since 2021 additional trees have been recorded along the transects. These were trees whose canopy intercepted the canopy but had not done so previously and/or which now met the criteria for recording. By including new trees that meet the survey requirements as the trees along the transects mature, the transition in age classes and maturation of new recruits has been effectively demonstrated by the surveys of the canopy cover transects as part of the overall health of tree vegetation within Eliza Creek.

The canopy cover data is considered to provide an objective method of determining trends in canopy health across the whole of the transect, including documenting tree deaths and recruitment. The trial in 2019 of using remote sensing of aerial imagery to estimate vegetative cover in increments downstream from the TSF embankment is considered a useful additional tool to monitor vegetation health within Eliza Creek.

4.3.5 Weed transects

Weed transects represent a repeatable, temporal examination of weed diversity and abundance at the site and are not time consuming to conduct. They are aligned along roads and intersect drainage lines and dam outlets, which are considered to be the key sources and/or vectors of seed spread. As such, the weed transects represent a key method (when coupled with weed data from rangelands assessments and opportunistic observations) to directly address a number of mine conditions and outcomes.

4.3.6 Landscape Function Analysis transects

Landscape Function Analysis at two rehabilitation sites at the mine site commenced in 2019, and two more were introduced in 2022. In 2023, all sites were surveyed using the established LFA method (as opposed to the Bank and Trough method applicable only for the very early stages of assessment). Introduction of the Point-centred Quarter Method (an extension of the Established Method) has proven very useful for reporting on the density of vegetation as it establishes within the rehabilitation sites, and especially when vegetation along the LFA transect has been absent or very sparse. The current methods are considered suitable to demonstrate change at the rehabilitation sites over time, as vegetation trends towards the 'baseline' / analogue condition. Current methods have already been successful in detecting notable differences in the success of the four sites, reflective of the different rehabilitation methods applied on the ground. This data is useful for future rehabilitation around the broader mining lease area and meeting OMC requirements.

4.3.7 Fauna surveys

Fauna trapping undertaken during autumn 2023 was comparable to the effort undertaken in spring 2018-2022, on the basis that the most important data is species diversity rather than species abundance. Despite cooler conditions during late autumn, overall fauna diversity was comparable with previous baseline survey periods and with the spring/autumn 2018-2023 survey numbers. Dams were full, and there was an increase in bird diversity detection across the site that may have been related to lower temperatures lower wind speeds, vegetation condition, as well as complimentary methods for detection (e.g. song meter). For mammals and reptiles however, capture rates were low and at the lower end of baseline ranges but diversity was maintained (mammals and reptiles). Fauna trapping represents the greatest opportunity to definitively record the EPBC listed Plains Mouse, and to demonstrate persistence of this species at the site throughout mining operations, which is an important outcome for OZ Minerals / BHP. As such, fauna trapping is still considered a requirement for informing impacts of the mining operation on conservation significant fauna. As suggested in the 2020 survey report, camera trapping at the designated fauna sites (outside of the fauna trapping project) may provide improved provide results. During the annual compliance surveys non-baited camera trapping has been used in

2021 - 2023 concurrently with open pit sites, species detected included Forrest's Mouse, Stripe-faced Dunnart, Planigale, Australasian Pipit, Australia Raven, Kangaroos, Cats, House Mice and Rabbits. Baited camera trapping without opening pits similar to the South Gap EPBC offset program may detect Plains Mouse, particularly following suitable rainfall events. It is noted that Plains Mouse were detected via baited camera traps at the South Gap in 2022, at most of the core habitat sites across the entire offset area, following substantially increased rainfall, decreased predator presence and decreased competition from herbivores within the fenced area (Nature Foundation 2023).

Bird surveys continue to provide good indications of overall site species diversity, with numbers increasing from 2020/2021/2022 and reflective of baseline conditions. Most of the historic sites are relatively homogeneous from a habitat perspective, but greater diversity observed at some sites appears to align with creek line sites, drainage lines and dune sites with taller and diverse vegetation. There are no historic records of any EPBC listed threatened birds at the site (apart from newly listed Blue-winged Parrot and Southern Whiteface), but regardless, the mine conditions require reporting of future records of EPBC listed species. This would not be possible without some level of bird survey. Several state-listed species were also detected (Major Mitchells / Pink Cockatoo, Restless Flycatcher, Western Gerygone and Peregrine Falcon, the first three for the first time). A number of waterbirds were detected at dams during the survey, including one state-listed species that had not been recorded at the site previously (e.g. Musk Duck), which is not an unusual record given the proximity to Lake Torrens. Many resident birds were breeding, and different types of bird families were well represented. Resident White-wing Fairy Wrens, Purple-backed Fairywrens and Rufous Fieldwrens were present across the site at multiple locations and Splendid Fairywrens were detected at and near sand dune sites for the first time since 2018.

Active / opportunistic reptile searches at fauna sites continues to provide good return on investment, and is considered an important part of the overall fauna survey program, though not directly related to any of the mine outcomes or conditions. As per fauna trapping active reptile searches are still considered suitable for informing overall impacts of the mining operation on fauna diversity. Both reptile and mammal diversity was in the range of baseline surveys, with reptile diversity maintained from previous years. Opportunistic surveys made up the bulk of the reptile diversity, given captures were low due to cooler day time temperatures. Of the reptiles that were detected, several species had juveniles present (e.g. Bearded Dragon, Earless Dragons, Bynoe's Gecko, Tree Dtella). Of note, one species that has not been recorded at the site since baseline and not recorded during compliance monitoring to date (Eyrean Skink). Feral mice were detected in low numbers at one fauna site (control site 1 and South Eliza Dam), a cat was detected via camera at site 3 and environmental staff report that a number have been removed from site or destroyed in the last 6 months. Rabbits were detected at several locations and a warren was located near site 15. Hence ongoing feral animal control is required.

4.4 Recommendations for future surveys and data analysis

Construction / operational compliance monitoring has been conducted since autumn 2018, involving two surveys in 2018, and annual surveys thereafter. Hence there have been seven complete fauna and flora surveys, and additionally, a separate dust impact survey and separate Eliza Creek flora and canopy cover survey. There have been two autumn and six spring surveys. The period 2018 to 2023 has covered extreme low rainfall years (2018 and 2019 when yearly rainfall totals for the year were in the 10% decile), average rainfall years and well above average seasonal rainfall events. This compares well with the baseline survey duration and climate patterns, namely 2012 to 2017 when rainfall totals varied from below average to well above average. During the compliance monitoring period, there has been no impact from mining on any of the PEPR Leading Indicators that relate to fauna and flora outcome measurement criteria. Fauna and flora species diversity has been within the baseline range, there have been no new declared weeds or increase in abundance of declared or listed weeds and no long-term population trends evident in existing weeds. The health of Eliza Creek vegetation has remained stable. All short-term changes to date in flora and fauna diversity, perennial plant population abundances, and canopy health at Eliza Creek transects have been attributed to variation in seasonal and/or yearly rainfall.

The compliance outcomes and measurement criteria require annual monitoring to occur at the sites. However, it is recommended that fauna surveys involving existing trapping techniques need only be conducted every two years. This is because there has been little change in the diversity of species captured over a range of seasonal and yearly rainfall conditions. It is recommended that bird surveys and cameras (potentially baited) continue to be used annually, which require less survey effort.

It is recommended that all sites surveyed in 2023 be re-surveyed in either autumn or spring 2024, using the same survey techniques (without fauna trapping if conducted in autumn 2024 and with fauna trapping if conducted in spring 2024). It is recommended that the seasonal timing of the survey remain flexible. In the arid zone, flora diversity, and often fauna diversity, reflects rainfall events, rather than a specific season. Mean monthly rainfall for the nearest long-term weather station, Woomera indicates highest rainfall means occur between November and March rather than winter but can be extremely variable year to year.

The autumn 2023 survey was conducted in May 2023, when conditions were cool to mild. Although the diversity of mammals and reptiles was in line with previous compliance and baseline surveys, the abundance of animals was low. Flora diversity was very high due to the diversity of short-lived species. It is recommended that surveys be conducted in either September/October or late March to April, when daily temperatures are not extreme and compliant with animal ethics requirements. The preference for an autumn or spring survey should be determined by seasonal conditions in the previous six months, namely consideration should be given to conducting the survey in response to particular climatic conditions (i.e., good rainfall) in order to maximise the chance of demonstrating compliance against some conditions (in particular, the presence of Plains Mouse).

Baseline data in Eliza Creek commenced in 2018 and includes conducting eight surveys of on ground canopy cover data recording. This has provided an indication of the inherent variability in the data, and the dynamic response of Red Gum canopies to seasonal conditions. At Eliza Creek medium to longer term trends in plant health are of major concern, rather than seasonal changes. Given that monitoring has been established since 2018, and additional reporting of individual tree health has been established, yearly surveys of Eliza Creek are considered sufficient. It is recommended that additional remote sensing reporting be continued, to supplement on-ground data.

Further details regarding future recommendations are provided below.

4.4.1 Rangelands quadrats

Rangelands sites represent a key measure of flora species diversity, abundance (as per Crown Separation Ratio categories) and grazing impact and should continue across the site, annually, as per the outcome measurement criteria for the mine lease (Outcome measurement criteria NV3, SWRF1, TSF6, AQ2). To date, the construction / operational phase monitoring data results have indicated species diversity has remained within the baseline range. This survey technique used during compliance monitoring reports upon both long-lived and short-lived species diversity, the latter largely influenced by weather events.

Flora Sites 21 and 22, were established on dunes in autumn 2018 to monitor this previously un-surveyed dune habitat within the Operation area. This monitoring should continue annually to address potential impacts from the Western Access Road on dune habitat to address the agreed outcomes for the Operation (Outcome measurement criteria NV3).

For all sites excluding site 21 and 22, Jessup monitoring should continue annually to address the agreed outcomes for the Operation (Outcome measurement criteria NV3, SWRF1, TSF6, AQ2).

4.4.2 Data analysis of Rangeland quadrats and Jessup transects

To date compliance monitoring has categorised sites as either control or impact sites, defined as sites either greater than 2 km or less than 2 km, respectively from mining infrastructure. The 2 km criteria was based on a literature review of the likely potential distance of dust and/or noise impact upon vegetation and dust impact modelling. All sites along Eliza Creek, however, were deemed to be potential impact sites, regardless of distance downstream from the TSF. During compliance monitoring, however, the Western Access Road has been developed, the Northern Welfield Supply Road (Khamsin Road) receives greater usage, and the Southern Access Road is no longer widely used. This has meant the original designation of sites as either control or impact should be reviewed. Similarly, some sites classified as impact upon the basis they were less than 2 km from the TSF should be reviewed (as they are hydrologically disconnected from the TSF).

It is recommended that future reporting consider either a re-assessment of control and impact sites or restricting Rangeland and Jessup reporting to analysis of flora diversity and abundance by habitat and trends of individual sites (as is currently done). A re-assignment of sites as control or impact would require a recalculation of baseline data means and ranges for newly assigned control and impact sites.

4.4.3 Canopy cover transects

Canopy cover assessment should continue, given transects have been conducted assessed in Eliza Creek on eight occasions since 2023. Given the long-term monitoring, the technique has been made more robust to increase the precision of transect alignment, a clearer indication of variability in data has been gained – both actual seasonal variation in tree health and inherent variability or "noise" in the method. It is recommended than annual surveys are sufficient.

The numbering of individual trees along the transect has greatly tightened up the repeatability and precision of the method. Tags that have dislodged from trees are replaced each survey period, and new trees are tagged. It is recommended that this continues for future surveys. Following recent rainfall events and storms, the most robust tagging appears to be where two galvanised nails are used with a metal tag (Figure 4-1).

Continuation of the Eliza Creek canopy cover data is expected to detect potential tree stress and death over time and will contribute to addressing the agreed outcomes for the Operation (Outcome measurement criteria NV3, SWRF1, TSF6, AQ2).

Figure 4-1 Canopy Cover tags used in Eliza Creek

4.4.4 Weeds transects

The 2021 survey increased the number of weed transects surveyed to also include Northern Wellfield locations, and a weed transect towards the western end of the newly constructed WAR. These were re-surveyed in 2023. The location of weed transects is considered to be a good representation of sites across the mineral leases that capture locations for potential spread of weeds due to mining related activities. Targeted locations, where weed populations are considered most likely on site (particularly dams, effluent irrigation areas, and the villages) were also re-surveyed. Weed transects CWM01 and CWM02 are located along the Southern Access Road, which now receives very little mining-related vehicle traffic. However, the transects are still within current mineral leases, and include populations of the declared weed, Batthurst Burr, plus several non-declared weeds that favour high moisture habitats. For this reason, it is recommended that these two transects also continue.

The weed transects and targeted survey locations are considered a very efficient way of detecting new weeds or an increase (or decline) in existing weed populations, as evidenced by the post-construction data. Collection of weed data should continue as per the autumn 2023 survey at assigned transects and opportunistically around the site to address the agreed outcomes for the Operation (Outcome measurement criteria WP1, WP2) and Mineral Lease condition 6 (sixth schedule) and MPL 156 conditions. Populations of Bathurst Burr should be revisited and monitored to determine success of control efforts.

4.4.5 Landscape Function Analysis

The LFA data collected (and PCQ data) indicates that all four established rehabilitation sites are transitioning as vegetation establishment commences, with the Aerodrome Laydown and Tjungu sites the most advanced. The data collected presents a simple means to graphically show changes in indices, and to also compare the indices with previously collected data from analogue sites considered broadly representative of natural conditions across the mine lease. The establishment of the Midway Quarry and Tjungu sites in 2023 provided a greater opportunity to monitor rehabilitation success as well as variation in techniques (e.g., deep cross ripping, plus hand seeding). Continued data collection will enable opportunities for ongoing data analysis, and a determination of when recorded indices approach or reach the range of the analogue data.

It is recommended that the monitoring of the eight transects (at four sites) continues in 2024 to meet the agreed outcomes for the project. Currently, the sites are divided into two zones, plant and rocky. For future surveys, based on plant species and ground cover composition, the need to divide plants into further zones should be considered, e.g., long-lived perennial shrubs vs short-lived shrubs.

Similarly, with PCQ method, consideration should be given to refining the method to measure the density of targeted species (e.g., Bladder Saltbush) or targeted categories of species, e.g. (long-lived vs short-lived species).

It is recommended that the Ventia site be surveyed in 2024, before assessing the need for active intervention. If results of the LFA monitoring in 2024 continue to show minimal improvement for the Ventia site, then BHP may consider deep ripping the site or supplementing with hand seeding and continuing monitoring.

Whilst the analogue sites provide a broadly representative set of data for comparison BHP may consider running additional transects adjacent the rehabilitation sites which would represent ‘control sites’, immediately comparable to the rehabilitation sites without confounding issues of seasonal variation and different locations which the analogue sites bring. These additional sites could be established during the next survey.

4.4.6 Fauna surveys

Similar to 2018 -2022, single pitfall trapping lines provided suitable capture of small mammals during the 2023 survey, however reptile captures were less successful. The most common mammal species that have been captured across all baseline surveys were still detected, with all small mammal captures made in pitfall traps. It is recommended that pitfall trapping is retained in order to detect presence or absence of Plains Mouse as per PEPR condition EPBC2, in addition to continuing to monitor habitat condition (flora monitoring). As suggested following the spring 2022 survey, increased rainfall in the region (spring and summer) resulted in an autumn survey in 2023 instead of spring survey, however Plains Mouse were not detected. As per 4.3.7 above, Plains Mouse has been detected via baited camera trap at the South Gap offset area in 2022, so detection at Carrapateena may still occur in the future, if above average rainfall persists. To increase the chance of detection of Plains Mouse at Carrapateena, particularly at control sites 1 and 2, options may include:

- increasing the number of lines and pits open at fauna sites during the next survey
- setting up targeted baited Elliot traps at good quality gilgais, at the established fauna sites. E.g. 5 baited Elliot traps at 10 sites, 100m apart, for a standard four night survey
- setting up baited camera traps similar to South Gap (noting there would be greater success at sites where predators (e.g. cats) are under control
- as per above consider whether bi-annual survey should be undertaken moving forward (i.e. consider during PEPR update).

As mentioned in Jacobs (2022, 2023), some pits within lines were decreasing in integrity and it is noted that the site environmental team have undertaken activities to replace pit bases and or patch holes. It is noted that the new pit bases are suitable for dunnarts and native mice, but may not withstand presence of Planigales or House Mice or increased numbers of small mammals (as occurred in 2022), given the tendency for these species to chew holes in the bases, hence regular maintenance / checking is still required. As per previous surveys, the lids of the semi-permanent pits need to be pushed down correctly before hex screws are applied to ensure there are no gaps that enable small mammals or reptiles to get through and be trapped outside of a survey period. The site environmental team have again scheduled pit maintenance prior to the next survey at the time of reporting. It is noted that stainless steel mesh bases have been ordered and these will be installed by the site environmental team prior to the 2024 annual survey.

Results for single pit line trapping continues to be comparable to baseline results and in general, mid-late spring is a suitable time to undertake an annual survey, however 2023 provided opportunity to survey during late autumn. For 2024, consideration could be given to surveying again in autumn in response to good climatic conditions (given high rainfall end of 2022, beginning of 2023), if conditions persist to maximise the chance of demonstrating compliance with the PEPR conditions. Double pit lines for a subset of impact and all control sites, and opening 7 traps, may also maximise detection, however this would require extra effort and may increase the length of the survey. Fauna trapping should continue at the mine site until such time as it can be clearly demonstrated that conservation significant species (in particular) persist alongside the operational mine, but this should be considered and discussed following the next PEPR update. Noting that several state species and one EPBC listed species were detected in autumn 2023 opportunistically, rather than via formal trapping. Camera trapping outside the survey period, given the success at South Gap offset area, using alternate, less labour intensive methods (without baits) or more labour intensive (with baits) may also be an option, i.e. aligning cameras with short lengths of fauna fence line to direct fauna into view. However, given the presence of cats at the site, regular checks would be required to avoid increasing predation of small mammals at trapping sites.

Whilst reptile diversity is interesting and provides a good indicator for overall site conditions, it does not specifically relate to PEPR conditions, and therefore use of funnel traps could be ceased in the future and reptile diversity could be collected opportunistically and via pitfall captures alone, particularly during the spring surveys when reptiles are more active. However, setting and checking funnel traps requires minimal additional effort compared with additional pitfall lines and provides opportunity to trap snakes where present, it is suggested that funnel trapping be retained at the current time.

The bird surveys at fauna sites, flora sites and water points currently provide valuable data regarding overall avifauna diversity at the sites, and birds are expected to respond to mine impacts such as noise and traffic if levels are unacceptable to them. In addition, pest bird species are also monitored e.g. House Sparrows still present (low numbers). For this reason, bird surveys should be continued during operational compliance monitoring until data patterns are clear, and to meet PEPR conditions related to Thick-billed Grasswren and Night Parrot records (EPBC1 and EPBC 3) as well as conditions related to pests (WP1, WP2). Survey at water points (particularly pre-dawn and post dusk) as well as spotlighting / night call detection is also an important survey technique to detect whether the Night Parrot is present at the site. A value add for 2023 included deployment of song meters to detect nocturnal, dawn and dusk species at both chenopod shrubland sites and representative creekline sites (e.g. Eliza Creek site 10). Noting that threatened species were detected opportunistically / via bird survey (Blue-winged Parrot, Major Mitchell's / Pink Cockatoo, Musk Duck, Western Gerygone, Peregrine Falcon) and some were also confirmed via song meter (e.g. Blue-winged Parrot).

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Appendix A Site Photo Logs Autumn 2023

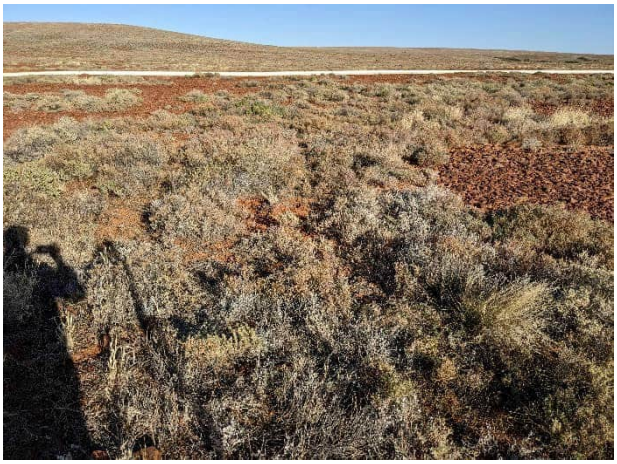
A1. Photo Log – Rangeland Flora Sites

A2. Photo Log – Jessup Transects

A3. Photo Log – Canopy Cover Transects Eliza Creek

A4. Photo Log - Weeds

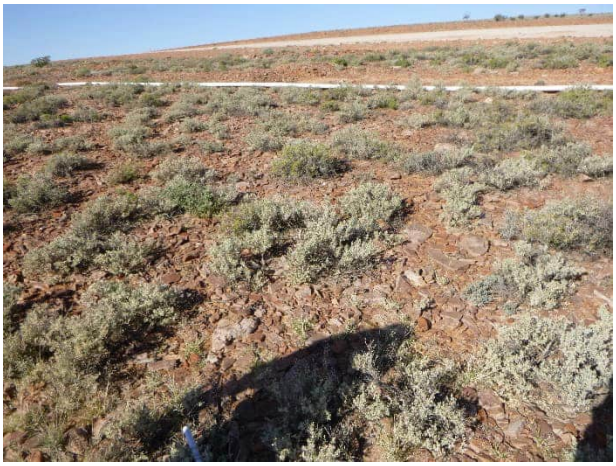
AppendixA1. Photo Log – Rangeland Flora Sites

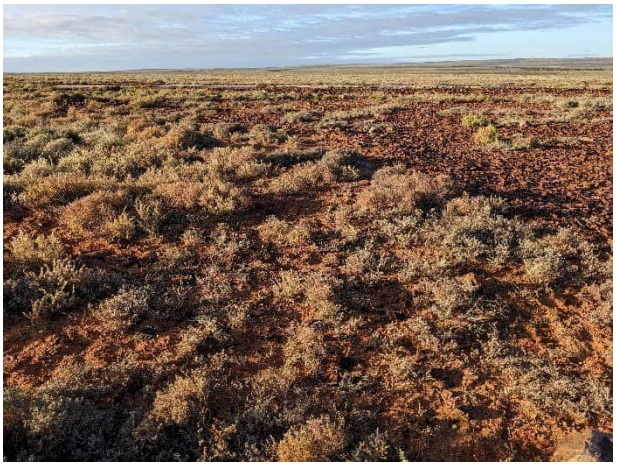
CAR001	
North	East
	
West	South
	

CAR002	
North	East
	
West	South
	

CAR003	
North	East
	
West	South
	

CAR004	
North	East
	
West	South
	

CAR005	
North	East
I 	
West	South
	

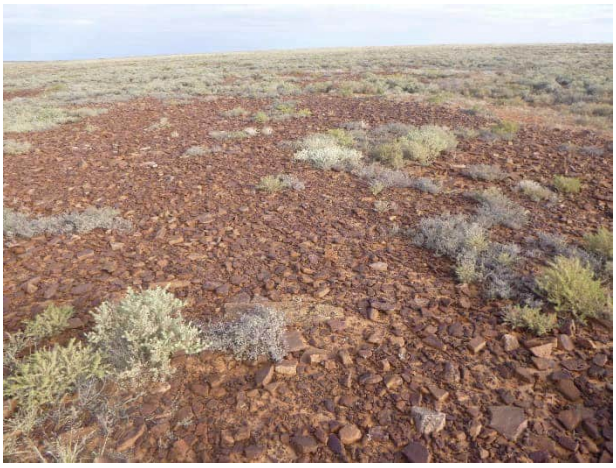
CAR006	
North	East
	
West	South
	

CAR007	
North	East
	
West	South
	

CAR009	
North	East
	
West	South
	

CAR010	
North	East
	
West	South
	

CAR011	
North	East
	
West	South
	

CAR012	
North	East
	
West	South
	

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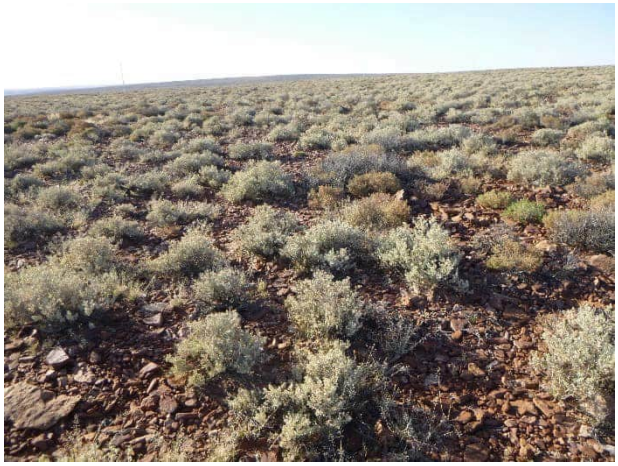
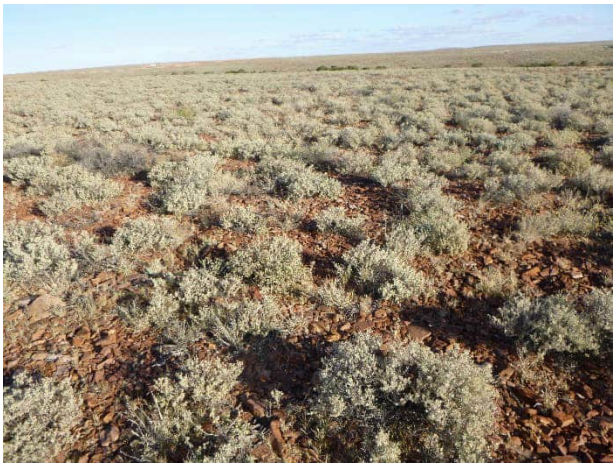
North	East
	
West	South
	

CAR015	
North	East
	
West	South
	

CAR016	
North	East
	
West	South
	

CAR017	
North	East
	
West	South
	

CAR018	
North	East
	
West	South
	

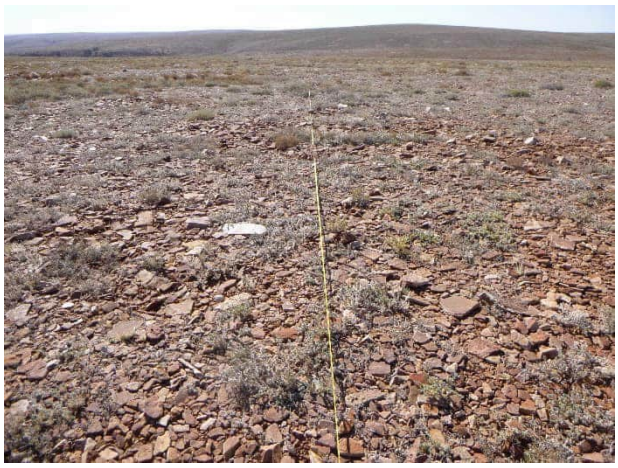
CAR019	
North	East
	
West	South
	

CAR020	
North	East
	
West	South
	

CAR021	
North	East
	
West	South
	

CAR022	
North	East
	
West	South
	

A2. Photo Log - Jessup Transects

CAR001	CAR002
	

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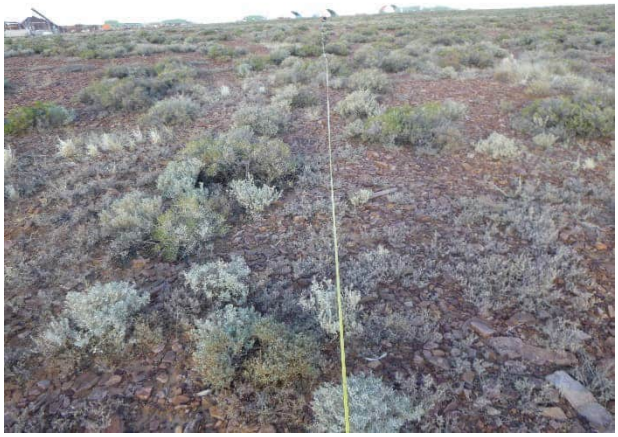	

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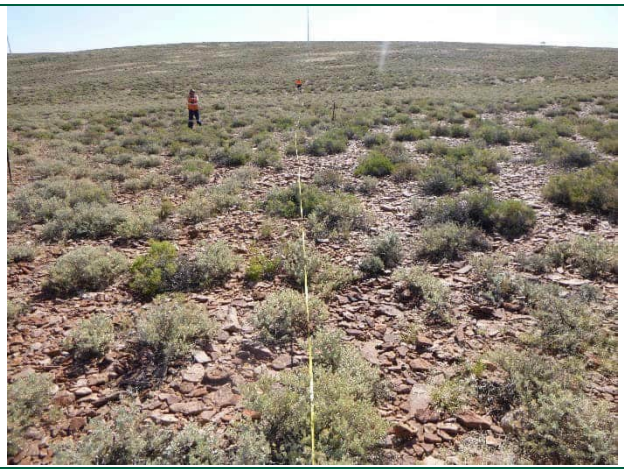	

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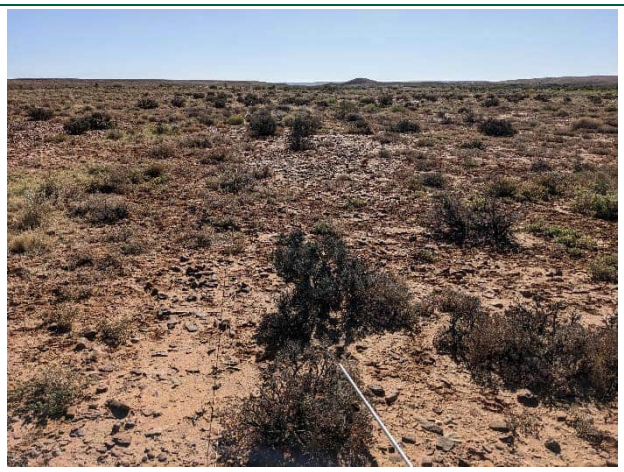
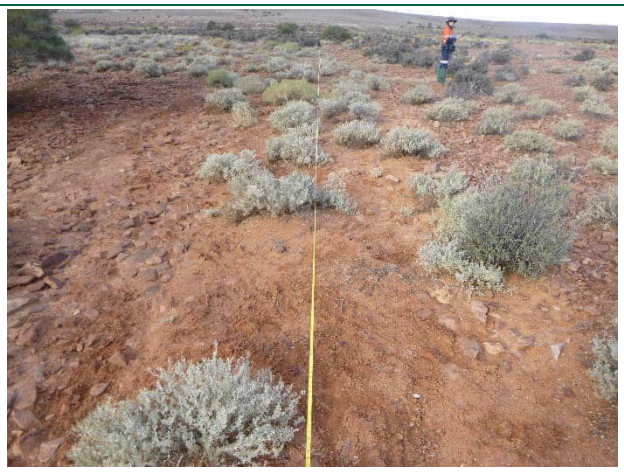
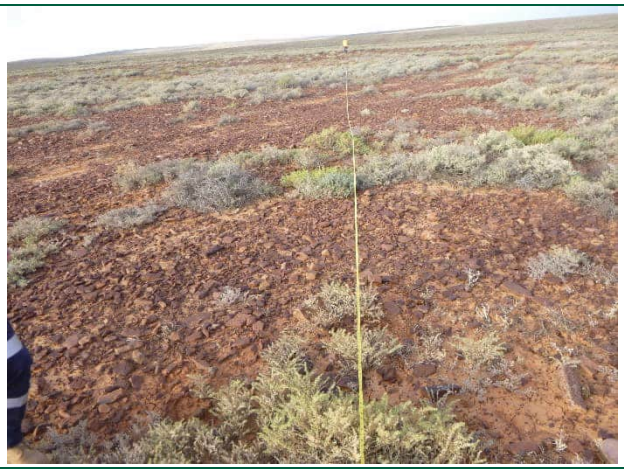
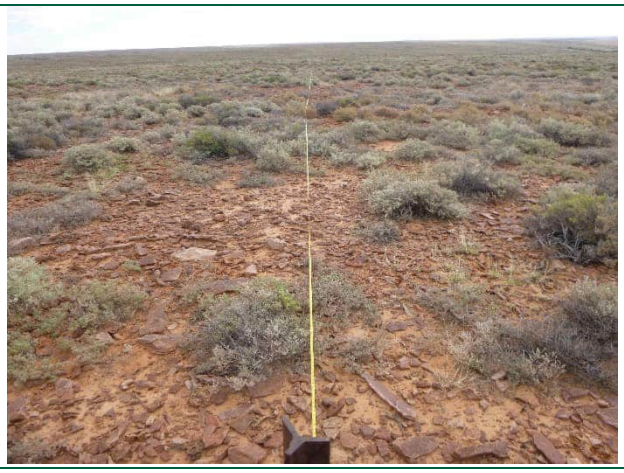
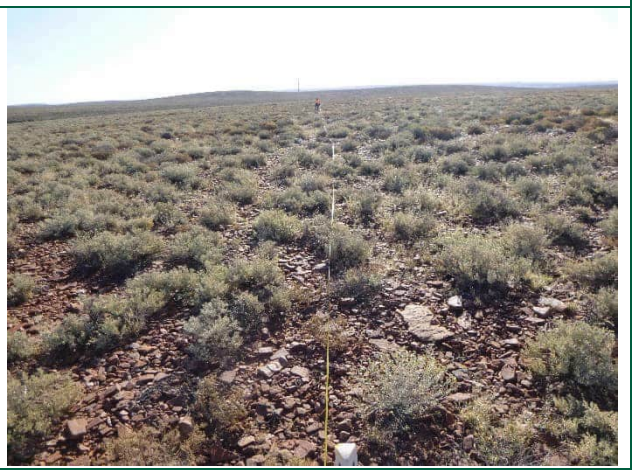
	

CAR010	CAR011
	

CAR012	CAR013
	

CAR015	CAR016
	

CAR017	CAR018
	

CAR019	CAR020
	

A3. Photo Log - Canopy Cover Transects Eliza Creek

CAR017	
Transect A	Transect B
	

CAR018	
Transect A	Transect B
	

CAR019	
Transect A	Transect B
	

CAR020	
Transect A	Transect B
	

A4. Photo Log - Weed Survey

Transect: CWM01

Point: 0 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM01

Point: 250 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM01

Point: 500 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM01

Point: 750 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM01

Point: 1000 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM02

Point: 0 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM02

Point: 250 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM02

Point: 500 m

<table>
<tr><td colspan="2">Eastern side of road</td></tr>
<tr><td>South</td><td>North</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Western side of road</td></tr>
<tr><td>South</td><td>North</td></tr>
<tr><td>  </td><td>  </td></tr>
</table>

Transect: CWM02

Point: 750 m

Eastern side of road	
South	North
	
Western side of road	
South	North
	

Transect: CWM02

Point: 1000 m

Eastern side of road	
South	North
	
Western side of road	
South	North
	

Transect: CWM03

Point: 0 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM03

Point: 250 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM03

Point: 500 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM03

Point: 750 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM03

Point: 1000 m

Northern side of road	
East	West
	
Southern side of road	
East	West
	

Transect: CWM04

Point: 0 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM004

Point: 250 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM04

Point: 500 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM004

Point: 750 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM04

Point: 1000 m

Western side of road	
North	South
	
Eastern side of road	
North	South
	

Transect: CWM05

Point: 0 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM05

Point: 250 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM05

Point: 500 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM05

Point: 750 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM05

Point: 1000 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM06

Point: 0 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM06

Point: 250 m

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<tr><td colspan="2">Southern side of road</td></tr>
<tr><td>West</td><td>East</td></tr>
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</table>

Transect: CWM06

Point: 500 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM06

Point: 750 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM06

Point: 1000 m

Northern side of road	
West	East
	
Southern side of road	
West	East
	

Transect: CWM07

Point: 0 m

North	South
	

Point: 250 m

North	South
	

Transect: CWM07

Point: 500 m

North	South
	

Point: 750 m

North	South
	

Transect: CWM07

Point: 1000 m

North	South
	

Transect: NWM01

Point: 0 m

<table>
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<tr><td>East</td><td>West</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">North side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
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Transect: NWM01

Point: 250 m

<table>
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<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">North side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
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Transect: NWM01

Point: 500 m

<table>
<tr><td colspan="2">Southern side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
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<tr><td colspan="2">North side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
<tr><td>  </td><td>  </td></tr>
</table>

Transect: NWM01

Point: 750 m

Southern side of road	
East	West
	
North side of road	
East	West
	

Transect: NWM01

Point: 1000 m

<table>
<tr><td colspan="2">Southern side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td colspan="2">North side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
<tr><td>  </td><td>  </td></tr>
</table>

Transect: NWM02

Point: 0 m

Southern side of road	
East	West
	
North side of road	
East	West
	

Transect: NWM02

Point: 250 m

Southern side of road	
East	West
	
North side of road	
East	West
	

Transect: NWM02

Point: 500 m

<table>
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<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">North side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
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</table>

Transect: NWM02

Point: 750 m

Southern side of road	
East	West
	
North side of road	
East	West
	

Transect: NWM02

Point: 1000 m

<table>
<tr><td colspan="2">Southern side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Northern side of road</td></tr>
<tr><td>East</td><td>West</td></tr>
<tr><td>  </td><td>  </td></tr>
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Transect: NWM03

Point: 0 m

<table>
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<tr><td>South</td><td>North</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Intersection</td></tr>
<tr><td>North</td><td>East</td></tr>
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Transect: NWM03

Point: 250 m

<table>
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<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Eastern side of road</td></tr>
<tr><td>South</td><td>North</td></tr>
<tr><td>  </td><td>  </td></tr>
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Transect: NWM03

Point: 500 m

Western side of road	
South	North
NA	
Eastern side of road	
South	North
	

Transect: NWM03

Point: 750 m

Western side of road	
South	North
	
Eastern side of road	
South	North
	

Transect: NWM03

Point: 1000 m

Western side of road	
South	North
	
Eastern side of road	
South	North
	

Appendix B Rangeland Sites Plant Species

The following is a cumulative list of plant taxa recorded at Rangeland assessment sites (Flora Sites 1 – 22), spring autumn 2023, their life span status, and the number of sites at which they were recorded.

Family	Species	Common name	Number of records	
			Long-lived	Short-lived*
ACANTHACEAE	*Rostellularia adscendens* ssp.	Pink Tongues		5
ADIANTACEAE	*Cheilanthes lasiophylla*	Woolly Cloak-fern		1
AIZOACEAE	*Trianthema triquetrum*	Red Spinach		1
AMARANTHACEAE	*Alternanthera denticulata*	Lesser Joyweed		3
AMARANTHACEAE	*Alternanthera nodiflora*	Common Joyweed		4
AMARANTHACEAE	*Ptilotus nobilis* ssp.	Yellow-tails		5
AMARANTHACEAE	*Ptilotus obovatus*	Silver Mulla Mulla	8	
AMARYLLIDACEAE	*Crinum flaccidum*	Murray Lily		5
BORAGINACEAE	*Trichodesma zeylanicum* var. *zeylanicum*	Camel Bush		2
CAMPANULACEAE	*Wahlenbergia* sp.	Native Bluebell		2
CARYOPHYLLACEAE	*Spergularia marina*	Salt Sand-spurrey		1
CHENOPODIACEAE	*Atriplex fissivalvis*	Gibber Saltbush		2
CHENOPODIACEAE	*Atriplex holocarpa*	Pop Saltbush		9
CHENOPODIACEAE	*Atriplex lindleyi* ssp.	Baldoo		1
CHENOPODIACEAE	*Atriplex velutinella*	Sandhill Saltbush		2
CHENOPODIACEAE	*Atriplex vesicaria*	Bladder Saltbush	17	
CHENOPODIACEAE	*Chenopodium curvispicatum*	Cottony Goosefoot	4	
CHENOPODIACEAE	*Dissocarpus biflorus* var.	Two-horn Saltbush		8
CHENOPODIACEAE	*Dissocarpus paradoxus*	Ball Bindyi		12
CHENOPODIACEAE	*Einadia nutans* ssp.	Climbing Saltbush	8	
CHENOPODIACEAE	*Enchylaena tomentosa* var.	Ruby Saltbush	9	
CHENOPODIACEAE	*Maireana aphylla*	Cotton-bush	10	
CHENOPODIACEAE	*Maireana appressa*	Pale-fruit Bluebush	10	
CHENOPODIACEAE	*Maireana astrotricha*	Low Bluebush	1	
CHENOPODIACEAE	*Maireana eriantha*	Woolly Bluebush	8	
CHENOPODIACEAE	*Maireana georgei*	Satiny Bluebush	1	
CHENOPODIACEAE	*Maireana integra*	Entire-wing Bluebush	3	
CHENOPODIACEAE	*Maireana pyramidata*	Black Bluebush	2	
CHENOPODIACEAE	*Maireana spongiocarpa*	Spongy-fruit Bluebush	7	
CHENOPODIACEAE	*Maireana turbinata*	Top-fruit Bluebush	1	
CHENOPODIACEAE	*Osteocarpum acropterum* var.	Bonefruit		1
CHENOPODIACEAE	*Osteocarpum dipterocarpum*	Two-wing Bonefruit		3
CHENOPODIACEAE	*Rhagodia spinescens*	Spiny Saltbush	3	
CHENOPODIACEAE	*Salsola australis*	Buckbush		6
CHENOPODIACEAE	*Sclerolaena brachyptera*	Short-wing Bindyi		12
CHENOPODIACEAE	*Sclerolaena diacantha*	Grey Bindyi		1
CHENOPODIACEAE	*Sclerolaena divaricata*	Tangled Bindyi		10

CHENOPODIACEAE	*Sclerolaena intricata*	Tangled Bindyi		12
CHENOPODIACEAE	*Sclerolaena* sp. *Pernatty*			1
CHENOPODIACEAE	*Sclerolaena ventricosa*	Salt Bindyi		16
CHENOPODIACEAE	*Tecticornia medullosa*	Samphire	12	
CHENOPODIACEAE	*Tecticornia pergranulata* ssp.	Black-seed Samphire	2	
CHENOPODIACEAE	*Tecticornia tenuis*	Slender Samphire	3	
COMPOSITAE	*Brachyscome ciliaris* var.	Variable Daisy		3
COMPOSITAE	*Centipeda crateriformis* ssp.	Sneezeweed		1
COMPOSITAE	*Chrysocephalum pterochaetum*	Shrub Everlasting		1
COMPOSITAE	*Glossocardia bidens*	Native Cobbler's-pegs		2
COMPOSITAE	*Gnephosis* sp.	0		2
COMPOSITAE	*Minuria cunninghamii*	Bush Minuria	13	
COMPOSITAE	*Pluchea rubelliflora*	0		3
COMPOSITAE	*Podolepis davisiana*	Button Podolepis		1
COMPOSITAE	*Polycalymma stuartii*	Poached-egg Daisy		2
COMPOSITAE	*Pterocaulon sphacelatum*	Apple-bush		3
CONVOLVULACEAE	*Convolvulus remotus*	Grassy Bindweed		1
CRUCIFERAE	*Arabidella nasturtium*	Yellow Cress		1
CRUCIFERAE	*Lepidium phlebopetalum*	Veined Peppercress		6
CYPERACEAE	*Cyperus rigidellus*	Dwarf Flat-sedge		1
CYPERACEAE	*Cyperus* sp.	Flat-sedge		3
CYPERACEAE	*Eleocharis pallens*	Pale Spike-rush	1	
EUPHORBIACEAE	*Euphorbia drummondii group*	0		3
EUPHORBIACEAE	*Euphorbia stevenii*	Bottletree Spurge		8
EUPHORBIACEAE	*Euphorbia tannensis* ssp. *eremophila*	Desert Spurge		3
EUPHORBIACEAE	*Lysiandra fuernrohrii*	Sand Spurge		1
FRANKENIACEAE	*Frankenia serpyllifolia*	Thyme Sea-heath	12	
GOODENIACEAE	*Scaevola spinescens*	Spiny Fanflower	5	
GRAMINEAE	*Aristida contorta*	Curly Wire-grass		2
GRAMINEAE	*Aristida holathera* var. *holathera*	Tall Kerosene Grass		2
GRAMINEAE	*Astrebla pectinata*	Barley Mitchell-grass	6	
GRAMINEAE	*Austrostipa* sp.	Spear-grass		5
GRAMINEAE	*Chloris pectinata*	Comb Windmill Grass		1
GRAMINEAE	*Digitaria brownii*	Cotton Panic-grass	5	
GRAMINEAE	*Digitaria divaricatissima* var. *divaricatissima*	Spider Grass	4	
GRAMINEAE	*Enneapogon avenaceus*	Common Bottle-washers		14
GRAMINEAE	*Enteropogon acicularis*	Umbrella Grass		6
GRAMINEAE	*Eragrostis australasica*	Cane-grass	2	
GRAMINEAE	*Eragrostis setifolia*	Bristly Love-grass	11	
GRAMINEAE	*Eragrostis xerophila*	Knotty-butt Neverfail	1	
GRAMINEAE	*Eulalia aurea*	Silky Brown-top	3	
GRAMINEAE	*Iseilema membranaceum*	Small Flinders-grass		1
GRAMINEAE	*Panicum decompositum* var. *decompositum*	Native Millet		12
GRAMINEAE	*Paractaenum novae-hollandiae* ssp. *reversum*	Barbed-wire Grass		2

GRAMINEAE	*Setaria constricta*	Knotty-butt Paspalidium	2	
GRAMINEAE	*Sporobolus actinocladus*	Ray Grass		18
GRAMINEAE	*Themeda triandra*	Kangaroo Grass	3	
GRAMINEAE	*Tragus australianus*	Small Burr-grass		2
GRAMINEAE	*Tripogonella loliiformis*	Five-minute Grass		2
GRAMINEAE	*Triraphis mollis*	Purple Plume Grass		2
GRAMINEAE	*Zygochloa paradoxa*	Sandhill Cane-grass	2	
LABIATAE	*Teucrium racemosum*	Grey Germander		4
LEGUMINOSAE	*Acacia aneura* var.	Mulga	2	
LEGUMINOSAE	*Acacia ligulata*	Umbrella Bush	2	
LEGUMINOSAE	*Acacia papyrocarpa*	Western Myall	7	
LEGUMINOSAE	*Acacia ramulosa* var. *ramulosa*	Horse Mulga	1	
LEGUMINOSAE	*Acacia tetragonophylla*	Dead Finish	5	
LEGUMINOSAE	*Crotalaria eremaea* ssp.	Loose-flowered Rattle-pod		2
LEGUMINOSAE	*Cullen australasicum*	Tall Scurf-pea		4
LEGUMINOSAE	*Cullen cinereum*	Annual Scurf-pea		3
LEGUMINOSAE	*Lotus cruentus*	Red-flower Lotus		8
LEGUMINOSAE	*Senna artemisioides* ssp. *helmsii*	Blunt-leaf Senna	4	
LEGUMINOSAE	*Senna artemisioides* ssp. *oligophylla*	Limestone Senna	3	
LEGUMINOSAE	*Senna artemisioides* ssp. *X artemisioides*	Silver Senna	4	
LILIACEAE	*Bulbine semibarbata*	Small Leek-lily		2
LILIACEAE	*Wurmbea australis*	Inland Nancy		4
MALVACEAE	*Abutilon halophilum*	Plains Lantern-bush	10	
MALVACEAE	*Abutilon otocarpum*	Desert Lantern-bush	7	
MALVACEAE	*Hibiscus krichauffianus*	Velvet-leaf Hibiscus		1
MALVACEAE	*Lawrencia glomerata*	Clustered Lawrencia		1
MALVACEAE	*Malvastrum americanum* var. *americanum*	Malvastrum		5
MALVACEAE	*Sida ammophila*	Sand Sida		2
MALVACEAE	*Sida fibulifera*	Pin Sida		15
MALVACEAE	*Sida intricata*	Twiggy Sida	3	
MALVACEAE	*Sida petrophila*	Rock Sida		7
MARSILEACEAE	*Marsilea drummondii*	Common Nardoo		3
MYOPORACEAE	*Eremophila latrobei* ssp.	Crimson Emubush	4	
MYOPORACEAE	*Eremophila oppositifolia* ssp.	Opposite-leaved Emubush	2	
MYOPORACEAE	*Eremophila oppositifolia* ssp. *oppositifolia*	Opposite-leaved Emubush	3	
MYOPORACEAE	*Eremophila serrulata*	Green Emubush	4	
MYOPORACEAE	*Myoporum montanum*	Native Myrtle	6	
MYRTACEAE	*Eucalyptus camaldulensis* ssp. *arida*	Northern River Red Gum	3	
NYCTAGINACEAE	*Boerhavia dominii*	Tar-vine		1
NYCTAGINACEAE	*Boerhavia schomburgkiana*	Schomburgk's Tar-vine		5
PLANTAGINACEAE	*Plantago drummondii*	Dark Plantain		8
POLYGONACEAE	*Duma florulenta*	Lignum	3	
PORTULACACEAE	*Anacampseros australiana*	Australian Anacampseros		3
PORTULACACEAE	*Portulaca oleracea*	Common Purslane		15

SANTALACEAE	*Exocarpos aphyllus*	Leafless Cherry	4	
SANTALACEAE	*Santalum lanceolatum*	Plumbush	5	
SAPINDACEAE	*Alectryon oleifolius* ssp. *canescens*	Bullock Bush	1	
SAPINDACEAE	*Dodonaea lobulata*	Lobed-leaf Hop-bush	5	
SAPINDACEAE	*Dodonaea viscosa* ssp. *angustissima*	Narrow-leaf Hop-bush	1	
SOLANACEAE	*Nicotiana velutina*	Velvet Tobacco		3
SOLANACEAE	*Solanum lithophilum*	Velvet Potato-bush		5
SOLANACEAE	*Solanum quadriloculatum*	Plains Nightshade		5
THYMELAEACEAE	*Pimelea microcephala* ssp.	Shrubby Riceflower	1	
UMBELLIFERAE	*Daucus glochidiatus*	Native Carrot		4
ZYGOPHYLLACEAE	*Abutilon halophilum*	Plains Lantern-bush	1	
ZYGOPHYLLACEAE	*Atriplex holocarpa*	Pop Saltbush		1
ZYGOPHYLLACEAE	*Dissocarpus paradoxus*	Ball Bindyi		1
ZYGOPHYLLACEAE	*Lepidium phlebopetalum*	Veined Peppercress		1
ZYGOPHYLLACEAE	*Panicum decompositum* var. *decompositum*	Native Millet		1
ZYGOPHYLLACEAE	*Plantago drummondii*	Dark Plantain		1
ZYGOPHYLLACEAE	*Roepera eremaea*	Twinleaf		2
ZYGOPHYLLACEAE	*Roepera howittii*	Clasping Twinleaf		2
ZYGOPHYLLACEAE	*Salsola australis*	Buckbush		1
ZYGOPHYLLACEAE	*Sclerolaena intricata*	Tangled Bindyi		1
ZYGOPHYLLACEAE	*Sclerolaena ventricosa*	Salt Bindyi		1
ZYGOPHYLLACEAE	*Sida intricata*	Twiggy Sida	1	
ZYGOPHYLLACEAE	*Sporobolus actinocladus*	Ray Grass		1
Total Species Diversity			58	90

Appendix C Long-Lived Woody Perennial Classification

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
MALVACEAE	*Abutilon halophilum*	Plains Lantern-bush	Y
MALVACEAE	*Abutilon leucopetalum*	Desert Lantern-bush	Y
MALVACEAE	*Abutilon otocarpum*	Desert Lantern	Y
MALVACEAE	*Abutilon sp.*	Lantern-bush	Y
LEGUMINOSAE	*Acacia aneura var.*	Mulga	Y
LEGUMINOSAE	*Acacia papyrocarpa*	Western Myall	Y
LEGUMINOSAE	*Acacia tetragonophylla*	Dead Finish	Y
LEGUMINOSAE	*Acacia victoriae ssp.*	Elegant Wattle	Y
SAPINDACEAE	*Alectryon oleifolius ssp. canescens*	Bullock Bush	Y
AMARANTHACEAE	*Alternanthera denticulata*	Lesser Joyweed	N
AMARANTHACEAE	*Alternanthera nodiflora*	Common Joyweed	N
LORANTHACEAE	*Amyema maidenii ssp. maidenii*	Pale-leaf Mistletoe	Y
LORANTHACEAE	*Amyema quandang var. quandang*	Grey Mistletoe	Y
PORTULACACEAE	*Anacampseros australiana*	Australian Anacampseros	N
COMPOSITAE	*Anemocarpa podolepidium*	Rock Everlasting	N
COMPOSITAE	*Angianthus sp.*	Cup-flower	N
CRUCIFERAE	*Arabidella glaucescens*	Bluish Cress	N
CRUCIFERAE	*Arabidella sp.*	Native Cress	N
GRAMINEAE	*Aristida anthoxanthoides*	Yellow Three-awn	N
GRAMINEAE	*Aristida contorta*	Curly Wire-grass	N
GRAMINEAE	*Aristida holathera var. holathera*	Tall Kerosene Grass	N
GRAMINEAE	*Aristida nitidula*	Brush Three-awn	N
GRAMINEAE	*Aristida sp.*	Three-awn/Wire-grass	N
GRAMINEAE	*Astrebla pectinata*	Barley Mitchell-grass	Y
GRAMINEAE	*Astrebla sp.*	Mitchell-grass	Y
CHENOPODIACEAE	*Atriplex fissivalvis*	Gibber Saltbush	N
CHENOPODIACEAE	*Atriplex holocarpa*	Pop Saltbush	N
CHENOPODIACEAE	*Atriplex lindleyi ssp.*	Baldoo	N
CHENOPODIACEAE	*Atriplex lindleyi ssp. conduplicata*	Baldoo	N
CHENOPODIACEAE	*Atriplex lindleyi ssp. inflata*	Corky Saltbush	N
CHENOPODIACEAE	*Atriplex lindleyi ssp. lindleyi*	Baldoo	N
CHENOPODIACEAE	*Atriplex sp.*	Saltbush	N
CHENOPODIACEAE	*Atriplex spongiosa*	Pop Saltbush	N
CHENOPODIACEAE	*Atriplex turbinata*	A Saltbush	N
CHENOPODIACEAE	*Atriplex velutinella*	Sandhill Saltbush	N
CHENOPODIACEAE	*Atriplex vesicaria ssp.*	Bladder Saltbush	Y
GRAMINEAE	*Austrostipa nitida*	Balcarra Spear-grass	N
GRAMINEAE	*Austrostipa scabra ssp.*	Rough Spear-grass	N
GRAMINEAE	*Austrostipa sp.*	Spear-grass	N
GRAMINEAE	*Austrostipa trichophylla*	Spear-grass	N
CYPERACEAE	*Baumea sp.*	Twig-rush	Y
COMPOSITAE	*Bidens pilosa*	Cobblers Pegs	N
COMPOSITAE	*Blennospora drummondii*	Dwarf Button-flower	N

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
NYCTAGINACEAE	*Boerhavia dominii*	Tar-vine	N
NYCTAGINACEAE	*Boerhavia sp.*	Tar-vine	N
GRAMINEAE	*Brachiaria praetervisa*	Large Arm-grass	N
GRAMINEAE	*Brachiaria sp.*	Arm-grass	N
COMPOSITAE	*Brachyscome ciliaris var.*	Variable Daisy	N
COMPOSITAE	*Brachyscome ciliaris var. lanuginosa*	Woolly Variable Daisy	N
COMPOSITAE	*Brachyscome sp.*	Native Daisy	N
LILIACEAE	*Bulbine semibarbata*	Small Leek-lily	N
LILIACEAE	*Bulbine sp.*	Bulbine-lily	N
PORTULACACEAE	*Calandrinia sp.*	Purslane/Parakeelya	N
PORTULACACEAE	*Calandrinia volubilis*	Twining Purslane	N
COMPOSITAE	*Calotis hispidula*	Hairy Burr-daisy	N
COMPOSITAE	*Calotis sp.*	Burr-daisy	N
AIZOACEAE	*Carpobrotus rossii*	Native Pigface	Y
COMPOSITAE	*Centipeda cunninghamii*	Common Sneezeweed	N
COMPOSITAE	*Centipeda thespidioides*	Desert Sneezeweed	N
CHENOPODIACEAE	*Chenopodium desertorum ssp.*	Desert Goosefoot	N
CHENOPODIACEAE	*Chenopodium sp.*	Goosefoot	N
GRAMINEAE	*Chloris pectinata*	Comb Windmill Grass	N
GRAMINEAE	*Chloris sp.*	Windmill Grass/Chloris	N
COMPOSITAE	*Chrysocephalum pterochaetum*	Shrub Everlasting	N
COMPOSITAE	*Chrysocephalum sp.*	Everlasting	N
COMPOSITAE	*Compositae sp.*	Daisy Family	N
CONVOLVULACEAE	*Convolvulaceae sp.*	Bindweed Family	N
CONVOLVULACEAE	*Convolvulus angustissimus ssp.*	Narrow-leaf Bindweed	N
CONVOLVULACEAE	*Convolvulus erubescens complex*	Bindweed	N
CONVOLVULACEAE	*Convolvulus remotus*	Grassy Bindweed	N
CONVOLVULACEAE	*Convolvulus sp.*	Bindweed	N
COMPOSITAE	*Craspedia sp.*	Buttons	N
Crassulaceae	*Crassula sp.*	Crassula/Stonecrop	N
AMARYLLIDACEAE	*Crinum flaccidum*	Murray Lily	N
LEGUMINOSAE	*Crotalaria eremaea ssp.*	Loose-flowered Rattle-pod	N
LEGUMINOSAE	*Cullen australasicum*	Tall Scurf-pea	N
LEGUMINOSAE	*Cullen cinereum*	Annual Scurf-pea	N
LEGUMINOSAE	*Cullen graveolens*	Native Lucerne	N
LEGUMINOSAE	*Cullen sp.*	Scurf-pea	N
CONVOLVULACEAE	*Cuscuta sp.*	Dodder	N
GRAMINEAE	*Cymbopogon ambiguus*	Lemon-grass	Y
ASCLEPIADACEAE	*Cynanchum viminale ssp. australe*	Caustic Bush	Y
CYPERACEAE	*Cyperus rigidellus*	Dwarf Flat-sedge	N
CYPERACEAE	*Cyperus sp.*	Flat-sedge	N
GRAMINEAE	*Dactyloctenium radulans*	Button-grass	N
UMBELLIFERAE	*Daucus glochidiatus*	Native Carrot	N
GRAMINEAE	*Dichanthium sericeum ssp.*	Silky Blue-grass	Y

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
GRAMINEAE	*Digitaria brownii*	Cotton Panic-grass	Y
GRAMINEAE	*Digitaria coenicola*	Spider Grass	Y
GRAMINEAE	*Digitaria divaricatissima var.*	Finger Panic-grass	Y
GRAMINEAE	*Digitaria sp.*	Summer-grass	Y
CHENOPODIACEAE	*Dissocarpus biflorus var.*	Two-horn Saltbush	N
CHENOPODIACEAE	*Dissocarpus paradoxus*	Ball Bindii	N
SAPINDACEAE	*Dodonaea lobulata*	Lobed-leaf Hop-bush	Y
SAPINDACEAE	*Dodonaea viscosa ssp. angustissima*	Narrow-leaf Hop-bush	Y
POLYGONACEAE	*Duma florulenta*	Lignum	Y
CHENOPODIACEAE	*Dysphania cristata*	Crested Goosefoot	N
CHENOPODIACEAE	*Dysphania pumilio*	Clammy Goosefoot	N
POLYGONACEAE	*Duma florulenta*	Lignum	Y
CHENOPODIACEAE	*Einadia nutans var.*	Climbing Saltbush	Y
CYPERACEAE	*Eleocharis pallens*	Pale Spike-rush	N
CHENOPODIACEAE	*Enchylaena tomentosa var.*	Ruby Saltbush	Y
GRAMINEAE	*Enneapogon avenaceus*	Common Bottle-washers	N
GRAMINEAE	*Enneapogon cylindricus*	Jointed Bottle-washers	N
GRAMINEAE	*Enneapogon polyphyllus*	Leafy Bottle-washers	N
GRAMINEAE	*Enneapogon sp.*	Bottle-washers / Nineawn	N
GRAMINEAE	*Enteropogon acicularis*	Umbrella Grass	N
GRAMINEAE	*Enteropogon ramosus*	Umbrella Grass	N
GRAMINEAE	*Enteropogon sp.*	Umbrella Grass	N
GRAMINEAE	*Eragrostis australasica*	Cane-grass	Y
GRAMINEAE	*Eragrostis dielsii var. dielsii*	Mulka	N
GRAMINEAE	*Eragrostis eriopoda*	Woollybutt	N
GRAMINEAE	*Eragrostis parviflora*	Soft Love-grass	N
GRAMINEAE	*Eragrostis setifolia*	Bristly Love-grass	Y
GRAMINEAE	*Eragrostis sp.*	Love-grass	Y
GRAMINEAE	*Eragrostis xerophila*	Knotty-butt Neverfail	Y
MYOPORACEAE	*Eremophila duttonii*	Harlequin Emubush	Y
MYOPORACEAE	*Eremophila glabra ssp.*	Tar Bush	Y
MYOPORACEAE	*Eremophila latrobei ssp.*	Crimson Emubush	Y
MYOPORACEAE	*Eremophila maculata ssp.*	Spotted Emubush	Y
MYOPORACEAE	*Eremophila oppositifolia ssp.*	Opposite-leaved Emubush	Y
MYOPORACEAE	*Eremophila serrulata*	Green Emubush	Y
GERANIACEAE	*Erodium crinitum*	Blue Heron's-bill	N
GERANIACEAE	*Erodium sp.*	Heron's-bill/Crowfoot	N
MYRTACEAE	*Eucalyptus camaldulensis ssp.*	River Red Gum	Y
GRAMINEAE	*Eulalia aurea*	Silky Brown-top	Y
EUPHORBIACEAE	*Euphorbia drummondii group*	Spurge	N
EUPHORBIACEAE	*Euphorbia sp.*	Spurge	N
EUPHORBIACEAE	*Euphorbia stevenii*	Bottletree Spurge	N
EUPHORBIACEAE	*Euphorbia tannensis ssp. eremophila*	Desert Spurge	N
SANTALACEAE	*Exocarpos aphyllus*	Leafless Cherry	Y

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
COMPOSITAE	*Flaveria trinervia*	Clustered Yellow-tops	N
FRANKENIACEAE	*Frankenia serpyllifolia*	Thyme Sea-heath	Y
FRANKENIACEAE	*Frankenia sp.*	Sea-heath	Y
FRANKENIACEAE	*Frankenia subteres*	Round Sea-heath	Y
STERCULIACEAE	*Gilesia biniflora*	Western Tar-vine	N
COMPOSITAE	*Glossocardia bidens*	Native Cobbler's-pegs	N
LEGUMINOSAE	*Glycine sp.*	Glycine	N
COMPOSITAE	*Gnephosis arachnoidea*	Spidery Button-flower	N
COMPOSITAE	*Gnephosis sp.*	Cup-flower	N
GOODENIACEAE	*Goodenia fascicularis*	Silky Goodenia	N
GOODENIACEAE	*Goodenia lunata*	Stiff Goodenia	N
GOODENIACEAE	*Goodenia pinnatifida*	Cut-leaf Goodenia	N
GOODENIACEAE	*Goodenia sp.*	Goodenia	N
GRAMINEAE	*Gramineae sp.*	Grass Family	N
AIZOACEAE	*Gunniopsis quadrifida*	Sturt's Pigface	Y
BORAGINACEAE	*Heliotropium sp.*	Heliotrope	N
MALVACEAE	*Hibiscus krichauffianus*	Velvet-leaf Hibiscus	N
GRAMINEAE	*Iseilema membranaceum*	Small Flinders-grass	N
COMPOSITAE	*Ixiochlamys cuneifolia*	Silverton Daisy	N
COMPOSITAE	*Ixiochlamys nana*	Small Fuzzweed	N
COMPOSITAE	*Leiocarpa leptolepis*	Pale Plover-daisy	N
CRUCIFERAE	*Lepidium phlebopetalum*	Veined Peppercress	N
CRUCIFERAE	*Lepidium sp.*	Peppercress	N
GRAMINEAE	*Leptochloa sp.*	Umbrella Cane-grass	N
LILIACEAE	*Liliaceae sp.*	Lily Family	N
LILIACEAE	*Lomandra sp.*	Mat-rush	Y
LEGUMINOSAE	*Lotus cruentus*	Red-flower Lotus	N
LEGUMINOSAE	*Lotus sp.*	Lotus	N
SOLANACEAE	*Lycium australe*	Australian Boxthorn	Y
CHENOPODIACEAE	*Maireana aphylla*	Cotton-bush	Y
CHENOPODIACEAE	*Maireana appressa*	Pale-fruit Bluebush	Y
CHENOPODIACEAE	*Maireana astrotricha*	Low Bluebush	Y
CHENOPODIACEAE	*Maireana coronata*	Crown Fissure-plant	Y
CHENOPODIACEAE	*Maireana eriantha*	Woolly Bluebush	Y
CHENOPODIACEAE	*Maireana georgei*	Satiny Bluebush	Y
CHENOPODIACEAE	*Maireana integra*	Entire-wing Bluebush	Y
CHENOPODIACEAE	*Maireana pyramidata*	Black Bluebush	Y
CHENOPODIACEAE	*Maireana sedifolia*	Bluebush	Y
CHENOPODIACEAE	*Maireana sp.*	Bluebush/Fissure-plant	Y
CHENOPODIACEAE	*Maireana spongiocarpa*	Spongy-fruit Bluebush	Y
CHENOPODIACEAE	*Maireana turbinata*	Top-fruit Bluebush	Y
CHENOPODIACEAE	*Malacocera tricornis*	Goat-head Soft-horns	N
MALVACEAE	*Malvastrum americanum var.*	Malvastrum	N
MARSILEACEAE	*Marsilea drummondii*	Common Nardoo	N

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
COMPOSITAE	*Minuria cunninghamii*	Bush Minuria	Y
COMPOSITAE	*Minuria denticulata*	Woolly Minuria	N
COMPOSITAE	*Minuria integerrima*	Smooth Minuria	N
COMPOSITAE	*Minuria leptophylla*	Minnie Daisy	N
COMPOSITAE	*Mitrasacme sp.*	Mitrewort	N
MYOPORACEAE	*Myoporum montanum*	Native Myrtle	Y
CHENOPODIACEAE	*Neobassia proceriflora*	Desert Glasswort	N
SOLANACEAE	*Nicotiana velutina*	Velvet Tobacco	N
CHENOPODIACEAE	*Osteocarpum acropterum var.*	Bonefruit	N
CHENOPODIACEAE	*Osteocarpum dipterocarpum*	Two-wing Bonefruit	N
CHENOPODIACEAE	*Osteocarpum sp.*	Bonefruit	N
GRAMINEAE	*Panicum decompositum var.*	Native Millet	N
GRAMINEAE	*Panicum sp.*	Panic/Millet	N
GRAMINEAE	*Paractaenum novae-hollandiae ssp. reversum*	Barbed-wire Grass	N
EUPHORBIACEAE	*Phyllanthus fuernrohrii*	Sand Spurge	N
EUPHORBIACEAE	*Phyllanthus lacunarius*	Lagoon Spurge	N
EUPHORBIACEAE	*Phyllanthus sp.*	Spurge	N
THYMELAEACEAE	*Pimelea simplex ssp. simplex*	Desert Riceflower	N
PLANTAGINACEAE	*Plantago drummondii*	Dark Plantain	N
COMPOSITAE	*Pluchea rubelliflora*	Plains-bush	N
COMPOSITAE	*Podolepis capillaris*	Wiry Podolepis	N
COMPOSITAE	*Polycalymma stuartii*	Poached-egg Daisy	N
PORTULACACEAE	*Portulaca oleracea*	Common Purslane	N
PORTULACACEAE	*Portulaca sp.*	Purslane	N
COMPOSITAE	*Pterocaulon sphacelatum*	Apple-bush	N
AMARANTHACEAE	*Ptilotus incanus/obovatus*	Mulla	Y
AMARANTHACEAE	*Ptilotus nobilis var.*	Yellow-tails	N
AMARANTHACEAE	*Ptilotus obovatus var.*	Silver Mulla	Y
AMARANTHACEAE	*Ptilotus sp.*	Mulla	Y
COMPOSITAE	*Pycnosorus pleiocephalus*	Soft Billy-buttons	N
COMPOSITAE	*Pycnosorus sp.*	Billy-buttons	N
CHENOPODIACEAE	*Rhagodia sp.*	Saltbush	Y
CHENOPODIACEAE	*Rhagodia spinescens*	Spiny Saltbush	Y
COMPOSITAE	*Rhodanthe corymbiflora*	Paper Everlasting	N
COMPOSITAE	*Rhodanthe floribunda*	White Everlasting	N
COMPOSITAE	*Rhodanthe microglossa*	Clustered Everlasting	N
COMPOSITAE	*Rhodanthe sp.*	Everlasting	N
COMPOSITAE	*Rhodanthe stricta*	Slender Everlasting	N
COMPOSITAE	*Rhodanthe uniflora*	Woolly Daisy	N
LEGUMINOSAE	*Rhynchosia australis*	Rhynchosia	N
ZYGOPHYLLACEAE	*Roepera ammophila*	Sand Twinleaf	N
ZYGOPHYLLACEAE	*Roepera aurantiaca ssp. aurantiaca*	Shrubby Twinleaf	Y
ZYGOPHYLLACEAE	*Roepera billardierei*	Coast Twinleaf	N
ZYGOPHYLLACEAE	*Roepera crenata*	Notched Twinleaf	N

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
ZYGOPHYLLACEAE	*Roepera eremaea*	Climbing Twinleaf	N
ZYGOPHYLLACEAE	*Roepera iodocarpum*	Violet Twinleaf	N
ZYGOPHYLLACEAE	*Roepera ovata*	Dwarf Twinleaf	N
ZYGOPHYLLACEAE	*Roepera prismatothecum*	Square-fruit Twinleaf	N
ZYGOPHYLLACEAE	*Roepera sp.*	Twinleaf	N
ACANTHACEAE	*Rostellularia adscendens var. pogonanthera*	Pink Tongues	N
GRAMINEAE	*Rytidosperma caespitosum*	Common Wallaby-grass	Y
GRAMINEAE	*Rytidosperma sp.*	Wallaby-grass	Y
CHENOPODIACEAE	*Salsola australis*	Buckbush	N
SANTALACEAE	*Santalum lanceolatum*	Plumbush	Y
SANTALACEAE	*Santalum sp.*	Plumbush	Y
AIZOACEAE	*Sarcozona praecox*	Sarcozona	N
GOODENIACEAE	*Scaevola spinescens*	Spiny Fanflower	Y
CHENOPODIACEAE	*Sclerolaena anisacanthoides*		N
CHENOPODIACEAE	*Sclerolaena bicornis var. bicornis*	Goat-head Bindyi	N
CHENOPODIACEAE	*Sclerolaena brachyptera*	Short-wing Bindyi	N
CHENOPODIACEAE	*Sclerolaena cuneata*	Tangled Bindyi	N
CHENOPODIACEAE	*Sclerolaena decurrens*	Green Bindyi	N
CHENOPODIACEAE	*Sclerolaena diacantha*	Horned Bindyi	N
CHENOPODIACEAE	*Sclerolaena divaricata*	Tangled Bindyi	N
CHENOPODIACEAE	*Sclerolaena intricata*	Poverty Bush	N
CHENOPODIACEAE	*Sclerolaena parallelicuspis*	Western Copperburr	N
CHENOPODIACEAE	*Sclerolaena patenticuspis*	Spear-fruit Copperburr	N
CHENOPODIACEAE	*Sclerolaena sp.*	Copperburr	N
CHENOPODIACEAE	*Sclerolaena sp. Pernatty Station*		N
CHENOPODIACEAE	*Sclerolaena tricuspis*	Giant Redburr	N
CHENOPODIACEAE	*Sclerolaena ventricosa*	Salt Copperbush	N
COMPOSITAE	*Senecio magnificus*	Showy Groundsel	Y
LEGUMINOSAE	*Senna artemisioides ssp.*	Desert Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. alicia x ssp. coriacea*	Desert Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. artemisioides x ssp. coriacea*	Desert Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. helmsii*	Blunt-leaf Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. oligophylla*	Limestone Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. X artemisioides*	Silver Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. X coriacea*	Broad-leaf Desert Senna	Y
LEGUMINOSAE	*Senna artemisioides ssp. X sturtii*	Grey Senna	Y
GRAMINEAE	*Setaria constricta*	Knotty-butt Paspalidium	Y
GRAMINEAE	*Setaria sp.*	Pigeon-grass	Y
MALVACEAE	*Sida ammophila*	Sand Sida	N
MALVACEAE	*Sida corrugata var.*	Variable Sida	N
MALVACEAE	*Sida fibulifera*	Pin Sida	N
MALVACEAE	*Sida intricata*	Twiggy Sida	N
MALVACEAE	*Sida intricata*	Tangled Sida	N

Family Name	*Scientific Name*	Common Name	Long-lived Woody Perennial*
MALVACEAE	*Sida petrophila*	Rock Sida	Y
MALVACEAE	*Sida trichopoda*	Narrow-leaf Sida	N
SOLANACEAE	*Solanum ellipticum*	Potato-bush	N
SOLANACEAE	*Solanum quadriloculatum*	Tomato Bush	N
SOLANACEAE	*Solanum sturtianum*	Sturt's Nightshade	Y
GRAMINEAE	*Sporobolus actinocladus*	Ray Grass	N
GRAMINEAE	*Sporobolus caroli*	Yakka Grass	N
STACKHOUSIACEA	*Stackhousia muricata ssp. Perennial*		N
CRUCIFERAE	*Stenopetalum lineare*	Narrow Thread-petal	N
LEGUMINOSAE	*Swainsona sp.*	Swainson-pea	N
COMPOSITAE	*Taraxacum cygnorum*	Dandelion	N
CHENOPODIACEAE	*Tecticornia indica ssp.*	Samphire	Y
CHENOPODIACEAE	*Tecticornia medullosa*	Samphire	Y
CHENOPODIACEAE	*Tecticornia pergranulata ssp.*	Black-seed Samphire	Y
CHENOPODIACEAE	*Tecticornia sp.*	Samphire	Y
CHENOPODIACEAE	*Tecticornia tenuis*	Slender Samphire	Y
AIZOACEAE	*Tetragonia eremaea*	Annual Spinach	N
AIZOACEAE	*Tetragonia tetragonioides*	Warragul cabbage	N
LABIATAE	*Teucrium racemosum*	Grey Germander	N
GRAMINEAE	*Themeda triandra*	Kangaroo Grass	Y
CHENOPODIACEAE	*Threlkeldia sp.*	Bonefruit	Y
LILIACEAE	*Thysanotus baueri*	Mallee Fringe-lily	N
LILIACEAE	*Thysanotus patersonii*	Twining Fringe-lily	N
LILIACEAE	*Thysanotus sp.*	Fringe-lily	N
UMBELLIFERAE	*Trachymene glaucifolia*	Blue Parsnip	N
GRAMINEAE	*Tragus australianus*	Red Spinach	N
AIZOACEAE	*Trianthema triquetra*	Small Hogweed	N
BORAGINACEAE	*Trichodesma zeylanicum var.*	Camel Bush	N
GRAMINEAE	*Tripogon loliiformis*	Purple Plume Grass	N
GRAMINEAE	*Triraphis mollis*	Purple Needle-grass	N
COMPOSITAE	*Vittadinia cuneata var.*	Fuzzy New Holland Daisy	N
COMPOSITAE	*Vittadinia sp.*	New Holland Daisy	N
CAMPANULACEAE	*Wahlenbergia communis*	Tufted Bluebell	N
CAMPANULACEAE	*Wahlenbergia luteola*	Yellow-wash Bluebell	N
CAMPANULACEAE	*Wahlenbergia sp.*	Native Bluebell	N
CAMPANULACEAE	*Wahlenbergia stricta ssp. stricta*	Tall Bluebell	N
CAMPANULACEAE	*Wurmbea latifolia ssp. latifolia*	Early Nancy	N

Appendix D Jessup

D1 Jessup Raw Data - total number of long-lived woody perennial adults and juveniles, autumn 2023

Scientific Name	A/J[1]	1	2	3	4	5	6	7	8	10	11	12	13	15	16	17	18	19	20	Total
Abutilon halophilum	A	16	10	4		56			0		178			1	29					294
	J	12	1			22					14			3	23					75
Abutilon otocarpum	A									11							17	2	1	31
	J									13						6	15	1		35
Acacia papyrocarpa	A								1							15	40	12	1	69
	J															6	16	1		23
Acacia tetragonophylla	A									8								26	11	45
	J									17							1			18
Atriplex vesicaria	A	57	95	141	105	403	149	40	93	1	440	205	188	94	290	91	140			2532
	J			2	23	11	2	10	5		62	15	32	18	11	5	5	2		203
Chenopodium curvispicatum	A									1						9	16			26
	J															10				10
Cullen australasicum	A																	2		2
Dodonaea lobulata	A									38						18	13	102	11	182
	J																	4		4
Duma florulenta	A									7								5	24	36
Einadia nutans ssp.	A									0								10	1	11
	J																		3	3
Enchylaena tomentosa var. tomentosa	A									33						36	60	23	1	153
	J									3						8	43	7	2	63
Eremophila latrobei ssp. glabra	A																10		1	11
	J									1										1
Eremophila oppositifolia ssp. oppositifolia	A								1								1			2
Eremophila serrulata	A									1						2				3

Scientific Name	A/J[1]	1	2	3	4	5	6	7	8	10	11	12	13	15	16	17	18	19	20	Total
	J										1									1
Eucalyptus camaldulensis ssp. arida	A									5								5	5	15
Exocarpos aphyllus	A									1										1
Frankenia serpyllifolia	A	1		28		74	5	7	13		3	2	30	6						169
	J					0														0
Maireana aphylla	A										2			20			2			24
Maireana appressa	A			3		2	1	12	2		0		2		2					24
Maireana astrotricha	A							3												3
Maireana eriantha	A					4														4
Maireana georgii	A							1												1
Maireana integra (new record)	A															2				2
Maireana spongiocarpa	A							4			37					18	28			87
	J										52						1			53
Maireana turbinata[2]	A					9														9
Minuria cunninghamii	A			10	1	4	26	5			58	14			4					122
	J			1																2
Myoporum montanum	A									4								11	9	24
	J									1								25	11	37
Ptilotus obovatus	A									110						67	75	17	1	270
	J									15						17	5		2	39
Rhagodia spinescens	A															1	3			4
Roepera aurantiaca (No fruit, heavily grazed)	A					0														0
Santalum lanceolatum	A									2							2	4		8
	J									3								1	5	9
Scaevola spinescens	A									21						5	2	15	5	48

Scientific Name	A/J[1]	1	2	3	4	5	6	7	8	10	11	12	13	15	16	17	18	19	20	Total
	J									2								1		3
Senna artemisioides ssp. artemisioides	A									2										2
Senna artemisioides ssp. helmsii	A									2								1	1	4
	J									1										1
Senna artemisioides ssp. oligophylla	A															5		1		6
Senna artemisioides ssp. X artemisioides	A															1	1			2
	J																2			2
Sida intricata	A				4			1				11		21						37
	J							2												2
Sida petrophila	A							2		69						3	1	5	2	82
	J							10		14							1			25
Tecticornia medullosa	A	2	1	61	1	151	22				2	9	62	5	11					327
	J											1	6							7
Tecticornia pergranulata ssp.	A							30	45											75
Tecticornia tenuis	A			2				6	6											14
	J								2											2
Transect Totals		88	107	252	134	736	205	133	168	386	849	257	320	168	370	325	500	283	97	5379

[1] A = Adult , J = Juvenile;

[2]recorded as *Maireana spongiocarpa* 2018 to 2021 when not in fruit), presence of fruit in 2022 suggests correct identification *is Maireana turbinata*. No fruit 2023.

D2 Jessup Data – Eliza Creek species abundance trends

Acacia tetragonophylla	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	39	28	22	43	37	34	25
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	1
19	31	27	26	19	26	32	26
20	9	6	7	11	14	11	11
TOTALS ALL SITES	79	61	55	73	77	77	63
Acacia papyrocarpa	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	0	1	0	2	3	0	0
17	33	28	30	29	33	37	21
18	42	53	15	49	45	63	56
19	8	20	11	10	15	13	13
20	2	1	1	0	1	1	1
TOTALS ALL SITES	85	103	57	90	97	114	91
Dodonaea lobulata	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	25	37	25	31	33	25	38
17	17	21	24	20	21	22	18
18	11	11	13	15	15	14	13
19	106	122	116	118	150	128	106
20	13	6	12	16	12	20	11
TOTALS ALL SITES	172	197	190	200	231	209	186
Duma florulenta	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	6	6	8	7	5	8	7
17	0	7	0	0	0	0	0
18	0	7	0	0	0	0	0
19	0	2	5	2	7	7	5
20	27	31	24	26	26	24	24
TOTALS ALL SITES	33	53	37	35	38	39	36
Eremophila latrobei	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	1	1	1	1	0	1	1
17	0	0	1	1	1	2	0
18	3	7	9	5	11	9	10
20	0	0	1	0	1	1	1
TOTALS ALL SITES	4	8	12	7	13	13	12
Eremophila serrulata	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	2	2	2	0	1	0	1
17	1	1	0	1	1	3	2
18	2	1	0	4	0	0	0
19	1	2	1	2	0	1	0
20	0	0	0	0	0	0	0
TOTALS ALL SITES	6	6	3	7	2	4	3
Maireana spongiocarpa	A2018	S2018	S2019	S2020	S2021	S2022	A2023
17	nr	14	10	24	12	27	18
18	nr	19	11	29	16	33	29
TOTALS ALL SITES		33	21	53	28	60	47
Myoporum montanum	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	23	7	19	23	10	27	5
19	27	17	18	15	17	19	36

20	16	14	19	16	16	27	20
TOTALS ALL SITES	66	38	56	54	43	73	61
Ptilotus obovatus	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	25	66	31	65	71	105	115
17	30	30	31	46	52	95	84
18	100	73	48	46	23	97	80
19	9	1	5	6	12	18	17
20	0	0	3	1	1	2	3
TOTALS ALL SITES	164	170	118	164	159	317	299
Scaevola spinescens	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	12	21	6	11	22	13	23
17	4	4	5	2	3	4	5
18	4	3	3	2	1	2	2
19	11	9	11	12	15	18	16
20	2	1	9	10	6	5	5
TOTALS ALL SITES	33	38	34	37	47	42	51
Senna (all species combined)	A2018	S2018	S2019	S2020	S2021	S2022	A2023
10	4	2	3	4	5	4	5
17	7	4	4	3	6	7	6
18	4	6	3	4	2	5	3
19	1	3	1	2	0	2	2
20	0	0	0	0	0	1	1
TOTALS ALL SITES	16	15	11	13	13	19	17

Appendix E Canopy Cover Visual Estimates of Canopy Extent

Species / Transect	Tree No.	2019	2020	2021	2022	2023
Myall: 17A	1	98	100	100	100	100
Myall: 17A	2	98	100	100	95	100
Myall: 17A	2b				76	75
Myall: 17A	3	100	100	100	100	100
Myall: 17A	4	40	32	45	41	40
Myall: 17A	5	95	90	98	95	100
Myall: 17A	5b			95	90	100
Myall: 17A	6	86	100	100	100	100
Myall: 17A	7	86	86	100	98	100
Myall: 17A	7b			100	100	100
Myall: 17A	7c			100	100	100
	Mean	**86**	**87**	**94**	**90**	**92**
	SD	**21.1**	**24.9**	**17.2**	**17.9**	**18.9**
Myall: 17B	1	100	98	100	98	95
Myall: 17B	2	95	95	95	90	100
Myall: 17B	3	95	76	76	78	100
Myall: 17B	4	76	95	90	86	90
Myall: 17B	5	100	100	100	100	100
Myall: 17B	5b			100	95	100
Myall: 17B	6	72	86	86	77	90
Myall: 17B	7	90	95	100	100	100
	Mean	**89.7**	**92.1**	**93.4**	**90.5**	**96.9**
	SD	**11.3**	**8.4**	**8.8**	**9.4**	**4.6**
Myall: 18A	1	86	nr	81	81	100
Myall: 18A	2	86	nr	81	90	90
Myall: 18A	3	9	nr	1	5	5
Myall: 18A	3B					100
Myall: 18A	4	98	nr	81	100	100
Myall: 18A	5	98	nr	85.5	100	100
Myall: 18A	6	98	nr	98	100	100
Myall: 18A	7	100	nr	85.5	86	100
Myall: 18A	7A					100
Myall: 18A	7B					100
Myall: 18A	7C					100
Myall: 18A	8	10	nr	0	0	0
Myall: 18A	8A				90	100
Myall: 18A	8C*		nr	85.5	86	100
Myall: 18A	8D					100
Myall: 18A	9	95	nr	76.5	77	100

Species / Transect	Tree No.	2019	2020	2021	2022	2023
Myall: 18A	10	95	nr	76.5	100	100
Myall: 18A	11	100	nr	90.25	100	100
Myall: 18A	12	100	nr	90.25	100	100
	Mean	**81**		**72**	**80**	**89**
	SD	**34**		**32**	**34**	**31**
Myall: 18B	1	57	nr	8	1	0 (died)
Myall: 18B	2	56	nr	25	40	72
Myall: 18B	3	29	nr	6	23	12
Myall: 18B	4	67	nr	49	76	90
Myall: 18B	5	2	nr	0 (died)	0	0
	Mean	**42**	**nr**	**22**	**28**	**35**
	SD	**27**	**nr**	**20**	**32**	**43**

Species / Transect	Tree No.	2019 autumn	2019 spring	2020 spring	2021 spring	2022 spring	2023 autumn
Red gum: 19A	1	93	88	90	86	81	90
Red gum: 19A	5	40	27	27	27	29	29
Red gum: 19A	7	72	77	90	75	80	100
Red gum: 19A	8	57	72	56	57	63	100
Red gum: 19A	9	26	68	45	63	75	100
Red gum: 19A	10	64	90	72	54	76	100
	Mean	**59**	**70**	**63**	**60**	**67**	**87**
	SD	**24**	**23**	**25**	**20**	**20**	**29**
Myall: 19A	2	100	100	100	100	100	100
Myall: 19A	4b				72	100	100
Myall: 19A	4c				100	100	100
Myall: 19A	6	93	100	100	100	100	100
Myall: 19A	6b				100	100	100
Myall: 19A	6c				100	90	100
Myall: 19A	10b				100	100	100
	Mean	**97**	**100**	**100**	**96**	**99**	**100**
	SD	**4**	**0**	**0**	**10**	**4**	**0**
Red Gum: 19B	1	8	5	9	5	5	4
Red Gum: 19B	2	46	86	81	90	96	100
Red Gum: 19B	4	51	15	3	0	0	0
Red Gum: 19B	5	33	81	56	43	81	100
Red Gum: 19B	5A					10	100
Red Gum: 19B	6	67	90	86	77	60	100
	Mean	**41.0**	**55.4**	**47.0**	**43.0**	**42.0**	**67**
	SD	**22.1**	**41.7**	**39.2**	**40.8**	**42.2**	**51**
Myall: 19B	6A	100	100	100	100	nr	nr

Species / Transect	Tree No.	2019 autumn	2019 spring	2020 spring	2021 spring	2022 spring	2023 autumn
Myall: 19B	7	10	8	5	3	5	15
Myall: 19B	7B				81	86	100
Myall: 19B	7C						100
Myall: 19B	8	100	100	98	93	95	100
Myall: 19B	5AA					100	100
Myall: 19B	5B				100	100	100
	Mean	70	69	68	75	77	**86**
	SD	52	53	54	41	41	35
Red Gum: 20A	1	55	80	46	68	90	100
Red Gum: 20A	2	2	3	2	23	90	90
Red Gum: 20A	3	6	11	30	Not recorded	96	100
Red Gum: 20A	4	42	72	53	60	63	80
Red Gum: 20A	5	34	45	35	18	67	90
Red Gum: 20A	6	55	48	53	64	90	100
Red Gum: 20A	7	86	88	56	81	98	100
Red Gum: 20A	8	18	42	33	18	38	70
Red Gum: 20A	10	54	49	49	46	90	90
	Mean	**39**	**49**	**40**	**47**	**80**	91
	SD	**27**	**29**	**17**	**25**	**20**	11
Red Gum: 20B	1	24	45	35	28	48	70
Red Gum: 20B	2	81	86	68	77	98	100
Red Gum: 20B	3	20	36	33	23	67	90
Red Gum: 20B	4	81	86	49	56	86	80
	Mean	**52**	**63**	**46**	**46**	**75**	85
	SD	**34**	**27**	**16**	**25**	**22**	13
Myall: 20A	9	100	100	90	77	100	100

Appendix F Flora Abundance and Grazing Impact

The following table lists all native and exotic plants species recorded at Flora Sites 1-7,9-13,15-22 (Rangeland Assessment Sites) in autumn 2023, along with their classification as a long-lived woody perennial and their abundance. For all long-lived woody perennial, their life stages present, and the percentage of long-lived woody perennials with different grazing levels are also provided.

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
CAR001	*Abutilon halophilum*	Plains Lantern-bush	Y	3/4	M	>50	0	0
	Alternanthera nodiflora	Common Joyweed	N	1				
	Astrebla pectinata	Barley Mitchell-grass	Y	3/4	A	>50	0	0
	Atriplex vesicaria	Bladder Saltbush	Y	4	A	>50	0	0
	Brachyscome ciliaris var.	Variable Daisy	N	2				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	3				
	Enneapogon avenaceus	Common Bottle-washers	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	0	0
	Eragrostis xerophila	Knotty-butt Neverfail	Y	1	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	2				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	3	A	>50	0	0
	Maireana appressa	Pale-fruit Bluebush	Y	2	A	>50	0	0
	Maireana eriantha	Woolly Bluebush	Y	2	A	>50	0	0
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	3	A	>50	0	0
	Malvastrum americanum var. americanum	Malvastrum	N	1				
	Minuria cunninghamii	Bush Minuria	Y	2/3	A	>50	0	0
	Nicotiana velutina	Velvet Tobacco	N	3				
	Panicum decompositum var. decompositum	Native Millet	N	3				
	Plantago drummondii	Dark Plantain	N	1				
	Portulaca oleracea	Common Purslane	N	2				
	Ptilotus nobilis ssp.	Yellow-tails	N	1				
	Sclerolaena brachyptera	Short-wing Bindyi	N	3				
	Sclerolaena divaricata	Tangled Bindyi	N	3/4				
	Sclerolaena intricata	Tangled Bindyi	N	3/4				
	Sclerolaena ventricosa	Salt Bindyi	N	3/4				
	Sida fibulifera	Pin Sida	N	2/3				
	Solanum quadriloculatum	Plains Nightshade	N	3				
	Sporobolus actinocladus	Ray Grass	N	3/4				
	Tecticornia medullosa	Samphire	Y	2	A	>50	0	0
	Tripogonella loliiformis	Five-minute Grass	N	1				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	CAR001 Totals: 31 (long-lived = 11 / short-lived = 20)							
CAR002	*Abutilon halophilum*	Plains Lantern-bush	Y	2	M	>50	0	0
	Astrebla pectinata	Barley Mitchell-grass	Y	3	A	>50	0	0
	Atriplex vesicaria	Bladder Saltbush	Y	4	M	>50	0	0
	Boerhavia dominii	Tar-vine	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Enneapogon avenaceus	Common Bottle-washers	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	1				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	3	A	>50	0	0
	Lepidium phlebopetalum	Veined Peppercress	N	1				
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	1	A	>50	0	0
CAR00	*Panicum decompositum var. decompositum*	Native Millet	N	2				
	Portulaca oleracea	Common Purslane	N	2				
	Ptilotus nobilis ssp.	Yellow-tails	N	1				
	Salsola australis	Buckbush	N	3				
	Sclerolaena brachyptera	Short-wing Bindyi	N	5				
	Sclerolaena divaricata	Tangled Bindyi	N	4				
	Sclerolaena intricata	Tangled Bindyi	N	4				
	Sclerolaena ventricosa	Salt Bindyi	N	4				
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	2	M	>50	0	0
	CAR002 Totals: 21 (long-lived = 7 / short-lived = 14)							
CAR003	*Abutilon halophilum*	Plains Lantern-bush	Y	1	M	>50	0	0
	Astrebla pectinata	Barley Mitchell-grass	Y	2	A	>50	0	0
	Atriplex fissivalvis	Gibber Saltbush	N	1				
	Atriplex holocarpa	Pop Saltbush	N	3				
	Atriplex lindleyi ssp.	Baldoo	N	1				
	Atriplex vesicaria	Bladder Saltbush	Y	5	M	>50	0	0
	Brachyscome ciliaris var.	Variable Daisy	N	2				
	Crinum flaccidum	Murray Lily	N	1				
	Cullen cinereum	Annual Scurf-pea	N	3				
	Daucus glochidiatus	Native Carrot	N	3				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	3	A	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Frankenia serpyllifolia	Thyme Sea-heath	Y	3	M	>50	0	0
	Gnephosis sp.	A daisy	N	1				
	Iseilema membranaceum	Small Flinders-grass	N	1				
	Lotus cruentus	Red-flower Lotus	N	3				
	Maireana appressa	Pale-fruit Bluebush	Y	2	A	>50	0	0
	Maireana eriantha	Woolly Bluebush	Y	2	A	>50	0	0
	Minuria cunninghamii	Bush Minuria	Y	2	M	>50	0	0
	Panicum decompositum var. decompositum	Native Millet	N	3				
	Plantago drummondii	Dark Plantain	N	2				
	Podolepis davisiana	Button Podolepis	N	1				
	Portulaca oleracea	Common Purslane	N	3				
	Sclerolaena brachyptera	Short-wing Bindyi	N	2				
	Sclerolaena divaricata	Tangled Bindyi	N	2				
	Sclerolaena intricata	Tangled Bindyi	N	2/4				
	Sclerolaena ventricosa	Salt Bindyi	N	2				
	Sida fibulifera	Pin Sida	N	3				
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	5	M	>50	0	0
	Tecticornia tenuis	Slender Samphire	Y	1	M	>50	0	0
	Wurmbea australis	Inland Nancy	N	1				
	CAR002 Totals: 34 (long-lived = 10 / short-lived = 24)							
CAR004	*Atriplex holocarpa*	Pop Saltbush	N	1				
	Atriplex vesicaria	Bladder Saltbush	Y	4	M	>50	0	0
	Austrostipa sp.	Spear-grass	N	1				
	Daucus glochidiatus	Native Carrot	N	1				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2/3	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	1				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	2	A	>50	0	0
	Lepidium phlebopetalum	Veined Peppercress	N	1				
	Lotus cruentus	Red-flower Lotus	N	2				
	Maireana appressa	Pale-fruit Bluebush	Y	2	A	>50	0	0
	Minuria cunninghamii	Bush Minuria	Y	2	A	>50	0	0
	Panicum decompositum var. decompositum	Native Millet	N	2				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Plantago drummondii	Dark Plantain	N	1				
	Portulaca oleracea	Common Purslane	N	2				
	Sclerolaena brachyptera	Short-wing Bindyi	N	2				
	Sclerolaena divaricata	Tangled Bindyi	N	2				
	Sclerolaena intricata	Tangled Bindyi	N	3				
	Sclerolaena ventricosa	Salt Bindyi	N	2/3				
	Sida fibulifera	Pin Sida	N	2/3				
	Sida intricata	Twiggy Sida	Y	1	A	>50	0	0
	Sporobolus actinocladus	Ray Grass	N	3				
	Tecticornia medullosa	Samphire	Y	3	M	>50	0	0
	Wahlenbergia sp.	Native Bluebell	N	1				
	CAR004 Totals: 21 (long-lived = 7 / short-lived = 18)							
CAR005	*Abutilon halophilum*	Plains Lantern-bush	Y	4	M	>50	0	0
	Anacampseros australiana	Australian Anacampseros	N	3				
	Atriplex holocarpa	Pop Saltbush	N	1				
	Atriplex vesicaria	Bladder Saltbush	Y	5	M	>50	0	0
	Austrostipa sp.	Spear-grass	N	1				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	1				
	Enneapogon avenaceus	Common Bottle-washers	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	<50	0
	Frankenia serpyllifolia	Thyme Sea-heath	Y	4	M	>50	0	0
	Gnephosis sp.	0	N	1				
	Lepidium phlebopetalum	Veined Peppercress	N	1				
	Maireana aphylla	Cotton-bush	Y	1	A	>50	0	0
	Maireana appressa	Pale-fruit Bluebush	Y	2	A	>50	<50	0
	Maireana eriantha	Woolly Bluebush	Y	3	A	>50	0	0
	Maireana turbinata	Top-fruit Bluebush	Y	3	A	0	0	>50
	Minuria cunninghamii	Bush Minuria	Y	3	A	>50	0	0
	Osteocarpum dipterocarpum	Two-wing Bonefruit	N	1				
	Panicum decompositum var. decompositum	Native Millet	N	3				
	Portulaca oleracea	Common Purslane	N	3				
	Sclerolaena brachyptera	Short-wing Bindyi	N	3				
	Sclerolaena intricata	Tangled Bindyi	N	3				
	Sclerolaena sp. Pernatty		N	1				
	Sclerolaena ventricosa	Salt Bindyi	N	3				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Sida fibulifera	Pin Sida	N	1				
CAR005	*Sporobolus actinocladus*	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	4	M	>50	0	0
	CAR005 Totals: 26 (long-lived = 10 / short-lived = 16)							
CAR006	*Atriplex vesicaria*	Bladder Saltbush	Y	4	M	>50	0	0
	Bulbine semibarbata	Small Leek-lily	N	1				
	Centipeda crateriformis ssp.	Sneezeweed	N	1				
	Chloris pectinata	Comb Windmill Grass	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	2/3				
	Euphorbia tannensis ssp. eremophila	Desert Spurge	N	2				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	2	A	>50	0	0
	Lotus cruentus	Red-flower Lotus	N	1				
	Maireana aphylla	Cotton-bush	Y	1	A	>50	0	0
	Minuria cunninghamii	Bush Minuria	Y	2/3	A	>50	0	0
	Panicum decompositum var. decompositum	Native Millet	N	2/3				
	Plantago drummondii	Dark Plantain	N	1				
	Portulaca oleracea	Common Purslane	N	2				
	Sclerolaena divaricata	Tangled Bindyi	N	3/4				
	Sclerolaena intricata	Tangled Bindyi	N	3				
	Sclerolaena ventricosa	Salt Bindyi	N	3				
	Sida fibulifera	Pin Sida	N	2/3				
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	3	M	>50	0	0
	CAR006 Totals: 21 (long-lived = 6/ short-lived = 15)							
CAR00	*Aristida contorta*	Curly Wire-grass	N	3				
	Atriplex vesicaria	Bladder Saltbush	Y	4	M	>50	0	0
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Enneapogon avenaceus	Common Bottle-washers	N	3/4				
	Enteropogon acicularis	Umbrella Grass	N	1				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	1	A	>50	0	0
	Lotus cruentus	Red-flower Lotus	N	1				
	Maireana appressa	Pale-fruit Bluebush	Y	2/3	A	>50	0	0
	Maireana astrotricha	Low Bluebush	Y	2	A	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Maireana georgei	Satiny Bluebush	Y	2	A	>50	0	0
	Maireana pyramidata	Black Bluebush	Y	2	A	>50	0	0
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	2	A	>50	<50	0
	Malvastrum americanum var. americanum	Malvastrum	N	1				
	Minuria cunninghamii	Bush Minuria	Y	2/3	M	>50	<50	0
	Myoporum montanum	Native Myrtle	Y	1	A	>50	0	0
	Osteocarpum acropterum	Bonefruit	N	2				
	Portulaca oleracea	Common Purslane	N	1				
	Sclerolaena divaricata	Tangled Bindyi	N	2				
	Sclerolaena intricata	Tangled Bindyi	N	2	M	>50	0	0
	Sclerolaena ventricosa	Salt Bindyi	N	2				
	Sclerolaena ventricosa	Salt Bindyi	N	2				
	Sida petrophila	Rock Sida	N	1	M	>50	0	0
	Sporobolus actinocladus	Ray Grass	N	3				
	Tecticornia pergranulata	Black-seed Samphire	Y	3	A	>50	0	0
	Tecticornia tenuis	Slender Samphire	Y	2	A	>50	0	0
	CAR007 Totals: 25 (long-lived = 11 / short-lived = 14)							
CAR00	*Abutilon halophilum*	Plains Lantern-bush	Y	2/4	A	>50	0	0
	Abutilon otocarpum	Desert Lantern-bush	Y	2	A	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	4	M	>50	<50	0
	Anacampseros australiana	Australian Anacampseros	N	2				
	Astrebla pectinata	Barley Mitchell-grass	Y	1	A	>50	0	0
	Atriplex fissivalvis	Gibber Saltbush	N	1				
	Atriplex vesicaria	Bladder Saltbush	Y	4	M	>50	0	0
	Cullen australasicum	Tall Scurf-pea	N	1				
	Cyperus sp.	Flat-sedge	N	1				
	Digitaria brownii	Cotton Panic-grass	Y	1	A	>50	0	0
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Einadia nutans ssp.	Climbing Saltbush	Y	1	A	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	3	M	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	3				
	Enteropogon acicularis	Umbrella Grass	N	3				
	Eremophila oppositifolia	Opposite-leaved Emubush	Y	1	A	0	0	>50
	Frankenia serpyllifolia	Thyme Sea-heath	Y	2	M	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Lawrencia glomerata	Clustered Lawrencia	N	2				
	Maireana aphylla	Cotton-bush	Y	1	A	>50	0	0
	Maireana appressa	Pale-fruit Bluebush	Y	3	A	>50	0	0
	Maireana eriantha	Woolly Bluebush	Y	2	A	>50	0	0
	Minuria cunninghamii	Bush Minuria	Y	3	A	>50	0	0
	Myoporum montanum	Native Myrtle	Y	2	M	>50	0	0
	Osteocarpum dipterocarpum	Two-wing Bonefruit	N	2				
	Panicum decompositum var. decompositum	Native Millet	N	3				
	Portulaca oleracea	Common Purslane	N	3				
	Ptilotus nobilis ssp.	Yellow-tails	N	1				
	Ptilotus obovatus	Silver Mulla Mulla	Y	3	M	>50	0	0
	Rostellularia adscendens ssp.	Pink Tongues	N	3				
	Sclerolaena brachyptera	Short-wing Bindyi	N	3				
	Sclerolaena intricata	Tangled Bindyi	N	4				
	Sclerolaena ventricosa	Salt Bindyi	N	4				
	Sida fibulifera	Pin Sida	N	2				
	Sida petrophila	Rock Sida	N	2				
	Solanum lithophilum	Velvet Potato-bush	N	1				
	Solanum quadriloculatum	Plains Nightshade	N	2				
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	4	M	>50	0	0
	Tecticornia pergranulata	Black-seed Samphire	Y	4	A	>50	0	0
	Tecticornia tenuis	Slender Samphire	Y	4	M	>50	0	0
	CAR009 Totals: 40 (long-lived = 19 / short-lived = 21)							
CA010	*Abutilon otocarpum*	Desert Lantern-bush	Y	4	M	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	4	M	>50	0	0
	Acacia tetragonophylla	Dead Finish	Y	4	A	>50	0	0
	Alternanthera denticulata	Lesser Joyweed	N	3				
	Alternanthera nodiflora	Common Joyweed	N	3				
	Aristida contorta	Curly Wire-grass	N	4				
	Atriplex vesicaria	Bladder Saltbush	Y	2	M	>50	0	0
	Boerhavia schomburgkiana	Schomburgk's Tar-vine	N	2				
	Brachyscome ciliaris var.	Variable Daisy	N	1				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Chrysocephalum pterochaetum	Shrub Everlasting	N	2				
	Convolvulus remotus	Grassy Bindweed	N	2				
	Crinum flaccidum	Murray Lily	N	2				
	Cullen australasicum	Tall Scurf-pea	N	2	M	>50	0	0
	Cyperus rigidellus	Dwarf Flat-sedge	N	2				
	Digitaria brownii	Cotton Panic-grass	Y	4	A	>50	0	0
	Digitaria divaricatissima var.	Spider Grass	Y	2	A	>50	<50	0
	Dodonaea lobulata	Lobed-leaf Hop-bush	Y	4	M	>50	0	0
	Duma florulenta	Lignum	Y	2	A	>50	0	0
	Einadia nutans ssp.	Climbing Saltbush	Y	2	M	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	2	M	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	3	M			
	Enteropogon acicularis	Umbrella Grass	N	2				
	Eremophila latrobei ssp.	Crimson Emubush	Y	2	A	>50	0	0
	Eremophila oppositifolia	Opposite-leaved Emubush	Y	1	A	>50	0	0
	Eucalyptus camaldulensis ssp. arida	Northern River Red Gum	Y	4	A	>50	0	0
	Eulalia aurea	Silky Brown-top	Y	3	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	1				
	Exocarpos aphyllus	Leafless Cherry	Y	1	A	>50	<50	0
	Glossocardia bidens	Native Cobbler's-pegs	N	1				
	Glossocardia bidens	Native Cobbler's-pegs	N	1				
	Maireana aphylla	Cotton-bush	Y	1	A	>50	0	0
	Malvastrum americanum	Malvastrum	N	2				
	Marsilea drummondii	Common Nardoo	N	2				
	Myoporum montanum	Native Myrtle	Y	2	M	>50	0	0
	Pluchea rubelliflora	0	N	4				
	Portulaca oleracea	Common Purslane	N	1				
	Pterocaulon sphacelatum	Apple-bush	N	2				
	Ptilotus obovatus	Silver Mulla Mulla	Y	4	M	>50	0	0
	Rostellularia adscendens	Pink Tongues	N	2				
	Santalum lanceolatum	Plumbush	Y	2	M	>50	0	0
	Scaevola spinescens	Spiny Fanflower	Y	2	M	>50	<50	0
	Senna artemisioides ssp. helmsii	Blunt-leaf Senna	Y	3	M	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Senna artemisioides ssp. X artemisioides	Silver Senna	Y	3	A	>50	0	0
	Setaria constricta	Knotty-butt Paspalidium	Y	2	A	>50	<50	0
	Sida fibulifera	Pin Sida	N	2				
	Sida petrophila	Rock Sida	N	4				
	Solanum lithophilum	Velvet Potato-bush	N	2				
	Sporobolus actinocladus	Ray Grass	N	2				
	Teucrium racemosum	Grey Germander	N	3				
	Themeda triandra	Kangaroo Grass	Y	2	M	>50	<50	0
	CAR010 Totals: 50 (long-lived = 24 / short-lived = 26)							
CAR011	*Abutilon halophilum*	Plains Lantern-bush	Y	3	M	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	2	M	>50	0	0
	Anacampseros australiana	Australian Anacampseros	N	3				
	Astrebla pectinata	Barley Mitchell-grass	Y	3	A	>50	0	0
	Atriplex holocarpa	Pop Saltbush	N	2				
	Atriplex vesicaria	Bladder Saltbush	Y	5	M	>50	0	0
	Chenopodium curvispicatum	Cottony Goosefoot	Y	2	A	>50	0	0
	Daucus glochidiatus	Native Carrot	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Enchylaena tomentosa var.	Ruby Saltbush	Y	1	A	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	3				
	Enteropogon acicularis	Umbrella Grass	N	1				
	Eragrostis australasica	Cane-grass	Y	1	A	>50	0	0
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	0	0
	Eremophila oppositifolia ssp. oppositifolia	Opposite-leaved Emubush	Y	1	A	0	>50	0
	Eremophila serrulata	Green Emubush	Y	1	A	>50	0	0
	Euphorbia stevenii	Bottletree Spurge	N	2				
	Exocarpos aphyllus	Leafless Cherry	Y	1	A	0	>50	0
	Frankenia serpyllifolia	Thyme Sea-heath	Y	2	A	>50	0	0
	Lotus cruentus	Red-flower Lotus	N	1				
	Maireana aphylla	Cotton-bush	Y	2	A	>50	0	0
	Maireana appressa	Pale-fruit Bluebush	Y	1	A	>50	0	0
	Maireana eriantha	Woolly Bluebush	Y	2	M	>50	0	0
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	3/4	M	>50	<50	0
	Minuria cunninghamii	Bush Minuria	Y	3	A	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Plantago drummondii	Dark Plantain	N	2				
	Portulaca oleracea	Common Purslane	N	2				
	Ptilotus nobilis ssp.	Yellow-tails	N	1				
	Rhagodia spinescens	Spiny Saltbush	Y	1	A	>50	0	0
	Salsola australis	Buckbush	N	1				
	Sclerolaena brachyptera	Short-wing Bindyi	N	2				
	Sclerolaena divaricata	Tangled Bindyi	N	3				
	Sclerolaena ventricosa	Salt Bindyi	N	3				
	Sida fibulifera	Pin Sida	N	2				
	Sporobolus actinocladus	Ray Grass	N	3				
	Tecticornia medullosa	Samphire	Y	4	A	>50	0	0
	Wurmbea australis	Inland Nancy	N	2				
	CAR011 Totals: 37 (long-lived = 19 / short-lived = 18)							
CAR012	*Abutilon halophilum*	Plains Lantern-bush	Y	3	M	>50	0	0
	Atriplex holocarpa	Pop Saltbush	N	4				
	Atriplex vesicaria	Bladder Saltbush	Y	5/6	M	>50	<50	0
	Austrostipa sp.	Spear-grass	N	1				
	Bulbine semibarbata	Small Leek-lily	N	1				
	Cullen cinereum	Annual Scurf-pea	N	2				
	Daucus glochidiatus	Native Carrot	N	2				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	2				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Eragrostis australasica	Cane-grass	Y	1	A	>50	0	0
	Eragrostis setifolia	Bristly Love-grass	Y	2	M	<50	>50	<50
	Euphorbia stevenii	Bottletree Spurge	N	1				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	3	A	>50	0	0
	Lotus cruentus	Red-flower Lotus	N	2				
	Maireana appressa	Pale-fruit Bluebush	Y	3	A	>50	0	0
	Minuria cunninghamii	Bush Minuria	Y	2	M	>50	0	0
	Osteocarpum dipterocarpum	Two-wing Bonefruit	N	1				
	Panicum decompositum var. decompositum	Native Millet	N	4				
	Plantago drummondii	Dark Plantain	N	2				
	Portulaca oleracea	Common Purslane	N	2				
	Roepera eremaea	0	N	1				
	Salsola australis	Buckbush	N	2				
	Sclerolaena brachyptera	Short-wing Bindyi	N	2				
	Sclerolaena diacantha	Grey Bindyi	N	4				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Sclerolaena intricata	Tangled Bindyi	N	2				
	Sclerolaena ventricosa	Salt Bindyi	N	4				
	Sida fibulifera	Pin Sida	N	2				
	Sida intricata	Twiggy Sida	Y	2	A	>50	<50	<50
	*Sonchus oleraceus**	Common Sow-thistle	N	1				
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	2	A	>50	0	0
	CAR012 Totals: 30 (long-lived = 9 / short-lived = 21)							
CAR013	*Abutilon halophilum*	Plains Lantern-bush	Y	3	M	>50	0	0
	Arabidella nasturtium	Yellow Cress	N	1				
	Atriplex holocarpa	Pop Saltbush	N	2				
	Atriplex vesicaria	Bladder Saltbush	Y	4/5	M	<50	>50	0
	Austrostipa sp.	Spear-grass	N	1				
	Cullen cinereum	Annual Scurf-pea	N	3				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	1				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	<50	0
	Euphorbia drummondii group	Spurge	N	1				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	3	A	>50	0	0
	Lotus cruentus	Red-flower Lotus	N	2				
	Maireana appressa	Pale-fruit Bluebush	Y	1	A	>50	0	0
	Maireana eriantha	Woolly Bluebush	Y	1	A	0	>50	0
	Minuria cunninghamii	Bush Minuria	Y	3	A	>50	<50	<50
	Panicum decompositum var. decompositum	Native Millet	N	3				
	Plantago drummondii	Dark Plantain	N	3				
	Portulaca oleracea	Common Purslane	N	3				
	Sclerolaena brachyptera	Short-wing Bindyi	N	2				
	Sclerolaena divaricata	Tangled Bindyi	N	3				
	Sclerolaena ventricosa	Salt Bindyi	N	4				
	Sclerolaena ventricosa	Salt Bindyi	N	2				
	Sida fibulifera	Pin Sida	N	2/4				
	Solanum quadriloculatum	Plains Nightshade	N	1	A			
	*Sonchus oleraceus**	Common Sow-thistle	N	1				
	Sporobolus actinocladus	Ray Grass	N	4/5				
	Tecticornia medullosa	Samphire	Y	4	M	>50	0	0
	Wahlenbergia sp.	Native Bluebell	N	1				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	CAR013 Totals: 27 (long-lived = 8 / short-lived = 19)							
CAR015	*Abutilon halophilum*	Plains Lantern-bush	Y	2	M			
	Atriplex holocarpa	Pop Saltbush	N	2				
	Atriplex vesicaria	Bladder Saltbush	Y	4	M			
	Dissocarpus biflorus var.	Two-horn Saltbush	N	2				
	Dissocarpus paradoxus	Ball Bindyi	N	2				
	Enneapogon avenaceus	Common Bottle-washers	N	2/3				
	Frankenia serpyllifolia	Thyme Sea-heath	Y	2	A			
	Lepidium phlebopetalum	Veined Peppercress	N	1				
	Lotus cruentus	Red-flower Lotus	N	1				
	Maireana aphylla	Cotton-bush	Y	3	A			
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	1	A			
	Panicum decompositum var. decompositum	Native Millet	N	2				
	Plantago drummondii	Dark Plantain	N	1				
	Salsola australis	Buckbush	N	2/3				
	Sclerolaena brachyptera	Short-wing Bindyi	N	2				
	Sclerolaena divaricata	Tangled Bindyi	N	2				
	Sclerolaena intricata	Tangled Bindyi	N	4				
	Sclerolaena ventricosa	Salt Bindyi	N	3/4				
	Sida intricata	Twiggy Sida	Y	2/3				
	Sporobolus actinocladus	Ray Grass	N	3				
	CAR015 Totals: 21 (long-lived = 6 / short-lived = 15)							
CAR016	*Abutilon halophilum*	Plains Lantern-bush	Y	4	M	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	1	M	>50	0	0
	Astrebla pectinata	Barley Mitchell-grass	Y	3	A	>50	0	0
	Atriplex holocarpa	Pop Saltbush	N	1				
	Atriplex vesicaria	Bladder Saltbush	Y	5	M	>50	0	0
	Austrostipa sp.	Spear-grass	N	1				
	Dissocarpus biflorus var.	Two-horn Saltbush	N	3				
	Dissocarpus paradoxus	Ball Bindyi	N	3				
	Enneapogon avenaceus	Common Bottle-washers	N	2				
	Eragrostis setifolia	Bristly Love-grass	Y	2	A	>50	0	0
	Euphorbia tannensis ssp. eremophila	Desert Spurge	N	3				
	Lepidium phlebopetalum	Veined Peppercress	N	3				
	Maireana appressa	Pale-fruit Bluebush	Y	3	A	>50	<50	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Maireana eriantha	Woolly Bluebush	Y	2	A	>50	<50	0
	Minuria cunninghamii	Bush Minuria	Y	3	M	>50	0	0
	Panicum decompositum	Native Millet	N	3				
	Portulaca oleracea	Common Purslane	N	2				
	Sclerolaena brachyptera	Short-wing Bindyi	N	5				
	Sclerolaena divaricata	Tangled Bindyi	N	2				
	Sclerolaena intricata	Tangled Bindyi	N	4				
	Sclerolaena ventricosa	Salt Bindyi	N	4				
	Sida fibulifera	Pin Sida	N	2				
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	4	M	>50	0	0
	CAR016 Totals: 24 (long-lived = 9 / short-lived = 15)							
CAR017	*Abutilon otocarpum*	Desert Lantern-bush	Y	3	M	>50	0	0
	Acacia aneura var.	Mulga	Y	1	A	>50	0	0
	Acacia tetragonophylla	Dead Finish	Y	3	A	>50	0	0
	Atriplex vesicaria	Bladder Saltbush	Y	4	M	>50	0	0
	Boerhavia schomburgkiana	Schomburgk's Tar-vine	N	1				
	Chenopodium curvispicatum	Cottony Goosefoot	Y	4	M	>50	0	0
	Crinum flaccidum	Murray Lily	N	4				
	Digitaria brownii	Cotton Panic-grass	Y	3	A	>50	0	0
	Dodonaea lobulata	Lobed-leaf Hop-bush	Y	5	A	>50	0	0
	Einadia nutans ssp.	Climbing Saltbush	Y	1	A	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	4	M	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	4				
	Enteropogon acicularis	Umbrella Grass	N	2				
	Eremophila oppositifolia ssp.	Opposite-leaved Emubush	Y	1	A	>50	0	0
	Eremophila serrulata	Green Emubush	Y	2	M	>50	0	0
	Exocarpos aphyllus	Leafless Cherry	Y	1	A	>50	0	0
	Lepidium phlebopetalum	Veined Peppercress	N	1				
	Maireana aphylla	Cotton-bush	Y	1	A	>50	0	0
	Maireana eriantha	Woolly Bluebush	Y	1	A	>50	0	0
	Maireana integra	Entire-wing Bluebush	Y	3	A	>50	0	0
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	4	M	>50	<50	0
	Myoporum montanum	Native Myrtle	Y	1	M	>50	0	0
	Portulaca oleracea	Common Purslane	N	1				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Ptilotus obovatus	Silver Mulla Mulla	Y	4	M	>50	0	0
	Rostellularia adscendens	Pink Tongues	N	3				
	Santalum lanceolatum	Plumbush	Y	2	M	>50	0	0
	Scaevola spinescens	Spiny Fanflower	Y	2	M	>50	0	0
	Sclerolaena intricata	Tangled Bindyi	N	1				
	Senna artemisioides ssp. helmsii	Blunt-leaf Senna	Y	2	M	>50	0	0
	Senna artemisioides ssp. oligophylla	Limestone Senna	Y	3	M	>50	0	0
	Senna artemisioides ssp. X artemisioides	Silver Senna	Y	3	A	>50	0	0
	Sida fibulifera	Pin Sida	N	3				
	Sida petrophila	Rock Sida	N	4				
	Solanum lithophilum	Velvet Potato-bush	N	3				
	Solanum quadriloculatum	Plains Nightshade	N	1	A	>50	0	0
	Sporobolus actinocladus	Ray Grass	N	4				
	Tecticornia medullosa	Samphire	Y	1	A	>50	0	0
	Tripogonella loliiformis	Five-minute Grass	N	2				
	CAR017 Totals: 38 (long-lived = 24 / short-lived = 14)							
CAR018	*Abutilon otocarpum*	Desert Lantern-bush	Y	4	M	>50	0	0
	Acacia aneura var.	Mulga	Y	1	A	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	5	M	>50	0	0
	Acacia tetragonophylla	Dead Finish	Y	2	A	>50	0	0
	Alternanthera nodiflora	Common Joyweed	N	3				
	Atriplex vesicaria	Bladder Saltbush	Y	4	M	>50	0	0
	Boerhavia schomburgkiana	Schomburgk's Tar-vine	N	2				
	*Centaurea melitensis**	Malta Thistle	N	1				
	Cheilanthes lasiophylla	Woolly Cloak-fern	N	1				
	Chenopodium curvispicatum	Cottony Goosefoot	Y	3	M	>50	0	0
	Digitaria divaricatissima var. divaricatissima	Spider Grass	Y	1	A	>50	0	0
	Dodonaea lobulata	Lobed-leaf Hop-bush	Y	5	M	>50	0	0
	Einadia nutans ssp.	Climbing Saltbush	Y	1	M	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	5	M	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	4				
	Enteropogon acicularis	Umbrella Grass	N	2				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Eremophila latrobei ssp.	Crimson Emubush	Y	4	M	>50	0	0
	Eremophila oppositifolia	Opposite-leaved Emubush	Y	1	A	0	0	>50
	Eremophila serrulata	Green Emubush	Y	4	A	>50	0	0
	Exocarpos aphyllus	Leafless Cherry	Y	1	A	>50	0	0
	Maireana aphylla	Cotton-bush	Y	2	A	>50	0	0
	Maireana spongiocarpa	Spongy-fruit Bluebush	Y	2	M	>50	0	0
	Marsilea drummondii	Common Nardoo	N	1				
	Panicum decompositum var. decompositum	Native Millet	N	2				
	Portulaca oleracea	Common Purslane	N	2				
	Ptilotus nobilis ssp.	Yellow-tails	N	1				
	Ptilotus obovatus	Silver Mulla Mulla	Y	4	M	>50	0	0
	Rostellularia adscendens	Pink Tongues	N	3				
	Santalum lanceolatum	Plumbush	Y	2	M	>50	0	0
	Scaevola spinescens	Spiny Fanflower	Y	3	M	>50	0	0
	Sclerolaena brachyptera	Short-wing Bindyi	N	1				
	Sclerolaena ventricosa	Salt Bindyi	N	1				
	Senna artemisioides ssp. helmsii	Blunt-leaf Senna	Y	3	A	>50	0	0
	Senna artemisioides ssp. X artemisioides	Silver Senna	Y	2	A	>50	0	0
	Sida fibulifera	Pin Sida	N	4				
	Sida petrophila	Rock Sida	N	4	M	>50	0	0
	Solanum lithophilum	Velvet Potato-bush	N	1				
	Spergularia marina	Salt Sand-spurrey	N	3				
	Sporobolus actinocladus	Ray Grass	N	4				
	Teucrium racemosum	Grey Germander	N	2				
	Trianthema triquetrum	Red Spinach	N	2				
	Wurmbea australis	Inland Nancy	N	3				
	CAR018 Totals: 41 (long-lived = 21 / short-lived = 20)							
CAR019	*Abutilon otocarpum*	Desert Lantern-bush	Y	3	M	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	4	M	>50	0	0
	Acacia tetragonophylla	Dead Finish	Y	4	A	>50	0	0
	Alternanthera denticulata	Lesser Joyweed	N	3				
	Alternanthera nodiflora	Common Joyweed	N	3				
	Atriplex holocarpa	Pop Saltbush	N	3				
	Atriplex vesicaria	Bladder Saltbush	Y	2	M	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Boerhavia schomburgkiana	Schomburgk's Tar-vine	N	2				
	Crinum flaccidum	Murray Lily	N	3				
	Cullen australasicum	Tall Scurf-pea	N	2	A	>50	0	0
	Cyperus sp.	Flat-sedge	N	1				
	Digitaria brownii	Cotton Panic-grass	Y	2				
	Digitaria divaricatissima var. divaricatissima	Spider Grass	Y	2				
	Dodonaea lobulata	Lobed-leaf Hop-bush	Y	5	M	>50	0	0
	Duma florulenta	Lignum	Y	3				
	Einadia nutans ssp.	Climbing Saltbush	Y	3	M	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	4	M	>50	<50	0
	Enneapogon avenaceus	Common Bottle-washers	N	4				
	Eremophila latrobei ssp.	Crimson Emubush	Y	3	A	>50	0	0
	Eucalyptus camaldulensis ssp. arida	Northern River Red Gum	Y	2/4	M	>50	0	0
	Eulalia aurea	Silky Brown-top	Y	3				
	Maireana aphylla	Cotton-bush	Y	2	A	>50	0	0
	Maireana integra	Entire-wing Bluebush	Y	3	A	>50	<50	0
	Malvastrum americanum var. americanum	Malvastrum	N	3				
	Myoporum montanum	Native Myrtle	Y	2/4	M	>50	0	0
	Pluchea rubelliflora		N	2				
	Pterocaulon sphacelatum	Apple-bush	N	3				
	Ptilotus obovatus	Silver Mulla Mulla	Y	4	M	>50	0	0
	Rhagodia spinescens	Spiny Saltbush	Y	2	A	>50	0	0
	Rostellularia adscendens	Pink Tongues	N	3				
	Santalum lanceolatum	Plumbush	Y	3	M	>50	0	0
	Scaevola spinescens	Spiny Fanflower	Y	4	M	>50	0	0
	Senna artemisioides ssp. helmsii	Blunt-leaf Senna	Y	2	A	>50	0	0
	Senna artemisioides ssp. oligophylla	Limestone Senna	Y	2	A	>50	0	0
	Senna artemisioides ssp. X artemisioides	Silver Senna	Y	4	A	>50	0	0
	Sida fibulifera	Pin Sida	N	3				
	Sida petrophila	Rock Sida	N	4				
	Sporobolus actinocladus	Ray Grass	N	3				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Teucrium racemosum	Grey Germander	N	3				
	Themeda triandra	Kangaroo Grass	Y	2				
	Wurmbea australis	Inland Nancy	N	3				
	CAR019 Totals: 41 (long-lived = 24 / short-lived = 17)							
CAR020	*Abutilon otocarpum*	Desert Lantern-bush	Y	2	M	>50	0	0
	Acacia papyrocarpa	Western Myall	Y	2/4	M	>50	0	0
	Acacia tetragonophylla	Dead Finish	Y	4	M	>50	0	0
	Alternanthera denticulata	Lesser Joyweed	N	3				
	Boerhavia schomburgkiana	Schomburgk's Tar-vine	N	3				
	*Centaurea melitensis**	Malta Thistle	N	2				
	Crinum flaccidum	Murray Lily	N	3				
	Cullen australasicum	Tall Scurf-pea	N	1				
	Cyperus sp.	Flat-sedge	N	2				
	Digitaria brownii	Cotton Panic-grass	Y	3	A	>50	<50	0
	Digitaria divaricatissima var.	Spider Grass	Y	2	A	>50	0	0
	Dodonaea lobulata	Lobed-leaf Hop-bush	Y	4/5	M	>50	0	0
	Duma florulenta	Lignum	Y	4	M	>50	0	0
	Einadia nutans ssp.	Climbing Saltbush	Y	2	M	>50	0	0
	Eleocharis pallens	Pale Spike-rush	Y	2	A	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	2	M	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	3				
	Eragrostis setifolia	Bristly Love-grass	Y	3	A	>50	<50	0
	Eremophila latrobei ssp.	Crimson Emubush	Y	2	M	>50	0	0
	Eremophila serrulata	Green Emubush	Y	2	A	>50	0	0
	Eucalyptus camaldulensis ssp. arida	Northern River Red Gum	Y	4	M	>50	0	0
	Eulalia aurea	Silky Brown-top	Y	2/4	A	>50	<50	0
	Euphorbia tannensis ssp. eremophila	Desert Spurge	N	1				
	Maireana aphylla	Cotton-bush	Y	1	A	>50	0	0
	Maireana integra	Entire-wing Bluebush	Y	1	A	>50	0	0
	Malvastrum americanum var. americanum	Malvastrum	N	2				
	Marsilea drummondii	Common Nardoo	N	2				
	Minuria cunninghamii	Bush Minuria	Y	1	Y	>50	0	0
	Myoporum montanum	Native Myrtle	Y	4	M	>50	0	0

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Pluchea rubelliflora		N	4				
	Pterocaulon sphacelatum	Apple-bush	N	4				
	Ptilotus obovatus	Silver Mulla Mulla	Y	2/4	M	>50	0	0
	Santalum lanceolatum	Plumbush	Y	2	M	>50	0	0
	Scaevola spinescens	Spiny Fanflower	Y	2	M	>50	0	0
	Senna artemisioides ssp. oligophylla	Limestone Senna	Y	2	M	>50	0	0
	Setaria constricta	Knotty-butt Paspalidium	Y	2	A	>50	0	0
	Sida petrophila	Rock Sida	N	4		>50	0	0
	Sporobolus actinocladus	Ray Grass	N	2				
	Teucrium racemosum	Grey Germander	N	3	M			
	Themeda triandra	Kangaroo Grass	Y	2	M	>50	<50	0
	Trichodesma zeylanicum var. zeylanicum	Camel Bush	N	1				
	CAR020 Totals: 40 (long-lived = 25 / short-lived = 15)							
CAR021	*Abutilon otocarpum*	Desert Lantern-bush	Y	3	A	>50	0	0
	Acacia ligulata	Umbrella Bush	Y	4	M	>50	0	0
	Alectryon oleifolius ssp. canescens	Bullock Bush	Y	1	A	0	>50	0
	Aristida holathera var.	Tall Kerosene Grass	N	4				
	Atriplex velutinella	Sandhill Saltbush	N	1				
	Chenopodium curvispicatum	Cottony Goosefoot	Y	1	A	>50	0	0
	*Citrullus sp.**	Wild Melon	N	2				
	Crotalaria eremaea ssp.	Loose-flowered Rattle-pod	N	2	M	>50	<50	0
	Dodonaea viscosa ssp. angustissima	Narrow-leaf Hop-bush	Y	4	M	>50	0	0
	Einadia nutans ssp.	Climbing Saltbush	Y	1	A	>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	2	A	>50	0	0
	Enneapogon avenaceus	Common Bottle-washers	N	3				
	Euphorbia drummondii group	Spurge	N	1				
	Lysiandra fuernrohrii	Sand Spurge	N	3				
	Maireana pyramidata	Black Bluebush	Y	1	A	0	>50	0
	Minuria cunninghamii	Bush Minuria	Y	1	A	>50	0	0
	Nicotiana velutina	Velvet Tobacco	N	3				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	Paractaenum novae-hollandiae ssp. reversum	Barbed-wire Grass	N	1				
	Pimelea microcephala ssp.	Shrubby Riceflower	Y	3	A	>50	0	0
	Polycalymma stuartii	Poached-egg Daisy	N	3				
	Ptilotus obovatus	Silver Mulla Mulla	Y	1	A	>50	0	0
	Roepera eremaea	Twinleaf	N	2				
	Roepera howittii	Clasping Twinleaf	N	1				
	Salsola australis	Buckbush	N	3				
	sida ammophila	Sand Sida	N	3	M	>50	0	0
	*Sisymbrium erysimoides**	Smooth Mustard	N	2				
	Solanum quadriloculatum	Plains Nightshade	N	1				
	Tragus australianus	Small Burr-grass	N	1				
	Triraphis mollis	Purple Plume Grass	N	3				
	Zygochloa paradoxa	Sandhill Cane-grass	Y	4	A	>50	0	0
	CAR021 Totals: 28 (long-lived = 12 / short-lived = 16)							
CAR022	*Acacia ligulata*	Umbrella Bush	Y	4		>50	0	0
	Acacia ramulosa var. ramulosa	Horse Mulga	Y	1		0	>50	0
	Aristida holathera var. holathera	Tall Kerosene Grass	N	4				
	Atriplex velutinella	Sandhill Saltbush	N	3				
	*Citrullus sp.**	Wild Melon	N	2				
	Crotalaria eremaea ssp.	Loose-flowered Rattle-pod	N	4	M	>50	<50	0
	Einadia nutans ssp.	Climbing Saltbush	Y	3		>50	0	0
	Enchylaena tomentosa var.	Ruby Saltbush	Y	2		>50	0	0
	Euphorbia drummondii group	Spurge	N	1				
	Hibiscus krichauffianus	Velvet-leaf Hibiscus	N	3				
	Nicotiana velutina	Velvet Tobacco	N	2				
	Paractaenum novae-hollandiae ssp. reversum	Barbed-wire Grass	N	1				
	Polycalymma stuartii	Poached-egg Daisy	N	2/4				
	Ptilotus obovatus	Silver Mulla Mulla	Y	1		>50	0	0
	Rhagodia spinescens	Spiny Saltbush	Y	1		>50	0	0
	Roepera howittii	Clasping Twinleaf	N	1				
	Salsola australis	Buckbush	N	1				
	sida ammophila	Sand Sida	N	2				

Site	Species	Common Name	Long-lived[1]	CSR[2]	Life Stages[3]	Grazing Level % of total population		
						Intact	Modi-fied	Over-utilised
	*Sisymbrium erysimoides**	Smooth Mustard	N	2/4				
	Solanum lithophilum	Velvet Potato-bush	N	1				
	Tragus australianus	Small Burr-grass	N	3				
	Trichodesma zeylanicum var. zeylanicum	Camel Bush	N	4				
	Triraphis mollis	Purple Plume Grass	N	1				
	Zygochloa paradoxa	Sandhill Cane-grass	Y	2/4		>50	0	0
	CAR022 Totals: 22 (long-lived = 7 / short-lived = 15)							

[1] Long lived woody perennials – refer Appendix B

[2] CSR ratio (Source = DENR (2011). Pastoral Lease Assessment Manual. Pastoral Land Management Group

CLASS	TERM	CSR	FIELD CRITERIA
1	Present	< 12 plants	< 12 plants within 200 m radius
2	Isolated Clumps	>20 spaces	Isolated clumps of two to five woody plants 200 m further apart
3	Isolated Plants	>20 spaces	Isolated plants
4	Very Sparse	6-20 spaces	Well spaced, crowns well separated
5	Sparse	1-5 spaces	Clearly spaced, crowns clearly separated
6	Mid dense	0-0.9 spaces	Crowns touching to slight separation
7	Closed or dense	0	Crowns touching to overlapping

Appendix G Weed Summary

G1 Weeds recorded at various locations across the Carrapateena Site during baseline (2012-2016) and construction (autumn 2018 to autumn 2023)

Scientific name	Common Name	Location	EBS 2012 – 2016	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
Asphodelus fistulosus	Onion Weed	Dawsons Dam	NR	NR	NR	NR	2	NR	NR	NR
Carrichtera annua	Wards Weed	CWM01	NR	NR	NR	NR	4	NR	NR	NR
Carthamus lanatus	Saffron Thistle	CWM01	Present	1	1	NR	NR	2	NR	1
		CAR007	Present	NR	NR	NR	NR	NR	NR	NR
		South Eliza Dam	NS	NR	NR	NR	NR	2	NR	NR
		Whittata Creek	NS	NS	NS	NS	NS	1	NS	NS
Centaurea calcitrapa	Star Thistle	CWM02	Present	NR	NR	NR	NR	NR	NR	NR
Centaurea melitensis	Malta Thistle	CAR010	Present	NR	NR	NR	NR	1	NR	NR
		CAR018	NS	NR	NR	NR	NR	1	NR	1
		CAR020	NS	Present	NR	NR	NR	2	NR	2
		Dawsons Dam	NS	NR	NR	NR	NR	2	2	NR
Centarium erythraea / tenuiflorum	Centaury	CAR010	Present	NR	NR	NR	NR	NR	NR	NR
		EV EIA	NS	NR	1	NR	NR	NR	NR	4
		Dawsons Dam	NS	NS	NR	NR	4	NR	NR	1
		Anzac Dam	NS	NR	NR	NR	NR	NR	1	NR
		South Eliza Dam	NS	NR	NR	NR	NR	NR	2	NR
		North Eliza Dam	NS	NR	NR	NR	NR	NR	NR	2 to 4
		Dawsons	NS	NS	NS	NR	4	NR	NR	NR
Chenopodium album/murale	Goosefoot	EV EIA	NS	Present	2	2	4	2	NR	2
		Anzac Dam	NS	NS	1	NR	4	1	2 to 4	2
		Whittata Creek	NS	NS	NS	NS	NS	1	NS	NS
		Dawsons Dam	NR	NR	NR	NR	4	3	3	2 to 3
Citrullus species, inc. *C. colocynthis*	Bitter Melon	Anzac Dam	NS	NS	NR	3	2	2	2	2 to 4
		South Eliza Dam	NS	NS	NR	4	Present	NR	NR	NR
		Dawsons Dam	NS	NS	1	1	4	NR	NR	2

Scientific name	Common Name	Location	EBS 2012 – 2016	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
		CWM01	NR	NR	NR	NR	3	NR	1	NR
		CWM02	NR	NR	NR	NR	NR	NR	1	NR
		CWM05	NS	NS	NS	NS	3	NR	4 to 5	2 to 5
		CWM06	NR	NR	NR	NR	1	NR	1	2 to 3
		CWM021	NS	NS	NR	NR	1	NR	1	2
		CWM022	NS	NS	NR	NR	1	NR	1	2
		Tjungu EIA	NS	NS	NR	NR	NR	NR	NR	1 to 3
Cucumis myriocarpus	Paddy Melon	EV EIA	NS	Present	NR	NR	3	NR	NR	3
		CWM01	NR	NR	NR	NR	3	NR	NR	NR
		Dawsons Dam	NR	NR	NR	NR	3	NR	NR	2 to 5
		South Eliza Dak	NR	NR	NR	NR	3	NR	NR	2 to 5
Cynodon dactylon	Couch	Whittata Creek	NS	NS	NS	NS	NS	2	NS	NS
Erodium sp. including E. cicutarium	Cut-leaf Stork's-bill	CWM02	NR	NR	NR	NR	1	NR	NR	NR
		Dawsons Dam	NR	NR	NR	NR	1	NR	NR	NR
		Whittata Creek	NS	NS	NS	NS	NS	1	NS	NS
		Anzac Dam	NR	NR	NR	NR	2	1	NR	NR
Heliotropium curassavicum	Smooth Heliotrope	North Eliza	NS	NS	3	1	2	2 to 4	2 to 4	2 to 5
		South Eliza	NS	NS	3	4	Present	2 to 5	2 to 5	2 to 5
		Anzac Dam	NS	NS	2	2	4	4	4 to 6	4 to 5
		Dawsons Dam	NS	NS	4	4	4 to 5	4	2	2 to 5
		CWM02	Present	NR	NR	1	2	1	3	4
		Whittata Creek	NS	NS	NS	NS	NS	2	NS	NS
		CWM01	NR	NR	NR	NR	NR	NR	NR	1
		CWM02	Present		NR	1	2	1	NR	2
		CWM06	NR	NR	NR	NR	NR	NR	NR	1

Scientific name	Common Name	Location	EBS 2012 – 2016	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
Heliotropium supinum	Spreading Heliotrope	CWM01	Present	2	2	NR	NR	1	NR	NR
		CWM02	NR?	2	NR	NR	NR	NR	NR	NR
		Anzac Dam	NS	NS	NR	1	NR	NR	NR	NR
		North Eliza Dam	NS	NS	NR	4	3	2 to 4	2 to 4	2 to 4
		South Eliza Dam	NS	NS	NR	NR	NR	2	2	1 to 4
		Dawsons Dam	NS	NS	2	3	4	2	NR	NR
		Whittata Creek	NS	NS	NS	NS	NS	2	NS	NS
Lepidium africanum	Peppercress	CWM02	Present	NR	NR	NR	NR	NR	NR	NR
Lysimachia arvensis	Scarlet Pimpernel	EV EIA	NS	4	4	4	2	NR	NR	NR
		CWM001	NR	NR	NR	NR	NR	NR	1	NR
		CWM006	NR	NR	NR	NR	1	NR	NR	NR
Malva parviflora	Mallow	Anzac Dam	NS	NS	NR	1	NR	NR	NR	NR
		South Eliza Dam	NS	NS	NR	NR	NR	NR	NR	3
		CWM01	NR	NR	NR	NR	1	NR	1	NR
		CWM02	NR	NR	NR	NR	3	NR	NR	2
Medicago sp (including M. minima)	Medic	CWM01	NR	NR	NR	NR	NR	NR	1	NR
		CWM02	NR	NR	NR	NR	NR	NR	1	NR
Mesembryanthemum crystallinum	Iceplant	CWM01	NR	NR	NR	NR	3	NR	NR	NR
		South Eliza Dam, EV	NR	NR	NR	NR	1	NR	NR	NR
Mesembryanthemum nodiflorum	Slender Iceplant	CAR001, CAR008, CAR009, CAR010	Present	NR	NR	NR	NR	NR	NR	NR
Nicotiana glauca	Tree Tobacco	CAR013	Present	NR	NR	NR	NR	NR	1	NR
		Dawsons Dam	NS	NS	NR	NR	NR	NR	NR	1
		South Eliza Dam	NS	NS	2	2	NS	4 ##	4	2 to 5
Opuntia sp. [1]	Prickly Pear	Yeltacowie homestead	NS	NS	1	1	1	1	1	1

Scientific name	Common Name	Location	EBS 2012 – 2016	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
Polygonum aviculare	Wire Weed	Anzac Dam	NS	NS	NR	1	NR	NR	NR	NR
Rostraria pumila	Tiny Bristle Grass	CAR003-CAR005, CAR007, CAR008, CAR012-CAR015, CAR022	CAR003-CAR005, CAR007, CAR008, CAR012-CAR015	NR	NR	CAR004, CAR012	CAR021 (CSR = 1)	NR	NR	NR
		South Eliza Dam	NS	NS	NR	3	NR	NR	NR	NR
		EV	NS	NS	NR	4	4	2	1	NR
Rumex vesicarius	Rosy Dock	CAR004, CAR013	Present	NR	NR	NR	NR	NR	NR	NR
Rumex vesicarius	Rosy Dock	CAR007	Present	NR	NR	NR	1	NR	NR	NR
Schinus molle	Pepper Tree	Whittata Creek	NS	NS	NS	NS	NS	1	NS	NS
Schismus barbatus	Arabian Grass	CAR003, CAR006, CAR012, CAR014	Present	NR	NR	NR	NR	NR	NR	NR
Sisymbrium erysimoides	Smooth Mustard	Dawsons Dam, Anzac Dam	NS	NS	NR	1	NR	NR	NR	NR
		CAR001, CAR009, CAR011, CAR013, CAR014, CAR016	Present	NR	NR	NR	NR	NR	NR	NR
		CAR010	NS	NS	NR	NR	NR	1	NR	NR
		CAR012, CAR017	NS	NR	NR	1	NR	NR	NR	NR
		CAR021	NS	NR	NR	NR	3	NR	1	2 to 4
		CAR022	NS	Present	NR	1	3	1	3 to 4	2
		CWM01	NR	NR	NR	3	3	NR	1	2 to 4
		CWM03	Present	NR	NR	NR	NR	NR	NR	NR
		CWM05	NS	NS	NS	NS	3	1	NR	NR
		CWM06	NR	NR	NR	3	3	1	1	1
		South Eliza Dam	NS	NS	NR	3	Present	NR	NR	NR

Scientific name	Common Name	Location	EBS 2012 – 2016	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
		EV	NS	NR	NR	NR	2	NR	NR	NR
Solanum nigrum	Black Nightshade	Anzac Dam	NS	NS	NR	1	1	1	1	1
		Dawsons Dam	NS	NS	1	1	1	NR	NR	1
		South Eliza Dam	NS	NS	NR	NR	Present	NR	NR	1
		EV	NS	2	2	1	2	1	NR	1
		EV EIA	NS	Present	2	3	1	1	NR	1 to 4
		Whittata Creek	NS	NS	NS	NS	NS	1	NS	NS
		CWM01	Present	NR	NR	NR	NR	1	1	NR
		CWM02	Present	NR	NR	NR	NR	NR	NR	NR
Sonchus oleraceus	Sow Thistle	EV	NS	1	1	NR	NR	NR	NR	NR
		EV EIA	NS	Present	4	3	NR	1	NR	4
		TV EIA	NS	Present	4	4	4	4	4	4
		CAR006-CAR010, CAR014	Present	NR	NR	NR	NR	NR	NR	NR
		CAR012	Present	NR	NR	NR	NR	NR	NR	1
		CAR003, CAR011, CAR015	Present	NR	NR	1	NR	NR	NR	NR
		CAR013	Present	NR	NR	1	NR	NR	NR	1
		CAR016	NR	NR	NR	1	NR	NR	NR	NR
		CAR019	NS	NR	NR	NR	1	NR	NR	NR
Tamarix aphylla[1,2]	Athel Pine	Yeltacowie homestead	NS	NS	1	1	NS	1	1	1
Tribulus terrestris	Caltrop	CAR002, CAR005, CAR008-CAR010, CAR013,CAR014	Present	NR	NR	NR	NR	NR	NR	NR
		CAR020	NS	NR	NR	NR	1	NR	NR	NR
Urtica urens	Stinging Nettle	Exploration Village EIA	NS	NR	NR	NR	NR	NR	NR	2
Verbena supina	Trailing Verbena	Anzac Dam	NS	NR	NR	NR	NR	NR	2	NR
Xanthium spinosum[1]	Bathurst Burr	CWM01	NR	Present	1	1	NR	1	NR	1 to 3

Scientific name	Common Name	Location	EBS 2012 – 2016	Autumn 2018	Spring 2018	Spring 2019	Spring 2020	Spring 2021	Spring 2022	Autumn 2023
		CWM02	NR	Present	NR	4	NR	2	NR	3 to 4
		Dawsons Dam	NS	NS	NR	4	Dead plants with burrs (4)	Dead plants with burrs (4)	Dead plants with burrs (4)	4 to 5
		South Eliza Dam	NS	NS	NR	3	NR	2 to 5	NR	2 to 5
		Whittata Creek	NS	NS	NS	NS	NS	2 to 5	NS	NS

[1] Declared in SA under the Landscapes South Australia 2019 Act. Declared plant species are regulated as to their movement, sale, notification and/or control.

[2] WoNS - Weed of National Significance. ***Must be controlled within 100m of a watercourse

[3]EV = Exploration Village, EV EIA = Exploration Village Effluent Irrigation Area. TV EIA = Tjungu Village Effluent Irrigation Area

[4]Abundance recorded using the CSR scale (1 = < 12 individuals; 2 = isolated clumps, 3 = isolated individuals, 4 = plants separated by 6-20 crown widths, 5 = plants separated by 1-5 crown widths

NR = Not Recorded, site was surveyed, but weed species was not observed; NA = Not applicable, site was discontinued in spring 2018

Nicotiana glauca This species was recorded as moderately dense to dense bands in drainage outlets to south and west of South Eliza dam complex. Recorded between Easting 737732 Northing 6529815 and Easting 738038 Northing 6529842. Mixed age trees were recorded and the population has the potential to increase.

G2 Weed species recorded at weed transects, all reporting periods

Transect*	Species	2012-2016[1]	Autumn 2018	Spring 2018	Autumn 2019	Spring 2019	Spring 2020	Spring 2021	Spring 2022*	Autumn 2023*
CWM01	*Brassica tournefortii*	Present	NR**	NR	NR	NR	NR	NR	NR	NR
CWM01	*Carrichtera annua*	NR	NR	NR	NR	NR	Present	NR	NR	NR
CWM01	*Carthamus lanatus*	Present	Present	Present	NR	NR	NR	NR	NR	1
CWM01	*Cucumis* sp.	NR	NR	NR	NR	NR	Present	NR	NR	NR
CWM01	*Heliotropium curassavicum*	NR	NR	NR	NR	NR	NR	NR	1	1
CWM01	*Heliotropium supinum*	Present	Present	Present	Present	NR	NR	Present	NR	NR
CWM01	*Lysimachia arvensis*	NR	NR	NR	NR	NR	NR	NR	1	NR
CWM01	*Malva parviflorus*	NR	NR	NR	NR	NR	Present	NR	1	NR
CWM01	*Medicago minima*	NR	NR	NR	NR	NR	NR	NR	3	NR
CWM01	*Mesembryanthemum crystallinum*	NR	NR	NR	NR	NR	Present	NR	NR	NR
CWM01	*Sisymbrium erysimoides*	NR	NR	NR	NR	NR	Present	NR	1	2 to 4
CWM01	*Sonchus oleraceus*	Present	NR	NR	NR	NR	NR	Present	1	1
CWM01	*Solanum nigrum*	NR	NR	NR	NR	NR	NR	NR	1	NR
CWM01	*Xanthium spinosum*	NR	Present	Present	Present	Present	NR	Present	NR	3
CWM02	*Centaurea calcitrapa*	Present	NR	NR	NR	NR	NR	NR	NR	NR
CWM02	*Citrullus cucumis*	NR	NR	NR	NR	NR	NR	NR	1	NR
CWM02	*Erodium cicutarium*	NR	NR	NR	NR	NR	Present	NR	NR	NR
CWM02	*Heliotropium curassavicum*	Present	NR	NR	Present	Present	Present	Present	3	2
CWM02	*Lepidium africanum*	Present	NR	NR	NR	NR	NR	NR	NR	NR
CWM02	*Malva parviflorus*	NR	NR	NR	NR	NR	Present	NR	NR	2
CWM02	*Medicago minima*	NR	NR	NR	NR	NR	NR	NR	1	NR
CWM02	*Solanum linnaeanum*	Present	NR	NR	NR	NR	NR	NR	NR	NR
CWM02	*Solanum nigrum*	NR	NR	NR	NR	NR	NR	NR	1	NR
CWM02	*Sonchus oleraceus*	NR	NR	NR	NR	NR	NR	NR	1	NR
CWM02	*Xanthium spinosum*	Present	NR	NR	NR	Present	NR	Present	NR	2 to 4

Transect*	Species	2012-2016[1]	Autumn 2018	Spring 2018	Autumn 2019	Spring 2019	Spring 2020	Spring 2021	Spring 2022*	Autumn 2023*
CWM03	*Sisymbrium erysimoides*	Present	NR	NR	NR	NR	NR	NR	NR	NR
CWM04	*Sonchus oleraceus*	Present	NR	NR	NR	NR	NR	NR	NR	NR
CWM05	*Sisymbrium erysimoides*	NS***	NS	NS	NS	NS	Present	NR	NR	NR
CWM05	*Citrullus* sp.	NS	NS	NS	NS	NS	Present	NR	4 to 5	4 to 5
CWM06	*Citrullus* sp.	NR	NR	NR	NR	NR	Present	NR	1	2 to 3
CWM06	*Lysimachia arvensis*	NR	NR	NR	NR	NR	Present	NR	NR	NR
CWM06	*Sisymbrium erysimoides*	NS	NS	Present	NS	Present	Present	NR	1	1
CWM07	*Sisymbrium erysimoides*	NS	NS	NR	NR	NR	NR	NR	NR	NR
NWM01	*Tribulus terrestris*	NS	NS	NS	NS	Present	NR	NR	NR	NR
NWM02	*Citrullus* sp.	NS	NS	NS	NS	Present	NR	NR	NR	NR
NWM02	Cucumis sp.	NS	NS	NS	NS	Present	NR	NR	NR	NR
NWM03		NS	NS	NS	NS		No weeds	No weeds	No weeds	No weeds

Includes along weed transect, but outside of a designated recording quadrat.

[1]Data source: baseline surveys autumn 2012 – 2016 (EBS 2015a; EBS 2015b; EBS 2016).

*Presence abundance is CSR scale (1 = < 12 individuals; 2 = isolated clumps, 3 = isolated individuals, 4 = plants separated by 6-20 crown widths, 5 = plants separated by 1-5 crown widths

**NR = surveyed but not recorded

***NS = Not surveyed

Appendix H Fauna Summary

Table H1 Small Fauna Capture / Observations (F = Funnel, AR = Active Reptile Search, OP = Opportunistic, SP = Spotlighting) (excludes song meter bats)

Scientific Name	Common Name	Site																Total	OP[1]
		1 F	1 P	2 F	2 P	3 F	3 P	4 F	4 P	5 F	5 P	6 F	6 P	15 F	15 P	16 F	16 P		
Leggadina forresti	Forrest's Mouse		2		2		1		1			1[3]					1	8[4]	
Austronomus australis	White-striped Freetail Bat																	many	TJ EV, EX EV, S10 (SP)
Mus musculus	House Mouse		1[3]															2	SED
Planigale tenuirostris	Narrow Nosed Planigale						1										2	3[4]	
Sminthopsis crassicaudata	Fat-tailed Dunnart														1			3	2@S10 (SP)
Sminthopsis macroura	Stripe-faced Dunnart		2		3		1		1		1[3]		2		4		2	16[4]	
Ctenophorus fionni	Peninsula Dragon																	1	S7
Ctenotus olympicus	Salt-bush Ctenotus													1	3	1		4	
Ctenotus taeniatus	Eyrean Ctenotus																1	1	
Gehyra versicolor	Eastern Tree Dtella																	2	S10 x 2 (SP)[4]
Heteronotia bynoei	Bynoe's Gecko																	23	S18 (1), S3(2), SED (10), YHS (9)[4]
Menetia greyii	Common Dwarf Skink																	1	YHS
Pseudonaja sp.	Brown Snake																	1	YHS (skin)

Scientific Name	Common Name	Site																Total	OP[1]
		1 F	1 P	2 F	2 P	3 F	3 P	4 F	4 P	5 F	5 P	6 F	6 P	15 F	15 P	16 F	16 P		
Morethia boulengeri	Common Snake-eye																	1	S17
Pogona vitticeps	Central Bearded Dragon																	2	S20[2],S21[4]
Suta suta	Curl Snake																	1	YHS
Tiliqua rugosa	Shingle Back Lizard																	1	S20[2]
Tympanocryptis intima	Smooth-snouted Dragon		1															1	
Tympanocryptis tetraporophora	Eyrean Earless Dragon																	2	S12, S16
Totals		0	6	0	5	0	3	0	2	0	1	1	2	1	8	1	6		

[1] OP = Opportunistic, SP = spotlighting, SED = South Eliza Dam, SAR = Southern Access Road, WAR =Western Access Road, TJ EV = Tjungu Village, EX EV = Exploration Village, S1-S22 = CAR001-CAR022;[2]Carcass under Wedge-tail Eagle nest; [3]Also via camera trap, [4]Juveniles detected.

Table H2 Summary of Birds Recorded Across the Carrapateena Site during the autumn 2023

Family	*Species*	Common Name	Status	Site																				Opportunistic observation locations[1]
				1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	18	19	20	21	22	
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater		1[5]	1[5]					1[5]	1	1[5]						1	1	1		1		WE02[5], SED, WAT17, YHS, DD, NED Creek, CWM05
Acanthizidae	*Acanthiza uropygialis*	Chestnut-rumped Thornbill										1								1				NED Creek, CWM05
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar		1[5]																				
Anatidae	*Anas gracilis*	Grey Teal								1[5]														NED, AD, SED
Anatidae	*Anas superciliosa*	Pacific Black Duck																						
Motacillidae	*Anthus novaeseelandiae*	Australian Pipit		1	1[5]	1[3]	1[5]	1	1[5]			1[5]	1	1	1	1	1[5]	1						
Accipitridae	*Aquila audax*	Wedge-tailed Eagle				1		1								1								SED, WE02
Artamidae	*Artamus cinereus*	Black-faced Woodswallow		1	1[5]	1		1[5]		1	1	1[5]	1	1	1		1[4]							SED, WE02[5], CWM05, DD[5]
Psittacidae	*Barnardius zonarius zonarius*	Australian Ringneck								1[5]		1[5]												NED track, WE02[5]
Anatidae	*Biziura lobata*	Musk Duck	SA Rare																					AD (male), NED (female) new record
Cacatudiae	*Cacatua sanguinea*	Little Corella							1															
Acanthizidae	*Calamanthus campestris*	Rufous Fieldwren		1[5]	1[5]		1	1[5]	1[5]					1		1	1[5]							LFAIR, WE02,
Cuculidae	*Chalcites basalis*	Horsefield's Bronze-cuckoo																						WE02

Family	*Species*	Common Name	Status	Site																				Opportunistic observation locations[1]
				1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	18	19	20	21	22	
Anatidae	*Chenonetta jubata*	Australian Wood Duck																						SED, DD[5],
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow								1														Dd?
Cinclosomatidae	*Cinclosoma cinnamomeum*	Cinnamon Quailthrush									1												1	WE02
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike																						SED
Corvidae	*Corvus coronoides*	Australian Raven		1[5]	1[5]	1	1[5]	1[5]	1[5]	1[5]		1[5]	1		1		1[5]	1				1		CMW05, SED, DD[5], WE02[5]
Phasianidae	*Coturnix pectoralis*	Stubble Quail																	1					
Artamidae	*Cracticus torquatus*	Grey Butcherbird			1[5]					1[5]		1[5]								1				WE02[5],
Anatidae	*Cygnus atratus*	Black Swan																						NED, DD
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoe Bird										1[5]						1						
Casuariidae	*Dromaius novaehollandiae*	Emu									1[2]							1	1[2]	1[2]	1[2]	1	1[2]	7@S21, WE02[5], CMW05,
Ardeidae	*Egretta novaehollandiae*	White-faced Heron										1[5]												
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel								1[5]	1													NED, SED, DD[5]
Cacatudiae	*Eolophus roseicapilla*	Galah				1						1		1							1			AD, CMW05, DD[5]
Meliphagidae	*Epthianura aurifrons*	Orange Chat		1								1[5]												SED, DD[5], WE02[5]

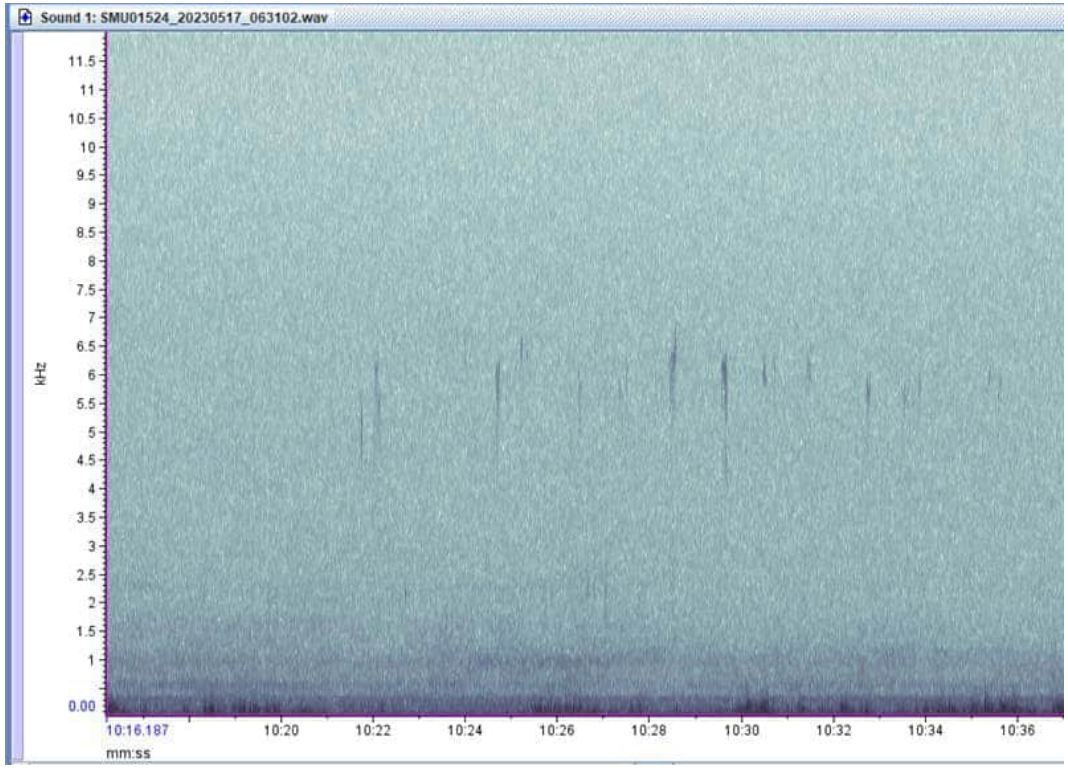
Family	*Species*	Common Name	Status	Site																				Opportunistic observation locations[1]
				1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	18	19	20	21	22	
Falconidaeeurasion coot	*Falco berigora*	Brown Falcon				1																		WE02
Falconidae	*Falco cenchroides*	Nankeen Kestrel			1			1					1					1						SED, KR,
Falconidae	*Falco peregrinus*	Peregrine Falcon	**SA Rare**				1			1														
Rallidae	*Fulica atra*	Eurasian Coot																						NED, SED
Meliphagidae	*Gavicalis virescens*	Singing Honeyeater		1[5]	1			1[5]	1[5]	1	1	1[5]	1		1		1[5]		1	1		1	1	EVEIA, NED, SED, WAT!&, WE02[5], YHS, NED creek, CWM05
Acanthizidae	*Gerygone fusca*	Western Gerygone	**SA Rare**																	1				New record
Monarchidae	*Grallina cyanoleuca*	Magpie-lark									1													
Artamidae	*Gymnorhina tibicen*	Australian Magpie			1[5]			1[5]		1[5]		1[5]					1[5]							YHS, WE025
Hirundinidae	*Hirundo neoxena*	Welcome Swallow		1[5]								1[5]					1							DD[5], AD, EVEIA, NED, SED, WE02[5]
Cacatudiae	*Lophochroa leadbeateri mollis*	Major Mitchell / Pink Cockatoo	**SA Rare**																					CWM05 / WAR Mulga Dunes, new record flock
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck																						NED
Maluridae	*Malurus assimilis assimilis*	Purple-backed (was Variegated) Fairywren										1						1	1			1		NED, CWMO5

Family	*Species*	Common Name	Status	Site																				Opportunistic observation locations[1]
				1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	18	19	20	21	22	
Maluridae	*Malurus leucopterus*	White-winged Fairywren		1[5]	1	1		1[5]	1	1[5]		1[5]		1	1		1[5]	1				1		WE02[5]
Maluridae	*Malurus splendens*	Splendid Fairywren																				1		WE02[5]
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner																						WE02[5], CWM05
Accipitridae	*Milvus migrans*	Black Kite										S M												
Monarchidae	*Myiagra inquieta*	Restless Flycatcher	**SA Rare**															1						SED, new record
Psittacidae	*Neophema chrysostoma*	Blue-winged Parrot	**AUS VULNERABLE**					S M		S M							1[5]							4 records, different days
Psittacidae	*Neopsephotus bourkii*	Bourke's Parrot				S M			S M															WE02 (group of 4)[5]
Psittacidae	*Northiella haematogaster haematogaster*	Blue Bonnet																						SED, WE02[5]
Columbidae	*Ocyphaps lophotes*	Crested Pigeon								1	1							1			1		1	EV EIA, SED, WAT17, KR, DD[5], WE02[5]
Oreoicidae	*Oreoica gutturalis*	Crested Bellbird																					1	NED
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler										S M								1				
Pardalotidae	*Pardalotus striatus*	Striated Pardalote																						WAT17, YHS
Passeridae	*Passer domesticus*	House Sparrow				1																		SED, TJ EIA, EV EIA, Admin, DD[5]

Family	*Species*	Common Name	Status	Site																					Opportunistic observation locations[1]
				1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	18	19	20	21	22		
Hirundinidae	*Petrochelidon ariel*	Fairy Martin																							
Petroicidae	*Petroica goodenovii*	Red-capped Robin										1					1			1			1		EV EIA, NED, SED, WE02[5]
Columbidae	*Phaps chalcoptera*	Common Bronzewing																							WE02[5], NED creek
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe																							SED
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler										SM			1		1	1							SED, WE02[5],
Rallidae	*Porzana fluminea*	Australian Spotted Crake																							TV EIA
Psittacidae	*Psephotus varius*	Mulga Parrot								SM		SM								1					SED, NED Creek
Psophodidae	*Psophodes cristatus*	Chirruping Wedgebill										1													
Meliphagidae	*Ptilotula penicilata*	White-plumed honeyeater																							SED
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail										SM													
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail			1					1[5]	1						1	1							EV EIA, NED, SED, KR, LFA AIR, DD[5], WE02[5], NED Creek
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe																							AD, NED, SED, DD[5]
Estrildidae	*Taeniopygia guttata*	Zebra Finch		1				1[5]			1	SM	1				SM	1		1	1	1	1		AD, NED, SED, WE02[5], YHS,

Family	*Species*	Common Name	Status	Site																				Opportunistic observation locations[1]
				1	2	3	4	5	6	7	9	10	11	12	13	15	16	17	18	19	20	21	22	
																								DD[5], NED Creek, CWM05
Rallidae	*Tribonyx ventralis*	Black-tailed Native Hen																						SED, TJ EIA
Charadriidae	*Vanellus tricolor*	Banded Lapwing															1					1		
	Total observations bird species per opp site																							129 (opp only)
	Total number of species	67		11	11	8	4	10	6	14	10	18	6	5	6	3	13	13	5	10	4	9	7	173 (at bird survey sites)

[1]Opportunistic observation locations: South Eliza Dam (SED), North Eliza Dam (NED), Dawson Dam (DD), Exploration Village (EV), Tjungu Village (TV), Western Access Road (WAR), Exploration Village Effluent Irrigation Area (EVEIA), Tjungu Village Effluent Irrigation Area (TVEIA), Southern Access Road (SAR), Myall Creek near SED (MC), Northern Wellfield Road (NW), Khamsin Rd (KR) – road to site 1 and 2, Waste Rock Stockpile (WRS), CWM02/CWM03/CWM06 (weed monitoring site), Wellfield Expansion RAM02 (WE020; [2] Tracks/scats [3]Also observed on camera trap (CT); [4]Juveniles present; [5] Observed plus Song meter detection.; SM = Song meter detection only; Note '1' denotes present, not counts of individuals.



Blue-winged Parrot site CAR016 (song meter harmonic)

Appendix I Landscape Function Analysis Additional Information

I1 LFA Assessment Methods

Multiple methods can be used to assess LFA Bank & Trough Method (or 'Mine Site Rehabilitation'), and the 'LFA Established Method' with an optional Point-Centred Quarter (PCQ) method.

LFA Bank and Trough Method

This method is recommended for the early stage of rehabilitation. The early stages of rehabilitation are characterised by the initial ripping of furrows, the banks and troughs of the furrows are distinct, and plants are largely absent. This method was applied at the newly established Midway Quarry and Tjungu sites.

Soil, sheet and wind erosion reduces the bank height and causes debris, seeds and water to accumulate in the troughs. It is anticipated that the accumulation of resources in troughs would facilitate germination. Troughs over 10 cm in depth were considered to provide a more stable microclimate for resources to accumulate, plants to germinate, and form 'patches'. Over time, troughs become shallower and wider, providing a less stable microclimate for the accumulation of resources (Figure 1). Once the trough depth falls below 10 cm in depth, its ability to facilitate the accumulation of resources is considered to have deteriorated. Instead, resources tend to be transported and is defined as an 'interpatch'.

In 2023, at both the Midway Quarry and the Tjungu site, the method was switched from the Bank and Trough to the Established Method. At the Midway Quarry sights, the troughs had levelled out and were less than 10 cm deep. At the Tjungu site, considerable plant establishment had occurred in 2023.

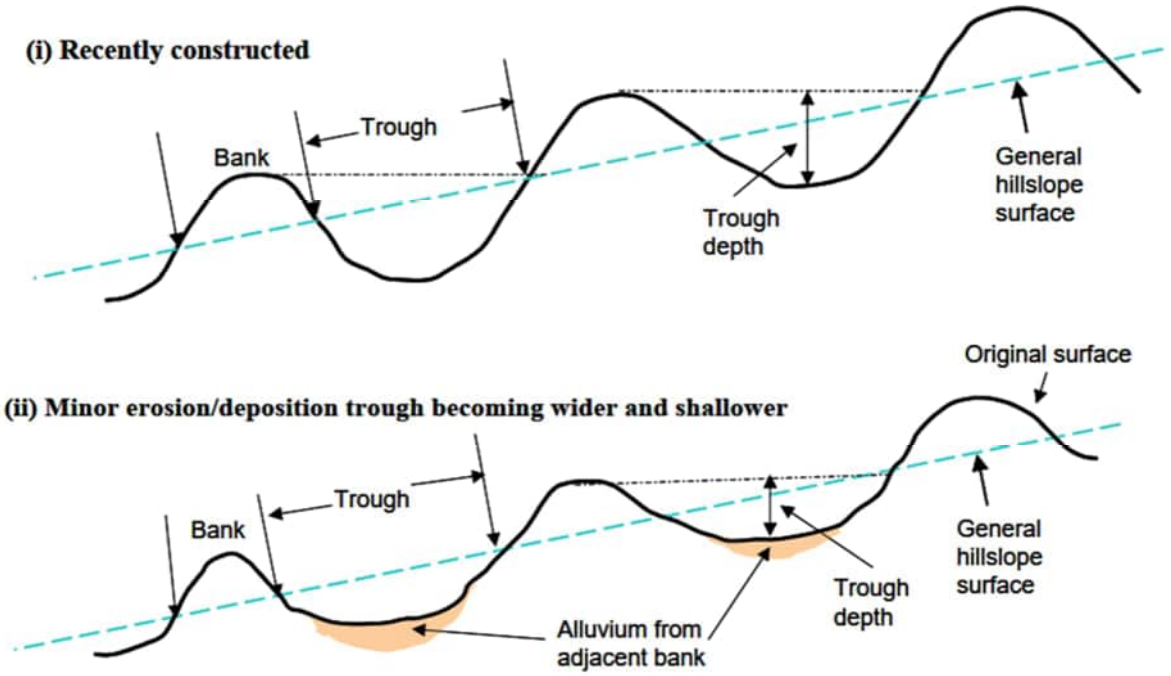


Figure 1: (i) the initial Bank & Trough structure following initial ripping of furrows; (ii) As figure (i), showing the erosion process over time (Figure 29 & 30 in Tongway and Hindley 2005).

LFA Established Method

In 2023 all sites were surveyed using the established method (see above LFA Bank and Trough Method)

In the Established Method, a patch is classified as a perennial plant (or other resource-accumulator such as litter, logs), and an interpatch is the area of un-vegetated bare soil between patches where resources exit (Refer Figure 2) (EBS 2013, 2014; Tongway and Hindley, 2005). For a plant to be classed as a 'patch', the transect line must pass through or over the foliage of a plant or grass butt, in accordance with the LFA manual (Tongway & Hindley 2005).

The LFA Established Method was used by EBS to characterise the Analogue sites (EBS 2013, 2014).

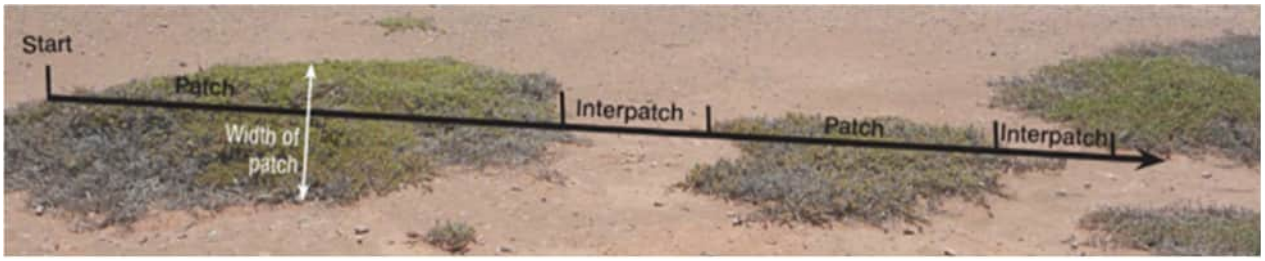


Figure 2: Example of how to collect Landscape Organisation data for the Established method (as per data collection by EBS at the Analogue benchmark sites) (DMITRE 2013).

The Point-Centred Quarter (PCQ) method

In areas where plants are present in low abundance, or clumped, and difficult to representatively sample along a transect, vegetation can be systematically sampled using the Point-centred Quarter (PCQ) method (Tongway and Hindley 2004).

The Point-centred Quarter (PCQ) method samples vegetation within four quarters around the transect at a number of points along the transect. In this survey the PCQ method was applied at regular intervals along the transect: 10 m, 20 m, 30 m, 40 m and 50 m (the start of the transect line was excluded due to its proximity to pre-existing established vegetation outside of the rehabilitation area).

At each sampling point, the species of the nearest perennial and biennial plant was recorded in each of the four quarters. Only plants up to 10 m from the point were recorded to avoid recording a single plant twice (i.e. at different sampling points along the same transect) (refer figure 3). No data was recorded for a quarter where there were no perennial plants within 10 m of the sample point.

The Point-centred Quarter (PCQ) method was applied for the first time during the Spring 2020 survey.

For the 2023 survey, two indicators for vegetation development / growth using the PCQ method were: mean distance between plants, and density of plants per m2. Over time, it is anticipated that the mean distance between plants would decrease (as more plants become established), while the plant density would increase.

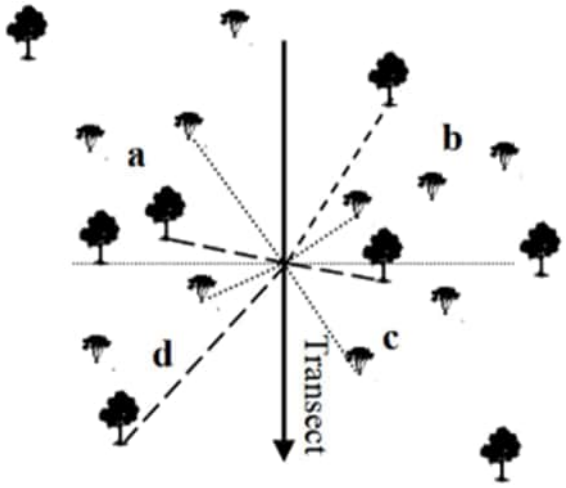


Figure 3: The Point-centred Quarter method of sampling from a single point (Figure 53 in Tongway and Hindley, 2005).

Soil surface assessment

Both the LFA Bank and Trough Method and the LFA Established Method use 11 indicators to assesses soil surface processes. These indicators are consolidated into three measures of landscape function: Stability, Infiltration and Nutrient cycling. These three measures can be used to assess the improvement of a site towards sustainability (Tongway and Hindley 2005).

I2 Additional Data and Photos

Aerodrome Laydown, transect 1A (LFA01-AL1A)

Plate 1 Rehabilitation site Aero Laydown, transect 1A (LFA01-AL1A). Photo taken at the start of the transect, facing north (2022).

Plate 2 Photo taken at the start of the transect, facing north (2023).

Note native *Cullen* species (Scurf Pea) present off transect in 2022 and 2023.

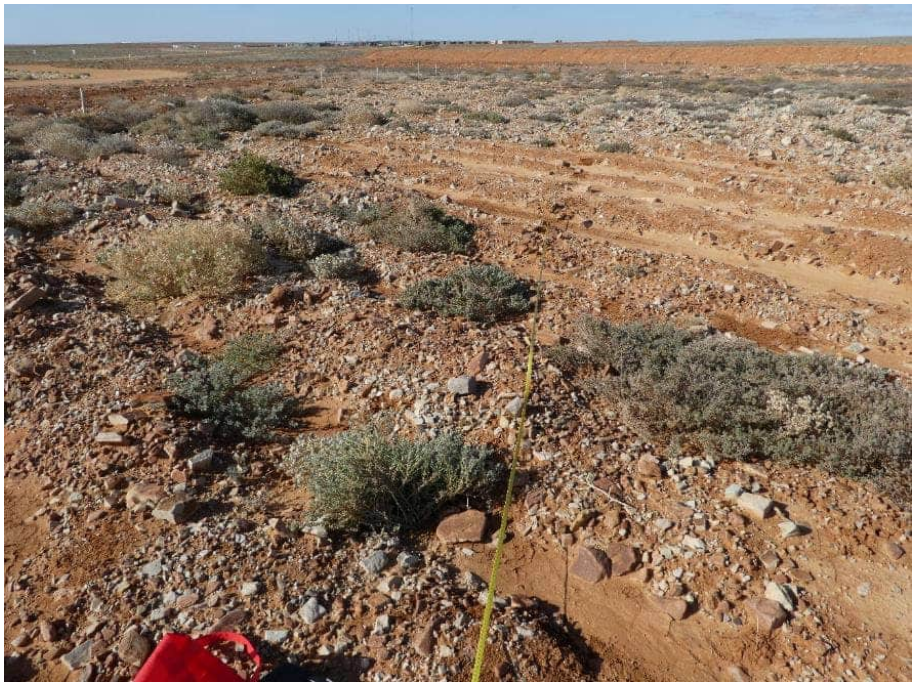


Plate 3 Rehabilitation site Aero Laydown, transect 1A (LFA01-AL1A). Photo taken at the start of the transect, facing north (2022)

Plate 4 Photo taken at the end of the transect, facing south (2023)

Zones and Soil Surface - Aero Laydown transect 1A (LFA01-AL1A)

Zone	Mean Zone Length (m)		% of total transect		Soil Surface Assessment Indices (autumn 2023)		
	2022	2023	2022	2023	Stability	Infiltration	Nutrients
Rocky	1.9	1.4	79.0	70.6	38.3	25.2	14.0
Plant/s	0.5	0.6	21.0	29.4	50	53.0	53.8

LFA Established Method Indices- Aero Laydown transect 1A (LFA01-AL1A)

Attribute / indices	Value 2022	Value 2023
Number of Patches/10m	3.90	4.8
Total Patch Area (m2)	10.20	24.9
Patch Area Index	0.02	0.05
Landscape Organisation Index	0.21	0.29
Average Interpatch Length (m)	1.91	1.41

Aerodrome Laydown, transect 1B (LFA01-AL1B)

Plate 5 Rehabilitation site Aero Laydown, transect 1B (LFA01-AL1B). Photo taken at the start of the transect, facing north (2022).

Plate 5 Rehabilitation site Aero Laydown, transect 1B (LFA01-AL1B). Photo taken at the start of the transect, facing north (2023).

Plate 6 Transect 1B. From 50 m mark facing start. May 2023

Zones and Soil Surface - Aero Laydown, transect 1B (LFA01-AL1B)

Zone	Mean Zone Length (m)		% of total transect		Soil Surface Assessment Indices (Autumn 2023)		
	2022	2023	2022	2023	Stability	Infiltration	Nutrients
Rocky	2.7	4.8	85.3	95.6	36.6	24.1	13.3
Plants	0.5	0.2	14.7	4.4	2.2	2.3	2.4

LFA Established Method Indices- Aero Laydown, transect 1B (LFA01-AL1B)

Attribute/indices	Value 2022	Value 2023
Number of Patches/10m	3.20	1.8
Total Patch Area (m2)	2.50	1.4
Patch Area Index	0.01	0.0
Landscape Organisation Index	0.15	0.04
Average Interpatch Length (m)	2.68	4.78

Ventia, transect 2A (LFA02-VOL2A)

Plate 7 Rehabilitation site Ventia, transect 2A (LFA02-VOL2A). Photo taken at the start of the transect, facing north (2022).

Plate 8 Transect 2A (LFA02-VOL2A). Photo taken at the start of the transect, facing north (2023).

Plate 9 Transect 2A. From end facing start. May 2023

Zones and Soil Surface – Ventia transect 2A (LFA02-VOL2A)

Zone	Mean Zone Length (m)		% of total transect		Soil Surface Assessment Indices (Autumn 2023)		
	2022	2023	2022	2023	Stability	Infiltration	Nutrients
Rocky	11.5	4.9	91.6	96.9	40.8	23.9	9.3
Plants	1.4	0.2	8.4	3.1	37.5	35.1	16.3

LFA Established Method Indices– Ventia transect 2A (LFA02-VOL2A)

Attribute/indices	Value 2022	Value 2023
Number of Patches/10m	0.60	1.8
Total Patch Area (m2)	1.50	0.6
Patch Area Index	0.00	0.0
Landscape Organisation Index	0.08	0.03
Average Interpatch Length (m)	11.45	4.85

Ventia, transect 2B (LFA02-VOL12B)

Plate 10 Rehabilitation site Ventia, transect 2B (LFA02-VOL2B). Photo taken at the start of the transect, facing north (2022)

Plate 11 Ventia, transect 2B (LFA02-VOL2B). Photo taken at the start of the transect, facing north (2023)

Plate 12 Ventia, transect 2B (LFA02-VOL2B). Photo taken at 50m, facing start (2023)

Zones and Soil Surface – Ventia transect 2B (LFA02-VOL2B)

Zone	Mean Zone Length (m)		% of total transect		Soil Surface Assessment Indices (Autumn 2023)		
	2022	2023	2022	2023	Stability	Infiltration	Nutrients
Rocky	4.2	8.2	89.8	98.7	40.8	23.9	9.3
Plants	1.0	0.1	10.2	1.3	37.5	35.1	16.3

LFA Established Method Indices – Ventia transect 2B (LFA02-VOL2B)

Attribute/indices	Value 2022	Value 2023
Number of Patches/10m	1.10	1.0
Total Patch Area (m2)	2.40	0.2
Patch Area Index	0.01	0.0
Landscape Organisation Index	0.10	0.01
Average Interpatch Length (m)	4.14	8.23

Midway Quarry, transect 3A (LFA03-QUA3A)

Plate 13 Rehabilitation site Midway Quarry, transect 3A (LFA03 - QUA3A) start facing south east (2022)

Plate 14 Midway Quarry, transect 3A (LFA03 - QUA3A) start facing south east (2023)

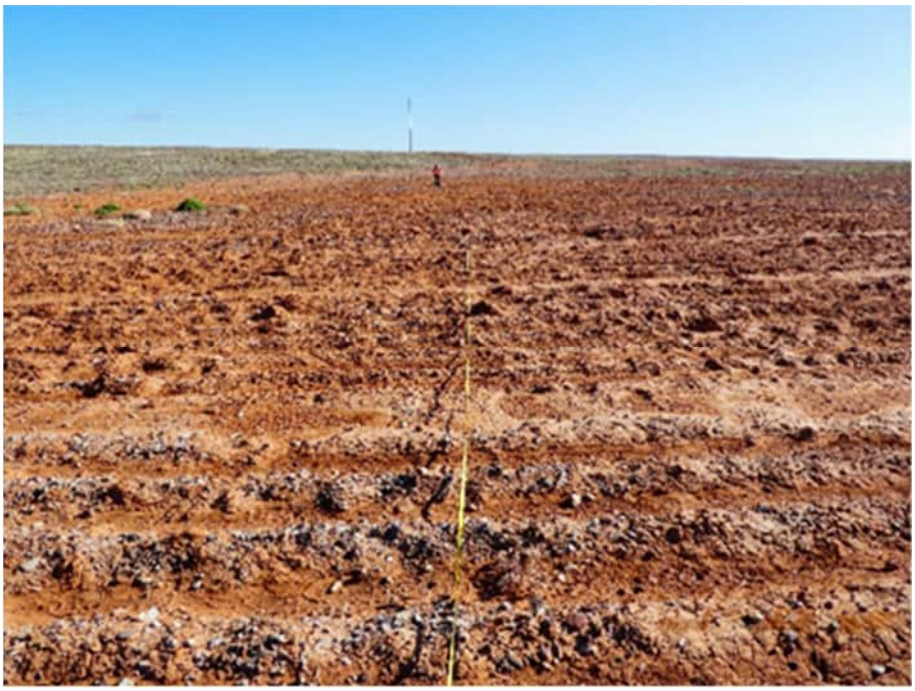


Plate 15 Midway Quarry, transect 3A from 50m start facing start (2023)

Zones and Soil Surface – Midway Quarry, transect 3A (LFA03 - QUA3A)

Zone	Mean Zone Length (m)	% of total transect	Soil Surface Assessment Indices		
			Stability	Infiltration	Nutrients
Rocky	50	100	46.7	19.8	9.3
Plant	0	0	0	0	0

LFA Established Method Indices Midway Quarry, transect 3A (LFA03 - QUA3A

Attribute/indices	Value 2023
Number of Patches/10m	0
Total Patch Area (m2)	0
Patch Area Index	0
Landscape Organisation Index	0
Average Interpatch Length (m)	50

Midway Quarry, transect 3B (LFA03-QUA3B)

Plate 16 Rehabilitation site Midway Quarry, transect 3B (LFA03 - QUA3B) start facing south east (2022)

Plate 16 Rehabilitation site Midway Quarry, transect 3B (LFA03 - QUA3B) start facing south east (2023)

Plate 17 Midway Quarry, transect 3B (LFA03 - QUA3B) 50m mark facing start (2023)

Zones and Soil Surface – Midway Quarry, transect 3B (LFA03 - QUA3B)

Zone	Mean Zone Length (m)	% of transect	Soil Surface Assessment Indices		
			Stability	Infiltration	Nutrients
Rocky	9.89	98.9	46.7	19.8	9.3
Vegetation	0.13	1.1	47.5	23.3	14.0

LFA Established Method Indices – Midway Quarry, transect 3B (LFA03 - QUA3B)

Attribute/indices	Value
Number of Patches/10m	0.8
Total Patch Area (m2)	0.2
Patch Area Index	0.0
Landscape Organisation Index	0.01
Average Interpatch Length (m)	9.89

Tjungu (to WAR) (LFA04-TJU4A)

Plate 18 Rehabilitation site Tjungu, transect 4A (LFA04 – TJU4A) start facing north (2022)

Plate 19 Tjungu, transect 4A (LFA04 – TJU4A) start facing north (2023)

Plate 19 Tjungu, transect 4A (LFA04 – TJU4A) facing start from 50m (2023)

Zones and Soil Surface – Tjungu, transect 4A (LFA04 – TJU4A)

Zone	Mean Zone Length (m)	% of transect	Soil Surface Assessment Indices		
			Stability	Infiltration	Nutrients
Rocky	1.61	86.8	45.0	21.6	14.0
Plants	0.25	13.2	47.5	26.8	20.9

LFA Established Method Indices - Tjungu, transect 4A (LFA04 – TJU4A)

Attribute/indices	Value
Number of Patches/10m	5.2
Total Patch Area (m2)	3.1
Patch Area Index	0.01
Landscape Organisation Index	0.13
Average Interpatch Length (m)	1.61

Tjungu (to WAR) (LFA04-TJU4B)

Plate 20 Rehabilitation site Tjungu, transect 4B (LFA04 – TJU4B) start facing north (2022)

Plate 20 Rehabilitation site Tjungu, transect 4B (LFA04 – TJU4B) start facing north (2023)

Plate 20 Tjungu, transect 4B (LFA04 – TJU4B) facing start (2023)

Zones and Soil Surface – Tjungu, transect 4B (LFA04 – TJU4B)

Zone	Mean Zone Length (m)	% of transect	Soil Surface Assessment Indices		
			Stability	Infiltration	Nutrients
Rocky	1.45	84.4	45.0	21.6	14.0
Plants	0.28	15.6	52.5	26.8	20.9

LFA Established Method Indices - Tjungu, transect 4B (LFA04 – TJU4B)

Attribute/indices	Value
Number of Patches/10m	5.6
Total Patch Area (m2)	3.7
Patch Area Index	0.01
Landscape Organisation Index	0.16
Average Interpatch Length (m)	1.45

Appendix J Wildlife Ethics Incident Report

SOUTH AUSTRALIAN WILDLIFE ETHICS COMMITTEE

ADVERSE INCIDENT REPORT

Please submit your report immediately to the Executive Officer via email to:
DEW.WildlifeEthicsCommittee@sa.gov.au

This form is to be used when reporting an adverse event to a research or teaching project previously approved by the Wildlife Ethics Committee, in compliance with the Australian code of practice for the care and use of animals for scientific purposes 2013 (the Code) which states:

Section 2 Responsibility of institutions

2.1.5(d) guidelines must include actions required for unexpected adverse events and emergencies, including those that require welfare interventions such as the emergency treatment or humane killing of any animal, to ensure that adverse impacts on animal well-being are addressed rapidly. Such guidance should include timeframes for actions, prompt reporting to the AEC, liaison between animal carers of investigators, and circumstances where consultation with a veterinarian, the performance of a necropsy by a competent person, and access to diagnostic investigations are required.

Section2.4 Responsibility of investigators

2.4.34 Investigators must provide the following to the AEC in accordance with AEC and institutional policies and procedures (see clauses 2.2 .24 and 2.2 .32)

(ii) prompt notification of any unexpected adverse events. (See clause 2.1.5 [v] [d])

1. Project Details

AEC Project Number:	38/2022	Approval period including Existing Expiry Date:	1/09/2025
TITLE OF PROJECT: Carrapateena Ecological Monitoring			

Name of Primary Applicant Title/first name/last name	Dr Zeta Bull
Applicants Institution and Department	Jacobs Australia
Email address:	Zeta.bull@jacobs.com
Telephone:	0439358171
Report completed by: Title/first name/last name	Dr Zeta Bull
Institution and Department	Jacobs Australia
Email address and telephone	As above
Animals species/strain:	Native Rodent, small reptile (Native Rodent (*Leggadina forresti*, Forrest's Mouse);
Date of Incident:	21/9/22; 22/9/22
Approval to share information	By submitting this application I give approval for this application and any information relating to it to be shared by South Australian Animal Ethics Committees and the Animal Welfare Unit within the Department for Environment and Water for the purposes of administration, approval and monitoring. X Yes

Your answers to the following questions will help the Wildlife Ethics Committee (WEC) to determine why the incident occurred (if known) and what has (or will be) done to reduce the risk of future incidents.

2. Preliminary history and timeline of events.

Provide a history to date of affected animals.

NA – animals wild animals, no history details available.

3. Type of problem and number of animals affected:

Problem	Species and breed/strain	Number of Animals affected
Unexpected Death	Native Rodent, (Native Rodent (*Leggadina forresti*, Forrest's Mouse)	2
Unexpected Death		
Unplanned euthanasia		
Sick, injury, abnormal behaviour		
Environmental or husbandry problem		
Other		

4. Incident or Event Report

Reported to : (Executive Officer for the WEC)	Date	Time	Method of Reporting
DEW WEC Kerrin / Lynne	18/5/23	11.09 am	email
Describe the event or incident:	Incident 1 (18/05/23, Site 2). Team checked traps in the am between 6.45-7 am. Juvenile female Native Rodent (Forrest's Mouse, *Leggadina forresti*,) was alive when traps checked, but was cold and not very active. Placed in a calico bag, weighed, then briefly handled (sexed, measurements of ear, tail and body taken), but was dead upon release within minutes of handling. These native rodents are not long lived and are known not to be very resilient to handling. Cooler am temperatures may have added to stress from brief handling. DNA collected and animal preserved for provision to SA Museum. Incident 2 (18/05/23, Site 1). Team checked traps between 7.25-7.30 am. Adult female Native Rodent (Forrest's Mouse, *Leggadina forresti*) was alive when traps checked, and was relatively active. Placed in a calico bag, weighed, but handled less given experience with other female at site 2, but was dead upon release within minutes of handling. These native rodents are not long lived and are known not to be very resilient to handling. Cooler am temperatures may have added to stress from brief handling. DNA collected and animal preserved for provision to SA Museum.		

What observations were made in the days/hours leading up to the death(s)/event(s)?	Incident 1 – animals appeared cool, less active to usual, but temperatures were cooler the previous evening.
What supportive interventions or medications were provided in the day(s) /hours leading up to the death(s)/event(s)? (if applicable)	NA
If the animal(s) was euthanaised, what signs, forming the basis of your decision, were shown by the animal(s)?	NA
What method was used?	NA
Who performed the euthanasia?	NA

5. Describe what measures were being undertaken at the time of the event to minimise impact on the animal/s (if applicable)

Incident 1 – following normal procedure regarding extraction of animal from the pit trap, placement in calico bag, crush proof container, prior to handling to id and determine sex, weigh, take measurements.

6. Describe what measures have been undertaken, post event, to minimise a repeat of the incident or event.

Incident 1 – ongoing care when handling small mammals, particularly those that are more sensitive to handling (e.g. native rodents). Undertook trap checks earlier for the remainder of the survey (e.g. 6.30 to 7 am, using head torches), in addition to the existing toilet rolls (2) and vegetation in base of pit added more vegetation and a small piece of cloth towel for animal to snuggle into. Restrained from taking measurements for sensitive animals, immediate release to gilgaes with large cracks for animals to refuge below the ground surface.

7. Post mortem details:

Have the animal(s) been submitted for post mortem examination?	☐ Yes X No If No, please provide reason Will be provided week commencing 29 May
The post mortem has been done/is being done by:	SA Museum
A copy of the post mortem report is attached:	☐ Yes ☐ Not yet available – will forward on receipt ☐ Other: NA – confirm with SA Museum

8. Health and welfare of remaining animals

Provide a status report on the health and welfare of animals remaining in the study.

34 other fauna (27 small mammals and 7 reptiles) were handled and released without incident. Although once an animal is released back into the wild it cannot be known what there fate is. No recaptures were recorded and appeared in normal health.

9. To solve the problem is an amendment(s) to the approved protocol required?

☐ Yes X No

If yes, date submitted:

10. Summary of causes and outcomes.

Animals died following handling, potentially as a result of stress / cold temperatures (Native Rodents). Weather conditions were optimal for an Autumn survey, with some cooler temperatures and some warmer temperatures, but no extremes for the arid climate. There was no rainfall and limited wind during the survey.

Primary Applicant or Delegate	Signature	Date
Zeta Bull		26/05/2023

11. Animals offered to SA Museum Yes

Yes, will be provided week commencing 29th May, when formalin drum is returned to SA Museum.

Provide photographs of deceased animal in situ.

See below

Site 2 animal alive, was biting on glove

Forrest's Mouse preserved for SA Museum

Another mouse released on same morning at another site

Appendix E. 2023 Air Quality Monitoring Report

2023 Compliance Report

Carrapateena Air Quality Review

BHP

LATHWIDA ENVIRONMENTAL

March 2024

Final

Document Status

Version	Doc Type	Reviewed By	Approved By	Date Issued
Final	Report	Rachel Farrugia	David Winterburn	20 March 2024

Project Details

Client	OZ Minerals
Project	Carrapateena 2023 Air Quality Review
Project Number	LE23029
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Project Manager	David Winterburn
Authors	David Winterburn
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1 Introduction

1.1 Context

BHP operates the Carrapateena copper and gold mine (the Operation) in the far north of South Australia, approximately 160 km north of Port Augusta. The site operates in accordance with a Program for Environment Protection and Rehabilitation (PEPR), approved by the Government of South Australia's Department for Energy and Mining (DEM). The current, approved PEPR is MPEPR2019/026, approved on 12 November 2020 (OZ Minerals 2020). The PEPR contains a suite of Outcomes, Outcome Measurement Criteria (OMC) and Leading Indicators (LI) designed to manage the environmental and social impacts and risks associated with the Operation.

BHP commissioned Lathwida Environmental Pty Ltd (Lathwida) to review the results of monitoring undertaken on site during 2023 in the context of those Outcomes, OMCs and LIs related to air quality. This is presented across the following sections, with reference to the relevant PEPR requirement.

1.2 Data Sources

BHP provided the following information in support of this review:

- Environmental Radiation Monitoring Location (ERML) depositional dust data for 2023
- High Volume Air Sampler (HVAS) PM_{10} dust results for 2023
- Metals in dust data for June 2022 to July 2023
- Carrapateena meteorological data spreadsheet for 2023
- Data related to soil sampling (ERML16–ERML19) in the vicinity of the Tailings Storage Facility (TSF) in 2023.

2 Air Quality Compliance Review

The review of the above information was undertaken with reference to the relevant Outcome, OMCs and LIs described in MPEPR2019/026.

2.1 Public Nuisance

2.1.1 Criteria

Outcome

The Tenement Holder must during construction and operation ensure that there are no public nuisance impacts from dust and noise generated by mining operations or mining-related traffic.

Outcome Measurement Criteria

OMC PN2: Annual laboratory analysis of continuous dust deposition collected quarterly at monitoring site adjacent to Pernatty Homestead (ERML09) demonstrates dust deposition rates do not exceed 4 g/m^2/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DEC, 2005; superseded by NSW EPA, 2017). Applies during the operation of the Southern Access Road.

Leading Indicator

LI PN3: Continuous dust deposition rate monitoring undertaken at Pernatty Homestead (ERML09) is analysed monthly during construction and demonstrates a trend of continual exceedances of baseline levels of 1.6 g/m^2/month. Applies during the project construction phase only.

2.1.2 Results

OMC PN2: Not applicable

Outcome Measurement Criteria PN2 applies only during the operation of the Southern Access Road. Following the commissioning of the Western Access Road, the Southern Access Road is no longer used by BHP and management of the road has been handed back to Government of South Australia's Department for Infrastructure and Transport (DIT) and therefore compliance against this criterion was not monitored during the 2023 reporting period.

LI PN3: Not applicable

Leading Indicator PN3 applied only during the construction phase of the Southern Access Road. Following the commissioning of the Western Access Road, the Southern Access Road is no longer used by BHP and management of the road has been handed back to Government of South Australia's Department for

Infrastructure and Transport (DIT) and therefore compliance against this criterion was not monitored during the 2023 reporting period.

2.2 Air Quality

2.2.1 Criteria

Outcome

The Tenement Holder must during construction, operation and post Completion ensure no adverse change to the air quality environment as a result of particulate emissions and/or dust generated by mining operations or mining-related activities.

Outcome Measurement Criteria

OMC AQ1: Annual laboratory analysis and review of continuous dust deposition collected quarterly at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates dust deposition rates do not exceed 4 g/m^2/month (total) as per Table 7.1 of Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2017).

Leading Indicators

LI AQ4: Annual laboratory analysis of continuous metals in dust collected quarterly at sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates a rising trend in metals concentrations when compared to previous monitoring results (ERML01–ERML15). Applies during operation of the TSF.

LI AQ7: Annual soil sampling and laboratory analysis undertaken at monitoring sites adjacent to the Tailings Storage Facility (ERML16–ERML19) demonstrates a rising trend in metals concentrations when compared to previous monitoring results. Applies during operation of the TSF.

2.2.2 Results

OMC AQ1: Compliant

The average rate of dust deposition at ERML16–ERML19 (inclusive) in 2023 was 1.0 g/m^2/month. This is significantly below the OMC value of an annual average of 4 g/m^2/month in accordance with NSW EPA (2017) guidance.

In 2023, dust deposition rates generally continued the downward trend observed in the latter half of 2022 following the completion of TSF Stage 2 embankment construction works. Dust deposition rates at ERML16 (TSF North, see Figure 2.1) were highly variable throughout the year and peaked in the last quarter at 4.2 g/m^2/month, with an annual average of 2.5 g/m^2/month at this monitoring location. This is considered likely to be the result of material movements related to local construction and maintenance activities associated with the TSF and decant dam embankment and the installation of additional local seepage control measures.

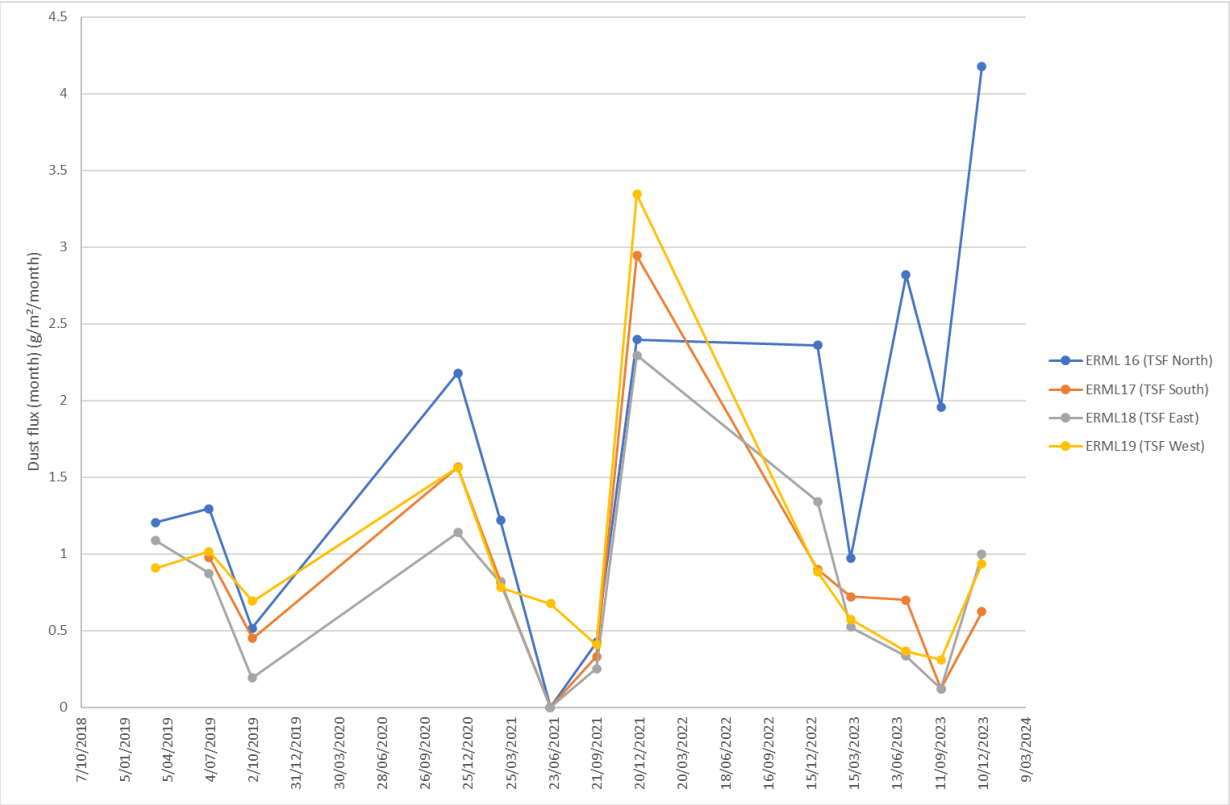

Figure 2.1: Measured Deposited Dust at the Tailing Storage Facility (2019–2023)

LI AQ4: Compliant

Metals in deposited dust concentrations were generally similar to the previous reporting period. Measured concentrations of metals are typically consistent with pre-operations baseline concentrations with the exception of chromium, copper and nickel. Whilst these metals concentrations are elevated compared to those recorded during baseline monitoring, they remain consistent with previous reporting periods, and no clear trends regarding rising concentrations are observed.

Metals in dust from sites ERML16–ERML19 inclusive are compared to long-term average metal in dust concentrations and baseline concentrations from ERML01–ERML15 in Table 2.1. Metals concentrations at sites around the TSF continue to be, in general, elevated compared to other monitoring sites across the operation.

Table 2.1: Metals in Deposited Dust (ERML16–ERML19, 2023, versus Baseline)

Metal (mg/g)	2018–19		2020		2021		2022		2023		Baseline Range
	(ERML01–15)	(ERML16–19)	(ERML01–15)	(ERML16–19)	(ERML01–15)	(ERML16–19)	(ERML01–15)	(ERML16–19)	(ERML01-15)	ERML16-19)	
Arsenic	0.0031–0.0051	0.0046–0.0054	0.0037–0.015	0.0064–0.0083	0.0026–0.0183	0.0093–0.0156	0.0018–0.0153	0.0063–0.010	0.0019-0.0171	0.0060-0.0152	0.001–0.1084
Chromium	0.022–0.066	0.38–0.7	0.028–0.20	0.12–0.18	0.0124–0.3544	0.1181–0.2612	0.0111–0.193	0.0834–0.197	0.0070-0.2710	0.0870-0.4150	0.009–0.092
Cobalt	0.0045–0.0081	0.01–0.015	0.005–0.027	0.0093–0.013	0.0025–0.365	0.0114–0.0201	0.0015–0.0479	0.0105–0.0163	0.0012-0.0663	0.0070-0.0221	0.0018–0.1893
Lead	0.13–4.0	0.37–0.81	0.12–3.3	0.58–0.89	0.1681–5.0295	0.2729–3.2112	0.0692–1.27	0.387–0.497	0.0599-0.9220	0.2920-0.8100	0.024–20.0
Molybdenum	0.0008–0.0051	0.0047–0.01	0.17–0.7	0.27–0.47	0.0019–0.0115	0.0052–0.0075	<0.0026–0.0070	<0.0028–0.0045	0.0014-0.0135	0.0035-<0.0074	0.0012–0.1097
Nickel	0.032–0.12	0.024–0.37	0.029–0.13	0.082–0.11	0.0250–0.3974	0.1789–0.2837	0.0149–0.154	0.104–0.0168	0.0096-0.2520	0.0920-0.3840	0.009–0.21
Selenium	0.0012–0.0064	0.0018–0.0028	0.0012–0.004	0.0019–0.0023	0.0015–0.0233	0.0026–0.0039	<0.0020–0.0412	<0.0029–<0.0034	0.0012-0.0084	0.0031-<0.012	0.0018–0.1596
Thorium	0.0011–0.0056	0.0049–0.0071	0.47–1.3	0.86–1.2	0.0003–0.0041	0.0013–0.0032	<0.0004–0.0064	0.0034–0.0054	0.0015-0.0201	0.0032-0.0129	0.0003–0.3806
Titanium	0.056–0.29	0.46–0.67	0.22–0.62	0.5–0.66	0.0153–0.1557	0.0600–0.1427	0.0237–0.171	0.0597–0.123	0.0206-0.2360	0.1140-0.2360	0.014–2.11
Uranium	0.0003–0.0011	0.0007–<0.002	0.06–0.64	0.083–0.13	0.0001–0.0057	0.0010–0.0020	<0.0002–0.0076	<0.0007–0.0010	0.0001-0.0160	0.0007-0.0023	0.00019–0.00158
Tungsten	<0.002–<0.007	<0.008–<0.02	0.0073–0.17	0.017–0.024	<0.00061–<0.00670	<0.00061–<0.00670	<0.0002–<0.0005	<0.0003–<0.0007	<0.0004-<0.011	<0.0026-<0.012	0.0003–0.24
Lanthanum	0.005–0.014	0.005–0.014	0.84–4.5	1.8–2	0.0014–0.0318	0.0072–0.0130	0.0013–0.0271	0.0092–0.0131	0.0008-0.0503	0.0054-0.0103	0.002–0.035
Copper	<30–<100	45 ± 39–<120	14–44	27–50	34.176–163.64	113.16–189.90	21–120	97–130	<5.9-<140	<48-<170	2–98.0

LI AQ7: Compliant

The average concentration of metals in soil sediments was presented in Appendix B1 to the MLP (OZ Minerals 2017), with sites SED2, SED6 and SED8 occurring in the Eliza Creek catchment. Comparison against monitoring undertaken during 2023 is presented in Table 2.2.

This demonstrates that measured concentrations at the ERML sites are consistent with previous reporting periods. The measured concentrations remain (generally) orders of magnitude less than the relevant National Environment Protection (Assessment of Site Contamination) Measure 1999 guidelines for commercial/industrial environments. The 2019 values are considered to represent baseline conditions at the ERML sites as no tailings deposition occurred prior to the soil sampling in 2019.

Table 2.2: Metals in Soil (ERML16–ERML19, 2023, versus Baseline)

Metal (mg/kg)	Metals in Soil					
	MLP 2017 (Appendix B1)	2019 (ERML16–19)	2020 (ERML16–19)	2021 (ERML16–19)	2022 (ERML16–19)	2023 (ERML16–19)
Arsenic	5	5	6.5	4.25	4.1	<5
Beryllium	1	1	1.1	1.05	<2	<2
Cadmium	1	0.1	<0.1	<0.1	<0.2	<0.2
Cobalt	5	9	9.6	8.67	7.3	6
Copper	9	23	22	21.5	12.6	11
Chromium	12	90	197	28.75	18.5	19
Lead	7	13	13.7	12.25	7.8	7
Manganese	171	381	346.5	305.25	252.5	260
Nickel	7	20	22.2	16.75	9.5	10
Selenium	5	2	<2.0	<2.0	<2.0	<2
Uranium	0.3	1.1	1.2	1.03	<2.0	<2
Zinc	3	56	58	56.75	28.3	32

3 Conclusion

A review of relevant 2023 air quality and soil monitoring results was undertaken in order to establish the status of compliance against relevant Outcomes, OMCs and LIs as presented in the PEPR for Carrapateena (OZ Minerals 2020). The compliance status determined from this review is:

- PN2: **Not applicable**
- PN3: **Not applicable**
- AQ1: **Compliant**
- AQ4: **Compliant**
- AQ7: **Compliant.**

This review demonstrated that all OMCs and LIs were met for the reporting period, and thus the Outcomes associated with public nuisance and air quality were achieved during 2023.

4 References

NSW EPA. 2016. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. Published January 2017. New South Wales Environment Protection Authority, New South Wales, Sydney.

OZ Minerals. 2017. *Carrapateena Project Mining Lease Proposal and Miscellaneous Purposes Licence Management Plans*, May 2017. South Australia, Adelaide.

OZ Minerals. 2020. *Carrapateena Project Program for Environment Protection and Rehabilitation. ML 6471 Mineral Lease, MPL 149 Airstrip, Workers' Accommodation Village, Access Road and Ancillary Infrastructure, MPL 152 Western Infrastructure Corridor, MPL 153 Eastern Radial Wellfield, MPL 154 Southern Access Road and Radial Wellfield, MPL 156 Northern Wellfield*, MPEPR2019/026. Dated February 2020. OZ Minerals, South Australia, Adelaide.

Appendix F. 2023 Environmental Radiation Impact Assessment

Radiation Consulting Australia
Daniel Emes, Radiation Safety Consultant
www.radiationconsulting.com

BHP

Carrapateena Project

Environmental Radiation Impact Assessment:

Non-Human Biota and Member of Public Doses

March, 2024

Prepared by: Daniel Emes
Radiation Consulting Australia

CONTENTS

1. INTRODUCTION

1.1 Purpose of this report

The purpose of this technical report is to:

- Provide an assessment of the radiation related impacts specific to non-human biota and members of the public for the existing Carrapateena operation.

The assessment of potential radiological impacts will be undertaken using the Environmental Risks from Ionising Contaminants: Assessment and Management (ERICA) Tool.

This report consists of the following:

- An outline of the relevant radiological characteristics of the operation,
- A description of the methods for the assessment,
- Assessment of the radiological impacts to representative and user-specific flora and fauna (referred to as non-human biota (NHB)), and,
- Assessment of doses to members of the public.

1.2 Overview

BHP operates the Carrapateena mine in the mid-north of South Australia. The deposit contains copper, and additionally uranium at an average concentration of approximately 240 ppm.

Low levels of uranium are associated with the orebody. The concentration of uranium is approximately 3 Bq/g head of chain.

When mining and processing is carried out with materials containing uranium, there is the potential for radiological impacts to the environment to occur. It is therefore important to measure and characterise the potential dose pathways for members of the public and non-human species present in the environment, to determine whether there are any radiological impacts, and what dose pathways may require further control.

2. ENVIRONMENTAL RADIATION IMPACT ASSESSMENT

This document assumes a basic understanding of radiation protection. An overview of key concepts is provided here for contextualization of the environmental radiation impact assessment.

The protection of the natural environment from emissions from nearby human activities has historically been based on the protection of humans. This approach was outlined by the International Commission on Radiation Protection (ICRP), which stated that "if man is protected then it can be assumed that the environment is protected" (ICRP, 1991). More recently, however, it has been generally expected that there is a need to demonstrate, rather than assume, that non-human biota living in natural habitats are protected against ionising radiation risks from radionuclides released to the environment by human activities (ARPANSA, 2014).

More recent publications (ICRP, 2014 and ARPANSA, 2015) have addressed this, and recommended that assessments be made on the impact of radiation on non-human biota. It is important to note that protection of non-human biota is demonstrated at the species level, rather than the individual level, as is the case for humans.

ARPANSA, 2015, suggests considering an as-simple-as-possible but as-complex-as-necessary approach to demonstrating protection, which assists in optimising the resources spent on the assessment and allows for a graded approach to protection. To facilitate this, a tiered approach may be used, which involves a first screening using simplified methodology and deliberately conservative (although not necessarily unrealistic) assumptions and parameter values, against a screening value of dose rate.

2.1 The ERICA Tool

The ERICA Tool was developed under the European Commission to provide a method of assessing the impact of radiological contaminants to the natural environment.

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has noted that the ERICA Tool is applicable for use in Australia (ARPANSA, 2010). The software uses changes in radionuclide concentrations and concentration ratios in species, derived from monitoring and studies, to provide an estimated dose and measure of radiological impact to a number of reference animals and plants (RAPs).

The database of the ERICA Tool has been built around a number of RAPs. Each RAP has a specified geometry, and default concentration ratio (CR) values. The geometry of an organism is represented as an ellipsoid – and by varying its axes – it can be used as a reasonable approximation for much of the existing wildlife on Earth (see Figure 2-1). Radiation damage arises due to ionisation along the path radiation takes as it passes through tissues, hence the dimensions of the organism have relevance to the degree of radiation damage that can occur. User specific organisms can be defined in ERICA, and the size and weight altered from that of RAPs.

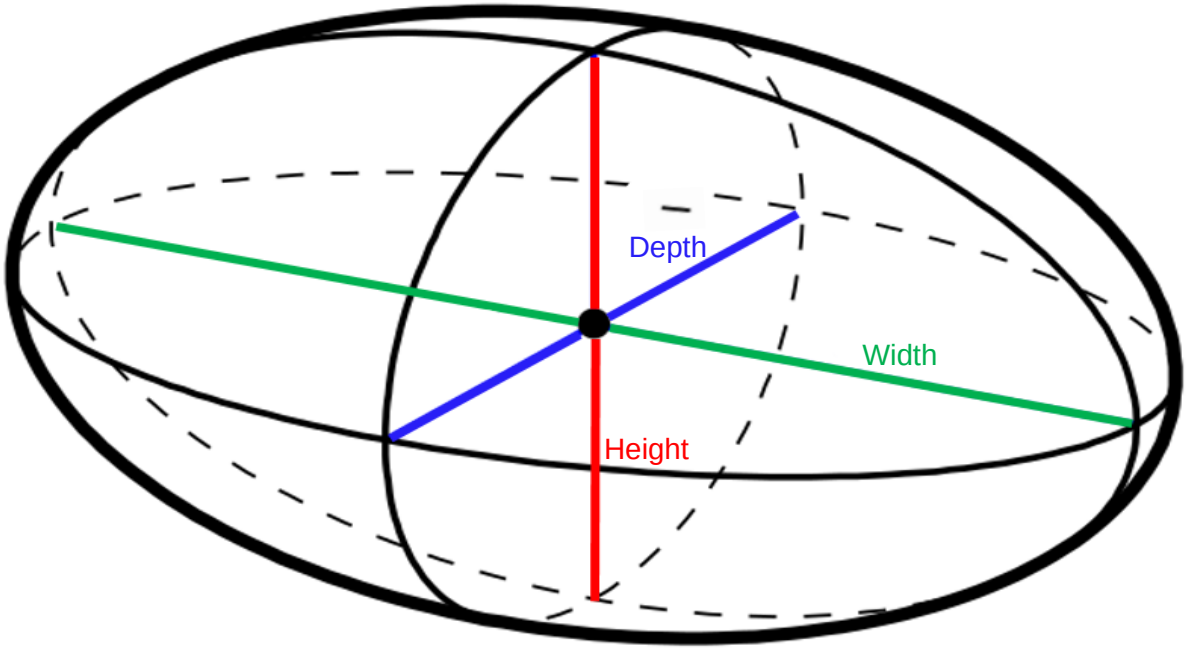

Figure 2-1: An example of an ellipsoid, which can be used to approximate the geometry of biota by varying the axes.

Some simplifications introduced when using RAPs include:

- An assumption of homogenous radionuclide distribution in the tissues of the organism (for internal dosimetry),
- Generic biological data in terms of habitat, occupancy, life cycle, and reproduction among other factors.

ERICA is a tiered assessment, and the level of assessment depends upon the level of impact (the higher the potential impact, the higher the level of scrutiny) (ARPANSA, 2010). The tiered approach aims to ensure that the level of assessment is commensurate with the level of risk. The tiers are:

- Tier 1, the first assessment level, requiring the least amount of input data. Tier 1 assessments are used to determine a risk quotient for the site, based on generic data. Where the potential impacts are higher and more data is available, a Tier 2 assessment can be conducted.

- Tier 2, which allows the user to examine and edit most of the parameters used in the calculation including concentration ratios, distribution coefficients, percentage dry weight soil or sediment, dose conversion coefficients, radiation weighting factors and occupancy factors, and results in a dose rate, rather than a risk quotient. Tier 2 assessments are primarily intended to involve a more intensive literature search to modify the assumptions of the benchmark criteria used in Tier 1 (e.g. to use site specific data or more appropriate data identified in literature).
- Tier 3, which are performed when the likely impacts need to be further defined (e.g. if doses are above screening values, or Derived Consideration Reference Levels (DCRLs)). Tier 3 offers the same flexibility as Tier 2 but allows the option to run the assessment probabilistically if the underling parameter probability distribution functions are defined.

Each assessment tier produces a dose rate which is comparable to a 'screening dose rate'. The default ERICA screening dose rate is 10 µGy/h (ARPANSA, 2015), which is the level below which no effects would be observed for even the most sensitive species (predicted no-effect dose rate).

The two important inputs for an ERICA assessment are:

- Operationally derived changes in media concentration (the additional radionuclide concentration in soils or water attributable to the operation), in units of Bq/kg or Bq/L.
- The radionuclide concentration ratios, which is the ratio of radionuclide concentrations in the media to concentrations in flora and fauna.

These inputs allow external and internal doses to be estimated for reference (or user defined) animals and plants. User defined species with specific CR value data (where available) and user specified geometry allow the user to estimate doses to specific species more accurately.

The latest version of the ERICA software was released in February 2024 (version 2.0.225) and was used in the assessment. A Tier 2 ERICA assessment was conducted because some additional concentration ratio data is available.

2.2 Initial (pre-mining) conditions

The area surrounding the Carrapateena project was extensively surveyed in 2007 (Papari Radiation Services, 2008) to determine pre-mining baseline radiological conditions in the immediate area surrounding proposed mining activities. Gamma dose rates were measured in a grid pattern over the entire study area, as well as along transects of interest. The study area and measurement locations are shown in Figure 2-2.

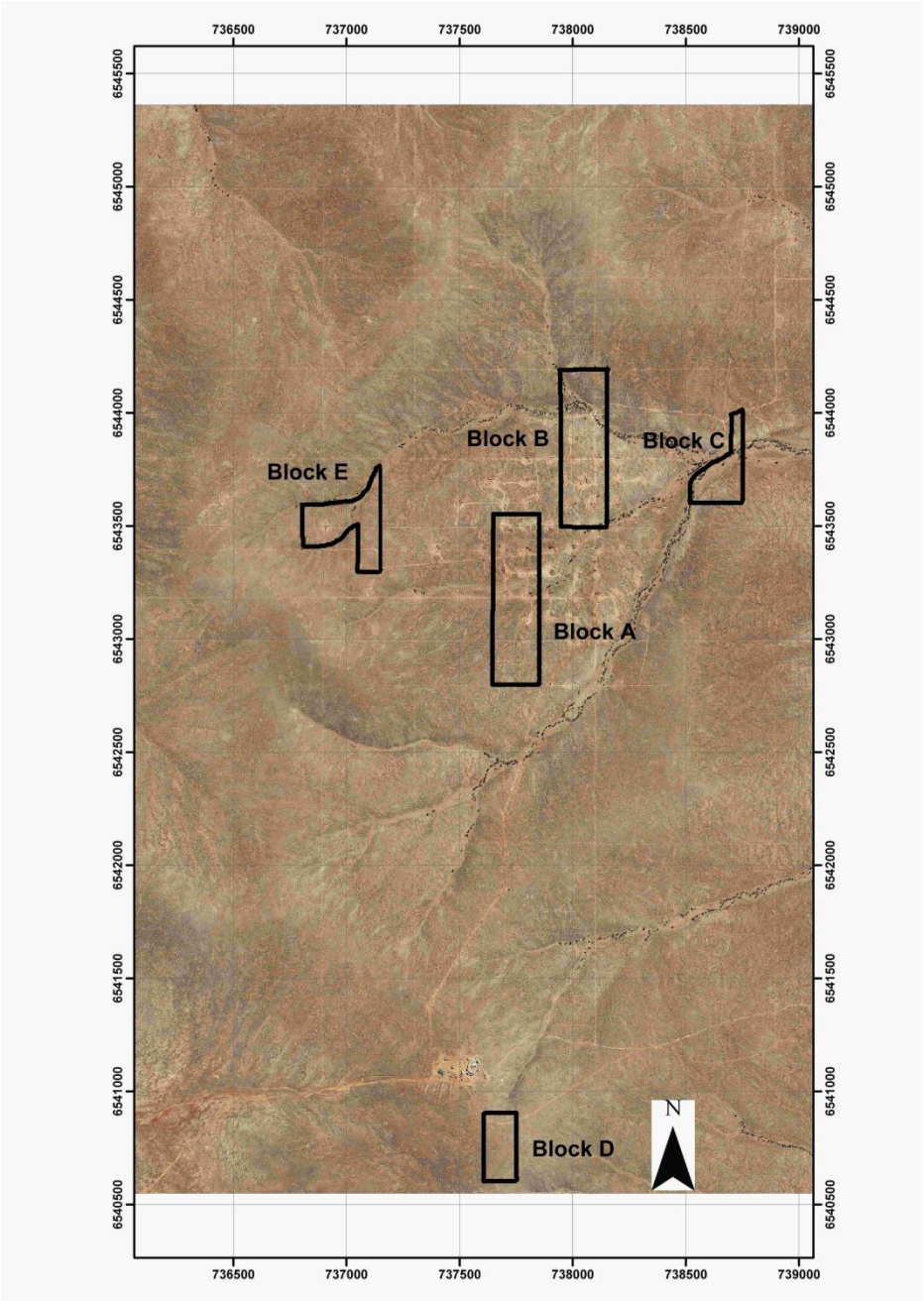

Figure 2-2: Carrapateena project area, along with monitoring locations from the 2007 survey

Gamma surveys were conducted in 2007, and the average contact dose rate was found to be 0.074 µGy/h over all measurements. This dose rate is again low compared to typical environmental levels, with the average in Australia being 0.09 µGy/h (UNSCEAR, 2000).

Measurements conducted in 2012 (JRHC, 2014) were similar. Several locations were monitored over a long-term period, with average dose rate estimated to be 0.06 µSv/h. The same locations were sampled to determine radionuclide concentrations in the soil, and the average concentration of uranium in soil was found to be 13 Bq/kg (0-2cm soil depth), equivalent to approximately 1ppm U. This concentration is low, but still typical of normal soil. For reference, the worldwide average uranium concentration is approximately 3 ppm (UNSCEAR, 2000).

The data collected from all locations showed that the radiological conditions are fairly consistent across the wider area. Uranium concentrations in soil are low compared to Australian averages, which are reflected in measured terrestrial dose rates.

Baseline data has been collected for dust over a number of years, and the most recent baseline report (JRHC, 2020) documents baseline radionuclide dust deposition data for U^{238}, Ra^{226}, Pb^{210} and Po^{210}. The average deposition rates were 0.017 Bq/m^2/month U^{238}, 0.027 Bq/m^2/month Ra^{226}, 3.04 Bq/m^2/month Pb^{210} and 2.04 Bq/m^2/month Po^{210}.

Radon monitoring was conducted as part of the same baseline study, and reported concentrations ranged from <15 to 37 Bq/m^3.

Groundwater radionuclide concentrations were measured in 2019 prior to TSF activities, with average concentrations of 0.31 Bq/L for gross alpha, 0.69 Bq/L for gross beta (excluding K^{40}), 0.19 Bq/L for Ra^{226} , and 0.69 Bq/L for Ra^{228}.

2.3 Assessment approach

Dust deposition has been monitored since the commencement of mining, at a total of 19 sites surrounding the Carrapateena deposit, mine, processing facility, camp and access roads (Figure 2-3). Dust mass varies at each site, with some of the highest sites being away from any operation activities. Dust mass per square meter per month has been calculated for each location, and ranged from 0.48 g/m^2/month to 16.08 g/m^2/month over the monitoring conducted in Q3, Q4 2022, and Q1, Q2 2023. Uranium in total dust over Q3, Q4 2022, and Q1, Q2 2023 ranged from less than 0.1 to 16 ppm (average of 1.9 ppm, where values below MDL (Minimum Detection Limit) are taken as the MDL). This resulted in an average deposition of approximately 0.03 Bq/m^2/month, and a maximum deposition of 0.22 Bq/m^2/month. Radium^{226}, Lead^{210}, and Polonium^{210} deposition rates were also able to be determined, ranging from 0.01 to 0.39 Bq/m^2/month, 1.5 to 4.8 Bq/m^2/month, and 1.1 to 8.2 Bq/m^2/month respectively (averages of 0.07 Bq/m^2/month Ra^{226}, 3.7 Bq/m^2/month Pb^{210}, and 3.1 Bq/m^2/month Po^{210}). These deposition rates are approximately double the previous year, however, are likely attributed to environmental variations (if it were due to radon emissions, Ra^{226} would not be expected to increase along with Pb^{210} and Po^{210}).

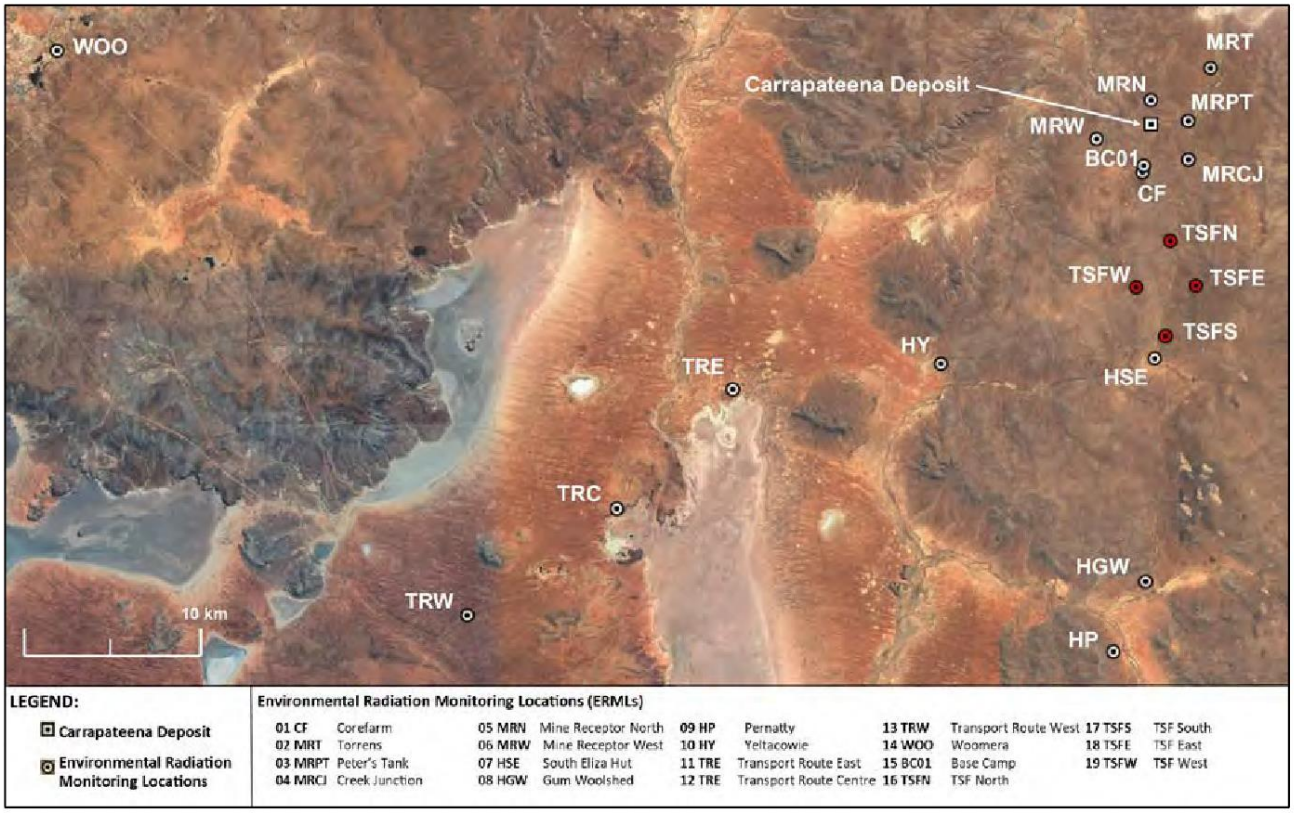

Figure 2-3: Dust deposition gauge locations Carrapateena

The difference between the approximate baseline dust and the dust measured at each location could be attributable to operational activities (dust generated by processing, mining and stockpiling activities, along with dust generated from use and maintenance of roads).

Groundwater concentrations in two of the four TSF monitoring bores have increased from baseline values determined in 2019. The concentrations for TSFMB1D have increased by approximately 10x for gross alpha, and 5x for gross beta, while the concentrations for TSFMB3S have increased by approximately 5x for gross alpha, and 10x for gross beta. Both locations previously increased in 2022. TSFMB1D has remained similar to the concentrations measured in 2022, however TSFMB3S has again increased from concentrations measured in 2022 in gross alpha and gross beta, up from approximately 2x baseline values in 2022. Although the gross alpha and gross beta are beyond trigger values for drinking water for these bores (which also occurred in some samples during baseline monitoring), the water is not for human consumption – and even in the case that it was, calculated doses would be below 1 mSv/annum in all locations. These bores will continue to be monitored quarterly.

2.4 Radiological impact of operations

If we consider that the additional dust for the site is on average 0.02 Bq/m^2/month for U^{238}, 0.04 Bq/m^2/month for Ra^{226}, 0.62 Bq/m^2/month for Pb^{210} and 1.1 Bq/m^2/month for Po^{210} (baseline data subtracted), and conservatively use this as a representative location (the median deposition result is lower than the average in this case), then over a 12 month period (the time since the majority of surface based operational activities commenced), 0.21 Bq of U^{238}, 0.51 Bq of Ra^{226}, 7.47 Bq of Pb^{210} and 13.2 Bq of Po^{210} of radionuclides, additional to baseline data, has been deposited per 1m^2. Assuming this mixes with the top 10 mm of soil evenly over time (consistent with measurements in SE Australia and in grasslands – Kaste, Heimsath and Bostick, 2007), and assuming a soil density of 1500 kg/m^3, the total additional activity in the soil can be determined. Once mixing is considered, the calculated additional concentration in soil due to deposited dust is 0.0001 Bq/g U^{238}, 0.0003 Bq/g Ra_{226}, 0.005 Bq/g Pb^{210}, and 0.0088 Bq/g Po^{210}. This assessment does not include radionuclides from the Th^{232} chain, due to the comparatively minimal concentrations of Th within the ore and processing material handled during Carrapateena operations.

Assuming unknown daughter products are in equilibrium with their relevant parent for any operationally derived dust, the soil concentrations (additional to baseline concentrations) applicable to ERICA are displayed in Table 2-1. It should be noted that radioactive daughter nuclides are included in the dose conversion coefficients of their parents if their half-lives are shorter than 10 days. The U^{235} decay chain is estimated based on the natural radio of U^{238}:U^{235} of 0.9928:0.0072. Ac^{227} was excluded from analysis due to no data being available with respect to biological uptake, but due to the low activity concentration, the effect on total dose is negligible.

Table 2-1: Increased radionuclide concentrations in soil at reference location for 2023

Radionuclide	**Increased activity concentration in soil (Bq/g)**
U^{238} Decay Chain	
U^{238}	0.0001
Th^{234}	0.0001
U^{234}	0.0001
Th^{230}	0.0001
Ra^{226}	0.0003
Pb^{210}	0.005
Po^{210}	0.0088
U^{235} Decay Chain	
U^{238}	0.000001
Pa^{231}	0.000001
Ac^{227}	0.000001
Th^{227}	0.000001
Ra^{223}	0.000001

Using the increased concentration in soils as inputs to ERICA, the output doses to RAPs can be determined (using generic CR values), and are shown in Table 2-2, with doses calculated to the 99^{th} percentile. All terrestrial RAPs available in ERICA were selected for assessment.

Table 2-2: Doses to reference animals and plants at reference location in 2023

Organism	Total dose rate per organism (µGy/h)	No effect dose threshold (µGy/h)
Amphibian (reference)	3.22E-02	10
Annelid (reference)	6.28E-02	10
Arthropod – detritivorous (reference)	8.51E-02	10
Bird (reference)	8.75E-03	10
Flying insects (reference)	2.23E-02	10
Grasses & Herbs (reference)	8.86E-02	10
Lichen & Bryophytes (reference)	8.49E-01	10
Mammal – large (reference)	2.68E-02	10
Mammal – small-burrowing (reference)	2.69E-02	10
Mollusc – gastropod (reference)	1.96E-02	10
Reptile (reference)	3.49E-02	10
Shrub (reference)	1.32E-01	10
Tree (reference)	1.68E-02	10

Some additional data was used to determine doses to some user defined plants and animals, based on estimated size, mass and occupancy data outlined in Table 2-3. Where possible Australian data was utilised (table 2-4), and has been used to determine doses to Australian plants and animals. The user defined animals and plants were selected based on the availability of Australian data, and the species used to determine doses to humans from bush tucker ingestion (see Section 3.2).

Table 2-3: User specific geometry, mass and occupancy values

Species	Geometry and mass data				Occupancy Factor
	Organism mass (kg)	Height (m)	Width (m)	Length (m)	
Red Kangaroo *(Macropus rufus)*	45.0	1.5	0.75	0.75	100% on soil
Emu *(Dromaius novaehollandiae)*	34.0	1.75	0.4	1.5	100% on soil
Sand Goanna *(Varanus gouldii)*	6	0.3	0.3	1.4	50% in soil, 50% on soil

Table 2-4: User specific CR values derived from Australian data

Species	Elemental Concentration Ratio (Bq/kg fw whole organism / Bq/kg dw soil)					Source
	U	Th	Ra	Pb	Po	
Red Kangaroo[1] *(Macropus rufus)*	0.0076	0.000136*	0.289	0.0222	0.598	ARPANSA, 2014
Emu *(Dromaius novaehollandiae)*	0.00126	0.000389	0.0362	0.0608	0.0102	Default ERICA values for reference "Bird"
Sand Goanna *(Varanus gouldii)*	2.5	0.027	0.0044*	1.2	11	ARPANSA, 2014

*Default ERICA values used where Australian data was unavailable.

Using user-specific data for these species in ERICA, doses to RAPs have been calculated to the 99th percentile, shown in Table 2-5 (using the radionuclide concentrations in soil from Table 2-1).

Table 2-5: Dose rate per organism at reference location for 2023

Organism	Total dose rate per organism (µGy/h)	No effect dose threshold (µGy/h)
Red Kangaroo *(Macropus rufus)*	6.82 E-02	10
Emu *(Dromaius novaehollandiae)*	8.78 E-03	10
Sand Goanna *(Varanus gouldii)*	2.59	10

All doses to RAPs and user-defined species in ERICA are below the screening threshold of 10 µGy/h. The screening threshold is the threshold at which even the most sensitive NHB are unlikely to suffer any population effects as a result of chronic exposure to that dose.

All doses to all species are a few orders of magnitude below the screening threshold, except for sand goannas. It should be noted that the sand goanna is very sensitive to Polonium, and as Po^{210} is varied in deposited dust, if the annual deposition slightly exceeds the baseline data, doses to the sand goanna are increased significantly in the ERICA model. The Po^{210} deposition in 2023 was within the range of baseline values, so although the dose is high compared to previous reporting years, it is unlikely to be due to operationally derived radionuclides.

Does are well below the appropriate DCRLs for each species (including sand goannas), so it can therefore be concluded that there are likely no impacts due to operationally derived radiation doses to NHB due to the current operations at Carrapateena.

3. HUMAN DOSES

3.1 Member of public dose assessment

The potential exposure pathways for members of the public are:

- Irradiation by gamma radiation,
- Inhalation of radionuclides in dust,
- Inhalation of radon, thoron and associated decay products,
- Ingestion of animals or plants that have come in contact with radionuclides released into the environment as a result of operations.

Assessments assume that a member of the public resides at the location with the highest levels of inhalable and deposited dust that has been modelled or measured at the site for a full year. This is considered conservative, as members of public are unlikely to be able to access or reside in these areas (due to the site being located in a reserve). Dust levels at accessible locations will be considerably lower. It is likely that if public exposure does occur close to or at locations that have the highest levels of inhalable and deposited dust, that exposure will occur for only a relatively short period of time (e.g. hours or days, rather than an entire year).

Gamma radiation exposures to members of the public from sources within the Carrapateena Mining Lease (ML) are considered to be negligible due to the distance between the sources and the public. The sources of gamma radiation (for example ore stockpiles) are well within the mining lease boundary and inaccessible by the public. Gamma radiation intensity reduces significantly with distance (as one divided by the distance squared, when the source is at such a distance that it can be considered to be a point source). The gamma levels in addition to natural background at the closest accessible area are unlikely to be detectable. Gamma monitoring at each location, has not shown an increase in dose rate vs control dosimeters, nor baseline data, since operations began.

Doses due to inhalable dust have been calculated based on dust concentrations measured by hi-vol air sampling. The formula to determine dust dose, as given by ICRP Publication 119 (ICRP, 2012) is:

> *Inhalation dose (mSv/y = Dust activity concentration (Bq/m^3) x breathing rate (1.0 m^3/h for members of the public) x hours per year (8,760 h/y) x Dose Conversion factor for each radionuclide (mSv/Bq)*

The radionuclide concentration in air are estimated to be < 0.0001 Bq/m^3 for U^{238} and for all associated daughter products, based on the filter concentrations from high volume air sampler (HVAS) filters used to collect dust in 2023 (accounting for background). Even if all radionuclides are assumed to be in equilibrium with the highest activity concentration found (Pb^{210}) after accounting for background, the airborne concentrations are less than 0.0001 Bq/m^3. The total dose based on dust with 0.0001 Bq/m^3 for all radionuclides is calculated in Table 3-1.

Table 3-1: Doses to members of the public due to inhalation of suspended dust

Radionuclide	**Inhalation coefficient (5 um particulates) (Sv/Bq) from ICRP 119 (Table G.1 – M type as default)**	**Dose (1.0m^3/h breathing rate, 8760 h/y occupancy) (mSv)**
U^{238} decay chain		
U^{238}	2.90E-06	2.54E-03
Th^{234}	6.60E-09	5.78E-06
Pa^{234}	3.80E-10	3.33E-07
U^{234}	3.50E-06	3.07E-03
Th^{230}	4.30E-05	3.77E-02
Ra^{226}	3.50E-06	3.07E-03
Pb^{214}	1.40E-08	1.23E-05
Bi^{214}	1.10E-06	9.64E-04
Pb^{210}	9.30E-08	8.15E-05
Bi^{210}	3.30E-06	2.89E-03
Po^{210}	2.90E-06	2.54E-03
Total Dose		**5.03E-02**

Radon, thoron and associated decay products are considered negligible for this assessment, as any radon and/or thoron will be quickly diluted in outdoor air. Monitoring conducted at all locations since commencement of mining have not detected any radon concentrations above typical background concentrations (<15 – 37 Bq/m^3) measured during baseline data collection (with the overwhelming majority of results below detection limits).

Ingestion doses for members of the public have been calculated based on the conservative assumption that all food consumed is sourced from the immediate area (where the maximum radionuclide deposition has/will occur), for example growing vegetables, and grazing cattle for consumption. It would be unlikely that all food consumed by an individual is generated solely in the area, so this provides a conservative estimate of ingestion doses. Harvesting of native plants and hunting of animals has been assessed separately in Section 3.2.

The assessment method assumes that dust emissions from the proposed operation deposit in the surrounding environment and are taken up by plants and animals. Exposure to people occurs when the plants and animals are consumed. The assessment only considers the project originated radionuclides. There are three main factors to consider when making an ingestion dose assessment; food consumption rates, concentration factors into foods, and radionuclide concentrations released into the environment from the project.

Consumption rates are based on the following consumption rates (Ridoutt, B et al. 2016):

Vegetation:

- 25.5 kg root vegetables
- 71.1 kg non-leafy vegetables
- 23.7 kg leafy vegetables

Meat:

- 81.2 kg assumed to be beef from cattle grazing in the area

The concentration ratio is a factor that relates the concentration of an element in the media (such as soil and foods) and the concentration of the element in the plant or animal. For plants, it is the ratio between the soils and the plant. For animals, it is the ratio between the food and the animals. Published factors are available in IAEA 2010 and the Compendium of Transfer Factors (DoE, 2003). For this assessment, the uptake factors used can be seen in Table 3-2.

.

Table 3-2: Elemental uptake values for vegetation and beef

Element	Vegetation* Bq/kg (dry weight)/Bq/kg (dry soil weight)			Beef Bq/kg (whole body), per Bq/d (ingested)
	Non Leafy	Leafy	Root	
Uranium	0.053	0.020	0.028	0.0003
Thorium	0.022	0.0012	0.0087	0.00004
Radium	0.061	0.091	0.071	0.0009
Polonium	0.00019	0.0074	0.077	0.005
Lead	0.015	0.080	0.063	0.0004

*The concentration ratio figures are quoted as 'dry weight'. To apply the ratios to live plant matter, a factor needs to be applied which converts the dry weight to a wet weight. For this assessment it has been conservatively assumed that the wet weight is twice the dry weight. In reality the wet weight may be 4 or 5 times higher and depends upon the plant species, so the number used is conservative.

The maximum change in radionuclide concentration in soil has been found to be 0.0001 Bq/g U^{238}. The intake of radionuclides is a function of the quantity of radionuclides in the soil, the quantity of radionuclides that transfer to the food, and the food intake. For example, to calculate the dose from consuming leafy vegetables containing U^{238} originating from operations, the calculations are as follows:

Assumed ingestion of leafy vegetables is 23.7 kg/y

The U^{238} concentration in soil is 0.0001 Bq/g

The concentration ratio for uranium for leafy vegetables is 0.02 Bq/kg (dry weight) per Bq/kg (soil); converting to wet weight gives 0.01 Bq/kg (wet weight per Bq/kg (soil)).

Plant uranium concentration is 0.01 x 0.0001, giving a U^{238} concentration of 0.000001 Bq/g.

If ingestion of leafy vegetables is assumed to be 23.7 kg/y, this gives a total ingested activity of 0.024 Bq.

Ingestion of 0.024 Bq of U^{238} gives a dose of 1 nSv (using an ingestion dose coefficient of 4.5 x10^{-8} Sv/Bq).

This calculation can be repeated for each radionuclide present for which CR data and intake-to-dose data is available (it is assumed that radionuclides are in secular equilibrium with daughter products), and doses calculated for each food type, as detailed in Table 3-3. The U^{235} decay chain has been ignored, as doses will be comparatively negligible with the natural U^{238}:U^{235} ratio. This assessment does not include radionuclides from the Th^{232} chain, due to the comparatively minimal concentrations of Th within the ore and processing material handled during Carrapateena operations.

Table 3-3: Member of the public doses from ingestion of operationally derived radionuclides

Food	Dose (mSv/year)
Leafy Vegetables	0.0035
Non-Leafy Vegetables	0.0020
Root Vegetables	0.0049
Meat (Beef)	0.0005
Total	**0.0109**

Maximum doses to members of the public can be estimated by combining each dose, as shown in Table 3-4.

Table 3-4: Maximum total dose to members of the public as a result of operational activities

Dose pathway	Estimated dose (mSv/year)
Gamma irradiation	0.0000
Inhalation of operationally derived dust	0.0503
Inhalation of operationally derived radon/thoron and associated decay products	0.0000
Consumption of food derived solely from areas with highest effects due to operationally derived radionuclides	0.0109
Total	**0.0612**

The estimated total dose to the highest exposed members of the public is approximately 0.0612 mSv/year. It should be noted, that this is with highly conservative assumptions regarding the quantity of radionuclides released to the surrounding environment, the residency of humans within the ML and that of a reserve, and assuming that a person's annual food intake is solely derived from the immediate area. Even with these conservative assumptions, the estimated doses are several orders of magnitude below the public dose limit of 1mSv/year.

Doses from locations surrounding the reference location (representing the most impacted site) are expected to be less than the doses estimated in this assessment, due to the concentrations of radionuclides in plant and meat food sources being lower than that of the site with the highest radiological impact. It has conservatively been assumed that all plant and meat sources has accumulated radionuclides to the same concentration (in reality, while cattle may graze in the highest impacted site, they will also graze on vegetation in the surrounding area containing lower concentrations of operationally derived radionuclides). Again, doses are considered very conservative, and are likely much lower in realistic exposure scenarios (bioaccumulation in animals does not occur all in one location, occupancy of members of the public will be significantly lower, and quantities of foods collected from the area ingested will be significantly lower).

3.2 Bush tucker assessment

An estimate of the potential dose from the ingestion of bush tucker has been made for people living in the region and consuming bush tucker that has biologically accumulated radionuclides at the most impacted sites. It is relevant to note that that it is unlikely that inhabitants of the region would take their entire food intake as bush tucker from the immediate region.

The method to calculate bush tucker doses is the same as the method used for assessing ingestion doses (see Section 3.1), however, in this case, more relevant data is available. The AAEC (1985) assumed a diet that consisted of an intake of 155 kg/y of plant material and 125 kg/y of animal material for traditional owners of the Maralinga lands. These consumption estimates have been used and a factor has been applied for likely bush tucker consumption rates that will occur (based on predicted occupancy in the region). ERICA derived radionuclide concentrations (based on bioaccumulation at the most impacted site, conservatively used as the reference location) given in Table 3-5 for the kangaroo and goanna have been used to estimate doses due to meat ingestion. There is no readily available published data for Australian vegetation; therefore values from IAEA 2010 have been used.

Table 3-5: ERICA outputs for activity concentrations in the kangaroo and the goanna

Isotope	Activity concentration in organism (Bq/kg)	
	Kangaroo	Goanna
U-238	7.60E-01	2.50E+02
U-235	7.60E-03	2.50E+00
Th-234	7.60E-01	2.50E+02
Th-230	4.94E-02	1.20E+00
Th-227	1.11E-01	2.70E+00
Ra-226	8.67E+01	1.32E+00
Ra-223	1.98E+02	7.96E+04
Po-210	2.98E+03	5.98E+03
Pb-210	2.22E-02	6.60E-02
Pa-231	2.72E-02	6.57E-02
Ac-227	4.26E-04	1.04E-02
Bi-210	7.98E-02	1.21E-03
Bi-214	1.05E+00	1.05E+00
Pb-214	5.89E-04	2.37E-01
Pa-234m	2.02E-04	2.02E-04
Th-231	1.11E-01	2.23E-01

The following assumptions have been made:

- It is assumed that locally sourced bush tucker (from the immediate area surrounding the mine) makes up 10% of a person's diet (therefore local vegetation is estimated to be 15.5 kg/y, and local meat ingestion is estimated to be 12.5 kg/y based on AAEC data).
- The vegetation portion of the bush tucker consists of the same ratios of consumption rates given by Ridoutt, B et al.:
    - 21% root vegetables
    - 59% non-leafy vegetables
    - 20% leafy vegetables
- The composition of the meat portion of the bush tucker consists of:
    - 90% kangaroo
    - 10% goanna

The annual bush tucker consumption estimates for this assessment are therefore:

- 14 kg of kangaroo
- 1.5 kg of goanna
- 4 kg of root vegetables
- 12 kg of non-leafy vegetables
- 4 kg of leafy vegetables

The same method that was used in Section 3.1 has been used, and results can be seen in Table 3-6.

Table 3-6: Total maximum doses from ingestion of operationally derived radionuclides contained in bush tucker

Food	**Dose (mSv/year)**
Leafy Vegetables	0.0005
Non-Leafy Vegetables	0.0003
Root Vegetables	0.0008
Meat (Kangaroo)	0.0106
Meat (Goanna)	0.0141
Total	**0.0264**

Doses from ingestion of bush tucker across each location considered in this report are expected to be less than the doses estimated in the assessment of the most impacted site, due to the concentrations of radionuclides in plant and meat food sources being lower than that of the site with the highest radiological impact. It has conservatively been assumed that all plant and meat sources has accumulated radionuclides to the same concentration (in reality, while kangaroos and goannas will spend time in the highest impacted site, they will also spend time in the surrounding area containing lower concentrations of operationally derived radionuclides).

When using the conservative assumption that bush tucker is consumed from the areas of highest operational impact at each site, and estimating that 10% of a person's diet comes from this area, total doses from ingestion are below the member of public dose limit. Realistically, doses are likely to be much lower if average radiological impact sites were to be used across the broader area (e.g. when taking occupancy factors of animals into account – kangaroos and goannas will not remain in the small area of the greatest operational impact due to their relatively large home range – Viggers & Hearn, 2005 and Green & King, 1978).

4. SUMMARY

No RAP or user defined animal or plant received a dose of above the screening dose rate of 10 µGy/h, at the reference location deemed to be conservative for the Carrapateena operations study area. This indicates that there are no impacts from a radiological perspective due to current approved operational activities.

The sand goanna received the highest potential total dose rate of any RAP or user defined animal or plant, with a total dose rate (combined from internal and external sources) predicted to be 2.59 µGy/h, under the default ERICA screening value of 10 µGy/h, the lowest DCRL band (for the most sensitive species) and the most appropriate DCRL band for the species of 40-400 µGy/h. It should be noted that the sand goanna is very sensitive to Polonium, and as Po^{210} is varied in deposited dust, if the annual deposition slightly exceeds the baseline data, doses to the sand goanna are increased significantly in the ERICA model. The Po^{210} deposition in 2023 was within the range of baseline values, so although the dose is high compared to previous reporting years, it is unlikely to be due to operationally derived radionuclides.

Dose estimates to members of the public and bush tucker consumption dose estimates are below the member of public dose limit of 1 mSv/year. Public doses are considered highly conservative, given that consumption of food from the local area is likely over estimated, the occupancy times of members of the public in the region are much higher than likely (if at all possible), and that it is unlikely that all food could be sources from the areas that represent the areas of greatest radiological uptake.

The assessment has shown that Carrapateena operations result in no radiological impacts to NHB, and to members of the public.

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Appendix G. 2023 South Gap Offset Annual Report

16 JANUARY 2024

South Gap-EPBC Offset

Annual report 2023

Nature Foundation

Contents

Abbreviations

IBRA	Interim Biogeographic Regionalisation for Australia (Region, Sub-region, Association)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EOMP	EPBC Offset Management Plan
MNES	Matters of National Environmental Significance

1. Introduction

1.1 Background

Delivery of the EPBC Act on-ground offset program on behalf of BHP at South Gap Station (central South Australia) is part-way through delivering the third year of management. The main focus of this site is to protect the EPBC listed Plains Mouse (*Pseudomys australis*) and restore their habitat. To achieve this, we follow the EPBC Offset Management Plan (EOMP) to satisfy relevant approval conditions.

The management goals of the on-ground offset are to:

Goal 1- Establish baseline conditions, including the distribution and condition of Plains Mouse habitat, the presence and distribution of target species, and the identification and prioritisation of local threats (refer to Jacobs 2020)
Goal 2- Refine the presence, distribution, and abundance of Plains Mouse within the offset
Goal 3- Manage total predation pressure (from Cats, Foxes and possibly Wild Dogs)
Goal 4- Maintain and / or enhance the condition of the habitat for the benefit of Plains Mouse through the management of total grazing pressure and invasive weeds
Goal 5- Improve knowledge of local target species populations, including how they respond to management locally.

The EOMP presents 14 individual objectives grouped under 11 management strategies to address EPBC Act offset liability and associated legislative and policy obligations for the first 10-year period of management. This report will detail progress against these objectives for 2023.

1.2 Location and site features

The South Gap EPBC offset area is in central South Australia, approximately 100 km north of Port Augusta and 30 km south-east to the Carrapateena mine (Fig. 1). The site is adjacent to Lake Torrens. It is in the traditional country of the Kokatha people, who have strong connections to this land. The pastoral industry has utilised the landscape for the last 200 years, with sheep as the dominant stock for the area. The South Gap EPBC offset area is approximately 1882 ha in size.

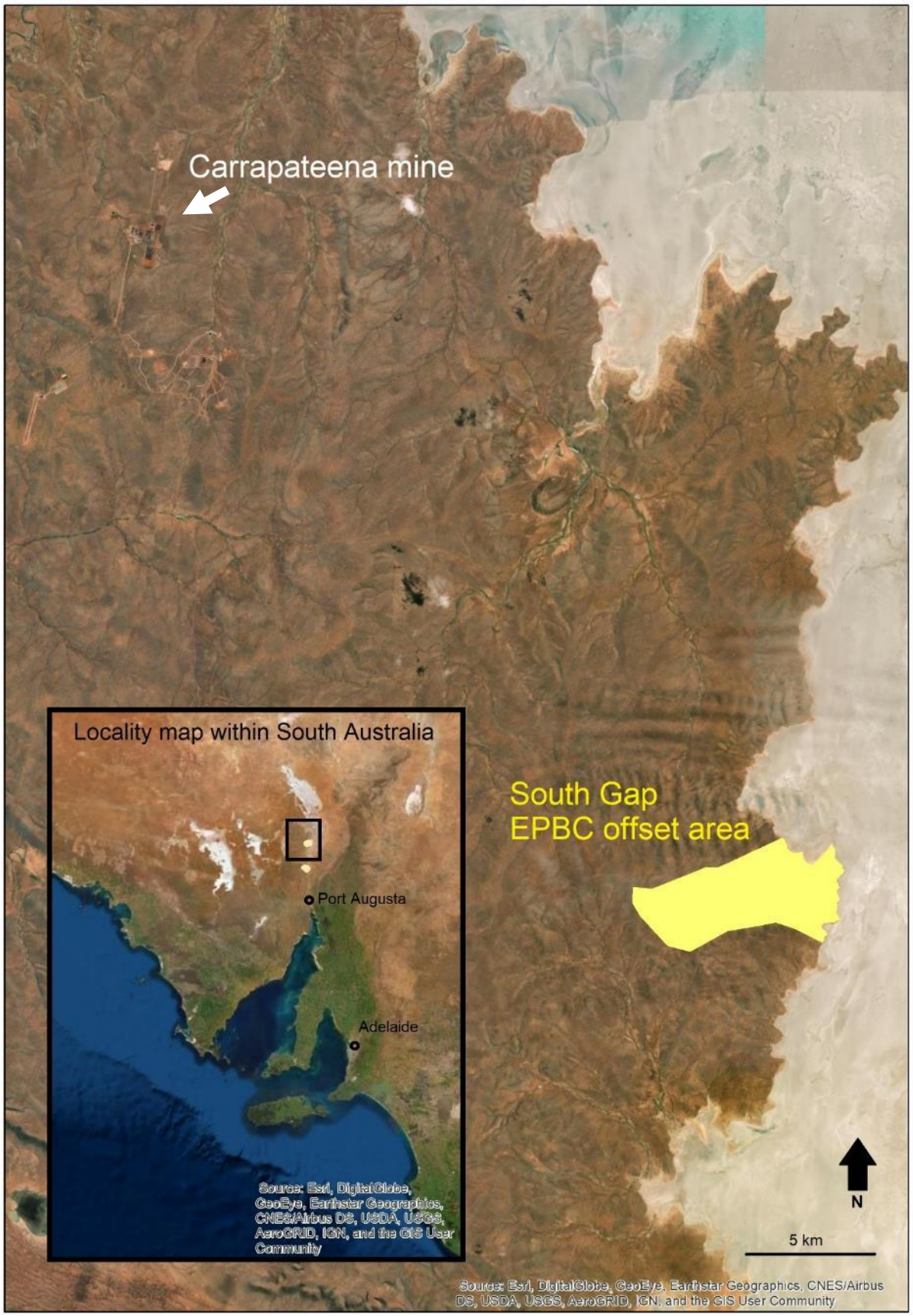

Figure 1. Location of the South Gap EPBC offset area (yellow) within South Australia

1.3 Landscape

The South Gap EPBC offset area's habitat is dominated by low plateau hills around 200m high. Vegetation is mostly low open Chenopod shrublands, interspersed with trees and shrubs along the drainage lines. The most important habitat features for the Plains Mouse (*Pseudomys australis*) are cracking clays (also known as Gilgai's).

1.4 Climate

The South Gap EPBC offset area has a semi-arid climate, with average annual rainfall of 180 mm per year (nearest BOM station, South Gap station number 016043, complete records for 1884–December 2023). So far during 2023, South Gap has recorded 206 mm of rain which would be classed as average rainfall. This follows three years of average and above average rainfall (Fig 2).

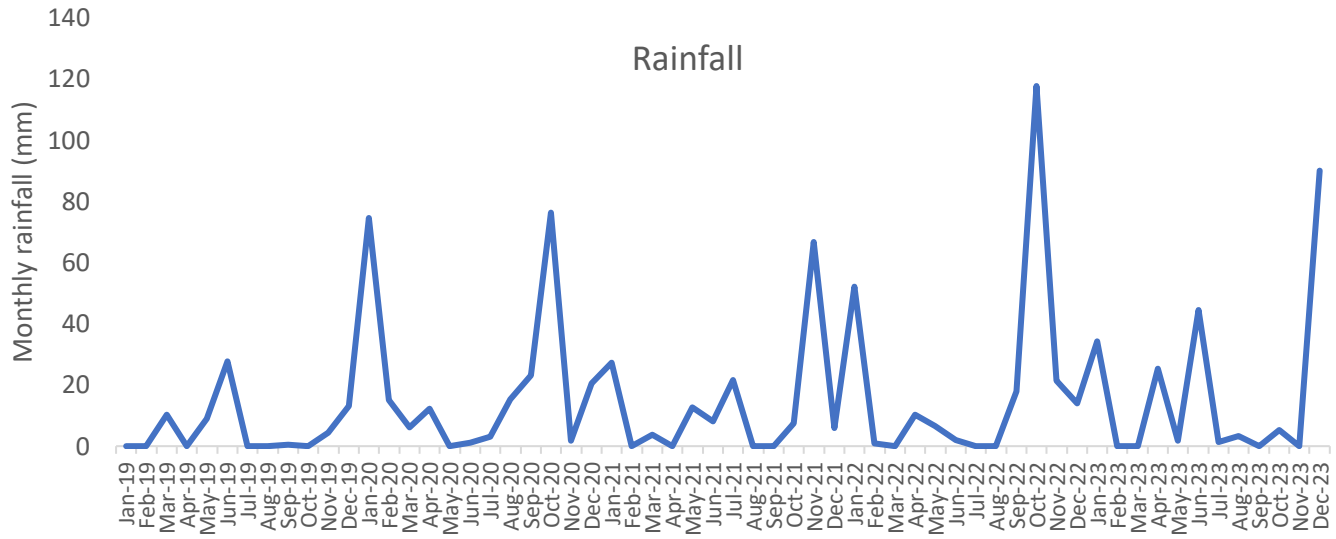

Figure 2. Rainfall from January 2019 to December 2023 from the South Gap BOM weather station (# 016043)

1.5 Conservation Values

The primary conservation value for the South Gap EPBC area is the preservation of habitat for the Plains Mouse, a threatened native rodent. This species lives in the open dry shrubland, builds small burrows, and is, on average, 55 g. This makes it within the critical weight range of mammals, where species with a body mass between 35 – 5500 g have a propensity to be threatened by feral Cats and Foxes (Johnson and Isaac 2009, Woinarski, Burbidge et al. 2015). Plains Mice are listed under Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) as a Vulnerable Matter of National Environment Significance.

Two nationally threatened species may occur on site, although there are no known recent records from the surrounding area. These are the Thick-billed grass-wren (*Amytornis modestus*) and Night Parrot (*Pezoporus occidentalis*). Other local species of note include the locally endemic Pernatty Knob-tailed Gecko (*Nephrurus deleani*), along with small native mammals like Spinifex Hopping Mouse (*Notomys alexis*) and Bolam's Mouse (*Pseudomys bolami*).

1.6 Threatening processes

Key threatening processes most likely affecting the offset areas and the Plains Mouse include:

- Predation by European Red Fox (*Vulpes vulpes*)
- Predation by Feral Cat (*Felis catus*)
- Predation by Wild Dog (*Canis* spp.)
- Competition and land degradation by European Rabbit (*Oryctolagus cuniculus*)
- Competition and land degradation by domestic stock (*Bos* spp. and *Ovis aries*)
- Competition and land degradation by feral Goats (*Capra hircus*)

2. Legislative Framework

2.1 Environment Protection and Biodiversity Conservation Act (1999)

The Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) is the primary Commonwealth legislation established to protect and manage Matters of National Environmental Significance (MNES), including nationally and internationally important flora, fauna, ecological communities, and heritage places.

The EOMP guides the delivery of an on-ground offset required to address the residual impact to Plains Mouse (Condition 3, 4 and 5) as per the EPBC Act Approval conditions (granted on 29 March 2018).

2.2 Other legislation

Other relevant legislation relating to the offset area includes the National Parks and Wildlife Act (1972), Native Title Act (1993), Aboriginal Heritage Act (1988), Landscape Act (2019) and the Pastoral Land Management and Conservation Act (1989). For more detail on these acts, refer to the EOMP.

3. Management Goals, Strategies and Objectives

Goals	**Strategies**	**Objectives** (under same acronym headings as EOMP)
Goal 1- Establish baseline conditions	Strategy 2: Improve knowledge of target species population dynamics and management	PM1: Quantify and monitor Plains Mouse habitat within the offset
Goal 2- Refine the presence, distribution, and abundance of Plains Mouse within the offset	Strategy 2: Improve knowledge of target species population dynamics and management	PM1: Quantify and monitor Plains Mouse habitat within the offset
Goal 3- Reduce predation pressure	Strategy 3: Cat control Strategy 4: Fox control Strategy 5: Wild dog control	CC1: Reduce Cat density to less than 4 Cats / 100 km within the offset area. FC1: Reduce Fox density to less than 1 Fox / 100 km within the offset area. DC1: Keep the offset area free of Wild Dogs.
Goal 4- Reduce total grazing pressure	Strategy 1: Stock management Strategy 6: Rabbit control Strategy 7: Weed control	SM1: Keep the offset area free of domestic livestock. RC1: By 2023, reduce Rabbit numbers and warrens by 80% within the offset area. RC2: Map and rip 5 km^2 of chenopod shrublands in priority areas each year for 4 yrs. WC1: By 2028, the distributions of invasive weeds (i.e. Declared and Weeds of National Significance) will be reduced.
Goal 5- Improve knowledge of local target species populations	Strategy 2: Improve knowledge of target species population dynamics and management	PM1: Quantify and monitor Plains Mouse habitat within the offset

4. Results

4.1 Goal 1 - Establish baseline conditions

4.1.1 Overview

The vegetation of the South Gap EPBC offset area is important to manage and understand. We monitor vegetation condition with annual Rangeland Assessment Method (RAM) floral surveys and Jessop transects (described in more detail below). We have also begun detailed research on cracking clay function and ecology.

4.1.2. Rangeland Assessment Method floral surveys

To record a broad measure of how vegetation condition changes through time relative to the baseline, the Botanist, Andrew Sinel, (Ecosphere Ecological Solutions) conducted the annual vegetation monitoring survey in June 2023. This consisted of Rangeland Assessment Method (RAM) floral surveys, weed assessments, and measuring vegetation structure in three Jessop transects. Also, Nature Foundation has conducted more quantitative measures of cracking clay habitat condition at extra sites. The RAM floral surveys record characteristics of vegetation structures, species composition and disturbances (Ecosphere Ecological Solutions (2023)). This is conducted at eight cracking clay sites, which have been sampled since 2019 (Clive and Fels (2020)). This allows us to compare changes against a baseline before our management. The overall broad vegetation condition at all sites was classed as ‘moderate’ (all scores were between 42 – 57 RAM score). These scores have been stable through time (Fig 3) and have not significantly changed (mixed effects linear model, coefficient -0.17, standard error = 0.46, degrees freedom =15, t=-0.37, P=0.72). Ecosphere Ecological Solutions (2023) concludes that recent good rains had resulted in abundant growth, however, this was offset by increased presence of weeds and grazing pressures. Since the creation of this offset vconditions have remained stable.

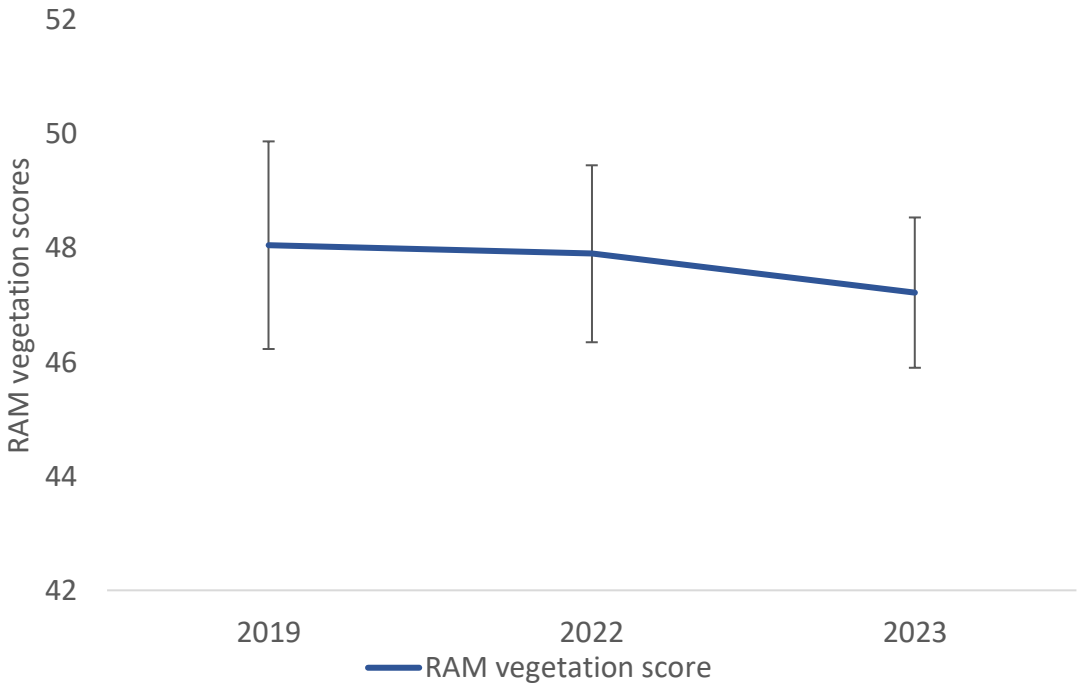

Figure 3. Trends in Rangeland Assessment Method (RAM) scores at the South Gap EPBC offset area from 2019 to 2023 at eight different sites sampled.

4.1.3 Jessup transects

Vegetation structure is measured at three permanent Jessup transects set up on the South Gap EPBC offset area. These differ from the RAM scores by having a more quantitative measure of structure. They consist of a fixed 4 m x 100 m transect, comprised of twenty smaller 10 x 2 m plots. Every shrub and grass with a stem inside the transect are identified and assigned age class (adult/juvenile). This provides density and frequency estimates of each perennial plant species for each site. Three of these sites were set during 2022, and surveyed again in 2023. This was also conducted by Dr Sinel. All three of these sites reported an increase in shrub abundance, with Bladder Saltbush (*Atriplex vesicaria*) increasing by the greatest extent at all three sites.

4.1.4 Weed assessments

Weed assessments were conducted on site. No weeds of national significance were detected. However, some annual exotic forbs were found at cracking clay sites, including Sow Thistle (*Sonchus oleraceus*), Malvastrum (*Malvastrum americanum*) and London Rocket (*Sisymbrium irio*). These species are expected and are widespread across the region after heavy rainfall (Ecosphere Ecological Solutions 2023).

To limit the spread of weeds to the South Gap EPBC offset area, vehicles are washed down before and after arrival. For the Nature Foundation field ecologist based in Roxby Downs, this occurs at the Arid Recovery wash down facility at Olympic Dam.

4.1.5 Cracking clay condition

We have begun new research into the impacts of herbivore management on cracking clay habitats in 2023. In April 2023, we conducted a preliminary survey at 16 sites inside the offset area, with eight at cracking clay and eight at nearby saltbush plain sites. Each site was centered within a 3 m radius around a fixed post for consistency. At each site we measured herbivore scat volume with scales (grams), estimated the length of the cracks (total cm), measured the depth of the deepest crack with a ruler (cm), and estimated vegetation cover by dividiing the extent of each species in m^2 by the plot total area. Scat was removed from the site after recording. These surveys were intended to occur annually. However, due to a large incursion of sheep into the offset area (see 4.4), we repeated the survey in August 2023 to quantify the scale of the incursion relative to previous data. Each site has a small wooden post marking the survey center.

The condition of the cracking clay sites has decreased dramatically since the April 2023 survey (Table 1 and Fig 4). The volume of sheep scat at each site was markedly higher in August 2023, with a more substantial increase at the cracking clay sites than nearby saltbush habitat. This suggests incursion sheep are spending more time in areas of cracking clay. Whilst the volume of kangaroo scat decreased at all sites between April and August, this does not necessarily indicate a reduction in kangaroo presence. For the first survey in April, scat could have accumulated for a long time prior, yet for the second survey, scat could only have accumulated for a maximum of four months. The average crack length decreased substantially between April (571 cm), and August (57 cm) in addition to a reduction in the number of crack entrances (Table 1), with some sites observed to be entirely trampled with no remaining cracks (e.g. Fig 4). Vegetation cover in the cracking clay sites also decreased between April (24%) and August (14%), with a smaller magnitude reduction in cover being observed in the saltbush sites (Table 1). The increased sheep presence is the most probable cause of this decrease in habitat condition at cracking clay sites. However, as this is only the second survey, we cannot yet distinguish between seasonal impacts.

Table 1. Average values from sixteen sites sampled twice, spread equally between sites at cracking clay and nearby saltbush plains.

	Apr-23	Aug-23
Sheep scat (g)		
cracking clay	0	97
Saltbush	4	11
Kangaroo scat (g)		
cracking clay	59	20
Saltbush	18	15
Crack length (cm)		
cracking clay	571	57
Saltbush	0	0
Crack entrances (n)		
cracking clay	8	2
Saltbush	0	0
Vegetation cover (%)		
cracking clay	24	14
Saltbush	33	29

Figure 4. Example of one of the cracking clay sites where herbivore damage has been substantial.

These methods for measuring cracking clay conditions have thus far been able to provide useful and repeatable measurements of habitat condition. Therefore, we will set this up as a permanent monitoring technique. We aim to set up a basic herbivore-proof fence around four or more of the sites during 2024, to better tease apart grazing impacts from background seasonal changes.

4.2 Goal 2 - Presence, distribution, and abundance of Plains Mouse

We monitor Plains Mouse activity at 12 permanent remote camera sites. These consist of a remote camera (Reconyx Hyperfire 2 Professional HP2X) with adjusted focus to 90 cm placed on a star-picket facing down at a lure (PVC tube with peanut butter). A 50 x 50 cm corkboard with 10 mm gridlines was placed underneath to enable measurements of animal size. Using this guide, we can identify Plains Mice as they are the only local rodent with a head and body length 90 – 145 mm, and tail less than 125 mm (Van Dyck *et al.* 2013). The camera batteries were checked and replenished in December 2023. Two of the cameras were not operational, with one having too many false triggers and running out of battery, and the other being knocked down by inquisitive kangaroos.

We identified Plains Mice using the characteristics listed above. Images of rodents with a head and body length of approximately 90 mm were only classed as 'likely' Plains Mice. We could reliably identify to species level the spinifex hopping-mouse (*Notomys alexis*), Narrow-nosed planigale (*Planigale tenuirostris*), and desert short-tailed mouse (*Leggadina forresti*). Some individuals of the other small mammal species could be identified to species, though not all. For example, some dunnart images could be differentiated between *Sminthopsis crassicaudata* or *S. macroura*, though often not. Therefore, these species were often clumped together, along with small rodents (*P. bolami*, *P. hermanbergiensis* or *M. domesticus*).

Five Plains Mice were detected at the South Gap EPBC offset area early in 2023. Two of those five detections were only classed as 'likely' Plains Mice, as they measured around 80 mm long. This is lower than our threshold for identification, and they could either be small Plains Mice or large Bolams Mice. Despite these detections early in the year, there were no more detections from May onwards on remote cameras. This decline is likely due to the increased degradation of cracking clay habitat, discussed in the previous chapter. April is when there was a sharp increase in sheep activity on site, and there was no major increase in feral predator activity over that same time period.

The decline in Plains Mice detections from April onwards corresponds with a decline in the detection rate of all other small mammals, including Dunnarts, Spinifex Hopping-mice, and other small rodents (Fig. 5). Dunnarts consist of both the species Fat-tailed Dunnart (*Sminthopsis crassicaudata*), Stripe-faced Dunnart (*S. macroura*, and the smaller Narrow-nosed Planigale (*Planigale tenuirostris*). These Dunnarts had a peak in activity during April and May, but reduced to lower activity in spring

and summer. This pattern does not appear seasonal but would be more related to recent rainfall in an arid environment such as this.

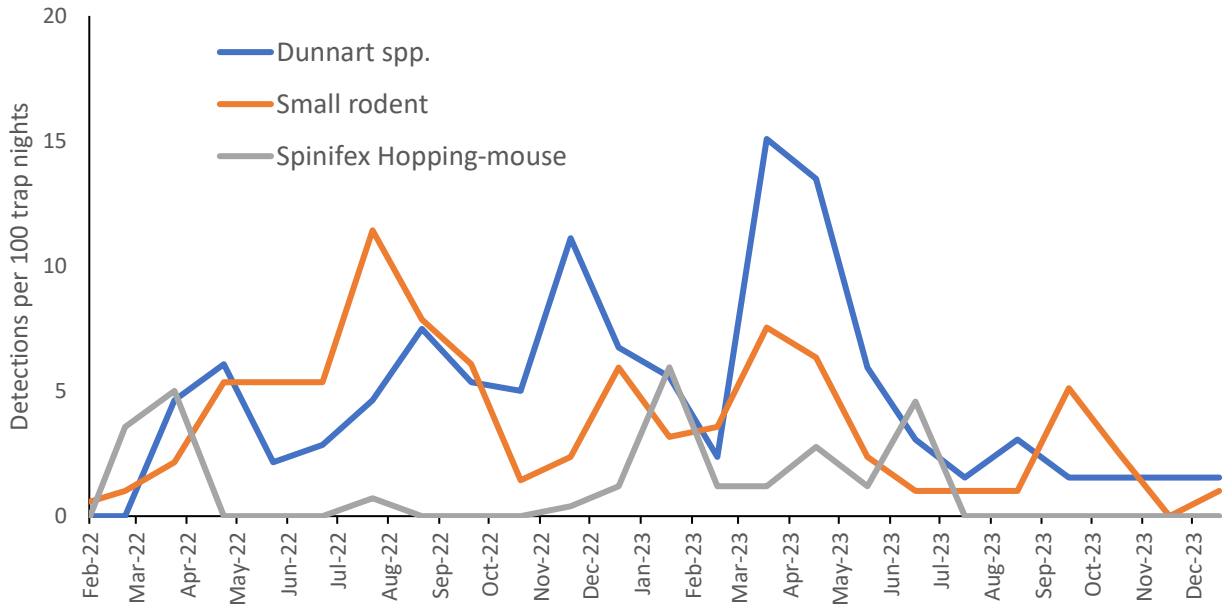

Figure 5. Detection rates of dunnarts, small rodents (<20g) and Spinifex Hopping mice at the South Gap EPBC offset area.

4.3 Goal 3 - Reduce predation pressure

We have conducted four feral predator control trips in the South Gap EPBC offset area during 2023, conducted by the professional shooters Graham Miller and Phil Johns. On these trips, six feral cat and two red fox have been shot. To monitor trends in feral animals and place this control in context, we have spread 20 Swift Enduro Pro remote cameras across the paddock (Fig. 6). These were deployed in February 2022, and have been continuously deployed since then. From these cameras, fox activity has decreased on site (Fig 7). There was a spike in cat activity during July this year, although this has abated. Feral predator control will be continued through 2024.

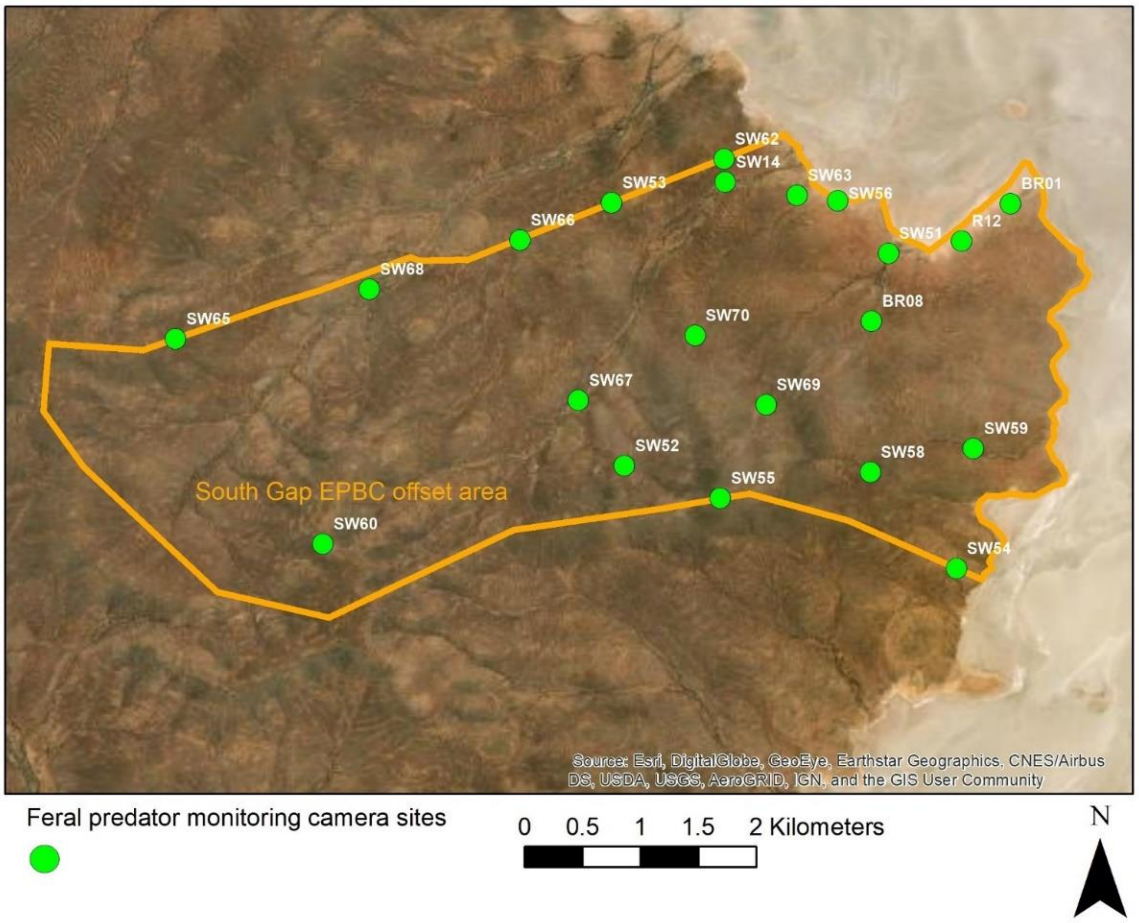

Figure 6. Location of the remote camera sites used at the South Gap EPBC offset area to monitor feral predators from 2022 and 2023.

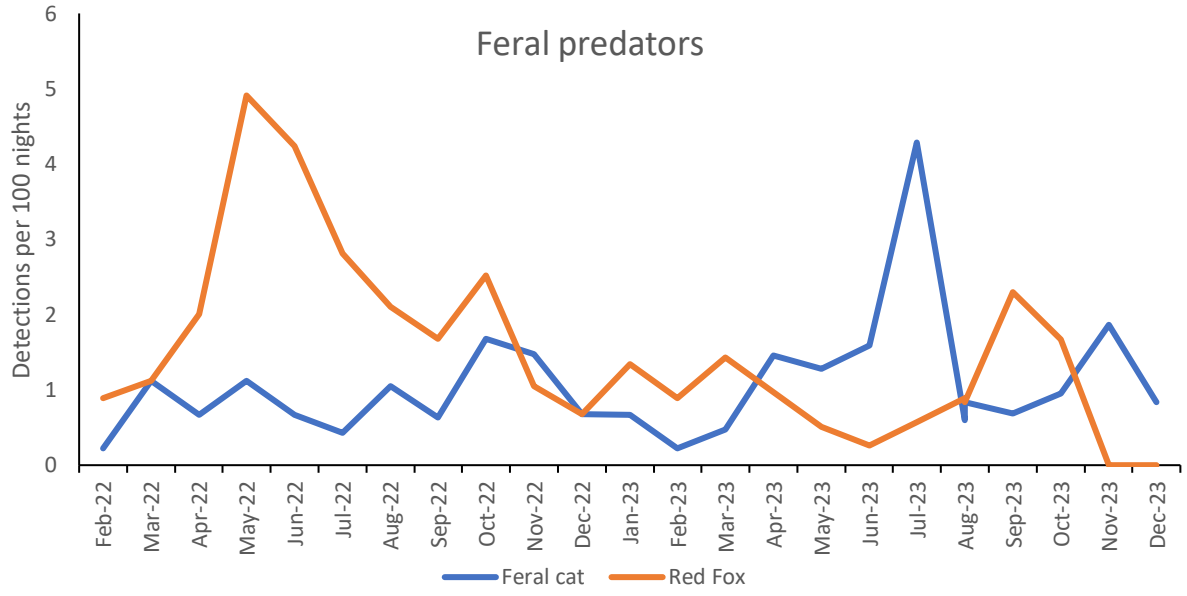

Figure 7. Detection rates of Feral cats and Red Fox at remote camera trap sites spread across South Gap EPBC offset area from intial deployment in Feb 2022 to August 2023.

4.4 Goal 4 - Maintain habitat condition through management of grazing and invasive weeds

To maintain and enhance habitat condition, we aim to reduce total grazing pressure to prevent negative impacts to vegetation. Primarily, this is achieved using stock-proof perimeter fence and removal of sheep and goats. We also control rabbits and aim to manage kangaroo numbers. In this section, we will begin discussing the current condition of the fence, then report on the activity of each of the main herbivores.

4.4.1 Fence condition

The northern fence line was in poor condition during 2023. There were five breaches anecdotally detected, and patched, in April and May 2023. A fence audit was conducted in August 2023, which involved driving the full boundary looking ingress points where sheep were able to breach the fence and taking photos and recordings of each patch. In total, nine ingress points were found (Fig. 8). Two points consisted of approximately 100 m sections where star pickets have corroded to ground level, and the whole fence has fallen. There were multiple sheep tracks crossings over these sections. The other seven ingress points consisted of gaps 30 cm or greater under the fence, usually in a hollow or creekline (Fig 9). All of these had wool attached to the lower rung of strainer wire, suggesting many sheep have been going in and out. The western and southern fence line were in good condition. Despite the fact the fence was down for most of 2023, the offsetr was in no worse condition than when management commenced.

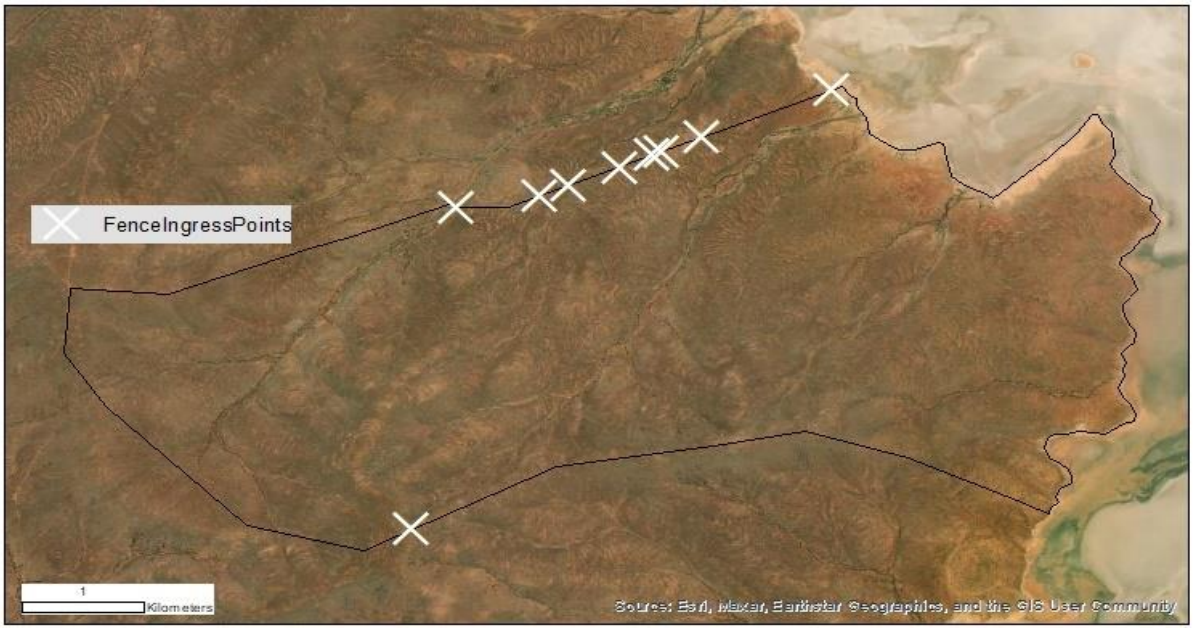

Figure 8. Location of the nine ingress points found on the boundary fence where there was evidence of domestic sheep getting in and out of the South Gap EPBC offs et area.

Figure 9. Example of stock ingress points on the fence line, where there is a large gap under the fence and wool deposited on the wires after frequent use.

The northern boundary fence was not in stock-proof condition during 2023. A full replacement was constructed in 2024, and all stock were mustered out.

4.4.2 Sheep activity

Sheep were prevalent on the South Gap EPBC offset area during 2023. Based on the remote cameras set to monitor feral animals, we have recorded a substantial increase in sheep activity after April 2023 (Fig 10). They were essentially a permanent presence. Although the previous year in 2022 there was a large flock of sheep that in September 2022, these were soon removed and most of the year was sheep-free. The decline in sheep activity later in 2023 corresponds with drier conditions. Although sheep activity was higher in 2023 than 2022 or 2021, it would still have been lower than activity prior to the EPBC offset being created and southern fence set up.

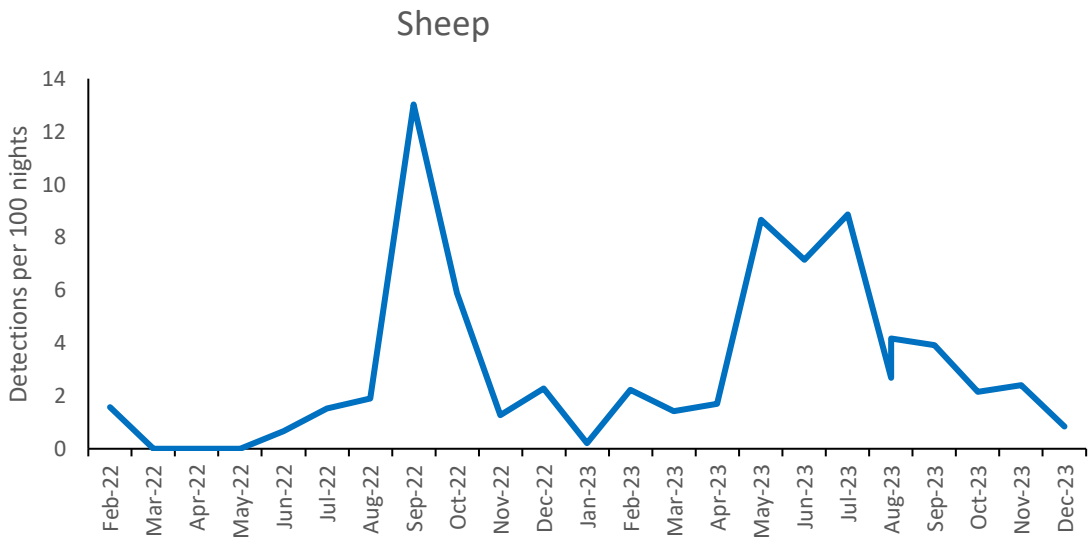

Figure 10. Sheep activity at the 16 remote cameras set to monitor feral animals.

4.4.3 Goats

Despite the large influx of domestic sheep, no goats have been detected on remote cameras inside the South Gap EPBC offset area since February 2023.

4.4.4 Rabbits

Our management of the South Gap EPBC offset area aims to reduce rabbit activity by 80 % through mapping then ripping warrens. However, monitoring began in 2020 at the end of a long drought. Rabbit activity was extremely low in 2021, and there were few active warrens. Therefore, our original aims were not necessarily relevant. Instead, over the last few years we have aimed to keep rabbit numbers low. We monitor the distribution and number of warrens across the offset area, along with broad activity of rabbits on whole EPBC offset area.

Rabbit monitoring methods: To monitor the distribution and locations of rabbit warrens, we conduct walking transects. Transects are 1–15 km long, and all rabbit warrens and sign are recorded. On each trip, we conduct at least three transects. As rabbit activity was focused on the sand habitat on the banks of Lake Torrens, we also conduct a 6 km walking transect around this habitat on every trip. This has been done four times every year since 2021. During 2023, we were able to conduct 56 km of walking transects over four different field trips (April, May, August, and December). These include four transects in the sandy banks of Lake Torrens (Fig 11). The other 16 transects were typically shorter, and focused on habitats where possible rabbit warrens were detected on satellite imagery. To monitor rabbit activity across the site, we report on rabbit detections rates on the feral animal remote cameras (see 4.3). These rates are converted to detection rate per 100 trap nights.

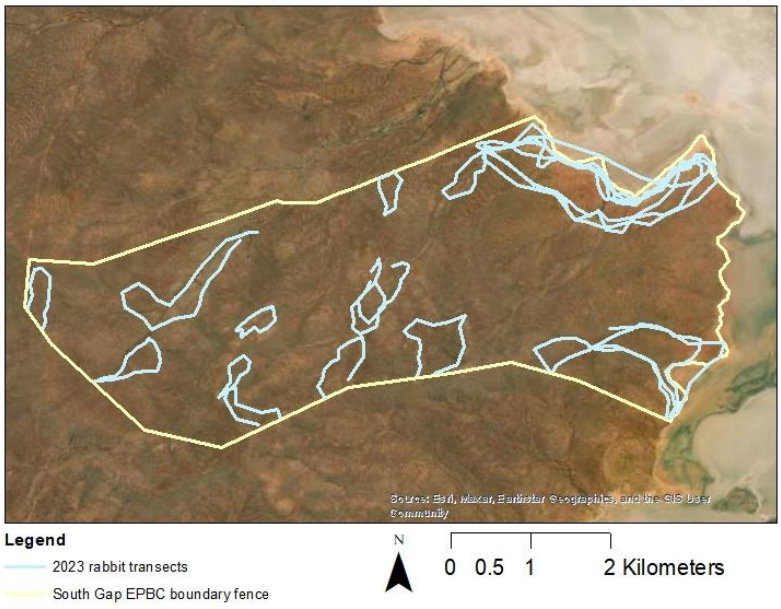

Figure 11. Map of the rabbit sign transects conducted during 2023. The tracks in the north-east corner are part of regular monitoring transect.

Rabbit activity and control: Rabbit activity fluctuated substantially during 2023. We only located active rabbit warrens in the sandy habitat. There were no active warrens outside this area. All other possible old warrens that we visited in calcite habitats were completely flat and devoid of entrances. The number of active rabbit warrens in sandy habitat peaked in April 2023 (21 warrens at 2.3 per km). After this peak was recorded, we conducted rabbit control, which involved going to all known burrows, and placing a fumigant at least 60 cm down a warren entrance. That and all other entrances were then collapsed. We revisited these warrens one month later in May 2023 to find that the majority of those rabbit warrens were re-activated (16 of the 21).

Despite many of the warrens reactivating post fumigation in May 2023, we recorded a substantial subsequent decline in rabbit activity across the South Gap EPBC offset area (Fig 12). By December, we had almost zero detections on the walking transect and on the remote cameras (Fig 13). This decline corresponds with a wider regional decline as anecdotally noted by other ecologists in the region (Dr John Read, personal communication). It is unlikely this decline is mostly attributable to our management, as it was regional and continued well after our fumigation. However, it does appear at minimum that our control is causing temporary reprieves from rabbit numbers. During 2024, we could move toward control occurring more frequently.

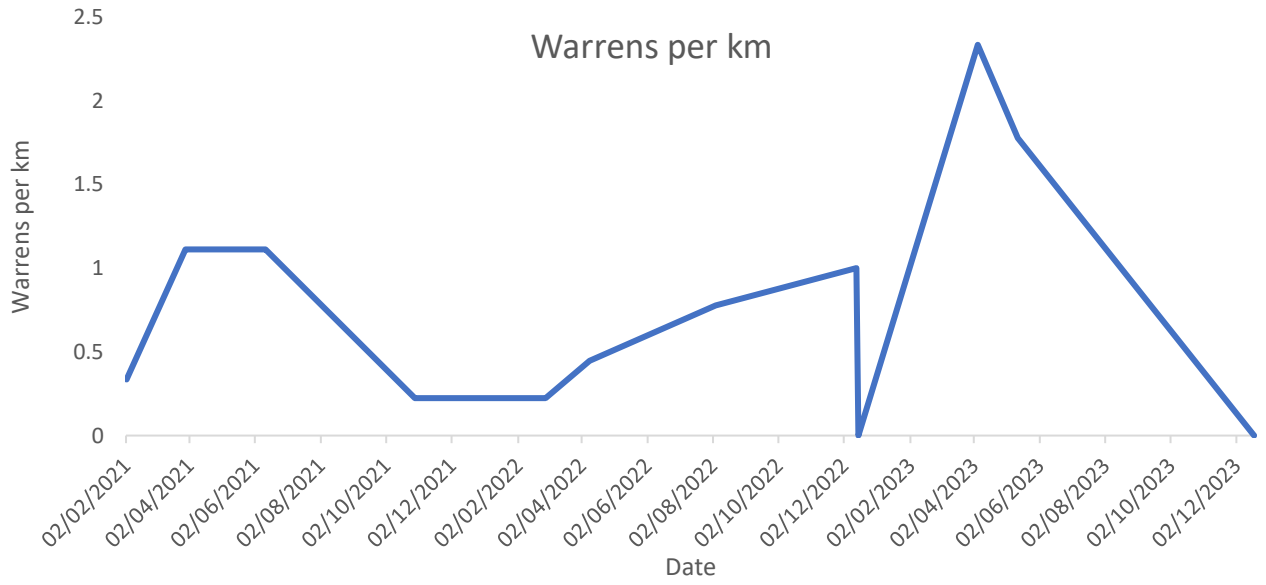

Figure 12. Count of warrens along the walking transect that includes the sandy section on the banks of Lake Torrens.

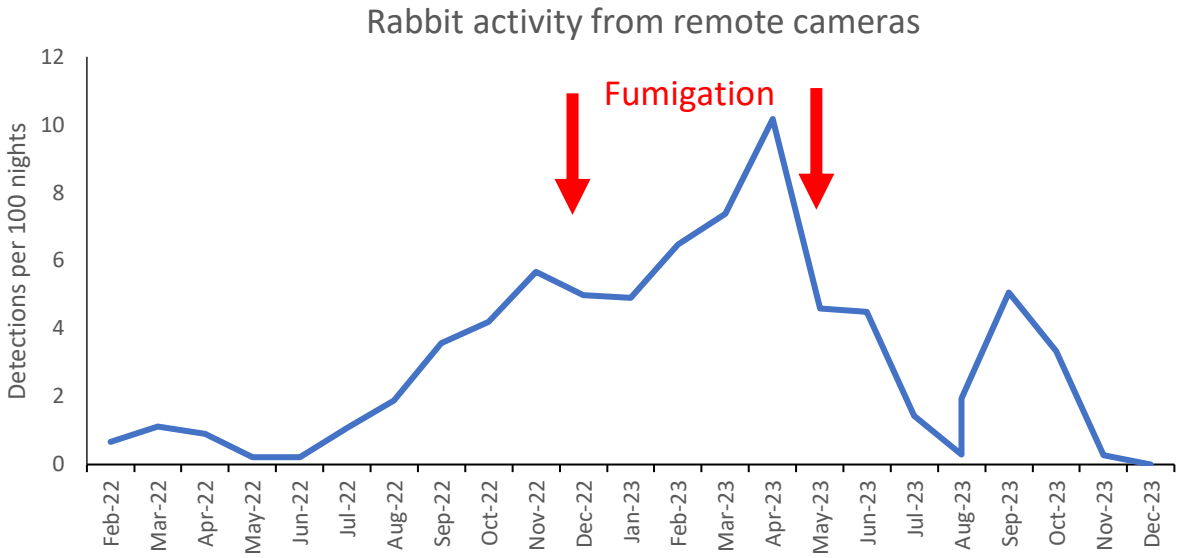

Figure 13. Activity rates of rabbits from 16 remote cameras at the South Gap EPBC offset area. Red arrows indicate when direct control of rabbits was conducted, involving collapsing and fumigating rabbit warrens.

4.4.5 Kangaroos

We measure kangaroo activity both by detection rates on remote cameras and using thermal camera point-based surveys. For the former, we count detections on the feral animal remote camera array, then average this across all cameras. For thermal camera point-counts, we drove the central road at night stopping every 500m. At each stop, all lights are turned off and we use the thermal camera to conduct a full 360˚ scan for animals. For each detection we measure count of individuals and distance. Kangaroo activity has steadily increased at the South Gap EPBC offset area during 2023, both as recorded on remote cameras (Fig 14) and in the thermal camera surveys (Fig 15). However, as of September, kangaroo numbers remained stable and decreased, likely due to drying conditions.

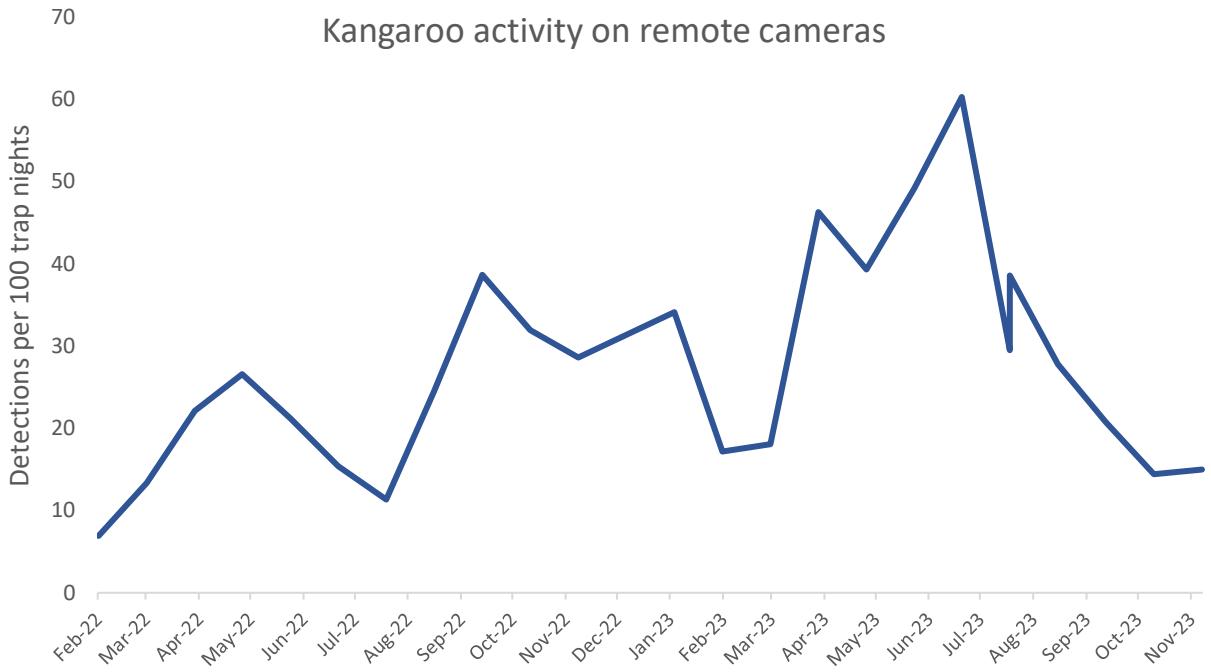

Figure 14. Activity rates of kangaroos (both Red Kangaroos and Euros) from remote cameras at the South Gap EPBC offset area.

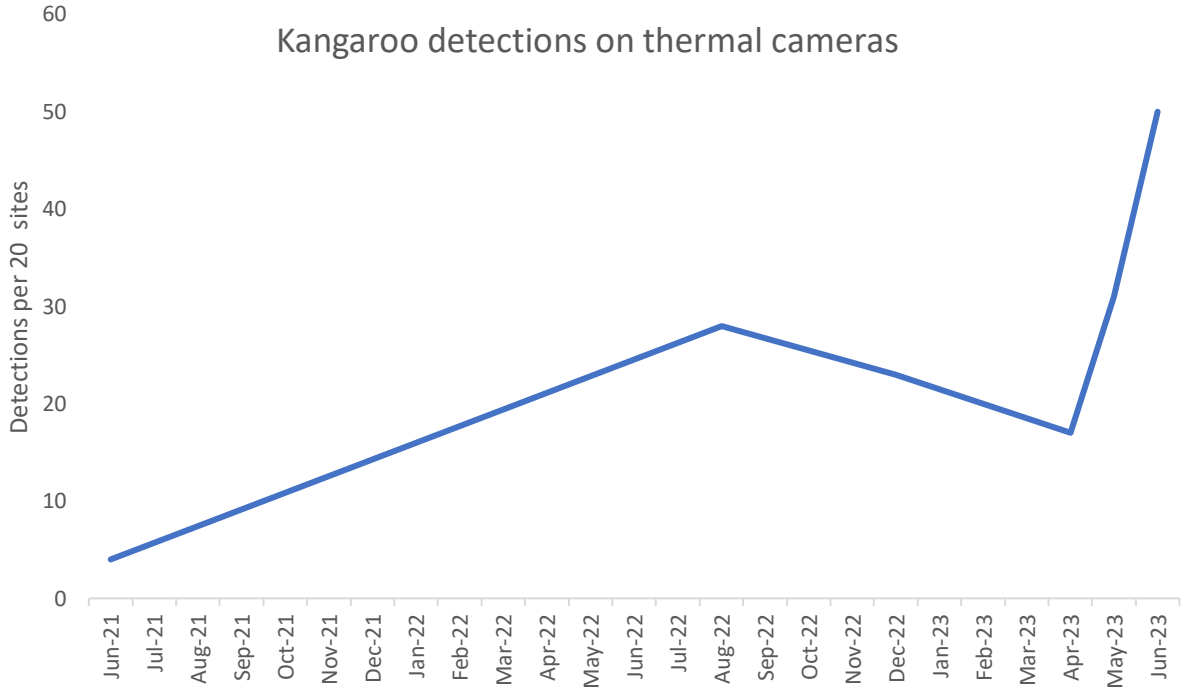

Figure 15. Count of kangaroos seen using thermal camera at 20 sites in the South Gap EPBC offset area.

4.5 Goal 5- Improve knowledge of local target species populations, including how they respond to management locally.

The only other threatened species with a high chance of being found on the South Gap EPBC offset area is the Thick-billed Grasswren (*Amytornis modestus* , Fig 16). This is a large wren, currently found in dense saltbush to the north, it has never been detected as far south as South Gap (Black, Carpenter et al. 2011), despite habitat appearing similar. There was a potential sighting on the 30th August where Field Ecologist Dr Hugh McGregor saw a large wren hopping over the road in a grasswren-like fashion. It seemed larger than a Rufous Fieldwren. Unfortunately, there was a strong wind, and it could not be enticed with call playback. The habitat around this sighting was dense old samphire and saltbush. Two remote cameras were set nearby in dense shrubs. In December 2023, these cameras were collected and targeted surveys for this species conducted at five sites. The latter consisted of call-playback followed by 20 minutes of active search. No Thick-billed Grasswrens were recorded during subsequent survey, although Rufous Field-wrens were detected at all sites. Further survey for this species will be conducted during 2024, and an audio-recording device will be set up to increase our chances of detecting them if on site.

Evening surveys were conducted for the Night Parrot on three occasions. These involved going to an ideal habitat location and listening for calls from dusk to nautical twilight. The survey was conducted by Hugh McGregor, who has seen and heard night parrots on multiple occasions at Pullen Pullen reserve in western Queensland and is a coauthor on two papers regarding their management. No parrots were heard. This is not surprising, as there have been no recent confirmed records of this species in South Australia over the last 70 years.

Other wildlife highlights over 2023 include flocks of Orange Chats (*Epthianura aurifrons*), Inland Thornbills (*Acanthiza apicalis*), nesting Blue Bonnets (*Northiella haematogaster*), and a family of Wedge-tailed Eagles (*Aquila audax*).

Figure 16. Thick-billed Grasswren from Witchelina Nature Reserve. Photo by Dr Marina Louter

6. Infrastructure

Roads have remained functional through 2023. The access road via Pernatty was accessible by 4WD, although rocky. It was graded again in late 2023. The access road via South Gap homestead is difficult yet still useable. All internal roads through the paddock are usable to a 4WD and do not require extra grading or fixing (Fig 17). So far, these roads have been adequate for all needs. We do not believe a new road is required, nor is grading on site, as the extra clearing and damage to vegetation would outweigh potential benefits at this stage.

Figure 17. Example of a road inside the South Gap EPBC offset area.

7. Future Priorities

For 2024, we will continue all ongoing monitoring and management actions. Extra priorities include:

- Maintain the northern boundary fence
- Begin survey for Plains Mice across the surrounding region
- Set at least four small grazing exclusion fences around cracking clay sites
- Begin monitoring of feral animals at a site outside the offset area where no conservation management is conducted, to better inform the impacts of our methods.
- Conduct further Thick-billed Grass-wren survey, and possibly deploy sound recording devices

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